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ABSTRACTS

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0001 (153517)

Dynamic Bioactive Interface with the Dental Tissues

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Objectives: To investigate the morphological and chemical characteristics of the interface between human dentine and a new calcium silicate based dental cement (Biodentine™-Septodont, Saint Maur des Fosses- France).

Methods: Occlusal cavities were prepared in extracted human teeth. Cavities were filled with Biodentine (n=26), and Fuji IX Glass ionomer cement (GIC)(n=11). Samples were divided into three groups; Micro-permeability group, where Rhodamine-B dye solution was applied into exposed pulp chambers of Biodentine (n=14) and GIC (n=5) samples. In the second "double labelling" group, Biodentine (n=6) and GIC (n=3) cements were mixed with a fluorescent dye then applied into the cavities just before conducting micropermeability test. These samples were examined using confocal microscopes after sectioning and polishing. In the third group; Biodentine (n =6) and GIC (n=3) samples were kept in distilled water for two days after mixing, then sectioned and polished before they were examined using a micro-Raman spectroscopy to obtain chemical maps for the interfaces. Furthermore, fractured surfaces of these interfaces were examined using the SEM.

Results: A highly reflective band was detected just beneath the dentine-Biodentine interface in reflection mode confocal images. Double labelled samples revealed a highly permeable zone beneath the interface which was richly infiltrated by the fluorescent dye leaching out of both cements but with two different patterns, indicating an inversed effect of these cements on the peritubular and intertubular dentine. Structural changes were confirmed by the SEM images that showed a band of structurally altered dentine beneath the interface, and tag-like structures forming within the dentinal tubules. Raman maps indicated an increase in the carbonate content of interfacial dentine, which suggested intertubular diffusion of Biodentine hydration products.

Conclusions: The dentine Biodentine interface is dynamic and interactive; that is manifested by water movement between the two substrates, and hydrated cement diffusion into the dentine, accompanied by microstructural changes.

0002 (153518)

In Vivo Evaluation of the Bioactivity of a Tri-Calcium Silicate Cement, An Experimental Animal Approach

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Objectives: Biodentine, a new experimental Ca₃SiO₅-based restorative cement, intends to be a glass ionomer cement and composite-resin substitute in restorative dentistry. Our aim was to evaluate in vivo the bioactive effects of Biodentine as assumed from the formation of reactionary and reparative dentins in a in vivo animal model.

Methods: Using 6-7 week-old rat, half-moon cavities were prepared on the mesial aspect of the first maxillary molar with and without pulp exposure. The cavities were i) left unfilled (sham group) or ii) filled either with a glass-ionomer cement (control group) or iii) with Biodentine (experimental group). The rats were killed by perfusion through the heart with the fixative solution 8, 15 or 30 days, and 3 months after the dental treatment. Block sections including the three maxillary molars were demineralised and processed for light microscopy. After histological processing measurements were done on micrographs.

Results: In the absence of pulp exposure, after 8 days a slight inflammatory reaction was seen in each group of rats. In the Biodentine group, a dentin layer of reactionary dentin started to be formed by the odontoblasts, slightly thicker than in the 2 other groups. After 15 days, a tendency to spontaneous repair was observed in the pulps of the sham and control groups. In the Biodentine group, close to the cavity, a 40-80 µm thick layer of reactionary dentin protected the pulp. In the Biodentine group, after one month, the mesial part of pulp was partially filled with a homogenous dentin-like material (160µm) whereas the rest of pulp appeared normal. Reactionary dentin was also seen along the root canal. After three months, the thickness of a homogenous reactionary dentin was unchanged compared with the 1 months reaction. After pulp exposure and direct pulp capping, Biodentine-induced reparative dentin was observed, displaying both a lack of cytotoxicity and bioactive properties.

Conclusions: The present data i) suggests that Biodentine displays novel bioactive properties, ii) stimulates the formation of reactionary dentin in the rat molar model shortly after a switch on, iii) there is actually a "switch off", keeping the remaining pulp alive, iv) used as direct capping agent Biodentine seems to be efficient in the formation of reparative dentin. For ref. see: Boukpepsi T, Septier D, Goldberg M. Animal studies, in "Biocompatibility and cytotoxic effects of dental composites", M. Goldberg ed. Coxmoor, Oxford, UK2009, pp 200-203.

0003 (153519)

Pulp Cells Response and Dentine Regeneration

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This work was carried out to investigate Biodentine as dentin substitute by studying its interactions with dental pulp tissues. The interaction of Biodentine with pulp cells was investigated on cell cultures from human third molars (30000cells/cm²). Samples of the material, prepared according to the manufacturer's instructions, were incubated in DMEM medium at determined surface/medium volume ratios. After 24 hours, these conditioned media were incubated with injured or intact cells. Transforming Growth Factor-β1 (TGF β1) quantification in the supernatants was performed with ELISA test. Differentiation and mineralization markers were investigated after incubation of cells with Biodentine extracts for 4 weeks. Immature third molars were used to investigate the effect of Biodentine on dentin regeneration using the human entire tooth culture model. A cavity with pulp exposure was performed per tooth under sterile saline coolant and Biodentine was applied as a pulp capping material. The teeth apical part was dipped in DMEM medium and cultured for different periods. After 24 hours incubation with Biodentine extracts, a significant induction of TGF β1 secretion from injured cells was observed. Interestingly, after 4 weeks, the cultured cells expressed odontoblastic markers and showed mineralized nodules formation. These results were confirmed in the entire tooth culture model. Indeed, after tooth pulp capping with Biodentine, mineralized foci including sequestered cells were observed after 14 days just beneath the material in the wound area and this increased after 4 weeks. Collagen I, Osteonectin and Dentin Sialoprotein were expressed in the mineralized matrix and in the sequestered cells which also expressed Nestin. Taken together, these results show that Biodentine induced odontoblast differentiation via induction of TGF β1 secretion by injured cells. The resulting matrix has the dentin molecular characteristics and the matrix-sequestered cells express the odontoblast molecular markers. These results strongly suggest that Biodentine is bioactive and stimulates dentin regeneration.

0004 (153520)

Development and Pre-Clinical Evaluations of a Novel Dentine Substitute

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A new material in the field of restorative dentistry has to combine physical and biological properties with sealing capacity and handling properties. It's a long way from the characterization of the material and the setting reaction to the clinical trials but it's also a beautiful challenge to improve and to evaluate a new material in the same time. Most of the behaviour and of the physical properties of tri calcium silicate cements could be explained from the scientific literature of concrete and from the understanding of the different speciations of water inside the cement: adsorbed, inter-layer or linked. Then, the characterization of the setting process can easily be evaluated by the evolution of the different mechanical properties such as microhardness, flexural strength, compressive strength. However, the understanding of the behaviour of the interface with dental tissues needs other methodologies such as impedance spectroscopy, dye penetration measurements,

SEM observations. The main interest of this kind of dentin substitute is the crystallization of a “hydroxyapatite like” material inside the dentine tubules without any kind of dentin conditioning. It's there the opportunity to seal the interface and to improve the quality of sealing with time while many other materials are decreasing regarding this property. We called these crystals “mineral tags” because of the structure and of the localization of these new formations. Obviously, we are now going to evaluate with more sophisticated devices the interface between dentine and calcium silicate cements to demonstrate the potential of such material in term of bioactivity.

0005 (152014)

Cell Biofilm For Tissue Engineering

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Cell spray deposition techniques for the needs of tissue engineering are being actively developed during the last few years. They permit easier deposition of cells on surfaces with complex configurations, creation of cell multilayers and three-dimensional cell cultures.

Objectives: The aim of the present study was to optimize the parameters of cell spray deposition (cell concentration, cell environment during the spraying process, and functionalization of surfaces) in order to achieve better cell adhesion, improved cell vitality and cell proliferation on the surface.

Methods: Two cell lines were used in the experiments: human pulp fibroblasts isolated from freshly extracted teeth and immortalized oral keratinocytes, TERT-2 OKF-6 (BWH Cell Culture and Microscopy Core, Boston, MA, USA). The method of non-automatic nebulization in sterile conditions was used for cell deposition. Surfaces were functionalized prior to cell spraying with either different configurations of poly-lysine (PLL)/poly-glutamic acid (PGA) multilayers or with a collagen film (Collagen Type I from calf skin). Cell characterization was performed at 24, 72 hours and 7 days after deposition using fluorescence microscopy (Nikon TE 2000), FDA/PI vital cell coloration and atomic force microscopy (AFM- MFP3D Asylum Research) in tapping and/or contact mode

Results: Fluorescence microscopy images recorded on the seventh day after cell deposition proved cell survival after the spraying and evidenced the pattern of cell vitality for this period. Cell surface imaging and force mapping via AFM in force-volume mode provided the characteristics and variations of cell morphology and cell elasticity. These measurements confirmed cell adhesion on the functionalized surfaces and enabled identifying the optimal surface functionalization for an improved cell adhesion and proliferation.

Conclusion: Cell spraying is an innovative method for cell deposition onto different types of surfaces that can constitute a valuable technique in cell engineering.

0006 (152169)

Preparation of calcium phosphate coatings on titanium by ND:YAG laser

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Objectives: The biocompatibility, osteointegration of the titanium implants, which are mainly used in dentistry essentially depends on both the morphology and chemical composition of the surface, i.e. on the interface between the bio-tissue and the implant. The aim of the study was to create a new biomimetic surface where the hydroxyl apatite (HA) was fixed on titanium (Ti) surface using ND: YAG laser.

Methods: 10 sample of 10x10x2mm Ti plates were used. The samples were covered by a layer of HA, which was fixed with the treatment of the laser on the Ti surface. The laser processing of the surface was carried out at normal atmosphere conditions using the 106 µm wavelength output of an ND: YAG laser. The surface modification was investigated by optical (Car Zeiss, AXIOTEC) and scanning electron microscope (Hitachi S-4300), moreover the cross-section of the sample was analysed by energy dispersive X-ray analysis (EDX).

Results: The EDX revealed that a specific surface microstructure, micro-heterogeneous titanium-calcium phosphate coatings can be fabricated by the developed method which may further influence the osteointegration of Ti implants due to the changes of surface morphology, chemical stability, bio-activity.

Conclusions: More versatile bioactive coating may be created this way in comparison with the known plasma spray method. The work/publication is supported by the TÁMOP 4.2.1/B-09/1/KONV-2010-0007 project. The project is co-financed by the European Union and the European Social Fund.

0007 (151470)

Surface properties of nano-structured TiO2 for dental implants design

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Objectives: The objective of this study is to characterize the interactions and the adsorption of some small organic molecules on nano-structured Ti surfaces and to characterize them by using different spectroscopies, such as X-photoelectron spectroscopy (XPS), infrared (IR) spectroscopy and scanning electron microscope (SEM), which may define the ideal surface properties for better biological results of dental implants.

Methods: Titanium nanotubes arrays were fabricated by anodic oxidation of titanium samples in a fluoride-based solution at a constant potential. We have studied the adsorption of sodium phosphate Na3PO4, aspartic acid HOOCCH(NH2)CH2COOH and Amoxicilline C16 H19N3O5S. The molecular deposition was carried out by two methods; the first one was electro-deposition and the other was simply immersing the samples in the solution and then rinsing.

Results: Scanning electron microscope (SEM) showed the morphology of the fabricated nanotubes arrays. Results obtained from infrared spectroscopy showed that the molecular adsorption by nano-structured titanium is realizable in both methods and infrared spectroscopy allows us to highlight differences in the mechanism of adsorption between early and late filing of deposit. Similarly, different levels of adsorption can be observed according to the potential of working electrode and the molecules themselves. X-photoelectron spectroscopy (XPS) confirmed the previous results.

Conclusion: Molecular adsorption by titanium nanotubes arrays is realizable and it depends on many factors such as the conditions of deposition, the size of nanotubes and the studied molecules.

0008 (151390)

Palatal implant supported versus conventional dental anchorage in adolescents

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Objectives: Clinical comparison of the osseointegrated palatal implant (PI) supported anchorage with conventional dental anchorage (DA) for the two-phase retraction, in extraction cases requiring 'maximum anchorage', in growing patients after post pubertal growth spurt.

Subjects and methods: 30 patients selected with homogeneous facial skeletal characteristics (mean age: 14.22±1.37 years) were randomly allocated in two groups. In the PI group (n=15) Orthosystem® implants were placed into the palate for absolute anchorage and in each case a 1.2 x 1.2 mm thick rigid TPA was fixed to the implant and to the molar bands by laser welding. In the DA group (n=15) the maximal anchorage was provided by a TPA and a 0.017 x 0.025 inch SS utility arch. A super-elastic closed-coil spring was used for canine retraction. Sequential activation of the 'teardrop' closing loop of the SS contraction arch was used for incisor 'en

mass' retraction. The main outcome measures were duration of the orthodontic treatment phases and cephalometric analysis of maxillary first molar movement. **Results:** Insignificant difference ($p=0.47$) was observed between the groups regarding the duration of the extraction's gap closure. In the PI group the duration of the front retraction ($p < 0.001$) and the total treatment time was shorter ($p < 0.05$). No significant difference in molar mesial movement was found in both treatment phases even if the net molar anchorage loss was 4.35 ± 1.69 mm in the DA group while 3.7 ± 1.94 mm in the PI group. ($p=0.35$) **Conclusions:** Stable implant supported anchorage could be demonstrated, in conclusion the possible 'maximum anchorage' was proved in this study. A shorter orthodontic treatment period was achieved by fastening the anchorage teeth to palatal implant, compared to dental anchorage. The use of palatal implant was without complication, representing a safe alternative in growing adolescents for 'maximum anchorage' cases.

0009 (152015)

Bone healing around implants in two colitis rat models

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Objectives: Crohn's disease is a chronic inflammatory process of the gastrointestinal system that has recently been associated with a higher risk of early implant failures. However, we currently lack information on the impact of colitis on the process of peri-implant bone regeneration. Aim: To provide this information based on preclinical models of a chemically induced inflammatory gastrointestinal system.

Methods: In the first model, colitis was induced by intrarectal instillation of 2,4,6-trinitro benzene sulfonic acid (TNBS). In the second model, colitis was induced by feeding rats with dextran sodium sulfate (DSS) polymers in the drinking water. One week after disease induction, miniscrews were inserted into the tibia. Four weeks after implantation, peri-implant bone volume per tissue volume (BV/TV) and bone-to-implant contacts (BIC) were determined by histomorphometric analysis.

Results: Cortical histomorphometric parameters were similar in the control, DSS and TNBS groups. Cortical BV/TV was $92.2 \pm 3.7\%$, $92.0 \pm 3.0\%$ and $92.6 \pm 2.7\%$ - and BIC was $81.3 \pm 8.8\%$, $83.2 \pm 8.4\%$ and $84.0 \pm 7.0\%$, respectively. Also no significant differences were observed when comparing the medullary BV/TV and BIC ($19.5 \pm 6.4\%$, $16.2 \pm 5.6\%$ and $15.4 \pm 9.0\%$) and ($48.8 \pm 12.9\%$, 49.2 ± 6.2 and $41.9 \pm 11.7\%$), respectively. Successful induction of colitis was confirmed by loss of body weight and morphology of the gut.

Conclusion: The results suggest that bone regeneration around implants is not impaired in chemically-induced colitis models. These findings can be considered a primer for further studies aiming to understand the cause of early implant failures in patients with Crohn's disease.

0010 (153803)

New Challenges in Drug Research: Nonsynaptic Receptors and Transporters in the CNS

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0011 (151326)

Diffuse Reflectance of Dental Materials After Staining: A Comparative Study

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Objectives: To evaluate in vitro, the color staining susceptibility of eight popular composite resins used in general practice, after immersion in staining solutions.

Methods: Samples of eight light-cured composite resins (Filtek™ Z250 (FZ250), Filtek™ Silorane (FS) and the Filtek™ Supreme XTE system (enamel: FXTEE, dentin: FXTED, body: FXTEB) from 3M-ESPE; Enamel HRI™ system (enamel: EHRIE, dentin: EHRIID) from Micerium S.p.A and Durafill VS (DVS) from Heraeus Kulzer), ($n=32$) (12mm in diameter, 2mm in thickness) were made. All specimens were then immersed in distilled water (control-group), red wine (Quinta dos Ganhões – Alentejo, Portugal), espresso coffee (Nespresso "Roma" blend - Nestlé, Switzerland) and black label tea (Lipton Yellow Label Tea - Lipton, France), for a period of 72 hours and kept in an incubator at 37°C. Reflectances in the UV-Vis-NIR spectral range and also the remission function (plotted in terms of $F(R)$ – Kubelka-Munk equation) were measured by a spectrophotometer (equipped with a ICCD Andor optical sensor model i-Star 720 and a 450W Xenon lamp) through ground-state diffuse reflectance absorption spectra.

Results: All dental materials immersed in staining solutions presented a generalized increase on their remission function. The highest remission variation was observed for EHRIE with espresso coffee, while the lowest variation was observed for FS with black label tea. Red wine proved to have the highest staining potential for all resins followed by espresso coffee. Black label tea showed the lowest staining potential.

Conclusion: All the resin composites in this study were susceptible to pigmentation, with some variation depending on the constituent monomers, the volume percentage of inorganic filler and the staining solutions.

0012 (151595)

Two-Body Wear Test of Three Restorative Materials Opposing Human Enamel

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Objectives: Aim of the study was to evaluate the wear depth of different restorative materials subjected to a two-body wear test against human enamel cusps using a Dual Axis Chewing simulator.

Methods: Three restorative materials were selected and stratified into cylindrical molds: Filtek Silorane (3M ESPE), Tetric EvoCeram (Ivoclar Vivadent) and GrandioSO (VOCO GmbH). As control, enamel specimens were obtained from crown's buccal aspect of caries-free, freshly extracted molars. All samples were placed inside the chamber of a Dual Axis Chewing Simulator with physiological saline and tested against mesio-palatal enamel cusps, cut out of similar molars. Cusps were ground and polished to a 3-mm spherical radius shape with 1000-grit silicon carbide paper. On each sample 120000 cycles were performed. All samples were subjected to a quantitative surface analysis using a profilometer and the vertical substance loss (μm) was recorded. Mean values were statistically compared (One-Way-ANOVA).

Results: The vertical substance loss for human enamel specimens was $63.48 \mu\text{m}$. Filtek Silorane showed the overall highest value ($206.81 \mu\text{m}$). The closest to human enamel (control) values were achieved with GrandioSO restorative.

Conclusions: After 120000 cycles, equivalent to about 6 months of chewing, commonly used restorative materials showed a dissimilar wear pattern compared to that of human enamel. Among the several properties of restorative materials, a wear resistance as close as possible to that of human enamel should be preferred by the clinician.

CTE Determination Of 5 Composites Using ESPI

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Objectives: The coefficient of thermal expansion (CTE) provides a measure of the dimensional stability during heating or cooling. For dental restorations, this may have an important influence on their marginal integrity: the greater the difference of CTE between tooth and restoration, the more one may expect marginal leakage. Various methods have been used to measure CTE in dental composites. Electronic speckle pattern-correlation interferometry (ESPI) is a non-contact non-destructive full-filled laser-based deformation measurement tool. The aim of this study is the determination of CTE of 5 different dental composites using ESPI.

Methods: One microhybride (Arabesk Top®), two nanohybrides (Grandio Flow®, Grandio Top®) and two ormocers Admira Flow® and Admira® were tested. Five dry samples sized 15×15×1 mm³ were produced and measured 24 hours after conventional light-curing at room temperature. The samples were fixed on a Peltier-element with a thermo-paste and sub-micrometer surface deformations were measured during heating from 25°-65° by ESPI (Q300, DantecEttemeyer, Ulm, Germany). Standard aluminum with a well known CTE of 23,5*10⁻⁶ /°C was used as reference. The differences among the composites were analyzed using one way ANOVA.

Results: The following CTE's (x10⁻⁶ /°C and standard deviations) were found for Admira-Flow, Admira, Arabek-Top, Grandio-Flow and Grandio-Top: 42.9 (5.9), 39.2 (6.5), 33.0 (9.4), 29.6 (3.7) and 18.6 (2.8) respectively.

Conclusions: The high sensitivity of ESPI is an advantage for the non-contact and reproducible determination of CTE in dental-composites. Both filler content matrix affect the CTE. The highly filled nanohybride Grandio Top® has a CTE closest to that found in tooth crown (11.4×10⁻⁶ /°C).

Fracture toughness of dental restorative materials

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Objectives: The ability of a restorative material to withstand fracture is of crucial importance especially in stress bearing area. The study aim therefore to analyse the fracture toughness of a large number of dental restorative materials categories.

Materials and Methods: The fracture toughness (K_{IC}) of 69 restorative materials belonging to 10 materials categories – Micro-hybrid, Nanofilled, Microfilled, Packable, Ormocer-based and Flowable resin-based Composites (RBC), Compomers and Flowable Compomers as well as Glass Ionomer Cements (GIC) and Resin-modified GIC was measured by means of the single-edge notched-beam method after storing the samples (n=8) for 24h in distilled water. Data were analyzed with the one-way ANOVA followed by the Tukey's test and partial eta-squared statistics (p < 0.05).

Results: Large variations between the tested materials within a material category were found. The lowest K_{IC} was reached in the GIC-group, followed by the microfilled-RBCs, resin-modified GIC and flowable compomers, which do not differ significantly among each other as a material group. The ormocer-based, packable and micro-hybrid RBCs performed statistically similar, reaching the highest K_{IC} values. Between the two categories of flowables – composites and compomers – no differences were measured.

Material Type	K _{IC} [MPa√m]
GIC	0.45 ^a (.12)
Microfilled-RBCs	1.02 ^b (.22)
Resin-modified-GIC	1.12 ^{bc} (.33)
Flowable compomers	1.29 ^{bcd} (.37)
Flowable-RBCs	1.41 ^{cde} (.32)
Compomers	1.44 ^{cde} (.46)
Nano-RBCs	1.46 ^{cde} (.28)
Ormocer-based Composites	1.55 ^{def} (.27)
Packable-RBCs	1.77 ^{ef} (.41)
Hybrid-RBCs	1.84 ^f (.45)

Conclusions: The correlation between K_{IC} and filler volume (0.34) and weight (0.40) was low. K_{IC} increased with the volume fraction of fillers until a critical value of 57%, following with a plateau, with constant values until ca. 65% volume fraction, decreasing slightly above this value. Due to very large variability of K_{IC} within a material type, the selection of a suitable restorative material should not be done with respect to a specific material category, especially in stressed bearing areas, but by considering the individual measured material properties.

Hardness Mapping of Light-Cured Composites to Identify Inhomogeneous Curing

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Objective: Light-curing units for dental materials exhibit an inhomogeneous intensity distribution. This leads to locally different curing processes and mechanical properties. The aim of this study is to map the surface hardness of cured samples to identify inhomogeneous curing and to measure the temporal evolution of post-curing.

Methods: The dental composite Arabesk Top OA2 (VOCO) was shaped into plates of diameter 8mm and thickness 1mm and cured with the Halogen polymerization unit (Polofil LUX, VOCO) for 40 seconds. Subsequently, top and bottom surfaces were scanned with a Vickers micro-hardness tester (MacroMet 5103, Buehler) with a force of 2N (200gf) according to the grid shown in Fig.1 (left). The hardness measurements were started after 10min.

Results: Within two hours after light-curing the hardness of the composites increased by approximately 40%. This post-curing effect is superimposed by hardness differences due to inhomogeneous intensity distributions as the total hardness scan takes approximately two hours, Fig.1 (right). To extract intensity distribution effects all individual hardness measurements have to be referred to a certain time requiring a correcting post-curing function. The hardness at the bottom surface significantly exceeds the hardness of the top surface.

Conclusion: The correcting post-curing function allows for the mapping of inhomogeneous curing states for certain times via the local hardness. This hardness pattern of the surface can be correlated to intensity distribution pattern of the light-curing unit. The slower cured bottom surface exhibits a higher hardness than the top surface. This allows for the assumption that the higher the concentration of activated initiator molecules is the more low-molecular components are captured in cured network.

Wear Resistance of Resin-based Commercially Restorative CompositesT. NIHEI¹, K.-H. KUNZELMANN², S. YAMAGUCHI¹, K. OHASHI¹, K. MIYAKE¹, T. SHIMIZU¹, T. SUZUKI¹, R. HICKEL², and T. TERANAKA¹¹Oral Medicine, Kanagawa Dental College, Yokosuka, Japan, ²Restorative Dentistry, University of Munich, Munchen, Germany**Objectives:** This study was carried out to evaluate the wear resistance of the commercially available restorative resin composites.**Methods:** Seven photo-cured commercial resin composites, Kalore (KA: GC Co.), Filtek Silorane (FSR: 3M ESPE), Filtec Supreme XT (FSX: 3M ESPE), Clearfil Majesty (CM: Kuraray Medical Co.), Beatifil II (BE: Shofu Co.), Estelite " Quick (ESQ: Tokuyama Dental Co.), and Estelite P Quick (EPQ: Tokuyama Dental Co.) were filled into cylindrical metal sample-holder and light cured for 180 seconds. Finished and prepared ten specimens per group were subjected to the three-body-wear tests with the ACTA machine (Willytec GmbH, Germany) for 200,000 cycles after 1-day room temperature storages. The collected data (wear loss in μm) were analyzed statistically using the one-way ANOVA and Tukey's multiple comparison test as the post-hoc test.**Results:** The wear loss values of ESQ (20 μm) was the lowest within the composites tested, and significantly lower when compared with the KA, CM, and BE composite ($p < 0.05$) respectively. The wear loss values of BE composite (29 μm) was the highest.**Conclusion:** ESQ showed the superior wear resistance. The reasons might be the components of well dispersed submicrometer hybrid fillers having round particles and aromatic DMA may play important roles in the high wear resistance. This study was supported by grant (#22592132) from the Ministry of Education, Science, Sports and Culture of Japan.**Anti-bacterial filling material to influence initial bacterial adhesion**

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Objective: Incorporation of delivery systems with an antibacterial agent into resin-based composites and analysis of its influence on initial adhesion of bacteria onto the materials' surface.**Methods:** An experimental resin-based restorative material representing a common formulation for resin-based composite was prepared (ST) and used as a standard. ST was modified by replacing only small parts of the filler (4%) with a methacrylate based delivery system loaded with triclosan as an anti-bacterial agent resulting in the test material AB. N=6 disc-shaped samples per group (diameter $10 \pm 0.1 \text{ mm}$, thickness $1 \pm 0.1 \text{ mm}$) were prepared, polymerized (40s/side), water-stored (37°C , 21 d), disinfected and polished (1min, fine/superfine polishing discs). Afterwards samples were stored in human saliva (250 μl , 2h, 37°C), washed and incubated with an overnight-culture of *A. naeslundii*, *A. viscosus*, *S. mitis*, *S. oralis* and *S. sanguis* (350 μl , 8h, 37°C respectively 24h, 37°C). Vital fluorescence was performed on four randomly chosen sites per sample by using LIVE/DEAD BacLight bacterial viability Kit (Molecular Probes, Eugene, OR, USA). Quantification of vital (fluorescent green) and avital (fluorescent red) bacteria was calculated by counting pixel per colour. A t-test for unpaired samples was performed (SPSS).**Results:** A significant reduction ($p < 0.05$) of vital bacteria except for *S. mitis* and an increase of avital bacteria could be found after 8h on AB. After 24h this effect could be shown for all tested bacteria except for *S. sanguis*. The total amount of bacteria was mostly not affected.**Conclusion:** Using new delivery systems loaded with an antibacterial agent might allow changing the initial adhesion of bacteria onto resin-based restorative materials. It could be demonstrated that the ratio of vital and avital adhering bacteria could be changed. This research was supported by Deutsche Forschungsgemeinschaft (RU825/3-1).**Evaluation of polymerization contraction of experimental composites using laser interferometry**D. MATOSEVIC¹, Z. TARLE², K. SARIRI³, I. SOVIC³, N. DEMOLI³, D. SKRTIC⁴, and G. SCHMALZ⁵¹School of Dental Medicine, University of Zagreb, Zagreb, Croatia, ²Dept. of Restorative Dentistry, School of Dentistry, Zagreb University, Zagreb, Croatia, ³Institute of physics, Zagreb, Croatia, ⁴Paffenbarger Research Center, ADA Foundation, Gaithersburg, MD, ⁵Poliklinik für Zahnerhaltung und Parodontologie, University of Regensburg, Regensburg, Germany**Objectives:** The contraction of composite materials is a consequence of monomer cross-linking during polymerization. The contraction is especially expressed in materials with low filler load, such as bioactive composite resins with amorphous calcium phosphate (ACP) as filler. These materials have shown to remineralize carious lesions in aqueous environment. The aim of this study was to determine if the addition of inactive fillers reduces the polymerization shrinkage of ACP materials.**Methods:** Four composites were tested: ACP control containing only ACP (40%) and the experimental hydrophilic resin (60%); two composites containing 40% ACP, 10% silanized fillers [silica (12 μm) or barium glass (0.7 μm)] and 50% hydrophilic resin and commercial control- nano ceramic material (CeramX, Dentsply Caulk, Germany) with approximately 85% barium-glass and silica fillers. Composite disk specimens (10/group) were light-cured for 30s in high power curing mode (Bluephase G2, Ivoclar Vivadent, Liechtenstein). Linear dimension change was recorded during each second of the polymerization process and 30s after polymerization using laser interferometry. The results were analyzed by ANOVA and Tukey post-hoc test was used in order to find significance levels.**Results:** The initial expansion and consecutive contraction were observed for all materials. There was no statistically significant difference among the materials regarding the expansion. Commercial control had statistically lower shrinkage (1.01%) than any other tested material ($p = 0.01$). ACP composite with no inert fillers had the statistically higher polymerization contraction (1.43%) than the ACP material containing 10% barium-glass (1.13%) or the ACP composite containing silica fillers (1.17%) at the 0.01 significance level.**Conclusions:** The addition of silanized fillers has reduced the polymerization contraction of experimental remineralizing composite resins. In order to further diminish the dimensional changes, higher filler load should be included in the formulation of ACP composites. This study was supported by MZOS (065-0352851-0410), Croatian Foundation for Science, Forschungsgemeinschaft Dental and NIDCR (DE13169).**Effects of Sports Drinks on the Microhardness of Composite Materials**U. ERDEMIR¹, E. YILDIZ¹, M. MERT EREN¹, and S. OZEL²¹Dept. of Operative Dentistry, University of Istanbul, Istanbul, Turkey, ²Department of Biostatistics and Medical Informatics, University of Istanbul, Istanbul, Turkey**Objectives:** The purpose of this study was to determine the effect of acidic sports drinks on surface hardness of polyacid-modified resin composite, microhybrid composite and nanofilled composites.**Methods:** One hundred sixty eight disc-shaped specimens (8 mm in diameter and 2-mm thick) were made for each composite. After 24 hours, all specimens were polished with Sof-Lex disks and the baseline microhardness was then measured using a Vickers hardness measuring instrument with a 200-g load for 15 seconds. After the baseline evaluation, seven specimens of each experimental group were immersed in the following storage solutions: distilled water (control), Powerade, Ixir, Gatorade, Burn, and Redbull for 1 week and 1 month, and microhardness values of each specimen was re-evaluated. Data were statistically analyzed by using two-way repeated ANOVA and followed by Bonferroni's multiple comparison test ($\alpha = 0.05$).**Results:** Statistical analysis revealed that all storage solutions significantly decreased microhardness values of polyacid-modified resin composite, microhybrid composite and nanofilled composites at the different storage time ($p < 0.05$). All materials tested had various softening characteristics depending on the types of storage solutions. Sports drinks significantly reduced microhardness for all materials, compared with the distilled water ($p < 0.05$).

Conclusion: The storage solutions tested and immersion time were significant factors on the reduction of surface microhardness of restorative materials. Distilled water storage had less effect on microhardness over time compared with the other solutions.

0020 (152021)

Contraction Stresses of Composites And Influence on Marginal Cavity Adaptation

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Objective: The aim of this study was to determine the volumetric polymerization contraction stress of packable composites (ALERT, Surefil, Solitaire) and a packable ORMOCER material (Definite) in comparison with a conventional hybrid composite (Tetric Ceram).

Method: The volumetric shrinkage measurements were performed by mercury dilatometry, and the contraction stress and tensile modulus were determined by means of stress-strain analysis. The statistical analysis was conducted by ANOVA and Tukey's post hoc test, and linear regression.

Results: Strong linear correlation for most resin composites were found for (i) contraction stress and shrinkage (ii) contraction stress and tensile modulus, and (iii) shrinkage and tensile modulus. For most of the materials the unpolymerized resin content determines the amount of shrinkage, contraction stress and tensile modulus. Maximum contraction stresses of the packable materials were highest for ALERT, followed by Definite, Solitaire and Surefil, and all were significantly higher than that of Tetric Ceram which showed the least values for contraction stresses.

Conclusion: High contraction stress and rapid contraction force development can lead to failure of bond to tooth structure. This study suggested that, packable composite resins are less capable of reducing the contraction stress during the early setting stage, thus not superior in maintaining the bond with cavity walls compared to conventional hybrid composite Tetric Ceram.

0021 (152059)

A Post-cure Nano-scale Shrinkage Study of Dry and Wet Composite

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Objectives: Dental-composites undergo post-cure dimensional changes after intra-oral placement. Most effects occur immediately, where post-cure polymerization, leaching of substances and water sorption are the most prominent. The purpose of this study was to study the dynamics of post-cure polymerization shrinkage and water uptake, during the first 60 minutes following light-cure of a highly-filled composite, and to understand the dimensional response of typical composites, stored wet or dry, when heated to 37°C.

Materials and methods: Samples of Grandio (VOCO Cuxhaven, n=12) 1mm thick, 15mm diameter were light cured and either immersed in water for 1h or placed in ambient air for 5min, 1h or 3d. Following storage, samples were placed on a precision Peltier thermal-stage and heated to 37°C. Surface deformations were monitored at 4sec intervals by non-contact electronic speckle pattern interferometry (ESPI), repeatedly determining displacement-difference maps for up to 30min. Statistical significance of shrinkage was assessed by two-way ANOVA.

Results: Table 1 depicts the cumulative deformation[%] exhibited in three groups, expansion for the first 2 minutes of heating and shrinkage at 15 and 30 minutes thereafter. All samples firstly expanded. The 1h water immersed samples exhibited similar shrinkage as the 5min samples, higher than the 1h dry samples. The highest expansion and the lowest shrinkage were observed for the 3d dry samples. The differences were statistically significant.

	2min	13min	15min
1h wet	0,03%	-0,04%	-0,01%
5 min	0,02%	-0,04%	-0,01%
1h dry	0,03%	-0,03%	-0,01%
3d dry	0,07%	-0,01%	-0,01%

Conclusion: Substantial shrinkage takes place following curing of dental restorative-composites due to post-cure polymerization. Interferometry measurements of deformation revealed markedly different dynamics of the rate/extent of shrinkage. Placement of freshly-cured composites in water influences the post-polymerization dynamics, suggesting the need for more studies to better understanding the dynamics of interaction between water and dental-composites.

0022 (152089)

Amount of resin composite materials used for direct restorations

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Objectives: The purpose of this study was to measure and evaluate the usage of composite resin filling materials in various types of direct restorations. Several different materials have appeared on the market in the last decade, price and quality diversity makes it difficult for the dentists to choose the right product.

Methods: In this pilot study 250 direct restorations have been examined. All used composite materials have been measured before and after the intervention. Measurements were done using a professional, calibrated scale.(Shinko Densi Co. LTD., SJP-420 CE)

Results: Results were evaluated considering Black's classification. Average amount of the filling materials used was calculated. The use of resin composite is obviously in strong connection with the type of the cavity. Amounts used for class II. preparations were somewhat higher in cases where the operator was a student. Specialists needed even less amount of material than residents. The subjective evaluation of the cavity being small, medium and large was not comparable between students and dentists.

Conclusion: The method and the evaluation sheet is usable for gaining data about composite usage. Further investigation shall be done in order to achieve statistically analysable samples. Bigger sample groups could provide information about different cavity types.

0023 (152131)

Effect of nano-sized prepolymers to resin matrix of dental composite

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Objectives: The knowledge on the efficiency of the organic prepolymers in the dental composites is limited. In this study the influence of reactive polymeric nanoparticles (RPNPs) as nano-sized organic prepolymers on the mechanical properties of different composite was examined. The aim of this study is to examine how

the organofillers influence the mechanical and rheological properties as volumetric shrinkage, compression strengths and viscosity of the dental resin matrices.

Methods: Organofillers were polymerized in two types of mole ratios (3/7 and 7/3). Two series of nanocomposites were formed by mixing two types of organofillers and Bis-GMA based dental resin in the range of 5 and 25 w/w%. The nanoparticles were analyzed by TEM, DLS and ¹H-NMR methods. The characterization of reinforced resins was performed by compression strength (Instron 4302), volumetric shrinkage (buoyancy method) and rheology (AR 550) methods.

Results: The mean hydrodynamic diameter of organofillers was in the range of 150 and 350 nm. The Mann-Whitney statistical analysis of contraction data showed that the shrinkage was significantly decreased by increasing the volume of filler compared to the reference resin. As a result it was found that the compression strength values (223.72±36.10 MPa) for the nanocomposites modified with reactive polymeric nanoparticles separated significantly from reference unfilled resin (167.59±26.99 MPa).

Conclusion: The prepolymerized nanoparticles have remarkable effect on the rheological properties, polymerization shrinkage and compression strength. The photopolymerization shrinkage and compression strengths were improved significantly by adding prepolymers due to the specific structure of nanoparticles. The work/publication is supported by the TAMOP 4.2.1/B-09/1/KONV-2010-0007 project. The project is co-financed by the European Union and the European Social Fund.

0024 (152152)

Does "soft-start" curing mode really makes a difference?

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Objectives: The aim was to determine how physical properties of nanohybrid composite material EmpressDirect (IvoclarVivadent, Schann, Liechtenstien) will change if cured with different curing modes.

Methods: Bluephase G2 polywave (IvoclarVivadent, Schann, Liechtenstien) was used for polymerization with high power mode (1200 W/cm²), low power mode (650 W/cm²) and soft start mode (650 W/cm² to 1200 W/cm²). Changes were recorded during polymerization process using laser interferometry. The Vickers test was performed to measure hardness of polymerized composite samples (10 g load for 10 seconds). The results were analyzed by ANOVA, and Tukey post hoc test was used for finding significance levels.

Results: The highest shrinkage values were observed in case of composite polymerization using the soft start polymerization mode of the curing unit (9,03µm or 1.06%), while lowest results were obtained when low power mode was used (7,32µm or 0.86%). Average polymerization shrinkage in the case of using high power mode was 7,86µm or 0.92%. Initial expansion of samples was greatest when soft start mode was used (1,41 µm or 0.15%), while high and low power modes gave mean 0,56 µm or 0.07% shrinkage. The difference between samples cured with soft start mode and both low and high power mode is statistically significant (p=0.05). The hardest samples were those polymerized with high power light mode (24.47 HV) and the softest samples were obtained when low power mode was used (20.59 HV). Average Vickers Pyramid Number of samples cured with soft start mode is 23.62 HV. The difference between samples polymerized with low power mode and both soft start and high power mode is statistically significant with p=0.01.

Conclusions: Based on obtained data physical properties of nanohybrid composites will not be superior if cured with soft-start curing mode. This study was supported by grants 065-0352851-0410 and 035-0352851-2854 of MZOS, Croatia.

0025 (151252)

Morphological and Acoustic Characteristics of Tongue-thrust Swallowers

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Objectives: The purpose of this study was to investigate morphological and acoustic characteristics of persons who had tongue-thrust swallowing habits.

Methods: The subjects were 36 college students with normal swallowing patterns (normal group) and 46 students with tongue-thrust swallowing habits (thrust group). 30 cephalometric parameters in each subject were measured and the frequencies of the first formant (F1), the second formant (F2) and the fourth formant (F4) of the postalveolar fricative consonant /ʃ/ were analyzed.

Results: FMA, gonial angle, total facial height, lower facial height, ANS-M/N-M, TPD1-TPD7, F1/F4 and F2/F4 in thrust group were significantly higher than those in normal group. Mandibular arc, N-ANS/N-M, overjet and overbite in thrust group were significantly smaller than those in normal group.

Conclusions: These results suggest that tongue-thrust swallowing habits can affect the vertical dimensions of the lower face, and the tongue posture at rest is lower and the articulation point of the consonant /ʃ/ is anterior and lower in tongue-thrust swallowers.

0026 (151291)

Dental age assessment and lateral incisor in complete facial clefts

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A sound statistical correlation was established between agenesis of the permanent maxillary lateral incisors and severity of unilateral complete cleft lip and palate.

Objective: The aim of this study was to determine a possible relationship between agenesis of the permanent lateral incisors and delay in tooth maturation.

Material: a sample of 161 children (100 boys and 61 girls) with complete cleft lip and palate aged between 2 and 18 years, who were followed by the Plastic Surgery Department of Montpellier, was divided in two groups: a group of 60 children (36 boys and 24 girls) with agenesis of the lateral incisors and a group of 101 children (64 boys and 37 girls) without agenesis.

Methods: Maturation of the seven permanent teeth on the left side of the mandible was determined according to the crown and root developmental stages described by Demirjian et al. (Hum Biol 45:211-227, 1973). The method of dental age assessment was based on Bayes' theorem (1763). Two different methods of analysis were used: the Bayes-Independent predictions which regards the 7 teeth of the left side mandible as an independent variable and the Bayes-Dependent predictions in which these 7 teeth are treated as dependent variables.

Results: The study did not find any significant correlation between agenesis of the permanent lateral incisors and delay in tooth maturation in children with cleft lip and palate.

Conclusion: Agenesis of the permanent lateral incisors is not an indicator of delayed dental age.

0027 (151292)

Prevalence of caries in children with facial cleft and prevention

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Objectives: The aim of this study was to analyze caries experience among children with cleft lip and palate (CLP), and to compare it to a control group of non-cleft children.

Material and Methods: A cross-sectional survey was conducted, and 486 children were recruited at the dental care service of the Montpellier hospital. They were included according to the same age distribution in each group (range: 7 to 10 years). The mean age was neither significantly different between the two groups, nor

between girls and boys. 132 children with CLP and 354 non-cleft children were included. Oral examinations were performed by one calibrated dentist (O.C.), following WHO recommendations. The dft and DMFT scores were recorded at the caries into dentin threshold. Chi-square and Kruskal-Wallis tests were used for statistical analyses. **Results:** The DMFT + dft scores were 2.47 in cleft children and 1.52 in the control group, with a significant difference ($p=0.03$). Separate analyses according to gender showed a significant difference among girls (2.81 in cleft children and 1.72 in non-cleft children), but not among boys (2.28 and 2.09 respectively). **Conclusion:** In conclusion, this sample of children aged 7 to 10 years showed a higher caries experience in cleft children than in the control group. This result was consistent with those of previous studies about caries prevalence in children with CLP. Therefore special preventive dental care should be considered for patients with CLP and specific recommendations about hygiene and prevention have been implemented in the dental care service of the Montpellier hospital.

0028 (151537)

Developmentally Regulated Expression of Sema3A in the Developing Mouse Incisor

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Objectives: Semaphorin 3A (Sema3A) is an essential chemorepellant controlling peripheral axon pathfinding and patterning but also serves non neuronal cellular functions. Incisors of rodent are distinctive from molars as they erupt continuously, have only one root and enamel is present only on the labial side of the crown. The aim of this study is to address putative regulatory roles of Sema3A chemorepellant in the development of incisor innervation and formation.

Methods: We analyzed expression of Sema3A mRNAs during embryonic and early postnatal stages of mouse mandibular incisor using sectional radioactive in situ hybridization.

Results: Although Sema3A mRNAs were observed in condensed dental mesenchyme during the early bud stage of incisor tooth germ, they were absent in dental papilla or pulp at later stages. Sema3A mRNAs were also observed in the dental epithelium including the cervical loops and a prominent expression was also seen in alveolar bone. Of note, transcripts were absent from the mesenchymal dental follicle target area (future periodontal ligament) throughout the studied stages.

Conclusion: The expression patterns of Sema3A indicate that it may control the timing and patterning of innervation of mouse incisor. In particular, Sema3A appears to regulate innervation of the periodontal ligament, while nerve penetration into the dental pulp appears not to be dependent on Sema3A. Moreover, it may also regulate cellular functions of the cervical loop cells and the development of the alveolar bone. Future study with Sema3A deficient mice will help to elucidate the putative neuronal and non-neuronal functions of Sema3A in incisor tooth development.

This study has been supported by grants from the Norwegian Cancer Society and L. Meltzer's foundation.

0029 (151599)

Chaillet's International Scores for Age Estimation in Croatian Children

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Background: Dental age estimation in children plays an important role in forensic dentistry. The most wide used method for age estimation developed by Demirjian in 1973 on French-Canadian sample generally overestimates dental age in many population. Chaillet's international maturity scores were formed to obtain a predicted age with more confidence when ethnical origin was not available.

Objectives: The aim of this study is to evaluate the accuracy of Chaillet's international scores for the dental age assessment in Croatian children.

Methods: panoramic radiographs of 1475 children, 805 girls and 670 boys, from 4.79 to 14.92 years, were assessed using Chaillet's international maturity tables and curves. The dental age was compared to the chronological age through a paired t-test for both genders separately.

Results: Mean overestimation using Chaillet's international maturity scores were 0.19 ± 0.77 year for girls ($P < 0.001$) and 0.50 ± 0.83 year for boys ($P < 0.001$). Absolute accuracy of residuals between dental and chronological age were 0.63(0.48) years for girls (Median: 0.54 year) and 0.75(0.60) years for boys (Median: 0.62 year).

Conclusion: Polynomial compound formula was recommended to predict dental age with more accuracy for results of international maturity scores in Croatian children.

0030 (151647)

Sexual dimorphism in children with functional posterior cross-bite

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Objectives: The aim of this transversal study was to compare the differences in electromyographic (EMG) activity of masticatory muscles at rest and during clenching between males and females with functional unilateral posterior cross-bite (FUCB).

Methods: The sample included 15 males and 15 females with FUCB (6-9 years of age) in the early mixed dentition with at least 1.5 mm of mandibular shift, no skeletal asymmetry or previous orthodontic treatment. Surface electrodes were used to record EMG activity of anterior temporalis (TA), masseters (M), posterior temporalis (TP) and anterior digastric (DA) at rest and during maximal clenching. Differences between males and females and between sides (Homolateral-HL and Contralateral-CL to the cross-bite side) were calculated using Student t-test and paired t-test. EMG activities and asymmetry and activity indexes were compared between groups.

Results: Age, skeletal and dental maturation and mandibular shift (mm) were similar between genders. At rest no differences in EMG activity were found between genders for any muscle. Asymmetry and activity indexes at rest were similar too. Comparisons between sides were also non significant within each gender group. During maximal clenching, males showed a significantly higher EMG activity than females in the cross-bite side (TA: 351.04 vs. 283.50 μV ; M: 321.08 vs. 247.03 μV) and non-CB side muscles (TA: 321.58 vs. 257.60 μV ; M: 320.50 vs. 251.57 μV) ($p < 0.05$). However, when considering the asymmetry and activity indexes comparisons we did not find any significant difference. Comparisons between sides during clenching were non-significant within each gender group.

Conclusions: At rest, no sexual dimorphism was found for EMG activity in a FPCB sample. But during maximal clenching, males showed higher activity than females. No EMG asymmetry was found in any of the groups of this early mixed dentition sample. This study was funded by the Fundación Investigación Médica Mutua Madrileña.

0031 (151651)

Gender related changes in mandibular shift after posterior cross-bite correction

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Objectives: The aim of this prospective study was to compare the changes in mandibular shift and rest position in males and females with functional unilateral posterior cross-bite (FUCB) after maxillary expansion.

Methods: The sample included 15 males and 15 females that were balanced regarding age, dental and skeletal maturation. Skeletal asymmetries were excluded from the study. A mandibular kinesiograph was used to record both the mandibular resting position and opening-closing movements. Changes in the lateral mandibular shift from maximum opening (MO) to centric occlusion (CO) and from rest position (RP) to CO after maxillary expansion (T1-T2) were compared between genders using Student t-test. T1-T2 comparisons were performed using paired t-test.

Results: Before treatment, no differences in lateral shift (mm) from MO-CO were found between genders (males: 3.15; females: 3.92; diff: -0.77; 95%CI: -2.30, 0.75). After treatment, lateral shift from MO-CO was similar in both genders (males: 1.64; females: 1.68; dif: -0.04; 95%CI: -1.69, 1.61). A significant reduction was found after treatment for both groups (1.89mm; p=0.002). The lateral shift from MO to RP was similar for males and females before (males: 2.46; females: 2.87; diff: -0.41; 95%CI: -1.75, 0.93) and after treatment (males: 1.52; females: 1.50; diff: 0.014; 95%CI: -1.42, 1.46). The mean post-treatment reduction (1.24mm) was significant for both groups (p=0.013). T1 lateral displacement of the mandible at rest position was similar in males and females (males: 0.8; females: 1.09; diff: -0.29; 95%CI: -0.81, 0.22). Similar results were found at T2 (males: 0.34; females: 0.48; diff: -0.13; 95%CI: -0.54, 0.27). T1-T2 changes were significant for both groups (0.48mm; p=0.012).

Conclusions: Orthodontic treatment of FUCB showed a reduction in the mandibular shift from MO-CO, MO-RP and RP-CO. No differences were found between genders at any stage of the study.

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0032 (151719)

Occlusal patterns in patients with ocular torticollis

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Introduction: Ocular torticollis is a faulty compensatory head posture secondary to ocular conditions such as misalignment. It was hypothesized that it may also be associated with some forms of occlusal asymmetries like in the case of other conditions of altered body posture.

Subjects: A group of 99 consecutive patients with ocular torticollis was clinically examined by a pediatric ophthalmologist and an orthodontist. Their occlusal pattern was compared with that of a control group (n=705) of school-aged children in Jerusalem for whom identical variables were examined previously. Methods: The difference in the frequency distribution of the following occlusal variables of asymmetry was estimated in relation to the controls: 1. Asymmetric molar relationships; 2. Asymmetric canine relationships; 3. Class II subdivision; 4. Lower midline deviation; 5. Posterior cross-bite.

Results: Of the 5 occlusal features of asymmetry studied 4 were found significantly more prevalent in the torticollis group compared with the controls: class II subdivision (p<0.001), lower midline deviation (p<0.001), posterior cross-bite (p=0.003) and asymmetric canine relationships (p=0.019). In the patients with asymmetric molar and canine relationships there was no significant tendency towards the side of chin deviation or head tilt.

Conclusions: 1. Patients with ocular torticollis have more asymmetric features of occlusion than a random group. 2. Clinical significance: early detection and treatment of the ocular condition may prevent development of an asymmetric malocclusion and orthopedic involvement.

0033 (152064)

Light-elastics Use In The Early-phase Of Passive Self-Ligating Orthodontic Treatment

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Objectives: to summarize some general remarks about the use of light-elastics during the initial phase of straight-wire orthodontic treatment. Methods: PubMed research of articles containing the terms "elastomer" and "orthodontic".

Results: elastomers are materials characterized by the property of returning to their original size immediately after undergoing a distortion; their "Limit of Elasticity" is the stress at which the material stop to return to its original shape when the applied stress is removed; the "Maximum Elastic Force" is equivalent to a distortion corresponding to three-times its initial size. Benefits: self-managed by a properly-trained patient, disposable, no orthodontic activation required, effects enhanced by mandibular movements. Disadvantages: deterioration due to loss of elastic memory, variability of the forces exerted if prescription is not properly implemented and not regularly monitored, unwanted movements in the event of misuse by the patient, non-constant forces, patient's cooperation is required.

Conclusions: the employment of light-elastics as an auxiliary procedure in the early-phase of a straight-wire orthodontic treatment can be extremely useful in obtaining dental movements not otherwise attainable with a simple interaction arch-bracket. Factors to be considered are: clinical objective; magnitude of the force in relation to the type of movement; distribution of forces in relation to the point of application (bracket arm or bow pin); use of other auxiliary devices, in particular the parallel use of occlusal-rises; type of elastic (diameter and overall strength); interval between check-ups depending on type of movement, estimated time of response to therapy, integration and interaction with other auxiliary devices; risks and errors due to inadequate control. However, for such a technique to be successful, it must be conducted following a precise criteria of programming and treatment planning, with goals articulated over intermediate stages, involving not only procedural implementations, but also a check-up schedule aimed at monitoring the expression of the clinical outcome.

0034 (152071)

Occlusal Disclusion In The Early-phase Of Passive Self-ligating-multi-torque Orthodontic Treatment

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Objectives: to provide, with a careful review of the literature, usage policies and guidelines for implementing the methods of disclusion (functional occlusal disarticulation and occlusal disarticulation with mandible repositioning) at an initial phase of a straight-wire orthodontic treatment.

Methods: PubMed research of articles containing the terms "disarticulation" and "orthodontic".

Results: "Functional occlusal disarticulation" it is usually identified by symmetrical occlusal rises in the anterior region (palatal side of upper incisors) or posterior region (buccal cusps of lower molars). The analysis of the desired disclusion is performed just chair side by guiding the patient from rest-position to maximum jaws closure. After occlusal rise realization it's necessary to verify, by means of plaster casts and initial centric wax, if there was any appreciable modification of the spatial relationships between lower jaw and skull. The sagittal dimension is also affected by the action of the disarticulation of occlusal contacts. Indeed, reduced occlusal interference achieved by the placement of the rise in arches banded with a self-ligating straight wire device promotes the development of arch form (left-right and front to back), especially when it takes advantage of the coil effect due to elective stops positioning on round copper Ni-Ti wires. "Occlusal disarticulation with mandible repositioning" implies the dislocation of the tooth-arches in subjects presenting a shift (front or side) in the transition from the first contact to the maximum dental closure. In addition to the effects mentioned above, this type of disarticulation would also allow (in association with the early use of light elastics) the gradual correction of mandibular deviation towards centric adjustment.

Conclusions: the availability of a protocol for occlusal disarticulation including performance indicators and control elements such as those mentioned above could represent a valuable aid in the initial phase of self-ligating low friction orthodontic treatment.

0035 (152073)

Choice Of Multi-torque Options With A Passive Self-ligating Low-friction Orthodontic-technique

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Objectives: to provide the clinician with usage policies to select the best torque-value for anterior teeth movement. Methods: retrospective critical review of cases treated selecting different levels of torque for upper and lower anterior teeth.

Results: Upper incisors: high-torque in case of class-II division-2 malocclusion, when it's needed the use of class-II elastics, in almost all extractive treatments and in

case of space closure mechanics; low-torque in case of class-III malocclusion and however in case of use of class-III elastics, when it's needed an increase of arch-width and in case of dental-crowding. Lower incisors: standard-torque in case of use of class III elastics, in case of extractive treatments; low-torque in case of severe dental-crowding of the anterior region, when it is needed to use class-II elastics, in case of severe deep-bite combined with the use of anti-spee arch-wires. Upper cuspids: standard-torque in case of low need of arch-width increase; high-torque in case of severe dental-crowding, in case of extractive treatments, when their root needs uprighting from vestibular to palatal position or their crown is erupted in a high vestibular position; low-torque when their crown is erupted in palatal displacement or when the tooth is in palatal inclusion, when their root needs uprighting from palatal to vestibular position. Lower cuspids: low torque in case of extractive treatments, when their root needs uprighting from vestibular to lingual position, in case of dental-crowding of the anterior region and of lingual displacement of their crown; high torque when all the circumstances of standard torque option are present at the maximum level. In all cases standard-torque with a good initial teeth position and with no needs of high-anchorage.

Conclusion: multiple-choice options in upper and lower anterior teeth can be very useful to avoid unsought dental movements in the anterior region of the dental arch.

0036 (152082)

The relationship between body posture and malocclusion

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Objectives: The aim of this study was to compare changes in the masticatory system with changes in body posture and the function of the cervical spine and associated muscles.

Methods: The study was designed as a double-blind clinical trial. Both experimental and control groups were carefully selected. Subjects were chosen using the RDC/TMD protocol, screened by an EMG device and mandible movements analyzed with ArcusDigma(Kavo,Germany) device. This data was used to ensure that patients have all the variables within requested parameters. The criteria for the experimental group were: orthopedically unstable occlusion, Angle class II or III occlusion with no canine guidance, and non-classifiable malocclusions. Several tests about body posture, neck and mouth mobility were performed using an infrared optoelectronic system and EMG recording. All subjects were diagnosed as mild cases of TMDs and were provided with a splint. They were instructed to wear the splint overnight before the actual recording took place. After the initial recording was done, subjects were allowed to take off splints, and after a meal the recording was repeated, implementing the same protocol as previously.

Results: The data was transferred to an appropriate database, and statistically mined for specific patterns and differences. Result didn't show a specific parameter or variable which could be attributed to all of the participants. However, when data was recalculated in form which allowed to group differences, there was a significant distinction between those recordings with and without a splint in the examination group, and also between both groups.

Conclusion: Taking into account variety of compensation mechanisms and individual responses to same the disturbance, it is difficult to prove that occlusion has an influence on the entire body. Looking at the problem as multivariate allowed us to prove that a connection does exist but that it isn't straightforward or easy to explain.

0037 (152174)

Interdisciplinary Treatment Of 2 Cases With Congenitally Missing Lateral Incisors

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Introduction: Tooth agenesis is one of the most common developmental dental anomalies. According to many studies the most frequent missing teeth were maxillary lateral incisors, and bilateral missing is more common than unilateral missing. Successful and satisfying dental treatment is always the goal for patients and dental practitioners, meaning that a patient's needs are solved in a functional and esthetic way. Treatment options for these patients are orthodontically space closure, prosthodontics after orthodontic treatment, implantology and multidisciplinary approaches.

Methods: case 1: The first patient was 22 years old male with bilateral congenitally missing upper lateral incisors. He is skeletally Class I and he has Angle Class I occlusion. The treatment goal was opening space for missing teeth orthodontically and then to place two implants for restorations. The mesiodistal width of laterals was planned 7 mm. The braces were removed at the same time with cementation of the restorations. Total treatment time was 22 months.

Results: case 2: The second patient was 24 years old female with unilateral congenitally missing upper lateral incisor on the right side. She has Angle Class I occlusion with skeletally Class I. The treatment goal was opening space for right lateral incisor after extraction of deciduous canine and to restore with the support of implant. The mesiodistal width of lateral was planned 6,8 mm. Total treatment time was 24 months. The debonding procedure was the same with the first patient.

Conclusion: Orthodontic space opening is a common treatment method for congenitally missing maxillary lateral incisors. In these situations implants are often used to replace the missing tooth to establish ideal function and esthetics without restoring the adjacent teeth especially in adult patients.

0038 (152208)

Prevalence Of Tooth Agenesis In Permanent Dentition Of Romanian Subjects

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Objectives: Tooth agenesis is a frequently encountered developmental dental anomaly. The prevalence of agenesis depends on the population studied. There are only a few data available in Romania on this subject. Our purpose was to determine the prevalence of tooth agenesis among Romanian subjects.

Methods: We analyzed orthopantomograms and anamnestic data of 567 children and young adults at the Dental Medicine Faculty of the Târgu-Mureş University of Medicine and Pharmacy, Romania.

Results: The prevalence of congenitally missing third molars was 12.34 %. Excluding third molars, the prevalence of congenital agenesis was found 5.46 % (19 women and 12 men). The frequency of missing teeth was: upper lateral incisors, lower second premolars, upper second premolars, upper first premolars, lower first premolars and lower central incisors. Upper central incisor, lower second incisor and upper canine were missing only once. Oligodontia was found in two subjects (0.35 %).

Conclusions: The most affected region in the permanent dentition is the premolar. We found similar data in the dental literature. The maxilla was more affected than the mandible. The female/male ratio was very close to 3:2, the more extreme forms of agenesis were found among women.

0039 (152255)

Masticatory Performance: Particle-size Distributions Determined Using Optical Scanning Versus Sieving

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Objectives: The standard procedure for the determination of masticatory performance is the fractionated sieving of comminuted test-food, which is time-consuming. Aim of this study was to introduce a comparable feasible and valid technique based on scanning.

Methods: Twenty-one chewing samples (Optosil) were comminuted by healthy dentate adults and analysed by a sieving and scanning method. The sieving procedure was carried out using ten sieves (5.6-4.0-2.8-2.0-1.4-1.0-0.71-0.5-0.355-0.25 mm), the retained particles per sieve were weighed. Scanning was performed

with a conventional flatbed scanner (Epson Expression1600Pro, Seiko-Epson-Corporation, Japan, 1200dpi). All scanned images underwent image analysis (ImageJ1.42q, NIH, USA), which yielded descriptive parameters such as area, best-fitting ellipse etc. for each particle. Out of the 2D-image, a volume was estimated for each particle, which was converted into a weight. In order to receive a discrete distribution of particle sizes comparable to sieving, five chewing samples were used to calculate a size-dependent area-volume-conversion factor. The cumulated weights yielded by either method were curve-fitted with the Rosin-Rammler-distribution using a least-square-method (Matlab, The-Mathworks-Inc., Natick, USA) to determine the median particle size x50.

Results: The Rosin-Rammler distributions for sieving and scanning resemble each other. The distributions show a high correlation (0.919-1.0, N = 21, P < 0.01, Pearson's Correlation Coefficient). The median particle sizes were vary between 3.83 and 4.77mm (mean: 4.31) for scanning and 3.53 and 4.55mm (mean: 4.21) for sieving. On average, scanning overestimates the x50 values by 2.4%. A modified Bland-Altman-Plot reveals that 95% of the x50 values fall within 10% of the average x50. The scanning method took 10 min per sample as opposed to 50 min for the sieving method.

Conclusion: The scanning method is a valid, simple and feasible method to determine masticatory performance.

0040 (151265)

Bone-regeneration After Apical Surgery Using Reabsorbable Membrane And Powder Bone

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Apical surgery may be considered when conventional root canal re-treatment cannot be performed or has failed. It is a surgical procedure performed at the apex of dental pieces to resolve chronic problems that involve infectious processes or post-endodontic complications. This treatment not ever has the expecting success, many times due to the invagination of connective tissue into the prepared surgical window which obstructs bone modeling. Also, if bone damage is severe, the regeneration of this tissue could be unsatisfactory.

Objectives: To assess periradicular bone regeneration during 24 months post-apical surgery performed using a reabsorbable membrane and osteoinductor biomaterial.

Methods: In human patients with apical pathology of dental pieces, treated endodontically, apical surgery was performed including the collocation of reabsorbable biologic fascia lata membrane (Biotar) between the flap of total wide and bone tissue. In the middle of them lyophilized human powder bone (Biotar) was collocated as osteoinductor with the objective to obtain an adequate recuperation of periradicular bone tissue. Amoxicillin (500mg) as antibiotic and sodium phosphate of dexametasona (2 ml, EV) as anti-inflammatory were prescribed for 7 days, and ketorolac (10 mg, SL) as analgesic for 2 days. Clinical and radiographic control was performed for 24 months.

Results: Three months after the surgery, pain, inflammation and discomfort were not evidenced. Twelve months after the surgery radiographic images of periradicular bone clearly improved as compared to pre-surgical images. Significant less radio-lucid image was observed. Twenty four months after the surgery, the clinical symptoms disappeared and the radiographic images became normal, without fibrosis.

Conclusion: The present results demonstrate that the utilization of human fascia lata membrane plus powder bone improves and accelerates bone regeneration after apical surgery and can be used in severe cases of alveolar bone loss. (Grants: UBACyT-O007 and UBACyT-20020090300051)

0041 (151449)

The effect of two bleaching agents on the enamel surface

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Objectives: To compare the effect of 10% and 15% carbamide peroxide based experimental (EBG) and commercial bleaching gels (CBG) on the enamel surface.

Methods: 15 human extracted caries-free permanent teeth were bleached with two carbamide peroxide based gels, EBG and CBG (Opalescence, Ultradent), concentrations 10% and 15%. The teeth were divided into 3 groups (G1 - G3) and were sectioned mesio-distally with a microtome, obtaining two fragments, a buccal and a lingual one for each tooth. The buccal surfaces were bleached with the EBG and the lingual surfaces with the CBG. The concentration of the gels on the same tooth was identical. G1 was treated with 10%, G2 and G3 with 15% carbamide based peroxide gels. The EBG in G2 and G3 were both 15%, but with different ingredients. The "home-bleaching" protocol was simulated. SEM (scanning electron microscopy) analysis of the dental surfaces was performed, digital images were taken and 4 examiners scored (scores 1-4) the aspect of the surfaces, according to a certain protocol. ANOVA statistical test was performed in order to evaluate the modifications induced by the different EBG and CBG concentrations on the enamel surface.

Results: There were no statistically significant differences between the effects of: a) various formulas of either EBG (p1 = 0.11438) or CBG (p2 = 0.74795) or b) the equivalent concentration of EBG and CBG on the same tooth (p3 = 0.09716 - G1, p4 = 0.61311 - G2, p5 = 0.53696 - G3).

Conclusions: 1. 10% and 15% carbamide peroxide based bleaching formulas do not induce significant alterations on the enamel surface. 2. There was no significant difference between the effects of 10% and 15% gels. 3. EBG had similar effects with CBG, concerning the morphological aspects of the enamel. -->

0042 (151984)

In vitro examination of dental erosion by a new model

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Objectives: Examination of dental erosion runs into difficulties. Therefore, in vitro experiments carried out on human samples play a crucial role in the description of erosion processes. The aim of our experiment was to explore the dynamics of erosion on intact enamel surfaces and to compare the acid resistance of different tooth types.

Methods: Surgically removed impacted teeth were used in our tests. Out of a total of 30 samples 17 were lower, 12 were upper third molars and 1 was an upper canine. A standard examination surface was prepared on the largest crown convexity. The remaining surface was covered with acid-proof varnish. The prepared samples were incubated in 20 ml of 10 mM (pH 2) hydrochloric acid solution. The samples were replaced into a fresh solution every 6 hours in the first 24 hours, then the incubation period was changed to 12 hours. The quantity of dissolved Ca²⁺ in the incubation solution was measured by a Radelkis OP-274 pH-ionometer using a OP-Ca-0711P-S-Ca²⁺ selective electrode.

Results: The kinetics of Ca²⁺ dissolution was not uniform. In the first incubation period the Ca²⁺ dissolution rate was 0.39 mmol/l/hour, in the second 1.29 mmol/l/hour, in the third 0.26 mmol/l/hour, in the fourth 0.14 mmol/l/hour and in the fifth 0.2 mmol/l/hour (SEM=0.003; 0.09; 0.04; 0.01; 0.15 respectively). The dissolution curves of different samples ran parallel, which suggests that the solubility difference present between samples doesn't change in the course of time. The difference between lower and upper molars proved to be significant (p<0.05) by the Mann-Whitney U test in each incubation period.

Conclusion: Our study shows that Ca²⁺ dissolution rate changes with different enamel depths and different types of teeth have significantly different dissolution rates. These results suggest that in the course of similar tests the above variables can influence the final results. Support: TÁMOP-4.2.1/B-09/1/KMR-2010-0001

0043 (152041)

Hard Dental Tissue Demineralization Followed With SOPROLife™ And Raman Microscopy

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A fluorescence based method for dental caries detection was recently developed.

Objectives: The aim of this study was to investigate correlations between variation of dental hard tissues fluorescence and structural changes during dentin demineralization.

Methods: Tooth longitudinal slices with a thickness up to 0.5mm were prepared from freshly extracted sound teeth. The samples were grinded to 0.25 mm, polished and cleaned up in an ultrasound bath for 5 min. Four samples were demineralized in 2.5% aqueous nitric acid solution (pH 1) and another four in 4% aqueous solution of lactic acid in carboxymethylcellulose sodium salt (pH 3.5) for seven days. Demineralization solutions were changed every two days. The samples were rehydrated in ultrapure water (Milli-Q®18.2 MOhm.cm) for five days. Two samples from each group were incubated into a PBS solution of Methylglyoxal 1,1-dimethyl acetal 10 mmol/L at 37 °C for four weeks. For each stage we recorded pictures of the samples with intraoral fluorescent camera SOPROLife™ in daylight mode, diagnostic mode and treatment mode. Raman spectra of each type of sample were registered with confocal Raman microscope (Lab RAM ARAMIS IR2 / HORIBA JOBIN YVON) at 633nm.

Results: The nitric acid treated samples lost completely their green fluorescence, which reappeared partially after rehydration. An incomplete lactic acid demineralization decreased the email translucency, but the dentin fluorescence did not disappear. Raman spectra of several samples revealed a decrease of the phosphate and collagen matrix (Amide I, II, III) bands.

Conclusion: The fluorescence of dental tissue was correlated with the degree of mineral component in dentine and with the modification of collagen matrix structure.

0044 (152168)

Laser and cerium-chloride to improve acid resistance of dentine?

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Objective: To investigate the protective effect of cerium chloride, amine fluoride and combined application with or without additional laser irradiation on the erosion of dentine.

Methods: Ninety-six dentine samples were prepared from human premolars and randomly assigned to eight groups (G1 to G8). Samples were treated for 30 s with the following solutions: placebo (G1/G2), amine fluoride (Elmex fluid; G3/G4), cerium chloride (G5/G6) and combined fluoride/cerium chloride application (G7/G8). Samples of groups G2, G4, G6 and G8 were additionally irradiated with a carbon dioxide laser through the solutions for 30 s. For the determination of acid resistance, the samples were consecutively eroded six times for 5 min with lactic acid (pH 3.0) and the calcium release in the acid was determined by atomic absorption spectroscopy (AAS). Furthermore, six additional samples per group were prepared and subjected to EDS-analysis. Calcium release and EDS data were analysed by ANOVA and Scheffe's post hoc tests.

Results: In the non-irradiated groups, specimens of G1 (placebo) showed the highest calcium release ($42.5 \pm 5.0 \mu\text{g}$) when compared to the other treatments (G3, G5 and G7). The highest acid resistance was observed for group 7 ($1.5 \pm 0.7 \mu\text{g}$). In G3, calcium release was lower than in G5, but higher than in G7. In the laser-irradiated groups, specimens of G4 and G8 ($8.8 \pm 2.2 \mu\text{g}$ and $8.1 \pm 1.7 \mu\text{g}$) showed the lowest calcium release while in the remaining groups (G2 and G6) the calcium release was significant higher. In general (except for the placebo groups), calcium release in the laser-irradiated groups was higher compared with the respective non-irradiated groups. EDS showed a replacement of calcium by cerium and of phosphor by fluoride.

Conclusion: Highest anti-erosive potential was found after combined cerium chloride and amine fluoride application. Laser irradiation had not adjunctive effect.

0045 (152222)

The prevalence of talon cusp in primary dentition. Case presentation

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Objectives: The purpose of the study was to examine the prevalence of talon cusp in preschool children in Hungary and to present a case of a talon cusp localized on an upper first primary incisor and its consequences in permanent dentition.

Methods: Preschool children, aged 2 to 6 years from the VIII. district (Józsefváros) of Budapest presenting for annual dental check-out were examined for talon cusp in the primary dentition. Classification of talon cusp was made according to Hattab et al.(1996), according to the extension and the degree of expression.

Results: Only one case was detected, which was monitored during and after secondary dentition and was treated with interceptive orthodontics for the occlusal anomaly due to talon cusp on the primary upper incisor.

Conclusions: Talon cusp is an uncommon and rare malformation with localization on primary teeth. If present, it can cause occlusal anomalies and localized malpositions of permanent teeth.

0046 (152256)

Ellipsometric analysis of enamel bleached with tooth whitening agents

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Objectives: Tooth discoloration can be classified on the basis of localization and etiology. One way of treating discolored teeth is tooth whitening procedure using different concentrations of bleaching agents (hydrogen-peroxide, carbamide-peroxide) depending on the bleaching technique. The aim of this study was to examine and evaluate the effects of bleaching agents on human enamel with ellipsometry. Ellipsometry is a non destructive and contact-free optical technique that investigates refractive indexes (n) and extinction coefficients (k) of thin films.

Methods: Extracted human teeth were embedded in polystyrene resin with vestibular/oral enamel surface exposed and polished. Ellipsometer analyses the change of polarization of light which is reflected off a sample, and probes the complex refractive index which gives access to physical parameters that are related to a variety of sample properties including morphology. Measurement of n and k were performed between 246-1000 nm at three different points on untreated and treated enamel surfaces and at two different angles (70° and 75°). The treatment consisted of 10% hydrogen-peroxide bleaching for 30 min.

Results: Ellipsometric measurements showed an increase in the refractive index of enamel after bleaching treatment by 10% hydrogen-peroxide: at 70° and 633 nm n₇₀ was 1.521 ± 0.0038 before treatment and 1.542 ± 0.0031 after treatment; at 75° n₇₅ was 1.526 ± 0.0019 before treatment and 1.546 ± 0.0039 after treatment. The measurements proved a 0.0026 increase in the absorption coefficient at 70° and 0.0033 at 75°.

Conclusion: This change in the values of refractive index and absorption coefficient implicates that the surface morphology of enamel has changed from a porous structure to a more concise structure after application of 10% hydrogen-peroxide as bleaching agent.

Fracture toughness by energy development of bleached enamel

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Objectives: To determine the effect of 38% hydrogen peroxide bleaching agent on enamel fracture toughness (K_c) immediately, after 24h, and after one week by nanoindentation and scanning electronic microscope (SEM).

Methods: Four recently extracted bovine incisors were selected and polished using a mechanical grinder (Labopol-5, Struers) on polishing cloths with alumina suspension slurry of 3µm and OP-A. Hardness (H) and elastic modulus (E) of labial enamel surfaces were determined by nanoindentation using a Berkovich tip (Nanoindenter XP-MTS). A Continuous Stiffness Measurement methodology (CSM) was set to determine H and E with a maximum penetration depth of 300nm. To estimate K_c, three indentations were performed on each sample (n=12) with a maximum penetration depth of 2000nm to generate cracks. These measurements were performed immediately after bleaching the specimens for 1 hour with 38% hydrogen peroxide (Opalescence® Boost, Ultradent), 24h later, and a week after the treatment application. During the timeouts, the samples were stored in artificial saliva. Moreover, photographs were taken of the residual imprints by SEM for each treatment condition to measure the size of the cracks. K_c results were calculated according to the formula included in the table and were analyzed by paired Student's t-test (p<0.05).

Results: K_c mean values (sd) are shown in the table. Similar letters indicate no differences on K_c mean values. Bleaching treatment significantly increased K_c mean values (p<0.001) with no statistical differences after 24h (p=0.927). K_c mean values were statistically higher than control, immediately and 24h after the bleaching procedure (p<0.01).

	E (GPa)	H (GPa)	K _c (MPa√m)
CONTROL	92.13 (6.01)	4.68 (0.31)	2.63 (0.59) a
BLEACHING	86.05 (7.34)	4.30 (0.46)	3.92 (0.41) b
24 H	83.22 (7.11)	4.16 (0.50)	3.94 (0.49) b
1 WEEK	76.56 (6.42)	4.25 (0.52)	4.83 (0.55) c

σ (Poisson ratio); C (Crack length from indentation center); Δu (Area below the force-displacement indentation curve);
(Where a is the crack length from indentation edge and ht is the maximum penetration depth)

Conclusion: K_c was affected by bleaching procedure with 38% hydrogen peroxide. K_c increased with time after the bleaching application.

0048 (151304)

Morphological Changes in Dentin Formation after Neonatal Desensitisation

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Objectives: Capsaicin is known to block the nociceptive fibers in the dental pulp of rats. The sensory innervation of pulp reaches its maximum after 6-7 weeks of age. The purpose of this study was to determine the influence of capsaicin on dentin formation in neonatal desensitized rats, after 60 days.

Methods: 6 Wistar rats were given a subcutaneous application of capsaicin (50 mg/Kg body weight) in a sterile vehicle on the 3rd day of life. This group served as the experimental group. 6 control rats were treated with the sterile vehicle without capsaicin. After 60 days, all rats were deeply anesthetized before intra-vital perfusion and fixation. The left upper jaws were excised and post-fixed in phosphate buffered 4% paraformaldehyde for 24 hours. The first molar was ground sagittally from the pulp horn to the apex and prepared for scanning electron microscopy (SEM). Images were captured in 3 areas (tip, middle and base of the distal pulp horn) at magnification of 1800-fold and the number of tubules was counted. A counting grid was used to measure the diameter of the dental tubules in 5 fields in each image. 5 tubules each in the center of a grid field were chosen for analysis. Differences in number and size of dentinal tubules between the experimental and control group were calculated using the Student T-test (SPSS).

Results: Differences were found in dentin structure between the capsaicin and control group. The number of tubules, regardless of the region, were significantly greater in the control group compared to the capsaicin-treated rats (p<0.05). The diameter of the tubules in the control group was lesser in the experimental group, but showed no significant difference.

Conclusion: From these results we may conclude that the neonatal application of capsaicin produces changes in the dentin formation after 60 days.

0049 (151386)

Assessment of stem cell markers in multipotent dental pulp cells

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Objectives: We previously reported that rat and mouse dental pulp-derived cells can differentiate into osteogenic, neurogenic and myogenic lineage cells. The aim of the present study was to identify possible markers for the multipotent dental pulp-derived cells.

Methods: To achieve this, we performed in vitro adipogenic differentiation of rat dental pulp-derived cells, and compared the changes in expression of stem cell markers such as Oct-3/4, Sox2 and Nanog in the dental pulp-derived cells during the induction of differentiation with those in the 3T3 L1 adipocyte progenitor cell line. Insulin, 3-isobutyl-1-methylxanthine and dexamethasone were added to induce adipogenesis.

Results: Dental pulp-derived cells containing lipid droplets were observed after the induction, similar to the case for 3T3 L1 cells. Oct-3/4, Sox2 and Nanog were expressed in both types of cells during culture in basal medium. In 3T3 L1 cells after the induction of differentiation, the levels of Oct-3/4 and Sox2 expression were significantly decreased to 25% and 30%, respectively (p<0.01), while the level of Nanog did not change significantly during the differentiation. In the dental pulp-derived cells, the expression patterns of Sox2 and Nanog during the differentiation were similar to those in 3T3 L1 cells. Interestingly, the expression of Oct-3/4 was transiently increased at 1 week after the induction and then significantly decreased (p<0.01).

Conclusion: These findings suggest that Oct-3/4 and Sox2 may be better markers for assessing differentiation than Nanog, because it is also known that Nanog is not a defining factor in inducible pluripotent stem cells derived from somatic cells. Therefore, assessment of Oct-3/4 and Sox2 in rat dental pulp-derived cells during the induction of differentiation could be useful for future regenerative medicine applications. This study was supported in part by JSPS KAKENHI (21592547) and by MEXT HAITEKU (2007-2011).

Angiogenesis And Lymphangiogenesis In Inflamed Human Dental Pulp

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Objectives: The study aimed to investigate the impact of inflammation, as well as the impact of VEGF on angiogenesis and lymphangiogenesis, in inflamed human dental pulp using monoclonal mouse anti-human antibodies.
Methods: Thirty samples of healthy dental pulps and twenty-seven pulps with irreversible pulpitis were included in this study. All specimens were immunohistochemically stained for: CD34 (react with blood endothelium), D2-40 (react with lymphatic endothelium) and VEGF. Positively stained blood and lymphatic vessels were counted by a light microscopy in an area of 1 mm². VEGF expression was evaluated semiquantitatively in vascular endothelial, stromal and inflammatory cells, considering cytoplasmic staining intensity and the proportion of positive cells. Staining intensity was graded as weak (+), moderate (++), and strong (+++) staining. The presents of active cells was considered significant if more than 25% cells were found in the area.
Results: The mean number and standard deviation of blood vessels positive for CD34 in the group with inflammation (78.93 ± 25.80) was significantly higher (P< 0.0001) than the mean number in the group without inflammation (50.40 ± 9.34). The mean number and standard deviation of lymphatic vessels positive for D2-40 in the group with inflammation (8.04 ± 2.8) was significantly higher (P< 0.0001) than the mean number in the group without inflammation (3.93 ± 1.11). VEGF expression was found in 10 samples of irreversibly inflamed and 8 samples of healthy dental pulps.
Conclusion: The study established an increased number of blood and lymphatic vessels in the inflamed human dental pulp, which suggests that inflammation contributes angiogenesis and lymphangiogenesis. VEGF expression and the occurrence of angiogenesis and lymphangiogenesis did not highly correlate in this study.

In vitro pulse measurements in a human tooth-gingivamodel

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Objectives: Several methods are clinically available to indirectly test the vitality of human tooth pulp tissue in vivo. Pulse signals detected directly from the pulp might be considered reliable for an objective assessment of pulp vitality. A recently presented tooth model (J Dent Res 87[Spec Iss C],82.2008) was further developed simulating a simultaneous bloodflow in the gingiva and the tooth. The purpose of this study was to test the influence of gingival signals on blood flow in the tooth.
Methods: A custom-built photoplethysmograph (PPG) using a 625nm light emitting diode, indirectly adapted to the tooth-gingivamodel (TGM) via fiberoptics was used. Emitter and detector holders were applied lingual-buccally to the tooth-pulp model and connected to the PPG. Pulse measurements were performed for human blood flowing through (i) tooth only, (ii) gingiva only, and (iii) alternately through tooth and gingiva with a frequency of 2 Hz, using a custom-built dual channel pulsepump. An aluminium foil was used to shield pulse signals from the pulp from those of the simulated gingiva. (n=6; non-parametric statistical analysis, a=0.05; Test Parameter ΔU := maximum – minimum of PPG Signal [V]).
Results:
ΔU (Medians(25-75% Percentiles)):

Blood flow through	aluminium foil	
	no	yes
tooth	.6400(.6100-.7025)	.3200(.2975-.3225)
gingiva	.2200(.2200-.2300)	.1800(.1800-.1900)
tooth and gingiva	.8050(.7450-.8550)	.4000(.3825-.4250)

Significantly higher signals without aluminium foil suggested that signals from the root and gingival parts of the tooth model influenced the measurements.
Conclusions:
The TGM seems to be a reliable model for detecting blood flow through a tooth surrounded by a blood carrying gingival model. Even though an increased signal was detected when blood was flowing through tooth and gingiva, the main part of the signal originated from the pulpal part.
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Expression of thermosensitive trp channels in human dental pulp

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Objectives: Transient receptor potential (TRP) channels are „cellular sensors“ that play a central role in the detection of various (mechanical, osmotic, pain and thermal) stimuli. In recent years, in part due to the work of our laboratory, it has become apparent that the thermosensitive members of the family are widely expressed in non-neuronal tissues. Since the expression and function of thermosensors can have important effects on the thermal sensitivity of the tooth in physiological and pathological conditions, our goal was to determine the expression of thermosensitive TRP channels in healthy and inflamed human dental pulp.
Methods: On healthy human dental pulp we identified the expression of the warm-sensitive TRPV1, TRPV3 and TRPV4 using quantitative real-time PCR. We were able to support these findings on the protein level, since the expression of TRPV1, TRPV3 and TRPV4 was also found by immunohistochemistry.
Results: Interestingly the expression of the “cold-sensitive” TRPA1 and TRPM8 was not detected on either the gene, or the protein level. We also found that the expression of TRPV1 and TRPV4 in pulpitis samples decreased to approximately half that found in the healthy samples. The expression of TRPV3 on the other hand drastically increased in these samples (the expression of TRPA1 and TRPM8 was not found in the pulpitis samples). We are currently in the process of elucidating the functionality of these receptors.
Conclusions: Our data suggests that human dental pulp expresses numerous receptors that are capable of detecting warm stimuli; on the other hand, structures other than TRP channels are responsible for the detection of cold stimuli. Our data also suggest to the possibility that the change in the expressional pattern of TRP channels might be responsible for the thermal hyperalgesia that develops on patients with pulpitis.

Small area dentin recording in vivo

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Objective: The purpose of this study was introducing a dentin recording technique which records pulp nerve activity from very small areas of the dentin in vitro and in vivo as well.
Methods: The upper first molar of anaesthetized rats prepared and etched by a 38% orthophosphoric acid and the outflow fluid flow was blocked with 1‰ epinephrine

administered to the buccal cortical. With the aid of a digital CCD microscope (Mintron 63W3H) at 400x magnification the electrode was inserted into dentin using three-axis tilt table and electrode positioning device. An electrode with 20µm tip diameter and effective tip mean impedance of 707±94.18 kOhm at 1kHz AC was bonded to the dentin. Impedance measurement was repeated again to test leakage around the electrode. Stimulated compound action potential was recorded through the dentin. Finally the teeth were extracted and burred for laser confocal microscopy to determine the number of dentinal tubules and their respective conductance action potential to the inserted electrode. Auto-fluorescence of the dentin to laser beam was scanned at 458 nm wavelength using Zeiss LSM 710 confocal microscope.

Results: The impedance of the inserted electrode was 191.4±84.32 kOhm higher than that of the uninserted coated electrodes. Recording of compound action potential proved that the conduction went through the dentin. Laser confocal microscopic image analysis proved that the inserted electrode tip was in contact with less than 100 dentinal tubules.

Conclusion: This technique provides multiple dentin recordings from small cavities on laboratory animals.

0054 (152286)

Dental Pulp Stem Cells Adhesion/Proliferation On Porous Silicon Scaffold

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Introduction: Porous silicon (pSi) is a promising biomaterial that is non-toxic and bioresorbable. Surface modifications can offer control over the degradation rate and can also impart properties that promote cell adhesion. Coupling the capacities of Dental Pulp Stem Cells (DPSC) with the pSi properties is a promising tool in regenerative medicine.

Materials and Methods: P-type silicon wafers were etched at a constant current density of 30 mA/cm² or 300 mA/cm². The samples were oxidized or hydrosililized. The topography of surface modified pSi samples was analysed by scanning electronic microscope (SEM) and water contact angle measurement. Dental pulp cells were collected from healthy adults and analyzed by flow cytometry. Cells were incubated on pSi samples for either 4 hours or 24 hours. Cellular morphology on pSi was evaluated with fluorescein diacetate (FDA) staining. Cell proliferation was measured through acid phosphatase activity.

Results: After oxidation or hydrosililation, at either 30 or 300 mA/cm², pSi wafers became clearly hydrophilic. SEM revealed a highly porous surface, with a mean size of pore of 10nm±2 for 30mA/cm², and 21nm±3 for 300mA/cm². With flow cytometry, cells were 17% CD34+ and 77% CD146+. Acid phosphatase assay showed that samples etched with 300mA/cm² tend to offer a better adhesion for cells; the same tendency was observed for hydrosililation treatment. Cells presented the same morphology on pSi as on culture plate.

Conclusion: Surface modification, by turning pSi from hydrophobic to hydrophilic, allows cell adhesion. The two tested sizes of pore and the two tested surface treatments allowed adhesion of DPSC. Cell morphology on pSi was similar to culture plates. pSi resorption time is influenced by surface modification and DPSC adhesion is possible on both surface modifications, highlighting an interest for cell/tissue graft. And the tunable size of pore might permit to incorporate growth factors or nutriments inside the scaffold.

0055 (152288)

Production and Characterization of Biodegradable scaffolds for pulp regeneration

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Objectives: The aim of the present work was to evaluate biocompatibility of two biodegradable scaffolds, based on pectin/chitosan (PEC/CH) and hyaluronan/chitosan (HA/CH), designed for pulp regeneration.

Methods: 1% (w/v) solutions of pectin and chitosan were prepared by dissolving each polysaccharide in a 0.01M acetate buffer (pH=4.5). Hyaluronan solution was prepared in a 2% (w/v) concentration using the same buffer solution. The polyelectrolyte complexes (PECs) between the polymers were formed by mixing under homogeneizer agitation, the solution of the two chosen polymers at room temperature (PEC/CH and HA/CH). After PECs formation and precipitation, they were isolated by centrifugation, frozen under liquid nitrogen and finally freeze-dried for 8 hours. The samples were prepared in a cylindrical mould (4mm high and 2 mm diameter) in order to fit the tooth cavity. Scaffolds biocompatibility was assessed through in vitro studies, using mice mesenchymal stem cells. Cells were seeded in the presence or absence of each scaffold. Optical microscopy and a non-radioactive assay (3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulfophenyl)-2H-tetrazolium) – MTS) were used to characterize cell viability.

Results: Cell adhesion and proliferation was observed. MTS assay results showed a significant difference between cells exposed to the two scaffolds (PEC/CH and HA/CH) and the positive control (dead cells) (p<0.05), and between cells exposed to the scaffolds and the negative control (live cells) (p<0.05), after 24, 48 and 72 hours of incubation. The results obtained for both scaffolds were not statistically different.

Conclusions: In vitro studies showed that cells adhere and proliferate in the presence of the scaffolds, which is indicative of the biocompatibility of the scaffolds herein produced. Further in vivo studies are currently being performed in order to characterize the applicability of these constructs.

0056 (151469)

Short-term results in evaluating a gingiva-adhesive hydrophobic-CHX-gel in chronic periodontitis

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Objectives: "golden standard" of cause-related therapy of chronic periodontitis remain chlorhexidine-based products (Russell 1986) as rinsing solutions (Faveri et al. 2006), but also as gels, increasingly indicated lately. The study evaluates whether the use of a hydrophobic gel with good gingival adhesion 14 days after the scaling and root planing of patients with chronic periodontitis would improve the treatment outcome, when compared with a regular hydrophilic gel.

Methods: 24 patients with moderate periodontitis were included. At baseline and 3 months after the treatment, following parameters were recorded: pocket depth (PD), approximal plaque index (API, Lange 1986), modified gingival index (MGI, Lobene 1986), simplified oral hygiene index (OHI-S, Greene & Vermillon 1964), bleeding on probing (BOP). Patients received professional hygiene and repeated instructions until API decreased under 30%, underwent two sessions of ultrasonic and manual scaling-root planing in 24 hours. At the end of SRP, patients in test group received application of the hydrophobic adhesive chlorhexidine gel (Durimplant, Lege Artis Pharma GmbH+Co KG, Dettenhausen, Germany) on the marginal gingiva and received indication to apply the gel the same way, every second day once daily, after the last brushing, for the next 14 days. Patients in control group received instead a hydrosoluble 1% CHX gel within the same protocole and timeframe. Wilcoxon nonparametric test compared mean differences between baseline and three months after, and Mann-Whitney test compared mean differences between groups.

Results: both treatments resulted in significant improvements in all clinical indices, except API. At 3 months, in the test group mean PD changed from 4.16±0.45 mm to 2.80±0.42 mm (p<0.001), while in the control group PD changed from 4.16±0.30 to 2.69±0.19 (p<0.01). Mean values of PD, MGI and BOP improved statistically significant (p<0.01), while API deteriorated statistically significant (p<0.05) in both groups; OHI-S values did not changed statistically significant.

Conclusions: following both approaches, there were improvements at 3 months. In all parameters, differences between the two treatments were not statistically significant.

Effect of dental amalgam on rat gene expression profilesY. TAKAHASHI¹, S. TSURUTA¹, A. HONDA², Y. FUJIWARA², M. SATOH², and A. YASUTAKE³¹Dental Materials Science, Aichi-Gakuin University, School of Dentistry, Nagoya, Japan, ²Aichi-Gakuin University, School of Pharmacy, Nagoya, Japan, ³NIMD, Minamata, Japan

Dental amalgam is a source of exposure to elemental mercury vapor in the general population, and possible health risks from this have been debated for a long time. Many studies have examined the relationship between dental amalgam fillings and the amount of mercury in organs, blood, urine and other tissues. However, adverse health effects from mercury accumulated in the tissues were not clear.

Objectives: The aim of this study was to elucidate the effect of elemental mercury vapor exposure from dental amalgam fillings on gene expression profiles.

Methods: Ten female Sprague-Dawley rats were randomly assigned to experimental and control groups (n=5). Each experimental group received four amalgam fillings under anesthesia. Six months later, all animals were terminated by bleeding from the right auricle of the heart under anesthesia and they were then transcardially perfused with normal saline solution for one hour. After perfusion, brain, liver and kidneys were removed and their gene expression patterns were examined using a DNA microarray containing 26,962 genes. The amount of mercury in each organ was also measured.

Results: Compared with the controls, 2 genes (Atp1b3, Dnaja2) were found to be up-regulated (control > 2.0) and 1 gene (Tap1) was down-regulated (control < 0.5) in the brain, 2 genes (Actb, Timm23) were found to be up-regulated and 1 gene (Spink3) was down-regulated in the liver and 2 genes (Mgat5, RT1-Bb) were found to be up-regulated and 6 genes (Rara, Pias4, Tnfrsf8, Slc2a4, Wdr12, Timm13) were down-regulated in the kidneys. The amounts of mercury in the experimental groups were higher than those of the controls.

Conclusion: Results of the present study showed that mercury vapor release affected the genes in the organs of rats which received amalgam fillings.

Sealing ability of two thermoplastic materials after different irrigation protocolsW. WILKOŃSKI¹, L. JAMRÓZ-WILKOŃSKA² and J. KRUPIŃSKI³¹Research Department, Polish Endodontic Association, Wadowice, Poland, ²Conservative Dentistry with Endodontics, University of Silesia, Katowice, Poland, Wadowice, Poland,³Conservative Dentistry with Endodontics, University of Silesia, Katowice, Poland, Cracow, Poland

Objectives: The aim was to evaluate the apical and coronal sealing ability of gutta-percha/AH-Plus and resilon/EpiphanySE after five different irrigation protocols.

Methods: 200 extracted human single-straight-root-canalled teeth were prepared with MTwo rotary instruments to size 40/04, divided into five groups and irrigated as follows: Group 1 – 5,25% sodium hypochlorite, Group 2 – 20% citric acid, distilled water, Group 3 – 20% citric acid, distilled water, 2% chlorhexidine, Group 4 – BioPure/MTAD (Dentsply), distilled water, Group 5 – BioPure/MTAD, distilled water, 2% chlorhexidine. Each group was divided into two equal subgroups: A and B (n=20). The root canals were filled using vertical condensation technique with gutta-percha/AH-Plus and resilon/EpiphanySE respectively. After incubation, cutting and varnishing, the samples were stored in 2% methylene blue for 7 days. Then the roots were split longitudinally into two halves and the measurement of apical and coronal leakage was carried out with the micrometer and operating microscope OMPI Pico (Zeiss). The data was analyzed with Mann-Whitney U, Kolmogorow-Smirnow and Wald-Wolfowitz tests.

Results: The best apical seal was in subgroups 3A, 4A and 5A. The best coronal seal was in subgroup 5A. The worst sealing ability was in subgroups 1B and 4B. Overall gutta-percha/AH-Plus fillings yielded less leakage.

Conclusions: 1. The best apical seal was obtained by irrigation with 20% citric acid, water, 2% chlorhexidine and filling with gutta-percha/AH-Plus. 2. The best coronal seal was achieved with the use of BioPure/MTAD, water, 2% chlorhexidine and gutta-percha/AH-Plus. 3. The worst results were gained with 5,25% sodium hypochlorite followed by resilon/EpiphanySE. 4. Overall gutta-percha/AH-Plus exhibited less leakage. 5. The final flush with 2% chlorhexidine improved coronal sealing ability of both materials and apical seal of gutta-percha/AH-Plus (after 20% citric acid) and of resilon/EpiphanySE (after BioPure/MTAD). 6. Chlorhexidine interacted with resilon and lead to discoloration of the teeth.

Correlation between Coronal and Apical Microleakage for Endodontic Filling Materials

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Objectives: Importance of apical or coronal leakage is well recognized but which pattern may superiorly affect the prognosis of root canal therapy is controversially and the possible correlation between them has not been investigated. Therefore, this study was aimed to investigate the presence of possible correlation between coronal and apical microleakage in canals filled with either gutta percha or Resilon filling material.

Methods: Sixty freshly extracted one-canalled lower first premolars were sectioned at cemento-enamel junction. The roots were randomly divided into three equal groups. In Group I, 20 roots were obturated using Resilon/Epiphany SE sealer, Group II, roots were obturated using gutta-percha and Epiphany SE sealer, Group III, 20 roots were used as control groups; canals of 10 roots were filled with gutta-percha/Epiphany SE and other 10 canals were filled with Resilon/Epiphany SE. Half of this group (equally including both materials) was used for positive control and the other half for negative control. The coronal leakage was measured with dye penetration using Methylene blue for 7 days at 37°C. The teeth were sectioned longitudinally, and the linear extent of dye penetration was measured for apical and coronal directions and data were collected and statistically analyzed by One-Way NOVA test.

Results: Negative controls revealed no dye penetration and positive controls displayed total dye penetration. Resilon revealed significantly less microleakage than gutta percha group ($P < 0.05$) for both apical and coronal directions. For the same material, coronal leakage was significantly more than apical leakage ($P < 0.05$) and the correlation between the apical and coronal leakage was not significant ($p = 0.092$).

Conclusions: Coronal leakage was significantly more than that of apical seal and there was no correlation between the two patterns regardless the filling material used. Resilon provided better seal than gutta percha, but it failed to provide complete seal.

Bond strength evaluation of endodontic sealers with different rinsing protocolsL. MARKOVIC¹, R. BEER¹, C. ESPIG², H. WALTER³, and S. ZIMMER¹¹Dept. of Operative and Preventive Dentistry, University of Witten/Herdecke, Witten, Germany, ²Private Practice, Gotha, Germany, ³Dept. of Environmental and Reliability Engineering, Fraunhofer IZM, Berlin, Germany

Objectives: The aim of this study was to examine the influence of different cleaning and disinfecting rinsing solutions on the bond strength of two endodontic sealers.

Methods: 70 human incisivi were randomly assigned to seven groups (n=10) in an in-vitro study. The teeth were decapitated 2mm above the dentino-enamel junction and root canal treatment was performed. Rinsing during the root canal treatment was carried out using 5% NaOCl solution (group 1) or a consecutive use of the following rinsing solutions: 5% NaOCl+17% EDTA (group 2), 5% NaOCl+2% CHX (group 3), 5% NaOCl+20% citric acid (group 4), 5% NaOCl+20% citric acid+2% CHX (group 5), 5% NaOCl+17% EDTA+2% CHX (group 6). 0.9% saline solution (group 7) served as control. In each group, five teeth were obturated by lateral condensation using AH-Plus® (AH), and five teeth by using a single cone technique with resin-coated guttapercha and EndoREZ® (ER). 2mm thick root-disks were cut from the apical section. Performing a push-out test, the bond strength of the different sealers was determined at a universal test bench. For statistical analysis, one-way-ANOVA was applied at a significance level of 95%.

Results: In five out of seven examined rinsing groups lateral condensed guttapercha with AH reached higher bond strengths than the adhesively processed guttapercha of the ER-system ($p < 0.05$): mean force (N \pm SD) AH vs. ER: group (1)*: 8.48 ± 0.60 vs. 0.08 ± 0.00 ; group (2): 6.98 ± 2.14 vs. 3.17 ± 2.88 ; group (3)*: 8.40 ± 0.07 vs. 3.37 ± 2.64 ; group (4)*: 7.90 ± 1.88 vs. 0.30 ± 0.10 ; group (5)*: 8.37 ± 0.43 vs. 0.50 ± 0.20 ; group (6)*: 8.13 ± 0.07 vs. 3.10 ± 3.90 ; group (7): 8.14 ± 0.07 vs. 5.10 ± 3.59 . No significant differences were found with respect to the rinsing protocol.

Conclusions: In this in vitro-study, different rinsing protocols had no effect on the bond strength of AH and ER as endodontic sealers.

0061 (152080)

Antibacterial Properties of Endodontic Sealers Following Incorporation of Antimicrobial Agents

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Objectives: The antimicrobial activity of different endodontic sealers following incorporation of 2% Benzalconium Chloride(BC) and 2% Cetylpyridinium Chloride(CPC)– against three different microorganism strains– was evaluated.

Methods: The agar diffusion method was used for determination of the inhibitory effect of: RoekoSeal, Endomethasone, N2 and AH plus; on Streptococcus mutans - ATCC 25175, Lactobacillus casei - ATCC4646 and Actinomyces viscosus - ATCC19246. Bacterial strains were inoculated into BHIB, incubated in anaerobic atmosphere (37°C, 48 hours). From the bacteria grown in the liquid medium, the density of the inoculum was set to be equivalent to McFarland 2 standard. In Shaedler agar, 350 μ L of the bacterial suspension were equally spread. Forty-five specimens (4x6mm) were prepared from each material without (control) and with addition of 2%BC and 2%CPC (experimental groups). All plates were incubated in anaerobic conditions (37°C). The inhibition zones were read after 48 hours (zero time), specimens were then transferred onto new plates and read after 7 days. The data were analyzed by One-Way ANOVA and Post-hoc-Tukey (HSD) test ($p < 0.05$).

Results: The effectiveness in the antimicrobial activity of the control groups, in descending order was as follows: for Streptococcus mutans- N2>Endomethasone>AH plus>RoekoSeal; for Lactobacillus casei- N2>Endomethasone=AH plus=RoekoSeal; for Actinomyces viscosus- Endomethasone=AH plus>RoekoSeal=N2. After incorporation of BC, the inhibitory effect was: for Streptococcus mutans- N2>Endomethasone>AH plus>RoekoSeal; for Lactobacillus casei- AH plus>N2>Endomethasone=RoekoSeal; for Actinomyces viscosus- AH plus>Endomethasone>RoekoSeal>N2. After incorporation of CPC the inhibitory effect was: for Streptococcus mutans- N2>Endomethasone>AH plus>RoekoSeal; for Lactobacillus casei- N2>AH plus>Endomethasone=RoekoSeal; for Actinomyces viscosus- AH plus=N2>Endomethasone>RoekoSeal

Conclusions: All tested materials significantly increased their antimicrobial activity after the incorporation of antimicrobial agents. Generally, the most resistant strain was Lactobacillus casei; while CPC demonstrated better antimicrobial effect (except for RoekoSeal). The antimicrobial activity in all groups decreased after 7 days.

0062 (152115)

Cycle Fatigue in Nickel-Titanium Rotary Endodontic Instruments

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Objectives: The purpose of this study was to examine cycle fatigue of Ni-Ti rotary endodontic instruments subjected to artificial root canals with different curvatures and to determine a mathematical model connecting lifespan of the instrument with the curvature to which it is subjected.

Methods: We used a new mathematical model for the deformation of Ni-Ti material, showing that the maximal stress in a bent Ni-Ti endodontic instrument is not necessarily at the outer layer of the instrument. On the basis of this observation we modified Coffin-Manson relation so that a parameter corresponding to the position of the maximal stress within the instrument is introduced. Experiments were performed to determine coefficients in the modified Coffin-Manson relation. Twenty Ni-Ti rotary endodontic instruments BioRaCe (BR3 FKG Dentaire S.A., Chaux-de-Fonds, Switzerland) with tip size 25, 0.06 taper were subjected to the rotating-bending fatigue in an artificial root canals manufactured for cyclic fatigue test with two different curvatures; group I (27° angle of curvature and radius of curvature of 40 mm) and group II (35° angle of curvature and radius of curvature of 13 mm). Mean values were then calculated. Data were subjected to an independent sample t-test ($p < 0.05$).

Results: A highly statistically significant difference in the average number of cycles to failure ($p < 0.05$) was noted between instruments of groups I and II confirming that the increase of bending curvature to which instruments are subjected reduces their resistance to cyclic fatigue.

Conclusions: The results of mathematical modeling indicated that the number of cycles to failure was influenced by the curvature of the canal and the arc length.

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0063 (152166)

Ni-Ti rotary instruments surface alterations caused by heat sterilization

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Objectives: Defects on of nickel–titanium endodontic file surface can play a role in instrument fracture. Aim of our study was to evaluate the effect of repeated dry heat sterilization on surface characteristics of NiTi rotary instruments by using scanning electrical microscopy (SEM), Energy dispersive x-ray spectroscopy (EDS) and Atomic Force Microscopy (AFM).

Methods: ProTaper (Dentsply Maillefer, Switzerland) and AlphaKite (Komet, Italy) files were tested. The instruments were exposed to 1, 5 and 10 cycles of sterilization. Each groups included four Protaper and four AlphaKite. After sterilization the samples were observed by SEM (FEI, Netherlands), and surface analysis was performed on each instrument by EDS. Moreover, twenty areas of the surface the files were analyzed by AFM (Perception, Assing, Italy). Three-dimensional images were processed by Gwiddion software and the roughness average (Ra) and the root-mean-square value (Rms) of the scanned surface profiles were recorded. Data were statistically analyzed by Student t Test ($p < 0.05$).

Results: SEM observations showed the presence of debris, pitting and deep milling marks in both new and sterilized files. After 5 and 10 sterilization cycles, surface roughness increased significantly for ProTaper, while AlphaKite (TiN-coated) instruments showed no significant differences compared to the controls. EDS analysis showed the presence of Nickel and Titanium in both instruments, while Nitrogen (21.08%) was present only on AlphaKite surfaces. The percentages of metals changed after dry heat sterilization, with alterations of coating surfaces. AFM observations showed that Ra and Rms values of ProTaper instruments, after 5 and 10 cycles of sterilization were significantly higher compared to controls. In contrast, Ra and Rms values of AlphaKite instruments showed no significant differences with the controls.

Conclusions: Our results suggested that dry heat sterilization might modify the surface morphology and chemical composition of NiTi instruments and that TiN coating might reduce these phenomena.

The effect of ozone-application on shear bond strengths of sealers

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Objectives: To investigate the effect of ozone treatment on shear bond strength of resin based endodontic sealers to root dentin. **Methods:** 36 extracted premolars were sectioned buccolingually and 72 root halves were randomly divided into six groups (n = 12). The cut surfaces were ground and pretreated with 5% NaOCl and 17% EDTA solutions for 5 minutes followed by 5 minutes of distilled water irrigation. Three resin based sealers AH Plus (Dentsply), Real Seal (Sybron Endo), Hybrid Root SEAL (Sun Medical) were used. All specimens were then fixed with cold acrylic resin to a plastic cylindrical ring (2 cm in diameter and 2.5 cm height). The first three groups were allocated for ozone treatment (80 %, 120 second, KP probe, Biozonix; Dental high-frequency ozone generator, Germany). Three mm high build-ups with a constant surface area of 3.14 mm² were created using the sealers and allowed to set (37°C, 100% humid, 72 hrs). The samples were tested to failure for shear bond strength (1 mm/minute). The data was calculated (MPa) and analyzed Two-way ANOVA, Tukey HSD and Yndependent-t tests , sig. 0.05). Results: There were statistically significant differences in the shear bond strengths values of the tested groups related to the tested endodontic sealers (P<0.05). AH Plus showed statistically higher bond strength than Real Seal and Hybrid Root SEAL (P<0.05). Ozon treatment had no effect shear bond strength (p>0.05). **Conclusions:** Results of this study suggested that ozone treatment did not alter the bond strengths of resin based sealers to dentin. AH Plus showed better adhesive performance than the other sealers both on ozon treated and non-treated root dentin.

Light transmission through ceramics: effects of thickness and shade

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The ceramics systems without metal alloy as become a definite option for prosthetic crowns as it offers the possibility of light curing adhesive through the ceramic. It results a tough adhesion between the prosthetic crown and the teeth, which is a guarantee for the success of the treatment.

Objective: This study analyses the effects of shade and thickness of porcelain on light transmission.

Methods: Thirty-five porcelain disks (25 Vita Mark II, 10 Empress Cad) were made to combine four different thicknesses (2, 4, 8 and 10 mm) and six shades (0M1; 1M1; 2M2; 4M2; A1HT A1LT). An integrative sphere coated with barium sulfate (Gigahertz-Optik, Puchheim, Germany) coupled with a P9702 optometer was used to measure the percentage of transmitted light power (PTLP). Four high power light curing units were based on the three technologies (LED, Plasma and halogen) were used.

Results: The percentage of transmitted light power (PTLP) through ceramics range between 0.01 and 13.95, with an overall mean of 2.95 (SD= 4.02). The mean PTLP per curing unit, through 2 mm thickness, were 9.65 (Celalux), 9.15 (Flipo) and 8.27 (SM light). Globally, the mean values of PTLP per thickness were 9.02 (2 mm), 1.70 (4 mm), 0.78 (8 mm) and 0.32 (10 mm). Analysis of variance for PTLP showed a significant effect of thickness (p=0.0001), shade (p=0.0001) and curing unit (p=0.0001).

Conclusions: Whatever the shade or curing unit, there was a significant decrease in light transmission as the sample porcelain thickness increased. For the same thickness most shades presented statistical difference between the PTLP. However, for larger thicknesses, the curing unit effect was no longer statistically significant.

The Comparison of Marginal Fit of Two Different Cores

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Objectives: The purpose of this in vitro study was to investigate the marginal fit of two types of copings fabricated by conventional and CAD/CAM method before and after cementation.

Methods: Fourty machined stainless steel molar die models with a chamfer margin design (C) were prepared. Preparations were standardized with a height of 4mm and a total convergence angle of 6°. Standardized copings were fabricated and divided into four groups (n=10 for each coping material). Coping materials tested were Ni-Cr CAD/CAM (NCC), Ni-Cr conventional (NC), Zirkonzahn CAD/CAM (ZZC) and Zirkonzahn (ZZ); luting agent was Poly F. Marginal fit was evaluated before and after cementation with a stereomicroscope at X40 magnification. The means and standard deviations of marginal fit values per group were used for statistical analysis. CAD/CAM and conventional methods were compared in themselves. In addition, different production techniques of the same material were compared. Independent t test was used for the comparison of marginal fit before, after and post-pre cementation (α=.05).

Results: The mean marginal fit values (µm) of groups before and after cementation were reported in Table I. According to independent t test results, before and after cementation significant differences were observed between the marginal fit of NCC-NC and ZZC-ZZ (p<0.01). However no significant differences were observed between the CAD/CAM and conventional methods (p>0.05).

Conclusion: Both before and after cementation, NCC revealed the lowest mean marginal fit and ZZ revealed the highest mean marginal fit value. In addition, both before and after cementation, mean marginal fit values of CAD/CAM were lower than the conventional. Both types of copings demonstrated that the mean marginal fit was considered acceptable for clinical application (<120µm).

Table I. Mean and SD values (mm) of marginal discrepancies in each group (n=10)

Group	Precementation		Postcementation		Post-precementation	
	Mean	SD	Mean	SD	Mean	SD
NCC	43,29	12,68	69,64	22,84	26,35	18,96
NC	79,42	24,31	97,51	20,4	18,08	15,92
ZZC	57,17	20,51	82,03	26,45	24,86	20,89
ZZ	92,52	18,63	113,99	22,8	21,46	16,98

Electronic Articulator-Related Bite Registrations: Occlusal Precision and Adjustment Time Analysis

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Objectives: The study aimed to compare the number of contacts and time consumption for occlusal adjustment of FPDs produced using electronic and non-electronic articulator-related bite registration.

Material and methods: Single crowns, 3-unit FPDs and 4 and more unit FPDs were made to 77 patients randomly divided into two groups. In group A bite registrations were transferred by a face bow to articulator (Protar EVO 7, Kavo, Germany) set on average values, while in the group B electronic ultrasonic device (Arcus Digma II, Kavo, Germany) was used to record individual TMJ values. All registrations were done by one prosthodontic specialist and FPDs made by one dental technician. FPD try-in and occlusal adjustments were done randomly by two experienced dentists blinded from the study. The number of contacts per unit and time needed for occlusal adjustments were recorded and analyzed.

Results: For single crowns and 3-unit FPDs there were no statistically significant differences between groups A and B ($p>0.05$). For the 4 and more unit FPDs with no intermaxillary distance change significant correlations were determined between the type of bite registration and number of contacts per unit (34% more in group B than in group A; $r=0.71$, $p<0.05$) as well as adjustment time, (21% less time consumption in group B; $r=0.66$, $p<0.05$). For the 4 and more unit FPDs with intermaxillary distance change the occlusal adjustment time was reduced 33% and the number of contacts per unit was 46% more in the group B compared to group A.

Conclusions: The use of Arcus Digma II and individual articulator settings enable more accurate occlusal scheme design in multi-unit FPDs significantly increasing the number of contacts per unit while reducing the intraoral occlusal adjustment time, thus optimizing appointment time.

0068 (152143)

Psychometric Properties of Croatian version of the Orofacial Esthetic Scale

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Objectives: To develop a Croatian version of the Orofacial Esthetic Scale (OES) and test the psychometric properties.

Methods: OES is the 8-item instrument for measuring self-reported orofacial esthetics in patients with prosthodontics concerns. The questionnaire was designed to be used as a stand-alone instrument to measure direct esthetic impacts. The English version of the OES (0-10) was translated into Croatian language according to the accepted methods (forward-backward method). The original 11 point scale, as well as the 5 point scale (1=unsatisfactory, 5=excellent) were used. Convergent validity was tested on 126 subjects, and discriminative validity on the same subjects divided into 4 groups: patients esthetically normal ($n=25$), patients esthetically impaired ($n=42$), controls esthetically normal ($n=37$), and controls esthetically impaired ($n=22$). Test-retest reliability was tested on 43 subjects. Responsiveness was tested on 32 esthetically impaired patients (P-EI) who received prosthodontic treatment.

Results: Additional explanation was added to the first two items of the OES. Convergent validity was confirmed by the association between the OES scores and the self-reported oral esthetics and the 3 OHIP questions related to esthetics (correlation coefficients ranged from 0.734 to 0.811, $P<0.001$). Discriminative validity showed the results as predicted. Test-retest reliability showed high intraclass correlation (0.79-0.95) and no significant differences between the two administrations of the 1-5 OES scale ($P>0.05$). The 0-10 OES scale showed significant differences for the third and the eighth question ($P<0.01$). Internal consistency showed high Cronbach α (0.802-0.962). Responsiveness was confirmed by a significant difference between the baseline and follow-up ($P<0.001$) and a high effect size.

Conclusions: Psychometric properties of OES-CRO render the instrument suitable for the assessment of esthetics in Croatia. We recommend changing the first two items by adding explanation that questions are related to the lower third of the face and the five point scale for rating.

0069 (152175)

Effect of Different Light Sources on the Color of All-ceramics

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Objectives: All ceramic restorations allow superior translucency and can be used in areas of high esthetic demand. A challenge in the success of these restorations is color assessment and reproducibility. The available shade guides, in addition to minor differences in light conditions, have been found to dramatically affect the outcome of restoration color and the production of an acceptable color match. The aim of this in vitro study was to evaluate the effect of different light sources on the color of leucite-glass ceramics.

Methods: 24 ceramic disks were fabricated with IPS Empress Esthetic porcelain according to the manufacturer's instructions and randomly divided into 2 groups of 12 each (10 mm diameter-0.5 mm thickness and 10 mm diameter-1 mm thickness). A digital spectrophotometer were used under 5 different light sources (Fluorescent lamp, dental unit lamp, daylight, Ultraviolet light and no light) to examine the color. The CIE Lab values were recorded and statistical analysis was performed using two-way analysis of variance and Tukey HSD tests.

Results: Statistical analysis indicated that L* values were significantly affected by the light source and the ceramic thickness ($P<0.05$). Mean a* values were significantly affected by the light source ($p<0.05$), but not affected by the ceramic thickness ($p>0.05$). Mean b* values were significantly affected by the light source and the ceramic thickness ($p<0.05$).

Conclusion: When L*a*b* values were significantly affected by the light source, the digital spectrophotometer showed the same color shade number with all light sources.

0070 (152178)

Comparison of Accuracy of Optical Impression Methods versus Conventional Procedures

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Objectives: This study evaluated the marginal and internal gap using intraoral and extraoral optical impression methods.

Methods: 40 acrylic premolar teeth (Frasaco, #15) were used in the study which were prepared for a full crown preparation. They were then randomly divided into four groups ($n=10$). For group 1, a thin layer of powder was applied directly onto the surface of the preparation for imaging and optical impression with Cerec Bluecam. For group 2, a sectional impression was made with polyvinylsiloxane (PVS) (3M ESPE Express). The dies were fabricated in stone (GC Fujirock) and the images were made without powdering by Cerec Bluecam. For group 3, a sectional impression was made with PVS, the dies were fabricated in stone and the images were taken without powdering by Cerec InEos Blue Scanner. For group 4, a sectional impression was taken with PVS and lithium disilicate crown copings were produced by conventional methods (control group). The precision of ceramic crowns were examined by measuring the marginal and internal fit of copings by silicon replica technique. The copings were filled with a light body silicone, stabilized with a heavy body material (3M ESPE Express) and the replica samples were examined under light optical microscope.

Results: The marginal and internal fit values of all samples were within clinically acceptable limits. Significant difference was observed in the accuracy of the scanners of the dental CAD/CAM systems. Conventional methods with PVS impression presented the highest marginal and internal fit values ($P<0.001$). Cerec InEos Blue Scanner showed significantly higher precision compared to impressions made with Cerec Bluecam ($P<0.001$).

Conclusions: Optical scanning methods in dental CAD/CAM technologies are precise and reliable methods of digitizing the real-life models, compared to conventional techniques.

The effect of glaze firing on color stability of porcelains

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Objectives: The aim of this study was to investigate the changes in color parameters of enamel porcelains before and after glazing using a spectrophotometer.

Material and Methods: A total of 30 disc-shaped specimens (12 mm in diameter and 2 mm thickness) were fabricated with 3 different dental enamel porcelain materials (Ivoclar IPS D Sign, Vita Omega 900 and Ceramco III) according to manufacturers' instructions (n= 10). Objectives: The aim of this study was to investigate the changes in color parameters of enamel porcelains before and after glazing using a spectrophotometer. A total of 30 disc-shaped specimens (12 mm in diameter and 2 mm thickness) were fabricated with 3 different dental enamel porcelain materials (Ivoclar IPS D Sign, Vita Omega 900 and Ceramco III) according to manufacturers' instructions (n= 10). Both sides of the porcelain specimens were polished with wet 600-, 1000-, 1500-grit silicon carbide papers. Glaze was applied one side of specimens. Color value (L*, a*, b*) of each specimen was measured three times with a spectrophotometer (Vita Easyshade, Zahnfabrik) before glaze firing and after glaze firing. Color change (ΔE) was calculated with mean L*, a*, b* values and data were analyzed with One-way ANOVA. Confidence level was 95%.

Results: Statistically significant difference was found among the tested groups (p=0.07). Glaze firing affected the colors of Ivoclar IPS D Sign ($\Delta E=2.35\pm0.45$), Vita Omega 900 ($\Delta E=3.14\pm1.94$) and Ceramco III ($\Delta E=1.01\pm0.61$) specimens. Color change was less in Ceramco III group than Vita Omega 900 and Ivoclar IPS D Sign groups.

Conclusions: Within the limitation of the present study; glaze firing affected the specimens color and this effect considered clinically noticeable for Ivoclar IPS D Sign and Vita Omega 900 groups.

Contrast Ratio of CAD/CAM ceramic blocks for CEREC system

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Objectives: To compare the relative translucency of 5 CAD/CAM ceramic materials for CEREC system.

Methods: Commercial blocks of 5 core materials (VITA AL, VITA YZ [LL2], In-Ceram Alumina, In-Ceram Spinell and In-Ceram Zirconia [Vita Zahnfabrik, BadSackingen, Germany]) for CEREC CAD/CAM system were selected for the study. The blocks were perpendicularly cut by a water cooled diamond saw (Isomet, Buehler, Lake Bluff, USA), 20 flat specimens were prepared at 0,5mm of thickness for each material and randomly divided in 4 groups (n=5). Specimen were prepared strictly following manufacturer instructions, 3 groups were veneered in a Vita Vacumat 4000 furnace (Vita Zahnfabrik) in order to obtain specimens with an overall thickness of 1,0, 1,5 and 2,0mm. The specimens were finished on a grinder/polisher device and ultrasonically cleaned. For measurements, a spectrophotometer (OceanOptics PSD1000) equipped with an integrating sphere was used. Contrast Ratios (CR) were calculated as Yb/Yw.

Result: The two-way Analysis of Variance (post-hoc: Tukey test) was applied. Result are summarized in table 1.

Tab. 1

Materials	0,5 mm			1,0 mm			1,5 mm			2,0 mm			Sign.
	Mean	SD	Sign.	Mean	SD	Sign.	Mean	SD	Sign.	Mean	SD	Sign.	
Zirconia	0,99	0,01	d	1	0,01	d	1	0,01	d	1	0,01	b	D
YZ	0,71	0,02	c	0,81	0,04	bc	0,9	0,03	c	0,94	0,01	a	C
AL	0,69	0,02	c	0,85	0,04	c	0,87	0,06	bc	0,95	0,02	a	C
Alumina	0,65	0,02	b	0,79	0,03	b	0,85	0,02	b	0,96	0,01	a	B
Spinell	0,44	0,02	a	0,73	0,03	a	0,81	0,06	a	0,93	0,02	a	A
Sign.	A			B			C			D			

Conclusion: A wide range of translucency was identified in the materials tested. This variability has to be taken into account for the selection of the materials in different clinical situations also related to the thickness clinically required.

Quality of Ceramo-Metal Crowns produced in the Far East

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Objectives: To reduce the costs in dental therapy German dentists often brief foreign labs to produce the dental prostheses required. The aim of this study was to compare the quality of single crowns produced by two different Far East dental labs by marginal gap measurement.

Methods: The dental impressions of 50 randomly selected patients each were send to a lab in Thailand and a lab in China. All patients were provided with ceramo-metal crowns with non-precious alloy framework. The marginal discrepancy of one randomly selected crown of each patient seated onto the plaster die produced at the respective dental lab was determined by microscopic measurement at ten positions. The significance of the margin differences was determined by one-way ANOVA on the 0.05 level.

Results: The size of the crown margins verified for the Thailand lab was $165.5 \pm 72.1 \mu\text{m}$. 12% of the crown means were even above $200 \mu\text{m}$. The marginal gaps found for the crowns produced in the Chinese lab were significantly smaller (99.3 ± 25.7) (p=0.01).

Conclusions: Big differences were found in quality of crowns produced in the Far East. Compared to literature the Chinese lab met the expected standard. However, the quality of the crowns of the second lab was not acceptable. Dentists briefing dental labs to produce dental prostheses should always make sure that the quality delivered is acceptable. Reduction of costs is not necessary equal to a lack of Quality.

Comparative analysis of oral health students of ISCSEM

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Objectives: To comparatively evaluate the plaque index (PI) and gingival index (GI) in students of 1st and 5th years of the master's degree in Dental Medicine School of Health Sciences Egas Moniz (ISCSEM).

Methods: A transversal study was carried out, in the dental clinic of Egas Moniz - Cooperative Higher Education, a sample of 49 dental students of 1st year and 28 dental students from 5th (30% of total), chosen randomly and without prior notice, at least 6 teeth per quadrant, full crown restored or integrates and with theme oral hygiene performed, until, at least, three hours. We administered a questionnaire, which were approached habits and oral hygiene practices, and preventive knowledge. After calibration between researcher, was calculated the PI and the GI through a clinical examination of the oral cavity of individuals. Data were subjected to descriptive and inferential statistical analysis, the latter using the chi-square test and Mann-Whitney test, for a significance level of 5%.

Results: Students in grade 5th have a more careful oral hygiene than the 1st, because they have lower values of PI and GI ($p=0.014$ and $p<0.001$). For the questions "Have you had knowledge, through a professional, the correct form to brush your teeth?", "What was the professional?" and "Since began the course, have you changed the form that you made your oral hygiene?" were found in the responses, differences with statistical significance ($p<0.001$).

Conclusions: Students in grade 5th have a more careful oral hygiene than the 1st. The way that dental students take care of theme oral hygiene will be reflected in preventive procedures and how they will transmit the knowledge.

0075 (151426)

Prevalence of otalgia in Tempero-Mandibular Disease: a pilot study

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Objectives: determine what is the prevalence of otalgia in Tempero-Mandibular Disease (TMD), at the ambulatory office of Serviço de Assistência Médico- Social dos Bancários – Sul(SAMS-Sul) and to assess its repercussions in these patients' lives.

Methods: this study comprised 50 patients at first with TMD. The sample was divided in two sub-groups. For all patients was applied the Research Diagnostic Criteria for Tempero-Mandibular Disorders (RDC/TMD). Group A refers to patients diagnosed with TMD and otalgia with a non otologic cause (TMDO-NOC) and group B refers to patients diagnosed only with Tempero-Mandibular Disease (TMD). Group A had them diagnostic confirmed by occlusion specialist and the otolinolaryngologist. Group B had them diagnostic confirmed by the occlusion specialist and were sent by the dentist of this institution. To assess the repercussions in patients' lives, we use the Portuguese version of the RDC/TMJ questionnaire (Axis II).The statistic analyses were obtained by using ANOVA One- way for a significance level of 5%.

Results: Otalgia had a prevalence of 17, 3% (n=9). Group A obtained 100% (n=9) of facial pain while in Group B only 66, 75% (n=28) had facial pain (pvalue=0,043). In Group A, the individuals claim that they tighten or grind their teeth during the day when compared to Group B (p value = 0, 01). In Group B, the individuals claim that they tighten or grind their teeth during the night when compared to Group A (p value = 0, 03).

Conclusions: The prevalence of otalgia was lower than others recent studies. Group A had stronger oral facial pain compared to Group B. Group A had a significant ability to tighten or grind their teeth during the day, in contrast to Group B that had a significant ability to tighten or grind their teeth during the night.

0076 (151486)

Dental Fear Related Parameters in Graphology. A Pilot Study

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Objectives: Our previous study indicated influence of dental fear and anxiety on form/shape parameters of tooth drawings. The aim of this study was to investigate if there are similar influences of dental fear and anxiety on graphological parameters of written free associations about teeth.

Methods: In this study 136 schoolchildren were investigated (n = 136 male: 54, female 82, age: 8-18 years, mean 12,92 ± 3,05 yrs.). Demographic data were collected and Hungarian versions of dental fear scales (DAS, DFS, Expectation) and anxiety scales (STAI-S, STAI-T) were administered. Subjects were also asked to write any thoughts that came into their mind about teeth on a sheet of paper. Graphological analysis included determination of upper- lower- left- right margins, spaces between lines and words, ratio of width/height of ovals, ratio of upper/lower zones, height of letters and their middle zone, and other ratios of the above including ratio of page width/left margin and ratio of space-between-words/oval width.

Results: Mean values of the scales were: DAS: 10,64 ±3,83; DFS: 40,99 ±16,0; Expectation: 2,33 ±0,89; STAI-S: 37,33 ±11,27; STAI-T: 40,15 ±10,44. Gender influenced DAS, Expectation, STAI-S, STAI-T, left and right margins, height of letters and ratio of width/height of ovals (t-probe, $p \leq 0,05$). Age influenced left and right margins, spaces between words and lines, height of letters and ratio of space-between-words/oval-width (ANOVA, $p \leq 0,05$). Dental fear influenced upper and left margins (ANOVA, $p \leq 0,05$). Expectation scores influenced ratio of upper/lower zones (ANOVA, $p \leq 0,05$). Ratio of page-width/left margin influenced DAS scores; and upper margin value influenced Expectation scale scores (ANOVA, $p \leq 0,05$).

Conclusion: Our data may indicate that, there are some couplings between dental fear and certain parameters of graphology. This research was supported by TÁMOP-4.2.1/B-09/1/KMR-2010-0001.

0077 (151488)

Dental Fear and Anxiety in the Hungarian-Slovakian Border Region

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Objectives: Our previous study indicated high dental fear and anxiety scores of Hungarians living as a minority in Romania. The aim of this pilot study was to investigate whether Hungarians living as a minority in Slovakia also score higher on dental fear related and anxiety scales or not.

Methods: In this study 201 volunteers (n = 201, inside border Hungarian: 144, outside border Hungarian: 57, male: 90, female 111, age: 8-83 years, mean 44 ± 16 yrs.) were investigated. Demographic data of the subjects were collected and Hungarian versions of dental fear scales (DAS, DAQ, DASQ, DFS) a scale about patients' beliefs related to dentist (DBS), a scale about patients' expectations about dental fear of their surrounding people (Expectation Scale) and anxiety scales (STAI-S, STAI-T) were administered.

Results: Mean values of the scales were: DAS: 10,34 ±3,54; DAQ: 2,3 ±1,15; DASQ: 12,58 ±4,55; DFS: 40,37 ±15,67; DBS: 32,89 ±12,94; Expectation Scale: 2,87 ±3,56; STAI-S: 39,51 ±10,68; STAI-T: 41,65 ±9,08. There were no significant differences related to gender in any scales. Age was a significant factor of DAS, DASQ and DFS scales, the scores were highest at the age group of 20 yrs. and below. The mean scores of all the scales were higher in the case of Hungarians living inside the border of Hungary. The differences were statistically significant in the case of DAS, DAQ, DASQ, and DFS scales (t-probe, $p \leq 0,05$).

Conclusion: Data of our pilot study indicated that, living as a Hungarian minority in Slovakia not necessarily leads to the increase of dental fear and anxiety. This research was supported by TÁMOP-4.2.1/B-09/1/KMR-2010-0001.

Tobacco Use Counselling: Assessing Oral Health Professionals' Implementation DifficultiesM. AMEMORI¹, T. KORHONEN¹, H. MURTOMAA², S. MICHIE³, and T. KINNUNEN⁴¹University of Helsinki, Helsinki, Finland, ²Institute of Dentistry, University of Helsinki, Helsinki, Finland, ³University College London, London, United Kingdom, ⁴Oral Health Policy & Epidemiology, Harvard University, Boston, MA

Objectives: Tobacco use adversely affects oral health. Clinical guidelines recommend oral health professionals to promote tobacco abstinence by providing tobacco users at least with brief tobacco use cessation counselling. These guidelines are seldom fully implemented, however. To improve guideline adherence, it is essential to understand provider practice and challenges to implementation. We used a theory-based assessment tool to evaluate implementation difficulties related to tobacco use counselling among a sample of oral health professionals.

Methods: A 35-item questionnaire based on key theoretical domains relevant to the implementation behaviours of healthcare providers was applied. The data were collected from dentists (n = 73) and dental hygienists (n = 22) in 36 dental clinics in Finland using a web-based survey. Of 95 providers, 73 participated (76.8%).

Theoretical domain scores were based on responses measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). We calculated a total score for each domain and divided it by the maximum score for the given domain. The domain scores were reported as a percentage of the maximum possible. A low percent value suggests that that particular domain may be an area of difficulty for implementation, and a high percent value suggests that that particular domain may facilitate the implementation of guidelines.

Results: Of the key theoretical domains 'Environmental context and resources' (21.3%; 95% CI: 17.2-25.4), 'Beliefs about capabilities' 26.0% (21.4-30.7) and 'Skills' 33.5% (29.2-37.8) provided lowest mean scores (21.3%; 95% CI: 17.2-25.4) and were identified as potential implementation barriers. The domain 'Emotion' provided the highest mean score (60%; 95% CI: 55.0-65.0).

Conclusion: Our data demonstrates that it is possible to identify implementation barriers related to tobacco use counselling among oral health professionals. Further research is needed to develop and assess interventions to reduce these identified barriers to achieve successful guideline implementation.

Attitude of Dental Students and Dentists towards Drug Addicted PatientsV. STEFANOVA¹, S. TZANOVA¹, M. MANOLOVA¹, I. STAMATOVA¹, G. TOMOV¹, B. ANDONOV¹, and I. PANAYOTOV²¹Operative Dentistry and Endodontics, Faculty of Dental Medicine, Medical University-Plovdiv, Plovdiv, Bulgaria, ²Laboratory of Biology and Nano-sciences EA4203, Faculty of Dentistry, University of Montpellier 1, Montpellier, France

Objective: To study and compare the attitudes of dental medicine students and practicing dentists towards the treatment of drug addicted patients in Plovdiv, Bulgaria.

Methods: The research is a part of the project "Oral Health of Drug Addicted Patients", funded by a grant from the Medical University-Plovdiv. Data has been collected by an anonymous survey, specifically designed for the study. Questionnaires have been completed by a random sample of students from the Faculty of Dental Medicine in Plovdiv and dentists, practicing on the territory of the town of Plovdiv. Statistical analyses include descriptive statistics and non-parametric tests, performed by SPSS 13.0 software.

Results: 162 dental medicine students and 172 dentists are inquired. The mean age of the students is 22.6±1.8 years and 43.3±10.7 for the dentists (p<0.001). Students are more self-confident of identifying a drug addicted patient (48.7%) than dentists (32.2%) (p<0.001). Predominant part of the dentists answer that the most frequent infectious disease is Hepatitis B while 50.3% of the students think it is AIDS (p<0.001). Both, students (95.1%) and dentists (71.9%) expect higher prevalence of caries in drug addicted patients (p<0.001). Almost a quarter of the students want to be further educated about the problem during their undergraduate learning. Dentists prefer to receive such information in post graduate training programs (15.3%), through internet (14.0%) or by printed dental magazines (13.6%). Most of the students (69.4%) and dentists (73.1%) answer that drug addicted patients should be treated in specialized dental practices (p>0.05).

Conclusion: The inquired dental medicine students and practitioners show inadequate competence about the specific problems of drug addicted patients. There is a need of additional courses on that subject during the undergraduate and post graduate education in dental medicine. Drug addicted persons should receive an optimal dental treatment by well trained dental specialists.

Socio-economic Background Associated with Early Childhood CariesI. PINKE¹, O. NEMETH², E. PAULIK³ and K. NAGY⁴¹Faculty of Dentistry, Dept. of Pedodontics and Orthodontics, University of Szeged, Szeged, Hungary, ²Department of Prosthodontics, Semmelweis University of Medicine, Budapest, Hungary, ³University of Szeged, Szeged, Hungary, ⁴Department of Oral Surgery, University of Szeged Faculty of Dentistry, Szeged, Hungary

Objectives: Early Childhood Caries (ECC) is one of the most common diseases, more prevalent than asthma. The primary teeth are susceptible to decay as soon as they begin to erupt. It is major public health problem in Hungary. The purpose of this study was to assess parental attitudes, education, family income regarding dental decay and synergistic relationship with oral health and nutrition.

Methods: Using self-reported questionnaires - concerning socio-economic background, deprivation status, oral hygiene behaviors, meal patterns - 324 children (age 4-5) were examined for the presence or absence of dental caries or filling in the primary dentition, as measured by the d3mft index (according to WHO Basic Method). The cases were recruited from kindergartens to source children from different socio-economic backgrounds. Four groups were created according to exposure of caries (dmft 0; 1-2; 3-5; >5) Data analysis was performed using SPSS 15.0 (p=0.005)

Results: There was a significant association between the mothers highest level of education and dmft index (p=0.001). The mean d3mft score was 7.33 (SD: 3.843) in ethnic minorities and poor socio-economic background and 0.74 (SD: 1.309) in high income families. We found no significant correlation between the age of parents and caries index. Comparing a sweetened drink intake or breastfeeding during the night with presence of caries was significant too (p<0.001). Frequency of daily tooth brushing with fluoride toothpaste was associated with decreased caries index.

Conclusion: ECC correlated significantly with child's family background, as well as family income and the educational level of the mother of the child. The development of appropriate preventive oral health programs is urgently needed to improve oral health behavior for children from ethnic minorities and for children from poor socio-economic background. The Ethical Committee of The University of Szeged approved the study.

Baseline DMFT and tooth loss and DMFT 10 years laterI. MORITA¹, S. YOSHII², H. NAKAGAKI¹, K. MIZUNO³, A. SHEIHAM⁴, and W. SABBAH⁵¹Department of Preventive Dentistry and Dental Public Health, School of Dentistry, Aichi Gakuin University, Nagoya, Japan, ²Aichigakuin University, Nagoya, Japan, ³Aichi Health Promotion Foundation, Nagoya, Japan, ⁴Dept. of Epidemiology & Public Hlth, University of London - Medical School & College, London, England, Uk, ⁵University College London, London, England, Uk

Objectives: Dental status at one stage of the life course affects the risk of tooth loss and dental caries experience later in life. The aim of this study was to assess the relation between dental status (DMFT) at one stage of life and risk of having one or more teeth extracted and increases in DMFT 10 years later in Japanese employed adults.

Methods: Participants were employed people working in the Nagoya area and who had attended statutory annual health checkups between December 1997 and

February 2006. Of 56,561 people who had a dental examination as part of a complete physical examination, 2,216 underwent the same examination 10 years later. At baseline, participants ranged in age from 30 to 59 years. General linear models were used to estimate the relative risk and 95% confidence intervals (CIs) for 10-years incidence of tooth loss, and DMFT for individuals with low, middle and high DMFT at baselines.

Results: In the 30-39 year-old group the DMFT 16-28 group at baseline was 2.2 (95% CI: 1.4-3.5) times more likely to lose one or more teeth than the DMFT 0-9 group 10 years later. The DMFT 17-28 group was 2.2 (1.7-2.8) times more likely to have one or more teeth extracted than the DMFT 0-10 group 10 years later in 40-49 year-olds. The DMFT 18-28 group was 1.9 (1.5-2.5) times more likely to have one or more teeth extracted than the DMFT 0-11 group 10 years later in 50-59 year-olds. However, there were no significant relation between DMFT at baseline and increasing DMFT over the next 10 years.

Conclusion: There was a relationship between DMFT and tooth loss, although baseline DMFT was not related with increasing DMFT in employed adults.

0082 (151680)

Caries Trends in Czech Preschool Children over Last 20 Years

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Objectives: To evaluate trends in caries experience of 5yr olds in the Czech Republic since 1994.

Methods: Data from two sources were available. (i) A series of cross-sectional national surveys of 5yr olds was conducted by the Institute of Health Information and Statistics (IHIS) and supported by the Czech Ministry of Health in years 1994, 1997, 2000, 2003 and 2006 (n=3383, 3578, 3186, 3337 and 3561, respectively). Dental data were collected from all general dental practitioners in the country and comprised of all 5-year old patients examined in a dental office within one calendar month (each subject was included only once). (ii) Institute of Dental Research (IDR) conducted its own, smaller, IDR surveys in years 1998, 2001, 2005 and 2010 (n=435, 297, 285 and 583, respectively). Calibrated examiners assessed geographically stratified sample using D3 caries diagnostic threshold. For each survey, the following parameters were calculated: mean dmft; mean dt, % of caries-free subjects. For the assessment of the trends, regression modelling was used separately for each series of surveys.

Results: Over the respective periods, in both IHIS and IDR surveys: a significant trend of declining mean dmft and mean dt and increasing trend of percentage of caries-free was observed ($p<0.05$). Dmft reduced from 3.53 to 2.69 (IHIS) and 3.68 to 2.98 (IDR), respectively, while % of caries-free children increased from 23.9 to 42.2% (IHIS) and from 26.7 to 44.9% (IDR), respectively.

Conclusions: A positive trend of caries experience over a period 1994-2010 was observed both for national monitoring and smaller epidemiological studies that differed in data collection methodology (patients x general subjects, non-calibrated x calibrated examiners). Consistency observed in trends of individual parameters enhances the validity of the results of both set of studies. Acknowledgements: Grant Agency of the Ministry of Health (CZ), Grant No. NS10599-3/2009.

0083 (151703)

Links between oral health and personality among police students

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Objectives: Vocational training for the law enforcement agencies in Hungary takes place in special residential schools which students enter after graduating from secondary school. The objective of the present study was to survey the temperament and character factors which characterise police students, and what their dental status reflects in this respect.

Methods: The study involved 792 law enforcement school students of average age 20.43 ± 1.25 years. They completed, by computer, the 240-question Temperament and Character Inventory (TCI) devised by Cloninger. This was preceded by a dental screening where their DMFT was measured. Statistical analysis was carried out using the SPSS for Windows 10.0 program suite and involved descriptive statistical methods (distribution, average, variance), ANOVA tables, Pearson correlation analysis and Cronbach's alpha.

Results: Students in 57.5% of cases rated their own teeth as being in good or very good condition, and only in 2.7% of cases as bad condition. Those, who rated their dental status as "good" their average DMFT was actually found to be 9.23 ± 5.01 , and their D value to be 6.93 ± 4.26 . The scores for various temperament and character dimensions in the TCI test were then compared with the DMFT values. There were significant differences ($p<0.05$) among the following groups: those with extremely low novelty-seeking (T) scores in the TCI test had very high DMFT (11.25 ± 2.06). The group of students with extremely high scores on the reward dependence dimension had low DMFT (5 ± 1.24).

Conclusion: The students in this study who had bad teeth, whether they assessed them positively and negatively, showed signs of extreme personality traits. It may be useful to screen for these students using subjective health survey questionnaires, so as to permit more effective efforts to predispose them to positive health behaviour.

0084 (151858)

Surveying the Influencing Factors of Oral Hygienic Habits

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Objectives: The aim of the study was to survey the dietary, oral hygienic habits and to determine all factors which have influence on dental surgeon attendance. Our hypothesis was that the health related quality of life, mood and disposition have influence on the above mentioned habits.

Methods: In this study, based on a questionnaire, 1158 adults participated. 383 of them were surveyed with traditional PP (paper and pencil) the others with online questionnaires. Statistical analysis was performed using SPSS for Windows 17.0 statistical and Statistica 8 software.

Results: 19,31% of the questioned population visited their dentists in the last two and 8,11% in the last five years. 63,95% of the examined population cleaned their teeth twice, and 21,11% of them only once a day. Frequency of tooth-cleaning was significantly increased parallel to increase the educational level. In 50% the dental surgeon attendance could be connected to acute problems. There were significant differences ($p<0,05$) among different BMI groups and the number of regular daily tooth cleaning. There was also significant difference between BMI and the date of last check up ($p<0,05$) and BMI and reason of dental surgeon attendance ($p<0,05$). Between the Beck Depression Index and oral hygienic habits correlation also could be found.

Conclusions: Predisposition to depression, higher level of BMI and the level of education could affect oral hygienic habits.

0085 (151859)

Erosive wear in 18 year old Norwegians

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Objective: The aim was to study the prevalence of erosive wear and association with caries experience, socio-economic status and national background factors in a group of 18-year-old Norwegians.

Methods: A total of 1456 adolescents were examined for erosive wear as part of their regular dental visit at the Public Dental Service (PDS) clinics in Oslo. Of those with erosive wear, 231 accepted an "in depth-examination" to record lesion severity, performed by a previously calibrated clinician at the University clinic of Oslo. An evaluated erosive wear system (VEDE) was used. Occlusal surfaces of the first and second molars in both jaws and the labial and palatal surfaces of the upper incisors and canines were selected as index teeth.

Results: Dental erosive wear was registered in 33% of the adolescents examined at the PDS clinics. Of the 231 individuals re-examined, 63% had erosive wear in enamel only, whereas 37% had at least one lesion extending into dentin. The upper central incisors and first lower molars were the most affected teeth with the highest occurrence on the palatal surfaces. "Cupings" on molars were registered in 62%, most often in addition to erosive lesions on other surfaces. Eighty-five percent of the cupings were on 1. molars and 34% on the mesio-buccal cusp. Significantly more males had erosive lesions into dentin compared to women ($p=0.04$). There was a significant association between erosive lesions and DMFT scores ($p=0.004$), but no significant association between erosive lesions and socio-economic status or national background.

Conclusion: A high proportion of Norwegian adolescents had erosive wear. Cupings on first molars as one of the first signs were a common finding.

0086 (151860)

Dental erosive wear and salivary flow rate in physically active

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Objective: To study prevalence of erosive wear and salivary flow rate before and after exercise in physically active.

Methods: Young adults (age range 18-32 years) and members of a fitness-centre were invited to participate in the study. Inclusion criteria were healthy adults training hard at least twice a week. One-hundred and four participants accepted an intraoral examination. Of those 70 also agreed to carry out saliva sampling. The examination was performed at the fitness-centre by a previously calibrated clinician, using an evaluated erosive wear system (VEDE). Saliva sampling (unstimulated and stimulated) was performed before and after exercise. Occlusal surfaces of the first molars in both jaws and the labial and palatal surfaces of the upper incisors and canines were selected as index teeth.

Results: Dental erosive wear was registered in 64% of the participants, 58% in females and 78% in males. Enamel lesions dominated and were most often observed in the upper front, dentin lesions dominated in lower first molar. One fourth of the participants had erosive wear into dentin, significantly more in males than in females ($p=0.047$). One third (34%) of the participants had stimulated salivary flow rate in the lower range (<0.1 ml/min), and significantly more erosive lesions were registered than in subjects with higher flow rate ($p=0.002$). Significantly more participants with erosive wear had a decrease rather than increase in salivary flow rate during exercise compared with the non-erosion group ($p=0.001$). Unstimulated salivary flow rate was not affected by exercise.

Conclusion: A high proportion of physically active young adults had erosive wear. Stimulated salivary flow rate was influenced by hard exercise.

0087 (151979)

The role of oral hygiene education and motivation of adolescents

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Objectives: The aim of this study was to evaluate the role of motivation and education in oral hygiene of adolescents by measuring plaque index.

Methods: The study population consisted of 62 schoolchildren at the age of 14-15, first graders from First secondary high school in Zagreb. The plaque index was measured before and after a motivational and educational lecture and a demonstration of the right toothbrush technique on a model. Non-parametrical statistical methods were used and independent and per example Student's t-test ($p<0.05$).

Results: The mean plaque index of all examined subjects at the beginning of the study was 3,52 (s.d.=1,12) and after the education it decreased to 2,63 (s.d.=1,06). At the beginning of the study the plaque index was higher in male subjects than female in all segment parts except the lower right buccal one ($p<0.001$). After the education the difference between male and female subjects was found only in the upper and lower frontal labial segment ($p<0.001$). The right buccal part of the upper and lower jaw had the highest plaque index 4,27 (m.r.=1,24) in the beginning and after the education it had the highest improvement 3,11 (m.r.=1,33). The left buccal part of the upper and lower jaw had the highest plaque index 3,16 (m.r.=1,20) after the educational program.

Conclusion: After the conducted motivation and education a decrease of plaque index confirms their importance in the improvement of oral hygiene in adolescents. High amounts of plaque index at the beginning indicate the lack of prevention programs in the Republic of Croatia.

0088 (152036)

Factors influencing patients treatment choice

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Objectives: The aim of this pilot study was to determine and understand the keywords of today's educated patients' habit in choosing a dental treatment in cases, where different solutions are offered by the operator.

Methods: 200 patients have been questioned about their treatment choice with a detailed questionnaire. In every case two or three treatment options were offered, with prices and detailed descriptions about the solutions. Keywords, such as esthetics, durability, longevity were hidden in the questions.

Results: 122 patients have chosen saving a tooth instead of extraction if it is possible, but only 100 of these insisted on this possibility if a crown was also needed for the final restoration. In orthodontic treatment cases, double the amount of patients have chosen more esthetic treatments, even when the price was higher than with the regular option. In single crown cases patients were more keen on esthetics than durability.

Conclusions: The questionnaire is a good tool to evaluate patient treatment decisions, but to understand all factors, more varied questions shall be asked from different patient groups. The word "esthetics" had much more influence in each case on the decision, than the word "durability".

Reasons for Dental Care under GA in the Helsinki PDS

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For patients with missing ability for normal dental care, Public Dental Service (PDS) in Helsinki offers dental treatment under general anaesthesia (GA).

Objectives: We assessed reasons for dental care under GA in relation to patients' personal and medical background in Helsinki, Finland.

Methods: All dental GA appointments (n=355) in the Helsinki PDS in 2010 were analyzed utilizing patient referrals and documents. For each patient, one or more reasons for referring to GA were documented as free-format text, later categorized as dental fear, excessive treatment need, severe uncooperation, inhibition of dental fear, strong emetic reflex, ineffective local anaesthesia, and large surgical procedures. Personal background covered age (<6, 6-12, 13-18, >18-yrs), gender and being immigrant or not; medical background included mental deficiency, mental disorder, and difficulties in social interaction due to mental or physical problems. Chi-square tests served for statistical analyses.

Results: Patients' age range was 2.3-67.2 years, 31% were under 6 and 26% over 18, 54% were males, 27% were immigrants, 16% had mental deficiency, 14% difficulties in social interaction and 5% mental disorder. The most common reason for GA was uncooperation (65%), followed by dental fear (37%) and excessive treatment need (26%), all with obvious age-differences. Comparison by age-group showed that children under 6 years dominated regarding the reasons of uncooperation (75% vs. 56-65% in other age-groups; p=0.035) and excessive treatment need (35% vs. 11-32%; p=0.001). Adolescents aged 13-18 years dominated regarding dental fear (61% vs. 21-43% in other age-groups; p<0.001). Comparison by background showed that mental deficiency (87%) and difficulties in social interaction (82%) dominated regarding uncooperation (p<0.001), mental disorder regarding dental fear (65% vs. 5-49% in other background-groups; p<0.001), and immigrant background regarding excessive treatment need (41% vs. 12-25%; p=0.002).

Conclusions: Uncooperation and dental fear should be diagnosed and controlled early to decrease the need for dental GA.

Factors related to occurrence of untreated root caries in Finland

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Objectives: We assessed occurrence of untreated root caries and factors related to it in Finland.

Methods: The nationwide Health 2000 Survey in Finland used a representative sample (N=8028) of subjects aged 30+ years; 79% (n=6335) participated in the clinical oral examination and reported their oral self-care. Of the respondents, 85% (n=5401) were dentate. Clinical recordings covered dental and periodontal findings and presence of dental plaque. Teeth with clear cavitations were recorded as carious: with either root caries or coronal caries or with both. Periodontal measurements on four sites of each tooth were recorded by tooth as: no deepened pockets, pockets 4-5mm or 6+ mm in depth. Dental plaque on three index teeth was recorded as: absent, present gingivally, or elsewhere. Per subject, periodontal status and dental plaque were described by his/her worst findings. After excluding subjects with incomplete data (n=95), the final sample comprised 4894 subjects. Their mean age was 49.1 years (SD=12.9; range 30-94), mean number of teeth 23.3 (SD=7.5); 53% were female. Chi-square tests and logistic regression served for statistical evaluation.

Results: Untreated root caries occurred in 10% of women and 17% of men (p<0.001); in 6% of the 30-34-year-olds, in 14% of the 45-54-year-olds, and in 25% of the 65+-year-olds (p<0.001). Maximum number of teeth with root caries was 11, the mean being 0.2 (SD=0.7) for women and 0.3 (SD=0.9) for men. The model controlling for gender, age, education-years and numbers of teeth revealed presence of root caries being related to greater numbers of teeth with coronal caries (OR=1.5), to serious pocketing (OR=1.5), poor plaque status (OR=1.4), and less-than-daily tooth brushing (OR=1.4). Consumption of sugary products and use of electric toothbrush remained statistically non-significant.

Conclusion: Poor dental and periodontal conditions and inadequate oral hygiene were noticeably related to occurrence of root caries in Finland.

Community Periodontal Index And Smoking Behavior In Romanian Adult Population

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Introduction: Tobacco consumption is one of the first preventable death causes. The aims of this study were to assess the community periodontal index in correlation with periodontal risk factors like smoking behavior and oral hygiene status in adult population from Iasi, Romania.

Methods: A cross-sectional study of 428 patients 35-44 years old who attended for dental treatment the University Dental Clinic in Iasi, Romania, was conducted since 2010 to 2011. The patients were both from urban and rural area and from all socio-economic status. The clinical examination was done in accord with European Global Oral Health Indicators Developing criteria, using Community Periodontal Index (CPI). Oral hygiene was assessed using Oral Hygiene Index. A self-administered questionnaire based on "SANFACTOR EXPERT SYSTEM" was realized and structured as a personalized information package in order to allow the tobacco use control and smoking behavior. This study was approved by the ethics committee of "Gr. T. Popa" University of Medicine and Pharmacy, Iasi, Romania. SPSS 19.0 was used for data analysis.

Results: Periodontal status was normal in 10.1% of patients. 27.7% had score 1, 48% of examined patients had CPI score 2, 9.7% had score 3 and 4.5% had score 4. Multivariate logistic regression analyses were performed to study periodontal risk factors and differences between smokers and non-smokers. The main predictors for periodontal treatment needs were the variables: "smoking habit" and "poor oral hygiene". The prevalence of smoking was 54%. Smoking was more prevalent among male (56%) than female (44%). Non-smokers tended to brush their teeth more often than smokers (OR 8.47, 95% CI 2.77-39.28) and they spent more time brushing their teeth than smokers (OR 12.66, 95% CI 1.96-62.11).

Conclusions: Smoking and oral hygiene are risk factors for periodontal disease. Sanfactor expert system contributes on the facilitation of development, transfer and acquisition of knowledge in smoking control.

Innervation of Taste Buds in Streptozotocin-induced Diabetic Rat

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Objectives: Abnormal sensation, so taste changes and pain are features of approximately 10% of patients with diabetes mellitus (DM). Therefore the aim of the study was to investigate and quantify the different neuropeptides containing nerve fibres which are known to be the neurotransmitters of sensory nerve terminals.

Methods: Immunohisto-, immunocytochemical methods were used to study the changes in DM in the number of different nerve terminals located in the vallate papillae. Diabetes was induced in the rats with streptozotocin (STZ).

Results: The number of the substance P (SP), galanin, calcitonin gene related peptide (CGRP), vasoactive intestinal polypeptide (VIP) and Neuropeptide Y (NPY) immunoreactive (IR) nerve terminals was significantly increased (p<0.05) after 4 weeks of the treatment in the tunica mucosa of the tongue. The number of the mast cells also increased significantly (p<0.001). Some of the IR nerve terminals were located in the lingual epithelium both intragemmally and extragemmally and to

comprise dense bundles in the lamina propria just beneath the epithelium. No taste cells were IR for any of the investigated peptides. VIP and NPY IR nerve fibres was not detected in the taste buds. After 2 months of the treatment the number of the SP, CGRP and galanin IR nerve terminals was decreased both intragemmally and intergemmally. The morphometry revealed no significant difference in papilla size between the control and diabetic groups, but there were fewer taste buds (per papilla).

Conclusions: Increased number of IR nerve terminals and mast cell after 4 weeks of diabetes was the consequence of the neurogenic inflammation that might cause vasoconstriction and lesions of the oral mucosa. After 2 months of DM the taste impairment may be caused by neuropathy defects and degeneration or morphological changes in the taste buds and nerve fibres.

0093 (151695)

Alcohol use as a risk factor for bruxism among adults

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Introduction: Different factors affecting the central nervous system are considered as risk factors for bruxism. Among others, alcohol consumption and smoking are suggested to increase the risk. Further, alcohol drinking and smoking correlate strongly which may disturb their independent effects on bruxism. The aim of the present study was to investigate the possible independent effect of alcohol consumption on bruxism while controlling for age, sex and smoking.

Methods: The material derives from the Finnish Twin Cohort study consisting of 12,502 twin individuals (45.6% men, 54.4% women, mean age 44 years) born in 1930–1957. Twins responded to a questionnaire in 1990 (response rate of 77%) consisting of 103 multiple choice questions, four dealing with alcohol use, seven with tobacco use and two with perceived bruxism.

Results: Based on subjective responses and multivariate analyses adjusted for age and sex, and for age, sex and smoking status (never, occasional, former, current), those drinking alcohol heavily, i.e. more than 13 bottles beer per week, 3 bottles wine per week, at least 2 bottles of spirits per month, were more than two times more likely report weekly bruxism compared to those drinking no alcohol (OR 2.7 beer, 2.7 wine, 2.3 spirits; 95 % CI 1.61–4.44, 1.02–6.99, 1.59–3.27). The significant association between consumption of beer and spirits with bruxism held when the effect of smoking was controlled while the effect of wine consumption lost statistical significance. Also, binge drinking and passing out due to alcohol raised the risk independently. When the overall consumption was computed as grams of alcohol per day (log-transformed), this was highly significantly associated with bruxism even when adjusted for smoking status.

Conclusions: Given the observed associations with heavy drinking, binge drinking and passing out due to alcohol, the present results support our hypothesis of an independent link between alcohol use and bruxism.

0094 (152000)

Influence of forward head tilt on multichannel near-infrared spectroscopy measurement

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Objective: Near-infrared spectroscopy (NIRS) is a method for measuring brain function by assessing changes in blood hemoglobin concentrations, which are dependent on neural activity. An advantage of NIRS is that it can be used during a variety of postures and actions, and in tasks that cannot be investigated using functional magnetic resonance imaging (fMRI) and Magnetoencephalography (MEG). We have previously performed NIRS measurements of cerebral blood flow during exercise in oral functional movements represented by chewing. At that time, the waveform of NIRS signals synchronized with a motion of the head was often observed. In the present study, the influence of the forward tilt of the head on NIRS measurements was examined.

Methods: The subjects were 10 healthy volunteers (6 males, 29.0±1.5 yrs). Multichannel NIRS (Hitachi Medical Corporation; ETG-4000) was used to measure cerebral blood flow, with a measurement probe (3×11; 52 channel) placed in frontal and temporal lobe regions. Cerebral blood flow was measured while the head tilted forward 10 degrees, 20 degrees and 30 degrees, respectively, after a three-minute rest (rest: upright position). There was 30 s rest between each task. Paired t-tests were used to identify significant differences in cerebral blood flow associated with the tilt of the head (significance level of $p < 0.05$ was used for each channel).

Results: Compared with rest in the upright position, the cerebral blood flow of one channel increased by tilting the head forward 10 degrees. Cerebral blood flow increased for 23 channels by tilting the head forward 20 degrees, and for 31 channels when the head was tilted forward by 30 degrees.

Conclusion: For healthy volunteers, NIRS signals have been shown to increase with increasing forward tilt of the head. Therefore, when measuring cerebral blood flow using NIRS, it is necessary to note the head tilt.

0095 (152007)

Influence of lateral head tilt on multichannel near-infrared spectroscopy measurement

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Objective: Near-infrared spectroscopy (NIRS) is a method for measuring brain function by assessing changes in blood hemoglobin concentrations, which are dependent on neural activity. An advantage of NIRS is that it can be used during a variety of postures and actions, and in tasks that cannot be investigated using functional magnetic resonance imaging and Magnetoencephalography. We have previously performed NIRS measurements of cerebral blood flow during exercise in oral functional movements represented by chewing. At that time, the waveform of NIRS signals synchronized with a motion of the head was often observed. In the present study, the influence of the lateral tilt of the head on NIRS measurements was examined.

Methods: The subjects were 10 healthy volunteers (6 males, 29.0±1.5 yrs). Multichannel NIRS (Hitachi Medical Corporation; ETG-4000) was used to measure cerebral blood flow, with a measurement probe (3×11; 52 channel) placed in frontal and temporal lobe regions. Cerebral blood flow was measured while the head tilted left side 10 degrees, 20 degrees and 30 degrees, respectively, after a three-minute rest (rest: upright position). There was 30 s rest between each task. Paired t-tests were used to identify significant differences in cerebral blood flow associated with the tilt of the head (significance level of $p < 0.05$ was used for each channel).

Results: Compared with rest in the upright position, the cerebral blood flow of 5 channels increased by tilting the head left side 10 degrees. Cerebral blood flow increased for 18 channels by tilting the head left side 20 degrees, and for 20 channels when the head was tilted left side by 30 degrees.

Conclusion: For healthy volunteers, NIRS signals have been shown to increase with increasing lateral tilt of the head. Therefore, when measuring cerebral blood flow using NIRS, it is necessary to note the head tilt.

Near-infrared spectroscopy study of brain activity in swallowingK. INAMOTO¹, S. SAKUMA², I. MORITA³, H. HATTORI², Y. ARIJI⁴, K. NAKATA¹, E. ARIJI⁴, H. NAKAGAKI³, Y. ITO² and H. NAKAMURA¹¹Department of Endodontics, School of Dentistry, Aichi Gakuin University, Nagoya, Japan, ²Department of Fixed Prosthodontics, School of Dentistry, Aichi Gakuin University, Nagoya, Japan, ³Department of Preventive Dentistry and Dental Public Health, School of Dentistry, Aichi Gakuin University, Nagoya, Japan, ⁴Department of Oral and Maxillofacial Radiology, School of Dentistry, Aichi Gakuin University, Nagoya, Japan

Objective: Near-infrared spectroscopy (NIRS) is a non-invasive method to measure brain activity. NIRS detects concentration changes in blood oxy- and deoxy-hemoglobin associated with neural activity. NIRS is safe, portable and very affordable neuroimaging system relative to other technologies such as fMRI, PET and MEG. Furthermore, NIRS has no restriction of subject position and location, thus allowing naturalistic experiments. The purpose of this study was to assess the activation patterns of the cerebral cortex on voluntary swallowing using NIRS.

Methods: Seven healthy right-handed subjects (age 26.6±1.1 yrs) were studied. All subjects gave written informed consent before this study. For the NIRS measurement, a 52-channel NIRS system (Hitachi ETG-4000) was used. Subjects were seated with 3x11 probes mounted on the head. Command swallow was performed by injecting 5-ml water into the oral cavity as a task. Ten tasks (10s) alternating with 10 rest (60s) trials were carried out for one subject and changes in oxy-hemoglobin (Oxy-Hb) measured. For each 52 channel, the average data from 10 trials of the task was obtained and the peak Oxy-Hb value in 10 s periods, which is 15 s after starting of the task, was assessed. Analysis of differences in peak value of Oxy-Hb by front-behind and right-left side on head was assessed using two-way analysis of variance and Tukey's honestly significant difference test.

Results: Swallowing activity was associated with increases in oxy-Hb levels in the right and left temporal region. There was a significant difference between temporal region and other regions (p<0.01).

Conclusion: The brain region activated by swallowing was corresponding to areas in super temporal gyrus, inferior frontal gyrus, middle temporal gyrus, and temporal pole. NIRS may be a suitable method of evaluating the brain activation patterns on swallowing.

Synergistic cytotoxicity of SN-38 and gefitinib against OSCC cell lineK. HIRANO¹, N. TAMURA¹, J. SHIMADA¹, H. SAKAGAMI¹ and J. SAITOH²¹Meikai University School of Dentistry, Sakado, Japan, ²Ichijokai Hospital, Ichikawa, Japan

Objective: We have recently found that among five topoisomerase inhibitors, SN-38, an active metabolite of irinotecan, showed the highest cytotoxicity against human oral squamous cell carcinoma (OSCC) cell lines, and relatively higher tumor-specificity (against OSCC vs. normal human oral cells such as gingival fibroblasts, pulp cells, periodontal ligament fibroblasts) (tumor-specificity index=1327) (Tamura et al., IADR meeting at Toronto, 2008), and induced different type of cell death (apoptosis or autophagy) in two OSCC cell lines (HSC-2 and HSC-4, respectively) (Tamura et al., IADR meeting at Balcerona, 2009). The aim of the present study is to find out anti-tumor agents that show synergistic cytotoxicity with SN-38 against OSCC cell lines to further reduce the side effect of SN-38.

Methods: HSC-2 cells were cultured in DMEM+10% FBS. Viable cell number was determined by the MTT assay, CC50 value by the dose-response curve. Caspase-3 activity was determined by the substrate cleavage. DNA fragmentation was assayed by agarose gel electrophoresis.

Results: Among nine compounds, gefitinib, an inhibitor of tyrosine kinase domain of epidermal growth factor receptor (EGFR), most clearly enhanced the cytotoxicity of SN-38 against HSC-2 cells. Methotrexate and doxorubicin showed similar but slightly less enhancing activity. On the other hand, cisplatin (CDDP), 5-FU, docetaxel, benzaldehyde, sodium ascorbate and sodium-5,6-benzylidene-L-ascorbate were inactive.

Conclusion: The present study suggests possible potentiation of anti-tumor activity of SN-38 by targeting the EGFR.

Cytotoxicity of dental medicaments against oral normal and tumor cells

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Objective: Eugenol, hydroquinone, benzoquinone, phthalaldehyde are used in the dentistry and also as the antiseptic or the medical agents exclusively used as cosmetics. To use these highly reactive compounds safely in the dentistry, it is necessary to investigate the cytotoxicity against both normal and tumor cells at the same time. Eugenol and hydroquinone have previously been reported to induce the apoptosis in human promyelocytic leukemia cell line. However, no study has been reported about the cytotoxicity of these compounds against normal cells, in conjunction with that against tumor cells. Therefore, the cytotoxicity of these four compounds against human three oral squamous cell carcinoma cell lines vs. human oral normal cell [gingival fibroblast, pulp cell, periodontal ligament fibroblast], and the type of cell death induced were investigated in the present study. Since many toxicants show biphasic effects on the growth, that is growth stimulating (hormetic) and inhibitory effects at lower and higher concentrations, respectively, the possible hormetic effects of these compounds were also investigated.

Methods: Viable cell number was determined by MTT method. The 50% cytotoxic concentration (CC50) was determined from the dose-response curve. The relative cytotoxicity against tumor cells vs. normal cells (RC value) was determined by the ratio of mean CC50 value for normal cells to that for tumor cells. DNA fragmentation was monitored by 2% agarose gel electrophoresis. Caspase-3 activation was monitored by the cleavage of the substrate (DEVD-p-nitroanilide).

Results: All four compounds showed comparable cytotoxicity against both normal and tumor cells (RC=0.8-1.0), without inducing any hormetic effects at lower concentrations during 0-48 hours. These compounds did not induce the caspase-3 activation nor internucleosomal DNA fragmentation, suggesting the induction of cell death other than apoptosis.

Conclusion: The lower RS value suggests the necessity of cautionary use of these compounds in the oral cavity.

In Vitro Effect of AmF/StF/Zn Formulation on Malodor Related Parameters

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Oral malodor (halitosis) is a common and disturbing condition. In most cases it derives from bacterial activity within the oral cavity. These bacteria breakdown and utilize proteins and produce foul smelling by-products such as volatile sulfide compounds (VSC).

Objectives: The aim of the present study was to test the in vitro effect of a mouthrinse containing: amine fluoride/stannous fluoride and zinc lactate (meridol® HALITOSIS, GABA*, International AG) on malodor related parameters.

Methods: Salivary incubation assays are commonly used as in vitro assays for malodor production. In the present study, whole saliva samples were incubated in decarboxylase media under anaerobic conditions for 48 hours. The test samples were added with 3% (v/v) of the tested formulation. 0.2% chlorhexidine containing mouthwash (Corsodyl, GSK) served as positive control, and saline (NaCl 0.9%) as negative control. Malodor production was scored by two odor judges on a 0-5 scale. VSC production was measured using Halimeter®. VSC producing bacteria were quantified using a microscopic sulfide assay (MSA). Salivary protein degradation was measured densitometrically following a 12% SDS-PAGE analysis. Enzymatic (i.e. Beta-galactosidase) activity was evaluated using a chromogenic substrate (X-Gal, Sigma). All the experiments were conducted in nine replicates, and statistically analyzed.

Results: The tested formulation caused a significant reduction of 55% (p<0.001) in malodor production, 91% (p<0.001) in VSC production, 45% (p<0.001) in VSC producing bacteria, 56% (p<0.001) in salivary protein degradation, and 50% (p=0.027) in β-galactosidase activity, as compared to the negative control. The positive

control performed slightly better yielding a significant reduction of 90, 95, 62, 70 and 56%, respectively. Differences between the positive control and the tested formulation were significant for malodor production, VSC production and MSA ($p < 0.001$).

Conclusion: The tested formulation was very effective in reducing malodor related parameters in vitro. *Source of funding: The research was funded by GABA, International AG.

0100 (151517)

Propofol Anesthesia is Prevent of Emergence Agitation in Pediatric Patients

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Introduction: Sevoflurane is a popular inhalational anesthetic that is used for general anesthesia in children. Emergence agitation has been reported as an adverse effect of sevoflurane use in pediatric patients. Several studies have suggested that propofol anesthesia is associated with a lower incidence of emergence agitation. In this report, we performed a meta-analysis of randomized controlled trials to compare the incidence of emergence agitation in pediatrics following sevoflurane or propofol anesthesia.

Methods: A comprehensive search of the literature was conducted to identify clinical trials that compared the incidence of emergence agitation in children with sevoflurane versus propofol. Two reviewers independently assessed each report to ensure that it met our inclusion criteria. Prospective randomized trials comparing sevoflurane and propofol anesthesia for children under 15 years of age were included for further analysis. The reviewers also extracted data from each published study. The data from each trial were combined using the Mantel-Haenszel fixed-effects model to calculate the pooled odds ratio (OR) and their corresponding 95% confidence intervals (CIs). Funnel plots were used to assess publication bias.

Results: A total of eight studies were identified that met our inclusion criteria. Overall, 350 patients received sevoflurane and 344 received propofol. As the included trials compared sevoflurane and propofol anesthesia in minor surgical or diagnostic procedures in children, we considered it appropriate for the results of the respective studies to be combined for analysis. The heterogeneity of the data was statistically refuted ($p = 0.01$). The pooled OR for all studies was 0.19 with 95% CI of 0.11 to 0.34 ($p < 0.001$), which indicated that propofol anesthesia resulted in a lower incidence of emergence agitation. Publication bias was not apparent in a funnel plot.

Conclusions: This meta-analysis revealed that emergence agitation occurred less frequently with propofol than with sevoflurane anesthesia in pediatric patients.

0101 (151554)

Enhanced Dectin-2 gene expression by lignin-carbohydrate complex in macrophages

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Objective: Lignin carbohydrate complex (LCC) fractions of *Lentinus edodes* mycelia extract (LEM) have shown anti-HIV and immunopotentiating activity. In contrast to polysaccharides, the signaling pathway for LCC has not been identified. Macrophages play an important role in the innate inflammatory response during the progression of periodontal disease. We performed DNA microarray analysis of the possible changes in the gene expression of various receptors after treatment with LCC in mouse macrophage-like J774.1 cells.

Methods: RNA was isolated with Qiagen RNeasy Plus Mini kit, hybridized with GeneChip MouseGene 1.0 ST arrays, and scanned with Affymetrix GeneChip Command Console software.

Results: One of the seven LCC fractions isolated from LEM (Fr4) affected immune response-related gene expression, but did not affect the expression of as many as genes as LPS did. Fr4 enhanced the expression of dectin-2 (4.2-fold) and TLR-2 (2.5-fold) prominently, but only slightly modified the expression of dectin-1 (0.8-fold), complement receptor 3 (0.9-fold), TLR1, 3, 4, 9 and 13 (0.8- to 1.7-fold), Sykb, Zap70, Jak2 (1.0- to 1.2-fold), Nfkb1, Nfkb2, Rela, Relb (1.0- to 1.6-fold), Nfkbia, Nfkbib, Nfkbie, Nfkbj12 and Nfkbiz (0.8- to 2.3-fold). On the other hand, LPS did not affect the expression of dectin-2 nor TLR-2.

Conclusion: These data suggest the significant role of the activation of the dectin-2 signaling pathway in the action of LCC on macrophages.

0102 (152017)

Effect of dexamethasone on adhesion and growth of osteoblast-like cells

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Objectives: The objective of the present study was to set, in vitro, the effect of Dexamethasone trometamol, a non-steroidal-anti-inflammatory drug (NSAIDs), on proliferation and adhesion in osteoblast-like cells (MG63), because the cyclooxygenase activity and prostaglandins signalling are critical regulators of normal skeletal metabolism and inflammation related to injury or disease.

Methods: The adhesion and growth studies were performed with human osteoblast-like cells (MG-63 line) which were cultured as in Dulbecco's Modified Eagle Medium (DMEM) with antibiotic and 10% foetal bovine serum. For the study a suspension containing 1×10^5 cell/ml in DMEM was cultured in 96-well plate in presence of 0 (control group), 1 and 10 μM of Dexamethasone trometamol (Enantyum®) at 37°C in CO₂ (5%) atmosphere. After 0, 60, 90, 120, 150, 180 min and 24 h the suspension containing unattached cells was removed by pipetting carefully from the surface in order to collect osteoblast-like cells suspension not attached to the surface. Effect of dexamethasone trometamol on adherence and growth of cultured osteoblasts were detected by MTT assayed. The experiences were carried out threefold and the t Student analysis was followed for the statistical analysis.

Results: The treatment with doses of 1 and 10 μM of Dexamethasone trometamol showed a significant increase on adherence human cultured osteoblast-like cells (MG63) at 60, 90 and 120 min. In all assays, the cell attachment after 120 min was almost the same in the treatment and control group. There was not effect on growth of osteoblast-like cells in the treatment with two doses assays.

Conclusions: The dexamethasone trometamol in therapeutic doses could be the choosing NSAID in those clinical situations which require a regeneration and rapid adherence of bone tissue, like in implantology.

0103 (152054)

Antibiotic prophylaxis in dentistry

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Objective: Our Infection Control and Antibiotic Committee issued a recommendation in 2007 on prophylactic antibiotic use aiming to reinforce prophylactic antibiotic usage according to international guidelines at our clinic. The aim of this study was to determine whether antibiotic use is well documented by dentists and to reveal to what degree documentation meets professional standards. Invasive dentoalveolar surgical cases, which need antibiotic prophylaxis in the presence of risk factors, were investigated.

Methods: Retrospective data collection has been done in the University of Szeged, Faculty of Dentistry, between August, 2007 and June, 2008. Invasive dentoalveolar

surgical cases were included in the study. Paper-based and electronic documentation of patients who had undergone such procedures and subsequently admitted to the ward were reviewed. We examined the indications for antibiotic administration.

Results: 150 patients were included in the study, 30 % of whom received antibiotics. The review showed that in several prophylactic cases data were missing either about the dosage, the usage or about the type of antibiotics. Documentation about the presence of risk factors was also missing in several cases.

Conclusion: Patient documentation considering indication of antibiotic use is incomplete. We propose the introduction of a complementary checklist, which would facilitate decision-making and would supplement patient documentation. In case of a legal procedure accurate documentation can be written evidence that patient care meets professional standards of infection control.

0104 (152099)

Analysis of cell adhesion/motility in parotid gland cell lines

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The main purpose of our novel technique, chemotactic drug targeting (CDT) is to enhance specific delivery of drugs into target cells via selective induction of their migratory responses. In CDT-ligands professional chemoattractants are preferred, they possess high activity on target cells, while sequences of biologically active substances are valuable as carriers and inducers of internalization.

Objectives: to characterize the cell adhesion in human and rat parotid gland cell lines (HSG, Par-C10); to test effects of CDT-conjugates labeled with targeting peptide side chains on adhesion; to analyze the effect of CDT-conjugates on micro-motion; to evaluate anti-proliferative effects of CDT-conjugates as index of potential clinical usability.

Methods: Electric Cell-substrate Impedance Sensing (ECIS) technique was applied to measure cell adhesion and micro-motion in a real-time-mode. The tested conjugates were oligo-tuftsins based conjugates substituted with formyl peptide (fMLF) and tuftsins monomers (TKPKG, TKPR) as chemotactic ligands and the drug methotrexate (MTX). Our MATLAB-based routine was used to analyze the micro-motion activity.

Results: A significant difference in adhesion characteristics was detected in the two parotid models. The interaction between the surfaces is dependent upon the coating molecules (fibronectin is preferred), while FCS as inducer in the fluid phase is also required. Both tuftsins monomers (TKPKG, TKPR) could decrease the cell adhesion. In T20 CDT-conjugates presence of any side chains (fMLF, TKPKG or TKPR) could result in time dependent negative shifts in adhesion, presence of the proliferation inhibitor drug, MTX was not acting in the same manner. Computer based evaluation of micro-motion showed that both coating and the active CDT-ligands can influence this behavior of the cells, however, strong auto/paracrine influences are also conceivable.

Conclusions: Cell line specific characteristics were detected in cell adhesion and micro-motion in both model-cells. The adhesion/micro-motion and anti-proliferative effect of tuftsins based CDT-drugs underline the significance of further investigations of these derivatives.

0105 (152151)

Investigation of paradoxical growth by Candida species at caspofungin

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Caspofungin belonging to the class of echinocandin drugs is a new antifungal agent, which can be used for the treatment of both oropharyngeal, and systemic Candida infections. Several authors experienced an increase of Candida species in the higher echinocandin concentration range (Eagle-effect) in the in vitro sensibility testing, however the exact frequency was not known.

Objectives: In our experiments we investigated the paradoxical growth occurring at the application of higher doses of caspofungin in the case of Candida species (Candida albicans, Candida dubliniensis, Candida krusei and Candida tropicalis), which have an outstanding significance from the oropharyngeal aspect.

Methods: We evaluated the in vitro acting of caspofungin against Candida species using minimal inhibitory concentration and minimum fungicidal concentration measurements and time-kill methodology in two different media (RPML-1640, antibiotic medium 3).

Results: Our results confirmed and revised the results of previous authors' investigations concerning the occurrence of paradoxical growth.

Conclusions: Preclinical and clinical investigations are needed to clarify the in vivo significance of the paradoxical growth appearing at high caspofungin concentration for the sake of safe therapy.

0106 (152249)

Bahaviour of amine fluorides in toothpastes using teeth brushing models

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In elmex® and meridol® toothpastes, a well characterised amine fluoride (Olaflur®) is used as source of fluoride in order to provide protection from caries. Up to now, data about the stability of these amines in the presence of the oral microflora are lacking.

Objective: To investigate how contents of amines in toothpaste are influenced by tooth brushing and whether incubation of salivary slurry and rinsings collected after tooth brushing influences microbiological activity with respect to potentially modifying amine contents.

Methods: Amine profiles and contents were characterized by LC/MS in the original toothpaste and after teeth brushing in slurry and rinsings collected. To simulate worst case conditions, salivary slurry was incubated at 37°C, 2h.

Results: In toothpaste samples (n=31), tertiary amine contents were found to range from 8.4 to 35.9 mg/g and those of secondary amines from 39 to 197 µg/g. After teeth brushing, mean tertiary amine content corrected for dilution in the slurry was diminished down to about one third of the original amount. Secondary amine content, only about 1/1000 of tertiary amines, was reduced by one third. After slurry incubation, mean contents of tertiary amines were found enhanced by 39%, most probably by liberation from toothpaste particles, whereas secondary amine contents remained constantly low.

Conclusion: Teeth brushing markedly reduces amine contents in toothpaste when comparing original contents in toothpaste with contents in teeth brushing slurry and rinsings. This indicates that amines remain fixed in the oral cavity. Secondary amines are less retained in the oral cavity than tertiary amines. There is no influence on secondary amine contents after 2 hrs incubation at 37°C of collected teeth brushing slurry and rinsings. The results clearly show that there is no influence of microbiological metabolism on secondary amine contents.

Work sponsored by GABA international

0107 (152299)

Effects of Fluorides in Toothpastes on Oral Nitrite Formation

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In elmex® and meridol® toothpastes, a well characterised amine fluoride (Olaflur®) is used as source of fluoride in order to provide protection from caries and to inhibit the oral microflora.

Objective: To investigate to which extent the usage of amine fluoride containing toothpastes as compared to a sodiumfluoride containing toothpaste influence oral nitrite formation from dietary nitrate.

Methods: In a cross over design, 33 probands used amine fluoride or sodiumfluoride containing toothpastes for 2 weeks, 2 times daily, respectively. After uptake of 200 ml nitrate rich beetroot juice, nitrate and nitrite formation in saliva over time (4h) was monitored. Nitrate was determined by RP-HPLC/UV, nitrite photometrically. Dental health status was evaluated by the DMFT status which was in the range between 0-15 with a median of 4.

Results: Salivary nitrate contents increased up to 340 µg/g (cmax) after beetroot juice uptake. On average about 20% of nitrite being secreted into the oral cavity was reduced to nitrite within 4 hours. No differences were found between probands using amine fluoride or sodiumfluoride containing toothpastes in this cross-over study. No influence of dental health status on nitrite formation was observed.

Conclusion: Toothbrushing two times daily for two weeks prior to alimentary uptake of nitrate in a vegetable juice with toothpastes containing amine fluorides or monosodium fluoride did not result in differential salivary nitrite formation.

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0108 (151245)

Effect of ABO antigens' expression into saliva on childhood caries

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Objectives: ABO antigen expression into the body fluids is a well known event and the individuals who show this phenomenon are secretors. Individuals who do not secrete antigens are non-secretors. Previous studies revealed connection between certain diseases and the proven secretor status e.g. stomach and duodenal ulcer. The aim of the study was to investigate the possible effect of ABO antigen expression into saliva on caries in a group of Hungarian children who have same social and economic condition. Our initial question was whether there is association between non-secretor status and the prevalence of dental caries.

Methods: Non-stimulated whole saliva was collected for approximately 10 minutes by spitting method from 130 healthy subjects (M/F was 60/70), aged 6-18 years. The total number of participants were divided into two groups (mixed-, and permanent dentitions). The saliva samples were boiled, centrifuged and the supernatant was detected for ABO blood group substances by hemagglutination-inhibition test with appropriate antiserum with a plate-method. DMF-T and dmft-t (decayed, missing, and filled teeth) indexes were measured according to WHO criteria. Oral health hygiene index- simplified plaque index (OHI-S) and calculus index of subjects have been recorded.

Results: The blood group distribution [blood group A (44.8%), B (18.7%), AB (14.6%), O (21.9%)] and the incidence of secretor and non-secretor status (74.6% vs. 25.4%) were normal, according to the previously published international and Hungarian data. No significant difference has been observed between the secretor and non-secretor groups in relation with ABO blood groups, the DMF-T vs. OHI-S and dmft-t vs. OHI-S.

Conclusions: Our results do not show a statistically significant relationship among blood groups, secretor status, DMF-T, dmft-t scores and OHI-S rates in children.

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0109 (151456)

Salivary Cotinine Concentration in 15-19 year-old Smokers from Constanta, Romania

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Objective: The aim of the present study was to evaluate the salivary cotinine concentration using the "NicAlert™ saliva" tests in a group of 15 - 19 year-old smokers from Constanta, Romania.

Methods: The study was made on a representative sample of 362 highschool students (stratified multistadial sampling design; 7% sampling error; 95% C.L.). Ethical permission was given by the Professional Ethical Committee of Ovidius University. Data regarding tobacco consumption was collected on a self-administered questionnaire basis, that divided the subjects in three groups: active constant smokers, occasional constant smokers and non-smokers. Collection of the total unstimulated saliva was performed from all subjects (passive collection) in the same appointment with completing the questionnaires. The salivary cotinine evaluation was made from the saliva of all identified (questionnaires answers) active smokers (constant and occasional), using NicAlert™ Saliva strip tests (NYMOX Pharmaceutical Corporation, Canada). Statistical analyses were performed using SPSS 12.

Results: Based on the questionnaire's answers analysis, 141 (39%) from all subjects were smokers, namely 38 (10.5%) active occasional and 103 (28.5%) active constant smokers, and 221 (61%) were non-smokers. Based on salivary cotinine analysis in the smokers group (n=141), 15 (10.7%) were active occasional smokers (salivary cotinine concentration between 10 and 100 ng/mL) and 126 (89.3%) were active constant smokers (salivary cotinine concentration over 100 ng/mL). The study didn't find a significant correlation between the self-declared active smoker status and the active smoker status given by the salivary cotinine concentration (p>0.05).

Conclusion: A number of 126 from all participating subjects (34.8%) had a salivary cotinine concentration over 100 ng / mL, indicating an active constant smoker status; this percentage leads for applying effective smoking cessation programs and promoting a healthful lifestyle in adolescents from Romania.

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0110 (151501)

Proteins profiling in oral biological fluid using Seldi Tof MS

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Objectives: The goal of this study is to compare protein profiles of saliva and gingival crevicular fluid against sera in order to get more insights concerning the clinical potentiality of the two oral fluids.

Methods: Saliva and GCF were obtained from healthy nonsmoking subjects in the morning at least 2 h after eating and after rinsing mouth with water. In order to obtain optimal mass spectrometry results using the SELDI-TOF method, we used anion-exchange (Q10), cation-exchange (CM10), reversed phase (H50), and immobilized affinity capture (IMAC3) ProteinChip arrays (Ciphergen Biosystems, Fremont, CA, USA).

Results: In the working mass range of 1,000 to 20,000 m/z, approximately 200 peaks were resolved using the 4 different ProteinChip arrays. The comparison of the 4 protein profiles show significantly different expression levels (P < 0.05). Protein peak clustering analysis was also able to distinguish protein composition between the Saliva and CGF.

Conclusion: In conclusion, the results show that SELDI-TOF MS provides a simple and high throughput technique to identify a large number of differently expressed peptides/proteins in oral fluid samples, especially low mass proteins (<20 kDa) that have been difficult to assay effectively with other methods. In perspective, this technology represent a powerful tool to evaluate the implication of proteins in human oral disease.

Effect of Photo-Acoustic Stimulation Patterns on Human Whole Saliva SecretionA. BECK¹, K. PERCZEL-KOVÁCH¹, K. KÁLLÓ¹, P. FEJÉRDY², P. HERMANN², G. VARGA¹ and T.K. FÁBIÁN²¹Department of Oral Biology, Semmelweis University Budapest, Budapest, Hungary, ²Clinic of Prosthetic Dentistry, Semmelweis University Budapest, Budapest, Hungary

Objectives: Previous studies indicated significant effect of mixed photo-acoustic stimulation on human salivary secretion. The aim of this pilot study was to investigate if administration of specific photo-acoustic stimulation patterns have pattern specific effect on saliva secretion, and whether it is coupled to phenomenological effects or not.

Methods: Six healthy volunteers without any oral pathologies participated (male: 3, female 3, age: 23-27 yrs). Four patterns of stimulation frequency were studied within a range of 1-15Hz such as increasing pattern; decreasing pattern; increase followed by decrease and decrease followed by increase. Experiments were repeated four times in a self control design. Whole saliva was collected in 5min phases before the stimulation as control value, under administration of specific patterns, under post stimulation phases and after the experiment as last value. The volume of saliva was measured, the flow rate was calculated. Total protein (Bradford) and amylase (starch split) concentration of samples were determined (after 10.000g 4°C 10min). Phenomenological parameters were measured with numerical analogue scales.

Results: Flow rate, protein- and amylase outputs decreased and protein concentration increased significantly ($p \leq 0.05$, Friedman ANOVA, Wilcoxon test) and amylase concentration did not change during stimulation phases. Flow rate, protein concentration, protein- and amylase outputs increased significantly ($p \leq 0.05$, Friedman ANOVA, Wilcoxon) and amylase concentration did not change during post stimulation phases. Protein and amylase concentrations, protein- and amylase outputs were significantly higher ($p \leq 0.05$, Wilcoxon test) also in the last value comparing to control. Pattern-specific effects were: differences of amylase output and phenomenology during stimulation, protein concentration and output in post stimulation phases ($p \leq 0.05$, Wilcoxon test).

Conclusion: Our data indicate significant effect of photo-acoustic stimulation on saliva secretion. A specific effect on certain salivary parameters and phenomenology may not be excluded. Salivary and phenomenological effects seem to be rather independent. This research was supported by TAMOP-4.2.1/B-09/1/KMR-2010-0001.

Dental erosion and saliva parameters in Hungarian adolescentsZ. TÓTH¹, G.M. ZSOLDOS², L. SULYOK², J. BÁNÓCZY³, G. VARGA³ and M. JÁSZ⁴¹Conservative Dentistry, Semmelweis University of Medicine, Budapest, Hungary, ²Faculty of Dentistry, Semmelweis University of Medicine, Budapest, Hungary, ³Oral Biology, Semmelweis University of Medicine, Budapest, Hungary, ⁴Prosthodontics, Semmelweis University of Medicine, Budapest, Hungary

Objectives: The aim was to investigate dental erosion in school-children regarding their saliva parameters.

Methods: After obtaining the ethical approval (TUEB: 40/2008) clinical data of 49 Hungarian adolescents (mean age 14.27±0.67 year) were analysed by Lussi's erosion index. 38 persons have agreed to be involved into saliva investigations. Salivary secretion rate was assessed by collecting resting and stimulated saliva. Flow rate, buffering capacity and pH of the mouth were determined. The data were statistically analysed by SPSS for Windows program using the Chi-Square test.

Results: Dental erosion was found in 75.5% of the adolescents (at 37 children: boys 92.3%, girls 69.4%), the prevalence in boys was significantly higher. The most affected locations were the four first molars' occlusal and the incisors' buccal and incisal surfaces. More surfaces affected by erosion - although not significant - were found in boys, than in girls (14.27±23.82 and 9.70±11.85). If the secretion rate of resting saliva was lower, than 0.35 ml/min, the total sum of eroded surfaces/capita was higher, however this difference was not significant (15.88±22.90 and 7.50±6.80). The secretion rate of stimulated saliva was significantly higher in adolescents affected by dental erosion, than in the patients without erosion (1.44±0.62 ml/min and 1.04±0.27 ml/min, $p=0.01$). The buffering capacity of the stimulated saliva was found also higher in erosive pupils, but this difference was not significant (3.72±0.68 and 3.43±0.24, $p=0.062$). There was no difference in the pH values between adolescents with (7.33±0.67) or without (7.33±0.71) erosion.

Conclusion: The high rates of dental erosion in Hungarian adolescents require effective effort to prevent the process. Our contradictory results on the secretion rate might be explained by the increased production of saliva in patients with erosion, due to an increased acidic effect. For proving this theory a higher number of patients and examinations will be required.

Technetium-99 Pertechnetate Imaging of Parotid Hypertrophy/Hyperplasia in Unstimulated StateT. ZELLES¹, M. KELLERMAYER², D. MÁTHE³, C. DOBÓ-NAGY⁴, I. HORVÁTH², K. OFFENMÜLLER¹ and K. SZIGETI²¹Oral Biology, Semmelweis University of Medicine, Budapest, Hungary, ²Institute of Biophysics and Radiation Biology, Semmelweis University of Medicine, Budapest, Hungary, ³CROMed Ltd, Budapest, Hungary, ⁴Division of Radiology, Semmelweis University of Medicine, Budapest, Hungary

Objectives: One of the oldest questions in the salivary research – both in theoretical and clinical aspects – is whether there is a close relation between tissue mass and functional capacity of salivary glands? It is widely accepted that the technetium uptake is particularly useful for evaluating the glandular functions. The hypertrophy and simultaneous hyperplasia (Htr/Hpl) model appears suitable to study this question. Previously we have shown that heat treated raw soya-bean feeding induces a marked Htr/Hpl of rat parotids (similar to the pancreas enlargement induced by soya). A surprising difference is the lack of effect of the soya diet on submandibular glands. There is another animal model, the well known Isoproterenol (ISO)- Htr/Hpl, where both major glands are enlarged.

Methods: The functional activity of salivary glands was scanned for 10 days by the dynamic, non-invasive NanoSPECT/CT method under unstimulated conditions in the above-mentioned Htr/Hpl in rats. Animals were injected with ~100 MBq of ^{99m}TcO₄ and imaged after injection. Volumes of parotids (VOI) were defined (in mm³) by CT where the radioactivity uptake (in MBq) was determined. Radioactive dose concentration was determined by dividing measured radioactivity in the animal (in MBq) with the whole body weight (in g) of the animals.

Results: Maximal Tc-99 uptake was reached within 10 minutes by all glands in both treatment groups. Gradually increased uptake was detected on the 5th and 10th days by the parotids, of both soya and ISO-treated animals and by the submandibular glands of ISO-treated rats. There was no increase in the submandibular glands of soya-fed rats.

Conclusions: There is a simultaneous increase of tissue mass and function in the glands where Htr/Hpl were detected but the increased rate of function is lower than the growth rate of glands. Support: TAMOP-4.2.1/B-09/1/KMR-2010-0001, ETT-430-03

Fluoroquinolone treatment alters the peptidergic innervation of rat salivary glandsB. KELENTEY, Jr.¹, R. MOGYORÓSSY², B. SKOPKÓ¹, T. ZELLES³, Á. DEÁK⁴, K. MATESZ⁴ and T. BÁCSKAI⁴¹Faculty of Dentistry, University of Debrecen, Debrecen, Hungary, ²Faculty of Dentistry, University of Debrecen, Debrecen, Hungary, ³Department of Oral Biology, Semmelweis University, Budapest, Hungary, ⁴Department of Anatomy, University of Debrecen, Debrecen, Hungary

Objectives: Fluoroquinolones (i.e. Peflacin, PEF) are widely used in dental and medical therapy. The most common side effects of the fluoroquinolones are the gastrointestinal disorders accompanied by the decreased saliva production. It was previously demonstrated that chronic treatment of the rat with PEF resulted in morphological sign of atrophy in the secretory units. The molecular mechanism of decreased saliva production caused by PEF treatment was explained by the topoisomerase II inhibition and subsequent disorder of DNA synthesis. Since the saliva production is regulated by the nervous system and the PEF treatment causes alteration in the central and peripheral nervous system, we proposed that the morphological and functional disorder of salivary glands developed on the basis of a neuronal disorder.

Methods: The aim of this study was to determine the effect of pefloxacin treatment to the innervation pattern of the parotid, as a pure serous, and sublingual, as pure

mucous salivary glands of the rat. Adult rats were treated with PEF for 3 and 7 days and substance P (SP) and calcitonin gene related peptide (CGRP) -immunoreactive fibers were detected and counted.

Results: After chronic treatment we have found decrease of SP and CGRP-immunoreactive nerve fibers in the major salivary glands. As SP and CGRP are present in the sensory and the parasympathetic nerves of salivary glands, in separate experiments we have tested whether the parasympathectomy alters the innervation pattern of salivary glands caused by the PEF treatment. We have shown that the PEF effects mainly on the parasympathetic innervation of salivary glands.

Conclusion: These findings suggest that the impaired innervation pattern of salivary glands is related to the neurotoxic adverse effect of PEF treatment therefore, the administration of fluoroquinolones should be avoided or used with great caution in neurological diseases. This study was supported by DE OEC Mecenatura Grant 02/2005.

0115 (152246)

Bacteriostatic Effect of Cervitec Gel treatment

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Objectives: The purpose of this study was to evaluate bacteriostatic effect of Cervitec Gel (Ivoclar/Vivadent) paste in reducing the number of potentially cariogenic bacteria (Streptococci, Lactobacilli) in children. The aim was also to evaluate pH value and OHI after teeth were cleaned by using Cervitec Gel.

Methods: The number of Streptococci and Lactobacilli, as well as pH value and OHI were evaluated prior and after Cervitec Gel treatment in 30 patients by using CRT for individual caries risk determination (Ivoclar/Vivadent). With respect to potentially cariogenic effect of Streptococci and Lactobacilli, children were regarded as having low ($<10^5$) or high ($\geq 10^5$) caries risk. In all children, pH value was rated as low, medium or high.

Results: According to Wilcoxon test, a significant difference in the number of Streptococcus ($p=0,002$) and Lactobacillus ($p=0,046$) was found in both low and high caries-risk groups of children. In all children, a statistically significant improvement of pH measurements towards physiological values was observed with respect to Cervitec Gel treatment ($p=0,046$). However, no statistically significant difference in gender was observed related to Cervitec Gel treatment neither in the number of Streptococcus and Lactobacillus, or oral hygiene index.

Conclusion: Cervitec Gel treatment significantly reduces the number of cariogenic bacteria in the mouth and stabilizes physiological pH value of saliva, which can be easily determined by using CRT tests in everyday clinical practice.

0116 (151423)

Effect of silica coating on microtensile bond strength of zirconia

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Objectives: This study aimed to evaluate the adhesive properties of a MDP-containing resin cement to a colored zirconia ceramic, using a new laboratory silica coating technique in different priming conditions.

Methods: 18 zirconia ceramic discs (Cercon base colored) were divided into two groups: the control group with no pretreatment, the other group was pretreated to get silica coating, by first spreading a thin layer of flowable composite resin (Filtek™ supreme XT) on the zirconia surface, and then sintered at 1200°C for 10 min. Specimens in each group were further divided into 3 subgroups ($n=3$) according to the priming conditions: no primer, a MDP-containing primer (ED PRIMER II) or a silane coupling primer (RelyXTM CERAMIC PRIMER). Then resin-composite discs (Filtek™ Z250) were bonded to the treated surface using a dual-cured MDP-containing resin cement (Panavia F 2.0). The bilayered specimens were cut into microbars and 20 microbars were randomly selected from each specimen, half of which were stored in 37°C water bath for 24 h, and the other half were stored for 30 days. After water storage, the samples were exposed to a Micro Tensile Bond Strength test (MTBS). The results were analyzed by ANOVA, while the fracture surfaces were examined by SEM.

Results: After 24h water storage, silica coating followed by silanization showed a significantly ($P<0.001$) higher MTBS value 45.0 (10.9) MPa, while in other priming conditions silica coating did not improve MTBS. Water storage affects ($P<0.05$) MTBS in the control group (24.1-30.3 MPa to 2.8-3.1 MPa), but only partially in the silica coating group (20.0-45.1 MPa to 17.4-25.9 MPa). SEM analysis revealed a failure mode change after water storage, from mainly mixed fracture into adhesive type.

Conclusion: Durable bonding to zirconia cannot be established without surface pretreatment. The combination of silica coating with silane coupling can improve the bonding of resin cement to zirconia.

0117 (151448)

Topographical Surface Changes of Zirconia After Different Surface Treatments

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Objectives: The purpose of this study was to investigate the effect of different surface treatments on the roughness of zirconia.

Methods: Eighty sintered zirconia ceramic specimens (VITA In-Ceram® 2000 YZ for inLab®) were divided into 4 groups ($n=20$) according to the surface treatments received: none (control), Er:YAG laser irradiation (AT Fidelis Er:YAG) (400 mJ, 10 Hz, 4 W, 100 MPa, distance: 1 mm), tribochemical silica coating using aluminium oxide (Al₂O₃) modified by silica (30 µm), and air abrasion using Al₂O₃ particles (110 µm). After the surface treatment procedures, the surface roughness (Ra in µm) of the specimens was evaluated using a surface texture measuring instrument (Mitutoyo Sufest 402). Topographical surface changes of zirconia after surface treatments were also evaluated with atomic force microscope (AFM) (Quesant-Ambios Universal Scanning Probe Microscope) and scanning electron microscope (SEM) (LEO 440) analyses. The surface roughness values were analyzed using the Kruskal-Wallis test, followed by multiple pairwise comparisons using the Mann-Whitney U test ($p=0.05$).

Results: The results of the statistical analysis are summarized in table. The Kruskal-Wallis test revealed that there were significant differences among the groups ($p<0.001$). According to the Mann-Whitney U test, the surface roughness values of the air abrasion group showed statistical significance when compared with the other groups ($p<0.05$). However, there were no significant differences between the laser and silica groups ($p>0.05$).

Conclusion: According to the results of the statistical and microscopic analyses, all of the surface treatments increased the roughness of zirconia when compared with the control group; however, air abrasion is an effective surface treatment for roughening zirconia.

Groups	N	Mean	Median	SD	Kruskal-Wallis test	
					Chi-square value	p-value
Control	20	0,221	0,215 ^a	0,040		
Laser	20	0,335	0,290 ^b	0,145	55,969	<0.001
Silica	20	0,397	0,405 ^{bc}	0,122		
Air abrasion	20	0,753	0,745 ^d	0,107		

Zirconia ceramic resin cement bonding

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Introduction: The increasing demand for esthetic dental treatments and ongoing advances in research have lead to a situation whereby dentists now have recourse to a range of different ceramic materials, chosen according to the needs of each case. Amongst these, zirconium oxide ceramic offers several advantages in terms of opacity, strength and biocompatibility but when it is joined to composite resins used for bonding its behavior is unknown.

Objectives: To evaluate bond strength between zirconium oxide and different resin composite cements by means of shear testing. **MATERIALS AND METHODS:** 130 Lava TM ceramic cylinders were fabricated. These were sandblasted with 80µm aluminum oxide or with Cojet Sand. A silane coupling agent, adhesive and/or Clearfil Ceramic Primer were applied. 130 resin composite cement cylinders were bonded, selecting different bond techniques, two with dual polymerization (Variolink II and Panavia F) and two with self-polymerizing cements (Rely X and Multilink). Shear bond testing was carried out, and samples were subjected to optical microscope examination in order to locate and classify the type of bond failure. The statistical examination were performed with the Mann Whitney, Kruskal-Wallis and student t tests ($\alpha=0.05$).

Results: The two most successful combinations were Lava + Sandblasting + Clearfil SE Bond Primer + Porcelain Activator + Panavia F and Lava + Cojet + Clearfil Ceramic Primer + Variolink II (Groups 4 and 3 respectively). The least successful techniques were Lava + Sandblasting + Silane + Rely X and Lava + Sandblasting + Silane + Multilink (Groups 7 and 10). Bond failure was produced with less shear force than cohesive failure.

Conclusions: The cements that produced higher bond strength values were those with dual polymerization in combination with either sandblasting or silica coating and an adhesive containing MDP.

Bond Strength of Composite to Different Zirconia Ceramic MaterialsP. HAHN¹, M. MEHLICH¹ and M. WOLKEWITZ²*¹Dept. of Operative Dentistry and Periodontology, University Medical Center Freiburg, Freiburg, Germany, ²Institute of Medical Biometry and Medical Informatics, Freiburg, Germany*

Objectives: The purpose of this study was to evaluate impact of three different manufacturing processes on tensile bond strength (TBS) and its durability. Additionally, influence of two different resin luting materials on TBS was examined.

Methods: Y-TZP ceramic specimens were divided in three groups (n=48). In group 1 zirconia ceramic discs were industrially fabricated using ceramic injection moulding (CIM, gapless, D), in group 2 specimens were milled with a Lava machine (L, 3M Espe, D) and subsequently sintered, and in group 3 specimens consisted of hiped zirconia ceramic (DC-Zirkon, Metoxit, CH), and were milled after finishing the hip-treatment. Hollow plastic screws filled with composite resin were bonded to the zirconia ceramic discs, half and half with a conventional composite resin (V, Variolink II) and with a phosphate monomer-containing resin (P, Panavia 21). TBS was measured in a universal testing machine after 24 hours, and after 150 days aging in Ringer's solution. Failure modes were examined under magnification. ANOVA was used to test the effects of the manufacturing processes, the luting materials and the aging procedure on bond strength. Multiple comparisons of least-square means were done for the pair-wise comparisons adjusted by Tukey-Kramer.

Results: With both resins tested CIM ceramic revealed significantly higher TBS compared to the other tested ceramic materials. Using the conventional composite resin, additionally L ceramic showed significantly higher TBS compared to DC ceramic. Mean bond strength values of 37.4MPa (± 1.7) and 33.9MPa (± 1.7) for P, and 36.1MPa (± 2.2) and 27.8MPa (± 2.2) for V were measured after 24h and after 150d, respectively. Influence of aging was significant for V only ($p \leq 0.002$). Fracture mode was basically mixed cohesive/adhesive.

Conclusion: Tensile bond strength between zirconia ceramic and composite luting materials is influenced by the manufacturing process of the ceramic work piece, and the luting material used.

Bonding effectiveness of luting composites to zirconia ceramicsM. INOKOSHI¹, A. KAMEYAMA¹, S. MINAKUCHI², J. DE MUNCK¹ and B. VAN MEERBEEK¹*¹Leuven BIOMAT Research Cluster, Department of Conservative Dentistry, Catholic University of Leuven, Leuven, Belgium, ²Complete Denture Prosthodontics, Tokyo Medical & Dental University, Tokyo, Japan*

Bonding to dental zirconia ceramics has been shown to be challenging.

Objectives: To evaluate the effect of mechanical surface conditioning and artificial aging on the micro-tensile bond strength (μ TBS) of two dual-cure composite cements to zirconia ceramics.

Methods: Fully sintered IPS e.max ZirCAD (Ivoclar-Vivadent) blocks were either (1) not pre-treated or (2) subjected to tribochemical silica coating (CoJet, 3M ESPE) for 2 sec (at a distance of about 10 mm). Next, the silane coupling agent Clearfil Ceramic Primer (Kuraray) was applied during 60 sec, followed by gentle air-drying, after which two zirconia blocks were bonded together using one of two dual-cure composite cements (Panavia F2.0 or Clearfil Esthetic Cement, Kuraray). The specimens were trimmed at the interface to a cylindrical hour-glass shape (diameter = about 1.2 mm). All specimens were stored for 7 days in distilled water at 37°C, after which they were randomly divided into 2 subgroups; half of the specimens were subjected to 10,000 thermocycles between 5 and 55°C during 10 days; the other half were further immersed in 37°C water for 10 days (n=15-20 per group). After storage, the μ TBS was determined in MPa. Data were analyzed with Weibull, three-way ANOVA and Turkey's test ($P < 0.05$). Fractographic analysis was performed using SEM.

Results: Weibull analysis revealed the highest (scale-parameter of 54), most reliable (shape-parameter of 3.5) and least low (Blife significantly higher at 10% unreliability) values for the CoJet-Panavia F2.0 group, thereby scoring significantly higher than any other group. Without tribochemical silica coating, the lowest μ TBS was measured for Panavia F2.0 (Tukey, $p < 0.05$). When Clearfil Esthetic cement was used, neither tribochemical silica coating, nor thermocycling influenced the μ TBS.

Conclusion: Mechanical surface conditioning using tribochemical silica coating appeared needed for Panavia F2.0 to effectively bond to zirconia ceramics, while not for the more hydrophobic Clearfil Esthetic Cement.

Influence of Surface Treatments on Surface of Four Zirconia CeramicsI. YONDEM¹, M.T. YUCEL¹, M. BULBUL² and A.N. OZTURK³*¹Department of Prosthodontics, Selcuk Universitesi, Konya, Turkey, ²Gaziantep University Faculty of Dentistry, Gaziantep, Turkey, ³Prosthodontics, Selcuk Universitesi, Konya, Turkey*

Objectives: The aim of this study was to evaluate the effect of different surface treatments on the surface roughness of four different zirconium oxide ceramics.

Methods: Four different sintered zirconium oxide ceramic specimens (Cercon®, In-Ceram® YZ, IPS e.max® ZirCAD and Lava™, Ø12 mm x 11 mm x 1 mm) were treated with (n = 4): (1) Neodymium:yttrium-aluminium-garnet (Nd:YAG) laser was applied with 300-µm fiber probe at 3W, 20Hz, 150 mJ with 100µs pulse duration after the graphite powder on the ceramic surface; (2) CoJet™ Sand sandblasting with silica powder (30 µm particle size) at a pressure of 3.0 bar, distance of 10 mm, perpendicular to the treated surface for 20 s; (3) 9.5% HF acid etching for 90s; (4) no treatment. Ceramic specimens' surfaces were analyzed by Atomic Force Microscope (AFM) recording average surface roughness (Ra) measurements of the substrate. Four measurements were performed for each pre-treated ceramic

specimen using a standardized rectangular spot. Data were statistically analyzed by two-way ANOVA and Tukey HSD tests ($\alpha = 0.05$). The same discs were evaluated under Scanning Electron Microscope (SEM) for surface topography analysis.

Results: Significant changes in all zirconium oxide ceramic surfaces roughness occurred after laser irradiation ($p < 0.05$). No differences in ceramic surfaces roughness occurred after any of the CoJet Sand and HF acid etching treatments compared to no treatment groups ($p > 0.05$).

Conclusion: Nd:YAG laser irradiation resulted in an increase of surface roughness but the other surface texture parameters behaved similarly with no significant increase of Ra values. However, Nd:YAG laser irradiation induced cracking on the surfaces of all specimens, in addition to a blackening effect.

0122 (152628)

Keynote Address: Role of MMPs in the Degradation of the Hybrid Layer

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The hybrid layers created by contemporary adhesives are unstable in aqueous environments due to hydrolytic degradation of both resins and collagen fibrils compartments. It has been shown that endogenous enzymes bound to the dentin organic matrix and named as matrix metalloproteinases (MMPs) can degrade the exposed collagen fibrils within the hybrid layers, if unprotected by adhesive monomers. Evidence of collagenolytic and gelatinolytic activities in partially demineralized dentin treated either with etch-and-rinse or self-etch adhesives further confirmed the potential involvement of these endoproteases in the disruption of incompletely infiltrated collagen fibrils within hybrid layers. Recent studies identified MMP-2 and -9 as important enzymes involved in the degradation process. Indirect evidences of the enzymatic activity of MMP-2 and -9 were also obtained with chlorhexidine digluconate (a proven synthetic MMP inhibitor) or other MMP-inhibitors (such as galardin) that, if used as therapeutic primers during the bonding technique, preserved the morphological and mechanical properties of hybrid layer both under in vivo and in vitro conditions. The use of adhesive build-in inhibitors seems also to have a potential therapeutic effect stabilizing the adhesive interface over time. While several studies confirmed the existence of the intrinsic proteolytic activity, the effective role of dentin MMPs in comparison with salivary or bacteria-derived enzymes in the degradation of the hybrid layer should be still elucidated.

0123 (151852)

MMP-9 involvement in dentin-bond degradation

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Many studies suggest that MMP-9 might be involved in degradation of resin-dentin interfaces.

Objective: To determine the effect of an activated MMP-solution on the mechanical properties of the bond to dentin. If MMP-9 is involved in the bond-degradation process, the activated MMP-9 solution is expected to reduce the bond strength to dentin.

Methods: Bur-cut dentin surfaces of 6 human molars were etched with 37% phosphoric acid (Scotchbond Etchant, 3M ESPE) for 15 sec and rinsed with water for 10 sec. Half of the surface was treated with either a 0.1 μ M (MMP-LC) or 10 μ M MMP-9 solution (MMP-HC) in TRIS-buffer for 60 seconds, while the other half (buffer treatment only) served as control. Then, the etch&rinse adhesive Scotchbond 1 XT (3M ESPE) was applied, followed by a composite (Z100, 3M ESPE) build-up. After storage in water for 7 days at 37°C, 1x1 mm resin-dentin sticks were prepared and the micro-tensile bond strength (μ TBS) was determined.

Results: One-way-ANOVA revealed no significant differences between the groups ($p = 0.8081$). The mean μ TBS values were 48.4 ± 8.6 MPa for group MMP-LC, 45.3 ± 15.3 MPa for group MMP-HC and 44.9 ± 14.3 MPa for the control. Failure analysis revealed predominantly mixed failures for all groups, including failures inside the dentin, at the resin-dentin interface and inside the resin (adhesive/composite) part.

Conclusion: Application of a highly concentrated, activated MMP-9 solution did not affect the bonding effectiveness of a 2-step etch&rinse adhesive to dentin. Therefore, the role of this gelatinase in bond degradation appears limited, as before the gelatinase can be involved, collagen fibrils need first to be broken down by other degradation mechanisms.

0124 (151472)

Effect of HEMA on bonding efficiency of 10-MDP to hydroxyapatite

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The functional monomer 10-methacryloxydecyl dihydrogen phosphate (10-MDP) ionically bonds to hydroxyapatite (HAp) (Yoshida et al., JDR 2004). This bond is very stable, as was confirmed by the low dissolution rate of 10-MDP's calcium salt in water.

Objectives: To study potential interference of HEMA on the chemical bonding efficiency of 10-MDP to HAp.

Methods: We examined the chemical interaction of 5 experimental adhesive solutions, containing 0.005 mol 10-MDP and 0.228 mol H₂O with EtOH and HEMA respectively varying following the mol ratio's 0.10:0 (exp-1), 0.75:0.25 (exp-2), 0.05:0.05 (exp-3), 0.25:0.75 (exp-4) and 0:0.10 (exp-5), with HAp by means of XRD (X-ray Diffraction) and solid-state NMR (Nuclear Magnetic Resonance: 31P MAS NMR, 31P CP-MAS NMR and 1H MAS NMR). In addition, QCM (Quartz Crystal Microbalance) equipped with a HAp sensor was used to study the potential adsorption of HEMA (5wt% in H₂O) onto HAp.

Results: XRD revealed nano-layering of CaMHP2 for exp-1 and also, though less intensively, for exp-2, but not for exp-3/4/5. NMR disclosed a strong peak at -1.96 ppm for exp-1 that can be assigned to CaMHP2. All other solutions showed a significantly less intense peak that should be assigned to 10-MDP molecules adsorbed onto HAp, and this irrespective of the mol ratio of EtOH to HEMA. Finally, QCM showed that HEMA molecules are adsorbed to HAp as well.

Conclusion: This experiment showed that HEMA restrained nano-layering or the formation of CaMHP2, since both 10-MDP and HEMA molecules compete to interact with the HAp surface.

Bonding Effectiveness of Self-adhesive Composites to Dentin

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Self-adhesive composites are bonded to the tooth without a separate adhesive. Today, independent information regarding their adhesive properties is still limited.

Objectives: To investigate the effect of surface smear on the micro-tensile bond strength (μ TBS) to dentin.

Methods: Self-adhesive flowable composites or adhesive/flowable composite combinations were applied to either bur-cut (medium-grit = 100 μ m) or SiC-paper ground (600-grit) dentin surfaces. After 1-week water storage, 5 teeth per group were sectioned into 1x1 mm micro-specimens, prior to being subjected to a μ TBS test protocol.

Results:

		Dentin preparation	μ TBS		Failure Analysis (%)				
			MPa \pm SD	ptf/n	S	I	B	B/C	C
Self-adhesive flowable composite	Fusio Liquid Dentin (Pentron Clinical)	bur	17.7 \pm 8.7 ^{ad}	0/30	1	88			11
		SiC	17.1 \pm 9.5 ^d	0/30		98			2
	Vertise Flow (Kerr)	bur	5.4 \pm 1.7 ^f	16/24		94			6
		SiC	9.7 \pm 6.2 ^f	14/31		38			62
1-step adhesive/flowable composite	Adper Prompt L-Pop/ Filtek Supreme XT Flow (3M ESPE)	bur	25.4 \pm 10 ^{ab}	0/30		3	41		55
		SiC	34.9 \pm 13.4 ^c	0/30	6	16	31	1	47
	AdheSE One/ Tetric Evoflow (Ivoclar Vivadent)	bur	9.0 \pm 5.2 ^f	26.m ^{arc}	2		85	9	4
	iBond/Venus Flow (Heraeus Kulzer)	bur	24.7 \pm 9.5 ^{bd}	31.jan	4	29		33	34
	Xeno V/ X Flow (Dentsply)	bur	29.4 \pm 11.7 ^{bc}	0/30	7	2		2	90
3-step adhesive/flowable composite	Optibond FL/ Premise Flowable (Kerr)	bur	44.8 \pm 13.6 ^e	0/20	33	8	8	5	48

SD: standard deviation; ptf/n=pre-testing failures/number of specimens; Means with the same superscript are not significantly different (Tukey HSD, $p < 0.05$); ptf=0 MPa;

S= substrate; I=interface; B=bond; C=composite

Conclusion: Disregarding one 1-step adhesive/flowable composite combination, both self-adhesive flowable composites exhibited a significantly lower bond strength than the flowable composites that were bonded using a separate adhesive. The way dentin was prepared did not affect the bonding effectiveness of the self-adhesive composites. The more fluid self-adhesive composite Fusio Dentin Liquid bonded significantly better than Vertise Flow.

Bond strength of porcelain laminate veneers to dental hard tissuesE. OZTURK¹, S. BOLAY², R. HICKEL³ and N. ILIE⁴¹School of Dentistry, Hacettepe University, Ankara, Turkey, ²Dental College, Ankara, Turkey, ³Dept. of Rest Dent, Period & Pedodont, University of Munich, Munich, Germany,⁴Department of Restorative Dentistry and Periodontology, Ludwig-Maximilians University, Munich, Germany

Objectives: The aim of this in vitro study was to evaluate shear bond strength of porcelain laminate veneers to three different surfaces by means of enamel, dentin and enamel-dentin complex using three different resin cements.

Methods: Onehundredthirtyfive extracted, noncarious human maxillary central incisor teeth were used and the teeth were randomly divided into 9 groups(n=15). The teeth were embedded in acrylic molds and prepared with three different levels for bonding surfaces of enamel(E), dentin(D) and enamel-dentin complex(E-D). Porcelain discs(IPS e.max Press/Ivoclar Vivadent) of 2 mm in thickness and 4 mm in diameter were prepared according to the manufacturer's instructions. Porcelain discs were luted to the tooth surfaces by using two light-cured[RelyX Veneer(RV); Variolink Veneer(VV)] and a dual-cured[Variolink II(V II)] resin cements according to the manufacturers' instructions. All the samples were stored in distilled water for 24 h at 37°C and were thermal cycled for 5000 cycles in 50°C ve 55 °C deionized water. Shear bond strength test was performed in a universal testing machine(MCE 2000ST, Quicktest Prüfpartner GmbH) at 0.5 mm/min until bonding failure. The datas were statistically analyzed using 1-way ANOVA and Tukey-HSD post hoc-test($p = 0.05$).

Results: Group RV-D exhibited the lowest bond strength value(5.42 \pm 6.6 MPa). There was statistically no difference between RV-D, V II-D(13.78 \pm 8.8 MPa) and VV-D(13.84 \pm 6.2 MPa) groups($p > 0.05$). However, significant differences were found between the group RV-D and the other groups($p < 0.05$). Group VV-M exhibited the highest bond strength value (24.76 \pm 8.8 MPa). Group VV-M was statistically different from the groups RV-D, VV-D and V II-D($p < 0.05$).

Conclusions: Porcelain laminate veneers bonded to dentin surfaces only effected the shear bond strength values negatively. When dentin exposure is necessary during the preparation, enough sound enamel must be protected as possible to maintain a good bonding and to obtain a maximum bond strength, preparation margins should be on sound enamel.

Observer's Confidence in Occlusal Caries DetectionÁ. ÁSTVALDSDÓTTIR¹, W.P. HOLBROOK², B. DE VERDIER³ and S. TRAN-ÆUS⁴¹Cariology, University of Iceland, Faculty of Odontology, Reykjavik, Iceland, ²Faculty of Odontology, University of Iceland, Reykjavik, Iceland, ³Department of Radiology, Skaraborg Hospital, Skövde, Sweden, ⁴SBU, Stockholm, Sweden

Objectives: To examine how observer's background and different caries detection methods influenced the observer's confidence in placing their diagnosis.

Material and methods: The material comprised 80 extracted molars and premolars, presenting as occlusal surfaces, both sound and with a variety of carious lesions. Ten dentists examined the material, five of them had work experience of more than 10 (average 19 years) and five had less than 10 years (average 5 years). They examined radiographic images, DIFOTI images and teeth visually, on separate appointments. Occlusal surfaces were graded on a 5 point scale: 0= definitely not caries, 1=probably not caries, 2=questionable, 3=probably caries and 4=definitely caries. They were also asked to grade the surfaces on a 5point scale with respect to the extent of the caries lesion.

Results: The more experienced dentists showed greater confidence in placing their diagnoses for all three detection methods. On average, the more experienced group was confident in their diagnosis for 76.5% of surfaces when using DIFOTI, 72% when using radiographs and 64.5% for visual inspection. The results for the less experienced group were 42.8% for DIFOTI, 56.8% for radiographs and 53.8% for visual inspection. The difference was though non-significant between groups or methods. Non-significant difference was observed between groups in the accuracy of their diagnosis concerning the extent of the lesions.

Conclusions: Increased work experience results in more confidence in placing occlusal caries diagnosis but does not necessarily increase the accuracy of the diagnosis.

0128 (151246)

Pulse oximetry for diagnosis of the status of the pulp

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Tests relying on the passage of the light through a tooth have been considered to be a suitable means of assessing pulp vitality in children. Pulse oximetry which is an effective, objective oxygen saturation monitoring technique broadly used in medicine for recording blood oxygen saturation levels, can also be used in endodontic diagnosis for differential diagnosis of vital and necrotic pulps in young teeth. In this system, light is passed from a photoelectric diode across the tooth structure into a receptor. The instrument detects changes in absorption in both red and infrared light caused by alteration in tissue volume during the cardiac cycle. However, there are some limitations inherent in its, such as the effect of increased acidity and metabolic rate which cause deoxygenating of hemoglobin and changes in the blood oxygen saturation. Because this test produces no noxious stimuli, patients usually accept it more readily than routine methods. In this lecture, principles, indications, limitations, influencing factors, and variations in probe design for dental usage would be presented.

0129 (151216)

Teaching of Color in Predoctoral Dental Education: US and Germany

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Objectives: The goal of the study was to determine the current status of the teaching of color in dental education at undergraduate level in United States (USA) and Germany (GER).

Methods: A cross-sectional web-based survey, containing 27 multiple choice, multiple best and single best answers, was created. Upon receiving IRB approval, dental faculty involved in the teaching of color to undergraduate dental students in USA and GER (N=121), were administered. Statistical analysis of differences between Pre-D and Post-D was performed using Fisher's Exact Test ($\alpha=0.05$).

Results: A total of 49 responses were received (response rate 40.5%); There were 34 responses from USA and 15 from GER. A course on "color" or "color in dentistry" was included in the dental curriculum of 73.5 of US programs and 80% of GER programs. The number of hours dedicated to color-related topics was 4.0 ± 2.4 and 3.7 ± 2.49 for USA and GER, respectively. The following topics were frequently taught in both countries: color dimensions, tooth color range, ceiling shade matching lights, color temperature, shade matching method (position, distance, time and length of color selection, tooth condition - dry/moist), dimension by dimension shade matching technique, shade guides, color communication using written instructions and digital imaging, color of ceramics and resin composites, and tooth whitening (techniques, longevity and mechanism of action). Significant differences were recorded in teaching on Munsell color notation system ($p=0.002$), metamerism ($p=0.00003$), time/length of color selection ($p=0.018$), value scale of Vitapan Classical ($p=0.0003$) and custom color characterization ($p=0.008$).

Conclusions: Teaching of color in undergraduate dental education United States and Germany is to a large extent in accordance with advancements in dental materials and technology. Many similarities in teaching of color were recorded between the two countries. Both these similarities and significant differences between certain topics can be used by dental educators as guidelines for improvements.

0130 (152108)

Development of patient simulation systems for dental education, SIMROID®

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Objective: The Nippon Dental University Hospital is making efforts to develop systems simulating patients' feelings, and apply them to the education of dentists to nurture holistic dentistry. We tried to improve the efficiency of interns' self-learning by adding new post-training feedback functions and clinical programs according to various situations to the GUI (Graphical User Interface) for a patient simulation systems for dental education (SIMROID®) developed in this project.

Methods: We upgraded the GUI, developed based on a survey on feelings during clinical programs using SIMROID® in twenty doctors who had agreed on the purpose of its development, by adding new post-training feedback functions using "Microsoft Visual C++ 8.0" and clinical programs to encourage interns' self-evaluation.

Results: As part of the feedback functions, the GUI is equipped with a video-recording function using an external camera during the training session, and a display function of the entire history of actions (commands) with a touch pen issued for the patient robot. The latter allows the user to stop the movie at any time and print the scene. Furthermore, training data can be collectively managed within the GUI by creating folders for individual interns. This function enables interns to easily reflect on their own performance.

Conclusion: The upgrade of the GUI for the patient simulation system for dental education, together with the addition of the new feedback functions essential in objective evaluation by instructors and self-evaluation by interns, will lead us to develop "SIMROID®", a comprehensive simulation system, with which we can further advance holistic dental education. [This study was subsidized by Japan science and technology agency as a "development of creative technology seeds"]

0131 (152116)

Does visual acuity influence operative skills?

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Objectives: The aim of this intervention study was to test if the visual acuity has in impact on operative skills with a dental bur.

Methods: Twenty-nine undergraduate students with half a year of phantom head training underwent a classical optical test at an optician. In the first run, the students were instructed to prepare two different geometrical forms on acrylic blocks (A-PTS, Frasco, Germany) mounted in phantom heads. In a second run two weeks later the students repeated the same task but were provided with dental Galilean loupes (EyeMag, Zeiss; 2.5X magnification) that were individually adjusted. Quality parameters included a) operative accuracy (Neuhaus et al. 2010), b) simple following of a line with a rotating diamond bur, c) preparation depth, and d) preparation angles of a 3D-cavity. Students with an observed natural visus <1 were defined as bad viewers (Eichenberger et al. 2011)

Results: The use of dental loupes significantly enhanced the operative accuracy and preciseness of drilling. According to the optical test, two students were classified

as bad viewers. A significantly lower accuracy was found in the group of bad viewers. Over-preparation in particular was significantly enhanced in this group. After application of the dental loupes to all students, no difference could be detected between bad and good viewers with respect to operative accuracy. As to preparation depth and preparation angles, the differences that were detected between good and bad viewers or between first and second run showed clear tendencies towards better preparation with better vision, but failed statistical significance.

Conclusion: Dental loupes can be recommended to all dental students and particularly benefit students with a bad natural vision. However, accuracy of more complex cavity preparation tasks seem to be dependent on more skills and on individual training than on vision alone.

0132 (152294)

Screening of Oral Cancer by Using Mass Spectrometry Method

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Objectives: Cancer is the 2nd leading cause of death worldwide. The morbidity and mortality of oral cancer cause a heavy impact on quality of life, life expectancy and economy. A variety of commercial diagnostic procedures are available to potentially assist in the screening of non-cancer but high-risk patients. With the increasing population of cancer patients scientists worldwide are challenged to find new and better ways for prevention and early detection.

Methods: Mass spectrometric profiling of the protein expression by pathological tissues is a non invasive saliva examination. This presentation focuses on the recent discoveries of new procedures of biomarkers detection for early cancer diagnose by means of MALDI-TOF mass spectrometry.

Results: we found the previously detected peptides in all saliva samples of all oral cancer patients using by targeted peptide analysis.

Conclusion: This high-throughput method could be a new promising possibility of screening of high risk people (early smokers, homelesses, etc).

0133 (152130)

Radiological Features of the Adenomatoid Odontogenic Tumor

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Objectives: The aim of this study was to evaluate the radiological and clinical features of the Adenomatoid Odontogenic Tumor (AOT).

Methods: A total of 273 cases (267 from the English-language literature and six new cases) were studied and critically evaluated with emphasis on the radiological features.

Results: Age at time of initial diagnosis ranged from 3 to 82 years (mean 18.4 years, median 16 years). The distribution between females and males was 3:2. The ratio between the maxilla and mandible was 3:2. Mandibular lesions were significantly more frequent among subjects older than 16 years of age. Lesions were dominantly radiolucent in 90.6%; of them, small opacities were present in 76%. Of all lesions, 90.2% were unilocular. Borders were well-defined in 91.5% of cases. The lesions were round or oval in shape in 75.5% and irregular in 24.5%. The most common AOT variant was the intra-follicular with significant priority to maxillary canines. The extra-follicular variant was less common. Tooth displacement was noted in 81.2% of all cases. Tooth resorption was described in 18.9% of the lesions and was significantly more prominent among subjects who were older than 16 years of age. Expansion of cortex was noted in 67.3% of cases and was significantly more prominent among subjects who were older than 16 years of age.

Conclusions: Some radiological features are characteristics to most cases of AOT (radiolucency presented with opacities, unilocularity, well-defined borders, and tooth displacement). Other features are more variable and are influenced by the age of the patient. Patients older than 16 years of age are more likely to present mandibular AOT, the extra-follicular variant of AOT, tooth resorption and expansion of cortex. Hence, AOT should be considered more often in the differential diagnosis of radiolucent or mixed lesions of the jaws.

0134 (152198)

Regulatory mechanism in apical periodontitis

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Objective: We attempt to critically review regulatory mechanisms controlling the activity of effector cells and molecules contributing to protection-from-infection, host tissue injury and repair processes in apical periodontitis lesions.

Methods: Results of recent experimental and clinical observations made by our group and available in the scientific literature were reviewed.

Results: Protective and destructive immune-inflammatory reactions take place simultaneously in periapical lesions. However, the same "protective" reactions defending the periapical area from extensive infection may result in tissue injury. Recent results revealed new aspects of multiple and, in part, interrelated stimulatory and inhibitory effects, operative in apical periodontitis. Periapical inflammation is initiated by root canal infection in the majority of cases. In addition to microorganisms, dental materials and orthodontic tooth movement stimulate the expression of early inflammatory cytokines and chemokines by the cells of the pulp and of the periodontal ligament attracting leukocytes to the lesion site and stimulate their activities. Immigrating leukocytes produce further mediators amplifying the intensity of inflammation and resulting in tissue injury. Negative feed-back loops, at the cellular and molecular levels, inhibiting uncontrolled tissue damage and contributing to repair mechanisms are being set in motion parallel to the inflammatory reactions. The net balance of the networking regulatory processes is chronic apical periodontitis, a limited lesion in terms of both infection control and tissue injury, that can get completely healed after proper endodontic treatment.

Conclusions: Development, progression and repair of periapical inflammatory lesions require the intricate interplay of virtually every subpopulation of inflammatory cells and mediators. Experimental models should be scrutinized before extrapolating observations to the periapical pathoses of human subjects. The work/publication is supported by the TÁMOP 4.2.1/B-09/1/KONV-2010-0007 project. The project is co-financed by the European Union and the European Social Fund.

0135 (152205)

Comparative inhibitory activity of new-antiseptic octenidine-hydrochloride solution on *Enterococcus faecalis*

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Objectives: To determine the minimum inhibitory concentration (MIC) of a new antiseptic solution used in medicine for traumatic, acute, chronic, surgical or burn wounds; octenidine hydrochloride (OCT) (Octenisept®, Schülke&Mayr, Germany) in comparison with 2.5% and 5.25% sodium hypochlorite (NaOCl) (CaglayanKimya, Turkey) and 2% chlorhexidine gluconate (CHX) (Imicyrl, Turkey) required to kill *Enterococcus faecalis*.

Methods: The MIC test was prepared in sterile 96-well microtiter plates. Initially, each well received 150 µl of sterile phosphate saline solution (PBS) and then 150 µl of the test irrigant were added to first well. After serial two-fold dilutions up to ten different concentrations, 150 µl of spectrophotometrically standardized *E. faecalis* inoculum was added into each well. 300 µl of bacterial suspension (positive) and 300 µl of sterile PBS (negative) were served as control groups. Subsequently, the first spectrophotometric reading was carried out and then the growth of surviving bacteria was measured at the end of the 6, 12, 18 and 24 hours. The microplates were kept at 37°C under aerobic conditions. After the determination of MIC values with the spectrophotometric readings, the minimal bactericidal concentration (MBC) was determined by inoculating 25 µl from each diluted well on Brain Heart Agar plates at 37°C for 48 hours.

Results: MIC and MBC values ($\mu\text{g/ml}$) for *E. faecalis* were 0.64 and 0.128 for OCT, 12.5 and 6.25 for 2.5% NaOCl, 6.56 and 3.28 for 5.25% NaOCl, 0.156 and 0.078 for CHX. The antimicrobial effectiveness of the test irrigants were listed from highest to lowest as follows: CHX, OCT, 5.25% NaOCl and 2.5% NaOCl.

Conclusion: Within the limitations of this in vitro study, it can be concluded that octenidine hydrochloride is a potent antibacterial solution that might be used as an alternative irrigant in endodontics. Further research is needed in order to prove other expected properties from octenidine hydrochloride for endodontic use.

0136 (152252)

Mother to Child Transmission of *Streptococcus mutans*

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Objectives: To study the transmission of *Streptococcus mutans* (SM) between mother and child outpatients of the Egas Moniz Dental Clinic (Almada, Portugal), as well as to analyse the sensitivity of the methods used for detection.

Methods: Saliva samples were obtained from 30 pairs of mother and child. The presence of SM was analysed in each of the 60 subjects by inoculation in culture medium (Mitis Salivarius Bacitracina Agar) and by PCR. Information was collected through surveys on several habits of mother and child and their DMFT Index was obtained by clinical examination. These data were then subjected to statistical analysis, both descriptively and crossed with the incidence of SM. The degree of relationship between the SM genotypes detected in mother and child was determined by genotyping methods.

Results: Isolation in culture media revealed an SM prevalence of 43.3% ($n = 13$) in mothers and 30% ($n = 9$) in children, and PCR revealed an SM prevalence of 63.3% ($n = 19$) in mothers and 56.7% ($n = 17$) in children. Inferential statistical analysis focused on the cross tabulation of the variables obtained from the clinical exam and questionnaire with the presence of SM revealed no statistical differences. PCR proved to be more sensitive than the isolation in culture media to analyse the prevalence of SM ($p < 0.05$). Genotyping detected 6 different SM genotypes in 11 individuals. The presence of the same SM genotype between mother and child from the same pair was detected in 75% (3 out of 4) of the pairs studied.

Conclusions: PCR proved to be more sensitive than the isolation in culture media to analyse the prevalence of SM. Genotyping study revealed diversity of SM genotypes in the sample as well as a relatively high frequency of genotypic relationship between the SM detected in mother and her child.

0137 (152088)

ICON- Caries Infiltration in Molar, Occlusal Fissures

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Objectives: Aim of present research is to arrest caries incipient in molar, occlusal fissure system without drilling, aided by the methacrylate based caries infiltration solution ICON (DMG). This is noninvasive alternative to fissurotomy or microabrasion. Until now, the indication area was only smooth surface and interdental caries.

Methods: Five fresh, healthy molars were cut horizontally at the anatomical equator and cleaned. Five measuring points were determined in the occlusal fissures (P1-P5). Control measurement was done on each point with Diagnodent Pen (KaVo). We stored the teeth in demineralising solution according to Buskes et al. with constant pH 4,7 at 37°C so as to induce experimental tooth decay. The study was subdivided into three phases. Phase1 (first demineralisation): Control point P1 (single demineralised control) and axial surfaces were covered with acid resistant nail varnish and then teeth were demineralised until P2-P5 achieved Diagnodent value 14. Phase2 (second demineralisation): Removal of nail varnish from P1, ICON application at P2, P3 and subsequent demineralisation of the teeth (P4, P5: double demineralised absolute controls). Phase3 (evaluation phase): As soon as P1 equalled or was over Diagnodent value 14, the examination was stopped and we evaluated P1-P5. Stereo photos were taken in order to present the fissure system with anaglyph pictures. Statistica 8.0 (Stat Soft Inc.) software with ANOVA Repeated Measures and Dunnett Test ($p < 0.05$) was used for statistical measures.

Results: There were significant differences in Diagnodent values of the three phases. There were not any significant differences between the free and ICON applicated points.

Conclusions: Preventive effect of ICON on smooth surface and interdental areas is literarily documented. Although in vitro effect has not been proved yet statistically, longterm studies and increase of tooth number will hopefully confirm our hypothesis also on occlusal surface.

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0138 (152277)

Primary Sjögren's Syndrome: Rituximab Restores Salivary Gland Structure and Function

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Objectives: To investigate the efficacy of the anti-CD20 antibody rituximab on the immune-mediated inflammatory changes in labial salivary gland tissue and on the salivary gland function in patients with primary Sjögren's syndrome.

Methods: In this open-label study including 20 female patients (mean age 48 ± 15 years) with primary Sjögren's syndrome fulfilling the revised American-European Consensus Group Criteria, unstimulated and chewing-stimulated whole saliva and stimulated parotid saliva flow rates were measured and labial salivary gland biopsies obtained before and 195 days after treatment with rituximab (infusion of 1,000 mg on days 1 and 15). The biopsies were routinely processed, embedded in paraffin wax and stained with haematoxylin/eosin. B- and T-lymphocyte distribution was analysed using immunohistochemistry. Also the relative amount of salivary gland parenchyma and lymphocytic inflammation was assessed.

Results: At baseline, labial salivary gland biopsies revealed focal periductal lymphocytic infiltrates in all patients (mean focus score 3.7; range 1-12). After treatment, the extent and amount of lymphocytic infiltrates, including germinal centers, decreased in 60% of the patients (focus score: 1.9; 0-12, $p = 0.02$). Also the relative amount of acinar and fat tissue increased and the relative number of B-cells and plasma cells decreased after treatment. Unstimulated and chewing-stimulated whole and parotid saliva flow rates increased in 65%, 60% and 70% of the patients, respectively (mean increase from baseline: 39%, 21% and 18% ($p = 0.03$, $p = 0.001$ and $p = 0.02$, respectively). The improvement of salivary gland function did not correlate to the reduction in focal lymphocytic infiltration nor to age or duration of disease.

Conclusion: Our results indicate that B-cell depletion with rituximab can attenuate the immune-mediated inflammatory changes in labial salivary gland and independently hereof improve salivary gland function in terms of whole and parotid saliva flow rates in the majority of patients with primary Sjögren's syndrome, and presumably postpone the progression of the disease.

Salivary Albumin Concentration in Patients with Long-term Periodontal DiseaseJ. MEURMAN¹, K. KARI¹, A. SAARINEN¹, B. SÖDER², P.-Ö. SÖDER², and M. YAKOB³¹University of Helsinki, Helsinki, Finland, ²Department of Dental Medicine, Karolinska Institutet, Huddinge, Sweden, ³Department of Dental Medicine, Karolinska Institutet, Stockholm, Sweden

Objective: Salivary albumin is serum albumin ultrafiltrate and its concentration reflects oral mucosal integrity (Meurman et al. Oral Surg 2002;94:432; Shoval et al. Bone Marrow Transplant 2005;36:33). Periodontal disease may or may not affect the concentrations (Henskens et al. J Oral Pathol Med 1996;25:360). We analyzed factors affecting salivary albumin in patients with and without long-time history of periodontal disease. We hypothesized that disease states reflect in high albumin concentrations.

Methods: From original sample of 1676 individuals, 99 subjects (60±3 years) were followed from 1985 to 2009, when paraffin-wax stimulated saliva samples were taken for microbiological and biochemical analyses. The patients oral health and medical records were available. Immunoturbimetry (Tina-Quant®, Roche) was used for albumin analysis. Subjects with albumin values below and higher than median were compared using group statistics. The effect of various background variables on albumin values was analyzed using logistic regression model.

Results: The statistically significant oral health parameters in patients with lower vs. higher than median albumin concentrations were periodontal probing depth (2.6±0.5mm vs. 3.9±0.8mm; p<0.01) an attachment level (3.1±0.5 vs. 3.4±0.9; p<0.05), respectively. Logistic regression showed that high salivary albumin concentration was explained by high salivary IgG (odds ratio [OR] 1.416; 95% confidence interval [CI] 1.173;1.709) and by infection by Porphyromonas gingivalis (OR 7.091, CI 1.645;30.571). Age, gender, systemic diseases, drugs used daily, smoking, prevalence of other periodontal disease indicator bacteria and Candida, however, did not associate with high salivary albumin concentrations.

Conclusion: Our study hypothesis was partly confirmed by showing high salivary albumin concentrations particularly in patients with long-term periodontal disease and infection with the periodontal pathogen P. gingivalis. However, the other background factors investigated did not seem to affect the concentrations. Supported by The Finnish Medical Society.

0140 (151883)

Contribution of tongue microflora to the development of dental cariesJ. GALRÃO¹, L. PROENÇA², and H. BARROSO²¹Instituto Superior de Ciências da Saúde Egas Moniz, Almada, Portugal, ²CiiEM, Instituto Superior de Ciências da Saúde Egas Moniz, Almada, Portugal

Objectives: Determine the influence of bacteria on the tongue dorsum in the development of dental caries. The human tongue is a very complex organ and microbiologically, is an important bacterial reservoir, thus serving as a key factor in the level of colonization of the tooth surfaces.

Methods: The study involved 50 subjects assessed for their DMFT levels, through a clinical examination, separated into two groups of 25 elements each, being one group a high prevalence of dental caries and the other a low prevalence of dental caries. After the clinical examination, a sample of the tongue dorsum was taken, with a sterile swab, stored in BHI and inoculated on Columbia agar media, MSA, MSB and Rogosa Agar. Subsequently the plates were observed for bacterial growth and the bacteria were identified using the Gram stain, catalase test and biochemical identification using API® test strip. Information on Hygienic and food habits was also obtained. Inferential statistical analysis was performed on the obtained results.

Results: A positive relationship between the values of Streptococcus mutans and Lactobacillus spp. with subjects with a high DMFT (p<0,001) was observed. In individuals who drink alcohol, it was shown that there is a smaller number of bacteria at the tongue dorsum (p<0,05). It was observed that in people who brush their tongues, there are less Streptococcus mutans at their tongue dorsum (p<0,05). The use of dental floss shows a significant difference in mutans streptococci carriers from non carriers, in which there are more mutans streptococci carriers who do not use the dental floss (p<0,05).

Conclusion: Data from this study strength the idea that the bacteria on the tongue dorsum have a direct influence on the development of dental caries.

0141 (152114)

Effect of photoactivated disinfection using a light-emitting diodeS. EICK¹, G. SALVI² and A. SCULEAN²¹Department of Periodontology, Laboratory of Oral Microbiology, University of Bern, Bern, Switzerland, ²Dept. of Periodontology, University of Bern, Bern, Switzerland

Objectives: The aim of the study was to determine the effect of photoactivated disinfection using a light-emitting diode in the red spectrum after application of photosensitizer (PAD-LED) on bacteria involved in the pathogenesis of periodontitis and peri-implantitis.

Methods: Fifteen single species (among them 2 Porphyromonas gingivalis and 2 Aggregatibacter actinomycetemcomitans) and a multispecies mixture consisting of 12 species in a final concentration of 10⁸ were exposed to PAD-LED for 30 s and 60 s. After that, changes in the viability were determined. Application of each photosensitizer (Ph-S) and 60 s of light emitting (LED) only served as controls. Statistical analysis was made by Student's t-test and ANOVA with Post-Hoc Bonferroni using the log₁₀ values each.

Results: Compared to negative controls, the addition of PH-S reduced the cfu counts by 1.11 log stages (p<0.001). This effect was more visible on gram-negative bacteria than on gram-positives (p=0.048). In contrast, exposure to LED did not change the numbers of viable microorganisms. After PAD-LED for 30 s, the cfu counts were 1.42 log stages lower compared to negative control (p<0.001) and 0.31 log stages lower compared to Ph-S (p=0.012) in mean. 60 s PAD-LED reduced further the numbers of viable bacteria, the differences were 1.99 log stages compared to negative control (p<0.001). Focusing on group of microbes (microaerophiles, anaerobes, superinfecting species, multi-species), differences in the sensitivity were visible after 30 s PAD-LED and 60 s PAD-LED (p=0.023 and p=0.004 respectively). The Bonferroni analysis confirmed a higher efficacy against anaerobes after 30 s PAD-LED (p=0.015) as well as microaerophiles (p=0.015) and anaerobes (p=0.003) after 60 s PAD-LED compared to superinfecting species each.

Conclusion: PAD-LED might be a promising tool in therapy of infections caused by microaerophilic and anaerobic periodontopathogens. The study was supported by CMS Dental, Copenhagen, Denmark.

0142 (151444)

Dental Plaque Associates with MMP-9/TIMP-1 in Blood from Periodontitis SubjectsB. SÖDER¹, M. YAKOB¹, J. MEURMAN², and P.-Ö. SÖDER¹¹Department of Dental Medicine, Karolinska Institutet, Huddinge, Sweden, ²University of Helsinki, Helsinki, Finland

Objective: The aim was to study the influence of oral hygiene on MMP-9 and TIMP-1 in blood from subjects who in a longitudinal study had developed chronic periodontitis.

Methods: A group of 50 subjects were randomly selected in 2003 from 1390 periodontally healthy individuals initially examined in 1985. Clinical parameters were determined at the start and end of the study. At the time of the final oral examination, blood was collected after 12 hours of overnight fasting for the analysis of MMP-9 and TIMP-1. The relation between dental plaque, MMP-9 and TIMP-1 as dependent variables and several independent variables were evaluated in a multiple regression model.

Results: Clinical examination 16 years after baseline revealed that 16 subjects had developed chronic periodontitis 31 were still periodontally healthy. Multiple logistic regression analyses identified PLI as a principal independent predictor in blood for MMP-9 as well as for TIMP-1 with OR, 6.54; p=0.013, CI 1.48 – 29.0 and OR 6.30, p=0.029, CI 1.20 – 33.0, respectively.

Conclusion: Our results implicate that dental plaque associate with increased levels of MMP-9 and TIMP-1 in blood hence supporting the oral infection – systemic inflammation paradigm.

0143 (151636)

Periodontal micro-organisms, salivary proteins and MMP-8 in gingival crevicular fluid

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Objective: We investigated in subjects with and without long-term periodontitis the levels of certain salivary proteins and matrix metalloproteinase-8 (MMP-8) in gingival crevicular fluid (GCF), in relation to the presence of specific periodontal pathogens. The hypothesis was that bacteria by triggering inflammatory reactions in gingival pockets cause disruption of epithelial integrity which reflects in saliva proteins.

Methods: Clinical parameters were recorded at baseline in 1985, and in 2009, from 99 subjects; 55 with 44 without periodontitis (mean age 60.2 ± SD 2.9). Saliva samples collected in 2009 were analyzed for salivary albumin, total protein, and immunoglobulins A, G and M. GCF was collected for analysis of MMP-8 levels and for the PCR-analysis of the micro-organisms *A. actinomycetemcomitans*, *P. gingivalis*, *P. intermedia*, *T. denticola* and *T. forsythia*.

Results: Periodontitis patients were more often than controls infected by *P. gingivalis* ($p < 0.01$), *P. intermedia* and *T. denticola* ($p = 0.01$). Salivary albumin and protein concentrations were significantly higher in subjects with *T. denticola* ($p < 0.05$). MMP-8 levels were significantly higher in subjects with *T. denticola* ($p < 0.001$) and *T. forsythia* ($p < 0.01$). No corresponding results were found in salivary immunoglobulin concentrations.

Conclusion: The presence of *T. denticola* seemed to increase salivary albumin and total protein concentrations, and GCF levels of MMP-8. Both *T. denticola* and *T. forsythia* seemed to induce a cascade of host response with increased MMP-8 in GCF. Hence our study hypothesis was partly confirmed.

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0144 (151603)

Anti-odour effects of toothpaste formulations using in-vitro flat-bed biofilm model

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Objectives: A modified flat-bed perfusion biofilm matrix system was tested using active toothpaste formulations directly without dilution, as a layer in direct contact with the biofilm matrix surface. Final biofilm yields and VSC biogenesis were measured to show the relative efficacy of toothpaste formulations.

Methods: Diffusion characteristics of the flat-bed system to active treatment with meridol® HALITOSIS tooth & tongue gel (TTG; 1400 ppm F- from amine fluoride/stannous fluoride, 0.5% zinc lactate, oral malodour counteractives) was assessed using a bioluminescent target species coupled with a low light photon camera to visualise the kill kinetics. Three biofilms received 5, 15 and 30-min treatment with TTG respectively to determine the optimum time of exposure. VSC biogenesis was measured from headspace by OralChroma prior to and following treatment of 2 daily applications for 4-days of treatment and controls (placebo, 1% chlorhexidine gel and sham treatment). Viable counts were performed at the end of experiments by destructive sampling and plating on selective and non-selective agar.

Results: Following treatment with TTG, the biofilm with lux target gave >50% reduction before recovering to a steady-state over 10 h suggesting that the treatment mechanism was bacteriostatic inhibition. For 15 and 30-min treatment exposure, almost identical reductions in final biofilm yields were seen. Biofilms treated with TTG gave greatest reductions in both pre-post levels of H₂S ($P < 0.01$) and CH₃SH ($P < 0.05$) and population yields at the end of the experiments ($p < 0.001$).

Conclusion: The in vitro flat-bed perfusion model may be used to replicate many of the activities and reactions believed to be occurring by the tongue biofilm microflora within a real mouth, including VSC biogenesis and their inhibition by exposure to active agents as components of toothpastes and gels applied in direct contact with the biofilm. Supported by GABA International AG.

0145 (151867)

Comparison of Reverse Headgear and Chincap in Class III Malocclusions

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Introduction: The aim of this study was to compare cephalometrically the treatment effects of chincap and reverse headgear in subjects with a Class III skeletal malocclusion with a combination of and mild underdeveloped maxilla and mild prominent mandible.

Methods: Forty patients were divided into two groups according to the treatment type. Twenty consecutive patients (mean age 10,92 years, 12 female and 8 male) were treated with first Delaire type reverse headgear and rapid palatal expansion than fixed orthodontic treatment. With a protraction force of 400 to 600 gm, the patients were treated before fixed orthodontic treatment until a 2 mm positive overjet had been attained. Other twenty consecutive patients (mean age 10,60 years, 16 female and 4 male) were treated with chincap and fixed orthodontic treatment. The mean treatment time were 3,07 years in reverse headgear group and 3,94 years in chincap group. Lateral cephalometric films taken at the beginning of treatment, the end of the treatment. For statistical analysis, Wilcoxon and Mann-Whitney U tests were used.

Results: In both groups, a significant increase in SN length, SNA, ANB angles and decrease INTERINCISAL angle, and increase overjet length showed the effect of the appliances in the treatment of Class III malocclusions. In comparing the two groups, the maxilla was displaced more anteriorly and molar relationship correction was greater in the reverse headgear group ($P < 0.05$). Mandibular incisors were more retrusion in chincap group ($P < 0.05$).

Conclusions: Both appliances are effective in the treatment of Class III. ANB, IMPA, and nasolabial angles and overjet showed differences between chincap and reverse headgear groups.

0146 (152611)

Oral Keratinocyte Stem Cells and Oral Epithelial Equivalents

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Objective: Although oral keratinocyte stem cells play a key role in tissue homeostasis, wound healing, and neoplasia, they remain difficult to identify and characterize. The specific aim of the present study is to characterize an oral keratinocyte stem-cell population separated using a magnetic technique.

Methods: Oral human keratinocytes obtained from keratinized oral mucosa were magnetically separated using a proliferation-related marker, CD71 and $\alpha_6\beta_4$ integrin. The expression of different stem cell markers: CD44H, Nestin, Nanog, Oct3/4, CD117 was checked by immunofluorescence. The ability of $\alpha_6\beta_4^{pos}$ CD71^{neg} fraction to form oral epithelial equivalents was also assayed.

Results: Three different oral keratinocyte subpopulations were obtained following magnetic separation: $\alpha_6\beta_4^{pos}$ CD71^{neg}, $\alpha_6\beta_4^{pos}$ CD71^{pos} and $\alpha_6\beta_4^{neg}$. Our $\alpha_6\beta_4^{pos}$ CD71^{neg} stem cell fraction was positive for Oct 3/4, CD44H and cytokeratin 19 while Nanog, Nestin and CD117 expression was absent. At the same time the other two cell fractions $\alpha_6\beta_4^{pos}$ CD71^{pos} and $\alpha_6\beta_4^{neg}$ were negative for all stem cell markers. Also $\alpha_6\beta_4^{pos}$ CD71^{neg} fraction was able to regenerate a well stratified and organized

oral epithelial equivalent. The distribution of cytokeratin 19 and involucrin in the oral epithelial equivalent reflected the in-vivo situation in oral gingival epithelium. **Conclusions:** The human gingival $\alpha_6\beta_4^{pos}$ CD71^{neg} fraction was strongly positive for a panel of stem cell markers and could form oral epithelial equivalent. It is also suggested that a magnetic system may be an important tool in acquiring oral keratinocyte stem cells for research.

0147 (152139)

Condylar Asymmetry In True Unilateral Posterior Crossbite Patients

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Objectives: Unilateral posterior crossbite involves multiple teeth on one side of arch and can be defined either as functional crossbite or true (skeletal) unilateral posterior crossbite. In true unilateral posterior crossbite, the posterior teeth on one side of maxilla are positioned more palatally than the posterior teeth on that side of mandible. It was reported that in skeletal unilateral posterior crossbite, because of compensation of lateral shift of the mandible, condylar heights in crossbite side are shorter than in noncrossbite side. The purpose of this study was to investigate condylar and ramal asymmetries in true unilateral crossbite patients as compared with normocclusive subjects.

Methods: The study group consisted of 21 patients (14 girls and 7 boys) with the mean age 14.31 ± 2.68 years and the control group consisted of 21 patients (13 girls and 8 boys) with the mean age 13.08 ± 0.84 years. Condylar (CH), ramal (RH), and condylar-plus-ramal (CH + RH) asymmetry values were computed for all subjects on panoramic radiographs. The asymmetry indexes of the CH, RH and CH + RH were also computed by using a predefined formula. Data were analyzed statistically with ANOVA for repeated measures and univariate ANOVA.

Results: In both groups no difference was found between the sexes. In the study group, on crossbite side, RH and CH + RH were smaller and CH was longer than those of the non-crossbite side but all measurements were not statistically significant in both groups. CH, RH and CH + RH asymmetry indexes were higher in the crossbite group than in the control group, and statistical significances were seen in the condylar and ramal index ($p < 0.01$). Group-sex interaction was significant in condylar index.

Conclusion: The patients with true unilateral posterior crossbite had more asymmetric condyles when compared to normocclusive subjects.

0148 (152188)

Craniofacial Changes After Facemask With Rapid Maxillary Expansion Versus Facemask

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Objectives: The aim of this study is to evaluate posttreatment skeletal changes after face mask therapy (FM) and face mask therapy combined with rapid maxillary therapy (FM+RME) in subjects with Class III skeletal malocclusions.

Methods: There were two groups (26 patients) in this study. The first group (FM+RME) consisted of 13 patients (mean age of 11.6 years, 9 female and 4 male) were treated by a Delaire type face mask with bonded acrylic-splint rapid maxillary expander and the second group (FM) consisted of 13 patients (mean age of 10.4 years, 9 female and 4 male) were treated by Delaire type face mask with a bonded acrylic-splint. It was applied a protraction force of 400 to 600 gf to both groups. Once adequate overjet (min 2 mm) was obtained in both application groups, face mask therapy was ended. Cephalometric radiographs were taken at the beginning (T1) and end of treatment (T2). The mean treatment times were 6.8 months and 5.9 months for FM+RME and FM, respectively. The skeletal changes were evaluated on cephalograms. Data were analyzed statistically with paired-t test and ANOVA.

Results: A significant increase in the sagittal growth of the maxilla (SNA angle, A-VR and A-MaxVR length), ANB angle, total, upper and lower anterior face height, midfacial length, incisor overjet were seen in both groups. Statistical significance was seen only in the FMA angle in the comparison of two groups ($p < 0.01$). Vertical dimensions of FM+RME group increased more than FM group.

Conclusions: Both appliances are effective in the treatment of Class III malocclusions. However in the patients who have critical bite the clinicians should be careful in using face mask therapy with rapid maxillary expansion because of decreasing in overbite and increasing in vertical dimensions.

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0149 (152221)

Soft-Tissue Changes After Facemask With Rapid Maxillary Expansion Versus Facemask

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Objectives: The aim of this study is to evaluate posttreatment soft tissue changes after face mask therapy and face mask therapy combined with rapid maxillary therapy in subjects with a Class III skeletal malocclusion.

Methods: The sample (26-patients) divided into two groups. The first group (FM+RME) consisted of 13 patients (mean age of 11.6 years, 9-female and 4-male) were treated by a Delaire type face mask with bonded acrylic-splint rapid maxillary expander and the second group (FM) consisted of 13 patients (mean age of 10.4 years, 9-female and 4-male) were treated by Delaire type face mask with a bonded acrylic-splint. A protraction force of 400 to 600 gf was applied to both groups. Once adequate overjet (min 2mm) was obtained in both application groups, face mask therapy was ended. Cephalograms were available at 2 time periods: pretreatment (T1), end of active treatment (T2). The mean T1-T2 interval was 6.8 months for FM+RME and 5.9 months for FM. The soft tissue changes were evaluated on cephalograms. Data were analyzed statistically with paired-t test and ANOVA.

Results: A significant increase in H angle, facial contour angle, lower face height (Sn-Me'), anterior displacement of upper lip, posterior displacement soft tissue pogonion and decrease in lower vermilion height (Sti-Li) were seen in both groups. In the comparison of two groups, soft tissue pogonion, pogonion and lower lip displaced more posteriorly ($p < 0.01$) and upper lip height increased much more and upper incisor view decreased much more in FM+RME group ($p < 0.05$). Nasolabial angle increased in FM+RME whereas it decreased in FM group.

Conclusion: In Class III patients, both appliances are effective in correction of profile. In severe Class III patients, who grows horizontally, soft tissue profile can be improved with using rapid maxillary expansion and face mask together.

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0150 (152026)

Effects Of Hydrogen Peroxide On Human Enamel Structure

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Objectives: The aim of this study was to describe the effects of hydrogen peroxide on enamel structure.

Methods: 10-20-30 % hydrogen peroxide solutions were used for treatment of human enamel samples. Thirty samples made from human tooth crown. Enamel structure was investigated by atomic force microscopy (AFM), and FT-IR spectroscopy. The total treatment time was 120 minutes. Infrared spectra and AFM scan was taken before treatment, thus each specimen served its own negative control. Further spectra and scans were taken after 30, 60 and 120 minutes. After the 2-hour

treatment samples were stored in isotonic salt solutions for two weeks. At the end of the 2-week incubation period, another set of infrared spectra and surface scan were taken to test spontaneous reversibility in enamel structure.

Results: AFM images showed shallow grooves with depth and width varied between 28-84 nm and 100-250 nm, respectively. Treatment with 20% and 30% solutions further increased the width and depth of the grooves. There was no spontaneous reversibility detected by AFM after the two-week storage in isotonic salt solution. Enamel specimens showed a characteristic infrared spectrum with two distinct peaks, representing the hydroxiapatite structure v1 at 996 cm⁻¹ and v2 between 1410 and 1460 cm⁻¹ wavelength before hydrogen peroxide treatment. Alterations in the IR spectra were found after hydrogen peroxide treatment in all cases (i.e. peroxide concentration and treatment time). Both v1 and v2 bands became distorted after treatment. The v2 peak was missing after the 30% hydrogen peroxide treatment. Neither the v1, nor the v2 bands showed spontaneous alterations after the two-week period.

Conclusion: The alterations on enamel surface and inner structure were directly proportional to the treatment time and the hydrogen peroxide concentration. The work/publication is supported by the TAMOP 4.2.1/B-09/1/KONV-2010-0007 project. The project is co-financed by the European Union, European Social Fund.

0151 (152027)

New Experimental Method for monitoring bone building (OSSI-model)

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Objectives: Implant stabilization during bone regeneration involves the close contact of the foreign material and the existing bone, resulting in a fixation of the two structures to each other. Rat tail bones have a structure similar to that of the alveolar bone. We aimed to develop a rat model to study osseointegration.

Methods: Female rats were anesthetized, the tail was disinfected and ligatured. The tail was amputated between C4-C5 vertebrae. Into the exposed surface of C4, a 5mm deep, 1mm wide central cavity was drilled. Then a wider and shallower concentric hole was made (2.0x3.5mm) to create an "empty" cylinder. Screw-type titanium implants (1.2mm) were introduced into the deeper thin hole. Following implant insertion, the skin was repositioned over the implant and tightly sutured. The surgical wound was protected aseptically by a plastic film layer. To inhibit osteoclast activity in this model, some animals were treated with zoledronic acid, an amino-bisphosphonate. Animals were sacrificed at different time points. The axial removal force of the implant was evaluated on the extracted vertebra with a force measurement system. New bone formation was also tested using a microCT instrument. Statistical analysis was performed by ANOVA.

Results: The strength of osseointegration increased gradually with time as measured by the force needed to extract the implant. It reached a plateau at 36 weeks after implantation (extraction force on week 6: 30±5,9N, on week 16: 107,9±22,7N). microCT investigations confirmed these functional observations showing a gradual increase of bone hard tissue structure during the investigated period. Bisphosphonate treatment increased new bone formation around the implant by about three times at week 6 and significantly increased the extraction force.

Conclusion: Our newly developed rat OSSI model allows us to quantitatively study osseointegration and new bone formation around implants.

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0152 (152140)

Loss of Transglutaminase-2 results in accelerated enamel mineralization in mouse

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Objectives: Tissue Transglutaminase (TG) has effect on numerous physiological and/or pathological functions. The role of extracellular TG2 has been demonstrated previously in cell adhesion, extracellular matrix assembly or bone ossification, however in vivo / in vitro studies have not been carried out yet to assess the effect of TG2 on tooth development. Samples taken from TG2 null mice were studied to characterize its tooth phenotype.

Methods: Mice were sacrificed at different developmental stages as follows: intraembryonic developmental stages (E 14, 15, 16), prior to tooth eruption (postnatal day 1), and adulthood (2 months postnatal). Microscopical and computer aided 3D morphological measurements and enamel hardness test were carried out.

Results: We could not detect any obvious morphologic alterations due to the loss of TG2 during early tooth development phases, when the tooth germs were going through bud, cap and bell morphogenetic stages. Significant differences in the hardness of the enamel were measured at postnatal stage, which implies accelerated enamel mineralisation. It has been revealed by 3D analysis of incisors from the knockout mice that they were slightly longer with a thicker enamel layer than their wild-type controls.

Conclusions: Our findings suggest that TG2 may have an effect on enamel bio-mineralization processes. The work/publication is supported by the TAMOP 4.2.1/B-09/1/KONV-2010-0007 project. The project is co-financed by the European Union and the European Social Fund.

0153 (152307)

Evaluation of AmF on Dentine Tubule Occlusion – In-vitro Study

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Objective: The aim of this study was to determine the effectiveness of an amine fluoride dentifrice and dental rinse to occlude dentine tubules, and to characterize the nature of the occlusion in an in-vitro study.

Methods: Human dentin samples from unerupted third molars were prepared into 1.5 mm dentinal discs with a diamond saw, and etched. The discs were then allocated to the following groups: control (artificial saliva), elmex® Sensitive Plus dental rinse (250 ppm F- from Olaflur and potassium fluoride) and elmex® Sensitive Plus toothpaste (1400 ppm F- from Olaflur). The rinse was applied using 10 ml diluted with 10 ml artificial saliva for 2, 20 and 120 minutes. The toothpaste was applied by brushing for 2 minutes with a power toothbrush using a pea-sized amount. Samples were assessed for tubule occlusion by scanning electron microscopy (SEM) equipped with Elemental Detector. Raman spectroscopy for chemical analysis was used to identify the composition of the occlusive material.

Results: In this hypersensitivity-treatment in-vitro model comparison of the test discs with the control discs demonstrated visually a blocking of 80±5% of the dentine tubules by toothpaste. After the dental rinse application the most pronounced effect was visible after 120 minutes: 70±4% tubules occluded in comparison with 20±5% after 2 minutes and 40±7% after 20 minutes. Microspectral and elemental analysis showed different chemical composition of precipitated intra-tubular plugs depending on what was applied, toothpaste or dental rinse.

Conclusions: Amine fluoride dental rinse and dentifrice effectively occluded dentin tubules (partially or totally) and therefore may reduce patients' hypersensitivity symptoms in-vivo. The AmF products adhered to an exposed dentin surface and reacted with it to form a mineralized layer rich in elements. Supported by GABA.

3D-surface roughness, microstructure and monoclinic-phase distribution in Y-TZP CAD/CAM frameworks

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Objective: The aim of this study was to assess the surface roughness and presence of monoclinic phase (m-ZrO₂) in CAD/CAM frameworks of fixed partial dentures (FPDs) manufactured of yttria-stabilized tetragonal zirconia polycrystals (Y-TZP).

Methods: Three-unit fully sintered FPDs were prepared from Cercon (CR), Lava (LW), Zenotec Zr Bridge (WD), In-Ceram YZ (YZ) and IPS e-max ZirCAD (ZC) materials. Raman spectroscopy was used to identify and map the distribution of the m-ZrO₂ phase at cervical crown margins, pontic and connector regions (n:3x2). The percentage volume of the m-ZrO₂ phase (%Vm) was calculated per region. An optical profiler was used to measure amplitude 3D-surface roughness parameters at the same regions and a SEM for the microstructure.

Results: The m-ZrO₂ phase was detected in all the specimens, with the highest intensity located at the crown margins. WD showed the lowest %Vm content (0-3.14%), followed by LW (10.26-12.39%), CR (11.72-13.19%), ZC (11.13-14.10%) and YZ (12.15-14.99%). No statistically significant difference was found among LW, CR, ZC, YZ per region. Within each material group, significant differences were found between margin-pontic/connector (WD, YZ), margin-connector (CR, ZC) and margin-pontic (LW). 3D roughness parameters ranged within 0.49-1.94 µm (Sa) and 6.26-14.46 µm (Sz). No statistically significant differences were found in Sa, Sz among regions for CR and YZ. WD demonstrated the highest values at the margins (Sa, Sz), ZC at the pontic (Sa,Sz) and LW at the connector (Sa). Grinding defects were identified in all systems, especially at regions with elaborative milling.

Conclusions: The Y-TZP destabilizing m-ZrO₂ phase was identified in all the fully-sintered frameworks tested, with the highest %Vm located at the margins. Differences were found in roughness parameters among the regions and materials tested not correlated with the distribution of the m-ZrO₂ phase. Milling-induced defects were identified in all specimens.

0155 (151443)

Outcome of HIP Zirconia Fixed Dental Prosthesis after 7 Years

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Objectives: Due to rare long-term clinical data of zirconia supported fixed dental prosthesis the purpose of this prospective study was to evaluate the clinical outcome of anterior, posterior and combined anterior/posterior fixed dental prosthesis made of HIP zirconia framework material (DCS Dental AG, Allschwil, Switzerland).

Methods: Between December 1998 and September 2007 105 FDPs were inserted in 70 patients. Sixteen anterior, 59 posterior and 30 combined FDPs replaced 1 to 5 missing teeth. Vita D was used as veneering material. All restorations were either adhesively luted (23.8%) or inserted with zinc oxide phosphate cement (76.2%). Follow-up appointments were performed 6 months after insertion, then annually. Necessity of renewing a restoration was defined as failure.

Results: Thirteen patients (18.6%) with 22 FDPs were defined as drop-outs. For the remaining 83 FDPs the mean observation time was 62.4 months (range: 6.9-130.4 months). After 5 and 7 years the Kaplan-Meier-survival-rate was 85.8% and 77.7%, respectively. In total 13 (4 technical, 9 biological) failures in 12 patients were observed. Log rank test showed that the kind of cementation did not significantly influence the survival (p=0.7). The complication-free rate concerning chipping of the veneering material after 5 and 7 years was 89.2% and 80.3%, respectively.

Conclusions: Although HIP zirconia was used, 3 framework fractures were reported. One fracture had progressed from an access for endodontical treatment of an abutment tooth two years after trepanation, 1 fracture was detected in the connector area of two pontics in a 5-unit FDP, the 3rd fracture occurred in the connector area to a pontic that had a length of 9.5 mm. Summing up, the estimated survival rate of the present study is still in the range of the survival rate for zirconia FDPs known from literature. Supported by DCS Dental AG, Allschwil, Switzerland

0156 (151515)

Effect of polishing on color and surface roughness of porcelains

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Objectives: Porcelain surface is generally finished by glazing procedure but sometimes it can be removed after cementation because of the occlusal adjustment, correction of contours. The aim of this study was to investigate the effects of different polishing techniques on color change (ΔE) and surface roughness (Ra) of 2 different porcelains.

Methods: Firstly 80 porcelain specimens were divided into two subgroups (Ceramco 3 and IPS empress II) then each subgroup was divided into 4 groups (n=10). One group served as a control and had no surface treatment, the glaze layer of each specimen was removed in the other 3 groups and the surfaces were polished with 3 different ceramic polishers (2 different diamond ceramic polishers and 1 occlusal brush set). VITA Easys shade was used to measure color differences in the specimens according to the CIE L*a*b* color system. Surface roughness (Ra) of the porcelain discs were evaluated using a profilometer. One specimen from each group were analyzed with SEM after measurements. The color change (ΔE) and surface roughness (Ra) of porcelains were statistically analyzed by Two-way ANOVA followed by a Tukey HSD test (α=0.05).

Results: There were relationship between the porcelain systems and polishing techniques but no significant differences between porcelain systems for surface Ra values (p>0.05). There was relationship between the porcelain systems and polishing techniques but no significant differences between porcelain systems for ΔE values (p>0.05). The different polishing techniques affected color differences significantly (p<0.01).

Conclusion: Polishing procedures were not able to provide a porcelain surface as smooth as the glazed surface for the IPS empress and Ceramco 3 porcelains. Rubber polishing systems are more successful than brushes for polishing porcelains.

0157 (151842)

Lighttransmission Through High-Density-Polymers for CAD/CAM Fabrication

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Objective: Temporary restorations are an essential part of dentistry. CAD/CAM- fabrication of industrially prefabricated polymers enhances material properties compared to conventional fabrication of temporaries. Besides mechanical strength the optical properties of polymers play an important role. This study evaluates the light transmission of 7 high-density-polymers for CAD/CAM fabrication and 4 polymers from dispenser systems for chairside fabrication.

Methods: 40 disc shaped specimen (16,0 x 1,0mm) were produced from each CAD/CAM-material (A= Polycon ae; B= artbloc Temp; C= Cercon base PMMA; D= CADtemp; E= Ambarino high class; F= TelioCAD; G= Zenotec Pro Fix) and dispenser material (H= Luxatemp fluorescence, I= Protemp 4; J= Structur 2SC; K= Fixtemp c&b). After grounded / polished under standardized conditions the direct transmission coefficients tc [%] of comparable shades (A3) of all-ceramic frameworks were quantified in a spectrophotometer with an "integrating sphere" (Lambda 35, PerkinElmer) at wavelengths (λ) of the visible spectrum (400 to 700 nm). The overall light transmission for each material was calculated as the integration of all tc values.

Results: A wide range of overall transmission was observed: A= 33%; B= 33%; C=38%; D= 45%; E= 46%; F= 47%; G= 54%; H= 40%; I= 41%; J= 42%; K= 46%. One-way ANOVA and following post-hoc test (Student-Newman-Keuls) revealed statistically significant differences (p= 0,05) for the overall light transmission between all

materials except between A and B and E and K. As well, the spread of overall light translucency values was greater among the high-density polymers (from 33-54%) than among dispenser materials (from 40-46%).

Conclusion: Despite having the same shade designation A3 from the manufacturers, high-density-polymers as well as chairside temporary materials show significant differences in light transmission. These results should be considered especially for anterior temporary restorations depend on the clinical situation either to mask discolorations or to interact with the underground.

0158 (151808)

Micro- Meso- Macro-Structure, Setting Dynamics and Mechanical Failure of GICs

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Objectives: (1) To formulate a methodological synergy between experiment, theory and imaging for biocompatible glass ionomer cements (GICs), (2) To resolve atomic, meso- and macro-scopic structural features of GIC and relate them to determined mechanical properties, (3) To determine absolute and relative atomic/ionic (Al, Ca, Si, O, H, F, P, Na, Sr) content & mobility in GICs; (4) Quantify Ca- and Al-chelation strengths from mobility/diffusion results; (5) Quantify coupling of dynamics/diffusion to GIC setting (over 24hrs) and resultant material properties.

Methods: Hertzian Indentation, Micro- and Nano-tomography, Scanning Electron Microscopy, Deep Inelastic Neutron Scattering, Neutron Diffraction, Density Functional Theory

Results: Micro-CT (uCT) was used to characterise the volumetric-porosity of fully-cured biocompatible glass samples, accurately tracking fracture branches through three Cartesian axes, in addition to incomplete bottom-initiated cracking. Nanocomputed tomography analyses supported the reliability of the uCT results. Complementary 2-Dimensional fractographic investigation was carried out by optical and scanning electron microscopies, resulting in qualitative feature-resolution towards identification of fracture characteristics. The combined 3-D qualitative assessment of microstructure and fracture features, complemented by 2-D methods, provided an increased understanding of the properties and subsequent mechanism of mechanical failure in these bioglasses. Specifically, cracks preferentially linked the pores and propagated along the glass-matrix interface. Parallel studies of the setting kinetics and associated reaction dynamics were characterised using evolved neutron scattering techniques. Complementary high-level quantum chemical determinations were in agreement and highlighted the need for increasing matrix packing towards enhancing toughness in these materials.

Conclusions: The multi-disciplinary approach described herein provides the most effective means towards the rational characterisation of mechanical failure in biocompatible glasses. The combination of neutron scattering complemented by high-level quantum-mechanical simulations provided insight into setting dynamics. The methodological development is exploitable on related biocompatible systems and represents a new tool towards the rational characterisation, optimisation and design of novel materials for clinical service.

0159 (151741)

Does long-term water-storage affect retentive strength of self adhesive cements?

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Objectives: The retentive strength of seven self adhesive cements (RelyX Unicem Aplicap, RelyX Unicem Clicker, RelyX Unicem2 Automix/3M ESPE, iCEM/Heraeus, Maxcem Elite/sds Kerr, Bifix SE/VOCO, SpeedCEM/Ivoclar), two self adhesive cements with self etch primers (Panavia 21/Kuraray, Secure/Sun Medical) one glass ionomer-cement (Ketac Cem Aplicap/3M ESPE), one resin modified glass ionomer-cement (Meron Plus/VOCO), and a zinc-phosphate cement (Harvard) were examined for luting zircon-oxide ceramic crowns (LAVA, 3M ESPE) on extracted human teeth after thermocycling and after one year of water storage.

Method: 240 extracted teeth (n=10) were prepared in a standardized manner (10°, h=3mm). The resin cements and the adhesive system were used according to manufacturers' recommendations; in dual-curing systems, only the self-curing approach was conducted. The crowns' inner surfaces were sandblasted. After thermocycling (5000x, 5-55°C) and one year of water storage, the cemented ceramic crowns (Rocatec-pretreatment at the outer surface; connected over a low shrinkage epoxy resin to a resin block, made of Paladur denture base material) were removed along the path of insertion using a Zwick universal testing device. Statistical analysis was made using the two-sample Kolmogorov-Smirnov test.

Results: The median retentive strength values [N/mm2] for samples thermocycled only (1st number) and samples thermocycled + 1 a of water storage (2nd number) were: Panavia21: 1.7/2.5, Secure: 3.0/3.0, RelyX Unicem Aplicap: 3.1/3.4, RelyX Unicem Clicker: 4.1/4.2, RelyX Unicem2 Automix: 3.0/3.1, iCEM: 2.3/2.7, Maxcem Elite: 3.0/3.2, Bifix SE: 1.7/1.7, Quickcem 1.3/1.6, Meron Plus AC: 3.1/2.7, Ketac Cem Aplicap: 1.4/1.4, Zinc phosphate cement: 1.1/1.6. No significant difference was found between the samples thermocycled only and those who underwent an additional one year of water storage (p>0.2) in any single comparison.

Conclusion: Long term water storage did not affect the retentive strength of self adhesive cements significantly. This study was supported by 3M ESPE, Heraeus, Ivoclar Vivadent, VOCO, and Sun Medical.

0160 (153473)

The Basics of Adhesion to Enamel and Dentin According to the AD Concept

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The mechanism of bonding to tooth tissue is principally based upon micro-mechanical interaction, potentially supplemented with primary chemical bonding. The 'adhesion-decalcification concept' or 'AD-concept' describes how acidic molecules interact with hydroxyapatite-based substrates. In a first step, the molecule electrostatically interacts with hydroxyapatite. Depending on the stability of this bond, the second phase involves 'decalcification' or 'adhesion'. Following an 'etch-and-rinse' approach, acids like phosphoric acid (but also maleic and lactic acid, the latter in case of caries) do not form a stable bond to hydroxyapatite and, besides being readily detached, withdraw calcium from the surface (decalcification). When etching is followed by water rinsing, the dissolved calcium-phosphates are removed from the surface. At enamel, the resulting micro-retentive surface has been shown to most effectively interlock the dental adhesive. At dentin, an organically rich substrate up to several micrometers deep is exposed. Bonding to 'etched' dentin should then be realized through diffusion of resin in the exposed collagen-fibril network, which can hardly be achieved completely. Also following a 'self-etch' approach, the acidic monomers get initially bonded to hydroxyapatite. This bond is unstable in case of 'strong' self-etch adhesives (decalcification); as such self-etch primers/adhesives are not rinsed off, the dissolved calcium-phosphates are embedded in the exposed collagen network. This bond to dentin is unstable, while 'strong' self-etch adhesives bond reasonably effectively to enamel. Most effective bonding to dentin is however thought to be achieved through 'mild' self-etching using functional monomers that ionically bond to hydroxyapatite within a submicron hybrid layer (adhesion); they keep collagen protected by hydroxyapatite with direct benefit to bond durability. In this process, specific monomers self-assemble in 'nano-layering', as was demonstrated morphologically and chemically.

Laboratory Effectiveness of Adhesives: A Meta-Statistical Approach

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Most current adhesives can bond predictably to dental tissues. On the longer term, however, some adhesive techniques are clearly superior to others. In this lecture, we will concentrate on how dental adhesive bonds do fail and what we can learn from literature. Worldwide, bond-strength tests are used to screen bonding effectiveness of dental adhesives. The objective was to systematically collect bond-strength data, to identify the primary parameters affecting the outcome of bond-strength tests, and to attempt to disclose trends in adhesive performance of different adhesive approaches. We identified 1019 studies by entering the search term 'dentin bond strength AND "published last 5 years"[Filter]' in PubMed. 296 studies met the inclusion criteria, yielding 2140 individual bond-strength tests. The bond-strength test used most often was the micro-tensile bond strength test (μ TBS: 61%), followed by the macro-shear (SB: 22%), macro-tensile (8%) micro-shear (6%), and push-out bond strength test (3%). Different tests yielded different outcomes (for example μ TBS versus SB: 31.5 versus 15.2 MPa respectively, $p=0.0002$), so that separate analyses for μ TBS and SB are indicated (other tests were excluded). Because of the inhomogeneity of the data, a meta-modelling analysis based upon artificial neural networks was employed. This allowed us to build a statistical model based upon 10 predicting variables. Variables like 'research group' and 'adhesive brand' appeared most determining. Weighted means derived from this analysis confirmed the high sensitivity of current adhesive approaches (especially of all-in-one adhesives) to long-term water-storage and substrate variability. In summary, despite the lack of a standard bond-strength protocol, this meta-analysis allowed, thanks to the vast amount of data available, to draw some clear conclusions with regard to the bonding effectiveness to dentin of different adhesive approaches.

Clinical Effectiveness of Adhesives and Its Predictability From Laboratory Testing

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The complex oral environment continuously challenges adhesive bonding. Even though contemporary adhesives have proven to adequately bond to enamel and dentin, their long-term bonding efficacy may be compromised. Ideally, tests to determine the bonding effectiveness of dental adhesives should always encompass a randomized clinical trial. In spite of their time-consuming and expensive character, clinical trials remain the most effective and powerful method to test dental adhesives. In this lecture, we will focus on clinical class V trials in literature and on the clinical effectiveness of the latest generation of dental adhesives, the one-step self-etch adhesives. Additionally, the predictability of the clinical effectiveness from laboratory testing will be discussed.

Glass-Ionomer Based Restorative System As a Long-Term Restorative Alternative

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Glassionomer cements have been used since many years as restorative materials, fixing cements or temporary fillings. They have some significant properties: Creation of a chemical bond with enamel and dentin collagen. Good resistance to compression (equal to about 30 MPa). Coefficient of thermal expansion almost equal to that of dental tissues. Constant release of fluoride content in the matrix, through ions exchange lasting over time. The role of these dental materials in preventing and blocking caries and its progression has been widely described in literature, and has earned them the name of "biomimetic" or also "bioactive" materials. However, the oldest formulations of GICs were limited in success by their poor resistance to abrasion, low tensile strength and low final hardness. Glassionomer cements for dental restorations for this reasons acquired the label of cheap materials, not of high quality, especially useful for time-saving restoration, and more focused on social assistance. The advent of nanotechnology allowed in recent years significant structural changes in many dental materials, from impression materials to resin composites, and of course also for glassionomer cements, allowing in some cases to overcome physical limitations that are thought to be insurmountable. Thanks to this, the limits of hardness and resistance to stress of GICs have been exceeded, and today modern GICs can give an aspect of natural translucency and coloration to restorations, representing both a long lasting and also a valid aesthetic solution. Considering the evolution of GICs and their role as Biomimetic/Bioactive materials, and through the results of a multicenter clinical trial, the aim of this lecture is to show some new possibility of use, durability, efficiency, aesthetics and possible problems of a modern system based on a high-viscosity glassionomer cement, coated with a light-curable nanotechnological resin, when used for long-term restorations of teeth.

BMP's for Periodontal Wound Healing / Regeneration and Implant Dentistry: Biologic Realities - Clinical Directives

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Current clinical protocol aimed at regeneration of the periodontal attachment meets limited success. The procedures are unpredictable or with few exceptions result in only incremental improvements. Limited outcomes may result from incomplete understanding of biologic processes critical to periodontal wound healing/regeneration. Our laboratory has developed discriminating preclinical models to evaluate the biology of periodontal regeneration under optimized conditions for wound healing. This presentation will discuss biologic requirements for periodontal wound healing/regeneration unrelated to adjunctive devices, biomaterials, and biologics. This presentation will also discuss background and biologic potential of candidate BMP technologies for periodontal regeneration. Our studies suggest that wound stability, space provision and conditions for primary intention healing are critical for periodontal regeneration. Root conditioning and/or surgical implantation of biologic agents, bone biomaterials, and devices for GTR may dramatically alter the outcomes of healing for better or worse. Surgical placement of oral implants is governed by the prosthetic design and the morphology and quality of the alveolar bone. Often, implant placement may be difficult, if at all possible, due to alveolar ridge aberrations. In consequence, prosthetically dictated implant positioning commonly entails bone augmentation procedures. A second objective of our laboratory is to explore the biologic and clinical potential of BMPs, other candidate biologics, and bone biomaterials/devices for alveolar ridge augmentation/implant fixation using discriminating, clinically relevant defect models. This segment will discuss the unique biologic potential, the clinical relevance and perspectives of recent and unpublished observations of BMP technologies for alveolar bone augmentation and oral implant fixation, BMP dosing and delivery strategies. Our studies suggest that BMPs have an unparalleled, dose dependent potential to augment alveolar bone and support osseointegration. Inclusion of BMPs for alveolar augmentation and osseointegration will not only enhance predictability of existing clinical protocol but radically change current treatment paradigms and make "grafting" and GBR procedures altogether obsolete.

0165 (153509)

Nano Biomaterials in Regenerative Dentistry

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The need for less invasive procedures, and enhanced recovery times is a driving force in clinical treatment and the medical devices market. Nanotechnology can address these issues by improving materials used for reconstructive and regenerative medicine. Areas such as design, mechanical and physicochemical properties of materials are critical to good clinical outcomes. To this end, nanoscale cues built into a medical material surface can dictate biological interactions. The underlying hypothesis here is that matching nanometer structure with the dimensions of the natural extracellular matrix can result in "instructive materials" to control the interaction of the target tissue-forming cells. In this presentation specifically nanotexturing of titanium dental implants, and nanocomposite bone fillers will be addressed, with a focus on the translation of in vitro data to (pre)clinical models.

0166 (153510)

News on Enamel Formation and Regeneration

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Dental enamel is the hardest substance in the human body. It consists almost entirely of carbonated hydroxyapatite (HA) crystal prisms. The unique interdigitating spatial arrangement of these crystal prisms gives enamel its remarkable flexural strength. If properly formed and cared for, this natural bioceramic is designed to last a lifetime under immense mechanical stress, large fluctuations of pH and temperature, and constant challenges by aggressive microorganisms in the oral cavity. However, tooth decay and erosion, which usually start with the irreversible demineralization of the dental enamel surface, are still among the most significant global health problems. A natural repair mechanism for enamel does not exist and synthetic materials used for restoration are inferior to natural enamel. To devise strategies for enamel regeneration it is essential to understand the detailed molecular mechanisms of enamel development. Over the past 3 decades it has been recognized that enamel is formed in a biomineralization process where the order of HA crystals is established under the guidance of specific structural proteins such as amelogenin (AMEL), Ameloblastin (AMBN) and enamelin (ENAM) during the secretory stage. The structural proteins are removed by specific proteases such as MMP-20 and KLK-4 during the following maturation stage. It has also been recognized that the ultrastructure of the enamel surface is different from that of the bulk. Although this distinct surface layer is the critical interface for the formation of caries lesions, biofilms and erosion, the mechanisms that control its formation have not been explored. Two new enamel proteins, Amelotin (AMTN) and ODAM have lately been identified. These two proteins are most highly expressed during the maturation stage, and localized at the ameloblast/enamel interface. In this presentation, several biochemical, genetic and molecular strategies are summarized that collectively aim at deciphering the molecular function of AMTN and ODAM in enamel formation.

0167 (153511)

Pluripotent Stem Cells as a Model System for Craniofacial Regeneration

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Craniofacial skeletal defects may be congenital (e.g. cleft palate), traumatic, post inflammatory (e.g. periodontal disease), post surgical (e.g. dental implants) or due to post tumor resection, and in an aging population, the demand for repair and regeneration has significantly increased. Bone engineering requires a source of cells to drive regeneration, along with growth factors, and a suitable biomaterial, to support and sustain new tissue growth. However, achieving these three components remains as challenge and we are focusing on deriving a potential cell source that could be eventually used for therapeutic applications. Pluripotent stem cells i.e. human embryonic stem cells (HESCs) and induced pluripotent stem cells (iPSCs) offer a potential resource to address this problem. Previously we have shown the ability of HESCs to differentiate along the osteogenic lineage and presented a model system for this process. However, we are now focusing on iPSCs, which may provide significant clinical benefits as patient-matched cells can be used and epigenetic evidence suggests that the cells embryonic origin has an important role in ensuring successful tissue regeneration. We are exploring novel approaches to derive bone cells from these pluripotent stem cells, including factor induction, the study of differentiation pathways and isolation and selection of cell populations with the propensity to form osteoblasts for future craniofacial therapeutic applications.

0168 (152086)

Determination of Satisfaction Factors for Dental Patients in Romania

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Aims: Nowadays, patient satisfaction is not only related to the medical act but also to the whole experience during the visit in the dental office. The study wants to reveal which are the patients' criteria in choosing a dental practice or a dentist as well as the key determinants of patient satisfaction related to dental care services.

Methods: A 20-item questionnaire was administered to 200 random subjects of whom 154 met our age criteria (between 15 and 65 years of age). The multiple choice questions were inquiring about previous experiences in the dental office without referring to a certain practice or doctor and about the factors that determine their satisfaction related with the whole experience in the office. A simple descriptive statistic was done to interpret the data.

Results: Studying the lot we observed a well balanced gender representation (52% men and 48% women) as well as a homogeneity in regard to the educational background (34% were highly educated, 32% benefited of education of intermediate level and 34% had basic level education). The most important criteria for choosing a practice or a doctor are by recommendations regarding the clinician (45 %), followed by the location of the practice (36%). While assessing the dental treatment most patients appreciate a well trained doctor (41%) or personnel attitude (37%) and only few are taking into account the prices (7%), the doctors' experience in the field (4%) or the appearance of the office (6%). Most of the interviewed consider to have benefited of a very good (27%) or good (49%) dental treatment and 70% of them would not hesitate in recommending their dentist to a friend.

Conclusions: The results of the study can help dentists in the future to provide their patients full satisfaction in accordance to their dental needs.

0169 (151541)

Diabetes-induced Expression of iNOS in Rabbit Parotid Artery

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Objectives: Expression of iNOS is critical determinant in the development of diabetes complications in humans. Evidence suggests potential importance of iNOS in salivary gland hypofunction associated with Sjögren's syndrome (Correia et al., 2010) and diabetic periodontal disease (Pan et al., 2010), but there are no data concerning the involvement of iNOS in vascular dysfunction in diabetic salivary glands.

Method: Diabetes was induced by a single i.v. injection of alloxan (100 mg/kg) in physiological saline solution. After 6 weeks of alloxan or saline administration, animals were sacrificed and rabbit parotid artery, branch of external carotid artery that supplies parotid gland was immediately frozen in liquid nitrogen. Selection of appropriate endogenous control was made by TaqMan Real-time RT-PCR in arterial rings from diabetic and nondiabetic rabbits. Expression stability was analyzed by GeNorm and Normfinder software packages. Quantification of iNOS expression was measured on ABI 7500 Real-time RT-PCR system using Applied Biosystems Taqman gene expression assay for iNOS in a MicroAmp 96 well optical plate. Results were analyzed using the comparative 2- $\Delta\Delta C_t$ method where C_t is the cycle threshold number.

Results: The variability in expression of the four endogenous controls, assessed by real-time RT-PCR and analyzed by GeNorm and NormFinder, identified glyceraldehyde-3-phosphate dehydrogenase (GAPDH) as a gene with the lowest stability value. Quantitative real-time RT-PCR analysis showed hardly any iNOS mRNA in nondiabetic rings. However, in diabetic rings there was 2.06 fold increase in iNOS expression.

Conclusions: GAPDH was identified as the most suitable reference for studying alteration in iNOS gene expression in diabetic rabbit parotid gland feeding arterial rings. In this arterial preparations, iNOS expression was increased and it could be speculated that iNOS is involved in the pathogenesis of salivary hypofunction during diabetes. Study was supported by Ministry of Science, Serbia No 175021

0170 (151279)

Hungarian Oral Health Related Quality of Life and Influencing Factors

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Objective: This study is going to respond to the question whether a correlation may be found between social –economical background of Hungarian inhabitants with special attention to oral health related quality of life (OHRQoL).

Methods: Representative samples of 1200 individuals were selected according to gender, age, level of education, region and the profession of respondents and distribution of income. Types of presenting dentures were also recorded. Respecting all geographic parts of this country 8 regions were visited to find the respondents from 5 forms of various settlements. OHIP-H14 questionnaire was applied to measure the Oral Health Related Quality of Life. Results were evaluated with OHIP-H summery scores. For statistical analysis SPSS (10.0) software was used and data were analyzed by χ^2 and ANOVA test.

Results: With the questionnaires the Hungarian population based norm was established (5,76). Significant differences were found between the investigated independent variables. Elderly patients and patients with lower educational level had worse OHIP scores. Denture wearers also gained significantly higher scores (8,6). The accessibility of dental office and the different regions has influence on OHIP scores. „Service on demand” type visit in dental practice reached the 57% of respondents and gained significantly higher OHIP scores.

Conclusion: The investigated independent variables really have influence on oral health related quality of life in Hungary. With the norm value based on our study the Hungarian results could be compared with other countries.

0171 (151864)

Denture adhesive reduces the secretion of minor salivary glands

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Objective: was to determine the effect of a commercially distributed denture adhesive onto subjective orofacial sicca symptoms (OSS), unstimulated whole saliva (UWS), palatal (PS) and labial (LS) saliva flow rate.

Methods: 15 complete denture wearing patients (6 male, 9 female; average age: 72,27 \pm 11 years, took part in this follow-up study. Patients used a gel type denture adhesive (Blend-a-Dent Extra Stark Neutral, Procter&Gamble, Hungary) during the 3 weeks of the examination. The subjective orofacial sicca symptoms were evaluated using a questionnaire with 16 questions. UWS was determined using the spitting method. PS and LS flow rates were measured with the Periotron Method with filter paper discs using the Periotron®8000 (Oraflow Inc. Amityville, USA) device. Tests used for the statistic analysis were as follows: subjective values - χ^2 -test; flow rates - ANOVA, and unpaired Student's t-test.

Results: According to the answers of the questionnaire, a significant increase of a subjective symptom (saliva thickness) was registered after week 1 compared to the initial values. UWS flow rates showed a non-significant increase (initial value: 0,45 \pm 0,42 ml/min; week 1: 0,48 \pm 0,45 ml/min; week 2: 0,45 \pm 0,46 ml/min; week 3: 0,50 \pm 0,43 ml/min). LS flow rates (initial: 5,96 \pm 4,04 μ l/cm²/min; week 1: 6,80 \pm 5,74 μ l/cm²/min; week 2: 4,74 \pm 3,54 μ l/cm²/min; week 3: 3,25 \pm 4,22 μ l/cm²/min) decreased at all compared to the initial values. PS flow rates decreased from week to week (initial: 5,76 \pm 4,31 μ l/cm²/min; week 1: 4,42 \pm 4,57 μ l/cm²/min; week 2: 3,71 \pm 3,04 μ l/cm²/min; week 3: 2,77 \pm 3,31 μ l/cm²/min). The decline of both PS and LS flow rates became significant after the 3-week adhesive usage, compared to the initial values.

Conclusion: Results suggest, that a 3-week use of the denture adhesive led to a significant decrease of PS and LS flow rates. One subjective symptom (saliva thickness) increased significantly. The continuous increase of the UWS flow rates could be detected as well, but this was not significant.

0172 (151446)

The Motivation of Dental Treatment Requests in a Romanian Population

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Objectives: 1. to assess the frequency of addressing the dental office for emergencies versus routine check-ups or other dental treatments 2. to determine the self perception of oral health status in a sample of adult patients from North-Western Romania.

Methods: A descriptive cross-sectional study was conducted on a sample of 1340 subjects, using a self-administered questionnaire. Information on the most frequent reasons for addressing the dental office, as well as on the subjects' self perceived oral health status was obtained. The sample was stratified by age, gender and educational background and data were processed using descriptive statistics.

Results: The study showed that 27% of patients addressed the dental office for emergencies (tooth ache) and 52% for routine check-ups. A considerable proportion of patients (15%) sought aesthetic treatments while a lower number sought assistance for other affected oral functions. The highest demand for routine check-ups was noted in the 21-35 age group (61%) and the lowest in the >55 age group (28.6%). Demand for emergency interventions was highest for the <21 age group (29.4%) and lowest for the 36-55 age group (18.8%), while aesthetic treatments were mostly requested in the 36-55 age group (25%). Patients perceived their oral health status as good (33%), acceptable (52%), weak (11%), and very weak (3%), while 1% declared not being able to appreciate it. Self perceived oral health worsened with age.

Conclusions: 1. The most frequent reason for addressing the dental office was the routine check-up, followed by emergencies and aesthetic considerations. 2. The distribution of motivation varied according to age and educational background, being less influenced by the subjects' gender 3. The self perceived oral health status became less favorable with age.

Prevalence of TMDs, their relationships with orthodontic anomalies in HungaryP. HERMANN¹, P. FEJÉRDY¹, M. KAÁN², J. BORBÉLY¹, L. GÓTAI¹, and M. MADLÉNA²¹Dept. of Prosthetic Dentistry, Semmelweis University of Medicine, Budapest, Hungary, ²Dept. of Pedodontics and Orthodontics, Semmelweis University of Medicine, Budapest, Hungary**Objectives:** The aim of the study was to assess the prevalence throughout Hungary of pathological symptoms of the temporomandibular joint (TMJ), vertical orthodontic anomalies, and to investigate interrelationships between these conditions.**Methods:** The 4604 probands were selected randomly from individuals attending compulsory lung screening examinations and were divided into different groups aged ≤19, 20-24, 25-34, 35-44, 45-64, and 65-74 years. All participants were examined by dentists using the 1997 WHO criteria. TMJ symptoms and vertical orthodontic anomalies were analyzed by age, gender, and geographic distribution.**Results:** Clinical signs of TMJ functional problems were found in 41% of examined subjects, mostly in individuals aged 35-44 years. The most frequently recorded signs were deviation and/or deflection of the mandible, observed in 53% of the population, and sound in the TMJ, observed in 43.7% of subjects. The frequency of clicking or crepitation of the joint was significantly higher among women than men ($p < 0.05$). The TMD rate was highest in southwestern Hungary and lowest in central western Hungary, and significant regional differences in deviation/deflection were evident. Among vertical orthodontic anomalies, deep bite was most frequent in southwestern Hungary, and open bite was most common in southern Hungary. Deep bite was more frequent in men than in women and showed the highest incidence in individuals aged 35-44 years. Except in the youngest and the two oldest age groups, co-occurrence of deep bite and pain, and of deep bite and noise in the TMJ, were significantly correlated.**Conclusion:** The prevalence of TMD signs and symptoms was higher in individuals aged 35-44 years than in other age groups, and was greater in women than in men. Vertical orthodontic anomalies may be significant in TMD patients, especially when joint noise is observed.**Age estimation by dental developmental stages in the Icelandic population**

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Objectives: All teeth share morphologically distinct stages of mineralization which can be identified radiographically. The diversity is such that it is helpful to create a database of dental maturity and ethnicity for every distinct population. The present investigation is the first performed on the Icelandic population. It should create important information for forensic purposes in age estimation and should help with developmental age assessment in children and adolescents.**Methods:** Dental developmental stages of 1200 Icelandic children and young adolescents were established from panoramic radiographs. The first 200 were used for a pilot study. The remaining 1000 were used for the main study, 508 girls and 469 boys aged 4-25 years. 23 radiographs were eliminated. Haavikkosx eleven dental maturity scores were used. 201 radiographs were studied both on the left and right side and the rest unilaterally.**Results:** Males and females differed in the age at which their permanent teeth attained various stages of mineralization. Girls reached most dental stages earlier than boys. Root apex closure started in girls in lower central incisors at the average age 8.03 (sd. 1.07) years and in lower third molars at 19.44 (sd. 1.76) years and for boys at 8.28 (sd. 0.72) and 18.53 (sd. 1.48) years respectively. The difference between genders was not significant except in a few stages in some teeth and particularly for the mandibular canines ($p < 0.01$). There was no significant difference between bilaterally symmetrical teeth. The correlation between maturity scores on both sides was very high ($r = 0.98-1.00$, $p < 0.005$).**Conclusion:** A reliable database has been established for age estimation for the Icelandic population. Estimating the age from dental panoramic radiographs showed high accuracy and the results are comparable with other Western European studies. This will help to establish, with accuracy, age and maturity- estimation in Icelandic children and adolescents.**Shortened dental arch revisited: going from evidence to recommendations**

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Background/Objectives: Clinicians must frequently decide whether or not to treat patients with loss of posterior teeth, a condition called the shortened dental arch (SDA). Although many studies have been reported, there are no clear recommendations for management of SDA cases. Therefore, the objective of this work was to assess the quality of the body of evidence and the strength of recommendations, and propose some guidance for dealing with SDA.**Methods:** An extensive literature search for longitudinal studies was conducted on 17 November 2010 in the PubMed and LILACS electronic databases using the term shortened dental arch. A "snowballing" strategy, for example manual searching of the reference lists of included papers, was also conducted. Unpublished and published studies were sought in ClinicalTrials.gov and in the search engine 'Google' (Scholar) in English, French, German, Italian, Portuguese, and Spanish. Finally, grey literature was searched in OpenSIGLE (System for Information on Grey Literature in Europe). The quality of evidence and the strength of recommendations were determined by the GRADE (grading of recommendations assessment, development and evaluation) system.**Results:** Titles and abstracts of one-hundred and thirty-three articles were initially assessed. Nine studies were finally included. Although there was no difference between the effectiveness of restorative and non-restorative approaches for SDA, fixed partial dentures seem better than removable prostheses. The overall body of evidence was, however, graded as low-quality. Two different clinical scenarios are used to illustrate recommendations in the management of SDA cases by use of the GRADE system.**Conclusions:** Restorative treatment should not necessarily be regarded as the mainstay of therapy for SDA. The GRADE approach may improve transparency in a shared decision-making process, mainly under conditions in which the quality of evidence is low or unclear.**Presentation Of Mandible Biomechanics By Finite Element Analysis**Z. RASKÓ¹, B. ERDŐHELYI², E. VARGA, Jr.¹, and E. VARGA, Sr.³¹Oral- and Maxillofacial Surgery, University of Szeged, Szeged, Hungary, ²Image Processing and Computer Graphics, University of Szeged, Szeged, Hungary, ³Traumatology, University of Szeged, Szeged, Hungary**Objectives:** The quality and form of a human mandible is genetically determined. The aim of this interdisciplinary research was to open a new way to virtual anatomical analysis of the mandible, and so far to make possibilities to use this method for visualizing and analyzing injuries and orthognathic procedures.**Materials and methods:** Generally reconstruction of an individual mandible anatomy requires the use of CT scans of the patient. Bony material, teeth, the load of surrounding muscles has to be considered in imaging procedure and stress analysis. In our study a three dimensional finite element mandible model was generated using traditional axial CT scans of DICOM format. This model had osseous qualities about densitometric data of literature. Direction of tension forces of masticatory and suprahyoid muscular origin were pointed out, thus the model was loaded with them. Stress patterns and micro-dislocation of the bone itself were visualized in the mandible.**Results:** Evaluation results confirmed the basic principle of facial bone biomechanics established by Champy and correspondence was found to the earlier static or virtually generated model experiments.

Conclusion: Comparing our experiments to the base araldite model of Champy, the main difference was the utilization of a closely real-time three dimensional rendering of any living patient's bone geometry. This way a new aspect of anatomical approach of individual human mandible can be achieved. The other new advantage of our method was, thus a motion picture could be created using this method, so strain patterns and visualized micro dislocation of the virtual bone could be presented, and this way experiments were repeatable. Our method could open a new aspect of anatomical education of mandible and midface.

0177 (152136)

Assessment of Trabecular Bone Microarchitecture using Differing CBCT-s and Micro-CT

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Objectives: The goal of this study was to determine parameters of the microarchitecture of trabecular bone by two differing CBCT instruments by scanning three female cynomolgus monkeys' skulls.

Methods: The skulls of three female cynomolgus monkeys (*Maccaca fascicularis*), terminated for other research purpose, were fixed and stored in paraformaldehyde solution. These were scanned using Planmeca ProMax 3D smart cone beam CT instrument at a resolution of 200 μm isometric cube voxel and using i-CAT cone beam CT instrument at a resolution of 250 μm isometric cube voxel. We analyzed the trabecular bone both in the maxilla and mandible, on the left side between the roots of the third molars. Following preparation of dental jaw sections with relevant molars (M3 and M2), the samples were scanned using microCT (SkyScan 1172) at a resolution of 17 μm isometric cube voxel. The micro CT scanning was used as a basis of comparison, as the micro CT is regarded as the best recognised radiation imaging technique. These scanned images were used as a gold standard for comparison. The trabecular structure and texture was determined by CTan v. 1.1 software (SkyScan), using manual thresholding.

Results: Correlation coefficient values between the Planmeca ProMax 3D smart and micro-CT were: structural model index: 0.79, and trabecular thickness: 0.85. Weak correlation was found between any derived parameters of iCAT and micro-CT (0-0.16).

Conclusions: The strong correlation between Planmeca ProMax 3D smart and micro-CT suggests that high-resolution cone beam computed tomographs might provide reliable derived parameters presenting the trabecular bone microarchitecture.

0178 (152149)

Identification of root canal curvatures from CBCT scans

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Objectives: The goal of our research is to provide an identification method that correctly localizes the root canal, and its medial line with bifurcation points.

Methods: After the manual choice of a (volume of interest) VOI, which is supposed to be inside the investigated root canal. As a first step, the algorithm performs a quick fuzzy c-means clustering based separation of light and dark areas within the selected VOI. This is followed by a three dimensional region growing starting from the manually selected initial point. Thus we obtain the approximate volume of the root canal bounded by light regions in the CBCT records. An adaptive stopping criterion was developed to avoid the inclusion of voxels that are situated outside the root canal. When the set of inner voxels is identified, the corrected marching cube algorithm is employed to extract the triangle mesh surface of the root canal. This is computed using the original intensity values, and subpixel coordinates were obtained. The medial line of the root canal is approximated using the 3D curve skeleton of the identified root canal. The curve skeleton is extracted using the mesh contraction algorithm. The extracted curve skeleton is a collection of points having floating-point coordinates, which can be efficiently approximated as spline curves.

Results: After a manual selection of the VOI, the proposed algorithm can automatically produce an accurate center line in more than 98% of cases with simple root canal, and in 95% of bifurcated root canals. The whole identification process of one root canal took less than 3 seconds.

Conclusions: We have proposed and implemented a complex image processing procedure for the detection of the medial line of root canals from CBCT records. The proposed algorithm proved accurate and efficient.

0179 (152162)

MRI planning of Dental Implants and Alveolar Bone Characterization

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Objectives: The aim of this study was to evaluate the feasibility of magnetic resonance imaging (MRI) for three dimensional dental implant planning and characterization of alveolar bone at the implant site.

Methods: In the study, 5 patients were imaged by the conventional T1-weighted spin-echo method in a whole body 3 TMRI scanner (Siemens Magnetom Trio, Erlangen, Germany). The signal-to-noise ratio (SNR), was optimized by using a dedicated temporomandibular surface RF coil of 10 cm diameter for NMR signal detection. MR images were acquired in transverse 3mm-thick slices that offered the best compromise between spatial resolution and signal to noise ratio for a gingival tissue. The tissue was characterized by a MRIsignal intensity, which is for the spin-echo method given by the relation $(1 - \exp(-TR/T1))\exp(-TE/T2)$. Here TR and TE are characteristic repetition time and echo time constants to optimize image contrast, while T1 and T2 are corresponding tissue relaxation times.

Results: Results of the study confirmed that MRI is an appropriate method for planning of dental implants and assessment of bone geometry and integrity. In addition to its non-invasiveness it excels by an exceptional soft tissue differentiation; i.e., it can very efficiently detect nerve locations and possible inflammations.

Conclusions: MRI is a promising non-invasive alternative to CT in planning of dental implants and dental tissue characterization.

0180 (152106)

New Possible Therapeutic Adjuvants For The Management Of Periodontal Inflammation

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Objectives: In healthy gingival sulci, tooth-adherent microbial biofilms induce an inflammatory exudate that promotes colonization by a successor microbiota responsible for a persistent inflammatory response in the periodontal tissues. Potential therapy is to suppress development of the successor microbiota, or reduce the excessive inflammatory host response. In dental biofilms, *Eikenella corrodens* and *Capnocytophaga* spp. produce lysine decarboxylase which converts the amino acid lysine to cadaverine. Lysine depletion and cadaverine production promote successor dental biofilm accumulation and halitosis. The aims of our work were to study whether the development of experimental periodontal inflammation was retarded by inhibiting biofilm lysine decarboxylase enzyme activity or by administering an anti-inflammatory peptide, BPC157. This peptide was originally isolated from gastric juice and was found to have wound healing and osteogenic effects.

Methods: Besides plaque index and gingival crevicular fluid volume, lysine and cadaverine were measured from biofilm samples by laser-induced fluorescence after capillary electrophoresis before and after treatment with the bacterial lysine decarboxylase inhibitor tranexamic acid in a human oral hygiene restriction model. We investigated gingival capillary permeability by Evans-blue extravasation, gingival blood flow by laser Doppler flowmetry, alveolar bone morphometric parameters by microCT, and osteoblast functional activity by nanoSPECT/CT before and after BPC157 administration in a ligature-induced periodontitis model in rats.

Results: The activity of plaque lysine decarboxylase increased during experimental gingivitis. Tranexamic acid inhibited plaque development, the exudation of gingival crevicular fluid and cadaverine production in the biofilm. BPC157 had no effect on gingival blood flow, but it significantly reduced plasma extravasation, inflammatory histological alterations, as well as alveolar bone resorption.

Conclusions: Plaque cadaverine content may be a biomarker for diagnosis or for the examination of therapeutic response. Lysine decarboxylase enzyme inhibitors and the anti-inflammatory peptide BPC157 are potential new candidates for controlling periodontal disease.

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0181 (151196)

Porphyromonas gingivalis regulates cathepsin B activity in endothelial cells

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Objectives: Porphyromonas gingivalis (Pg) can affect endothelial cells after dissemination through blood flow. Our study aims to analyze potential effects of this bacteria and his lipopolysaccharide (LPS) on endothelial cells especially regarding the regulation of lysosomal enzymes such as cathepsin B.

Methods: Endothelial cells (HUVEC) were stimulated by purified Pg-LPS for 24, 48 or 72 hours or infected with whole bacteria for 2 to 6 hours. Cell lysates were prepared to measure the enzymatic activity of cathepsin B as well as the amount of protein by Western blotting.

Results: Our results showed an increase of the enzymatic activity of cathepsin B during the time-course stimulation by Pg- LPS or infection with whole bacteria without modification of the rate of mRNA expression or protein concentration. Concerning regulation of the activity of cathepsin B, our data showed that the tyrosine-dephosphorylation form of the enzyme is associated with its activity in infected endothelial cells and not in cells only stimulated by purified Pg-LPS.

Conclusion: Our results evidenced that cathepsin B is differentially regulated depending on bacterial virulence factors. These results contribute to explain deleterious action of Pg on endothelial cells.

0182 (151225)

In vitro effects of oral bacteria on mesenchymal stem cells

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The loss of periodontal tissues is considered as the critical manifestation of periodontitis. Numerous different therapies have been developed, including surgical strategies, grafts, membranes, and the application of growth factors. Nevertheless, complete regeneration is still a challenge. Recent studies showed that stem cell-based-therapies become a promising strategy. The immunomodulatory functions, the self renewal capacity and the potential to differentiate into several types of tissue cells make mesenchymal stem cells (MSC) an interesting therapeutical tool. However, for their potential application in periodontal regeneration therapies the effect of physiological and pathogenic oral bacteria on MSC has to be elucidated.

Objectives: In this study we tried to establish a model to investigate the interaction of oral bacteria with MSC.

Methods: Porphyromonas gingivalis (Pg), Fusobacterium nucleatum (Fn) and two strains of Aggregatibacter actinomycetemcomitans (Aa and AaHK) were chosen as periodontal pathogens. As representatives for the physiological flora the two strains Streptococcus sanguinis Sang and SangSK were tested. The viability of cells and bacteria was pretested under aerobic and anaerobic conditions. After this the microorganisms were inoculated to a monolayer of MSC and cultivated under anaerobic conditions. The cell and bacteria mortality was determined by Fluorescence microscopy after LIVE/DEAD staining. To document morphological aspects safranin staining and scanning electron microscopy was applied. Cytotoxic effects of the bacteria on MSC were analyzed by Lactat-Dehydrogenase (LDH) measurement. Furthermore, adherence to and internalization into MSC was tested.

Results: We were able to show that MSC can survive under anaerobic conditions for more than three days. The co-cultivation of MSC with S. sanguinis resulted in a good adherence of S. sang to the MSC.

Conclusion: Overall, our results revealed species specific bacterial interactions with human mesenchymal stem cells. To elucidate the underlying mechanisms will be part of future studies.

0183 (151280)

Success rates of tunnel technique for Miller III type recessions

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Objective: Subepithelial connective tissue grafts (sCTG) have been shown to be effective in obtaining root coverage. The application of sCTG using Tunnel technique is a successful therapy for covering exposed root surfaces. The double-crossed suture can be regarded as a suitable suturing technique in a variety of clinical situations where treatment with tunneling flap preparation techniques is indicated. The goal of the study is to evaluate the clinical results of sCTG-tunnel procedure and a modified suture technique.

Material & Methods: 7 female patients exhibiting multiple gingival recessions were enrolled into the study. Following Phase-I therapy, sCTG operation using tunnel technique was performed. A modified suture technique were used to obtain graft and flap stabilization. Clinical recordings including recession depth, coronally-apically recession width, width of keratinized gingiva, area of recession, the distance between contact point and most coronal part of interproximal papilla were recorded pre-operatively and 6th months post-operatively.

Results: In total 47 teeth were treated with sCTG. The average number of teeth treated per patient was 6.71. On average, a gain of 1,91mm (81,4%) tissue covering on previously exposed root surfaces was achieved at the end of the 6 months. The mean keratinized tissue was 3,14mm at baseline and it was increased to 3,86 mm at 6th months. Full coverage was achieved in 86,7% of the cases with Miller III type recessions, where percent of root coverage was 93,3%.

Conclusion: These findings suggest that subepithelial connective tissue grafting with modified tunnel approach, results in early healing and highly predictable root coverage in Miller Type III gingival recessions.

0184 (151513)

Effect of Crown Restorations to Periodontal Markers in Healthy Subjects

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Objectives: To investigate the possible influence of fixed dental prosthesis (FDP) procedures with/without gingival retraction to, MMP -1, MMP-8 and TNF- α ; gingival crevicular fluid (GCF) levels in periodontally healthy subjects.

Methods: A total of 8 periodontally healthy subjects who had at least 2 abutment teeth to prepare were included to the study. One of the abutment teeth per each patient with potassium-aluminum-sulfate braided retraction cord. GCF samples were obtained from two prepared teeth and one control tooth (negative control) before initiation of FDP treatment and repeated during the procedures (Day 2, 3, 7) and 1 month later after finishing the treatment. GCF concentrations of MMP-1,-8 and TNF- α ; were determined by ELISA. Concentrations of the assayed proteins were analyzed by analysis of variance (ANOVA).

Results: The MMP-1 concentrations showed slightly differences in between control, ret(-) and ret(+) groups when compared on the same sampling days, these differences were not found to be significant ($p>0.05$). The MMP-8 concentrations showed significant differences among study groups ($P=0.017$), but not among the sampling days ($P>0.05$). The TNF- α concentrations showed significant differences in all study groups ($P=0.014$). In contrast to ret(-) and control groups, TNF- α concentrations of ret(+) group seemed to be significantly different among sampling days ($P=0.003$).

Conclusions: Within the limitations of present study, it may be suggested that well-fitted FDP procedures performed to periodontally healthy subjects do not permanently and negatory affect the periodontal tissue health.

0185 (153505)

Living in Harmony with Our Resident Flora: A United Front or a Battle for Survival

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The oral resident microflora is diverse, natural and exists as spatially-and functionally-organised biofilms. This microflora provides benefit by excluding exogenous and potentially pathogenic microbes, and promoting the development of the normal physiology and defence systems of the host. Once established, their composition remains relatively stable over time (microbial homeostasis). This does not indicate a passive relationship with the host; the stability reflects a dynamic balance due to complex microbial interactions. Recent evidence has demonstrated that commensal oral bacteria are involved in active cross-talk on mucosal surfaces to promote host-microbe homeostasis.

This natural stability can be perturbed by changes to the habitat or life-style (e.g. diet, medication, smoking, saliva flow, dentures) leading to overgrowth by previously minor components of the microflora or permanent colonisation by normally transient micro-organisms. An increase in the frequency of fermentable sugars in the diet leads to more regular periods of acid production by saccharolytic bacteria, resulting in the prolonged exposure of the biofilm to low pH. This selects for acidogenic and acid-tolerating bacteria at the expense of those associated with enamel health that prefer a neutral pH. Inflammation occurs if plaque accumulates due to poor oral hygiene to levels no longer compatible with oral health. This results in changes to the subgingival environment (increased flow of GCF, bleeding, raised pH and temperature) that enrich for proteolytic and anaerobic bacteria.

In order to control disease, clinicians need to intervene to prevent the breakdown of microbial homeostasis and the inevitable disruption to the normal harmonious and beneficial relationship between the microflora and the host, rather than just treat the consequences of microbial activity. The potential of contemporary approaches to control plaque at beneficial levels, including the use of replacement therapy and probiotics, antiplaque and antimicrobial agents, and other interventions to augment conventional mechanical plaque control will be discussed.

0186 (153506)

Antioxidant Micronutrients: Nature's Fuel for Controlling Inflammation

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Periodontitis is a clinical term employed to describe a common clinical phenotype that results from a complex series of biological events. Whilst the tissue destructive outcomes that result are triggered by the emergence of a characteristic sub-gingival biofilm, the majority of the tissue damage that ensues results from a dysregulated inflammatory-immune response in susceptible patients. The exposures that drive those clinical outcomes differ from patient to patient, but ultimately result in the convergence of ubiquitous signalling pathways, whose interactions exceed the immune tolerance of the individual patient, triggering a chronic non-resolving inflammation and ultimately, connective tissue destruction, alveolar bone and tooth loss.

Modern theories of causality have started to challenge the traditional paradigm of gingivitis and periodontitis being predominantly plaque-driven inflammatory conditions. Indeed, they suggest that whilst plaque is a necessary pre-requisite for periodontitis, it is not in fact part of the causal pathway of the disease. The inflammatory status of the periodontal environment, which is host-dependent and influenced systemically as well as locally, drives the nature of the periodontal biofilm that develops. This realisation has opened up new therapeutic approaches that focus on the modulation of destructive inflammatory responses and/or the augmentation of more efficient and time limited immune-mediated antimicrobial defences.

One such approach derives from the impact of macro- and micronutrients upon gene expression and cytokine signalling. Certain nutrients such as refined simple sugars and saturated fats drive inflammation via metabolic and innate immune mechanisms and predispose to a destructive "hyper-inflammatory" state. Other nutrients, such as the antioxidant micronutrients are now known to possess powerful anti-inflammatory and pro-resolving properties, which may be exploited through local or systemic routes in order to control the inflammatory status of the periodontal tissues and, in doing so, influence the development of a health-promoting sub-gingival biofilm.

0187 (153507)

Efficient Delivery Systems in the Design of Oral Care Products

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The concept of beneficial plaque control is reviewed from the point of view of product formulations and current body of evidence of their efficacy. The challenges of balancing the introduction of innovative steps to deliver new benefits while maintaining the performance of well established and proven technologies are discussed.

0188 (153458)

State-of-the-Art Adhesive Dentistry, Longevity/Cost

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The introduction of dental composites and adhesively bonded restorations changed dentistry. Dental amalgam is no longer routinely the material of choice in anterior or posterior restorations. Also indirect restorations are placed with adhesive bonding techniques and as adhesively retained restorations need less extensive preparations to ensure retention, the applications and indications begin to overlap. Today both direct and indirect restorations not only show remarkably equal esthetic results with almost similar amounts of healthy tooth tissue retained, but also in regards to longevity they seem closer matched than ever before. So how now must the practicing dentist decide what technique to use? Is it merely a matter of being a restorative or prosthodontic specialist, or as so often in life whether the patient pays directly or through a third party (be it state or insurer, both usually paying less)? This presentation hopes to give some answers to this question, discussing the current results in longevity, tissue preservation, expected longevity and cost to the patient – per service year. Also another important aspect will be covered; what if the intervention fails?

Interface Characterization of New Self-Adhesive Systems

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Today, both etch-and-rinse and self-etch procedures can be used to bond composite to enamel and dentin. Ideally, durable bonding can be achieved following a three-step procedure by first selectively etching enamel with phosphoric acid, followed by application of successively a 'mild' self-etch primer to the etched enamel and (unetched) dentin, and finally a separate solvent-poor adhesive resin. Indeed, enamel requires phosphoric acid to expose a micro-retentive etch pattern, in which resin is known to stably interlock. Phosphoric acid might however be too aggressive for dentin, as it removes the natural hydroxyapatite protection and exposes dentinal collagen up to several micrometers deep. Bonding should be obtained by diffusion of resin in an attempt to envelop the exposed collagen, which hardly can be achieved completely. The alternative mild self-etch approach keeps collagen protected by hydroxyapatite. Specific functional monomers have been shown to effectively interact chemically with hydroxyapatite to the direct benefit of bond durability. As several bonding approaches can thus today be used, a 'modular' adhesive was recently developed to be applied following either a full 'etch-and-rinse' or full 'self-etch' approach, or a combined 'etch-and-rinse' (selectively at enamel) and 'self-etch' approach (at both pre-etched enamel and dentin). The purpose of this presentation is to present how this modular adhesive interacts with enamel and dentin following the different approaches, as well as what bonding effectiveness can be achieved accordingly.

In-Vitro Results on Self-Adhesive Resin Cements

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Objective: The aim of this study was to evaluate the push-out bond strength of two self-adhesive resin cements used for the cementation of glass fiber posts.

Materials and Methods: Sixty recently extracted non-carious human molars, with one straight palatal or distal root canal and fully developed apices extracted for periodontal or orthodontic reason were selected for this study. After endodontic treatment, glass fiber posts (RelyX Fiber Post, Size 3, 3M ESPE) were cemented with two types of self-adhesive resin cements (RelyX U200, 3M ESPE, and Maxcem Elite, Kerr). Perpendicular to the post, four to six sections of 1 mm height were cut from each specimen using a diamond saw (Isomet 1000, Buehler) starting 1 mm coronal from the tip of the post. Each section was tested on push out bond strength with the testing machine (0.5 mm/min, Lloyd Instruments Ltd, Fareham Hants, UK). The retentive strength of the post fragment (MPa) was calculated by dividing the load at failure (N) by the interfacial area of the post segment. Failure modes were evaluated by a single operator under a stereomicroscope (Stemi 2000-C; ZEISS, Jena, Germany) at 40x magnification and SEM.

Results: Push out bond strength of RelyX U200 (8.3±4.1) was higher than that of the Maxcem Elite (6.1±3.8). Failure mode was predominantly at resin cement/dentin interface. The results recorded were statistically different when was evaluated with one-way analysis of variance and Tukey test (p<0.05).

Conclusions: Push out bond strength was influenced by cement type and varies upon different regions of the root canal. Adhesive interface between resin cement and root dentin was the most fragile region.

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Microleakage and Bond Strength of a New Self-Etch Adhesive

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Aim: To evaluate adhesion of new composite bonding system Uno (3M ESPE) to dentine and enamel.

Material and methods: 20 sound human molar teeth, extracted for orthodontic reasons, were used. All teeth were prepared in the same way; two class II cavities were prepared, of the depth of medium caries. The teeth were randomly divided into 4 groups; Group A filled with composite Filtek and Uno bonding system LC with etching, Group B: composite Filtek and Uno LC without etching, Group C: composite Filtek and Uno SC with etching, Group D (control): Herculite with Optibond FL. All procedures were carried out according to manufacturers recommendation. After filling, all teeth were stored for 24h in high humidity at 37°C then sectioned longitudinally using a low speed diamond saw. The sections were polished and evaluated microscopically with particular attention to the material-enamel, material-dentine interfaces at the bottom of cavity and adjacent to the storage environment. Shear bond strengths were also determined, using bovine dentine and enamel, results were subjected to statistical analysis.

Results: All groups showed complete seals with both enamel and dentine, with no observable differences between them. In all case, the seal appeared complete along the entire length, with no interfacial gaps or other evidence of debonding. This applied equally to enamel and dentine in both experimental and control groups.

Conclusions: Both etched and non-etched groups showed excellent seals, suggesting that prior etching is not essential for establishing such seals with this material. Use of the Uno bonding system as either SC or LC was equally effective at providing seals with enamel and dentine. Shear bond strengths for this system will also be discussed.

In-vitro Results with a New Self-Adhesive Resin Cement

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Recently, the appropriate, durable bond of adhesive systems and composite resin cements to retain endodontic posts was challenged. The question arises whether it would be possible to adhesively lute fiber posts in a less technique sensitive approach using a self-adhesive composite resin cement (SARC). The influence of bonding techniques on the push-out bond strength and load capability of post-endodontic restorations were investigated comparing etch-and-rinse and self-etch adhesives with SARC.

Effect of curing on clinical retention. A 7-year evaluation

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Objective: To evaluate in a prospective evaluation the retention of Class V compomer and hybrid resin composite restorations placed with a 1-step self etch system and cured with continuous, soft-start and pulse-delay curing.

Methods: 139 Class V restorations were placed and cured at random in 60 subjects with a compomer (Dyract AP;68) or resin composite (Tetric Ceram;67) and cured for 40s with continuous, soft-start and pulse-delay modes. The restorations were evaluated with slightly modified USPHS criteria yearly during 7 years.

Results: Of 135 restorations evaluated at 7 years, 29 were lost, 17 compomer (25%) and 12 Tetric Ceram (18%). The cumulative loss rates for the compomer and resin composite restorations cured with the three curing modes were: continuous cure: 26.1%/18.2%, soft-start: 22.7%/19.0%, pulse delay: 26.1%/16.7%. No statistical difference were seen between the curing modes.

Conclusions: The clinical retention of Class V compomer and resin composite erosion/abrasion restorations was not influenced by the curing modes used.

0194 (151626)

Clinical Evaluation Of A Low-shrinkage Composite After 1 Year

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Objectives: The aim of this study was to compare the 1-year clinical performance of three restorative systems, which included a novel low-shrinkage composite and two bonding strategies.

Methods: Twenty-five patients received three Class I (occlusal) or Class II restorations performed with one of three restorative systems: Filtek Silorane Restorative System (FS); Adper Scotchbond 1 XT, a 2-step etch-and-rinse adhesive, with Filtek Z250 (XT); and Adper Scotchbond SE, a 2-step self-etch adhesive, with Filtek Z250 (SE). All materials were applied following the instructions of the manufacturer. Two independent observers evaluated the restorations at baseline, after 6 months and 1 year, according to the USPHS modified criteria. Kruskal-Wallis and Mann Whitney U tests were computed to compare the behavior of the restorative systems; Friedman and Wilcoxon tests were used to analyze the intra-system data ($p < 0.05$).

Results: All restorations were evaluated at 1 year. FS and XT performed statistically similar at 1 year, but marginal staining for SE was statistically worse. Intra-system comparisons between baseline and 1 year also showed deterioration of marginal staining for SE, while a deterioration of the marginal adaptation was recorded for both SE and FS. XT was the only system for which there was no statistical change of the parameters measured in this study.

Conclusion: Both restorative systems using self-etch adhesives showed a tendency to worse marginal adaptation after 1 year of clinical use compared to baseline. Although the clinical performance of FS was deemed acceptable after 1 year, this study did not find any advantage of the silorane-based composite over the methacrylate-based composite. The low-shrinkage associated with FS may not be a determinant factor for clinical success.

0195 (151543)

Five Year Clinical Evaluation of Filtek™ Silorane versus Tetric Ceram

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Objectives: Polymerization contraction has been a clinical problem for resin composites. Manufacturers have attempted to develop materials that have less contraction. The aim of this clinical investigation was to evaluate the performance of Filtek™ Silorane (3M ESPE), a low shrink composite, used in conjunction with a dedicated experimental adhesive system, that was never commercialized, and compare to Tetric Ceram bonded with AdheSE (Vivadent).

Methods: The materials were placed in teeth in individuals that needed at least two box shape class II restorations of similar size. The restorations were placed by one operator in private practice. A total of 53 restoration pairs were placed in 31 patients. The restorations were evaluated by two trained examiners using USPHS criteria.

Results: At five years 49 restoration pairs were available for reevaluation. One Tetric restoration had been removed because of tooth sensitivity excluding that patient and three could not be reached. All but three contacts scored normal, color match and gingival status was unchanged and neither secondary caries nor sensitivity reported. Slight chipping (Beta) was reported for four Tetric and five Silorane restorations, while two Tetric and four Silorane restorations showed some surface roughness. When marginal integrity was evaluated 2/3 scored Alfa for both materials and 45% Tetric and 35% Silorane restorations scored Alfa for interfacial staining. 16(33%) Tetric and 33(67%) Silorane scored Beta and one restoration (2%) Charlie for anatomic form. There was no significant difference between the materials tested for any of the criteria evaluated except anatomic form ($p < 0.001$).

Conclusions: At five years Silorane showed significantly more wear than Tetric. In both groups high incidence of marginal discoloration and marginal breakdown suggest that improved or different adhesive systems are needed. This study was supported by 3M ESPE, Seefeld, Germany and University of Iceland.

0196 (151536)

Longevity of class II restorations with outline above/below the CEJ

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In vitro studies indicate that class II restorations ending cervically below the cemento-enamel junction (CEJ) have reduced prognosis due to increased microleakage.

Objectives: to evaluate whether class II restorations with cervical margins apical to the CEJ ending in dentin have an increased risk for secondary caries and clinical failure compared to restorations with margins coronal to the CEJ ending in enamel.

Methods: Records from patients with at least one restoration replaced due to secondary caries were selected from an existing database. On the first bitewings after restoration placement, cervical margins of 1912 approximal restoration sites were scored in relation to the cemento-enamel junction as either coronal to the CEJ, at, or apical to the CEJ. Restorations with margins at the CEJ were considered as ending in dentin. For all restorations dates of placement, replacement and failure were recorded. Survival times were calculated and Cox-regression analysis was applied to assess influence of cervical margin extension on survival of restorations. Hazard ratios (HR) were calculated.

Results: Of the 1912 restoration sites examined, 655 failed during the average 13.7 years observation time, 399 restorations with margins ending in enamel and 256 with margins ending in dentin. Cox-regression analysis revealed that restorations ending below the CEJ (HR 1.28) and the number of restoration surfaces (HR 1.15) resulted in a significantly increased risk for failure. In general, amalgam and composite restorations had comparable survival. The cracked tooth syndrome only was found in relation to amalgam restorations, whereas secondary caries was found more in relation to composite restorations (HR 1.96, $p < 0.001$). However, no difference in secondary caries was found between restorations ending in enamel and those ending in dentin.

Conclusion: Differences in survival between restorations ending in dentin or enamel were found, although a relation with secondary caries could not be established.

0197 (151492)

Four-year clinical evaluation of a self-adhesive luting agent

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Objectives: The aim of this randomized controlled clinical trial was to evaluate the 4-year clinical performance of a self-adhesive resin cement, RelyX Unicem (3M ESPE), used for cementation of ceramic inlays. In addition, the influence of selectively acid-etching enamel prior to luting on the clinical performance of the restorations was assessed.

Methods: Sixty-two IPS Empress 2 inlays/onlays were placed in 31 patients by two experienced clinicians. The restorations were luted with RelyX Unicem with (=experimental group: E) or without (=control group: NE) prior enamel etching with phosphoric acid. At baseline, 6 months, 1, 2 and 4 years after placement, the

restorations were assessed by two calibrated investigators using modified USPHS criteria. Ten selected samples of each group were investigated under SEM regarding morphological changes at the cement-inlay interface.

Results: The recall rate at 4 years was 97%. Two restorations (1 E, 1 NE) were lost, and one restoration (E) had to be replaced due to inlay fracture resulting in a survival rate of 95%. No significant differences between the experimental and control group were noticed regarding all criteria except for colour match (McNemar, $p < 0.05$). An obvious deterioration in marginal integrity was observed after 4 years as only 5% (E=7%; NE=3%) of the restorations exhibited an excellent marginal adaptation. In 90% of the restorations small, still clinically acceptable marginal deficiencies were observed. SEM of the luting gap showed an increased wear of the RelyX Unicem cement over the 4-year period.

Conclusions: The self-adhesive luting cement RelyX Unicem can be recommended for bonding of ceramic inlays/onlays. Additional selective enamel etching does not improve the clinical performance of the restorations within the 4-year period.

0198 (151422)

Three-year clinical success and survival of composite based indirect restorations

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Objectives: The objective of this study was to test the new resin composite "NECO" as a material for indirect restorations clinically.

Methods: Forty-five patients were selected, of which 12 men and 33 women, with a mean age of 53. A total of 91 post-canine NECO (Heraeus Kulzer, GmbH) restorations were placed, of which 86 full crowns and 5 onlays. Restorations were cemented with either 2bond2 or Fuji Plus. The restorations were evaluated 1-2 weeks (baseline), 6 months, 1, 2, and 3 years after placement. At these recalls, success and survival data of the abutment teeth and of a comparable reference teeth which served as a control, were documented. Survival was defined as the restoration being in situ, and success as the restoration in situ without complications.

Results: After 3 years of clinical service, the restorations had success and survival rates of 84.8 and 91.6%, respectively. Restorations were unsuccessful because of debonding (n=5) with possibility for recementation, endodontic (re)treatment need (n=5), and repairable core fracture (n=3). These restorations were continued to be followed after repair. Restorations did not survive because of irreparable core fracture (n=4), debonding (n=1), crown fracture (n=1), and root fracture (n=1).

Cementation with Fuji Plus cement resulted in higher success (93.1%) and survival (100%) rates than cementation with 2bond2 cement of 81.4 and 87.9% respectively. Restorations on vital teeth resulted in higher success (86.8%) and survival (95.3%) rates than restorations on endodontically treated teeth of 82.6 and 87.5% respectively. Complications with vital teeth were mostly less severe than complications with endodontically treated teeth.

Conclusion: Success and survival rates after three years of NECO restorations are 84.8 and 91.6%, respectively. Abutment teeth being vital and cementation with Fuji Plus leads to higher success and survival rates.

0199 (151655)

Keynote Lecture: LBP modulation of LTA-induced TLR2 signalling in human odontoblasts

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Previous studies have suggested that human odontoblasts are involved in the dental pulp immune and inflammatory response to oral pathogens that invade dentin during the caries process. However, how odontoblasts regulate the early pulp response to Gram-positive bacteria, which predominate in shallow and moderate dentin caries, is not completely understood. We previously showed that activation of Toll-like receptor (TLR)2, a pattern recognition molecule activated by lipoteichoic acid (LTA) from Gram-positive bacteria, triggers TLR2 up-regulation, NF- κ B nuclear translocation, and production of pro-inflammatory chemokines and cytokines, including CXCL8 and IL-6, by odontoblasts in vitro.

Objective: To determine whether odontoblast activation by LTA is modulated by the lipopolysaccharide-binding protein (LBP), an acute-phase protein over-expressed in inflamed pulps which has been shown to interact with LTA.

Methods: Human teeth were collected with the informed consent of the patients, in accordance with the Declaration of Helsinki and following a protocol approved by the local ethics committee. Odontoblast-like cells were differentiated from pulp explant cultures derived from non-erupted healthy third molars. Cells were stimulated for 4 h with various concentrations of LTA, alone or in association with LBP. Gene expression of the pro-inflammatory chemokine CXCL8, the cytokine interleukin-6 (IL-6), and the LTA receptor TLR2 was assessed using real-time PCR. Results were expressed as mean values \pm SD and statistical analysis was determined with Student's t test.

Results: CXCL8, IL-6 and TLR2 genes were significantly up-regulated by LTA, but this increase was reduced when LBP was added together with LTA in the culture medium.

Conclusion: These data demonstrate that LBP negatively regulates TLR2 signalling induced by LTA in human odontoblasts and might play a role in protecting human dental pulp from excessive immune response to cariogenic Gram-positive bacteria. Supported by University Lyon 1, CNRS, IFRO and Région Rhone-Alpes.

0200 (152181)

Human dental pulp stem cells differentiate towards peripheral glial cells

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Objectives: In the peripheral nervous system, Schwann cells (SCs) are responsible for the formation and preservation of myelin sheaths around axons. Also, SCs play an important role in the regeneration of peripheral nerves after Wallerian degeneration. However, for the treatment of peripheral nerve injury, an alternative cell source is needed since SCs are difficult to obtain and the clinical applications are difficult. Recently, it has been described that dental pulp stem cells (DPSC) are capable of differentiating into glial and neuronal cells and are able to produce neurotrophic factors like BDNF, GDNF and NGF. Since DPSC already express glial markers like S100 and NGFRp75, it is interesting to further investigate their potential to differentiate into glial cells of the peripheral nervous system, like SCs.

Methods: DPSC were isolated from human dental pulp tissue and cultured via the explant method. When confluency was reached, cells were subcultured and media was changed every 3-4 days. In vitro, DPSC were stimulated to differentiate into SC-like cells via a mix of growth factors. After 21 days in culture, the differentiation of DPSC towards SCs was analyzed. Via immunocytochemistry, the expression of SC markers GFAP, S100 and NGFRp75 was evaluated. To further elucidate the differentiation into SC-like cells, reverse-transcriptase PCR, cytokine array, and transmission electron microscopy was performed.

Results: At the mRNA level, transcripts of GFAP, p75 and S100 were observed in SC differentiated DPSC. These results were confirmed by immunocytochemical analysis. Furthermore, an increased production of neurotrophic factors like BDNF, GDNF, NCAM-1, NT-3 and TGF-Beta1 was found. Ultrastructural analysis showed a Schwann cell morphology.

Conclusions: The results of this study indicate that DPSC are capable of differentiating towards peripheral glial cells, like SCs. Therefore, DPSC could be an alternative cell source for future stem cell treatment of peripheral nerve injuries.

Angiogenic properties of human dental pulp stem cells (hDPSC)

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Objectives: Since the currently used prostheses are prone to biological and mechanical failure and inorganic pulp replacement materials often lead to pulp necrosis, there is an urgent need for new pulp regeneration strategies. Recently, adult mesenchymal stem cells have been isolated from tooth dental pulp tissue. These human dental pulp stem cells (hDPSC) have the capacity for multilineage differentiation into cell types such as chondrocytes, osteoblasts and neural-like cells and are currently evaluated in clinical trials for bone tissue engineering. Moreover, this stem cell population has been suggested to provide an effective strategy for pulp regeneration. As neovascularisation is a crucial event for the success of pulp tissue regeneration, we investigated in detail the angiogenic activities of hDPSC.

Methods: We evaluated the angiogenic proteins produced by the hDPSC by means of an antibody array. The results of this array were validated by ELISA and RT-PCR. Furthermore the biological effects of the hDPSC on mouse brain endothelial cells (MBEC) were investigated with an in vitro proliferation and migration assay.

Results: Numerous angiogenic factors such as vascular endothelial growth factor (VEGF), interleukin-8 (IL-8), monocyte chemoattractant protein-1 (MCP-1), fibroblast growth factor-2 (FGF-2) are highly expressed by these stem cells. Also anti-angiogenic factors such as endostatin and TIMP-1 were found in the conditioned medium of the hDPSC. Moreover, hDPSC significantly induced MBEC migration in vitro, while no effect on MBEC proliferation could be found.

Conclusions: Our data clearly show that hDPSC are able to induce angiogenesis in vitro, particularly endothelial cell migration. In the future, the potential effect of hDPSC on the endothelial survival and tube forming capacity will be investigated. If hDPSC are able to contribute to vascular networks, this will have great therapeutic potential, not only in terms of pulp regeneration, but also as a cell-based therapy for stroke and myocardial infarctions.

Contribution of pulpal stem cells to heal a wounded pulp

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Objectives: Our aim was to (1) localize cells entering in mitosis in response to pulp injury and (2) evaluate whether the implantation of pulpal multipotent progenitors improves tooth repair in a rat molar after pulp exposure.

Methods: (1) Immunohistochemical analysis of the cell proliferation zones 24-48h after pulp exposure. (2) Histological analysis of dentin formation after implantation of pulp-derived clonal precursor cells in the rat molar.

Results: We have identified three well-delimited zones of cell proliferation 24-48h after pulp exposure. In the crown, cells leaving their quiescent state are recruited in the isthmus between the mesial and central parts of the pulp chamber as well as between the coronal pulp and the upper pulp part of the root. The restricted location of these mitotic cells within the crown precisely overlaps the area where the dentinal bridge will be formed. In the root, far from the inflammatory site, proliferative cells can also be visualized near the apex. Besides, by exploiting a mouse pulp-derived cell line, we provide the prime evidence that implantation of exogenous stem cells in a rat molar leads to the formation of a robust dentin barrier. Osteodentin totally fills the mesial pulp chamber and in turn, protects the residual pulp. The pulp vitality is preserved and the inflammatory process is also rapidly resolved. Thus, a pulp-derived stem cell line has the ability to contribute to heal a wounded pulp when re-introduced within its "natural" environment. These data provide the foundation for characterizing the signals that support their reparative activity.

Conclusions: Future prospects will aim to determine whether the implanted pulpal cells are directly involved in reparative dentin formation or whether they induce the recruitment and differentiation of host progenitor cells. Our pre-clinical experimental approach paves the way to the development of cellular therapies for pulp injury.

The influence of prostaglandin D2 on human mesenchymal stem cells

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Objective: Periodontal regeneration starts with the proliferation and differentiation of progenitor cells and the formation of the extracellular matrix. Mesenchymal stem cells (hMSCs) are able to differentiate into cells of the periodontal complex and form periodontal tissue. Previous studies indicate, that prostaglandin D2 (PGD2) is a potent modulator of osteoblastic function and bone formation. The aim of this study was to observe the influence of PGD2 on proliferation and differentiation of hMSCs.

Methods: hMSCs were cultivated with three different concentrations of PGD2 (0,1ng/ml; 0,5ng/ml; 1,0ng/ml). Cells were counted and the cumulative population doubling was calculated at 1, 2, and 4 weeks. Additionally hMSCs were stimulated with osteogenic supplements and PGD2. Following the osteogenic stimulation, the amount calcium deposition was determined and histologically assessed. The expression of osteogenic markers after 21 days was determined using RTQ-PCR. Statistical analysis was performed, using Games-Howell test at a level of significance of $p < 0.05$.

Results: Compared to the unstimulated control-group, the population-doubling of the 0,1ng/ml and the 1,0ng/ml PGD2 group decreased on day 21 and 28. The population doubling of the 0,5ng/ml PGD2 group was similar to that of the control-group. The amount of deposited calcium decreased in all PGD2 stimulated groups compared to the control group. The RNA-expression of alkaline phosphatase ($p < 0,001$) and collagen I ($p < 0,001$) was significantly higher in the 0,5ng/ml concentration-group compared to the other PGD2 groups and the control group.

Conclusion: The results indicate, that PGD2 has no effect on the proliferation rate but a strong effect on the regulation of osteogenic differentiation and bone formation at a concentration of 0,5ng/ml. Higher and lower concentrations of PGD2 inhibited the proliferation and the osteogenic differentiation of hMSC. Based on these observations it can be assumed, that the influence of PGD2 on hMSC follows a very fine regulated concentration-dependent system.

Introduction: Management of Dental Caries: How Relevant Are Properties of Restorative Materials?

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All around us, science is rapidly expanding with new knowledge. Focusing on health care, many dentists and dental researchers are involved in these developments. Cutting-edge research continues to cross the boundaries of established domains, exploring new venues in search for answers to unresolved clinical problems. Whether that new knowledge is in dental materials science, our profession's backbone for decades, or moves to incorporate biological and social sciences, our knowledge base is expanding exponentially in each of these arenas.

How does this relate to the management of dental caries? Despite the many advances over the last decades, caries disease is still a major health care problem for many of us, and increasingly so on a global scale. This presentation is placing biologic and materials advances in a broader perspective, to show their potential complimentary impact on oral health: on dental practice, research and health care policy.

Properties of Dental Materials for the Next 20 Years: a Delphi Survey

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The aims of this study were to forecast trends in restorative dentistry for the next 20 years and to determine treatment goals and corresponding material properties. Methods: A panel of 4 experts identified 8 key questions, which were sent to international experts in restorative and preventive dentistry using the DELPHI method. The survey was administered as internet questionnaire by TNS EMNID (Germany). A first round with 15 international experts resulted in a semantic precision of the questions and the completion of the items for two additional rounds. In the second round 105 experts from 35 countries rated the items developed in round 1 of the 8 questions by using a Likert scale. In round 3 the same experts received the results of round 2 and were asked to agree or disagree to the results by re-voting all questions. Among the 8 questions the following 2 questions were of interest regarding this report: Q1) „What will be the future role of restorative treatment?“, and Q6) „What will be the key qualities for clinical success of restorations?“. For both questions the experts were asked to evaluate the importance and the feasibility for each item of the questionnaire. Results and Conclusions: As expected all items developed by the experts in round 1 were regarded to be important expressed by the fact that the mean values for the future importance of items ranged between 2.8 and 3.8 (Likert scale 1-4). The most important items for Q1 were „preservation of existing enamel and dentin tissue“, „prevention of secondary caries“, „maintenance of the pulp vitality“ and „improvement of aesthetics“, and for Q6 „optimization of adhesion“, „biocompatibility“, and „minimization of technical sensitivity“. „Prevention of secondary caries“ was rated as having a high potential (potential = (importance + (Importance-Feasibility)) for future restorative treatment in general and key property of future dental materials. The survey and particularly the procedure support of the internet based survey was sponsored by DENTSPLY DETREY, Germany

Dental Materials' Needs for the Management of Caries Risk Groups: a Delphi Survey

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The aims of this study were to forecast trends in restorative dentistry for the next 20 years and to determine treatment goals and corresponding material properties for caries risk groups. Methods: A panel of 4 experts identified 8 key questions which were sent to international experts in restorative and preventive dentistry using the DELPHI method. The survey was administered as internet questionnaire by TNS EMNID (Germany). A first round with 15 international experts resulted in a semantic precision of the questions and the completion of the items for two additional rounds. In the second round 105 experts from 35 countries rated the items developed in round 1 of the 8 questions by using a Likert scale. In round 3 the same experts received the results of round 2 and were asked to agree or disagree to the results by re-voting all questions. Among the 8 questions the following 4 questions were of interest regarding this report: Q4) „Which additional goals compared to traditional restorative therapy should be fulfilled by future materials or technologies to improve the success rate in risk groups?“, Q5) „Which properties of a special restorative material are needed to achieve these goals?“, Q7) „Which key properties of restorative materials or devices will be required for the treatment of elderly, special care patients or children?“, and Q8) „Do you agree to the following statements?“. Results and Conclusions: Elderly and migrants were identified as increasing caries risk groups especially in industrial countries. The requirements of restoratives for elderly and children should have similar properties worldwide like ease of use, optimized adhesion and biocompatibility; however, for some properties like wear behaviour, erosive stability or affordability different rankings in different countries were found ($p < 0.05$). Children and older patients have similar requirements of restorative materials worldwide due to an increased caries risk. There is a need for restorative materials designed for these risk groups The survey and particularly the procedure support of the Internet based survey was sponsored by DENTSPLY DETREY, Germany

Requirements for New Dental Materials: Clinically Relevant Testing

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New dental materials are brought to the market at a rapid pace, often with promises of enhanced clinical performance over existing materials. A battery of testing methods is available for evaluating these materials to ensure that they are safe and to gauge their potential clinical effectiveness. While most would agree that clinical studies are the best screening methods for new materials, they are expensive and time consuming, mitigating the possibility that new products will always be adequately clinically tested before marketing. Thus, it becomes important to identify in vitro test methods that correlate with clinical performance. This presentation will discuss the difficulties encountered in trying to predict clinical performance from in vitro tests, and will identify those methods for which some evidence of relevance exists.

Periodontal and Cardiovascular Interactions – a Clinical Point of View

[I. GERA](#)

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The first papers indicating a close association between *Chlamydia pneumoniae*, *Helicobacter pylori* or Cytomegalovirus infection and the incidence of cardiovascular diseases (CVDs) were published in the mid 80's. The bacterial involvement in the development of atherosclerosis may rather be an effect of the total infectious burden than a single bacterial infection. Periodontitis is one of the most common infectious diseases in humans and the periodontal pockets harbouring several hundreds of pathogenic bacterial species that can enter into the systemic blood circulation sustaining a chronic infectious burden in the body. Since Mattila and co-workers published the results of their case control studies in 1989 several hundreds of epidemiological studies have identified statistically significant associations between the presence of deep periodontal pockets or periodontal bone loss and cardiovascular diseases. Nevertheless since that time on the nature of this association has always been disputed. Data based on meta-analyses have suggested odds ratios between 1.1 and 2.2. The case-control and cross sectional studies showed greater odds of an association between periodontitis and CVDs. Meta-analyses of prospective and retrospective follow-up studies have shown only a slightly increase of the risk of cardiovascular disease. Several studies have identified bacteria associated with periodontitis in biopsy specimens collected from the blood vessels or heart valves. Several markers of inflammation such as CRP, interleukin-6, plasminogen factors, white blood cell counts, and serum lipids are significantly increased in periodontitis and might have a negative effect on the endothelium and arterial flow rates and may contribute to cardiovascular disease in susceptible subjects. Recently published papers showed evidence that following periodontal therapy arterial flow rate improved. Although more longitudinal and intervention trials are needed to identify how periodontitis and periodontal therapy can affect cardiovascular system. The review is to summarize the most recent findings and discuss possible biological mechanisms involved.

0209 (153513)

Genetic and Epigenetic Aspects of the Association Between Periodontitis and Cardiovascular Disease

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Genetic risk factors, lifestyle and environmental factors, including periodontal pathogens, play a role in complex diseases such as periodontitis. Many genetic factors in periodontitis have been investigated, but not all are as strong we have hoped for. Multiple genes play simultaneously a role and ethnic differences exist. Further, some new data in twins indicate that genetic factors are indeed part of the complexity of the pathophysiology of periodontitis, but not fully deterministic for extent and severity of the disease. We believe here epigenetics come into play. Repeatedly clear associations are observed between periodontitis and cardiovascular diseases. Cardiovascular diseases are also complex diseases with an etiology similar to other complex disease, such as genetic risk factors, lifestyle and environmental factors. There has been large efforts to dissect the possible causative effects of periodontitis for cardiovascular diseases. However, we have recently identified common risk genes; we hypothesize now that both oral bacteria with frequent bacteraemias and shared inflammatory reactions may connect these two diseases. Throughout life epigenetic changes may occur in the shared key genes of both periodontitis and cardiovascular diseases which could explain the coexistence of these two conditions.

0210 (153514)

Periodontal Disease and Premature Birth Complication – Arguments for

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During past years, a new area of periodontal medicine has emerged and new evidence has been collected relating to the connection between periodontal infection and systemic diseases. For these days about 200 scientific papers were published related to preterm birth and periodontitis. Results of scientific researches were analyzed, including animal experiments, cross-section, case-control and interventional studies. It was shown in different studies that an infection may be distant from the fetal-placental unit or the genitourinary tract, yet still present a risk for preterm birth, as a result of the indirect action of translocated bacteria and bacterial products or the action of maternally-produced inflammatory mediators. During pregnancy vascular permeability increases as a result of increased levels of progesterone, consequently the epithelial barrier effect of the gingival tissues decreases. In the case of a weaker or exaggerated host immune response these repeatedly occurring bacteremias can have great influence on the systemic condition of patients, in this relation the pregnancy outcome. The comparison of the different studies has the limitation of different sample size, inclusion and exclusion criteria, ethnicity and social background of the pregnant women, and the lack of uniform criteria of periodontal disease, and adverse pregnancy outcome. The number of studies which found evidences for the association between maternal periodontitis and preterm birth and low birth weight are much greater in number, then those did not find a correlation. For future researches a consensus in criteria of periodontitis and study protocol would be necessary that would provide the possibility to conduct great multicenter trials in different countries including women with different social circumstances. The research should be continued, since the average age of women at first delivery increased in the last decades.

0211 (153515)

Periodontal Disease and Premature Birth Complication – Arguments Against

[G. WIMMER](#)

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Maternal periodontal disease is a highly prevalent condition that has been studied extensively in relation to adverse pregnancy outcomes, including preterm delivery, preeclampsia, and low birth weight. Investigators speculate that hematogenous transport of bacteria and/or pro-inflammatory mediators from sites of periodontal infection into the placenta, fetal membranes, and amniotic cavity induces pathological processes that lead to these adverse outcomes. Preliminary observational studies supported this hypothesis, but more recent work do not demonstrate an increased risk of adverse pregnancy outcomes among women with periodontal disease, and most randomized trials fail to demonstrate improved perinatal outcomes following treatment of periodontal disease in pregnancy. The lecture describes the basics as well as possible pathogenic backgrounds of this connection. Its conclusions regarding the clinical implications are derived from the according recent literature.

0212 (153806)

The Biology of Dental Materials: From Toxicity to Tissue Regeneration

[G. SCHMALZ](#)

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0213 (151273)

Radiopacity Of Dental Adhesives: A Comparative Study

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Objectives: To evaluate the radiopacity of 10 popular adhesive systems and compare them with healthy and decayed human enamel and dentin.

Methods: Samples of 10 adhesives (A.R.T.Bond (ART), One Coat™Bond (OCB), One Coat™7.0 (OC7) and One Coat™Self-etching Bond (OCS) from Coltène Whaledent; Adper™Scotchbond™Multi-purpose Adhesive (ASM), Adper™Scotchbond™ 1XT Adhesive (AS1XT), Adper™Scotchbond™SE (ASSE) and Adper™Easy Bond (AEB) from 3M-ESPE; Optibond™FL (OFL) and Optibond™All-in-One (OAO) from Kerr), (n=30) (10 mm in diameter and 2 mm in thickness) were prepared and compared to slices (2 mm thickness) of human healthy and decayed enamel and dentin (n=12). An x-ray was taken per specimen and 9 measurements of the radiodensity were obtained per sample using a transmission densitometer (X-Rite). Radiodensity data (optical density unit - ODU) were statistically analyzed using Kruskal-Wallis test followed by post-hoc paired comparisons.

Results: Radiopacity varied between adhesives (range: 0.27±0.03 to 1.82±0.06 ODU). Only OFL (0.29±0.05 ODU) and ASSE (0.27±0.03 ODU) showed a radiopacity significantly higher than healthy enamel (0.42±0.03 ODU) and dentin (1.08±0.05 ODU) (p<0,05). ART (1.82±0.06 ODU) and OCS (1.63±0.03 ODU) showed no significant difference to decayed dentin (2.29±0.32 ODU)(p>0,05). All other adhesives were less radiopaque than healthy enamel and dentin.

Conclusion: Popular adhesive systems vary considerably in radiopacity. Some adhesives present a radiolucency similar to decayed dentin which is critical for an accurate differential diagnosis and subsequent clinical treatment procedure.

Marginal microleakage evaluation-in-class II resin restorations by direct versus indirect-techniqueJ. MARTINS¹, M. POLIDO¹, J. BRITO¹, and A.C. AZUL²¹Dental Materials, Instituto Superior de Ciencias da Saude Egas Moniz, Caparica, Portugal, ²Operative Dentistry, Instituto Superior de Ciencias da Saude Egas Moniz, Caparica, Portugal**Objectives:** The purpose of this in vitro study was to evaluate the marginal microleakage in class II preparations with enamel margins, restored with a composite resin by direct versus indirect technique.**Methods:** Twenty human extracted molars were used in this study. In each tooth, two standardized Class II preparations were made (mesial and distal). Preparations were randomly restored by a direct technique (Group G1: n=20) or by an indirect technique, (Group G2: n=20) with Tetric EvoCeram composite resin (Ivoclar Vivadent AG – Schaan, Liechtenstein) and All-Bond 2 adhesive system (Bisco, Inc – Schaumburg, IL-USA). Preparations restored by the indirect technique were cemented with C&B resin cement (Bisco, Inc – Schaumburg, IL-USA). All products were manipulated according to manufacturer instructions. After restoration, teeth were stored in distilled water for 24 hours at 37°C, thermo cycled 500 cycles, between 5 °C and 55 °C; dwell time of 30s, sealed and immersed in 0.5% basic fuchsin for 24 hours. Teeth were longitudinally sectioned, in two halves in a mesio-distal direction, and microleakage was evaluated using the microleakage score: 0 - no dye penetration, 1 - dye penetration limited to enamel wall, 2 - dye penetration extending to dentinal wall, 3 - dye penetration extending to pulpal wall. Data were statistically analyzed using Wilcoxon signed-rank and Sign tests, at the 5% significant levels.**Results:** The mean microleakage is shown in the following table. No significant differences were found between the groups (p>0.05). Nevertheless, Group G2 showed a tendency to less microleakage.**Conclusion:** This study showed that both direct and indirect class II composite resin restorations, with enamel margins, presented similar results to microleakage.

Restorative	Microleakage Frequency							
	0		1		2		3	
Technique	n	%	n	%	n	%	n	%
Direct	5	25	13	65	2	10	0	0
Indirect	11	55	7	35	1	5	1	5

Immediate and aged bond strength to uncut and bur-cut enamelS. HOSHIKA¹, A. KAMEYAMA¹, Y. SUYAMA¹, J. DE MUNCK¹, H. SANO², and B. VAN MEERBEEK¹¹Leuven BIOMAT Research Cluster, Department of Conservative Dentistry, Catholic University of Leuven, Leuven, Belgium, ²Department of Restorative Dentistry, Hokkaido University, Sapporo, Japan**Objectives:** To determine the micro-tensile bond strength (μTBS) of two self-etch adhesives to bur-cut and uncut enamel.**Methods:** The buccal and lingual enamel surfaces of 15 teeth were ground flat using a 100-μm diamond bur (bur-cut enamel), while the enamel surface of another set of 15 teeth were solely prophylactically cleaned (uncut enamel). Resin composite (Herculite XRV Ultra, Kerr) was bonded to the surfaces using either the 2-step self-etch adhesives OptiBond XTR (Kerr) or Clearfil SE Bond (Kuraray), or the 3-step etch-and-rinse adhesive OptiBond FL (Kerr) that served as gold-standard control. After 1-week water-storage at 37°C, specimens were serially cut into 1-mm2 stick-shaped micro-specimens, of which per tooth half of them were further subjected to 20,000 thermo-cycles (TC). The μTBS was determined at a crosshead speed of 1.0 mm/min. Failure analysis was performed using stereo-microscopy and SEM. Data were statistically analyzed by ANOVA and post hoc Tukey test.**Results:** After 1-week water storage and upon aging by thermocycling, both self-etch adhesives bonded significantly (p<0.05) less effectively to enamel than the etch-and-rinse OptiBond FL control (both to bur-cut and uncut enamel), except when OptiBond XTR was bonded to bur-cut enamel and a similarly high μTBS was measured (p>0.05). Aging by thermocycling did not decrease the μTBS for any of the adhesives as well as enamel substrates (p>0.05).**Conclusions:** The best bonding effectiveness to enamel is still achieved by etching with phosphoric acid following an etch-and-rinse approach, while specific self-etch adhesives may bond equally well on the condition that enamel is beforehand roughened by bur.**Influence of CHX on Microtensile Bond Strength of Self-etching Adhesives**

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Objective: The aim of the present study was to evaluate the influence of different concentrations of chlorhexidindigluconate (CHX) on microtensile bond strength (mTBS) of two self-etching dentin adhesives (Futurabond NR, Bond Force) in vitro.**Methods:** 150 extracted third molars were included in this study. All teeth were specially prepared allowing the simulation of dentin perfusion. The specimens were randomly assigned to one of the ten groups of fifteen samples each: group F-C: Futurabond NR, control group (no CHX-application); F-0.2: immersion for five minutes in 0.2% CHX prior to bonding with Futurabond, F-2: immersion for five minutes in 5% CHX prior to bonding, F-5: immersion for five minutes in 2% CHX prior to bonding, groups B-C, B-0.2, B-2 and B-5 followed the same procedure with Bond Force as adhesive. MTBS was measured 15 minutes after application of the composite (Tetric Ceram) using a Zwick testing machine.**Results:** Following mTBS were evaluated (mean values and standard deviations in MPa):

	F-C	F-0.2	F-2	F-5	B-C	B-0.2	B-2	B-5
Mean	23.9	18.4	17.3	16.3	23.0	19.6	13.9	10.8
+/-	7.7	4.4	5.2	5.7	7.5	5.6	6.5	3.0

Statistical analysis showed a significant influence of the used dentin adhesive and the pre-treatment with CHX in different concentrations (p< 0.001, ANOVA). The application of 2% and 5% CHX before bonding procedure (F-2, F-5, B-2, B-5) resulted in a significant reduction of mTBS compared to the untreated control groups (F-C, B-C) (p< 0.05, Tukey test). Between the controls and the 0.2% CHX-groups, no significant differences could be detected (p> 0.05, Tukey test). Pairwise comparison between Futurabond and Bond Force showed no significant differences in all groups (p> 0.05, Tukey test).

Conclusions: Within the limitations of an in vitro investigation it can be concluded that CHX in higher concentrations affected the mTBS of both tested self-etching adhesive systems.

Effect of Pro-Argin Technology on Bond Strength After Artificial Aging

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Objectives: The aim of this study was to evaluate the effect of a recently introduced desensitizing paste based on Pro-Argin technology (elmex Sensitive Professional Desensitizing Paste, GABA, Germany) on microtensile bond strength of a total etch adhesive system (Syntac, Vivadent, Liechtenstein) after artificial aging using water storage and application of a provisional cement (Temp Bond, Kerr, Germany).

Methods: 60 freshly extracted third molars were included. All teeth were specially prepared allowing the simulation of dentin perfusion and standardized conditions. The specimens were randomly assigned to four experimental groups of fifteen each: group 1: control without desensitizer; group 2: desensitizing paste application; group 3: desensitizing paste, water storage; group 4: desensitizing paste, application of Temp Bond, water storage. Group 3 and 4 were stored in water for one week. In group 3 Temp Bond was additionally applied after desensitizer application. Microtensile bond strength was measured using a Zwick testing machine.

Results: For the test series following tensile bond strengths were evaluated (mean values and standard deviations in MPa): Group 1: 24.66 (+/-7.96), group 2: 15.54 (+/-2.99), group 3: 13.61 (+/- 2.25), group 4: 16.16 (+/- 1.55). Statistical analysis showed a significant influence of the different aging procedures on microtensile bond strength ($p < 0.001$, ANOVA). After application of the desensitizing paste a significant reduction of bond strength could be observed compared with the untreated control ($p < 0.05$, Tukey test). Pairwise comparison showed no further significant reduction of bond strength in specimen after water storage and application of the provisional cement ($p > 0.05$, Tukey test).

Conclusions: Within the limitations of an in vitro investigation it can be concluded that application of the desensitizing paste based on Pro-Argin technology might affect microtensile bond strength of the used total etch adhesive system.

Influence of Surface Preparation on Performance of Self-Etch Adhesives

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Objectives: Bond strength of self-etch adhesives is known to depend on the grain size of the bur. Aim of this study was to assess the shear bond strength (SBS) of several self etch adhesives to dental surfaces prepared with grinding media of different coarseness.

Methods: Bovine incisors were embedded in cold-cure acrylic resin. The labial surface of each tooth was ground to expose enamel or dentin using grinding media of 80 (coarse), 400, 1200, and 4000 (fine) grit, representing mean abrasive particle sizes of 200, 35, 15, and 6µm. A cylindrical button of Filtek™ Z250, A3 (3M ESPE, 2.36mm diameter, 2mm height) was cured on the tooth surfaces treated with an experimental adhesive EXL-759, (3M ESPE), iBond SE (IBSE, Heraeus Kulzer), AdheSE One F (AOF, Ivoclar-Vivadent) according to the manufacturer's instructions (n=5). A notched-edge shear method (Ultradent) was used to measure the SBS.

Results: The table shows the SBS in MPa. The standard deviations (SD) are given in parentheses. All data per substrate were analyzed by ANOVA and multiple comparisons using Fisher's LSD procedure ($p < 0.05$). Means with the same letters are statistically the same.

Adhesive_Grit	Enamel SBS [MPa]	Dentin SBS [MPa]
EXL-759_0080	24.9(3.8)A	25.9(3.1)c
EXL-759_0400	25.2(4.2)A	27.3(3.3)b,c
EXL-759_1200	25.1(2.8)A	31.8(1.2)a,b
EXL-759_4000	26.7(3.5)A	36.8(5.5)a
IBSE_0080	19.6(3.0)B	15.5(3.8)d
IBSE_0400	24.1(3.7)A	15.1(2.5)d
IBSE_1200	25.4(1.1)A	17.1(2.6)d
IBSE_4000	25.7(3.5)A	18.1(2.5)d
AOF_0080	13.9(2.7)C	6.7(6.3)e
AOF_0400	8.4(3.9)D	9.7(5.9)e
AOF_1200	16.7(2.7)B,C	10.9(3.8)d,e
AOF_4000	12.0(2.2)C	13.3(7.5)d

Conclusion: Multiple statistically significant differences were found. EXL-759 yielded higher SBS than the comparative materials, iBondSE and AdheSE One F, independent of surface preparation. Fine grinding media lead to higher SBS than coarse grinding media, although this trend was not always significant.

Microleakage of porcelain veneers prepared using high-speed and sonic instrumentation

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Objectives: To compare marginal microfiltration in porcelain veneer restorations in relatio to the instrument used for dental preparation.

Methods: Twenty-four extracted human upper central incisors (n=24) were selected for study. They were divided randomly into two groups (n=12). Group I samples underwent dental preparation using high-speed rotary diamond burs, whilst Group II used oscillating sonic diamond burs. Standard buccal chamfer preparation was carried out for both groups. All the restorations were performed using IPS Empress ceramics. 2% methylene blue was used to evaluate microfiltration. Teeth were cut long-ways into three parts along their longitudinal axes and microfiltration was measured at two points – cervical and incisal – on each cut. Before bonding, the prepared teeth were evaluated by SEM and Laser Scanning confocal microscopy.

Results: Analysis of the dentinal shoulders (cervical) microleakage produced a value of 13.2% in Group I and 7.5% in Group II with significantly different ($p < 0.05$), whilst incisal microleakage was 1.6% for Group I and 1% for Group II not significantly different. Cervical scanning electron micrograph revealed sealed dentinal tubules, the dentinal smear layer and an absence of enamel prisms; Incisal analysis showed enamel prisms. Group I with rounded abrasion grooves with milled effect and thick smear lager. Group II showed abrasive erosion, deep grooves and thin smear layer. Laser scanning confocal microscopy analysis was used to quantify the surface topography finding Ra 2.1 µm for Group I, and Ra 3.5 µm for Group II. The oscillating sonic significantly increased the Ra ($p < 0.05$).

Conclusions: Porcelain veneers prepared with high velocity rotating burs produced significantly more microfiltration. No differences were found in the incisal enamel area. Dental preparations show dentin tubules at cercial level and enamel rods at incisal level. Oscillating sonic instrumentation prepares rougher surfaces.

Shear and flexural viscoelastic properties of dental adhesives

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Objectives: The aim of this study was to evaluate the viscoelastic properties and creep deformation of contemporary dental adhesives under different conditions. **Methods:** The materials tested were: Clearfil S3 Bond (Kuraray), Optibond Solo Plus (Kerr), One-Step Plus (Bisco), Silorane System Adhesive Bond (3M ESPE) and cmf Adhesive System Bond (Saremco). A bonding resin was used as control (Heliobond, Ivoclar Vivadent). Cylindrical specimens for each material (n=4, d=1 mm, l=18mm) were prepared and stored dry for 24h at 21oC. A Sm-Co magnet was attached to the end of each specimen generating torque (M = 3.53x10⁻³ Nm/A) at the center of a Helmholtz coil. Each specimen was tested at four different conditions: 21oC dry, 21oC wet, 37oC wet and 50oC wet under shear and bending. Young's modulus E, shear modulus G and Poisson's ratio v were calculated. Creep testing was performed under shear stress (0.2MPa, 0.3MPa and 0.4MPa) with a constant torque being applied for 3h to the specimen and then let to recover for 50h. Statistical analysis was performed with two-way ANOVA and Bonferroni post-tests (α:0.05). **Results:** Statistically significant differences were found among the materials tested. Shear modulus G ranged from 0.06GPa to 1.99GPa depending on the conditions, while Young's modulus E ranged from 0.3GPa to 5.69GPa. All materials were affected by the testing conditions with the moduli decreasing with the increase of temperature. Under creep, the materials always exhibited permanent deformations after 50h, with the exception of Protobond, Optibond and cmf which fully recovered at the lowest stress (0.02MPa). **Conclusions:** The viscoelastic properties of the dental adhesives tested were affected by temperature and water storage. Moreover, the materials were susceptible to creep deformation.

Bond Strengths Obtained by General Practitioners with a Portable Device

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Objective: Very often adhesive bond strengths are evaluated by researchers either from the university or industry. Aim of this study was to compare shear-bond strengths created by a large number of general practitioners with a portable testing device. **Methods:** Immediate bond strengths were collected for 15 adhesives and one experimental adhesive (EXL759,3M ESPE). Control group: SBM(ScotchbondMultiPurpose), OFL(OptiBond-FL) and SYN(Syntac). Adhesives: AEB-SE(AdperEasyBond), AEB-TE(AdperEasyBond, with selective enamel-etch), ADO(AdheseOne), CSE(Clearfil-SE-Bond), FUB(Futurabond), IBO(iBond), OSP(OptiBond-Solo-Plus), PBN(Prime&Bond-NT), SBO(Scotchbond-1XT), XEV(XenoV), EXC(Excite), GBO(G-Bond). Data were collected from 27 events with a total of 376 private practitioners. A portable shear-bond tester (Bisco, Ref. T-63010K) was used for debonding of samples prepared by the Ultradent method. Bovine incisors were embedded in cold-cure acrylic resin. The labial surface of each tooth was ground to expose enamel (E) or dentin (D). After application of the adhesive a cylindrical composite button (Filtek Supreme XT/XTE, A2, 2.36 diameter, 1-2mm height) was light-cured on the prepared tooth surfaces. **Results:** Shear-bond strengths are reported in MPa (table). All data were analyzed by 1-way ANOVA and multiple comparisons using Fisher's LSD procedure (p<0.05). Means with the same letter are statistically the same.

	Dentin		Enamel
SBM	28.1(10.8) ^a	SBM	22.8(9.4) ^{ab}
EXL759	25.7(6.6) ^a	AEB-TE	21.7(6.3) ^a
OFL	17.6(8.6) ^b	SBO	21.1(7.6) ^{ab}
AEB	16.6(7.0) ^b	OFL	19.0(7.2) ^{bc}
SBO	15.8(9.1) ^{bc}	AEB-SE	15.6(5.6) ^d
ADO	12.5(6.2) ^{cd}	SYN	15.5(5.4) ^d
EXC	12.4(3.6) ^{bcd}	CSE	15.1(4.0) ^{cdef}
SYN	11.7(7.0) ^d	PBN	14.7(8.9) ^{de}
CSE	11.5(5.5) ^{de}	IBO	14.6(4.1) ^{de}
IBO	11.4(4.5) ^{def}	FUB	13.1(6.9) ^{def}
XEV	10.3(6.8) ^{def}	XEV	12.3(4.9) ^{ef}
FUB	9.6(5.6) ^{cdef}	OSP	10.5(5.6) ^{ef}
PBN	8.4(6.2) ^f	ADO	10.3(6.4) ^f
OSP	8.2(6.0) ^{def}		
GBO	7.5(5.3) ^{ef}		

Conclusions: Multiple significant differences were found between the different types of adhesives. The highest bond strengths for dentin were found for SBM and EXL759. For enamel the highest bond strengths were found for SBM, AEB-TE and SBO. Some of the 1-bottle adhesives showed similar or higher bond strengths than the multi-bottle adhesives SYN and CSE.

Bond durability of adhesives containing modified-monomer with/without-fluoride aged under pulpal-pressure

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Objective: To evaluate the dentin bond strength durability of adhesives containing modified-monomer with/without-fluoride after aging in artificial saliva and under intrapulpal pressure simulation (IPPS). **Materials and Methods:** Occlusal enamel of thirty-six freshly-extracted teeth was trimmed to expose mid coronal dentin. Roots were sectioned to expose pulp-chamber to connect the specimens to the pulpal-pressure assembly. Specimens were distributed over three groups (n=12) according to adhesive system used. The adhesive systems were: a two-step etch-and-rinse adhesive system (SB-Adper TM Single Bond 2, 3MESPE) and two single-step self-etch adhesives with the same modified monomer (bis-acrylamide); one containing fluoride (AOF, AdheSE One F, Ivoclar-Vivadent) and the other not (AO, AdheSE One, Ivoclar-Vivadent). Bonding was done while the specimens were subjected to 15mmHg IPPS. Resin composite (Valux Plus, 3M ESPE, USA) buildups were made. After curing, specimens were aged

in artificial saliva and under 20mmHg IPPS at 37°C in a specially constructed incubator either for 24h or 6 months prior to testing. Thereafter, bonded specimens (n=6/group) were sectioned into beams (n=24/group) with a cross-section of 0.9+/-0.1 mm² and subjected to microtensile bond strength (µTBS) testing using a universal testing machine. Data were statistically analyzed using Kruskal-Wallis and Mann-Whitney tests (P>0.05). Failure modes were determined using a stereomicroscope at x40 magnification.

Results: At 24h, SB showed statistically higher µTBS (P<0.05) than the other two adhesives which were not statistically different (P>0.05). The µTBS of SB fell significantly (P<0.05) after 6-month aging in artificial saliva and under IPP. For AO and AOF, the bond values at 6-month were not statistically different from the values measured at 24-h (P>0.05). Modes of failure were mainly adhesive and mixed.

Conclusions: Etch-and-rinse adhesives are more sensitive to IPPS than self-etch adhesives. Adhesives modification with hydrolytically stable monomers could be a valuable approach to enhance dentin bond durability.

0223 (152280)

In vitro analysis of interfaces materials-cavities prepared with LASER

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Objectives: The aim of this study was to analyze the hybrid layer=HL by scanning electron microscopy (SEM) in class I cavities, prepared kinetic with laser (WaterlaseMD-Biolase) and restored with different filling materials.

Methods: The study was realized in vitro on a sample of 40 human premolars and molars, extracted for orthodontic or periodontal reasons, divided at random into 4 equal groups=Gr. The cavities were made in enamel in a rectangular shape with a depth of 2,5mm, the laser being previously operated within a template to obtain equal volume; peaks MG6-MZ6 30%water, 60%air, for enamel 5,5W+20Hz and for dentin 3W+15Hz; filled using: SE™=SchotchbondEtch(3M™), P=Primer Vitremer, ASBP=AdperSingleBondPlus(3MESPE), SB=SingleBondDentalAdhesiveSystem3M™, halogen source (3M), in according to manufacturer's instructions as follows: Gr.1(n=10):P+Vitremer™Tri-CureGISystem(3MESPE); Gr.2(n=10):SE™+SB+Beautiful(Shofu); Gr.3(n=10): SE™+ASBP+SDR™(DentsplyDeTrey); Gr.4(n=10)SE™+ASBP+FiltekZ2503M™. The samples were processed term cycled at 500 cycles (5-55 degrees), stored (48h), cut lengthwise (diamond), polished, conditioned (H3PO4-37%-5s) visualized by SEM (VEGAIIITSCAN and JEOLJSM6390A) and statistically analyzed with SPSS14.00(ANOVA, p<0.05).

Results: Analysis of the HL highlighted differences between groups ANOVA-p=0,001 the average size of the HL being Gr.1=3,52(±0,71)µm, Gr.2=6,07(±1,34)µm, Gr.3=5,90(±2,84)µm, Gr.4=4,03(±0,12)µm. The differences were statistically significant between Gr.1-Gr.2:p=0.007, Gr.1-Gr.3:p=0,013 and Gr.2-Gr.4:p=0,046. Laser cavity preparation favors the material penetration only a maximum depth 9,65 µm.

Conclusions: Although the dimensional values of the HL were higher at materials with higher flow capacity, uniformity of the HL was present in those with high viscosity. Permission was obtained from a institutional ethical committee of University of Medicine and Pharmacy Gr.T.Popa, Iasi and the subjects gave written, informed consent. Founding source: CNCIS-Project: No. 2669/2008-Ultrastructural analyze of dental hard tissue hybridization in the minimal invasive treatment of the dental lesions achieved through mechanical and kinetic treatment with laser

0224 (152295)

Effects of adhesive systems on the microleakage of compomer restorations

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Objectives: The aim of this in vitro study was to evaluate the effects of different types of adhesive systems on the microleakage of compomer restorations (Dyract Extra) in class V cavities prepared by Erbium, chromium:yttrium–scandium–gallium–garnet (Er,Cr:YSGG) laser.

Methods: Class V cavities were prepared on facial/ lingual surfaces of 50 noncarious, extracted sound primary molar teeth with Er,Cr:YSGG laser. The cavities were randomly assigned into five groups of 10 teeth each and these bonding agents were applied to the cavities: Group 1: Single Bond 2, Group 2: Scotchbond Multi-Purpose Plus, Group 3: Xeno III, Group 4: Clearfil Protect Bond, Group 5: Prime&Bond NT. Cavities were restored with the compomer according to the manufacturer's instructions. After finishing the restorations with aluminium oxide disks all teeth were subjected to termocycling (5-55°C for 500 cycles) and then immersed in 0.5% basic-fuchsin solution for 24 hours. Dye penetration was evaluated under stereomicroscope and data were statistically analyzed by Kruskal-Wallis and Mann-Whitney U test.

Results: Gingival margins showed significantly higher microleakage than occlusal margins in all the test groups (p<0.05). It was observed that group 1 and group 2 showed less microleakage than group 5 (p<0.05). Also, no statistically significant differences were found between 3,4 and 5 of the groups (p>0.05).

Conclusions: None of the dentin bonding agents did eliminate mikroleakage completely and higher microleakage scores were observed at gingival margins than occlusal margins.

0225 (151353)

Effect of three in-office tooth bleaching gels in enamel microhardness

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Objectives: To evaluate the effect of three different bleaching products containing hydrogen peroxide (HP) or carbamide peroxide (CP), with/without fluoride and sodium nitrate, on surface enamel microhardness.

Methods: Thirty human extracted molars were used. Roots were cut about 2 mm from the amelo-cementum junction and crowns sectioned longitudinally, in two halves, in a mesio-distal direction, resulting in sixty tooth fragments. Each fragment was individually embedded in a 30 mm diameter mold with EpoFix self-curing resin (Struers-Ballerup,Denmark). The external enamel surface was exposed using a sequence of SiC abrasive papers (120, 320, 600, 1000 grit) (Struers-Ballerup,Denmark) and polishing discs with 6, 3, 1, 0.25 µ diamond pastes (Buehler MetaDi Diamond Paste-Illinois,USA). The polished enamel surface was covered with varnish leaving a window test with 3x3 mm. The fragments were randomly divided in four groups (n=15) and the bleaching gels applied: G1: Placebo agent, G2: Opalescence Boost (38%HP)(Ultradent-South Jordan,USA), G3: Zaris White Brite (30%CP)(3M ESPE-Seefeld,Germany) and G4: Opalescence 45% PF (45%CP)(Ultradent-South Jordan,USA). Each fragment was exposed to the bleaching gels 3 times during 14 days (day 1, 7, and 14), according to manufacturer's instructions, and conserved between applications in artificial saliva at 37°C. Vickers microhardness (HV) measurements were obtained from each sample, on the following testing periods: before bleaching, after each one of the 3 application periods, and one week after last application, with a Shimadzu HSV-30 (Shimadzu Corporation-Kyoto,Japan) with a 29.42N load for 5 sec. Data were statistically analyzed using one-way Anova for comparison between groups at the 5% level of significance, after assumption validation.

Results: All groups showed an increasing in their final mean HV values. No significant differences were found between mean HV values between groups (p=0.821).

Conclusion: This study showed that bleaching agents didn't show a significant different effect on enamel surface microhardness compared to placebo agent.

Effect of in-office-bleaching systems on surface roughness of different materialsT. ALPTEKİN¹, F. AYKENT², K. HALUK BARIS², and O.Y. OZYILMAZ²¹The Ministry of Beyhekim Oral and Dental Health Center, Konya, Turkey, ²Prosthodontics, Selcuk Universitesi, Konya, Turkey

Objectives: The aim of this in vitro study was to evaluate surface roughness during office bleaching procedures with blue light emitted diode (LED) and diode laser (DL) irradiation of six different restorative materials.

Methods: FiltekTM supreme (nanofilled), Tetric EvoCeram (nanohybrid), Tescera ATL (ormocer), Clearfill Majesty Esthetic (nanohybrid), Durafill VS (microfilled) and IPS Empress2 (ceramic) materials were evaluated in this study. Twenty specimens, 10 mm in diameter and 2 mm thick, were fabricated from each material using a teflon mold. All specimens were randomly assigned to two groups (n=10). Group 1 received two topical applications of 35% hydrogen peroxide for 20 s. and was photoactivated using LED. Group 2 received topical application of 46% hydrogen peroxide (Laserwhite 20TM Gel) using diode laser (EzlaseTM Laser, wavelength 980 nm, average power 7 watt, energy setting 200 J, continuous mode). Surface roughness values were measured prior to and following bleaching procedures by using a profilometer. Differences in percentage of surface roughness in all materials were evaluated. Results were analyzed statistically, by Univariate Analysis, one-way-analysis of variance (ANOVA), post-hoc Tamhane's T2 and independent t tests.

Results: Surface roughness values for all restorative materials tested increased after both bleaching procedures (p<0.05). Differences in percentage of surface roughness in Tetric EvoCeram group were significantly higher than IPS Empress2 and TesceraATL groups (p<0.05). Tescera ATL bleached with diode laser photoactivation showed higher surface roughness value than LED activation (p<0.05). However, there were no significant differences in two bleaching methods for other restorative materials (p>0.05).

Conclusion: After bleaching procedures, surface roughness of restorative materials might be increased, therefore dentists should protect the present restoration intraorally.

Effect of two-in-office bleaching agents on microhardness of restorative materialsT. ALPTEKİN¹, F. AYKENT², O.Y. OZYILMAZ², and H.B. KARA²¹The Ministry of Beyhekim Oral and Dental Health Center, Konya, Turkey, ²Prosthodontics, Selcuk Universitesi, Konya, Turkey

Objectives: The aim of present study was to evaluate the effect of two office bleaching agents on different esthetic restorative materials by performing superficial microhardness analysis.

Material and methods: Twenty discs (10-mm diameter, 2 mm thick) were fabricated each of the following restorative materials: Clearfill Majesty Esthetic (nanohybrid), Tetric EvoCeram (nanohybrid), Durafill VS (microfilled), FiltekTM supreme (nanofilled), Tescera ATL (ormocer) and IPS Empress2 (ceramic). Specimens were randomly divided into 2 subgroups (n=10) according to bleaching procedure. All specimens were wet flattened with 600-, 1000- and 1200-grit aluminum oxide abrasive papers. Composites and ormocer materials were polished with aluminum oxide discs. Ceramic material was glazed according to the manufacturers instructions. The first group of each material was bleached with 35% hydrogen peroxide (HP) for 20 s and then photoactivated with blue light emitted diode. This procedure was repeated 4 times. The second group was exposed to 46% HP (Laserwhite 20TM Gel) for 5 min and then photoactivated with diode laser (EzlaseTM Laser, wavelength 980 nm, average power 7 watt, energy setting 200 J, continuous mode) for 30 s in each application. Baseline and after bleaching microhardness measurements were taken with a Vickers hardness tester that was used, with a 300 g for the porcelain and 100 g for the composite and ormocer samples. The loading time was 30 s. The mean of the hardness values of each specimen was calculated and data were analyzed by one-way ANOVA and post-hoc Tamhane's T2. Confidence level was 95%.

Result: After application of both office bleaching agents, microhardness of all restorative materials tested were significantly decreased (p<0.05). However Tetric EvoCeram composite resin material showed the least microhardness value (p<0.05)

Conclusion: Although clinical effects depend on in-vivo conditions, the effects of office bleaching agents should be known and applied consciously when restorative materials are present.

Effect of Bleaching on Color Stability of Ceromer and PorcelainsH.B. KARA¹, F. AYKENT¹, and B. OZTURK²¹Prosthodontics, Selcuk Universitesi, Konya, Turkey, ²Conservative, Selcuk Universitesi, Konya, Turkey

Objectives: The aim of this invitro study was to determine the color changes of 5 different restorative materials after exposing 2 different bleaching agents.

Methods: An ultra low fusing porcelain (Finesse), a low fusing porcelain (Vita VM9), 2 heat-pressed glass ceramic (IPS Empress 2 - IPS e.max Press), a ceromer (Estenia) were chosen in this study. Twenty four disc shaped specimens were fabricated (in a diameter of 10 mm and in a thickness of 2 mm) from each material. Two experimental groups including 12 specimens were occurred. After the specimens were left in distilled water for 24 hours the initial color measurements were taken with a spectrophotometer (Vita Easyshade Compact). Then first group specimens of all materials were bleached with 10 % hydrogen peroxide (HP) (Opalescence Treswhite Supreme gel) for 1 hour daily for 10 days. The other group specimens were bleached with 10 % carbamide peroxide bleaching gel (CP) (Opalescence gel) for 8 hours daily for 14 days. After bleaching, color measurements were repeated. Data were analyzed with OneWay ANOVA and Kruskal-Wallis statistical test. The statistical meaningful level was accepted as p<.05.

Results: Statistically significant difference was found among the color changes of test groups after exposing bleaching agents (p<.05). Appreciable color change was observed in Estenia (ΔE=3,99) specimens which were bleached with HP and noticeable color change was observed in Estenia (ΔE=1,89) and IPS Empress 2 (ΔE=1,66) groups which were treated with CP.

Conclusion: Restorations (especially polimer content) should be protected before any bleaching procedure because of fear color change.

Effect of Different Tooth Bleaching and Adhesives on Orthodontic BondingS. AKSAKALLI¹, M. AKIN¹, A. DEMIR², F.A. BASCIFTCI¹, and T. YAVUZ³¹Orthodontics, Selcuk Universitesi, Konya, Turkey, ²Department of Orthodontic Dentistry, Selcuk University, Faculty of Dentistry, Konya, Turkey, ³Department of Prosthodontics, Selcuk University, Konya, Turkey

Introduction: The purpose of this study was to determine the effect of enamel bleaching and composite types on the shear bond strength of orthodontic brackets.

Methods: Seventy two freshly extracted human premolar teeth were randomly divided into 3 groups of 24 teeth each. The control groups consisted of 24 teeth. For the other groups, two bleaching protocols were used. In at-home bleaching group (n=24), Opalescence bleaching agent (Ultradent, South Jordan, Utah), which contains 10% carbamide peroxide, was applied and in office group (n=24), Opalescence boost pf (Ultradent, South Jordan, Utah), which contains 38% hydrogen peroxide gel was applied according to manufacturers' recommendations. After bleaching, the 3 groups were divided into 2 equal subgroups for total etch and self etch adhesives (3M Unitek, Monrovia, Calif) and stored in artificial saliva at 37°C for 14 days before bonding. After bonding, shear bond strength of these brackets was measured on a universal testing machine and recorded in MPa. Adhesive remnant index (ARI) scores were determined after the brackets failed. Data were analyzed with analysis of variance (ANOVA) and chi-square tests.

Results: In shear bond strength and comparisons there were statistically significant differences between groups (P<0.001) and between composites (P<0.001) but there was not interaction between bleaching and composite types (P>0.05). ARI scores were significantly different in all groups.

Conclusions: The SBS values of all groups might be clinically acceptable. However the use of bleaching agents before bonding significantly reduces the shear bond strength values on total and self-etching primer systems, further studies are warranted to evaluate their effectiveness.

Bond strength of resin cements to bleached-ozone applicated enamelB. OZCOPUR¹, E. AYHAN ALKAN², C. YEGIN³, S. KESKIN⁴, and G. ESKITASCIOGLU⁵¹Endodontics, Yuzuncu Yil University Faculty of Dentistry, Van, Turkey, ²Periodontology, Yuzuncu Yil University, Van, Turkey, ³Endodontics, Yuzuncu Yil University, Van, Turkey,⁴Biostatistics, Yuzuncu Yil University, Van, Turkey, ⁵Prosthodontics, Yuzuncu Yil University, Van, Turkey**Objectives:** To evaluate the bond strengths of two resin based cements bonded to ozone-treated or non-treated bleached enamel.**Methods:** Eighty freshly extracted sound human maxillary incisor crowns were assigned to eight groups (n = 10): (G1, G2) bleached (10% carbamide peroxide, Opalescence) without or (G3,G4) with application of gaseous ozone (40%, 50 second, CR probe, Biozonix; High-Frequency Ozone Generator, Germany), (G5, G6) ozon treated without bleaching and (G7, G8) untreated control groups. The crowns were embedded in acrylic resin and flat enamel surfaces were exposed. Specimens were bonded with one of the two resin cements: Secure Cement (Sun Medical) (G1, G3, G5, G7); Clearfil Esthetic Cement (Kuraray) (G2, G4, G6, G8). Three x 3 build-ups were created with the resin cements and allowed to set (37°C, 100% humid, 24 hrs) and then tested to failure for shear bond strength (0.5 mm/minute). The data was calculated as MPa and analyzed using Kruskal-Wallis test (P < 0.05).**Results:** There was no statistically significant difference among groups (p>0.05), except ozone treated unbleached Secure Cement group (G5) (p < 0.05). The bond strength results were significantly decreased by the application of ozone in unbleached Secure Cement group.**Conclusions:** Ozone application on bleached enamel surfaces can not alter Secure Cement and Clearfil Esthetic Cement bonding to enamel. In addition, following the ozone treatment on enamel surface, the use of Secure Cement may not be preferred in clinical conditions.**Clinical Evaluation of Two At-home Tooth-whitening Products using a Spectrophotometer**

A. MAJEED, S.R. GROBLER, and M.H. MOOLA

*Oral & Dental Research Institute, University of the Western Cape, Cape Town, South Africa***Objectives:** The purpose of this study was to compare the color changes achieved with two different at-home tooth-whitening products using a spectrophotometer.**Methods:** Forty two subjects with an A2 or darker shade seeking tooth-whitening treatment were recruited for this single center, observer-blind, parallel group, randomized clinical trial. The study was approved by the ethics committee of UWC and all patients signed a consent form. After initial examination and dental prophylaxis, each subject was randomly assigned to one of the two treatment groups (n=21). One group used Nite White ACP 10% carbamide peroxide in custom-fitting trays overnight (8 hours) for 14 days while the other group used Opalescence Treswhite Supreme 10% hydrogen peroxide in prefabricated trays for 60 minutes per day for 14 days, as suggested by the manufacturers. The color changes were measured objectively as L*, a*, and b* at the middle one-third of maxillary center incisors using a spectrophotometer. The subjects were asked to record any thermal tooth sensitivity on sensitivity forms using a 0 to 4 point scale.**Results:** After 14 days of treatment, both groups demonstrated significant improvement in L*, a* and b* color parameters from baseline (Wilcoxon Signed Rank Sum Test, p<0.05). The most significant factor of color change was L* followed by b* and a*. When comparing the total color change (ΔE^*_{ab}) between products, Nite White showed significantly better whitening efficacy with a median ΔE^*_{ab} of 5.29 than Treswhite Supreme (ΔE^*_{ab} , 4.09) (Wilcoxon Rank Sum Test, p<0.05). Subjects in both groups experienced mild tooth sensitivity during the active bleaching period with no statistically significant differences.**Conclusions:** Both products showed significant improvement in all three color coordinates (L*, a* and b*). However, Nite White demonstrated significantly better whitening efficacy than Treswhite Supreme. Tooth sensitivity was mild and disappeared after the completion of the treatment.**One Year Clinical Evaluation of Vertise Flow**J. SABBAGH¹, S. DAGHER², N. EL-OSTA³, and P. SOUHAID⁴¹Lebanese University-Beirut, Lebanon, Lebanon, ²Pediatric dentistry, Universite Saint-Joseph, Beirut, Lebanon, ³Université Saint-Joseph, Beirut, Lebanon, ⁴Ortho Pedo, Dental College, Beirut, Lebanon**Objectives:** Recently, self-adhesive resin composites were introduced to dental practise. Those materials are easy to apply and have many indications such as sealants and small class I cavities. This study compares the clinical performance of a self-adherent resin composite to a conventional flowable composite Premise-flowable used with etch and rinse bonding system on permanent teeth. The effect of rubber dam will also be investigated.**Methods:** Patients aged between 6 and 12 years and presenting at least two permanent molars in need of small class I restorations, were selected for this study. In total thirty-four pairs of restorations (n=68) were placed. Fifteen patients were treated under rubber dam, and nineteen using cotton rolls isolation. The restorations were evaluated according to the modified USPHS criteria at baseline, 3, 6 and 12 months by two independent evaluators.**Results:** All patients attended the one-year recall. The statistical analysis was conducted using the SPSS for Windows. Repeated measures ANOVA followed by Bonferroni multiple comparisons were carried out at p < 0.05 level. At the first year recall, one Vertise Flow restoration was lost and one Premise-Flowable composite was broken. The marginal adaptation of eleven Premise-Flowable and twelve Vertise-Flow restorations were rated Bravo. For all the measured variables, no differences were observed between the two composite materials, when used with or without rubber dam. After one year, significant differences were observed for the marginal adaptation of both Vertise-Flow and Premise Flowable (p-value=0.023 and p= 0.038).**Conclusions:** Self adherent resin composite is a very promising material, as it behaved in a similar way to etch and rinse flowable composite. In addition, the use of rubber dam did not affect the clinical performance of both composites. Further long term investigations are needed to confirm those data.**Placement and Replacement of Restorations in General Practice in Iceland**

S. RICHTER, and S.T. ELIASSON

*Faculty of Odontology, University of Iceland, Reykjavik, Iceland***Objectives:** Practice based research allows monitoring of changes occurring in general practice over time. The aim of the investigation was to study the restorative pattern in Icelandic general dental practice with regards to selection of restorative materials and the reason for placing restorations.**Methods:** One hundred and ninety general dentists in Iceland were invited to participate in the study. They were asked to register information on patient's gender and age, clinician's gender and experience in years since graduation and using defined reasons for placement and replacement of 100 restorations placed consecutively.**Results:** Ninety seven dentists (51.1%), 59 males and 38 females, returned the survey forms with information on 9,043 restorations and 604 sealants, 48.9% in male and 51.1% in female patients. Average age of the patient was 36.5 years and clinician's age since graduation 19.5 years. 85.2% were composite restorations, 7.1% amalgams, 4.4% glass ionomers and 3.3% other materials. Composite was the predominant material used for Class I (89.7%) and Class II (83.7%) while amalgam was used 3.3% in Class I and 10.6% in Class II restorations. Replacements of failed restorations comprised 50.3% of all restorations. Of primary restorations 82.1% were placed due to primary caries and 15.3% non-carious defects. Secondary caries was the main reason for replacements (45.6%), followed by marginal and bulk fractures (28.8%). The use of amalgam was significantly higher (p<0.001) in males (58.8%) than females (41.2%), but not in the use of composite (51.8% in female, 48.2 in male).**Conclusion:** The present study shows that composite resin is the most common restorative material used and primary and secondary caries is still the main reason for placing all types of restorations.

Clinical evaluation of Venus Diamond in posterior cavities (18 months)

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Objectives: To determine the clinical performance of a nano-hybrid composite in an ongoing study.

Methods: 48 Venus Diamond + iBond Self Etch (VD; Heraeus Kulzer) and 50 Tetric EvoCeram + Gluma Comfort Bond (TC; Vivadent + Heraeus Kulzer; control) restorations were placed according to manufacturers' instructions by 3 dentists in class I and II cavities of 71 adult patients. Clinical assessment at baseline and after 18 months was performed by 2 independent dentists using modified USPHS criteria (surface texture ST; color match CM; anatomic form surface AS; anatomic form marginal step AM; marginal integrity MI; marginal discoloration MD; tooth integrity TI; restoration integrity RI; occlusion OC; sensitivity SE; postop. symptoms PS; patient's compliance PC) and statistically analyzed with Mann-Whitney U-test ($p < 0.05$).

Results: At 18 months, 46 VD and 34 TC restorations were rated. A total of 97.8% VD and 97.1% TC restorations were assessed as clinically excellent or acceptable with predominating Alpha scores. 1 VD and 1 TC restoration had to be replaced until 18 months. Results are listed in the table [(alpha / bravo / charlie / delta) in %].

	ST	CM	AS	AM	MI	MD
VD	84.8/15.2/-/-	87.0/13.0/-/-	95.7/4.3/-/-	84.8/15.2/-/-	87.0/13.0/-/-	76.1/23.9/-/-
TC	58.8/41.2/-/-	79.4/20.6/-/-	91.2/8.8/-/-	82.4/17.6/-/-	91.2/8.8/-/-	58.8/41.2/-/-
	TI	RI	OC	SE	PS	PC
VD	84.8/15.2/-/-	82.6/15.2/-/2.2	97.8/2.2/-/-	100.0/-/-/-	100.0/-/-/-	100.0/-/-/-
TC	97.1/-/2.9/-	97.1/2.9/-/-	94.1/5.9/-/-	100.0/-/-/-	100.0/-/-/-	94.1/5.9/-/-

VD showed a significantly better ST ($p = 0.01$; MW U-test). Fisher's exact test showed no significant differences between VD and TC concerning the failure rates ($p > 0.05$).

Conclusion: Up to 18 months, the clinical performance of VD and TC exhibited excellent results. Sponsored by Heraeus Kulzer, Germany.

Clinical comparison of Glass Fiber with Zirconium oxide posts

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Objective: A clinical comparison of glass fiber reinforced root posts with zirconia (ZrO₂) reinforced root posts in endodontically treated prosthodontic abutment teeth.

Methods: 42 abutment teeth (15 anterior/27 posterior) in 11 patients (6 male/ 5 female) were reinforced with posts for later prosthodontic treatment. 28 received a single crown and 14 were retainers for fixed-partial-dentures (FPD). Glass fiber-reinforced post luted with resin luting agent (Rebilda Post, n=22), and resin luted ZrO₂ post (Cosmopost/ Flexi-Flow, n=20) were assigned by random in patients receiving more than one post. Follow-up examination consisted of a complete dental status as well as a quality assessment of the post-supported restorations including 6 periodontal probings per teeth. Variables of interest were pain on percussion, increased probing depths or fracture of tooth / restauration.

Results: The median observation time of all 11 patients was 15 months (range: 5 to 32). 25 posts (64%) were observed for more than 14 months. No adverse events occurred. All post-reinforced teeth and supported restorations were free from complication.

Conclusion: Both post-system yielded promising first results as reinforcement of endodontically treated abutment teeth supporting crowns and 3-unit FPDs in standard situations. The glass fiber reinforced root posts, in comparison with zirconia (ZrO₂) reinforced root post-systems may offer a clinical alternative to conservative esthetic quality post reconstruction techniques.

Comparison of ozone treatment and desensitizing paste on dentin hypersensitivity

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Objectives: The aim of this in vivo study was to evaluate the clinical efficacy of gaseous ozone in comparison with desensitizing paste on dentin hypersensitivity.

Methods: An 16-week, 9-visit, double-blinded stratified clinical study was conducted in Yuzuncu Yil University Faculty of Dentistry, Van, Türkiye. The study included 9 subjects suffering from hypersensitive teeth with gingival recession defects. A total of 56 hypersensitive teeth with air blast hypersensitivity scores range of 3-10 were treated. One side was assigned for ozone gas application (70%, 50 second, CA probe, Biozonix; Dental high-frequency ozone generator, Germany), while in the contralateral side desensitizing paste (5% Sodium Fluoride varnish, Flor-Opal, Ultradent, USA) was applied. The pain in response to air blast dentin hypersensitivity was measured with a Visual Analogue Scale (VAS) before first application and prior to each follow-up visit. Data were analysed using Wilcoxon and Friedman tests ($P < 0.05$).

Results: After 16 weeks all subjects reported a clinically significant reduction of hypersensitivity. Over time, the pain level decreased significantly in all groups: The pain level in ozone group was significantly reduced in Weeks 8-16 ($P < 0.05$) compared to the desensitizing paste group.

Conclusions: In repeated visits, application of ozone for hypersensitive teeth may provide better pain reduction than desensitizing paste.

Five-Year Clinical Evaluation of Posterior Nano-Hybrid Composite Resin Restorations

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Objectives: The aim of this prospective clinical trial was to evaluate the performance of the Nano-Hybrid composite Tetric EvoCeram (Ivoclar Vivadent) in posterior cavities using selected FDI criteria and a semi quantitative clinical evaluation method (SQUACE).

Method: A total of 50 (11 Class I and 39 Class II) cavities were treated with the total etch adhesive system Syntac (Ivoclar Vivadent) and Tetric EvoCeram in the course of this study. The follow-up examinations took place after 6 months, 1, 2 and 5 years. After 5 years, 34 restorations could be examined concerning their clinical properties: 1="excellent", 2="good" (after correction "very good"), 3="satisfactory", 4="unsatisfactory" (but repairable) and 5="poor" (replacement necessary). Three cases dropped out due to a change in the prosthetic planning, the other 13 drop-outs were due to patients having moved away.

Results: After 5 years, 100% of the restorations that were available for evaluation were still in place and the majority of them showed a grading ranging between "excellent" to "good". Only 1 restoration (3%) had to be repaired due to minor material chipping. Documented marginal flaws affected only small portions of the total margin length.

FDI-Grading		“excellent”	“good”	“sufficient”	“unsatisfactory”	“poor”
Criteria		-1	-2	-3	-4	-5
Marginal Irregularities	Mean % of total margin length	95(±7)	4(±7)	1(±5)	0	0
Marginal gaps		99,5(± 2)	0	0,5(±2)	0	0
Submargination	(SQUACE)	100	0	0	0	0
Marginal Staining		94(±8)	1(±2)	5(±8)	0	0
Caries	% of restorations	100	0	0	0	0
PostOp Sensitivity/ Tooth Vitality		100	0	0	0	0
Fracture of Material/ Retention		97	3	0	0	0
Colour Match		44	56	0	0	0
Lustre		15	50	35	0	0

Conclusion: The combination of Tetric EvoCeram and Syntac showed a reliable clinical performance after 5 years in posterior restorations and an outstanding marginal quality.

0238 (151965)

Lithiumdisilicate-ceramic restorations: Press vs. CAD after 2years of clinical service

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Objectives: To compare the clinical behaviour of lithiumdisilicate ceramic Press (made labside by a dental technician) and CAD (made chairside/Cerec by a dentist) inlays/partial crowns after two years of clinical service.

Methods: 54 Press and 56 CAD restorations (IPS e.max) were adhesively luted. After two years of clinical function all restorations (n=110) were evaluated by means of FDI-criteria for evaluation of indirect restorations (Hickel et al. 2007). The FDI-criteria include the evaluation concerning aesthetic(A), functional(B) and biological(C) properties. Criteria concerning the restorations marginal quality were semi-quantitatively evaluated as % of total margin length (SQUACE). For statistical analysis SPSS 16.00 was used.

Results: After two years nearly all Press and CAD restorations presented an a grading concerning their clinical performance. A detailed evaluation only revealed a slight difference (p<0.05) between α1 and α2 for Press and CAD restorations for colour match, anatomic form and marginal adaptation, due to the different manufacturing processes and operators (Press=labside/dental technician; CAD=chairside/dentist).

Conclusion: After two years of clinical service both IPS e.max Press and IPS e.max CAD restorations showed an outstanding clinical performance.

0239 (152063)

The Effect of Adhesives on Post-operative Sensitivity and Marginal Integrity

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Background: Self-etch adhesives are believed to prevent postoperative sensitivity when used under posterior resin-based composite restorations. More commonly these adhesives are associated with lower bonding effectiveness to both enamel/dentin than the multi-step versions.

Study objectives: A twofold hypothesis was tested: a one-step self-etch adhesive (1-SEA) would result in less postoperative sensitivity than a three-step etch-and-rinse adhesive (3-E&RA); there is a significant difference in marginal performance at the enamel side between a 1-SEA and a 3-E&RA.

Design and key methods: Two hundred Class I or II posterior composite restorations were placed in 89 patients following a split mouth design. Two or four restorations were placed in each patient following two randomly assigned experimental protocols: 1) Application of a 1-SEA and 2) Application of a 3-E&RA. A nanofilled resin-composite (Filtek Supreme, 3M ESPE) was used as restorative material. The restored teeth were tested for vitality, sensitivity to cold and masticatory forces at baseline, 7, 14, 30 days and after 6 months. In addition, marginal adaptation and marginal discoloration of the restorations was evaluated at baseline and after 6, 12 and 36 months.

Essential results: The statistical analysis revealed significant differences in postoperative sensitivity to masticatory forces at postoperative day 14 and day 30 in the 3-E&RA group (p < 0.05). At any recall time, significantly more small marginal defects (clinically acceptable) and superficial marginal discoloration at the enamel side was noticed in the 1-SEA-group compared to the 3-E&RA group.

Conclusions: Post-operative sensitivity to masticatory forces is connected with 3-E&RA while marginal disintegration at the enamel side is related to 1-SEA.

0240 (152067)

Clinical Effectiveness of Composite Inlays for Posterior Teeth Restoration

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Objectives: This study aimed to evaluate the clinical performances of two composite systems for inlay restorations applied to Romanian patients. The goal was to investigate the quality of composite inlays for posterior teeth restoration considering the increasing aesthetic demands of the patients, and the Romanian social-economic conditions that often represent an impediment to use more expensive restorations.

Methods: Seventy-two class II inlays were applied in 60 patients by one operator, using two indirect composite systems, i.e. BelleGlass NG (Kerr Dental) and Gradia (GC Corporation). All restorations were luted using the dual-cured resin cement Variolink II(Ivoclar-Vivadent) in combination with the adhesive system Excite DSC (Ivoclar-Vivadent). Inlays manufacture and luting procedure were performed according to the manufacturers' instructions. Evaluation was performed using the USPHS modified criteria for anatomic form, marginal adaptation, color matching, marginal discoloration or secondary caries. Data were statistically analyzed using Fisher-exact test and Kaplan-Meier survival curves with SPSS and Statistica 7.0 softwares; the significance level was 0.05.

Results: Composite inlays were used to replace damaged restorations or to treat extended carious lesions. Their quality was evaluated at baseline and after 1, 6, 12, 24 and 36 months. No withdrawals of the patients or losses of the restorations by fracture or recurrent caries were reported. All restorations received Alfa or Bravo scores, being considered clinical acceptable. The statistical analysis revealed no significant differences between the investigated materials (p>0.05).

Conclusions: The two materials behaved similarly in time. After 3 years, all restorations exhibited minor changes, regarding the marginal discoloration, surface coloration or marginal adaptation, but they remained clinical acceptable. The results and the statistical analysis show a great survival rate of the composite inlays which could indicate a high durability of these restorations in Romanian patients. This work was supported by CNCIS-UEFISCSU, PN II-RU, PD-538/2010.

0241 (151637)

Bonding of fiber posts with different cements: Aging Influence

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Objectives: Measure the bond strength of cement with the push-out test in different root thirds (cervical, middle and apical) at 24h and at 6 months with and without restoration and with different cements

Methods: 90 monoradicular teeth, crowns were cut and endodontic treatment was made. The canal preparation was made with a calibrated drill system (Rebilda®, Voco, Germany). The glass fiber post (Rebilda Post, Voco, Germany) was cemented with three different cements RelyX® Unicem (3M, USA), Rebilda DV (VOCO Cuxhaven, Germany), core-X™ flow, (Dentsply, Konstanz, Germany). The roots were stored in distilled water at 37°C. They were divided in three groups for each cement. Each group was composed of 10 roots: group A was stored for 24h with a Cavit (3M, USA) filling, group B for 6 months with Rebilda (Voco, Germany) filling and group C without restoration for 6 months. The roots were sectioned to get 1mm disks of the three different root thirds (apical, medial and coronal) and submitted to push-out test, (Instron 3345, Bucks, United Kingdom) at 1,0 mm/min. The Shapiro-Wilk test was used to test the normality. The significance of the differences in strength among luting cements and root thirds was assessed by one-way ANOVA and ANOVA with Brown-Forsythe tests, followed by the Scheffe test for multiple comparisons (p-value of 0.05)

Results: For Group A there was no statistical significant difference in any of the cements. For Groups B and C RelyX® Unicem (3M, USA) had higher results that were statistical significant different from the other cements. At 6 months RelyX® Unicem (3M, USA) and Rebilda DV (VOCO Cuxhaven, Germany) had higher results without a restoration.

Conclusions: Dentin bond strength of the resin adhesives fell over time but RelyX® Unicem (3M, USA) improved even without a restoration.

0242 (151659)

Reinforcing Weakened Teeth with Self-adhesive Resin-composite Cured with Modified Technique

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Objectives: The purpose of the study was to evaluate the strengthening effect of self-adhesive resin composite (SARC), cured with a modified incremental protocol, for teeth with simulated coronal fracture and immature root.

Methods: Fifty maxillary incisors, with similar root length and diameter, were decontaminated leaving 2mm above the CEJ, then root length was standardized to 12mm by removing root apices. The specimens were equally distributed into five groups. Group-1 (n=10) roots apices were flared up to size 6 Pesso drills. The coronal part was flared using tapered stone until only 1mm dentin thickness remained. Root ends were filled with a 3mm MTA barrier. The canals were backfilled with Vertise Flow (Kerr, USA) following a modified incremental protocol using two light transmitting posts size 6 and 3 (Luminex, Dentatus, USA). Then, DT light post size 2 (Bisco, USA) was cemented using the same material. Curing was done using Elipar10s (3M ESPE, USA) with intensity of ≥800mW. Group-2 and -3 were prepared and cured in the same way as group-1. However, in group-2, Clearfil TriS Bond adhesive and Majesty Flow (Kurary, Japan) were used instead while in group-3 Panavia F (Kurary, Japan) was used. Group-4 was similar to group 3 but with unflared roots. Group-5 was prepared similar to groups 1-3 and left unfilled. Core build ups were prepared for all groups with nanohybrid resin composite (Filteck Supreme (3M ESPE, USA). After 24h storage fracture resistance was measured. Data was analyzed using Kruskal Wallis followed by post hoc test.

Results: Results revealed that group 1 and 2 were statistically significant higher than the control group (p>0.05). Cervical fracture was the predominant mode of failure.

Conclusion: It could be concluded that reinforcement of teeth with coronal fractures and immature roots with SARC could be a promising and simplified approach for practitioners.

0243 (151730)

Post-retentive Ability of New Flowable Composite Resins

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Objectives: Two innovative flowable composites are claimed to possess reduced shrinkage stress (SDR, Dentsply Caulk, Milford, DE, USA) and self-adhering potential (Vertise Flow, Kerr, Orange, CA, USA). The aim of the study was to investigate their applicability as post luting agents by assessing the push-out strength of posts.

Methods: Thirty six intact single rooted human premolars were selected. The endodontic treatment was performed and the specimens were randomly divided into 6 groups (n= 6). Half of the specimens were restored with light transmitting posts - DT Light Post Illusion (RTD, St Egreve, France)- and the other half with opaque posts - Tech 21 X-OP (Isasan, Rovello Porro, Italy). The following combinations of adhesives and cements were tested: 1. (control) OptiBond Solo Plus (Kerr)/Nexus 3 (Kerr) 2. XPBond adhesive (Dentsply Caulk)/SDR; 3. Vertise Flow. The thin-slice push-out test was used to assess the retentive strength of fiber posts. Compressive load was applied on each slice until debonding of the post. After failure, specimens were analyzed under a stereomicroscope to determine the failure mode (adhesive between luting agent and post, adhesive between luting agent and dentin or mixed failure). Push-out data and failure modes distribution were analyzed by Two-way ANOVA and Chi-square test, respectively (p<0.05).

Results: The statistical analysis revealed that only the type of luting agent significantly influenced push-out strength of the post (p<0.001). SDR (9.11+/-3.20 MPa) outperformed the other two materials. Nexus 3 (7.21+/-3.07 MPa) measured significantly higher values than Vertise Flow (4.86+/- 2.09 MPa). Failure modes differed significantly among groups.

Conclusions: Flowable composite SDR provided reliable retention of the fiber posts. The light transmitting ability of the posts did not influence the post retention.

0244 (151855)

Micro push-out bond strengths of 2 contemporary post systems

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Objectives: The purpose of this ex vivo study was to evaluate the push-out bond strengths of a newly marketed post system (Spirapost, Poly Fiber Strands, Zenith) and fiber posts (D.T. Light-Post Illusion X-RO, Bisco) adhesively luted with a dual cure resin cement.

Methods: Forty single-rooted human maxillary teeth were sectioned below the cemento-enamel junction and the roots were endodontically treated. The roots were

randomly divided into 2 groups of 20 specimens each according to the post type used: Group A: Spirapost and Group B: D.T Light-Post Illusion X-RO. All posts were cemented with ParaPost/ParaCore (Coltène), a dual cure resin cement and its bond system. Bonded specimens were cut (1mm thick sections) and push-out tests were performed (crosshead speed 0.5 mm/min) after 1 week using a universal testing machine. All specimens were loaded until fracture and the failure modes were evaluated with a stereomicroscope at original magnification x40. Data were statistically analyzed and p-value was set at 0.05. Representative specimens were analyzed with SEM.

Results: Micro push-out bond strengths were significantly affected by the type of post ($P<0.05$). In all root sections, the push-out bond strength values of Spirapost were significantly higher than that of fiber posts ($P<0.05$). Cohesive failure within the post was the most frequent type of failure for Spirapost.

Conclusion: In all root segments, the Spirapost system provided significantly increased post retention compared with the fiber post.

0245 (151881)

Influence of ferrule and post lengths on endodontically treated teeth

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Objectives: The aim of this in-vitro-study was to investigate the influence of different post- and ferrule lengths on the fracture resistance and fracture pattern of endodontically treated teeth (ETT) restored with fiber-reinforced composite posts.

Methods: 60 human maxillary canines were endodontically treated and randomly assigned to 6 groups ($n=10$). Three groups (A,C,E) were decoronated 1.5mm and three groups (B,D,F) 2.5mm above the cemento-enamel junction. Post preparation were proceeded with a depth of 6mm (A,B), 8mm (C,D) and 10mm (E,F). All posts (Rely Post, 3M ESPE) were luted with a self-adhesive resin-cement Rely X™-Unicem (3M ESPE). The resin composite cores were standardized prepared and all specimens were restored with self-adhesive luted zirconia crowns. Each root was covered with a thin layer of silicone and embedded in epoxy resin. All specimens were loaded until failure (135 degrees to long axes) in a universal testing machine at a crosshead speed of 0.5mm/min. Fracture patterns were classified in above (a) or below (b) the incisal third of the roots.

Results: Given as mean fracture load values [N](SD): Pearson's chi-square test revealed significant differences between the several post length groups regarding mode of fracture. The relations of fracture pattern a/b for the different post lengths were: 6mm (14/6), 8mm (10/10) and 10mm (2/18). The ferrule length had no influence on fracture patterns. One way ANOVA showed significant differences of fracture load according to the post lengths between group A,C,E ($p=0,034$) and no significant differences between group B,D,F ($p=0,695$).

Conclusion: Increase of post length resulted in higher fracture load for groups with 2,5mm ferrule. When a ferrule of 2.5mm was prepared fracture load was not affected by different post lengths. However, with increasing post length a higher number of fracture lines below the incisal third of the root was observed, irrespective of the ferrule extension.

0246 (152123)

Transillumination of composite posts after treatment in cold H2 plasma

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Objectives: The aim of this study was to determine increase in transillumination of composite posts after etching and treatment in cold H2 plasma.

Methods: Initial spectrophotometric measurement was taken for each of 20 FRC Postec composites used (Ivoclar, Schaan, Liechtenstein). Each post was illuminated with LED lamp LUX.V ST. HEX LAMB. DENT-BL. LXHL_LRD5 (455 nm) and light collected with fiber P600-2-VIS_NIR (Ocean Optics) on three places, coronal, middle and apical, each three mm apart. Information was collected with Spectrometer Ocean Optics (HR-2000 CGI-UV-VIS) and processed with computer program OOIBase32 (Ocean Optics). Based on similar values posts were placed in four groups of five. Group 1 was etched with orthophosphoric acid, Group 2 treated in H2 plasma 60 sec, 250W, 40 Pa, Group 3 treated in H2 plasma 30 sec, 250 W, 40 Pa and Group 4 was a control group.

Results: Values of Group 1 for untreated samples coronally, middle and apically (K, M and A) were 1148 ± 24 , 505 ± 21 and 224 ± 10 , respectively, and for treated samples K was 1160 ± 32 , M was 503 ± 12 and A was 186 ± 27 . Values for Group 2 for untreated K was 1361 ± 9 , M was 650 ± 20 and A was 303 ± 16 . For treated K was 1473 ± 35 , M was 776 ± 32 and A was 336 ± 47 . In Group 3 for untreated K was 1209 ± 9 , M was 550 ± 28 and A was 250 ± 18 while for treated K was 1208 ± 39 , M was 560 ± 14 and A was 262 ± 23 . Group 4 was a control group where sensitivity of method was determined with several consecutive measurements.

Conclusion: Etching of posts in plasma increases transillumination of posts up to 10% which may enable better setting of adhesive cements compared to treatment with orthophosphoric acid. The research was supported by MSES grants No. 065-352851-0410 and 035-352851-2856

0247 (152135)

Microleakage of two fiber posts luted with simplified adhesive approaches

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Objectives: The aim of this in vitro study was to compare the microleakage of two fiber-reinforced post systems cemented with luting agents that utilize two currently available adhesive approaches in three segments of teeth.

Methods: Forty two extracted human maxillary central incisor and canine teeth with straight root canals were prepared using a step-back technique and obturated with gutta-percha using lateral condensation. Following standardized post-space preparations, the roots were divided into 2 fiber-post groups (Carbopost, RelyX Fiber Post) and further divided into 3 subgroups of 7 specimens each for the adhesive approach (Panavia F, RelyX Unicem, Maxcem). All specimens were thermal cycled 2500 times between 5°C and 55°C and stored in methylene-blue solution for 24 hours. Bonded specimens were cut horizontally into three sections (Cervical, Medium, Apical) and each section was evaluated using a stereomicroscope at original magnification X12. For each image, dye penetration was estimated as the ratio of methylene-blue-infiltrated surface divided by total dentin surface. The data were statistically analyzed by using the Kruskal-Wallis test and Mann-Whitney U test ($p<0.05$).

Results: Carbon fiber-reinforced posts demonstrated significantly higher microleakage in cervical root sections ($p<0.05$) than the glass fiber-reinforced posts. For the glass fiber-reinforced post groups, the least microleakage was observed for the Panavia F 2.0 in all root sections, while the highest microleakage was observed for the Maxcem ($p<0.05$). Regardless of the post types, Panavia F 2.0 demonstrated the highest sealing ability, while Maxcem exhibited higher microleakage in all root sections ($p<0.05$).

Conclusion: In all root section glass fiber-reinforced posts cemented with Panavia F 2.0 had the least microleakage when assessed using a dye penetration technique.

Pull-out bond strength of metal posts after cyclic loadingT. RADICS¹, A. PETERCSAK², T. SZEKELY², and C. HEGEDUS³¹Department of Prosthetic Dentistry, University of Debrecen, Medical- and Health Science Center, Faculty of Dentistry, Debrecen, Hungary, ²Department of Prosthetic Dentistry, University of Debrecen, Medical- and Health Science Center, Faculty of Dentistry, Debrecen, Hungary, ³Department of Prosthetic Dentistry, University of Debrecen Medical and Health Science Center, Debrecen, Hungary**Objectives:** Post and core restorations might receive an immediate loading by chewing forces right after cementation. Glass ionomer luting materials have a ~7 minutes hardening time and a ~24 hour setting time. The purpose of our in vitro study was to determine the influence of this premature loading on the tensile bond strength of metal post cemented to root dentine.**Methods:** Forty-eight sheep incisor teeth were divided into three groups. All teeth were restored with the same size cast metal post and core. Post length was 10 mm. The first group (G1) contained specimens luted with glass ionomer cement (Ketac Cem Easymix, Espe) to investigate the influence of a hardened but unset luting material. In the second group (G2) specimens were undisturbed until setting reaction had finished. In the control group (G3) posts were cemented with phosphate cement (Adhesor, Spofa). Each group were divided into two subgroups (n=8), to perform a pull-out test without (w) and after (a) mechanical cycling (50 N, 45°, 8 Hz, 300.000 cycles). The tensile forces required to dislodge the cemented posts were recorded using a 1 mm crosshead speed. The peak forces of each group were analyzed for statistical differences using ANOVA and Student's t-test.**Results:** Mean peak forces at failure (N) and standard deviation for tested cements were the following: G1w=366.1(±54.4), G1a=506.6 (±52.6), G2w=371.4(±27.1), G2a=463.6(±60.3) and the control group: G3w=291.5 (±49.1), G3a=301.6 (±54.4). Posts luted with set glass ionomer cement represented statistically significant higher tensile bond strength than those in the control group. Mechanical cycling increased peak pull-out forces in each group and it was statistically significant in G1 and G2. This gradation was more pronounced in G1.**Conclusion:** Mechanical loading increased the retention of posts and might result in root fracture. Supported by TÁMOP 4.2.1/B-09/1/KONV-2010-0007 project and co-financed by EU and EHF.**Retrospective Study of the Clinical Performance of Fiber Posts**E. DUNAVÁRI¹, D. KENDE¹, B. BENKE¹, E. LEMPEL¹, S. JEGES², and K. KRAJCZÁR³¹Department of Operative Dentistry, University of Pécs, Medical School, Pécs, Hungary, ²Institute of Bioanalysis, University of Pécs, Medical School, Pécs, Hungary, ³Dentistry, Oral and Maxillofacial Surgery, University of Pécs, Pécs, Hungary**Objective:** The aim of this study was to retrospectively evaluate the medium-term clinical performance of fiber reinforced posts after a service period of 1-5 years.**Methods:** 198 posts were included in the study: 38 light post, and 160 Composipost were placed into endodontically treated teeth. The treatment outcome was assessed by clinical, intraoral, and panoramic X-ray examinations. Endodontic and prosthodontic results were recorded.**Results:** 179 posts placement fulfilled the requirements. 19 failures were observed in our study. Failures were divided into two groups. First group contains failures caused by post placement: debonding, post fracture, root fracture. Second group contains failures not strictly caused by the post placement: endodontical, periodontal lesions. In 4 cases the failures caused by debonding. 3 post fractures occurred. 2 root fractures were also detected in the study. In 6 cases periodontal lesions, and in 4 cases endodontic lesions causes the failures.**Conclusions:** Our success (90, 4%) was confirmed by results found in the literature (89-99%). The results indicated that fiber posts in combination with bonding/luting materials may be used routinely for restoring endodontically treated teeth. The use of fiber post can provide a medium term clinical success.**Bond Strengths of Self-adhesive Resin Cements for luting Fiber Posts**K. BITTER¹, G. STERZENBACH², A. MICIC¹, L. BRESCHI³, and M. TASCHNER⁴¹Department of Operative Dentistry and Periodontology, Charité - Universitätsmedizin Berlin, Berlin, Germany, ²Dept. of Prosthodontics, Geriatric Dentistry and Craniomandibular Disorders, Charité - University of Berlin, Berlin, Germany, ³Department of Biomedicine, University of Trieste, Trieste, Italy, ⁴Dental Clinic 1, University of Erlangen, Erlangen, Germany**Objectives:** The aim was to investigate the push-out bond strength of fiber posts inside the root canal luted with five different self-adhesive cements or one cement with a self-etch adhesive system.**Methods:** 60 extracted human anterior teeth were endodontically-treated, sectioned at the cemento-enamel junction, and fiber posts were inserted using five commercially available self-adhesive cements and one resin cement with a self-etch adhesive system (N=10): Bifix SE Cement/Rebilda Post (Voco) (BF), Clearfil SA Cement (Kuraray)/RelyX Fiber Post (3M Espe) (CSA), RelyX Unicem 2/RelyX Fiber Post (3M ESPE) (RX), SpeedCem/FRC Postec Plus (Ivoclar Vivadent) (SpC), Smart Cem/X-Post (Dentsply Detrey) (SmC) and Rebilda DC/Futurabond DC/ Rebilda Post/ (Voco) (RB). All specimens were stored in 100% humidity for 24 h to allow the complete polymerization. The luted specimens were sectioned into six slices (1 mm thick), and bond strength was measured using push-out tests. Additional samples were prepared for exemplary interfacial nanoleakage evaluation by light microscopy.**Results:** Bond strength of fiber posts was significantly affected by the type of resin cement ($p < 0.0005$, Repeated-Measurement-ANOVA). CSA revealed significantly lower bond strength values [mean (SD)] [3.3 (2.7) MPa] compared to all other investigated resin cements ($p < 0.05$; Tukey post-hoc test). Bond strengths of RB [10.3 (4.4)], BF [11.7 (5.8) MPa], SmC [11.4 (4.3) MPa], SPC [12.2 (4.2) MPa] and RX [15.6 (7.1) MPa] were not significantly different ($p > 0.05$; Tukey post-hoc test). CSA showed more interfacial nanoleakage and gaps than the other tested materials.**Conclusion:** All luting strategies revealed similar bonding potential when used to lute fiber posts inside the root canal, with the exception of Clearfil SA Cement (in combination with RelyX Fiber Post) that showed lower bond strength.**Stress Distribution In Post-Reconstructed Teeth With Severely Reduced Periodontium**I. STASINOPOULOU¹, M. MANDA¹, C. GALANIS², and P. KOIDIS¹¹Department of Fixed Prosthesis and Implant Prosthodontics, Aristotle University of Thessaloniki, School of Dentistry, Thessaloniki, Greece, ²Department of Mechanical Design and Control Systems Division, National Technical University of Athens, School of Mechanical Engineering, Athens, Greece**Objectives:** The aim of the study was to investigate the effect of post length on stress field in the end-abutment of 3 types of FPDs, applied in severely reduced osseous level.**Methods:** The methodology was based on the development of 18 human mandible models, dentate bilaterally to second premolars. Right premolars were restored with: a. single crowns, b. splinted crowns and c. 1-unit cantilever splinted crowns. The end-abutments were either vital, which served as control models, or endodontically treated and reconstructed with cast post-and-core of 7- and 10 mm-length, inside the root. Periodontal support of the end-abutments was considered to be reduced at 50% for all the models. All structures were obtained from CT-scan image control system or developed in 3-D computer-aided design environment. The models were loaded under axial and oblique static force and analyzed in 3-D Finite Element Program. Von Mises stress values and distribution patterns were evaluated.**Results:** The post insertion resulted in considerable stress increase within dentine, for both axial and oblique loadings. Stress values tended to be higher in dentin

areas surrounding guttapercha and the apical part of the post, when 10mm-post used, regardless of the loading case. The use of 7mm- compared to 10mm-post was biomechanically favorable, except from the case of single-crown restoration, under oblique loading. Longer post-and-cores developed higher stress field under axial loading, in contrast to the oblique loading, under which the short posts exhibited the higher stress values. The addition of 1-unit cantilever had a dramatic impact on stress values developed within post and dentin for all the models, overlapping the post effect.

Conclusions: Under the limitations of the present study, the use of short (7-mm) post-and-core along with non-cantilever splinting is recommended, when periodontally compromised teeth are restored.

0252 (151709)

Bone Marrow Stromal Cell-Loaded Biomimetic Constructs For Bone Repair

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One of the extensively investigated approaches for bone repair is based on the integration of extracellular matrix proteins into a biomaterial scaffold with the attempt to mimic the extracellular environment of the bone tissue. We have previously demonstrated the ability to produce functional biomimetic constructs for bone tissue engineering application, composed of hydroxyapatite scaffold modified with in vitro-derived cellular matrix (HA-ECM), that provide a promising alternative to autografts and may facilitate cell delivery to the site of defect.

Objectives: In the current study we aimed to investigate the osteogenic properties of the constructs combined with rat bone marrow stromal cells (BMSC) using a rat calvarial critical-size defect model.

Materials and methods: HA-ECM were produced by seeding adult rat dermal fibroblasts on the top of synthetic HA microparticles. Calvarial critical size defects (8 mm) were created and treated with the generated HA-ECM or HA, alone or combined with BMSC, harvested from adult Lewis rats of EGFP-transgenic strain. New bone formation and the local inflammatory response (PCNA-index, CD68+ macrophage, eosinophil and polymorphonuclear leukocyte infiltration) were assessed by histomorphometry and immunohistochemistry at 2 and 12 weeks postoperatively. In addition, the BMSCs survival and engraftment were checked.

Results: A significant increase in the amount of the newly formed bone was noted in defects treated with HA-ECM loaded with BMSC, compared to HA-ECM alone, HA-BMSC or HA alone-treated groups. Moreover, the implanted BMSC modulated the local inflammatory response, demonstrated by significant decrease in the inflammatory cell infiltration and PCNA-index. No donor BMSCs were detected at the site of implantation or in the host bone marrow at 2 or 12 weeks postoperatively.

Conclusion: Cell-loaded HA-ECM modulated the local tissue inflammatory response and significantly enhanced new bone formation suggesting a higher efficiency for the combination therapy with BMSCs.

0253 (151805)

PRF and Xenograft Combination, in Sinus Floor Augmentation: Case Series

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Objective: Platelet rich fibrin is biochemical part of blood that contains growth factors and important mediator for new bone formation. This study aims to evaluate the newly formed bone after volume changes in maxiller sinus floor augmentation with platelet rich fibrin (PRF) and xenograft combination using clinical and computerized-tomography (CT) technique.

Methods: 10 patients presenting with alveolar bone height of less than 5 mm between the sinus floor and alveolar crest were performed 16 sinus floor augmentation with combination of PRF and xenograft (Gen-Os) without placing implants. For each patient pre-surgical and 6 months postsurgical radiologic exams were performed by CT which have sectioned into 1m, and panoramic radiographies were obtained immediately after sinus floor augmentation. CT was standardized and volumetric measurements were made by using computer program. Also bone quality was assessed by the surgeon during augmentation and implant placement according to Lekholm & Zarb classification.

Results: 6 months after lifting operation, the implants were placed uneventfully in all patients. The vertical dimensions were enough to place the implants so lifting operation was succeeded in all patients. Also the quality of new bone after lifting operation was better than bone before lifting operation.

Conclusion: Combination of PRF and xenograft achieved the aim of the sinus floor augmentation procedure clinically and radiographically.

0254 (152038)

Effects of Blocking Sensation of Temporomandibular Joint during Clenching

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Objectives: The aim of this study is to investigate the effects of blocking sensation of the temporomandibular joint during clenching on cerebral activity by an fMRI.

Methods: The subjects were four healthy volunteers who have not been found abnormalities of the TMJ. The study measured blood oxygenation level-dependant (BOLD) signals during clenching without or with anesthesia for the TMJ. After the images of clenching without anesthesia as a control(normal) were obtained by a 1.5 Tesla clinical scanner, sensory nerve of the TMJ was blocked by injecting to the upper joint space of temporomandibular joint on the left side with 2ml of 1 percent lidocaine, and its images were obtained. Then the sensory information of the TMJ on the other side was also blocked by similar way and its images were also obtained. The image processing and statistical analysis of the fMRI data were conducted using the statistical parametric mapping software (SPM) Version 5.

Results: In normal clenching, the cerebra were activated bilaterally in the sensory area, motor area, premotor area, somatosensory association cortex, prefrontal cortex, limbic system and parietal association cortex on the left side. Blocking sensation of temporomandibular joint on the left side or both side gave change of brain activities in these regions.

Conclusion: From our results, the sensation of the temporomandibular joint during clenching is associated with activity of cerebral area, especially parietal association cortex and limbic system. It is suggested that the disappearance of activity of limbic system by blocking TMJ sensation is the same situation that the internal pressure of articular cavity of TMJ is reduced by using occlusal splints during clenching.

0255 (152129)

Oral squamous cell carcinoma in young Hungarian adults

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Objectives: The purpose of this study was to delineate the profile of patients with oral squamous cell carcinoma (OSCC) with an emphasis on younger people in Northeastern Hungary.

Methods: From a cohort of 119 patients diagnosed with OSCC, 22 (18.5%) were 45 years of age or below. This group was compared to the control group of 97 cases aged over 45 to determine if there were any differences in epidemiological data, clinicopathological features and risk factors between the two groups.

Results: In the young group there were 17 males and 5 females. The floor of the mouth was the commonest cancer site for the younger group (50%) followed by the

tongue and the gingiva (18.2% each), while lip (33%), tongue (23.7%) and floor of the mouth (22.7%) were for the older group. The younger patients had a significantly worse clinical stage ($p=0.022$), more regional and distant metastases ($p=0.028$). The 5-year overall survival rate was lower, though not significantly, in the younger group (27.3% vs. 41.2%). Risk factors of tobacco use and excessive alcohol consumption were present in the vast majority of the younger patients. Smoking habit significantly correlated with younger age ($p=0.031$).

Conclusions: The rate of the younger patients with OSCC in Northeastern Hungary is extremely high. At 45 years of age or below we found a decreasing overall survival time along with increasing intensity of risk habits, but this association was not significant. Clinical stage and lymph node involvement were the most significant prognostic factors in both younger and older patients. Therefore, early detection and treatment together with cessation of tobacco and alcohol abuse may improve patient survival in the region.

0256 (152158)

Effects of Blocking Periodontal Sensation on Cerebral Activity during Clenching

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Objectives: This aim of this study is to investigate the effects of blocking sensation during clenching on brain activation.

Materials and Methods: Using functional magnetic resonance imaging (fMRI) in four healthy volunteers, the study measured blood oxygenation level-dependant (BOLD) signals during clenching. After analysis of normal clenching, local anesthesia was conducted to teeth right side of dental arch to block periodontal sensation. Then the other side teeth were performed local anesthesia and fMRI imaging were obtained. Image processing and statistical analysis of the fMRI data were conducted using the statistical parametric mapping software (SPM) Version 5.

Results: During clenching with periodontal sensation, activations in brain regions were seen in premotor cortex, prefrontal cortex, and sensorimotor cortex. After the left blockage of periodontal sensation by local anesthesia, activations of brain region were increased in the right premotor cortex and sensorimotor cortex. After blockage of both sides, increased BOLD signals in the premotor cortex, prefrontal cortex, and sensorimotor cortex was settled and similar to activation during clenching with normal sensation.

Conclusion: From our results, these findings suggested that periodontal sensation increased BOLD signals at another activation region. Furthermore, our findings demonstrated that the brain region activated by clenching stress was also activated without periodontal sensation. It seems that brain activation by clenching stress may be controlled by other centripetal sensations such as those in the muscle and temporomandibular joint.

0257 (152164)

Synergistic anti-tumor effect of CRM197 in oral cancer

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Objectives: FCRM197 is a nontoxic mutant of diphtheria toxin, and it is a specific inhibitor of Heparin-binding EGF-like growth factor (HB-EGF), which belongs to the EGF family, that has been implicated in the increased progression, proliferation, and metastasis of oral cancer. In this study, we analyzed the anti-tumor effects of CRM197, which represent possible chemotherapeutic agents for oral cancer.

Methods: In the experiment, we used the oral squamous cell carcinoma cell line HSC3 and SAS. Cells treated with CRM197 were analyzed based on the cell viability, MTT assay, invasion assay, Western blot, and zymography. Moreover, HSC3 cells were injected subcutaneously into female BALB/c nu/nu mice at 5 weeks of age. CRM197 and/or CDDP were injected intraperitoneally into tumor-bearing mice, and tumor volume measured over time.

Results: HB-EGF expression in HSC3 and SAS treated with CRM197 was significantly reduced and cell proliferation was inhibited. The invasiveness of CRM197-treated cells was relatively low. MMP-9 and VEGF were suppressed in HSC3 treated with CRM197 on zymography and Western blot. Further, tumor growth in xenografted mice was suppressed by CRM197 or CDDP in all cases. Furthermore, co-administration of CRM197 and CDDP completely inhibited tumor proliferation.

Conclusion: These results suggest that HB-EGF is a target for oral cancer, and CRM197 is effective in oral cancer therapy.

0258 (152176)

Early Detection of Cancerous Lesions by Fluorescence Visualization

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Objectives: Early detection of high-risk disease could greatly reduce both mortality and morbidity due to oral cancer. We describe a simple handheld device that facilitates the direct visualization of oral-cavity fluorescence for the detection of precancerous and early cancerous lesions.

Methods: Blue excitation light (400 to 460 nm) is employed to excite green-red fluorescence from fluorophores in the oral mucosa. Tissue fluorescence is viewed directly along an optical axis collinear with the axis of excitation to reduce inter- and intraoperator variability. This robust, field-of-view device enables the direct visualization of fluorescence in the context of surrounding normal tissue.

Results: From a pilot study of 17 patients are presented. Using histology as the gold standard, the device achieves a sensitivity of 98% and specificity of 100% when discriminating normal mucosa from severe dysplasia/ carcinoma in situ (CIS) or invasive carcinoma.

Conclusions: We envisage this device as a suitable adjunct for oral cancer screening, biopsy guidance, and margin setting.

0259 (151195)

Modulating Factors of Pain After Dental Implant Surgery

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Objectives: This study aims to assess the factors involved in subjective and objective assessment of pain after dental implant placement: Defcon®, (Impladent, Spain).

Methods: 97 patients participated in this pilot study. All patients completed the depression (Beck) and anxiety (STAI) tests. 2 and 7 days after surgery they were evaluated in terms of subjective (EVA2 and EVA7) and objective (ALGO2 and ALGO7) pain using a visual analogue scale and a pressure algometer of Von Frey (EB-instruments, U.S.A). The location of pain on the second and seventh day was recorded by the patient by a dermatographic trigeminal model on which they painted the painful area. We performed a multiple linear regression with SPSS v.15 to describe and predict the subjective and objective pain on the seventh day using: Stepwise regression analysis, with Pin=0.05 and Pout: 0.10.

Results: The objective pain was predicted by a statistical model ($R^2_{Adj} = 0.66$, $p < 0.001$) based on subjective pain on the seventh day (Standardized $\beta = -0.72$, $p < 0.001$) and on the second day ($\beta = -$ Standardized 0.19, $p < 0.01$). The states of anxiety and depression recorded at the beginning do not predict neither subjective nor objective pain on the seventh day, although the recount of the Beck questionnaire is significantly correlated with subjective pain on the 7th day ($r = 0.27$, $p < 0.01$). The correlation between EVA2 and ALGO2 was $r = -0.66$, $p < 0.01$, and between EVA7 and ALGO7 it was $r = -0.80$, $p < 0.01$.

Conclusions: There is a high correlation between subjective and objective pain in the postoperative period following an implant placement. The objective pain measured on the seventh day of surgery and the dermatographic extent are the main predictors of postoperative subjective pain. Preoperative anxiety and depression seem not to modulate the degree of objective or subjective pain.

Early Treatment Modality in Cleft Care – Nasoalveolar Molding

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Orofacial clefting is the most common congenital deformities of the face. Treatment guidelines emphasize modern, multidisciplinary approach. The surgical techniques are well known and mature. However, it is less well known that surgical results are greatly influenced by the combination of passive presurgical orthopaedic treatment with lip adhesion (non-surgical and surgical). An advanced method in presurgical orthopaedics is the nasoalveolar molding technique. It combines a palatal plate with a nasal extension.

Objectives: To describe our surgical method of early treatment modalities in the management of cleft lip and palate at the Cleft Center of the Semmelweis University Budapest.

Methods: The nasoalveolar molding technique is inserted into the surgical treatment protocol the following way: 0-6 week: lip taping / non surgical lip adhesion, 6 week: surgical lip adhesion, 8 week: adaptation of the plate, 9 week: incorporating the nasal bulb into the plate, 12-16 week: definitive lip closure, 2 weeks after surgery: re-adaptation of the plate without nasal bulb

Results: The combination of nasoalveolar molding with lip adhesion procedure (non-surgical and surgical) was performed in 10 primary cleft lip patients between 1st September, 2010 and 1st June, 2011. In all cases, segment repositioning was controlled by the palatal guidance plate and better nasal form was achieved.

Conclusions: The beneficial effects of nasoalveolar molding in combination with lip adhesion outweighed the risks for anatomical reconstruction of a platform for definitive lip and nose repair.

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Biodegradable And Photopolymerizable Hydrogels In Dentistry

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Objective: The hydrogels as high water containing materials are widely used in biomedical, because it has tissue-like properties. The aim of this study to create a novel photopolymerizable hydrophilic material based on biodegradable polymer, as a drug delivery system.

Methods: Methacryl-group attached to the polymer it can be reactive, and use a non toxic photo-initiator that it will be polymerizable with blue light. This hydrogel can load with different drugs and it will be a drug delivery system. The poly-gamma-glutamic acid (PGA) can take photo-reactive with methacryl-group and moreover it can modify with diamino compound and in this way nanoparticles were obtained. These nanoparticles can use as physically bonded filler, or it can take reactive too as the PGA. The hydrogels were studied with NMR, DLS, MTT- and LDH-tests and measured the swelling and release feature.

Results: PGA based nanoparticles were obtained as the DLS results shows. A novel system can build with nanoparticles use as physically bonded filler, or chemically bond it to the matrix. The whole system and all of the components were not cytotoxic. It can state after the ~2% cytotoxicity from LDH-test, and more than 98% viability from LDH test results. These new hydrogel systems were useful drug delivery system according to a drug release measurements, and the swelling ratio was 140-160% after 24 hours.

Conclusion: These hydrogels can modify with the crosslinking density of the PGA matrix, but there will be a basically potential from the nanoparticles. So this is a model system for in situ cured potentially local drug delivery devices for curing periodontal diseases. The local controlled release can raise the effectiveness of the drugs, beside the minimal applicable dose. The work is supported by the TÁMOP 4.2.1/B-09/1/KONV-2010-0007 project. The project is co-financed by the European Union and the European Social Fund.

3D rapid prototyped composite scaffolds for bone tissue engineering

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Objectives: Tissue engineering is an emerging multidisciplinary field of research that aims to repair damaged tissues as well as to create replacement organs. The aim of this research was to evaluate the mechanical and biological properties of composite scaffolds for bone tissue engineering fabricated by using a rapid prototyping technique.

Methods: Hybrid inorganic/organic TiO₂/PCL and ZrO₂/PCL particles, all containing 6, 12 and 24 % of the organic component, were synthesized by means of the sol-gel process and, then, used as fillers to reinforce 3D PCL-based scaffolds. PCL-based composite scaffolds were manufactured through 3D fiber-deposition technique and their mechanical properties were measured by compression tests. 3D morphology of the scaffold was analyzed by means of micro-computed tomography (microCT). Atomic force microscopy (AFM) was performed in order to evaluate surface features. In order to evaluate cells-materials interaction, bone marrow-derived human mesenchymal stem cell (hMSC) and human dental pulp mesenchymal stem cell were seeded on specimens and cell proliferation was evaluated by Alamar Blue Assay.

Results: AFM analysis performed on the sol-gel synthesized hybrid inorganic/organic particles demonstrated a nanostructured surface with domains between 10 and 100 nm. Compression tests carried on the 3D rapid prototyped composite scaffolds highlighted the effect of the hybrid inorganic/organic particles on the mechanical behavior. MicroCT analysis showed 100 % of interconnected pores. Moreover, these composites were very biocompatible and MSCs were able to proliferate on the substrates.

Conclusions: The use of rapid prototyping techniques combined with a reverse engineering approach results a very promising strategy to design multifunctional tailor-made scaffolds for bone regeneration.

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Bone Healing Around Biphasic HA-(Beta-TCP)/Autologous Platelet Lysates Constructs

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Objectives: Autologous platelet concentrates have been proposed as biological enhancers with bone substitutes in bone reconstructive surgery. HA- (Beta-TCP) (ratio 60/40) (BoneCeramic® Straumann) is a bone substitute frequently used in orofacial applications. The aim of this study was to investigate the effect of autologous platelet lysate (APL), in conjunction with particles of Biphasic HA - (Beta-TCP) ceramic on bone healing.

Methods: Rabbit APL was prepared by freeze thawing from a platelet suspension (109 platelets/ml) according to published methods (Soffer et al., 2006). Critical size defects (10mm in depth and 6mm in diameter) were drilled in lateral femoral condyles of New Zealand rabbits. Defects were filled with particles of biphasic HA - (Beta-TCP) ceramic alone or associated with APL. Animals were sacrificed after 6 weeks. New bone formation and ceramic resorption were evaluated using non-demineralized histology and histomorphometry.

Results: New bone formation was observed around ceramic particles. The mean surface of new bone in the defects filled with biphasic HA - (Beta-TCP) or biphasic HA - (Beta-TCP) +APL constructs was $7,95 \pm 3,35 \text{ mm}^2$ and $7,55 \pm 3,05 \text{ mm}^2$ respectively. The mean residual surface of particles in defects filled with biphasic HA - (Beta-TCP) +APL constructs was $6,54 \pm 3,99 \text{ mm}^2$ and biphasic HA - (Beta-TCP) alone was $6,90 \pm 2,72 \text{ mm}^2$. There were no significant difference in bone formation ($p=0.629>0.05$) and in material resorption ($p=0.790>0.05$) between Biphasic HA - (Beta-TCP) alone and Biphasic HA - (Beta-TCP) + APL constructs.

Conclusions: The results of this study showed that bioactive components of APL in addition to a Biphasic HA- (Beta-TCP) ceramic did not provide an additional benefit in bone formation and didn't affect the resorption of the material. However, this study confirmed the osteoconduction potential of this bone substitute.

0264 (152154)

Effect of sinterized beta-tricalcium-phosphate and titanium granulate on human osteoblasts

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Objectives: The connection called osseointegration between the implantation and its' bone environment is critical. In our study we investigated the effect of the sinterized beta-tricalcium-phosphate and titanium granulate on osteoblast cells. The aim of the study was to create new surfaces which contain B-TCP beside Ti and determine the most favourable ratio for the differentiation of osteoblasts and for the creation of extracellular matrix.

Methods: Powders with different concentration of Beta-tricalcium-phosphate B-TCP (0-5-25%) were pressed with 30000N pressure onto disks with a diameter of 15mm and were sinterized in vacuum chamber. The cell adhesion and morphology examination were performed with confocal laser scanning microscope (LSM 510, 40X/0.6 Na objective), osteogenetic gene-expression (osteocalcin) in human osteoblasts' DNA with real time polimeras chain reaction (TaqMan Gold RT-PCR Kit). As an endogenous control 18s ribosomal RNS (Applied Biosystems Kit 4310893E) was used.

Results: Larger number of cells was harvested from control surfaces than from the modified disks. RT-PCR revealed that cell counts decreased when we increased the B-TCP content in the composite and the same tendency was resulted with RNS concentration. The morphology also showed differentiation because the shape of the cells was long, elongated compared to the control cells with less connecting surfaces to each other.

Conclusion: The B-TCP facilitates bone configuration around implantation surfaces but higher amount of B-TCP is dramatically reducing the cell adhesion. The physical property of calcium phosphate crystals that inhibits cell proliferation may be surmounted by the inhibition of intracellular signalling pathway to rescue delayed proliferation of osteoblasts on this surface. Our future plan is to find the optimal composition for physical properties and surface morphology. The work/publication is supported by the TÁMOP 4.2.1/B-09/1/KONV-2010-0007 project. The project is co-financed by the European Union and the European Social Fund.

0265 (152212)

Periodontal Response To Dental Porcelain Modified By Bioactive Glass

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Objectives: The aim of the study was to investigate in vivo the regenerative capacity of bioactive glass-dental porcelain material on periodontium.

Methods: Three 1-year-old female rabbits were used. Full thickness periodontal flaps were elevated and osseous defects were produced on the alveolar eminence over the lower incisors. Two spherical bottom wells per incisor were prepared and restored with: a. bioactive glass-dental porcelain specimens, b. porcelain specimens and c. amalgam restorations. Non-resorbable membrane was pin-stabilized over the defects and the flap was repositioned. The incisors were crowned to inhibit eruption, while the membrane was removed six weeks after the operation. At the completion of sixteen-week healing period, the rabbits were euthanatized and the incisor site excised. The samples were quick-frozen and embedded in carboxyl-methyl-cellulose at -80oC. Undecalcified longitudinal cryo-sections were obtained, by the application of cryofilms. The sections were stained with: a. Monoclonal Antibodies against collagen I, III, IV and VI, b. Alizarin Red S (ARS) and c. Non Specific Esterase (NSE).

Results: The immunohistochemical assessment revealed that the connective tissue was dominated by the presence of collagen VI, followed by collagen I. Staining intensity for collagens III and IV was faint, thought there was strong localization on specimens-dentin interface. Collagen fibers oriented almost perpendicular to the bioactive glass-dental porcelain surface, in contrast to the porcelain specimens. Histochemical analysis with ARS identified the bone regeneration in one defect, by detecting apatite phases, while no cementum-like tissue was traced on any specimen's surface. NSE staining ascertained the absence of inflammation, since no NSE-positive macrophages were detected.

Conclusions: The bioactive potential of the composite material was revealed via the partial regeneration of the periodontium in terms of connective and bone tissue. Though, the co-ordination of cell populations to act repetitively, under the membrane-mediated periodontal wound healing process, was difficult to be achieved.

0266 (151264)

Anti-inflammatory Effects Of Methanandamide On Oral Tissues Of Rats

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The immunological function of the submandibular gland (SMG) maintaining the oral health is well established. Also, the endocannabinoid system plays immuno-modulatory effects in different organs of the body exposed to pathophysiological conditions. Cannabinoid receptors were identified in oral tissues such as SMG and gingiva by immuno-histochemistry.

Objectives: to assess the possible anti-inflammatory effects of methanandamide, a synthetic cannabinoid receptor type 1 (CB1) selective agonist, on SMGs and gingival tissues exposed to lipopolysaccharide (LPS).

Methods: gingival tissues and SMGs extracted from intact rats were used for in vitro studies and rats exposed to different experimental conditions were used for in vivo studies.

Results: Methanandamide (10-9M) decreased ($p<0.05$) LPS (10 $\mu\text{g/ml}$) -induced tumor necrosis factor alpha (TNF α , measured by ELISA Kit) and prostaglandin E2 (measured by radioimmunoassay) release from SMGs and gingival tissues incubated in vitro (N=6/group) in a thermostatic bath (37° C) with continuous agitation, while the CB1 selective antagonist AM251 (10-5M) blocked ($p<0.05$) the inhibitory effects. The in vivo studies showed that a daily local topical application of methanandamide (500 ng/ml) attenuated ($p<0.05$) alveolar bone loss induced by injections of 20 μl of LPS (1 mg/ml) in the gingival tissue around the neck of the first upper and lower molars of the rats (N=6/group), three times a week during 6 weeks (an infectious model of periodontitis induction). Furthermore, the treatment with methanandamide reduced ($p<0.05$) the LPS-increased activity of the enzyme inducible nitric oxide synthase (iNOS) measured in SMGs and gingival tissues extracted from the rats at the end of the experiment.

Conclusion: The present results demonstrate the anti-inflammatory effects of methanandamide on LPS-induced oral tissues inflammation and confirm the participation of the endocannabinoid system in the oral health of rats. (Grants: PICT 07-1016, UBACyT-O007 and UBACyT-20020090300051).

The association of smoking and diabetes with periodontitis in Koreans

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Objectives: Smoking and diabetes are well-known risk factors for periodontitis. However, the extent to which periodontitis is attributable to smoking and the association of periodontitis with diabetes in Koreans have not been examined. The aims of this study are to examine whether smoking and diabetes is associated with periodontitis in Korean representative samples and to estimate the the public health impact of smoking and diabetes on periodontitis in Korea.

Methods: The Korean National Oral Health Survey 2006 collected nationally representative oral epidemiologic data for the Korean population. Examiners measured periodontal health status using the community periodontal index (CPI). CPI 3 to 4 and CPI 0 to 2 were classified as periodontitis and non-periodontitis, respectively. 4,425 participants from KNOHS 2006 were interviewed on the current and former history of smoking and diabetes. The structured questionnaire designed to collect demographic data were used. Periodontitis was outcome variable. Smoking and diabetes were explanatory variable. Confounders were age, gender, education, occupation, monthly income, and residential area. Logistic regression analyses were used to evaluate the association of smoking and diabetes with periodontitis adjusted for the effect of confounders. Subgroup analyses by age and gender were performed to assess whether age and gender could modify the associations.

Results: Among the total population, smokers were 19.8% and diabetes patients were 7.2%. Associations of smoking and diabetes with periodontitis were as follows; current smokers (OR=1.33, 95% CI=1.04-1.70) and diabetes (OR=1.23, 95% CI=0.90-1.68). The association of smoking and periodontitis was increased in young adults aged 20 to 39 years old (OR=2.24, 95% CI=1.09-4.62) and females (OR=1.71, 95% CI=1.03-2.24).

Conclusions: Our results suggested that smoking has a significant impact on periodontal health of the Korean adults and the association was confounded by age and gender.

Long Term Results Following Surgery with PRP and NBM

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Background: Regenerative periodontal surgery utilizing a combination of a natural bone mineral (NBM) and platelet-rich plasma (PRP) has been shown to enhance the outcomes of regenerative surgery. At present, the long-term effects of this therapy are unknown. AIM: To evaluate clinically the long term results following treatment of deep intrabony defects with either NBM+PRP or NBM alone.

Material and Methods: Thirty patients suffering from advanced chronic periodontitis, and each of whom displayed one advanced intrabony defect were randomly treated with either NBM+PRP (test) or NBM (control). Clinical parameters were evaluated at baseline, at 1 year and 5 years after treatment. The primary outcome variable was clinical attachment level (CAL).

Results: The test sites showed a reduction in mean probing depth (PD) from baseline 8.17 ± 1.03 mm to 3.17 ± 1.27 mm at 1 year and to 2.83 ± 2.08 at 5 years, respectively. In the control group mean PD was reduced from baseline 8.92 ± 2.07 mm to 3.50 ± 1.31 mm at 1 year and to 3.50 ± 1.62 at 5 years. In the test group mean CAL changed from baseline 9.67 ± 1.92 mm to 4.08 ± 1.38 mm at 1 year and 3.75 ± 2.26 mm at 5 years, respectively. In the control group mean CAL changed from baseline 9.83 ± 2.76 mm to 4.58 ± 1.83 mm at 1 year to 4.42 ± 1.56 at five years. There were always statistically significant differences between baseline and one year data. No statistically significant differences in any of the investigated parameters were observed within groups and between the two groups at 1 and 5 years.

Conclusions: The present results have shown that the clinical improvements obtained with both treatments were stable over a period of 5 years.

Development of Translucent Three-dimensional Vital Microscopy in Dental Research

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Objectives: Our team examines the vasoactive materials related reactions of gingival superficial venules with vital microscopy. The lack of tissue transparency and the missing of one dimension (depth) constrained our work so far. In order to access the deeper vascular network, it became necessary to develop a biocompatible substance that helps to increase the gingival translucency so as to have visual access to the profound layers. Development and determination of in vivo feasibility of this supporting solution and a unique 3D vital microscopy system have become the main goal of our research group.

Methods: The tissue clearing test solutions were adjusted similar to the extracellular fluid, and the absorbance change induced was measured in vitro using different tissue samples (skeletal muscle, submandibular gland, intestine, liver, kidney). Moreover, our staff developed a 3D imaging system, which consists of a stereo microscope, 2 stereo converters, 2 high-resolution cameras connected to the ocular of the stereo microscope, 2 monitors with a special glass plate used for imaging, and a computer software with 3D measuring capability. We tested the system in vivo on rat microcirculation and secretion (gingiva, submandibular gland). Repeated Measures ANOVA was applied for statistical analysis.

Results: We demonstrated that the developed solutions significantly increased the transparencies of the treated tissues. The absorbance values of the samples were reduced by nearly 50-60 % after 60 minutes, when they reached a plato phase and remained stable in the following 60 minutes. In vivo preliminary experiments confirm this fact.

Conclusions: The solution, the protocol and the set up which have been developed, technically allow the implementation of translucent 3D vital microscopy, a cutting edge, incomparable investigation method that allows to make high fidelity 3D observations in vivo in different organs in a so far unavailable manner.

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Biofilm morphology in the transition zone of combined endo-perio lesions

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Objectives: Evaluation of the biofilm morphology in the transition zone between apical lesions and periodontal pockets in combined endo-perio lesions with a modified protocole involving a simplified histologic sample preparation and a low-vacuum SEM examination method.

Methods: 21 teeth with combined endo-perio lesions, extracted and washed with saline, underwent fixation in modified Karnovsky solution and dehydration in alcohol series. The transition zone between the apical lesion and the periodontal pocket was located and examined under low-vacuum SEM (INSPECT

S,FEI,Hillsboro,OR,USA), at 80-250Pa and 15kV. Presence of established biofilm, isolated glycocalyx, isolated bacteria, nude cement areas, periodontal fibers, resorbition areas, calculus, unstructured debris, and the type of microorganisms (cocci, rods, filaments, spirils) was assessed, results were quantified and expressed as percentage. Correlations were established between characteristics using the Spearman correlative analysis.

Results: Low-vacuum inspection resulted in electrical charge-free images of the non-conductive or contaminated biofilm-covered surfaces. The transition zones displayed established biofilms in 38%, isolated glycocalyx strands in 9.5%, resorbive areas in 28.5%, scattered bacteria in 24%, nude cement areas in 71%, calculus deposits in 24%, debris in 28.5%, and periodontal fibers in various degrees of destruction in 24% of the samples, respectively. Cocci were in 57%, bacilli 14%, and filaments in 24% of the samples, and no spirils. Significant strong positive correlations were between presence of cocci and established biofilm ($\rho=0.84$, $p<0.01$), between presence of rods and cemental resorbitions ($\rho=0.68$, $p<0.01$) and between filaments and cemental resorbitions ($\rho=0.48$, $p<0.5$), respectively.

Conclusion: The transition zone in combined endo-perio lesions displays a relatively low incidence of established biofilm presence. Coccioid forms were predominant, while bacilli and filaments were rather rare. Resorbive lacunae appeared in one third of the samples. The low-vacuum SEM method is simple, cost-saving, results in excellent biofilm images, avoids sputtering and destruction of the biologic samples and electrostatic charges.

0271 (151479)

The use of the microDent® test in diabetic patients

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It is generally accepted that, the periodontitis is initiated by establishment of specific subgingival bacterial flora. Periodontopathogenic bacteria activate inflammatory mechanisms within the periodontal tissue through the production of toxins. The degree of this response depends on the general health of the patients. Risk factors such as diabetes mellitus can negatively influence the progression of periodontal disease. Choice of medication depends on the composition of the subgingival flora and the clinical manifestation of the periodontal disease. These marker species can be detected with the microDent®test.

Objectives: The aim of this study was to determine in patients with type 1. diabetes mellitus the correlation between periodontal condition and presence periodontopathogenic bacteria, employs probes for A. actinomycetemcomitans, P. gingivalis, B. forsythus and T. denticola.

Method: 108 plaque samples obtained from periodontal pockets patients with type 1. diabetes mellitus. For the assessment of the periodontal condition the CPITN index was used. The microDent®test is molecular biological diagnostic device. Since it is based on the analysis of nucleic acids, there is no need for viable bacteria to perform the test and no special precautions are required during transport.

Results: In diabetic patients correlation was observed concerning the intensity of gingivitis, periodontitis and the prevalence of the periodontopathogenic bacteria. The most prevalent bacterium was found Bacteroides Forsythus (11. 11%) in patients only have gingivitis, but in periodontitis it was Treponema denticola (75. 92%).

Conclusion: Performing the microDent®test result proving the presence of specific periodontopathogenic bacterial species. Antibiotics should be applied, to raise the effectiveness and active tackle of the progression of the gingivitis or periodontitis in diabetic patients.

0272 (151546)

Effects of Porphyromonas gingivalis Lipopolysaccharide on Dental Follicle Progenitor Cells

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The identification of dental follicle progenitor cells (DFPCs) has stimulated interest in their potential use in stem cell-based therapies to treat periodontitis. However, the inflammatory state of periodontal disease displays a major challenge to such therapeutical approaches.

Objectives: In this study, we challenged human DFPCs with Porphyromonas gingivalis lipopolysaccharide (Pg-LPS) - a major etiological factor in periodontitis - and assayed the response of DFPCs in terms of viability and secretion of interleukin-6 (IL-6), a pleiotropic cytokine that is considered as an osteolytic factor involved in periodontitis.

Methods: Human DFPCs were obtained from extracted wisdom teeth and characterized. Second passage cells were subsequently stimulated with different concentrations of Pg-LPS (0 µg/ml, 1 µg/ml, 10 µg/ml and 50 µg/ml) respectively. After 24 hours of incubation cytotoxicity assays (MTT) were performed and concentration of secreted IL-6 in culture supernatants was determined by a specific enzyme-linked immunosorbent assay (ELISA). Human mesenchymal stem cells (MSCs) were used as a control group.

Results: DFPCs were able to attach onto plastic surface, showed a typical fibroblast-like morphology and formed single-cell colonies. Furthermore, DFPCs could differentiate into adipocytes, osteoblasts and chondrocytes and were strongly positive to typical stem cell markers (CD29, CD44, CD73, CD90 and CD105). Interestingly, after LPS challenge no secretion of IL-6 was detected in the supernatants of DFPCs, while ELISA demonstrated the secretion of IL-6 by MSCs in a concentration-dependent manner. In terms of cytotoxicity, the challenge with LPS showed no statistically significant influence on both cell populations.

Conclusion: The findings of this study indicate that Pg-LPS do not affect DFPCs regarding their viability and IL-6 secretion.

0273 (151615)

LL-37 induces angiostatic activity through FPRL1 in microvascular endothelial cells

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Objectives: Cationic antimicrobial protein 18 (hCAP18) is the only antimicrobial peptide of the cathelicidins family identified from human. hCAP18 is the proprotein and LL-37 is the mature processed form. Cathelicidin antimicrobial peptides seem to play a central role in host defense by direct antimicrobial activity and modulation of inflammation. Recently, LL-37 was found to have angiogenic activity. The purpose of the present study is to examine the effect of LL-37 peptide in angiogenesis.

Materials and Methods: LL-37 peptide was synthesized as a C-terminal amide of 37 amino acids (LLGDFFRK SKEKIGKEFK RIVQRIKDFL RNLVPRTES). Human microvascular endothelial cells (HMVECs) were cultured in EGM-2MV growth medium (including 5% fetal bovine serum: FBS) with or without peptide. Angiogenesis was evaluated by tube-formation assay using the full growth factor Matrigel. The cell migration was assessed wound healing assay-using chamber of the cell culture insert (ibidi GmbH). Cell proliferation was determined by MTT assay. Formyl peptide receptor-like 1 (FPRL1) mRNA was estimated by RT-PCR. In addition, FPRL1 protein was analyzed by Western blot using a specific antibody. For inhibition experiments, pertussis toxin (Ptx: 10 ng/ml, Sigma-Aldrich) was applied. The statistical difference was analyzed using Student t-test (n=5).

Results: hCAP18/LL-37 peptide (0, 0.1, 0.5, 1, and 10 µg/ml) inhibited the tube formation of HMVECs in dose dependently (No. of brunch points: 91±19.16, 90.33±7.37, 77.33±6.43, 27.67±5.69, and 11.67±2.08, respectively) and decreased cell migration, whereas increased proliferation of HMVECs. RT-PCR and Western Blot showed the expression of FPRL1 in HMVECs. Ptx abolished effect of LL-37- induced inhibition of endothelial tube formation.

Conclusions: These results indicate that LL-37 has angiostatic activity through FPRL1. We suggest that LL-37 peptide will potentially be useful in therapeutic agent for the treatment of periodontitis and other inflammatory diseases.

IL1A(-889)/IL1B(+3954) is Not Associated With Bone Levels in Middle-Aged ArabsA.M.A. SAFAR¹, H.A.A.A. AL-NAJJAR², K.M. BARRIESHI-NUSAIR³, and H.-P. MÜLLER⁴¹Kuwait University, Safat, Kuwait, ²Faculty of Dentistry, Kuwait University, Kuwait City, Kuwait, ³Kuwait University, Kuwait City, Kuwait, ⁴Institute of Clinical Dentistry (IKO), Tromsø University, Breivika, Norway

Objectives: Specific polymorphisms in the interleukin (IL) 1 gene cluster have been associated with chronic periodontitis in certain ethnicities. The aim of this communication was to assess alveolar bone levels in 35 to 44 year-old Arab patients and to associate them with a combination of alleles 2 of IL1A(-889) and IL1B(+3954), the so-called IL-1 genotype.

Methods: Panoramic exposures of 50 patients attending a dental school in Kuwait were digitally stored and available for analysis. Thirteen patients were smokers. At each tooth, distal and mesial bone levels as expressed as % of root length were assessed to the next 5%.

Results: The average bone level was located at a mean (\pm standard deviation) distance of $17 \pm 7\%$ of the root length apical to the cemento-enamel junction. Bone levels were significantly lower at distal as compared to mesial sites ($p < 0.001$). Forty-four % patients were characterized by the specific combination of alleles 2, and thus regarded IL-1 genotype positive. Cumulative frequency distributions of bone levels were similar in IL-1 genotype-positive and -negative patients. Multiple linear regression of the proportion of sites with bone levels beyond a 15% or 35% threshold revealed that only smoking, but not the IL-1 genotype, was strongly associated with the extent of bone loss. The adjusted models explained 26% and 11% of the variance of extent, respectively. According to a 2-level (subject, site) logistic regression model of bone level at a threshold of 15% as response, adjusted for IL-1 genotype, gender and age, smokers had significantly higher odds of reduced bone levels at all tooth types except maxillary molars.

Conclusions: While the prevalence of this particular haplotype may be high in Arabs, at least in middle-aged adults it seems not to be associated with periodontal bone loss. Supported in part by KURA Grant # DS04/02.

Mouth-rinsing solutions and Aggregatibacter actinomycetemcomitans and Porphyromonas gingivalis biofilmsW. PFISTER¹, T. LIMPET¹, H.F.R. JENTSCH², and S. EICK³¹Dept. of Medical Microbiology, University of Jena, Jena, Germany, ²Periodontology, University Leipzig, Leipzig, Germany, ³Department of Periodontology, Laboratory of Oral Microbiology, University of Bern, Bern, Switzerland

Objectives: The study was aimed to compare the efficacy of different mouthrinse-solutions with chlorhexidine against periodontopathogens within a single-species biofilm.

Methods: Biofilms of six strains (3 *A. actinomycetemcomitans* (Aa) and 3 *P. gingivalis* (Pg)) were established over five days. Then the biofilms were exposed to the different rinsing solutions (Meridol, NovaTop, Delmopinol, 0.06, 0.1 and 0.2% chlorhexidine digluconate (CHX) and 0.9% NaCl as control) for 1 min. Thereafter the solution was removed and nutrient broth was added again. 24 and 48 h later, the colony forming units (cfu) within the biofilms were determined. Statistical analysis was made by using ANOVA with post-hoc Bonferroni test for each strain.

Results: All rinsing solutions significantly reduced the cfu counts by at least 3.5 log-stages, a complete killing was never found. Differences between 24 and 48 h after application of the solutions were extremely low and did not reach significance. CHX solutions showed a concentration-dependent effect. 0.1 and 0.2% CHX solutions were most efficient and showed superiority against Meridol and NovaTop for all tested strains and against Delmopinol and 0.06% CHX for each 2 Aa and 2 Pg strains.

Conclusion: Although diverse mouth-rinsing solutions act antibacterial, CHX still represents the gold-standard in activity against bacteria within biofilm. Nevertheless a complete killing of bacteria within biofilm by disinfectants is impossible.

Investigating the Impact of Gingival Health on Cognitive Emotions RegulationA.L. DUMITRESCU¹, C. TOMA², and V. LASCU²¹University of Tromsø, Institute of Clinical Dentistry, Tromsø, Norway, ²University of Medicine and Pharmacy Carol Davila, Bucharest, Romania

Aim: The aim of the present study was to evaluate the interrelationship between gingival status and cognitive emotion regulation. The impact on oral health behaviours was also examined.

Material and Methods: The present study sample consisted of 190 first year dental students. The questionnaire included information about socio-demographic factors, behavioral variables and self-reported oral health status. To measure the specific cognitive strategies, the Cognitive Emotion Regulation Questionnaire (CERQ) was used (Garnefski et al., 2002).

Results: Self-reported gingival bleeding was associated with statistical significant higher values of self-blame and rumination. Participants who evaluated their self-reported gingival condition as poor/very poor scored higher values on rumination, catastrophising and lower on positive reappraisal, when compared with students with excellent gingival condition. Multiple linear regression analyses revealed that presence of gingival bleeding was an independent determinant of self-blame, rumination and putting into perspective. Among participants with positive self-reported gingival bleeding, reason for dental visits was significantly correlated with positive refocusing, planning, positive reappraisal, putting into perspective and catastrophizing. Positive reappraisal was found to be a mediating variable in the relationship between gingival status and reason for dental visits. Thus, positive reappraisal helps to explain the association between gingival status and reason for dental visits.

Conclusions: Helping patients to challenge these maladaptive cognitive emotion regulation strategies may therefore play an important role on the focus and content of (preventive) oral health behaviour interventions to be developed for patients with gingival and periodontal disease.

Establishment Of The iPS-cells From Human Periodontal Ligament Fibroblast CellsY. NOMURA¹, M. ISHIKAWA², Y. YASHIRO², C. ARAI², S. SANGGARNJANAVANICH², T. YAMAGUCHI³, E. KAKUTA¹, Y. ISHIKAWA⁴, K. NODA², Y. NAKAMURA², and N. HANADA¹¹Translational research, Tsurumi University, Yokohama, Japan, ²Orthodontics, Tsurumi University, Yokohama, Japan, ³Operative dentistry, Tsurumi University, Yokohama, Japan,⁴Department of Pathology, The Cancer Institute of JFCR, Tokyo, Japan

Objectives: Among the various kinds of fibroblasts existing in the human body, the periodontal ligament fibroblast cells have been suggested as multipotent cells. It is characterized by rapid turnover, a high remodeling capacity and remarkable capacity for renewal and repair. It also differentiates into osteoblasts and cementoblasts. To establish the pluripotent cells from periodontal ligament fibroblast cells can be the great advances in the regenerative therapy in dentistry.

Methods: We established the induced pluripotent stem cells from human periodontal ligament fibroblasts by introducing Oct3/4, Sox2, Nanog, Klf4 and Lin28 by retroviral transfection.

Results: Even without the oncogene c-Myc, the reprogramming efficiency was higher than that of any other human fibroblast reported previously. The iPS cells established in this study expressed ES cell markers and formed teratoma in SCID mouse. The periodontal ligament fibroblasts endogenously expressed ES cell markers such as Oct 3/4, Nanog, Klf4 and c-Myc.

Conclusions: The periodontal ligament fibroblasts could be an optimal cell source for the iPS cells.

PRF Application for Treatment of Multiple Gingival Recessions: Case SeriesA. URAZ¹, Y. SEZGIN², D. CETINER¹, M. YALYM¹, and L. TANER¹¹Dishekimligi Fakultesi, Periodontoloji Bolumu, Gazi University, Ankara, Turkey, ²Periodontology, Gazi Universitesi, Ankara, Turkey

Objectives: The connective tissue graft has been considered as “gold standard”, but it is limited by the availability of palatal mucosa. Platelet rich fibrin (PRF) can provide alternative method because it can cover larger area as a graft material. The aim of this study was to describe effectiveness and the predictability of PRF in the treatment of gingival recessions affecting multiple adjacent teeth.

Methods: Forty teeth with Miller Class I or II gingival recession defects were treated in 10 systemically healthy patients. The teeth with defects were randomly assigned to the test group (n=20) treated with PRF and to the control group (n=20) treated with connective tissue graft. Clinical recordings including probing depth (PD), clinical attachment level (CAL), recession depth (RD), recession width (RW) and keratinized tissue (KT) width were evaluated at baseline and at 6 month after surgery.

Result: Mean root coverage was 95% in PRF group and 96% in connective tissue group. Six months after surgery, a statistically significant gain in CAL and increase in KT were assessed in both group (p<0.05). No statistically significant difference was found between the two groups for all these parameters (p >0.05).

Conclusion: The results of this study indicate that the usage of PRF allowed the treatment of multiple adjacent recessions with adequate wound healing and highly predictable root coverage. More expanded clinical studies are needed to confirm the present findings.

Severity of chronic periodontitis in COPD patientsZ.F. NEMETH¹, B. NAGY¹, L.A. HENTER², S. SOOS², M. BALASKO², and A. BAN¹¹Department of Dentistry, Oral and Maxillofacial Surgery, Medical School University of Pecs, Pecs, Hungary, ²Department of Pathophysiology and Gerontology, Medical School University of Pecs, Pecs, Hungary

Introduction: Chronic periodontitis (CP), one of the most prevalent oral diseases may lead to loss of teeth independently of cariological status. It has been shown that some systemic diseases e.g. diabetes mellitus aggravate CP. On the other hand, CP has been suggested as a potential factor in the progression of systemic disorders. Earlier studies have raised the possibility that CP and chronic obstructive pulmonary diseases (COPD) might show positive correlation.

Objectives: In this project the relationship between CP and COPD was investigated.

Methods: Human volunteers (altogether n=25, COPD n=9, control smoker n=16) recruited in the Department of Dentistry, Oral and Maxillofacial Surgery Medical School, University of Pecs participated in the respiratory and periodontal tests. Concerning COPD, mean measured FEV1 was 44.11±3.45 % of expected standard values, indicating GOLD III. stage (FEV1/FVC = 53.11±4.25%). In control patients these values were all in the normal range (FEV1 = 93.94±3.77%; FEV1/FVC = 91.69±2.21%). Periodontal tests included mean- and maximal clinical attachment loss (CAL in mm) assessment via recession and probing pocket depth measurements. Bleeding on probing (BOP) index, furcation involvement, mobility of teeth, simplified oral hygiene index (OHI-S), decayed/missed/filled teeth index (DMF-T) were also recorded. For statistical analysis one-way ANOVA and non-parametric Mann-Whitney test were used.

Results: Our results show that there are no statistically relevant differences in oral hygiene- and DMF-T index between the COPD and control groups. However, in the COPD group maxCAL, meanCAL and mobility of teeth values were significantly higher than in controls (maxCAL 10.0±0.56 vs 5.82±0.62, meanCAL 3.96±0.27 vs 3.05±0.25, mobility of teeth 2.0±0.34 vs 1.06±0.45).

Conclusions: There appears to be a positive correlation between CP and moderate COPD. However, it is not clear whether systemic inflammation in COPD aggravates CP or on the other hand, CP enhances the progression of COPD.

Subgingival microflora of Sudanese patients with aggressive periodontitisH.R. ZEIN ELABDEEN¹, M. MUSTAFA¹, R.W. ALI², and A.I. BOLSTAD¹¹Department of Clinical Dentistry - Periodontics, University of Bergen, Bergen, Norway, ²Faculty of Dentistry, University of Science and Technology Sudan, Khartoum, Sudan

Objectives: Aggressive periodontitis (AgP) has a complex microbial composition making it difficult to identify specific causative agents. The aim of the present study was to investigate the microbial profile of AgP in a group of patients in Sudan.

Methods: A study population consisting of 19 patients with AgP was recruited from patients seeking treatment at University of Science and Technology (UST) in Khartoum. Nineteen healthy subjects were included as controls. For each individual, plaque samples were collected with a curette from the subgingival area of mesiobuccal sites of molars or premolars, ten of these sample sites with probing pocket depth between 5 and 11 mm. Plaque samples from 17 of the AgP patients and 15 of the healthy controls were analyzed using a 16S rRNA-based method on Human Oral Microbe Identification Microarrays (HOMIM). Plaque samples from the 19 AgP patients were analyzed using Real-Time PCR for the detection of *Aggregatibacter actinomycetemcomitans* and *Porphyromonas gingivalis*.

Results: Using HOMIM, *Streptococcus* Cluster II and III were found in all patients and controls. The most prevalent bacterium detected in AgP was *Eubacterium yurii* which was found in 64.7% of the patients. This was significantly different (P=0.037) from the prevalence in healthy controls (26.7%). *Eubacterium nodatum* was found in AgP patients but was totally absent from controls (P<0.05). Only two patients harbored *A. actinomycetemcomitans*, and *P. gingivalis* was not detected. Using RT-PCR, the two pathogens were found at low levels.

Conclusions: *E. yurii* was the most prevalent bacteria in AgP patients. The classic periodontal pathogens were not frequently detected suggesting a diverse microbial profile in Sudanese AgP patients.

Periodontal disease and acute myocardial infarction: a 24-year prospective studyA.M.J. SAARINEN¹, J.H. MEURMAN¹, B. SÖDER², and P.-Ö. SÖDER²¹University of Helsinki, Helsinki, Finland, ²Department of Dental Medicine, Karolinska Institutet, Huddinge, Sweden

Objective: To investigate in a longitudinal study the association between periodontal disease and acute myocardial infarction (AMI). The hypothesis was that periodontal disease may accelerate the onset of AMI.

Methods: From a cohort of 105798 inhabitants from Stockholm, Sweden, 1676 subjects were included in 1985 for oral examination. The following oral health parameters were recorded: Plaque index (PLI), Calculus index (CI), Gingival index (GI), Pocket depth (PD) and number of missing teeth. 24 years later AMI data (including the date of hospitalization) were collected from the Swedish hospital database using the International Classification of Diseases (WHO ICD-9 ; ICD-10). Pair-wise comparisons and chi-square were the statistical methods used.

Results: During the follow-up, out of the 1676 clinically examined subjects 29 had AMI (22 men, 7 women; p<0.01), while 1647 had not. A logistic regression analysis revealed dental plaque as an explanatory variable for AMI (OR=4.5, 95% CI 2.3-8.7; p<0.001). Out of the 29, 6 had periodontal disease while 23 were periodontally healthy. The time from baseline to infarction was 12.7 years in the periodontally diseased vs. 18.4 for the periodontally healthy subjects (p<0.01). No statistical difference was observed in gender, age, socioeconomic status or smoking habits between these groups. Subjects with periodontitis had logically higher gingival index and more periodontal pockets (2.0, 1.3 and 5.3, 0; p<0.001 and p<0.001 respectively). There was no statistical difference seen in PLI, CI or in the number of missing teeth between the groups, however.

Conclusion: The 24-year results showed that periodontal disease indeed was linked with the early onset of AMI. Acknowledgement: DFS, Department of Health and Welfare, grant F 84/189 and the Karolinska Institutet, Stockholm Sweden, Philips Oral Healthcare Inc. and The Medical Society of Finland supported this study.

Occurrence of Peridontal Bacteria and Clinical Parameters in Pregnancy Gingivitis

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Objectives: The existing limited information regarding the effect of periodontal bacteria on pregnancy gingivitis encouraged us to determine if there is any correlation of the occurrence of the 7 putative periodontopathogens and two early colonizers in subgingival plaque samples from pregnancy gingivitis lesions with the clinical parameters.

Methods: Seventy primigravida and 40 nulliparous women participated voluntarily in the study. An oral examination of the subjects was done to score gingival and plaque indices, bleeding upon probing (BOP) and clinical pocket depths (CPD) from four aspects of whole dentition. Subgingival plaque samples were obtained from sites showing signs of gingivitis as well as from healthy sites. A method for detection of 7 types of periodontopathogens and 2 types of early colonizers using agarose gel electrophoretic analysis of specific bacterial sequences of DNA extracted from plaque samples and amplified by PCR was employed.

Results: Pregnant subjects harbored *C. rectus*, *T. forsythia*, *T. denticola* in a higher rate in gingivitis lesions in comparison with their healthy sites ($p < 0,01$, $P < 0,01$, $p < 0,05$). Pregnant group's gingivitis lesions harbored *P. intermedia* and *P. gingivalis* at a higher rate than in control group ($p < 0,01$, $p < 0,05$) whereas *A. actinomycetemcomitans* was found at a lower rate ($p < 0,01$), healthy sites harbored *P. intermedia* and *P. gingivalis* at a higher rate than in control group ($p < 0,01$) and *A. actinomycetemcomitans* was found at a higher frequency than in control group ($p < 0,05$). BOP was found higher in *A. actinomycetemcomitans* negative healthy sites of pregnant women than in *A. actinomycetemcomitans* positive healthy sites ($p < 0,05$). *S. sanguinis* negative healthy sites showed higher BOP and CPD than in positive sites ($p < 0,01$, $p < 0,05$). Preterm labor was higher in women having *P. intermedia* negative healthy sites than in positive healthy sites ($p < 0,05$).

Conclusion: It was found that absence of *P. intermedia* increased the risk of preterm labor 10 times.

The histologic alterations of rat-gingiva in Cyclosporin-A and Tacrolimus Administration

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Objectives: The aim of this study was to evaluate histologic alterations of gingiva of rats treated daily with 10 mg/kg Cyclosporin A and 1,5 mg/kg for 30 days.

Methods: Cyclosporin A and Tacrolimus are immunosuppressive drugs which are frequently used in organ transplantation. CsA can cause various side effects including gingival overgrowth. However, it has unfavorable effects on kidney, liver and bone healing. 50 Spargue Dawley male rats were used in our study. Animals were divided into six main groups respectively: control 15, control 30, CsA 15, CsA 30, tacrolimus 15, tacrolimus 30. All experimental groups received 10 mg/kg/day CsA and 1,5 mg/kg tacrolimus via subcutan injection. All main group were sacrificed at 16th, 31th days respectively. At this time all rats were weighed. Right segment of the mandible were processed for routine histologic observation.

Results: According to our findings, there were differences in histomorphometric levels between groups on 16th and 31th days, which was statistically significant. In CsA administered group, E, L, C, W, levels were significantly more than other groups. The developed gingival overgrowth in this group increased relating to the height and width of the connective tissue and the increase of the thickness of the epithelium. The density of fibroblasts and collagen fibers also increased.

Conclusion: Within limits of the experimental study, it may be concluded that the deleterious side effects of tacrolimus on the gingival tissues of rats may be time-related.

Halitosis And Gingivitis Reduction Using A Zinc-gluconate-taurine-cetylpyridinium-chloride Oral-rinse And Toothpaste

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Objectives: to evaluate the efficacy in reducing halitosis and gingivitis insurgence in fixed orthodontic patients of a zinc-gluconate, taurine and cetylpyridinium-chloride (CPC) oral-rinse, sole or combined with a toothpaste with the same active principles.

Methods: a group of 30 healthy and non-smokers orthodontic patients, between 17 and 38 years of age and without periodontal pathology, was randomly divided in three groups of 10. Two weeks after a professional oral hygiene, instruction and motivation session (t0) the study started recording Plaque Index (PI), Gingival Index (GI), Periodontal probing Depth (PD) and Odor Score (according to Rosenberg's method). The control group A used Super floss® (Oral B®) and toothbrush without toothpaste; the group B additionally used twice a day a zinc-gluconate, taurine and CPC mouthrinse; the group C used also a zinc-gluconate, taurine and CPC toothpaste. Measurements were repeated after one month (t1), a professional oral hygiene session was performed and group B and C were crossed. Finally measurements were again recorded by the same blind operator after one month (t2).

Results: measurements obtained were analyzed by a third blind operator. PI, GI and odor score were statistically ($P < 0,05$) higher in the control group than in the group using the oral-rinse; moreover they were higher in the group using the oral-rinse than in group using oral-rinse and toothpaste. There was no statistically significant difference regarding PD.

Conclusion: the oral-rinse used in this study was effective to prevent halitosis, plaque accumulation and gingival inflammation in periodontal healthy orthodontic patients. Its efficacy was augmented if associated with a zinc-gluconate, taurine and CPC toothpaste.

How can the genetic predisposition influence the periodontopathy in diabetics?

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Genetic factors play a role in the clinical manifestation of periodontopathy. In the Interleukin-1 (IL-1) gene family two gene-variations indicate connection with the formation of disease. The genetic test maps these variations, namely the position of IL-1A gene -889 and IL-1B gene +3953. The presence of both gene variations increases the chance of developing periodontopathy.

Objectives: The aim of our examination was to determine the frequency of IL-1 gene family's alleles in type 1 diabetics with various forms of gingivitis and parodontitis, furthermore to determine the possible connection between the positive genetic attendance and the seriousness of tooth socket status, or frequency of tooth removal.

Method: During our examination we performed 173 clinical dental treatments on type 1 diabetics (105 women, 68 men). To record the status of tooth socket we used the Löe Silness gingival index. The mean number of previously removed teeth was recorded by using the DMF-T index. For the genetic examination we detected the IL-1A and the IL-1B gene (a polymorphism of each) from oral mucosa scrapings. The examination was made by the commercially available kits (Hain Life Science).

Results: 1. There is a significant connection between the specific variant of IL-1 gene family and the incidence rate of moderate to serious gingivitis of type 1 diabetics ($p < 0,001$). 2. The DMF-T index was significantly higher in the gene variant positive patients and more teeth had been removed ($p < 0,001$) probably as a consequence of periodontopathy, than in the gene variant negative group or non-diabetic people.

Conclusion: Knowing the gene variant positive status of type 1 diabetics would allow particular focus and regular dental control to improve patient care in these patients.

Applications of chemotactic-drug-targeting in prevention of periodontitisS. SLEZÁK, IV¹, E. LAJKÓ¹, É. PÁLLINGER¹, K.B. BAI², C. DOMBI³, Z.M. LOHINAI⁴, G. MEZŐ², I. GERA⁵, and L. KÓHIDAI¹¹Genetics, Cell- & Immunobiology, Semmelweis University of Medicine, Budapest, Hungary, ²Department of Organic Chemistry, Eötvös Loránd Tudományegyetem, Budapest, Hungary, ³Division of Oral Diagnosis, Dental Training Center, Semmelweis University of Medicine, Budapest, Hungary, ⁴Dept. of Conservative Dentistry, Semmelweis University of Medicine, Budapest, Hungary, ⁵Department of Periodontology, Semmelweis University Budapest, Budapest, Hungary

Objective: Gingival sulcus is a preformed, physiological space between gingiva and teeth. Gingivitis and periodontitis. result characteristic changes in deepness of the sulcus and in cellular composition of crevicular fluid (CF), therefore this space and its elements are also essential for preventing diseases. Our objectives were: to test impedance based techniques in cell adhesion assay of CF-cells; to test effect of CDT-conjugates on CF-cell adhesion; to describe correlation between cellular responsiveness in samples representing different diseases; to find correlation between cell populations/CD markers and responsiveness of CF-cells.

Methods: Carrier of the tested CDT ligand was a tuftsin derivative. Cell adhesion of CF-cells was monitored in a real-time mode by xCELLigence. CD-marker profiles of samples were characterized by direct immunocytochemistry/flow cytometry. Samples of 120 patients were analyzed. ANOVA test was used for statistical evaluation of data.

Results: Cell adhesion of CF-cell samples proved to be significant on fibronectin coated surfaces, which property was influenced/blocked by the tuftsin containing CDT derivative. Diverse responsiveness was detected in samples of different pathological backgrounds (periodontitis, gingivitis, plaque, caries). Some drugs (antidepressants, antiepileptics) and some lifestyle habits (smoking) has decreased effectiveness of CDT-s. Investigation of CF-cell populations with CD-marker profiles show: the dominant cell population is the neutrophil granulocyte, while HLA-DR and CD14 negativity indicates the lack of monocytes. High number of cells express fibronectin receptor (CD49d) in patients of periodontitis and plaque, while complement receptor 3 (CD11b) and 4 (CD11c) were detected in samples from periodontitis, gingivitis which points to the presence of dendritic cells in these conditions.

Conclusions: Some CDT ligands are able to modulate cell adhesion of CF-cells in a disease dependent way. It is presumed that differences in expression of molecular structures are responsible for diversities in cell adhesion (CD49d) and the effector functions (CD11b-c) characteristic to clinical conditions.

The Plaque Inhibiting Effect of an Essential Oil MouthwashF. HANSEN¹, H. PREUS², A. AASS¹, and O.C. KOLDSLAND¹¹Department of Periodontology, University of Oslo, Oslo 3, Norway, ²Dept. of Periodontology, University of Oslo, Oslo, Norway

Objective: The aim of the present study was to test the clinical efficacy of an essential oil mouthrinse (Listerine Total) on plaque formation and gingivitis in an experimental gingivitis model, compared to a placebo (22 % alcohol) and a positive control (0.2 % chlorhexidine).

Methods: Forty-five dental and dental hygienist students were randomly divided into 3 study groups. All participants were given a professional tooth cleaning one week before the study started. Mechanical oral hygiene was prevented in the upper right quadrant of the mouth during 21 days by using a tooth guard fixed to the teeth while daily mechanical tooth cleaning was conducted. Pl.I and GI were assessed at day 7, 14, and 21 in both upper quadrants.

Results: Rinsing with chlorhexidine resulted in an average Pl.I of 0.30 after 3 weeks of rinsing, which was significantly lower than rinsing with Listerine (Pl.I 0.81) or alcohol (Pl.I 1.14). The GI scores were significantly lower in the chlorhexidine group (GI 0.99) compared to Listerine (GI 1.34) and alcohol (GI 1.29). In the left quadrant, where mechanical measures were used in addition to rinsing, the plaque scores were very low in all three groups. There were also a decrease in GI scores.

Conclusion: Listerine has little effect on plaque formation, and there is no reason to recommend Listerine as an alternative or a supplement to mechanical tooth cleaning.

Effect of Melatonin on Periodontal Bone Destruction and Oxidative StresM. ÖZDEM¹, F.Y. KIRZIOĞLU¹, H.R. YILMAZ², H. VURAL³, Ö. GÜNHAN⁴, Ö. FENTOĞLU¹, and A. KOCAK⁵¹Periodontology, Suleyman Demirel University, Faculty of Dentistry, Isparta, Turkey, ²Medical Biology, Suleyman Demirel University, Faculty of Medicine, Isparta, Turkey,³Biochemistry, Suleyman Demirel University, Faculty of Medicine, Isparta, Turkey, ⁴Pathology, Gülhane Military Medical Academy, Faculty of Medicine, Ankara, Turkey, ⁵Histology and Embryology, Suleyman Demirel University, Faculty of Medicine, Isparta, Turkey

Objectives: The purpose of this study was to evaluate the effect of melatonin on periodontal bone destruction and serum malondialdehyde (MDA), superoxide dismutase (SOD), glutathione peroxidase (GSH-Px) and determine the level of gingiva melatonin in experimental rat periodontitis.

Methods: This study, 30 Wistar Albino male rats were used. Rats were divided into 4 groups as Healthy(S) saline solution(s), Smelatonin(m), Periodontitis(P)s and Pm. Rat tissue samples were obtained for histomorphometric and histopathologic evaluation. Serum samples were collected in order to determine levels of MDA, SOD, GSH-Px and melatonin. However melatonin levels were evaluated in gingival tissue of the rats.

Results: Ps and Pm groups were similar in histopathological and histomorphometric evaluation. However PMNL density in Pm group was lower than Ps group. Low levels of SOD and GSH-Px, MDA levels were higher in P group when compared with S group. Melatonin was led to a decrease in MDA levels and an increase SOD and GSH-Px levels. Gingival melatonin levels were determined significantly lower in Ps group.

Conclusions: Our study supported that melatonin by virtue of its ability to directly scavenges reactive oxygen species (ROS), indirectly stimulates antioxidant enzymes and decrease of tissue concentration levels of melatonin in inflammation, melatonin may reduce oxidative stress and associated damage in experimental periodontitis.

Plaque Accumulation and Estrogen Levels Predict Gingival Inflammation during PregnancyM. GURSOY¹, U.K. GURSOY¹, T. SORSA², R. PAJUKANTA², and E. KÖNÖNEN¹¹Institute of Dentistry, University of Turku, Turku, Finland, ²Institute of Dentistry, University of Helsinki, Helsinki, Finland

Objectives: Pregnant women are known to be prone to gingivitis; however, the gingival inflammation does not develop in all subjects. Dental plaque may initiate this pregnancy-related inflammation; on the other hand, it does not explain its severity. The present longitudinal study aims to define risk subjects of pregnancy gingivitis through the analysis of periodontal status and salivary hormone levels.

Methods: Thirty generally healthy, non-smoking women at an early phase of their pregnancy and 24 non-pregnant women as their controls were recruited. The pregnant group were examined three times during pregnancy (Pr Ex I, Pr Ex II, Pr Ex III), and twice during post-partum (Pr Ex IV, Pr Ex V). For the present analyses, the parameters included visible plaque index (VPI) and bleeding on probing (BOP) measurements, and salivary estrogen levels.

Results: At all visits, BOP correlated with VPI. Subjects were categorised according to the median value of estrogen at each visit as having high or low salivary estrogen. At Pr Ex II, III and IV, the subjects with high estrogen levels had clearly stronger correlations between BOP and VPI. ROC curves confirmed that the subjects with a high estrogen level (above the median) and a high VPI score ($\geq 20\%$ of the sites) have the highest risk of developing gingivitis (BOP $\geq 20\%$ of the sites) during the second and third trimesters.

Conclusion: Dental plaque is the initiating factor for BOP during pregnancy and estrogen has a synergistic effect on gingival inflammation. Subjects with high estrogen levels are more susceptible for developing gingivitis during the second and third trimesters of pregnancy.

Esthetic Rehabilitation of Complicated Crown Fractures after Rapid Orthodontic ExtrusionS. MILARDOVIC¹, M. STRUJIC², A. AURER³, J. VISKIC⁴, L. BERGMAN¹, and K. MEHULIC¹¹Department of Prosthodontics, School of Dental Medicine - University of Zagreb, Zagreb, Croatia, ²Department of Orthodontics, School of Dental Medicine - University of Zagreb, Zagreb, Croatia, ³Department of Periodontology, School of Dental Medicine - University of Zagreb, Zagreb, Croatia, ⁴Department of Orthodontics, School of Dental Medicine, Zagreb, Croatia

Objectives: Complicated crown fractures involve enamel, dentine and the pulp, whereby the most commonly affected tooth is the maxillary central incisor. Various treatment modalities are available depending upon the clinical and radiographic status. In this case a multidisciplinary treatment of complicated crown fractures of both maxillary central incisors in a 12-year-old boy is presented.

Methods: Proper root canal treatment was carried out. The patient and his parents wished for an esthetic, metal-free restoration of the lost tooth structure. The main part of the left incisor was preserved, but the crack on the right incisor extended about 3 mm subgingivally. Therefore, in the first phase the right central incisor was extruded using rapid orthodontic extrusion until all tooth margins layed supragingivally. The tooth was splinted for 2 months as a retention phase. Afterwards periodontal plastic surgery was performed to correct the discrepancy of the gingival margin which occurred as a consequence of forced eruption. FRC Postec Plus posts (Ivoclar Vivadent) were used to stabilize the restorations and a provisional crown was placed to stabilize the soft tissue. After 2 months the teeth were definitely restored. The left incisor was built up directly using composite material (IPS Empress Direct, Ivoclar Vivadent), while the right, extruded incisor was built up with a core material followed by the placement of an all-ceramic crown (IPS Empress II, Ivoclar Vivadent).

Results: After orthodontic extrusion and the surgical recontouring of the altered gingival margin the precondition for an esthetic rehabilitation was created. By applying two different restoration methods – the direct with a composite material, and the indirect using an all-ceramic crown – an esthetic outcome was achieved.

Conclusion: Rapid orthodontic extrusion as a simple, safe, and fast technique to reestablish biological width. It is possible to combine direct and indirect restoration modalities to achieve pleasant results.

Ten-year clinical prospective evaluation of IPS Empress-II fixed dental prostheses

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Objective: The aim of this prospective study is to evaluate the clinical efficacy and long-term survival rate of three-piece partial fixed prostheses (PFP) made from lithium disilicate glass-ceramics (IPS Empress II, Ivoclar Vivadent, Schaan, Liechtenstein). The study was conducted in the Department of Prosthodontics and Occlusion, Faculty of Medicine and Dentistry, University of Valencia and is approved by the Ethics Committee. After signing informed consent, patients who meet the following criteria were evaluated by a protocol.

Material and Methods: Twenty-one three-piece PFPs were placed in nineteen patients to replace single lost teeth in the anterior group, following a treatment protocol that took clinical, aesthetic and radiological aspects into consideration. Each case was reviewed at one month following placement, six months and annually for ten years. Bivariate analysis was carried out (Mann-Wallis Tests and Fisher's exact test) and Kaplan-Meier Survival Analysis.

Results: Out of the nineteen patients, 14.28% presented reversible post-operative sensitivity, recession was observed in 16.6% of dental posts, 7.14% marginal discoloration; treatment did not increase either haemorrhage indices or plaque on dental posts; secondary caries did not appear either. The restorations' survival rate at the ten-year follow-up was 71.4%; six bridges fractured and one debonded.

Conclusions: The use of lithium disilicate glass-ceramics three-piece PFPs placed in the anterior sector, with correctly designed bridge structures and a favorable occlusion (excluding untreated bruxist patients) is justified whenever good aesthetics are a requirement.

A Retrospective Evaluation of 323 Porcelain Laminate Veneers

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Objectives: The objective of this study was to evaluate the clinical results of 323 porcelain laminate veneers over a period of 3 to 11 years.

Methods: This study included 70 patients, aged between 18 and 74 years. Of the 323 total veneers, 124 were of a simple design and 199 were of a functional design. The condition of the soft tissues and hygiene, in addition to the condition of the abutment teeth, the restorations and patient satisfaction were all clinically examined. In carrying out the statistical analysis, a descriptive approach was taken in analyzing the data. The Kaplan-Meier method was used for statistically analyzing the survival rates of the porcelain laminate veneers.

Results: Analysis of the soft tissue revealed marginal recession in 7.7% of the cases, and in 21.6% of the cases, bleeding was detected on probing. Analysis of the condition of the abutment teeth revealed secondary caries and hypersensitivity in 3.1% of the cases, and changes in pulp vitality were observed in 2.8% of the cases. In studying the condition of the restorations, marginal integrity was observed to be excellent in 98% of the cases, slight marginal pigmentation was present in 39.3% of the cases, fractures were present in 4% of the cases and discoloration in 9% of the cases. The degree of patient satisfaction was considered to be excellent in 97.1% of the cases.

Conclusions: Porcelain laminate veneers are a predictable treatment option that offer excellent results.

Clinical performance of all-ceramic cantilever fixed-dental-prostheses: 2-year-results, a pilot study

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Objective: The objective of this prospective, randomized, controlled clinical study was to evaluate the clinical performance of zircon-based cantilever fixed dental prostheses (FDPs).

Materials and Methods: The investigation was realized by twenty-one cantilever FDPs supplying 21 patients. The FDPs were designed as three or four units replacing one premolar or one incisor. Patients with missing canines were not included. These 21 FDPs were randomly assigned to 11 zirconia cantilever FDPs (test group) and 10 conventional metal-ceramic cantilever FDPs (control group). The all-ceramic FDPs were manufactured using a Y-TZP framework (Lava; 3M Espe) and veneered with feldspathic ceramic (Lava Ceram; 3M Espe). The 10 metal-ceramic FDPs were manufactured by fusing a conventional feldspathic ceramic to a noble metal alloy. Controls were scheduled after 2 weeks (baseline), 6 months, 1 year and after 2 years. Complications, plaque accumulation, signs of inflammation of the gingiva, aesthetic performance and patients' satisfaction were documented. Statistical analysis was performed by use of the Log-rank-test, the Mann-Whitney U-test and the Chi-square test.

Results: During the two-years observation period, a total of four clinical relevant complications occurred, including root canal treatment once in each group and two chippings in the test group. The Log-rank-test showed no significant difference to the rate of complication ($p=0.315$). After 2 years in service all restorations showed similar plaque retention and bleeding indices of the marginal gingiva. Without significant differences between the groups. All patients rated the aesthetic performance of both types of FDPs very good without significant differences between the test- and the control-group ($p\geq 0.173$). No caries, discolourations, retention loss was observed.

Conclusion: Stability and aesthetic performance were acceptable for all-ceramic cantilever FDPs made of zirconia. A long observation period with a large number of all-ceramics FDPs is needed to make valid predictions about the longevity of these restorations.

Quality Of Life Of H&N Cancer Patients After Prosthetic Rehabilitation

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Objectives: Progress in treatment of oral cancer has made it possible to reduce the post-treatment mortality and the survival rate was increased. Maxillofacial rehabilitation is the last step in the treatment of head and neck cancer trying to return to pre-illness function. Quality of life in patients treated for head and neck cancer is an important outcome parameter in the post-treatment follow-up. The aim of the study was to examine how does the quality of life of head and neck cancer patients decay after treatment (operation, radiotherapy, chemotherapy), how we can improve it with maxillofacial prosthetic rehabilitation and by which failed function we have the best results.

Methods: 92 head and neck cancer patients were rehabilitated after tumor treatment between 1991 and 2010 at the University of Szeged, Faculty of Dentistry, at the Department of Maxillofacial Rehabilitation. 59 patients completed two quality of life questionnaires /one of the University of Washington (UW- QOL) and the other of the European Organization for Research and Treatment of Cancer (H&N35)/first after treatment but before rehabilitation, second time after maxillofacial rehabilitation. We made statistical comparison from the answers.

Results: In comparison of results UW-QOL and EORTC H&N35 before and after rehabilitation, eating and speech was the huge problem before rehabilitation, and we could improve all of damaged function with prosthetic methods significantly.

Conclusions: Quality of life of head and neck cancer patients decreases after treatment because of the damage important function such as eating, swallowing, speech, aesthetic. Failure of speech and eating means the highest problem for patients before rehabilitation. With methods of maxillofacial prosthetic rehabilitation we have improved all of the decayed functions significantly.

Vertical Bite Reconstruction with Resin-Composite: Survey of a New Restoration-Technique

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Objectives: The purpose of the present survey was to evaluate the implementation and experience of a new method for posterior vertical bite reconstruction using direct resin composite restorations by private practitioners who attended a hands-on continuing education course on this technique.

Methods: In the years 2007 and 2008, 17 one-day continuing education courses on vertical bite reconstruction in the worn dentition by using direct resin composite restorations placed by means of a wax-up-based template were attended by 310 participants. A questionnaire was posted to all course participants in April 2009 seeking information on the acceptance, implementation and experience of the presented technique in the private practice.

Results: A total of 97 (31%) questionnaires were returned, whereas 67% of the respondents had used the presented technique. Analysis of the overall experience and satisfaction with the placed resin composite restorations using visual analogue scale (VAS) revealed a mean VAS score of 7.2 ± 1.7 (0 = maximal unsatisfied, 10 = maximal satisfied). The direct resin composite restorations were predominantly rated 'good' within the assessed criteria surface texture, anatomical form, marginal integrity, marginal discoloration and color match. Ninety-eight percent of the private practitioners stated that they would continue to carry out vertical bite reconstructions according to this technique. The three most frequently observed clinical problems were related to marginal discolorations, bulk fractures and adhesive failures.

Conclusions: The presented technique for posterior vertical bite reconstruction was well accepted by private practitioners who used this treatment approach at least once after course participation, even though some clinical problems were observed.

Comparison of several segmentation techniques used in prosthetic treatment

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Objectives: This paper presents several segmentation techniques used in prosthetic and CAD / CAM modeling.

Methods: The first step consists of using the digitized image obtained with a medical diagnostic device, such as Computed tomography (CT) or Magnetic resonance imaging (MRI) scanner. The medical data was then exported into the DICOM standard format. The segmentation process is crucial for an accurate geometric model of anatomical structure. Choosing between one or more segmentation techniques follows in the next step. The resulting model is exported to a vector format for further processing and analysis in the final step.

Results: The classification of several of the most frequent techniques was performed. The selected segmentation techniques were analyzed and shown schematically. The quality of results obtained by the computer model plays an important role in subsequent analyses such as FEM, FDM or FVM.

Conclusions: The selection of segmentation techniques depends primarily on the input parameters of obtained data. The selection of devices for medical diagnostics also plays an important role. In clinical practice, for example, MRI is often used for soft tissue analysis while CT is often used for display and analysis of hard tissue.

Influence of the zirconia core-design on the in-vitro failure performance

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Objectives: The aim of this study was to test whether the core design of ceramic molar crowns has a significant influence on chipping of ceramic veneering during chewing simulation. The aim was to compare layered- and pressed- veneering techniques.

Material and Methods: The roots of PMMA molars (tooth 46, 1 mm deep circular shoulder, Morita) were coated with a polyether layer (1 mm, Impregum, 3M Espe) for simulating the periodontal mobility and arranged in resin (Palapress Vario, Heraeus-Kulzer). Molar copings (n=8 per series) of zirconia (Lava Ceram, 3M Espe) were made and veneered with layering ceramic veneering ("LC"-Lava Ceram, 3M Espe) or press ceramic ("ZP"-ZirPress, Ivoclar-Vivadent, FL). The veneering thickness varied between 0.6 mm (anatomically reduced) and 1.5 mm (simple core) according to the design. For investigating the influence of the cooling regime, one group ("LCsc") was repeated with reduced cooling rate. All crowns were cemented using Rely X Unicem (3M Espe). Identical antagonists (CoCr-alloy; Wirobond LFC, Bego/ Vita VMK13, Vita) and crowns were transferred to thermal cycling and mechanical loading [TCML] with 1,200,000 [ML]/50N and 6000 [TC]/2min each cycle- water: 5°C and 55°C, which is supposed to simulate five years of service. During simulation the restorations were controlled (chipping, fracture, etc.) every 100,000 ML. Type and size of crown failure was analyzed (SEM; Quanta; FEI-Philips, NL). Statistics: One-way ANOVA ($\alpha=0.05$).

Results: With pressed veneering for both core designs, no failures could be found during chewing simulation. For the layering technique two failures were detected for the simple core design and no failure for the anatomically reduced design. Slow cooling during veneering reduced failures for the layering technique with simple core design.

Conclusions: The results showed that cracking and chipping were dependent on the design of the core and the type of veneering. Slow cooling during fabrication reduced failure sensitivity.

Impact of Marginal Findings on Complications in Zirconia-based CrownsF. HUETTIG¹, C. MESMER², and M. GROTEN¹¹Dept. of Prosthodontics, University of Tübingen, Tübingen, Germany, ²Dental Clinic, University of Tübingen, Tübingen, Germany**Aims:** Evaluation of the marginal integrity and its impact on complications in a clinical followed-up and growing cohort.**Methods:** 37 patients were treated with 82 Zirconia-based single tooth crowns on natural teeth. The Zirconia frameworks were CAM-fabricated (Cercon Smart Ceramics, Degudent) and veneered with a glass-ceramic material (Cercon Kiss, Degudent) in layering technique. Luting protocol was conventional mostly with self-adhesive universal resin cement. Clinical follow-up examinations consisted of a complete dental and hygiene status and a clinical quality assessment according to modified CDA-criteria. Due to a loss to follow up of 4 patients, 77 restorations (36 anterior, 41 posterior) were investigated and evaluated.**Results:** During a mean observation time of 27 months (range 1 to 81, median 21 months), 8 constructions experienced complication (10.4%) affecting four patients. The quality was ranked by according to CDA-scheme: R(excellent)=56, S(acceptable)=12, T(problematic)=6, and V(failed)=3. Ranking included historical adverse events of technical (i.e. chip-off) or biological (i.e. caries, endodontic problem) nature as well as findings at marginal integrity (probing for gap formation, discoloration). Marginal integrity rated 76 crowns as satisfactory (R=65, S=11) and 1 crown "T" to correct for prevention. This misfit denotes 1 out of 77 crowns as "not acceptable", but was already found at baseline and might be a luting mistake. It changes the complication rate to 11,7% (9 out of 77).**Conclusion:** CAM fabricated Zirconia-based crowns showed clinically perfect marginal quality, without impact on overall survival. Nevertheless, clinical short-term performance is compromised by technical complications of the veneering ceramic.**Behavior of Porcelain-Veneered Zirconium Oxide Restorations after Static Load**

R. AGUSTÍN PANADERO, Sr., A. FONS FONT, J.L. ROMÁN RODRÍGUEZ, M. GRANELL RUÍZ, C. LABAIG RUEDA, and M.F. SOLÁ RUÍZ

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Objective: To study the behavior of three types of porcelain-veneered crowns with zirconia cores when subjected to static compressive loading.**Methods:** 80 individual full coverage crowns were studied. Crowns were divided in to four groups: Group I: Ivoclar IPS e.max Zir-CAD crowns (Core: IPS e.max ZirCAD; Porcelain Veneer: IPS e.max Ceram); Group II: Ivoclar IPS e.max ZirPress crowns (Core: IPS e.max ZirCAD; Porcelain Veneer: IPS e.max ZirPress); Group III: 3M ESPE Lava™ crowns (Core: Lava™ Frame Zirconia®; Porcelain Veneer: Lava™ Ceram); Group IV (Control Group): metal-ceramic crowns with porcelain stratification layering technique (Core: Rexillum V nickel chrome alloy; Porcelain Veneer: IPS d.SIGN ceramic). The compression test was carried out using an Instron 4202 testing machine. The load applicator descended onto the sample exercising continuous vertical force with a crosshead speed of 0.5 mm per second, moving vertically downwards perpendicular to the occlusal zone.**Results:** In the porcelain veneer compressive test, Group IV, the control group, achieved the highest values (2310.49 N), closely followed by Group III (2210.95 N). Group II (1818.01 N) and Group I (1773.92 N) came in third and fourth place respectively. The different groups were compared to the control group applying Mann-Whitney non-parametric tests (ZirPress vs Control, p-value: 0.000; ZirCAD vs Control, p-value: 0.000; Lava™ vs Control, p-value: 0.565), taking a significance level of 5% (p-value=0.05). When the resistance of different porcelains is compared, excepting the control group (Lava™ vs ZirPress, p-value: 0.002; Lava™ vs ZirCAD, p-value: 0.001; ZirPress vs ZirCAD, p-value: 0.553).**Conclusions:** Resistance to compressive loading for the metal-ceramic and Lava™ samples obtained an average surface fracture value that was significantly greater in comparison with the ceramic coatings of ZirCAD and Zir-Press. All the porcelain veneers analyzed far surpassed average compression loads subjected during mastication as established by ISO 6872.**Crown inclination and curvature: influence on chipping of veneered zirconia**

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Objectives: The aim of this in-vitro study was to investigate the influence of the occlusal crown design (inclination, curvature) on the chipping performance of veneered zirconia molar crowns.**Material and Methods:** The roots of PMMA molars (tooth 46, 1mm deep circular shoulder, Morita) were coated with a polyether layer (Impregum, 3M Espe) for simulating the periodontal mobility and arranged in resin (Palapress Vario, Heraeus-Kulzer). 40 molar copings (n=8 per series) of zirconia (Cercon Base, Degudent) were made and veneered with layering ceramic (Cercon Ceram Kiss, Degudent). The crowns varied in the design of the occlusal surface. Three different cusp angles (inclination) were applied: steep (S), medium (M anatomical) or flat (F). Anatomically formed cusps were combined with two different shapes of the cusps (curvature): round (r) or accented (a).All identically shaped crowns were adhesively cemented (Variolink 2, Ivoclar Vivadent). Identical antagonists were used (CoCr-alloy; Wirobond LFC, Bego/ Duceragold Kiss, Degudent). Crowns and antagonists were transferred to a chewing simulator in a three point contact. Thermal cycling and mechanical loading [TCML] was performed with 1,200,000 [ML] a 50N and 6000 [TC] (2min each water cycle- 5°C and 55°C), which are supposed to simulate five years of oral service. During simulation the restorations were optically controlled (chipping, fracture, etc.). Type and size of crown failure was analyzed in detail by means of SEM (Quanta; FEI-Philips, NL). Statistics: One-way ANOVA ($\alpha=0.05$).**Results:** With steep cusps, half of the tested crowns showed chipping. No chippings were found for anatomical or flat cusps. Only in combination with steep cusps one crown of the anatomical group failed during simulation.**Conclusions:** The inclination of the cusps had a strong influence on the chipping rate of molar crowns. Within the limit of this investigation, curvature has only small influence on the survival rate.**Fracture resistance of zirconia implants after simulated oral service**M. ROSENTRITT¹, M. BEHR¹, C. KOLBECK², and G. HANDEL¹¹Department of Prosthetic Dentistry, Regensburg University Medical Center, Regensburg, Germany, ²Dept. of Prosthetic Dentistry, Regensburg University Medical Center, Regensburg, Germany**Objectives:** The aim of this in-vitro study was to examine the fracture performance of experimental two-part zirconia implants after simulation of oral service. Zirconia implants were investigated with screwed zirconia abutments and compared to commercially available titanium implant systems.**Material and Methods:** Experimental zirconia (n=8 per group, Tosoh Y-TZP, J) implants (Z) with corresponding zirconia abutments were fabricated. Implants (diameter of 3.8, 4.1 and 4.8 mm) were arranged in resin (Palapress Vario, Heraeus-Kulzer, G) under 45° to the tooth axis. Zirconia abutments were screwed (25 Ncm) onto the implants and restored with standardized crowns (PMMA, d=10mm). After 24hrs (baseline) and after TCML, maximum load to fracture was determined (v=1mm/min, 1446, Zwick, G). Thermal cycling and mechanical loading [TCML] was performed with 2,400,000 [ML] a 50N and 2x6000 [TC] (2min each water cycle- 5°C and 55°C), which are supposed to simulate ten years of oral service. During simulation all restorations were controlled (chipping, fracture). Type and size of crown failure were analyzed in detail by means of SEM (Quanta; FEI-Philips, NL). As a reference titanium implants (with abutments) (T) with diameters of 3.25, and 4.5 mm were investigated (Semandos S, Bego, D). Statistics: One-way ANOVA ($\alpha=0.05$).

Results: None of the implants failed during TCML. Group comparison revealed a significant ($p < 0.039$) reduction of fracture resistance after TCML for T3.25 and Z4.8.

Conclusions: Fracture resistance of zirconia implants in tendency was lower in comparison to the values of titanium implants, but zirconia implants showed promising fracture values after simulated 10-years oral service of $>350\text{N}$ for anterior ($d=3.8\text{mm}$) and of $>600\text{N}$ ($d>4.1\text{mm}$) for posterior applications. We thank CeraM for providing materials.

0302 (151597)

Chipping on zirconia: a comparison of FEA and in-vitro simulation

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Objectives: The aim of this study was to test whether chipping of ceramic veneering is influenced by the design of a zirconia core. Finite Element Analysis (FEA) data were compared with in-vitro chewing simulation.

Material and Methods: Resin molars (Morita, 46, G) were digitalised with $\mu\text{-CT}$ (SkyScan 1172, Micro Photonics, USA), transformed (CATIA, Dessault Systemes, F) and analysed (Solid187, 45mm, ANSYS 12.1 USA). In-vitro simulation and FEA were designed accordingly. Human periodontium was simulated with a 1 mm thick layer of a polyether material (Impregum, 3M Espe, G). Preparation was a 1 mm deep circular shoulder. Four point contacts were sinusoidally loaded. Three series of molar copings ($n=8$) of the yttria-stabilized zirconia (Cercon Base; DeguDent, G) were simulated. The cores differed in design and thickness: simple core 0.5mm, core with minimal occlusal support (max. 0.8mm) and core with optimized occlusal support and cusp-design (max. 1.3mm). The thickness of core plus veneering (Cercon Ceram Kiss) was 2.5 ± 0.1 mm. For FEA verification, one crown was used without core. All crowns were cemented (ZnO-Ph-cement Harvard, Hoffman&Richter, G). Identical antagonists were used (CoCr-alloy; Wirobond LFC, Bego, G/ veneered with Duceram Kiss, Degudent, G). Thermal cycling and mechanical loading (TCML) was performed for aging simulation (1,200,000 mechanical loadings [ML] \times 50N sinusoidal loading and 6000 thermal cycles [TC] -2min between 5°C and 55°C). Crown failures were analyzed by means of a SEM. Statistics: One-way ANOVA ($\alpha=0.05$).

Results: The number and size of chippings was dependent on the design of the core. Simple cores showed a survival rate of only 25%, whereas an optimized design increased survival rates up to 75%.

Conclusions: Both, FEA and in-vitro chewing simulation showed that chipping was dependent on the design of the core: the better the support of the veneering ceramic, the lower the chipping rates.

0303 (151640)

Influence of Surface Treatment on Wear of Solid Zirconia

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Objective: Recently there is a talk of the use of full-contour solid zirconia crown or bridge restorations with no porcelain overlay. That could be a useful solution by patients with bruxism or limited interocclusal space. However the hardness of zirconia could affect the opposite natural dentition. The aim of this in-vitro study was to investigate the role of surface treatments and glazing on wear of a zirconia material and its antagonist.

Materials and Methods: Forty (40) plates $10 \times 10 \times 1$ mm made of Zirconia (LAVA, 3M ESPE), divided in four equal groups, were sandblasted and ground under standardized conditions with a fine-grit diamond bur (Komet Brasseler, Germany) to simulate clinical conditions. The group (a) was only sandblasted, (b) only ground, (c) was ground and additionally polished (EVE Ceramic Polishing-Set, Pforzheim) and (d) was ground and glazed. Wear behavior was measured with a pin-on-disk apparatus ABREX against 6mm Steatite balls as antagonists (45° , 5N load, 5000 cycles, water). The amount of wear was determined topographically using a 3-D profilometer (Concept 3D, Mahr, Germany) by measuring the height loss of the antagonist and the depth of wear Pt of the zirconia.

Results: Mean values (\pm S.D.) are given in the table:

Conclusion: In the groups (a), (b) and (c) wear value Pt could not be determined ($<1\mu\text{m}$). Wear values of the antagonists (steatite balls) revealed a similar outcome in contact with (a), (b) and (d) in the range of 81 to 85 μm , whereas (d) was more abrasive but not significantly. This can be attributed to the higher roughness of the glazed surface. A noticeable difference in the wear of the antagonist showed group (c) with the smallest value.

0304 (151846)

Digital Assessment of Preparation Geometry for Zirconia Crowns by Dental Practitioners

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Objective: Adequate tooth preparations are an important prerequisite for exact fit of dental restorations. Crowns CAD/CAM fabricated Zirconia crowns convergence angles at $12\text{-}20^\circ$ have been recommended. This study uses a new digital approach measure and compare the convergence angles of tooth preparations for Zirconia crowns conducted by dental practitioners.

Methods: A total of 75 preparations of tooth 26 (FDI) were assessed. STL datasets were obtained from gypsum models by optical scanning (LAVAScan ST, 3M Espe, Seefeld, Germany) and imported to a inspection software (Comet inspect plus 4.5, Steinbichler Optotechnik, Neubeuern, Germany). Nine surface points were defined on the tooth dataset by the examiner (z = centre, m = mesial, mb =mesio-buccal, b = buccal, db = disto-buccal, d = distal, dp = disto-palatinal, p = palatinal, mp = mesio-palatinal). Using these points 4 virtual crosssection-planes ($A=m-z-d$; $B=mb-z-dp$; $C=b-z-p$; $D=dp-z-mp$) were constructed and the convergence angle ($A=\alpha$; $B=\beta$; $C=\chi$; $D=\delta$) in every plane was assessed digitally.

Results: The mean of all 300 convergence angles in all planes was 26,7°. Angle β (31,69°) showed the greatest mean values, followed by α (26,27°), χ (24,58°) and δ (24,39°). β differentiated significantly from α , χ and δ (Kolmogorov-Smirnov followed by Mann-Whitney-U; $p=0,05$).

Conclusion: General dental practitioners seem to have difficulties in meeting the general recommendations for Zirconia crown preparations. Convergence angles were detected to be too conical in all planes. These results may influence the decision for an adequate luting mode.

0305 (152186)

A new fluorescent dental zirconia by improved shading liquids

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Objectives: Several factors are important for the aesthetic appearance of dental zirconia. Among high translucency and accurate shading, fluorescence is one of those. The purpose of this study is to determine the fluorescence effects obtained by using newly developed shading liquids for the high translucent Lava Plus zirconia (3M ESPE, Germany).

Methods: Investigated materials were Zirkonzahn ICE Zirkon (Zirkonzahn, Italy), Lava Frame (3M ESPE, Germany) and Lava Plus. Samples were produced by cutting discs out of machined green state cylinders, immersing them into the corresponding shading liquids, drying and sintering according to the IFU. For the Lava Plus samples the newly developed iron free shading liquids containing selected rare earth element ions were used. The sintered samples were grinded and polished (final step 9 μm diamond suspension) (Spectrum System SS 1000, Leco, Germany) to 1,5 +/- 0,05 mm. The fluorescence effect was determined in an UV chamber (CM-10, Spectroline, USA) under UV light.

Results: The shaded Lava Plus sample shows an orange fluorescence, while all comparative samples show no fluorescence at all (see Table 1). This effect can be attributed to the elaborate selection of rare earth elements in combination with the absence of fluorescence quenching iron ions.

Conclusion: The combination of high translucent Lava Plus with the new fluorescent shading liquids results in a dental zirconia with significant improved aesthetics. Fluorescence in dental zirconia adds to the brightness of the material and a more natural appearance. The orange fluorescence gives an appealing colour impression, adding a warm tone to the material.

0306 (152226)

Fracture Toughness of Zirconia depending on thermal and hydrothermal treatment

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Objectives: Fracture Toughness describes the resistance of ceramics against crack propagation. Transformation toughened ceramics like Yttria stabilized Zirconia show different fracture toughness's due to different crystal phase contents or test methods. Aim of this study is the investigation of fracture toughness depending on the test method and thermal or hydrothermal treatment.

Methods: LAVA Zirconia (3M ESPE) specimens were sintered at 1500°C for 2h and ground to 30 bars of 4x3x40mm dimension. 15 samples were mechanically notched according to EN-ISO-6872 (SEVNB). To provoke smaller intergranular cracks for Single Crack in Flexure-Method (SCF) a Vickers Diamond pyramid was indented 15 seconds with 511 N in remaining 15 bars. For both methods the bars were divided in three groups: untreated reference; tempered for 1350°C/0,5h and tempered with following hydrothermally aging for 30h. All bars were tested in 4-point-bending setup (Instron5566). The crack length was measured by Laser Scanning Microscope (KeyenceVK-9710). The fracture toughness was calculated according to following equation $K_{Ic} = Y\sigma\sqrt{a}$. The crystal phase content was measured by XRD (BrukerD8 Discover, Monocapillar200 μm) at the crack area, caused by diamond saw and razor blade or Vickers indentation after testing.

Results: See Table 1

Conclusions: Tempering reduces the fracture toughness and the monoclinic phase content significantly for SEVNB tested samples. Tempering of SCF samples increases fracture toughness and decreases monoclinic phase content. Long term hydrothermally aging increases the fracture toughness by $\geq 30\%$ and the monoclinic phase content for both methods compared to the tempered samples. A possible mechanism is the formation of pressure stress zones at the crack tip caused by phase transformation from tetragonal to monoclinic (local volume expansion) due to hydrothermal aging or mechanical preparation (SEVNB notching).

0307 (152265)

Wear Behavior of Zirconia after Hydrothermal Accelerated Aging

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Objectives: Investigation of zirconia wear behavior after hydrothermal accelerated aging.

Methods: Steatite spheres were used as antagonists (Ceramtec, \varnothing 6 mm). 3M ESPE Lava Frame Zirconia (LFZ), Wieland Zenotec Zr Bridge translucent (WZZ) and 3M ESPE experimental veneering material (VM) were used as initial material groups ($n=4$). All sample surfaces were polished with 9 μm diamond suspension prior to testing. Groups ($n=4$) of LFZ and WZZ were hydrothermally aged in a steam autoclave at 135°C, 2 bar for 5 hours and 30 hours respectively. Spheres and samples were fixed in a longitudinal moving abrasion test device (Elcometer 1720). Spheres were slid under water across material plates at a constant load of 5 N (path length 32 mm, 37 cycles/min for 120 min). X-ray measurements were performed by micro diffraction (diameter 200 μm) in Bragg-Brentano geometry (Bruker D8 Discover) and semi-quantitative phase analysis of monoclinic phase (M) was done by the Rietveld method (Bruker TOPAS software). Waviness depth (Wd) after abrasion was determined by profilometry (Mahr S2) at 6 positions per sample and surface roughness was measured before (Ra0) and after abrasion (Ra1). Sphere abrasion was measured by microscopy (Zeiss SV11) and volume loss (Vl) was calculated.

Results: Mean values for Vl, Wd, Ra0, Ra1 and M are summarized in Table 1. For Vl two sample t-tests ($p<0,05$) were performed between each group.

Conclusions: The VM has shown a statistically significant higher antagonist wear compared to all zirconia groups before and after aging. For LFZ 30 h hydrothermal accelerated aging induced 12 wt.% monoclinic crystal phase at the outer sample surface, however wear properties did not show a significant change. WZZ had 64 wt.% monoclinic phase after 30 h aging and antagonist wear was statistically significant higher compared to the initial value.

0308 (152278)

Influence of coloring procedure on the flexural strength of zirconia

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Objectives: The aesthetic properties of dense-sintering zirconia are limited by low translucency and intense white color. To partially overcome this problem some manufacturers have proposed various techniques for coloring the zirconia framework. The aim of this study was to verify if the coloring procedure may influence the flexural strength of zirconia.

Methods: ISO Standard 6872:2008 was followed in specimens preparation and test procedures. Specimens were cut from a milling block (In-Ceram YZ1), refined, and fired according to manufacturer instruction. Wet-finishing was performed with 600 and 1200grit paper to the required dimensions of 15mm length, 4,0 \pm 0,2mm wide, and 1,2 \pm 0,2mm high. The coloring procedure was performed as described in the table. A final 'regeneration firing' was performed according to the manufacturer recommendation. Specimens were tested in a 3-point bending apparatus (span=13mm; cross-head speed=1mm/min) until failure, and the flexural strength was calculated. Data were analyzed with One-Way ANOVA and Games-Howell.

Results: Group 1-4 obtained statistically similar results. Group 5-6 (painting technique) obtained lower values.

Conclusions: From this preliminary study, both pre-colored blocks and pre-firing immersion-colored blocks had similar flexural strength of the control blocks. The painting technique negative affected the final flexural strength of the material.

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0309 (152585)

Keynote Lecture: Risk Factors for Dental Erosions

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Dental erosions are caused by the attack of an acidic solution, which is undersaturated with respect to hydroxyapatite. This means that not only the pH or amount of titrable acid is responsible for the erosive capacity of a solution, but also the concentration of minerals in the liquid, such as calcium and phosphor. Additionally special properties of the solution, like viscosity, flow behaviour, flow velocity and wettability play a crucial role determining the erosive potential of a liquid. On the other hand, frequency of tooth-acid contact, duration of the contact, status of fluoridation, presence or absence of the salivary acquired pellicle may also have an impact on the erosively induced destructive process of dental hard tissues. Furthermore, some properties of the saliva, such as flow rate and buffer capacity are involved in the development of dental erosions in the oral cavity. This numeration shows that a bundle of different impacts are involved in the development of dental erosions, classifying this disease as multifactorially induced. The lecture intends to discuss these various influences on and risk factors for dental erosions in the light of the current literature.

0310 (152283)

The Role Of The Toothbrush In The Abrasion Process

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Objectives: To evaluate the relative abrasivity of different toothbrushes both qualitatively and quantitatively.

Methods: Acrylic plates were exposed to brushing in a brushing machine with ten different toothbrushes with water alone and with a toothpaste. The results were evaluated using a profilometer after one and six hours of brushing (corresponding to 2000 and 12000 double strokes respectively). A surface roughness value (Ra-value) and also a volume loss value were calculated from the profilometer measurements. These values were then compared to each other.

Results: The results showed that brushing with water alone caused less abrasion than when a toothpaste was added. Six hours brushing with water caused less abrasion than one hour with a toothpaste. The number of filaments or filament diameter influenced the results in various ways. When brushing with water the harder toothbrush (Jordan Medium) caused more abrasion (higher Ra-value) but when adding the toothpaste, the softer toothbrush, (Jordan soft) caused more abrasion after 12000 double strokes.

Conclusion: Besides supporting the fact that a toothpaste is needed to create a significant abrasion, this study also showed that a softer toothbrush can cause as much and in some cases more abrasion than harder ones. When conducting abrasivity studies, it is important to look at both the quantitative and qualitative aspect of abrasivity.

0311 (151378)

Effect of Dental Rinse on Enamel Surface Loss in vitro

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Objectives: To investigate the efficacy of an erosion protection dental rinse on enamel under erosive/abrasive conditions over 28 days compared to tooth brushing without the rinse.

Methods: Sixty human enamel specimens standardised for flatness were mounted in acrylic blocks and divided into three groups: Fluoride-free control toothpaste, NaF toothpaste alone (1400 ppm F) and NaF toothpaste (1400 ppm) with elmex Erosion Protection dental rinse (NaF+rinse). pH cycling was carried out with 1.0 % citric acid (pH 3.6) for 2 mins 5 times daily. Test slabs were treated with a slurry of 1400 ppm NaF dentifrice for two minutes including 15 brushing strokes (200g) twice a day, before the first and after the last acid challenge. The control slabs were brushed with fluoride-free dentifrice. Immediately following the second treatment the slabs of one group were exposed to the rinse for 30 seconds with oscillation. Samples were kept incubated in artificial saliva (pH 6.8). Surface loss was assessed by profilometry after 7, 14 and 28 days.

Results: After 7, 14 and 28 days there was a significantly higher surface loss of enamel for the fluoride-free group compared with the two test groups (p<0.001). Also after 7 and 14 days the NaF+rinse showed significantly more protection (1.59±0.59 and 2.58±1.03 μ m) compared with NaF (2.11±0.54 and 3.28±0.97 μ m). However, after 28 days the difference between the two test groups was not statistically significant.

Conclusions: In this model both the 1400 ppm NaF toothpaste alone and together with a erosion protection dental rinse showed protection against erosion/abrasion for all three time periods. NaF plus rinse showed better protection for 7 and 14 days but not at 28 days, probably due to the selected erosive/abrasive challenge in our model. Supported by GABA

Comparative Efficacy of Nanoparticulate and Non-nanoparticulate Agents against Cariogenic BacteriaA. BESINIS¹, T. DEPERALTA², and R. HANDY¹¹Biomedical & Biological Sciences, The University of Plymouth, Plymouth, United Kingdom, ²Peninsula Dental School - Universities of Exeter & Plymouth, Plymouth, United Kingdom**Objectives:** To assess the inhibitory effect of nanoparticulate solutions and compare them with other antimicrobial/antiseptic compounds currently used in clinical dentistry. Also to evaluate the impact of these agents on the mineral content of dentine.**Methods:** The solutions tested were silver (Ag), titania (TiO₂) and silica (SiO₂) nanoparticles (NPs) as well as silver nitrate (AgNO₃), sodium hypochlorite (NaOCl), calcium hydroxide (CaOH₂), thymol and chlorhexidine. The efficacy of these solutions was tested against *Streptococcus mutans* (S. mutans), which is one of the most cariogenic bacterial species. Efficacy was determined by evaluating the minimum inhibitory concentration (MIC) through an agar diffusion assay and also by measuring the turbidity increase caused by the bacteria growth. Bovine dentine disks were also acquired and stored in the solutions up to 14 days. After 24h and 14 days, dentine surfaces were examined with scanning electron microscopy (SEM) to evaluate the presence of bacteria. The possible loss of minerals from the specimens' matrix after exposure to the solutions was investigated using inductively coupled plasma optical emission spectrometry (ICP-OES).**Results:** AgNO₃ and Ag NPs were the most effective antibacterial agents against S. mutans having MICs of 0.0025% and 0.01% w/v respectively, followed by chlorhexidine (0.13% v/v), NaOCl (0.15% v/v) and SiO₂ NPs (2.5% v/v). The remaining solutions did not demonstrate antibacterial properties. ICP examination of the solutions containing the dentine specimens showed raised levels of calcium and phosphorus in the case of chlorhexidine, SiO₂ NPs and AgNO₃, suggesting dentine demineralisation. SEM confirmed that dentine surfaces treated with NaOCl, SiO₂ NPs, Ag NPs and AgNO₃ remained bacteria free 14 days after storage.**Conclusions:** NaOCl, SiO₂ NPs, Ag NPs and AgNO₃ demonstrated an inhibitory effect against S. mutans and could potentially be used as constituents in dental biomaterial compounds for the control of cariogenic oral bacteria.**Caries Risk Factors In Children Under Orthodontic Treatment**N. UNLU¹, O. AKINCI², F. CEBE¹, and A. DEMIR²¹Department of Operative Dentistry, Selcuk University, Faculty of Dentistry, Konya, Turkey, ²Department of Orthodontic Dentistry, Selcuk Universitesi, Konya, Turkey**Objectives:** The aim of this study was to investigate the influence of oral hygiene instructions (OHI) on the caries-related factors shortly in patients undergoing orthodontic treatment with fixed appliances.**Methods:** Forty-two patients (29 females and 13 males) age 10-21 years, scheduled for orthodontic treatment with fixed appliances were participated in this study. They were divided into two groups based on DMFT/dmft scores (decayed, missing, and filled permanent and deciduous teeth) prior to treatment. High caries risk group (5≥DMFT/dmft) and low caries risk group (2≤DMFT/dmft) were created. The patients were instructed on how to carry out effective oral hygiene close to brackets and ligatures. Visible plaque index (VPI) and gingival bleeding index (GBI) were used to measure oral hygiene status. Paraffin stimulated whole saliva was collected for estimations of salivary flow rate, buffer capacity, MS and LB levels, and white spot lesion index (WSL). VPI and GBI were recorded on six anterior maxillary anterior teeth before treatment, 1 month after appliance placement without OHI, and after 2 months of OHI. The obtained data was statistically evaluated with independent t-test and ANOVA.**Results:** In both groups, the pretreatment buffer capacity, MS levels, and WSL remained statistically unchanged at 1 month after appliance placement without OHI. However, while the levels of LB in high caries risk group significantly elevated, the salivary rate, VPI, and GBI were high in both groups. VPI and GBI were statistically lower following OHI. However OHI did not significantly affect the levels of MS and LB.**Conclusions:** The results of this study showed that OHI significantly improved oral hygiene in both groups. However, patients with fixed orthodontic appliance should be more protected against the caries risk.**Digital image correlation study on polymerization shrinkage of resin-based composites**V. MILETIC¹, D. MANOJLOVIC¹, T. SAVIC STANKOVIC¹, M. MILOSEVIC², and N. MITROVIC²¹School of Dentistry, University of Belgrade, Belgrade, Serbia, ²Innovation Centre of Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia**Objectives:** The aim of the study was to analyze polymerization shrinkage of resin-based composites (RBCs) cured with different light-curing regimes using digital image correlation.**Methods:** Three RBCs were used in the study: low-shrink, microhybrid Filtek Silorane (3M ESPE), nanohybrid Tetric EvoCeram (Ivoclar Vivadent) and microhybrid Filtek Z250 (3M ESPE). Materials were placed in Teflon moulds, 5 mm in diameter and 2 mm thick, held in a fixating device. One surface was lightly sprayed with fine black paint to produce irregular speckles and the other was irradiated from 1 mm tip-to-surface distance with one of the three light-curing regimes: standard halogen at 500 mW/cm², soft-start halogen and standard LED at 600 mW/cm². Digital images of each sample were taken by the Aramis system (Aramis 2M, GOM, Braunschweig, Germany) based on two cameras at 25° angle, immediately prior and after light curing. Local shrinkage of the photographed surface was calculated as Mises strain. The data were statistically analyzed using two-way analysis of variance at alpha=0.05.**Results:** No significant difference in strain was observed between the three materials (p>0.05). Strain distribution was non-homogeneous, the outer or peripheral 1-2 mm showed significantly higher strains than central parts in each material (p<0.05). Peripheral strain was in the range of 2-4% whereas that in the central parts was between 1 and 2%. Soft-start curing regime did not reduce polymerization shrinkage compared to standard halogen or LED units (p>0.05).**Conclusions:** Polymerization shrinkage strain was non-homogeneously distributed across the surface of RBCs. Shrinkage was independent of the chemical composition of the three tested RBCs as well as of the applied light-curing regime. Digital image correlation based on two cameras allows qualitative and quantitative three-dimensional analysis of shrinkage patterns in RBCs.**Improvement of Archimedes method to characterize continuous composite shrinkage**C. RIBEYRON¹, N. PRADELLE-PLASSE², C. VILLAT³, P. COLON², and B. GROSGOGAT³¹UFR Odontology, University of Lyon, LMI UMR CNRS 5615, Lyon, France, ²UFR Odontology, University of Lyon and University of Paris Diderot, Lyon, France, ³UFR Odontology and Service de Consultations et Traitements Dentaires, University of Lyon, LMI UMR CNRS 5615 and Hospices Civils de Lyon, Lyon, France**Objective:** Progress Archimedes method to obtain a better reproducibility of the continuous recording giving informations about stress between charges and matrix, during and after photopolymerization process.**Materials and method:** Four composite resins have been used, Gradia Direct (GC); Clearfil Majesty™ Posterior (KURARAY); Clearfil Majesty™ Esthetic (KURARAY); Grandio® (VOCO). Samples (sphere of 5 mm diameter) made by an holder are weighted with a balance XS205DU with a tenths of a milligram precision and the LabX software (Mettler Toledo LTd, UK) in the dry air and then in the auxiliary liquid. The sample is held in suspension in the auxiliary liquid and stay between two LED lights (GC). After 30 seconds (needed time to obtain stable measurement) the two LED lights are both simultaneously switched on during 20 seconds. The weight is computed during 480 seconds by the software every second. This method allows a better understanding of the behavior of composite resin during curing process.**Results:** From 30 to 60 seconds, there is an exothermic peak due to the rise of temperature of the auxiliary liquid. Results give the volumetric contraction as shown in the table below:

Product	Average weight in the dry air	Average contraction at 50sec	Average contraction at 480sec	Exothermic peak
Gradia Direct	0.1081±0.0027	1.2099±0.0069	1.8827±0.0016	0%
Clearfil Majesty™ Posterior	0.1817±0.0024	0.8157±0.0030	1.3777±0.0024	0.42%
Clearfil Majesty™ Esthetic	0.1252±0.0022	1.1954±0.0018	1.4531±0.0018	0%
Grandio®	0.1621±0.0031	0.7911±0.0069	0.7911±0.0068	0.43%

The analysis of graphics reveals different stress evolutions between charges and matrix of each resin in relation with their density. A 40 seconds polymerization time (higher rate polymerization) could be of course realized to quantify the final contraction.

Conclusion: With the improvement of methodology, results show a good reproducibility and explain materials behavior regarding shrinkage. There are differences between each composite resin, which demonstrate the interest of this continuous registration technique

0316 (151978)

The Degree of Conversion of Composites Using Different Light-Curing Sources

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Objectives: The purpose of this study was to investigate the effect of different light-curing units and irradiation modes on degree of conversion (DC) in resin composite polymerization. Further aim was to evaluate the depth of cure of resin composite layers with the above mentioned different curing units.

Materials and methods: 2 x 4 mm and 4 x 4 mm sized composite model resins were prepared from Filtek Z250 (3M, St Paul, MN, USA). The standard supplements were irradiated with 6 different curing units (conventional halogen, high power halogen, plasma arc (PAC) and 3 blue LED light-curing units) in different curing methods. After irradiation the specimens were stored in ethanol for 72 hours in dark at 25°C. The ethanol solutions containing unpolymerized, dissolved monomer were analyzed with reversed phase high performance liquid chromatography (RP-HPLC).

Results: The highest DC was observed from LED curing devices. There was no difference between DC used standard mode and soft-start extended curing intervals. The PAC and the high power halogen unit showed the lowest DC in fast cure mode. Higher DC was produced by increasing curing time. At 4 mm depth all curing units and methods showed lower curing efficiency, than at 2 mm.

Conclusion: Degree of polymerization shows direct correlation with total energy of irradiation. The LED light provides the highest DC in standard and soft-start methods, while exposure time is not enough for complete polymerization recommended for PAC and high power halogen sources. Photo-activated composite in thickness higher than 2 mm should not be utilized in clinical situations. Acknowledgements: This work was supported by Grants PD 76395 and PD 78599 of the Hungarian National Science Foundation (OTKA).

0317 (151467)

Depth Dependent Curing Behaviour of Dental Composites using DEA

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Objectives: Photo-curing dental filling composites should cure completely and very quickly for the patients convenience and the required mechanical performance. However, the curing rate depends significantly on the light intensity generating the required initiator radicals which is affected by the kind of lamp and the absorption behaviour of the composites. This work investigates the question: How are curing process and ion-viscosity linked to each other, and does the curing behaviour and curing kinetics depend on the depth within the sample?

Methods: Two photo-curing composites Arabesk Top OA2 and Grandio OA2 (VOCO, Germany) were investigated using the dielectric cure analyser NETZSCH DEA 231 with the frequency of 1 kHz. The surface of Mini-IDEX-sensors was covered with layers having thicknesses of 0.5 up to 6 mm. The curing process was initiated with the LED curing device Celalux (VOCO) for 80 seconds. The temperature dependency was investigated for 1 mm thick samples at temperatures between 25 and 50°C.

Results: With increasing depth i) the initial slope of the ion-viscosity decreases significantly indicating a lower curing rate, Fig. 1. Furthermore, it seems that curing mechanisms change for thicknesses exceeding 2 mm; ii) the ion-viscosity drops due to inhibition processes directly after starting the illumination. This drop is more pronounced for Arabesk Top OA2, iii) the final ion-viscosity is slightly higher for slow curing rates. The temperature affects mainly the ion-viscosity of the uncured state and the initial slope, not the final ion-viscosity.

Conclusions: The DEA allows to measure the curing behaviour depth sensitively as the penetration depth of the electric field corresponds to the electrode distance. Furthermore, it indicates that slower curing rates lead to higher final conversion degrees.

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0318 (151639)

Fracture toughness of Composites, Comparison of CNB and SEVNB Methodologies

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Fracture toughness is a key parameter to study chipping fractures and wear. Because of their heterogenic nature, the fracture toughness of dental composites is often hard to assess.

Objectives: To determine the fracture toughness of 4 composites using 2 different test methodologies.

Methods: For the Chevron-Notched Beam (CNB) test, the ISO 24370:2005(E) for ceramics was slightly adapted to comply with resin-composite specimens. Composite blocks of 25x3x35-50 mm were prepared and cut into 25x3x4 mm specimens. After 1 week of water storage, a notch was prepared using a precision low-speed saw (Accutom 50, Struers) mounted with a 150-µm thick diamond blade. Next, the fracture toughness was determined by subjecting the specimens to a four-point bending setup in a universal testing machine (5848, Instron). For the single-edge V-notched beam (SEVNB) test, eight 16x3x2 mm specimens were prepared for each composite according to the ASTM Designation E 399-83. Notch tip radii of 5–10 µm were prepared and specimens with notch depths of 0.8–1.4 mm were used. Specimens were then loaded to fracture in a three-point bending test setup (4400, Instron), after which KIC was calculated.

Results: Fracture toughness measured using the CNB method resulted in significantly higher values than that measured using the SEVNB method (2-way ANOVA, p<0.0001). Nevertheless, both methods correlated very well (Pearson's correlation coefficient = 0.9779; p=0.0221), so that ranking and the observed differences between the different composites were preserved.

	CNB			SEVNB		
	mean ± SD	n	Tukey	mean ± SD	n	Tukey
Tetric Evo Ceram	1.97 ± 0.23	10	bde	1.48 ± 0.45	8	a
N'durance	1.79 ± 0.18	10	ab	1.01 ± 0.07	8	c
Filtek Supreme	2.27 ± 0.25	11	de	1.89 ± 0.18	8	ab
Filtek Z100	2.36 ± 0.46	9	d	1.92 ± 0.11	8	ab

Conclusion: Fracture toughness of dental composites can be determined by the CNB as well as the SEVNB methodology; despite the difference in specimen size, the outcome of both methods correlated very well. The easier specimen preparation of the CNB methodology renders the outcome less technique sensitive and enables to prepare more specimens with less effort.

0319 (151677)

Mechanical characteristics of human tooth to improve dental materials development

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Objectives: The physicochemical-mechanical properties of dental restoration materials should be similar to natural enamel and dentin. Therefore, it is essential to know which of these material properties are most important for dental materials development.

Methods: Extracted human molars were stored in artificial saliva and wrapped during embedding in Parafilm® M (Brand & Co KG) to avoid epoxy resin infiltration (EpoThin, Buehler). The molars were sliced, sectioned to pins and finally into cubes (edge length 1.2 mm, Medim Histosaw). Afterwards, the specimens were divided into enamel and dentin as well as sorted beginning from coronal to apical.

Mechanical parameters were determined using a material testing machine (BZ2.5/TN1S, Zwick GmbH & Co. KG, Ulm, Germany) under free uniaxial compression load (load cell 2500N, force velocity 1 mm min⁻¹). Structure modulus is used instead of Young's modulus since enamel and dentin show an anisotropic viscoelastic material behavior. Statistics: Kruskal Wallis H test (p < 0.05) and Spearman's rank correlation (p < 0.05).

Results: No differences were found between both structure modulus of enamel and dentin as well as in vertical direction. By contrast, compression strength values of dentin were up to 60 % higher compared to enamel. Otherwise, elongation at break of dentin was approximately twice higher as enamel. From coronal to apical, compression strength as well as elongation at break decreased. Spearman's rank correlation test showed that the structure modulus of enamel decreased with the elongation at break. In contrast, the structure modulus of dentin correlates positively with the compression strength. Therefore, dentin has to be more resistant to compression forces than enamel because the dentin tubules act as buffers to mechanical load which was confirmed by the results as wells as microscopic studies.

Conclusion: Compression strength and the elongation at break are the most important parameters in restoration material design.

0320 (151498)

Adaptation of Growing Alveolar Bone to Orthodontic Miniscrews

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Objectives: To evaluate growing bone reaction to the insertion and immediate-loading of orthodontic miniscrews.

Methods: Sixteen devices, eight of stainless steel (Leone, Firenze, Italy) and eight of Ti6Al4V (Absoanchor, Dentos, Daegu, Korea), were inserted in the mandible of four Large White pigs (three month-old), in an anterior and a posterior area. After 4 weeks of loading, bone parameters were evaluated by histomorphometric analysis. These parameters were assessed for the bone area located at the apical third of the devices and for a bone area used as a control zone in a 1mm surrounding external zone of the miniscrews. The ethics committee on animal research (National Veterinary School of Lyon, France) approved the study protocol.

Results: Bone parameter assessment did not reveal differences between both types of devices (mixed effects logistic regression). Bone in the anterior area tended to present lower density than in the posterior one: while trabecular bone volume (BV/TV), trabecular thickness (Tb.Th) and trabecular number (Tb.N) tended to be greater in the posterior zone, the trabecular separation (Tb.Sp) values appeared higher in the anterior area. Compared with bone in the control area, no significant differences were found for BV/TV (p=0.23), Tb.N (p=0.9), and Tb.Sp (p=0.46). In the anterior zone, Tb.Th values appeared to be greater for bone in the vicinity of miniscrews than for bone in the control area (p=0.05). This increased trabecular thickness was not found in the posterior area.

Conclusion: Increased trabecular thickness was noted at 4 weeks in the anterior region in the vicinity of the devices compared with the control bone area. In the growing animal model, and for bone with low density, increased bone trabecular thickness would represent an adaptation mechanism to the stress induced by loading.

0321 (151564)

Ultrastructural study of Wistar rat dentin after Low-Frequency Noise (LFN)

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Low-frequency noise (LFN) (≤ 500Hz, infrasound included) is present in professional, residential and leisure environments, and is inadequately measured with standard procedures. Our group and others have reported the appearance of abnormal proliferation of connective tissue in several organs and tissues of animals exposed to LFN. These lesions of fibrosis usually occur in the absence of inflammatory signals. There is a high prevalence of barodontalgias, a greater number of fillings, endodontic treatments and tooth replacements in military flight personnel. There have also been reports of a relationship between high levels of occupational noise and tooth abrasion in exposed textile workers. Dentin is a dynamic substrate - injuries like caries, stress, trauma, among others, induce a repair reaction.

Objectives: To characterize the morphological alterations in the dentin of Wistar rats exposed to LFN.

Methods: We used 30 adult male Wistar rats. Twenty rats were divided in 2 experimental groups of 10 animals each and exposed to LFN for 4 and 7 months, with a weekly average of 40 hours of exposure. The remaining 10 animals were kept in silence and used as controls. We extracted 8 molar teeth from each animal. The specimens were fractured, processed for electron microscopy, and studied with field-emission scanning electron microscopy (FESEM) and energy dispersive spectroscopy (EDS).

Results: Under the FESEM, a 3.5 to 4.0 µm wide mineral-like band was present in the pulp chamber roof of the animals exposed to LFN. EDS analysis revealed this band to have a similar composition to that of hydroxyapatite. Severe occlusal abrasion was also depicted in the animals subjected to LFN.

Conclusions: LFN induced the formation of tertiary dentin localized in the pulp chamber roof corresponding to the areas of occlusal wear.

The Comparison of White Spot Lesion Treatments

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Introduction: The aim of this study was to compare the white spot lesion treatments after fixed orthodontic treatment.

Methods: The study population consisted of 80 (46 females, 34 males) (967 effected teeth) patients with multiple decalcified enamel lesions after fixed orthodontic therapy. The patients divided into 4 equal groups (flouride group, CPP-ACP group, microabrasion group, and control group). The flouride group patients were instructed to use the 30 ml neutral 0.05% sodium flouride rinse two times in a day for six months, CPP-ACP group patients were instructed to use Tooth Mousse (GC Asia Pty. Ltd., Japan) two times in a day apart from flouridated toothpaste for six months, well-accepted 18% hydrochloric acid and pumice technique was used for microabrasion methods. The control group patients were given the same flouridated toothpaste as the test group. The photographic records were taken on first examination and six months later on last examination. The area of white spot lesion was measured by AutoCad software program. After measuring the effected teeth surfaces, they were divided into three groups according to the Gorelick classification (mild, moderate, severe demineralization) in three groups. Data were analyzed with General Linear Model test.

Results: In comparisons there were statistically significant differences between groups ($P < 0.001$) and between classes ($P < 0.001$) and there was interaction between groups and classes ($P < 0.001$). The success rates were 61% in CPP-ACP group, 49 % in flouride group, 98 % in microabrasion group, and 44 % in control group. The results reveal that microabrasion significantly reduced visible enamel demineralization according to the other groups.

Conclusions: The use of the CPP-ACP can be beneficial in postorthodontic remineralization more than flouride rinse. Microabrasion is an effective treatment approach for the cosmetic improvement of long-standing white spot lesions.

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Experimental periodontitis in *Msx2* mutant mice: impaired periodontal tissue responses

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Objectives: Many of the pathogenic mechanisms that trigger profound periodontal tissue breakdown, such as connective attachment and alveolar bone losses remain unknown. Host response to periodontal infection displays unspecific and specific aspects. The homeogene *Msx2* is specifically involved in the control of root formation and physiological alveolar bone resorption. This study aimed to evaluate in vivo the periodontal tissue responses to experimental periodontitis in *Msx2* knock-in mice with insertion of beta-galactosidase gene.

Methods: Severe periodontitis were induced by wrapping silk ligatures previously incubated with *Porphyromonas gingivalis* (PG) around right first maxillary molar twice a week during four weeks. Periodontal tissue destruction and inflammation were evaluated by histomorphometry and beta-galactosidase immunocytochemistry, and compared in *Msx2*+/-, +/-, and -/- mice.

Results: Beta-galactosidase staining was mainly detected in Malassez's rests. A significant connective attachment and bone loss was observed in sites with ligature compared to control sites. Apical Epithelial downgrowth was more pronounced in *Msx2*-/- than in *Msx2*+/- and *Msx2*+/. Extension and severity of inflammatory cell infiltrate was also majored in *Msx2*-/. Alveolar bone fragments were observed in contact or close to the inflamed epithelium in *Msx2*-/-, and at a lesser extent in *Msx2*+/- mice.

Conclusion: In *Msx2* gene defective mice, epithelial and bone response to experimental periodontitis were impaired. These data suggested that *Msx2* was involved in periodontal tissue homeostatis, and epithelium-connective tissues cross-talk during periodontal inflammation.

Human Adipose Derived Stem Cell-Coral Constructs and Bone Formation

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Objectives: Grafts and substitutes, used to treat bone defects, have several disadvantages (hemorrhagia with autografts, viral contamination risks with allografts, poor osteogenic potential with alloplastic grafts). Biohybrids, that combine scaffolds with growth factors and/or stem cells, may represent an alternative to current bone regeneration techniques. This study aims to explore the osteogenic potential of human adipose derived stem cells (hADSC) in a composite biomaterial using coral scaffold.

Methods: To study their in vitro-behaviour, hADSCs were plated (10^4 cells/cm²) with 450µm large coral particles (2.5mg/cm²). The cells were cultured either in plain medium (control) or in medium supplemented with vitC, b-glycerophosphate, and dexamethasone (osteogenic). DNA proliferation assays and quantification of alkaline phosphatase activity were performed according to established methods. To study their osteogenic potential, hADSCs were loaded on 3mm coral cubes (3.105 cells/cube) and cultured for 7 days in either control or osteogenic media. Then, the constructs were subcutaneously implanted in 6 week-old NMRI-nu/nu male mice. Non-demineralised histological analysis was performed.

Results: In vitro, compared to cells cultured in control media, hADSCs cultured in osteogenic media showed increased alkaline phosphatase activity from day21 and formed mineral from day21 to day28. Coral particles and glass micro beads (used as control) didn't interfere with hADSCs' osteoblastic differentiation. In vivo, after a 46-day-implantation, all hADSC-coral constructs implanted were fully cell-colonized. Constructs with differentiated cells showed coral surface dissolution, rich vascularization and collagen-rich extra-cellular matrix, whereas constructs with undifferentiated cells showed increased coral resorption. None of the constructs showed new bone formation.

Conclusion: This preliminary study shows that the association with coral doesn't modify hADSCs' behaviour in vitro and that hADSCs' state of differentiation affects coral dissolution in vivo. The optimal on-scaffold culture conditions (seeding density, loading techniques, differentiation state) and cell-survival after implantation need to be further investigated.

Impact of Laminar Acid Flow Velocity on Enamel Calcium Loss

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Objective: To evaluate the impact of flow velocity under laminar flow conditions of different acidic solutions on enamel calcium loss.

Methods: 240 bovine enamel specimens were fixed in a flow chamber system with laminar flow behavior (Yu et al: Arch Oral Biol 55:702-705, 2010). Samples (n=8) were superfused with 1 ml of citric acid or hydrochloric acid (HCl) of pH: 2.0, 2.6, or 3.0. Flow rates in the sample chamber were adjusted to 10, 60 or 100 µl/min. To simulate turbulent flow behavior, samples were immersed in 1 ml of the respective solution, which was vortexed (15 min, 600 U/min). Calcium in the solutions was determined using Arsenazo-III-method (Attin et al.: Caries Res 39:432-436, 2005).

Results: Mean amounts (standard deviation) of accumulated calcium [nmol/ml] in the solutions are depicted in Table 1. For all acidic solutions, calcium accumulation decreased with increasing flow velocity. Immersion in vortex led to significantly higher calcium loss than under flow conditions. For acidic solutions of pH 2.0, erosive potential of citric acid was higher than for HCl at all flow rates. This was not true for pH 2.6 and pH 3.0, where no difference was found between both solutions.

Conclusion: Under laminar flow conditions of the used superfused model, flow rate variations lead to different erosive impact of citric acid compared to hydrochloric acid at pH 2.0, but not at pH > 2.6.

Detection of oral bacterial DNA in synovial fluidS. REICHERT¹, M. HAFFNER¹, G. KEYBER², C. SCHÄFER³, S. HEIDE⁴, S. HEIKO⁴, W. ANDREAS⁵, G. CHRISTIANE⁶, H.-G. SCHALLER¹, and S. SCHULZ¹¹Operative Dentistry and Periodontology, Martin Luther University, Halle (Saale), Germany, ²Clinic Internal Medicine II, Martin Luther University, Halle (Saale), Germany, ³Clinic for Internal Medicine II, Martin Luther University, Halle (Saale), Germany, ⁴Institute for Forensic Medicine, Martin Luther University, Halle (Saale), Germany, ⁵Institute for Medical Epidemiology, Biometrics and Informatics, Martin Luther University, Halle (Saale), Germany, ⁶Institute of Human Genetics and Medical Biology, Martin Luther University, Halle (Saale), Germany**Objective:** Periodontopathogens could influence formation of rheumatic diseases. Recently we developed a method for the molecular detection of DNA of *A. actinomycetemcomitans*, *P. gingivalis*, *P. intermedia*, *T. forsythia*, and *T. denticola* in synovial fluid. The aim of this study was to compare synovial microbial findings between patients with rheumatic diseases (RD) and subjects without rheumatism (controls).**Methods:** 44 patients with RD (mean age 53.0±16.5, 43.2% females) and 75 controls (mean age 55.5±16.7, 46.1% females) were included. Synovial fluid was aspirated from swollen joints. DNA was isolated by QiaAmp-kit (Qiagen, Hilden, Germany). PCRs specific for the 16S rRNA genes of these bacteria were optimized in order to detect up to 10 DNA copies of each periodontopathogen per 1 ml synovial fluid. For positive control of DNA preparation the samples were spiked with *E. coli* strain XL2B. Subgingival bacterial colonization was analysed using micro-Ident® test (HAIN-Diagnostik, Nehren, Germany).**Results:** Synovial samples from patients with RD were slightly more often positive for periodontopathogens (36.4%) in comparison to controls (31.6%). Moreover, *A. actinomycetemcomitans* (2.3% vs. 1.3%), *P. gingivalis* (11.4% vs. 3.9%), *T. forsythia* (15.9 vs. 7.9%), and *T. denticola* (11.4% vs. 7.9%) were more often proven among the RD group whereas *P. intermedia* occurred rarely in comparison to the controls (11.4% vs. 13.2%). Comparing the subgingival plaque analyses with the synovial findings 20.5% of the RD patients but only 14.5% of the controls showed a correlation in at least one bacterium.**Conclusion:** DNA of periodontopathogens was proven in the synovial fluid obtained from patients with RD or controls. Although no significance could be reached, there was a tendency for a higher infective burden in the synovial fluid in patients with RD. Therefore, further evaluation should be performed in larger cohorts. DGP/GABA research support 2008**The effect of mechanical stress on periodontal fibroblast cells**E. LUKÁCS¹, G. BERTA², G. SÉTÁLO, Jr.², J. DOBSA³, J. SZEBERÉNYI², G. SZABO³, and J. SZALMA⁴¹Department of Prosthodontics, Department of Medical Biology, University of Pécs Medical School, Pécs, Hungary, ²Department of Medical Biology, University of Pécs Medical School, Pécs, Hungary, ³Department of Prosthodontics, University of Pécs Medical School, Pécs, Hungary, ⁴Department of Oral and Maxillofacial Surgery, University of Pécs, Pécs, Hungary**Objectives:** the aim of this study was to investigate age-related changes in the biosynthetic capacity of prostaglandin E2 (PGE2) and the expression of the enzyme, cyclooxygenase-2 (COX-2) from periodontal ligament cells in response to mechanical compression and the activation of certain intracellular signal transduction proteins involved in stress- and survival pathways. We hypothesized that mechanical compression promotes the induction of COX-2, promoting PGE2 production in an age-dependent manner.**Methods:** pieces of PDL were obtained exclusively from the middle of tooth root extracted for orthodontic or prosthetic reasons from human donors aged 10-77 y. Ligament samples were cultured in a medium containing fetal bovine serum and proliferated cells were passaged 4-6 times. The cells were subjected to a static compressive load (2 g/cm²) applying a uniform compression for up to 48h. Culturing media were collected of both control and pressurized cells. Enzyme-Linked Immunosorbent Assay (ELISA), Western blotting and immunocytochemical methods were used to analyze the production of inflammatory mediators; expression of cathepsins, and COX-2, and at the same time, activation of certain signaling proteins like extracellular signal-regulated kinase (ERK), c-Jun N-terminal kinase (JNK), p38 mitogen-activated protein kinase, and Src tyrosine kinase.**Results:** age-related changes in PGE2 production and COX-2 expression varied among patient groups, in most cases compression stimulated these inflammatory responses as much as 5 and 7 fold, respectively in some of the samples. Early activation (as soon as 5 min) of protein kinases (ERK, p38, Src) was detected.**Conclusions:** this study demonstrates that periodontal ligament cells obtained from older donors do not have significantly greater COX-2 expression and PGE2 secretion in response to compressive force than those obtained from younger donors. These signaling molecules may be potent factors in the degradation of the periodontal ligament but unanimous increase in sensitivity to mechanical stress during aging has not been found.**Mutual Interaction of Mesenchymal Stem Cells with Various Periodontal Cells**S. PROKSCH¹, T. STEINBERG², U. SCHWARZ³, E. HELLWIG¹, and P. TOMAKID²¹Dept. of Operative Dentistry and Periodontology, Freiburg University Medical Center, Dental School and Hospital, Freiburg, Germany, ²Dept. of Oral Biotechnology, Freiburg University Medical Center, Dental School and Hospital, Freiburg, Germany, ³Department of Oral and Maxillofacial Surgery, University Medical Center Freiburg, Dental School and Hospital, Freiburg, Germany**Introduction:** Human mesenchymal stem cells (hMSC) are promising for regenerative therapies in dentistry. In this context, interactions between hMSC and various periodontal cell types are poorly understood. Therefore, we aimed to assess the mutual interactions of hMSC with human alveolar osteoblasts (hOA), periodontal ligament cells (hPDL) and gingival fibroblasts (hGF).**Methods:** Bone marrow hMSC and hOA, hPDL and hGF characterized according to established protocols. For interactive co-cultures of 7, 14 and 21 days, hMSC were incorporated in collagen-gels with periodontal cells grown on the gel surface. Cryosectioned collagen gels were stained for matrix deposits (Giemsa, Masson-Goldner trichrome) and immunolabelled for osteocalcin, osteopontin, osteonectin, collagen 1a1. For RNA isolation, hMSC and periodontal cells were established in transwell systems. Expression of osteogenic genes was evaluated in co-cultured and mono-cultured control cells by qRT-PCR (statistics: Repeated Measures Analysis; Dunnet's adjustment of p-values).**Results:** hMSC exhibited a multilineage differentiation potential and expressed the typical surface markers, which fairly also applied for hOA, hPDL and hGF. Irrespective of co-cultures, gels tended to contract with the ranking: hOA > hGF > hPDL, and correspondingly featured extracellular matrix deposits and cell clusters. The expression of osteogenic marker genes tended to be delayed in hMSC upon co-culture with hOA, but not in co-culture with hPDL and hGF. Vice versa, co-culture with hMSC generally supported the expression of osteogenic markers in the periodontal cells.**Conclusion:** The results obtained from our study show for the first time that expression of osteogenic markers was mutually influenced by the interactions of hMSCs and various periodontal cell types established in co-cultures. These findings provide first evidence that the lineage fate of hMSC may be influenced by periodontal cells. More important, hMSC appear to be modulators of periodontal cell differentiation, thereby rendering a promising tool for prospective therapeutic approaches in periodontology.

Effect of Er:YAG laser as adjunct to guided tissue regenerationA. HORVÁTH¹, I. GERA¹, P. WINDISCH¹, D. SZENDRŐI-KISS¹, and A. SCULEAN²¹Department of Periodontology, Semmelweis University Budapest, Budapest, Hungary, ²Department of Periodontology, University of Berne, Berne, Switzerland

Objective: To evaluate the effect of the erbium:yttrium-aluminium-garnet laser (ERL; Key II®, KaVo, Germany) on the healing of human intrabony defects treated with a demineralised bovine bone mineral (DBBM) and a bioresorbable collagen barrier (BioOss® and BioGide®, Geistlich, Switzerland).

Methods: Twenty-two periodontitis patients were included. Inclusion criteria were: presence of intrabony defect with minimum 3 mm of depth following initial periodontal therapy; good oral hygiene (FMPS<25%); non-contributing medical history and signed informed consent. Plaque/bleeding score (FMPS/FMBS); pocket depth (PPD); gingival recession (REC) and attachment level (CAL) were measured at baseline and after twelve months. Following flap reflection, subjects were randomised in two groups. Root surface debridement and granulation tissue removal were carried out either with ERL at 160 mJ/pulse, 10 Hz and 15-20 degree between the chisel shaped tip and the root surface (test) or by ultrasonic and hand instruments (control). Defects were then filled with DBBM and covered with the collagen membrane prior to flap closure. Postsurgical regime included amoxicillin (500mg, TID, 7 days) and chlorhexidine rinse (0.2%, BID, 2 weeks). Patients were enrolled in a supportive oral hygiene program.

Results: No statistically significant differences were detected between test and control groups at baseline. Postoperative healing was uneventful in both groups. In the ERL group mean PPD was reduced from 9.2±2.8 mm to 3.7±1.1 mm (p<0.001) and mean CAL changed from 11.7±2.9 mm to 7.5±1.8 mm (p<0.001). In the test group mean PPD was reduced from 8.5±2.6 mm to 3.4±1.0 mm (p<0.001) and mean CAL changed from 10.6±3.6 mm to 6.5±2.0 mm (p<0.001). None of the investigated parameters showed statistically significant intergroup differences.

Conclusion: Within their limits, the present findings indicate that: a) both therapies led to significant clinical improvements and b) ERL has failed to additionally enhance the benefit of conventional debridement, as adjunct to guided tissue regeneration.

0330 (152161)

Periodontitis is no source for rhythm management device infectionsJ. EBERHARD¹, S.N. STUMPP¹, U. SCHNAIDT¹, W. HEUER¹, T. BISDAS², C. KÜHN², A. HAVERICH², M. PICHLMAIER², and M. STIESCH¹¹Prosthetic Dentistry and Biomaterials Science, Hannover Medical School, Hannover, Germany, ²Thoracic, Transplant and Cardiovascular Surgery, Hannover Medical School, Hannover, Germany

Objectives: Several reports have identified oral bacteria in atheromatous plaques pointing to a potential causal pathway for the association of periodontitis and cardiovascular diseases. The aim of the present study was to evaluate if periopathogens/oral bacteria are also involved in the pathogenesis of rhythm management device infections by the systemic transmission of bacteria from the oral cavity.

Methods: From April 2005 to December 2010 twenty rhythm management devices were explanted due to infections in patients showing at least PD>4mm in 30% of all teeth. Subgingival plaque samples were collected by standardized procedures. The biofilms adherent to the rhythm management devices were removed and analysed by single-strand confirmation polymorphism (SSCP) analyses following by sequencing. The dental plaque samples were investigated with oligonucleotide primers specific for bacteria identified in the biofilms adherent to the rhythm management devices.

Results: In the 20 patients (age: 75.7±10.6 years) observed rhythm management devices were implanted for a mean period of 8.2 years. The bleeding frequency (mean (min-max)) was 42% (12-100%) and the mean pocket depth was 5.2mm (4.0-9.1mm). The SSCP analyses identified bacterial DNA in 16 out of 20 specimens. The predominant species found on the surfaces of the rhythm management devices were *Staphylococcus epidermidis* (n=6), *Staphylococcus aureus* (n=2), and *Propionibacterium acnes* (n=2). The analyses by species-specific primers identified *P. acnes* within the oral plaque samples.

Conclusions: The present study did not observe the bacterial infection of rhythm management devices by periopathogens released from periodontal lesions. The transmission of oral bacteria by blood and the concordant infection of rhythm management devices is an unlikely event.

0331 (152231)

Microassay for PMN intra-/extracellular production of reactive oxygen species (ROS)

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Luminol dependent chemiluminescence (CL) is frequently used for the detection of ROS.

The objective: of this ex vivo study was to establish a method for the detection of receptor stimulated extra- and intracellular ROS production by polymorphonuclear neutrophils (PMN).

Methods: 12 healthy individuals participated after written informed consent. Solubility of cell impermeant iso- vs. permeant luminol was tested employing DMSO, double distilled water or 0.9% saline solution. Dose responses for N-formyl-Met-Leu-Phe (fMLF) opsonized zymosan (OZ) and phorbol-12-myristate-13-acetate (PMA) were assayed to determine responses by formyl-peptide- or Fcγ-receptors or direct PKC stimulation by PMA. CL was measured with a Mithras LB940 (Berthold, Germany), at 37°C using 96 well microplates. After equilibration, cells were stimulated with fMLF, PMA or OZ and CL was recorded for 60min. Intracellular ROS generation was calculated by subtracting the extracellular (isoluminol) from the overall (luminol) CL. Assay conditions were optimized for PMN in a range of 10⁶-10⁴ cells/well and adapted for minimum stimulus concentrations.

Results: Optimized PMN concentration for the assay was found to be 5*10⁵ PMN/well (ANOVA;p<0.05), allowing functional CL to fMLF as low as 10⁻¹⁰M. The CL differed depending on the chemilumigenic substrates (ANOVA;p<0.001) as well as stimuli in use. Independently of the stimulus concentration, PMN yielded maximum CL for OZ followed by PMA and fMLF (ANOVA;p<0.001). Dose responses were established with optimized concentrations: 0.5g/l (OZ), 10⁻⁷M (PMA) and 10⁻⁶M (fMLF), respectively. Significances in between the distinct concentrations used within each dose response series were p<0.05 (ANOVA).

Conclusions: Based on concentrations of 5*10⁵PMN/well we were able to detect extra-/intracellular ROS. The results further indicate that the corpuscular stimulus (OZ) was associated with a maximum yield of intra-/extracellular ROS production. Intermediate production followed by receptor independent activation of PKC via PMA. The soluble stimulus and chemoattractant fMLF had minimum potential inducing global or extracellular CL.

0332 (151391)

Prevalence and Risk Factors for Peri-implant Disease in Belgian Adults

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Objectives: Since more and more patients receive dental implants, increasing numbers of biological complications are observed. The aim of this study was to evaluate the prevalence and risks indicators for mucositis and peri-implantitis in a Belgian population with implants of at least five years in function.

Methods: 103 patients were treated at the university hospital or in several private practices. There were 65 females, 38 males with a total of 266 implants. Full mouth clinical parameters (PII, BOP, PPD) and X-Rays were assessed in order to evaluate periodontal and peri-implant status. Patient's characteristics such as gender, age, history of periodontitis and systemic conditions as well as implant's variables (localisation, duration, trademark, surface and prosthetic type) were screened.

Results: The average patient's age was 62 years (+/- 13.4). The frequency of their dental visit was 1.7 per year (+/- 0.9). Prevalences of peri-implant mucositis and peri-implantitis were calculated for patients (31% and 37%, respectively) and for implants (38% and 23%, respectively). Positive correlations were found between peri-implant disease and periodontal status (active periodontitis: OR= 3.46), age (65 and over: OR= 2.73), presence of plaque (30% and over: OR= 1.63), absence of teeth

(total edentulous: OR= 4.77) and implants age (10 years and over: OR= 3.24). No association was found between peri-implant disease and tobacco, gender or localisation of the implants in this population.

Conclusion: Several factors were associated with biological complications such as mucositis and peri-implantitis. Indeed, total edentulous patients, subjects with active periodontitis, and implants with 10 years or more in function were more prone to present peri-implant disease. -->

0333 (151912)

Parathyroidhormone stimulated Osteoblasts differentiating on titanium surfaces

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Objectives: Parathyroid hormone (PTH) has anabolic effects on bone formation in-vivo by stimulating the activity of osteoblasts and down-regulating osteoclasts if applied intermittently. The study aimed at evaluating the effects of titanium characteristics and PTH stimulation protocols on the differentiation of primary osteoblasts in vitro.

Methods: Primary osteoblasts were isolated from a human donor, trypsinized and passaged till level of confluence. At passage 4 to 5 cells were placed upon titanium discs either of a machined, SLA or modSLA surface preparation. The stimulation by PTH was chosen for 6 hrs resembling an intermittent protocol or over 48 hrs mimicking a continuous stimulation. Cells seeded on plastic or on titanium surfaces without PTH stimulation served as controls. Cell adhesion and proliferation were assessed by assay, whereas the expression of Collagen 1 (Col1), Osteopontin (ON), RUNX2, PTH R1, Osteocalcin (OC) were analysed by rtq-PCR reflecting the level of differentiation of osteoblasts in each experimental condition.

Results: PTH-stimulation showed no influence upon adhesion of osteoblasts on any surface included. Cell proliferation was statistically increased on smoother surfaces ($p<0,05$). Intermittent stimulation with PTH showed significant suppression of cell proliferation in contrast to permanent or no stimulation ($p<0,05$). Osteopontin and Osteocalcin expression rates were elevated in intermittent PTH stimulation group disregarding the surface characteristics. Expression of COL I, ON, PTH R1 and RUNX2 was up-regulated in all titanium groups by continuously stimulation with PTH.

Conclusions: Gene expression of osteoblasts on different surfaces showed heterogeneous effects in regard to stimulation protocols. The effect of titanium surface characteristics on gene expression remained masked due to the set up of the study. The source of the cells used should be discussed. All primary osteoblasts were derived from single donor being passaged for the level of confluence. Supported by Institute Straumann AG.

0334 (151589)

Prosthetic rehabilitation of extraction sites with horizontal-vertical bony defects

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Aims: In the present case series patients with advanced alveolar defects underwent complex surgical and prosthetic rehabilitation. We aimed at establishing optimal periimplant hard- and soft tissue conditions, as well as eliminating periodontal pockets of neighbouring teeth.

Materials and methods: 20 patients in good general health presenting at least one tooth with hopeless prognosis were enrolled to the study. Patients completed initial periodontal treatment, full mouth gingival- and plaque scores were kept less than 20% throughout the study. Teeth with hopeless prognosis upon severe periodontal attachment loss were removed. Subsequently, extraction site development was performed to preserve horizontal and vertical dimensions of the edentulous alveolar ridge. When needed, soft tissue augmentation was performed simultaneously. After 6 months of healing, 10 patients received fixed partial dentures. 10 patients underwent further hard- and soft tissue augmentation with simultaneous implant placement. After 9-12 months of healing inserted implants were loaded.

Results: 10 patients received conventional fixed partial dentures, 6 patients received implant-borne single crowns, 4 patients implant-borne fixed partial dentures. In all cases, esthetically and functionally optimal hard- and soft tissue conditions were achieved. At neighbouring teeth, mean PPD changed from 3,95mm ($\pm 1,39$) to 2,51mm ($\pm 0,75$), mean GR from 0,79mm ($\pm 0,53$) to 1,92mm ($\pm 1,04$), mean CAL from 4,74mm ($\pm 1,53$) to 4,38mm ($\pm 1,31$).

Conclusions: Complex reconstruction of lost hard- and soft tissues following the removal of teeth with hopeless periodontal prognosis was successful in all treated cases. Optimal hard- and soft tissue environment was created around inserted implants. Removal of hopeless teeth and surgical reconstruction of edentulous sites may have contributed to elimination of periodontal pockets at neighbouring teeth.

0335 (151592)

Epigenetic modification in TNF α -gene and periodontal disease

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Objective: Periodontitis as a bacterially induced chronic inflammatory disease is triggered by specific host dependent immune response. The expression of the genes involved in inflammatory processes is influenced among others by genetic and epigenetic modifications. Moreover, many risk factors associated with periodontitis, including bacterial occurrence, smoking, or diabetes, are known to induce epigenetic changes.

Methods: In order to evaluate the impact of epigenetic modification on regulation of inflammatory genes in periodontitis we established and validated a Combined Bisulfite Restriction Analysis (COBRA) for assessing CpG methylation of TNF α -gene on position c.-668. After bisulfite conversion (EpiTect Bisulfite Kit, Qiagen) specific seminested PCRs were performed. For COBRA restriction enzyme HinfI was used. As positive and negative controls methylated and non-methylated converted DNA (Qiagen) were used. Patients: 24 patients (18 patients with severe chronic or aggressive periodontitis: mean age: 47.5+9.7y, 13males; 6 periodontitisfree healthy controls: mean age: 41.8+6.6y, 4 males) were included in the study. From 12 periodontitis patients the methylation status was determined in gingival tissue. The methylation pattern of 6 controls and 6 periodontitis patients was assessed in venous blood.

Results: In gingival tissue there was a significant reduction of CpG methylation in TNF α -promoter compared with venous blood (61% vs. 100%, $p<0.001$) possibly leading to an increase in TNF α -gene expression. However, in venous blood there was no difference in methylation status in dependence periodontal disease (controls: 100%, periodontitis patients: 100% methylation, ns). In gingival tissue a distinct decrease in methylation was obviously in CP-patients compared to AP-patients (56.9% vs. 65%, $p=0.085$).

Conclusion: For the first time a change of epigenetic pattern in TNF α -gene was assessed comparing inflamed gingival tissue and venous blood. However, because of the small cohorts the results obtained could only be regarded as preliminary and should be verified in larger cohorts. Supported by DGP and Martin-Luther-University

Treatment of multiple gingival recessions with a bioresorbable collagen matrix

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Objectives: The aim of this prospective, randomized, controlled split-mouth clinical trial was to compare the treatment of Miller Class I and II multiple gingival recessions using the modified coronally advanced tunnel (MCAT) technique either with a bioresorbable collagen matrix or a connective tissue graft (CTG).

Methods: Seventeen subjects exhibiting multiple Miller Class I and II gingival recessions (i.e. at least 3 recessions per site) were included and treated. According to a computer-generated randomization schedule, recession sites were treated using the MCAT technique by means of either a bioresorbable collagen matrix (Mucograft®, Geistlich, Wolhusen, Switzerland) (test) or a CTG harvested from the palate (control). The following clinical parameters were assessed at baseline and at 1, 3, and 6 months postoperatively: recession depth and width, width and thickness of keratinized tissue, percent of 100% root coverage.

Results: No allergic reactions, soft tissue irritations or matrix exfoliations occurred at test sites. At 6 months, mean root coverage amounted to $1,4 \pm 0,9$ mm vs. $1,4 \pm 1,0$ mm; mean increase in keratinized tissue width amounted to $0,5 \pm 1,2$ mm vs. $0,4 \pm 1,0$ mm at test vs. control sites, respectively. Differences were statistically not significant. Mean increase in keratinized tissue thickness amounted to $0,16 \pm 0,32$ mm vs. $0,3 \pm 0,37$ mm; complete root coverage was found in 54% vs. 73% at test vs. control sites, respectively. Differences were statistically significant. Duration of surgery and patient morbidity were lower in the test compared to the control group.

Conclusions: i) treatment of Miller Class I and II multiple gingival recessions using the MCAT technique combined with either Mucograft® or CTG may result in substantial mean root coverage, but lower complete root coverage with Mucograft® and ii) Mucograft® may represent a valuable alternative to CTG, resulting in lower patient morbidity and duration of surgery.

0337 (151953)

Genetic determinants of periodontitis in the Hungarian population

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Objectives: Periodontitis is a complex multifactorial disease: genetic factors are evidenced in the etiology besides pathogenic bacteria and various environmental factors. Depending on the ethnic group or investigated population there are multiple genes with several polymorphisms, which may be variably involved in the development of periodontitis. Our goal was to investigate the incidence of 7 single nucleotide polymorphisms (SNPs) (IL-1α -889A/G, IL-1β+3954C/T, IL-1β-511G/A, IL-10-1082T/C, TNFα-308A/G, TLR4-299A/G, TLR4-399C/T) in patients with several forms of periodontal disease in the Hungarian population.

Methods: DNA was isolated from buccal swabs from 259 healthy volunteers and patients with several clinical forms and severities of periodontal disease. They were classified according to clinical parameters into healthy control, gingivitis and chronic and aggressive periodontitis groups and were further stratified based on pocket depths into 4 groups (0-1 mm, 1-3.5mm, 3.5-5.5mm, and >5.5mm). The 7 SNPs were identified by Genotyping Realtime PCR using Taqman SNP Genotyping assays. Group-wise differences were calculated by logistic regression and Chi2 probe.

Results: The rare A allele frequency at IL-1β-511G/A SNP increased with increasing periodontal pocket depths: OR=2.007 between control and 3.5-5.5mm groups (p=0.0097) and OR=2.372 between control and >5.5mm groups (p=0.0024). The rare AA genotype frequencies were significantly different between the control and 1-3.5mm groups (19.1% and 36.2%, respectively), and the 3.5-5.5mm and >5.5mm groups (38.6% and 45.6%, respectively). Other SNPs did not exhibit significant differences at our sample numbers yet.

Conclusions: According to our results the IL-1β-511G/A polymorphism has a stronger association with periodontitis in the Hungarian population while other examined SNPs might have a relatively weak role or necessitate larger sample numbers to achieve significance. The IL-1β-511G/A SNP may be used in the future as a selection criterion to identify individuals with an increased risk to develop periodontitis. Supported: OTKA-72385, TAMOP-4.2.1/B-09/1/KMR-2010-0001.

0338 (152321)

BM-MSC adhesion and differentiation increase by oxidized nano-structured titanium surfaces

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Objectives: to characterize the micro- and nano-texture of a novel oxidized titanium implant surface with respect to a conventional turned one, and to evaluate their ability to affect the response of human bone marrow mesenchymal stem cell (BM-MSC) in terms of adhesion, proliferation and osteogenic differentiation.

Methods: 10x10x1 mm turned (control) and oxidized (test) titanium samples (P.H.I. s.r.l., San Vittore Olona, Milano, Italy) were examined by scanning electron microscopy (SEM) and atomic force microscopy (AFM) and characterized by different roughness parameters at different dimensional analysis ranges. Primary cultures of BM-MSC were seeded on titanium samples and cell morphology, adhesion, proliferation and osteogenic differentiation, in terms of alkaline phosphatase activity, osteocalcin synthesis and extracellular matrix mineralization, were evaluated.

Results: oxidized surfaces showed a more complex micro- and nano-scaled texture with respect to turned ones at both SEM and AFM analyses, with higher values of roughness parameters at different analysis ranges. Also cell adhesion and early and late osteogenic parameters were greater on oxidized (p<0.05 at least) vs turned surfaces, whereas the cell proliferation rate was similar.

Conclusions: Both control and test samples were in the "smooth" range of average roughness, but they exhibited significantly different topographic properties, which could be properly characterized only using a multi-range/multi-parameter approach and proper filtering procedures. This different micro- and nanostructure resulted in an enhanced adhesion and differentiation of cells cultured onto the oxidized surfaces.

0339 (151955)

Improving osseointegration of titanium implants by surface modifications

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Objectives: Achievement of the biointegration of alloplastic materials is one of the most important targets of research in the medical, dental, and biological sciences. As the average human lifespan is growing, ever more people need tooth replacement using titanium dental implants. The demand is increasing to speed up the otherwise long osseointegration period (3-6 months) to rehabilitate the damaged chewing apparatus of the patients as soon as possible even for people in a worse than average health status. Various tools can speed up the osseointegration of titanium implants: physical-chemical and biochemical surface modifications. A lot of research work is devoted to elaborate these methods to achieve the desired biological responses: in case of healthy patients a regular osseointegration process, but in case of older or even ill patients a lower bone quantity or not ideal bone quality means a handicap in biointegration. These cases are often avoided by patient selection. The proposed lecture will contain an overview of this topic and the presentation of our own results.

Methods: Our group has developed three surface modifications of titanium implants: laser surface modifications, self-assembled polypeptide layers or octacalcium phosphate layer on the surface of implants. The properties of these modified surfaces were investigated by modern surface science techniques (AFM, SEM, XPS).

Results: The applicability and effectiveness of these modifications will be investigated by in vitro (cell-culturing) and in vivo animal experiments. One of the most promising surface modifications that could enhance the osseointegration of dental implants are the laser modifications, as proven by our results.

Conclusions: Many of the surface modifications are in experimental stage and the in vivo or clinical studies are still ahead. It is our belief that these surfaces will represent a huge positive contribution to clinical implant science, especially if we target the older or ill patients.

0340 (151223)

Fibroblasts Attachment to CaCl₂ Hydrothermally Treated Titanium Implant

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Objectives: This study investigated the effect of hydrothermal treatment with calcium chloride (CaCl₂) solutions on fibroblast attachment and proliferation to titanium implants in the presence and absence of fetal bovine serum.

Methods: Pure titanium (The Nilaco Corporation, Tokyo, Japan) specimens were prepared, polished (1500 grit), cleaned with ethanol, hydrothermally treated with CaCl₂ solutions at 200°C for 24hs (Ti-CaCl₂). Two different concentrations of CaCl₂ solutions were tested (10mM/L and 20mM/L). Titanium specimens without CaCl₂ treatment were used as a control. Then, specimens were exposed to L-929 fibroblasts to test the cellular attachment and proliferation after 30 min, 1h, 2h, 5h, 1day, 3day and 1 week with and without fetal bovine serum. The percentage of viable attached cells (cells/ml) for each surface treatment was measured using trypan blue assay. Cellular growth on just culture plate material was used as a negative control. The data (n=5) were statistically analyzed by ANOVA/Tukey test (p<0.05).

Results: Without fetal bovine serum after 1 week, a statistically significant (P<0.05) higher cell attachment to titanium control (4.1x10⁴±0.5x10⁴) than to Ti-CaCl₂ 10mM/L (0.7x10⁴±0.1x10⁴) or Ti-CaCl₂ 20mM/L (1x10⁴±0.1x10⁴) was revealed. With fetal bovine serum after 1 week, there was a significant (P<0.05) lower cell attachment to Ti-CaCl₂ 20mM/L (76x10⁴±7x10⁴) than to titanium control (142x10⁴±3x10⁴).

Conclusions: The CaCl₂ hydrothermally treated titanium showed lower evidence of fibroblasts attachment than pure titanium did, which means decreasing the liability of fibrosis, and hence, stronger bonding of CaCl₂ hydrothermally treated titanium implant to bone (better osseointegration).

0341 (151671)

The usefulness of Volumetric Tomography on implant around bone structure

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Objective: To assess image quality on cross-sectional peri-implant anatomy in the bucco-lingual plane using Volumetric Tomography (VT) and Cone Beam Computed Tomography (CBCT).

Materials and method: The VT used was OP-200D (Instrumentarium Dental Co., Finland) and CBCT was 3DX (Morita Co., Japan). ITI implants were used as a implant body. A 1:2 mixture of plaster of paris and saw dust was used to simulate the bone block. Metallic post of 2 and 2.5 mm diameter were used to simulate the metal objects to generate the artefacts on the image. The implant body was placed in between two metallic posts of similar diameter in the same line separated by equal distances in the simulated bone block. 14 different combinations were prepared using two posts to simulate the varied possible locations of such posts in vivo. The images were analysed by 5 oral radiologists who were asked to score the visibility of the peri-implant anatomy in terms of their central and peripheral regions separately. The scale used was: 1. no confident, 2. somewhat not confident, 3. indecisive, 4. somewhat confident and 5. confident. The results were statistically analyzed using one-way analysis (ANOVA) between each modality, from all scores of distance between implant body and metallic post.

Results: There was no statistical difference between two modalities on both central and peripheral regions. The distance between implant body and metallic post did affect significantly on the image quality, but there was somewhat better tendency to visualize peri-implant anatomy on VT compared to CBCT.

Conclusion: The results suggested that the distance between implant body and metallic post could be measured using VT without significant degradation of images around implant and its peripheral bone. VT could be one of the alternatives to observe post-operative alveolar bone changes three-dimensionally.

0342 (152238)

Bone-tissue Response to Titanium Implant Bioactivated with Organic Phosphate-containing Polymer

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Inorganic polyphosphates are said to stimulate not only the behaviour of osteoblast-like cells in vitro but also bone formation in vivo.

Objectives: The purpose of this study is to evaluate in vivo bone regeneration around titanium implants treated with an organic phosphate-containing polymer.

Methods: Twelve experimental sand-blasted and acid-etched implants (GC; Sa=1.35 µm) were treated with a 10%wt solution of a phosphorylated polysaccharide (PPS) prior to implantation in the forehead of 12 Domestic Belgium pigs. Control group included 12 non-treated implants. Animals were sacrificed after 4 or 12 weeks. Ground-sections were prepared and stained with Stevenel's blue and Von Gieson's picrofuchsin for histological and histomorphometrical analysis. Bone regeneration around implants was evaluated in terms of bone-to-implant contact (BIC) and bone fraction (BF) considering three different areas of interest: collar, body, and total length of the implant. Data were statistically analysed using Wilcoxon matched-pair and Mann-Whitney U tests (p<0.05).

Results: Implants treated with PPS induced higher BF around implants in both healing times (4 and 12 weeks) when the total length and the body of the implants were taken into account (p<0.05). On the other hand, no statistically significant difference was found around their collar. Irrespective of the area of interest to be considered, higher ratios of BIC were found for implants treated with PPS after 12 weeks (p<0.05), although no statistically significant difference was observed after 4 weeks. Following a healing timeline from 4 to 12 weeks, a significant decrease in BIC was observed around non-treated implants (4 weeks = 61.4±6.6%; 12 weeks = 48.1±11.6%; p<0.05) while no difference was found for PPS-treated implants (4 weeks = 67.4±8.7%; 12 weeks = 64.8±12.6%; p>0.05).

Conclusion: Implant-surface treatment with PPS may positively influence bone formation and osseointegration around titanium implants.

0343 (152223)

Cytocompatibility of BCP grit-blasted surface versus other common surface treatments

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Objectives: The surface properties of titanium dental implants are key parameters for osteointegration. The purpose of this study is to investigate the cytocompatibility of a type of titanium implant material grit-blasted with Biphasic Calcium Phosphate (BCP).

Material and Methods: Titanium implants were either grit-blasted with biphasic calcium phosphate (BCP), sandblasted with glass abrasive grains or smooth. For biocompatibility evaluation MG63 osteoblast-like cells were used. Cell morphology was assessed with scanning electron microscope (SEM). Additionally, cell proliferation and viability were investigated by biological MTT assay as well as the total protein content after 2, 5 and 8 days. One-way analysis of variance (ANOVA) and t-test were used to determine the differences of cytocompatibility between the three surfaces treatments.

Results: The comparison between the three surface treatments shows us that cytocompatibility was improved on the biphasic calcium phosphate grit-blasted surface. Effectively, cell proliferation and viability were significantly higher on BCP-grit-blasted implants than on smooth and sandblasted surfaces either after 2, 5 or 8 days. From the results of cell morphology observation, cell densities positively correlate with the proliferation data.

Conclusion: Based on these results, it can be suggested that a biomimetic biphasic calcium phosphate grit-blasted surface shows better biological performances than the two other surface treatments. This biomimetic grit-blasted method might enhance the apposition of bone onto titanium dental implants.

0344 (153490)

Structural Variables and Outcomes in the Design of Resin-Composites

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Dental resin-bonded composites (RBCs) are formulated with substantial volume-fractions of reinforcing particles of hybrid size-ranges. The particles are coated by a coupling agent, and dispersed in an organic resinous matrix. The matrix monomers contain dissolved sensitizer molecules that are activated by visible light to initiate the photo-curing process. During the past 50 years, RBCs have undergone intense development, mostly reduction of the maximum particle size-ranges, and recently by the incorporation of nano-sized particles. During the past decade attention has partly switched to innovations in the resin-monomer matrix due to the polymerization shrinkage inherent in most resin-monomers, notably bisGMA/TEGDMA. Concurrently, resin-composites have been marketed with a wider range of viscosities, especially with the flowable RBCs. Consequently, it is essential for developers and end users to be clear about the key functional requirements of RBCs. In sequence of application, these are: 1. User-friendly handling properties. 2. Rapid property development: 'kinetic functionality'. 3. Customized space filling: dimensionally stable materials. 4. Distribution of stress / load transmission: strong and retentive / adhesive materials. 5. X-ray contrast: radiopacity. 6. Aesthetic appearance: appropriate optical properties: translucency, gloss, opalescence, etc. It follows that the RBC structural variables can be fine-tuned to achieve quite varied performance outcomes. Certain products, especially some with innovative large-size monomers intended to reduce shrinkage, exhibit greater viscoelastic strain and so are virtually restricted in application to 'smart dentin replacement' and require coverage by materials that exhibit high strength and good aesthetics. Some users will prefer materials that can achieve the latter properties in a single formulation, possibly placed by a 'bulk-fill' technique. Irrespective of specific formulation, many bisGMA/TEGDMA composites are rather sensitive to the mode and time-scale of light-curing. Sub-optimal irradiation of such RBCs can generate inferior matrix structures and performance. But when used appropriately, the best of current RBCs have proven to deliver excellent clinical outcomes of adequate longevity.

0345 (153491)

"Chameleon" Effect – How to Measure Color Adjustment of Resin Composites

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Some esthetic materials tend to adjust their color to the color of the surround. The term blending effect ("chameleon" effect) refers to the perceived color difference between esthetic dental materials and hard dental tissues, and manifests as a smaller color difference when observed together than would be expected if they were viewed in isolation. This is primarily perceptual phenomenon, not measurable with conventional colorimetric devices. However, the translucency of dental materials (when they overlay hard dental tissue) would also be expected to contribute to the degree to which a restoration is visually acceptable. This latter is a physical phenomenon that can be measured. Color difference, ΔE^* , between some dental materials and the hard dental tissue is frequently smaller when the dental material is in situ than when the two are in isolation, because of their translucency. Disc-shaped specimens ($n=5$) and dual specimens ($n=5$) of A1 and A3 shades of Venus Diamond (Heraeus Kulzer), Tetric EvoCeram (Ivoclar Vivadent), and Filtek Supreme Plus (3M ESPE); M1 and M5 shades of Ceram X mono (Dentsply Caulk) were evaluated. Color evaluations were performed by means of spectroradiometer. All specimens were positioned in focus on a clear acrylic stand and measured with no backing. A 1-mm circular area, with its center in the middle of the specimen was measured. The data were analyzed by analysis of variance. Fisher's PLSD intervals for comparison of means were calculated at the 0.05 level of significance. Results clearly demonstrate that: (a) a majority of resin composites exhibited color adjustment potential; (b) color adjustment potential was highly varied and was composite- and shade-dependent; and (c) because of huge differences in color adjustment potential among materials and its possible influence on esthetic outcome, it can be beneficial to quantify the color adjustment potential of resin composites both scientifically and clinically. It was difficult to tie differences in color adjustment potential values to information reported by manufacturers on composite type, particle size, filler content, or monomer. Within the limitations of this study, the most pronounced color adjustment by product/shade was recorded for Venus Diamond (A1), followed by Ceram X Mono (M5), Tetric EvoCeram (A1), and Filtek Supreme Plus (A3).

0346 (153492)

Mechanical Characteristics of Nanofiller Containing Resin Composites and Clinical Significance

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A wide variety of dental resin composites both for use in anterior and posterior areas are available in the dental market. Apart from traditional hybrid, microhybrid and microfilled materials, nanofilled and nanohybrid composites were recently introduced. According to manufacturer claims, these latter products are characterized by high mechanical strength and good wear resistance, low polymerization contraction strain and stress, superior polish and gloss retention. Generally, handling characteristics and clinical performance of resin composite restorations depend on their composition, i.e. the type and amount of matrix monomers and fillers used, the efficacy of the coupling between matrix and filler, and finally the activation system. Although new monomers have been introduced to reduce curing shrinkage and stress, modification of filler concepts, reduction of the filler particle size and increase of filler load seem to be the most significant changes, that might have a direct impact on mechanical characteristics. According to a recent review article on clinical challenges with resin-based restorations, secondary caries and restoration fracture proved to be the most common clinical problems in the long term. Composite fracture was the most frequent type of restoration failures identified within the first five years. Although in vitro trials cannot adequately mimic the complex in vivo conditions, comparative evaluations of basic mechanical characteristics of resin-based restorative materials might hint at their susceptibility to mechanical failure during clinical service. Therefore, the objective of this investigation was to determine several common mechanical characteristics and the degree of cure by depth of six recent nanofiller containing resin composites, compared to one microhybrid and one microfilled reference material. In this presentation composition-property relations will be discussed and clinical recommendations given.

0347 (153493)

Filler Particles... the Magic Ingredients of Composites - A Key for Advanced Products

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With the introduction of composite materials, basically inorganic-organic-hybrid systems, any progress in dental restorative materials development was correlated to the improvement of the filler system. A classification of composites regarding the particle size distribution is popular and well accepted in the scientific literature, but composite properties are much more complex than determined by particle sizes only. A more detailed analysis of filler characteristics and resulting composite material properties is a key for further progress. Today we are able to combine very different filler particles and materials. Whereas future materials may contain tailor-made filler structures and dimensions for improved resin composite characteristics. This lecture illuminates the options and advantages new filler technologies can feature in future development of dental resin composites.

Dental and Clinical Aspects of HalitosisC. SCULLY*Eastman Dental Institute for Oral Health Sciences, University College London, London, England*

Oral malodour or halitosis (Latin halitus = breath) describes any disagreeable breath odour. Genuine halitosis is where breath malodour is verified objectively. Pseudo-halitosis is where objective evidence of malodour is unobtainable. Halitophobia is where patients persist in believing they have halitosis despite firm evidence for absence of it. Malodour originates from the mouth, mainly from poor oral hygiene, ulcers or infections, in about 85% of patients affected. Halitosis is much less frequently associated with extra-oral causes (e.g. respiratory, gastrointestinal, hepato-renal drugs, metabolic). The odiferous products responsible appear to be (partly) produced endogenously and/or in the mouth and usually arise from microbial action involving a range of micro-organisms. They include volatile sulphur compounds - VSCs (such as hydrogen sulphide, methylmercaptan)- indoles such as indole and skatole, and polyamines (putrescine and cadaverine). Short chain fatty acids (e.g. valerate, propionate and butyrate) may also arise. Acetone, 2-butanone, 2-pentanone and 1-propanol may appear in both mouth and alveolar (lung) air, with indole and dimethyl selenide in alveolar air. Assessment of halitosis is usually based upon organoleptic assessment of exhaled air - the clinician sniffs air exhaled from the mouth and nose - most apparently objective measurements of halitosis are expensive and time-consuming. Oral and extraoral causes of malodour must be identified and treated. Smoking, drugs, and foods that might be responsible for malodour should be avoided. Regular meals are important. Current treatment is directed towards reducing accumulation of food debris and malodour-producing oral bacteria, achieved by treating oral/dental diseases, improving oral hygiene - tooth cleaning (brushing and interdental flossing) and use of antimicrobial toothpastes and/or mouthwashes (chlorhexidine, ceptylpyridinium, zinc, stannous or triclosan, products may be beneficial), by stimulating salivation (chewing gum), and reducing the tongue coating by brushing/scraping. Emerging strategies are mainly directed against the bacteria, their metabolism, or their odiferous products.

Biofilms and Oral MalodourJ. GREENMAN*Center for Research in Biosciences, University of the West of England, Bristol, United Kingdom*

Halitosis can be classified according to its site of generation, and if this is within the oral cavity, then it can be classified as "oral malodor" of microbial origin and accounting for >90% of all halitosis-cases. The "cause" is the presence of VOC-generating microbial biofilms on the mucosa and/or teeth, particularly the dorsum of the tongue, which supports high numbers of microbes as biofilms. There is general agreement that the degree of bad breath (as reported by trained odour judges) correlates well with objective measurements by analytic instruments. Since all processes in the mouth are continuous, it seems likely that a continuous level of malodour is coupled to a continuous generation rate from the biofilm. This in turn correlates strongly with the quantity (or load) of microbes that can be recovered from the tongue surface. In other words, the amount or thickness (aerial density) of an individual's biofilm is the most important predictor of bad breath. Oral malodour, tongue biofilm load and ecological composition have been shown to be stable over many months. The specific theory of oral malodour suggests that specific microbial species are responsible (i.e. aetiological) whilst the non-specific theory suggests that the tongue biofilm "as a whole" is important, without the need for a specific agent (i.e. amount is more important than specific composition). In a diverse biofilm there may be many species that can transform substrates to VSC and many species can "substitute for others" in different cases. From a modelling perspective, the tongue surface biofilm can be classed as a continuously perfused matrix biofilm system. An in vitro laboratory model using real tongue-derived biofilm as the inoculum may be used to help explain contributing factors that would be occurring in a real mouth, including the application of chemo-preventative treatments.

Halitosis – Recommendations for the Dental PractitionerK. KISLIG*University of Bern, Switzerland*

Data from halitosis clinics around the world reveal that the primary source for oral malodor is bacterial tongue coating. Thus, oral hygiene measures including tongue cleaning, and the use of antiseptic agents can help patients to manage their problem. However, the underlying cause for the development of tongue coating also has to be considered, and therefore a proper diagnosis should always include the source of the odorants and the potential cause for their presence. The first step in the diagnostic procedure of halitosis is to distinguish between persons with and without malodor. In case of the presence of an odor, the second step is to detect the source of it. Several organoleptic techniques and the use of sulfide monitors have been recommended for that purpose. However, both the instrumental and the organoleptic measures require a certain amount of training and experience and might overburden a general dental practitioner without particular training in diagnosis of halitosis. Therefore, we recommend the implementation of a very simple organoleptic scale for the dental practice, which is based on the idea to judge the intensity of oral malodor by the distance between the patient and the investigator. Data reveal that the scale delivers reproducible results and might be recommended for the general dental practitioner.

Role Of H2S In Blood Circulation Of The Oral StructuresB. KEREMI¹, A.D. SZEKELY², K. MODIS³, K. NIKITA², D. GERO³, G. VARGA¹, and Z. LOHINAI⁴¹Department of Oral Biology, Semmelweis University, Budapest, Hungary, ²Department of Anatomy, Histology and Embryology, Semmelweis University, Budapest, Hungary,³Department of Anesthesiology, University of Texas Medical Branch, Galveston, TX, ⁴Department of Conservative Dentistry, Semmelweis University, Budapest, Hungary

Hydrogen sulfide (H2S) is a recently discovered endogenous gaseous mediator in circulation.

Objectives: To investigate the effects of H2S on local blood flow regulation in the submandibular gland (SMG) and gingiva (GIN), and the localization of H2S producing enzymes in oral tissues.

Methods: Rat (n=7) SMG and gingival blood flow (BF) was measured by laser Doppler flowmetry before (bsl) and after the stepwise application of 3 drops of a serial dilution (0.1, 1, 10, 50 microM) of the H2S donor sodium hydrosulfide (NaHS) directly on the surface of the exposed right SMG and the upper central papilla for 20 min. Mean arterial blood pressure and heart rate were also continuously monitored and vascular resistance (VR) was calculated. Following the physiological experiment the H2S producing cystathionine gamma-lyase (CTH) and cystathionine beta-synthase (CBS) enzymes were localized by immunohistochemistry.

Results: Local drippings of NaHS doses did not influence systemic haemodynamic parameters. SMG BF significantly increased first at 10 microM (bsl vs. 2nd min: 142±11 vs. 230±33 BPU) and for a longer time at 50 microM (bsl vs. 2nd and 5th min: 258±31 vs. 520±23 and 430±41 BPU). SMG VR changed in an antiparallel manner in response to NaHS application. In contrast, GIN BF and VR did not change in response to any NaHS concentrations. CTH and CBS were found in mast cells and the vascular muscle layers. In the salivary glands, acinar myoepithelial cells were CTH+, whereas the excretory duct epithelium contained CBS.

Conclusion: The SMG and the GIN can produce endogenous H2S. However, vessels are responsive to H2S only in the SMG but not in GIN. H2S may contribute to the blood flow regulation of SMG. The lack of gingival responsiveness to H2S produced by halitosis-causing bacteria could protect from frequent changes in gingival blood flow. Supports: OTKA T049708, TAMOP-4.2.1/B-09/1/KMR-2010-0001

Mean Caries Experience in ADD/ADHD Children; a National Survey

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Objectives: Many types of medications are related to a higher caries experience often through the side effect of xerostomia. Methylphenidate (Ritalin) use in Iceland is the highest in the world, thus prompting a study of the effects of this treatment for ADHD on mean caries experience in children. In a national study of dental health of children (MUNNÍS) performed in 2005, information was gathered on dental health, systemic diseases and the use of medication. The relationship between ADD/ADHD and its treatment on caries experience in children was studied.

Methods: A 20% representative sample of Icelandic children, aged 6, 12 and 15 years, was examined, a total of 2,251 children. Oral examinations were performed in elementary schools by one trained examiner. Questionnaires on oral-health-related factors were completed. Children were categorized as having ADD/ADHD if they (i) reported this in the questionnaire or, (ii) if they reported taking medication typically used for ADD/ADHD therapy. Caries was scored according to ICDAS (dmfs 1-6 and DMFS 1-6) criteria.

Results: The response rate to the questionnaire was 81%; 3.3% of those who responded had ADD/ADHD. Only 11.5% of individuals with ADD/ADHD were caries free compared to 32.2% without ADD/ADHD ($p < 0.001$). The mean DMFS 1-6 score in ADD/ADHD children was 13.6 compared to 8.2 in their peers ($p = 0.009$); thus mean caries experience was 66% higher in ADD/ADHD children. Mean caries experience was higher in ADD/ADHD children in all age-groups, although only reaching significance in 12-year-olds and for all age-groups combined.

Conclusion: Children with ADD/ADHD had a higher caries frequency and a higher mean caries score than their peers. Therefore, these children should receive additional dental health care and stringent preventive measures. In addition, parents, guardians and health care personnel need to be informed of the increased caries risk in these children.

Oral Health Among 12-year Olds In Norway And North-West Russia

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Objectives: To assess oral health and oral health associated factors in 12-year-olds representing two cities in the Barents region (Arkhangelsk, Russia and Tromsø, Norway).

Material and methods: The samples consisted of Russian (N=590) and Norwegian (N=124) 12-year-olds and their parents. Study included clinical examination (children) and self-reports (children and parents). The child's oral health conditions i.e. dental caries, oral hygiene and bleeding index were recorded under field conditions. Statistical analyses were conducted on pooled sample of subjects.

Results: The mean DMFT/S-scores were 3.5/3.9 for sample from Arkhangelsk and 1.2/1.5 for the sample from Tromsø ($p < 0.001$). Regarding oral hygiene, Norwegian subjects prevail in group with low OHI-S score while Russian subjects had higher prevalence in groups with higher OHI-S score ($p < 0.001$). Parental factors showing the strongest association with variation in dental caries were Russian nationality (OR=3.8) and description of child's oral health as bad (OR=2.2) ($R^2=0.18$) while Russian nationality (OR=2.1) and dissatisfaction with child's oral health (OR=2) were associated with higher oral hygiene index values ($R^2=0.06$). Children factors showing the strongest association with variation in dental caries were Russian nationality (OR=3.8), irregular use of dental floss (OR=4.9), irregular eating habits (OR=0.5) and filling obtained during last visit to dentist (OR=5.3) ($R^2=0.34$), while male gender (OR=2.2) and bleeding points as higher than zero (OR=2.6) were associated with the higher oral hygiene index values ($R^2=0.09$).

Conclusions: Dental caries prevalence is higher among the Russian children. Oral hygiene is better among the Norwegian than the Russian 12-year-olds. Nationality was found to be the most important factor for predicting child's dental caries and oral hygiene. Predicting power of children's and parental factors for dental caries and oral hygiene seems to be different with children's factors as the strongest.

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Tenascin-c in Chronic Submandibular Sialadenitis associated with Sialolithiasis

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Objectives: To expand our understanding of the processes involved in fibrosis that occurs in chronic submandibular sialadenitis associated with sialolithiasis (CSSAS) by investigating the distribution of tenascin-c (TNC).

Methods: Fifteen specimens of CSSAS with varying degrees of fibrosis and five normal submandibular glands were retrospectively examined immunohistochemically for the distribution of TNC.

Results: Linear deposition of TNC was found around collecting ducts in normal glands and collecting ducts without surrounding fibrotic tissue in CSSAS. Percentage incidences were not statistically different. Deposition of TNC with the form of band was found in the fibrous tissue around collecting ducts in CSSAS with widespread degree of fibrosis and in which the percentage incidence was statistically different. Also, deposition of TNC was found around duct-like structures and extremely atrophic acini but was not found in fibrotic interlobular septa.

Conclusions: The results of this investigation suggest that TNC is likely involved in the fibrosis that occurs around collecting ducts in CSSAS.

Median Mandibular Cyst in a 4-Year-Old Child

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Objectives: The scientific debate on median mandibular cysts is ongoing. Since it is an extremely rare lesion, there is difficulty in determining the nature and origin of this entity. Some authors consider its origin from epithelial inclusions trapped in the area during embryonic development. Several researchers discuss this theory as the mandible forms as a single unit and no fusion takes places between the ectodermal processes. The aim of this study is to present a case where clinical, radiological and intraoperative findings were consistent with a median mandibular cyst.

Methods: A 4-year-old girl was presented to our department with tenderness and swelling of the lower lip and vestibule. Her teeth were all firm, non-carious and vital. There was no dental displacement or discoloration and the periodontal status was excellent. X-ray revealed an approximately 2 cm in diameter well-defined ovoid radiolucent area in the midline of the mandible. Surgical exploration was performed. A cystic lesion with a thick, fibrous capsule was removed in toto. The cyst clinically was not in contact with the dental roots and it did not contain any tooth bud.

Results: The pathological features were consistent with an inflammatory cyst. Permanent tooth buds were neither detectable on the X-ray nor were seen intraoperatively.

Conclusions: An additional case of a median mandibular cyst is described. The clinical, radiological and intraoperative findings were obvious but the pathology was

not helpful in this case due to the secondary infection. Follow up is necessary to check the eruption of the lower permanent incisors. Although the existence of a median mandibular cyst is still debatable, this case may contribute to a better understanding of this phenomenon.

0356 (151877)

A national survey of erosion scored using the BEWE method

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A scoring method for tooth erosion is needed to enable community-based assessment of the problem.

Objectives: To compare the prevalence of erosion in permanent teeth in children from a national survey using the Basic Erosive Wear Examination (BEWE) scoring method.

Methods: A representative, nationwide sample of 2,251 Icelandic children, 20% of those aged 6y, 12y and 15y, was examined. Erosion was recorded in detail for all erupted permanent teeth and graded initially using the modified scale of Lussi and later converted to the BEWE scoring method.

Results: Erosion was not seen in the permanent teeth of six-year olds, but was present in 15.7% of 12-year-olds, more frequently and with higher BEWE scores in boys than girls (19.9% boys, mean BEWE 0.22; 11.0% girls, mean BEWE 0.079; $p < 0.001$). Among 15-year-olds, erosion was seen in 30.7% of subjects (38.3% boys, mean BEWE 1.00, 22.7% girls, mean BEWE 0.42; $p < 0.001$). 26% of boys 15 y had BEWE scores of 3 but only 3% of girls. Mean BEWE scores were significantly higher for subjects living in the capital city area compared with country districts (0.22 and 0.04 respectively at 12y ($p < 0.001$) and rising to 0.81 and 0.60 respectively at 15y ($p < 0.001$)).

Conclusions: The BEWE scoring method clearly demonstrated the increasing severity of erosion between the ages of 12 y and 15 y. It also clearly indicated differences in erosion severity according to gender and place of residence. The BEWE scoring method is valuable for assessing erosion in populations, similar to methods commonly used for monitoring caries. It should enable evaluation of methods for control and treatment of erosion. Detailed examination of the clinical records showed mainly an increase in the number of erosion-affected teeth rather than increased severity of erosion in some teeth.

0357 (152097)

Computer-Controlled Articaine Delivery for Intraseptal and Periodontal Ligament Anaesthesia

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Objective: The aim of this study was to compare pulpal anaesthesia efficacy and injection pain between intraseptal (ISA) and periodontal ligament (PDL) anaesthesia of upper lateral incisors.

Method: 60 volunteers, randomly divided into 2 groups, participated in the study. Periodontal ligament or intraseptal injection of 0.8 ml 4% articaine with 1:100000 epinephrine was administered on the mesial and distal side of the upper lateral incisor, with computer-controlled local anaesthetic delivery system (CCLADS)(Anaject®, Septodont, France). Intensity of pain, both for needle insertion and anaesthetic injection, was assessed by Visual Analogue Scale (VAS).

Results: There was significant difference in success rate of pulpal anaesthesia with ISA (93.3%) in comparison with PDL (73.3%). On the other hand, intensity of pain for needle insertion (ISA 26.2 ± 17.6 / PDL 30.7 ± 19.3) and anaesthetic injection (ISA 10.6 ± 15.8 / PDL 14.4 ± 14.8) was similar between groups evaluated with VAS..

Majority of the patients reported no pain or just noticeable pain.

Conclusion: Using CCLADS, pulpal anaesthesia efficacy was significantly higher with ISA in comparison to PDL, with tolerable injection pain in both groups.

0358 (152271)

In vivo Comparison of Electronic and Combined Working Length Determination

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Objectives: Comparing the accuracy of electronic, radiographic, and combined (radiograph and electronic apex locator- EAL) working length determination by evaluating the apical extent of root canal fillings.

Methods: 91 teeth with 127 root canals were treated endodontically. The patients were treated by one of 3 dentists, who were free to choose the measuring method for obtaining the working length. The teeth were then filled on the determined length and were divided into three groups, group I was measured only with radiograph, II was only by EAL, III was with the combination of EAL and radiograph. The postoperative radiographs were randomized for evaluation. Observers were not aware of the group the radiographs were taken from. The dentists were asked to measure the length in millimeters (0,1 mm accuracy) between the apical end of the root canal filling and point of intersection of the external surface of the root and the line of extension of the root canal filling. Measurements were repeated 1 month later to assure the consistency of the evaluators. Statistical analysis was done by SPSS version 14 software (SPSS, Chicago, IL, USA). The single and the multi-rooted teeth were analyzed separately. Multiple comparison Turkey HSD tests were carried out. Statistical significance was considered to be $p < 0.05$.

Results: In the case of the single-rooted teeth there was no significant difference between the methods, meanwhile in the case of the multi-rooted teeth the measured distances were significantly shorter in the case of group II ($P=0.015$) and III ($P=0.04$) compared with group I. There was no significant difference between group II and III ($P=0.999$)

Conclusions: The results show that using EAL is more accurate than the radiographic method alone; however the mean distance was highest in the multi-rooted teeth in group I (1.47 ± 0.77) which is still acceptable clinically.

0359 (151779)

Potential smear interference with self-etch hybridization studied by TEM

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Objectives: To evaluate whether hybridization of enamel/dentin by self-etch adhesives may be affected by smear.

Methods: Two 2-step self-etch adhesives, the recently marketed Optibond XTR (O-XTR; Kerr) and Clearfil SE Bond (C-SE; Kuraray), were bonded strictly according to the manufacturer's instructions to either (1) bur-cut (100- μ m grit) enamel/dentin, (2) 600-grit SiC-paper ground enamel/dentin, or (3) smear-free un-cut enamel and fractured dentin (non-carious human third molars). The 3-step etch-and-rinse adhesive Optibond FL (O-FL, Kerr) served as control. After 1-day storage in water (37°C), non-demineralized/demineralized 70-90 nm sections were prepared following common TEM-specimen processing, and eventually examined by TEM (JEM-1200EX II, Jeol).

Results: At enamel, a tight bond based on only superficial interaction was observed for both O-XTR and C-SE. Especially at uncut enamel, hydroxyapatite rods appeared hardly dissolved (in contrast to phosphoric-acid etched enamel in case of O-FL). At dentin, the hybrid layer varied from maximum 1 μ m in thickness for C-SE to about 1.5 μ m for O-XTR (again in contrast to the 3-5 μ m hybrid layer produced by O-FL). For O-XTR, the hybrid layer appeared nearly completely demineralized, with only at the bottom part some hydroxyapatite remaining. For C-SE, residual hydroxyapatite could be found within the whole hybrid layer. Especially at bur-cut dentin, the hybrid layer of C-SE, somewhat in contrast to that of O-XTR, appeared to contain more minerals, most likely representing resin-encapsulated smear remnants.

Conclusion: The obtained tight interface at both enamel and dentin indicates that both the two-step self-etch adhesives O-XTR and C-SE effectively bonded to tooth tissue. O-XTR etched slightly deeper, which should be attributed to its lower pH of 1.6 (vs. 1.9 for C-SE), and following the AD-concept of Yoshida et al. (2004) maybe also because of the more decalcification than adhesion effect of its functional monomer GPDM (vs. 10-MDP in C-SE).

Immediate and aged bond strength to differently prepared dentin surfaces

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The way dentin is prepared is known to reduce the bonding efficiency of especially 'mild' self-etch adhesives.

Objectives: To investigate to what extent the way of dentin preparation affects the micro-tensile bond strength (μ TBS) to dentin 'immediately' and after aging using medium-term thermo-cycling.

Methods: 60 mid-coronal sound dentin specimens cut from extracted human molars were prepared using either a 100- μ m diamond bur (bur-cut), 600-grit silicon carbide (SiC) paper, or were fractured, thus not having produced a smear layer. Resin composite (Herculite XRV Ultra, Kerr) was bonded to the surfaces using either the 2-step self-etch adhesives, OptiBond XTR (Kerr) or Clearfil SE Bond (Kuraray), or the 3-step etch-and-rinse adhesive OptiBond FL (Kerr) that served as gold-standard control. After 1-week water-storage at 37°C, specimens were serially cut into 1-mm² stick-shaped micro-specimens, of which per tooth half of them were further subjected to 20,000 thermo-cycles. The μ TBS was determined at a crosshead speed of 1.0 mm/min. Failure analysis was performed using stereo-microscopy and SEM. Data were statistically analyzed by ANOVA and post hoc Tukey test.

Results: No significant difference in μ TBS was found for all three adhesives when bonded to the three differently prepared dentin surfaces (Table; $p > 0.05$). However, when the specimens were aged using thermo-cycling, the two self-etch adhesives, OptiBond XTR and Clearfil SE Bond, revealed a significantly lower μ TBS ($p < 0.05$) to bur-cut dentin then to SiC-ground and fractured dentin, at which respectively a thinner and less compact smear layer, or no smear layer was produced.

Conclusion: The way dentin is prepared and thus the kind of the smear layer is produced affect the 'aged' bond strength to dentin.

The effect of air-blowing duration on three contemporary all-in-one systems

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Objective: To evaluate the effects of air-blowing duration on the bonding performance in three contemporary all-in-one systems.

Methods: Three all-in-one adhesives were employed: Easy Bond (EB, 3M ESPE, USA), BeautiBond (BB, SHOFU Inc, Japan) and G-Bond plus (GBp, GC Corporation, Japan). 63 human third molars without caries were randomly divided into 21 groups of 3 teeth each, and every 7 groups of each system followed as air-blowing for 5s, 10s, 15s, 20s, 25s, 30s and 35s before light-curing. Then, the teeth were built-up with resin composite (Clearfil AP-X). After 24 hour at 37°C distilled water storage, the bonded specimens were sectioned into 1.0 mm² sticks, which were subjected to the micro-tensile bond strength (μ TBS) test at a crosshead speed of 1 mm/min. The obtained data were expressed as MPa and statistically analyzed by Dunnett-Test (the air-duration which revealed maximum μ TBS was employed as control group). The dentin side of the fractured surfaces was observed by SEM.

Results: The results from the μ TBS testing for the groups showed that the best bonding performance in EB and BB would be obtained after 15s air-blowing before light-curing, as for GBp, a longer air-blowing time of 25s performed the best. Studies using SEM showed that, fewer bubbles were observed in the specimens of EB comparing with BB and GBp, and there were no significant differences from 5s to 35s of either system.

Conclusion: There was the optimal air-blowing duration for each one-in-one system tested in this study, which should be considered in clinical situation. However, as the oral situation may be different from laboratory condition, optimal air-blowing duration in clinical situation should be clarified in future studies.

Shear Bond Strength of Different Adhesives after Caries Infiltrant Application

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Objectives: The purpose of this study was to investigate the influence of caries infiltrant application on the shear bond strength of different adhesives on sound and demineralized enamel.

Methods: Sound and artificially demineralized (14 d, acidic buffer, pH 5.0) bovine enamel specimens were treated with a caries infiltrant (Icon, DMG), three different commercial adhesives (unfilled etch&rinse adhesive: Heliobond, Ivoclar Vivadent; filled etch&rinse adhesive: Optibond FL, Kerr; or self-etching adhesive: iBOND Self Etch, Heraeus Kulzer) or a combination of caries infiltrant and adhesive. Shear bond strength of a nanohybrid-composite was analysed after thermo-cycling (5000x, 50 to 55°C) at a crosshead speed of 1 mm/min. Failure mode was inspected under stereomicroscope at 25x magnification.

Results: In both sound and demineralized enamel, shear bond strength of the caries infiltrant was not significantly different from the etch&rinse adhesives, while the self-etching adhesive showed significantly lower values compared to all other groups. Pretreatment with the caries infiltrant significantly increased the bonding strength of the self-etching adhesive in both substrates and of the filled etch&rinse adhesive in demineralized enamel. While shear bond strength was not significantly different between both substrates, cohesive failures were more likely to occur in demineralized than sound specimens.

Conclusion: The shear bond strength of the caries infiltrant was similar to the etch&rinse adhesives. The caries infiltrant did not impair bonding to sound and demineralized enamel, and even increased adhesion of the self-etching agent.

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3-Year Clinical Effectiveness of One-step Adhesives in Non-carious Cervical Lesions

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One-step adhesives are either HEMA-rich or HEMA-poor/free. For both kinds, some concerns regarding bond durability have been raised.

Objectives: To evaluate the clinical performance of two one-step self-etch adhesives in a randomized controlled clinical trial.

Methods: Thirty patients had 175 non-carious cervical lesions restored with composite (Gradia Direct Anterior, GC) using either the HEMA-rich adhesive Clearfil Tri-S Bond (C3S; Kuraray) or the HEMA-free adhesive G-Bond (GB; GC). The restorations were evaluated by two calibrated examiners at baseline and after 6, 12, 24 and 36 months of clinical service regarding retention, caries recurrence, marginal integrity and discoloration and post-operative sensitivity. Retention loss, caries recurrence or any severe marginal defect/discoloration requiring clinical intervention (repair or replacement) were considered as clinical failures. The data were statistically analyzed with Mann-Whitney U and Friedman ANOVA tests ($p < 0.05$).

Results: The recall rate at 6 and 12 months was 100% and decreased to 96.7% at 24 and 36 months. At 3 years, the retention rate was 93.8% for C3S and 98.8% for GB ($p = 0.08$). No significant differences were observed between the two adhesives for all the parameters evaluated, irrespective of the recall ($p > 0.05$). After 2 and 3 years of clinical service, both adhesives presented an increase in the percentage of small, though still clinically acceptable marginal defects up to 27.6% for C3S [18.4% for enamel (E) and 9.2% for dentin (D)] and 23.2% for GB (15.9% E; 7.3% D). The percentage of severe marginal defects was 2.6% (1.3% E; 1.3% D) and 3.6% (1.2% E; 2.4% D) for C3S and GB respectively. At 3 years, C3S presented marginal discoloration in 31.3% and GB 26.8%. The overall 3-year clinical success rate was 89.0% and 94.0% for C3S and GB, respectively.

Conclusion: Both one-step self-etch adhesives presented an equally favorable clinical effectiveness at 3 years.

Clinical Evaluation of Self-etch Adhesives in Class V Carious Lesions[A. ABDALLA](#)*Dep. Of Restorative Dentistry, Faculty of Dentistry, University of Tanta, Tanta, Egypt*

Objectives: The purpose of this randomized, controlled clinical study was to evaluate the 24-month clinical performance of four self-etch adhesive systems in combination with a nano-composite for the restoration of Class V carious lesions.

Methods: Thirty-three patients with at least 2 equivalent carious cervical lesions were enrolled in the study. One hundred and twenty lesions were restored with a nano-composite (Grandio SO, Voco, Germany) (n=30/per adhesive system) according to the manufacturer's instructions by one operator. The tested adhesives were; Futurabond DC (Voco), Clearfil SE Bond (Kuraray, Japan), Adper Easy One SE adhesive (3M-Espe); G-Bond (GC- Europe). Two other independent examiners clinically evaluated the restorations for retention, color match, marginal adaptation, anatomic form, marginal discoloration, recurrent caries, post-operative sensitivity and surface texture at baseline, one year and two-years according to the modified USPHS criteria. Statistical analysis was completed using the Pearson Chi-square and Fisher's Exact Test ($p < 0.05$).

Results: Twenty-nine patients were available for recall after 2 years and 112 restorations were evaluated (recall rate of 93 %). All tested adhesives showed Alpha rating for anatomic form, recurrent caries, surface texture and post-operative sensitivity after two years. Two restorations of Adper Easy One SE and one restoration of G-Bond were lost after two years. There was no statistically significant difference between the tested adhesives after two years ($p > 0.05$).

Conclusions: Considering all the clinical evaluation criteria, all tested adhesive systems performance was found to be acceptable for the restoration of Class V carious cervical lesions over a period of 24-months.

Confocal Raman Microscopy investigations: interface zirconia core and veneering porcelain[J.-C. DURAND](#), [L. DERELY](#), [B. JACQUOT](#), [J. MARGERIT](#), and [F.J. CUISINIER](#)*BioNano Laboratory EA 4203, Montpellier 1 University, Faculty of Dentistry, Montpellier Cedex 5, France*

Objectives: The interface is the weakest component of core veneered all-ceramic restorations and it is the origin of failure. The purpose of this study is to investigate a transitional layer between a zirconia core and veneer porcelain, due mainly by interpenetration of components and crystalline phases diffusion.

Methods: The samples were manufactured according dental laboratory's procedure. Y-TZP was used as a framework material suitable for CAD/CAM machines. An optional thin layer of liner was applied prior to layering veneer porcelain. To investigate the interface, the samples were cut (Isomet 2000) and polished (ESCIL). Raman spectra (MCR WITTEC® Alpha 300R) and Raman imaging (K-Means Cluster Analysis, WITTEC® Project 2) were carried out cross-sections of the interface area.

Results: Raman spectra of Y-TZP or veneer porcelain are clearly distinguished. The line scan crossing the interface shows a unique spectrum characterized by the presence of components of both materials. The Raman maps allow phase contribution assignment selecting specific spectral regions. Greater interdiffusion zone seems to have occurred when a liner is present.

Conclusion: With the limitations of this study, Raman microscopy is able to investigate the interface between zirconia core and veneering porcelain. Chemical modification are visible on 2d images and allow to clearly describe the interface by highlighting chemical differences due to different manufacturing methods.

Resin-Bonding to Cr-Co Alloy and Zirconia after Tribochemical Treatments[N. SILIKAS](#)¹, [S. ZINELIS](#)², and [G. ELIADES](#)³*¹Biomaterials Science Unit, University of Manchester, Manchester, United Kingdom, ²Faculty of Dentistry, University of Athens (EKPA), Athens, Greece, ³Biomaterials, University of Athens (EKPA), Athens, Greece*

Objective: To investigate the shear bond strength and failure mode of a resin composite bonded to base metal alloy and zirconia frameworks that have been subjected to tribochemical treatments.

Methods: Disk-shape specimens from a Cr-Co alloy and fully sintered zirconia (Group Z, n=20) were metallographically polished up to 1000 grit-size SiC and covered with a masking tape, leaving a free circular area (2mm). The specimens were randomly selected into two subgroups (M1, M2 and Z1, Z2, n=10 respectively). M1 and Z1 were sandblasted with CoJet (3M ESPE) and M2, Z2 with the experimental SilJet (Danville Materials) under the following conditions: 5 mm distance, 90° angle, 5 s blasting at 3 bar pressure. All surfaces received a silane treatment and then restored with a flow-composite and cured for 30s. For Group M, prior to composite placement, a thin opaque layer (0.2mm) was applied and cured as above. All the specimens were stored in water (5d/37°C) and then thermo-cycled (x3000, 5/55°C, 10s dwell & 5s transfer times). Bond strength was determined under shear loading (SBS) at a crosshead speed of 0.5 mm/min. Results were statistically analysed with One-Way ANOVA at $p=0.05$. Failure mode analysis was evaluated under a stereomicroscope.

Results: The results of SBS were (MPa, mean/sd): M1:22.9 (2.5), M2:26.1 (2.0), Z1:12.1 (2.7), Z2:14.4 (2.1). M2 and Z2 showed significantly higher values from M1 and Z1 groups respectively. Failure mode in M group was mainly mixed (50%) and adhesive (30-40%), whereas in Z group was mainly adhesive (70-80%).

Conclusions: Significant differences were found between the two tribochemical treatments tested. Both treatments were more effective on the Cr-Co alloy than on zirconia.

Quality of Adhesive/dentin Interface with Ethanol-wet Bonding[M.K. AYAR](#), [C. YESILYURT](#), and [C.K. ALP](#)*Operative Dentistry and Endodontics, Faculty of Dentistry, Karadeniz Technical University, Trabzon, Turkey*

Aim: The nanoleakage and bonding on resin-dentin interfaces created with water or ethanol wet-bonding technique analyzed by microtensile bond strength (micro-TBS) test and SEM/EDS.

Materials and Methods: Sixteen bovine incisors were divided into four groups according to dentin bonding techniques and two adhesives (n=4). Group I: Conventional wet bonding + Single Bond, Group II: Conventional wet bonding + Prime & Bond NT, Group III: Ethanol wet bonding + Single Bond 2 and Group IV: Ethanol wet bonding + Prime & Bond NT. The adhesives were applied according to manufacturer's in Group I and II. In Group III and IV, before adhesive application, dentine surfaces were dehydrated with ethanol solutions (%100) 60s for each application. The restored teeth with composite were stored in water for 24h, sectioned into sticks (0.42 mm2) and stressed to failure. Microtensile stress at failure was recorded using a universal testing machine. Three sticks from each tooth were immersed in 50% w/w silver nitrate solution for 24 hours and then immersed in reducer solution. Interfacial silver leakage evaluation was analysed by SEM/EDS. ANOVA and Tukey HSD tests were applied on all quantitative data ($p < 0.05$).

Results: The mean micro-TBS (MPa) were; Group I: 34.4 ± 12.6 , Group II: 41.6 ± 11.8 , Group III: 43.51 ± 13.8 and Group IV: 41.6 ± 9.1 . There was no significant difference among groups ($p > 0.05$). The mean metallic silver concentrations (wt%) within measured areas in the hybrid layers were; Group I: 78.40 ± 2.31 , Group II: 71.34 ± 3.5 , Group III: 69.82 ± 5.53 , Group IV: 69.64 ± 5.05 . There was a significant difference in metallic silver concentration values only between Groups I and III ($p < 0.05$).

Conclusion: The ethanol wet bonding technique may not affect the resin-dentin micro-TBS of etch-and-rinse adhesives. However, the effect of ethanol wet bonding on nanoleakage may depend on the used adhesive agent.

Shear Bond Strength of Self-Adhering Flowable Resins to Dentin Substrates

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Objectives: The aim of this study was to compare the shear bond strength (SBS) of two self-adhering flowable resins to a flowable resin and its bonding agent.

Methods: Thirty freshly extracted human teeth were sectioned longitudinal to expose superficial dentin and dentin substrates were polished with 600 grit SiC paper. The materials tested were: two self-adhering flowable resins, Fusio Liquid Dentin (Pentron Clinical) and Vertise Flow (Kerr) and a self-etch adhesive/flowable resin, S3 Bond/Clearfil Majesty Flow (Kuraray). Manufacturers' instructions for applying of materials were strictly followed. A cylindrical teflon mould (3x4mm) was placed over the dentin substrate and filled with each of the tested materials. Ten specimens were prepared for each material and all specimens were stored in distilled water at 37°C for 24 hours. SBS was measured using a universal testing machine at a rate of 0.5mm min⁻¹ until failure. The load to fracture was calculated in MPa and mean data were statistically analyzed with the Welch robust analysis of variance and Games-Howell statistic at p<0.05. Failure patterns were analyzed using a stereomicroscope x40 in order to determine the failure modes. Representative specimens were evaluated under SEM at various magnifications.

Results: No statistically significant differences (p>0.05) were found between the two self-adhering materials. Significant higher SBS values were observed with the self-etch adhesive/flowable resin (Welch statistic p<0.001) in comparison to the self-adhering flowables. Stereoscopic evaluation of the failure patterns showed that failures of the self-adhering systems were exclusively adhesive, while the failure patterns of the self-etch adhesive/flowable resin were mixed types of failure. SEM findings confirmed the results.

Conclusion: SBS of the self-adhering flowable resins to dentin substrates was lower than the flowable resin and its bonding agent tested.

HEMA and TEGDMA Delay Odontogenic Differentiation Of Apical Papilla Cells

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Objectives: The aim of this study was to investigate the effects of HEMA (2-hydroxy-ethyl-methacrylate) and TEGDMA (triethylene-glycol-dimethacrylate) on the odontogenic differentiation potential of Stem Cells derived from the Apical Papilla (SCAP) of human developing teeth.

Methods: SCAP cultures were established from the apical papilla of third molars at the stage of root development after enzymatic dissociation with collagenase I/dispase. All donors signed an informed consent. Cell cultures were screened for stem cell markers, including STRO-1, CD146, CD34 and CD45 using flow cytometry. Cytotoxicity was evaluated with the MTT assay. DTSCs were then induced for osteo/odontogenic differentiation by media containing dexamethasone, KH₂PO₄, b-glycerolphosphate and L-ascorbic acid in the presence of nontoxic concentrations of HEMA (0.05-0.5mM) and TEGDMA (0.05-0.25mM) for 3 weeks. Additionally, the effects of a single exposure (72h) to higher concentrations of HEMA (2mM) and TEGDMA (1mM) were evaluated.

Results: SCAP cultures were positive for STRO-1 (1.70 ± 0.37 %), CD146 (63.54 ± 3.72%), CD34 (10.55 ± 1.74%) and negative for CD45. In the absence of monomers cell migration, differentiation and production of mineralized dentin-like structures could be observed. Cells also progressively expressed differentiation markers, including dentin sialoprotein-DSP, bone sialoprotein-BSP, osteocalcin-OCN and alkaline phosphatase-ALP. On the contrary, long-term exposure to nontoxic concentrations of HEMA and TEGDMA delayed the differentiation and mineralization processes of SCAP cells, whereas, one time exposure to higher concentrations of these monomers delayed to a higher extend the amount of mineralized matrix produced (p<0.01). BSP, OCN, ALP and especially DSPP expression were also down-regulated.

Conclusion: These findings suggest that HEMA and TEGDMA are able to disturb the odontogenic differentiation potential of stem/progenitor cells derived from the apical papilla, which might have significant consequences for pulp tissue homeostasis and repair when resin-based materials are applied on developing teeth. Supported by a grant of DAAD (German Academic Exchange Service)

Effect of composites on mRNA gene transcription of gingival keratinocytes

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Objectives: This in vitro study evaluated the effect of three different composite materials on the mRNA gene transcription of immortalized human gingival keratinocytes (IHGKs).

Methods: Three composite materials were used: Ceram X (Dentsply DeTrey) (CX), Filtek Supreme XT (3M ESPE) (FS) and Filtek Silorane (3M ESPE) (SIL). From each composite material 20 specimens (diameter: 5mm, thickness: 2mm) were prepared and polymerised according to the manufacturer's instructions. Each sample was immersed in 1ml cell culture medium. Half of the samples were stored in a dark box at room temperature for 24 h and the other half for 4 days. At the end of each storage period, the solution, in which the composite samples were immersed, was given on precultured IHGKs. One half of the IHGKs were incubated at 37 degrees for 24 hours and the other half for 4 days. For each tested time period, representative amounts of IHGK were cultivated in untreated medium as controls. After cultivation, the total RNA from the cell cultures was isolated, the integrity and total concentration of RNA was measured and a quantitative real time PCR was performed.

Results: Each composite material resulted in a reduced amount of isolated total RNA compared to the control, at both time periods. After 24h, the measured amount of RNA was similar for all three composites. However, after 4 days the RNA-amount isolated from FS and SIL was almost the half of the one measured of CX. For the latter time period, qPCR revealed a significant increased gene expression of the terminal differentiations marker filaggrin and involucrin for the groups of FS and SIL.

Conclusions: All three tested composite materials had a negative effect on IHGK, concerning the total amount of RNA; however, only FS and SIL were shown to promote the differentiation of the IHGKs.

Ferrule-effect and fiber-post placement: influence on fatigue and fracture resistance

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Thanks to the significant progress adhesive dentistry has made, post placement might be avoided in light of a less-invasive tooth build-up approach.

Objectives: To evaluate the influence of the ferrule effect (1) and the fiber-post placement (2) on the fracture resistance of endodontically treated teeth subjected to cyclic fatigue loading.

Methods: 40 extracted single-rooted upper pre-molars were sectioned at the CEJ (groups a and b) or 2 mm above the CEJ (groups c and d), and subsequently endodontically treated. After 24-hour water storage at 37°C, specimens were restored according to four build-up approaches (n=10 per group): a. NF-NP (no ferrule, no post), b. NF-P (no ferrule, fiber-post), c. F-NP (ferrule, no post), d. F-P (ferrule, fiber post). RelyX Posts (3M-ESPE) were used in groups NF-P and F-P, and were cemented with Panavia F 2.0 (Kuraray). A standardized composite core was built, after which the specimens were restored with an all-ceramic crown (IPS Empress

CAD, Ivoclar-Vivadent) that was cemented with Panavia F 2.0. Specimens were fatigued by exposure to 1,200,000 cycles using a chewing simulator (Willytech). All specimens that survived fatigue loading were fractured using a universal loading device (Microtester, Instron). Data were statistically analyzed using ANOVA.

Results: Only one NF-NP specimen failed under fatigue. The ferrule effect significantly enhanced the fracture resistance of the restored teeth, regardless the use of a post ($p=.003$). F-NP obtained the highest fracture resistance (758.52 ± 121.89 N), which was not significantly different from F-P (647.58 ± 132.95 N); NF-NP presented the lowest fracture resistance (361.52 ± 151.69 N). For all groups, only 'repairable' failures were recorded.

Conclusions: Avoiding extra-removal of sound tooth structure, rather than placing a fiber post, can protect endodontically treated teeth against catastrophic failure. However, when any ferrule can be preserved, a fiber-post may improve the retention and fatigue resistance of the restoration.

0372 (151856)

Silane and Adhesive Influence on Fiber Post-Composite Bond Strength

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Objectives: To evaluate the influence of adhesive and silane application on microtensile bond strength of a composite resin to sandblasted fiber posts. **Methods:** 18 epoxy resin-based fiber posts (DT Light Post, RTD) were used in the study. Posts were sandblasted (Rocatec-Pre, 3M ESPE) and divided into three groups, according to the surface treatment performed. Group 1: silane application (RelyX Ceramic Primer, 3M ESPE); 2: adhesive application (Adper Scotchbond 1 XT, 3M ESPE); 3: no treatment. Resin composite (Filtek Supreme, 3M ESPE) was applied on the posts to produce cylindrical specimens. Specimens were cut to obtain microtensile sticks that were loaded in tension at a cross-head speed of 0.5 mm/min until failure. Statistical analysis was performed with Kruskal-Wallis analysis of variance followed by Dunn's multiple range test ($p < 0.05$). **Results:** Bond strength on silane treated posts was not significantly different than on posts that received no treatment. Adhesive application resulted in fiber post-composite bond strength that was significantly higher in comparison to no treatment and silane application (Table). **Conclusions:** Adhesive application improved adhesion to sandblasted epoxy resin-based quartz fiber posts. Silane application had no influence on post-composite bond strength.

Table: Post-cement microtensile bond strength [MPa] 1

Treatment	Microtensile bond strength
RelyX Ceramic Primer	13.64 [5.34] B
Adper Scotchbond 1 XT	19.16 [5.88] A
None	11.52 [5.73] B

¹Numbers are means. Values in brackets are standard deviations. Different letters indicate statistically significant differences.

0373 (151790)

Microleakage Of Different Dowel Systems Luted With Resin Cements

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Objectives: The purpose of this in vitro study was to compare microleakage of dowel systems: stainless steel dowel system (SSD), resin-supported polyethylene fiber dowels (RSPFD), zirconia dowels (ZD) and glass fiber dowels (GFD) luted with two different resin cements.

Methods: The root canals of 96 human intact single-rooted extracted teeth were obturated with gutta-percha using lateral condensation. Roots were restored with one of the following dowel systems according to the manufacturer's instructions: Parapost (SSD), Ribbond (RSPFD), Cosmopost (ZD), Superpost (GFD). Two different resin cements (Multilink automix and Clearfil Esthetic cement) were used in cementation procedure. Using the computerized fluid filtration method, microleakage of the specimens along the dowel space and root canal restorative material was measured at 1 week, and 6 months following dowel insertion. A repeated-measures analysis of variance (ANOVA) was used to analyze logarithmic transformations of data (time and dowel material) for significant differences. Tukey HSD test and paired t tests were used to perform multiple comparisons ($p=0.05$).

Results: The data indicated that the microleakage values varied according to the dowel system and luting cement used ($p < 0.05$). The initial microleakage measurement in Parapost was similar with the other dowel systems, but became significantly different at 6 months ($P < 0.05$). The microleakage of Parapost increased over time ($P < 0.05$), but microleakage of Ribbond, Cosmopost and Superpost dowels remained constant ($P > 0.05$). The statistical microleakage values for Multilink Automix cement were higher than Clearfil Esthetic cement ($P < 0.05$) for all the dowel system groups.

Conclusions: Resin-supported polyethylene fiber, glass fiber and zirconia dowels tested exhibited less microleakage compared to stainless steel dowel system. Multilink Automix cement showed higher microleakage than Clearfil Esthetic cement.

0374 (152308)

Influence of mixing method on the porosity of resin cements

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Introduction: The significant attempt in dentistry was followed by introduction of resin based cements in every day practice. One of the most relevant feature of resin cements is low design porosity. On the other hand, the importance of open porosity is in its impact on possibility of penetration of undesired oral fluids, bacterial toxins and bacteria into underlying dentin structure.

Objective: According to the previous state, the purpose of this study was to evaluate the effects of mixing methods on the porous structure of commercial resin cements.

Method: Testing was performed on cylindrical specimens made of three self adhesive resin cements: first product, hand mixed, consisted of two paste (Rely X U100), second cement, auto-mixed also consisted of two paste (Rely X Unicem2, Auto-mix) and the third resin cement was encapsulated and prepared for the experiment mechanically by shaking (Rely X Unicem Aplicap). The porous structure of cements was estimated by mercury intrusion porosimeter (Carlo Erba 2000) using Milestone software system. This apparatus operates in the interval .1-200MPa, enabling the detection of pores in interval 7,5-15000nm.

Results: All samples had very low porosity, particularly sample of encapsulated resin cement that can be regarded as nonporous. All parameters of porous structure of encapsulated sample resin cement have values within values of experimental error of the instrument. Somewhat more expressed porosity ($< 2\%$) of hand mixed and auto mixed samples could be considered almost negligible. Distribution of pore size diameter indicated that $\sim 75\%$ pores were in the mesoporous region (7.5-50 nm) for all investigated samples, also indicating less expressed porous structure.

Conclusion: Based on results of this study it is possible to concluded that capsulation should enable uniform proportioning and mixing of dental cements so the functional properties of cementitious mass will not be susceptible to clinically induced variability.

Microhardness of Mineral Trioxide Aggregate stored in acidic environment

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Objectives: The effect of acidic pH on Vickers microhardness (HV) of Mineral Trioxide Aggregate (MTA) surface has been already investigated. The present study aimed to evaluate how acidic pH affects MTA microhardness at different depths.

Methods: ProRoot MTA (Dentsply Tulsa Dental, USA) was mixed with sterile water and compacted into cylindrical moulds having an internal diameter of 3 mm and height of 6 mm. Specimens were randomly assigned to group 1 (G1, n=12) or 2 (G2, n=12), immediately immersed into buffer solutions at pH values of 7.4 (G1) or 4.4 (G2) and stored for 24h. Thereafter, each specimen was cross-sectioned at a depth of 3 mm. HV analysis was performed on the top, on the intermediate (3 mm) and on the bottom surfaces; three indentations per surface were made. The mean HV values were calculated for each group and subjected to repeated measures analysis of variance, paired and independent samples t-tests ($p < 0.05$).

Results: Top surfaces in G2 were found to be crumbling, thus HV reading was unfeasible. HV mean values \pm SD were: G1 top 68.60 \pm 16.48, G1 intermediate 66.51 \pm 7.66, G1 bottom 62.46 \pm 5.68; G2 intermediate 56.41 \pm 4.13, G2 bottom 61.33 \pm 12.55. No significant differences were found within each group amongst measured surfaces. Similar HV values were found on bottom surfaces in G1 and G2, whilst significantly lower values were recorded in G2 when comparing intermediate surfaces.

Conclusions: A pH value of 4.4 affected the HV of MTA on the exposed top surface and at a depth of 3 mm. A similar behavior in clinical conditions can be expected when MTA is used as root-end filling material; further clinical studies are needed.

Thickness Dependent Dielectric Monitoring of Light-Curing Composite SamplesJ. STEINHAUS¹, B. MOEGINGER¹, M. GROSSGARTEN¹, M. FRENTZEN², M. ROSENTRITT³, and B. HAUSNEROVÁ⁴

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Objectives: The curing behaviour of photo-curing composites is significantly affected by the locally available light intensity, which especially depends on the employed light curing unit and the light absorption of composites. The aim of this study was to investigate the effects of light intensity on the curing behaviour of a dental composite in different specimen depths using three different curing units.

Methods: An exemplary dental composite (VOCO, Arabesk Top shade OA2, Germany) was investigated using a dielectric cure analyser (NETZSCH, DEA 231, Germany) with a frequency of 1 kHz. The surface of Mini-IDEX-sensors was covered with composite layers of 0.5-2 mm. Three curing units – Polofil Lux halogen (VOCO), LED Celalux (VOCO) and LED Bluephase 20i in turbo-modus (IVOCAR VIVADENT, Liechtenstein) – were used for curing with a polymerisation time of 80s respectively 20s with Bluephase turbo. The DEA-curves were evaluated with respect to reaction-time-constant τ and maximal slope (Fig.1).

Results: For all curing units the maximum slope of the ion-viscosity depended significantly on the thickness of the specimens. When exceeding the reaction-time-constant τ all curves decreased significantly. Reaction-time-constant and maximal slope of the ion-viscosities μ versus sample thickness showed an exponential dependency, Fig.2.

Conclusion: The DEA provided intensity-dependent data of the curing behaviour. A transition from the primary-curing to post-curing was found when exceeding the reaction-time-constant. This may indicate a glass transition change of the polymer resin at curing temperature. Because the reaction-time depends on the radicalised initiator concentration, the curing rate slowed down in increasing sample depths. The slopes of ion-viscosity during the post-curing allow for the assumption of higher final values meaning a higher degree of conversion up to 1-2 mm depth.

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Quantitative microleakage evaluation of repaired resin-based restorations with different treatmentsC. CELIK¹, S.B. CEHRELİ², N. ARHUN¹, and M. COLAK³

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Objectives: The successful addition of new restorative materials to an existing restoration may be the most conservative course of treatment. Repairing resin based restorations with resin materials remains a viable clinical alternative to replacement. The aim of the study was to evaluate the effect of different adhesive systems and surface treatments on the integrity of resin-resin and resin-tooth interface after partial removal of preexisting resin composites using quantitative image analysis for microleakage testing protocol.

Methods: 80 defect-free human molar teeth were restored with two different types of resin composites (Filtek Z250 and GrandioSo) occlusally. The teeth were thermocycled (1000X) between 5°C and 55°C with a dwell time of 30 seconds. Mesial and distal 1/3 parts of the restorations were removed out leaving only middle part. One side of the cavity was finished with course diamond bur and the other part is sandblasted (50 μ m AlO₃). The samples of each composite group were randomly divided into 4 groups (n=10/group) to receive the following adhesive systems: Group1: Single Bond2 (3M); Group2: AllBond3 (Bisco); Group3: Clearfil SE (Kuraray); Group4: Beauty Bond (Shofu). All the cavities were restored with resin composite (Filtek Z250). The specimens were re-thermocycled (1000X), sealed with nail varnish, stained with 0.5% basic fuchsin for 24h, sectioned mesiodistally and photographed digitally. The extent of dye penetration was measured by image analysis software (ImageJ) for both course-finished and sandblasted surfaces at resin-tooth and resin-resin interface. The data were analyzed statistically.

Results: Beauty Bond exhibited the most microleakage at every site. Surface finishing with sandblasting showed less microleakage when compared to bur finishing at every site for all the adhesive types except Beauty Bond. The type of initial repaired restorative material did not affect the microleakage.

Conclusion: All-in-one adhesives may not be the choice for composite resin repair in terms of microleakage prevention.

Effect of bleaching on μ -TBS to enamel at different timesM. CURA¹, M.V. FUENTES, and L. CEBALLOS*Universidad Rey Juan Carlos, Madrid, Spain*

Objectives: To assess the effect of 10% carbamide peroxide, 10% hydrogen peroxide and two over-the-counter (OTC) whitening products on μ -TBS to enamel at different times after the treatment.

Methods: One hundred incisors were randomly divided into five groups to receive bleaching treatments: No treatment (control), 10% carbamide peroxide (Opalescence, Ultradent Products), 10% hydrogen peroxide (Opalescence Treswhite Supreme, Ultradent Products), 3% carbamide peroxide plus lactoperoxidase (Whitekin, Kin) or 3% carbamide peroxide plus 2.7% carbamide peroxide (Clysiden Kit Express, Ern) for four weeks. Teeth were always stored in artificial saliva at 37°C and were cleaned with 1450 ppm NaF tooth paste twice a day. Teeth were restored 1, 3, 7 and 14 days after bleaching using Adper Scotchbond 1 XT adhesive (3M ESPE) and Filtek Z250 resin composite (3M ESPE). After 24 hours of storage, samples were subsequently prepared for μ -TBS testing. Beams of approximately 1 mm² were tested in tension at 1 mm/min in a universal tester (Instron 3345). Data were analyzed one-way ANOVA and S-N-K test ($p < 0.05$).

Results: Mean μ -TBS values in MPa (sd) are shown in the table. As mean values were similar for the control group at different times, they were all grouped. Different

letters indicate statistically different μ -TBS values among treatments. Bleaching treatment with Whitekin and Clysiden significantly reduced μ -TBS mean values at 1, 3 and 7 days after the treatment. No differences were detected on μ -TBS mean for the bleaching products tested 14 days after bleaching.

Conclusion: Whitekin and Clysiden products reduced the μ -TBS to enamel. However, all bleaching treatments showed μ -TBS similar 14 days after treatment. This period after treatment would be necessary to re-establish the μ -TBS to enamel when Whitekin and Clysiden products are used.

Time after bleaching / Bleaching treatment	1 day		3 days		7 days		14 days	
	x (sd)	n	x (sd)	n	x (sd)	n	x (sd)	n
Control	25,1	107	25,1	107	25,1	107	25,1	107
	(5.2)a		(5.2)a		(5.2)a		(5.2)a	
Opalescence 10%	26,3	30	27,1	19	25,7	30	25,6	32
	(9.8)a		(7.4)a		(5.0)a		(7.5)a	
Opalescence Treswhite	28,3	40	26	32	25,8	20	24,7	17
	(8.6)a		(9.3)a		(5.6)a		(3.9)a	
Whitekin	21,5	26	18,4	26	20.0 (6.2)b	23	21,3	24
	(6.5)b		(5.7)b				(8.4)a	
Clysiden Kit Express	17	23	16,4	26	19,6	30	22,8	22
	(4.7)c		(3.0)b		(6.1)b		(6.2)a	

0379 (152040)

Effect of Sandblasting Conditions on Alumina Retention on Dental Alloys
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Objectives: To estimate the effect of grit-size and applied pressure on Al₂O₃ retained fragments on representative types of prosthodontic alloys following sandblasting.

Methods: Plastic patterns (l:25, w:3, h:0.6, n: 240) were equally shared in four groups and cast with Au-Pt (d.Sign 98, Ivovlar Vivadent), Ni-Cr (4 all, Ivocalr Vivadent), Co-Cr alloys (d.Sign 30, Ivocalr Vivadent) and cpTi grade II (J Morita Co) respectively. The specimens of each alloy were metallographically ground/polished and divided in 12 subgroups, which were sandblasted employing all combinations of Al₂O₃ grit-sizes (50, 100, 250) and propulsion pressures (0.15, 0.30, 0.45, 0.60 MPa). The surfaces were then imaged using backscattered electron emission and analyzed by SEM/EDX in area scan mode. The results of Al (%at) content were statistically analyzed by two-way ANOVA (grit-size and pressure discriminating variables). Significant differences among subgroups were determined by using Tukey multiple comparison test (a:0.05).

Results: All alloys showed a substantially amount of retained Al within the following range (%at): Au-Pt(10.0~20.0), Ni-Cr(16.5~26.3), Co-Cr(10.7~20.9), cpTi(8.1~12.4) with significant differences among subgroups. The discriminating variables showed significant interactions for Au-Pt, Ni-Cr and Co-Cr alloys, implying a synergistic effect on the extent of embedded Al₂O₃ fragments. For cpTi, no significant differences were found, denoting that the extent of retained Al₂O₃ fragments was independent of the selected sandblasting conditions.

Conclusions: Specific sandblasting conditions showed less retained Al₂O₃ fragments on Au-Pt, Ni-Cr and Co-Cr alloys, decreasing their detrimental effect on metal-ceramic strength.

0380 (151681)

Rugosimetric analysis of flowable composites after aluminum oxide paste polishing
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Objectives: Clinicians require simplified and effective protocols in order to polish composite resin restorations. Flowable composites have been advocated for small occlusal restorations. The present analysis evaluates the surface roughness of 4 flowable composites polished with a recently introduced one step aluminum oxide paste.

Methods: Twenty discs per composite were polymerized under a mylar strip: Filtek Supreme XT flow (3M ESPE, USA) (group 1 = G1); Dyract flow (Dentsply Caulk Mildford, USA) (group 2 = G2); Tetric flow (Ivoclar, Germany) (group 3 = G3); Premise flow (Kerr, USA) (group 4 = G4). Ten discs per group were finished with 1200 grit sandpaper and polished with Nupro Shimmer paste (Dentsply Caulk Mildford). Specimens were stored in artificial saliva for 24h and then underwent a profilometric analysis; a threshold value of 0.20 μ m was assumed. Rugosimetric data were statistically analyzed with parametric tests (p<0.05). A qualitative SEM evaluation of specimens was carried out.

Results: Ra mean values \pm SD (μ m) of polished specimens were: G1, 0.07 \pm 0.01; G2, 0.08 \pm 0.02; G3, 0.05 \pm 0.01; G4, 0.04 \pm 0.01; control mylar values were: G1, 0.03 \pm 0.01; G2, 0.16 \pm 0.07; G3, 0.04 \pm 0.01; G4, 0.05 \pm 0.01. Mean roughness was significantly lower in polished specimens in G1 and G3, whereas greater in G2; mylar and polished specimens showed similar surface roughness in G4. No statistically significant difference was found between G1 vs G2 and G3 vs G4 for polished specimens. SEM analysis showed smooth surfaces in all groups.

Conclusions: Flowable composite polishing with Nupro Shimmer lead to roughness mean values lower than the established threshold value in all groups. Best results were achieved with Tetric and Premise flowable composites.

0381 (151683)

Rubber point polishing and resin coating of a micro-hybrid composite
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Objectives: Finishing and polishing are essential phases of composite restoration. There is not agreement in literature regarding the gold standard technique to achieve a polished surface under a 0.2 μ m Ra threshold. The present rugosimetric study investigates the effectiveness of each step of a polishing protocol by using a diamond bur, decreasing particle size rubber points and resin coating.

Methods: Seventy-two composite discs (Filtek Z250, 3M ESPE, USA) were prepared and randomly divided into 6 groups (n=12); each group represented a step of the following polishing protocol: G1, 40 μ m diamond bur; G2, bur and 70 μ m black rubber point; G3, bur, black and 40 μ m yellow rubber points; G4, bur, black, yellow and 5 μ m grey rubber points; G5 as G4 + felt wheel; G6 as G4 + resin coating and felt wheel. Specimens underwent profilometric analysis by considering a superficial parameter (Sa). Data were statistically analyzed by means of Kruskal-Wallis and Conover tests (p<0.05).

Results: The mean Sa values \pm DS (nm) were: G1, 0.50 ± 0.21 ; G2, 0.18 ± 0.01 ; G3, 0.19 ± 0.04 ; G4, 0.11 ± 0.04 ; G5, 0.12 ± 0.02 ; G6, 0.10 ± 0.03 . Maximum roughness values were found in G1; a significant surface roughness decrease was registered in the groups in which the black (G2) and grey rubber points (G4) were used.

Conclusions: The black rubber point step already produced roughness values lower than the established threshold; therefore, it is possible to shorten the polishing sequence by excluding the yellow rubber point. Felt wheel and resin coating did not seem able to further decrease surface roughness.

0382 (153494)

Biological Determinants of the Biological Width

P. WINDISCH

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Peri-implant tissues significantly differ from periodontal tissues. According to literature the peri-implant environment is more prone to infections resulting in loss of hard- and soft tissues. Several longitudinal studies indicated that success rate of dental implants is significantly lower in patients with chronic periodontitis. For biological complications, bacterial colonization of implant surfaces is considered to be the most important ethiological factor. Nevertheless, the significance of the inadequately dimensioned biological width has to be more emphasised. Progressive crestal bone loss is frequently detected around dental implants, especially at rough or moderately rough surface textures. Inferior long-term success rates of rough surface compared to machined surface implants in periodontal patients confirm these observations. Biofilm accumulation resulting in peri-implant mucositis and peri-implantitis is widely discussed in literature. The importance of a certain amount of peri-implant keratinized tissues in the long-term maintenance of crestal bone levels however, is still under discussion. Around dental implants with reduced peri-implant keratinized tissue dimensions non-inflammatory progressive crestal bone loss is frequently observed. Thus, preservation or reconstruction of keratinized tissues around implants might facilitate the success of restorative procedures and improve aesthetics as well as the efficacy of individual and professional plaque control. Due to increasing aesthetic demands several novel surgical protocols have been recently proposed for soft tissue preservation and reconstruction around implants to improve pink aesthetics. Various flap designs alone or in combination with free connective tissue grafts or xenogenic matrices have been suggested in literature. Improvements in implant design such as platform switching might also contribute to maintain peri-implant soft tissue and marginal bone levels. The presentation is to give an overview of the most recent literature data supported by clinical observations on soft tissue preservation and reconstruction around dental implants.

0383 (153495)

Impact of Implant Macroscopic Design (microgap, platform switching)

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In recent years, crestal bone level changes that are frequently observed at titanium implants exposed to the oral environment have become a topic of growing interest. From a clinical point of view, the exposure of structured titanium surfaces may result in an accumulation of bacterial plaque biofilms, which in turn causes inflammatory reactions in the implant supporting soft- and hard tissue. Several factors have been proven to be associated with changes in crestal bone height adjacent to titanium implants. These include a bacterial colonization of the micro-gap at the implant-abutment interface, biologic aspects such as the establishment of an adequately dimensioned biological, or dis- and subsequent reconnections of the abutment component compromising the mucosal barrier. In addition, biomechanical aspects such as interfacial shear strengths, the influence of the macrodesign, as well as the location of the borderline between the machined and structured implant surface have been discussed. In recent years, a concept termed platform switching was introduced and suggested to overcome some of these problems. The presentation will provide an evidence based overview on the impact of implant macroscopic design (microgap, platform switching) to preserve the crestal bone level.

0384 (153496)

Impact of Abutment/Prosthetic Design and Material

I. URBAN

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The peri-implant mucosa has been studied extensively. It consists a two millimeter long junctional epithelium and more apically a one and a half millimeter connective tissue layer. It has been demonstrated that the junctional epithelium is attached to the titanium surface with hemidesmosomes and the connective tissue layer is rich in collagen fibers and sparse in cells and vascular structures. The attachment of these structures to the abutment is important in the maintenance of the peri-implant mucosa and the marginal bone level. Titanium abutments of different heights, gold and ceramic abutments were investigated in experimental studies for soft and hard tissue response. It has been demonstrated that titanium and ceramic materials have a proper attachment whereas no proper attachment formed around gold alloy and dental porcelain. Microgap location and configuration as well as abutment design and connection were also investigated. These investigations demonstrated that all these are important factors for proper soft tissue attachment and long-term stability of the peri-implant hard and soft tissue health. This presentation will review and discuss these important factors. Results of experimental investigations as well as representative clinical examples of will be shown throughout the presentation.

0385 (153497)

Impact of Implant Placement (immediate/delayed implants)

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Objectives: to evaluate the soft tissue healing when implants of different surfaces and designs are placed immediately into fresh extraction sockets.

Methods: experimental studies in dogs where different implant systems are inserted immediately in fresh extraction sockets and the healing of both soft and hard tissues are evaluated. The histological outcomes will include soft tissue landmarks as the length of the epithelium and the connective tissue attachment, as well as the measurement of the alterations in the alveolar ridge dimensions. These outcomes will be compared with adjacent sockets left to heal spontaneously.

Results: the soft tissue barrier 6 weeks after implant placement, consisted of a junctional epithelium measuring between 2-2.7 mm and a connective tissue component between 1-1.8 mm. The overall mean length of the biological width was on the buccal side, 4.17 (SD 0.34), 4.09 (SD 1.38), 3.40 (SD 0.56) and 4.14 (SD 0.94) mm for 3i, Astra Tech, Thommen and Straumann implants, respectively, whereas the corresponding values at the lingual side were 3.18 (SD 0.62), 2.85 (SD 0.42), 2.70 (SD 0.42) and 3.20 (SD 1.01) mm. Differences among the implant systems were not statistically significant. Differences with the sockets left to heal spontaneously were also non-significant although a more apical position of the buccal wall alveolar crest was found when implants were immediately placed.

Conclusions: these experimental studies in the beagle dog have shown that different implant designs and surface modifications did not influence the soft tissue dimensions after 6 weeks of healing when this implants are immediately placed after tooth extraction

Salivary Export Proteins in Health and Disease -From Classical to Proteomic ApproachesG. PROCTOR*Salivary Research Unit, King's College London Dental Institute, London, United Kingdom*

Proteins present in whole mouth saliva are a rich source of potential biomarkers, dependent upon a variety of contributions and influences which are reviewed in this presentation. Salivary gland acinar cells secrete most salivary protein by exocytosis of stored mucins, amylase, proline-rich proteins, histatins etc. which are the abundant salivary proteins largely responsible for the properties and functions of saliva. Other glandular salivary proteins are contributed by ductal or non-parenchymal cells and show a different pattern of secretion in response to glandular stimulation. Proteomic analyses have revealed that a huge number of less abundant proteins can be found in unstimulated whole mouth saliva many of which appear to be derived from plasma and thus may provide biomarkers of systemic disease. Although salivary glands present a tight barrier many plasma derived proteins have been identified in glandular salivas. However, most plasma derived proteins enter whole mouth saliva as tissue transudate across oral mucosal surfaces and the extent of such movement is likely to depend upon mucosal/ gingival health. Thus the utility of salivary protein biomarkers for both oral and systemic disease will be influenced by the extent of mucosal involvement in disease. The presence of proteins in saliva is subject to change during and following secretion into the mouth due to protein - surface interactions, proteolysis and, in the case of glycoproteins, glycolysis. Consequently, the way in which saliva is collected and processed can greatly influence the presence and form of proteins. Although the format of sample collection in many studies may not allow the use of protease inhibitors this does not necessarily prevent salivary proteins from still being of use as biomarkers.

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Saliva As a Stress MarkerK.J. KOVÁCS*Laboratory of Molecular Neuroendocrinology, Institute of Experimental Medicine, Budapest, Hungary*

Bulk of evidence has been accumulated over the years that human saliva contains steroids and enzymes whose concentration reflect the neuroendocrine and sympathetic activity and immune status in the body. The major advantage of analyzing salivary stress markers in humans is the noninvasive way, with which saliva samples can be collected throughout the whole circadian cycle. With the advent of sensitive analyzing methods tools became available to reveal subtle changes of cortisol and dehydroepiandrosterone (DHEA), the end products of the neuroendocrine stress axis. Steroids enter the saliva by passive diffusion and the correlation between plasma and saliva concentration of these hormones is high. The ratio of cortisol to DHEA have been observed in connection with various disorders, including depression, psychiatric conditions, and HIV infection. In most healthy people morning awakening is associated with a burst of cortisol secretion: the cortisol awakening response (CAR). It is argued that the CAR is subject to a range physiological regulatory influences that facilitate this rapid increase in cortisol secretion. However, the CAR literature is inconsistent with regard to associations with trait psychosocial and health measures. Alpha-amylase production in the saliva glands increases in response to psychological and physical stress through interactions with the autonomic nervous system (ANS), and it has been found to be a useful as a marker of activity in the autonomic nervous system. Salivary alpha-amylase levels have been used as a biomarker of ANS activity in various fields of biobehavioral research. The usefulness of salivary alpha amylase (sAA) as an SNS marker however is undermined by the fact that the parasympathetic nerves also play a significant role in sAA release. Taken together, saliva is a diagnostic fluid in experimental stress research and might be useful to diagnose endocrine and stress-related disorders as well.

Saliva in Sjögren's SyndromeA. VISSINK*Dept. of Oral & Maxillo. Surg, University Medical Center Groningen, Groningen, Netherlands*

Sjögren's syndrome (SS) is a systemic autoimmune disease characterized by chronic inflammation of salivary and lacrimal glands, frequently accompanied by systemic symptoms. Classified as an autoimmune disorder of the exocrine glands, SS is generally regarded as the second most common rheumatic disorder, exceeded in incidence only by rheumatoid arthritis. Having SS has a great impact on the patient's physical, mental, and social well being. Physically, patients may suffer from exhausting fatigue, persistent daily discomfort of dry eyes and mouth and may have other complaints related to either general autoimmune processes, or exocrine gland inflammation throughout their body. With regard to salivary gland function, progressive loss function mainly occurs in early SS (i.e. the first 4 years after disease onset) and stays relatively stable during the subsequent disease course. Moreover, salivary gland dysfunction in SS is characterized by a rather specific sialometrical/sialochemical profile. Furthermore, recent achievements in proteomics and genomics of saliva have shown that a set of specific biomarkers might be very useful asset in the diagnosis of SS. Treatment of salivary gland dysfunction was mainly symptomatic, but recently there is some evidence that salivary gland function may improve and salivary glands may regenerate when SS patients are subjected to an intervention therapy with so-called biologicals, in particular when subjected to rituximab (antiCD20) treatment. The impact of SS on salivary gland function, the possibilities of saliva to be used in the diagnostic work up of SS and its related complaints, and the current achievements of biologicals in the treatment of SS will be discussed.

Saliva As a Psychological Marker - Role of Heat Shock Protein and Fluid SecretionT.K. FABIÁN*Clinic of Prosthetic Dentistry, Semmelweis University of Medicine, Budapest, Hungary*

Saliva is a major determinant of the oral environment and oral comfort. Occurrence of psychosocial and/or psychoemotional stress strongly influences saliva secretion and therefore may lead to the appearance of general oral discomfort as well as specific oral symptoms. Besides chronic stress conditions, acute psychoemotional stress may also lead to rather significant changes of salivation including changes in salivary flow rate, level of salivary amylase, level of salivary heat shock proteins and level of salivary sIgA. Acute stress may also lead to prompt changes of bacterial adherence to salivary mucins. Such prompt psychogenic alterations of salivation may alter acquired pellicle formation, bacterial adhesion, biofilm formation, crystal growth homeostasis, hard tissue surface protection, antimicrobial defense, mucosal surface protection, etc. Prompt psychogenic alterations of salivation may also lead to dry mouth sensation and halitosis as well as alterations of taste perception and phonation. Besides their important role in the above processes, prompt changes of salivary amylase level and salivary heat shock protein level may also be used as salivary markers of acute stress conditions. In our previous studies prompt effects of several psychological stimulations (i.e. photic, acoustic and mixed photo-acoustic stimulations) and psychophysiological stimulations (i.e. taste, chewing, oral stereognostic task and oral motor ability task) on salivary flow rate, salivary heat shock protein concentration, total protein concentration and salivary amylase concentration values were characterized. In this lecture a summary of our results on the effects of psychological/psychophysiological stimulation on saliva secretion in humans will be presented and discussed. Psychophysiological aspects of salivary fluid secretion and salivary heat shock protein concentration as well as their possible use as a marker of psychological processes will also be discussed.

Salivary Gland Gene Therapy for Salivary, Systemic and Oral Diseases

G. RACZ, E. BORI, and G. VARGA

*Department of Oral Biology, Semmelweis University of Medicine, Budapest, Hungary***Objectives:** To give an update on salivary gland (SG) gene therapy and to present our results.

Introduction: Gene therapy uses a gene as a drug. In gene therapy, a gene encoding a therapeutic protein, rather than the protein itself, is delivered to a patient. A vector is the means by which recombinant DNA is introduced. Target cells are the cells which receive the recombinant DNA. Careful choice of vector and target is crucial to successful gene therapy. The key selection criteria for vectors are safety and efficacy. SGs are promising target tissues for gene therapeutics. They can be used to deliver therapeutic proteins into the mouth, and for systemic protein delivery. Regulated secretory pathway (RSP) proteins such as human growth hormone (hGH) are secreted mostly to the saliva from SGs. Constitutive pathway (CSP) proteins such as immunoglobulin Fc fragment (Fc) are secreted basolaterally to the bloodstream. Another aim of SG gene therapy can be to improve gland function. Our research has been focused on gene delivery into rodent SGs, on the mechanism of active fluid transport by salivary gland epithelia after aquaporin-1 (AQP1) gene transfer, and on producing therapeutic proteins to prevent bone loss in experimental periodontitis. Methods: Delivery of hGH, Fc, AQP1 and osteoprotegerin (OPG) to salivary gland cells using adenoviral gene transfer.

Results: Fc, a prototype CSP polypeptide is secreted via a CSP from rat submandibular salivary glands, whereas hGH via the regulated pathway. AdAQP1 gene transfer by itself increases fluid secretion by SG epithelia by a mechanism inhibited by basolateral bicarbonate ions. Transgenic OPG is secreted to the saliva from rodent salivary glands suggesting the possibility of peptide delivery to the mouth.

Conclusions: Salivary glands are a valuable platform not only for gland treatment, but also for both local and systemic gene therapeutics. Support: TÁMOP-4.2.1/B-09/1/KMR-2010-0001, OTKA K83915.

Structural Analysis and Protein Identification from Submandibular Salivary StonesJ. SZALMA¹, K. BÖDDI², E. LEMPEL¹, Z. SZABÓ², Á. NAGY³, L. OLASZ¹, and A. TAKÁTSY²¹*Department of Oral and Maxillofacial Surgery, University of Pécs, Pécs, Hungary,* ²*Faculty of Medicine Department of Biochemistry and Medical Chemistry, University of Pécs, Pécs, Hungary,* ³*University of Pécs, Pécs, Hungary***Objectives:** Sialolithiasis affects approximately 1-2% of the population, causing frequently obstructive and inflammatory malformations of the salivary glands.

Sialoliths consist of both inorganic compounds (mainly calcium phosphate) and organic molecules. In the literature there are several contradicted theories about the composition and the spatial distribution of the organic constituents. Our aim was to examine the organic central core theory.

Methods: The structure of 15 submandibular salivary stones were analysed with electro-microscopy (EM), scanning EM and two stones with micro computed tomography (CT). After structural analysis, the core and cortical region of intact other halves of stones were digested with trypsin after extraction, and then analysed with MALDI-TOF (matrix assisted laser desorption ionisation - time of flight) instrument. The peptide mass finger prints (PMF) were compared with the results of in silico digestion.

Results: The ms/ms measurements were completed from the intensive masses, and human defensin was proven to be present in sialoliths. Previously made microscopical structure analysis (EM, SEM, microCT) showed that organic structures (collagen fibers, bacterial structures, epithelial cells, red blood cells) are visible only on the peripheral parts.

Conclusions: Our MALDI results affirmed that structural observation, that protein structures are identifiable in salivary stones, however not in the central core. The organic core theory that stone formation is starting on a central protein structure (e.g.: epithelial cell, bacterial fragment) was contradicted in this study.

Formation Of Monolayers And Acinotubular Structures From Salivary Gland CellsA. FÖLDES¹, O. HEGYESI¹, E. BORI¹, Z. BORBÉLY¹, M.C. STEWARD², and G. VARGA¹¹*Oral Biology, Semmelweis University of Medicine, Budapest, Hungary,* ²*Faculty of Life Sciences, University of Manchester, Manchester, United Kingdom*

Objectives: To restore lost salivary epithelial function, either acinar cell renewal should be achieved or the function of the remnant ductal cells should be altered from an absorbing epithelium into a secretory epithelium. Our aim was to find optimal conditions to form functional epithelial monolayers and to form acinotubular structures using salivary cells originally isolated from rat or human salivary glands.

Methods: Human cell cultures were prepared from dissected human submandibular glands. From culture day-2 either non-attaching supernatant cells (huSMG) or all surviving cells (PTHSG) were cultivated to obtain epithelial-like progenitor or mixed epithelial-mesenchymal progenitor culture, respectively. Passage 1-3 cells were seeded onto Transwell Clear permeable supports in either MEM or HepatoStim medium to prepare polarized monolayer. Par-C10 cells, originated from rat parotid gland, were cultured under standard conditions in DMEM/F12.

Results: Autocrine factors and cell density are important for the growth and differentiation of huSMG and PTHSG cultures but not of Par-C10 cells. Both huSMG and PTHSG cultures grew to confluence as polarized monolayers on the permeable support in the presence of HepatoStim (TEER reached 700-1500 ohm*cm²) but not in MEM (TEER under 200 ohm*cm²). Culture in HepatoStim was required for the differentiation but not for the maintenance of human salivary gland epithelial cells. Acinar differentiation and acinotubular formation was successfully achieved by basal membrane extract Matrigel in both Par-C10 and human salivary gland cultures.

Conclusion: We have successfully established a functional model of human salivary gland epithelium and achieved acinar differentiation of rat and human salivary glands. Support: OTKA CK80928 and TÁMOP-4.2.1/B-09/1/KMR-2010-0001

Effects of a Novel Potential mPGES-1 Inhibitor on PGE2 Production

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Objectives: Prostaglandin E2 (PGE2) has a central role in the pathogenesis of inflammatory conditions such as periodontitis. The final step of the PGE2 biosynthesis is catalyzed by the PGE synthases, where the inducible isoform, mPGES-1, is an attractive target for selective PGE2 inhibition. The objective of this study was to investigate the effect of a novel compound as a potential mPGES-1 inhibitor on cytokine-induced PGE2 synthesis in gingival fibroblasts.

Methods: Several compounds were identified as mPGES-1 inhibitors by docking models using a modeling program. The most potent of the compounds, TH-848, was used alone or in combination with pro-inflammatory cytokines TNF α or IL-1 β on gingival fibroblasts. After stimulation, PGE2 levels were measured in the culture medium using EIA, and protein expression of PGE synthases and COX-2 was analyzed by flow cytometry and western blot. Cytotoxicity was evaluated using the CytoTox 96 Non-Radioactive Cytotoxicity Assay.

Results: TH-848 (1-5 μ M) dose-dependently abolished PGE2 production in gingival fibroblasts stimulated by IL-1 β and TNF α . The anti-inflammatory substance dexamethasone, used as a control, also decreased the cytokine-stimulated PGE2 production. The cytokine-induced mPGES-1 protein expression was decreased by TH-848. In contrast, mPGES-2 and cPGES protein expression was not affected by cytokines or TH-848. The cytotoxicity of TH-848, determined by LDH release, showed no increased release of LDH from cells treated with different doses of TH-848 compared to control cells.

Conclusions: TH-848 inhibits PGE2 synthesis and might represent a novel mPGES-1 inhibitor that may potentially be used in the treatment of periodontitis.

A Novel Local Drug Delivery System

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Objectives: In the present study our aim was to test the efficacy of our newly developed low-cost local drug delivery device.

Methods: Four types of polymethyl-methacrylate (PMMA) capsules were prepared with different wall thickness and filler content. Following ethylene oxide sterilization the capsules were loaded with commercially available antibiotics (gentamicin, tobramycin, amikacin, clindamycin). The release of antibiotics in vitro was determined by microbiologic diffusion assay and high performance liquid chromatography (HPLC). The effectiveness of the capsules was evaluated in vivo using *Staphylococcus aureus* induced rabbit osteomyelitis model.

Results: The capsules showed prolonged release in vitro far above the minimal inhibitory concentration throughout the clinically important period (42 days). The capsule insertion also significantly bettered the healing process of induced osteomyelitis in vivo.

Conclusion: These newly developed PMMA-filler based capsules may be a versatile devices in the management of chronic osteomyelitis and soft tissue suppurations by providing efficient release and reducing the significant financial burdens of the disease. Financial support was provided by Hungarian Research and Technology Innovation Found [OMFD-0040312068/INNO-6-2008-0001] and OTKA 78480.

Functional Foods with Oral Health Benefits - Fiction or Facts? - Acta Odontologica Scandinavica Prize lecture 2011

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Different preventive approaches have, during the years, been developed in order to improve oral health. The therapeutic effect of various food products has a long history and for example the intake of fluoride naturally occurring has been one method used for caries prevention. However, in recent years, an increased awareness and interest in "functional foods" have been demonstrated. Although there is no international agreement on the terms "food" or "functional", a number of foods and beverages and their constituents are today, apart from their basic nutritional value, also known to possess health promoting properties. For some products it may also be related to their physical properties. Research has traditionally focused on medical aspects, but benefits in relation to oral health, with particular interest for dental caries and periodontal diseases, have recently also been shown. Such food components may affect bacterial properties and therefore the complex oral microbial communities. This symposium will give an overview of the current knowledge within the field and discuss biologically active components, as well as summarize the findings from an EC multicentre study (Nutrident: towards functional foods). This study isolated, identified and evaluated active components from foods and beverages which showed anti-caries and anti-gingivitis activities.

Chemical Characterization of Bio-active Compounds

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Functional foods are common foods, consumed as part of a varied diet in their naturally-occurring form, that provide beneficial effect on health, beyond the traditional nutrients they contains. The term nutraceutical indicates those functional food components responsible for healthy biological activities. Therefore, nutraceuticals, most of which are natural products that can be obtained from plants and animals, may include both nutrients and non-nutrients, belonging to many different chemical classes, such as lipids (that include plant sterols and stanols, long chain polyunsaturated fatty acids), carbohydrates (such as dietary soluble and insoluble fiber), vitamins, minerals and polyphenols. Among chronic diseases whose development can be influenced by the consumption of specific foods, there are oral diseases, such as caries and gingivitis. It is well known that oral pathogens virulence can be strengthened or conversely inhibited by dietary factors (1). For a long time the negative role of diet sucrose in inducing caries formation has been recognized. As regards nutraceuticals with beneficial effect on oral health, many classes of food components can be considered, such as minerals, mainly fluoride, certain dietary sugar alcohols, notably xylitol and sorbitol (2), and different classes of polyphenols, such as catechins, and tannins (3). The aim of this presentation is to point out the main nutraceuticals active in protecting oral health and to describe the most recent analytical methods used for their chemical characterization.

1) Chankanka O. et al. Mixed dentition cavitated caries incidence and dietary intake frequencies. *Pediatr Dent.* 2011; 33:233-40. 2) Kauko K. Makinen. Sugar Alcohols, Caries Incidence, and Remineralization of Caries Lesions: A Literature Review. *Int J Dent.* 2010;2010:981072 3) Yoo S. et al. Antimicrobial Traits of Tea- and Cranberry-Derived Polyphenols against *Streptococcus mutans*. *Caries Res.* 2011; 45:327-335.

Evaluation of Plant and Fungal Extracts from the Nutrient Study for Their Beneficial Oral Health Properties

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Recently, epidemiological studies have demonstrated a clear relationship between diet and health and this has resulted in new roles being ascribed to foods. Foods are now regarded not only as being an indispensable source of nutrition, but can be considered to be beneficial in many other ways. Foods that have some particular beneficial effects on health, are generally defined as functional foods. Their activity is determined by a more or less specific and selective interaction of their minor components with one or more physiological functions of the organism. Dental caries and gingivitis are the most prevalent infectious diseases of humans and are due to the accumulation of a bacterial biofilm on the tooth surface and at the gingival margin respectively. Caries and gingivitis are the only infectious diseases for which daily prophylactic measures are required. Unfortunately, few individuals have the manual dexterity, or the commitment, to ensure that sufficient plaque is removed to prevent the occurrence of these diseases. Consequently, professional treatment is required to remove or restore teeth affected by caries and to treat periodontitis, a sequel to gingivitis in many individuals. There is evidence that certain beverages and foods can protect against caries and gingivitis. The results of a large multi partner EU FP6 funded project, NUTRIDENT, will be presented and discussed. We have demonstrated that extracts and fractions from shiitake mushroom (*Lentinula edodes*), chicory (*Cichorium intibius*) and raspberries (*Rubus idaeus*) have activity in a wide range of anti-caries and anti-gingivitis assays. The active compounds associated with these properties have been isolated and identified. These plants and fungi as functional foods and the pure compounds are promising candidates for gingivitis prevention and treatment.

0398 (153563)

Effectiveness of Food Extract Identified from the Nutrient Study: in vitro and Clinical Evaluation

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Unfortunately, due to poor oral hygiene among the general population, gingivitis is prevalent and results in high treatment costs. Consequently, the option of treating gingivitis using functional foods, which promote oral health, is an attractive one. Foods that have some particular beneficial effects on health, are generally defined as functional foods. Their activity is determined by a more or less specific and selective interaction of their minor components with one or more physiological functions of the organism. Medicinal mushrooms, including shiitake, have long been known for their immune system boosting as well as antimicrobial effects; however they have not been employed in the treatment of oral disease. The results of a large multi partner EU FP6 funded project, NUTRIDENT, will be presented and discussed. The effectiveness of shiitake mushroom extract was compared to that of the active component in the leading gingivitis mouthwash, containing chlorhexidine, in an artificial mouth model (constant depth film fermenter). The total bacterial numbers as well as numbers of eight key taxa in the oral community were investigated over time using multiplex qPCR. The results indicated that shiitake mushroom extract lowered the numbers of some pathogenic taxa without affecting the taxa associated with health, unlike chlorhexidine which has a limited effect on all taxa. Interestingly these findings were also shown in a small scale gingivitis trial. The results from the trial were interesting from two perspectives. Firstly, we showed that although chlorhexidine was able to reduce the plaque scores over time this wasn't related to a concomitant decrease in gingivitis scores. This appeared to be related to the increase in proportions of *Fusobacterium nucleatum* and *Prevotella intermedia* within the population as shown by qPCR. Secondly, although shiitake mushroom had little effect on the plaque scores it was able to reduce some of the pathogenic microbiota present.

0399 (153463)

Why Do We Ignore Multilevel Modeling in Oral Health Research?

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In oral health research, information is often collected at the level of individual teeth or at even more detailed level. Caries experience data are usually registered at tooth surface level with tooth surfaces nested within teeth and teeth nested within mouths. A comparable situation is seen in periodontal research where information is collected at several pocket sites surrounding a same tooth and this is repeated for several (all) teeth in a mouth. In both these examples it is clear that the obtained data are not independent; they are interrelated and show a hierarchical structure. This aspect needs to be taken into account when analyzing the data. But equally important is that when interest is at the lower level then conclusions must be made at that level and this requires that the statistical analysis is done at the appropriate level. In this contribution examples are provided of published research from different areas within oral health research, with emphasis on the multilevel structure of the data and the way this characteristic was handled in the analysis of the data.

0400 (153464)

Multilevel Models and Their Application in Oral Health Research

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Dental data most often exhibit a hierarchical structure. Neglecting this structure usually results in biased estimates of all parameters. This implies in practice that some of the effects (between-subject effects) should not have been declared significant if the appropriate analysis taking into account the multilevel structure had been performed. However, neglecting the hierarchical structure can equally imply that other effects should have been declared significant (within-subject effects). In other words, neglecting the hierarchical structure likely affects both the validity of the statistical analysis as well as the power. Employing the richness of the hierarchical data structure can also provide extra information of covariates that influence the outcome at the different levels of the data (e.g. surface, tooth, mouth, etc.). A brief introduction into the statistics of multilevel models is given. We show that they offer a possible solution to the problem of correlated data. We also show that multilevel models provide a flexible tool to examine the effect of different types of covariates, i.e. covariates that happen at the different levels of the data. The multilevel models are illustrated on split-mouth studies and on caries research studies using the Signal Tandmobiel® Study. References: Lesaffre E., Feine J., Leroux B. and Declerck, D. (eds.) Statistical and Methodological Aspects of Oral Health Research (2009, John Wiley).

0401 (153499)

Introduction in Implant esthetics

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Esthetics has a important psychological and social impact on individual's quality of life, which also depends on esthetic appearance. In the last decades osseointegration of intra and extra-oral implants enabled a variety of soft and hard tissue reconstruction. The goal of the presentation is to give basic introduction, what the term "esthetic" means, starting with single tooth restoration and heading to large maxillofacial defects and their implant-supported esthetic rehabilitation. Dental implants, and their improved modification for extraoral use gives us an opportunity to choose different prosthetic solutions, and determine a function-based material selection.

0402 (153500)

Anterior Esthetic in Implant Restorations - Clinical Parameters and Advantages of Customized CAD/CAM Components

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Ever increasing patients' demands for a natural looking and long-term stable restoration can be a considerable challenge for the surgeon and restorative team. While dental implants are considered a standard of care today, custom made implant restorations were often associated with time consuming laboratory protocols to achieve proper contour and fit. In recent years computer aided design and computer aided manufacturing (CAD/CAM) technology has been impacting everyday clinical and laboratory routine. The primary objective of prosthodontic superstructures is to provide proper support of the surrounding tissues, optimal morphology to support the restoration without impairing hygiene maintenance, and anatomic design to allow for proper support of the veneering ceramics in case of screw retained restorations. Based on clinical and scientific evidence zirconiumdioxide is more frequently used as an abutment material due to its strength and excellent biocompatibility. Various studies have demonstrated the successful application of zirconia abutments in terms of stability of soft tissue and marginal bone. The presentation will summarize clinical rationales for design and material selection based on scientific evidence.

Nature-Like Emergence Profile and Reduced Treatment Time by Immediate Anatomical Soft-Tissue Shaping or Prosthetic Socket Preservation

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Aesthetic outcomes (PES, WES) depend on stable midfacial soft tissue levels. A lot of factors and treatment concepts are discussed to achieve predictable and long lasting results. In case of a fresh extraction socket the seal with the own tooth or a temporary crown can preserve the complete soft tissue shape. This "prosthetic" socket preservation simulates an intentional tooth re-implantation without the root. The same seal and therefore an optimal healing mode of the extraction socket is realized by an immediately inserted and restored implant. However, the subsequent manufacturing of the final restoration includes a repeated assembling and removing of components involved in the established periimplant mucosal seal: temporary abutments and temporary crowns. The disrupted epithelial and connective tissue attachment is associated with dimensional and structural changes of the mucosal seal and contributes to pink aesthetic failures. Therefore the "one abutment one time" and the "one crown one time" concepts are preferred. A platform switched and sealed implant-abutment connection is additionally identified to be important for preventing a crestal bone loss and an apical shift of the midfacial soft tissue level. The lecture demonstrates a workflow for oral surgeons, prosthodontists and dental technicians to achieve a predictable midfacial soft tissue level by an effective and non traumatic protocol. Primarily results of a prospective clinical trial are promising. Additionally an insight into a scientific based explanatory model is given how a stable conical connection can increase the probability of a periimplant tissue preservation.

Choice of Abutments and Supraconstructions for White Esthetics

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The natural appearance of a patient's smile is determined by an harmonious combination of red and white esthetics. Lots of influencing factors can affect the red and white esthetics. The red esthetics is influenced for example by the chosen surgical protocol, the type of implant (tissue vs. bone level), the patient's gingiva biotype (thick, flat vs. thin scalloped) and the material of the abutment. The white esthetics is affected by the abutment design and material, the chosen material for the restoration and the cement used. The best white esthetics will result when ceramic abutments are combined with all - ceramic restorations, e.g. the combination of zirconium oxide abutments (like the Straumann® Anatomic IPS e.max® Abutment) with lithium disilicate restorations (IPS e.max Press). The lecture will present an overview about different types of ceramic abutments with and without a titanium base. Also different materials for esthetic superconstructions with and without framework will be discussed regarding the currently available literature. Some clinical cases will highlight the advantages and disadvantages of the different abutment and superconstruction combinations. The conclusion will present a recommendation to the practitioner which material combination (abutment, cement, restoration) seems to be the best choice for white esthetics.

Chromatographic Analysis of Eluted Monomers From Three Resin Cements

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Objectives: identifying and quantifying residual monomers, through chromatographic technics, leached from three dental resin cements (Multilink® Automix, SpeedCEM® e Dual Cement®) and identifying compounds that aren't described by the manufacturer.

Methods: 30 human molar teeth were randomly divided in three groups of 10 teeth each. In each group (Group A1, Group A2 and Group A3) a standard Class I cavity was prepared. 30 pre-fabricated lithium disilicate inlays (IPS e-max Press®) were cemented with different cements: Group A1 (Multilink® Automix); Group A2 (SpeedCEM®) and Group A3 (Dual Cement®). The teeth were stored for 24h in artificial saliva, with neutral pH, at 37°C +/- 1°C. Then all of the samples were analysed by HPLC to identify and quantify the studied monomers and by GC-MS to identify leached compounds that aren't described by the manufacturers. In the statistical analysis of the obtained data, ANOVA one-way and t-Student tests were made for a significance level of 5%.

Results: In Group A1, results with statistical significance (p=0,033) were obtained when comparing the average concentration values of HEMA (15,73 µg/ml; SD 3,21) and UDMA (10,89 µg/ml; SD 4,62). In Group A2, the obtained average concentration of TEGDMA (3,88 µg/ml; SD 1,40) and UDMA (12,25 µg/ml; SD 4,57) also proved having statistical significance (p<0,001). In group A3 the average concentration of UDMA is 16,69 µg/ml; SD 7,07. However when comparing the UDMA concentrations, found in the three groups, there is no statistical significance (p=0,126). In group A1 and group A2, EDMA and acetic acid were found, respectively.

Conclusion: The leached concentrations of the residual monomers make them possible to be analysed by chromatographic technics. The leached concentration of HEMA is bigger than UDMA and the leached concentration of UDMA is bigger than TEGDMA. There are leached compounds that aren't described by the manufacturers.

Human Epithelial Tissue Culture Study on Restorative Materials

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Objectives: The health condition of the gingival tissues contacting the surfaces of fixed prostheses is a resultant of multiple etiologic factors, like oral-hygiene, marginal seal, luting material, emergence profile of the crown, systemic health of the patient and the restorative material. Our aim was to evaluate under in vitro circumstances the attachment and proliferation rate of cultured human epithelial cells on three commonly used restorative materials.

Methods: The morphological and chemical structure of Yttrium modified zirconium dioxide (5-TEC ICE Zirkon Translucent, Zirkonzahn GmbH srl, Germany), lithium disilicate (E-max press, Ivoclar Vivadent AG Germany), Co-Cr alloy (Remanium star, Dentaaurum GmbH & Co. KG, Germany) discs with polished surfaces were examined by scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS). Human epithelial cell attachment (24 h observation) and proliferation (72 h observation) were investigated via dimethylthiazolyl-diphenyltetrazolium bromide (MTT) and Alamar Blue (AB) on control surface (cell-culturing plate itself) and on the different restorative materials.

Results: SEM revealed no significant difference in the roughness of the three materials. EDS confirmed the constant presence of typical elements. On the control surfaces MTT and AB assays showed a significant growth of cell numbers after 74 h compared to 24 h. For the restorative materials MTT and AB assays indicated similar epithelial cell attachment and proliferation. A slight decrease between cell attachment and proliferation was observed for the Co-Cr samples with MTT assay.

Conclusions: These results suggest that on zirconia, lithium-disilicate and Co-Cr alloy surfaces fewer cells attach as compared to the control surface. The attachment and proliferation of human epithelial cells is less supported on crown materials, than on control surface.

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TEGDMA-modulated expression of genes involved in oxidative stress responses

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Objectives: Aim of the study was to assess whether and to what extent the comonomer triethyleneglycol dimethacrylate (TEGDMA) modulates the expression of genes involved in oxidative stress responses in human periodontal ligament fibroblasts (hPLF).

Methods: Confluent hPLF were treated with 2.5 mM TEGDMA for 24, 48, and 72 h in cell culture dishes (3 cm diameter). Quantitative gene expression of six genes involved in oxidative stress response compared to untreated cells was assessed by real-time PCR. cDNA was synthesized from total RNA using the QuantiTect™ Reverse Transcription Kit. Real-time PCR was performed using Rotor GeneSYBR® Green PCR Kit on the Rotor-Gene Q® real-time PCR system. Quantification was adjusted by amplification efficiency and genes were normalized to the expression levels of the two most stable housekeeping genes, B2M and SDHA, evaluated by geNorm. Experiments were repeated at least three times. REST® software was used for testing significance by a pair-wise fixed reallocation randomisation test ($p < 0.05$).

Results: Incubation with TEGDMA resulted in a marked increase of heme oxygenase-1 (HO-1) mRNA expression ($66.2\text{-fold} \pm 14.7$) compared to untreated controls after 24 h. After 48 h and 72 h this gene still exhibited an approximately 18-fold increase (all $p < 0.05$). Interestingly, superoxide dismutase (MnSOD) mRNA level was significantly increased 2.1-fold compared to untreated controls after 24 h and 48 h ($p < 0.05$). However, catalase was expressed at similar levels in treated and untreated control cells. Enzymes involved in glutathione metabolism (glutathione synthetase (GSS), glutathione S-transferase theta 2 (GSTT2), glutathione peroxidase 4 (GPx4)) showed no significantly clear modulations in mRNA expression levels.

Conclusions: TEGDMA induces significant changes in oxidative defense responses. The high induction of HO-1 supports the existence of oxidative stress in the cells. In addition, the induction of SOD mRNA indicates the generation of superoxide radicals by TEGDMA.

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0408 (151914)

Effects of Ethanol and DMSO on TEGDMA Solubility and CytotoxicityV. RIVIECCIO¹, G. SPAGNUOLO¹, V. D'ANTO¹, S. RENGO¹, A. LUPI², and G. NOCCA³¹University of Napoli "Federico II", Napoli, Italy, ²Istituto di chimica del riconoscimento molecolare, Consiglio Nazionale delle Ricerche - CNR -, Rome, Italy, ³Università Cattolica del Sacro Cuore, Roma, Italy

Objective: Several in vitro studies have been carried out to investigate the triethyleneglycol-dimethacrylate (TEGDMA) cytotoxicity. However, these studies have never focused on how the solvents used to dissolve TEGDMA in the experimental conditions might influence monomer effective concentrations and in turn its cytotoxicity. Hence, the aim of this study was to evaluate the active concentrations of the TEGDMA over the routinely experimental conditions used in biocompatibility in vitro tests and to determine any changes in cytotoxicity depending on the TEGDMA solution composition.

Methods: TEGDMA dilutions were prepared directly in DMEM (in absence of cells) or were dissolved previously in DMSO or ethanol and then in medium. Monomer concentrations were quantified by an HPLC system. The cytotoxicity effects of TEGDMA dilutions (1 and 2 mmol/L, with and w/o solvents) were evaluated on 3T3-fibroblasts by MTT assay. ROS production (by FACSscan flowcytometer) and intracellular and extracellular TEGDMA concentration (by HPLC) were also determined. Data were analyzed by ANOVA followed by Turkey's test for multiple comparisons.

Results: Maximum solubility of TEGDMA in DMEM (in absence of cells) was 0.5 mmol/L both in the presence and absence of solvents. 2 mmol/L TEGDMA - solubilized in DMSO or ethanol and then dissolved in medium - caused a significant decrease in cell viability and an induction of ROS production compared to the same TEGDMA concentration dissolved in medium directly. Moreover when 2 mmol/L TEGDMA was added to the cells in presence of DMSO and ETOH, after 2h of incubation, TEGDMA concentration was reduced respectively 10% and 20%, while, TEGDMA added without vehicles remains constant.

Conclusions: Our results showed that TEGDMA solubilization in DMEM was not complete and that the cytotoxic effects of the monomer was influenced by the method of solubilization.

0409 (151926)

Genotoxic effect of two bleaching agents on the oral mucosaE. KLARIC¹, Z. TARLE¹, M. PAR², I. PROFETA², V. KASUBA³, R. ROZGAJ³, N. KOPJAR³, and D. ZELJEZIC³¹Department of Endodontics and Restorative Dentistry, Stomatoloski Fakultet, Zagreb, Croatia, ²Stomatoloski Fakultet, Zagreb, Croatia, ³Institute for Medical Research and Occupational Health, Zagreb, Croatia

Objective: The purpose of this study was to investigate a possible genotoxic effect of two bleaching products.

Methods: The research was conducted on 21 test subjects divided into two groups. Group 1 was treated with in - office bleaching agent Zoom2 (Discus Dental, SAD), while Group 2 was treated with Opalescence Boost (Ultradent, SAD). From each subject specimens were taken, in two separate swabs, of the gingival area and the upper lip mucosa. Swabs were taken three times: just before, immediately after and 72 hours after the tooth bleaching procedure. The specimens were analyzed using micronucleus test.

Results: The mean values of the individual genotoxicity markers were compared using the nonparametric chi-square test, at a significance level of 0.05. Statistically significant increase of the total number of micronuclei, and cells with more than 3 micronuclei were found in specimens taken from the gingiva and lip 72 hours after bleaching by means of the Zoom 2 preparation. The bleaching by means of the Boost preparation showed a statistically significant increase of the total number of micronuclei and cells with more than 1 and more than 3 and micronuclei in the specimen taken from the gingiva and lip 72 hours after bleaching.

Conclusion: Both bleaching procedures showed statistically significant increase of the cells with more than one, more than three or total number of micronuclei in specimens taken from the gingiva and lip 72 hours after the bleaching. Under assumption that monomers can be found in protective soft tissue gel and because of the initially conditions and great distinction between the test subjects we can not be sure in possible genotoxic effect of this two bleaching products. This study was supported by the Ministry of Science, Education and Sport, Croatia (project 065-0352851-0410).

0410 (152145)

In Vitro Biocompatibility of HEMA-free Dental AdhesivesG. SPAGNUOLO¹, V. RIVIECCIO¹, M.P. DI CAPRIO¹, V. D'ANTO¹, M. AMATO², and S. RENGO¹¹University of Napoli "Federico II", Napoli, Italy, ²University of Salerno, Salerno, Italy

Objectives: 2-hydroxyethyl methacrylate (HEMA) is a common component in current dental adhesives. Several studies demonstrated HEMA cytotoxicity in different cell lines. Since recently new adhesive formulations without HEMA were suggested, the aim of our study was to evaluate the biocompatibility of new commercial HEMA-free dental adhesives in human pulp cells.

Methods: Human pulpal cells (HPC) were plated in 96-multiwell plates for 24h and then exposed to different concentrations (0–0.75 mg/ml) of six dental adhesives (OptiBond FL, Beauty Bond, G-Bond, XenoV, CMF, AdheSe). The cytotoxicity was assessed by MTT assay after 24 hours incubation. Moreover, the effects of adhesives on cell proliferation was evaluated by Alamar Blue after 24h. Data were statistically analyzed by ANOVA followed by Tukey's post hoc test.

Results: All adhesives tested decreased cell viability in a dose-related manner after a 24h exposure period. In a concentration range of 0-0.1 mg/ml, there was no substantial difference between the adhesive. At 0.1 mg/ml concentration only OptiBond showed a significant decrease in cell vitality ($25.70\% \pm 2.93\%$). 0.4 mg/ml caused a cytotoxic effect ranked as follows: OptiBond FL ($15.35\% \pm 3.35\%$) > Beauty Bond ($17.78\% \pm 4.91\%$) > G-Bond ($27.93\% \pm 3.73\%$) > XenoV ($29.53\% \pm 6.46\%$) >

CMF (32.15% \pm 0.34%) > AdheSe (33.39% \pm 4.54%). At the concentration of 0.75 mg/ml also G-Bond caused a significant decrease in cell vitality. Moreover, after 24h OptiBond FL showed a significant dose dependent inhibitory effect on cells proliferation.

Conclusions: Although toxicity might depend by adhesives composition, our results suggested that HEMA-free adhesives were less cytotoxic than those containing HEMA.

0411 (152216)

Hazards of Bisphenol A: A Review of IADR Abstracts

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The International Association for Dental Research (I.A.D.R.) congress permits communication of research findings and their implications throughout the world, and evaluates research activity.

The putative xenoestrogen Bisphenol A (BPA) is a component of molecules that are present in resin-based composites, including pit, fissure sealants, or resin luting cements.

Objectives: the purpose of this study is to measure the interest of the scientific community in release and health hazard of BPA and Bis-GMA coming from dental composite resins within the I.A.D.R. congress.

Methods: we analyse the abstracts concerning elution and general toxicity of dental composite resins presented in every I.A.D.R. congress from 2002 to 2011. With the search engine of I.A.D.R. website, we use the term "bisphenol" by year for every IADR congress (international and all divisions).

Results: 35 abstracts concern BPA release and health hazards. Numerous abstracts are published each year (average 3.5+/-2.55, with 2 peaks in 2002 and 2008) mainly originating from 4 countries (United-States: 31.6%, Japan: 20%, United-Kingdom: 11.5%, Germany: 11.5%).

The methods are: elution (37.1%), cytocompatibility (20%), gene assay (11.4%), animal exposition (8.6%), enzymatic degradation essay (8.6%), semiempirical method calculation (8.6%), salivary and urinary BPA concentration (5.7%)

BPA A elution and release: 13 abstracts (restorative composite resins: 9, resin luting cements: 2, orthodontic plastic bracket: 2)

Health hazards: 22 abstracts (estrogenicity and effects on corticosterone: 5, effects on cholesterol esterase enzyme: 4, gene transcription modification: 3, cytotoxicity: 8).

These risks are considered: 7 abstracts concerned BPA free composites (71.4% of abstracts published since 2009).

Conclusion: This preliminary result suggests that the scientific community shows a great interest in the potential hazards of bisphenol A. "Taken together, the risk of BPA in dentistry is according to present evidence acceptable" (G. Schmalz, AADR 2010). However, manufacturers tend to develop materials with less estrogenic potential.

0412 (151357)

Extended Finite Element Method Used For Complete Dentures With Defects

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Objective: The aim was to investigate the stress distribution on complete dentures, based on a proposed methodology involving FEM analysis and Fatigue and Fracture Mechanics.

Materials and method: One used two pairs of complete dentures, made of different resins: Superacryl, Eclipse Base Plate, at which one knows the material's mechanical properties. The finite element analysis was made on geometric models, resulted after the complete dentures' 3D scanning (with 3D laser scanner LPX1200, Roland) and image processing by „reverse engineering", taking into consideration the located defects (software: Abaqus/CAE V6.9). The geometric model was meshed in tetrahedral finite elements, C3D8 (154742 elements) and based on FEM simulation, one determined the Maximum Principal Stress and Maximum Principal Strain. Extended Finite Element Method (XFEM-ABAQUS) was used to determine whether to applied load of 1.5MPa, a crack is initiated or not.

Results: As fracture criteria the maximum principal stress were used (for evaluation the stress and strain state in complete dentures). For Eclipse, the Maximum Principal Stress was:72,48MPa and Maximum Principal Strain was: 0,0265%. For Superacryl, the Maximum Principal Stress was:97,09MPa and Maximum Principal Strain was: 0,0201%. Comparing the FEM results with mechanical properties of these two materials on can observe the bigger mechanical strength of Eclipse denture. The initiated crack length in Superacryl was enough big to determine a fracture of complete denture. In the same conditions in the Eclipse prosthesis the crack length do not contribute to fracture.

Conclusions: The defects in the material's structure may have a negative impact on denture's mechanical resistance. Analytical study of the dentures by finite element analysis is used for knowledge of the risk zone for fracture and long life determination of prosthesis(grantID1878).

0413 (151550)

Clinical Trial Locator® System In Patients With Implant Overdentures.

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Objectives: Review the operation and behavior of the Locator ® system in patients with mandibular overdentures retained by 2 implants and know the level of impact on quality of life and oral satisfaction. Establish a comparison with a control group of conventional complete denture wearers.

Methods: The study was conducted in the Department of Prosthodontics and Occlusion, Faculty of Medicine and Dentistry, University of Valencia and is approved by the Ethics Committee. After signing informed consent, were evaluated by a protocol (demographic, OHIP-20, OSS, implants, Locator ® males, Locator ® females, prostheses, soft tissue status) patients who meet the following criteria: - Patients with mandibular complete dentures. (30) - Patients edentulous with mandibular overdentures on 2 implants using the Locator ® connection system. (47) Patients filled out a questionnaire OHIP-20 and OSS. Perform a descriptive retrospective review of medical history and a basic oral examination, following the methodological criteria of WHO (1987) with a mean of 5 years. We performed a statistical analysis.

Results: The degree is oral patient satisfaction is high and the impact on quality of life is lower in those who belong to the study group than in the control group. The implants have a success rate above 95%. Locator ® males show no fracture, should be screwed with torque. Females dont have problems, regardless of placement technique. The prosthesis fractured in 10% of cases, without affecting the presence of metal reinforcement. The soft tissue swelling present recession and especially when there is no attached gingiva.

Conclusion: Locator ® system presents a good clinical performance in cases of mandibular overdentures on two implants. The placement of an implant-prosthesis increases the oral satisfaction of patients by reducing the level of impact on quality of life in edentulous patients.

Double-Crown-Retained Partial Dentures – A Randomized Clinical StudyT. STÖBER¹, J.L. BERMEO², F. LEHMANN¹, A.-C. SÉCHÉ¹, and P. RAMMELSBERG¹¹Department of Prosthodontics, University Hospital Heidelberg, Heidelberg, Germany, ²Institute of Medical Biometry and Informatics, University Hospital Heidelberg, Heidelberg, Germany**Objectives:** To quantify and compare the clinical performance of removable partial dentures retained by cast conical double-crowns (C-RPD) and electroplated telescopic double-crowns (EP-RPD).**Materials and Methods:** 54 patients were provided with a total of 60 removable partial dentures (RPD). The participants were randomly assigned to two study groups (C-RPD and EP-RPD). Altogether 217 abutment teeth were provided with double crowns. Follow-up examinations were performed after 6, 12, 24, and 36 months. Survival of RPD and abutment teeth were the main endpoints; secondary endpoints included technical and biological complications, such as failure of facing, loss of cementation of primary crowns, and post-prosthetic endodontic treatment. Group differences regarding characteristics of patients and partial dentures were analysed by chi-squared tests. Survival differences were statistically investigated by log-rank tests and Cox regression, secondary endpoints by logistic regression taking into account the clustering of dentures and abutment teeth within patients.**Results:** Survival rates after 36 months were 100% for C-RPD and 93.3% for EP-RPD. The cumulative survival rate for abutment teeth was 97.3% in the C-RPD group and 96.2% in the EP-RPD group. Survival differences between the two study groups did not reach statistical significance. The survival of abutment teeth depended on tooth vitality and tooth location. No differences were found regarding facing failure, decementation of primary crowns, or post-prosthetic endodontic treatment.**Conclusions:** Vitality and position are important for the survival of teeth supporting partial dentures. Longer follow-ups and larger patient collectives are needed to evaluate possible differences between cast conical and electroplated telescopic double-crown-retained partial dentures. This study was financially supported by Wieland Dental, Pforzheim, Germany.**Surface Characterization Of Nylon Overdenture Attachment Components After Clinical Wear**S. RADJ¹, P. DUBOT², P. CENEDESE², and O. FROMENTIN¹¹Prosthodontics, UFR d'Odontologie Université Paris 7 Denis Diderot, Paris, France, ²Umr 7182 - Cnrs, Institut de Chimie et des Matériaux Paris Est - CNRS, Thiais, France**Objective:** The objective of this in vitro study was to characterize the chemical changes of nylon matrix attachment related to a short period of clinical wear using Fourier Transform Infrared (FTIR) Spectroscopy.**Methods:** 12 slices of Locator nylon matrix (Zest Anchors, Escondido, CA, USA), 2 unused and 10 used for 3 months, were investigated. The measurements were made on two different areas (1x1 mm² in size) of the inner part of the specimens with a FTIR Spectrometer (Thermo Nicolet, Madison, WI, USA) in attenuated total reflexion mode (ATR). The spectral range was between 4000 to 650 cm⁻¹. After background correction, a qualitative method was used to analyze IR spectra to identify absorption band modifications before and after clinical wear, with and without cleaning procedure.**Results:** For FTIR spectra, peak intensities and frequencies of nylon components were determined for 1630 cm⁻¹ (amide I, C=O stretch), 1538cm⁻¹ (amide II, secondary N-H band), 1445cm⁻¹ (side chain carbon bend), 1395cm⁻¹ (C-N stretch) and 1030cm⁻¹ (C-C stretch). Significant differences in intensity among listed peaks were found when they were compared before and after clinical wear. A broadening of the bands located between 1700 and 1500 cm⁻¹ due to local chemical modifications of the amide bonds in the polymeric chain has been observed. A broad absorption band near 1000 cm⁻¹ seemed to be strongly correlated to uncleaned worn components. Hydrolysis degradation of the material with aging and mechanical wear was revealed by a broad peak located between 3500 and 3000 cm⁻¹ (O-H and N-H stretch).**Conclusion:** It is possible to characterize chemical changes of nylon overdenture attachment components using infrared spectroscopy in ATR mode. Short period of clinical wear has revealed a degradation of the nylon surface due to mechanical and thermo hydric wear.**Validating Facial Markers for Dentures Making by Digital Photography Analysis**

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During fabrication of complete dentures, dentists utilize some facial markers in order to place the artificial teeth in an optimal position, aiming to mimic the original position of former teeth. Apparently, some of these markers may have been arbitrarily chosen, but nevertheless were constantly advocated.

Objectives: to validate the relation of these markers (namely the tragus- ala-nasi line, the eye pupils-ala-nasi and lips' corners) to the occlusal plane and the width of the frontal maxillary teeth of dentate adults, by using digital photography analysis software.**Methods:** 60 adult patients (mean age 28.7) were photographed by the same researcher, with occlusal plane attached to upper teeth. Photos were analyzed by Viewbox3 software, to produce angles between true occlusal plane and tragus- ala nasi line (Camper's line), and also distances between different facial markers.**Results:** only 41% of the patients demonstrated near parallelism between Camper line and the occlusal plane. 26% showed more than 6 degrees differences. Maximal width of the nose was found as good "predictor" for the width of the frontal 6 maxillary teeth, with statistically significant differences of nose:teeth width ratios by gender.**Conclusions:** findings suggest that traditional facial markers which are taught and used in the process of rehabilitation of edentulous ridges may need few adjustments in order to better mimic natural dentate facial relation.**Knowledge and Attitude of Complete Denture Wearers Towards Denture Adhesives**C. BURAL¹, D. BIRLER YAGLI², I. TURP³, and G. BAYRAKTAR⁴¹Dept of Removable Prosthodontics, Istanbul University, Faculty of Dentistry, Istanbul, Turkey, ²Istanbul University, Faculty of Dentistry, Istanbul, Turkey, ³University of Istanbul, Istanbul, Turkey, ⁴Dept. of Removable Prosthodontics, University of Istanbul, Istanbul, Turkey**Objective:** Denture adhesives are used worldwide, but these materials are not believed to be used commonly in Turkey. The aim of this study was to evaluate the knowledge and attitude of complete denture (CD) wearers towards denture adhesives.**Methods:** A sample of 410 CD wearer subjects (228 women, 182 men- aged 43-92 years) attended to Prosthodontics Clinics of Istanbul University, Faculty of Dentistry, was studied. Subjects were interviewed using a questionnaire including information about age, gender, occupation, income level and questions to reveal the knowledge and attitude of CD wearers towards denture adhesives.**Results:** Questionnaire results showed that 65.12% of all the subjects knew the existence of denture adhesives. 19.16% of the subjects who reported to have poor retention of their CD (29.26%) had previously tried denture adhesives to improve retention. The rate of the subjects who believed that denture adhesives worked well to improve retention was 67.30% but the rate of the subjects who gave up using denture adhesives was 75%. The majority of the subjects (76.92%) responded that application of denture adhesives once a day was enough. 34.60% of the patients who used denture adhesives responded that the cost of denture adhesives were high. 50% of the patients responded that removal of denture adhesive from denture base was easy.**Conclusion:** The results of this study revealed that the majority of the CD wearers were not prescribed of a denture adhesive. Dentists and prosthodontists may recommend the use of denture adhesives to benefit from its advantageous properties, especially at the adaptation period of the patients to the newly fabricated CD.

In-vitro fluoride release and enamel fluoridation of fluoride varnishes

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Objectives: An experimental varnish formulation (EXP) with reduced fluoride concentration was compared with commercially available fluoride varnishes with respect to fluoride release and enamel fluoridation capacity.

Methods: In-vitro fluoride release (FR) was determined using varnish coated petri dishes (n=2) filled with artificial saliva. Samples were taken up to one day and analyzed for total released fluoride. For in-vitro fluoridation measurement cylindrical bovine enamel specimens (n=18) were polished (SiC, 4000Grit), demineralized (lactic acid, pH4.4,1h), covered with the products according to manufacturers instructions and dried (25°C, 1h). Then specimens were stored in artificial saliva (37°C, 24h) which was replaced after 1h. Subsequently, varnishes were removed with ethanol or acetone. Superficial alkali-soluble fluoride (ASF: 24h in 1M KOH) and structurally bound fluoride (SBF: 1h etching with 0.5M HClO4) were extracted and measured with an ion-selective electrode. Statistical analysis was made with an unpaired t-test, p<0.05.

Results: The products show distinctively different FR kinetics. After varnish application ASF and SBF on enamel is significantly increased with all products tested compared to water:

Product	Manufacturer	Product fluoride conc. [ppm]	Total FR 1hr. [µg/g*cm²]	Total FR 24hrs. [µg/g*cm²]	ASF [µg/cm²]	SBF [µg/cm²]
Duraphat	Colgate	22'600	23.4±4.3	79.7±11.9	19.3±7.6 ^a	21.0±6.9 ^a
Clinpro White Varnish	3M-ESPE	22'600	3.5±1.3	209.9±127.1	9.3±2.4 ^b	11.5±1.8 ^b
Profluorid Varnish	VOCO	22'600	26.8±3.3	182.9±13.5	11.6±2.9 ^c	11.9±2.7 ^b
EXP	Ivoclar-Vivadent	7'700	651.3±24.1	910.3±18.5	20.4±6.2 ^a	17.9±3.6 ^c
Control (water)		<1			1.4±0.8 ^d	4.2±2.5 ^d

Values with same superscript letter in one column were not significantly different.

Conclusion: It has been shown that good enamel fluoridation can be achieved with a lower concentrated varnish having 7'700ppm fluoride. The data suggest that this is due to the very effective fluoride release both initially and over a period of 24 hours.

Fluoride ion release and uptake of new dental adhesives

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Objectives: The aim of this study was to investigate the fluoride releasing and recharging ability of fluoride-containing dental adhesives.

Methods: Three fluoride-containing adhesive systems used in this study; Stae (SDI), FL Bond II (Shofu) and Prime and Bond NT (Dentsply). A non-fluoride containing adhesive Scotchbond 1 XT (3M ESPE) was used as a control. Eight disks specimens of each material were prepared and immersed individually in 4ml deionized water in plastic vials. Fluoride release was assessed over an 86-day period for all materials using fluoride ion-selective electrode. On day 86 specimens were soaked for 5 minutes in solution of 0.02%NaF, and daily fluoride release was determined for 5 days. This repeated three times. The same procedure was repeated for solutions of 0.04% and 0.2%NaF. Results were statistically analyzed by one-way ANOVA and Bonferroni post hoc test.

Results: All of the fluoride containing adhesives released measurable amount of fluoride throughout the test period. The concentration of fluoride released on the second day felt sharply for all materials. In terms of total fluoride released over the 86 day period Prime & Bond NT (37,55µg/cm²) > Stae (19,77µg/cm²) > FL Bond II (18,19µg/cm²) > Scotchbond 1 XT (0,18µg/cm²). Significantly more fluoride was released for all three adhesives for all three refluoridation periods, and for all different concentrations on first day after refluoridation compared to the fifth day after refluoridation (p<0.05).

Conclusions: All fluoride containing adhesives showed ability to release and uptake fluoride in different quantities. Initial fluoride release cannot be completely restored by exposure of the adhesive to the fluoridated solutions.

Evaluation of tooth fluoride uptake from glass-ionomer cements

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Objectives: Fluoride is released from glass-ionomer(GI) restoratives and penetrates into the tooth structure. The purpose of this study is to evaluate the fluoride uptake from commercially available resin-modified and conventional glass-ionomer restorative, Fuji IX™GP FAST Capsule(9FAST, GC), Fuji II™LC Capsule(2LC, GC) and KetacNano™Quick Mix Capsule(KNQ, 3M-ESPE).

Methods: Bovine anterior teeth were sectioned to 2mm thick at center of coronal portion. Center of specimens was ground 1.4mm wide from labial side until dentin was exposed using a diamond bur(M14H, GC) as a filling area. Cavity Conditioner(GC) was applied to the filling area for 10sec, rinsed and air dried. 9FAST and 2LC were placed into these preparations. 2LC was light-cured with G-Light(GC) for 20sec, and 9FAST was self-cured for 1hour at 37°C-100%RH. KetacNano™Primer(3M-ESPE) was applied to the filling area and light-cured for 10sec. KNQ was placed into the preparation, and light-cured for 20sec per manufacturer's direction. All specimens were stored in 20mM HEPES buffer(pH7.0) at 37°C for 2weeks. The surface for scanning area(GI/dentin junction) at each specimens was polished with 4000-grit silicon carbide paper and polished with diamond paste(DP-PasteP, Struers, particle size:0.25µm) after storage. Elemental distribution was scanned with a line from GI/dentin junction to dentin by wavelength dispersive spectrometry(WDS, OXFORD instruments:INCA-WAVE, n=3).

Results: In the following table, different alphabets in the same column indicated significant difference(p<0.01, one-way ANOVA). For 9FAST and 2LC, fluoride penetrated into dentin, but fluoride from KNQ with light-cured primer was not observed in dentin.

Conclusion: This result indicates that fluoride release into adjacent prepared tooth structure may be inhibited by the light-cured primer of KNQ restorative system.

Product	Manufacturer	Fluoride distribution(Count)					
		0µm (Depth into dentin from GI)	5µm	10µm	15µm	20µm	40µm
9FAST	GC	4(1)	17(2)	54(5) ^a	57(10) ^a	17(6)	5(3)
2LC	GC	5(1)	32(6) ^a	6(1) ^b	3(0) ^b	4(1)	3(1)
KNQ	3M-ESPE	4(1)	3(1) ^b	4(2) ^b	4(3) ^b	5(3)	3(1)

0421 (151236)

Staged guided bone regeneration and osseointegration

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Objectives: To assess the influence of two barrier membranes and two bone graft substitutes mixed with autogenous bone (AB) on staged guided bone regeneration and osseointegration of titanium implants in dogs.

Materials and methods: Four saddle-type defects each were prepared in the upper jaw of six fox hounds and randomly filled with a natural bone mineral (NBM)+AB and a biphasic calcium phosphate (SBC)+AB and allocated to either an in situ gelling polyethylene glycol- (PEG), or a collagen membrane (CM). At 8 weeks, modSLA titanium implants were inserted and left to heal in a submerged position. At 8+2 weeks, dissected blocks were processed for histomorphometrical analysis [e.g., treated area (TA), bone-to-implant contact (BIC)].

Results: Mean TA values (mm²) and BIC values (%) tended to be higher in the PEG groups [TA: NBM+AB (10.4±2.5); SBC+AB (10.4±5.8)/ BIC: NBM+AB (86.4±20.1); SBC+AB (80.1±21.5)] when compared with the corresponding CM groups [TA: NBM+AB (9.7±4.8); SBC+AB (7.8±4.3)/ BIC: NBM+AB (71.3±20.8); SBC+AB (72.4±20.3)]. A significant difference was observed for mean TA values in the SBC+AB groups.

Conclusion: It was concluded that all augmentation procedures investigated supported bone regeneration and staged osseointegration of modSLA titanium implants. However, the application of PEG may be associated with increased TA values.

0422 (151527)

Nasal reconstruction using extraoral implants

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Objectives: Major maxillofacial defects, generated by tumours are mainly causing several functional and social problems. Patients, who underwent several operations are suffering from psychological and social handicap. In order to restore function and quality of life, epithesis reconstructions have proven to be a good solution. Retention of these prostheses with extraoral implants is a developing option, however it is difficult for the operator to choose among the possible options and brands.

Methods: Two patients, treated from September 2007 to November 2009, were selected, to receive extraoral titanium implants. The two study patients had initially two different diagnosis: carcinoma basocellulare and squamous cell carcinoma. One of the patients has received implants from an implant system, that has long-term follow-up, the implants, placed in the other patient, were invented and manufactured by a different company with no extraoral experience. In both patients implants were placed in the distal stub of the nasal bone, and in the ridge of the notch in the mesial border of the maxilla, right and left side. The final epithesis was delivered using an Y-shaped bar retention.

Results: After an unloaded osseointegration phase of three month, all implants appeared to be osseointegrated according to the radiologic criteria and clinical examination. Patients demonstrated a high degree of satisfaction after receiving the final restoration. Operators reported both systems to be adequate in the surgical part. Both, the technician and the operator evaluated the prosthetic part of the developed system to be appropriate and the new system to be more difficult to work with.

Conclusions: Extraoral implants have proven to be a good alternate solution where reconstructive surgery cannot be performed. Advanced systems are more easy to work with, but even a newly developed system can give a perfect final functional and aesthetic result.

0423 (151528)

Laser Ablated Titanium Implants Tested by MG63 Osteoblast Cell Culture

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Objectives: The demand is increasing to speed up the otherwise long osseointegration period (3-6 months) to rehabilitate the damaged chewing apparatus of the patients as soon as possible. For dental implants, likewise to biomaterials, bio- and osseointegration processes can be controlled at molecular and cellular level by modification of implant surface. One of the most promising surface modifications that could enhance osseointegration of dental implants is laser ablation, as proven by our previous results.

Methods: Commercially pure (CP4) sandblasted and acid etched titanium discs (Denti® System Ltd. Hungary) were irradiated with a KrF excimer laser (248 nm, 0.4J/cm² fluence, FWHM=18 ns, 2000 pulses), or with green laser (532 nm, 40 mJ, FWHM=10 ns, 1.3J/cm² fluence, 200 pulses). The discs were examined by SEM, AFM and XPS. In vitro cell culture testing was performed with MG63 osteoblast-like cells. Attachment (24h) and proliferation (72h observation) of these cells were investigated via dimethylthiazol-diphenyl tetrazolium bromide (MTT) and Alamar Blue (AB) assays.

Results: SEM and AFM revealed significant morphological and roughness changes for the treated samples. XPS confirmed the presence of TiO₂ on each sample, but on the samples treated with green laser a more reduced state of Ti was also observed. MTT measurements proved that the amount of cells was increased three times after 72h compared to 24h observation, while AB measurements showed that the number of cells was doubled. Cell attachment and proliferation was significantly enhanced on the laser treated samples with respect to the control samples, revealed by MTT experiments.

Conclusions: Laser treatment and especially the excimer laser ablation led to a significant increase in the attachment and proliferation of MG63 osteoblast-like cells. This method may effectively accelerate osseointegration of titanium implants. Acknowledgments: Supported by the ETT project (434/2006) of the Hungarian Ministry of Health and OTKA (K67818).

0424 (151935)

Primary stability of dental implants

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Objectives: The aim of this pilot study was to measure primary stability of different types of dental implants. Primary stability is one of the most important factors to determine early loading possibilities and is very difficult to have objective measurements in the evaluation. The goal was to evaluate different methods for the measurement and compare with the recent publications.

Methods: 31 implants (parallel walled n=4, tapered n=27) in 12 patients (5 female, 7 male) were examined after transgingival surgery with Periostest device in both of the jaws (immediate and delayed implantation). A questionnaire on major influencing factors was filled in by the patients and submitted. Student t test and Pearson correlation was taken to get the statistic result. Implant diameter and length was investigated as covariate factors. P values (2-sided) ≤5 were considered statistically significant.

Results: Group ≥61 years had a -4.19 PTV (Periostest Value) of primary stability compared to group ≤60 years with -0.07 PTV. Delayed implantation provided better primary stability. There was no significant difference detected in primary stability between the genders, but the length.

Conclusion: All the factors have an influence on each other, and should be considered together. The method tested, is a good tool to evaluate primary stability but is difficult to carry out because of the presence of the gingiva during transgingival insertion. For more detailed and statistically reliable results a bigger sample group is to be examined in the near future.

0425 (151968)

Complications after Implant Therapy in Patients with Oral Lichen Planus

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Objectives: The aim of this prospective controlled study was to evaluate the number of visits to the office due to patient's complaints, patient's perception about improvement after treatment and overall satisfaction in patients diagnosed with oral lichen planus (OLP), compared with a control group with no mucosal lesions, after implant therapy.

Methods: Two groups, including 20 patients diagnosed with OLP and 20 controls, received 61 and 66 implants during the years 2003–2009. Clinical exam along the follow-up (mean, 68.5 and 66.8 months, respectively), a VAS scale to measure the patients confidence and satisfaction with the procedure at final examination, a personal questionnaire and the Oral Health Impact Profile Short form (OHIP-14) to measure the quality of life, were used to evaluate the patients.

Results: Patients in the OLP group (OLPG) attended much more frequently to the office after the implant and restorative procedure than those in the control group (CG) ($p<0.0001$). Peri-implant mucosal pain, peri-implant bleeding, and erosive/ ulcerative lesions around the fixtures were the conditions more frequently observed. Peri-implant lesions similar to those appearing in cases of desquamative gingivitis were observed in patients with lichen planus. Both groups of patients showed a high level of acceptance of the implant treatment. Both groups of participants had statistically significant improvements in life quality at the final examination when intra-group analysis was performed.

Conclusions: Despite the limitations of the small sample size, it seems that patients with OLP display more soft tissue complications and subjective complaints after the implant procedure. These patients significantly increase their oral related quality of life after the procedure showing a high level of acceptance of this treatment. Source of funding: Nobel Biocare S.A. provided partial support for this study through a contract signed with the Complutense University.

0426 (151972)

Influence of Internal-Fit, Taper and Surface-Conditioning on Tensile-Resistances of ZrO₂-Implant-Crowns

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Objectives: Evaluation of influence of internal-fit, taper and surface-conditioning to tensile resistance to dislodgement (TRD) of ZrO₂-crowns on ZrO₂-implant-abutments cemented with Telio CS Cem Implant and five different temporary, removable and definitive cements.

Methods: Two sets of ZrO₂-Crowns and ZrO₂-implant-abutments were constructed via CAD/CAM and milled analogue Straumann Anatomic IPS e.max Abutment (taper 6°, abutment-height 4mm) with internal-fit 100µm (Set1) or 200µm (Set2). A third set was constructed with 40° taper, 4mm abutment-height and 100µm internal-fit (Set3).

Before cementation, surfaces of Set1 were either left untreated as milled or sandblasted (100µm Al₂O₃, 1bar), Set2 and Set3 were likewise sandblasted (each N=10). Crowns were cemented (load 20N) using following cements in self-curing-mode: Telio CS Cem Implant (TCI), Systemp.link (SL), Ivoclar Vivadent; TempBond NE (TB), Kerr; Premier Implant (PI), Premier; Improv (IMP), Alvelogro; Implantlink semi (IS), Detax. After setting, samples were stored (>14h@37°C,<10%RH).

TRDs were determined with universal-testing-machine (Zwick-Roell, 1mm/min cross-head-speed).

Data was analyzed using two-way-ANOVA (Tukey's, $p<0.05$).

Results:

	TCI	SL	TB	IS	PI	IMP
Set1, untreated	33±13 ^{aA}	23±10 ^{aA}	148±64 ^{bB}	44±18 ^{aA}	47±38 ^{aA}	107±50 ^{aA}
Set1, sandblasted	74±13 ^{aAB}	24±7 ^{aA}	190±60 ^{cC}	138±46 ^{bB}	157±42 ^{bCC}	250±55 ^{dB}
Set2	86±32 ^{abB}	43±13 ^{aB}	105±34 ^{bB}	138±42 ^{bB}	110±22 ^{bB}	328±77 ^{cB}
Set3	57±40 ^{aAB}	37±22 ^{aAB}	34±10 ^{aA}	46±32 ^{aA}	75±27 ^{abAB}	136±115 ^{aBA}

Small letters in rows and capital letters in columns indicate equal statistical groups.

Conclusions: Cements exhibited the strongest influence on TRD-values ($p<0.001$, $\eta^2=0.351$) followed by taper ($p<0.001$, $\eta^2=0.281$) and surface-conditioning ($p<0.001$, $\eta^2=0.246$). Surprisingly, the size of internal-fit had no significant influence on TRD-values ($p=0.605$, $\eta^2=0.001$).

In detail, sandblasting didn't increase TRD-values of temporary-cements (SL, TB), but for all others. Flat taper lead to unchanged (SL, TCI) or lower TRD-values (all others). Bigger internal-fit lowered TRD-values for TB and PI, but not for all others.

Compared to earlier investigations with metal-crowns, TB lead to high TRD-values, potentially due to adhesive interactions with zirconia. TRD-values were also high for IMP and partially for PI and IS. The use of those four cements may negatively affect supra-construction-removal of ZrO₂-crowns.

In contrast, TCI offers TRD-values providing both, good retention and the option of non-destructive removal of ZrO₂-crowns, regardless of surface-treatment, taper or internal-fit.

0427 (151992)

Accuracy of two implant impression techniques: direct-splinted and direct-elastomeric

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Objectives: The purpose of this in vitro is to compare the accuracy of two impression techniques: a direct technique with impression coping splinted with a metal splint and gypsum and another with elastomeric impression material and open tray.

Materials and Methods: A stainless steel master model with six implant replicas in arch was used to make 5 impressions with a steel splint which fixed six implant replicas with impression plaster. An open tray and polyethers were used to make the other 5 direct pick-up impressions. Implant analogs were setting and impressions poured. A measuring scanner (0.001mm accuracy) was used to measure tri-dimensional (MOD XYZ) cast inter-implant distances and vertical (Z) discrepancies.

Results: Repeated measurements indicated significant differences ($p>.05$) for the distance XY with steel splinted and gypsum compared to master model. Direct open tray and polyethers didn't indicate significant differences ($p>.05$) compared to master model. Similar results were found for the vertical discrepancy Z.

Conclusion: Splinted impressions with a metal splint and gypsum showed significant discrepancies for horizontal XY and vertical Z distances compared to a steel master model with 6 implant replicas. These significant discrepancies were not found in open tray direct impressions with polyethers.

Marginal Bone Loss Around Implants Supporting Cantilever Fixed Restorations

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Objectives: The aim of this study was to evaluate the influence of cantilever extensions of implant supported fixed partial restorations on marginal bone loss around dental implants placed in the posterior region.

Methods: A total of 66 ITI dental implants were placed in premolar and molar regions of 53 partially edentulous patients. All implants were restored by means of ceramic-to-metal fused cantilevered fixed partial prostheses. Radiographs were obtained after implant placement and at the 2-years recall after implant placement. Calibrated measurements were conducted initiating from the cantilever side and the opposing side bone peaks to the implant-bone junction on each radiograph. The mean values were analysed using One Way ANOVA. P values <0.01 were regarded as statistically significant.

Results: There was statistically significant difference between the cantilever side bone loss rates of the upper and the lower jaw ($p < 0.01$). There was also statistically significant difference between the opposing side bone loss rates of the upper and the lower jaw ($p < 0.01$).

Conclusion: In cantilever design, bone loss rates of the upper jaw were statistically higher.

Comparison of Modalities to Disinfect Dental Implants

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Objective: Peri-implantitis is an oral infection leading to loss of dental implants. Disinfection of the implant surface is thought to be an important step in the treatment of peri-implantitis. Accordingly, this in vitro study compared four different protocols to disinfect dental implant surfaces.

Methods: Round titanium discs (10 mm x 1 mm) were placed into BHI broth to which had been added 10 ml of whole mixed saliva. The discs were incubated for 24h at 37°C. They were vigorously rinsed to remove non-adherent microorganisms and they were then treated with either; 1) a diode laser (Odyssey, Ivoclar); 2) 1% citric acid for one minute; 3) photofrin (porfimer sodium) for 45 mins followed by exposure to a 630 nm laser (photodynamic therapy); or, 4) ultraviolet light for 10 min. The discs were then examined by scanning electron microscopy to assess the titanium surface area covered by microorganisms. All treatments were performed in triplicate. Following treatment, one disc from each group was placed in BHI broth for 24h at 37°C and then vortexed to disperse any adherent bacteria. Then 0.1 ml aliquots were anaerobically cultured on blood agar media for 48-72 hours at 37°C and the number of colonies was enumerated. Positive controls included untreated contaminated discs and negative controls included untreated sterile discs.

Results: Compared to the positive controls or to contaminated discs treated with 1% citric acid, photodynamic therapy or ultraviolet light, scanning electron microscopy showed that the diode laser-treated titanium discs had a much lower proportion of surface area colonized by microorganisms.

Conclusions: Diode laser treatment was effective in vitro in reducing bacterial colonization of titanium surfaces. Diode laser treatment may be efficacious in vivo in disinfecting dental implants in the treatment of peri-implantitis.

Shear-Bond Strength of Adhesive Resin Cements to Enamel and Dentin

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Objectives: The purpose of this in-vitro investigation was to compare shear bond strength (SBS) of different adhesive resin cements and their dedicated adhesives to bovine enamel and dentin.

Methods: Materials tested were Multilink® Automix/Multilink® Primer A/B (Ivoclar-Vivadent), Panavia™ F2.0/ED Primer II (Kuraray), NX3/OptiBond Solo™ plus (Kerr), Clearfil™ Esthetic Cement/DC Bond (Kuraray), Experimental Cement/Experimental Adhesive (3M ESPE).

Bovine teeth were ground flat to expose enamel or dentin, polished (grit 320 sandpaper), water-rinsed and gently air-dried. Dedicated adhesive systems were applied according to the manufacturers' instructions. Stainless steel rods were cemented under pressure (20 g/mm²) onto the teeth and light cured. Specimens were stored for 24h at 36°C and 100% relative humidity. Half of the specimens were artificially aged (5.000 thermo cycles, 5°C-55°C, 30sec dwell time). SBS was measured using a universal testing machine (Zwick Z10, crosshead speed: 0.75 mm/min). Data obtained were analyzed using Multiple Range Test (Fisher's LSD; $p < 0.05$; $n = 6$).

Results: Statistical analysis revealed significant differences between the tested adhesive resin cements depending on tooth surface and storage/aging conditions (see table).

Values in one column with different superscript characters are statistically different.

	SBS Dentin Ic 24h[MPa]	SBS Dentin Ic TC[MPa]	SBS Enamel Ic 24h[MPa]	SBS Enamel Ic TC[MPa]
Multilink Automix/Primer A&B	13.9±2.7 ^b	7.6±4.6 ^a	29.1±5.5 ^b	25.4±9.7 ^a
Panavia F2.0/ED Primer II	26.8±7.5 ^c	26.5±2.7 ^b	40.2±10.1 ^c	39.6±10.6 ^b
NX3/OptiBond Solo plus	8.2±1.9 ^{ab}	9.3±2.5 ^a	15.5±4.8 ^a	17.8±5.4 ^a
Clearfil Esthetic Cement/DC Bond	6.5±3.8 ^a	9.7±4.4 ^a	44.3±8.0 ^{cd}	50.8±9.4 ^c
Exp.Cement/Exp.Adhesive	27.5±9.7 ^c	54.2±8.3 ^c	51.2±8.8 ^{de}	54.5±7.0 ^c
Exp.Cement/Exp.Adhesive/Etch	52.4±3.9 ^d	65.3±10.2 ^d	54.8±7.9 ^e	67.3±8.4 ^d

Conclusion: The experimental resin cement and its dedicated adhesive system show best overall adhesion performance to enamel and dentin under all testing conditions.

Comparison of Physical Properties of Different Selfadhesive and Composite Cements

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Cements are mostly compared in the light curing mode 24 hours after cure in accordance with ISO-4049:2009. The initial physical properties directly after cure and the properties in the self curing mode are seldomly considered, even though they are of clinical importance. Especially in situations where light curing is difficult or impossible to achieve.

Objective: Compare the physical properties of Multilink-Automix (MLA), Nexus3 (NX3), SpeedCem (SEC) and RelyX-Unicem Automix2 (RXU) 1 and 24 hours after curing in the self-curing mode. Determine the discoloration with Safranin-T and coffee during the first 24 hours.

Methods: Flexural strength and modulus of elasticity, water absorption and water solubility were measured according to ISO-4049:2009. Additionally the 1 hour strength values in the self-curing mode were examined.

Discoloration tests were conducted in aqueous 0.01% Safranin-T and 3% coffee solutions in self- and light-curing mode starting 1 hour after sample preparation and evaluated up to 24 hours in 37°C. ANOVA and Tukey were used to determine differences (p<0.05).

Results: In the self-curing mode (SC) the physical properties after 1 hour reach only a fraction of the 24 hour values. Especially the mechanical properties of RXU are very low 1 hour after mixing.

Cements	1h-SC-Flexural-strength-(MPa)	1h-SC-Modulus-of-elasticity-(MPa)	24h-SC-Flexural-strength-(MPa)	24h-SC-Modulus-of-elasticity-(MPa)	Water-absorption-(µg/mm³)	Water-solubility-(µg/mm³)
MLA	61.7±7.4 ^a	2091±238 ^a	85.2±5.0 ^a	3600±240 ^a	34.3 ^a	3.2 ^a
NX3	45.9±4.5 ^b	939±66 ^b	93.8±7.9 ^a	3692±224 ^a	36.9 ^a	5.0 ^a
SEC	42.4±5.9 ^b	2061±346 ^a	73.8±12.6 ^a	4186±646 ^a	29.7 ^a	5.2 ^a
RXU	6.4±1.7 ^c	<200 ^c	47.3±2.6 ^b	2615±181 ^b	61.1 ^b	9.4 ^b

The order of discoloration after 24 hours with Safranin-T of materials cured in the self-curing mode is “MLA<SEC=NX3<<RXU” and with coffee “MLA<SEC<NX3<<RXU”, in the light-curing mode with Safranin-T “MLA<SEC=NX3<<RXU” and with coffee “MLA=SEC<RXU<NX3”.

Conclusion: The differences in particular within the initial values are significant. A correlation could be determined between lower physical characteristics and a stronger tendency for discoloration during the first 24 hours and increased water sorption or water solubility.

0432 (152110)

Effects of Dycal on Shear Bond Strength of Resin Cements

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It has been proposed that calcium hydroxide weaken dentin. Calcium hydroxide is the main composition of Dycal which has been using for temporary cementation.

Objective: The purpose of this study was to investigate the effect of Dycal used as temporary cementation the shear bond strength of three different resin cements.

Methods: The occlusal dentin surfaces of ninety extracted human third molar teeth were exposed by cutting with an Isomet saw and then randomly divided of into 3 groups (n=30). The first and second group were covered with Dycal for 7 and 28 days and the third group was left uncovered and served as the control group. Each group was divided into 3 subgroups for each resin cement. After reaching the cover time Dycal was removed and dentin was cleaned with pumice-water slurry. Each of resin cement systems (self-adhsive;RelyX Unicem, self-etch;PanaviaF2, total etch;Superbond C&B) was applied according to manufacturer’s instructions followed by placement of resin composite rod . All bonded specimen were stored in distilled water at 37°C for 24 hours. The specimens were then subjected to the shear bond strength test by universal testing machine. The fracture surfaces were examined under stereomicroscope at 40 magnifications.

Results: The data were statistically analyzed by 2 way ANOVA. For RelyX Unicem and PanaviaF 2 resin cements, there were significant differences between the control group and the Dycal covering on dentin group, the mean shear bond strength of Dycal covering on dentin at 28 days was lower than 7 days whereas 7 days was lower than control group. It was found that no significant differences in Superbond C&B group. The mode of failure was mostly adhesive in nature.

Conclusion: Dycal reduced bond strength of dentin to self-adhesive and self-etch resin cement but does not affect bond strength of dentine to total-etch resin cement.

0433 (152111)

Effect of Cigarette Smoke on Color Stability of Resin Cements

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Objectives: The purpose of this in vitro study was to evaluate the color stability of five resin cements when subjected to cigarette smoke and after ultrasonic cleaning.

Methods: The color stability of a chemical-cured resin cement (Superbond C&B), two light-cured resin cements (Nexus 3, Variolink Veneer) and two dual-cured resin cements (Clearfil SA Luting, Multilink Speed) was studied. Specimen disks (n=10) was prepared with an acrylic block and subjected to continuous smoke of twelve cigarettes (Krong Thip,Thailand tobacco monopoly, Bangkok, Thailand) at the rate of 1 cigarette/6 min. The disks were measured the color(CIELAB system) in terms of L*(brightness), a*(red/green scale), and b*(yellow/blue scale) by using Sprecrophotometer (Hunter Lab, Ultrascan XE). Color was measured before smoke exposure (baseline), after smoke exposure, and after ultrasonic cleaning. Color changes (ΔE) were calculated between baseline color measurements and measurements made after smoke exposure (ΔE12), and between baseline color measurements and measurements after ultrasonic cleaning(ΔE13). Data were analyzed by pair t-test and one-way ANOVA/Tukey’s test at the 0.05 significance level.

Results: ΔE12 of the resin cements were 1.65, 4.59, 5.03, 6.38 and 7.62 for Clearfil SA Luting, Superbond, Multilink Speed, Nexus 3 and Variolink Veneer, respectively. ΔE13 were 0.85, 2.34, 2.74, 2.86 and 3.70 for Clearfil SA Luting, Multilink Speed, Superbond, Variolink Veneer and Nexus 3, respectively. The statistics revealed that color changes from ΔE12 and ΔE13 of all resin cements were significant decreased after ultrasonic cleaning.

Conclusion: Within the limitations of this in vitro study, 4 of 5 resin cements had perceptible changes (ΔE ≥ 3.3) after exposure to cigarette smoke. But after ultrasonic cleaning, all resin cements tested had acceptable changes except Nexus 3.

0434 (152112)

Dentin Moisture Effect on Microleakage of Self Adhesive Resin Cements

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Objective: The purpose of this study was to investigate the microleakage of Class II composite restorations luted with 3 different self adhesive resin cements on moist and dry dentin.

Methods: Sixty caries-free extracted human third molars were mounted in plastic ring using dental stone. Class II OM, OD cavities were prepared on both proximal sides of each tooth. The teeth were randomly divided into 6 groups (n=10) according to the type of resin cements and dentin surface condition was moist or dry. Self adhesive resin cements [(RelyX U100 (3M,ESPE), Clearfil SA Cement (Kuraray), MaxCem Elite (Kerr)] were used to lute an indirect composite restoration [Terric-N Ceram (Ivoclar Vivadent)] on moist and dry dentin cavities. A thin layer of resin cement was applied on all cavity walls and seated the restoration then light-polymerized (Elipar,3M) for 40 seconds on each side. Specimens were stored in water at 37°C for 24 hours. All tooth surfaces were sealed with two layer of nail-varnish to within 1 mm from the restoration margins and they were immersed in 0.5% basic fuchsin solution for 24 hours at 37°C. The restored teeth were then sectioned mesiodistally and dye penetration was assessed according to a five-point scale. The data were collected and statistically analyzed by Kruskal-Wallis non-parametric test and Mann-Whitney U test.

Results: Microleakage of moist dentin was lesser than that of dry dentin ($P<.05$) for all groups. RelyX U100 showed significantly lower microleakage results than Clearfil SA and MaxCem Elite in moist dentin condition. For dry dentin condition, there were no significant differences of microleakage value in three resin cements ($P>.05$).

Conclusions: The microleakage of moist dentin was significantly less than that of dry dentin. Rely X showed lower microleakage values than Clearfil SA Cement and Maxcem Elite in moist dentin condition.

0435 (152113)

Storage Temperature Effect on Tensile Bond Strength of Resin Cements

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Objective: To evaluate the effect of storage temperature on the tensile bond strength of four adhesive resin cements to human dentin.

Methods: The occlusal dentin surfaces of eighty extracted human third molars were exposed by cutting with the Isomet saw and then randomly divided into two groups. For first group was luted with the composite rod (8x5 mm²) by each of resin cements [RelyX U100, Clearfil luting, Maxcem Elite and Biscem] that stored in one month at 4°C and 40°C. Luting process used the loading and alignment apparatus. The other group was luted the composite rod by each of resin cements that stored in three months at 4°C and 40°C. The bonded specimens were immersed in distilled water at 37°C for 24 hrs and then prepared into mini-dumbbell shaped with 2x3 mm² bonded area according to ISO/TS 11405. The specimens were measured the tensile bond strength (TBS) by universal testing machine at a crosshead speed of 0.5 mm/min. Mode of failure was classified after fracture of the bonded specimens by stereomicroscope (40x magnification). TBS data (n=10 per group) were statistically analyzed using t-test. ($\alpha = .05$)

Results: The mean of TBS (MP) values at difference of storage times and temperatures is shown in the table.

Cements	1 month		3 months	
	4 °C	40°C	4 °C	40°C
RelyX U100	4.9±2.2	4.5±2.4	17.4±8.7	16.3±7.6
Clearfil luting	7.0±4.1	11.5±8.7	19.5±9.1	13.3±4.5
Maxcem Elite	7.3±2.6	6.0±1.5	4.3±0.8	5.8±2.2
Biscem	3.1±4.1	4.7±1.5	5.2±1.9	3.0±2.4

It was found that no significant difference between 4°C and 40°C temperature for each resin cement. The most of failure mode showed the adhesive failure in nature.

Conclusion: Our findings suggested that the incubation with 40°C temperature for 3 months was not affected to tensile bond strength of four resin cements.

0436 (152165)

Color Appearance of Resin Luting Composites and Try-in Pastes

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Objectives: Resin-based composite cements are the materials of choice for the adhesive luting of all-ceramic crowns and laminate porcelain veneers (LPV). Usually, water soluble, glycerin-based try-in pastes are used prior to final cementation to allow the shade of the restoration to be simulated. These pastes should feature the same optical properties as the subsequently used luting composite. The purpose of this study was to evaluate the color appearance of try-in pastes and composite cements.

Methods: The materials tested where: Vitique (DMG), Variolink Veneer (Ivoclar/Vivadent) and NX 3 Nexus (Kerr). Specimens of each shade of the three cements were tested as try-in paste, unpolymerized and polymerized cement. The color parameters (L, a and b) were determined with a calibrated spectrophotometer (Shimadzu UV-2401PC Series, UV-VIS). The DeltaE2000 color difference formula was used for the evaluation of color differences. Measurements were performed in triplicates. Color difference data were analyzed statistically ($p=0.05$).

Results: The measurements showed that there were significant color differences between the try-in paste and the polymerized luting composites ($\Delta E>3.3$) in Variolink Veneer and Vitique specimens. In NX3 Nexus cement the color difference between try-in and polymerized specimens was not clinically detectable ($\Delta E<3.3$). Unpolymerized and polymerized specimens of Vitique cement showed no statistically significant difference ($p>0.05$) and $\Delta E<3.3$.

Conclusion: The esthetic demand of the patients and the expectations of the dentist providing treatments with laminate porcelain veneers or all-ceramic restorations are very high and should not be compromised. The present study suggests that try-in pastes may not always match perfectly the color shade of the cement used for the final luting of all ceramic and LPV restorations.

0437 (152192)

Efficiency of Bonding Agent on Dentin for Self-Adhesive Resin Cements

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Objectives: This study evaluated the effect of additional bonding agent application prior to the application of three self-adhesive resin cements on dentin surface.

Methods: Occlusal surfaces of 105 human third molars were flattened and wet ground with 600 grit SiC paper to expose deep dentin surface. The teeth were embedded in acrylic resin. The molar specimens were divided into 7 groups (n=15 per group). For group 1 Maxcem (Kerr, USA) resin cement was applied onto dentin surfaces. For group 2 bonding (Clearfil DC, Kuraray, USA) was applied and light cured, followed by application of Maxcem resin cement. For group 3 RelyX Unicem (3M ESPE, USA) resin cement was applied onto dentin surfaces. For group 4 bonding was applied and light cured, followed by application of RelyX Unicem resin cement. For group 5 Clearfil SA (Kuraray, USA) resin cement was applied onto dentin surfaces. For group 6 bonding was applied and light cured, followed by application of Clearfil SA resin cement. For group 7 Panavia F 2.0 (Kuraray, USA) was applied onto total-etched dentin surfaces after application of bonding (Panavia F 2.0 ED Primer, Kuraray, USA), as a control group. The shear bond strength of the specimens were evaluated using a universal testing machine (Shimadzu AG-IS, Shimadzu, Japan) (0.5 mm/min). The data were submitted to one-way analysis of variance (ANOVA), followed by Tukey's HSD post-hoc test ($\alpha=.05$). Additionally, the hybrid layer and surface pattern was investigated for all groups using scanning electron microscopy (SEM).

Results: Higher mean bond strengths were obtained using bonding to dentin before application of self-adhesive resin cement ($P<.001$). Maxem self-etch resin cement yielded to the lowest mean bond strengths, while control group showed the highest bond strength among all groups ($P<.001$).

Conclusions: Application of bonding agent on dentin increased the bond strength of self adhesive cements.

Bonding of MDP Cements to Dentin Using Total-etching or Self-etching

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Objectives: This study evaluated the shear bond strengths of two different MDP containing adhesive resin cements to dentin using self etch and total etch techniques.

Methods: Occlusal surfaces of 75 human third molars were flattened and wet ground with 600 grit SiC paper to expose flat deep dentin surfaces. The teeth were embedded into acrylic resin. They were randomly divided into 5 groups (n=15). A teflon mold was used in order to place the resin cements onto dentin surfaces. The adhesive systems were applied according to the manufacturers' instructions. For Group 1, Panavia F 2.0 (Kuraray, USA) resin cement was applied following total-etching and bonding (Panavia F 2.0 ED Primer, Kuraray, USA). For Group 2 Panavia F 2.0 resin cement was applied following bonding without acid etching. For Group 3, Clearfil SA (Kuraray, USA) resin cement was applied following total-etching and bonding (Clearfil DC, Kuraray, USA). For Group 4 Clearfil SA resin cement was applied following bonding without acid etching. (Clearfil DC, Kuraray, USA). For Group 5 Clearfil SA resin cement was applied onto dentin surfaces neither with acid etching nor bonding. The shear strength of the specimens were evaluated using a universal testing machine (Shimadzu AG-IS, Shimadzu) (0.5 mm/min). The data were submitted to one-way analysis of variance (ANOVA), followed by Tukey's HSD post-hoc test ($\alpha=.05$). Additionally, the hybrid layer and surface pattern was investigated for all experimental groups using scanning electron microscopy(SEM).

Results: The difference between the bond strength of Panavia F 2.0 and Clearfil SA resin cements were not statistically significant ($P>.05$). However, total-etched groups displayed significantly higher bonding strength compared to self etched groups ($P<.001$).

Conclusions: In order to achieve better bonding strength, total etching of dentin surfaces are recommended when using MDP containing resin cements.

Non-abrasive Cleaning Liquid for Saliva-Contaminated Indirect Restoratives

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Objectives: Try-in of ceramic restorations inevitably causes contamination by adsorbed salivary proteins , severely affecting adhesive cementation. Though silicate-ceramics may be cleaned with 37% H3PO4 gel (PAG), PAG passivates zirconia regarding phosphate-functionalized primer-monomers. Air-abrasion, while decontaminating zirconia, aggravates soft veneering material. To provide a universally applicable decontamination procedure, the non-abrasive cleaning gel Ivoclean (IC) was developed. Here, its performance on ceramics and titanium is compared to conventional methods.

Methods: Tensile-bond-strength (TBS) (N=7/gp) was determined on HF-etched disilicate-ceramic (emax) or air-abraded zirconia (Zir) and titanium (Ti), using Monobond-Plus (MBP) with Multilink-Automix (MLAM). Contamination-decontamination was simulated by saliva-immersion (30s) and treatment (30s) with: water-spray (WS); PAG; cleaning gel IC. IC was applied by microbrush, left undisturbed (20s) and rinsed with water (15s). All samples were sonified in ethanol (60s), MBP/MLAM applied, stored (water, 24h, 37°C), tested (0.8mm/min) and statistically analyzed (ANOVA, Tukey's, $p<0.05$). Pristine controls (C) served as references. Scanning electron microscopy (SEM) was employed following decontamination to verify non-abrasive nature of IC.

Results:

	TSB [MPa]			
	C	WS	PAG	IC
Zir	49.2±11.1(a)	15.8±16.1(b)	7.9±7.8(b)	44.6±15.1(a)
emax	47.8±12.9(a')	21±13.6(b')	40.6±10.7(a')	46.6±12.1(a')
Ti	19.5±8.4(a'')	5.2±2.7	1.8±1.3(b'')	22.6±5.6(a'')

Same letters denominate statistical equivalence (ANOVA, Tukey-B, $p<0.05$)

Conclusion: Adhesive cementation of both ceramics and titanium is seriously affected by saliva contamination despite vigorous water-rinsing (WS). PAG, although effective for emax, obviously passivated Zir and Ti. Treatment with IC fully restored TBS on all surfaces. No evidence of abrasion or other obvious morphological changes following IC were detected by SEM. Presented IC offers the first non-abrasive approach to effective removal of adhering proteins on restorative ceramics and titanium.

Shelf-life of self-adhesive cements after two-storage time periods

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Objective: The aim of the study was to compare the bonding performance of three new self-adhesive resin cements to human dentin after two storage-time periods.

Methods: Occlusal, buccal, lingual, mesial and distal dentin surfaces of 30 human molar teeth were abraded with #600 SiC-papers directly below the enamel. The teeth were divided into two main test groups. In the first test group (FT), the cements were applied immediately after they were received from the companies. The cements were then used again for second test (ST) group after keeping them in room temperature (23±10 C) for 6 months. Each test group comprised 5 teeth and 20 dentin sections The cements Clearfil SA(CSA), G-Cem(GC) and Bis-Cem(BC) were applied to the surfaces in cylindrical-shaped plastic matrices. Shear bond strengths were determined at a crosshead speed of 0.5 mm/minute after application of cements to the flat dentinal surfaces and light curing. Bond strengths were then calculated and expressed in MPa. Data were analyzed with Kruskal Wallis and Wilcoxon Sign Tests. In order to investigate cement/dentin interfaces under Scanning Electron Microscope (SEM), buccal surfaces of 3 teeth were used for each test period.

Results:

Testing Periods	CSA	GC	BC	*p
	Mean ± SD (Median)	Mean ± SD (Median)	Mean ± SD (Median)	
ST	0,49±0,98 (0)	3,80±1,40 (3,8)	1,21±1,79 (0)	0,001**
FT	1,50±0,54 (1,63)	6,33±1,33 (6,02)	5,02±1,78 (5,05)	0,001**
p	0,001	0,001**	0,001**	

*Kruskal Wallis Test **Wilcoxon sign test **p<0.01

The bond strength values of cements were different from each other for testing periods. GC showed the highest values of all materials. The bond strengths of cements dramatically decreased after 6-month storage of the materials in room temperature. SEM pictures confirmed that there was more separation of cements from dentinal surfaces in ST groups.

Conclusions: Storage time affects bonding performance of self-adhesive cements

0441 (151279)

Physical properties of enamel treated with CPP-ACP and fluorides

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Objectives: This study was carried out to determine the effect of NaF, TiF₄ and CPP-ACP (Tooth Mousse, Recaldent®, GC) applications on artificial white spot lesions in vitro. In order to assess remineralization potential of those agents, a fluoride-uptake, CSMH, SEM and EDX measures were performed.

Methods: 75 samples of intact human premolars were expose to pH-cycling during 3 hours in demineralizing solution (pH=4,3) and 21 hours in artificial saliva (pH=7,2) during 8 days to create a white spot lesion. The remaining sound enamel was covered with an acid resistant nail-varnish in color (positive control window). After creation of the artificial lesion one demineralized area of each sample was covered with an nail-varnish in another color (negative control window). Specimens were randomly assigned into 5 experimental groups to obtain 15 samples per group. The groups received the treatments with different agents: 1. NaF solution (1%), 2. TiF₄ solution (1%), 3. NaF solution (1%) + CPP-ACP, 4. TiF₄ (1%) + CPP-ACP and 5. solely CPP-ACP. Fluoride-uptake was measured in first 4 groups. All samples were bisected in order to obtain two halves throughout experimental window and positive and negative control window. Samples were examined with micro-hardness tester by making three indentations on each experimental window. The indentations were 250µm (A), 400 µm (B) and 550 µm (C) of depth. Three selected samples per group were additionally examined with SEM and EDX.

Results: Fluoride uptake was the highest in the 2nd and the lowest in the 3rd group. There were no significant differences neither between 5 groups nor between experimental and control groups according to CSMH. EDX showed significant incorporation of titanium in surface layer of enamel (4,8 %Wt in 2nd and 7,4 %Wt in 4th group) ($p \leq 0,05$).

Conclusions: Presence of CPP-ACP does not influence physical properties of enamel.

0442 (151358)

Prevention of WSL by amine fluoride products in orthodontics

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Objectives: To examine the effect of combined use of amine fluoride-containing toothpaste and dental rinse on white spot lesion (WSL) formation in patients with fixed orthodontic appliances.

Methods: In a randomized, parallel-group, single-blind, 2-year study with 182 orthodontic patients, the test group applied elmex® CRIES PROTECTION® toothpaste 3x daily with an elmex® CRIES PROTECTION toothbrush and used elmex® CRIES PROTECTION® mouthrinse 2x daily. The control group maintained their personal oral hygiene routine. Clinical examination for WSL took place at baseline, after 6, 12, and 18 months, and after debonding at 24 months. WSL formation was assessed by WSL index (Gorelick et al. 1982). Data were analyzed using the non-parametric Mann-Whitney test for quantitative parameters and chi-square test for categorical parameters. Repeated measurements were analyzed by Friedman test for quantitative parameters. Pair ordinal data were analyzed with the McNemar test. A t-test was used to evaluate statistical differences between the groups and baseline. Significance level for all tests was $p < 0.05$.

Results: The WSL number between both groups was comparable at baseline (test: 1.21 ± 0.20 ; control: 1.19 ± 0.22) and after 6 months (test: 1.23 ± 0.22 ; control: 1.23 ± 0.23). After 12 months (test: 1.26 ± 0.25 ; control: 1.29 ± 0.26), 18 months (test: 1.23 ± 0.24 ; control: 1.27 ± 0.27); and 24 months (1.21 ± 0.28 vs. 1.32 ± 0.33), the number of WSL was significantly lower in the test group vs. control.

Conclusion: Two-year use of amine fluoride-containing oral hygiene products significantly reduced the incidence of WSL as compared to standard oral hygiene measures and thus supported the aesthetic outcome of the orthodontic therapy. Patients treated with fixed orthodontic appliances will clearly benefit from regular use of elmex® CRIES PROTECTION products. Supported by GABA International.

0443 (151424)

In vitro Models to Evaluate Fluoride Uptake to Soft Tissue

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Objectives: Whilst the uptake of fluoride to oral hard-tissues is relatively well studied, there is less understanding on how fluoride is taken up and released by the soft-tissues. The objective of this work was to model the interaction of fluoride with oral mucosa and biofilms in vitro in order to understand parameters that affect fluoride activity within the oral cavity.

Methods: Reconstructed 3D oral soft tissue and five-bacterial-species biofilms grown on hydroxyapatite were used as substrates. These were exposed to sodium fluoride solutions for two minutes, washed, then the fluoride desorbed by contact with water for periods of time, with subsequent determination of fluoride concentration by ion-chromatography. The effect of pH was investigated by pre-acidifying the sodium fluoride solutions; pre-treatment of the substrates with calcium ions was also investigated.

Results: A fluoride dose-response was seen for both substrates, with higher fluoride concentration yielding more fluoride uptake to mammalian or bacterial cells; correspondingly larger fluoride release was seen at all time intervals. Fluoride release behaviour was found to decrease bi-exponentially with time. Pre-exposure of the substrates to calcium ions led to dramatically increased fluoride uptake with a linear relationship between calcium concentration and fluoride uptake. Fluoride uptake was increased at acidic pH in the order $pH\ 3 > 4 > 5 = 7$.

Conclusions: These models have demonstrated fluoride uptake and release profiles that mirror salivary fluoride clearance curves measured clinically. Calcium pre-treatment promotes fluoride uptake presumably by allowing the precipitation of calcium fluoride-like materials on the surface of the soft tissue and within the bacterial biofilms. The relatively large area of soft tissues and biofilms within the oral cavity make these substrates important when considering the optimisation of fluoride-containing toothpastes and mouthrinses.

0444 (151494)

Maltitol is Safe for Teeth in Europe and in China

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Objectives: According to the Toothfriendly International Association, the cariogenic potential of a product can be evaluated using a standardized test which consists in measuring the interdental plaque pH in situ in humans during dietary product consumption and for the following 30 minutes. The "safe for teeth" or "toothfriendly" property of SweetPearl®-maltitol has been assessed with this pH-telemetry method in Europe and in China.

Methods: Studies were conducted in two test centres, one in the University of Zurich, Switzerland, and the other one in Peking University School and Hospital of Stomatology, China. Five volunteers in Europe and four in China consumed 15 mL of a 10% solution of maltitol and sucrose (control). The interdental plaque-pH measurement started during product consumption and lasted for the 30 following minutes. The tests were carried out with a miniaturized glass pH-electrode incorporated in mandibular telemetric protheses. Electrodes were covered with a 4 to 7 day-old interdental plaque, owing to the absence of oral hygiene prior to the test.

Results: In both China and Europe, all of the measurements showed that maltitol did not decrease the interdental plaque pH below the critical limit of 5.7. On the contrary, consumption of sucrose induced a drop in plaque pH below this critical limit, giving evidence of an accurate functioning of the pH-telemetric equipment and of plaque metabolism.

Conclusion: Maltitol is safe for teeth according to the standard operation procedures of the Toothfriendly International Association, without any impact of the ethnicity of the tested population. This suggests that a product considered as safe for teeth in Europe can be considered safe for teeth in China as well and vice versa.

0445 (151663)

Influence of Restorative Materials on Demineralization of Irradiated Dentin
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Objectives: The aim of this study was to evaluate the influence of different restoration materials on demineralization on irradiated dentin.

Methods: 55 freshly extracted human third molars without caries were used. Over the whole experimental period specimen were stored in 0.9% saline. Dentin disks were prepared. The 55 disks were assigned to five groups (n=11) including a positive and negative control. After preparation in three groups occlusal restorations with different materials (amalgam, base metal alloy, titanium alloy) were fabricated. Four groups were irradiated with 60 Gy (2 Gy/ day for six weeks), the negative control group remained non-irradiated. All specimens were demineralized for 14 days with acidified gel (HEC, pH 4.8, 37 degrees C). From each tooth, two dentinal slabs were cut. The depth of the demineralized areas was determined using a polarized light microscope.

Results: In all specimens lesion depth could be recorded. In the following table the evaluated lesion depths are summarized:

Group	Restoration Material	Irradiation	Mean Lesion Depth (µm)
C	None	0 Gy	155.1 ± 17.0
C60	None	60 Gy	166.5 ± 16.6
A60	Amalgam	60 Gy	276.7 ± 15.8
B60	Base Metal Alloy	60 Gy	260.9 ± 21.8
T60	Titanium Alloy	60 Gy	253.4 ± 15.3

Statistical analysis showed a significant influence of irradiation and the used material (p< 0.001, ANOVA). Between both control groups (C, C60) no significant differences could be detected (p> 0.05, Tukey test). Between the controls and the restored groups significantly increased lesion depths could be observed (p< 0.05, Tukey test). Pairwise comparison between the three materials showed no significant differences (p> 0.05, Tukey test).

Conclusion: Irradiated Dentin with metal restorations showed the significantly highest lesion depths after initial demineralization by acidified gel compared to the control groups. The different metal materials had no significant impact on artificial dentin demineralization.

0446 (152057)

Ozone treatment of initial caries in primary molars: 12-months results
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Objectives: To investigate the effect of ozone on initial fissure caries lesions in primary molars.

Methods: The study design was a split mouth longitudinal study. Twenty-one healthy children, 13 boys and 8 girls (mean age of 4.5 years) and a total of 35 pairs of initial caries lesions in primary molars were recruited from two Public Dental Health clinics in northern Sweden. Visual index according to Ekstrand and Laser fluorescence (LF) readings were carried out. In each pair the included primary molars were randomly assigned to ozone (test) or topical fluoride (control) treatment. The test tooth was treated with 40 s of ozone delivered by the ozone generating device Healozone® and the control with the topical fluoride varnish Duraphat®. Evaluation and treatment were conducted at baseline, 3, 6, 9 and 12 months or until operative treatment was necessary. Statistical methods: Wilcoxon signed rank tests were used for comparison LF values of groups. The level of significance was set at p<0.05.

Results: Median LF values at baseline were 21 and 19 respectively for test and control tooth. At baseline no higher than level 2a (i.e opacity brown distinctly visible without air drying) according to Ekstrand index were registered in the groups. The baseline values for the groups did not differ significantly. At 12 months median LF values were 15 and 17,5 respectively. No significant improvement of the LF values was found over time in none of groups. After 12 months, an increase of level according to Ekstrand was shown for one of the ozone treated molars with a level of 4 (i.e cavitation in opaque or discoloured enamel exposing the dentine beneath).

Conclusion: No positive clinical effect of ozone treatment was shown.

0447 (152190)

Chemical alteration of human salivary proteins with 30% H₂O₂ solution
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Objectives: Some salivary macromolecules penetrate enamel lesions and are adsorbed onto apatite crystal surfaces. Research has shown that removing salivary proteins from an enamel lesion with sodium hypochlorite solution enhances crystal growth. H₂O₂ at 20-35%, which is the active ingredient of in-office bleaching agents, denatures and/or degrades chromogenic molecules. We hypothesized that in-office bleaching can be used therapeutically to denature macromolecules present in enamel subsurface lesions and thereby to enhance remineralization. In this study, we support this hypothesis by demonstrating that exposure to 30% H₂O₂ solution chemically alters human salivary proteins.

Methods: Five ml of resting whole saliva was divided into two halves. The H₂O₂ sample was mixed with isopropanol to a final concentration of 70% and centrifuged. We added 30% H₂O₂ to the precipitate, incubated it for 30 min, and then again added isopropanol to precipitate protein. Precipitate and supernatant were separated by centrifugation and analyzed by SDS-polyacrylamide gel electrophoresis with dithiothreitol. We used an identical procedure to prepare the H₂O sample except that we added H₂O instead of H₂O₂. Intact and fragmented molecules in H₂O₂ sample were examined by Coomassie Brilliant Blue (CBB) staining, Stains-All staining, and Western blotting.

Result: Using CBB staining, we identified bands in the H₂O₂ sample that were not present in the H₂O sample. At the same time, certain bands in the H₂O₂ sample disappeared. Using Stains-All dye, we observed that the bands of acidic salivary mucin (> 250 kDa) were significantly larger in the H₂O₂ sample than in the H₂O sample. Using Western blotting with antibodies against serum albumin, we showed that such larger bands appeared as a result of reaction with anti-albumin antibody.

Conclusion: Salivary proteins in resting whole saliva reacted with 30% H₂O₂ resulting in fragmentation of certain proteins and in forming mucin of a larger size, which contains albumin component.

Acquired acid resistance of enamel by silica thin film coatingT. TANAKA¹, M. YAMAGUCHI¹, T. SHINDO², and T. TERANAKA¹¹Division of Restorative Dentistry, Department of Oral Medicine, Kanagawa Dental College, Yokosuka, Japan, ²Contamination Control Services, Sagami-hara, Japan

Objective: If the tooth surface is covered with a colorless transparent silica thin film, it can be expected to prevent caries. Previously we have reported that the rapid silica thin film coating method on enamel surface*. The purpose of this study was to examine the effectiveness of the silica coating method on acid resistance of enamel.

Methods: 10% of preceramic polymer perhydropolysilazane (PHPS; AZ Electronic Materials, Tokyo, Japan) solution was used. Finely finished bovine enamel slabs (7 x 7 mm) were divided into two groups; silica thin film coated group and non-treated control group (n=5). PHPS was applied on the enamel surface and 40µl of 3 % hydrogen peroxide solution was dropped onto the PHPS-coated surface. PHPS was converted to silica by CO₂ laser (Opelaser-03S, Yoshida, Tokyo, Japan) irradiation for 1 min. All specimens were covered with nail varnish except for a window of 3mm diameter and immersed in 0.1 mol/l hydrochloric acid solution for 30 minutes. The measurement of dissolved calcium ion concentration from the enamel surface was determined quantity spectrophotometrically by a colorimetric assay based on the Arsenazo III reaction at a wavelength of 660nm. The data were analyzed statistically by One-way ANOVA and Tukey's test at p<0.01.

Results: After the acid resistance test, the mean calcium concentrations that dissolved into the hydrochloric acid of the silica film coated and control group were 0.03 mmol/l and 1.89 mmol/l respectively. The silica film coated group was showed significantly lower concentration of calcium compared with the control group.

Conclusion: It was suggested that the silica thin film coating method is promising to create a firm acid resistant layer on tooth enamel surface. *Tanaka T et. al., abst # 271, IADR-CED with NOF & ID congress in Munich, 9-12 Sept. 2009

Compomer vs. composite resin in caries-prone population: 2-year clinical evaluationJ. SINIAWSKA¹, K. JURCZYK¹, E. CIEŻKA¹, A. KOCZOROWSKA¹, A. CZAJKA-JAKUBOWSKA¹, J. STOPA¹, and M.C. PETERS²¹Conservative Dentistry and Periodontology, Poznan University of Medical Sciences, Poznan, Poland, ²School of Dentistry, University of Michigan, Ann Arbor, MI

Objective: To compare longterm clinical performance of two filling materials: compomer (Dyract) and resin composite (Spectrum TPH) with a focus on caries incidence at restoration margins and adjacent surfaces.

Methods: 61 patients (18-23 years) with high caries risk, were enrolled. Inclusion criteria were: DMFT index ≥ 3, diagnosis of primary caries into dentin on 1-4 posterior proximal surfaces. Diagnosis was confirmed by existing radiograph. Filling material was randomly assigned to patients: compomer (N=31) and resin composite (N=30). Two independent calibrated teams of dentists (Clinic of Conservative Dentistry and Periodontology, Poznan University of Medical Sciences) treated the patients. Digital photographs of operation area were taken before and after cavity preparation, and after restoration. Impression of adjacent surface was taken after cavity preparation. X-rays were taken after treatment. Follow-up visits took place one week and two years after treatment. First recall was done in 61 patients, 2-year recall included in 41 patients (23: compomer; 18: composite resin). Two dentists, non-operators, independently evaluated caries presence by visual examination and infra-red laser (Diagnodent), quality of restoration and tooth integrity; followed by digital photograph and x-ray. Clinical performance data of both groups were compared and statistically analysed.

Results: Visual and laser-aided caries detection showed no difference. After two years, caries incidence in both groups had not changed. Clinical performance of both materials was excellent.

Conclusions: There was no difference in caries incidence between compomer and composite resin groups after two years of intra-oral service. All evaluated fillings fulfilled the highest criteria. Longterm follow-up of caries incidence in this caries-prone patient group is warranted. Sponsored in part by DENTSPLY-DeTrey (Germany).

Sense of Coherence and oral health in Japanese village residents

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Objectives: The aim of this study was to clarify the relationship between the Sense of Coherence (SOC) and oral health in village residents.

Methods: In this survey, 359 men and 401 women of the 3,619 residents aged 20 years and above, living in Tobishima, Aichi-prefecture, Japan, who responded to call for their annual health checkup recommended by the Ministry of Health, Labour and Welfare, were included. The subjects were asked to complete two questionnaires of SOC and Oral Saltgenic Score (OSS). A multivariate logistic regression analysis was performed to examine the relationship between SOC and OSS after adjusting for age and sex. Strong, slightly strong, slightly weak and weak SOC levels were calculated as percentile rank 0-25, 25-50, 50-75 and 75-100 respectively.

Results: The averages of SOC and OSS were 136.1 and 14.8 respectively. The subjects whose SOC level was slightly weak, slightly strong and strong were found to have hobbies 1.56(95%CI=0.95-2.57), 2.59(1.52-4.42) and 8.9(4.18-18.94) times more as compared with those of weak SOC level. The subjects whose SOC level was strong were less likely to have toothache (OR=0.46, 95%CI=0.26-0.80), to have bleeding gum (0.50, 0.31-0.83) and to smoke (0.50, 0.27-0.94), compared with those of weak SOC level. The subjects whose SOC level was slightly weak, slightly strong and strong were less likely to have gums swell 0.40(0.23-0.70), 0.55(0.33-0.92) and 0.49(0.29-0.82) times more as compared with of weak whose SOC level.

Conclusion: It was concluded that SOC was significantly associated with oral health (OSS score) in Japanese village residents.

Thai version of the Oral Health Impact Profile (Thai-OHIP)N. CHAIPHOTCHANAPHONG¹, W. TUMRASVIN¹, and S. KRISDAPONG²¹Department of Prosthodontics, Chulalongkorn University, Bangkok, Thailand, ²Department of Community Dentistry, Chulalongkorn University, Bangkok, Thailand

Objectives: To develop a Thai version of the Oral Health Impact Profile (Thai-OHIP) and to test for its psychometric properties.

Methods: The original English version of the OHIP with 49 items was translated into Thai following accepted cultural adaptation techniques guidelines using a forward-backward method. A de novo development of Thai items was conducted to establish content validity. The final version of the Thai-OHIP (a self-administered questionnaire) was tested for construct validity in Thai dental patients (n = 453, age 20-85 yr). A priori hypothesized associations between OHIP summary scores and self-reported oral health, self-reported denture quality, and six oral disorders were investigated. Spearman rank correlations were calculated to examine the association between self-reported oral health or self-reported denture quality and the Thai-OHIP. Point-biserial correlations were calculated to examine the association between TMD pain, burning mouth sensation, halitosis, joint clicking, difficulty in opening the mouth, oral habits, and the Thai-OHIP. To establish the reliability, internal consistency and test-retest reliability for OHIP summary scores and seven subscales (n = 40; 2 weeks interval) were examined, using Cronbach's alpha and intraclass correlation coefficients (ICC). ICC based on one-way ANOVA. Limits of agreement have been computed around the mean of difference (including a 95% confidence interval for the mean).

Results: After the de novo development, six new items ('bite cheeks', 'difficulty in swallowing', 'dry mouth', 'embarrassing joint sounds', 'avoiding eating with others' and 'take longer to complete a meal') were added to the Thai-OHIP. The pattern of the observed associations supported the new instrument's construct validity (P < 0.05). Internal consistency and test-retest reliability were excellent (Cronbach's alpha = 0.81-0.96; ICC = 0.76-0.90).

Conclusion: Sufficient psychometric properties of the Thai-OHIP make the new instrument suitable for assessment of OHRQoL in Thai patients.

Using 3D Tissues for Anti-inflammatory Screening of Oral Care Formulations

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Objectives: Oral care formulations often prove too viscous to be tested on monolayer cells. The introduction of reconstructed 3D EpiGingival™ tissues has made the evaluation of actives in oral care formulations more amenable. This study aims to develop a novel in vitro model using the EpiGingival™ tissues to assess the anti-inflammatory potential of new oral formulations.

Methods: Two novel dentifrices, one formulated with 0.1%w/w o-Cymen-5-ol and 0.6%w/w zinc chloride, the other containing 0.4% w/w PIPS (mixture of phosphatidylserine and phosphatidylinositol), were tested for their anti-inflammatory activities. Paste slurries were applied topically to the tissues for 1 minute for three times over 8 hours. Following paste treatments, tissues were challenged with Pgingivalis lipopolysaccharide (PG-LPS) for 24 hours to induce an inflammatory response. Culturing media was collected and release of Prostaglandin E2 (PGE2) and Interleukin 1-beta (IL-1b) were measured. In a parallel study, tissues were pre-challenged with PG-LPS for 1 hour, followed by repetitive topical treatments with dentifrice containing 0.1%w/w o-Cymen-5-ol and 0.5%w/w zinc chloride over 8 hours. These tissues were further cultured for overnight prior to media collection and measurement of PGE2 and IL-1b.

Results: Dentifrices formulated with o-Cymen-5-ol and zinc chloride or PIPs prevented PG-LPS induced release of both PGE2 and IL-1b from EpiGingival™ tissues. Dentifrice formulated with o-Cymen-5-ol and zinc chloride also effectively reduced PG-LPS mediated inflammation of these tissue.

Conclusion: The 3D EpiGingival™ tissues provide an effective tool for screening anti-inflammatory properties of novel actives formulated into oral formulations.

Oral Health-related Quality of Life of HIV-patients undergoing Highly-Active-Anti-Retroviral-Therapy (HAART)

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Objectives: Patients with Human Immunodeficiency Virus (HIV) infection may exhibit impaired oral status due to either HIV-related oral diseases or adverse oral drug reactions following a lifelong highly-active-anti-retroviral-therapy (HAART), which might affect their quality of life. This study assessed the oral health-related quality of life (OHRQoL) of a HIV-seropositive cohort undergoing HAART in Germany and potential influencing factors.

Methods: 104 non-dental patients of a HIV-specialised outpatient clinic were examined and viral load, cd4 counts, HAART, Centers for Disease Control classification and demographical data were recorded. Additionally, the oral health impact profile (OHIP-G53) was used to assess patients' OHRQoL, including the parameters functional limitations, oral pain, mental stress, physical, mental and social wellbeing, and disability. Patients' OHRQoL rating was correlated with the examined parameters using Pearson correlation with p<0.05 defined as statistical significance.

Results: Subjects mean age was 44.8 yrs (95%-CI: 42.8; 46.8); 12.5% of them were women. Mean CD4 counts were 589 per microlitre of blood (95%-CI: 538; 640) and viral load was 7,675 per millilitre of plasma. 41% received a protease inhibitor based HAART, 40% a non-nucleoside reverse transcriptase inhibitor based HAART, and 19% other regimens. Overall OHIP-G53 was 32.2 (95%-CI: 23.5; 37.0). Partial scores were: functional limitations 8.4 (7.2;9.6), oral pain 6.7 (5.4;8.1), mental stress 4.5 (3.5;5.5), physical wellbeing 4.1 (2.7;5.5), mental wellbeing 2.9 (2.0;3.9), social wellbeing 1.5 (0.8;2.1), disability 2.2 (1.3;3.0). Neither total OHIP-G53 nor partial scores were statistically associated with viral load, cd4 counts, HAART, Centers for Disease Control classification, and age (p>0.1).

Conclusion: No correlations between OHIP-G53 and clinical and demographical data of the patients were detected. Therefore, HAART might not have an impact on oral health related quality of life.

Clinical Efficacy of New Alcohol Free Mouthrinses after 8 weeks

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Objectives: To evaluate the efficacy of two alcohol-free antimicrobial mouthrinses in reducing plaque and gingivitis compared to an alcohol-containing rinse and toothbrushing alone.

Methods: 160 healthy volunteers were enrolled in the parallel-design examiner-blind study. After screening and stratification by sex and papillary bleeding index (PBI), participants were randomly and equally assigned to four groups: (1) toothbrushing + rinsing (0.06% CHX + 0.025% NaF, alcohol-containing rinse; positive control); (2) toothbrushing + rinsing (0.06% CHX + 0.025% NaF, alcohol-free experimental rinse); (3) toothbrushing + rinsing (0.06% CHX + 0.03% CPC + 0.025% NaF, alcohol-free experimental rinse); (4) toothbrushing alone (negative control). At baseline, QUIGLEY-HEIN plaque index (PI), the modified proximal plaque index (MPPI), and PBI were recorded. All subjects were advised to brush their teeth as usual during the eight weeks study period using Dr. Best multi aktiv toothpaste and Dr. Best plus toothbrush (medium stiffness). Additionally, groups 1-3 were instructed to rinse twice daily (30 sec. each). Eight weeks after baseline, indices were recorded again. ANOVA with Bonferroni adjustment was used for statistical analysis.

Results: After eight weeks, 155 participants were included into final analysis (1: n=39, 2: n=39, 3: n=37, 4: n=40). The two experimental rinses (2, 3) performed better than the negative control (4) with respect to PI and MPPI with no significant difference vs positive control at p<0.05: PI: (1) 1.66, (2) 1.82, (3) 1.65, (4) 2.07; MPPI: (1) 1.85, (2) 1.87, (3) 1.85, (4) 1.95. For PBI, no statistically significant difference was found between groups: (1) 0.21, (2) 0.22, (3) 0.24, (4) 0.25.

Conclusion: With respect to PI and MPPI, toothbrushing in combination with experimental alcohol-free antimicrobial mouthrinses was more effective than toothbrushing alone and as effective as an alcohol-containing control rinse. This study was sponsored by GlaxoSmithKline Consumer Healthcare.

Complex dental treatment effects on serum parameters of hyperlipidemic patients

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Objectives: The aim of this study was to investigate the associations between the oral health indicators and serum inflammatory and lipid parameters and human paraoxonase-1 (PON1) activity in hyperlipidemic patients.

Methods: Thirty four Caucasian patients (mean age 55.12±11.55) with hyperlipidemia and thirty four age- and gender matched healthy controls were enrolled. Dental examination (dental, periodontal status) and therapy (oral health care, endodontic, surgical treatment) was performed. We have investigated the serum levels of lipid parameters (triglycerids, cholesterol and lipoproteins), systemic inflammatory alpha) and the PON1 activity before,– TNF, factors (CRP, IL-6, IL-1beta one week and 3 month after the complex dental therapy.

Results: After the 3 month follow up, there were significant improvements in the clinical periodontal characteristics including plaque index (PI) (p<0.01) and gingival index (GI) (p<0.05). The PON1 activity was significantly increased after three months compared to the baseline (p<0.01). There was a significant reduction in the CRP (p<0.01). There were significant differences in the microbial analysis of supragingival and subgingival plaque examination between the baseline and 3 months of

follow up in reducing the pathogenic flora ($p < 0.01$). There were no significant reductions in the serum levels of lipid levels. There were significant parameters, IL-6 and TNF- α differences between the control group and the patient group in the lipid parameters and the IL-1 β levels at baseline and at the follow up as well ($p < 0.05$).

Conclusions: To our knowledge, this is the first study, which investigates the effect of a complex dental therapy on PON1 activity and systemic inflammatory factors in hyperlipidemic patients. The work/publication is supported by the TÁMOP 4.2.1/B-09/1/KONV-2010-0007 project. The project is co-financed by the European Union and the European Social Fund.

0456 (151436)

Caries prevalence in Hungarian police students

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Objectives: Oral health is an important and basic requirement for members of the armed forces. The aim of this study was to determine the caries experience (DMFT) of a group of Hungarian Police students, and evaluate associations with nutrition, oral hygiene habits and social factors.

Methods: Altogether 792 Hungarian Police student volunteers (9.7 per cent female) (mean age: 20.4 ± 1.25 years) participated in the study. Caries experience was measured using World Health Organisation (WHO) criteria, and a questionnaire was used to collect sociodemographic, nutrition and oral hygiene data.

Results: Mean DMFT was 10.2 ± 5.8 (mean \pm SD), with no significant difference with respect to gender. Statistically significant associations were found between increased DMFT and high frequency of drinking carbonated soft drinks, eating sugar-containing foods, frequency of tooth cleaning, use of dental floss or mouthwash during oral hygiene procedures and infrequent dental visits. Mean DT was significantly higher for participants who only attended for compulsory screening (8.7 ± 5.2) compared with those who attend more regularly (5.7 ± 3.9) ($p < 0.05$). Education of fathers was associated with mean FT; at higher educational levels, higher numbers of filled teeth were found ($p < 0.05$).

Conclusion: Caries experience was high in the police student population in Hungary. Nutrition, oral hygiene habits and some social factors were found to be associated with greater caries experience. Strategies aimed at more effective caries prevention should be established in the police student population in Hungary.

0457 (152132)

Genetic predisposition and periodontal diseases in adolescents with diabetes

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The age at onset of diabetes mellitus (DM) was related to the periodontal condition and the early onset of DM produced worse gingival values. Two polymorphisms within the IL-1 gene cluster show a close association with periodontitis. This overproduction of IL-1 seems to override the feedback mechanisms which normally limit inflammation resulting in the development of massive gingival pockets and degradation of periodontal tissue.

Objectives: The genetic association of interleukin-1A (IL-1) and interleukin-1B (IL-1B) with gingivitis periodontitis has been investigated.

Methods: Participant: 47 type 1 DM adolescents (age 15-19). The assessment of the gingival condition used the Löe and Silness Gingival index (GI). Oral hygiene was measured by means of Greene- Vermillion's OHI-S index. Using The GenoType® PRT test the base composition and allelic combination of the two IL-1 loci can be analyzed. These data allow a risk assessment, defining a patient as PRT-positive or PRT-negative. The test determines the presence of periodontitis risk alleles at positions IL-1A-889 and IL-1B+3953. (Hain Life Science)

Results: 15 patients showed positive test results. Gingivitis and periodontitis were more prevalent and more severe in patients with GenoType® PRT-positive ($p < 0.001$). No correlation was found between the severity of periodontal disease according to oral hygiene, however, in GenoType® PRT-positive cases with good oral hygiene (OHI-S=0) a positive correlation was found between the severity of gingivitis, periodontitis (PI) ($p < 0.001$).

Conclusion: Determining the patient's genetic susceptibility to developing severe, generalized periodontitis in the future helps to plan a comprehensive therapy. Supported by: Foundation for the Healthy and Beautiful Teeth.

0458 (151533)

Morphological Evidence of Local Reflex Arc in the Rat's Tongue

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Objectives: Some literature data suggest that lingual components of the autonomic nervous system may be considered the most rostral portion of the enteric nervous system consisting of different neuropeptides. Therefore our aim was to study the intrinsic nerve cell bodies and synapses that might be involved in the local reflex arcs.

Methods: Immunohisto-, immunocytochemical, confocal laser microscopy and electronmicroscopic methods were used to evaluate the possible presence of different subpopulations of nerve cell bodies.

Results: Several small groups of ganglia with immunoreactivity (IR) for vasoactive intestine polypeptide (VIP), neuropeptide Y (NPY) and substance P (SP) cell bodies were observed just below the gustatory epithelium. Several IR cell bodies were also found in the glands and next to the blood vessels. Some of these cell bodies were multipolar and some of them were small neurons with an ovoid shape having only one process. In the intrinsic nervous system, no cell bodies positive calcitonin gene-related peptide (CGRP) or galanin were detected either in the superficial or in the deep portion. Confocal laser microscopy showed that the SP showed colocalization neither to VIP nor NPY. Electronmicroscopical analysis demonstrated that some of the SP IR nerve fibres have synapses with the other immunonegative cell bodies.

Conclusions: The present work provides further data on the morphology and chemical specificity of different neuronal subclasses. The intraligular synapses suggest that a certain degree of functional specialization may exist: the presence of an intraligular reflex arc, where the ganglia might have an integrative role.-->

0459 (152173)

The Importance Of Self-identity For Oral Health Behaviours

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Objectives: The aims of this study were to determine if perceived self-identity was associated with oral health behaviours, to explore the predictive ability of potential additional factors (attitude, social norms, perceived behavioral control) for the intention to improve oral health behaviours, and to compare the individuals with low and high levels of self-identity.

Methods: The participants of this descriptive, cross-sectional study were 179 first year medical students at the University of Medicine and Pharmacy "Carol Davila" that completed a questionnaire assessing TPB variables, self-identity and their current oral hygiene behaviors.

Results: Significant differences in self-identity regarding the toothbrushing behaviour and reason for the dental visit were observed ($P < 0.0001$). Self-identity had a statistically significant positive correlation with attitudes, subjective norms, perceived control, locus of control and intention for improving oral hygiene and a statistically significant negative correlation with performance difficulty. When participants were classified in two groups according to their levels of self-identity, significant differences were found according to their age, toothbrushing frequency, attitudes, perceived behavioural control and intention for improving oral hygiene ($P < 0.0001$). Hierarchical multiple regressions for toothbrushing frequency revealed that the TPB factors and self-identity explained 31.4% and 40% from the intention to improving behaviours, the coefficients for self-identity being significant.

Conclusion: In summary, our findings revealed the value of the extended TPM model as a predictor of intention to improve oral health behaviors. Dental educators should focus on issues of students' self-identity as a person concerned by their oral health.

0460 (151576)

Anti-odor Effects of Mouthrinse Formulations Using in vitro Biofilm Model

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Objectives: A modified in vitro matrix biofilm perfusion model was used to study tongue-derived microcosms using a novel electrode assembly based on microbial fuel cell technology. In addition to the model modifications, a further aim of this study was to demonstrate the biofilm responses following exposure to biocidal, biostatic or volatile sulphur compound (VSC)-inhibiting active compounds.

Methods: The existing model was modified to give real-time measurements expressed as electrode power output, which were proportional to H_2S level. H_2S biogenesis was also measured by SIFT-MS, along with other volatile organic compounds (VOCs). Tongue-derived biofilms were pulsed with experimental mouthrinse (1400 ppm F- from amine fluoride/stannous fluoride, 0.2% zinc lactate, oral malodour counteractives), placebo and controls including Zn^{2+} ions and chlorhexidine. Changes in viable count of perfusate were followed prior and following treatment. Viable counts were also performed at the end of the experiment by destructive sampling.

Results: Compared with their pre-treatment conditions, all biofilms responded to the treatments in terms of reductions in hydrogen sulphide generation (as detected by the biofilm-electrode response) ($P < 0.05$) and other microbial VOCs (as detected using SIFT-MS) ($P < 0.01$). By comparison, microbiological analysis of the treated and control biofilms show that formulations with active agents gave reduced cell populations compared to the control biofilm ($P < 0.05$). The experimental mouthrinse showed a marked reduction in final biofilm yield compared to placebo ($P < 0.0007$) and was markedly better at reducing VSCs ($P < 0.05$).

Conclusion: This in vitro perfusion model may be used to replicate many of the activities and reactions believed to be occurring by the tongue biofilm microflora within a real mouth, including H_2S and VOC biogenesis and their inhibition by exposure to active agents. Supported by GABA International AG.

0461 (152201)

Influence of mothers' dental health attitudes on children's dental health

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Objectives: To mirror mothers self-report on dental health-related attitudes and behaviour on level of assisting their 1-10 yr old children's dental health and tooth-brushing behaviour.

Methods: A cross-sectional study was conducted among subjects attending Family Health Centres in Bornova and Konak, Izmir, Turkey. The sample comprised 516 pairs of mother-and-child, using semi-structured questionnaire-interviews to provide data.

Results: The response-rate was 90%. The mothers were 31.2 yrs old (sd 6.3), 46% had no formal education or only primary school. 58% had bad self-reported dental health and only 40% reported brushing teeth twice-daily. One third of the study population had received information on oral healthcare. Among them, significantly more subjects reported good dental health (50% vs. 21%), had higher education (48% vs. 14%) and better living conditions (36% vs. 27%). Two thirds informed about their child's caries status: 3, 26 and 60%, among 1-2, 3-6 and 7-10 yrs, respectively, had – according to their mothers - caries experience; 2, 13 and 43%, had 2-4 cavities; 1, 6 and 12%, had more than 4 cavities. Percentages of children brushing twice-daily were 3, 26 and 34%, respectively; 10, 28 and 9% received always help from their parents when brushing; 5, 16 and 26%, used fluoride toothpaste. The association between mothers' attitude to prevent oral diseases for herself and for her child was good: $Kappa=0.876$ ($p < 0.001$). Mothers were more likely to help with tooth-brushing when scoring high on motivation ($OR=14.0$; 95% CI 7.1-27.5), when the child was 3-6 yrs compared to younger or older ones ($OR=6.0$; 95% CI 1.9-18.4), and when mother had higher education ($OR=2.2$; 95% CI 1.1-4.5).

Conclusions: The self-reported dental behaviour in these mothers and children is far from optimal. When developing oral health promotion programs for children, the considerable potential of motivated mothers should be a major driving power.

0462 (152227)

Interdisciplinary treatment approach of two young patients. Case presentation

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Objectives: The purpose of the presentation was to illustrate two cases of young patients of different age groups suffering of congenitally missing teeth who were subjects to complex interdisciplinary therapy.

Methods: Two patients, ages 16 and 18 years, were selected, and treated interdisciplinary with orthodontic and prosthetic methods for complete oral rehabilitation.

Results: Presentation of case-sensitive, combined, orthodontic, restorative and prosthetic treatment solutions for patients with congenitally missing permanent germs and persisting primary teeth with use of long-term temporary adhesive prosthetic solutions in young patients with hypodontia. The possibility of prosthetic use of persisting primary molars with root resorption not exceeding stage 1.

Conclusions: The treatment possibilities presented add new long-term clinical experience for the interdisciplinary approach of cases with multiple permanent tooth agenesis.

0463 (152258)

Experiences with the oral health impact profile (OHIP-H) questionnaire

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Objectives: The aim was to perform an interventional Hungarian oral health-related quality of life (OHRQoL) clinical survey of patients requiring prosthetic treatment using the modified Hungarian version of the OHIP (OHIP-H) questionnaire which allows us to assess psychosocial impacts of the intervention in addition to conventional oral health indicators.

Methods: Patients were required to fill in the validated Hungarian version of the internationally accepted, comprehensive questionnaire, the 49-item version OHIP-H49 to assess OHRQoL before and after treatment. Additionally, we also investigated the influence of other independent variables such as socio-economic status, level of education, eating and oral hygiene habits, available dental services in our residential area (OHIP-HvDebrecen).

Results: Fifty and three participants (mean age: 58 ± 11 yrs) completed the questionnaire. A linear regression model was used to determine the rate of improvement of OHRQoL at baseline (T0) and 1 month (T1) after oral and prosthetic rehabilitation. Decreasing OHIP score (Likert-type scale) results at 1 month of follow-up indicated that OHRQoL improved in 87 % of the subjects regardless of the type of denture applied. However, we have found differences in the magnitude of the decrease in OHIP scores depending on patients had total (34%), partially removable (40%) or fixed (26%) dentures. The largest improvement was observed in patients treated with fixed dentures. Patient-reported OHRQoL hasn't developed in 8 % of subjects and deteriorated in 6 % of patients.

Conclusions: Modified OHIP-H proved suitable for evaluating of oral health requirements and OHRQoL of patients living in the less resourceful region of Hungary. The work/publication is supported by the TAMOP 4.2.1/B-09/1/KONV-2010-0007 project. The project is co-financed by the European Union and the European Social Fund.

0464 (151756)

The Interplay of Self-Monitoring and Attention with Oral Health

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Objectives: We examined the effects of self-monitoring and focus of attention as predictors of self-reported oral health behaviors.

Material and Methods: In this study of 212 first year dental students, attention was measured with The Focus of Attention Questionnaire (FAQ) and self-monitoring with Revised Self-Monitoring Scale (SMS-R). The questionnaire included also information about socio-demographic factors, self-reported oral health status and behaviors.

Results: Significant differences were found between participants with high and low levels of attention only on the appearance of their teeth. Self-Focused Attention (FAQself) was statistically significant higher in participants who reported more only gingival bleeding or more than one gingival signs, compared with those who reported healthy gums. Significant differences were observed between the high and low self-monitors regarding the dissatisfaction by appearance of own teeth, gingival health, dental visits and mouthrinse frequency. Relation between toothbrushing frequency and self-reported gingival status was moderated by Other-Focused Attention (FAQexternal). FAQexternal also emerged as a moderator for dental visit frequency and self-rated gingival status / dental decays. FAQself and FAQ were moderators for self-reported dental decays, dentist visit frequency and reasons for dental visiting. The relations between flossing frequency and self-rated gingival bleeding, between mouthrinse frequency and self-reported dental decays, between dental visit frequency or reason for dental visits and self-reported dental decays, between reason for dental visits and self-reported dental extractions was moderated by self-monitoring.

Conclusions: The effect of focus of attention and self-monitoring should be considered when tailoring intervention efforts to oral health promotion as well as in studies involving self-reporting as a tool in screening the gingival health of populations.

0465 (151352)

In-vivo sustained release tablet for local delivery of miconazole

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Objectives: To assess in-vivo a new bioadhesive buccal miconazole tablet for local sustained release and delivery of miconazole.

Methods: In-vitro experimentation was carried out and the ideal composition of the tablet (ensuring bioadhesive characteristics and sustained release of miconazole) was determined. After ethical approval, in-vivo use of the tablet was performed. Evolution of salivary miconazole concentration was studied following one daily application of bioadhesive tablets (50 or 100 mg), vs miconazole gel (Daktarin) (3 times a day, with a total of 375 mg daily). A three way randomized crossover controlled study was carried out in 18 healthy subjects (nine males, nine females) with a 1 week washout period between each treatment. Two ml of unstimulated saliva were collected into plastic tubes immediately before administration of the trial drug and at 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 24 h intervals. Salivary concentrations of miconazole were measured, and pharmacokinetic parameters were calculated for up to 24 h after first administration. The acceptability of the various treatments was scored in 4 classes, (Excellent, good, satisfactory, unsatisfactory)

Results: Saliva AUC 0 and 24 hours (136.16 ± 149.54 µg/ml/h for 100 mg tablet) and (55.23 ± 35.09 µg/ml/h for 50 mg tablet), and only (3.10 ± 4.20 µg/ml/h) for the gel, Cmax showed significant differences between the bioadhesive tablets (39.06 ± 49.29 µg/ml for the 100 mg tablet, and 15.07 ± 16.21 µg/ml for the 50 mg tablet) and the oral gel (1.61 ± 1.62 µg/ml). The minimum tablet retention time in-vivo was 9 h. The 50 mg tablet was good for 89% of the subjects.

Conclusion: Retention and acceptability of tablet were good, and a sustained release of active miconazole is obtained.

0466 (151360)

The antimicrobial combination effects of o-Cymen-5-ol and Zinc

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Antimicrobial ingredients have been suggested to be added to oral health products to deliver plaque control and gingivitis benefits.

Objectives: To evaluate antimicrobial effects of o-cymen-5-ol and zinc, alone and in combination, in simple solutions and whole toothpaste formulations.

Methods: Solutions of o-cymen-5-ol and zinc gluconate up to 6.7mM and 44mM were evaluated in minimum inhibitory concentration (MIC) or minimum bactericidal concentration (MBC) assays against five microorganisms: Streptococcus mutans, Actinomyces viscosus, Porphyromonas gingivalis, Fusobacterium nucleatum and Candida albicans; synergy was investigated in checkerboard MIC/MBC assays; inhibitory effects were assessed on S.mutans glycolysis and protease activity of P. gingivalis. The effects of o-cymen-5-ol and zinc chloride formulated into toothpastes at 0.1%w/w (6.7mM) and 0.6%w/w (44mM), respectively and slurried at 16.7% and 25%w/w were assessed by killtime (modified EN1276) assays against S.mutans.

Results: The MIC for o-cymen-5-ol was between 1.7mM and 3.4mM and MBC between 3.4mM and 6.7mM; for zinc gluconate the MIC was between 2.8mM and 11mM and MBC between 11mM and >44mM. Combinations of the two agents in solution showed significant synergistic effects ($FICIs \leq 0.50$) in MIC/MBC tests against oral anaerobic species, with effective MIC values as low as 0.42mM/0.69mM for the combination of o-cymen-5-ol/zinc gluconate, respectively. Both glycolysis and protease activity were inhibited to a greater extent by zinc than by o-cymen-5-ol; additive effects were seen for the combination of agents in glycolysis inhibition. In whole toothpastes the combination showed significantly greater effects (\log_{10} kill = 7.35 ± 0.40) than placebo paste (\log_{10} kill = 4.02 ± 0.40).

Conclusions: Combinations of zinc and o-cymen-5-ol produced antimicrobial effects against a range of oral microorganisms and important disease-related processes. Significant synergistic antimicrobial effects were seen against oral anaerobes. O-cymen-5-ol and zinc show a range of properties desirable for incorporation in toothpastes.

0467 (151365)

Synergistic anti-inflammatory and anti-oxidant activities of o-Cymen-5-ol and zinc chloride

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Objectives: O-Cymen-5-ol is an isomer of thymol, an ingredient recognized as anti-oxidant and anti-microbial. To explore its full potential for use in oral health care applications, this study aims to evaluate o-Cymen-5-ol mediated inhibition of inflammation, oxidant reducing potential and promotion of cell migration using in vitro cellular models. Addition of zinc chloride was also investigated to assess potential additive or synergistic anti-inflammatory and anti-oxidant activities.

Methods: The anti-oxidant and anti-inflammatory activities of o-Cymen-5-ol and zinc chloride were assessed using RAW264.7 cells and Human Gingival Fibroblasts (HGF), respectively. Cultured cells were starved in low serum medium prior to treatment with Pgingivalis lipopolysaccharide (PG-LPS) with or without testing agents. Release of nitric oxide radicals and Prostaglandin E2 (PGE2) were measured after 24 hours of treatment. Cell migration was assessed on HGF cells cultured with o-Cymen-5-ol at 2µM, 10µM and 50µM. A modified Boyden chamber assay was utilized to screen cell migration.

Results: O-Cymen-5-ol at 2-50µM inhibited PG-LPS-mediated release of Nitrite and PGE2 from cultured cells in a dose dependent manner. A 1.48 fold increase in gingival cell migration was observed with 50µM of o-cymen-5-ol relative to control. In addition, o-Cymen-5-ol and zinc chloride demonstrated strong synergistic anti-inflammatory and anti-oxidant activities on cultured cells.

Conclusion: The results indicate that o-Cymen-5-ol in combination with zinc chloride has good potential in promoting gingival health.

0468 (151557)

Adaptation of BSEN1276 Testing Bactericidal Activity for Novel Dentifrice Products

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Objective: The compendial method BSEN1276 for evaluating bactericidal activity in dentifrice products is widely used. The objective of this study was to modify BSEN1276 to investigate the effect of product format on the antimicrobial efficacy of gel to foam toothpastes in comparison with non isopentane placebo.

Method: Experimental formulations were manufactured with isoactive® technology (isopentane) and placebo variant, each with and without STP to give direct comparators for testing. The compendial method BSEN1276 was adapted in the following way: Streptococcus mutans test suspension at 1x10⁶ CFU was held at 35°C. Product was dispensed and 5x this weight in bacterial test suspension was added and stirring commenced. At 30, 60 and 120seconds, 1ml samples of the suspension were removed, neutralised and decimally diluted with TSB and TSA pour plates used for enumeration. Antimicrobial effects of isopentane were investigated by the indirect R.A.B.I.T. impedance test, with cultures of S.mutans challenged with 2% isopentane in TSB medium.

Results: Isopentane formulations produced statistically significant difference in favour at 30s and 60s compared with control. Differences between formulations (isoactive vs non isoactive) were carried out using an analysis of variance with factors for formulation and STP (present/absent). Mean log reductions 30s 60s 120s Placebo/STP 0.40 0.72 1.52 Isopentane/STP 1.12 1.65 2.25 Placebo 0.38 1.44 1.79 Isopentane 1.43 2.00 2.62

Previous standard BSEN1276 studies demonstrated no differences in antimicrobial properties between isopentane and regular pastes conventional BSEN1276 methodology. Isopentane alone had no effect in R.A.B.I.T. conductivity measurements.

Conclusion: The significantly greater kill by isopentane products versus placebo in modified BSEN1276 test at 30s and 60s was not attributable to the presence of isopentane. This supports the hypothesis that gel-to-foam format products can result in more rapid release of bactericidal ingredients than traditional paste products.

0469 (151705)

Pyrosequencing Analysis of Oral Flora isolated from Chimpanzees

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Objective: Chimpanzee is genetically most closely related species (98.8%) to the human. The comparison of chimpanzee and human could be useful for the consideration of human oral health. We investigated the usefulness of 16S rRNA gene pyrosequencing for analysis of the oral flora isolated from five chimpanzees.

Methods: Five chimpanzees (9 to 27 years-old) fed at the Primate Research Institute, Kyoto University were used. Oral plaque samples were collected using the sterilized tooth brush under anesthesia, during a routine medical check-up. The DNA from dental plaque was extracted with phenol after disrupting with glass beads, and prepared for Roche 454-sequencing analysis, by generating PCR products targeting the V5-V6 region (329 bp plus bar code) of the 16S rRNA gene. The obtained sequences were analyzed by the Ribosomal Database Project (RDP) Server and EzTaxon org Server. All sequences were identified by the RDP classifier.

Results: The oral health regarding caries and periodontal diseases of five chimpanzees exhibited extremely good condition. A total of 143,858 sequences were obtained by the pyrosequencing. Grouping the sequences in operational taxonomic units (OTUs) were from 207 to 856 OTUs at 3% cutoff in each individual. The predominant phylum was Firmicutes (75.5 to 98.7%), followed by Synergistes (0.56 to 15.1%). The phylum of Fusobacteria, Actinobacteria, Bacteroidetes and Proteobacteria were detected in all individuals. The phylum of TM7, Spirochaetaes, Bacteroides, Cyanobacteria, Bacteria incertae sedis and SR1 were detected in some individuals.

Conclusions: Many unknown and un-cultureable species were detected by the pyrosequencing method. This method is more useful for the study of oral flora, which contains unknown species, than the T-RFLP method and the DNA-DNA hybridization method, when the plaque seemed to be containing unknown species. This study was granted by JSPS (22592350).

0470 (151894)

Comparing the efficacy of chlorine-dioxide with commonly used oral antiseptics

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Objectives: To compare the disinfectant efficacy of the recently developed hyper-pure and stabile 0.12% ClO₂ solution (Solumium) with other well-known antiseptic rinsing agents of root canal and oral cavity on selected pathogen microorganisms in vitro. ClO₂ is an ideal antiseptic, as it kills the microorganisms effectively, without having the microbes to develop resistance against it. Furthermore, ClO₂ is harmless for the human body if used in small quantities needed for disinfection and it can penetrate with several tenths of mm into the human tissues.

Methods: The antimicrobial activity of oral antiseptics: Solumium, NaOCl (5.25%), Corsodyl, Listerin, were compared to the gold standard phenol on Streptococcus mutans, Lactobacillus acidophilus, Enterococcus faecalis, Veillonella alcalescens, Eikenella corrodens and Candida albicans. The microbiocide activities of the test compounds were expressed with the phenol coefficient, which is the ratio between the dilution of the test solutions and the dilution of phenol at which the compounds kills the test organism in 10 minutes, but not in 5 minutes. Same amount of bacteria (approximately 10⁵ CFU/ml) and 10 µl from each dilution of test solutions were inoculated on blood agar (anaerob in anaerobic environment) and incubated at 37°C for 24 hours. Each measurement was repeated in five parallels.

Results: All investigated antiseptic agents were more effective than phenol itself in all cases. Among the mouthwash solutions, ClO₂ was the most effective agent (533x dilution/phenol dilution (d/phd)) in contrast with Corsodyl (333x d/phd) and Listerin (13x d/phd) on S. mutans. As root canal rinsing solution again, ClO₂ was the more powerful agent (1250x d/phd) as compared to NaOCl (112x d/phd) on E. faecalis.

Conclusions: Our investigation demonstrated that Solumium solution is more effective than the other currently used disinfectants. Solumium is a new promising preventive and therapeutic adjuvant in dental practice. Support: Faculty Research Application FOK/DH/3-5/2011

0471 (152052)

Microbiological examination of dental unit water lines

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Objectives: Evidence of occupational exposure from dental unit water lines (DUWL) was first described in the 1960s. Since then it is known that dental unit water lines hosts diverse microflora and are a source of occupational and healthcare acquired infection in dental settings. The aim of this study was to investigate the quality and quantity of bacterial counts contained in the water, which is sprayed into the patient's mouth as a coolant for the high-speed drills and as an irrigant during dental procedures.

Method: DUWL samples were collected according to the „water quality – sampling for microbiological analysis” standard from the dental units of the prosthetic department and from the wash basins at the same department. The samples were examined at the Water Hygiene Department in the National Institute of Environmental Health.

Results: The total bacterial counts in the water samples taken from the dental unit water lines was not only higher than in the samples taken from taps, but also higher than the recommended limits of the water hygiene guidelines.

Conclusion: The findings of this study show that the quality of the water coming out of the dental unit water lines can be an important point in everyday routine dental infection control. This study draws the attention on the importance of examining and controlling the quality of the water from the dental unit. This is especially important when treating generally ill or immunocompromised patients at dental environments.

0472 (152156)

Yeast other than *Candida albicans* as oral colonizers

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Objectives: During the last decade, the isolation yeast species other than *Candida albicans*, have been increasingly detected in the oral mucosa, thus emerging as important oral colonizers. We studied the distribution of the different yeast species carried in oral cavity and evaluated its association with dental prosthesis wearers-related factors.

Methods: tRNA-PCR fingerprinting and sequencing of the 26S rDNA D1/D2 domain were used to identify the yeasts isolated from CHROMagar™ candida cultures of oral swabs collected from 178 patients. Associations with the host-related factors were conducted by logistic regression analysis.

Results: The most frequently isolated species were *C. albicans*, *C. glabrata*, *C. parapsilosis* and *C. tropicalis*. However, 12 other species were identified corresponding to 17% of the yeast isolates. The majority of the non-*C. albicans* was not detected as single colonizers but in co-colonization with one or two other different yeasts, in special with *C. albicans* (19% of the colonized subjects). The colonization with non-*C. albicans* and co-colonization were not independently associated with none of the analysed host-related factors, in particular, they were not significant risks factors for the elderly (age ≥ 65 years) or dental prosthesis wearers. Although statistically not significant, acrylic based prosthesis wearers showed a higher frequency of non-*C. albicans* (23%) than their metal counterparts (10%). The best fitted model indicates that the use of a dental prosthesis is effectively a risk for colonization by yeast in general (odds=3.84, IC95[1.6-9.3], p=0.003), but is not a risk for colonization by non-*C. albicans* species, in particular.

Conclusion: The results of this study do not support the existence of a significant risk for dental prosthesis wearers to be colonized by non-*C. albicans* species. Additionally, it was also shown that elderly, by itself, is not a risk factor to be colonized by those yeast species.

0473 (152207)

Treatment of oral halitosis: chlorhexidine mouthrinses

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Objective: Oral halitosis is commonly associated with volatile sulfur compound (VSC) - producing oral bacteria mainly on the dorsal surface of the tongue. This study examined the effect of a chlorhexidine mouthrinse on oral halitosis and on VSC - producing oral bacteria.

Methods: Oral halitosis was assessed as VSC's >180 ppb and organoleptic scores >3 in 52 subjects between 23 - 79 years including 14 periodontally normal subjects, 21 subjects with plaque-associated gingivitis and 17 subjects with oral halitosis. Subjects were instructed to brush their teeth twice a day with a fluoride-containing dentifrice followed by a one-minute rinse with a chlorhexidine mouthrinse. Subjects were examined at baseline, 2 and 4 weeks for clinical indices and oral malodor. Bacterial samples of dental plaque, saliva, and the dorsal tongue surface were assayed by culture on selective and non-selective media.

Results: After two weeks, all subjects had less oral malodor. Compared to baseline, there were significant reductions in both organoleptic scores and in mouth air sulfur levels. The later was reduced from an average of 253 ppb to 107 ppb (p<0.0001) in the halitosis group and from 114 ppb to 51 ppb (p<0.0001) in the gingivitis group. VSC-producing bacteria and total bacteria were significantly reduced from baseline (p<0.0001) in all three groups with the largest percent reduction in the halitosis group followed by the gingivitis group and the normal group.

Conclusions: Organoleptic measures and mouth air sulfur levels were greatly reduced by two weeks of twice daily brushing with a fluoride-containing dentifrice followed by a one-minute rinse with a chlorhexidine mouthrinse. The number of oral bacteria and VSC-producing bacteria were greatly reduced in dental plaque, saliva, and on the dorsal tongue surface.

0474 (152213)

Treatment of oral halitosis: EO-containing mouthrinses

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Objectives: Oral rinses containing phenolic compounds and essential oils (EO) have been shown to reduce the number of oral bacteria as well as associated gingival inflammation. This four-week clinical study examined the effect of this oral rinse (Listerine) on oral bacteria and gingival inflammation.

Methods: 42 subjects (18 males and 24 females, mean age 47.4 years, range 20 - 75 years) including 17 periodontally normal subjects, 8 subjects with plaque-associated gingivitis and 17 subjects with oral halitosis (>160 ppb volatile sulfur compounds [VSC's]) were examined at baseline, 2 and 4 weeks for probing pocket depths (PD), gingival index, gingival bleeding index (GBI), modified Quigley-Hein plaque index, oral malodor, tongue coating, polymorphonuclear leukocyte (PMN) numbers in an oral rinse sample and plaque bacteria. Subjects were instructed to brush their teeth twice a day with a fluoride-containing dentifrice followed by a one-minute rinse with an EO-containing mouthrinse.

Results: At baseline, the number of PMN's in the oral rinse sample was positively correlated with both gingival inflammation and halitosis. After 4 weeks, there was a significant reduction in PMN numbers in the halitosis group (p<0.0003) and in the gingivitis (p< 0.01) group. VSC's, organoleptic measures, and tongue coating scores were significantly reduced (p<0.0001) only in the halitosis group. Dental plaque and gingival bleeding was reduced in both the halitosis group and in the gingivitis

group. After four weeks, VSC levels in the halitosis group averaged 106 ppb compared to the 230 ppb baseline average ($p < 0.0001$). The number of total bacteria and the number of VSC-producing bacteria were significantly reduced ($p < 0.01$).

Conclusions: Twice daily brushing with a fluoride dentifrice and one minute rinsing with an EO-containing mouthrinse reduced oral halitosis, gingival inflammation, numbers of PMN's, plaque bacteria and VSC-producing oral bacteria in all groups.

0475 (152218)

Use of polymer-based drug delivery coatings in dental implantology

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Objectives: Biofilm-related implant infections are one of the main reasons for short and long term implant failures. Controlled local drug release from the implant surface can efficiently inhibit bacterial colonization and minimizes the risk of an implant infection. In this study, the effect of a polymer-based metronidazole delivery coating on the adhesion of the periopathogenic bacterium *Aggregatibacter actinomycetemcomitans* was evaluated.

Methods: The adhesion of the bacterium *Aggregatibacter actinomycetemcomitans* on polymer/drug-coated titanium specimens was analyzed under dynamic conditions in a flow chamber system. Therefore, titanium discs were spray-coated with a chloroform dissolved mixture of poly(4-hydroxybutyrate) (P(4HB))/metronidazole (70/30 % w/w) and subsequently fixed in custom-manufactured flow chambers. A suspension of *Aggregatibacter actinomycetemcomitans* DSMZ 8324, cultured in brain heart infusion medium under anaerobic conditions, was pumped at a constant flow-rate of 0.8 ml/min over the specimens. As controls, polished titanium discs (titanium grade 4, surface roughness $< 0.2 \mu\text{m}$) and coated discs without incorporated drug were used. After 6h, 12h and 24h, the specimens were removed from the chambers and the biofilm formation was analyzed by scanning electron microscopy.

Results: On the surfaces of the P(4HB)/metronidazole drug delivery coatings, a clear reduction of adhering bacteria was observed in comparison to polished and pure polymer coated discs. The following descending order of the antibacterial effect was observed: P(4HB)/metronidazole coating $>>$ P(4HB) coating $>$ polished titanium surface.

Conclusion: The potency of the P(4HB)/metronidazole drug delivery coating could be demonstrated in vitro. Furthermore, the antibacterial effect against additional periopathogenic bacteria as well as complex mixtures of oral microorganisms has to be investigated within further studies.

0476 (152228)

Effects of Human Neutrophil Defensin-1 on Epithelial Cells

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Objectives: Neutrophilic antimicrobial peptides, namely cathelicidins and α -defensins (human neutrophil defensins, HNP), contribute to the non-oxidative killing of microorganisms. In the present study we tested the effect of HNP-1 on epithelial cell attachment and spread and bacterial adherence on epithelial cells.

Methods: Keratinocytes were incubated with 1, 5, 10, 20, 50 $\mu\text{g/ml}$ of HNP-1 for 24 h. Proliferation and cell death of the epithelial cells were determined with proliferation and cytotoxicity kits. Afterwards, keratinocytes were incubated with non-cytotoxic concentrations (1 or 5 $\mu\text{g/ml}$) of HNP-1 on the fibronectin coated surfaces. Attached and spread cells were counted under a light microscope. *Fusobacterium nucleatum* ATCC 25586 and *Prevotella intermedia* ATCC 25611 were used in analyzing the effect of HNP-1 on bacterial adherence to keratinocytes. Keratinocytes, pre-incubated with 1 or 5 $\mu\text{g/ml}$ of HNP-1, were incubated with bacteria. Attachment of bacteria were determined with a standard antibiotic test. All tests were done triplicate and results were statistically analyzed using the t-test.

Results: Incubation with 1, 5, and 10 $\mu\text{g/ml}$ of HNP-1 slightly increased the keratinocyte proliferation in a concentration dependent manner. Cellular proliferation decreased in concentrations higher than 10 $\mu\text{g/ml}$. Concentrations of 10, 20, and 50 $\mu\text{g/ml}$ of HNP-1 increased the cellular death significantly. Concentrations of 1 and 5 $\mu\text{g/ml}$ of HNP-1 increased the cellular attachment, being highest in the concentration of 1 $\mu\text{g/ml}$. Keratinocytes spread was higher only in the concentration of 1 $\mu\text{g/ml}$. In the concentration of 1 $\mu\text{g/ml}$, HNP-1 decreased the adherence of *F. nucleatum* ATCC 25586. In the concentration of 5 $\mu\text{g/ml}$, HNP-1 increased the adherence of both bacteria, being statistically significant in *P. intermedia* ATCC 25611.

Conclusions: Low doses of HNP-1 play role in the integrity of keratinocytes by increasing their proliferation, attachment, and spread, while higher doses increase the bacterial attachment and keratinocyte death.

0477 (152279)

Changes in oral-microflora of patients with prosthesis on hygiene protocol

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Objective: The aim of this study is to describe the palatal mucosa microbial flora of individuals with complete mucous-supported dentures, before and after introduction of an oral hygiene protocol.

Methods: We observed 120 outpatients at Egas Moniz Dental Clinic, 60 of them complete denture wearers. Each patient was clinically examined and exclusively, the group of subjects with complete denture, was awarded a hygiene kit (dental prosthesis brush-Aquafresh®, cleaning tablets and antibacterial foam- Corega®) along with a protocol that had to be used for 15 days. The material for microbiologic assays was obtained by single swab sampling, cultured on the blood, mitis salivarius, Chapman, Drigalsky and Candida ID agar over 24 – 72 hours, in aerobic and anaerobic conditions and identified. Results were analyzed by applying descriptive and inferential statistics procedures (Chi-square, Fisher and McNemar tests).

Results: Of the 180 samples taken, 292 isolates were obtained. For bacterial morphotypes, it is noted that all patients have Gram + cocci. For Gram - bacilli, levels decrease after hygiene (16.7% to 10%). Species belonging to *Staphylococcus*, *Streptococcus*, *Enterobacteriaceae* and *Candida* were detected in all groups; *Pseudomonas* was only isolated in denture wearers previous hygiene protocol. *Candida albicans* was the most recovered specie in prothetic patients ($p < 0.001$). Concerning opportunistic bacteria and yeasts, there is a decrease after the introduction of the experimental protocol (16% to 8.7% and 70% to 51.7% respectively).

Conclusions: There was proven efficiency in the cleaning protocol under study, causing a remarkable change in the bacterial microflora ($p = 0.031$) and yeast flora ($p = 0.039$) of the individuals with complete mucus-supported denture. Therefore, patients should be properly informed about the products and methods for proper oral hygiene and consequential increase of the prosthesis longevity.

0478 (152273)

Comorbid diseases in patients with premalignant lesions

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Objectives: In oral leukoplakia (OL), local irritation has been considered as a major etiologic factor. Reports on an association with comorbid systemic diseases with oral lichen planus (OLP) are contradictory. Therefore, we have evaluated comorbid diseases in patients with OL and OLP to propose their possible etiologic role.

Methods: Between January 2, 2004 and May 2, 2006, 109 consecutive patients with OL and OLP have been investigated. A comprehensive physical examination and

laboratory analyses were performed. Characterization of lesions occurred with the help of clinical and histological examinations. Subgrouping of lesions was performed on the basis of clinical appearance. OL was classified into homogenous and non-homogenous types. OLP lesions were subclassified into non-erosive, non-atrophic (non-EA) and erosive-atrophic (EA) OLPs.

Results: Twenty-nine OL and 80 OLP lesions were confirmed both histologically and clinically. All patients had at least one and the majority of them had multiple comorbid disorders. There was a significant ($p < 0.01$) association between EA-OLP lesions and previously undiscovered or not optimally treated disorders. All the patients with HCV infections ($n=4$) had EA-OLP lesions ($p < 0.05$). No association with systemic diseases was revealed in respect of OL.

Conclusions: These observations strongly support the hypothesis that systemic diseases may contribute to lesion formation or probably progression in patients with OL and OLP.

The study did not have any funding source.

0479 (152287)

Adult Celiac Disease: Association between Oral Microflora, Caries and Saliva

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Objectives: To investigate whether the oral microflora in adults with celiac disease (CD) differs from that in healthy persons and to test if changes in the oral microflora are associated with high caries experience and reduction in saliva flow rates.

Methods: Nineteen patients with CD (mean age 50.5 ± 14.9 years, 15 women and 4 men) and 10 age- and gender matched healthy controls (47.8 ± 16.8 years) underwent an oral examination with registration of the DMFT/DMFS, plaque- and gingival indices, followed by measurement of unstimulated, paraffin-chewing-stimulated whole saliva and citric-acid-stimulated parotid saliva flow rates, determination of salivary *Streptococcus mutans* and *Lactobacilli* counts (Dentocult® SM Strip mutans and LB) and *Candida* smear from the dorsal part of the tongue.

Results: Unstimulated, chewing-stimulated and stimulated parotid saliva flow rates, DMFT/DMFS, plaque- and gingival indices did not differ between the CD patients and the healthy controls. *Streptococcus mutans* and *Lactobacilli* counts of more than 10,000 CFU/ml (colony forming unit/ml saliva) were more prevalent in patients with CD than in the healthy controls (58% versus 20% and 53% versus 20%). *Candida* hyphae were found in 26% of the patients, but in none of the healthy controls. *Candida* spores were present in 37% of the CD patients and in 20% of the healthy controls. DMFT/DMFS were associated with age in both groups, but not with salivary flow rates or bacterial counts.

Conclusion: Our results indicate that whole saliva and parotid saliva flow rates are not reduced in adults with CD and caries experience is not increased compared to that of healthy controls. However, the patients showed higher counts of *Streptococcus mutans* and *Lactobacilli* and a higher number of *Candida* hyphae which may be ascribed to changes in the local and systemic immunological response to oral bacteria and fungi. The study was supported by the Danish Dental Association.

0480 (152291)

The Role of Stress in Bruxism - A Comparative Study

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Introduction: The role of stress, emotional and physical, in bruxism has been discussed for a long time. Stress and anxiety are implicated in its etiology, in addition to precipitating, stress is also reported as predisposing and maintenance factor of bruxism and the prevalence of stress in individuals with bruxism is significantly higher when compared with patients without bruxism.

Objectives: Analysis of the relationship of results of clinical features and anxiety in bruxism, comparing them, similarly, with two different groups, the stress group and the general population group.

Material and Methods: Comparative cross-sectional study in a non-randomized sample of 45 individuals; the experimental group (bruxism diagnosis, $n = 15$), the control group 1 (group of Stress - diagnosis of Anxiety Disorder, $n = 15$) and control group 2 (general population, $n = 15$). Beyond the Clinical Evaluation (intra and extra-oral objective examination and functional examination; X-Ray examination; BruxChecker) the Characterization Questionnaire, Symptom Questionnaire (S. - SCL) and Rating Scale Hamilton Anxiety (HAMA) were used. Statistical procedures were performed using the Statistical Package for Social Sciences - SPSS 18 software.

Results: Diagnosis of bruxism (sleep, daytime or daytime and sleep) in 84.4% of the total sample. Statistically significant results and a positive correlation between the variables severity of bruxism, dental wear, general, physical and emotional anxiety symptoms.

Conclusions: Regardless of the group, with a previous diagnosis of Bruxism or Anxiety Disorder or not, bruxism is present in most of the sample study, however, with varying degrees of severity and frequency of the clinical features analyzed. Individuals with bruxism differ from those with anxiety disorder, not by the clinical signs and symptoms manifested, but rather by their severity. There is a significant positive association of stress and anxiety with bruxism, their contributing role, in maintaining and / or aggravation.

0481 (152302)

Analgesic and healing effects of diode laser on recurring aphthosis

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Objective: One of the most frequent pathologies of the oral cavity is recurring aphthous stomatitis (RAS). This multifactor immunologic inflammatory lesion causes patient discomfort, and treatment is controversial because of its unknown etiology. The aim of the present study was to assess the effect of Diode Laser on the control of pain and the repair of RAS.

Materials and Methods: 30 patients with RAS (both sexes, mean age 34 years, no smoking) were divided into an experimental group of 15 patients treated with Diode Laser and a control group treated with a topical corticoid agent. The first group was treated with diode laser with wavelength of 670 nm, 50 mW, 3 J/cm(2) per point in daily sessions (once per day) on consecutive days. The second group received conventional treatment with triamcinolone acetonide 4 times per day. Both treatments were applied until the disappearance of the lesions. Pain intensity before and after treatment and clinical measurement of lesion size were determined daily for all patients.

Results: The results revealed that 81% of the patients reported a reduction in pain in the same session after laser treatment, and total regression of the lesion occurred after 4 days. Total regression in the corticoid group was from 4 to 7 days.

Conclusions: The use of diode laser demonstrated analgesic and healing effects on recurring aphthous stomatitis.

Comparison of cryogun or cotton-swab cryotherapy for oral leukoplakiaH.-P. LIN¹, H.-M. CHEN², S.-J. CHENG¹, C.-H. YU³, and C.-P. CHIANG⁴¹Graduate Institute of Clinical Dentistry, National Taiwan University, Taipei, Taiwan, ²Graduate Institute of Oral Biology, School of Dentistry, National Taiwan University, Taipei, Taiwan, ³Institute of Stomatology, Chung Shan Medical & Dental College, Taichung, Taiwan, ⁴Graduate Institute of Clinical Dentistry and Graduate Institute of Oral Biology, School of Dentistry, National Taiwan University, Taipei, Taiwan**Objectives:** Oral leukoplakia (OL) is a common oral premalignant lesion. Our previous study showed that cotton-swab cryotherapy (CSC) is an alternative treatment modality for OL lesions. This study was designed to test whether the liquid nitrogen spray with a cryogun (cryogun cryotherapy, CC) was also an effective treatment modality for OL lesions and whether the CC is a more effective treatment modality than the CSC.**Methods:** This study used the CC to treat 60 OL lesions in 54 patients. The clinical outcomes of OL lesions treated with either the CC or CSC were compared.**Results:** Complete regression (CR) was achieved in all 60 OL lesions after an average of 3.1 ± 1.3 treatments of CC. We found that 60 OL lesions treated with CC needed significantly fewer treatments to achieve CR than 60 previously reported OL lesions treated with CSC (mean, 6.3 ± 3.8 treatments). The number of CC treatments required to achieve CR was significantly fewer for OL lesions on oral mucosal sites other than the tongue, those $< 2 \text{ cm}^2$, those with epithelial dysplasia, and those with a surface keratin thickness of $< 55 \text{ }\mu\text{m}$. However, only the surface keratin thickness ($p = 0.005$) was an independent factor influencing the number of CC treatments required to achieve CR by multivariate Cox proportional hazard regression analyses.**Conclusions:** For treatment of OL lesions, the CC is a more effective treatment modality than the CSC.**Ameloblastoma: A Multicentric Study**K. DHANUTHAI¹, S. CHANTARANGSU¹, S. ROJANAWATSIRIVEJ¹, E. PHATTATARATIP¹, M. DARLING², L. JACKSON-BOETERS², N. SAID-AL-NAIEF³, H.I. SHIN⁴, C.-H. AN⁴, N.T. HONG⁵, P.H. AN⁶, W. THOSAPORN⁷, A. LAM-UBOL⁸, and A. SUBARNBHESAJ⁹¹Department of Oral Pathology, Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand, ²Department of Pathology, University of Western Ontario, London, ON, Canada, ³University of the Pacific, San Francisco, USA, ⁴Kyungpook National University, Daegu, South Korea, ⁵Oral Pathology, University of Medicine and Pharmacy, Ho Chi Minh City, Vietnam, ⁶University of Medicine and Pharmacy, Ho Chi Minh City, Vietnam, ⁷Chiang Mai University, Chiang Mai, Thailand, ⁸University of Iowa, Iowa City, IA, ⁹Khon Kaen University, Khon kaen, Thailand**Objectives:** To supplement the current ameloblastoma database by reporting the clinic-pathologic features of ameloblastoma from Asia; Thailand, Vietnam and Korea and North America; Canada and The United States of America.**Materials and methods:** Biopsy records of the participating institutes were reviewed for lesions diagnosed as ameloblastoma during the year 1993-2009. Hematoxylin & eosin-stained glass slides were reviewed and re-classified according to the WHO Classification of Odontogenic Tumours in 2005. Clinical information as well as radiographic features was collected and analyzed.**Results:** The age of the patients in this study ranged from 4 to 107 years with the mean \pm SD = 38.27 ± 17.78 years. Six hundred and sixty two patients (51.36%) were males, while 627 patients (48.64%) were females. Mandible outnumbered maxilla and other locations combined in all countries. Soft tissue lesions were encountered in only 4.27% of the cases. Radiographically, the number of multilocular radiolucency cases (43.40%) was comparable to that of the unilocular radiolucency ones (42.04%), while 46 cases (4.16%) demonstrated mixed radiolucent-radiopaque pattern. Follicular pattern was the most common histopathologic pattern (27.70%) followed by plexiform (21.10%) and unicystic pattern (20.71%), respectively.**Conclusions:** the clinico-pathologic parameters of ameloblastomas in the present study show some similarities with previous studies. However, minor differences still exist. The clinico-pathologic features of ameloblastomas in Asia differ from those of the ameloblastomas in North America with respect to age, gender and radiographic features. The differences may be partially accounted for by ethnic influences, accessibility to treatments, documentation, and the availability of data.**Study of LINE-1 Methylation in Oral Epithelium of Smokers**S. WANGSRI¹, K. SUBBALEKHA¹, and A. MUTIRANGURA²¹Department of Oral and Maxillofacial Surgery, Chulalongkorn University, Bangkok, Thailand, ²Anatomy, Chulalongkorn University, Bangkok, Thailand

The contributory mechanism of tobacco smoking to oral cancer is not well understood. However, many studies confirmed that methylation of long interspersed nuclear element-1s (LINE-1s), the most common repetitive sequence in human genome, decreased in many cancers. Moreover, hypomethylation of LINE-1s could be detected from oral rinses of oral squamous cell carcinoma (OSCC) patients. Since oral epithelia directly contact with chemical gradients of tobacco. Therefore, it is interesting to study LINE-1 methylation levels in the oral epithelial cells.

Objective: To investigate methylation levels of LINE-1s in oral epithelium of smokers in comparison with non-smokers.**Methods:** Oral epithelia were collected from oral rinses of current smokers (n=96), former smokers (n=17) and non-smokers (n=60). Methylation levels of LINE-1s were assessed by combined bisulfite restriction analysis polymerase chain reaction (PCR) of LINE-1s (COBRA LINE-1). One-way ANOVA was used for statistical analysis.**Results:** LINE-1 methylation levels differed significantly among current smokers, former smokers and non-smokers ($32.04\% \pm 3.55$, $30.53\% \pm 3.71$ and $34.46\% \pm 3.47$, respectively, $p < 0.0001$). In addition, an inverse association between methylation levels and the number of cigarettes/day as well as number of years smoking was observed. LINE-1 methylation gradually decreased as number of cigarettes/day and years of smoking increased.**Conclusions:** Our findings suggested an association between smoking behavior and LINE-1 methylation level in oral epithelium. Future studies should focus on LINE-1 methylation aberrations associated with the progression from normal to potentially malignant disorders of oral mucosa in a long term follow up of smokers, former smokers and non-smokers.**Study of LINE-1 Methylation in Salivary Mucoepidermoid Carcinoma**P. SIRIVANICHUNTORN¹, N. KITKUMTHORN², K. SUBBALEKHA³, and A. MUTIRANGURA⁴¹Oral and maxillofacial surgery, Faculty of dentistry, Chulalongkorn university, Bangkok, Thailand, ²Oral and maxillofacial pathology, Faculty of dentistry, Mahidol university, Bangkok, Thailand, ³Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand, ⁴Anatomy, Faculty of medicine, Chulalongkorn university, Bangkok, Thailand

Mucoepidermoid carcinoma (MEC), the most common malignant tumor of salivary gland, is usually subclassified as low, intermediate, and high grade based on its histologic features. MEC composes of mainly three cell types (squamous, mucous and intermediate cells) which indicates histological grades and reflects clinical behavior. Most cancers have decreased methylation level of long interspersed nuclear element-1s (LINE-1s). However, there is no study of LINE-1 methylation in MEC and also among cellular components in whole tumor tissues.

Objective: To investigate methylation levels of LINE-1 in Salivary MEC in comparison with normal salivary gland.**Method:** Here, we compared LINE-1 methylation levels between normal salivary gland and MEC. Moreover, we also investigated LINE-1 methylation levels among squamous cell group (S; n=14), mucous cell group (M; n=16), intermediate cell group (I; n=4) and normal cell group (N, n=13) in laser-captured microdissected MEC tissue. Combined bisulfite restriction analysis of LINE-1 (COBRALINE-1) was performed to measure LINE-1 methylation levels. Independent t-test and one-way ANOVA were used for statistical analysis under the consumption.**Results:** Methylation levels of LINE-1s differed between normal salivary gland (n=16) and MEC (n=12) significantly ($31.13\% \pm 2.45$, $25.76\% \pm 2.81$, respectively,

$p < 0.001$) The percentage of LINE-1 methylation among cell types showed stepwise decreased from N group ($30.18\% \pm 1.99$), I group ($27.79\% \pm 1.79$), M group ($26.30\% \pm 1.32$) and S group ($24.13\% \pm 2.02$), respectively. The p-value in each group was significantly observed (N:M and N:S < 0.001, M:S = 0.009, S:I = 0.004) However, there is no significant difference in N:I group and M:I group ($p = 0.102$ and 0.453 , respectively).

Conclusions: Our findings suggested that LINE-1 methylation was decreasing during morphological progression from normal cell to MEC cell subtypes and might be associated with multistep carcinogenesis of mucoepidermoid carcinoma. Hence, this epigenetic event may be useful for MEC diagnosis, prognostic prediction and other clinical implications.

0486 (151940)

Can the diagnosis of primary Sjögren's syndrome be simplified?

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Subjective sicca symptoms of the mouth (xerostomia) (12%) and eyes (keratoconjunctivitis sicca) (20%) are commonly reported in Iceland, especially among women. Sometimes symptoms are associated with autoimmune disorders. Most patients do not, however, fulfil European-US criteria for the diagnosis of primary (pSS) or secondary (sSS) Sjögren's Syndrome. Investigations necessary to confirm a diagnosis of pSS are time-consuming and costly.

Objectives: This retrospective study aimed to determine which of the numerous criteria measured were best associated with the final diagnosis of pSS.

Methods: Extended data from a consecutive series of 37 referred female patients with presumed pSS were examined for evaluation of data on autoimmune status, salivary flow, ophthalmic investigation, salivary gland scintigraphy and labial gland biopsy.

Results: 12 (32%) patients met the EU-US-criteria for pSS, 7 (19%) had sSS. Significant differences between pSS and non-pSS were found for: SSA, SSB, ANA, unstimulated salivary flow, Schirmer and Rose Bengal tests, scintigraphy, and labial gland biopsy ($p < 0.001$). No significant differences were found for either RF or stimulated salivary flow. High sensitivity (0.92) was found for ANA. SSA and SSB had high specificity as did ANA and Schirmer tests taken together. As regards scintigraphy, parotid uptake of $^{99m}\text{TcO}_4$ 15 min. post injection, and uptake ratio (UR) gave a high specificity of 0.80 and 0.79 respectively. UR and stimulated salivary flow taken together had a specificity of 0.94. Biopsy had a sensitivity of 0.50 but a specificity of 0.80.

Conclusions: If both ANA and Schirmer are negative, pSS is unlikely. If both SSB and Schirmer are positive pSS is likely, also if both stimulated salivary flow and UR are positive. Positive SSA gives rather high suspicion of pSS. While no single test confirms a diagnosis of pSS, a structured approach to investigations could increase diagnostic reliability without undue costs and patient inconvenience.

0487 (151943)

Cytotoxicities of tooth surface modifiers having antibacterial potency

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Objectives: We have considered that decreasing the surface free energy of tooth surface may contribute to prevention of caries and periodontal disease. Recently we have successfully synthesized two antibacterial silane coupling agents, named N-allyl-N-decyl-N-methyl-N-tri-methoxysilylpropylammonium iodide (10-I), N-allyl-N-methyl-N-trimethoxysilyl-propyl-N-octa-decylammonium iodide (18-I). The aim of this study was to investigate the cytotoxicities of these modifier agents.

Methods: The glass plates were dipped in a 20mM of 10-I and 18-I solutions for 1 hour at 20 °C, and then were sterilized in an autoclave for 20 minutes at 121 °C. The modified glass plates were immersed in cell culture medium (MO5) for 24 hours at 37 °C to examine the extraction procedure toxicity. The extracted medium (100 %) was diluted with the MO5 into ten different concentrations (0.5 – 50 %). 0.5 ml of the V79 cell suspension (100 cells / ml) was seeded on 24 well cell culture well plate and pre-incubated for 6 hours at 37 °C in a 5% CO₂ atmosphere. After removal of MO5, the 0.5 ml of the extracts containing MO5 was poured onto the cell culture of V79 cells. After 6-day cultivation, cells were stained with 0.1% methylene blue solution, and calculated.

Results: The cytotoxicities of various modified agents were evaluated according to the 50% inhibitory concentration (IC₅₀). The IC₅₀ value of 18-I was 18.8%, while the IC₅₀ values of 10-I showed more than 100%.

Conclusion: These results suggested that the 10-I have no cytotoxicity, though the 18-I has moderate cytotoxicity.

0488 (152031)

TNF-a and IFN-gamma gene polymorphisms/haplotypes in oral lichen planus

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Objectives: Genetic alterations of the immune-response mediators, cytokines may strongly implicate in the pathogenesis of oral lichen planus (OLP). The aim of the present study was to investigate the prevalence of Tumor Necrosis Factor- α (TNF- α) and Interferon-gamma (IFN-gamma) gene polymorphisms and haplotypes in OLP.

Methods: Gene polymorphisms and haplotypes of IFN-gamma +874, TNF- α -238, and TNF- α -308 were detected in 40 patients with confirmed OLP from Northern Greece compare to 39 healthy individuals with similar age-gender characteristics. Cytokine typing was performed using the LIFECODES Cytokine-sequence-specific-oligonucleotides (SSOs) Typing Kit (GEN-PROBE Transplant Diagnostics, Inc) for polymerase chain reaction (PCR).

Results: No differences were found between OLP patients and controls for IFN-gamma +874 genotype distributions or A,T alleles frequencies ($p = 0.701$), as well as TNF- α -308 genotypes or A, G alleles frequencies ($p = 0.275$). In contrast, significant differences were observed in the frequencies of A/G, G/G genotypes ($p = 0.0001$) and A, G alleles ($p = 0.0002$) in TNF- α -238 position.

Conclusions: In contrast to researches for other ethnicities, this study suggests a strong association between gene polymorphism/haplotype in TNF- α -238 but not TNF- α -308 in OLP patients of Northern Greece. Furthermore, according to our results, the IFN-gamma +874 is not implicated in the genetic background of Northern Greek OLP-patients.

0489 (152203)

Antibacterial action of photoactivated disinfection (PAD) on endodontic bacteria

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Objectives: To determine the antibacterial effect of photoactivated disinfection (PAD) on *Enterococcus faecalis* biofilms in experimentally infected root canals.

Methods: 50 single-rooted extracted teeth with one root canal were flared using Revo-S instruments (size 25, 0.06 taper). Teeth were autoclaved and infected with a clinical isolate of *E. faecalis* for three days. Samples were taken using paper points to determine the presence of *E. faecalis* in the root canals. For the antimicrobial treatment the teeth were divided into two groups. In the first group teeth were treated using the PAD system (Aseptim Plus, SciCan, Germany), consisting of the photosensitizer Aseptim Solution, a toloum chloride solution and the PAD light source at 635 nm and sampled with paper points. Teeth were treated with Aseptim Solution and the PAD light source for a second time and sampled. In the second group root canals were rinsed with 5 ml of 20% citric acid. After sampling with paper

points, root canals were treated with Aseptim Solution and the PAD light source. Another sample was taken. Survival fractions of the samples were calculated by culturing on blood agar and counting colony-forming units.

Results: Treatment of root canals with PAD alone caused a reduction of bacterial load, resulting in a 76,6% kill of *E. faecalis*. A repeated PAD treatment killed 95,9% of *E. faecalis*. Rinsing root canals with 20% citric acid achieved a reduction of 93,7% and the combination of 20% citric acid irrigation and PAD reduced bacterial viability by 97,3%.

Conclusion: Photoactivated disinfection killed *E. faecalis* in human root canals. A second application of PAD leads to a more effective disinfection. PAD is not an alternative but a possible supplement to existing protocols of root canal disinfection. Disruption of the biofilm prior to PAD remain mandatory for adequate root canal disinfection. >

0490 (151282)

Can masseter stiffness become an index for evaluating massage treatment?

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Objective: To examine the masseter stiffness, the masseter thickness and the maximum occlusal force in patients with myofascial pain, and to analyze their changes after massage treatment.

Materials and Methods: Sixteen patients with temporomandibular joint dysfunction with myofascial pain were enrolled in this study. Their age ranged from 26 to 69 years, and the median age was 41 years. They were informed of the aim of the study, and provided their consents before participating. Four male and 8 female patients had the unilateral masseter pain, and the 4 female patients had suffered the bilateral masseter pain. The stiffness of the bilateral masseter muscles were measured using NEUTON TDM-N1. The thickness of the bilateral masseter muscles were measured on sonographic images with LOGIQ E9. Elastographic images were taken together. The maximum occlusal force was measured on the bilateral first molars using Occlusal Force Meter GM10. All patients undertook the massage treatment using a specially fabricated robot (WAO-1). After massage treatment, the masseter stiffness, the masseter thickness and the maximum occlusal force were measured.

Results: In patients with the unilateral masseter pain, the masseter stiffness of the symptomatic side was larger than those of the contralateral side ($p < 0.05$). In patients with the bilateral pain, there was a significant right-and-left difference ($p < 0.05$). There were no significant right-and-left difference in the masseter thickness and the maximum occlusal force. After massage treatment, VAS score of pain decreased. The masseter stiffness and thickness significantly decreased and the maximum occlusion force significantly increased ($p < 0.01$). Sonographic elastographic images before and after the treatment were presented.

Conclusion: The masseter stiffness in patients with myofascial pain had a significant laterality, and it significantly decreased after the massage treatment. Therefore, the masseter stiffness may have the possibility of an index for evaluating therapeutic gain.

0491 (151305)

New Adjunct Test for Oral Malodour: Pre Clinical Validation

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Introduction: Until now the application of biogenic amines as clinical markers of oral malodour has been limited because of technical complexity.

Objectives: This study aimed to characterize a colour reaction caused by a newly discovered diamine oxidase, isolated and purified from *Lathyrus cicera* seedlings, detecting amines in saliva.

Methods: The linearity of the colour reaction towards the concentration of amines was assessed by recording the absorbance (515 nm) of a dilution series of a mixture of amines (cadaverine and putrescine). The stability was evaluated by the measurement of the colour loss over time (every 15 minutes during 8 hours). In order to evaluate the reaction visually, a 5- and a 10-point scale were developed by transferring the colour of selected dilutions of a mixture of amines into a computer-based pink-colour palette. The standard addition method was used to estimate the amount of amines detected by the new test. A known concentration of cadaverine and putrescine was added 4 times and the absorbance was measured. A linear-curve ($y = \text{absorbance}$, $x = \text{concentration}$) was used to determine the initial sample concentration. Cadaverine and putrescine concentration in saliva were determined also by gas chromatography – mass spectrometry (GC/MS).

Results: The enzymatic reaction was linear ($r^2 0.99$) and stable for at least four hours (colour decay < 10% of initial response). Strong correlations were found between the concentrations of cadaverine and putrescine determined by GC-MS, the calculated concentration (standard addition method) and the color score of the enzyme test.

Conclusions: the results of the new test showed to be representative for the presence and concentration of amines in saliva. The reaction was shown to be linear and stable for sufficient time to allow accurate colour evaluation. The test results can be interpreted by means of a simple colour scale.

0492 (151393)

Measure of Anxiety's Criteria of Dental Students Ending Clinical Training

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Objectives: the aim of this study was to identify anxiety's criteria of dental students at the end of their two years of clinical training in a French dental hospital.

Method: we make an index form with 17 criteria of anxiety (Gillet D., IADR Barcelona 2010): 8 clinical criteria (CC): diagnosis, surgery, prosthesis (fixed, total, partial), restorative, endodontic and pedodontic treatments, and 9 environmental criteria (EC): management of general pathologies, ergonomics, administrative, material organisation, relations with adult and young patients, teachers, hospital personal and prosthesis laboratory. After their two years of clinical training, the 87 students have to answer at the question "Are you anxious with..?" by putting a cross on a 100mm line (from 0 for no anxiety to 100 for maximal anxiety) in front of each criterion in function of their feeling about each criterion. Scores are collected by direct measurement with a graduated ruler. Each expressed score is the average of the 87 values and a Multiple Range Test is performed on the data.

Results: general score of anxiety is 28.7 ± 8.1 . There is no significant difference between men (27.3 ± 6.7) and women (29.7 ± 10.1), $p > 0.05$. CC (33.9 ± 6.4) are significantly most stressful than EC (24.1 ± 6.6), $p < 0.05$. Within CC, results are: restorative treatmentsa (21.3 ± 17.2), diagnosis (b) (28.9 ± 19.6), prosthesis [partial]b (30.9 ± 20.4), totalb (33.6 ± 21.4), fixedc (37.9 ± 22.6), surgeryc (38.5 ± 24.7), endodonticc (39.2 ± 22.6) and pedodonticc (40.7 ± 20.7) treatments.a,b,c are three homogeneous groups significantly different, $p < 0.05$. Within EC, relations with young patients (36.9 ± 24.1), are significantly the most stressful, $p < 0.05$.

Conclusion: at the end of their clinical training in a French dental hospital, the students say that dental treatments performing get them more anxiety than environmental criteria. The young patients are the most stressful, whether it's for the care or for the relational.

Evaluation Of Dental Research Activity By A Country Performance Index

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The importance of the International Association for Dental Research (I.A.D.R.) congress to evaluate research activity has already been demonstrated (BERARD A. et al. J Dent Res 87 (Spec Iss C).

Objectives: The aim of this study was to measure the research efficacy (in I.A.D.R. congress) of five European countries in 2010.

Method: step one: With the search engine of the I.A.D.R. website, we used the term of each country for the Barcelona I.A.D.R. Congress (2010). To select one publication per European country, the first author only was retained with the European country associated. Step two: the number of inhabitants (in millions) of each country was noted in the Europa website. Step three: a "Country Performance Index" (C.P.I.) was created by dividing the number of countries' abstracts by the number of inhabitants.

Results: C.P.I. values were as follows: Sweden 41/9.2 = 4.45, Germany: 288/82 = 3.51, Hungary: 17/10 = 1.7, Romania: 25/21.5 = 1.16, France: 64/64.3 = .99. Germany had the largest number of abstracts (288) followed by France and Sweden. However, Sweden had the best C.P.I. (4.45) followed by Germany (3.51) and Hungary (1.7), with France having the lowest C.P.I. (.99)

Conclusion: This C.P.I. provides clear comparison between the dental research activity of countries with a view to encouraging dental research in all countries.

Comparison of the Airwayscope® Versus Macintosh Laryngoscope in Tracheal Intubation

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Introduction: The Airway Scope® (AWS, S-100, Pentax, Tokyo, Japan) is a fairly new video laryngoscope used in tracheal intubation. Recent studies have reported that the AWS is a useful tool for tracheal intubation, particularly in patients in which airway management is difficult. It has thus far remained unclear, however, if the AWS is more efficient than the Macintosh laryngoscope for tracheal intubation in normal airway patients. In this study, we performed a meta-analysis of randomized controlled trials to compare the success rate of tracheal intubation at first attempt, using the AWS or the Macintosh laryngoscope in normal airway patients.

Methods: A comprehensive search of the literature was conducted to identify clinical trials comparing tracheal intubation using the AWS with the Macintosh laryngoscope. Two reviewers independently assessed each report to confirm that all reports met our inclusion criteria. Prospective randomized trials comparing tracheal intubation using the AWS and tracheal intubation using the Macintosh laryngoscope were included for further analysis. The data from each trial were combined using the Mantel-Haenszel fixed-effects model to calculate the pooled odds ratio (OR) and their corresponding 95% confidence intervals (CIs). Funnel plots were used to assess publication bias.

Results: Four randomized controlled trials met our inclusion criteria. Among four trials with 880 patients, the success rate of tracheal intubation at the first attempt with the AWS was significantly higher than that with the Macintosh laryngoscope (OR = 3.14; 95% CI, 2.06–4.79; p < 0.00001). The heterogeneity of the data was not statistically refuted. Publication bias was evident in a funnel plot.

Conclusions: Our analysis revealed that the AWS provided a higher success rate of tracheal intubation compared with the Macintosh laryngoscope in normal airway patients.

In Vivo Evaluation of DIAGNOdent for Detection of Approximal Caries

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Objective: The accurate diagnosis of approximal caries is generally considered to be difficult. The aim of this study was to compare the diagnostic efficacy of the DIAGNOdent laser fluorescence device with traditional methods, namely visual inspection and bitewing radiographs, for the detection of approximal caries.

Material & Methods: 224 molars in 20 patients were diagnosed: (12 female, 8 male) with an average age of 26.70 (± 2.82) years participated in this study. Drop-out-rate was 0%. Every test tooth was assessed by one examiner sequentially by visual inspection, bitewing radiography, and DIAGNOdent. However, radiography and DIAGNOdent measurements were carried out in two different appointments. Radiographs were used as gold-standard to calculate an appropriate cut-off. If there was a necessity of caries removal, the cavities were visually assessed, and the level of caries was determined.

Results: For approximal caries at D3 level, the highest values of specificity and sensitivity were observed for the DIAGNOdent at a cut off value of 15 (96.8 % and 83.0%).

Conclusion: Within the limitations of this study, the results showed that at D3 level (cut off of 15), the DIAGNOdent showed the highest values of sensitivity and specificity. Therefore, the DIAGNOdent device is recommended to be used as adjunct in approximal caries diagnosis and treatment planning.

Tooth Brushing in Elderly: a randomized triple crossover trial

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Objectives: Purpose of this study was to evaluate the influence of brush type and oral hygiene instruction on the development of oral hygiene parameters in self-dependent and nursed elderly.

Methods: In the greater Düsseldorf area, Germany 72 elderly aged between 60 and 90 years were randomly selected from a nursing home (n=36) and a dental office (n=36). All 44 women and 28 men were assigned to 6 groups (A-F), each providing a different sequence of 3 various brush types (1.manual: Meridol sensitive; 2.oscillating: Oral-B Professional 500; 3.ultrasonic: Oral-B Sonic Complete). Additionally, half of each group received oral hygiene instructions weekly. Throughout each of all three two-week periods various oral hygiene parameters (Quigley-Hein-Index (QHI), Papillas-Bleeding-Index (PBI), and Denture-Hygiene-Index (DHI)) were recorded initially, and finally (after 2 weeks). Each examination period was followed by a one-week washout period. Significance was tested by one-way ANOVA and Duncan post-hoc test (level:p<.05).

Results: Oral hygiene parameters depended on age, care level, mental and physical condition. On average, self-dependent elderly had more remaining teeth and showed lower QHI-values than nursed elderly. The sequence of brushing had no significant influence on oral hygiene parameters, however the brush type revealed significant differences; electric brushing was superior to manual brushing (p=0.004). Manual brushing showed jaw- and side-specific differences. Basically, the DHI remained nearly constant over the whole investigation period. Influence of oral hygiene instructions was not shown (p=0.728). Differences between self-dependent and nursed seniors were not significant (p=0.153), except in some manually, visually or mentally impaired nursed elderly.

Conclusion: Efficiency of electric tooth brushes in elderly is obvious, whereas oral hygiene instructions did not significantly influence brushing quality in self-dependent elderly. Hence, we conclude that electric brushing in constrained elderly accomplishes an oral hygiene level which is comparable to those of manually brushing self-dependent seniors.

0497 (151617)

Effect of Chlorhexidine on Outcome of Pulpectomy in Primary Molars

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Purpose: The aim of this study was to evaluate the effect of 2% chlorhexidine compared with saline solution on the outcome of pulpectomy in primary molars.

Methods: Sixty-four mandibular primary molars from 40 children (average age 5.5±1.3 years) met the inclusion criteria. Chlorhexidine or Saline solution was allocated to each tooth by stratified randomization. A 1-visit pulpectomy and stainless steel crown was performed by 1 investigator. The clinical and radiographic diagnoses were blindly assessed by 2 calibrated investigators.

Results: At 6 months, the overall success rates were 100% for chlorhexidine group and 83.3% for saline solution. At 12 months, the overall success rates were 96% and 100% for chlorhexidine and saline solution groups, respectively. Using chi-square test, the outcomes were significantly different at 6 months, but not significant at 12 months.

Conclusion: Outcome of pulpectomy in primary molars might be enhanced by the use of 2% chlorhexidine at 6 months. Both irrigants gave comparable results at a longer period of time. (This study was supported by funding from the faculty of Dentistry, Chiang Mai University, THAILAND.)

0498 (151401)

New Adjunct Test for Oral Malodour: Clinical Utility

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Introduction: Until now, the application of biogenic amines as clinical markers of oral malodour has been limited because of the complexity of the techniques for their detection.

Objectives: The aim of this study was to evaluate the utility, as an adjunct test in the oral malodour diagnosis, of a simple colorimetric method able to detect amines in saliva.

Methods: Non stimulated saliva samples were collected from 100 volunteers with different degrees of oral malodour at a multidisciplinary consultation for bad breath. The colour developed by the saliva in contact with the new test was checked employing a 10-point colour scale developed ad hoc. The test results were correlated with the organoleptic score (OLS) and the volatile sulphur compounds (VSC) and compared with other salivary colour test (BANA test, beta-Galactosidase and Ninhydrin method). The difference between the results of the new test in patients with and without oral malodour was assessed. The sensitivity (Se), specificity (Sp), and positive (PPV) and negative predicted value (NPV) of the new test was calculated. A linear regression model was used to check whether the test improves the relation between the OLS and VSC measurements.

Results: The test results correlated with the OLS ($r = 0.5488$; $p < 0.0001$) and the VSC ($p = 0.5221$; $p < 0.0001$). The colour scores of patients without halitosis were significantly different from the colour scores of patients with halitosis (Mann-Whitney U-test, $p < 0.0001$). The Se, Sp and PPV, NPV of the new test were 75%, 77.1%, 78% and 74% respectively. The p-value for the addition of a variable to the model was 0.0001.

Conclusions: The amines in saliva detected by this test explain part of the OLS variability that VSC doesn't. Our results support the "fit for purpose" of the test as adjunct tool for the diagnosis of oral malodour.

0499 (151960)

Importance of the root-crown ratios in different populations

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Objectives: The aim of our study was to determine the root-crown ratios of the Japanese, Hungarian and German healthy, young populations according to jaws, genders and tooth-types; and to get know if this method is acceptable to follow-up the apical root resorption side effect, which can occur due to orthodontic treatment, in all investigated nations.

Methods: 104 Japanese, 95 Hungarian and 102 German patient's panoramic X-rays were investigated according to Lind's index. The panoramic x-rays were performed at Semmelweis, Asahi and Freiburg University between 2001-2008. One way ANOVA, two tailed t-test were used for evaluation the data.

Results: One way ANOVA showed that there is significant difference between genders, nations and tooth-types ($p < 0.0001$). T-test showed that males tended to have higher R/C ratios than females ($p \leq 0.001$ -NS). The ratios of the antagonist teeth were significantly higher in the mandible except the non-significant differences in the Japanese population; with the exceptions ($p \leq 0.001$ -0.05) of the lateral incisors (Hungarian population); central incisors and canines (German population). The average apical root resorption measured during orthodontic treatment made more R/C ratio change than the methodological error in all investigated countries ($p \leq 0.001$).

Conclusion: Root-crown ratio seems to be a representative factor for the jaws, genders and tooth-types although the nations must be investigated separately. The present method can be reliably used for assessment of R/C ratios from PRGs, especially when determining the apical root resorption due to orthodontic treatment.

0500 (151835)

Endodontic Working Length Control by Hand and Mtwo Rotary Instrumentation

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Objectives: The working length determination is carried out before the root canal preparation. We investigated the difference between hand instrumentation and preparation with nickel-titanium rotary instruments, how the preoperative defined working length was respected, and the possibility of length changes when using larger instruments.

Methods: By forty extracted upper molars the working length of the mesiobuccal root canal was estimated, and the teeth were fixed in acrylic blocks integrated in a mandibular arch model at the corresponding anatomical position in a dummy head. The root canal preparation was carried out in 1. group (n=20) with hand preparation (K-files, VDW, Munich, Germany) and in 2. group (n=20) with nickel-titanium rotary instrument (Mtwo, VDW, Munich, Germany). Vestibulo-oral and mesio-distal directional x-ray images were taken from each sample before the preparation with #10 K-file, inserted into the mesiobuccal root canal to the working length, and after preparation with #25, #30 and #40 files which were used during the enlargement of the canals. The distances between the radiological apex and the instruments were measured and compared to the distances measured on the preoperative X-ray image.

Results: There was significant difference ($p < 0.05$) in the 2. group between measurements with #10 and #40 files only on the vestibulo-oral x-ray images, while in the 1. group all three sizes show significant differences in both x-ray images ($p < 0.05$) (ANOVA). With regression analysis we found by the hand instruments a significant trend of work length shortening, with a mean of 0.022mm increase of the radiographic apex-instrument distance ($p < 0.01$) in relation to the size of instruments used. In the rotary prepared group the increase of distances shows neither significant regression nor linear relation.

Conclusion: We found that using nickel-titanium rotary instruments the estimated working length strictly respected, what could notably contribute to more successful therapeutic intervention.

Development of real 3D dental X-rayG. BERKEI¹, P. KIS¹, M. GYURKOVICS², I. STUBER³, C. KOROM⁴, and Z. LOHINAI²¹Faculty of Dentistry Semmelweis University of Medicine, Budapest, Hungary, ²Department of Conservative Dentistry, Semmelweis University of Medicine, Budapest, Hungary, ³Faculty of Physical Education and Sport Sciences, Laboratory of 3D morphology and movement analysis, Semmelweis University of Medicine, Budapest, Hungary, ⁴Department of Radiology and Oncotherapy, Semmelweis University of Medicine, Budapest, Hungary

Objectives: The aim of our group was the implementation of the nowadays widely used real three-dimensional (3D) visualization technology to dental X-ray diagnostic procedures. With the real 3D imaging we wanted to develop a user-friendly method, which is available for all those who have a common digital X-ray device in the dental office. This technique reduces the irradiation dose, price, and treatment time in contrast with Cone-beam CT. The development of this technique and tools needed, the improvement of the protocol, creation of the software background and the exploration of possible application perspectives were among the main goals of our team.

Methods: For the experiments a Gendex 765 DC dental X-ray unit, and an image-processing computer was used. The pictures were made with the help of a sensor holder connected to a pointer device, a ruler grid attached to the teeth and a laser targeting device mounted to the X-ray tube. We used a cadaver skull and voluntary patients, by whom X-rays were indicated anyway. The teeth were shot from 2 different angles closing 14-degrees with each other. In the computer an anaglyph image was constructed. By means of red-cyan glasses the 3D images were evaluated subjectively.

Results: We demonstrated that with the developed tools, it is possible to create true 3D X-ray images, which can be used for spatial measurements and diagnostics or for therapeutic control.

Conclusions: The real 3D X-ray is an easy to use, cheap, fast and spectacular alternative in certain cases to the currently prevalent Cone-beam CT. The real 3D X-ray can be especially useful e.g. by the investigation of the bony pocket/defect alterations, localization of impacted canines and the nerve-roots or sinus-roots relationships. The developed tools may promote this procedure to be more popular in everyday practice. Support: Faculty Research Application FOK/DH/3-5/2011.

Effect of Loupes on the Clinical Performance of Dentistry StudentsS. GURGAN¹, F. YALCIN CAKIR², and E. FIRAT¹¹Dept. Restorative Dentistry, Hacettepe University, Ankara, Turkey, ²Hacettepe University, Ankara, Turkey

Objective: Optical magnifying devices such as magnification loupes are increasingly used in clinical dental practice and educational settings with the advantage of reducing diagnosis and treatment faults by providing a better vision. However, scientific evidence to validate their benefits is limited. This study aimed to evaluate the effect of dental magnification loupe usage on the clinical performance of dentistry students by the assessment of quality and the time spent for each restoration stage.

Materials & Methods: One hundred dentistry students attending to fourth-year restorative dentistry clinical training course (Hacettepe University, School of Dentistry, Ankara/Turkey) were included in this study. The students were randomly allocated into two groups. The test group consisted of 50 dental students using magnification loupes (G1), while students not using them (G2, n=50) served as the control. The students were asked to treat patients with Class II lesions (D3 stage) on their upper second premolar teeth (15or25), which were in contact with the neighbouring teeth. Class II amalgam restoration stages including; cavity preparation, the placement of glass-ionomer cement, matrix application, amalgam restoration and polishing were evaluated by 1 faculty member in terms of quality and time spent. The quality of each stage were scored using a mark scale grading from 0 to 10. The data were collected and the t-test was used to analyze the mean differences between the groups (p=0.05).

Results: Although, the students using magnification loupes got slightly higher marks and required a little longer time for cavity preparation, the differences between the groups were not statistically significant for the quality and the time spent on any Class II amalgam restoration stages (p>0.05).

Conclusion: Based on this study, it seems that requiring students to purchase magnification loupes may not be justified. However, possible effects of students' inexperience and the need for specific training in the use of loupes should be addressed in the further studies.

Cardiac electrophysiologic effects of articaine and ropivacaineA. SZABÓ¹, I. MÁRTON², P. NÁNÁSI³, N. SZENTANDRÁSSY², P. BIRINYI², G. SZABÓ², J. MAGYAR², and T. BÁNYÁSZ²¹Oral and Maxillofacial Surgery, University of Debrecen, Debrecen, Hungary, ²Faculty of Dentistry, University of Debrecen Medical and Health Science Center, Debrecen, Hungary,³Physiology, University of Debrecen, Debrecen, Hungary

Objectives: articaine and ropivacaine are local anesthetics used in the clinical practice for a relatively short time. In spite of their widespread application, there is little information about their cellular cardiac effects. The purpose of this work was to analyse the cellular cardiac electrophysiological effects of articaine and ropivacaine in isolated canine cardiomyocytes, a preparation which is generally believed to be the best model of the human heart.

Methods: action potentials were recorded from enzymatically dispersed myocytes using sharp microelectrodes. Conventional patch clamp and action potential voltage clamp arrangements were used to study the effects of drugs on transmembrane ion currents.

Results: both articaine and ropivacaine caused concentration-dependent changes in the action potential configuration. They decreased action potential amplitude and maximum velocity of depolarization, shortened action potential duration, suppressed phase-1 depolarization, and depressed plateau. Characterization of sodium channel blockade by reduction of maximal rate of depolarization yielded an EC50 of 162±30, and 81±7 µM for articaine, ropivacaine, respectively. Under voltage clamp conditions a variety of ion currents were blocked by articaine and ropivacaine: L-type calcium current (EC50: 471±75 and 263±67 µM), transient outward current (EC50: 365±62 and 384±75 µM), inward rectifier potassium current (EC50: 372±46 and 372±35 µM), rapid delayed rectifier potassium current (EC50: 278±79 and 303±47 µM) and slow delayed rectifier potassium current (EC50: 326±65 and 106±18 µM). These effects on ion channels were also demonstrated under action potential voltage clamp conditions.

Conclusions: articaine and ropivacaine, can modify cardiac action potentials and the underlying ion currents at concentrations higher than the usual therapeutic range, that can be achieved only by accidental intravascular injection. While ropivacaine related cardiac complications may be anticipated during and after the anaesthesia in case of overdose, articaine may induce only moderate changes in action potential morphology

Is transport protein useful as malignant tumor marker ?T. SATO¹, Y. IWASHITA¹, Y. KAWABATA¹, H. INDO¹, K. KAWANO¹, S. SUENAGA¹, H. MAJIMA¹, and K. SUGIHARA²¹Maxillofacial Radiology, Kagoshima University Graduate School of Medical and Dental Sciences, Kagoshima, Japan, ²Maxillofacial Diagnostic and Surgical Sciences, Kagoshima University Graduate School of Medical and Dental Sciences, Kagoshima, Japan

Objectives: Nuclear agents of 18-F-FDG (18-F-fluorodeoxyglucose, PET), 201-TlCl (201-thallium-chloride) and 99m-Tc-MIBI (99m-technetium-hexakis-methoxyisobutylisnitrile) are used in dentistry. Uptake and discharge of them in tumor cells are controlled in large part by transport proteins expressed on cell membrane; glucose transporter (Glut) is for 18-F-FDG, Na/K-ATPase is for 201-TlCl and permeability glycoprotein (P-gp) is for 99m-Tc-MIBI. Moreover, L-amino-acid transporter-1 (LAT-1) has attracted special interest recently for amino-acid labeled nuclear agent. They tend to show a stronger expression in malignant tumor. The purpose of this presentation is to estimate the usefulness of transport proteins as malignant tumor marker.

Materials and Methods: Patients with oral cancer underwent scintigraphy with 18-F-FDG, 201-TlCl or 99m-Tc-MIBI. From scintigraphy with 201-TlCl or 99m-Tc-MIBI, tumor retention index (accumulation degree) was obtained, and SUV (standard-uptake-value) was gained from FDG-PET. Expression of transport proteins was evaluated immunohistochemically. Transport proteins were estimated in relation with the tumor retention index, SUV and histopathological tissue differentiation. Benign salivary gland tumor was used as a control.

Results: Transport proteins were found in malignant tumor more than in benign tumor, and the tendency was also distinct in relation with tissue differentiation. 201-TlCl showed a larger tumor retention index in malignant tumor than benign tumor. This means that Na/K-ATPase works as a transporter to incorporate 201-TlCl into tumor cells. On the contrary, 99m-Tc-MIBI showed a smaller tumor retention index in malignant tumor. This means that P-gp pumps 99m-Tc-MIBI out from tumor cells that was once accumulated inside cells. FDG-PET showed an apparent SUV in malignant tumor. This means that Glut helps 18-F-FDG to go into tumor cells. LAT-1 also showed a higher expression in malignant tumor.

Conclusion: Each transport protein has a possibility to be a malignant tumor marker and is surely useful for differentiating malignant tumor from benign tumor. We are trying to separate transporters from saliva.

0505 (152191)

Dental rehabilitation for children with disabilities under general anesthesia

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Objectives: The purpose of the present study is to present the dental treatment needs of the mentally disabled patients at the Semmelweis University, Department for Pedodontics and Orthodontics treated under conditions of general anesthesia.

Method: Special-needs patients who presented for dental treatment at Semmelweis University Department for Pedodontics and Orthodontics and have undergone pedodontic treatment under general anesthesia between 2005 and 2010 were analysed. A comparison was made between the general anesthesia agents used for this purpose at the Semmelweis University 2nd Department of Pediatrics and the Bethesda Children's Hospital of the Hungarian Reformat Church.

Results: Authors present the specific, conservative and surgical treatment options for handicapped children and the adverse events and outcomes of sedation under general anesthesia.

Conclusions: Dental treatment under general anesthesia has become an important and preferred alternative for treating disabled patients in pedodontic dentistry.

0506 (152193)

Micro-CT investigation of different root canals after Pro-Taper preparation

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Objectives: The aim of this study was to investigate the changing parametres of the straight and curved root canal morphologies after ProTaper rotary enlargement technique utilising micro-computed tomography (MCT) for this purpose.

Methods: Extracted incisors and canines with straight and curved root canals were scanned before and after shaping the canals with ProTaper rotary enlargement technique employing micro-computed tomography (MCT) scanner (cubic resolution 9 µm) to measure and to reconstruct three-dimensionally the changing instrumentational parametres. The transformation of post instrumental volumes, surfaces and the SMI of the root canals after the preparation were the objects of the investigation.

Results: The mean change of the instrumentational surface (ÅA) was 5.966 mm² (SD 1.393) in the case of curved root canals. This date was 1.334 mm² (SD 0.674) of the straight canals. The changes mean of the volume after instrumentation (ÅV) was 1.88 mm³ (SD 0.345) in the curved canals group and 1.334 mm³ (SD 0.674) in straight one. The transformation of the Structural Model Index (SMI) was 0.373 (SD 0.203) in curved canals and 0.192 (SD 0.135) was in the case of straight canals. The statistical analysis revealed that there were no statistically significant differences accordig to the different measured parametres between the straight and curved root canal group.

Conclusion: The micro-CT is a sensitive method to measure and analyse three-dimensionally the root canal morphology after root canal preparation. After Pro-Taper rotary enlargement of the root canals the investigated parametres (ÅA, ÅV, ÅSMI) changed more severely in curved canals than in the case of straight ones, however these transformations were not statistically significant.

0507 (151885)

Assessment of halitosis in a student population in Hungary

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Objectives: Oral malodor (halitosis) is a major social and psychological problem. A number of etiologic factors, both intra- and extraoral have been identified. However, in most cases, halitosis originates from the oral cavity itself. As a result of microbial putrefaction volatile sulphur compounds (VSC) will emerge, like hydrogen sulfide (H₂S), methyl mercaptan (CH₃SH) and dimethyl sulfide (CH₃)₂S. The first aim of this preliminary study was to estimate the prevalence of halitosis and measure VSC with OralChroma® (Japan) in the dental students at the University of Szeged. Another aim was to develop a new investigation method for ammonia measurements based on laser photoacoustic spectroscopy. According to findings of the photoacoustic measurements correlations between ammonia concentration and halitosis will be examined.

Methods: The study comprised 26 dental students from the Faculty of Dentistry, University of Szeged (15 women and 11 men) with a mean age of 23.9 years. According to the annual odontological examination, all students were free of dental caries and periodontal disease. Treatment with antibiotics in the past three weeks, and the consumption of onions or garlic in the past two days were exclusion criteria. OralChroma® measurement was performed to analyze each VSC component. Besides, a newly developed photoacoustic system will be operated in parallel with OralChroma® to dynamically measure ammonia in oral cavity.

Results: Gas chromatographic measurements gave 142 ± 32 ppb for H₂S, 30 ± 8 ppb for CH₃SH and 26 ± 9 ppb for (CH₃)₂S for females and 150 ± 42 ppb for H₂S, 15 ± 5 ppb for CH₃SH and 13 ± 4 ppb for (CH₃)₂S for males.

Conclusions: The results of this study demonstrate that OralChroma® is a reliable method to assess the VSC compounds. Acknowledgment: Supported by the TÁMOP 4.2.1/B-09/1/KONV-2010-005 project of the Hungarian Ministry of Education.

Frequency and K-File Diameter Influence on Endodontic ImpedanceE. VACHEY¹, G. LEMAGNEN², D. LARROUTURE², and L. GRISLAIN²¹University of Bordeaux2 / UFR Odontology, Bordeaux Cedex, France, ²Ltpib, University of Bordeaux2 / UFR Pharmacie, Bordeaux, France

Objectives: Electronic apex locators are inaccurate problems when using a 10/100e K-File in 40/100e opened apex (IADR06). The aim of this study is to determine K-File Diameter (KFD) and frequency influence on endodontic impedance: During catheterism: which KFD can allow us to determine displacement [-1 to +1mm/Apical Constriction AC] whatever frequency? K-File at AC: which frequency can allow us to be independent from KFD?

Methods: Resin model, 35/100e opened apex, canal irrigated with NaOCl 2.5%, is inserted in CuSO4 gel. It is catheterized with K-Files (15/100e to 35/100e step 5/100e), from 1mm upon AC, to 1mm beyond, 0.5mm step (micrometric displacement table). We obtain 750 impedances, performing spectroscopy analysis (10 frequencies from 100Hz to 100kHz).

Results:

*: significant difference (multiple range test, $pvalue \leq 5\%$)

Endodontic Impedances decrease when KFD increase, linear regressions are nearly parallel and R-squared increase from 0.49 (KFD 15/100) up to 0.86 (KFD 35/100).

K-File at AC

Impedances depend on KFD for every frequency (Mann and Whitney test, $pvalue \leq 0.06$)

Conclusion: Whatever frequency: K-file diameter close to AC diameter: impedances are well correlated to catheterism, and significantly different between two steps from AC-1mm, to AC+1mm. Endodontic impedances depend on KFD.

Multivariate Influence of Prosthetic Superstructures on Immediately Loaded Implant Success

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Objectives: To examine the influence of immediate implant placement and loading on the treatment outcome in restorative dental therapy.

Methods: A total of 195 patients (age 16.5–80.4 years) consecutively admitted between May 2003 and June 2010 were included in the study. The specimens examined were 310 prosthetic restorations supported by 896 immediately loaded implants. The mean follow-up time was 27.5 months. 45.8% of the implants were placed immediately into fresh extraction socket. The study distinguished between removable (strictly implant-supported) and fixed types of restorations (single crowns, implant-supported bridges, combination bridges).

Results: The overall implant success rate was 96.7%. Statistically significant results of multivariate analysis ($p < 0.05$) were found for the following factors: time in function ($p < 0.001$), type of prosthetic design ($p < 0.001$), type of connection between implant and restoration ($p < 0.001$) and which jaw was restored ($p = 0.026$). Neither the patient's age or sex nor the implant's position in the jaw, its design or height had a significant influence on clinical outcomes. One-piece implants exhibited the best results; this finding was statistically significant. Implants inserted in fresh extraction sockets had reduced hazard ratio of 0.483 compared to implants placed in healed bone. This influence was significant in univariate analysis ($p = 0.040$), but not in multivariate analysis ($p = 0.085$).

Conclusions: With adjusted hazard ratios of up to 51, the prosthetic design and its realization significantly influence the success rate of implant-supported restorations. Immediate stabilization by the prosthetic superstructure significantly improves treatment success. The only statistically significant patient-intrinsic factor was the parameter "maxilla versus mandible" with an adjusted hazard ratio of 2.75. This risk can be successfully lowered by increasing the number of implants placed in the maxilla. The decreasing risk of implant loss proved significant after the first six months of functional loading.

Laser Sintering Technology for Co-Cr alloysL.C. ARDELEAN¹, L. RECLARU², and L.C. RUSU¹¹Tehnology of Materials and Devices in Dental Medicine, University of Medicine and Pharmacy - Victor Babes, Timisoara, Romania, ²Research & Development, PX Holding SA, La Chaux-de-Fonds, Switzerland

Objectives: The objective of this study is to assess the quality of Co-Cr prosthetic restorations, obtained with the laser sintering technique.

Methods: Selective laser sintering technique uses a high power CO2 laser to fuse small particles of metal powders into a mass representing a desired 3-dimensional object. The laser selectively fuses metal powders by scanning cross-sections generated from a 3-D digital description by CAD file. After each cross-section is scanned, the powder bed is lowered by one layer thickness, a new layer of material is applied on top, and the process is repeated until the part is completed. The topography of the dental restoration is designed by numerical monitoring after having scanned devised prostheses. In our application the alloy consists of 64-67% Co, 28-30% Cr and 5-6% Mo, and has at equilibrium of a γ monophasic structure. Evaluation and characterisation was made by: Microstructure analysis; Corrosion resistance evaluation; Polarization test; Crevice corrosion test; Release of cations.

Results: Dimensional observations of Co-Cr restorations show that adjustment leads to satisfactory clinical results with a precision of 25 µm. The average hardness is 395HV, comparable to metal-ceramic elements obtained by casting technique. The metallographic observations show a slight porosity in the sintering plane. Punctual analysis shows a high regularity of the local chemical composition: 62.6-64%Co, 29.3-30.5%Cr and 4.9-6.4%Mo. Potentiodynamic polarization curves confirm the presence of the porosity in the structure of the restoration. SEM micrograph of the corroded surface after the polarization test shows: O 24.53, Na 1.19, Si 1.12, Cl 0.59, Cr 28.76, Co 34.30, Mo 9.52.

Conclusion: The technique of manufacturing by selective laser sintering allows obtaining prosthetic elements of high dimensional precision which present mechanical properties in agreement with the clinical requirements. However, the residual porosity inherent to the sintering process may present a risk for fracture and crevice corrosion.

0511 (151355)

Treatment alternatives to substitute upper lateral incisors: 10-year preclinical loading

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Objectives: to evaluate the survival of zirconia-based treatment alternatives when an upper lateral incisor is missing and a 10-yr simulation by thermomechanical loading (TML) was applied.

Methods: Human upper, central incisors were randomly assigned to 4 groups (n=8). Teeth were endodontically treated and restored as follows: (I) access cavity filled with composite, preparation according all-ceramic requirements, crowns with zirconia frame work (ZF) and one cantilever unit were adhesively placed, (II) as (I) but an one-wing resin-based cantilever FPD (RB-FPD) with ZF was adhesively placed, (III) specimens were cut 2 mm above cemento-enamel junction, composite-resin core build-up, final restoration as (I), (IV) specimens as in (III) built up, but an additional fibre post was inserted. (V) implant with all-ceramic abutment restored as in (I). To simulate 5 years of clinical function specimens were subjected to TML (1.2*10⁻⁶ load cycles 1 – 49 N; 6000 thermocycles 5°/55° C). If specimens survived this interval another TML interval was added. Kaplan-Meier curves were constructed and Log-rank tests performed (p = 0.05).

Results: Most events were observed in (I): 25% tooth fracture, 25% debonding with chipping; (II) 50% debonding only, 13 % debonding with chipping; (III) and (V) 25% of specimens failed by chipping, respectively, (IV) only 13% showed chipping. No significant differences were found regarding survival (p=0.162), but regarding failure patterns (Fisher' exact test: p=0.005).

Conclusions: After 10 years of preclinical TML all evaluated treatment alternatives appear recommendable to substitute an upper, lateral incisor. However, fibre-post supported restoration revealed the lowest number of failures.

0512 (151482)

In-vitro Study of the Fracture Resistance of Implant-supported All-ceramic Restorations

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Objectives: The purpose of this investigation was to evaluate the fracture resistance of implanted-supported zirconia and titanium abutments restored with glass-ceramic and zirconia-based ceramic crowns.

Methods: Using the Straumann CARES CAD/CAM technology, two groups of implant abutments were fabricated for the Straumann implant system (n=30): zirconia abutments (Z), and titanium abutments (T). All abutments were generated from the same STL file. Standardized maxillary central incisor all-ceramic crowns (n=10) were fabricated for the zirconia and titanium abutments using the following systems: heat-pressable lithium disilicate glass-ceramic (IPS e.max Press) (Zp and Tp), machinable lithium disilicate glass-ceramic (IPS e.max CAD) (Zc and Tc), and zirconia based-ceramic (IPS e.max ZirCAD) (Zz and Tz). The crowns were cemented to the implant abutments with a resin luting agent (Multilink Implant). Afterwards, all specimens were tested for fracture resistance according to the ISO norm 14801. Data were analyzed using two-way ANOVA and Tukey post hoc tests (α = .05).

Results: The mean fracture load values were 363 ± 50.5 N for group Zp, 482.2 ± 58.4 N for group Tp, 392.9 ± 55.3 N for group Zc, 558.5 ± 35.2 N for group Tc, 340.3 ± 61.8 N for group Zz, and 495.9 ± 53.4 N for group Tz. ANOVA detected significant differences with respect to implant abutment, all-ceramic restoration, and the interaction of the two factors (p = .0001). Titanium abutments showed significantly higher fracture loads than zirconia abutments (p = .0001). Zirconia ceramic crowns presented the lowest fracture resistance, revealing significant differences with respect to the glass-ceramic crowns (p = .0001).

Conclusions: The type of abutment and all-ceramic crown system significantly influenced the strength of single-tooth implant-supported all-ceramic restorations. Titanium abutments restored with machinable lithium disilicate exhibited the highest fracture load values.

0513 (151511)

CADCAM: a method for assessing mechanical behavior of ceramic crowns

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Objectives: A method for assessing mechanical behavior of full-ceramic peripheral crowns is developed. It is based on the use of industrial and dental CAD-CAM systems.

Methods: Five different shapes of dental preparations are designed. We manufacture by CAM, for each shape, a series of five aluminum supports. Glass-reinforced ceramic crowns are duplicated using CAD-CAM and optical imprints. They are glued identically on the aluminum supports. These samples are submitted to a compressive loading in occlusal direction until rupture. The compressive tests are performed by using a DARTEC mechanical press at a constant load speed. Simultaneously, a LVDT sensor monitors the compressive displacement response of the sample. In order to measure the evolutive response of the structure (stiffness, strength), a sequenced loading is applied: So partial unloadings (-100N) are conducted after each progressive loadings (+300N).

Results: The results (mean values, standard deviations) for each series and between series are discussed. The ultimate compressive force for the different series is between 1.01 and 1.90 kN. The minimum standard deviation is about 0.02 kN for a series, which proves the reproducibility of the method. These values and the analysis of force-displacement curves allow to estimate the influence of the supports geometry. Because it avoids most of "operator-dependent" tasks, CAD-CAM is an ideal way of producing samples for reproducible mechanical tests in the fixed prosthesis field.

Conclusions: This new approach shows a great promise and could be implemented for the study of reconstruction materials, interfaces and samples geometry. A complementary study by finite element modeling will lead to highlight on the local stress-strain responses of materials used.

Wear behavior of different double crown systemsJ. ENGELS¹, C. JAUERNIG², M. HOFFMANN¹, K. ERDELT¹, and F. BEUER¹¹Prosthodontics, Ludwig-Maximilians-Universität München, Munich, Germany, ²Ludwig-Maximilians-Universität München, Munich, Germany

Purpose: The aim of this study was to evaluate alterations in retentive force (RF) of different double crown systems. The effect of abutment height, inner- and outer-crown-material, taper and wear simulation was evaluated.

Material and Method: 240 inner- (IC) and outer- crowns (OC), divided into 4 groups, 60 specimens each, were manufactured: A: IC= Zirconia, OC= electroformed / B: IC= base metal, OC= electroformed / C: IC= gold alloy, OC= electroformed / D: IC= of gold alloy, OC= conventional casted. Each group had different abutment heights (5, 7 and 9mm) and two different tapers (0° and 2°) with 10 specimens each. Ten thousand separation cycles were performed for each specimen, and the RFs were measured at baseline, 5,000 and 10,000 cycles in presence of artificial saliva. Data were imported into a statistical software (SPSS, V18). A one ANOVA and the Student-Newman-Keuls-test were used to compare data. Level of significance was set at 5%.

Results: Group D showed highest RFs (baseline: 4,0N; 5,000 cycles: 3,9N; 10,000 cycles: 3,9N) compared to A, B and C (baseline: 2,6N/3,5N/2,6N; 5000 cycles: 2,5N/3,4N/2,5N, 10,000: 2,5N/3,3N/2,5N). RF was dependent on material ($p<0,001$). The RF of groups A, B and C were dependent on abutment height ($p<0,001$), taper ($p<0,001$) and wear simulation ($p<0,001$). Group D showed no correlation between retentive force and abutment height ($p=0,55$).

Conclusion: Wear caused loss of RF in all evaluated groups. However, the material used exhibited significant influence. But all evaluated groups showed RFs above general clinical recommendations.

In-Vitro-Examination of Frameworks and Veneered Three-Unit Fixed-Partial-Dentures Made of PolyetheretherketoneC. KOLBECK¹, N. SERENO², D.J. WOOD³, A. JOHNSON⁴, M. ROSENTRITT¹, and G. HANDEL¹¹Department of Prosthetic Dentistry, Regensburg University Medical Center, Regensburg, Germany, ²Invisio Ltd, Lancashire, United Kingdom, ³School of Clinical Dentistry, University of Sheffield, Sheffield, United Kingdom, ⁴Dept. of Restorative Dentistry, University of Sheffield, Sheffield, United Kingdom

Objectives: The aim was to evaluate the behaviour of three-unit frameworks (F) and three-unit fixed-dental-prostheses (FDP) made of polyetheretherketone (PEEK) during artificial ageing and fracture strength test.

Methods: Stone models were prepared to create identical situations for three-unit dentures. In part1 (n=5) unveneered substructures were made of polyetheretherketone (PEEK-Optima: Invisio, GB) with anatomically reduced framework design and optimized connector dimensions. For part2 (n=8) three-unit dentures were made of similar PEEK-frameworks veneered with a mikrofilled light-/heatcuring composite material (SR Adoro: Ivoclar-Vivadent, FL). The substructures and veneered dentures were adhesively luted onto the stone models with a dual cured composite cement (Calibra: Dentsply Detrey, G). TCML (Thermocycling and mechanical loading) was carried out with parameters simulating a period of five years of intraoral application (TC: 6000x5/55°C, 2min each cycle, distilled water; ML: 1.2x106x50N, antagonistic steelball). Behaviour during TCML was recorded optically. Afterwards fracture strength of the constructions was determined in a universal-testing-machine (UTM 1446: Zwick, G) with a crosshead speed of 1mm/min. Failure determination: 10% loss of current fracture force.

Results: None of the frameworks or dentures showed decementation or damage signs during TCML.

Conclusion: Regarding 500N in posterior areas as a threshold level for the fracture forces needed, the tested PEEK-Optima constructions showed positive results. With optimized connector areas and anatomic substructure design in vivo studies as well as further in vitro studies to optimize the veneering process should be encouraged.

3D slot roughness of seven contemporary plastic brackets

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Objectives: To evaluate the roughness of slots of seven orthodontic plastic brackets.

Methods: Seven plastic bracket brands (Brillant, Elegance, Spirit MB, Silkon plus, Avalon, OrthoFlex, Aesthetik-line) were included in the study. The bottom of each slot of every bracket was selected for evaluation and pictures were taken by optical microscopy at magnification (20x) for a general estimation of the roughness. Then the roughness parameters (Ra, Rq, Rt, Rz) of every slot were defined in a 3D optical profilometer in a higher magnification and 3D-images were obtained.

Results: Optical microscope pictures revealed a variety of textural characteristics of slots for the brackets tested. Metallic slots presented grooves and striations whereas plastic slots presented peaks and pits. OrthoFlex presented the highest Ra and Rq value, statistically higher than the other brackets tested. Elegance bracket exhibited the second higher Rq value, which statistically was higher among the other brackets. Brilliant, Silkon and Elegance presented the highest Rz and Rt values, which were statistically significant higher than the other brackets, followed by Orthoflex which presented statistically significant higher values compared to Avalon, Aesthetik line and Spirit MB brackets.

Conclusions: 3D-images and roughness parameters of slots represented significantly different among the tested brackets. Additional of metallic slot to some of tested brackets exhibited no statistically decrease in average of roughness with plastic slots except OrthoFlex slot gave high roughness than other brackets. Avalon , Aesthetik line and Spirit MB exhibited low roughness parameters.

0517 (152043)

Strength and Fit of four-unit Metal Laser Sintered Posterior Bridges

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Objectives: This study evaluated the microstructure, accuracy of fit and fracture resistance of frameworks of four-unit FDPs constructed using direct laser sintering (DLS).

Methods: A steel master model with two abutments (teeth 34-37) was scanned and a framework designed. 25 Frameworks were produced by metal laser sintering using CoCrMo-alloy. Cross sections of 5 in acrylic resin embedded samples were produced to illustrate the microstructure. 10 gypsum dies were produced from the master model then 10 frameworks were cemented using zinc phosphate cement (ZPC), embedded, and then sectioned buccolingually and mesiodistally. Widths of the marginal and internal gap were measured using a Light microscope at magnification x40, 82 measurements for each framework. 5 samples were positioned on the steel model as delivered after machining without cementation on the and loaded in a universal testing machine, the fracture strength was determined, 5 samples were cemented on the metal model using ZPC, sorted in distilled water at 37 °C for 24 h before testing to failure (CHS= 1 mm /min). The maximum force was registered. The tests were made at a constant cross-head speed (CHS) of 1mm/ min on a universal machine recording the load/displacement data until fracture of the specimen.

Results: Cementation has significantly ($P < 0.05$) affected the fracture resistance 1677.48 N before and 2210.44 N after. For internal and marginal gaps a broad variation of measurement values was observed.

Conclusions: The laser impulse onto the particles can cause a micro movement of them which results in an inaccuracy of the dimensions and one possibility to reduce such deviations is a manual treatment but that is in contrast to the CAD/CAM intention to produce devices with a high accuracy and precise fit. The fracture strength of increased considerably after cementation, based on the accepted minimum initial strength of 1000 N for posterior FDPs.

0518 (152053)

Temperature rise during laser welding on base metal castings

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Objectives: The neodymium:yttrium-aluminium-garnet (Nd:YAG) laser has been suggested to repair broken prostheses in the mouth. This study investigated the effects of different dentin thicknesses and air cooling on pulpal temperature rise during Nd:YAG laser welding.

Methods: Three intact human maxillary molars were prepared for full-veneer crown. For each tooth, dentin thickness in mesiopalatal cusp was 2, 3 or 4 mm. Twenty dies were duplicated from each of prepared teeth. For metal copings with 0.5 mm thickness, wax patterns were prepared with deep-wax technique directly onto each of dies. All patterns were sprued and invested. The castings were made using a nickel-chromium alloy. A hole with 0.5 mm diameter was prepared on the mesiopalatal cusp of each crown. The Nd:YAG laser (Fidelis Plus 3, Fotona, 9.85 W; 1 Hz repetition rate, fluence: 1,230 J/cm²) was used for welding with or without air cooling (n=10). The temperature rise was measured in pulpal chamber with a J-type thermocouple wire that was connected to a data logger. Differences between start and highest temperature reading were taken and temperature rise values were compared using two way analysis of variance (ANOVA).

Results: Pulpal temperature rise varied significantly depending on the dentin thickness and air cooling ($p < 0.05$). The non air cooling group induced significantly the highest temperature increases. There were no significant differences between 2 mm and 3 mm dentin thicknesses groups ($p > 0.05$), however pulpal temperature rise was the lowest for 4 mm dentin thickness group ($p < 0.05$). The highest values of thermal increase were found in the pulp chamber (6.8 °C) when no air cooling was used in 2 mm dentin thickness group.

Conclusions: Laser welding on base metal castings with Nd:YAG laser can be applied with air cooling to avoid adverse effects for the pulpal health in 2-3mm dentin thicknesses.

0519 (152134)

Electrochemical Impedance Spectroscopy Characterization of Experimentally Developed Ag-based Brazing Alloys

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Objectives: To evaluate the electrochemical behaviour of two experimentally developed Ag-based alloys, for the use in fabrication of space maintainers.

Methods: Two Ag-based Cu-free brazing alloys (Ag-12Ga and Ag-20In) and one commercially available (Dentaurum Universal silver Solder Ref.380-604-50, Dentaurum, Germany), were studied. The experimental alloys were fabricated by inductive melting of the pure metals and pellets of all the materials were conventionally ground and polished. The corrosion behaviour was investigated by Electrochemical Impedance Spectroscopy (EIS) and potentiodynamic anodic scan (PDS) in Ringer's solution employing a mini-cell system. Measurements were carried out within a 70KHz-10MHz frequency range and 15mV wave amplitude at a sampling rate of 10 points per decade. PDS was realised from -1V up to +1.2V (versus SHE) potential range and 10mV/s scan rate. A saturated calomel electrode was used as a reference electrode ($E_0 = 241$ mV vs.SHE) and sampling area was 0.008cm². Data were collected and analysed using Corrware, Corrview, VoltaMaster and Origin software. The equivalent circuits emerged using Zview software.

Results: From the Nyquist and Bode plots, two time constants are identified. The equivalent circuits of the experimental alloys are composed of the electrolyte resistance, the coating and the double layer resistances and constant phase elements (cpe). The Nyquist plot of Dentaurum contains a capacitive loop followed by an inductive one. The equivalent circuit contains the electrolyte and coating resistance, the coating and double layer capacitance. From PDS the I_{corr} values were calculated. The experimental alloys (I_{corr} Ag-12Ga = $2.82 \cdot 10^{-7}$ A/cm², I_{corr} Ag-20In = $2.15 \cdot 10^{-7}$ A/cm²) demonstrated lower I_{corr} values comparing to Dentaurum (I_{corr} Dentaurum = $2.40 \cdot 10^{-4}$ A/cm²) thus better corrosion behaviour.

Conclusions: The developed alloys form a non-homogenous oxide coating on their surface and are less vulnerable to corrosion than the conventional Ag alloy.

0520 (152172)

Interfacial analysis of porcelain fused to electroformed Au substrate

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Objective: The aim of this study was to investigate the interfacial elemental distribution of an electroformed Au substrate veneered with a dental porcelain.

Methods: Two electroformed Au specimens were prepared in a cap-like shape of 0.3mm thickness, employing an electroforming system (Ephos Galvano, Element Dental). The Au specimens were sandblasted with 100µm alumina particles and then covered with a dental porcelain (DuceraGold, Degudent). The specimens were embedded in epoxy resin, metallographically grinded/ polished and C-coated. Then the specimens were studied by SEM-X-ray EDS electron probe microanalysis.

operating under high vacuum mode and the qualitative analysis of electroformed Au substrate and of adjacent opaque layer was determined employing area scan analysis. Then the distribution of selected elements at the metal-ceramic interface was determined by using area and line scan analysis.

Results: Qualitative analysis showed that the Au substrate contained also B, C, O, N, and P while the opaque comprised of Si, O, Al, Ca, Na and K. The presence of B, C, O, N and P in the metallic substrate should be assigned to the Au-sulfite electrolyte used for the electroforming process. Elemental imaging did not show any concentration gradients at the interface, due to absence of metallic elements capable of oxidizing.

Conclusions: Electroformed Au-substrates contain also elements from the solution used in the electroforming procedure. The absence of elemental concentration gradients at the interface should be attributed to the limited ability of electroformed crowns to develop chemical bonding with porcelain.

0521 (151483)

Contemporary Composites May Release Nano-dust

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Today's composites may contain high amounts of nanofillers.

Objectives: To characterize composite dust to determine whether possibly hazardous respirable (< 5 µm) dust particles may be released upon grinding or polishing composites. We hypothesized that upon grinding/polishing, the filler particles would remain well embedded in the resin matrix and that no respirable dust would be released.

Methods: Standardized blocks of polymerized composite were ground with a diamond bur; and dust was collected on 1-µm pore-size filters and weighed. The released dust was also quantified and ultra-morphologically characterized by transmission electron microscopy. Both (microfilled) hybrid composites (Z100, 3M ESPE; Gradia Anterior, GC), and (hybrid-)nanocomposites (Filtek Supreme, 3M ESPE; Tetric EvoCeram, Ivoclar, Vivadent; CeramX, Dentsply; Premise, Kerr; Herculite XRV Ultra, Kerr) were tested.

Results: Gravimetric analysis revealed that all composites released appreciable amounts of respirable dust, with air concentrations from 7-32 mg/m³ immediately after grinding the composites. In addition, electron microscopic analysis revealed that composites may also release high amounts of particles smaller than 1 µm and even 100 nm. The ratio of dust particles smaller than 1 µm to those larger than 1 µm ranged between 3:1 to 9:1. The respirable fraction of the composite dust most often consisted of multiple fillers in the resin matrix, but also of single nanofillers.

Conclusion: Contemporary composites may release small respirable dust particles. Dentists should be urged to always wear protective masks, and to use water coolant during the polishing or removal of composites. However, more research is necessary to determine possible health hazards of the released composite dust. The first author of this study has been granted a Post-doctoral Research Fellowship from the Research-foundation Flanders (FWO). This study was supported by FWO-grant KAN 2010 1.5.128.10.

0522 (152079)

Monomers' elution from Silorane and its effect on gingival keratinocytes

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Objectives: The aim of the present study was to evaluate the elution of substances from a silorane composite and its effect of immortalized human gingival keratinocytes (IHGK).

Methods: FiltekTM Silorane (FS) was tested. For the analysis, 20 specimens (diameter 4.5 mm and 2 mm thickness) were prepared. 10 specimens were stored in human saliva and 10 in ethanol 75%, for 24 h, 7 days and 28 days. From the storage medium removed, solution samples were prepared for the analysis and they were scanned using SIM (scanning ion monitoring) for any masses between 100 and 1000. For testing the cell effects IHGK, immortalized with the HPV-16 E6/E7 oncogenes, were used and propagated under standardized cell culture conditions. 20 composite samples were prepared and were immersed separately in cell culture medium. Ten samples were stored in a dark box for 24 h and the other ten for 4 days. Subsequently, the solution was placed on IHGKs, for 24h or 4 days respectively, and incubated at 37 degrees. Additionally, IHGKs were cultivated in native medium as controls. After cultivation, the total RNA was isolated and RNA concentration was measured. Moreover, IHGKs from each group were subjected to Annexin-5 staining procedure and documented by fluorescence microscopy.

Results: Two different masses were detected ("393", "337"), after 28 days storage in human saliva and after storage in ethanol 75% independently of the storage time. The RNA concentration measured in the FS group was lower than the one in the control group, at both tested times (24h: control:302ng/ml, FS: 128ng/ml, 4days: control:528ng/ml, FS:162ng/ml). The fluorescence images revealed cell apoptosis.

Conclusions: Two different masses, corresponding to silorane monomers, were found to be eluted. FS showed a reduction of the RNA amount of IHGKs after 24h and 4 days indicating some severe effects on cell viability.

0523 (151327)

The Role of Glutathione in HEMA-induced Apoptotic Cell Death

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Objective: The increased production of reactive oxygen species (ROS) by resin monomers like 2-hydroxyethyl methacrylate (HEMA) may be responsible for adverse responses of the innate immune system, DNA damage and an arrest of the cell cycle or the induction of apoptosis. Since the cellular redox balance is regulated by the antioxidant glutathione (GSH), we hypothesized that HEMA-induced apoptosis is modified by intracellular levels of GSH. Therefore, GSH synthesis was inhibited by buthionine sulfoximine (BSO) in cell cultures exposed to HEMA or GSH synthesis was activated by the cysteine prodrug and antioxidant, 2-oxothiazolidine-4-carboxylate (OTC).

Methods: RAW246.7 mouse macrophages were pretreated (20h) with BSO (0-100µM) or OTC (0-10mM) and subsequently exposed to HEMA (0-8 mM) for 24h. The percentages of viable cells and cells in apoptosis or necrosis were determined by flow cytometry (FACS) after staining with annexin-V-FITC and propidium iodide (PI). Significant differences between median values (plus 25%/75% percentiles) were analyzed using the Mann-Whitney-U test (α = 0.05).

Results: Increasing HEMA concentrations reduced the number of viable cells in exposed cultures. Only 62% of viable cells were detected in cultures exposed to 8mM HEMA compared to 98% of viable cells in untreated controls. The percentage of cells in apoptosis and necrosis increased in parallel. While BSO (100µM) alone did not influence cell viability, the percentage of viable cells in cultures exposed to BSO and 8mM HEMA was significantly reduced to 32%. Contrary, the number of viable cells increased to 75% in the presence of 10mM OTC and 8mM HEMA, and the percentage of cells in apoptosis and necrosis was reduced accordingly.

Conclusions: Glutathione plays a major role in the protection of eukaryotic cells and tissues against the disturbance of the redox balance caused by dental resin monomers. Supported by the University of Regensburg (S.K.) and the Deutsche Forschungsgemeinschaft (Schw 431/13-1).

Nickel release from orthodontic retention wires: mechanical loading and pH

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Nickel (Ni) is an important component of orthodontic arch wires, bands and brackets with a content that ranges from 8% in stainless steel, to 50% in nickel-titanium alloys. These devices are exposed to the oral environment for a long period of time and are subjected to mechanical and chemical factors. This can promote leaching of Ni from the wires which may trigger immunologic responses.

Objective: The aim of this study was to quantify the nickel release from orthodontic retention wires under conditions that resemble the oral cavity in respect with mechanical loading and pH fluctuation.

Methods: Four types of multi-stranded wires (A=92-170mm²) were submersed for 24 h in 10 ml of either distilled water or lactic acid, pH 2.3 (ISO10271) and submitted to cyclic loading in a 3-point bending test (0x, 10.000x). The solutions were analyzed by ICP-MS. The data were statistically analyzed (one-way ANOVA; P<0.05).

Results: all results are summarized in table 1.

Conclusion: Within the limitations of the study three main conclusions may be drawn: Mechanical loading has a strong effect on the Ni release from orthodontic retention wires, especially in distilled water. Acidity has more impact on Ni release than mechanical loading. In some cases the release was higher than the EU Nickel Directive 94/27/EC. Finally, despite being sold as Ni-free the Noninium wire released quantifiable amounts of Ni due to the trace elements of nickel within the wire. Table 1: Ni release (ppb) from one Ni-free(1) and three stainless steel(2-4) 3-stranded, twisted, round orthodontic retainer wires are listed according to loading and submersion media.

A new approach to influence bacterial adhesion onto resin-based materials

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Objective: Incorporation of delivery systems with surface modifying agents into resin-based composites and analysis of their influence on initial adhesion of bacteria onto the surface of tested materials.

Methods: Six experimental resin-based restorative materials were prepared. Material ST, representing a common formulation for resin-based composite, was used as standard. To obtain materials A and B the matrix of ST was fractionally replaced by polymerizable silicone polyether acrylate. ST was modified by replacing parts of the filler with a delivery system loaded with two different polydimethylsiloxanes resulting in materials C to F. Disc-shaped samples (n=6 per group, diameter 10±0.1mm, thickness 1±0.1mm) were prepared, polymerized (40s/side), water-stored (37°C, 21d), disinfected and polished (1min, fine/superfine polishing discs). Afterwards samples were stored in human saliva (250µl, 2h, 37°C), washed and incubated with an overnight-culture of *A. naeslundii*, *A. viscosus*, *S. mitis*, *S. oralis* and *S. sanguis* (350µl, 8h, 37°C respectively 24h, 37°C). Vital fluorescence was performed on 4 randomly chosen sites per sample by using LIVE/DEAD BacLight bacterial viability Kit (Molecular Probes, Eugene, OR, USA). Quantification of vital (fluorescent green) and avital (fluorescent red) bacteria were calculated by counting pixel per colour. Multivariate analysis of variance and Scheffé post-hoc test were performed (SPSS).

Results: A significant reduction (p<0.05) of vital bacteria except for *S. mitis* could be found almost on all tested materials after 8h. After 24h this effect could only be shown for *A. naeslundii* and *A. viscosus*. Furthermore a significant increase (p<0.05) in number of avital bacteria could be measured for all streptococcus strains concerning some of the materials releasing polydimethylsiloxanes.

Conclusion: Using surface modifying agents might allow reducing the initial adhesion of bacteria onto resin-based restorative materials. In addition an influence on the viability of adhering bacteria could be demonstrated.

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Facial Skeletal Differences Between Children with Scoliosis and Scheuermann's Disease

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Objectives: The dentofacial examination of children with spinal deformities disclosed tight correlations between the skeletal differences of the two patient groups. The objective of our study is to compare the radiologic features of the subjects with scoliosis possessing a known dentofacial pattern - earlier more often examined with the children with second most frequent spinal deformities (M.Scheuermann).

Methods: The examinations were performed on 28 children with scoliosis (mean age: 13Y5M, SD: 2Y3M) and 23 children with M.Scheuermann (mean age: 14Y8M, SD: 1Y8M). The routine orthodontic diagnostic procedures were completed with the Ricketts analysis of the lateral cephalograms and asymmetry measurements of the OPG's.

Results: The lateral cephalogram evaluation showed beside the dominance of the skeletal class II. difference (maxillary depth: 91.83°±3.15, ramus position: 74.84°±2.91) proper to the subjects with scoliosis the decreased vertical distances (lower facial height: 39.50°±4.17, mandibular plane: 22.97°±5.80) in the case of subjects with M.Scheuermann. The asymmetry examinations of the OPG's beside the increase of the ramal values (length – left: 54.12mm±5.28, right: 52.10mm±5.76, asymmetry index: 3.16±2.18) of the patients with Scheuermann's disease resulted in the variability of the condylar values (length – left: 6.27mm±1.88, right: 6.10mm±1.54, asymmetry index: 12.45±8.53) of the patients with scoliosis.

Conclusion: The patients with these two spinal deformities are totally differentiated from the facial skeletal attributes as follows: the scoliotic group is characterized by the condylar asymmetry associated with the sagittal difference while the M.Scheuermann group is characterized by the ramus asymmetry existent beside the vertical difference.

Specific MicroRNAs Regulate Tooth Development Through Epithelial Stem Cell Differentiation

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Objectives: MicroRNAs are known to regulate gene function in many tissues and organs and we have identified specific microRNAs regulating tooth development and progenitor (stem) cell differentiation.

Methods: Pitx2, and Wnt-1 Cre's were used to delete mature microRNAs in Dicer 1 floxed mouse models. Transgenic mice expressing specific microRNAs reveal their effect on tooth development.

Results: Conditional knockout (cKO) of Dicer1 (mature microRNAs) in the dental epithelium using the Pitx2 Cre mice results in multiple and branched enamel-free incisors, cusp-less molars and a cleft palate. Analyses of differentiating dental epithelial markers reveal a defect in epithelial cell differentiation. Epithelial microRNAs control dental stem cell differentiation demonstrating a unique role for microRNAs in regulating in vivo dental stem cell biology. MicroRNAs control tooth branching and cell lineage differentiation. We have identified specific microRNAs that target Noggin, a potent BMP inhibitor; Lef-1 an essential transcription factor; and HMGN2 a chromatin-associated remodeling factor in vitro and in vivo. These factors are associated with developmental anomalies, cell differentiation defects and cancer.

Conclusions: We demonstrate molecular mechanisms for the function of specific microRNAs regulating gene expression during early dental developmental processes and stem cell biology. Furthermore, our data reveal a role for these specific microRNAs in the epithelial to mesenchyme transition associated with cleft palate. Support for this research was provided from grant DE13941 from the National Institute of Dental and Craniofacial Research.

TMJ Disorders in Treachers Collin Syndrome

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Objective: Treacher Collins syndrome (TCS) is an autosomal dominant defect with mutation in the TCOF1 gene resulting in cranioskeletal hypoplasia due to insufficient generation of neural crest cells. Along with other craniofacial abnormalities, patients with TCS suffer from defects in the formation of the TMJ. To study the TMJ defects in more detail we have turned to a mouse model of TCS to investigate the forming TMJ with the aim of understanding how congenital TMJ defects arise and may effect normal function.

Materials and Methods: 6 heterozygous Tcof1 deficient mice aged 6 weeks, on a Dolichos Biflorus Agglutinin background were analysed by microCT (Computerized Tomography), to assess whether these mice have any defect in formation of the TMJ. Two of them showed fusion or possibly abnormal bone formation in the glenoid fossa and condylar head. These mice were then prepared for histology to confirm the findings.

Results: A variety of defects, including fusion of the articular disc to the glenoid fossa and ossification of the disc, were observed in the Tcof1 mutant mice and confirmed on histology. The defects were often unilateral and did not appear to prevent the mice from feeding normally.

Conclusion: The TMJ defects observed in Tcof1 mutant mice mimic those observed in patients with TCS, making these mice an excellent model for studying congenital TMJ defects.

Condylar Morphological Changes In Juvenile Idiopathic Arthritis: Cone Beam CT

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Aim: To examine the relationship between the clinical signs and symptoms of temporomandibular joint disorders and Cone Beam Computed Tomography (CBCT) evidence of destruction of these joints in children afflicted with Juvenile Idiopathic Arthritis (JIA). It has been evaluated from a statistical stand point the temporal, metric and clinical variables of the disease, also measuring condylar and mandibular real volumes in order to plan an effective therapy.

Materials and Methods: This study enrolled 30 patients with JIA. CBCT has been performed. 3D quantitative measures of the mid-lateral and anterior-posterior diameters and angles of the condyles were taken. The mandible was isolated from others craniofacial structures; the whole mandibular volume and its components' volumes (condyle, ramus, emibody, emismphysis on right side and on left side) has been calculated by a 3D volume rendering technique.

Results: The analysis of the condylar changes showed that the most apparent signs were the erosion (44%), the flattening (24.5%) and the presence of osteophytes (15%). Only 2% of the study subjects had no damage. There was a very significant difference in the linear and angular measurements between healthy and affected condyles (p<0.01). The results show a highly significant statistical difference between affected side volumetric values versus normal side volumetric values above all on condyle region (P<0.01), while they doesn't show any statistical differences between right side versus left side.

Conclusions: CBCT represents an improvement in quantifying the morphological changes of the condyle and mandible, gives an accurate picture of these structures in JIA and allows the acquisition of true measurements of the mandibular components even in the early stages of JIA. Early initiation and optimal adjustment of aggressive therapy with disease-modifying anti-rheumatic drugs have been extremely successful in preventing irreversible joint damage.

Genetic Determinants of Tooth Agenesis in the Hungarian Population

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Objectives: Genes regulating tooth development have been studied actively and to date over 300 genes have been associated with patterning, morphogenesis and cell differentiation in teeth. Majority of these genes are signaling pathways mediating cellular communication between epithelial and mesenchymal tissues and mutations cause dental defects. As far as human regulation, the role of these genes is mostly to be confirmed yet on population level. Hypodontia population diversity studies so far reveal differences in the pattern of involved genes. We report data of the Hungarian population's genetic traits in Hypo- and Oligodontia.

Methods: Oral mucosal scrapings were collected from 466 patients (263 control, 192 hypodontia and 17 oligodontia) in four universities. DNA was isolated and Genotyping Realtime PCR was performed with Taqman assays for Pax9, Msx1, Axin2, Irf6, Fgf8 SNPs. Groupwise differences were calculated by logistic regression and Chi2 probe. Pairwise linkage disequilibrium and haplotype analysis was determined using Haploview software. Bayesian multilevel analysis of relevance was also performed.

Results: Allelic frequencies were not significantly different between controls and tooth agenesis in any SNPs. Genotypes of hypodontic patients differ significantly

from control in Pax9-912, Pax9-1031 and Msx1 SNPs. The rare GG genotype for Msx1 SNP is significantly different in tooth agenesis $p=0,0143$, (OR=2,553). For Pax9-912, the wild CC genotype differs $p=0,0128$, (OR=1,672), and also the wild AA genotype for Pax9-1031, $p=0,0333$, (OR=1,546). Joint effect of the two Pax9 SNPs were more pronounced than singular ones. The joint effect of Pax9 and Msx1 was weak.

Conclusion: Pax9 SNPs and Msx1 SNP are important factors in the Hungarian agenesis. Contrary to literature data, distribution of Fgfr, Irf6 and Axin2 SNPs were similar in controls and hypodontic patients. In the genetic background of Hungarians other SNPs or other genes must contribute, which will be subjects of further research. Supported: OTKA-75782 TÁMOP-4.2.1/B-09/1/kMR-2010-0001.

0531 (151411)

Future Possibilities in the Field of Computerized Treatment Planning

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Objective: Dentists and cranio-maxillofacial surgeons dealing with complex bony surgeries have to be familiar with the latest high end computerized possibilities. Both preoperative planning softwares and R&D tools can give clinically relevant information for the surgeons. Personal experiences will be shown during a one year cranio-maxillofacial fellowship in the AO Research Institute, Davos, Switzerland.

Methods: The lecture will give an overview of the whole virtual treatment planning procedure. The process from the CT scan through the virtual planning until the surgical room will be shown. The lecture will give an idea how a computerized 3D model is being created and what can it be used for. The potential in R&D tools such as shape and size analysis of the bony skull and implants, the latest possibilities with the present softwares such as treatment planning, finite element analysis and their combinations will be presented. The lecture will give an inspection in the symbiosis of the computerized world and oral surgery.

Result: The usage of computerized treatment planning and the latest technologies can increase the appropriate patient care and recovery.

Conclusion: The latest computerized treatment planning procedures can help surgeons dealing with dental implants and complex bony surgeries.

0532 (151667)

Transpalatal Distraction Compared to Disjunction for Palato-Maxillary Expansion

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Objectives: The aim of the study is how to complete the use of the surgical TPD- transpalatal distraction technique, combined with dentoalveolar orthodontics, regarding the long-term stability.

Methods: A bone-borne titanium device, used with a callous distraction policy, is presented for conventional devices used for rapid palatal expansion are tooth-borne, fixed at the crowns of bicusps and/or molars.

Results: Dental fixation as entails a number of possible drawbacks such as loss of anchor teeth, skeletal relapse during and after the expansion period, cortical fenestration and root resorption. comparison. The TPD – transpalatal distraction's treatment of skeletal maxillary constriction avoids all these aforementioned problems, since fixation is sought in the palatal bone.

Conclusion: The advantages of TPD compared with the surgically assisted rapid maxillary expansion (SARME), as widely used and acceptable means to widening the palate in adolescents and adult patients are compared statistically as well.

0533 (151865)

Hyperbaric Oxygen Therapy in Bisphosphonate-Related Osteonecrosis of the Jaws

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Objectives: Bisphosphonate (BP) associated osteonecrosis of the jaw (ONJ) is an emerging problem with few therapeutic options. This report describes curative effect of hyperbaric oxygen (HBO2) therapy for a case of BP-ONJ which could not be recovered with surgical debridement.

Methods: A 72 year-old man whose past medical history included prostate cancer had used oral zoledronate for two years. Six months after the completed zoledronate treatment, left mandibular second premolar tooth had been extracted in a private clinic. After the extraction, he had complained of discomfort and drainage in the extraction socket. Then he was referred to the clinic for an oral lesion at the left mandibular posterior region. Intraoral examination revealed that the alveolar bone of the left posterior mandibula was exposed with a purulent discharge. The surrounding soft tissue was erythematous and edematous. First, conservative treatment was begun with antibiotic therapy and irrigation of wound twice a week. After 2 months, regression of the lesion was not observed and the drainage was continued. Then, sequestrectomy was performed. The necrotic bone was removed by curetting until normal bleeding bone appeared. The patient did not respond to the surgical treatment, and there had been progressive necrosis. Because of the progressive necrosis the patient was prescribed a protocol of 47 HBO2 treatments at 2.4 ATA for 150 minutes on 100% oxygen daily, with 5-minute air breaks every 30 minutes.

Results: After HBO2 therapy the size of the lesion was decreased and healing of the oral mucosa over previously exposed bone was completed. Follow-up of the patient has been continues for one year.

Conclusion: HBO2 therapy may benefit patients with BP-ONJ which could not be recovered with surgical debridement. But the efficacy of HBO2 in the treatment of BP associated ONJ is needed to be clarified by further investigations.

0534 (151612)

Biofunctionalization of the implant surface with a synthetic peptide (P-15)

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Objectives: The connection between the cell-bonding-domain of type I collagen (P-15) and the cytoskeleton of osteoblasts is mediated by $\alpha 2 \beta 1$ -integrin, which represents a specific bonding site and also leads to the activation of cellular signalling pathways by force mediation, resulting in a specific cascade of bone formation. When immobilized on surfaces, this synthetic peptide acts as a bonding site for bone cells, which provides contact osteogenesis. This study aimed at identifying the ideal concentration of this biofunctionalized implant surface coating in order to promote the early stage of osseointegration.

Methods: Implants (modified ANKYLOS® A8) with 5 different concentrations (0 µg/ml to 400 µg/ml) of a P-15-coating were inserted in the os frontale of 45 adult domestic pigs. The histomorphometrical and microradiographical results were compared to those of the uncoated implants (Friadent plus® surface) after 7, 14 and 30 days (funding: Friadent GmbH DF 2550208).

Results: The highest bone-to-implant-contact (BIC) values were attained by using a P-15-concentration of 100 µg/ml. The BIC, representing the primary histological parameter for osseointegration, was significantly increased ($p = 0.004$) – achieving 86.2% ($\pm 17.4\%$) - compared to the uncoated surface (77.5% ($\pm 25.1\%$)) 30 days postoperative. At day 7 and 14 there was no significant enhancement of the bone-to-implant-contact, although the biofunctionalized implants showed tendencies of higher values. The same applies for the values of periimplant bone density at all investigated points in time.

Conclusion: BIC was increased by 8.7% after 30 days using a P-15 coating of 100 µg/ml compared to the uncoated implants. The results found indicate, that especially in compromised patients, e.g. patients with diabetes mellitus or after radiotherapy, the used coating seemingly influences the initial healing period positively. Furthermore the positive effects of this biofunctionalized coating may improve osseointegration in cases with periimplant bone gaps, like in immediate implantation.

0535 (152141)

Proteomic approach to diagnose oral malignancies in human whole saliva

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Objectives: Globally, oral and pharyngeal cancer represents the sixth leading cancer site. Among European countries, mortality rate is highest in Hungary. Early detection could reduce its associated morbidity and mortality. Changes in protein abundance, structure and function are indicators of abnormality before possible development of clinical symptoms and malignancy. Thus their diagnostic and prognostic value as biomarkers is of high importance.

Methods: Human whole saliva can be obtained in a noninvasive way and proteins derived from the living cancer cells can be obtained easily. The proteomic approach yields to provide identification of possible biomarkers for early detection.

Results: Our study compared whole saliva specimen from healthy, precancerous, cancerous and post therapy cancer patients.

Conclusion: Differences in protein patterns could be seen with MALDI/TOF system and might lead to promising candidates of significant diagnostic and therapeutic value.

0536 (151614)

Implant Site Development by Orthodontic Extrusion for Immediate Implant Placement

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Recession of the mid-vestibular mucosa is a common aesthetical complication with immediate implant placement (type 1).

Objectives: The aims of the study were to evaluate 1. if implant site development by orthodontic extrusion of nonrestorable teeth can create a keratinised mucosa surplus to compensate mid-vestibular mucosa recession following immediate implant placement 2. One year implant survival rate

Methods: Twenty patients were recruited with a nonrestorable tooth in the aesthetic zone: the marginal gingival level was more apical or at the same level as the adjacent teeth. Orthodontic extrusion was performed within 3 months using 2 or 3 adjacent teeth as anchorage. The tooth was carefully extracted . Flapless immediate implant placement was performed using Straumann SLActive Bone Level Implant (Regular Crossfit or Roxolid Narrow Crossfit). Immediate temporization was performed with screw retained resin crown within 24 hours. Final screw retained full ceramic restoration on zirconium framework (Etkon system) was placed 3 months after implant placement (conventional loading). The main followed parameters were the implant survival rate and the height of mid-vestibular keratinized mucosa.

Results: The orthodontic extrusion increased the height of mid-facial keratinized mucosa by 2.8 ± 0.7 mm. The mean recession 1 year after implant placement was 2 ± 0.6 mm. At 1 year, there was no implant loss, no aesthetical complaints, no biological complication and only 1 temporary crown veneer fracture (5% technical complication).

Conclusions: Implant site development by orthodontic extrusion seems to be a reliable therapeutic alternative to increase the height of keratinized mucosa and therefore compensate mid-vestibular recession following immediate implant placement. A longer follow up is needed to evaluate the stability of these results.

0537 (151577)

Systemic and local inflammatory responses in various experimental periodontitis models

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Objectives: Clinical studies have recently shown that periodontal diseases, especially severe periodontitis, worsened atherosclerosis. This influence could be explain by direct effects of periodontal pathogens (Porphyromonas gingivalis - PG) on vessel walls, and/or increased levels of systemic pro-inflammatory cytokines (IL-6, TNFalpha). Previous in vitro investigations have shown that PG triggers deleterious inflammatory responses of both gingival and endothelial cells. This study aimed to evaluate in vivo the specific responses to PG infection at local and systemic level in various experimental periodontitis models.

Methods: Severe periodontitis were induced in C57BL/6J mice by wrapping silk ligatures previously incubated (LIGPG group) or not (LIG group) with PG around first maxillary molars and compared to a mice control group. Blood samples were taken and mice were euthanized on days 15, 30 and 45 after ligature placement. Periodontal tissue destruction and inflammation were evaluated by histomorphometry and osteoclast TRAP enzymohistochemistry. Serum level of IL-6 and TNFalpha were measured by using ELISA bioplex methods (Bioplex, BioRad).

Results: The results showed that loss of connective attachment is higher in LIGPG mice compared to LIG mice at 15 days. The number of osteoclasts was significantly ($p<0.05$) higher in LIGPG mice compared to LG mice. At 15 days, the serum levels of IL-6 ($p=0.05$) and TNFalpha ($p<0.01$) were significantly increased in the LIGPG group compared the control group. Furthermore, serum level of IL-6 was also higher (twice) in the LIGPG group than in the LIG group. At 30 and 45 days, serum level of IL-6 was lower in the LIGPG than in the other groups.

Conclusion: The data confirmed the specific pathogenic role of PG in periodontal inflammation and showed the reliability of our model to investigate the periodontitis systemic influence. Indeed, the initial/acute phase of PG infection was associated to a systemic increase of pro-inflammatory cytokines.

0538 (151993)

Do Menstrual Cycle Phases Influence the Subgingival Microbiota?

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Objective: To evaluate the changes in subgingival microbiota induced by the increase in hormone levels over the one month of menstrual cycle in periodontally healthy and gingivitis female.

Methods: This open cohort study included 24 gingivitis and 24 periodontally healthy women, having regular menstrual cycle. Women were evaluated at three times; on menstruation (ME), ovulation (OV) and premensturation (PM) phases of their cycle. Microbiological, clinical and hormonal variables were assessed in each time. Frequency detection and proportions were calculated. Absence/presence of bacteria were performed by a generalized linear mixed model and subsequent multiple comparisons.

Results: Bleeding on probing was significantly higher in ME and OV than PM in gingivitis group ($p=0.001$ and $p=0.001$, respectively), whereas no significant differences were found between three phases of healthy group ($p>0.05$). Mean salivary estrogen levels were significantly higher in periodontally healthy than gingivitis group ($p=0.01$). A.actinomycescomitans was observed significantly lower and P. gingivalis was tended to detect lower amounts in the ME phase of healthy group than the same phase of gingivitis group. Significant reduction was observed in P. intermedia in the ME compared to PM phase of healthy group ($p=0.02$).

Conclusion: Quantitative differences in periodontal pathogens were found during menstrual cycle phases.

This study has been funded by the IADR.CED visiting scholar stipend.

Proinflammatory Cytokine Levels During Canine Distalization By Two Different TechniquesB. ÖZDEMİR¹, A. URAZ², C. ERDOĞAN², S. BOZKURT², B. TUNCER², B. ASLAN², and M. DİNÇER²¹Department of Periodontology, Gazi University Faculty of Dentistry Department of Periodontology, Ankara, Turkey, ²Gazi Üniversitesi, Ankara, Turkey

Aim: The aim of this study was to compare the level of proinflammatory cytokines (PICs); including interleukin-1β, interleukin-6 (IL-6), and tumor necrosis factor-α (TNF-α) in gingival crevicular fluid (GCF) during orthodontic tooth movement.

Materials & Methods: Ten orthodontic patients (13-14 years old) having different Angle classifications received professional prophylaxis and oral hygiene instructions prior to orthodontic treatment. After first premolar extractions, canines were randomly divided into two groups. 19 right canines were distalized by hybrid retractor with 150g, while PG retractors applying 100g were used for the distalization of 18 left canines. Plaque index (PI), gingival index (GI), probing depth (PD), clinical attachment level (CAL) and bleeding on probing (BOP) were recorded. GCF was sampled from distal gingival crevices of each canine at baseline (pretreatment), 1 hour, 24 hours, 7 and 28 days after the application of orthodontic forces. During the examination periods no orthodontic activation was performed. IL-1β, IL-6, and TNF-α levels in GCF were measured by enzyme-linked immunosorbent assay (ELISA). Repeated ANOVA, Mann-Whitney U test and Spearman rank correlation analysis were used.

Results: The levels of IL-1β, IL-6 and TNF-α were significantly increased in both groups at 24 hours ($p < 0.05$). Later both groups declared significant decreases at day-7 and 28. Intergroup differences revealed significantly higher values in the hybrid retractor group at 1 hour.

Conclusions: The local host response toward the orthodontic forces lead an increase in PICs in the early stages of inflammation, which may be one of the triggers for bone remodeling processes. The initial continuous force caused cytokines to increase significantly after one hour; therefore the importance of initial force can not be neglected.

Diabetic intervention and its role on early neutrophil (PMN) signaling

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Improved diabetic conditions were reported, when periodontal treatment accompanied systemic and metabolic intervention. Altered neutrophil (PMN) functions may contribute to local tissue damage and the deterioration of systemic parameters. Cellular (pre-) activation during host response is primarily receptor dependent. **Therefore, the objective:** of the study presented here was to investigate chemoattractant (FP-R) as well as immunoglobulin (Fc-R) receptor mediated PMN signaling activation prior and after a regimen of diabetic intervention.

Methods: In this prospective ex vivo study 24 individuals participated after giving their written informed consent. Peripheral blood PMN from diabetics and age- and gender matched controls were isolated by dextran as well as Ficoll® protocol. PMN were loaded with membrane permeant probes BCECF® for cytosolic pH (pHi) and/or Indo-1-AM® for cytosolic Ca²⁺ concentration ([Ca²⁺]_i). PMN receptor agonists N-formyl-Met-Leu-Phe (fMLF) and/or high valency immune complex (HIC) were employed for stimulation of early cytosolic signaling functions and measured in a Hitachi® F-7000 fluorimeter (Binniger-Analytik, Germany). Systemic parameters of diabetic and inflammatory controls as well as periodontal status (Florida Probe®) were monitored.

Results: Resting [Ca²⁺]_i dropped (ANOVA, $p < 0.05$) and altered cytosolic signaling [Ca²⁺]_i as well as pHi prior to intervention reached control levels after patients had undergone anti-diabetic medication, dietetic monitoring and physical exercises during a 2 to 3 weeks of hospitalization (ANOVA, $p < 0.01$). When compared to FP-R responses Fc-R agonist HIC lead to attenuated but elongated signaling (Kruskal-Wallis, $p < 0.01$).

Conclusions: On a receptor mediated level, anti-diabetic treatment may help to normalize diabetes induced PMN cytosolic signaling alterations. In addition, these data suggest the importance of synergistic periodontal and anti-diabetic treatment regimens for diabetes mellitus patients suffering from periodontitis.

Effect of mouthrinses in a subgingival-biofilm model by ATP bioluminescenceE. FIGUEROA¹, M.C. SÁNCHEZ-BELTRÁN², M.A. LLAMA-PALACIOS³, M.J. MARÍN-CUENDA³, V. BLANC⁴, R. LEÓN⁴, D. HERRERA⁵, and M. SANZ⁵¹Periodontal Department, University Complutense Madrid, Madrid, Spain, ²Faculty of Dentistry, Universidad Complutense Madrid, Madrid, Spain, ³Facultad de Odontología, Universidad Complutense Madrid, Madrid, Spain, ⁴DENTAID, Barcelona, Spain, ⁵Faculty of Odontology, University Complutense, Madrid, Madrid, Spain

Objectives: The aim of this investigation was to compare the antimicrobial efficacy of three antiseptic mouthrinses in terms of quantitative reductions of total viable microbial counts in mixed biofilm populations in vitro, and to evaluate whether the adenosine triphosphate (ATP) bioluminescence method is an appropriate tool to assess efficacy of antiseptic rinses.

Methods: Three mouthrinses, containing, respectively, chlorhexidine and cetylpyridinium chloride (CHX/CPC), essential oils (EO) and amine fluoride/stannous fluoride (AFSF) were tested in an in vitro static biofilm model by assessing the bacterial viability using the ATP bioluminescence method expressed in Relative Light Units and viable cell counts, as Colony Forming Units. Phosphate buffered saline (PBS) was used as control. Biofilms were grown on saliva-coated hydroxyapatite disks for 72 hours and then exposed for 1 minute to mouthrinses by immersion. Analysis of variance was used to test differences among mouthrinses. The reliability of ATP-driven bioluminescence to measure cell vitality was assessed calculating Pearson correlation coefficient.

Results: Antimicrobial activity was demonstrated by the tested mouthrinses, as compared to PBS control. CHX/CPC and AFSF showed similar antimicrobial activity, although AFSF had a lesser constant effect, and both were more effective than the EO rinse. ATP bioluminescence values were significantly correlated (0.769, $p < 0.001$) to the viable cell counts.

Conclusion: CHX/CPC and AFSF containing mouthrinses demonstrated superior antimicrobial activity, as compared to EO rinses, in a multispecies biofilm model. ATP bioluminescence viability assessment may be considered a useful tool to assess the in vitro efficacy of antibacterial compounds. -->

Influence of Electrospun Metronidazole-loaded Polymeric Non-Wovens on Periodontal BacteriaM. REISE¹, M. ZYLINSKI¹, U. MÜLLER², M. SCHNABELRAUCH², R. WYRWA², K. JANDT³, D. WATTS⁴, and B. SIGUSCH¹¹Department of Conservative Dentistry, Universitätsklinikum Jena; Friedrich Schiller-University, Jena, Germany, ²Biomaterials Department, INNOVENT e. V, Jena, Germany,³Institute of Materials Science and Technology (IMT); Friedrich Schiller-University, Jena, Germany, ⁴University of Manchester Dental School, Manchester, United Kingdom

Objectives: The aim of this study was development of a resorbable local drug delivery system for the treatment of periodontitis based on electrospun metronidazole-loaded resorbable polymer non-wovens as well as determination of the release characteristics of metronidazole and its antibacterial efficiency.

Methods: Poly(L-lactide-co-D,L-lactide) non-wovens containing different amounts of metronidazole were fabricated by electrospinning. To investigate the drug release, weighted pieces of the non-wovens were incubated in PBS solution for 28 days. The antibiotic release and efficacy was determined by measuring inhibition zones of drug-containing eluates in an agar diffusion test with *Aggregatibacter actinomycetemcomitans*, *Fusobacterium nucleatum* and *Porphyromonas gingivalis*. UV-VIS spectroscopy was applied to analyze the release profiles of metronidazole. Cytotoxicity testing was performed exposing human gingival fibroblasts directly onto non-wovens.

Results: Eluates from the non-wovens were found to inhibit the growth of all three bacteria strains. The drug amount released from non-wovens loaded with 40 wt-% metronidazole resulted in a significant decrease in viability of *F. nucleatum* and *P. gingivalis* within 28 days and for *A. actinomycetemcomitans* within 2 days. Even eluates with lower metronidazole concentrations (0.1 wt-% for *F. nucleatum* and 1 wt-% for *P. gingivalis*) exceeded the minimal inhibitory concentration (MIC) of these bacteria. It was found that non-wovens with high metronidazole concentrations (40 wt-%) show a linear release behaviour over time, while non-wovens containing 0.1 - 5 wt-% exhibit a faster drug release. All of the investigated non-wovens showed excellent cytocompatibility with cell-viabilities greater than 96%.

Conclusions: This study demonstrates that non-wovens containing high metronidazole concentrations exhibit ideal antibiotics release properties and cytocompatibility emphasizing their clinical applicability for the treatment of periodontal diseases.

Cytotoxicity of various epoxy and methacrylate-based sealers on PDL-hTERT cellsA.U. ELDENIZ¹, R. HICKEL², and F.X. REICHL³¹Department of Endodontics, Selcuk University, Konya, Turkey, ²Dept. of Rest Dent, Period & Pedodont, University of Munich, Munich, Germany, ³Department of Operative/Restorative Dentistry, Periodontology and Pedodontics, and Walter-Straub-Institute of Pharmacology and Toxicology, Ludwig-Maximilians University, Munich, Germany

Objectives: The aim of this study was to evaluate and compare the cytotoxic effects of two epoxy (AH Plus-Dentsply, Germany and Acroseal-Septodont, France) and four methacrylate (RealSeal & RealSeal SE-SybronEndo, CA, EndoREZ-Ultradent, USA and MetaSEAL-Parkell, NY) resin-based sealers on immortalized periodontal ligament cell line via lentiviral gene transfer of human telomerase reverse transcriptase (PDL-hTERT).

Methods: Bottom of 24-well plate was covered with test sealers and incubated (at 37°C, 24h). Dulbecco's minimal essential medium (DMEM, high glucose, PAA, Austria) was added to each well for 400 µL and incubated (24h, at 37°C). Collected sealer extracts were millipore filtered and further diluted with DMEM to obtain 100%, 33%, 10%, 3%, 1%, 0.3% and 0.1% diluted extracts. After cell exposure to each diluted sealer extract (24h), cytotoxicity was evaluated with a commercial kit (Cytotox, Xenometrix, Germany) that allows two different parameters of cell survival on the same sample: XTT and crystal violet dye elution (CVDE). XTT test measured ability of mitochondrial-dehydrogenase enzymes conversion of the yellow water-soluble tetrazolium salt XTT into orange-colored soluble compounds of formazan with a microplate spectrophotometer (480nm). CVDE evaluated cell density by staining DNA; after elimination of the excess dye, the absorbance (540nm) was proportional to the amount of cells in the well. Data were statistically analyzed with Kruskal-Wallis and Mann-Whitney U tests ($\alpha=0.05$).

Results: MetaSEAL and RealSeal were the most and AH Plus was the least toxic sealers ($P<0.05$). Cytotoxicity of the all tested sealers decreased according to the dilution rate when tested with both XTT and CVDE tests. Latest product, self-etch RealSeal SE was less toxic than its first version RealSeal root canal sealer ($P<0.05$). Acroseal and RealSeal SE Sealers were equally toxic on PDL-hTERT cells.

Conclusion: Cytotoxicity of epoxy and resin-based sealers on PDL cells may vary according to the dilution rate of the extracts and AH Plus is the least toxic sealer.

Regulation of Toll-like receptor-2 in TNF- α stimulated human gingival fibroblastsH. DAVANIAN MOHAGHEGH¹, T. BÅGE², and T. YUCEL-LINDBERG¹¹Department of Dental medicine, Karolinska Institutet, Huddinge, Sweden, ²Karolinska Institutet, Huddinge, Sweden

Objectives: Periodontitis is a chronic inflammatory disease involving the interaction between oral pathogens and host inflammatory response. Pathogen-associated molecular patterns are recognized by a family of receptors in the innate immune system, referred to as Toll-like receptors (TLRs). Studies have reported that mRNA expression of TLR-2 and TLR-4 is increased in gingival tissue from patients with chronic periodontitis as compared to periodontally healthy controls. Therefore the aim of this study was to investigate the expression and regulation of TLR-2 in human gingival fibroblasts (HGFs) stimulated with inflammatory mediators.

Methods: In vitro studies using reverse transcriptase-PCR and flow cytometry was applied to analyze the mRNA and protein expression of TLR-2 in HGFs. Furthermore, a global gene expression approach, utilizing microarray technology was performed to explore the involvement of different signaling transduction pathways in regulating the regulation of cytokine-induced TLR-2 expression.

Results: The mRNA and protein expression of TLR-2 was increased in HGFs stimulated with TNF- α and IL-1 β as compared to untreated cells. In addition, enrichment analysis of microarray data revealed several signal transduction pathways, indicative of inflammatory processes. Furthermore, inhibition of the NF- κ B pathway reduced TNF- α -induced TLR-2 mRNA expression as compared to cells treated with TNF- α only.

Conclusion: The present study demonstrates that the pro-inflammatory cytokine TNF- α up-regulates TLR-2 expression in HGFs and that the signal transduction pathway NF- κ B, is involved in regulation of TNF- α -induced TLR-2 expression in HGFs.

Effect of a novel PGE2 inhibitor on ligature-induced experimental periodontitis

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Objectives: The inflammatory mediator prostaglandin E2 (PGE2) has a central role in the pathogenesis of chronic inflammatory conditions including periodontitis. Elevated levels of PGE2 have been reported in gingival fluid as well as in gingival tissue of patients with periodontitis. The aim of this study was to investigate the effect of a novel potential PGE2 inhibitor on experimental periodontitis in rats.

Methods: Sprague Dawley rats were equipped with a silk ligature around the second upper molar on both sides to induce experimental periodontitis. A total of sixty rats were divided in four groups; the experimental periodontitis group receiving only ligatures, the experimental periodontitis group receiving ligatures and daily treatment with a gel containing the PGE2 inhibitor, the experimental periodontitis group receiving ligatures and a daily treatment with vehicle gel and the control group not receiving ligatures or treatment. The rats were euthanized after eight days and the jaws were collected for evaluation of alveolar bone resorption using dental radiography. The alveolar bone levels were measured in the radiographs at three sites by two blinded observers and Student's t test (two-tailed) was used for the statistical analysis.

Results: The radiographic alveolar bone loss was significantly higher at sites equipped with silk ligatures compared to sites without ligature. The experimental group treated daily by local application with the gel containing the PGE2 inhibitor showed reduced alveolar bone resorption compared to sites receiving ligatures only or treated with corresponding vehicle gel.

Conclusions: The novel PGE2 inhibitor reduces alveolar bone resorption in experimental periodontitis in rats, suggesting this inhibitor as a potential candidate for future treatment strategies of periodontal disease.

Neuromuscular interaction of jaw and neck muscles during clenchingD. HELLMANN¹, N.N. GIANNAKOPOULOS¹, B. KRÜGER², M. SCHMITTER¹, and H.J. SCHINDLER¹¹Department of Prosthodontics, University of Heidelberg, Heidelberg, Germany, ²Institute for Mechanics, Research Group Biomechanics, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany

Objectives: Epidemiological surveys indicate high comorbidity of masticatory-muscle and neck-muscle pain. It is hypothesized that close functional coupling between both muscle groups may be involved in the etiology of myofascial pain conditions. So far, however, interactions between pathophysiological loading of the masticatory system and the adjacent neck muscles, in particular caused by bruxism, lack the confirmation of neuromuscular coupling of both segments at submaximum bite forces. The objective of this study was to test the hypothesis that jaw and neck muscles co-contract during clenching of the masticatory system.

Methods: Bite force transducers which measured all three spatial force components were incorporated in 11 healthy subjects. The test persons developed different feedback-controlled submaximum bite forces in a variety of bite-force directions. The corresponding electrical activity (EMG) of the levator scapulae, splenius capitis, and trapezius muscles was recorded by use of intramuscular wire electrodes, and that of the sternocleidomastoideus by use of surface electrodes. The recordings were made at the level of the fifth cervical vertebra. For normalization of the EMG data, maximum effort tasks were conducted. A special force-transducer system, attached to the head, enabled EMG recordings of the neck musculature in eight different loading directions.

Results: The results confirmed the initially stated hypothesis. Co-contractions of the neck muscles in the range 2 to 8% of their maximum voluntary contraction were

observed. Significant ($p < 0.05$) activity differences were recorded as a result of the different force levels and force directions exerted by the jaw muscles. Long-lasting action potential trains of single motor units triggered by the jaw clenching tasks were also observed.

Conclusions: These findings support the assumption of pathophysiological coupling between jaw clenching and the neck-muscle activity investigated. The small amount of co-contractions, however, requires further studies to elucidate possible pathophysiological interactions at the level of single motor units.

0547 (153477)

The State of the Art Techniques in the Therapy of Multiple Gingival Recession

[S. AROCA](#)

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Recently new techniques have been proposed for the surgical treatment of multiple adjacent recession type defects and are mainly derived from a coronally advanced flap using a suprapariosteal envelope technique with a subepithelial connective tissue graft or its evolution in a tunnel technique. The main goal of these surgical procedures is to obtain root coverage and optimal aesthetic appearance with complete root coverage and blending of mucosa and/or gingival. However, the following questions need to be addressed: 1. How can soft tissues around teeth managed in the best possible way? 2. What is the scientific evidence of using an alternative of connective tissue graft and what is the clinical relevance of such a procedure? This course addresses general dentists and periodontists who intend to learn more about the use of plastic-aesthetic procedures in periodontology aiming to increase the predictability for obtaining complete root coverage. The course will also focus on presenting a comprehensive philosophy of surgical risk factors which need to take into account to optimize the results.

0548 (153478)

The Use of Bovine Derived Xenografts and Platelet Rich Plasma (PRP) in Periodontal Guided Tissue

[F. DÖRI](#)

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The biologic rationale behind the use of bone grafts in periodontal regenerative surgery is the assumption that the use of such materials may stimulate not only the regrowth of alveolar bone but also the formation of new attachment. This assumption is in conflict with current knowledge about the biology of periodontal wound healing, that repopulation of the detached root surface with cells from periodontal ligament is the prerequisite for new attachment formation. Bio-Oss® is one of the most investigated graft materials. The strategy is to amplify and accelerate the effects of growth factors released in recovering bone defects. The most simple way of it is to activate the local growth factor release of autologous platelets, which are the universal initiators of almost all wound healing. Platelet-rich plasma (PRP) is an autologous source of platelet-derived growth factor (PDGF) and transforming growth factor beta (TGF-beta), that is obtained by sequestering and concentrating platelets by gradient density centrifugation. PDGF seems to have numerous positive effects on wound healing, including mitogenesis, angiogenesis and up-regulation of other growth factors and cells. PDGF is the primary growth factor in platelets. It is the first growth factor in the wound and leads toward revascularization, collagen synthesis and bone regeneration. TGF-beta represents a growth factor mechanism that not only can initiate bone regeneration but also can sustain long-term healing, bone remodelling of a maturing bone graft. TGF-beta inhibits proliferation of epithelial cells in vitro and in vivo stimulates DNA, total protein, and collagen synthesis. The objective for GDF administration in the treatment of periodontitis is to enhance the normal wound healing response, which may be of insufficient magnitude to promote the optimal regeneration of all attachment structures.

0549 (153479)

The Use of Xenografts and Autologous Bone Transplantation for Vertical and Horizontal Bone Augmentation

[I. URBAN](#)

School of Dentistry, Loma Linda University

Vertical and horizontal augmentation presents one of the greatest challenges of bone regeneration in implant dentistry. This is primarily due to the difficulty of the surgical procedure and its potential complications. Several treatment modalities have been developed for vertical and horizontal bone growth, including distraction osteogenesis, onlay bone grafting, and guided bone regeneration (GBR). In the past decade vertical and horizontal augmentation utilizing guided bone regeneration (GBR) became a major treatment option in the development of optimal bone support for dental implants. Long-term clinical success and survival of the implants placed in vertically and horizontally augmented bone with the GBR technique appear similar to success and survival of implants placed in native bone under loading conditions. This presentation will review patient selection criteria, describe the technique for vertical augmentation with GBR. Newly developed, scientifically documented approach of horizontal GBR will be presented. This technique is utilizing particulated composite bone grafts and resorbable collagen membranes. The use of Deproteinized Bovine Bone Mineral (DBBM) in these procedures may lessen the need of harvested autogenous bone and may generally lead to decreased morbidity and therefore increased patient comfort and satisfaction associated with these regenerative procedures.

0550 (153522)

History and Overview of Caries Detection by Fluorescence

[P. RECHMANN](#)

Preventive and Restorative Dental Sciences, University of California - San Francisco, San Francisco, CA

The presentation will cover the history of caries detection by fluorescence and an overview of its application for caries detection. The presentation of the history of tooth fluorescence will start with the first mentioning by Stübel, who observed the fluorescence of rabbit teeth in 1911 using ultraviolet light, followed by the first mentioning of fluorescence specifically from a carious tooth by Policard in 1924. The background and physics of fluorescence will be briefly explained and representative examples of fluorophores in dentistry, typically for carious tooth structures will be given.

The application of fluorescence and laser fluorescence for caries diagnostics in modern dentistry will be presented. Caries detection tools based on fluorescence like DIAGNOdent, Quantitative light-induced fluorescence (QLF), Spectra Caries Detection Aid, SOPROLIFE and others will be described. Specific advantages as well as challenges for those qualitative and semi quantitative caries diagnostic tools will be discussed. Representative laboratory and clinical studies having used the most common fluorescence caries diagnostic tools will be presented and critically scrutinized.

Non Linear Optical Microscopy Study of Sound and Carious Dentin

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Non-linear optical microscopy (NLOM) is an effective method to follow pathological processes involving collagen fibrosis or collagen destruction. In particular, the intensity of the second harmonic generation (SHG) signal depends on the structure and orientation of the collagen fibers. In this work, we have used two-photon fluorescence (2PEF) and SHG to investigate the dental caries process. The objective of this study is the characterization of the collagen network in sound and carious dentin using NLOM to study non decalcified teeth. Materials and methods: Longitudinal slices with thickness up to 0.5mm were prepared from freshly extracted teeth: 4 from a sound tooth without caries and 4 from a carious tooth. The samples were polished to 0.25 µm and cleaned up in an ultrasound alcohol bath for 5 min. Fluorescence microscopy, at a wavelength of 480nm, was performed on sound and carious dentin structures. Dentin collagen network images were provided by means of 2PEF and SHG, using an incident wavelength of 800nm on areas previously defined by fluorescence microscopy. Results and conclusion: We have visualized groups of collagen fibres that are constituents of the healthy dentin extracellular matrix and succeeded to differentiate between healthy and carious tooth dentin structure. In a carious lesion, the SHG signal is low and the collagen network is difficult to observe. The obtained 2PEF and SHG three-dimensional images of dentine reveal the tubule network. The visualization of the three dimensional structure of the samples and the optical sectioning capacity inherent to the NLOM technique is a powerful approach for non-invasive investigation of dentine structure and caries.

In-vivo Mimicking of Caries: A Way to Understand the Origin of Fluorescence

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Our aim was to determine the origin of the fluorescence of dental tissues observed with the Soprolife camera during caries. We have conducted in-vitro studies to evaluate the origin of fluorescence using acid and MMP to mimic caries and methylglyoxal (MGO) to evaluate the effect of glycation reaction on final red fluorescence. The red color of carious dentin using Soprolife camera is corresponding to the brownish are observed using day light. Demineralization using nitric acid induces a loss of the green fluorescence of dentine. The red color of carious dentin is resisting to acid treatment. Immersions of demineralized dentin in MGO solutions induce a change of color from white to orange red. After two additional weeks in MGO the tooth section is homogeneously red. This is indicating that the Maillard reaction contributes to lesion coloration. The immersion of demineralized dentin in an MMP-1 solution followed by the same treatment with MGO appear to give a similar color.

Survey of Caries Detection Methods

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Laser fluorescence measurements have been shown to be well suited for both caries and calculus diagnosis. Thus, the Soprolife system with an excitation wavelength of 405nm should be compared to different laser fluorescence devices for caries and calculus detection.

We could observe that the Soprolife system can differentiate a carious lesion involving enamel and superficial dentine caries as well as a demineralization involving the middle third of dentine, improving the diagnosis by visual criteria. Thus, studies indicate that the novel laser fluorescence device seems to be suitable for occlusal caries diagnosis.

In previous studies, a novel fissure sealant seems to be promising with respect to control caries progression underneath the sealing material. Especially the visual output of camera based fluorescence devices might offer an easily usable possibility of long term caries monitoring and avoid unnecessary excavation procedures. With respect to periodontal diagnosis, we can observe that fluorescence of calculus is significantly higher compared to the fluorescence of cement. A differentiation using intensity values is possible as well as considering the spectrum. Using a wavelength of 405nm, both methods are suitable to distinguish calculus from cement and could be used in further devices, improving minimal invasive possibilities of periodontal diagnostics.

In general, the use of a 405 nm excitation wavelength might be a useful adjunctive tool for caries and calculus diagnosis.

Dental Caries Classifications and Clinical Applications of Fluorescence-Based Methods

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A medical approach of determining the patient's caries risk via a Cariogram, CAMBRA or MITP is needed for up to date dentistry with lot of previous and new caries classifications available: e.g Ekstrand, Hume and Mount, UniViss, ICDAS. But whatever the classifications or medical concepts used, the threshold of intervention seems to be whether there is a cavitated lesion and the remaining clinical question is still : drill or not drill in addition to the clinical sequence : sealing, drilling and monitoring. The choice between the preventive care advised and the preventive and operative care advised will depend on this decision, and the clinical end point criteria during the excavating procedure is unfortunately still subjective. Therefore we can divide our preventive and minimalist therapies into 2 groups: the first (Minimally Invasive Treatment 1 or MIT1) for treating enamel and enamel-dentine lesions without any preparation, provided that there is no surface cavitation. The second group (Minimally Invasive Treatment 2 or MIT2) is for treating early enamel-dentine lesions with surface cavitation and the main clinical challenge is to be able to see this first demineralization process as earliest as possible. Fluorescence dental devices e.g Soprolife, Diagnodent, Vistaproof ... could certainly enhanced the precision of our diagnosis depend of relevant sensitivity and specificity of the fluorescence devices and with no doubt increased our knowledge during all the treatment steps due to the fluorescence signals and the pictures magnification. The purpose of this lecture is to discuss about the link between caries classification, clinical operative treatments decision and fluorescence-based methods.

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