Posters
(Abstracts 72 to 394)

072 | Topic Implant Aesthetics

The comparsion of osteointegration of SLActive, SLA, BL implants using DVT pictures, bone level profile device and ostell-mentor system: case report

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Introduction: SLActive, SLA and Bone Level, a members of Straumann implants family, are the products to the combination of cylindrical-shape implant advantages, very good osteoconductive properties of the surface and different concept of the level of installed implants.

The aim: Of this work is to evaluate osteointegration of Straumann SLActive, SLA and Bone Level implants in two months after implantation in the patient with risk factors.

Material and methods: Male aged 29, heavy smoker, periodontitis in family history, poor oral hygiene and partial deficiency of the teeth revealed in intraoral examination. DVT diagnosis showed horizontal atrophy of alveolar process in tooth-less region. On the base of DVT (Picasso), diagnostic models, patient was qualified (Straumann recommendation) for SLAactive (immediate installation) SLA and Bone Level Implant (esthetic area) with bone augmentation using BioOss and BioGuide membrane. Two months later the osteointegration progress was evaluated in all installed implants using:

1. Mathematic analysys (Fourier transform, Fractal) of DVT, and dental X-rays, DVT of bone surrounding the implants.

2. Ostell Mentor – electro-magnetic camerton value (arbitrary units), recommended by ITI were used for that purpose.

3. Bone Profile Measurement device – direct evaluation augmented bone profile around the implants.

Results: In two months after implant installation some differences of Fractal analysis of bone trabeculae direction/size and Ostell Mentor arbitrary units value were found.

Conclusions: Presented case report of Straumann implants installation seems to confirm:

1. efficacy and excellent osteointegrational properties of SLActive implants.

2. high Ostell Mentor value of arbitrary units in all examined implants.

Good parameters of osteointegration of Straumann implants family evaluated 2 month after installation i.e time of early loading are not long-term prognostic factor. Only after two months period of healing, high level of integration was observed, despite of the risk factors coexistence. It indicates for reduction of overall implant healing and makes early prosthetic treatment possible.

073 | Topic Implant Aesthetics

Immediate implant placement and bonymucosal papilla healing in aesthetic areas

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The immediate restoration or loading of dental implants has been an intense area of clinical trial and research in the field of dental implantology over the last several years. The immediate placement of an implant, then, is not only possible but in some clinical situations advisable, with each case individually assessed and the time of placement determined by the clinician. In such cases, the immediate implant placement provides a considerable number of advantages over the traditionally established placement. Osseointegrated implants have been increasingly also used for aesthetic, predictable restorative treatment. This study presents the 2-year postoperative results of patients treated with immediate, single, tapered implants (Seven, MIS, Israel) in the maxillary incisor region and the simultaneous placement of screwed provisional implant-supported crowns. Implant stability was assessed clinically and by means of resonance frequency analysis (RFA) at surgery and after 3 months. Wound healing was evaluated after 1, 2, 6 and 12 weeks post-operatively. Of the total of 32 implants placed, no implants were lost, resulting in a 100% survival and success rate. All 32 implants were reevaluated and judged to have no signs of mobility, peri-implant inflammation, or adverse reactions. This pilot study has demonstrated that tapered implants yielded clinically after immediate implant placement into the extraction socket and when used in selected cases, this technique facilitated maintenance of the gingival architecture adjacent to immediate transalveolar implants.

074 | Topic Implant Aesthetics

Screw-retained implant-supported zirconia crowns: 12 months study

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This study evaluated the clinical performance of screwed customized zirconia abutments. Additionally, the marginal fit between the selected implant components was measured and the clinical gingival response was monitored. Twenty patients were consecutively selected for a prospective study of 30 implant-supported restorations. Customized zirconia abutment complexes were prepared, then ceramic was performed directly. The abutments were

screwed onto the implants and restored with all-ceramic crowns. Plaque and gingival indices were recorded monthly intervals over a 12- month period.

All ceramic zirconia abutments offered sufficient stability to support implant-supported single-tooth reconstructions in anterior and premolar regions. The soft and hard tissue reaction toward zirconia was favorable.

075 | Topic Implant Aesthetics

Extraction socket soft and hard tissue classification: reliability and validation

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Objectives: The aim of this study was to present and validate a new classification system for the maxillary anterior extraction socket based upon soft and hard tissue parameters and to determine indications, efficacy and advantages of the support immersion endoscope (SIE) method for extraction socket assessment.

Methods: Twenty-five maxillary anterior teeth from25 subjects (15 men and 10 women; ages 18 to 51 years; mean = 32.4 years) were used to validate the new proposed classification system. Two independent surgeons recommended a treatment approach based upon the classification proposed. These suggestions were verified at the time of surgery. Weighted Cohen's k was used to calculate interobserver reliability. Statistical analysis was performed using the paired t, Kolmagorov-Smirnov, and marginal homogeneity tests. Extraction sockets were evaluated either with conventional extraction site evaluation method (CESE) alone or with CESE plus SIE. CESE includes visual evaluation, periodontal probing, ridge-mapping with calipers, dental mirror, orthopantomogram, and diagnostic wax-up.

Results: Interobserver agreement and weighted Cohen's k were 96% and 0.94, respectively. This indicated a high reliability for the proposed classification system. No peri-implant soft tissues were classified as deficient when the newly developed classification was used to recommend treatment. Overall, 80% of sockets were graded as adequate based on soft tissue parameters ($P < 0.001$). CESE plus SIE had significantly better accuracy in examining extraction socket labial plate vertical position; labial plate thickness; and bone quality when compared to CESE alone.

Conclusion: The extraction socket classification proposed here is an objective and helpful tool for socket assessment and for promoting future implant esthetics. Support immersion endoscope can be used as an adjunct tool in assessing extraction socket morphology and bone conditions without flap elevation.

076 | Topic Implant Aesthetics

Simultaneous procedure including implant placement, GBR and SECTG

Beitlitum I

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The sub epithelial connective tissue graft (SECTG) predictably results in root coverage and improves esthetics. GBR procedures using resorbable membranes and deproteinized bovine bone mineral* (DBBM) are well documented. Applying both procedures simultaneously.may act synergistically.

Methods: Eight patients, missing upper first/second maxillary premolars were evaluated for the purpose of implant placement and correction of gingival recession in the adjacent tooth.

Delayed, tapered implant were placed to replace the missing premolars. Bone deficiencies around the implant were augmented using DBBM and covered with either cross-linked† (CLM) or a non-cross-linked‡ (NCLM) collagen membranes. Gingival recessions (Miller Cl I or Cl III) in the adjacent tooth were simultaneously corrected using SECTG.

Results: Clinical outcomes presented a successful integration of the implant, and harmonious gingival margin in both the implant and the adjacent tooth. Almost complete coverage of the Cl I recession (93%) and partial root coverage of the Cl III recessions (61%) were shown.

Conclusion: This report presents a successful simultaneous surgical approach for the correction of both bone and soft tissue deficiencies. This simultaneous approach proved to be predictable, less time consuming and more pleasing to the patient in comparison to a staged approach.

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077 | Topic Implant Aesthetics

Simultaneous GBR and immediate implant, leaving the gingival collar intact

Beitlitum I

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Separation of the free marginal gingiva and the mucoperiosteum from the alveolar bone triggers a cascade of cellular and molecular events activating bone resorption. Flapless immediate implants placement however limits the ability to correct localized fenestrations or augment the peripheral bone.

A semilunar incision approch is presented, aimed at enabling GBR procedures while maintaining the free gingival margin intact.

Methods: In eight patients requiring immediate implant placement in the maxillary esthetic zone, an a traumatic extraction was carried out, followed by insertion of a tapered implant and raising a semilunar flap for correcting either an existing

fenestration or a peri-apical lesion using deproteinized bovine bone mineral* and a native collagen membrane.

Result: Clinical outcomes presented successful integration of the implants, and harmonious gingival margins around the healing abutments, while treating bone defects around it.

Conclusion: Simultaneous GBR and Immediate Implant placement, using a semilunar incision and leaving the gingival collar intact, successfully retains esthetic gingival margin.

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078 | Topic Implant Aesthetics

Optimal function and esthetic in full-mouth implant reconstruction: case series

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Implant therapy is one of the prosthetic treatment options considering biological and mechanical factors. Conventional complete dentures as well as implant-supported fixed dentures are treatment alternatives for edentulous patients. Rehabilitation of edentulous patients with implant-supported fixed dentures provides significant psychosocial achievements due to the reestablishment of dentate state. Long-term clinical and esthetic success of implant-supported dentures is related to the longevity of osseointegration and restoration of periimplantary soft tissues.

Factors influencing the final esthetics of the implant-suppported fixed dentures for edentulous patients have been described in this clinical report. Treatment approach in esthetically compromised situations are described with case series. Reconstruction of cases with severe horizontal and vertical hard and soft tissue losses by using implant-supported dentures is challenging. Advanced surgical techniques for soft and hard tissue management might be required to obtain optimal esthetics especially in premaxillary region where treatment alternatives are limited due to anatomical and technical difficulties. Implant localization, framework material, abutment type, fixture-abutment-suprastructure assembly congruency, natural appearance and morphology of the prostheses are significant factors related with the esthetic outcome of the implant-supported restorations.

079 | Topic Implant Aesthetics

Esthetic and biological evaluation of implant-supported restorations: case series

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Implantology includes functional and esthetic rehabilitation of lost tissues. Implant-supported restorations are fabricated in cases of tooth loss due to periodontal diseases, caries and trauma and resultant severe biomechanical deteoriations. Implant-supported restorations are also important for patients' psychological concerns. This clinical report describes the surgical and prosthetic methods used for the determination of factors influencing treatment planning and optimal esthetics. Advanced surgical techniques, guidance of the emergence profile by postoperative temporary restoration fabrication and achieving optimal esthetics by definitive restoration application are discussed with case series at our clinics. The esthetic and functional needs of the patients had been restored. Patients are being recalled periodically. Clinical applications of different implant systems (Straumann, Biolok, Astra, BioHorizons, Bego), abutment types (metal, zirconium) and framework materials (metal-ceramic, heat-pressed ceramic, zirconium oxide and aluminum oxide) have been described. The clinicians' success has increased by the technological progress with scientific documentation. Non-traumatic surgical procedures, mechanical stability of the implant, choice of ceramic material and technological progress lead to highly esthetic and long-lasting restoration fabrication. Multidisciplinary teatment approach is the key factor to successful treatment.

080 | Topic Implant Aesthetics

High-tech esthetics: The zirconia implant approach

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The Challenge of Esthetic Implant dentistry has always been restoring what is lost to its original shape and color. Today, the means, methods and opportunities for implant esthetic dentistry seem to be at hand. The technological advances in biomaterials and the better understanding of their applications in implant dentistry allow us today the use of Zirconia white implants not only where esthetics is compromised but also in classical situations where the use of metal titanium is undesirable. Zirconia is very helpful in such situations, and better soft tissue-preserving than the conventional strategies. This presentation will give a closer look to the clinical approach, the integration of zirconia in hard and soft tissues, the indications and the results of the use of Zirconia white implants at 24 months follow up.

081 | Topic Implant Aesthetics

Significance of prosthetic components on peri-implant mucosa color changes

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Objectives: To evaluate the influence of peri-implant mucosa thickness on masking ability of different prosthetic components. To estimate the effect of light transmission of zirconium oxide based abutments and crowns on gingival esthetics.

Material and methods: Peri-implant mucosa color changes with different prosthetic materials were investigated using 2 titanium based (titanium only and titanium layered with ceramic) and 5 zirconium oxide based specimens using in-vitro porcine jaw model. Unstained, stained (A2, A3 and A4) and covered with pink ceramic Zirconzahn (Zirconzahn GmbH, Germany) and two types (white and yellow) of Cercon (DeguDent GmbH, Gemany) ceramic specimens comprised the zirconia group. ΔL, Δa, Δb and ΔE were calculated and compared for all specimens with different thicknesses of mucosa. Special setting was used to evaluate light transmission of different materials. Specimens covered with mucosa were lightened by the daylight or halogen light from one side and mucosal color changes evaluated.

Results: Study revealed that overall color change of mucosa was significantly influenced by the optic properties of the prosthetic components (ANOVA, $p < 0.05$). With increased thickness of the mucosa, color change was less expressed. Pink porcelain was found to be an effective measure to prevent adverse optic effects with thin peri-implant tissues. Significantly more light was transmitted to the mucosa in the zirconia group.

Conclusions: Thin peri-implant tissues are associated with the risk of mucosa color change due to the show-through of prosthetic components. Colored zirconia abutments ensure less discoloration. Light transmitting feature of zirconia materials might promote natural appearance of the marginal tissues.

082 | Topic Implant Aesthetics

Immediate implantation in inflamated versus non-inflamed sockets: clinical, radiological outcomes

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Intruduction: Immediate implantation is becoming very used method because of its predictable. Aim of our study was to compare implant outcomes and stability of marginal bone after immediate implantation between inflamed (ISO) and not iflamed sockets (NISO).

Methods: Eight implants (seven patients) were placed and prostethically restored by following immediate implantation with non-functional loading protocol. In ISO-group (four patients) four implants were implanted where at least one sign of inflammation was presented: fistula with push (3), evident mucosal swelling with redness (1). Other implants were inserted at NISO-group (three patients) after fracture of roots (4) were established. Antibiotic was prescribed for 10 days. Clinical controls and intraoral periapical x-rays were performed periodically at 1/6/12/24 week. Vertical changes of periimplant bone level were observed on mesial and distal site of the implant body. Bone apposition on implant shoulder was checked on last control. X-rays (image size 3072 × 2048 pixels) were examined with ImageJ program.

Results: All implants were osseointegrated and fulfilled other requested criteria of success. Average rates of subcrestally insertion were (ISO/NISO) mesially 2.540/2.805, distally 2.201/2.317 mm on x-rays at 1 week. After 24 weeks average resorption rates were mesially 0.023/0.073, distally 0.028/0.076 mm. With 5 implants, both shoulders were completely overgrown by bone. No bone apposition was observed only on one side (ISO).

Conclusions: Inflammation did not adversely affect osseointegration; bony overgrowth is suggesting the opposite. Marginal bone resorption with immediate implantation can not be avoided. Antibiotics had important rule of overweighting the threat of infectious non-integration. Small sample and minimal changes of bone level require for continuing of study.

083 | Topic Implant Aesthetics

Autogenous bone block with immediate implant placement in anterior maxilla

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Anterior teeth root fractures and chronical fistula usually results in bone deficiency of anterior maxilla. Insufficient bone volume in the anterior maxillofacial region often requires reconstructive surgery for ridge augmentation to make placement of endoosseous implants possible. In the majority of the cases the bone block grafts were harvested from the mandible using specially designed instruments.

A patient was a 36-year-old male with clinical and x-ray signs of a vertical fracture of the endodontically treated maxillary left central and lateral incisor. After extensive diagnostic procedures, therapeutical plan was made: two dental implants placement (XiVE® Implant System) immediately after teeth extractions and bone defect augmentation in the area 21 and 22. After immediately implants placement, autologous bone graft was used for remaining bone defect of the buccal cortical plate, combined with heterogenous bone filling material (Bio-Oss®, Geistlich, Germany) and finally covered with resorptive membrane (Bio-Gide®, Geistlich, Germany). During the osseointegration period, onlay composite resin bridge was made as the temporary prosthetic solution. Following the osseointegration period of 6 months, all-ceramic single tooth crowns on zirconium oxide abutments were used as final prosthodontic restorations. The patient exhibited neither clinical

nor radiologic complications throughout the 6 months period of clinical monitoring.

084 | Topic Implant Aesthetics

Tooth replacement using an ankylos implant with a cercon abutment and cercon crown

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First case: The presented 32 year old patient of us, came in March 2004. into our office. He told us he had an accident in his childhood, because of his maxillary right central incisor, tooth 11 was extracted. Since then he had a removable denture. Because of his young age and because of aesthetic reasons he was interested in an implant solution. After taking a panoramic x-ray, we have found that there is a possibility for an implantation. The amount and thickness of the bone was suitable for an implantation. The operation was done on the 9. October 2004. After raising the flap we have implanted an Ankylos implant type B of 14 mm length an 4.5 mm diameter. We have not found the amount of bone enough, this is why we have placed BIO-OSS cancellous bone around the implant. Before closing the wound the bone replacement material was fixed with a BIO-GIDE membrane. We have made a recall examination after half a year. Because of using a bone replacement material we have waited a year for opening the implant site. We have taken the impression September 2005. We used a CERCON abutment on which a CERCON crown was fixed.

Second case: The 25 years old patient came in June 2005. into our office for recementation of his post crown in his maxillary right central incisor, tooth 11. After taking an x-ray we suggested the extraction of the tooth. The tooth was extracted by using a periotome to preserve the buccal and palatal wall of the socket. A temporary removable denture was made. After we have waited 3 months, an Ankylos implant, type B of 17 mm length and 4.5 mm diameter was placed on site 11. The socket was preserved, that is why an augmentation was not made. In the middle of October the implant site was opened, after waiting 2 weeks the impression was taken. We used a CERCON abutment and a CERCON crown was made.

085 | Topic Implant Aesthetics

Gingivomorphometry—A new method for collection and measurement of standardized & reproducible data in oral photography

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The Gingivomorphometry method is a two step concept for evaluating certain intraoral soft tissue and crown parameters through 1. standardized and reproducible data collection and 2. standardized and reproducible parameter measurements. In order to acquire standardized and reproducible data in oral photography 3 basic criteria have to be fulfilled: 1. Standardized and reproducible patient positioning 2. Standardized and reproducible camera positioning 3. Standardized and reproducible mirror positioning for data collection in the premolar and molar regions. A device to fulfill the above mentioned criteria was developed and will be presented.

Standardized processing of the aquired data – the ''Morphometrical'' part of this concept – is based on the import of the acquired data into a medical image processing software designed for navigation and visualization of multimodality and multidimensional images. In our concept, the acquired data files are saved and imported into an image processing software (e.g. Photoshop®). With the help of this program a reference line connecting the midfacial gingival levels (FGL) of the adjacent teeth next to the implant restoration is added. The zeniths of the adjacent teeth can then be marked as reference points and – together with the resulting reference lines – they serve as standard orientation markers for the necessary morphometrical measurements. A standardized protocol of six different soft tissue measurements around implant supported crowns include mesial/distal papilla height and area, as well as soft tissue height of the implant supported crown and implant crown soft tissue perimeter. Implant supported crown area and perimeter can also be measured and compared to contralateral parameters.

086 | Topic Implant Aesthetics

Dimensional comparison of interproximal soft-tissue on multiple-implants and contra-lateral natural teeth

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Objectives: The purpose of the present study was to compare and to correlate the dimension of soft tissue from the tip of papilla to the crestal bone between 1) two adjacent implants 2) two contra-lateral natural teeth. Thus, the dimensional relationship and possible correlation would be investigated.

Methods: The present study involved 16 inter-implant papillae and 16 contra-lateral interproximal papillae in 13 patients. All the subjects had periodontal treatment prior to the implant surgery. Patients who had inflamed mucosa around implants with bleeding tendency and plaque accumulation were rejected. Plaque index (PI) and gingival index (GI) was recorded. The shortest distance from the tip of the papilla to the inter-implant crestal bone (DI)/and contra-lateral inter-dental (DN) crestal bone was measured with non-invasive method, developed and published by our team, using radiograph. Wilcoxon-Signed-Ranks-Test was performed in order to see the 1) difference of PI/GI between implants and natural teeth and 2) difference between DI and DN. Also, correlation between DI and DN was calculated (Spearman's correlation-coefficient).

Results: The mean PI/GI of implant (0.1 ± 0.08/0.1 ± 0.02) and natural teeth (0.1 ± 0.05/0.1 ± 0.01) were not different. Statistically significant difference was found between DI and DN (4.08 ± 0.68 vs 2.88 ± 0.9, $p = 0.001$). Correlation between DI and DN was not significant ($p = 0.12$, rho = 0.4).

Conclusion: The result of the present study showed that in periodontally treated patients, the dimension of interproximal soft tissue between multiple implants was significantly less than that of contra-lateral natural teeth. However, the correlation between two variables was not found.

087 | Topic Implant Aesthetics

Extraoral fixtures for nasal epithese

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Maxillofacial defects caused by cancer treatment are a huge problem affecting the quality of life of patients. Epithethic solutions are indicated if plastic surgery reconstruction is not a valid option for an extensive defect.

We present the case of a 42 years-old woman, who had underwent a total nasal resection, for a well-differentiated epidermoid carcinoma of the tip of the nose, resected in his totality. The anatomopathologic analysis of the piece of resection did not reveal any ganglionar metastase, then, the site of tumoral resection was not irradiated.Three month later, four extraoral ®Vistafix fixtures were placed. After four months, each fixture as a bone anchorage was connected with a retention device to be connected to the epithese. After four weeks, cutaneous healing allowed the prosthetic steps to be achieved.

The use of extraoral fixtures as bone anchorage for a nasal epithese represents an alternative to more heavy and more time-consuming surgical reconstruction techniques. Another advantage is that the site can be monitored easily, as for the carcinologic follow-up. It allows a good retention of the nasal epithese and an esthetic result which is satisfying for the patient.

A multidisciplinary co-operation is essential if optimal results are to be achieved.

088 | Topic Implant Aesthetics

Multicentric prospective study of immediately provisionalized postextractive implants

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Background: Immediate restoration of post-extractive single implants is gaining increasing popularity, but more information is needed about their success rate, patient perception and risk factors. The aim of this multicentric prospective study is assessing the success rate and identifying possible risk factors for aesthetic and functional failure.

Methods: Molar teeth were excluded from the study. One-year follow-up was planned: the recruitment will be terminated after the insertion of 250 implants in 15 centers.

Surgical protocol was designed to achieve optimum stability while striving for light contact with the buccal cortical bone. Cone-shaped implants (Nanotite Certain NT implants, Implant Innovation Inc., Palm Beach, Fla) were selected to increase primary stability and wound healing speed. Several morphologic variables were recorded, including periodontal biotype, crestal bone levels, marginal tissue level relative to adjacent natural teeth. A screwed temporary crown had to be delivered in 48 hours after the end of surgery. Any occlusal contact was eliminated.

Demographic and dental data were recorded in order to find possible relationships with implant failure or complications, with special emphasis on recession.

Results: The study was started in July 2007 and should be completed in 2 years. The success rate was greater than 98% in the first 88 cases. There have been too few complication to allow for an analysis of the risk factors.

Conclusions: Immediate provisionalization with non-functional loading is a safe option for postextractive implants in the short run. Long term data is needed to recommend this protocol for clinical practice.

089 | Topic Implant Aesthetics

Outcome analysis of immediately-placed, immediately restored implants in the aesthetic area: the clinical relevance of different inter-implant distances

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Background: The purpose of this study was to compare and evaluate bone and soft tissue levels between immediately-placed, immediately-restored implants positioned in the aesthetic anterior region with different inter-implant distances.

Methods: 49 patients requiring multiple implant restorations in the anterior regions received 152 implants, which were immediately restored. Periapical radiographs and digital images of 99 inter-implant sites were made in regular follow-up examinations at 0, 6, 12 and 24 months after surgery. They were digitally recorded and analyzed. The presence of the inter-proximal papilla was assessed and compared to the distances between the bone crest and the contact point between the natural teeth and the restoration crowns.

Results: Implants with an inter-implant distance of less than 2 mm seems to lose less bone laterally. When the inter-implant distance was less than 2 mm, vertical crestal bone loss was significantly greater than in the other groups. Interproximal papilla presence decreased in percentage when the distance between the bone crest and the contact point between the two restoration crowns was greater than 6 mm and when two implants where placed at a distance of 4 or more millimetres.

Conclusions: To guarantee a better aesthetic result in immediately placed, immediately restored implants, the contact point between the two prosthetic crowns should be placed at 3–4 mm and never more than 6 mm from the bone peak. Two adjacent implants should be placed at a distance greater than 2 mm and lesser than 4 mm.

090 | Topic Implant Aesthetics

Evaluation of implant-supported single crown esthetics: 2-year follow-up

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Objectives: The aim of this study was to evaluate the esthetics of implant-supported single crowns and adjacent soft tissues with the use of an esthetic index.

Material and methods: 35 implant-supported single crowns and their periodontal status were evaluated using Implant Crown Esthetic Index (ICEI) including 9 items by three oral-maxillofacial surgeons and three prosthodontists after 2 years. The rating was carried out twice by each of the examiners. Weighted Cohen's *k* was calculated to express the intra- and interobserver agreement.

Results: The agreements for prosthodontists, surgeons and both groups (overall) are shown in the Table. Intraobserver results indicated that the agreement among the ratings of oral maxillofacial surgeons was fair (0.39) while the prosthodontists' was moderate (0.45). The best interobserver agreement was observed among the prosthodontists (0.51).

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Prosthodontists	0.36	0.51	0.64	0.52	0.27	0.41	0.51	0.47	0.22
Surgeons	0.59	0.06	0.49	0.01	0.51	0.24	0.55	0.18	0.47
Overall	0.12	0.13	0.31	0.23	0.21	0	0.31	0.14	0.27

Conclusions: ICEI is an objective tool in evaluating esthetics of implant-supported single crowns and surrounding soft tissues. Prosthodontists exhibited the highest reliability in rating the esthetics of restorations. Although ICEI is frequently used for esthetic evaluation of implant restorations, it might be developed for further clinical data collection.

091 | Topic Implant Aesthetics

Comparision of impression making procedures for esthetic implant restoration

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Impression is the most important tool of communication between dentist and dental technician. Impression should have to transfer as much information as possible. To make more precise and convenient there were several modified technique. Individual impression coping, impression with temporary restoration as impression coping and manual modification of stone cast were representatives. This presentation will compare these technique with a newly developed a simple and accurate technique to produce an implant definitive cast with an analog block. An analog block is made from bis-GMA temporary restoration material. This chairside procedure is designed to transfer information regarding the contoured soft tissue and provisional restoration, enhancing the aesthetics of the definitive restoration. This method also reduces the number of parts used in impression procedures and numbers of connecting/disconnecting. So using this method will reduce the chance of misfit by repeated screwing. With clinical case presentation, upper mentioned technique were compared.

092 | Topic Implant Aesthetics

The influence of immediate implant loading on the gingival aesthetics

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Authors discuss the influence of immediate implantation with immediate loading on the red aesthetics over the early implantation with immediate loading (6 weeks after extraction).

Over 600 implats have been observed in years 2005–2008. The situation has been photo documentated in the day of 1st stage surgery, after 3 month and after 6 month.

The clinical experience shows, the best aesthetic results of gingiva are possible to achieve usually in young patients, with preoperative healthy gingiva and with sufficient bone support.

The implant width also acts the essential role in the red aesthetics, the wider the implant, the better the outcome. Immediate implantation with immediate loading has better aesthetic result than early implantation with immediate loading. Six month post surgical gingival recession was more pronounced after early implantation than after immediate implantation.

For good aesthetic result of gingiva, it is neccesary to have preoperative healthy gingiva, the sufficient height of interdental bone, wide implant platform and immediate implant loading. Passive fit of the crown in the cervical part and perfect oral hygiene are considered as the standard.

093 | Topic Implant Aesthetics

Intraoral luting: new prosthetic design to achieve aesthetics and passivity

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Intraoral luting between metallic framework and galvanic gold caps (AGC) is a good procedure to achieve passivity of the prosthesis. The limit of the conventional technique is the resultant thick prosthesis margin made of the AGC, the cement for the luting phase and the framework. A new intraoral luting technique is presented. The peculiarity is the different prosthetic design with

the metallic framework that is 1.5 mm shorter than the margin of the galvanic caps. As a consequence, only the thin prosthesis seal of the AGC (0.3 mm) is placed just beyond the apical limit of the aesthetic material with a good chromatic camouflage in the area next to the free gingival margin.

The technique has the advantage that it can be performed with all the implant systems which have milling abutments. The clinician and the technician can choose the metal for the casting of the framework and the aesthetic resin veneering material.

One disadvantage is the composite luting agent (Nimetic cem; 3 M ESPE, Seefeld, Germany), because it does not resist above 120°C. For this reason the aesthetic veneering is made with hybrid ceramic (Estenia; Kuraray Medical Inc, Okayama, Japan). In the future, the development of other luting materials which resist at the temperature for low fusing porcelains should overcome this limit.

The procedure presented is efficient, standadized and assures a prosthetic rehabilitation with a high aesthetic result.

094 | Topic Implant Aesthetics

Ridge augmentation of the anterior maxilla using cancellous freeze-dried block allografts

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Background: An esthetic final result depends on the presence of an adequate bone volume, providing a predictable bony support for the gingival margin and papillae. Therefore, pre-implant augmentative surgery is a pre-requisite in many cases in the anterior maxilla.

Aim: Evaluate the clinical, radiological and histological results of endosseous implants placed in the anterior maxilla following ridge augmentation with cancellous freeze-dried block bone allografts.

Material and methods: Consecutive patients requiring ridge augmentation of at least 4 mm in either vertical, horizontal or both dimensions of the anterior maxilla were included in the study. 55 implants were placed after a healing period of 4–6 months, based on age, defect size, radiographic and clinical follow up. Bone biopsies were taken after 4–6 months during implant placement. 19 implants were immediately loaded.

Results: 38 blocks were used in 26 patients (16 females and 10 males) aged 17–70 years (mean 34 ± 17 years). The mean follow-up was 33 ± 13 months (range 8 to 53 months). Histological evaluation demonstrated newly formed bone containing viable osteocytes merged with residual grafted bone characterized by empty lacunae devoid of osteocytes. Two blocks failed resulting in 94.7% survival rate. One out of the immediately loaded implants (98% survival rate) failed following trauma. After 3 months of waiting, the implant was reinserted and successfully osseointegrated. All patients received a fixed implant-supported prosthesis. No further implants have been lost in function.

Conclusion: Cancellous block-allografts appear to hold promises as a grafting material for the atrophic anterior maxilla.

095 | Topic Implant Aesthetics

Marginal adaptation in provisional crowns of immediate single tooth implants

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A body of literature describes good osseointegration outcomes following provisionalization of single tooth immediate implants in extraction sites. Good aesthetics results on the same day of the surgical procedures and maintenance of the soft tissue contours are the main advantages of this protocol. Cemented retained, screw retained and friction retained crowns can be used for the provisional restorations. The marginal adaptation of the provisional crowns next to the soft tissues margin can be achieved by different ways, always conditioned by the type of chosen provisional restoration. This clinical report describes a method of improving marginal adaptation of screw retained provisional crowns in immediate implants placed in 8 patients in 10 extraction sites, with the use of a temporary implant abutment, a polycarbonate crown and final adaptation with flow composite by an indirect placement using a silicon putty model. Different parameters like the papilla anatomy, marginal bone loss and satisfaction of the patients were evaluated. This technique offers a good soft tissue adaptation, a reduction of treatment time and an improved degree of satisfaction for the patients.

096 | Topic Implant Aesthetics

Soft tissue and bone evaluation around custom made abutments

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Introduction: Recent progress in the technology and research of new dental materials has resulted in an increased number of materials available for esthetic restorations. Increasing awareness among patients of dental esthetics had led some to be dissatisfied with the appearance of metal-ceramic crowns and titanium abutments.

Material and methods: 32 implants were placed in 12 patients. After implant surgery, impressions were taken and custom made zirconia abutments were prepared by Procera® (Gothenburg, Sweden). Implant supported zirconium restorations were made after 3 months of healing period. Heavy smokers, patients with systemic diseases were not included. The radiographic examinations were made with panoromic radiographies after 0, 3,6,12 months.

Results: Satisfactory functional and mechanical results were achieved in much of the restorations. 2 procera abutments with diameter of 3.5 Nobel Biocare Replace Select system have broken. The mean radiographic bone loss was 1.3 ± 1.2 mm

(range: 0.3–1.3). Periodontal health and aesthetic of the zirconium restorations were favorable.

Conclusion: Patient mediated zirconium made abutments would facilitate and improve the clinical prosthetic success and also aesthetic appearance. Clinical studies are required to confirm the long-term performance of this type of restoration.

097 | Topic Implant Aesthetics

Congenital missing teeth: Prosthetic rehabilitation following orthodontic treatment

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Missing teeth in anterior part of the maxilla cause functional, aesthetical and psychological problems. Especially in adolescents, apart from conventional methods (removable partial dentures, maryland bridges, fixed dentures), osseointegrated implants developed by Branemark et al. may be used for treatment of missing teeth. On account of function and aesthetics, implant application is reliable and predictable method. It is significant to apply implants after active bone growth period in adolescents.

In this study, single patient undergones prosthetic rehabilitation following orthodontic treatment. In the case, implants are applied after the preparation of necessary room for congenitally missing upper bilateral lateral incisors. After the distalization of canines,and mesialization of the central incisors to their proper anatomical location,two implants are applied in the gained space.

As a result, osseointegrated implant application in anterior part of maxilla is fairly conservative and aesthetic method.

098 | Topic Implant Aesthetics

Immediate implantation with zircon implants – a preliminary report

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The report describes a case involving the use of zirconium dioxide implants in the aesthetic segment of a 30-year old female patient.

Teeth numbers 11 and 12 of the female patient were extracted atraumatically following complications that arose during the course of endodontic treatment. Using piezosurgery and osteotomes implant beds were prepared for one-piece zirconium dioxide implants. Implants 4 mm in diameter and 14 mm in length were then inserted. The free space between the vestibular bone plate and the implant was filled with Bio-Oss mixed with the patient's venous blood.

Due to the indication for the restoration of teeth 12 and 21 with veneers, an adhesive resin bridge was inserted as a long-term provisional. The WhiteSky system (Bredent) was used to make the preparation of coronal part of the implants after insertion possible.

The final prosthetic restoration using individual Procera Zirconia crowns was completed 4 months later. Full osseointegration of the implants and a very good aesthetic effect were achieved.

099 | Topic Implant Aesthetics

Multidisciplinary treatment for missing upper central incisor in an adolescent

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Implant restorations are commonly used to replace missing incisors. However their use in adolescents is not very common. This case report represents a multidisciplinary treatment approach for missing upper central incisor in young patient. Fifteen-year-old girl was referred with missing upper right central incisor which was surgically removed at the age of 11. The tooth was impacted due to traumatic injury of deciduous upper right central incisor at the age of two which led to severe trauma of permanent tooth germ. Space between tooth 12 and 21 was completely closed with teeth crowding in both maxilla and mandible. Dental radiographs and diagnostic casts were made. Missing space was achieved by means of orthodontic space opening procedure which lasted till girl was 17 years old. It was decided to make an implant restoration after the orthodontist stated that the patient has completed her facial growth. Friadent XiVE implant (3.0 mm diameter) was placed and period of three months was recommended as healing time. During that time patient had teeth-retained removable temporary tooth designed as ovate pontic. It was used for aesthetic and soft tissue management with non-invasive papilla reconstruction, respectively. Satisfactory soft tissue emergence profile was achieved during healing period. After impression taking, PFM crown was made on 15degrees angled aesthetic abutment. Regular 6 months follow up showed excellent functional and esthetical results after one year.

100 | Topic Implant Aesthetics

Implant treatment of pediatric oligodontia

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The oligodontia patients have not only positional, dimensional and morphological abnormalities in tooth but also abnormalities in maxillo-facial skeleton. So it is important to cooperate with pedodontist, orthodontist, prosthodontist, and oral and maxiilofacial surgeon.

We report a case of pediatric oligodontia treated by multidisciplinary procedures including dental implants.

101 | Topic Implant Aesthetics

Implant replacement of congenitally missing lateral incisor in maxilla

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Purpose: Implant restorations are used to replace congenitally missing lateral incisors in orthodontic patients. The present study reports on the clinical and aesthetic results of implant-prosthetic treatment of this anomaly.

Material and methods: In 9 patients affected by monolateral agenesis and 17 patients with bilateral agenesis 43 implants (5 Branemark, 14 Straumann and 24 Ankylos implants) were inserted. The minimum length of implants was 8 mm. In different time intervals PlI, BOP, standardized periapical radiographs, technical complications and patients' satisfaction were recorded. All patients were submitted to maintenance therapy.

Results: Six months after surgery all implants were osseointegrated from clinical and radiographic point of view and loaded with temporary resin crowns. 31 implants received final restoration using Auro Galvan Crowns veneered with ceramic, the remaining 12 implants with metal-ceramic crowns. After 40.8 months of function (range 32–57 months) no implant failed. The majority part of implants presented healthy peri-implant soft tissue conditions (PlI < 1, BOP < 1). Marginal bone resorption ranging from 0.38 to 1.52 mm. During observation period, two cases of abutment screw loosening were recorded in a Branemark system. Two Straumann implants were considered as not being satisfactory for aesthetics.

Conclusion: The implant-prosthetic replecement of congenitally missing lateral incisor has proved to be a predictable treatment for both re-establishment of function and aesthetics. The long-term success of the rehabilitation depends on interdisciplinary treatment planning. The absence of microgap and micro-movement of the internal tapered implant-abutment connection could have a positive influence on the long term stability of peri-implant soft and hard tissue.

102 | Topic Implant Aesthetics

Implant treatment protocol for the patients with Parkinson's disease

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It is essential to consider systemic or localized diseases in establishing implant treatment and maintenance plan. In addition, for successful implant treatment, it is necessary not only for patients to keep their oral hygiene care, but also for implant dentists to supply continuous maintenance care to patients. In case of medically compromised patients, the followings must be reflected on treatment plan; the effect of systemic disease on implant surgery, the way to overcome the influence of disease, and maintenance strategy of implant prosthesis.

Parkinson's disease, among any other systemic diseases, a degenerative disorder of the central nervous system that often impairs the sufferer's and speech. And this disease belongs to a group of conditions called. It is characterized by muscle rigidity, tremor, a slowing of physical movement (bradykinesia) and, in extreme cases, a loss of physical movement (akinesia).

In this presentation, I'd like to suggest a protocol regarding implant treatment and maintenance for the patients with Parkinson's disease.

103 | Topic Implant Aesthetics

Ridge preservation using Bio-Oss® and collagen membrane without flap primary closure

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The development of dental implant has mature gradually until now. The result of dental implant therapy is predictable. The good bone support around the dental implant is necessary. After tooth removed, the extracted wound heals and the bone be resorpt after ridge remodeling. Hence there are many kinds of socket preservation techniques to develop to prevent the bone collapse after tooth removed, and keep the ridge width for the implant placement.

The case report is that a 23 year-old female patient, upper left central incisor had fractured due to traffic accident. After discussion with the patient, the implant placement was decided. Therefore, when the central incisor was removed, the ridge preservation with Bio-Oss and collagen membrane was applied simultaneously, and the flaps was suture without primary closure.

After 6 months, the implant was placed the gap, and the restoration had been finished after osseointegration. After one year follow-up, the soft tissue and bone condition is stable. So, the case is reported and the ridge preservation technique will be compared.

104 | Topic Implant Aesthetics

The influence of management of periodontal biotypes in sustaining soft tissue aesthetics around anterior maxillary implants: strategies for success

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The anterior maxillary implant site is most sensitive to aesthetic excellence. Success in this all important zone is defined by several factors, but aesthetic success does take precedence. Several myriad components contribute to the clinician's understanding and successful management of this zone. Of these, a biologic understanding of soft tissue biotypes and their influence on aesthetic success, is possibly paramount.

The anterior maxilla presents in a variety of tissue biotypes. Often the biotype is also a complex interplay between several components including tissue thickness, bone sufficiency, histological constitution and shape. While some biotypes lend themselves to more successful and easier management, others require careful diagnosis and handling to achieve similar success. Recognition of a

difficult biotype is all important and can sometimes make the difference even between success and failure of the implant.

This paper will seek to identify and classify potential biotypes that may be encountered. It will also endeavour to offer clinical solutions for various biotypes and consequent situations. Emphasis will be laid on seeking to identify the right clinical technique; in choosing between immediate implant placement, site development and interdisciplinary intervention or perhaps even combining all of these techniques. Cases will be used to illustrate various biotypes providing illustrative evidence of the presenter's understanding. An objective assessment will also be made of techniques that provide the recipe for long term clinical success.

105 | Topic Implant Aesthetics

Bone response between platform switched implants in minipigs

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The aim of the study is to investigate the bone tissue alterations at two adjacent implants with an inter-implant distance of 3 mm and 4 mm. The mandibular premolars and the first molar from 12 minigigs were extracted. After 3 months of healing 72 implants were placed using a template guide. Three experimental platform switching implants with SLActive surfaces (Institute Straumann, Switzerland) were placed on one side of the mandible with an inter-implant distance of 3 mm while on the contralateral side the distance was 4 mm. One stage procedure was used with abutment placement at time of surgery utilizing a transmucosal abutment healing cap.The minipigs were sacrificed 8 weeks after implant placement. Histomorphometric analyses including first bone to implant contact (fBIC) and bone to the implant contact in a defined region of interest (ROI) were performed. The results indicated a BIC of the interproximal sides of 88.8 $\pm$ 9.7% for the 4 mm group and 85.1 $\pm$ 12.2% for the 3 mm group. There was no significant differences between the groups. A mean bone gain of 0.5 mm $\pm$ 0.8 mm adjacent to the implants was recorded in the 3 mm inter-proximal distance group while a bone gain of 0.6 mm $\pm$ 0.5 mm in the 4 mm inter-proximal distance group was measured. The results were not significant. The results of the present study revealed no bone loss and no statistically significant differences in the bone maintenance in the proximal areas between the implants with inter-implant distances of 3 mm and 4 mm. The study was sponsored by Straumann.

106 | Topic Implant Aesthetics

Implant restoration with congenital absence of maxillary lateral incisors

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Introduction: The use of osseointegrated implants for the congenital absence of maxillary lateral incisors in adults is an ideal treatment plan with a very high success rate. In this project, three clinical cases are presented. Intention of this study is also to point out the advantages and disadvantages of the method as well as to discuss the potential problems and requirements, so that a successful aesthetical and functional result can be accomplished. The purpose of this study is to assess the alternative treatment of implant restoration on young patients with congenital absence of maxillary lateral incisors, comparing it to the conservative bridge restorations. The major advantage this treatment plan has to offer in comparison to the standard fixed prosthodontic choice is the conservation of the natural teeth which lie adjacently to the congenitally missing tooth, when the preparation of the former is required.

Material and methods: Thirty three female patients were included in this study. Their age ranged between 17–22 years old. After the completion of the orthodontic treatment, Xive implants (DENTSPLY-Friadent) with immediate provisional crowns were inserted. Aesthetic abutments were used to support permanent zirconia crowns.

Results: After a 5-year observation period none of the implants failed. After evaluation peri-implant bone loss and soft tissue recession were not detected. The initial satisfactory aesthetic result was not altered throughout this period.

Conclusion: This study showed that implant restoration of congenitally missing maxillary lateral incisors is a trustworthy and well documented treatment plan with a high rate of success.

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107 | Topic Implant Aesthetics

Osteogenic distraction for implant placement correction

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The aim of this study is to demonstrate a surgical technique of implant placement correction using the osteogenic distraction principles. One of the aesthetics factors in implantology is related to the place of the implants after surgery. We develop a surgical protocol for replace implants already osteointegrated using osteogenic distraction. This procedure is simple, well accepted by the patients and do not require edentulous period. After surgery the distractor is placed and it contains the provisory tooth. After seven days the movement starts and in 20 days the implants is in the new position. The patients didn't related pain or any kind of complications as excessive bleeding or edema. Five cases will be presented and in all of those success was achieved. The study allows to

concludes that this method is safe and gives a very important aesthetic result to our patients.

108 | Topic Implant Aesthetics

Preservation of buccal bone wall after immediate implant placement followed by immediate function. A case report

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Immediate placement of an implant into an extraction socket provides both patient and the clinician with the advantages of significantly decreasing treatment time by minimizing the surgical stages and helping to maximize the esthetic outcome by preventing alveolar ridge and gingival resorption. The aim of this case report is demonstrate through CT scan analysis the possibility of maintenance of buccal bone wall after immediate implant placement followed by immediate function protocol.

109 | Topic Implant Aesthetics

Immediate implant combined with tissue graft, a new protocol for predictable esthetic results: retrospective study

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DDS, Cannes-Le Cannet

Purpose: Evaluation of a surgical procedure of maxillary incisor immediate implant with anorganic bovine bone graft with or without a connective tissue graft.

Material and method: We used a NobelBiocare® implant system (Brånemark System® or NobelSpeedy®) with Procera® Zirconia Abtument. 26 implants had been placed, 4 to 1 years of follow-up. In all cases, an anorganic bovine bone graft had been done at implant placement time and in 19 cases a connective tissue graft had been added. Temporary acrylic resin restorations, which were fabricated with a temporary abutment at implant level, were connected at implant placement time.

Results: After three to four months, the provisional crowns were replaced by definitive ceramic crowns. Regular follow-ups were performed during the investigation period. No implants were lost. The Pink Esthetic Score andarchitecture of peri-implant tissuesare maintained or increased, thanks to the anorganic bovine bone and connective tissue grafts and prosthetic emergence profile. All patients were very satisfied with the esthetic outcome.

Discussion: Different parameters are important to achieve a predictable result.

Conclusion: This study suggests that this procedure is predictable for every kind of pathology, with a two pieces implant system in aesthetic region.

110 | Topic Implant Aesthetics

The influence of the teeth on the midbuccal tissue and the papilla

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The challenge of modern implant dentistry is achieving an esthetic as well as a functional implant restoration. An esthetic implant supported restoration requires ideal hard and soft tissue topography. This in large part depends on the interproximal papilla and the height of the midbuccal tissue. The purpose of this study was to determine whether changes in the bucco-lingual position of the maxillary anterior teeth were accompanied by a change in the height of the midbuccal tissue and interproximal papilla after orthodontic movement, and to discuss the relevancy of this finding to implant position and soft tissue height.

Material and methods: A total of 10 patients (2 males, 8 females) between 26 to 34 years of age (average 30.8 years old) were selected for this study. All patients were treated to improve the alignment of the upper anterior teeth. Ten pre-treatment and ten post-treatment casts of same patients were used for measurements. Only, maxillary anterior teeth (canines and incisors) were used for measurements in this study.

Results: Buccal and lingual movement following orthodontic treatment showed different effects on the gingival margin height as measured midbuccally on the canine teeth. Buccal movement of an average of 1 mm showed an average loss of 1.1 mm in bucco-gingival height, while lingual movement showed relatively no change (– 0.1 mm) in gingival height.

Conclusion: When canines were moved an average of 1.0 mm buccally, the buccal free gingival margin receded of an average of 1.1 mm. When the central incisors were moved an average of 1 mm buccally, the papilla height decreased of 0.5 mm.

111 | Topic Implant Aesthetics

Edentuous, mandible, atrophic Implant supported prosthesis for patient with atrophic edentulous mandible

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Most patient who have conventional mandibular full denture often complain about the reduced retention and stability, difficulties with eating and speech, pain and so on. Insufficient bone support and lack of attached gingiva may bring about the discomforts such as sore spots due to the impingement of thin gingival. And changes in neuromuscular system may results in impaired function and compromised esthetics and phonetics. Implant can be available to these patients. And implant has resulted in a drastic change in the treatment concepts for management of the atrophic edentulous mandible. Fixed type implant-Supported Denture is stable and useful to masticate rigid food, but it is not popular to all of the elderly patients with edentulism, because of its cost and needs of

additional surgical treatment. 2–4 implants without any additional surgery, the patient with atrophic edentouls mandible may get satisfaction.

This presentation give the option to treat the atrophic edentulous mandible with various prosthodontic design.

112 | Topic Implant Aesthetics

Nobel active implants in esthetic zone, in the absence of leteral incisiors

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Purpose: Nobel Active is an implant of the III generation which allows us to solve many esthetic clinical problems. It involves:

- self drilling,
- self cutting,
- self condensing abilities,
- minimal trauma during implantation
- possibility to redirect implant position during implant placement.

All these features make Nobel Active Internal implants of choice in cases of lack of lateral incisiors.

Material and methods: 9 patients were treated because of the absence of lateral incisors. In 5 of them we used Nobel Active Internal implants. 4 patients needed tissue reconstruction around implants, which was performed by the method of GBR technique and (or) soft tissue management. All of them received individual abutments and Procera crowns.

Results: All patients were ortodonticly treated before implantation. In one case a small inflammation around one implant developed, which reduced after antibiotics and healing abutment placement. Good esthetic results were obtained in all cases of tissue reconstruction after implant osteointegration and placing esthetic Procera crowns on individual abutments.

Conclusions: By useing Nobel Active implants we improve:

- primary stability of the implants by condensing a bone

shape of the alveolar process thanks to osteotom abilities of these implants

- time of the esthetic restoration.

Shape of the gingiva profile was improved after submucosus transplant placement and we also obtain good esthetic results with Procera individual crowns.

113 | Topic Implant and Guided Surgery

Retrospective study on RFA measurements of 385 ITI dental implants

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Objectives: There is no proven clinical tool to evaluate the amount of osseointegration and stability around dental implants. Therefore, the aim of this retrospective clinical study was to evaluate resonance frequency analysis (RFA) values of 385 ITI solid screw implants.

Experimental methods: Both at implant placement and after healing, implant stability quotients (ISQ) were determined. For statistical analysis, Pearson correlation coefficients, independent and paired samples t-tests were computed at a level of significance of alpha = 0.05.

Results: ISQ values ranged from 39 to 86 at implant placement and from 35 to 89 after healing showing a significant increase. The highest ISQ values at both stages were obtained in the posterior mandible ($p = 0.000$). After healing, ISQ values in the anterior mandible were also significantly higher than in the anterior ($p = 0.001$) and posterior maxilla ($p = 0.013$). Implant length had a significant influence upon ISQ in the anterior mandible ($p = 0.000$) at insertion and in the anterior ($p = 0.005$) and posterior mandible ($p = 0.036$) after healing. Implant diameter and ISQ at insertion correlated in the anterior mandible ($p = 0.037$). After healing, a significant influence was found for all regions except the posterior maxilla ($p = 0.795$). With the exception of the anterior maxilla ($p = 0.542$), ISQ at placement had a significant influence upon ISQ after healing. In the anterior maxilla ($p = 0.002$) and in the posterior mandible ($p = 0.007$) healing time significantly influenced ISQ after healing.

Conclusions: It appears that only repeated ISQ measurements of a specific implant bear some diagnostic benefit although the parameters influencing the absolute values still remain unclear.

114 | Topic Implant and Guided Surgery

Extra-oral implants: new expanded prosthetic options

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The titanium extraoral implant has become state-of-art treatment for retention of facial prostheses since first introduced by Tjellstrom et al. in 1981. The extraoral implant has also become the forgotten child of the endosseous implant market. Due to sales of small numbers of these implants, there has been little or no attempt by their manufacturers to improve and upgrade their original systems. Surface modifications have not kept pace with those of intraoral implants, and prosthetic systems have not come forward with new or improved systems.

Each of the systems has their own advantages, as well as shortcomings. The number of systems world-wide is very limited, with only two systems currently available in North America. These will be discussed along with the description of the treatment of a patient where current restorative options were expanded by combining the restorative parts from one manufacturer's extraoral system, with another manufacturer's intraoral system. This is the first time this approach has been reported. Advantages and cost savings will be among topics discussed in this approach of combining compatable parts from different systems.

115 | Topic Implant and Guided Surgery

Immediate full arch occlusal loading with Seven and Mistral Implants

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Prosthetic rehabilitation with implant-supported prostheses in the atrophic edentulous maxilla often requires a bone augmentation procedure to enable implant placement and integration. This paper reports the preliminary data from a clinical study of immediately loaded, full-arch, screw-retained prosthesis with distal extensions (hybrid prosthesis) supported by Mistral and Seven implants placed in the edentulous maxilla. Five patients who received 60 implants were enrolled in this study. All patients received all implants immediately loaded and the metal framework temporary prosthesis within 4 hours of surgery, and the hybrid prosthesis, made of a titanium framework and acrylic resin teeth, was placed after 3 months with no additional surgery. Marginal bone loss was monitored via periapical radiographs by a computerized technique.

Results: One failure (out of the 60 immediately loaded implants) occurred after 3 weeks of function because of infection. A cumulative success rate of 98.9% was achieved for up to 18 months of follow-up, while the prosthetic cumulative success rate for the same period was 100%. RFA measurements of Seven and Mistral implants showed an increased RFA value with time, indicating an increased stability. Marginal bone loss at the immediately loaded implants was within the generally accepted conventional limits for standard delayed loading protocols.

Discussion: This technique can reduce surgical treatment time but should be applied with caution.

Conclusion: The preliminary results of this study suggest that rehabilitation of the edentulous maxilla by an immediately loaded prosthesis supported by 6 implants may represent a viable alternative treatment to the classical delayed loading protocols.

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Ridge widening and immediate implant placement: a simplified technique

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Alveolar atrophy may present an anatomical limitation to the placement of endosseous implants. So narrow alveolar ridges remain a serious challenge for the successful placement of implants. This article reports a technique for widening the atrophic ridge by splitting the alveolar bone longitudinally using a novel bone expansion screw kit; treatment of ridges as thin as 2.5 mm at the alveolar crest and simultaneous placement of dental implants.

A novel approach for ridge expansion without the use of osteotomes and surgical hammer has been compared with classical techniques. The new compression and expansor kit developed by MIS improved the treatment in split crest and soft bone compression. A simple bone expansion procedure had enable a better implantation and better implant primary stability. The expansion and compression kit has prevented traumatic osteotomy, increased bone density, increased implant primary stability and gave a perfect gradual control of bone expansion. Ten patients have been divided in two groups of five. The study group has been treated with the novel expansor screws and the control group have been treated with classical technique.

Results showed that the expansor screws gave better stability of the implants and better control of the expansion procedure for a more secure and atraumatic surgery.

The advantages of this technique for patients include less surgical trauma and reduced treatment time.

Based on these findings, split bone with this widener screws are a promising alternative for alveolar ridge reconstruction in dental implantology.

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Preferable interradicular implant sites for orthodontic miniscrews

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Introduction: The interradicular space is the most common location for the placement of orthodontic miniscrews. However, as far as bone support is concerned, only little investigation has been performed on this topic so far. Therefore, the aim of this study was to evaluate the interradicular bone dimensions and as a consequence to find favourable interradicular implant sites for orthodontic miniscrews.

Material and methods: Randomized selected axial CT images of 24 maxillae and 21 mandibles were examined. Every interradicular space was measured horizontally at a depth of 3, 4, 5 and 6 mm apical from the cemento enamel junction by an accuracy of measurement of 0.1 mm.

Results: The highest amount of bone was found between the first molar and the second premolar in the upper jaw (average 2.65 mm $\pm$ 0.71), as well as between the first and second molar in the lower jaw (average 3.19 mm $\pm$ 0.72). In general, the interradicular distance increased significantly from coronal towards apical and the posterior teeth showed more interradicular distance than the anterior ones. Gender dependency has exclusively been detected in the area between the first molar and the second premolar in the upper jaw.

Conclusions: Although there are individual variations in the interradicular distance, a number of preferable locations for the placement of miniscrews were detected. In combination with a correct surgical technique, the risk of root damage can be minimized and the survival rate can be increased. The reflection of the physiological relations between dental roots might also be used for further implantological research.

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One-piece implant-retained overdentures – clinical procedures

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Ojectives: Although Nobel Direct (Nobel Direct: ND; Nobel Biocare, Sweden) has been generally used for regular crown and bridge rehabilitations, ND might be used for removable prostheses. The purpose of this paper is to present clinical procedures of one-piece implant-retained overdentures.

Material and methods: If existing mandibular denture has poor retention and instability, patient requires prompt improvement. For this situation, 2 to 4 NDs have been placed so that each implant is strictly parallel using a surgical guide. Ideally, NDs should be placed with minimally invasive flapless surgery using Nobel Guide. The intaglio surface of the denture can be adjusted with autopolymerized PMMA resin to fit the abutment head. The existing complete denture can be immediately modified to a ND-retained overdenture.

Results: Rubber O-rings are fitted on the abutment head of the NDs to obtain sufficient retentive force and flexible connection between the denture base and implant. Alternatively, the abutment head of the ND might be used as an inner crown for a Konus telescope system since it has a conical shape with six degrees of taper. Based on ''one metal rehabilitation'' concept, outer crown can be made with commercially pure titanium.

Conclusions: One-piece implant (ND)-retained overdentures have been tried to apply with immediate loading to elderly edentulous patients. Using commercially pure titanium for the outer telescope copings, the one-piece implant (ND)-retained Konus telescopic denture can provide appropriate retention and stability. Partially supported by a research grant from Nobel Biocare Research Foundation (Project No. 2007-556).

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Aplications of 3D software in dental implantology

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Purpose: We report our experience with the use of software for dental implant planning and implant placement.

Material and methods: During the period 2005–2008 523 dental implant were planned by using Simplant platform (Simplant Planner, Materialise, Belgium). Basic radiographic evaluation consisted of a conventional ortopantomogram. In all the cases CT scan was performed when clinical examination or ortopantomogram revealed the possibility of complications in dental implant placement. CT scan were processed to allow 3D mesaurement with simplant software. In some cases the planned case was sent to a manufacturing facility for splint and prosthesis construction.

Results: 512 (98%) of the 523 planned implants were placed. Only 8 implants could not be placed due to the lack of primary stability. Indications of the placed implants were: a) Fixed rehabilitation, b) Posterior mandible rehabilitation, c) Posterior maxillary rehabilitation, d) Aesthetic zone.

Surgical splints and cad-cam prosthesis were performed In selected patients.

Conclusions: The use of implant software may allow a more precise preoperative planning for implant placement. In some cases the planned case can be sent for splint and prosthesis construction.

We report our experience in guided surgery with bone level Straumann implant.

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Immediate loading of implants in edentulous maxilla: case series

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Objective: To evaluate the service period of immediately loaded Straumann-ITI sand-blasted, large-grit, acid-etched (SLActive) solid-screw dental implants in the edentulous maxilla after 12 months of loading.

Material and methods: Five patients (mean age 58 years) with edentulous maxillae each received 6/8 implants and 1 implant-supported fixed provisional prosthesis within 48 hours after surgery. After a mean healing time of 16 weeks, the patients received a definitive, solid/angled-screw retained, implant-supported, metal-ceramic fixed prosthesis. A total of 34 implants were placed. Clinical and resonance fequency analysis (RFA) evaluations were recorded after 1 month of loading with the implant-supported fixed prostheses as well as 12 months after implant placement. Radiological examinations were made at implant placement and after 12 months.

Results: The mean RFA values at 1st month were 67 ± 1.8 while the mean values at 12-month follow-up were 81 ± 2.1. Two implants failed during the healing period.

Conclusion: The increase in RFA values might be attributed to splinting the implants immediately after placement. Immediately loaded ITI SLActive solid-screw implants bearing fixed prostheses exhibited successful survival rates after 12 months.

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A study of 24 zygomatic implants submitted to immediate loading with a follow-up of 12 to 25 months

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Objective: The authors present a clinical retrospective study of total maxilla rehabilitations using zygomatic implants submitted to immediate loading in patients of their private center and the University Clinic. The purpose of this study is to present treatment options to atrophic maxilla, sequelae of implants complications and postmaxillectomy deficiency.

Material and methods: Between July 2005 to September 2007 a total of 8 patients with severely atrophic maxillae were submitted a surgical protocol to placement of zygomatic implants The zygomatic implants were placed in zygoma area, conventional implants in anterior region using palatine approach and in the pterigopalatine region. The zygomatic implants and conventional implants were placed with a anchorage torque of 45 N.cm and submitted to immediate loading. The patients were reviewed a time for month and the prostheses were removed after a period of 6 months. The osseointegration was evaluated, using reverse torque test and percussion.

Results: Eight patients (2 women and 6 men with mean age of 58 years) were rehabilitated with 24 zygomatic implants and 15 standard implants. Two patients with 2 zygomatic implants and four conventional implants in maxilla anterior region, one patient with 2 zygomatic implants and three conventional implants in maxilla anterior region, one patient with 2 zygomatic implants, two anterior implants and one remanescent implant, one patient with 4 zygomatic implants and two conventional implants in pterigopalatine region and three patients with 4 zygomatic implants. The patients with maxillae sequelae, were rehabilitated with removable prostheses presented a framework design of maxillary obturator prostheses, with implants splinted by a metallic bar. The follow-up examinations for the sample occurred between 12 to 25 months after prostheses installation. None implant presented mobility or failure. One patient presented soft tissues inflammation in two zygomatic implants region.

Conclusion: Zygomatic implants submitted to immediate loading presented in this study a good result to rehabilitation of atrophic maxillae, using 2 zygomatic implants and standard implants placed in the anterior area, and 4 zygomatic implants in the treatment of complex cases.

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In-loco cad/cam abutment and crown fabrication at the surgical procedure

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The association of two cad/cam machines – the BioGénie and CEREC systems, capable of milling individualized titanium abutments and temporary resin crowns respectively – created a new approach for immediate loading in osseointegrated implantology. For the first time both abutment and crown where machined and installed in a short period during the surgical procedure. Placing the final abutment and temporary crown, at the moment of implant installation, had the added benefits of better preserving the mucosal barrier without the need for abutment inventory, reducing treatment time, stress, and work for both patient and dentist. This new friendly approach can be a helpful aid or an alternative to promote the rehabilitation with guided surgery.

A clinical case is presented.

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Use of OPRA technique for the rehabilitation of above knee amputees suffering from vascular disease – experiences in Hungary

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Introduction: Main problems with lower limb amputation are high mortality and difficulties with prostheses. One of the cheering techniques is intramedullary osseointegration called OPRA technique (introduced by Dr. Brånemark).

Aim was to adapt this technique for rehabilitation of vascular ill lower limb amputees, as collaborative program of work between University of Pécs and Brånemark team, Gothenburg.

Methods: The rehabilitation program for osseointegration candidate is a long and intensive program following two surgical operations (at first a titanium fixture is built into the femoral bone; after a half year an abutment is inserted into previously implanted titanium fixture).

Till now in six patients titanium screw was built in, three of them received abutment also.

Results: Control X-rays after operation showed excellent incorporation of implanted titanium fixture in every case. Eight months after first operation one patient died because of myocardial infarction. During early phase of rehabilitation patients had no complains. One female patient had pain while loading during loading with full-length prosthesis. New X-ray and CT scan showed expressed signs of osteoporosis. Rehabilitation was stopped immediately. After short time moderate loading was started again with success. All patients reported much improved proprioception of the prosthetic limb, to a degree where the roughness of the walking surface could be felt through the prosthetic foot. Hereupon they feel their walking safer.

Conclusion: With careful patient selection OPRA technique can be used also for vascular ill above knee amputees, however, some aspects need to be critically evaluated before it becomes a routine clinical procedure.

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The stability assessment of the non-submerged, internal connection type implants simultaneously placed in maxillary sinus with deproteinized bovine bone by resonance frequency analyzer

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The aim of this study was the stability assessment of the non-submerged, internal connection type implants placed in maxillary sinus with deproteinized bovine bone mineral (BioOss®) by resonance frequency analyzer, when residual alveolar bone height is below 8 mm.

Material and methods: A total of 20 implants was placed into 5 grafted maxillary sinuses in 5 patients. Deproteinized bovine bone mineral (BioOss®) used as graft material. Osstem SSII implants (diameter 4.1 mm, and length 11.5 mm, RBM surface) were placed. All of the patients received maxillary sinus graft procedure by 1-step technique. Residual bone height was 1.3 ~ 7.8 mm (mean 4.2 mm) measured by panoramic radiography. After implant placement, RFA was measured at the time of 4, 8, 12, 20 weeks. Measured RFA was divided into two group, less than 4 mm and more than 5 mm of bone height. It was statistically analyzed.

Results: 1. The stability of all implants placed in the posterior maxilla with sinus graft was increased with time.

2. The RFA of the implants placed in the group of ''alveolar bone height over 5 mm'' presented 65 ISQ at 20 weeks. ($P < 0.01$).

3. The RFA of the implants placed in the group of ''alveolar bone height under 4 mm'' presented also 65 ISQ at 20 weeks. ($P < 0.01$).

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Gel-pressure technique for flapless transcrestal maxillary sinus floor elevation

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Purpose: A minimally invasive surgical technique for flapless transcrestal maxillary sinus floor elevation via surgical templates is presented.

Material and methods: The gel-pressure technique was carried out in 10 patients (mean age: 54 years) with deficient posterior maxillary bone. CT scan-designed surgical templates were manufactured preoperatively using 3D implant planning software. Flapless elevation of the sinus membrane was accomplished by navigated drills to the floor of the sinus followed by injection of a radiopaque gel. The pressure of the gel was controlled to elevate the sinus membrane without perforation. After interoperative radiographic verification of membrane integrity, augmentation material was inserted thru the drill holes and implants were placed simultaneously.

Results: Membrane perforation could be avoided successfully in all cases. One patient had to be reoperated due to a planning error. All planned implants could be inserted with adaequate primary stability.

Conclusions: The gel-pressure technique for flapless transcrestal maxillary sinus floor elevation represents a minimally invasive method to increase bone volume in the resorbed posterior maxilla.

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Densitometric comparison of implant placement between flapless and two-stage technique

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Flapless technique is a surgical approach of implant placement without raising a mucoperiosteal flap. Such approach has many advantages: shorter surgical treatment, minimal bleeding, postoperative discomfort for the patient is reduced; possibility of immediate loading of the inserted implant, faster procedure of implant placement and by that less time is needed for the complete implant-prosthetic restoration. Purpose of this study was radiographic assessment of flapless technique and determination of its clinical values in comparison with two-stage dental implant technique through computerized densitometric analysis.

The sample consisted of 10 patients with missing teeth in the premolar region in the upper jaw, where dental implants (Nobel Replace® Tapered) were inserted. In the first group of 5 patients the implants were placed using flapless technique, and with two-stage technique implants were placed in the other group of 5 patients. All inserted implants were loaded with metal-ceramic crowns 3 months after placement. The patients were followed for 18 months through clinical follow-ups and radiovisiographical (RVG) images made after 3, 12 and 18 months. After comparing the average densities, the results showed similar decrease of density in both groups, conventional two-stage technique showed 3.24 (desrease of average densities around inserted implant) and flapless technique 1.23 (desrease of average densities around inserted implant).

It can be concluded that flapless technique in everyday clinical usage has the same result as the two-stage dental implant technique.

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Prospective study of SLActive and SLA implants in irradiated patients

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In patients having undergone radiotherapy after treatment of oral cancer, osseointegration can be impaired because irradiation reduces

bone vitality due to vascular changes. The aim of this study was to evaluate the success rate of chemically modified and conventional SLA titanium implants loaded after a reduced healing period in irradiated oral squamous cell carcinoma (OSCC) patients.

Material and methods: 10 patients (10 males) with a mean age of 57.6 years were treated with dental implants after ablative surgery and radio-chemotherapy of oral cancer. The placement of SLActive and SLA implants was performed bilaterally according to a split-mouth design. All 53 implants placed showed an unloaded healing time of 6 weeks in the mandible and 12 weeks in the maxilla. At time of implant and abutment placement different variables and the success of the implants over time was determined by the criteria of Buser.

All patients received spaced standardized radiological examination for evaluation of periimplant crestal bone loss. As a baseline for the evaluation of bone loss orthopantomographic x-rays were obtained immediately after implant placement.

Results: Of 53 implants 27 SLActive implants and 26 SLA implants were placed.

21 implants (10 SLA implants, 11 SLActive) were located in maxilla and 32 (16 SLA, 16 SLActive). The average observation period was 9.1 months (7–12 months). The amount of bone loss at the implant shoulder at SLA active implants was 0.19 mm mesial (0.12–0.37 mm) and 0.21 mm distal (0.17–0.42 mm). The SLA implants displayed a bone loss of mesial 0.24 mm (0.21–0.46) and distal 0.22 mm (0.19–0.43 mm). No implant was lost resulting in a success rate of 100%.

Conclusion: Regarding the data found in this investigation we can conclude that implants with chemically modified (SLActive) and conventional SLA titanium surface show equivalent success rates in irradiated patients; even when the time of unloaded osseointegration was shortened. Sandblasted, acid-etched implants with or without a chemically modified surface placed in the maxilla regardless of the location can be restored after a 12-week healing period with a high predictability of success.

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Bone bed preparation through laser for implant installation

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Preparation of implant beds using with lasers is being tryed as an adjunctive method, but the accuracy of this technique has not been examined. The aim of the study was to evaluate the accuracy and effectiveness of implant bed preparation using an Er, Cr:YSGG laser with various laser tips. The laser was applied to pig rib bone. The laser was employed at a 5.75 W power setting, 30 Hz/sec pulse repetition, with 50% water and 60% air spray. According to laser tips the groups were divided as follows; Group 1: paralleled – shaped sapphire tip (0.6 mmΦ), Group 2: paralleled – shaped zirconia tip (0.6 mmΦ), Group 3: tapered sapphire tip (0.4 mmΦ). The laser tip was separated by 1 mm from the bone and applied for 15 seconds in a non-contact mode. After the application, the bone was sectioned for specimens, and histologic measurements were determined by computerized morphometry. The length of the prepared bone surface was measured and the width of the entrance was measured. The prepared length of Group 3 was longer than that of Group 2. The prepared bone width was larger than the width of the laser tip in every group. Additional bone removal was observed adjacent to the prepared area and displayed an irregular surface. Different cutting effects were observed according to the laser tip, emphasizing the importance of proper tip selection in the clinical setting.

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Histomorphometric analysis of delayed implantation after distraction osteogenesis in dogs

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The purpose of this study was to evaluate the osseointegration at implantation after consolidation in distracted narrow alveolar bone. Three adult mongrel dogs weighing 9–10 kg were studied. The lower premolars were extracted and horizontal distraction was performed using a distraction device for 8 weeks. Eight weeks after distraction, screw-type implants were installed. The dogs were sacrificed after 4 weeks implantation.

Direct bone contact was achieved, with no significant difference new bone formation observed between implants placed in the distracted and undistracted bone after 4 weeks.

It was concluded from this study that horizontal distraction is a useful technique in augmenting a narrow alveolar ridge necessary for implant placement.

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Effects of final drill diameter size on bone formation in the mandible of micropig

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Purpose: Final drill diameter (FDD) was controlled to insure a good primary stability on the clinical level. FDD have influenced on the bone compaction and wound chamber size. The aim of this study was to evaluate the effect of FDD on the primary stability and bone formation.

Material and methods: A total of 60 internal submerged type implants with 3.5 mm diameter and 8.5 mm length (GS II, Osstem implant Co., Ltd, Korea) were inserted in the mandible of 10 micropigs. The implantation sites were prepared as follow;

1) G1 (∅ 3.0 mm drill): bone compaction existence in the most of surrounding bone

2) G2 (∅ 3.3 mm drill): bone compaction and wound chamber together existence

3) G3 (∅ 3.5 mm drill): only wound chamber existence in 5 mm upper area of implant

Primary stability was measured with RFA. The polyfluorochrome sequential labeling was performed at 3 days and 2 and 4 weeks. The animals were sacrificed at 0, 1, 3 and 5 weeks. Bone formation was evaluated by histomorphometric and fluorescence microscopy analysis.

Results: The primary stability of G1, G2 and G3 were 82.6 ± 4.79, 78.3 ± 6.24, 60.5 ± 14.69, respectively. BIC value of G1 was the highest at 1 week and 3 weeksand decreased gradually from 3 weeks. BIC values of G1, G2 and G3 were 71.60 ± 12.6%, 79.37 ± 15.8%, 59.16 ± 16.7% at 5 weeks. For the evaluation of bone mineral apposition, G2 and G3 were higher than G1. In the fluorescent microscopic analysis.

Conclusions: In conclusion, the selection of optimal drilling diameter is very important for the primary stability and bone formation.

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Bone healing around implants following flapless and mini-flap surgeries in the canine mandible

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Objective: The aim of this study was to compare the effects of flapless and mini-flap surgeries on crestal bone changes around implants using a canine mandible model.

Study design: Bilateral, edentulated, flat alveolar ridges were created in the mandible of 12 mongrel dogs. After three months of healing, two implants were placed on each side of the mandible by flapless or mini-flap procedures. After a healing period of three months, six dogs were sacrificed to evaluate crestal bone changes after stage I surgery. In the other six dogs, a second stage surgery and transmucosal abutment attachment was performed for mini-flap implants. After a healing period of two months, the remaining dogs were sacrificed to evaluate crestal bone changes after stage II surgery.

Results: When the mean peri-implant bone levels for flapless and mini-flap implants from stage I to stage II surgeries were compared, the mini-flap implants had a significantly greater height than the flapless implants ($p < 0.05$); however, after stage II surgery, both flapless and mini-flap implants had comparable bone levels ($p > 0.05$).

Conclusion: The study demonstrated that, although there were no differences between flapless and mini-flap surgeries with respect to the overall amount of peri-implant bone loss, mini-flap surgery was more effective than flapless surgery in improving implant anchorage in the early phase after implant placement.

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Clinical and radiographic evaluation of low drilling speed without irrigation protocol

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Obtaining autologous bone with no risk to the patient and better control over the drilling depth which minimizes the potential risk of invading the adjacent tissues without increasing temperature are very important issues which presented in low drilling speed (50 rpm) without irrigation protocol.

The goal of this study is to evaluate this protocol in clinical situation.

Material and methods: Seventy implants (bti implants, different sizes and lengths) were placed for 23 patients (14 female, 9 male). Every type and part of bone was considered; every drilling step was performed with low speed (50 rpm) without irrigation, except initial drill with active point (800 rpm with irrigation). Standard X-rays were performed after placement of the implants, and then after 6 months and one year in follow up appointments.

Results: After an average time of one year of loading, osseous integration based on Albreksson success criterion's was recorded for all implants and none of implants were failed or failing after one year. X-rays evaluations did not show either craterisation or abnormal bone loss around implants.

Conclusion: Implant socket can be prepared with success at low drilling speed (50 rpm) without irrigation. This technical approach can provide the above mentioned advantages.

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The condition of soft tissues after 1-year of immediate loading

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Objective: The objective of this study was to evaluate the condition of the soft tissues following 1 or more years of immediate loading in patients that were treated with computer-assisted implant installation combined with the flapless surgical procedure.

Material and methods: Since 2003, 34 edentulous jaws have been treated using the Teeth-in-an-Hour™ protocol. During this period, suprastructures were removed in 22 cases (15 maxillary, 7 mandibular) after 1 or more years of functional loading. The clinical conditions were evaluated surrounding 126 implants and 79 residual teeth in the opposite jaw. Supragingival plaque around the implants and residual teeth was recorded before the removal of the implant-supported prosthetic suprastructure. Upon removal, probing pocket

depth was measured and clinical inflammation was assessed by bleeding on probing.

Results: Plaque index showed the presence of plaque on 46% of implants surfaces and on 63% of teeth. A significant difference ($p = 0.03$) in visible plaque around the implants and teeth was observed. Bleeding on probing registered at 87% of the implants, which was significantly higher ($p = 0.005$) than around the teeth (45%). Although, deeper pockets were found around the implants (2.7 mm) than around the teeth (1.9 mm) ($p = 0.02$) this did not exceed 5 mm.

Conclusion: In this study, clinical inflammation was more excessive and deeper periodontal pockets were found around implants than around residual teeth. The design of abutments and the suprastructure may have influenced this clinical finding.

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The influence of thin gingival tissues on crestal bone stability around implants with platform switching

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Evidence from clinical and animal studies suggests that platform switching concept may reduce early crestal bone loss around implants, as implant-abutment interface is shifted away from bone. However, some studies indicate that thin gingival tissues may cause marginal bone loss. It is not clear if the bone will be stable around implants with modified platform, placed in thin gingival tissues.

Objective: To evaluate the influence of thin gingival tissue on crestal bone stability around implants with platform switching.

Material and methods: Ten 3i implants with platform switching and 10 Biohorizons implants with traditional implant-abutment connection were placed in 6 patients, using non-submerged approach. Gingival tissue thickness was measured with periodontal probe after partial flap elevation. 3i implants were positioned equally with bone crest, while Biohorizons implants were inserted 2 mm supracrestally. After appropriate healing time and prosthetic manipulations, implants were restored with metal-ceramic fixed partial dentures, connecting both types of implants. Radiographic images were taken after implant placement, after prosthetic treatment and 1-year follow-up.

Results: All implants at a time of evaluation were successfully integrated. Mean bone loss around 3i implants was 1.58 mm $\pm$ 0.16, while Biohorizons implants underwent 1.61 mm $\pm$ 0.24 of bone loss. T-test revealed no statistical difference between tested implants.

Conclusion: Within the limitations of this pilot study it can be concluded that implants with platform switching do experience crestal bone loss, if at a time of implant placement thin gingival tissues were present.

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Maxillary sinus augmentation for implant placement: 1–12 years follow-up study

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Objective: Aim of this retrospective study was to evaluate the results after 12 years of application of the sinus augmentation procedure and the complications arised.

Material and methods: The material for the study came from the records of 275 adult patients (148 male and 127 female) aged of 30–72 years old, which underwent in 351 interventions of sinus membrane elevation. Two surgical techniques were used: lateral osteotomy window (282 cases), and osteotomes (69 cases). As graft materials were used: a) only autologous bone (187 cases), b) autologous bone in combination with platelet-rich plasma (38 cases), and c) autologous bone in combination with allograft (126 cases). Regarding the barrier membranes used, in 192 cases were resorbable and in 159 cases non-resorbable. In total, 676 Straumann implants (Institute Straumann AG, Basel, Switzerland) were placed in the sites of sinus augmentation. All patients had a detailed clinical and radiographic examination every 6–12 months. CT scans were taken in all cases where delayed implant placement was followed.

Results: Sinus augmentation was achieved in all cases and no implant failure occurred during the osseointegration period. In cases where combination of autograft with non-resorbable membrane was used, bone maturation and augmentation was faster according to clinical and radiographic evaluation. According to radiographic examination bone grat resorption was 0–0.5 mm in 188 cases (53.56%), 0.6–1 mm in 129 cases (36.75%) and > 1 mm in 34 cases (9.69%) ($p < 0.05$). In 252 cases (71.79%) were not observed complications. Complications existed in 99 cases (28.21%) ($p = 0.083$). Out of these: 68 (19.37%) concerned perforation of sinus membrane, 15 (4.27%) exposure of barrier membrane, 4 (1.14%) infection of barrier membrane and 12 (3.42%) loss of implants ($p = 0.003$). In total, 25 implants were lost (3.69%), mainly due to poor oral hygiene. In 63 cases of sinus membrane perforation, the size of damage was small. In these cases the re-establishment was done with the use of a fast resorbing collagen membrane. In 5 cases the membrane almost destroyed. 4 of these cases were faced with the use of autograft in combination with platelet-rich plasma, while in 1 case the intervention was stopped. There was no statistical significant correlation between the occurrence of complications and the gender or age of the patients ($p = 0.067$).

Conclusions: Autologous bone in combination with non-resorbable membrane appears to have more predictable results in sinus augmentation. In cases where PRP was used, clinical and radiographic evidences of bone maturation were earlier. In the majority of cases were not observed complications, while the more serious complication of intervention was the perforation of sinus membrane. The total rate of implant success was 96.31%.

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Infected tooth/root extraction and immediate implant placement with ultra-sonic surgery

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Reliability of ultra-sonic bone surgery (USBS) preparing implant osteotomies was investigated. Procedures included atraumatic tooth extraction and immediate implant placement in, infected or not, extraction sockets.

Inclusion criteria were: 1. Teeth/roots with acute, chronic or no inflammation; 2. Buccal table preserved; 3. Sites accommodating at least 10 mm long implants, 4. loading >3 months. During 01.2006–07.2007, 41 patients were treated with 74 immediate implants following immediate or early loading protocols. Sites in the anterior maxilla were 25, 26 in the posterior, 23 in the mandible. Acute, chronic and no infected sites were 30, 29 and 15, respectively. Atraumatic extraction and implant osteotomy was performed with UBS©. Osteotomy was performed with full conical tips of increasing diameter; working surface was located at the apical portion. Placed implants were ∅3.75 × 15 and ∅4.5 × 59, length was 8 × 10 mm, 24 × 11.5 and 42 × 13.

Teeth and roots were atraumatically extracted after cutting the PDL fibres over up to 10 mm in depth. Drilling at the apical third of the palatal table of anterior extraction sockets with the pilot tip and shifting palatally from socket axis was uncomplicated, without skidding; the same for the thin interradicular crest of the 14 biradicular teeth. The tips couldn't damage the fragile buccal table because the working surface was apical. Mean healing period was 1.8 months. All implants osseointegrated, whatever the sites were infected or not; 87.8% have been now loaded for 6–24 months.

Conclusion is that atraumatic tooth/root extraction, proper implant orientation and placement without skidding at extraction site can be performed by UBS with same high predictability, in infected and non infected sites.

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Simultaneous flapless implant placement and peri-implant defect correction: an experimental study in dogs

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Background: Minimally invasive implant surgery allows clinicians to place implants in less time, without extensive flaps, and with less bleeding and postoperative discomfort. The purpose of this study was to evaluate a new surgical technique by which implants are inserted in a deficient alveolar ridge using a flapless technique simultaneously with a peri-implant defect correction that is performed using a subperiosteal tunneling procedure.

Methods: Bilateral, horizontal defects of the alveolar ridge were created in the mandibles of five mongrel dogs. After three months of healing, one implant was placed on each side of the mandible by a flapless procedure. The exposed threads of the implant on one side of the mandible were covered with a 1:1 autogenous bone/xenograft mixture using a subperiosteal tunneling technique. Four months later, biopsies of the implant sites were taken and prepared for ground sectioning and analysis.

Results: All implants were well osseointegrated with the host bone. All of the peri-implant defects at the test sites were covered with tissue that resembled bone. In all specimens, a mixture of bone, connective tissue and residual bone particles was observed in the graft area. In the control sites where no graft was used, none of the exposed threads on any implants were not covered with new bone.

Conclusion: This preliminary report indicates the potential use of a minimally-invasive flapless technique as a substitute for a more invasive implant placement and ridge augmentation procedure.

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Radiological evaluation of template (NobelGuide) inserted implant positions. A prospective study

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The challenge of every complex implant supported prosthetic restoration is the connection of prosthetical and surgical planning. Treatment concepts for restorative-driven implant surgery were developed to enable sophisticated guided implant placement without any complications. The purpose of this study was the evaluation of the overall deviation in a clinical t reatment situation to assess the possible impact on the treatment safety of computer assisted, template guided implantology.

After computer aided planning (Procera® Software, Nobel Biocare, Sweden) 86 implants were placed in 18 partially or fully edentulous patients with the NobelGuide® treatment concept (NobelBiocare, Sweden). On the basis of the merged preoperative and postoperative CT-scans (fusion) the deviations between the virtually planned and the actually placed implants were measured to assess the treatment safety.

All patients underwent an uneventful one-stage implant surgery and were provided with healing abutments during conventional healing times of two months (lower jaw) and three months (upper jaw). The average linear deviation measured on implant shoulder and implant apex was below 0.9 mm for the mesio-distal direction and less than 0.6 mm for the bucco-lingual direction. The angular deviation between the proposed direction and the actual direction was less than 5 degrees.

The computer aided NobelGuide® template enables a guided flapless implant surgery. The study outcome of the NobelGuide® concept demonstrates those high accuracy required for transferring complex preoperative planning into surgical reality.

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A surgical guide for dental implant placement in edentulous anterior regions

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Tools for surgical guidance during implant insertion aim at transferring pre-operative planning to the intra-operative site. After computed tomography (CT)-based selection of the implant site, transfer of planning and insertion of implants can be accomplished via template or computerassisted navigation or a combination of both methods.

Implant placement after virtual planning of implant positions using CT data and surgical templates can be reliable for preoperative assessment of implant size, position, and anatomical complications. It is also indicative of cases amenable to flapless surgery.

As a result, we were able to perform transmucosal drilling and implant placement in all patients without disruption of important anatomical structures; none of the patients had signs of postoperative sensory changes in the lip or chin region.

The combination of computer and surgical guidance of dental implants in the interforaminal region provides excellent results in mandibular edentulism.

In this presentation, oral implants were planned on CT. A special surgical template was fabricated and the surgical bur tubes were directly positioned in this template. Bur tube positioning may represent a precise means for CT-guided template production.

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The role of matrix protein in the development of implantation by fresh socket

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Aim: One of the main problems of immediate implantation is crestal bone resorption. It seems that application of Emdogain (EMD) following implantation in fresh socket could be able to prevent it. In this randomized clinical trial study we decided to compare crestal bone resrption up to 1 year after implantation in fresh socket with and without Emdogain.

Material and methods: 28 patients volunteer immediate implantation in upper anterior site regarding to inclusion and exclusion criteria were selected. Min thickness of remaining buccal bone was 1 mm, therefore GBR technicque was not indicated. Also the distance between the shoulder of implant and crestal bone was not more than 2 mm. In test group (EMD) was used. All the fixtures submerged. 3 months later prosthesis was loaded. Digital radiographies with RVG system were taken before, immediately, 3, 6, 9 and 12 months after surgery. The statistical analysis was t test.

Result: Although in all images no significant difference was observed, but after 6, 9 and 12 months later the amount of crestal bone resorption slightly was less in test than control group. After 3 months it was 0.18 in test versus 0.17 in control group, after 6 months 0.23 versus 0.24, After 9 months 0.27 versus 0.38 and finally after 12 months 0.31 mm in test versus 0.59 mm in control group. All the implants were successful.

Conclusion: Regarding to mentioned results it is concluded that immediate implantation is an acceptable procedure. Although using of (EMD) was not statistically significant, but it could prevent crestal bone resorption slightly.

Keywords: Enamel matrix proteins, Immediate implantation crestal bone resorption, Radio Visio Graphy (RVG).

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Immediate loading of 2-implants mandibular overdentures - Active-in-one-day

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Objectives: Osseointegration-time of implants demands a downtime for the complete denture patient with discomfort and demands of aftercare. With the introduction of implants with the SLActive-surface, immediate loading of two implants interconnected by a bar with an overdenture has become a possible treatment option. In this study this treatment is evaluated.

Material and methods: One hundred and twenty four edentulous patients with atrophic mandibles were recruited and treated in a private Implant and Prosthetic practice. The procedure started with the manufacturing of a conventional denture. For implant placement this new denture was used as surgical guide and directly after surgery as impression tray. This impression was used to manufacture the bar and to mount the activated retention-clip in the denture. Overdenture and bar were placed at the same day as surgery. Instructions for the patients included almost no limitations in use of the overdenture.

Results: Only 3 implants were lost in 3 patients. Patients reported hardly complaints about pain, swelling, sore spots. The rate of acceptance of the overdenture was high. Compared with the traditional implant-procedure less appointments were necessary for aftercare. ISQ measurements (Osstell Mentor) proved to be of additional value for the prosthodontist and the patients.

Conclusions: The results of this clinical trial with immediate loading by a mandibular overdenture with 2 implants interconnected with a bar show that this new procedure is predictable and less time consuming for patients and professional dental workers. This Active-in-one-Day concept demands no special skills of the surgeon, prosthodontist and dental technician.

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Immediate loading of short implants with chemical modified SLA surface

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According to experiences and results of many studies about using of short implants, the goal of the this study was to examine changes of stability for immediate loaded short implants with chemical modified SLA surface and to compare their out – come to those of control implants. The implant stability was assessed according two different implant surfaces and functional loading. Study was performed on 12 patients with bilateral partial edentulous mandible. Three implants for both sides were placed in the positions of second premolar, first and second molar. Implants on one side were immediate loaded (IL group) and on the other side implants were early loaded (EL group). In the study 36 tapered implants with chemically modified SAL surface (SLActive) and 36 with standard SLA surface, 8 mm length were analyzed. Each implant was tested for primary stability with resonance frequency analysis (RFA – Osstel Mentor) and RFA was performed at examinations in the period 6 weeks following surgery. Mean of primary implant stability for SLActive implants was 80.33 ± 5.17 ISQ (IL – 81.83 ± 3.13; EL – 78.33 ± 6.06) and for SLA implants was 74.15 ± 7.26 ISQ (IL – 73.88 ± 7.97; EL – 74.41 ± 6.70). The primary stability of SLActive implants was significantly higher then in the group of SLA implants ($p = 0.01$). The decrease of implant stability wasn't presented in the both groups of SLActive implants. In the IL group of SLActive implants, increase of ISQ values has been noted 4 weeks after insertion and in EL group increase was detected in the 2nd week of study. In both functional loading groups of SLActive and SLA implants statistically significant increase of implant stability has been noted between value of primary stability and value of implant stability in 6th week. Based on these results, special anatomical shape with tapered effect of implant body provide higher value of primary implant stability as a main factor of immediate loaded procedure. Also, chemically modification of SLA surface influenced in the increasing of that value. Concerning that, short Straumann TE implants with SLActive surface is mainly indicated in immediate loading procedure.

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Maxillofacial rehabilitation of patient with ectodermic dysplasia; case report

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Introduction: Ectodermal dysplasia is a group of conditions in which there is abnormal development of the skin, hair, nails, teeth, and sweat glands. While females are carriers of the disorder, the disorder occurs mostly in males. The disorder occurs when abnormal skin tissue differentials, such as dentition, hairiness and sweat glands. Disorder can be observed in enlarged forehead, hollow nose and a thicker lips. The disorder also leads to a complete or partial missing teeth. Persons with ectodermal dysplasia may not sweat or have decreased sweating because of a lack of sweat glands. Children with the disease may have difficulty controlling fevers. Mild illness can produce extremely high fevers, because the skin can't sweat and control temperature properly. Affected adults are unable to tolerate a warm environment and need special measures to keep a normal body temperature. Other symptoms include: abnormal nails, abnormal and missing teeth, absent or very thin hair, absent tears (occasional), decreased skin color (pigment), foul-smelling nasal discharge, inability to sweat, large forehead, light coloring, lower-than-normal number of teeth.

Aim of the work: The aim of this work was to analyzed stages of maxillofacial rehabilitation of patient with ecodermal dysplasia.

Patient: A seventeen year old female patient was admitted to Department of Oral Surgery Medial University of Warsaw. Patient was diagnosed with ecodermal dysplasia. Symptoms included oligodontia, inherited lack of teeth: 15, 14, 13, 12, 22, 23, 24, 25, 31, 32, 41, 42. The patient's treatment involved surgical bone grafting from the hip and implantation of Nobel Replace implants. The surgery was conducted under general anesthesia. The autogenic material was used in conjunction with synthetic R.T.R. Septodont Cone.

Results: The two year patient observation showed full osteointegration of implants. After prosthetic reconstruction, full chewing ability was achieved, as esthetic appearance.

Conclusion: The implant – prosthetic treatment of patients with ecodermal dysplasia in whom ogligodontia occurs is the correct oral treatment which enables complete rehabilitation of chewing function. The use of prosthetic rehabilitation based on dental implants results to improvement of facial esthetical appearance. The use of autogenic material from hip bone combined with Calcium Triphosphoran results in adequate solution in patients with significant bone loss in maxilla.

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Marginal bone resorption: comparison between traditional or computer guided technique

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Aim: This prospective study evaluated marginal bone resorption between a computer guided flapless technique (Nobel Guide®, Nobel Biocare) and a traditional protocol for implant positioning.

Material and methods: A total of 132 implants (Nobel Speedy® and MK-IV®, Nobel Biocare) were placed in 33 fully edentulous patients. They were rehabilitated by immediately loaded full arch fixed prostheses, anchored to 4 implants, both axial and tilted. 21 patients (84 implants) were rehabilitated by traditional protocol, and 12 patients (48 implants) were treated with flapless computer guided technique. Bone level evaluation was assessed by image software (Image Tool® 3.0, UTHSCSA), analyzing intraoral radiographs obtained through individual positioning device.

Results: Cumulative implant survival rate for traditional and computer guided protocol was 100% for both treatments after two years of follow-up. Marginal bone loss averaged 1.62 ± 0.4 mm at 24 month evaluation for traditional protocol, and 1.1 ± 0.33 mm for computer guided technique. No significant difference in marginal bone loss was recorded between upright and tilted implants in the same group. A satisfaction questionnaire filled by patients revealed better results for computer guided technique, concerning pain, stress, oedema, and provisional prosthesis aesthetic and function.
Conclusions: This study indicated that computer guided technique might result in lower bone resorption around dental implants in respect to traditional protocols, executed by surgical flap elevation. A few contrasting data are actually available in Literature regarding to computer guided implantology. This might be depending on diagnosis, pre-surgical preparation, and careful protocols application in computer planning and surgical procedures.

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Bone-to-implant-contact of zirconia versus titanium: an experimental animal study

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Introduction: Zirconia (ZrO_2) seems to be a favourable material for dental implants. The aim of this study was to evaluate the bone-level of the uppermost part of zirconia versus titanium implants in dependence on the insertion level.
Material and methods: Two month after teeth extraction in the lower jaw in six dogs, four different implant types were inserted in each side of the mandibula: a zirconia implant, a coated (TiO_2, calcium liberating) zirconia implant, a titanium implant and an experimental synthetic implant. All implant types had the same macro- and microstructure (sand-blasted). In a split mouth manner they were inserted in a submerged and non-submerged gingival healing mode. During the healing period the epicrestal implant parts were immediately stressed by masticatory function. Histometrically the bone contact at the screw part and the bone level of the upper implant part were measured after a healing period of four month. (The synthetic implant was not evaluated.)
Results: All implant were clinically stable osseointegrated. No implant failed histometrically the bone-levels of the submerged test implants and the control implants of titanium were similar: zirconia 2.2 mm, coated zirconia 1.8 mm and titanium 1.9 mm. The non submerged implants showed a longer distance from the implant shoulder to the uppermost bone-to-implant contact: zirconia 3 mm, coated zirconia 2.5 mm, titanium 2.6 mm.
Summary: Zirconia- and titanium-implants didn't show significant differences of bone-to-implant contact in the screw-parts. The bone-level of the upper implant part seems to be dependent on the insertion depth and healing mode, but not on the implant material.

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Implant position indicator: a new device

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Although oral rehabilitation with dental implants is a well known technique worldwide, the correct position to place the implant is an important step for the success of the case. Different surgical techniques have been developed to optimize the prognosis, such as the use of a positioning indicator and guided surgery. Especially for beginners, but also to all implants surgeons we developed a new positioning indicator, different from those used in the surgical kits from the implants companies. In this new instrument we create a tooth crown over the position indicator, one for each kind of tooth. By using this model the surgeon has the possibility to view how the prosthesis will be during the surgery. With this work we intend to demonstrate the new device and to show how to use in the surgical procedure. We have observed that our students are having more facilities to understand the need of placing the implant in the correct position. Even small angulations mistakes are easier to be diagnosed and corrected. We do believe that this new device for positioning the implants should be used by all implants surgeons.

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The clinical study on the change of osseointegration and stability of dental implants; A clinical follow-up of ISQ values for two months

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Purpose: The purpose of this study is to evaluate the predictive success rate of dental implant indirectly by measurement of ISQ values.
Patients and methods: We selected a one-stage rough surface implant of which was used for implant installations at the department of OMFS, SNU Boramae hospital from May 2004 to January 2007. In all, 73 implants were selected in 34 patients, of which 17 were males (mean age 53.2) and 17 were females (mean age 49). Of the 73 implants, 29 were installed in the upper jaw, and 44 in the lower jaw. The ISQ values were taken at the time of installation, 1 month after installation, and and 2 months after installation.
Results: The mean ISQ value of fixtures installed immediately in the mandible and maxilla is 76.4 ± 4.19 and 72.5 ± 6.37 respectively. The 1-month postoperative ISQ value in the mandible was measured as 78.4 ± 3.00, whereas the maxilla produced an ISQ value of 74.7 ± 4.87 at 2 months after installation.
Conclusion: Although some authors say that one-stage rough surface type implants show decreasing one-month postoperative

ISQ values when tested expeimentally, our clinical results showed otherwise. We thus, conclude that using one-stage rough surface type implants show increasing ISQ values and increasing osseointegration tendency, making early loading possible.

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Effect of bone quality on insertion torque during implant placement

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Purpose: The aim of the study was to assess the influence of insertion torque of bone quality and to compare axial force, moment and von Mises stress using finite element analysis of plastoelastic property for bone stress and strain.

Material and methods: The Brånemark MKIII. RP implant and cylindrical bone finite model were designed as cortical bone at upper border and trabecular bone below the cortical bone. 7 models were made according to thickness of cortical bone, density of trabecular bone and bicortical anchorage and von Mises stress, axial force and moment were compared by running time.

Results: The axial force was measured highest when Brånemark MKIII implant flange inserts the cortical bone. And maximal moment was measured highest after axial force suddenly decreased when the flange impinged at upper border and the concentration of von Mises stress distribution was at the same site. The influence of density in trabecular bone to axial force was less when cortical bone was 1.5 mm thick but it might be more affected when the thickness was 0.5 mm. The total axial force with bicortical anchorage, was similar when upper border thickness was the same. But at the lower border the axial force of bicortical model was higher than that of monocortical model.

Conclusion: Within the limitation of this FEA study, the insertion torque was most affected by the thickness of cortical bone when it was placed the Brånemark MKIII implant in premolar region of mandible.

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A new lateral approach for sinus elevation

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In the present study a new lateral approach for sinus elevation and the installation of dental implants following a 2-stage approach is described. This approach includes the use of an ultrasonic generator to open the window which enables an increased tactile control and avoids soft tissue damage, the application of a mixture of bovine anorganic bone and preparation rich in growth factors (PRGF) as graft material and the use of autologous fibrin as sealing biomaterial. Initially, a bilateral sinus pilot study (n = 5) was carried out to evaluate the effect of using PRGF technology in the new sinus elevation approach. Results showed that the use of PRGF improved graft volume and facilitating its posterior manipulation. Additionally, the histomorphometrical data demonstrated that PRGF provided a 3-fold increase in the percentage of living bone comparing with the control side 5 months post-treatment. These results supported the 2-stage implant installation in a larger group receiving the new lateral approach. 18 patients received 43 dental implants after this new sinus floor elevation approach. The mean follow-up period for all implants was 33 ± 7 months. The overall survival rate of dental implants installed after sinus floor elevation was 100%. In addition, the histomorphometrical evaluation of 8 samples from PRGF grafted sinus involved in the study evidenced a 25.24% ± 4.62% of vital newly formed bone, 50.31% ± 15.56% of soft connective tissue and the remaining 24.46 ± 12.79 of bovine anorganic bone. This new approach for sinus elevation and implant installation is safe, effective and predictable.

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Treatment outcome following guided surgery: a 3-year preliminary report

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Purpose: The goal of this study was to investigate the outcome of NobelGuide™ in the treatment of totally or partially edentulous patients.

Material and methods: Over a three year period, a total of 39 consecutively treated patients have undergone implant treatment using NobelGuide™ system: 19 women and 20 men

-8 patients were totally edentulous for both mandible and maxilla;

-18 patients were totally edentulous in the mandible or in the maxilla;

-15 patients were partially edentulous.

A total of 49 totally or partially edentulous arches were treated.

A total of 258 implants have been inserted: 172 NobelSpeedyTiUniteGroovy™, 74 MKIIITiUniteGroovy™ and 12 NobelReplaceTiUnite Groovy™.

212 implants were immediately loaded.

In all partially cases with immediate function, temporary prosthesis were used.

In cases of full edentulism with immediate function: 12 rehabilitations were definitive prosthesis supported by Procera Implant Bridge™ and 17 rehabilitations were temporary prosthesis (because of a reduced occlusal height or inappropriate angulation):

Outcome measures were prosthesis and implant success, biologic and prosthetic complications, pain and oedema evaluation.

Results: All the restorations immediately loaded were delivered the same day of the surgery.

3 implants failed in two patients but were successfully replaced.

7 implants showed marginal bone loss higher than 2.5 mm

All implants with immediate loading were successful.

No major complication occurred.

3 patients with temporary prosthesis immediately loaded experienced prosthetic complication (resin break), no definitive prosthesis failed.

Conclusion: The present preliminary prospective study indicates that implant therapy with NobelGuide™ is a reliable treatment option.

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Oral rehabilitation of a totally edentulous patient with surgically guided implant supported fixed prosthesis

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Treatment of the edentulous jaws using a conventional complete removable denture is a common clinical undertaking, yet at times it can be a difficult and challenging intervention. Implant therapies have increased the range of prosthodontic options for the treatment of edentulism. Osseointegrated implant treatment can be originally designed for the edentulous patient to support a fixed prosthesis. Proper implant placement is crucial for successful implant-supported restorations. A surgical guide can also be used either for radiographic evaluation during treatment planning or during surgical procedures.

In this case report, we presented a patient who rehabilited with implant supported fixed dental prosthesis, and a bone supported surgical guide was used for proper position.

Key words: Edentulism, osseoinegration, implant supported fixed prosthesis

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Clinical experience in CAI: preliminary results

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Objectives: The advantages of computer aided implantology (CAI) are the better prepared surgery with visualisation of critical anatomic structures, assessment of available bone and data about bone quality, increased confidence for the surgeon, decreased operative time, less frequent use of bone grafts, higher quality of collaboration between dentists and prosthetic lab and better communication with patients. A thorough aesthetic evaluation should be performed especially in planning and replacement of anterior teeth.

Patients and methods: The study describes usefulness of computer assisted fabricated surgical templates as the static method for transfer of three-dimensional pre-operative planning to the patients. For the static method, the system SimPlant was used for placing in total 33 dental implants (P1H) in 6 females and 10 males, mean age 62 ± 7.5 years.

Results and conclusions: With the support of computer guided implantology, the precision achieved in the planning phase can be transferred to the patient so that the accuracy of the dental implant surgery and aesthetic are improved. Complications related to an incorrect position of the implants have not been observed so far; the preoperative planning could be exactly carried out. There was one failure within the first 6 months in the examined insertion group. A computer-aided method included in this study were successfully applied in a clinical treatment after a start-up period. Due to uncomplicated handling the static template technique can be recommended as the method of choice for the majority of cases.

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Guided surgery – clinical and model analysis

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Objectives: The aim of this study is to analyse the benfits and precision of CT based implant planning and guided implant placement.

Methods: After CT based implant planning with the SimPlant software (Materialise, Leuven/Belgium) Ankylos® (Friadent GmbH, Mannheim/Germany) implants are placed with a drill guide to the planned location with immediate provisionalization. The drill guides are custom manufactured by a stereolithography process for each patient. During the operation, the drill guide is tooth or bone supported. Furthermore on a model the precision of the CT scan and the rapid prototyping production is evaluated. Angulations, entrance points of the implants placed in the model with surgical template were evaluated.

Results: 23 implants have been placed and immediately loaded. Knowledge of the exact location of important anatomy, such as the mandible nerve and the maxillary sinus cavities, in combination with the drill guide helps to insure that all implants are properly placed. The model experiment showed a maximum deviation of 9.7° of the actual implant position. 87% of the implants were within less than 1 mm from the intended position.

Conclusions: The probability for a successful operation with a CT based implant planning and guided surgery seems to be increased due to a thorough knowledge of anatomy. The function of the provisional restoration can be significantly enhanced by CT guided implant insertion. Still the results from the model experiment indicate that there is room for improvement.

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A protocol for using CAD-CAM technique in extraction sites

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Purpose: To immediately restore compromised dentition with flapless implant surgery in fresh extraction sites, using a

specially designed radiographic stent in conjunction with NobelGuide™ system.

Method: The analysis was done with a two pieces radiographic guide. This guide is not affected by the presence of undercuts and it is well adherent to the gingiva allowing for a more precise planning. Also it will carry the expected final teeth position, independently from the position of the teeth to be extracted.

Implants in extraction sites were virtually planned with teeth/roots still in their alveolus. Extractions were performed just before fixation of the surgical guide.

A provisional screw-retained fixed bridge with titanium cylinders connection was delivered 2–3 hours after the surgery.

Results: 13 patients (8 female, 5male) mean age 56 (range 34–72) were treated following this method. A total of 76 implants (35 in extraction sites) were flapless inserted.

9 patients received total cross-arch screw-retained bridges, 4 received 6 partial bridges. During the follow up period (range 6–18 months) all implants, individually checked at 6 months, were stable. The patients showed aesthetic and functional satisfaction.

Conclusions: This method provides an easy and precise virtual planning and flapless surgery in post-extraction cases. The patient's desire, to have a smooth and immediate transition from a residual hopeless dentition to a new stable dentition on implants, is possible in few hours with little discomfort.

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Inmediate loading on zygomatic implants

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Introduction: Zygomatic implants (Nobel Biocare, Göteborg, Sweden), designed for implant supported rehabilitation of patients with severe atrophy in the posterior maxilla, have shown a success rate of more than 97%. From these data, new techniques have been developed to facilitate surgical insertion and for use in immediate loading protocols.

Objective: To assess the success rate and complications in the use of zygomatic implants protocol with immediate loading.

Method: Ten patients with full maxilla edentulism were included in the study. Two zygomatic implants (n = 20) were placed, along with a number from 4 to 6 conventional implants in the anterior maxillary area, which have been immediately loaded within the first 24 hours; The insertion of the zygomatic implants has been made through a modified protocol called ''sinus slot'', which facilitates their insertion while allowing the implant – crown connection in the alveolar ridge in the upper first molar area, instead of the usual palatal location between the upper premolars; The temporary prosthesis used in the immediate loading protocol is replaced by the final ceramometal prosthesis at 6 months. Success rate (asymptomatic implant, with no mobility or clinical signs of infection) in an average time of 3 years is assessed.

Discussion: Zygomatic implants are designed for those situations in that upper jaw bone atrophy would otherwise require the use of onlay and/or inlay (''sinus lift'') bone grafts, showing a success rate of more than 97%, overcoming the success rates of conventional bone graft/implant protocols used for the rehabilitation of people with severe reabsorbed jaws. The technique of ''sinus slot'' allows for a more predictable and easy insertion of these implants, which also will be located in an ideal prosthetic position (alveolar ridge of the theoretical upper first molar), preserving more bone and ensuring greater bone/implant surface contact than the standard zygomatic implants protocol; In this series a total of 20 zygomatic implants have been placed using this technique, in combination with 4 or 6 conventional implants in the anterior maxilla, which are functionally loaded in the first 24 hours; A success rate of 100% has been achieved, with a mean follow-up of 3 years (2 to 4), with good functional and aesthetic results. Therefore we conclude that this protocol has high reliability and validity and should be considered in the rehabilitation of complex cases of severe maxillary atrophy, allowing a very satisfactory rehabilitations.

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Immediate loading of implants immediately placed after teeth extractions in total rehabilitation

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As favourable loading conditions are obtained through rigid fixed supra construction (splinting) during the initial healing period; in order to reduce stresses on implants and to keep micro-motion below the critical threshold, initial and direct loading of the implants could be a successful treatment modality.

Between January 2000 and December 2005, seven patients, 5 women and 2 men, were selected for total immediate rehabilitation of implants immediately placed after teeth or roots extractions. The selection of these patients was based on their refusal to wear full temporary removable dentures during the 2–3 months healing period before the final fixed rehabilitation on the implants. They were treated using a one-day visit approach for extraction, implant placement, and total rehabilitation of the mandible and/or maxilla by means of full implant-supported fixed restoration. A total of 68 Strauman® SLA implants, with a maximum length of 12 mm, were placed directly after extraction and immediately loaded the same day of the surgery.

Among the 68 immediately loaded implants, one early failure was observed and no late failure was recorded over a period of 2–7 years. The success rate (SR) for implants was 98.5%. There were no surgical complications. Fracture and debonding of the acrylic resin provisional bridge occurred for 1 patient after the first 8 weeks of treatment.

This approach has the advantage of giving the patient a total fixed rehabilitation after teeth extraction, maintaining vertical dimension and skipping the uncomfortable interim period of patient adaptation with the removable complete denture.

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One stage operation of large oroantral fistula closure and sinus lifting for dental implant installation

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Bone grafts at the maxillary sinus are often required after closure of an oroantral fistula (OAF) to allow for subsequent implant installation. The present report describes a single procedure that provides large OAF closure and bone grafting at the involved sinus. This technique involves sinus mucosal lifting via elevating the sinus membrane, which is recovered as a continuous layer by combining the residual sinus membranes with a flipped part of the oral mucosa around the OAF. Autogenous bone from the Ileum was grafted into the prepared sinus space, and the oral side of the graft was covered by a rotated palatal flap. This technique was used to treat 3 patients who had large OAFs in the atrophied posterior maxillay region due to previous multiple implant failures after sinus lifting. The treatment was successful in all cases. This technique appears to be suitable for large OAFs where implants are subsequently required.

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Primary stability increase of dental implants using osteotome technique: A human cadaver study

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The objective of the present study was to determine the primary stability after using the osteotome technique in the maxilla of six human cadavers. All of the 28 tapered design implants (Warantec, Seoul, Korea) were inserted using osteotome and conventional drilling techniques. The implant stability data was recorded for each fixture site after placement. Subsequently, histologic analysis was performed using undecalcified ground sections. The results were as follows:

1. There was no significant difference in the peak insertion torque & periotest values between type 4 bone. In the type 3 bone, the peak insertion torque & periotests values of osteotome technique were significantly higher than that of the drilling technique ($p < 0.05$).

2. There was no significant difference in the RFA values among the groups ($p > 0.05$).

3. Histologic evaluations in the osteotome group showed that fractured bone chips were densely compacted inside the threads and the contact area with cortical bone in the neck threads were more wide than that of the drilling group. In the conventional drilling group, there were fewer bone chips in the threads and less cortical bone implant contact due to the countersinking and tap drilling.

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Immediate load for edentulous mandibles and maxillae

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Objectives: The accepted protocol for forecasting the success and predictability of osseointegrated implants included a stress-free healing period; however, the currently knowledge has been showed an equivalence to the functional concepts about delay and immediate load. The aim of this study was to clinically evaluate the viability and the survival rate after restore mandible and maxillae using four implants to support complete fixed dental prostheses made with a metal substructure and acrylic, 24 hours after surgery.

Material and methods: For this clinical study, 60 patients received 240 immediately loaded implants (NobelBiocare®, Sweden). The implants were placed in the anterior region of the mandibles and maxillae and the bilateral posterior implants were tilted about 30° relative to the occlusal plane. Multifunctional trays were used to guide the localization of the four implants during the surgery and after that in the prosthetic phase it was used as an individual tray assisting the casting and the determination of the occluding intermaxillary relationship.

Results: Clinical implant evaluations were performed in the periimplant areas. The overall implant success based on the sampling of the total number of the implants were 99.58%, and the prostheses survival rates were 100%, suggesting the viability of the proposed treatment.

Conclusions: The immediate loading fixed dental prostheses, made with a metal substructure and acrylic to support four implants showed to be a safe and predictable technique to settle the difficulties in the treatment of the atrophic mandibles and maxillae moreover with the complexity of the bone grafts procedures.

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Implant wound and periodontal pocket repair with Listerine® formulation

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The aim of this study was to evaluate the clinical results of local delivery of adjunctive antimicrobials in the treatment and management of patients with periodontitis and perinplantitis. The study population included 20 patients, with chronic adult periodontitis or perimplantitits. Ten out of 20 received local treatment with listerine in gel formulation injected directly into the periodontal pocket; 10 received local treatment with a chlorhexidine-based gel (1%) in situ.

In the 10 patients treated with Listerine we observed a reduction in attachment loss and a reduction in probing depth of 1.4 mm; in the 10 chlorhexidine-treated patients we observed a reduction in attachment loss and a reduction in probing depth of 0.9 mm.

Our results suggest that direct delivery of antimicrobial agents to the infection site may be a useful adjunctive to conventional periodontal treatment. Intra-pocket chlorhexidine-based gel (1%) is less effective than injected Listerine in controlling infection.

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Periimplant parameters in head & neck reconstruction—influence of extraoral or intraoral tissue

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Objective: This study is designed to assess soft tissue parameters of dental implants supporting overdentures in edentulous patients with head and neck malignancies. We will look for possible implication of extraoral tissue transfer on peri-implant parameters including microbiology.

Material and methods: A total of 33 implants supporting overdentures in 33 oral cancer patients were examined. Clinical parameters (mPI, probing depth, BOP, origin of peri-implant soft tissue and amount of radiation) were taken, and microbiological identification was carried out by DNA-DNA hybridization. To identify yeast species, the samples were cultivated on after Sabouraud agar plates then identified by API 20C AUX plates. The implants observed were in place for at least 6 months after the exposure of the transgingival portions.

Result: Transferred extraoral soft tissue was observed in eight cases, and oral mucosa was observed in the rest of the peri-implant area. Colonization of periopathogen was found on 14 implants. Ten of these were from peri-implant pocket of oral mucosa and 4 were from the transferred extraoral counterpart. There was no significant difference in the prevalence of periopathogen between the transferred extraoral tissue group and the oral mucosa group had no statistical significance. Yeast species were found in 14 cases consisting of 4 cases of *C. albicans*, 9 cases of *C. glabrata* and one case of *C. tropicalis*. Regarding the difference in the prevalence of *Candida*, the result was not statistically significant (Fischer's exact $p > 0.05$) according to the origin of peri-implant soft tissue although a low incidence of yeast was observed in the extraoral soft tissue group. However, considering irradiation as the confounding factor, *Candida* sp. is less frequently observed in the transferred extraoral soft tissue group with statistical significance ($p = 0.03$, Mantel-Haenzel Common Odd Estimate).

Conclusion: Peri-implant soft tissue originating from transferred skin may be less sensitive to irradiation in the context of prevalence of *Candida* sp. though further studies with greater number of subjects would be required to support this finding.

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Atraumatic removal of very well integrated but misplaced or misangulated implants

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Sometimes an implant is very well integrated but its direction or angulation is not quite satisfactory or even it is a sleeping implant that its space is needed or due to some changes in prosthetic designing, the place of a fixture in the jawbone needs to be changed. The problem is that in many cases, only one or one and half a millimeter of bone is left at buccal and/or lingual side of the implant which is to be removed. Creating a through and through bone defect is what really happens when a trephine is used to bring out the implant and its surrounding bone from the jaw. Then, the practitioner has to go through the time and money consuming procedures of repairing or reconstructing the alveolus using bone or bone substitutes. To avoid the above mentioned problem(s), I have been using the follwing techninque along the years and in several cases that the implants had to be removed because the restoring prosthodontist was not quite satisfied with the position or angulation of the implants or had changed his mind about the restoration planning.

First, the overlying mucosa or surrounding gingiva is completely detached from the implant neck and kept away. Then, one pole of the electrocautery is attached to the platform of the implant while the other pole is attached to one of the patient's limbs. The electrocautery is regulated on coagulation mode and kept working for five seconds. This procedure will cauterize and electro-necrotize the layer of bone which is in close proximity, or integrated to the implant body. The mucosa is then sutured, some analgesics are prescribed and the patient is dimissed. After seven to ten days the patient comes back to the office and the implant is unscrewed out of the bone very easily, even without the need for anesthetic injection. In my cases, there has never felt any necessity for using antibiotics and no complication in natural healing of the implant socket has ever been met.

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Meta-analysis of peri-implant crestal bone loss of different implant surfaces

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Introduction: The implant surface and gross structure are major determinants of implant success and the stability of the bone-to-implant interface. Comparative studies are time-consuming and challenging, because study designs are often not standardized. In the present study the effects of the implant surface structure on crestal bone loss and clinical success rates are evaluated.

Material and methods: 550 reports were collected in a manual and Medline-supported literature search using stringent

inclusion and exclusion criteria. Of these, 12 studies meeting the stringent inclusion criteria were included in the meta-analysis. 2,281 machined and 1,693 surface-roughened implants were compared. The Cochrane Collaboration Review Manager was used for statistical evaluations. Losses were quantified with odds ratios for each study and pooled with a random-factor model.

Results: There was no significant difference in peri-crestal bone loss (379 machined versus 384 surface-roughened implants; $p = .65$). Overall, 179 implants were lost. Of these, 119 were machined and 59 surface-roughened ($p = .01$).

Conclusions: The survival rate of machined implants is significantly lower than that of surface-roughened implants (2.38 × higher loss rate for machined implants at a 95% confidence intervals). There was no significant relation between the implant sites and the crestal bone loss.

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Immediate implantation and buccal bone remodeling following flap/flapless approach

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Background: Resorption of the buccal bone following immediate implantation with the flap approach has a significant impact on the aesthetic result if performed in the anterior region.

Purpose: The aim of the study is to evaluate in dogs the loss of buccal bone height after immediate implantation using the flapless or flap approach.

Method: The lower premolars were extracted from 3 dogs, in the test group (TG) the teeth were extracted with the flapless approach and in the control group (CG) using flaps. In sequence 18 Ankylos implants were placed, three on each side, they were placed at the level of the bone crest and 1 mm away from the buccal bone, no grafting material was used in the void between the implant and buccal bone. Gingiva formers were placed and the nonsubmerged healing went on for 8 weeks. At that time the animals were sacrificed and the bone blocks were prepared for undecalcified sectioning. On the histologic specimens, sectioned in a buccal-lingual direction, the loss of buccal bone height was measured in relation to the top of the lingual bone.

Results: For the CG the buccal bone had a mean resorption in height of 2.14 ± 0.34 mm and for the TC the loss was 0.98 ± 0.45 mm.

Conclusion: Immediate implantation with the flapless approach had less than half of buccal bone resorption when compared to the flap approach, even in the absence of grafting materials.

This protocol was approved by the Institution's Research Committee for Animal Experimentation.

This study was in part sponsored by Dentsply Friadent and the Coordination for the Development of Personnel in Higher Education (CAPES).

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The use of laser in dental implants decontamination

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This research aimed to evaluate the diode laser 980 nm and the Nd:YAG laser 1064 nm extra long pulse potentials on reducing the bacteria after irradiation of 3 different titanium dental implant surfaces (machined; acid etched; sandblasted-TiO_2) contaminated with E. faecalis and P. gingivalis, as well as the possible changes on the irradiated implant surfaces, considering their clinical use for the treatment of periimplantitis. The power settings studied were 2.5 and 3.0 W. When using the diode laser the results showed 100% of the bacteria reduction on the implants irradiated with 3.0 W. It was also achieved 100% of bacteria reduction on the implant surfaces contaminated with P.gingivalis when irradiated with 2.5 W and 3.0 W. The bacteria reduction was not complete for the implants contaminated with E. faecalis, irradiated with 2.5 W and sand-blasted-TiO_2 surface (78.6%) and acid etched surface (49.4%). The Nd:YAG laser extra long pulse provided 100% of the bacteria reduction in all samples, except on implants contaminated with E. faecalis irradiated with 2.5 W and acid etched surface (97.2%). The SEM analysis showed that, under the power settings used, no implant surface changes were found.

Conclusion: The diode laser 980 nm and Nd:YAG 1064 nm extra long pulse achieved, in vitro, bacteria reduction in three different implant surfaces, under the power settings applied, and may be indicated for the clinical treatment of periimplantitis.

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Anaerobic bacterial contamination of bone pieces collected during implant surgery

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Objectives: During dental implant surgery, drilling procedures produce some amounts of bone pieces. Such pieces can be used as minor ridge augmentation materials. To clarify the contamination risk of bone pieces by oral microorganisms, correlation between contamination degree and clinical variables were examined.

Methods: 51 partially edentulous patients were enrolled in this study. Bone pieces were collected by a bone trap inserted between the suction tip and tube in the implant surgery. They were immediately crushed aseptically, dispersed in sterilized PBS (pH7.2). The suspension was inoculated on blood agar plate and cultured anaerobically for 7 days to evaluate contamination by oral bacteria. To examine the effect of irrigation of bone pieces, 1 liter of sterile saline was suctioned through the bone filter in a part of patients.

Results: Average CFUs in upper and lower jaw samples were 20,174 and 37,337, respectively. The average CFUs per implant

number in a subject was higher in the lower than in the upper jaw ($p < 0.05$). The number of contaminating anaerobic bacteria correlated well with the number of implants in the upper jaw ($r = 0.673$, $p < 0.05$) not with that in the lower jaw. Irrigation of bone pieces by 1 liter of sterile saline has slightly reduced CFUs.
Conclusion: Lower jaw has relatively more contamination risk of bone pieces probably because of saliva. Such anaerobic bacterial contamination indicates that antibacterial treatment of bone before and after minor ridge argumentation is essential for dental implant patients.

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Computer-aided operation planning and 3-dimensional osteotomy guidance for alveolar distraction

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Objectives: In alveolar distraction, in cases of severe atrophy in particular, it is often difficult to perform osteotomies in order to make a transport segment in optimal size and shape. Moreover care must be taken, not to damage the closely locating anatomical structures such as the maxillary sinus, the inferior alveolar nerve, and the roots of the neighboring teeth. For setting ideal osteotomy lines exactly, we have developed a CT-based preoperative planning tool.
Methods: 3-dimensional visual reconstruction of the jaw is created from the preoperative CT scans (1.0-mm slice thickness). Using the image-processing software Mimics (Materialise, Yokohama, Japan), various procedures of virtual cutting are simulated first to determine optimal osteotomy lines and to design an ideal transport segment. After the computer planning, data from the virtual solid model are transferred to a rapid prototype model, and a guiding splint is made to transfer the planned surgical simulation to the actual surgery.
Results: The method was used in a case of severe atrophy of the anterior maxilla. The patient had a large maxillary sinus requiring a precise osteotomy in this critical area. Using the splint allowing a 3-dimensional guidance, alveolar osteotomies were easily done to achieve a transport segment in sufficient dimension as planned, and any perforation of the maxillary sinus could be avoided. Finally the alveolar distraction of 10 mm has successfully been performed.
Conclusion: The preoperative planning method and the guiding splint described here are useful in problematic cases requiring an extremely precise osteotomy due to lack of bony space.

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Applying vestibuloplasty with free gingival graft to the lip mucosa around endosteal implants. A case report

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Objective: The aim of this present case report was the treatment of soft tissue complication adjacent to endosteal implants, due to inadequate vestibular depth and insufficient keratinized tissue, by applying vestibuloplasty with free gingival graft to the lip mucosa.
Case Report: Mandibular anterior part of a 23-year-old male was reconstructed with a microsurgical fibula osteoseptocutaneous flap after a gun shot, resulting with a trauma between the right second molar to the left second molar. Four implants were placed in the anterior mandible region for prosthetic rehabilitation, 1 year after the surgery. After the implant surgery, severe gingival hyperplasia with labile mucosa from the lower lip was observed, owing to shallow vestibular groove with insufficient keratinized tissue around dental implants. Placement of the free gingival graft with vestibuloplasty was performed for solving this problem 6 months after the implant placement as a secondary procedure. After the vestibuloplasty, free gingival graft was placed on the lower lip mucosa, providing keratinized tissue for to prevent the migration of labile mucosa with increasing vestibular depth.
Results: Totally healthy gingival tissue was created around dental implants by applying vestibuloplasty with free gingival graft on the lower lip mucosa.
Conclusion: Vestibuloplasty with free gingival graft placing on lip mucosa has an excellent overcome for labile mucosa in shallow vestibular groove.

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Titanium granules for treating peri-implantitis – clinical study with human histology

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Objective: Evaluation of porous titanium granules (PTG) for treatment of peri-implantitis defects.
Material and methods: Ten patients with peri-implantitis were included in this case control clinical study. The patients were randomized into either solely open flap debridement with surface decontamination, or additional treatment with PTG.

The implants were loaded after 6 months of healing. Clinical and radiographic evaluation was performed at 6 and 12 months. Two test and one control implant in two patients were excluded at 6 months because abutments were unavailable. These implants were removed en bloc for histology. Sections from these biopsies were studied with SEM, element analysis, microradiography, micro-CT, and light microscopy.

Results: *Clinical:* The PTG treated defects healed uneventfully with an improvement in the clinical situation. One PTG treated implant showed signs of remission following loading. None of the PTG treated defects showed progression of bone loss compared to baseline. The control defects showed no signs of bone regeneration. One control showed a marked progression of bone loss at 12 months.

Biopsies: Test defects contained osseointegrated PTGs with bone growing both into the porosity of the granules and onto the implant surfaces. Element analysis demonstrated high contents of bone minerals in the new tissue. The control implant showed no signs of implant re-osseointegration and no bone minerals were observed in this defect.

Conclusion: The qualitative and quantitative tissue analysis confirms the regrowth of bone into PTG treated defects, suggesting that these granules can be used for bone regeneration adjacent to implants affected by peri-implantitis.

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A retrospective study on success of Southern Implants installed in periodontal clinics

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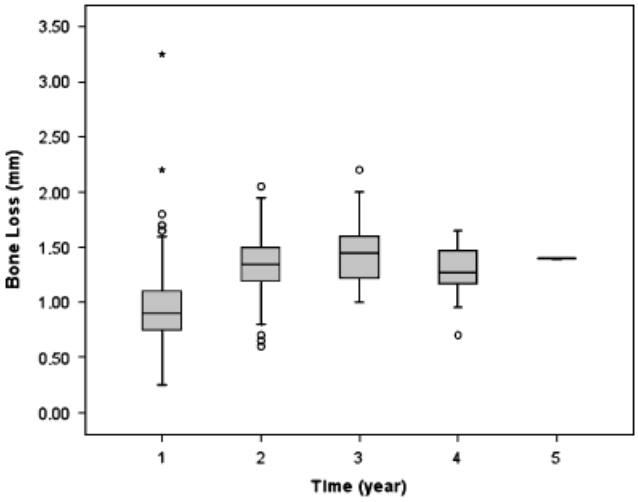
Objective: Determine clinical success of Southern Implants® installed in 2 periodontal clinics.

Material and methods: Non-biased examiners performed a quality assessment of patients treated with Southern Implants and clinical information and radiographs were collected in order to evaluate bone-level changes using DBSWIN 4.3 software with an accuracy of 0.1 mm. Statistical analysis was performed using SPSS v15.

Results: 332 patient's records (143 male, 189 female), corresponding to 717 implants were scrutinized with a follow-up ranging from 2 to 50 months. 88.3% were loaded delayed, 0.1% early and 11.5% immediately. 84.1% were placed in one stage, 91% in healed bone, 8% immediately after extraction and 1% after previous implant failure. 93.7% were placed without any form of soft or hard tissue graft. In total 14 out of 717 implants failed, resulting in a survival of 98.1%; 13 of those were early failures prior to loading of which 6 occurred in 1 patient.

165 implants (93 patients) were randomly analyzed radiographically. After a mean follow-up of 16 months (range 2–50) mean marginal bone loss was 1.14 mm; 0.97 mm and 1.34 mm after 1 and 2 years respectively (Boxplot represents marginal bone changes in time). After 2 years no statistically significant changes in bone loss were observed (Mann-Whitney U-test).

Conclusion: The Southern Implants system is highly effective with clinical survival of 98% and stable bone conditions according to scientific success criteria.



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Immediate placement of wide body implants in the molar region

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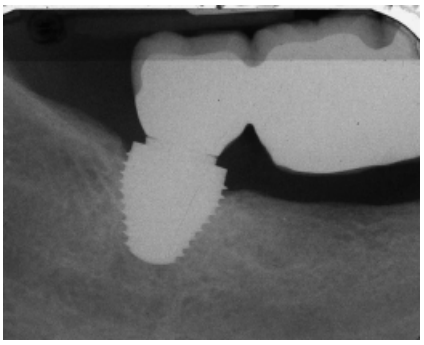
Aim: To evaluate implant success, based on bone levels, of short wide body implants, placed immediately into extraction sockets in the molar region.

Material and methods: 18 patients (6 male, 12 female), mean age 58 (range 45–72) with 21 MAXI® implants (Southern Implants Inc, Irene, South Africa) were retrospectively analysed by independent researchers. Radiographs taken at different intervals were analysed using DBSWIN software (precision of 0.1 mm).

Results: Implants varied from 9 to 13 mm length and 8–9 mm width. 20 implants were placed immediately after extraction, 1 in healed bone and 1 in a grafted site. Based on apical radiographs all implants were considered a success but the latter two implants were excluded from the bone loss calculation. In total, 19 implants (16 in the maxilla, 3 in the mandible) were analysed. 7 of them were placed in 5 smokers. One implant was placed following a 2-stage protocol. Bone levels for this implant were analysed starting from 2nd stage surgery. Seven implants were immediate loaded. Follow-up period ranged from 2 months up to 26 months (mean = 11,03 months). All implants were perfectly integrated. Boneloss varied between 0 and 1.6 mm, with a mean value of 0.92 mm after 11 months. All implants were considered successful according to the criteria of Albrektsson and Zarb (1986).

Conclusions: Wide body implants can be used in the molar region with success, even in more demanding circumstances as immediate placement and immediate loading.



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Clinical evaluation of an angulated implant up to 3-years in function

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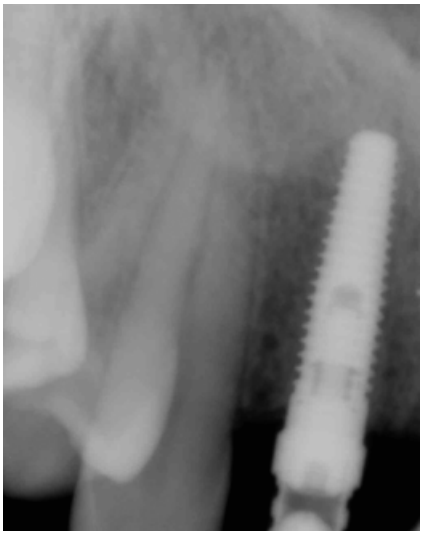
Introduction: The Coaxis implant (Southern Implants Ltd, Irene, South Africa) is a tapered implant with a 12 degree angulated implant neck especially designed for the anterior maxilla or to avoid critical anatomical structures such as sinuses or mandibular nerves. The advantage lies in the ability for angular correction without the use of an angulated abutment.

Objective: To determine clinical success of Coaxis implants placed in 2 periodontal clinics.

Material and methods: 25 patients (10 male, 15 female) were treated with 28 Coaxis implants in the upper jaw. Clinical survival and implant success based on marginal bone resorption were analysed. DBSWIN 4.3 software with an accuracy of 0.1 mm was used for evaluation of the periapical radiographs. Statistical analysis was performed using SPSS v15.

Results: Of all 28 implants, 5 were placed using a 2-stage protocol. 8 implants were placed in extraction sockets and 3 in combination with bone augmentation. 12 implants were immediately loaded. During the follow-up between 1–40 months no implants failed. Radiographs of 17 implants, taken at different intervals, were available for analysis. Mean radiographic follow-up was 11 months (range 1–40) and the corresponding mean bone loss from surgery was 1.06 mm (SD 0.39; range 0.3–1.7) indicating a very successful procedure (Criteria of Albrektsson and Zarb 1986).



Conclusion: The Coaxis implant shows perfect survival and stable bone conditions according to scientific success criteria.

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Migrated implant body removed from hiatus semilunaris by endoscopic operation

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Removal of the implant body using endoscopic surgery from hiatus semilunaris via nasal approach presented with the images of the intra-operative endoscopic video findings.

A 54 years old woman consulted our oral surgery clinic regarding abnormal feeling in the right maxilla and pus discharge from naris. Computed Tomograph estimated and revealed the migration of implant body to the superior-internal region in right maxillary sinus. Endoscopic surgery was carried out to remove the foreign body from the semilunar hiatus via nasal approach.The implant body was seen at the posterior portion of middle nasal meatus and took it out from the maxillary sinus by forceps. A part of tissue membrane around the semilunar hiatus extirpated and enlarged using the backbiter. Analytical electron microscopic findings revealed the peak of titanium from the foreign body itsself.

Their procedures for the treatment of migrated implant body were depended on the symptom of the maxillary sinus. Usually migration of the dental implant into the maxillary sinuses removed from the oro-antrum approach.

We have showed the procedure of the nasal approach using endoscopy with pathological findings and reviewed of the techniques.

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The correlation of bone to implant contact measurement between cone beam CT and histomorphometry

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The purpose of the study was to evaluate the correlation between bone to implant contact (BIC) obtained from histomorphometry and cone beam computerized tomography (CBCT).

Twenty seven dental implants were installed in nine pigs at the lower border of the mandibles and retrieved with the surrounding bone after 2, 4, 6, 8, and 12 week healing intervals. The specimens were scanned with CBCT, the digital files (Dicom) were obtained for the analysis. The Dicom file of each dental implant were randomized chosen and transformed to digital picture files (JPEG file). The digital pictures were enhanced and analysed for the BIC (Image J software, NIH). Each dental implant with surrounding bone were

prepared for the undecalcified ground section technique. The digital photographs of each section were used for the BIC histomorphometry analysis (Image J soft ware, NIH). The BIC obtained from both method were statistically analysed for the correlation.

Pearson's correlation showed that BIC obtained from CBCT and histomorphometry were significantly positive correlated ($r = 0.716$, $p < 0.01$).

The measurement of BIC using CBCT could be clinically used. However, the development of the computer software based on the proposed method is required.

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Immediate NanoTite implants plus platform switching technique preserving crestal bone

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Purpose: The aim of this study was to evaluate the crestal bone loss levels when use a mixed technique with immediate implants with Nano-Tite™ surface and platform switching technique (case), and compare this with the crestal bone loss levels when use immediate implants with Osseotite® surface and traditional corresponding abutment (controls) in a 12 month follow-up.

Material and methods: Patients that have bilateral failed upper teeth without active infectious condition, that need extraction was included in the study. A bite-block will be prepared to ensure proper radiographic alignment for subsequent periapical radiographs. Two to four case implants or control implants will be placed adjacent to support a fixed prosthesis in both sides in the same patient. Cantilevers will not be allowed, a interim-plant distance of 3 mm, and implant-tooth distance of 1.5 mm. A immediate post extraction implant placement protocol will be used, dont load apply, and the prosthesis attached at 3 months. Periapical radiographs will be obtained immediately after implant placement, at 2, 3, 6 and 12 months and analyzed with a computer image program.

Results: Fifteen case implants and Fifteen control implants was inserted in six patient three men and three women. A preliminary report at 6 months shows a mean bone-loss of $\pm$ 0.9 mm on the mesial aspect, and $\pm$ 1.1 mm on the distal aspect around the control implant. And a mean bone loss of $\pm$ 0.09 mm on the mesial aspect, and $\pm$ 0.12 mm at the distal aspect around the case implant. None implant loss at this evaluation point.

Conclusions: Immediate implantation of Nano Tite™ Prevail implants combined with the Platform Switching technique in a two phase implants protocol, shows a positive effect on the crestal bone preservation when compared with the immediate implantation of Osseotite® Certain implants without platform switching technique in a preliminary 6 month follow-up results.

The Nano-Tite surface applied to the traditional prevail implant body and the platform switching technique combined will translate in to more consistent bone preservation outcomes.

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Evaluation of biomechanical weak point on osseointegrated implant with vertical bone resorption: finite element study

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Purpose: This study evaluated the structurally weak points of fixtures depending on the extent of exposure of implants owing to the marginal bone resoption around the internal non-submerged type implants.

Material and methods: For this study, single implant fixture ($\varnothing$ 4.0 × L10.0 mm, HS II implant, Hiosssen, Philadelphia, USA) was anchored in the cylindrical alveolar bone ($\varnothing$ 28 × L30 mm). It was modeled including 1-piece type Solid Abutment and simplified crown. With varying bone levels, decreases of 0, -1, -2, and -3 mm were applied to four bone-implant models. Then, applying the inclined (30°) occlusal load to the center of the crown parallel with the axis of implants. They are evaluated on the maximum stress of the fixtures and its position.

Result: There was no difference in stress when bone level decreased by -1 mm In contrast, stress increased when bone level decreased by -2 mm or more (above 14%). In terms of stress concentrated position, a decrease in bone level caused be moved the position on bone level circumferences with the exposed fixture thread.

Conclusion: It was expected to be weak point on the implant-abutment connection regions in case of internal non-submerged type implant. It follows in result, in Bone level decreases, maximum stress increased and the position moves on bone level circumferences with the exposed fixture thread. Thus, clinical caution is required in marginal bone resorption causes increasing the possibility of implant fracture.

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Influence of early exposure on the crestal bone loss around implants

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Objectives: Plaque accumulation, bacterial colonization and epithelial invagination can occur during osseointegration period when a direct communication between the implant surface and the oral environment is established, and it can be a harmful factor resulting in early crestal bone loss.

Methods: The present study consisted of 371 patients who were treated with dental implants. 865 threaded internal implants were placed following a 2-stage surgical protocol (443 in maxilla,

422 in mandible). Among the study population, there were 22 subjects who had both early exposed and non-exposed implants (26 early exposed and non-exposed implants in each). Total early exposure rate was examined, and the crestal bone change of exposed and non-exposed implants in identical subjects was compared with Wilcoxon Signed Ranks Test.

Results: 42 implants in 33 patients were exposed to the oral cavity through the mucosa before uncovering surgery (4.9%), 16 implants in the maxilla presented spontaneous early exposure (3.6%) and 24 implants in the mandible (5.7%).

The crestal bone change was examined when the final restorations were inserted. The mean crestal bone change of exposed implants was $-0.43\,\text{mm} \pm 0.51$, ranged from a loss of 2.15 mm to 0.00 mm. The mean crestal bone change of non-exposed implants was $-0.23\,\text{mm} \pm 0.35$, ranged from loss of 1.20 mm to 0.00 mm. Wilcoxon Signed Ranks Test revealed that there was statistically significant difference between the crestal bone loss of exposed and non-expoesd implants ($p = 0.006$).

Conclusion: The early exposure of the implant seems to facilitate periimplant crestal bone loss. Initial healing phase follow-up may be critical for implant success.

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Safety of preoperative panoramic radiographs for anterior mandibular implants

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Objectives: Panoramic radiographis the standard examination tool for implant treatment planning. Haemorrhage in the floor of the mouth following implant placement in the anterior mandible has led to recommend CT examination before surgery in the interforaminal region.The aim of this study is to evaluate the incidence of bleeding complications after implant placement in the anterior region of the mandible in cases when a panoramic radiograph was the only preoperative imaging technique used.

Methods: The study included 1200 Straumann® implants (Straumann AG, Basel, Switzerland), inserted in the anterior region of the mandible of 735 patients (mean age 61 ± 13 years). The bone morphology was assessed by clinical examination and palpation of the bone ridge at the implant site during the preoperative planning and before local anaesthesia. The bone height was evaluated from the alveolar crest to the inferior border of the mandible on a standard panoramic radiograph. No implants longer than 12 mm were used. Implants were placed following a one-stage surgical procedure with an incision along the crest of the alveolar ridge and careful elevation of mucoperiosteal flaps. 112 implants were inserted in the incisor region, 702 implants in the canine region and 386 in the region of the first premolar.

Results: No haemorrhage or haematoma in the floor of the mouth following implant placement were reported.

Conclusions: Careful surgical technique and clinical examination combined with panoramic radiography, can be considered a safe procedure. CT examination, implying a supplementary radiation burden for the patient, is not justified.

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Surgical repair of sinus membrane perforations using PRF (Platelet-rich Fibrin) technique

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The most common complication during sinus graft surgery is perforation of sinus membrane. Opening of Schneiderian membrane may be caused by tearing during scoring of the lateral window or elevating the membrane from the bony walls. Sinus perforation may cause bacterial penetration into graft material through the torn membrane or graft material may migrate and obstruct ostium. Both these conditions increase the risk of infection and implant failure. If perforation occurs the opening can be sealed with resorbable membrane or sutured. PRF is a new technique to treat the perforation of sinus membrane. It is a new regeneration platelet concentrate and contains many growth factors. PRF technique is very simple. The blood sample, taken without anticoagulant, is centrifuged for 12 minutes. The resultant product consists of three layers. Acellular plasma (PPP) is concentrated at the top layer and red corpuscles are concentrated at the bottom layer. Fibrin clot (PRF) is obtained in the middle of the two layers. When fibrin clot is packed in two sterile compresses, fibrin membrane transferable to the Schneiderian membrane can be obtained. In this presentation PRF technique is described on cases for the management of sinus membrane perforation.

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Clinical effects and literature analysis of 980 nm-diode laser in implantology

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Background: Different wavelengths have been used in order to excise, ablate or decontaminate peri-implant soft and hard tissues.

Objectives: The aim of this presentation was to evaluate the intra-operative efficacy and post-operative clinical outcomes of the 980 nm-diode laser in peri-implant soft tissue surgery and treatment of peri-implantitis. An additional aim was to review the current literature of the laser use in Implantology.

Material and methods: 30 patients were selected for application of the 980 nm-diode laser (Kavo Gentleray 980, Biberach, Germany). The laser was used in the excision of peri-implant hyperplasias, in second-stage and in soft tissue pre-prosthetic surgery (focused beam). It was also used in the decontamination of implant surfaces before augmentations (defocused, ablative mode). Low power settings were applied (2–4 W, CW and pulse mode) in order to achieve sufficient coagulation, bacterial reduction and tissue excision, according to laser-tissue interactions and safety parameters. 30 papers selected from Pubmed/Medline search databases using the keywords ''dental implant and laser'' from the period of 1990–2007 were evaluated.

Results: We were able to show a precise incision quality with sufficient haemostasis and without scar tissue formation in the peri-implant mucosa. All of the peri-implantitis patients presented clinically healthy soft tissues with significant bone fill. The literature presented limited data in the use of the 980 nm-diode laser compared to different laser wavelengths.

Conclusions: The 980 nm-diode laser may be a new modality with advantages in Implantology offering promising results. More studies are necessary to support our observations and to gain clinical evidence.

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Determination the primary stability and the changes in early healing for ITI and Replace Select tapered implants

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Purpose: To determine the primary stability and the changes in stability as a reflection of early healing around single staged implants in human utilizing resonance frequency analysis (RFA). RFA makes use a smart peg, attached to an implant which is excited with a probe measurement of osstell mentor device over a range of sound frequencies with subsequent response analysis.

Material and methods: 125 patients had 1 to 8 implants placed in the canine premolar and molar regions of the maxilla and mandible. Bone type was classified into 1 to 4 groups according to the lekholm & zarb index (1985). RFA was used for direct measurement of implant stability on the day of implant placement and consecutively at 14, 30, and 60 days after placement.

Results: 306 implants (153 ITI SLA and 153 Nobelbiocare Replace select tapered) placed. No early failure occurred during healing phase. All 306 implants distributed as follows: 3.36% ITI and 8.90% Replace in type 1 bone, 72.84%ITI and 48.63% Replace in type 2 bone, 17.88% ITI and 38.38% Replace in type 3 bone and 5.98% ITI and 4.10% Replace in type 4 bone. In Replace implants the lowest mean stability measurement was at 30 days for all bone types. In ITI SLA implants the lowest mean stability was at 60 days for type 1 and at 30 days for type 2 and at the base line for type 3&4. A boneferroni adjust student t test comparison of bone groups.

At each time point revealed highly significant differences between implant stability in type 1 and 4 bone ($p < 0.001$) and a moderately significant difference between type 2 and 3, type 3 and 4 at all times in ITI SLA implants ($p = 0.07$). In Replace implants stability did not change significantly in all bone types ($P > 0.05$).

Conclusion: The geometry of implant and bone type are the main factors for implant stability in first 2 months and Replace implant is better for Immediate loading.

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Clinical evaluation of fixed zirconium-based restorations on implants

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Lack of elasticity and proprioreception makes implant-borne restorations more prone to technical complications. Material research did not prove the presence of chemical bond between zirconium and overlaying ceramic. Nonetheless, the use of zirconium-based restorations on implants is increasing in clinical practice. However, clinical evidence of success rates of zirconium-based crowns on implants is very sparse in the literature.

Objective: To evaluate the short-term clinical performance of zirconium-based restorations on implants.

Material and methods: Thirty-four patients who received 76 titanium implants, subsequently restored with 63 zirconium-based prostheses were recalled for retrospective evaluation. Fifty-one single crowns and 16 fixed partial dentures with regular occlusion scheme were delivered. Twenty-four restorations were inserted in anterior area, while lateral segments received 39 prostheses. All restorations were examined for presence or absence of contact during eccentric mandibular movements – 3 protrusion, 3 lateral guidance, 57 were guidance free. Three different zirconium systems were used for restoration of implants – VITA In-Ceram (43 cases), Ceramill Zi (13 cases) and Zirconzahn (7 cases). Mean follow-up period was 13.4 months, ranging from 7 to 29 months.

Results: All implants at a time of evaluation were successful. No fracture of framework was recorded. Fractures of ceramic occurred in 3 patients (8.82%) and in 3 restorations (4.83%). In anterior segment 1 fracture occurred (4.16%) and in lateral – 2 (7.69%). There was 1 failure in group of single crowns (1.96%) and 2 in fixed partial denture group (16.6%). In-Ceram encountered 2 fractures (4.65%), Zirconzahn – 1 fracture (14.2%). Two ceramic fractures occurred in lateral guidance (66%), 1 failure in guidance free group (1.75%).

Conclusions: Most failures occurred in fixed partial dentures with contact on lateral movement Zirconium-based restorations on implants do need more long-term research.

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Clinical and radiographical evaluation of narrow diameter implants

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The purpose of this study was to evaluate the clinical performance of narrow diameter Nobel Biocare (Replace) implants in limited available bone.

Totally 84 dental implants (3.5 mm narrow diameter Nobel Biocare/Replace) were inserted in 37 patients. All implants were

loaded after two or four months healing period in mandible and maxilla respectively. 22 single tooth and 62 partial fixed prosthesis were delivered. Panoramic and periapical radiographs were taken right after the operation, prosthesis delivery and 12, 24, 36 months. Peri-implant index scores (plaque and gingival indexes) were also recorded at 12, 24, 36 months after the operation.

The cumulative survival rate was % 96.4. All lost implants (three/10 mm length) were placed in posterior maxilla. None of splinted narrow diameter implant supported restorations were lost. Two single tooth restoration abutment screws were loosened that were placed most distally in posterior maxilla 1 year after delivery. Total mean bone loss was 0.9 ± 0.004 mm for all implants. Implants placed in maxilla were slightly showed more bone loss than mandibular implants but not significantly. There were no significant differences in peri-implant health (Modified Plaque Index, Gingival Index, Bleeding Index) between maxillar and mandibular implants.

Fixed prosthetic treatment choice supported with narrow diameter implants is a reliable and predictable method. However in low quality bone, splinting implants with fixed prosthesis may increase the success and also inhibit screw loosening of abutments.

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Clinical performance of tooth-implant fixed prosthesis

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The aim of this study was to investigate the success rate and marginal bone loss around implant and tooth-supported prostheses.

Thirty five partially edentulous patients consecutively who received 15 three-occlusal unit with one pontic between implant and natural tooth and 20 two occlusal unit without pontic with terminal implant and tooth support were subjected to quantification. The radiographs of the implants were digitized, and the areas of bone atrophy mesial and distal to the implants were determined. Radiographs were taken right after implant surgery, 6–18–30 months after prosthesis delivery. The distance between the tooth and implant was ranged 2–5 mm in prosthesis without pontic and ranged 7–12 mm in prosthesis with pontic between implant and natural tooth.

After 18 months 0.84 mm at mesial side 0.76 mm at distal side; after 30 months 1.25 mm at mesial side 1.12 mm at distal side mean bone loss observed around the implant splinted with natural tooth without pontic. After 18 months 1.16 mm at mesial side 0.86 mm at distal side; after 30 months 1.45 mm at mesial side 1.22 mm at distal side mean bone loss observed around the implant splinted with natural tooth with a pontic between a natural tooth and implant.

This study showed that the distance between implant and natural tooth effect the bone loss around the implant neck.especially bone loss at the mesial side of implants seemed more effected compared to distal side of the implant.

185 | Topic Technical and Biological Complications

Clinical and radiographical evaluation of Biohorizon implants

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Background: Dental implant rehabilitation is one of the most reliable and also predictable treatment method in edentulous cases. The purpose of this study was to evaluate the clinical and radiographical success of Biohorizon dental implants.

Material and methods: Totally 112 dental implants were inserted in 34 patients. Grafted sites, medically compromised patients and smokers were excluded from the study. 6 implants in lower, 8 implants in upper jaw were immediately loaded. 98 implans were loaded in conventional manner (3 and 6 months healing for lower and upper jaw respectively). Panoramic radiographs were taken right after the operation, at prosthesis delivery and 6, 18, 30 months after prosthesis delivery. Peri-implant index scores (Modified Plaque Index, Gingival Index) were also recorded at 6, 18, 30 months after prosthesis delivery.

Results: The cumulative survival rate was % 94.7. Six implants were lost. Five of lost implants were immediately loaded. Total mean bone loss was 0.06 ± 0.8 mm for all implants. No significant differences were found between immediate and conventional loading respective with peri-implant bone resorption. Implants placed in maxilla were slightly showed more bone loss than mandibular implants. Satisfactory peri-implant index scores were gained (less than score 1) in this study.

Conclusion: Conventional treatment protocol survival results are satisfactory and also predictable, however more attention is needed for immediate loading. More clinical studies are required to confirm the long term performance.

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Vascular endothelial growth factor in gingival crevicular fluid as a prognostic factor in implant treatment

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Angiogenesis is a process regulated by the cytokines and growth factors. It plays a crucial role in physiology and pathology. One of the most important angiogenic cytokine in inflammatory and immune responses of the tissues surrounding dental implants is the vascular endothelial growth factor (VEGF).

Objective: The aim of the present study is to investigate the levels of VEGF in GCF of healthy and inflamed sites around dental implants.

Material: Group of 32 edentulous patients (15M, 17F; mean age 64.5 (45–84)) after implant treatment with the use of OVD.

59 samples of GCF were collected with the use of Periopapers (Ora Flow Inc., NY, USA), 39 from sites with clinical symptoms of inflammation and 20 from clinically healthy sites (control group).

Methods: Periodontal status was assessed with the use of Florida Probe, marginal bone loss was evaluated on dental radiographs. Immunoabsorbent assay – ELISA (R&D Systems, Minneapolis, USA) evaluated the concentrations of VEGF.

Results: Statistically significant ($p < 0.05$) higher levels of VEGF were detected in the GCF of patients with clinical symptoms of periimplantitis (15.17 ± 0.38 pg/ml) compared to the clinically healthy sites (11.40 ± 0.20 pg/ml), and were correlated to the pocket depth.

Conclusions: VEGF is a probable factor of importance in the exacerbation of periimplantitis, possibly by promoting angiogenic processes in the tissues surrounding implants thus enhancing the distribution of inflammatory mediators and proinflammatory cells to the inflamed implant site.

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Bone qualitiy using the fractal dimension and the implant stability quotient

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Bone qualitiy using the fractal dimension and the implant stability quotient.

The purpose of this study is to investigate whether the fractal dimension of the panoramic radiograph is related to the primary stability of the implant as represented by RFA. This study included 22 patients who underwent dental implant installation at the Department of Periodontology of Seoul National University Dental Hospital. Morphometric analysis and fractal analysis of the bone trabecular pattern were performed using panoramic radiographs, and the implant stability quotient (ISQ) values were measured through RFA after the implant installation. The radiographs of 52 implant sites were analyzed, and the ISQ values were compared with the results from the morphometric analysis and fractal dimension. The Pearson correlation showed a linear correlation between the ISQ values of RFA and the parameters of morphometric analysis but there was no statistical significance. The fractal dimension had a linear correlation with a statistical significance. The correlation was more prominent in the mandible. In conclusion, we suggest that the fractal dimension acquired from the panoramic radiograph may be a useful method to predict the initial stability of dental implants.

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''GOOD'' biphosfonates in oral implant rehabilitation

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Intoduction: An increasing number of patients affected by oncologic and osteoporotic pathologies in treatment with Biphosphonates develops osteonecrotic lesions localized in the maxillary bone. In these patients the oral surgery should be avoided because of the poor implant prognosis during healing period. According to several Authors this kind of failure is related to all biphosphonate drugs. However, first generation biphosphonates (''good biphosphonates'' e.g. Clodronate) are able to improve implant osteointegration.

Methods: The Authors analyzed a series of 3 patients. Implant dental surgery was performed in one patient with zoledronate treatment. During the healing period the premature loss of the screws was noted and the implant situs showed extended bone necrosis.

In the other two cases, implant rehabilitation was preceded by intravenous clodronate administration for severe osteoporosis. A condition of mandibular bone loss indicated removable dental implants rehabilitation (overdenture with interforaminal located implants). We used Ankilos® plus Dentsply implants.

Results: In the patients with clodronate treatment was noted good bone vascularization and excellent primary stability. The load of the systems was carried out three months from their insertion. The healing period was uneventful and 12 months later, the radiological examination showed an optimal implant osteointegration.

Conclusion: The chemical structure of BPs ''good biphosphonate'' and strict selecting patient criteria can enhance the results.

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Connective tissue graft for anterior maxilla defect

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The reconstructive therapies with dental implants intend to recuperate function, good hygiene and aesthetic. Many factors are involved in this treatment, such as bad positioned implants, periimplant infections or even bone defects. Furthermore, some of these implants are on anterior region of maxilla, turning into poor prognosis. The solution for these cases may be very complex, and then simple and safe actions must be tried. The aim of this work is to report a variation technique of connective tissue graft. First of all a connective graft is removed from posterior palatal area next to the first molar, without epithelium. Then two oblique incisions adjacent the defect area are made and a divided flap detachment is also

done. A local antibiotic therapy over the implant surface is done for five minutes with tetracycline. Over the periimplant defect area the connective tissue is placed. In the end, the flap is positioned over the graft and sutured. After three to four months a new surgery is taken to expose the platform and an impression copy is performed to build the provisory acrylic crown immediately. This technique has been showing good results, leading to better aesthetic and also simplifying hygiene practices.

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Complications after implantation may have allergic background

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Aim: A study of correlation between allergy to metal ions (A) and implant integration (I) presented on the basis of to 4 options A + I + (successful implantation despite of allergy), A + I − (unsuccessful implantation probably caused by allergy), A − I + (successful implantation without allergy at all), A − I − (unsuccessful implantation without allergy).

Methods: Implanto-prosthetic procedures according totwo faze procedure, CT and panoramic radiological examination, allergic patch tests with special set of components used in implanto – prosthetic treatment.

Material: 60 subjects with implants and different prosthetic restorations, 41 to 65 year olds, 37 women and 23 men.

Results: In case of 1/4 of patients allergic to metal ions, a proper integration of titanium implants was observed. In case of 3/60 subjects, allergic to Ni, Cr, Co, Au metal ions, improper integration of implants occurred. There was 7 times more complicationin case of patients being allergic. A proper implant integration without allergy concerned 3/4 subjects. An improper implant integration among non-allergic patients occurred once.

Conclusions: Among own 60 cases, 3/4 complications after implantation had some allergic background.

Conclusion: The resultsof the research suggest allergic tests to be conducted as a routine before implant – prosthetic treatment.

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Comparison of Panoramic radiography and Computed Tomography (CT) for diagnosis of inferior alveolar nerve injury after implant surgery

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The aim of this study was to compare the relationship of implants and mandibular canal in panoramic radiography and Computed Tomography (CT) in inferior alveolar nerve injury patients after implant surgery.

56 patients, who complained of inferior alveolar nerve injury after implant surgery, were enrolled in this study. All the patients had been taken panoramic radiography and CT (DentaScan®) and examined the symptom area and previous dental history. In panoramic radiography, we classified the relationship of implants with the mandibular canal to three types (distant, contact, perforation type). And also four types (distant, contact with continuous cortical layer, contact with discontinuous cortical layer, perforation type) were classified in Computed Tomography.

In panoramic radiography, there were 18 cases (32%) of distant type, 28 cases (50%) of contact type and 7 cases (12%) of perforation type. In CT, there were 9 cases (16%) of distant type, 9 cases (16%) of contact with continuous cortical layer, 19 cases (33%) of contact with discontinuous cortical layer and 13 cases (23%) of perforation type. The most common type of injury was contact type. (50% in panorama and 49% in CT). 9 cases (16%) of distant type in panorama were investigated as contact type in CT and 6 cases (11%) of contact type in panorama were evaluted as perforation type in CT.

In this limited study, there were significant differeces between the results of panorama and CT in inferior alveolar nerve injury patients. We concluded that CT may be useful to diagnose the inferior alveolar nerve injury after implant surgery, when panorama does not show any evidence of nerve injury symptoms.

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Mean implant axis and abutment inclination

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Purpose: The aim of the present study was to determine the effectiveness of the Mean Implant Axis (MIA) methodology in controlling the angular preparation of multiple implant abutments compared to conventional abutment preparation.

Material and methods: Out from an actual clinical case 6 stone models were made and 5 were sent to 5 different dental laboratories not familiar with the proposed procedure. We requested them to define and mark on the model their milling arbitrary implant axis (AIA) and to prepare the implant abutments with a 6°milling taper. On one model we defined the implant milling axis by recording the implant angulations and by calculating the mean implant axis (MIA) and by preparing each abutments within the possible angular ranges offered by the 6°milling taper.

Among each set of prepared abutments we compared the milling angle used for the most angulated one.

Results: On the sagital plane the AIA preparation angle of the of the most angulated abutment average 26°.12′ with a range from 23°.46 and 28°.37 with a SD of ± 2°.25′. The MIA most angulated abutment was 13°.50′ ($p < 0.001$). No statistically significant differences were found among preparation angles on the frontal plane.

Conclusion: The difference between the AIA mean preparation angle and the MIA one is more then 5 times the SD. and it is

strongly correlated to the effectiveness of the proposed method in controlling the possible angular compensations when multiple implants need to be prepared with a common milling axis.

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Early bone healing around endosseous implants of different bulk designs

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Although great advancements and information regarding novel surface treatments are currently available, little attention and research has been devoted to the implant's bulk design and its effect in endosseous implants early healing. The purpose of this investigation was to analyze the bone healing around three different designs on the bone healing on a dog model.

Methods: Plateau (P) shaped, screw (S) shaped, and a mixed plateau and screw (PS) shaped implants were placed in the tibia of six adult beagle dogs and left in vivo for 2 and 4 weeks. Following euthanization, the implants separated in individual blocks. The samples were non- processed to nondecalcified sections, reduced to ~30 μm thickness plates, and bone-to-implant (BIC) was determined through computer software.

Results: Transmitted and polarized light microscopy showed a ~400 μm region of newly deposited bone along the perimeter of implant regions which remained in close proximity to cortical bone after surgery. This appositional bone healing was observed along the whole perimeter of S implants and plateau tips for P and SP implants. In contrast, substantial amounts of woven bone formation was observed in regions where surgery and implant design resulted in larger void spaces for the P and SP implants. Blood vessels were observed parallel to the space between fins of P and SP implants. No significant differences in BIC were observed for the different groups.

Conclusion: Different implant designs and surgical protocols resulted in different osseointegration pathways with comparable rates.

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Osteonecrosis related to bisphosphonate treatment and dental implants

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Bisphosphonates are therapeutic agents used to inhibit bone resorption and therefore bone renewal. They are established as effective treatment in clinical disorders such as multiple myeloma, bone metastasis, osteoporosis and Paget's disease of bone. Osteonecrosis of the jaws has been recently described as an adverse side effect of bisphosphonate treatment.

Since December 2003, 35 cases of osteonecrosis related to bisphosphonate treatment were treated in the School of Dental Medicine, Geneva, Switzerland. Two cases were related to implant placement. In our first case the patient was taking alendronate for 44 months at a dosage of 70 mg/week for her osteoporosis. She lost her two implants after osteointegration for two years and despite implant removal no healing occurred and a wide infected area of bone necrosis appeared after implant removal. Complete healing was achieved within 18 months for the soft tissue and 2 years for the bone. Our second case was treated by pamidronate and later zoledronic acid for bone metastasis from a breast cancer, no osteointegration was obtained and exposed bone surrounding the implant was seen. Complete healing is not achieved within 3 years.

At present implant placement in patients undergoing intravenous bisphosphonates therapy is contraindicated.

Osteonecrosis and implant failure in patients treated by oral bisphosphonates seems to be rare, but osteointegration can be lost and the risks of osteonecrosis increase especially after long term treatment with oral bisphosphonate (> 3 years). Informed consent should be provided related to possible future implant failure and possible osteonecrosis of the jaws.

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Ultrasound bone surgery vs. traditional rotative instruments for third molar surgery: a randomized clinical trial

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Background: Osteotomy is one of the major parts of third molar surgery. Edema, ecchymosis and trismus most commonly appear as a result of this surgical procedure. A double-blind, randomized study was performed to determine the efficacy of ultrasound bone surgery in decreasing edema, trismus and pain after third mandibular molar extraction.

Methods: Twenty patients undergoing third molar extraction were included in the study. Each patient had 2 symmetrical impacted third molar which were randomly allocated in 2 groups: control group (n = 10), the mucoperiosteal flap elevation and osteotomies were performed with traditional instruments; test group (n = 10), the mucoperiosteal flap elevation and osteotomies were performed with the ultrasound bone surgery instrument. Patients were evaluated during surgery for bleeding. All the patients were scored at 2, 5, 7, and 10 days after surgery for the following parameters: edema was evaluated according to a visual scoring system that describes the site, extension and degree of swelling; maximum interincisal distance was measured using calliper to evaluate the trismus; pain was objectively measured by counting the number of analgesic tablets required; the patients' perception of the severity of symptoms was assessed with a follow-up questionnaire (Visual scale).

Results: The bleeding during surgery showed lower level in the test group when compared with the control group. Edema and

trismus did not show significant difference between the control and test group at 2 days after surgery. Moreover, the scores for edema, trismus and pain showed higher values in the control group when compared to the test group at 5, 7 and 10 days after surgery. The evaluation of pain showed higher scores in the control group when compared with test group.

Conclusion: Ultrasound bone surgery used for flap elevation and osteotomies during third molar surgery showed better results in the prevention of edema, trismus and pain in the postoperative healing period.

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Mandibular fractures following implant placement: rarity or relevant risk?

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The aim of a retrospective study was to assess the number of factures of atrophic mandibles following implant placement, to describe the treatment concept of these fractures and to assess the different complications and the outcome of this treatment.

2239 patients received implants between 1996 and 2006. By searching the electronic patient database persons were identified, who were treated for mandibular fractures after implant placement. The aetiology of the fracture was analysed. Kind of fracture treatment, sensitivity impairment and other complications were compiled and the kind of the final prosthodontic restoration was documented.

Four patients with mandibular fractures following implant placement could be identified (2 female, 2 male, age range 65–77 years). Two mandibular fractures occurred after removal of implants. In the remaining two patients mandibular fractures occurred at the implant-bone interface after long lasting peri-implant disease.

The fractures were treated by interpositional bone grafts from the iliac crest and osteosynthesis plates. In one patient two additional fractures of the mandible occurred during the treatment period. In three patients sensitivity disorders in the innervation area of the inferior alveolar nerve were still present after 12 postoperative months. In three patients an implant borne removable denture could be installed, while one patient remained without denture at the end of the treatment period.

This retrospective study reveals that fractures of the edentulous atrophic mandible following implant placement are rare events. However, if these fractures occur they are difficult to treat and the re-occurrence of a fracture cannot be excluded. Moreover, there is no guarantee that patients who suffered from a mandibular fracture as a consequence of implant placement can ever be treated with an implant-borne prosthesis or even a conventional denture again.

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Conventional vs. implant-supported prosthetic treatment in lateral area – case report

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Conventional prosthetic treatment is often the dentist's first choice in reconstruction of the lateral area of the dental arch. However, sometimes an implant-supported prosthetic solution is narrowly indicated, as it is shown in the following case report.

Clinical examination of a 43-year-old patient found missing tooth 16 and 14 with very short clinical tooth crowns and habitual occlusion without interferences. An implant-supported prosthetic treatment was recommended for the area 16 and 14, which the patient refused and visited another dentist. He made a bridge with tooth abutments at 17 and 15, pontic at 16 and mesial cantilever at 14. This bridge loosed 4 times in a year, the patient was not satisfied with it, and she returned to the first dentist and agreed to the implant-supported prosthetic treatment.

XIVE (Dentsply) implants were placed. One implant (3.8/13) was placed in the area 14 with buccal soft tissue augmentation and second (4.5/11) in the area 16 with internal maxillary sinus floor elevation. During healing time of 3 months the patient wore a temporary acrylic bridge on the abutment teeth of the old bridge and satisfactory soft tissue emergence profile was achieved with pontic and cantilever. Impression was taken 14 days after the implant was opened and a healing abutment was placed. Standard abutments were used as implant build up, and 4 metal-ceramic crowns with functionally shaped occlusal surfaces were fabricated. Regular check-ups of the patient every 3 months and after 3 years showed excellent aesthetic and functional results.

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Oral surgery and compromised coagulation – prospective evaluation of the graz guidelines

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Introduction: Oral surgery including implantation and bone grafting is, dependent on extension of intervention, often even possible in haemostaseological deficient patients. The Graz Guidelines of compromised Coagulation (GGcC) provide a standardized concept for the individual management of different surgical extensions. To evaluate the intra- and postoperative haemorrhagic risk when GGcC is considered a prospective non-randomised clinical trial was performed.

Methods: In a time period from 03/2005 to 11/2006 a total of 491 surgical interventions in haemostaseologically compromised patients was performed. Three different samples of patients were defined:

1) maintenance of anticoagulant resp. antiplatelet drugs

2) discontinued anticoagulant resp. antiplatelet therapy without substitution

3) discontinued oral anticoagulation with substitution by LMH (low molecular heparine).

Frequency and intensity (mild/moderate/severe) of intra- or postoperative bleeding and other bleeding-associated complications were investigated.

Results: *Oral Anticoagulants*

Regarding intra- or postoperative haemorrhagic complications there was no significant difference between the samples of maintenance and discontinuation of the anticoagulant medication without replacement. Merely the LMH-substituted collective exposed higher quantitative and qualitative bleeding-data. A clinically relevant bleeding-course did not occur in a single case.

Antiplatelet Drugs

We observed a moderate increase of the intra-operative intensity of bleeding but no higher risk of postoperative bleeding complications. The frequency and intensity of postoperative bleeding episodes did not differ within the collectives. A clinical relevance of bleeding was not observed.

Conclusion: Oral-surgical including implantological procedures in haemostaseologic deficient patients can be performed safely, assuming the consequent adherence of the Graz Guidelines of compromised Coagulation (GGcC). In common of oral surgery cases there is mostly no indication for discontinuation of the anticoagulant resp. antiplatelet medication.

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Assessing blood supply to the mental region using CAT scans

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During implant placement, caution must be exercised when releasing a flap as well as when placing an implant in the mandibular anterior area, because the submental and sublingual arteries, may enter accessory foramina through the lingual plate and be present in this area (1). The purpose of this study is to assess the proximity of the mandibular lingual vascular canal to implants placed in the interforaminal area between the mandibular right and left central regions.

Material and methods: Consecutively stored 100 computerized axial tomography(CAT)-scans of the mandible were examined.

Results: The lingual vascular canal was found in 96% of the images. The number of canals ranged from 1 to 2, and they were positioned as follows:

1-ingual canal found at the midline (48%)

2-ingual canal found in the area of tooth 24 (22%)

3-ingual canal found in the area of tooth 25 (26%)

4-canals were vertically aligned on the midline (6%)

Conclusions: The median lingual vascular canal was found to be present in 96% of the edentulous and partially edentulous group and in 94% of dentulous patients.

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Allergy to titanium dental implants – clinical protocol of diagnosis

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Purpose: Metals are among the main reasons for contact allergies occurrences.

Most allergenic metals are: nickel, chromium, cobalt; rarely molybdenum, aluminum, palladium, copper and gold. Titanium has some physical – chemical properties; it is biocompatible, bacteriostatic, easily enters the process of osteointegration and has no influence on enzymes responsible of toxic reactions. All these means that it very seldom causes hypersensitivity reactions.

There are, though, recorded cases in scientific works which give record of allergic contact dermatitis, disorders in wound healing with granulation and sterile discharge after inserting a pacemaker or orthopedic implant with a titanium component.

Material and methods: 7 patients suspected of hypersensitivity to titanium were examined in Department of Allergology in Jagiellonian University Medical College, Kraków, in 2004.

4 of them, who underwent an insertion of titanium dental implants, were referred to Department of Allergology because of osteointegration disorders. Patch test has been a method of choice in diagnostic of contact allergies to metals for many years.

Results: A performed diagnosis in a form of a patch test did not show hypersensitivity to any contact allergen including titanium.

1 patient, with a medical history of contact allergy to such metals as: nickel, chromium and cobalt, was diagnosed for allergy to titanium before a planned procedure of titanium tooth implant insertion.

Conclusions: During the diagnostic process, a doubtful result in a patch test was obtained for filings of pure titanium. Allergy to titanium seems to be very rare. The mechanism of developing allergies to metal implants has not been fully examined. We lack fully standardized tests in allergy diagnostics for titanium.

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Is the implantological treatment using Nobel Active possible in patients with renal osteodysthropy?

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Introduction: Patients suffering from chronic renal failure are treated using haemodialysis. This leads to endocrinal and secretion dysfunction, reconstruction in osseous tissue, architectonics and quantities changes. Decreased amount of osseous tissue in jaws, besides indication to extractions, is the cause of premature teeth loss. Progress of implantology and replacement therapy of renal diseases allow to consider the prosthetic treatment based on implants in stabilized systemic diseases.

Aim: The aim of work was to estimate capabilities of implantological treatment of patients with renal osteodysthropy.

Material and methods: Supervisory group determined 50 generally healthy patients (average age 44 years). Investigated group consisted of 48 patients treated using haemodialysis (average age 45 years). X-rays were made using Planmeca 2002 PM.
Results: The radiodensynometric and radiometric analysis reviled decline of bone tissue in maxilla and mandible. 4 patients were excluded because of bad condition of bone tissue, 3 patients because of presence of active viral infection of HPV.
Conclusions: In investigated group decline of maxilla and mandible was observed. Although, this is not a contradiction for implantological treatment.

Decrease of optical bone density in the investigation group seems not to be objection for implantological treatment, because of possibility of using implants with osseous condensation surface around the implant.

Referring to the duration of haemodialysis, the percentage of patients, which are not qualified to implantological treatment, is higher. The length of implants are also different.

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The effect of Chlorohexidine on microgap invasion of periodontal pathogens

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The abutment-implant interface at the alveolar bone crest is related to the peri-implantitis and considered to be the potential contributing-factor and source of pathogen that induces the loss of alveolar bone regarding to the implant. Although the study on the invasion and colonization of the bacteria into the abutment-implant interface has frequently been carried out, the consideration on the clinical management or improvement plan should further be pursued.

In this study, the nonmotile Porphylomonas gingivalis and motile Treponema denticola that are thought to be the major bacteria responsible for the peri-implantitis and belong to the red complex were used. In the first group, the microgap existing between the GS II (Internal Hexatype, Korea) implant fixture and healing abutment was not treated with the irrigants, while in the second group, the microgap was treated with normal saline and preserved in wetness, in the third group it was treated with Chlorohexidine and preserved in wetness, and in the fourth group, it was treated with Chlorohexidne and dried by sterile paper points.

P. gingivalis and T. denticola were cultivated under anaerobic conditions during 1 week, and they that invaded the microgaps of the four groups were dyed with fluorescent pigments and the number was compared among 4 groups. On the basis of the result of this study, the aspect and degree of the invasion into the microgaps according to the type of irrigants (Chlorohexidine, or normal saline) and whether cleansed or not are investigated and the clinical significance was searched.

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Early implantation after crest widening by distraction osteogenesis

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Aim: To introduce a technique of early implantation after widening a narrow alveolar crest by Distraction Osteogenesis.
Material and methods: New distractor was used to widen a narrow crest. Under local anesthesia, three mucoperiosteal incisions were performed. Through these incisions, bone cuts were made without stripping the mucoperiosteum. The distractor was inserted into the crestal cut after fracturing with an osteotome. Distraction begun 7 days post-op by rotating the activating screw 1/4 of a turn 3 times a day. The distraction was performed by the patients. Consolidation period was 1–2 weeks. Implants were inserted at the same session of device removal or week later (5–6 weeks post-op).
Results: The study group consisted of 42 patients over period of 3 years. The amount of widening ranged from 4–8 mm. Distraction periods ranged from 10–18 days. Latency period was 7 days. Unfavorable fracture appeared in 2 cases and were redone successfully 2–3 months later. Total of 93 implants were inserted. 43 implants were inserted 1–2 weeks after removal of the distractor. 50 implants were inserted on the day of distractor removal. 5 implants failed and were replaced successfully 8 weeks later. Prosthetic treatment of the implants was completed 3–4 months after implantation. No complication was observed 18–36 months after prosthetic treatment.
Conclusions: Crest widening by distraction may be a better and faster alternative to bone augmentation. It provides distraction of the attached gingiva and enables very early implantation (5–6 weeks post-op).

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Mini-implants used to correct a postoperative open bite in a patient with TMJ anchylosis. A case report

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Mini-screws, microscrews and miniplates have been used in orthodontic treatment, for example in treating open bite, and as anchors for intrusion of the teeth.

The case report describes the treatment of a 37 year old, HLAb27 positive female, who, due to surgical treatment of TMJ anchylosis, developed an open bite.

The patient was referred to the Department of Clinical Dentistry, Vaasa Central Hospital, because of restricted mouth opening (24 mm) and pain during function of the right TMJ. She had earlier received orthodontic treatment. In spite of conventional TMD treatment; occlusal splint, jaw excersises, physical therapy, and

surgical treatment; artroscopy/lavage and discectomy of the right TMJ, the maximum mouth opening was further restricted to 12 mm.

An artroplasty with interpositional temporal muscle flap was done, and three months postoperatively the maximum mouth opening was 35 mm. Due to the structural changes of the right TMJ, the patient developed an open bite, with occlusal contacts only at the molars of the right side.

The open bite was treated orthodontically, intruding the upper molars by using two buccally placed mini-plates (2 mm L-shaped AO miniplates, Synthes, Switzerland) on each side. The mini-plates were serving as anchors while intruding the molars using elastic power chain (OM65, Ormco). A palatal arch served as anchor to prevent buccal tilting of the molars.

To prevent further TMD-problems, the patient used a soft TMD-appliance (LBB Appliance, Masel, UK) during the orthodontic treatment.

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3D analysis of intraoral MSC on different bone substitutes

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Objectives: Aim of the study was to investigate 3D migration and differentiation of mesenchymal stem cells (MSC) isolated from intraoral bone on 2 different bone substitutes.

Material and methods: MSC isolated from maxillary bone from five donors at the age of 14 to 20 years, were cultivated and differentiated both towards the osteogenic and the adipogenic lineage to proof multipotency. Alizarin Red S, Alkaline phosphatase and Osteocalcin were used as preliminary biomarkers of osteogenic differentiation. Oil Red O was used to verify adipogenic differentiation.

The osteogenic lineage and an undifferentiated control group of MSC were further cultured on natural bone mineral of bovine origin (BioOss®) and β-tricalcium phosphate (Vitoss®) scaffolds. A three dimensional observation of cell migration and growth behavior was performed by means of Laser Scanning Microscopy. Further a method was established to constitute seeding efficiency, osteogenic differentiation, cell distribution and proliferation behaviour.

Results: Cells isolated from maxillary bone could be differentiated towards an osteogenic and adipogenic lineage and therefore proofed multipotency. Cell migration and similar 3D growth behavior could be observed on both scaffolds. Both osteogenically differentiated MSC and undifferentiated MSC of the control group on the scaffolds could be stained for ALP activity on the scaffolds. No ALP secretion was observed in the undifferentiated control group without scaffolds.

Conclusion: Multipotency could be proofed for MSC isolated from maxillary bone. Similar 3D growth behavior could be studied on both bone substitutes. Both grafting materials seem to induce ALP secretion and osteogenic differentiation of MSC in vitro.

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Quantitative histologic outcomes of maxillary sinus floor augmentation with allomatrix

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Objectives: The present histologic study aimed to quantify bone regeneration in maxillary sinus lift procedures three months after grafting with a new bone osteoinductive allograft.

Methods: Twelve adult patients of both sexes underwent a unilateral or bilateral maxillary sinus floor augmentation using Allomatrix Injectable Putty (Wright Medical Technology, Tennessee, USA) and simultaneous placement of machined titanium implants. During the uncovering stage performed at 3 months of healing, bone biopsies were taken for histologic processing. A histomorphometric analysis was performed on the undecalcified sections using a standard point-counting technique. The percentage volume occupied by new bone, residual graft and bone marrow spaces was recorded.

Results: At 3 months of healing, no fibrous tissue, inflammatory cells or foreign body reactions were observed within the histologic specimens. In all the 15 augmented sites, newly formed lamellar bone with large trabeculae and osteons incorporated the putty, mostly in proximity of the reforming buccal cortex. Only few areas still showed a woven bone structure. Four specimens contained a few calcium-sulfate carrier remnants, surrounded by areas of bone remodelling with intense cellular activity and Howship's lacunae. Regenerated bone (mean density, 33.82 ± 8.63%), marrow spaces (mean density, 32.25 ± 10.33%), and residual graft (mean density, 33.88 ± 9.03%) occupied each about one third of the bioptical volume. No effects of patient sex or age on the percentage composition of the bone biopsies were observed.

Conclusions: Allomatrix resulted an effective bone graft for maxillary sinus floor augmentation, by accelerating bone regeneration and thus reducing the healing time in comparison with other bone substitutes.

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Peri-implant surgery: evaluation of keratinized mucosa

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Objective: Peri-implant plastic surgery (PPS) techniques can be used during implant treatment in order to improve aesthetics architecture around implants. The object of this study was to investigate the modification of connective tissue grafts using different PPS's techniques. Different influence variables were

investigated in order to evaluate a different type of healing.

Methods: This protocol considered a group of 14 patients, who presented an insufficient amount of keratinized mucosa in the second surgery phase, needing a peri-implant plastic surgery (PPS). Patients were treated with free gingival grafts or grafts subpedicled connective tissue grafts.

Results: Although the patients' sample was limited, a stability of the graft was obtained after almost 8 months from the surgery. A 36 months follow-up showed that the size of the graft was maintained. Statistically significant differences did not exist in patients with different type of graft, type of implant, recipient site, age and sex, but statistically significant differences were noticed in patients with different morphotype and in grafts positioned in maxilla or mandible.

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Short implants in mandibular reconstruction using free fibular graft

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Chondromyxoid fibroma is a rare slow-growing, benign neoplasm. Only about 2% of all reported cases involved mandible. Free fibular graft's low vertical height and tendency to resorb over time have been considered potential drawbacks. Ideal dental implant treatment is not achieved easily in patients who have undergone mandibular reconstruction with a free vascularized fibula flap, because of limited length, height, and width of the bone graft. Short-length implants are considered disadvantage because of more limited surface area to resist occlusal forces. Clinicians have avoided the use of short-length implants in areas of compromised bone. Nevertheless, anecdotal observations find many short implants performing well in different restorative conditions and recent clinical studies indicate that short implants may support most prosthetic restorations quite adequately, but still clinical documentation is sparse. This case report describes the use of short implants-supported partial denture in a vascularized fibular bone graft to reconstruct segmental resected mandible because of recurrent chondromyxoid fibroma, seven years after initial operation. A 28-year-old man presented with bilateral parasymphyseal composite mandibular defect. The residual ridge of the remaining mandible was at a higher level than the grafted bone. Six 3.5-mm-wide, 8 mm-long implants (Ankylos, Friadent, Germany) were placed into grafted bone. Although one implant did not achieve primary stability, eight months later, all implants were integrated. An arch-bar supported partial denture was processed. No complications occurred, graft showed stability and the result is optimal as is the quality of life of young patient 1.5 year after implant loading.

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New tunnel with acellular dermal matrix prior to block graft

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Background: The purpose of the study was to evaluate if a newly designed tunnel technique (NTT) using acellular dermal matrix (ADM) allograft for soft tissue augmentation prior to block grafting will minimize post-block grafting soft tissue complications.

Methods: Thirteen patients who required block grafting prior to implants participated in the study. They were divided into two groups: Group A: eight patients received block graft from symphysis, & Group B: five patients received ADM graft with a NTT for soft tissue preparation, followed, after 8 weeks by block graft from symphysis. Healing checked at 2, 4, 12, and 24 weeks post-surgery.

Results: *Group A*: Three patients had wound dehiscence and graft exposure. The first patient had 1 × 3 mm exposure at the fourth week post-surgery & 25% resorption of the graft. The second patient had 2 × 4 mm exposure at the fourth week & 45% resorption. The third patient had 4 × 5 mm exposure at the fourth week, infection at the seventh week, & 75% resorption.

In the other five patients, recipient sites healed with no complications and minimal graft resorption (10–20%).

Group B: In all cases, recipient site healed with no complications or infection, and minimal graft resorption (10–20%).

Conclusion: The New Tunnel Technique for soft tissue augmentation using ADM allograft prior to mono-cortical block grafting seems to be a valid approach in minimizing post-block grafting soft tissue complications. Further researches with larger sample size are needed to affirm this conclusion.

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The schneiderian membrane contains osteoprogenitor cells: in vivo and in vitro study

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Recent studies succeeded to demonstrate a new bone formation in the maxillary sinus, obtained by mucosal membrane lifting without following use of any graft material. The aim of this work was to prove the osteogenic potential of human maxillary sinus schneiderian membrane (MSSM) using both in vitro and in vivo assays.

Human MSSM was extensively rinsed with PBS – antibiotics, and processed for histology or extensively cut to obtain MSSM cell culture. Flow cytometry analysis was performed on P_0, P_1, P_2 cultures using classic mesenchymal progenitor cells (MPCs) markers (CD 105, CD 146, CD 73, CD 166). At the end of the in vitro experiment (P1), cells were either fixed and studied by morphology, histochemistry, immunohistochemistry, or harvested for RT-PCR

analysis and flow cytometry. In vivo tests were performed using ectopic subcutaneous model in immunodeficient mice. hMSSM cells (P_2; 1×10^6 cells) complexed with HA/β-TCP scaffold were implanted in the back area of the animals for 8 weeks.

FACS analysis demonstrated the presence of CD 105, CD 146, CD 73, CD 166. Osteogenic potential of MSSM culture was shown by expression of classic osteogenic genes (ALKP, BMP-2, Osteopontin, Osteonectin, osteocalcin), positive Osteocalcin immunostaining and extracellular matrix deposition. Pronounced new bone formation from human origin was observed in the subcutaneous transplants after 8 weeks.

This study provides the biological background for understanding of the observed clinical phenomena in sinus lifting. Our results prove the osteogenic potential of the hMSSM and contribute to development of successful sinus augmentation techniques.

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Immunohistochemical observations after sinus floor elevations with a reduced healing period

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Objective: Tenascin, an extracellular matrix glycoprotein, is present in the matrix surrounding osteoblast precursors and osteoblasts during bone development, but is absent from mineralized bone matrix and connective tissues adjactent to bone. In this study, biopsies which were harvested 4 months after sinus floor elevations were stained immunohistochemically with Tenascin specific antibodies and evaluated. Additionally histomorphemetric analysis was performed to quantify the amount of new bone.

Material and methods: In this clinical study, 34 two-stage sinus floor elevations were performed in 24 patients in accordance with the method described by Tatum. The chosen augmentation material was a synthetic bone graft material based on Calcium phosphate (BONITmatrix®, DOT GmbH, Germany), consisting of nano HA- and nano ß-TCP-crystals (60:40) embedded in a bioactive Silicon dioxide matrix. After 4 months of healing the patients recieved implants. During surgery 10 cylindric bone biopsy specimes were taken from the grafted posterior maxilla using a trephine bur. The bone cores were analysed immunohistolochemically and histomorphometrically.

Results: All bone core cylinders showed high tenascin activity, indicating bone growth after 4 months of healing. Histomorphometry revealed that 24.3% of the tissue volume was bone tissue, 32% residual graft and 43.7% connective tissue. All implants clinically proved high primary stability on insertion.

Discussion: Immunohistochemical analysis, using the highly specific glycoprotein tenascin, proved that the newly formed bone was actively growing. Through additional histomorphemetric analysis the exact amount of newly formed bone and the rate of resorption of graft material could be quantified.

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Clinical outcomes of dental implants placed in patients with atrophic ridges using various augmentation methods

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Contemporary approach to the rehabilitation of edentuluous patients involves utilisation of dental implants. Atrophied ridges and the proximity to vital anatomical structures could be an obstacle in treatment planning. Such obstacles will neccesiate application of various ridge augmentation techniques.

Our study included 137 patients with 352 dental implants. Patients were included in the study after detailed clinical and radiographic examinations. Dental implants were allocated into two groups, 1st group included 188 implants that were placed with no need for bone augmentation and the 2nd group included 164 implants placed in atrophic ridges after bone augmentation. Bone augmentation techniques used were guided tissue regeneration, ridge split, sinus lifting, and autologous onlay bone grafting. The success of these two treatment modalities were compared. Additionally different bone augmentation techniques were compared.

This study shows that the indications and the techniques for ridge augmentation are critical. The clinical success rate for dental implants placed after ridge augmentation is lower and that sinus lifting and ridge split are the most successful while autologous onlay bone grafting is the least successful bone augmentation technique.

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Comparison of space maintenance method in delayed implantation after ridge split surgery. A 2 year case report

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Objective: Ridge split technique is recently considered as a safe procedure in narrow ridge. Delayed implant placement is predictable and more aesthetic than simultaneous implant placement in ridge split surgery. However, precise guidelines for suitable timing of implant have not been established. The aim of the presentation is to evaluate the ridge widening in 5 kinds of ridge split surgery, radiographic and clinical result of the delayed implant placement. The partial thickness flap was applied to reduce the risk of buccal plate fracture during ridge split procedure and to prevent crestal bone loss.

Methods: Split spaces were maintained by five methods as follows. (1) fixed with screw, (2) autogenous bone chips, (3) rigid strength by surrounding bone, (4) one implant placement at the end-side of ridge split, (5) resorbable graft material (B-TCP). From February 2006 to December 2007, fifty five ridge split surgery were done in forty three patients and 127 delayed implants were placed. The diameter and the length of implant ranged from 4 mm and from 8.5 to 13 mm, respectively. Implants were placed after 4 to 6 (mean 4.7) months.

Results: The healing was uneventful after ridge split and the survival rate of implant was 100% for all groups. Space gaining was 1–5 mm. Space gaining by (1) fixed with screw method had the best result. Method (2) and (3) showed space relapse. Healing period of 4 months was enough in method (1–4). In this protocol, (5) B-TCP did not resorbed until 6 months after procedure, so, it needs more healing period. Although, we applied the partial thickness flap to reduce the buccal plate resorption, surface resorption seems to occur.

Conclusion: Delayed implant placement is a predictable and aesthetic approach in ridge split surgery.

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Natural bone chips harvested with piezo-surgery for gbr procedures

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The objective of the study is to evaluate the advantages of bone chips harvested with piezosurgery in adjunction to bioamaterials in GBR procedures for narrow edentulous ridges.10 patients with conditions of narrow edentulous ridges (3–5 mm wide) have been selected for GBR procedures and contemporary implant placement. Patients have been randomly divided in two treatment groups (A-B). Group A patients received a GBR procedure with only biomaterial insertion (Bio-Oss) and membrane (Bio Gide) at the same time of implant surgery. Group B patients received a GBR procedure with biomaterial (Bio-Oss) and about 50% of natural bone chips harvested with a piezo-surgery instrument (Mectron) in sites adjacent to the edentulous ridge or from tuber maxillae. Also in group B a collagen membrane(Bio Gide) was placed. All implants were 3.8 diameter (Xive Friadent). Measures of bone width at implant site have been taken with a specific instrument at flap opening, at the end of the surgery before flap closure and at flap reopening for second stage surgery.

At this time no implant have been lost. The mean value of bone width before surgery was 4.7 mm in Group A and 4.4 in Group B and 7.5 group A and 7.8 group B after biomaterial and membrane placement. No implant have been lost. At reopening Group A mean value was 5.6 mm and group B 6.2 mm.

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Clinical histology of SLA microimplants placed in two different biomaterials

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This randomized, controlled clinical study was designed to compare bone formation around micro-implants (MIs) with an SLA surface placed after maxillary sinus floor augmentation (MSFA) with a synthetic biphasic calcium phosphate (BCP) or deproteinized bovine bone (DBB), in a split mouth design. Ten completely edentulous patients and one partially edentulous patient with a bilateral need of MSFA were included in the study. Patients were randomized for augmentation with BCP in one side and DBB at the contralateral side. Simultaneously with the augmentation, a customized MI was placed vertically from the top of the alveolar crest, penetrating the residual bone and into the grafting material. After 8 months of healing, at the time of ordinary implant placement, all 22 MIs were retrieved with a surrounding bone core for histological analyses. All 22 MIs were surrounded by varying amounts of new bone, bone graft material and soft tissue. The percentage bone contact with the SLA surface (mean value) was 55% for DBB and 65% for BCP. The difference was not statistically significant. The total area of mineralized bone and bone graft material was similar for both materials, but the percentage of bone graft particles in contact with mineralized bone was in favour of DBB ($P = .007$). In conclusion, bone formation around micro-implants placed after MSFA using BCP or DBB was found to be equal.

Study supported by Straumann.

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Osteogenic diferentiation of adult mesenchymal stem cells derived from buccal fat pad by BMP-2

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Autologous adult mesenchymal stem cells provide new and innovative tools in tissue engineering. Recently adipose tissue has been described as an alternative source for adult mesenchymal stem cells (MSC). BMP-2 has been shown to induce osteogenic differentiation in mesenchymal stem cells. Therefore, we investigated the effects of BMP-2 on osteogenic differentiation of MSCs.

Buccal fat-derived cells (BFDC) were obtained from human buccal fat pad and cultured. BFDC were analyzed for presence of stem cell and osteogenic differentiation was induced by BMP-2. At that time, the different concentration of BMP-2 was applied to BFDC by 0, 10, 50, 100 and 200 ng, respectively. The cells were harvested at day 7, 14, 21 day and extent of osteogenic differentiation was checked by alkaline phosphatase (ALP) staining, Alizarin red staining and RT-PCR for osteocalcin (OC) gene expression.

Incubation of BFDC with BMP-2 significantly up-regulated ALP activity and showed increased intensity of Alizarin Red with concentration of 100 ng all three group. And also it demonstrated significantly increased relative OC gene expression at 100ng concentration.

These results suggest that the BFDC was likely to be differentiated into osteoblastic phenotype with application of 100ng concentration of BMP-2 and short treatment with growth factors could be of clinical importance.

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Nasal prosthesis supported with bioactive self-tapping implants surface

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Facial defects secondary to the treatment of neoplasms, congenital malformations, and trauma result in multiple functional and psychosocial difficulties. Prosthetic rehabilitation with implants support attempts to restore these facial disfigurements and may improve the level of function and self-esteem for these patients. However, difficulties with facial prostheses arise due to movable tissue beds, quality of prosthesis retention, and associated skin reactions to adhesives. The use of osseointegrated implants in the craniofacial region reduces prosthesis limitations associated with medical-grade adhesives and has been proven to be a reliable treatment option with high long-term success rates for facial prostheses. Patient acceptance of facial prostheses may be significantly enhanced thanks to the quality of prosthesis retention and stability afforded by craniofacial implants. Case report evaluated treatment option where were used 3 implants with magnet-supported nasal prosthesis. 74-years old women used nasal prosthesis with glass. Due to stability of oncological process the 3 implants have to be inserted (STI-BIO-C Impladent, Lasak). As soon as implants were integrated (6 months), a surgeon performed the X-ray examination and checked the grade of osseointegration. After the healing process the individual abutments with magnets were prepared and nasal prosthesis (Multisil epithetic set, Bredent) was prepared. Newly prepared self-tapping implant design with bioactive surface help us to insert the implants to fragile and porous bone. The case report reviews the rationale and principles of treatment, which needs individual approach to the patient rehabilitation.

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The effects of alloplasts on peri-implant defects in dogs

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Purpose: The objectives of this study were to evaluate the combined effect of β-tricalcium phosphate hydroxyapatite alloplasts(Osteon®) and SLA surface dental implants(Implantium®) placed in the surgically created two defects: circumferential and dehiscence gap.

Methods: In six mongrel dogs, all mandibular premolars and the first molar were extracted. After 8-weeks of healing period, submerged type implants were placed with circumferential cylinderical 2 mm coronal defects and 3 × 5 mm dehiscence defects surgically created around the implants by using customized step drills. The defects were treated with 1 of the following 4 modalities: Control 1) No treatment on peri-implant circumferential defects, Control 2) No treatment on peri-implant dehiscence defects, Experimental group 1) Bone graft on peri-implant circumferential defects, Experimental group 2) Bone graft and resorbable membrane(Gore Resolut XT®) applied on peri-implant dehiscence defects. The dogs were sacrificed following an 8-weeks healing period, specimens were analyzed histologically and histomorphometrically.

Results: Healing was uneventful and implants were all well maintained. The implant surface was covered with a bone layer as a base for intensive bone formation and remodeling. New bone formation was observed on peri-implant circumferential defects due to self contained gap. New bone formation was observed along the implant surface in the experimental group 2. The bone-to-implant contact (BIC) for experimental group 1 showed higher value than the control 1 and the value for experimental group 2 was higher than that for control 2.

Conclusion: The results suggests that β-tricalcium phosphate hydroxyapatite alloplasts are effective on peri-implant defects of circumferential and dehiscence.

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A novel sinus augmentation using tissue-engineered bone for immediate function

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The objectives of the investigation: A purpose of this clinical study is to evaluate the effects of injectable tissue-engineered bone (T.E.B.) on maxillary sinus floor elevation for the severe bone resorption of the alveolar arrest with simultaneous implant placement for earlier healing time, bone regeneration and immediate function.

Experimental methods used: This new technology, T.E.B. bone regeneration, used mesenchymal stem cells (MSCs) as cells of three elements in tissue engineering and platelet-rich plasma (PRP), which provides signal molecules, as an autologous scaffold. We applied T.E.B. to 16 sinus augmentations with 41 dental implants in 12 patients. The new regenerated mineralized tissue was evaluated by radiographic examination, computed tomography (CT) and orthopantomograph.

Results: The residual alveolar crestal bone height between the sinus membrane and nature bone was 5.5 ± 1.6 mm on average (range: 3–10 mm) at preoperation. The height of mineralized tissue showed the mean increases of 8.8 ± 1.6 mm compared to preoperative values. The survival rate of the fixtures placed with T.E.B. was 100%, and no adverse effects and remarkable bone absorption were seen for 6 years follow up time.

Conclusions: Although these results are preliminary, injectable tissue-engineered bone would stably predict the earlier success of bone formation and dental implants, reduce patient burden, and provide minimally invasive cell therapy for immediate loading and function.

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RFA values of implants placed in sinus grafted and nongrafted sites after 6 and 12 months

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Background: Maxillary sinus floor elevation surgery is widely used as a preimplantology method to permit implant insertion. Nevertheless, very few data are available about long-term stability of dental implants inserted in grafted sites.

Purpose: The aims of the present study are to evaluate the evolution of RFA values at 6 and 12 months from the implant insertion in sinus grafted sites and non-grafted sites.

Material and methods: In 14 patients 80 Xive implants were inserted. 63 implants were inserted in a site previously treated with a sinus lift, 17 implants were inserted in healed or post-extraction sites. For each implant diameter, length, bone density, insertion torque and percentage of implant fixed to a non-grafted bone were recorded. RFA values at implant insertion, after 6 and 12 months were recorded.

Results: After 6 and 12 months, grafted sites showed higher RFA values than control sites; after 12 months the difference was statistically significant (0.007). A statistically significant positive correlation was found between resonance frequency values and bone quality after 12 months (0.05). No statistically significant correlation between RFA values and all the other variables considered was found.

Conclusions: Sites treated with sinus lift can offer good long term stability. After 6 and 12 months, the geometrical characteristics of the implant are no longer important to obtain high RFA values and the bone-implant interface seems to be determinant.

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Healing of augmented extraction sockets after 6 and 12 weeks

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In this present study new bone formation of fresh extraction socket after augmentation with Bio-Oss Collagen was analyzed after a healing period of 6 and 12 weeks using histomorphometry.

Material and methods: 31 patients with an average age of 52 years and representing 34 extraction sockets were included in this evaluation. The extraction sockets were instrumented to eliminate all remnants of periodontal ligament tissue. In all patients the walls of the extraction sockets were intact and were augmented with Bio-Oss Collagen (Geistlich, Switzerland) without flap management. After a 6 weeks- (16 patients-17 extraction sites) and 12 weeks- (15 patients-17 extraction sites) healing period, at implant placement, bone biopsy samples were obtained with a trephine bur and evaluated histomorphometrically. Descriptive analysis of the amount of new bone formation, Bio-Oss remnants and connective tissue was performed using a digital imaging system (AxioVision; Zeiss).

Statistic analyses was performed using the Wilcoxon-Mann-Whitney test.

Result and discussion: Histomorphometric measurements after a 6-week healing period showed an increase of median new bone formation of 28%, 12% for remaining BioOss-collagen particles and 55% for the connective tissue. After a 12-week healing period, the median percentage part of new bone formation was 25%, and the percentage of remaining BioOss-collagen particles and the connective tissue 15% and 60% respectively.

These results encourage an early onset of implant placement after a healing period of 6 weeks.

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The vital bone formation after augmentation procedures – How far is it possible

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Purpose: Evaluation of the influence of stem cells on bone formation after augmentation procedures using allogenic and synthetic bone grafts.

Material and methods: Bone marrow containing adult stem cells was added to allogenic bone (group A) and to synthetic material based on beta-TCP (group B). Control groups were with allogenic bone (group C) and beta-TCP (group D) only without the addition of stem cells. After four months healing time core specimens of augmented sites in groups A and B were taken. According to contemporary protocol, core specimens in group C and D were taken between 6–12 months after surgery. Histological and histomorphogenic analyses were performed. The percentage of vital bone and residual graft material was measured. If the graft was matured for implantation-tapered screw implants were inserted. The primary stability of implants was measured using Resonance Frequency Analysis device immediately after placement.

Results: The comparison between patients reciving bone augmentation together with stem cells to those without this support show significantly better and earlier new vital bone development in groups which were enhanced with bone marrow.

The technique of taking out bone marrow is simple and much less invasive than autogenous bone harvesting.

This method of bone augmentation reduces the time necessary from initial surgery procedures to final prosthetic reconstruction on dental implants.

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Boneceramic as alternative for biooss to treat dehiscencies along implants

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Background: The unpreventable resorption of the alveolar crest after tooth extraction implies the use of a bone substitute to cover bone dehiscences after implant insertion. In this study we compared a synthetic bone substitute to a bovine bone mineral.

Material and methods: This split-mouth RCT compared the healing capacity of two bone substitutes: BioOss® (BO, Geistlich Biomaterials) and Straumann BoneCeramic® (BC) to treat bony dehiscences along implants. Thirteen patients, with a very narrow maxillary ridge, received 4 to 6 implants (SLActive®, Straumann) to support an overdenture. Two comparable dehiscences (at least 4 mm in height) were first covered with a layer of autogenous bone, followed by a layer of one of the bone substitutes, respectively. Finally a resorbable membrane (Bio-Gide®, Geistlich Biomaterials) sealed the augmented area. A submerged healing of 6 months was respected. A Cone Beam CT (Accuitomo®) was taken one week after implant placement and before second stage surgery. At abutment connection a vestibular flap was reflected to inspect the healing of both sites. Clinical and radiological parameters were compared at both time points.

Results: All implants integrated. Both substitutes led to comparable defect fill (initial defect height from implant shoulder: BO: 6.4 mm, range 4.0–9.0 mm; BC: 6.5 mm, range 4.0–12.0 mm; at reentry: BO: 1.5 mm, range: 0–5.0 mm; BC: 1.7 mm, range: 0–4.0 mm). Intra-product differences in clinical parameters were never observed ($p > 0.05$).

Conclusion: Both bone substitute materials are equally effective in the treatment of dehiscences along implants.

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Guided tissue regeneration in periapical surgery: a randomized clinical study

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Aim: This prospective clinical study evaluated success rate of endodontic surgery in large periapical lesions by using or not deproteinized bovine bone associated with a resorbable collagen membranes.

Material and methods: A total of 73 teeth in 55 patients were included in the study. Teeth treated surgically showed a periradicular lesion at least 10 mm wide. Full mucoperiosteal tissue flap were used. After the root end shaving away, root end cavities were prepared with ultrasonic tips. Root-ends were filled using Super Seal (Ogna Pharmaceuticals). The choice of using or not GTR associated with a xenograft (Bio-Oss, GeistlichPharma) for each patient was made by a computer-generated randomized table. In all GTR cases were used a resorbable collagen membrane (Bio-Gide, GeistlichPharma). The outcome was assessed by clinical and radiographical evaluation at 1 year follow up.

Results: Sixty-nine teeth were investigated up to one year. Thirty- one cases were through-and-through lesions. Fifty five teeth (79.7%) successfully healed, 11 teeth had doubtful healing and three were classified as failure. The total outcome of cases treated using GTR was significantly better as compared to the group in which GTR was not used ($P = 0.03$). A significant advantage of the use of GTR associated to periradicular surgery was found for the through-and-through lesions ($P = 0.02$) but not for the four walls defects ($P = 0.21$).

Conclusions: This study showed that the combined use of membranes and deproteinized bovine bone in periapical surgery can improve the outcome of the treatment for through and through periradicular lesions.

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Retrospective study of implant site augmentation with synthetic bone graft

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The primary objective of the study was to evaluate implant survival when implants are placed into augmented extraction sockets or when augmentation is performed in conjunction with implant placement for sinus elevation, extraction socket, dehiscence, or fenestration defects.

This study is an IRB approved retrospective, consecutive patient, single-center study of approximately 150 patients. All surgical procedures were performed by one surgeon. Augmentation procedures were performed using Straumann BoneCeramic (SBC) in combination with a resorbable collagen membrane (GBR). SBC is a synthetic bone graft substitute of medical grade purity in particulate form, composed of biphasic calcium phosphate. In representative cases, histologic analysis was performed to confirm the presence of vital bone in implant receptor sites. All implants placed were SLA or SLActive. Radiographs were taken at time of implant placement and at time of restoration for analysis of proximal bone levels.

Implant survival was 100% in this study. All augmentation procedures facilitated implant placement in prosthetically-driven positions. All simultaneous grafting procedures resulted in osseointegrated implants with healthy peri-implant tissues which were ready for restoration within 3 months post implant placement. No serious adverse events or graft failures were present. Histologic analysis revealed significant substitution of SBC by vital woven and lamellar bone at time of implant placement. Residual graft particles were always present, and well-incorporated with newly-formed bone without foreign body reaction or inflammation.

The results of this study demonstrate that SBC is a satisfactory bone graft material for socket preservation and/or simultaneous bone augmentation with implant placement.

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Different techniques of implant site preparation. Comparison of primary stabilization

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Problem: The technique of implant socket forming contributes to initial implant stability.

The aim of this study was to compare primary stability of various types of Camlog implants placed in sockets formed with burs and osteotome technique.

Material and methods: In animal bone (pig rib), implant sockets were formed using burs and osteotome technique. Then the implants of the same parameter were placed, using the minimum torque, which is indispensable for inserting the implant into the bone. Thirty trials were performed for each type of implants (screw, root, screw-cylindrical) and for both implant socket forming techniques. The results underwent statistical analysis with t-Student test. The X-rays of the implants were evaluated with Aphelion 3.1 computer programme.

Results: The highest value of minimum torque for implant placement in sockets formed with osteotomes was for screw implants; the lowest – for screw-cylindrical ones.

In percentage terms, the greatest increase was observed for screw implants.

The analysis of the results showed high statistical significance ($p < 0.001$).

The analysis of the X-ray picture using Aphelion 3.1 programme showed the extent of the increase in bone density during preparation of the implant socket with osteotome technique.

Conclusions: 1. In vitro studies demonstrated that primary implant stability for each type of implants was better for the implant sockets formed with osteotome technique.

2. To increase primary implant stability in implant sockets formed with osteotome technique, special osteotomes in the shape matched to each type of implants should be used. The universal shape is not optimal.

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Soft tissue response to platelet-rich fibrin (PRF) and resorbable collagene membrane in augmentation sites: preliminary results

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Purpose: Platelet rich fibrin (PRF) is a new generation platelet concentrate. Unlike commercially available fibrin adhesives or platelet rich plasma, it results from progressive polymerization occurring during centrifugation. PRF technique is very simple. The blood sample, taken without anticoagulant, is centrifuged for 12 minutes. The resultant product consists of three layers. Acellular plasma (PPP) is concentrated at the top layer and red corpuscles are concentrated at the bottom layer. Fibrin clot (PRF) is obtained in the middle of the two layers.

Material and methods: Bimaxillary edentulous 20 patients went under sinus lifting surgery. All patients were treated with Bio-oss with Bio-gide one side and Bio-oss with PRF in the other side. Following the surgery all patients were screened for soft tissue response and consequent complications.

Results: Two sites treated with Bio-Oss with Bio-Gide showed membrane exposure following the 15th day after surgery with nasal bleeding including graft particles. No complications were observed in PRF treated sites. Soft tissue recovery was observed to be faster in sites treated with PRF.

Conclusion: Sites treated with PRF were observed to be complication free. Growth factors inherited by PRF may be a supporting factor for faster soft tissue healing. Further investigation may render the clinical effectiveness of PRF.

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Effect of MBCP block carrier for RHBMP-2 with EPTFE membrane

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Objectives: The carrier used as delivery agent for bone morphogenetic proteins(BMPs) should also act as a scaffold for new bone formation. Moreover, bone formation should be predictable in terms of the volume and shape.

This study examined the osteogenic effect of macroporous biphasic calcium phosphate (MBCP) block combined with ePTFE membrane as a carrier for recombinant human bone morphogenetic proteins (rhBMP-2). In addition, the additive effect of ePTFE membrane on bone formation was evaluated.

Methods: Eight-millimeter critical sized calvarial defects were created surgically in 28 male Sprague-Dawley rats. The animals were divided into 2 groups containing 14 animals each. The defects were treated with either rhBMP-2/MBCP block (rhBMP-2/MBCP group) or rhBMP-2/MBCP block/ePTFE membrane (rhBMP-2/MBCP/ePTFE group). A disc-shaped MBCP block (3 mm height and 8 mm diameter) was used as the carrier for the rhBMP-2 and ePTFE membrane was used to cover the rhBMP-2/MBCP block. The histological and histometric parameters were used to evaluate the defects after 2- or 8-week healing period (8 animals/group/healing interval).

Results: The level of bone formation in the defects of both groups was significantly higher at 8 weeks than at 2 weeks ($P < 0.05$). The ePTFE membrane has no additional effect compared with the rhBMP-2/MBCP block only. However, at 8 weeks, rhBMP-2/MBCP/ePTFE group showed more even bone formation on the top of the MBCP block than the rhBMP-2/MBCP group.

Conclusions: These results suggest that the ePTFE membrane has no synergistic effect on bone formation when a MBCP block is used as a carrier for rhBMP-2.

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Successful restoration after sinus lift using either boneceramic or bio-oss

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Objectives: The goal of this clinical investigation was to evaluate implant-based restoration in the posterior maxilla previously augmented with a synthetic biphasic calcium phosphate on one side and an anorganic bovine bone mineral on the other side.

Method: Four patients with inadequate alveolar bone height in the posterior maxilla were enrolled. Bilateral sinus lift was performed exclusively using a synthetic biphasic calcium phosphate (BCP, Straumann® BoneCeramic) on one side and an anorganic bovine bone substitute (ABM, Bio-Oss®) on the other side. After eight to 16 months, dental implants were placed and loaded between three and seven months thereafter. Cores retrieved during implant bed preparation were histologically evaluated. The clinical outcome of the augmentation and the dental implant success was evaluated.

Results: All patients healed uneventfully. Histological evaluation showed similar new bone formation for BCP and ABM. Good primary stability was achieved for all dental implants except for one placed at a site augmented with BCP. The dental implant could still be placed manually achieving limited primary stability.

All dental implants, including the one with limited primary stability were loaded as scheduled and no loss of dental implant was observed up to now.

Conclusions: Within the limits of this investigation, it was observed that the exclusive use of BCP showed similar new bone formation to ABM and that successful implant based restoration was achieved. It could also be observed that the primary stability of dental implants placed at augmented sites was not necessarily correlated to the amount of newly formed bone.

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Stem cell in vitro proliferation over collagen membrane and Plga scaffold

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The bone marrow besides having a high number of heterogenic cells, like connective, hematopoietics, and neuronal cells, also presents a great number of stem cells. These cells are pluripotent, so can differentiate in any connective cell when a stimulus is given. The aim of this study was to evaluate bone marrow stem cells adhesion, proliferation, and differentiation to osteoblast in vitro, over a collagen membrane and a poli-lactic (glycolic) acid scaffold (PLGA), using either recombinant human bone morphogenetic protein (rhBMP-4) and platelet rich plasma (PRP). Bone marrow cells were aspirated from iliac crest and purify using specifics techniques. These cells were separated in main big groups cultured over collagen membrane and PLGA scaffold. Each culture had 4 distinct treatments: (1) with rhBMP-4; (2) with rhBMP-4 and PRP; (3) with PRP; and (4) control (only standard medium). The groups were evaluated after 6, 9 14 and 21 days. Microscopic analysis of collagen membrane and PLGA scaffold were performed using either Propidium Iodide, and Eosin and Hematoxilin. Real time PCR was performed to identify the expression level of osteopontin and osteocalcin, and standard PCR to osteopontin. The results showed cellular adhesion in both biomaterials, and suggest a higher cell proliferation and differentiation in rhBMP-4 and PRP, and PRP groups. The groups with rhBMP-4 had more differentiate cells that control group. The data obtained here indicate that PRP and/or rhBMP-4 induce adhesion, proliferation and differentiation of bone marrow stem cells into osteogenic lineage.

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Bone formation rate in various size defects in minipigs

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Introduction: It is of importance to investigate new bone formation in created defects to obtain information to determine the critical size defect in minpigs. To our knowledge, this was the first study investigating the bone formation rate in marginal resections of the alveolar crest to obtain information about the influence of the size of the defect in minipigs.

Material and methods: Marginal resection of the alveolar crest of the lower jaw were performed in three female miniature pigs. The animals used in the study were three years of age and weighing approximately 55 kg. In surgery the implants inserted for the use of a study with the surrouding peri-implant tissue were harvested 10 weeks after implant placement. For this, bone segments including the implants were removed from each side of the mandible. The sizes of resected bone blocks varied showing a diameter of 4.5 length × 1.6 cm width, and 1.7 length × 1.4 cm width. Periosteal coverage of the defects was performed. A computed tomography (CT) of the skull the miniature pigs was performed directly after the samplling procedure as well as seven weeks postoperative using a 64-channel multislice scanner.

Results: The CT has shown, that seven weeks after obtaining the biopsies, the filling of the defects with new bone varied. Whereas the smaller defect sized 1.9 cm^3 showed a new bone formation rate of nearly 63%, the defect with an extent of 10.1 cm^3 offered 47.7% neoossification.

Conclusion: The rate of new bone formation is dependent on the size of the created defect, whereas the critical size defect of the mandible in miniature pigs needs further investigations.

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Stem cell from dental pulp

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Introduction: Studies on adult stem cells for alveolar bone reconstruction have been increased through years. Recently, dental pulp from third molar is considered as less invasive source of multipotent mesenchymal stromal cells (MSC). Previously, we reported the possibility of MSC population in adult dental pulp after analyzing their phenotypes.

Objectives: The present study was performed to evaluate the differential potential of MSC from the adult human dental pulp.

Material and methods: Dental pulps were obtained from 11 human third molars. Teeth with dental pathology or from generally compromised patients are excluded. The tissues were digested and cells were cultured in low glucose DMEM supplemented with 10% fetal bovine serum and 1% antibiotics and antimycotics.

After expansion, the phenotypes were analyzed using the following antibodies: CD34, CD45, CD73, CD90, CD166, HLA-DR and CD105. Expanded cells were induced osteogenic, adipogenic, chondrogenic differentiation. We performed alizarin red, Oil red O stain and Type II collagen immunostain to evaluate their differential potential. We also performed RT-PCR by FABP, OCN, PPARr, RUNX2 to evaluate osteogenesis.

Results: They also expressed CD105, CD73 and CD90, but showed lack expression of CD45, CD34 and HLA-DR surface molecule. Expanded cell samples showed positive alizarin red stain, Oil red O stain and Type II collagen immunostain. FABP, OCN, PPARr, RUNX2 were increased in osteogenesis differentiation.

Conclusion: These data revealed the presence of MSC population in adult human dental pulp and suggest that these cells can be used to reconstruct the defect of alveolar bone.

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Bone formation in extraction sockets augmented with Bio-Oss collagen after a healing period of 6 weeks

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Objectives: In this prospective study, bone formation was quantified of extraction sockets augmented with Bio-Oss Collagen after a 6-week healing period using light microscopy.

Material and methods: Sixteen patients (10 females and 6 males), with a mean age of 50.5 years (range 28–69) underwent augmentation of the extraction socket was performed using Bio-Oss Collagen without raising a mucoperiosteal flap. After a six-week healing period at the time of implant placement, histologic specimens were taken from the grafted socket with a trephine bur ($\varnothing$ 2 mm) and analyzed by light microscopy using a digital imaging system (AxioVision). Descriptive analysis of the amount of new bone, Bio-Oss remnants, connective tissue, and statistical comparison between the apical and coronal region of the specimens was performed using the Wilcoxon signed-rank test.

Results: No signs of infection were evident clinically or histologically. The histologic appearance of the augmented region varied. A total of 17 sites in 16 patients were analyzed histomorphometricaly and showed a mean of 28% (range 9–57%) of newly formed bone and 11% (range 3–31%) of remaining Bio-Oss particles were found. Of the biopsies, 15% presented less than 10% of new bone formation and 75% had mature provisional matrix. There was a significant difference of the amount of newly formed bone in the apical and coronal region ($P = 0.02$).

Conclusion: This study provides data showing that the bone formation in human extraction sockets shows variation after a healing period of 6 weeks; with sockets presenting bone formation rates similar to those found after a three-month healing period. Bone formation in extraction sockets with no primary closure is initiated from the apical region.

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Bone regeneration with DBP/PLGA hybrid scaffold

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Objective: This study was designed to investigate the influence of demineralized bone particles (DBP)/PLGA hybrid scaffold on osteogenesis in a calvarial defect model.

Methods: DBP/PLGA scaffolds were manufactured by solvent casting/salt leaching method, and each scaffold contained 100 wt% DBP of PLGA, respectively. Cranial CSD(8 mm diameter) was created by placing bicortical holes on rat calvaria, and the defects were filled with DBP/PLGA scaffolds with or without osteoblasts which were osteogenically differentiated from bone marrow mesenchymal stem cells. After 1, 2, 4 and 8 weeks, specimens were taken and, histologic, radiographic analyses were carried out concerning density of regenerated bone.

Results: On week 1, in all experimental groups, bone formation occurred in a direction from defected margin of calvarium to center of implanted scaffold and new vessel formation took place in front of the osteogenic regeneration front. From week 4, we could see various stages of differentiation and maturation of bone, starting from cortex to center of the implant. The area of new bone inside of scaffold was found higher in DBP/PLGA groups than PLGA control group.

Conclusion: DBP inside of PLGA scaffold is attracting

osteoblasts into the bony defect site and stimulating their differentiation, which plays an important role in bone formation and maintenance, and bone tissue differentiation. We found that the DBP/PLGA scaffold had ability to regenerate new bone.

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Particle size effect on augmented bone volume in autogenous graft

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Introduction: Autogenous bone has been recognized as the gold standard for bone augmentation. However, grafted bone has suffered resorption and induced problems in implant treatment. The particle size of bone graft could be one of the factors of decreasing augmented volume.

The purpose of this study was to evaluate the remodeling process and volume of two different size autogenous bone graft.

Material and methods: 24 Japanese white rabbits were divided into four groups by experimental periods: 1, 2, 4 and 8 week.

Small and large (42–140 and 8.6–16 mesh respectively) bone graft was fabricated from tibia. The same weight of small particle bone (SB) and large particle bone (LB) were filled into Polytetrafluoroethylene chambers fixed on temporal bone.

After experimental periods, specimens processed for micro-CT and histological analysis.

Results: Histology

SB and LB occupied most of the chamber at 1 week. However, in SB group, bone height was decreasing by time-dependent manner. Meanwhile, in LB group, bone kept its height at all experimental periods. SB showed rapid resorption and favorable connection with newly formed bone. LB showed slower resorption than SB in all experimental periods.

Micro-CT analysis

SB group lost augmented volume by time-dependent manner. In LB group, stable bone volume was exhibited in all experimental periods. Statistical significance was observed between SB and LB at 4 and 8 week.

Conclusion: LB showed moderate remodeling process, and greater bone volume than SB. SB lost height and volume by time-dependent manner; however it showed satisfactory integration with newly formed bone connection.

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The comparison of the effect of emdogain on epithelial and fibroblast-like stem cells in vitro

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Introduction: Emdogain is a enamel-dentin growth proteins and clinically recommended as a periodontal regenerative factor. From theoretical point of view emdogain act on periodontal tissue i.e stem cells: epithelial as well mesenchymal. Transformed human epithelial HeLa cells c stimulate heterotpic bone induction via BMP mechanisms.

The Aim: of the study was evaluate and compare the effect of Emdogain on proliferative properties on mice C57B1-fibroblastoid stem cells, and human epithelial transformed HeLa cells in vitro study.

Material and methods: The primary cells culture (TPR plates) are incubated in 0,1 ml stock solution (empirically 0.35 ml E-Emdogain + 0.65 ml PBS = 10 mg/ml) for 2 ml final media solution. In control culture only PBS was used for final media solution (without emdogain). There are 2 cell culture: epithelial transformed HeLa cells, ibroblastoid C57B1 cells (22 passage of stem/fibroblastoid cells). The number of cells was counted directly using Burcker, 48 after sub-confluent cell culture (cells covered 80% of area of culture plates).

Results: The number of HeLa cells in control: 0.48×10^6, 0.50×10^6, and $0.64 \times 10^6 = 0.54 \times 10^6$ cells. The number of HeLa cells in Emdogain culture: 0.84×10^6, 0.98×10^6, $0.94 \times 10^6 = 0.92 \times 10^6$. The number of C57B1 cells in control culture: 70, 60 and 70 thousand of cells/plate, Emdogain: 83, 67, and 50 thousand of cells/plate.

Summary: Emdogain is a potent factor, which stimulate the cell culture of HeLa epithelial cells (their proliferation). The prolonged time of exposition of C57B1 f-stem cells to Emdogain stimulate their proliferation. It seems, that Emdogain can be use also in bone augmentation tissue engineering methodology around the implants.

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Cancellous block-allograft for sinus floor augmentation with simultaneous implant placement

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Background: Placement of dental implants in the posterior atrophic maxilla presents a challenge in many cases. Today, there is no specific bone height limit, and the surgical requirement is to stabilize the implant to enable osseointegration. The present study examined the use of cancellous block-allograft for sinus floor augmentation to allow stabilization of simultaneously placed rough-surface screw-type implants.

Patients and Methods: 28 patients (13 females and 15 males) aged 25–65 years (mean 54 ± 9 years) were referred for implant-supported reconstruction of posterior atrophic maxillae. Residual alveolar ridge height of less or equal to 4 mm was a mandatory inclusion criteria. Bone biopsies were taken after 9 months during implant exposure.

Results: All the procedures were performed successfully. 2–4 implants were placed in each patient (total 66). 62 implants were clinically osseointegrated yielding 93.9% success. Four implants failed at implant exposure. After 3 months of waiting, the implants were reinserted and successfully osseointegrated. All patients received a fixed implant-supported prosthesis.

The mean follow-up was 24 months (range 6 to 43 months). Histological evaluation demonstrated newly formed bone containing viable osteocytes merged with residual grafted bone characterized by empty lacunae devoid of osteocytes.

Conclusion: Cancellous block-allograft appears to hold promises as a grafting material for sinus floor augmentation with simultaneous implant placement.

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Genome-wide pathway analysis of osseous healing after guided bone regeneration

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Aim: To characterise the gene profiles expressed at different stages of intramembranous osseous healing following Guided Bone Regeneration.

Material and methods: Critical size calvarial defects were created in each parietal bone of sixteen Wistar rats. One defect was treated with intracranial and extracranial placement of ePTFE membranes (test), whereas the contralateral served as sham operated control. The animals were sacrificed after 7 and 15 days of healing and specimens were prepared for histological analysis ($n = 20$). RNA isolated from tissue samples was hybridised to Affymetrix 230 GeneChips ($n = 6$). Differential gene expression between experimental groups was statistically tested, using the Linear Models Bioconductor test. Pathway and Gene Ontology analysis were conducted using GenMAPP for identification of global biological trends in gene expression data.

Results: At 7 days of healing, granulation tissue formation was observed in the test and control defects, whereas, at 15 days, significant intramembranous bone formation occurred in the GBR treated defects. The inflammatory response pathway was over-expressed at 7 days (z-score > 2), with up-regulation of genes encoding for IL-1b, IL-6, PGE receptor, chemokine ligands, TNF superfamily and chondroitin sulfate proteoglycan ($p < 0.05$). At 15 days, the cytoplasmic ribosomal proteins pathway was significantly enriched (z-score > 2) with up-regulation of genes involved in osteoblast differentiation and bone mineralisation, such as BMP4, BMP receptor 1A, ras gene family, integrin b5, IGF, VCAM, FGF and growth hormone receptor.

Conclusion: Genome-wide expression profiling revealed transcriptomic variation during intramembranous bone formation. The data provide suggestions on the molecular pathways involved in osseous healing following Guided Bone Regeneration.

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Hard tissue alterations after overaugmentation of the extraction socket

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Objectives: The aim of the following experimental study was to assess bone changes in the horizontal and vertical dimension when the buccal aspect of the extraction socket was overaugmented at time of tooth extraction.

Material and methods: Four extraction sites in the beagle dog were randomly assigned to the following treatments: Tx1: Augmentation of the buccal plate with BioOss Collagen® and BioGuide® Tx2: The buccal plate was forced into the buccal direction with a specially designed instrument Tx3: The buccal soft tissue was augmented with a modified soft tissue graft Tx4: No treatment of the buccal plate. In each experimental site socket-preservation was conducted with BioOss Collagen® and a free gingival graft.

Results: After four month the vertical height of the buccal bone plate was: -3.6 ± 3.2 mm for Tx1; -4.7 ± 5.0 mm for Tx2, -3.9 ± 4.3 mm for Tx3 and -1.3 ± 1.5 mm for Tx4. Horizontal dimension of the alveolar process: 2.7 ± 0.9 mm for Tx1, 2.9 ± 1.1 mm for Tx2, 3.5 ± 0.9 mm for Tx3 and 2.9 ± 0.8 for Tx4. When tested with the analysis of variance, no statistical significance could be found between the different treatments.

Conclusion: Socket-preservation and overaugmentation of the buccal plate seems to have no influence on the resorption process of the buccal bone plate. The additional trauma on the buccal bone plate by overaugmentation procedures seems to be of determining importance.

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Combination with alpha-tricalcium phosphate and simvastatin stimulates bone regeneration

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Simvastatin, a cholesterol-lowering drug, stimulates BMP2 expression in osteoblasts and alpha-tricalcium phosphate (α-TCP) is osteoconductive and biodegradable bone substitute. Thus, the combination with simvastatin and alpha-TCP would be a biodegradable bone substitute stimulating bone formation. The purpose of the present study was to test this hypothesis and to examine the optimal dose of simvastatin in the combination with alpha-TCP particles in rat parietal bone defect model. Bilateral 5-mm diameter calvarial defects were created in adult Wistar rats and filled with preparations of different doses of simvastatin (0, 0.01, 0.1, 0.25 and 0.5 mg) combined with alpha-TCP particles or left empty. The animals were sacrificed at 2, 4 and 8 weeks and analyzed radiologically and histologically. Half of the animals of 4 and 8 weeks were labeled with fluorescence

dyes and histomorphometrically analyzed. Simvastatin doses of 0.25 and 0.5 mg caused inflammation of the soft tissue at the graft site whereas control and other doses did not. New bone formation was evident in the defects grafted with 0.1 mg simvastatin and α-TCP combination (TCP-0.1 group) at 2 weeks. Radiological and histological analyses revealed that in TCP-0.1 group bone volume in the defect was the highest at all three-time points. In TCP-0.1 group the highest mineral apposition rates were also observed at 4 and 8 weeks and the defect was almost completely closed by 8 weeks. Conclusively, when combined with α-TCP particles, 0.1 mg simvastatin is the optimal dose for stimulation of the maximum bone regeneration in rat calvaria defects without inducing inflammation and it could be applied as an effective bone graft material.

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Clinical applications of autologous osteoblasts in oral & maxillofacial lesions

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Tissue engineering is a new approach for regenerative part of the bone tissue. According to Stem cell concept, human bone can be regenerated by using of stem cell, scaffolds and related cytokines. It is useful fields in the oral and maxillofacial surgery for reconstructive use of the bone.

Technically we aspirated the iliac crest bone marrow with 13 G aspiration needle and cultured for 3 weeks in lab. We have applied prepared autologous osteoblasts ($1*10^7$ cells/ml) which incorporated with fibrin scaffolds into bone defects.

Overall length of regenerated bone was over 2 cm^3 volumetrically. Actually we reconstructed a half of mandible defects successfully in hemangioma case. Totally 20 cases of defect wounds were filled with regenerative new bone.

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Management of soft tissues for dental implants (systematic review)

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Objective: Dental implants are usually placed by elevating a soft tissue flap, but in some instances, they can also be placed flapless reducing patient discomfort. Several flap and suturing techniques have been proposed. Soft tissues are often manipulated and augmented for aesthetic reasons. It is often recommended that implants are surrounded by a sufficient width of attached/keratinized mucosa to improve their long-term prognosis. This review aims to look into the random controlled trials (RCT) of root-form osseointegrated dental implants in relation to these aspects affecting the soft tissue around dental implants.
Methods: Screening of eligible studies, assessment of the methodological quality of the trials and data extraction were conducted in duplicate and independently by two review authors. Authors were contacted for missing information. Results were expressed as random-effects models using mean differences for continuous outcomes and risk ratios for dichotomous outcomes with 95% confidence intervals (CI). Heterogeneity was to be investigated including both clinical and methodological factors.
Results: Eight potentially eligible RCTs were identified and five trials including 140 patients in total were included. On a patient, rather than per implant basis, implants placed with a flapless technique and implant exposures performed with laser induced statistically significant less postoperative pain than flap elevation. There were no other statistically significant differences for any of the remaining analyses.
Conclusions: Flapless implant placement is feasible and has been shown to reduce patient postoperative discomfort in adequately selected patients. There is insufficient reliable evidence to provide recommendations on the other issues mentioned in this review.

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Comparoson of synthetic HA/SIO2 matrix and bovine derived HA

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The substitution of autologous bone with synthetic materials for the treatment of bone defects is still a challenge, especially since autologous bone is composed of nano-cristalline HA, which can not be processed easily. Sol gel technology can be applied to embed nanocristalline hydroxyapatite (HA) in a porous silica gel. The substitute material NanoBone formed via the sol-gel process is characterized by small pores of 5–100 μ in diameter and nano-pores of 10–20 nm in diameter. This interconnective porosity is assumed to be responsible for the induction of new bone. In this study we used NanoBone to treat non critical size cranial defects in rabbits and compared it to BioOss, a bovine derived HA based bone substitute material. The study was performed in 6 rabbits with one defect being untreated and the other 2 defects being treated either with NanoBone or BioOss. 4 weeks after operation the animals were sacrificed and the samples embedded without decalcification. Histomorphometric analysis was performed using the middle section. The results showed that all in categories determined including bone to bone substitute contact, bone formation in defect, and bone bridging NanoBone performed better but not significantly better than BioOss.

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The effect of iliac block bone graft with or without periosteum on calvarium of rabbits

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This research was performed to evaluate the effect of periosteum attached to iliac block bone graft on resorption of grafted bone. Twenty one rabbit was used. Iliac bone was harvested with a size of 8 mm × 8 mm × 4 mm with periosteum (experimental group) or without periosteum (control group). The iliac bone was grafted on rabbit calvarium and fixed with miniscrews. Experimental animals were sacrificed at 1, 4, and 8 week after surgery. Radiographic and histological evaluations were done.

Results were as follows:

1. In radiographic evaluation, the area of grafted bone was reduced with as time passed in experimental group than in control group ($p < 0.01$).

2. The distance from the top of miniscrew to the top of grafted bone was lesser in the experimental group than in the control group ($p < 0.001$).

3. In the control group, all of the grafted bone were taken to recipient site without inflammation or rejection. Bone resorption was observed adjacent to periosteum of recipient site in all specimens. At 8 week, the grafted bone was resorbed severely, and overall shape was changed with remodeling.

4. In experimental group, the periosteum attached to the grafted bone can be observed, and periosteum of recipient site was not distinguished from that of grafted bone. At 8 weeks, overall shape of grafted bone was maintained with reduction in size.

These results suggested that periosteum attached to the grafted bone may help to establish early revascularization and prevent resorption of grafted bone.

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Use of collagenized porcine bone in sinus lift procedures

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Objective: The aim of this randomized clinical study was to evaluate with a clinical and histological analysis whether collagen and corticocancellous porcine bone is suitablefor sinus lift after 2 years follow up period.

Methods: Twenty-four patients with bilateral sinus lift, 12 female and 12 men ranging in age between 25 to 68 years, were included in the study divided in two groups. Group 1 received sinus lift with bovine bone (control group) group 2 corticocancellous porcine bone MP3 (test group). Seven months after surgery a bone biopsy were obtained with a trephine from all sites before implant placement. Fourty eight expanded platform nanotite implants were placed.

Results: The mean ridge heigh was 13 mm the test group, while the mean heigh was 11.5 mm in the control group. The sites which received porcine bone showed presence of vital bone and les residual biomaterial than the control group. The particle were surrouded by newly formed bone. No inflammatory infiltrate and no tissue reactions were observed. No implants were lost during 2 years follow up.

Conclusion: The sinus lift procedures using a mixture of collagen and corticocancellous porcine bone were efficacy, when compared to sinus lift made with bovine bone. This technique contributed to maintain stable the alveolar bone dimension, after 2 years. The histologic analysis showed that the porcine bone is biocompatible and can be used for sinus lift procedures without interfering with the physiological reparative bone processes.

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Clinical, radiographic and resonance frequency evaluation of implants in regenerated and nonregenerated bone

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Objective: The aim of this study was to compare the clinical and radiographic outcome of implants placed in alveolar ridges vertically augmented with a mixture of anorganic bovine bone and autogenous bone in combination with a titanium mesh with that of implants placed in non-augmented edentulous ridges in the same group of patients.

Material and methods: Eighteen partially edentulous patients were subjected to bone augmentation procedures 8–9 months prior to placement of 31 test implants. All patients received at least 1 implant, that was placed into an adequate volume of native bone in the same jaw, for a total of 27 control implants. Implant stability quotient (ISQ) was evaluated at implant placement (baseline), 3–4 months postplacement (at fixed prosthesis delivery) and 1 year postloading. Peri-implant bone level (PBL) changes were assesses using standardized radiographs at baseline, after 6 and 12 months postloading.

Results: ISQ values demonstrated a similar pattern in both groups: a significant increase, approximately 10%, was observed passing from baseline to 1 year postloading (Student t test, $P < 0.01$). The mean MBL was 1.27 ± 0.32 mm for test group and 0.89 ± 0.22 mm for control group after 1 year. The MBL values were found to increase significantly with time (Student t test, $P < 0.01$) and differed significantly among the treated groups (Mann-Whitney U test, $P < 0.01$).

Conclusions: This study demonstrated that implants placed in regenerated or nonregenerated bone yielded clinically equivalent short-term outcomes in terms of survival rate and ISQ measurements, but that peri-implant bone resorption was more pronounced in augmented sites.

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Tooth autotransplantation for bone preservation and implant placement-case report

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Pediatric and adolescent patients could benefit from the auto transplantation to replace early missing teeth. Recent studies demonstrate that auto transplantation of teeth is a viable option for teeth replacement in carefully selected patients. This case report describes a 15 year old adolescent female patient with an impacted canine with the root completely formed. The surgical procedure consisted in the extraction of the impacted canine and the placement of the tooth in a prepared recipient socket. At the age of 23 the patient came to our appointment to extract the transplanted tooth and place a dental implant. The radiographic images showed a replacement resorption (ankylososis) of the tooth. Before the implant placement a bone trephine collected a bone sample of the transplant site for a histological evaluation. Crestal bone and soft tissues around the placed implant were evaluated at 1, 3, 6 and 12 months after surgery. The transplant can replace missing teeth to ensure preservation of bone until growth as ceased, so the patient would be able to become a candidate to dental implants.

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Analysis of cell differentiation and bone remodeling patterns after sinus grafting

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Introduction: Since sinus grafting procedures were described, several modifications of the original technique have been introduced. Advances in biomaterials have enabled clinicians to apply a wide variety of grafting materials with different biologic properties. Currently, there is clinical evidence showing that regardless the material used, clinical outcomes after sinus grafting are commonly satisfactory. However, bone maturation stages could be determined by particular material characteristics.

Aims: Evaluate clinical success of a sinus grafting technique and bone remodeling patterns using a composite bone grafting material.

Material and methods: Thirteen patients were recruited for this study. Twenty-six bilateral sinus grafting procedures were performed, using a composite material consisting of cortical autogenous bone and anorganic bovine bone. Implant placement was delayed in every case. Bone core biopsy samples were taken 6 months later, at the time of implant placement, for a total of 59 implants. Samples were processed for TEM, light microscopy, histomorphometric, immunohystochemical and stereological analysis to determine cell behavior in terms of differentiation and distribution, as well as osteogenesis and bone resorption patterns.

Results: All sinus grafting procedures were successful. Mean value for vital bone present was around 40%. Osteocytic distribution and osteoblastic activity (positive expresión of osteopontin and BSP) were compatible with normal bone remodeling, in absence of signs of chronic inflammation, supported by the downregulation of COX-2. Microvessels density shows adequate tissue maturation after bone remodeling.

Conclusion: Bone remodeling phenomena suggest that the technique evaluated in the present study is valid to obtain adequate clinical outcomes.

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Purification and biological activity of RHBMP-2 produced by E.Coli expression system

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Objectives: Bone morphogenetic protein-2 (BMP-2) has been shown to possess significant osteoinducitve potential. There have been attempts to overcome a limitation of mass production, and economical efficiency of BMP. The aim of this study was to produce recombinant human BMP-2 (rhBMP-2) from E. coli in a large scale and evaluate its biological activity.

Material and methods: The E.coli strain BL21(DE3) was used as a host for rhBMP-2 production. Dimerized rhBMP-2 was purified by affinity chromatography using Heparin column. To determine the physicochemical properties of the rhBMP-2 expressed in E. coli, we examined the HPLC profile and performed Western blot analysis. The effect of the purified rhBMP-2 dimer on osteoblast differentiation was examined by alkaline phosphatase (ALP) activity and representing morphological change using C2C12 cell.

Results: E. coli was genetically engineered to produce rhBMP-2 in a non-active aggregated form. We have established a method which involves refolding and purifying a folded rhBMP-2 dimer from non-active aggregates. The purified rhBMP-2 homodimer was characterized by SDS-PAGE as molecular weight of about 28 kDa and eluted at 34% acetonitrile, 13.27 min(retention time) in the HPLC profile and detected by Western blot. The purified rhBMP-2 dimer stimulated ALP activity and induced the transformation from myogenic differentiation to osteogenic differentiation.

Conclusions: rhBMP-2 was produced in E. coli using genetic engineering. The purified rhBMP-2 dimer stimulated ALP activity and induced the osteogenic differentiation of C2C12 cells.

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Hereditary gingival fibromatosis by photometric evaluation: a case report

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Hereditary gingival fibromatosis (HGF) is a rare gingival lesion that presents as localized or generalized enlargement of the attached gingiva. The gingiva is characterized as pink, firm, and very fibrous, painless, enlargement with normal gingival color and little tendency to bleed. Gingival fibromatosis usually occurs as an isolated disorder or can be associated with a variety of other syndromes such as cherubism, hypertrichosis, sensorineural hearing loss, Laband syndrome, and Ramon syndrome. Treatment of HGF depends on its enlargement and basic concept has been suggested that the enlargement is minimal, thorough scaling of teeth and home care may be all that are required to maintain good appearance. On the other hand, overgrowth tissues should be surgically removed, including external or internal bevel gingivectomy in association with gingivoplasty. Despite the there is no consensus about evaluation of successfully treatment, the digitalized methods such as photometric evaluation may be useful in cases of HGF. The aim of this case was to assess the surgical HGF treatment by using photometric evaluation analysis. A systemically healthy 20-year-old girl referred to the Department of Periodontology of the Gulhane Military Medical Academy with a compliant of excessive gum enlargement. In our case, treatment consistent of gingivectomy. Dental casts collected before treatment and after 1 month periodontal surgery. Operation area were measured by photogrametric method. The volume of removed tissue that observed in clinically was detected easily by this analysis technique. Photogrametric method may be useful for the evaluation of operation sites.

Key words: Gingival, Fibromatosis, Photometric evaluation

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Reliability assessment on volumetric measurements of maxillary sinuses

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Objective: The intra- and inter-examiner reliability of maxillary sinus quantification by means of commercially available software based on axial CT data sets is of particular interest to clinicians and researchers in determining the volume change according to internal sinus augmentation.

Material and methods: The validity for the applied method was assessed by comparing the true volumes of two testing objects of amorphous form, filled with contrast liquid of defined quantity, and measured volumes. Additionally, the required number of objects and testers was calculated based on a preliminary series of 10 maxillary sinuses utilizing the same setting for volumetric quantification reported as follows. All measurements were carried out independently three times with an interval of minimum one week by each examiner tracing the maxillary sinus boundary manually on each single slice with a cursor. Thus the 3-dimensional template of the maxillary sinuses has been reconstructed and volume was calculated automatically.

Results: The measured values of the volumes of the testing objects deviate from the real values about 4.6‰. Thirty-four healthy maxillary sinuses in 17 patients were independently investigated by three examiners. When dealing with the maxillary sinuses the intra-examiner reliability expressed by the intra-class correlation coefficient (ICC; model 3, k) was 0.997 for tester A, 0.999 for tester B and 0.998 for tester C. The ICC for inter-examiner reliability was 0.997.

Conclusion: Our results propose that the applied method is suitable for volumetric analysis of maxillary sinuses.

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Enhancement of experimental implant osseointegration by systemic administration of human parathyroid hormone (PTH 1–34)

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Substantial progress has been made in the morphology and materials of dental implants to enhance osseointegration. However, a systemically administered therapy that could enhance implant osseointegration would be desirable. We therefore tested the hypothesis that a once-daily subcutaneous injection of Parathyroid hormone 1–34 (PTH) could enhance implant osseointegration. 500 grams Male Sprague Dawley rats were used for this study. PTH or aqueous vehicle were administered to the animals by daily subcutaneous injection. 2 experimental groups containing $N = 9$ each were used. Groups included: 1) Control Implant, aqueous injection; 2) Implant, 30 μg/Kg PTH injection. Each group contained 3 subgroups: a) Euthanasia day 21; b) Euthanasia day 35; c) Dosing ending day 35, and euthanasia day 84. Implants were placed in the rat femur according to implant placement protocol. At the time of euthanasia, the femurs were harvested and then prepared for histomorphometric analysis. The effects of PTH treatment was evaluated by analysis of variance (ANOVA) at $p < 0.05$. There was no significant effect of PTH on cartilage percentage, but showed higher cartilage percentage at day 21. Bone percentage showed significant increase PTH at day 35. No statistical difference was found between the experimental groups at day 84 either on cartilage percentage, bone percentage or voids percentage. Our results clearly added conformation to the anabolic ability of PTH around the Titanium implant.

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Enhanced bone formation using synthetic oligopeptide-coated bovine bone in vivo

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Introduction: Growth factors are difficult to use because of high molecular weights, immunological responses and difficulty in coupling to scaffolds. The objective of this study is to evaluate the ability of bovine bone mineral coated with synthetic oligopeptide to enhance bone regeneration *in vitro* and *in vivo*.

Methods: (1) A peptide sequence containing the binding domains for BMP receptors was applied onto the deproteinized bovine bone.

(2) The cell attachment was evaluated using confocal microscopy and cell proliferation was measured. Alkaline phosphatase (ALPase) activity and osteocalcin level was measured and amount of mineralization was determined by using Alizarin Red S staining.

(3) Two symmetrical defects were made in each rabbit. The peptide-coated bone mineral and uncoated one were placed. Computer-assisted histomorphometric measurements were obtained using an automated image analysis system at 1,2 and 4 weeks.

(4) L-shaped defects were prepared at the central part of the extraction site in beagles. The newly formed bone was evaluated at 4 and 6 weeks.

Results: The cell attachment and cell proliferation of the peptide-coated group were significant higher than the peptide-uncoated control. The ALPase activity and osteocalcin level in the test group was significantly higher than those of control group.

The ratio of new bone formation was significantly greater in the test group compared to that of control in 2- and 4-week rabbit model and 4-week beagle model.

Conclusion: The use of these peptide revealed to be effective and application as peptide-coated bone is a promising material for bone regeneration.

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The bone regeneration effect as membrane maintenance period in rabbit

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Aim of study: To compare bone regeneration effect relative to maintenance period of PTFE membrane in rabbit calvarial defects.

Material and methods: Eight rabbits were used. Four defects were made in calvaria and classified into 3 groups; control group(no graft), experimental group 1 (autogenous bone) and group 2 (deproteinized bovine bone). Defects were covered with PTFE membrane. Membranes were removed after 1, 2, 4 and 8 weeks and observed histologically.

Results: Control group. After 1 week no new bone formation was evident. After 2 weeks minimum of bridge-shaped new bone are formed. After 4 weeks defect was filled with new bone, thickness was less than adjacent bone. After 8 weeks new bone formation appears incomplete in bony cavity, with superficial connective tissue invasion.

Experimental group 1. At 1, 2 weeks new bone filled defects at adjacent bone with superficial connective tissue invasion. At 4, 8 weeks new bone formation appears complete in cavity without connective tissue and autogenous bone particle is blended with new bone.

Experimental group 2. At 1, 2 and 4 weeks defects were filled with new bone at original bone thickness. At 8 weeks complete new bone formation around deproteinized bovine bone particle was appeared in cavity without connective tissue.

Conclusion: Graft materials, membranes were necessary in GBR procedure. When PTFE membranes were removed early, the most favorable bone regeneration was revealed in experimental group I > group II > control group. Membrane should maintain for 4 weeks with autogenous graft. Use of xenograft need longer maintenance period than autogenous bone.

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Pre-implant reconstruction of the mandible: possibility and limits

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Material and methods: 27 patients operated for preprosthetic posterior mandible reconstruction. 16 patients were treated with mandibular block bone grafts, 8 with multiple calvarial block grafts, 3 with fibular free flap. After a 4–6 months healing period 76 implants were positioned in the grafted bone.

Cases presented were treated with bone grafts harvested form mandibular ramus, from calvaria or with fibular free flaps, according to the severity of atrophy and to the quantity of bone needed for the reconstruction.

For the treatment of Cawood and Howell class III and IV atrophy and for monolateral of localized class V we used bone grafts harvested form mandibular ramus.

For bilateral class V atrophy we used clavarial bone grafts and for total edentulous patients with class V or VI we used fibular free flaps.

The clinical parameters valued were: survival of bone graft, complications of the grafting procedure, complications on the donor site, graft resorption, and success of the implants.

Results: No complications were observed during the surgical procedures and during the healing period. Checkups showed a minimal degree of bone resorption and an excellent osteointegrative process.

Conclusion: The Authors report case series successfully treated with inlay, onlay, veneer or combined surgical technique before implant placement using mandibular ramus or calvarial bone

block grafts, solving many clinical situations (single tooth restoration, localized ridge augmentation, full-arch restoration) showing the great versatility of these harvesting sites.

Alveolar ridge augmentation using autogenous block graft is provided as a reliable and predictable possibility of restoring the adequate bone volume for implant insertion and to reestablish a correct maxillo-mandibular relationship in both sagittal and vertical dimension enhancing a better prosthetic results.

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Effect of emdogain in new bone formation in extraction sockets following socket preservation with punch technique

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Objective: The purpose of this study was to evaluate the healing and the formation of new bone in extraction sockets filled with Emdogain® and Bio-Oss® Collagen and covered by using the punch graft technique.

Methods: Ten (5 male and 5 female) patients having symmetrical teeth in contralateral quadrants of the same jaw condemned for extraction were participated in our study. After the initial periodontal therapy, the surgical operations were started. In the first operation, following tooth extraction, one site was received Emdogain® while the other socket was filled with Bio-Oss® Collagen. Primary coverage of the socket was achieved by using a mucosal punch graft harvested from the palate. After 3 months of healing period, in the second operation, the augmented extraction sites were re-entered. Bone biopsies were obtained and the histological examinations were started. Dental implants were placed. The numeric stability values of implants were evaluated by resonance frequency analysis (RFA). Implant stability measurements were re-evaluated at first and third months.

Results: Histologic examination revealed new bone in all specimens. When we compare the new bone between Emdogain® and Bio-Oss® Collagen groups, there was no statistically significant differences respectively in apical and coronal sections of biopsies between two groups. RFA values were statistically higher for implants placed in Emdogain® sites at first and third months while no significant differences were seen in RFA values for implants placed in Bio-Oss® Collagen sites. There was no correlation between the amount of new bone in sockets and baseline RFA values for implants in Emdogain® and Bio-Oss® Collagen groups.

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Split crest with simultaneous implants placement. Surgical protocol and clinical study

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Introduction: The present work shows our surgical protocol for the treatment of horizontal maxillary bone defects with split crest technique and simultaneous placement of osteointegrated implants.

Material and methods: For this study were selected patients with maxillary horizontal bone defects (residual crest width between 2.5 and 4 mm, measured 2 mm apically from the top of bone crest) and sufficient bone height (at least 10 mm). Split crest was performed with ultra-sonic instruments and screwed bone expanders, in the same time were positioned implants with covered healing technique.

During the first surgery bone width was measured before and after split crest. During second stage surgery, for the exposure of implants, were analyzed bone crest width, implant integraton and were taken peri-implant bone measurement on the vestibular, lingual mesial and distal surfaces.

8 patients were operated with split crest and selected for this study. 17 implants were positioned in the expanded ridge. One of the implants failed and was removed during the exposition procedure, all the other were correctly integrated. The mean bone with gain was estimated in 2.3 mm.

Conclusions: Split crest isn't a new technique, first studies were publicated in 1992, but there aren't many works on it yet.

From literature review and from our clinical experience we can conclude that split crest is a predictable technique for the treatment of horizontal bone defect, but rigid indication must be respected: sufficient bone height, minimum width of the bone crest 2.5 mm, presence of cancellous bone between the cortical plates. Maxillary ridge is more indicated than mandibula, and the better results were obtained for the placement of 2–3 implants in the latero-posterior zone of the upper jaw.

Main advantage of this technique are possibility to set implants in the same time of the regenerative surgery, without additional surgical procedures and time and the reduced necessity of biomaterials or bone harvesting procedure.

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Preliminary in vivo investigation of the biodegradability of a novel elastomer material for bone regeneration

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Objectives of the investigation: Assess in vivo the biodegradability and the bone formation of a novel elastomer material

(poly-glycerol sebate, PGS) in a bony environment of a rat calvarial model. Microcomputed tomography (micro-CT) imaging analysis, histological analysis and histomorphometric analysis will be used to determine the behavior of PGS. The specific hypothesis of this investigation was that PGS when placed in a bony defect will possess biodegradable properties that will lead to bone formation.

Experimental methods: Two 3 mm in diameter, circular full thickness non-critical size (Non-CSD) bone defects were surgically created in the parietal bones of 12 female Sprague-Dawley rats. The left side defect was filled with PGS. The right side defect was left empty and was used as a control. PGS supplied in 2 different porosities (50% and 60%) creating thus 2 test groups. Three rats from each test group were sacrificed at 2 (n = 6), and 4 (n = 6) weeks. Cranial bones were harvested to assess the biodegradability of the PGS.

Essential results: The micro-CT scan analysis provided the following average Hounsfield values for each group:

WEEK-2	Hounsfield Units	SD
Group 1 (50/50)	−338.333	20.66667
Group 2 (60/40)	−253	18.66667
WEEK-4		
Group 1 (50/50)	−252	15.66667
Group 2 (60/40)	244	18.66667

In both groups 1 and 2 there was an increase of Hounsfield Units from week 2 to week 4.

Conclusions: Based on the Hounsfield Units value the biodegradability of the material was confirmed, however less bone formation was observed when compared to the control site

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Growth of pulp derived stem cells on different implant surfaces in vitro

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Osteointegration of dental implants on the cellular level depends on surface characteristics as well as attachment of surrounding osteoblasts. In recent years tissue engineering techniques for augmentation purposes have gained much interest. For bone repair mesenchymal progenitor cells as source for viable osteoblasts have been propagated.

The aim of our study was to compare the influence of different implant surfaces on morphology and osteogenic differentiation of mesenchymal progenitor cells (MPCs) derived from human pulp tissue. Additionally the effects of incorporated BMP-2 on MPCs formation on implant surfaces in vitro were evaluated.

After informed consent was given MPCs from human pulp tissue were cultivated in DMEM, supplemented with 10%FCS, penicillin/streptomycin and 50 µg/ml ascorbic acid under standard conditions. MPCs from were cultivated on implant surface specimens with 10 mm diameter. Titanium and ZrO-ceramic discs with machined and grid blasted surfaces. The numbers of viable and proliferating cells on surfaces were assessed by WST-1 and BrDu assay respectively. The osteogenic phenotype of adherent cells was proved by alkaline phosphatase assay. Our results revealed differences between the ZrO and titanium surfaces. Incorporation of BMP-2 in a calcium phosphate coating enhanced osteogenic differentiation.

The contact area between implant surface and alveolar bone especially in areas lacking sufficient bony support needs special consideration. Stimulation and recruitment of MPSc for osteointegration is mandatory. BMPs can act as response modifier for accelerated osteointegration in augmented areas.

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Mucogingival surgery by laser technology

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In the last years laser technology has been introduced in the surgical periodontal treatment. A less post-surgical morbidity has been found as one of the advantages of its use.

When soft tissue are treated by laser, they follow a similar wound healing process as the one found in conventional surgery but without scare formation and without wound contraction.

Experimental studies in animal models compare the wound healing in oral mucosa, done with either conventional scalpel and with CO_2 or Nd:YAG laser. A delay in wound healing is observed due to the thermal necrosis and foreign body reaction. Wounds treated with this type of laser have a delayed healing in comparison with conventional scalpel because of the slower connective tissue regeneration as well as slower epithelialisation. Nevertheless, soft tissue healing after use of Er-Cr:YSGG laser is similar to the obtained with conventional scalpel because this type of laser has less thermal effects than the previously cited.

This poster shows the use of Er-Cr:YSGG laser as an alternative use of conventional scalpel within free gingival tissue grafts. Clinically is been observed that the use of this device in mucogingival surgery, can give some benefits in comparison with the traditional technique. These are: hemostasia during and after surgery, diminished post surgical edema, absence of sutures and scares in the donor site, reduced surgical time, diminished mechanical trauma, faster healing in the donor site, use of less quantity of local anesthesia, less vasoconstrictor concentration and avoid the use and confection of a palatal stent.

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Homologous-bone-grafting for atrophic maxilla: is it an evidence-based decision?

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Objective: Homologous bone is one of the materials used in the surgery of severe atrophic maxilla for an implant-supported rehabilitation. The aim of this study was to evaluate if homologous bone graftins is an evidence-based treatment to create adequte bone volume in the maxilla for the placement of endosseous implants.

Method: A systematic review of the literature on homologous bone grafting was undertaken, starting from the observation of a 55 year old patient with a Cawood and Howell's Class V atrhopy of the maxilla, an augmtented vertical jaws relationship and no local and general controindication to an implant supported prosthesis rehabilitation, to evaluate the effects of homologous bone grafting to solve both atrhopic maxilla and vertical jaws relationship in term of long-term stability or resorption, histological and histomorphometrical analysis and implant survival and succes rate. The search was undertaking using the PubMed database and manually. The same criteria were used to assess each article using the EBM evaluation parameters.

Results: Thirty-eight articles were found in the literature of which eleven were eligible. Outcome measures weren't the same in all articles: five articles investigated histology and histomorphometry frome bone biopsy core samples, one showed a quantitative radiographic analysis, five evaluated implant survival and succes rate. There were no articles concerning long-term stability or resorption. None of these articles considered all the searched parameters together.

Conclusion: The query of the research was not satisfied. More well-done studies are required.

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Perforations of the schneiderian membrane during sinus floor elevation

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Objectives: The aim of this study was to follow 41 intraoperative perforations of the Schneiderian membrane during sinus floor elevation and to identify potential differences to patients without perforations.

Material and methods: 201 sinus floor elevations were done in the department of oral and maxillofacial surgery of the University Hospital of Schleswig-Holstein in the years 2005 and 2006. 41 intraoperative perforations (20.4%) were documented and treated according to the following scheme: Defects smaller than 5 mm were covered with a collagen membrane. Larger Defects were additionally sutured. Particulated jaw bone mixed 50:50 with bone substitute (25 cases) and 50:50 mix of particulated iliac crest bone and BioOss® (6 cases) mainly served as graft material in the perforation group. In 12 cases implants were installed at the time of sinus grafting and in 27 cases a second operation was performed.

Results: Four sinus lift procedures had to be discontinued intraoperatively. Over a mean control interval of 162 days, one implant of the 93 inserted had to be replaced in the perforation group. After one year, implant survival rate was 14 out of 14 in the perforation group versus 81/92 in the control group.

Conclusions: With appropriate treatment, intraoperative sinus membrane perforations did not represent an elevated risk for implant loss, infectious complications or displacement of graft material in the investigated population.

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Peri-implantitis: regeneration of bone defects treated with a osteoinductive demineralized xenogenic bone graft (colloss®)

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Therapy of periimplantitis and the associated bone loss are still a challenge. Currently treatment is limited to decontamination, guided tissue regeneration and autologous bone graft augmentation. The aim of this study was to examine the clinical success of regenerative therapy of periimplant bone lesions with a demineralized xenogeneic bone graft material (Colloss®) which contains native BMPs.

36 implants of 22 patients with active infection and periimplant bone lesions were treated. After supracrestal smoothing and subcrestal cleansing implant surface was decontaminated with chlorhexidine. A mixture of autologous bone and Colloss® was augmentated afterwards. Periimplant pockets and bone lesions were measured and compared before and one year after surgery.

The regenerative therapy with Colloss® was at 35 out of 36 implants successful. Periimplant soft tissue pockets were reduced on average by 4 mm of 7.5 mm to 3.5 mm ($p < 0.001$). Periimplant bone showed after regenerative therapy with Colloss®, on average, a decrease of 3.5 mm by 5.1 mm to 1.6 mm ($p < 0.001$).

The clinical application of osteoinductive bone graft material Colloss® in combination with autologous bone is on the basis of this collective a safe and successful regenerative treatment after periimplantitis. In comparison to previous therapy approaches this treatment is able to improve periimplant bone regeneration significantly.

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Xenograft versus autogenous bone for maxillary sinus augmentation. A pilot clinical trial

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Background: Implant placement in the posterior maxilla may often be contraindicated because of insufficient bone volume and presence of the maxillary sinus. In these situations the sinus floor lifting and grafting have been frequently proposed as the best treatment. The aim of this study was to histologically compare the use of autogenous bone (100%) versus with a corticocancellous porcine bone.

Methods: Seven patients requiring a bilateral maxillary sinus augmentation were selected for this study. Each patient received in one sinus, randomly selected, autogenous bone 100% (control side), and in the contra lateral sinus a corticocancellous porcine bone (test side). Seven months after augmentation procedure bone biopsies were taken at the time of implant placement from the lateral window.

Results: No complications were observed during the surgical procedures. All the patients had an uneventful healing, no signs or symptoms of maxillary sinus disease were observed during the 7 months after surgery. No significant differences of trabecular bone percentages were observed in bone biopsies from test and control sites. Moreover, higher fraction of mineralized tissue were observed in the test sites when compared with the control sites.

Discussion: It could be concluded from this study that the corticocancellous porcine can be successfully used in maxillary sinus augmentation. More wide and long-term studies are required to evaluate the success of implants placed in both test and control sites.

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Combined graft technique of severe atrophic maxillae with ultrasonic surgery

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Severe atrophy of the maxilla (Cawood and Howell class V to VI) require bone augmentation procedures to increase vertical and horizontal bone volume to allow a 3D restorative-driven approach. Implant position and angulation compromises, instead, can lead to aesthetic dissatisfaction, mechanic overload and eventual implants loss. A simultaneous technique to correct class V and VI 3D maxillary defects with a combination of segmental maxillary osteotomies, interposition of endochondral bone grafts, membranous onlay grafts and sinus lift procedures using ultrasonic bone scalpels is presented. Prior to the procedure presurgical planning was made with a surgical guide made on casts models. The osteotomies, at donor and recipent sites, were carried out using the UBS® ultrasonic surgery device.

Major complications like surrounding soft tissue damage, excessive bleeding, inaccurate bone splitting, adverse effects or delayed healing were recorded over a 12-month follow-up period.

6 patients have been treated. The ultrasonic bone chisels allowed for a precise procedure in bone cutting. and avoided any hard or soft tissue complication. 18 implants were inserted in an anatomically favourable position after 6 month of bone healing. After 3 months, implants supported 2 cross-arch bridges and 6 partial dentures.

As surgical, aesthetic and functional results were satisfying, we can conclude, therefore, from these preliminary data that the surgical approach with UBS is efficient, comfortable and results in minimal morbidity.

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Straight long ultrasonic tips for orthognathic surgery: A technical innovationstraight long ultrasonic tips for orthognathic surgery: A technical innovation

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Ultra-sonic bone surgery (USBS) has been recently introduced and expansion of its application fields is still open and unknown. New shapes of vibrating tips can lead to new applications of USBS. Objective of the present clinical study was to assess, on the UBS®, the safety and efficacy of innovative vibrating tip designs. The aim was to perform LeFort I osteotomies and bilateral sagittal splits in orthognathic surgery with USBS. The designed tips were made of titanium alloy, straight in shape, 55–65 mm long. The purpose was to ease access to the pterygoid process, increase the visibility during surgery and minimize the risk of injuring the surrounding neuro-vascular elements.

Ten patients with class II and III malocclusion were treated by bilateral sagittal split and LeFort I osteotomies. The following parameters were recorded: 1. Cutting efficacy, 2. Ease of access to the surgery site, 3. Intra-operative visibility, 4. Surgical morbidity, 5. Post-operative events. The tips were efficient in bone cutting, comparable to oscillating and reciprocal saws classically used for this application. Access to the remote posterior area was easy because the tips were long, straight and not bulky. Visibility was enhanced because of decreased bleeding and permitted precise osteotomy cuts, especially in remote areas like the pterygoyd process and posterior border of mandibular ramus. No soft tissue injury was recorded and healing was uneventful.

We conclude that USBS with these straight, long ultrasonic tips made of titanium alloy can be considered as a safe and comfortable alternative method for maxillofacial complex surgeries.

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Bio-inspired composite nanofibers for controlling in vitro mineralization of human mesenchymal stem cells and in vivo bone formation

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Tissue engineering has become an alternative method to traditional surgical treatments for the repair of bone defects, and an appropriate scaffold supporting osteoconductivity is a key element in this approach. In the present study, nanofibrous organic/inorganic composite scaffolds containing nano-sized demineralized bone powders (DBP) with biodegradable poly(L-lactide) (PLA) were developed by an electrospinning process for engineering bone. In order to assess their osteoconductivity, *in vitro* osteogenic differentiation of human mandible-derived mesenchymal stem cells (hMSCs) cultured on PLA or PLA/DBP composite nanofiber scaffolds were examined. During 21 days of culture, the PLA/DBP nanofiber scaffolds remarkably enhanced calcium deposition of hMSCs in comparison with the PLA nanofiber scaffold. The *in vivo* osteoconductive effect of PLA/DBP nanofibrous scaffolds was further investigated using rats with critical-sized skull defects. Micro-computerized tomography revealed that a greater amount of newly formed bone extended across the defect area in PLA/DBP scaffolds in comparison to the non-implant and PLA scaffolds 12 weeks after implantation, and that the defect size was reduced by almost 90%. Therefore, PLA/DBP composite nanofiber scaffolds may serve as a favorable matrix for the regeneration of bone tissue.

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Treating buccal dehiscence defects in implants with a collagen lyophilisate

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Objectives: To explore the potential of a collagen lyophilisate for the treatment of dehiscence defects on the buccal surface of implants.

Material and methods: 3 dogs were used in the study. 6 months after extraction of all mandibular premolars, 2 implant sites (2.5 mm × 10 mm long) were prepared in both sides of the mandible in each dog. Then, the coronal 5 mm of each implant site was enlarged to 5 mm in diameter and had additionally its buccal plate removed. Thus, after installation of 3.25 mm × 10 mm long implants with their shoulder flush with the alveolar crest mesio-distally, a 5 mm deep buccal dehiscence defect and a ca. 0.8 mm circular defect were present at each implant site. The defects in each site were treated with application of a) the collagen lyophilisate (COL) alone, or b) COL + b-TCP, or c) COL + a deproteinized bovine bone graft, or d) COL + guided tissue regeneration (GTR), or e) autogenous bone graft + GTR, or f) were left empty as controls. Histological evaluation after 6 months of healing was performed and only descriptive statistics were used.

Results: No treatment modality resulted in complete regeneration of the buccal bone plate, but some coronal bone regrowth had always occurred. In each treatment groups, the following average distances from the shoulder of the implant to the most coronal level of buccal bone-to-implant contact were observed: a) 2.0 mm, b) 3.1 mm, c) 3.5 mm, d) 2.0 mm, e) 1.3 mm, and f) 2.1 mm.

Conclusions: No effect of application of the collagen lyophilisate on buccal bone regeneration was observed, while adjunct use of a bone biomaterial seemed to obstruct bone regeneration.

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Correlation of vital bone, implant survival and complications in SAP

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Sinus augmentation procedure (SAP) is a predictable method for augmentation of the posterior atrophic maxilla. Successful SAP can by the amount of vital bone (VB) formation and the subsequent implant survival rate (ISR). However, complications can occur during and after SAP and may have an adverse effect on post-operative healing.

The aim of this study is to investigate the correlation between ISR, percentage of VB following SAP and sinus complications.

Methods: A total of forty SAPs were performed, 100% anorganic bovine bone matrix (ABBM) was utilized in 20 SAPs, 100% mineralized cancellous bone allograft (MCBA) was utilized in 10 SAPs and 100% biphase calcium phosphate (BCP) was utilized in 10 SAPs. Six months following the procedure, a core was removed and sent for histomorphometric analysis. Eigthy implants were placed and remained submerged for 6 months before loading. Anova t-test was used to determine statistical significance between percentage of VB in graft materials. ChiSquare test was used to correlate ISR, VB formation and sinus complications.

Results: Histomorphometric analysis of ABBM, MCBA and BCP cores revealed a 17.9%, 28.2% and 28.35% average VB content respectively and ISR of 97%, 100% and 95% respectively, with an overall survival rate of 97.5%. In sinuses with VB less than 20% ISR was 94.1%. An average of 26% VB was reported in the perforated sinuses.

Conclusion: There was no correlation found between ISR and VB formation. Sinus perforations did not affect VB formation or ISR. The minimal VB content for successful implant osseointegration remains unknown.

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The collagen sponge as a substitute for bone graft materials

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The purpose of this study was to present a usefulness of sinus augmentation with collagen materials as space maintainer. 10 rabbit with sinus augmentation with deproteinated bovine bone(DPBB) or Collagen sponge(Gelfoam) were used. The split mouth design was applied for compaing the bone morphogenic power. The specimens were taken after 1 month or 2 months. The sinus liftings with DPBB and collagen sponge are illustrated with radiological and histological data. The discussion covers the usefulness of Collagen sponge as bone substitute. Our results show that a maxillary sinus augmentation with Collagen sponge is a possible method for creating adequate bone volume before implantation.

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A repeated sampling bone chamber methodology for the evaluation of bone response around calcium phosphate ceramics

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Background: A repeated sampling bone chamber methodology was developed for the study of the influence of the mechanical environment on skeletal tissue differentiation and bone adaptation around calcium phosphate implants.

Methods: 6 Beagle dogs were involved in the study. The bone chamber model primarily consists of two hollow cylinders, which fit exactly into each other. In this first stage, the outer cylinder is implanted in the proximo-medial tibia of the dogs under aseptic conditions and is allowed to osseointegrate. The bone chamber has an outer diameter of 12.5 mm and on average 11 mm of a total height of 17 mm. During this healing period, the outer bone chamber is filled with a solid Teflon cylinder to prevent tissue growth via the two perforations. Repeated sampling of the bone chamber will allow conducting several experiments within the same animal at the same site, thereby excluding subject- and site-dependent variability and reducing the amount of experimental animals.

Results: All surgeries went well and no complications or wound infections were found. All animals recovered satisfactorily and showed no signs of discomfort or lameness. In the postoperative radiographs, all bone chamber were perfectly implanted and no bone fractures around them were detected.

Conclusion: These pilot study, however, is too limited to make any conclusions on bone response, but they do indicate the feasibility of the bone chamber methodology. The methodology offers a wide range of applications in various fields of interest.

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Narrow-diameter implants. A three year retrospective study of 337 implants

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Objective: Narrow diameter implants (3.0 & 3.4 mm) are essential for clinical situations as reduced interradicular bone, replacing teeth with small cervikal diameter or a thin alveolar crest. An additional indication is immediate loading of the implant to stabilize a fixed provisional in cases of complex oral rehabilitations. Only few studies have analysed the outcome particularly with regard to immediate loading.

Material and methods: 137 patients undergoing implant treatment or complex oral rehabilitations including bone augmentation procedures received from 2005 to 2007 337 XIVE™ implants. 284 implants had a diameter of 3.4 mm. 38 implants with the grit blasted/acid etched/neutralized surface (Friadent Plus®) were placed with increasing torque to 35 Ncm to be immediately loaded with a metal framework within two days.

Results: Only two of the 337 implants were lost (3.4 mm). Non of the immediately loaded implants was lost. All of the immediately loaded implants could consequently be integrated in the definite prosthetic restoration. The survival rate of the narrow diameter implants in this retrospective study was 99.4%. No major prosthetic complication with the internal implant-abutment-connection was detected.

Conclusions: It can be concluded that implants with a reduced diameter (3.0 & 3.4 mm) have the same survival rates than regular platform implants. This is consistent to the data available. Even immediate loading of these implants seems not to affect the survival rates of the implants.

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Immediate loading and diabetes: 24 months clinical study

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Because the life expectansy of individuals continues to increase, implantologists providing dental implants treatment can expect to see an increasing number of patients with several sistemic diseases such as diabetes mellitus. Multiple implant supported crowns in the recent past has become the treatment of choice for multiple tooth replacement, even in patients with type 2 diabetes, although these patients have to accept several surgical and prosthetic intervention.

Osseointegrated implants have been found to result in a high longterm success rate. Several studies have reported immediate loading of implant and demonstrated predictable results for this treatment approach. Most used implant systems have documented long-term survival/success rates of crowns on implants that compete favorably with the traditional FPD.

The aim of this clinical study was to demonstrate the effectiveness of immediate loading procedures on type 2 diabetes patients.

10 patients with partial dentures and mobility grade 3 remaining teeth have been enrolled in the study.

60 implants have been positioned in the maxilla and the provisional crown s have been screwed to the implants and loaded at the surgical time. Clinical controls have been performed every 15 days for 12 weeks, radiological controls every 4 weeks for 12 weeks and Ostell measurements have been done time 0, 12 weeks and 6 months. An overall success of 100% of all implants was shown.

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Implant – identification tool for forensic dentistry

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The most common role of the forensic dentistry is the identification of deceased individuals. Dental identifications have always played a key role in natural and manmade disaster situations. The dental examination is very accurate and also nowadays in time of a comprehensive fingerprint and DNA assessment is objectively supported. The identification which is based on the dental documentation leads up to 43–89% of successful process and it is still a method of choice. Teeth and also titanium implants are usually not damaged i.e. in flames, however, they could break to pieces. The regular dental examination of the patients is ordinarily once to twice a year, in several EU countries it is required by health insurance companies. The identification procedure based on implant presence is documented in our case report. A man (*1963) was assessed in the place of the disaster by expert, who recorded his findings into the yellow Victim Identification Forms concerning the dental aspect of examination including implant presence in position tooth 25. The more detailed information was worked out in a part called ''specific data'' in a form of a free text, where the presence of a potential implant and metalceramic crown was described. The stages of the victims' teeth were transferred into the interactive Dental Cross with the advantage of changing the free text describing materials and prosthodontics to schemes, which were distinguished in colors. The orthopantomogram from year 2000 and implant description confirmed positive identification of man.

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Evaluation of three retention systems for implant supported mandibular overdenture

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Our aim is to compare, in a prospective clinical study, the Locator® System with two other types of stress-breaking retention (Retentive Anchors and Magnets) for implant supported overdenture in atrophic edentulous mandible, with the use of Straumann Dental Implant System.

Material and methods: 46 patients, fully mandibular edentulous were enrolled. Each patient received 2X screw-type Straumann implants, in the canine region of the mandible. After 6 weeks healing period implants were loaded and the patients were randomly assigned to one of two groups (23patients each): retentive anchors (B) and magnets (M). New mandibular overdenture with metal reinforcement was made. The two groups of patients were compared with 23patients receiving Locator system (L) following same protocol.

Data collection performed at baseline (1 week after insertion of the overdenture) (T0) and every 6-month (T1-T2): gingiva-scor, plaque-score, calculus, bleeding-score, probing pocket depth, standardized intra-oral radiographs, denture retention, mechanical complications of the attachment components. Implant stability was measured at the time of surgery (Mc), at abutment insertion (M0) and every 6 month (M1-M2) using Osstell Mentor.

Results: 4 implants failed from group B and M and none from group L (97,1% success rate). Mean scores on indices of gingiva, plaque, calculus, bleeding and pocket depth were low at all evaluation period. No loss of implants stability. Lower denture stability measured for magnet group.

Conclusions: Implant-retained overdentures improve retention and stability, despite of system used.

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Masticatory capacity and patient satisfaction with implant-supported mandibular overdenture

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The purpose of the investigation is to compare in a prospective study the satisfaction level and masticatory capacity of mandibular edentulous individuals, applying questionnaires adapted from the indexes oral health-related quality of life (OHIP) and its short form OHIP-EDENT during the phases of rehabilitation treatment with a two-implants supported overdenture and the use of Straumann Implant System.

Material and methods: 69patients fully mandibular edentulous with severe alveolar ridge atrophy and instability of the existing lower denture were enrolled in the study.

Each patient received two screw-type implants in the interforaminal region of the mandible. After 6 weeks healing period a new denture was made and the patients randomly assigned to one of the following equal groups: retentive anchors(B), magnets(M) and locator system (L).

All patients rated with the aid of questionnaires their general satisfaction as well as other features of their dentures (comfort, stability, ability of chewing, speech, esthetic and cleaning ability) prior to the treatment and at 6 and 12months.

Results: All the groups had less oral health related quality of life problems than before treatment. L-group gave higher rating on comfort, stability and ability to chew, B-group had higher rating on maintenance requirement comparing with the other groups.

Conclusions: Rehabilitation with implants produces a significant improvement in the satisfaction level and the masticatory capacity, despite the fact that the retention force of the magnet attachment is smaller.

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A five-year study of short straumann implants supporting fixed rehabilitations

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Objectives: The aim of this five-year study was to evaluate radiographic crestal bone loss (CBL) on short implants supporting fixed rehabilitations and to analyze the bone level versus crown-to-implant length (C/L) ratio.

Material and methods: 250 Straumann implants with mean length of 9.2 mm were placed in 135 patients to rehabilitate 163 mandibular and 87 maxillary sites. 95.2% of them were located in the posterior area. Fixed prosthetic restorations included 103 single crowns, 81 fixed partial dentures (FPDs). Using the rough-smooth implant interface as reference level, CBL was measured on the five-to-six year radiographs. Non parametric Wilcoxon's and Kruskal-Wallis tests were used for group comparisons.

Results: Fifty-two implants (20.8%) were considered dropped out. The overall survival rate was 99.5%; 11 implants showed CBL higher than 3 mm, bringing thus the success rate to 93.9%. The mean CBL was 0.93 ± 1.08 mm. The mean C/L ratio was 1.3 ± 0.3. CBL was 0.93 ± 1.09 mm for $0 < C/L < 1$ (22 implants), 0.86 ± 1.04 mm for $1 < C/L < 1.5$ (133 implants), 1.14 ± 0.92 mm for $1.5 < C/L$ (43 implants). Differences in CBLs between the C/L groups were not statistically significant ($p = 0.441$). Implants supporting single crowns showed a CBL of 0.79 ± 0.98 mm whereas a CBL of 1.01 ± 1.02 mm was measured for those supporting FPDs. The difference between the CBLs for these two prosthetic groups were statistically significant ($p < 0.05$).

Conclusion: The C/L ratio did not influence CBL around implants. Unfavourable C/L ratio generated by the use of short implants did not depreciate the success rate. Restorations with single crowns did not display higher risks of CBL increase than splinted ones.

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Use of short implants in single tooth replacement (follow-up 1-year)

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Objectives: The placement of endosseus implants in posterior sites represents a big challenge, particularly when the alveolar bone heigh is reduced. Bone stress due to implant loading seems to be indipendent of implant length. So it is not necessary to use long implants to have good results. Moreover the use of short implants could avoid the patient to undergo major oral surgery where the bone heigh is limited. The aim of this study is to evaluate the clinical outcome and survival rate, 1-year after loading, of 6 mm long implants used in the posterior regions.

Material and methods: forty-one SLActive Straumann® short implants, 6 mm long, were placed in 36 patients. Nineteen implants were 4.1 mm in diameter (regular neck), and twenty-two were 4.8 mm in diameter (wide neck). Implants were placed in premolars (14 implants: 34.1%) and molars region (27 implants: 65.9%), both in the mandible (25 implants: 60.9%) and in the maxilla (16 implants: 39.1%). Implants were loaded after 6 weeks.

Results: Two of 41 placed short implants were lost before loading. The overall survival rate was 95.1%. At the time of implant installation, bone quality 2 and 3 (Lekholm-Zarb classification, 1985) was found in 78% of the treated sites; the mean crown-implant ratio was 1.2.

Conclusion: This study showed a high success rate of 6 mm long implants used in the treatment of partial edentulism, in bone of good quality, at 1 year of follow up after loading in single tooth replacement in posterior sites.

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Maxillary implants with early loading – long-term results

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Objective: Because of the specific maxillary bone quality, literature used to recommend a 6 months healing period for implants in the upper jaw. The purpose of this clinical study was to evaluate, if maxillary implants loaded after 3 months show lower success rates and more marginal bone loss than respective implants with a healing period of 6 months. Patients were followed up for 8 years.

Material and methods: Prior to implant surgery, patients were devided into two groups. In group A fifteen patients received 37

implants (Astra Tech., Mölndal, Sweden). After 3 months of unloaded healing, crowns or fixed screw retained bridges were installed. In group B seven patients received 42 implants which were loaded after 6 months of healing. Subsequent to implant placement marginal bone loss was recorded annually using intraoral radiographs.

Results: No implants were lost during the observation period. The average marginal bone loss in group A was 0.33 ± 0.53 mm after 8 years. In group B bone a loss of 0.31 ± 0.58 mm was recorded. No soft tissue irritations or prosthetic failures had to be documented.

Conclussion: A healing period of 3 months proved to be highly successful. This could be confirmed by observing implants over a period of 8 years. As compared to the 6 month control group there are no statistically significant changes in radiographic bone level. Advantages of longer unloaded periods could not be documented.

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Prospective study of periodontal and peri-implant parameters of the pillars receiveing and implant supported dental prosthesis

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Since the introduction of implants in Dentistry, controversies have arisen about the possibility of connecting implants to teeth in fixed prostheses. The difference presented by this type of anchorage has led to some concern about the limited flexibility of the osseointegrated implant to share the functional loads with the connected teeth.

This study analyzed prospectively the periodontal parameters: plaque index (PLI), bleeding on probing (BOP), probing pocket depth (PPD) and it was used Digital Subtraction Radiography Method to verify the attachment level changes from pillar tooth and the implant that supported the prosthesis and the corresponding teeth at the control side. Twelve patients were selected who presented a posterior area edentulous jaw. Patients were treated with an implant of one stage of 10 mm standard Straumann (ITI) 4.1 mm diameter. The implant was placed more distally from the last tooth to retain the future prosthesis. The radiographs were taken at prosthesis placement, after six months and one year. Digital radiographs were analyzed using *software Inspector (Matrox company)*, obtaining an contrast image between the changes or not occurred between the radiographs. The values observed in the implant it was compared with the success criteria, widely mentioned in surveyed studies.

Results: There was no change around them and in the dental pillars of the prostheses at the one year follow-up. Prostheses continue to be in excellent conditions after the one year follow-up based upon clinical and radiographic analyses. In accordance with the Wilcoxon test, it was concluded that there was no statistical difference between each group of each patient during the time period analyzed, as well when the pillars were compared to their respective controls.

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Hydroxyapatite coated implants versus rough titanium implants, a clinical trial

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Purpose: The aim of this prospective clinical trial was to compare the outcomes of two different surfaces, hydroxyapatite and rough titanium, available for the same implant system in total and partial edentulous patients.

Material and methods: A total of 89 Nobel Replace implants of various diameters and lengths were placed in 56 patients. Different surfaces were used: TiUnited® and HA coated. All charge protocols (immediate, early or standard) and prosthodontic restorations (single crowns or bridges) were applied. Intra oral radiographs using individual holder were taken for evaluation from the time of implant charge, at the 6-month (upon delivery of the final prosthesis) and 1 year follow-up visits.

Results: The cumulative survival rate after one year for Ti-United implants was 100%, for HA coated implants it was 97%. The mean marginal bone loss during 1 year follow-up after implant load was 1.16 ± 0.48 mm for HA surface and 1.29 ± 0.48 mm for TiUnite®. This difference resulted not significant ($p > 0.05$)

Conclusions: The outcome of the present prospective 1-year study indicates that Nobel Replace implant system showed a high reliability; This trial suggests that there is no a real difference between the two surfaces (HA and TiU) during the first year since the time of implant loading. We aim to complete the 5 years of follow-up in order to obtain the most significant result possible.

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Immediate implant placement into unilateral enucleated incisive canal cyst area

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Objective: The aim of this case report was to present an immediate implant placement of endosseous implant into unilateral enucleated incisive canal cyst area.

Case Report: A rare case of unilateral incisive canal cyst, located right maxillary anterior area is presented. A 43 year old male patient referred to our clinic for dental implant therapy into the right maxillary incisor area. The clinic and radiographic examination revealed an apical lesion associate with right upper central tooth. When it was applied the vitality test on the central incisor, tooth was devital. We decided to perform root canal treatment and apical resection of this tooth at the same time the implant placement. The lesion was diagnosed as an unilateral incisive canal cyst from the clinical and radiographic

findings. Following removal of the lesion, the histopathology examination confirmed diagnosed of an incisive canal cyst. Healing was followed up for 12 months clinically and radiographically.

Results: The surgical approach described may be used to achieve bone reformation to enable placement of dental implant without the addition of any grafting material. One-year follow-up showed complete healing and implant was osseointegrated and functional.

Conclusion: Immediate implant placement can be applied successfully into the enucleated cyst area when the complete removal of the cystic lesion is performed. By the way of this clinical approach clinicians may prefer immediate implant procedure as an alternative treatment option in cases presenting with cystic lesions.

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Comparison of initial implant stability measured by RFA

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The clinical manifestation of osseointegration is the absence of implant mobility. Resonance Frequency Analysis (RFA) is a non-invasive method to determine stability of implant during the healing period. The objective of this study is to compare initial implant stability measured by RFA between different implant systems during the initial healing period. Fifty-four patients (36 males/18 females) who had been treated at the Department of Periodontology, Chonbuk National University Dental Hospital. A total of 104 implants (Group A: 3i Osseotite®, Group B: Replace® select, Group C: ITI implant) were placed following the manufacturer's standard surgical protocols. Implant stability quotient (ISQ) readings were obtained for each implant at the time of surgery, 2-, and 4-month postoperatively.

No implant was failed during the observation period. At the baseline, the difference between mean ISQ values of 3 implant systems was statistically significant ($p < 0.05$). However, at 2-, and 4-month following implant surgery, no significant difference was observed between ISQ values of the implant systems. In the same implant, the ISQ values of Type B and C implants increased ($p < 0.05$), but those of Type A implants decreased during the 2-month healing period. The mean ISQ values of Type B and C implants showed an increasing tendency, while those of Type A implants were stable for the 4-month follow-up period.

Within limits of this study, it can be concluded that different design and surface treatment of implant systems might influence ISQ value and changing pattern during the initial healing period.

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The long-term evaluation of bone markers after dental implant treatment in renal osteodystrophy

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Introduction: The number of patients suffering from renal osteodystrophy (r.o.) is increasing. R.o. starts from the permanent release of the bone mineral, which stimulates activity of parathormone and finally bone turnover and bone resorption. During our earlier studies we observed in hemodialysed patients changes in cortical bone of the mandible, nevertheless within years the bone quality and quantity was sufficient for implant therapy. However ITI standards point the r.o. as a contraindication for this treatment, we have found a few patients in our clinical files suffering from r.o. and have had GTR and GBR methodology done with placement of dental implants several years before start of the disease.

The aim: of the work was to evaluate bone tissue markers in patients suffering from r.o. in time span of 5 years after implants therapy.

Patients and methodology: 85 patients suffering from renal osteodystrophy treated with chronic hemodialysotherapy and 5 patients 5 years after (17) implant installation were examined. The level of bone markers was evaluated in blood of all patients: parathormone, alkaline phosphates, deoxypirydynoline, and osteocalcin for bone loss prognosis.

Results: The evaluated markers of renal osteodystrophy were similar in all r.o. patients (also after implant therapy) and different from control values. Despite worsening of these markers no implant loss after 5 years period in patients suffering r.o was observed.

Summary: Analyzing the clinical and biological data of patients suffering from r.o. we found, that implant treatment 5 years after first symptoms of the disease has not changed their number and stability.

The bone markers, bone quality and quantity have changed, nevertheless in our opinion there are only relative contraindication for dental implant therapy ie. poor bone quality and quantity, high overgrowth of gingival tissue and very poor oral hygiene.

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Sinus-lift with biostite: a 10 year clinical and radiological follow-up

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New procedures in the treatment of edentulous areas of the jaws have been giving more options for implant supported restorations.

The posterior area of the maxilla often represents a challenging situation, either for the lack of alveolar bone or for the structural characteristics of the bone trabeculae. In this paper, is outlined a procedure for restoring the posterior maxilla, using a sinus lift graft material and an implant-supported prosthesis. The graft consisted of an alloplastic material, a resorbable material composed by hydroxyapatite, collagen and glycosaminoglycan (Biostite®, Gaba-Vebas, Italy). Biostite is a radiotrasparent material which becames radiopaque after the mineralization process of the graft during the healingperiod.

The clinical and radiological results were evaluated annually after the grafting procedure and implant placement. Between 1996 and 2005, 27 augmentations of the maxillary sinus floor with alloplastic material were performed and, at the same time, 49 implants were inserted in 27 non-smoking and generally good health conditions patients. The mean follow-up after implantation was 84 months (from 12 to 132 months): 7 years. At the second stage surgery and at the end of the prosthetic rehabilitation all the implants were clinically osseointegrated. The cumulative implant survival rate and the prosthetic success rate after 10 years were of 100%. The mean bone graft resorption after 84 months was 1.80 mm (from 0 to 4 mm).

The implant survival rate obtained and the stability of the grafts showed by radiological measurements and by clinical analysis demonstrated that Biostite® is a suitable material for sinus augmentation.

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Implants in periodontally compromised patients – prospects of success

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Insertion of dental implants has been controversial assessed for patients, who suffered from periodontitis. Risk factors such as infection with periodontal pathogens or reduced bone support are discussed. Therefore, the aim of this systematic review was to evaluate the long- term success of implant treatment in periodontal compromised patients on the basis of representative studies.

The Medline-database was scanned in September 2006 using mesh terms containing dental implantation, periodontal disease, and study design. Only human clinical studies published in English or German were considered in this investigation.

The search result revealed 651 potentially relevant entries. The majority of publications could be rejected alone due to title or abstract. Finally, only 8 studies corresponded to the defined criterion: at least 3-Year follow-up, precise period of examination, implantation in non-augmented bone regions, data of bone resorption, implant loss or survival rate). These investigations differed clearly according to study design and applied study parameters impeding comparability of results. Furthermore, considerable discrepancies appeared in defining implant success.

Generally, implantation in periodontal compromised patients has a good long-term prognosis, provided that a systematic periodontal treatment was accomplished before, stable periodontal conditions exist, proper oral hygiene, and maintenance treatment takes place on long-term basis. Nevertheless, implants in periodontitis susceptible patients seem to be at increased risk for the occurrence of periimplantatis and periimplant bone loss.

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Crestal bone changes around dental implants: Retrospective radiographic evaluation

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The aim of this study was to compare changes in marginal bone level in implants with the same fixture design but different implant/abutment connection systems (internal vs. external).

Subjects of this study were selected from patients who received implant operations at Seoul National University Dental Hospital, department of periodontology and had intraoral radiographs at three stages(at fixture installation(baseline), prosthesis delivery, and 1 year after loading). First, the distance from the fixture-abutment junction to the first point of contact of the marginal bone with the fixture was measured. Second, the area of the triangular zone between the implant surface and marginal bone crest was determined. Third, the angle between the long axis of the implant fixture and incline of the bordering alveolar bone was assessed.

Overall distance changes were -0.53 ± 0.71 mm in external connection type implants and -0.31 ± 0.58 mm in internal connection type implants, but there was no statistically signigicant difference. The changes in dimension showed a similar pattern to the changes in distance. The angle increased with time at both systems. However, there were no statistically significant differences.

The difference in amount of marginal bone loss after 1 year of loading between the two systems was not statistically significant in all measuring parameters. In conclusion, the bone reaction to the two implant connection systems was similar, with small mean marginal bone level changes over time. During the early healing period, the bone remodeling pattern deffered between the two systems, but the difference was not statistically significant.

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Immediate occlussal loading of osseotite implants in fully edentulous patients: 6 to 117 months results

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Immediate loading has become a frequently used protocol for loading multiple implants in both arches.

In this prospective investigation 92 consecutive cases were treated with 628 double acid-etched threaded implants since May 1998. Seventeen mandibular and twenty eight maxillary cases received screw-retained provisional prostheses the day of surgery. Twenty two mandibular and twenty five maxillary cases were immediately loaded 24 to 48 hours after surgery with the final screw-retained metal-ceramic or metal-resin prostheses. All 395 maxillary implants and 233 mandibular implants were utilized for immediate loading and were followed for a minimum of 6 months to a maximum of 117 months. Follow up consisted of both clinical and radiographic examination once a year and RFA measurements.

The cumulative success rate obtained was 99.05% (99% for maxillary implants and 99.1% for mandibular implants). Only two mandibular implants and four maxillary implants were considered failures. The bone level was measured from the first bone to implant contact point every year. The radiographic bone level change was 0.37 mm at the 1st year, 0.51 mm at the 2nd year, 0.69 mm at the 3th year, 0.71 mm at the 4th year, 0.81 at the 5th year month, 0.91 at the 6th, 1.18 at the 7th year, 1.26 at 8th year and 1.55 at the 9th year follow up. When RFA was performed after bone cicatrisation, only two implants results with an ISQ lower than 50 (n = 523).

It is concluded that a high success rate can be achieved when double acid-etched microtextured implants are immediately loaded with full arch prostheses in the maxilla and the mandible.

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Xenografts long-term resultsretrospective analysis

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Purpose: The aim of this study was to make a retrospective study of xenografts in humans at long-term follow-up, and the performance of the next variables: type of xenograft (porcine,-bovine,equine etc), particle size, anatomical site or use given, clinical and radiographic methods to control, reabsortion.

Material and methods: Literature review in Pub-med, MEDLINE, Cochrane database of terms xenograft, bone graft materials, success criteria and bone grafts, bone substitute materials, xenografts outcomes, xenografts long-term follow-up.

Inclusion criteria:

- Studies conducted in the last 5 years
- Studies in humans
- studies with a follow up of 2 years or more

Results: We identified a total of 40 articles for which we selected 18 studies that met the inclusion criteria. Of those extracted following results:

Type of used xenograft: Bovine, equine, porcine, phicogenic, and adittioned or mixed with concentrated platelets, autologenous bone, steam cells, morphogenetic protein venous blood, aspiration of bone marrow.

No references to particle size.

Anatomical studies sinus lift(8), crestal bone augmentation(4), post-extraction socket fill(3), implant dehiscences(2), bone periimplant defects(1).

Clinical and radiographic controls using: xenograft length control or bone volume control, bone densitometry, reabsortion material in images of TC, tridimensional TC.

Reabsortion rates: 3 months (0), 7 month (5%), 12 month (25%), 24 month (28%), 36 month (30%), between 48–80 month (30–33%), at last 120 month (40%)

Conclusions: We can improve the performance of the graft material with the addition of other derivative. It must take into account the percentage of reabsorption in the long term (40% at ten year follow-up) when it comes to scheduling the volume of graft needed for a surgical procedure. It can measure the graft resorption, and its variations: radiographs (only 2 dimensions) densities (grafting and bone), volumetric analysis using three-dimensional CT.

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Non-interventional study on a new bone level implant: preliminary results

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Objective: Criticism has been raised that clinical trials often do not reflect everyday clinical settings due to the careful selection of centres, patients, and treatment protocols. This non-interventional cohort study aims to document the success and survival rates of the new Straumann Bone Level Implant in daily dental practice for up to 3 years following prosthetic restoration.

Material and methods: More than 1,500 implants have been placed in close to 900 patients in more than 120 centres in 9 countries in Europe and North America. There is no given treatment protocol, all patients have been treated according to their needs, utilizing the new implant in all approved indications.

Results: Although the majority of patients displayed very good periodontal conditions, 39.4% of the collective had a dental risk factor and 17.7% had a systemic risk factor. The implants have been used in all tooth positions, with various different surgical and healing procedures and loading protocols and with almost every type of prosthetic restoration. Country specific treatment preferences have been noticed. Up to Feb. 2008, more than 1,100 implants have been in-situ for at least 6 months. Only 10 implants have been reported as lost, while another 9 implants were unsuccessful according to the defined success criteria (Buser et al. 1992).

Conclusion: In a clinical daily practice setting, used in all approved indications and subject to various treatment protocols the new bone level implant achieves very good results, comparable to results achieved in clinical trial settings.

This project has been partly funded by Institut Straumann AG, Basel, Switzerland.

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Long-term evaluations of branemark implants placed on augmented maxillary sinus

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Purpose: This study retrospectively evaluated the prognosis and cumulative survival rate of maxillary sinus augmentation using the lateral window approach and compared the related factors over a 10-year follow up.

Material and methods: Between May 1997 and May 2007, 64 sinus augmentations using lateral window approach was performed by simultaneous or delayed implant placement. 131 Brånemark® implants were placed in 61 patients. The cumulative survival rates of the implants were calculated. The following factors were evaluated statistically using chi-square analysis: surgical sites, simultaneous vs. delayed, bone graft materials, bone quality and quantity, implant system, membrane, diameter and length of the implant.

Results: The 10-year cumulative survival rate was 96.18%. There was no difference in the survival rates of the implants between the simultaneous placement and delayed placement. The survival rate was similar regardless of the type and amount of graft materials used. There was no difference in the survival rate according to the implant site and bone quality and quantity. The survival rate was similar when CollaTape® or Gore-Tex® was placed in the window of the lateral wall. There was no statistically difference in the survival rate regardless of the implant length and diameter.

Conclusion: Implant placement with sinus augmentation using the lateral window approach was highly predictable treatment. The normal implant survival rate is expected if complications are prevented.

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Implants in conjunction with removable partial dentures: 10 year follow-up

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Objectives: The purpose of this longitudinal, large-sample study was to evaluate the treatment outcome of removable partial dentures (RPDs) in partially edentulous patients treated with dental implants as additional strategic abutments.

Material and methods: Seventy-eight partially edentulous patients with 132 dental implants in conjunction with RPDs participated in this study. Treatments were followed-up for a period of up-to10 years (3–10). The prosthetic elements that were used with the implants to support the RPDs were ball attachments, telescopes and bar connections. All patients were followed up every 6 months. The presence of clinical signs of mobility and gingival inflammation around implants and teeth was evaluated. Prosthetic complications ans patient satisfaction were evaluated.

Results: During the follow-up period, only 5 implants failed resulting in 96.2% implants success rate. During this period, prosthetic complications were minor without affecting the prostheses function. No significant clinical signs of mobility or gingival inflammation around implants and teeth were reported. Patients reported good chewing ability and stability of the prosthetic devices. The analysis of the costs of implant with RPDs (IRPDs)compared with implant-supported FPDs showed that patients save more than 50% on treatment costs when IRPDs are used.

Conclusions: On the basis of this longitudinal, large-sample clinical study, the following conclusions were drawn: 1) successful function over a prolonged period and a minor complication rate of implant-tooth-supported RPDs may be anticipated 2) the great variety of treatment modalities offered by tooth-implant-supported RPDs, appears to be useful as a treatment option for the partially edentulous patients.

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Method and results in harvesting mandibular bone block grafts

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Since 25 years mandibular bone block grafts are harvested using the MicroSaw (Dentsply Friadent, Mannheim, Germany). With the MicroSaw handpiece two vertical cuts are made in the retromolar region which are connected basilary with the contra-angled handpiece and next to the crest with holes made with the drill. Connecting the holes with a chisel the bone block can be luxated to the buccal.

Between 1982 and 2006 a total of 5964 autogenous bone block grafts were obtained using the MicroSaw from the retromolar area (n = 4831/75%), symphysis region (n = 716/12%) and edentulous ridge segments (n = 417/8%). In addition to clinical palpation of the donor site a panoramic radiograph was used to map the individual anatomy before the bone block preparation. Lateral cephalometric radiographs were used additionally for donor site assessment when grafts were harvested from the symphysis region. Volumetric measurements of the grafts were made and parameters such as lip and soft tissue sensibility, vitality of teeth, wound healing and clinical complications inspected.

Volumetric measurements of the grafts showed that the average graft volume harvested from the chin was 2.7 cm^3 as compared to 2.0 cm^3 from the retromolar area and 1.6 cm^3 from edentulous ridge sections of the mandible. The intra- and postoperative complication rate of harvesting grafts from the retromolar area was 0.5%, lesions of the inferior alveolar nerve did not occur. No complications occurred when bone was obtained from edentulous ridge segments of the mandible. The complication rate in the chin region was 9.5%, mainly anaesthesia and paresthesia of the lower anterior teeth for more than 6 months after surgery.

The data and experience described of this 25-year analysis indicates that the described diagnostic protocol and surgical procedure allowed efficient and safe bone block harvesting from intraoral mandibular sites. An injury of the mandibular nerve seems to be unlikely when the osteotomy is within the retromolar area. If big bone blocks should be harvested including the area of the ramus, the distal osteotomy should be made only with half of the cutting depth of the diamond disc because the position of the nerve might be more superficial.

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Non-invasive long implants in edentulous patients with atrophied posterior maxilla

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Atraumatic placement of long dental implants in the bone between maxillary sinus and nasal cavity was carried out in edentulous patients with atrophied posterior maxilla. From September 1995 to August 2006, a total of 435 implants longer than 13 mm were placed in the maxillary premolar and/or molar areas of 168 patients without any invasive surgery such as sinus floor elevation or bone augmentation. The bone was less than 7 mm in height in 126 implant sites of 82 patients. In 23 implant sites, the height was less than 3 mm. After a healing period of at least six months from the fixture installation, abutments were connected on the osseointegrated implants, and fixed prostheses were retained with screws. There was minimal postoperative swelling and pain after implant placement, and no infectious disease or sinusitis was reported. The patients were followed up for a period of one to eleven years after prosthetic reconstruction. 214 hydroxyapatite (HA) coated implants (Steri-Oss, USA), 103 titanium implants with acid-etched surface (3i, USA), and 115 of 118 titanium implants with machined surface (Nobel Biocare, Sweden) survived. The cumulative survival rates were 100% (HA), 100% (acid-etched), and 97% (machined). Atraumatic placement of long implants in patients with edentulous posterior maxilla is a revolutionary concept in implant dentistry. This procedure is more successful, safer, simpler to perform, less expensive, requires less time and has fewer complications compared to other invasive surgeries such as fenestrated sinus lift, bone augmentation and zygoma implant.

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A retrospective multicenter analysis of the mis seven implants in clinical practice

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Purpose: To evaluate clinical performance of MIS seven implant followed for at least 6 months after occlusal loading.

Material and methods: A retrospective multicenter analysis of 92 records of patients who treated with MIS seven implant at Daegu Catholic University hospital, Sun Dental Clinic and Seo-Mun Dental Clinic in South Korea was performed from November 2004 through December 2006. Implants had to have full occlusal loading for at least 6 months.

Results: A total of 294 MIS seven implants were placed in 92 patients. Patients ages ranged from 27 to 71 years old (mean age, 42 years old). Differences of implants survival among different implant locations and bone quality were observed. The overall survival rate of MIS seven implants was 97%. The overall success in the maxilla was 96%. In the mandible, the overall success was 99%. Of all implants, 7 were lost in the maxilla and 1 were lost in the mandible. In the maxilla most failures happened after maxillary sinus floor augmentation (4%). In normal bone, from 54 implants, 1 was lost(98% success). In regenerated defective bone, from 240 implants placed, 7 implants were lost(97% success).

Conclusion: The results show that the MIS seven implant placed either in normal or augmented bone will achieve satisfactory clinical performance under function over time.

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Prosthetic rehabilitation of edentulous patients with fixed and retrievable dentures

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This retrospective clinical study analyzed the long-term success of fixed and removable implant-retained prostheses in edentulous patients.

Retrospective evaluation of 223 edentulous patients with a total of 1624 implants over a mean period of 5.8 yrs (range 1.5–10.9 yrs.) was performed. The collective showed an average age of 63 years, 97 were male and 126 were female. Exclusion criteria were not explicitly formulated. 85% of the patients were edentulous in both jaws, 9% in the mandible and 6% in the maxilla. 35% of the patients smoked tobacco. 20% of the patients had undergone surgical treatment of oral cancer prior to implant placement, of these 6% were irradiated. Implant placement was accomplished according to a standard protocol. Implants were considered successful when fulfilling the Buser-criteria.

In 80% of the patients bone quantity was not sufficient, augmentative procedures had to be performed. In 20% iliac bone grafts were used, 3% received fibula grafts. All other grafting procedures included local bone grafts and heterologous material, 20% of the grafting was performed as a sinus lift. 24% of the patients were restored with fixed dentures in the maxilla, and mandibula. 76% of the patients received retrievable prostheses supported by a bar or telescopic denture. A success rate of 94.2% was determined, 5.8% of the implants failed. A statistical significant influence of the prosthesis or gender was not detectable.

Both forms of prosthetic rehabilitation show equivalent long-term results in regard to the success rate of the implants.

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Development of stability during healing of immediately loaded dental implants

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Objectives: To identify the progress of stability of immediately loaded screw-form implants four months after their insertion into the interforaminal region depending on primary stability.

Methods: Five hundred and twenty-eight Impladent® STI-Bio-C implants (Lasak, Prague, Czech Republic) were inserted interforaminaly over 39 months and immediately loaded. Stability was measured using an Osstell device (Integration Diagnostics AB, Sweden) at the time of 1st stage surgery and after 4 months of function. The final torque during the implant insertion was recorded. The implants were divided into 2 groups according to changes (increase or decrease) in their stability during the evaluation period.

Results: The average torque for both groups was 61.8 and 62.1 Ncm respectively ($P > 0.05$). Three implants did not osseointegrate; the success rate was 99.4%. The implants with a high primary stability (ISQ 73.6 $\pm$ 4.4) showed significant downtrend of their stability (toward 67.8 $\pm$ 5.2), whereas the implants with a low primary stability (68.3 $\pm$ 4.6) exhibited significant growth of their stability (toward 74.0 $\pm$ 4.6). Resulting from the linear regression analysis, the primary stability ISQ = 69 was not affected during healing.

Conclusions: Within the limits of the study, the implants with higher primary stability lose part of their stability during healing, while the implants with lower primary stability gain their stability. The primary stability, which maintains without any change during the healing period, represents the value 69 of the ISQ.

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A 5 year-retrospective study of survival rate in single bränemark tiunite implant

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Background: TiUnite™ is a highly crystalline and phosphate enriched titanium oxide surface which has a unique porous surface structure. This improved implant surface enhances bone response and reduces healing period. It also assures early stability of implant. These help to increase the success of implant. The aim of this study is to evaluate the survival rate of TiUnite™ surfaced single implant.

Material and methods: A retrospective analysis of 248 TiUnite™ surfaced implants replacing a single tooth was assessed according to their dental record. The age of the patients ranged from 17 to 82 years (mean age: 48.6 $\pm$ 12.5). Data were recorded regarding the survival rate of these implants.

Results: 129 implants (52%) were placed in the maxilla, and 119 (48%) in the mandible. Over 79.8% were placed in the posterior area. Of the placed implants, 34% were the wide type, while 58% were the regular type and only 8% were of the narrow type. The single implants produced an overall clinical survival rate of 95.2% over the observation period (mean 26 months). Among 248 implants, 12 implants were removed and one implant was submerged.

Conclusion: According to these data, TiUnite™ surfaced implant showed successful results when replacing single tooth in a single tooth although this study was done in a short term period.

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Comparison of peri-implant tissue according to the amount of keratinized attached gingiva

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Objective: The purpose of this study is to evaluate the effect of keratinized attached gingiva on peri-implant tissue and find out the role of implant surface characteristics and bone graft to maintain the adequate level of attached gingiva.

Methods: Three hundred and eight implants with 5 kinds of surface characteristics were placed and accompanied by bone graft in 76.6% from Jun, 2003 to Sep, 2005. The responses of peri-implant tissue according to the level of attached gingiva were observed in terms of gingiva index, plaque index, pocket depth, gingiva recession and alveolar bone resorption through 14 months follow-up.

Results: Gingiva recession was significant in deficient group of attached gingiva rather than sufficient one ($p < 0.05$), while there was not significant difference in gingiva index and plaque index between two groups ($p > 0.05$).

Neither implant surface characteristics nor bone graft had significnat effect on the maintenance of adequate level of attached gingiva ($p > 0.05$).

Conclussion: Adequate level of attached gingiva is more favorable for the prevention of gingiva recession and alveolar bone resorption, but neither implant surface characteristics nor bone graft have play an important role in the maintenace of the level of attached gingiva.

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Prefabricated telescopic restorations for immediate occlusal loading in the maxilla

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Background: Immediate occlusal loading in the edentulous maxilla has not been well documented in the international literature.

Objectives: The aim of this study was to evaluate the survival rate of immediately loaded, telescopic retained, implants in the maxilla.

Methods: In 51patients (15 male, 36 female; age: 62.12 ± 7.68 years) with edentulous maxillae 227 implants (4–6 implants per jaw) were placed and loaded immediately. 62 implants were placed in fresh extraction sockets. All implants were inserted at least 1 mm below the buccal plate (range 1–3 mm). The selected implant system had a progressive thread design, platform switching and sandblasted/acid etched surface (Ankylos®, Friadent-Dentsply). Prefabricated telescopic abutments (SynCone®; 4 or 6 degrees angulation) were connected with the implants in the entire loading period. The implants were splinted together with implant-supported overdentures via conical copings and loaded immediately after placement. Clinical and radiographical examinations were performed in order to evaluate the condition of periimplant hard and soft tissues once per year.

Results: 9 implants failed in 7 patients with 4 implants per jaw (6.25% failure rate), 2 implants in 2 patients with 6 maxillary implants (4.17% failure rate). This represents a survival rate of 95.15% after a loading period of 31.10 ± 18.30 months). The cresta bone levels showed stability over the entire loading period.

Conclusions: We concluded that the immediate occlusal loading in the edentulous maxilla using telescopic retained implant-supported prostheses seems to be a successful treatment concept with predictable long term clinical outcome.

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A prospectİve, controlled, randomized, multicenter study: short vs standard implants

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Objectives: The use of short implants hasn't reccomended because it's believed that occlusal forces must be dissipated over a large implant area. Finite element modeling analyses have shown that occlusal forces are distributed primarily to the crestal bone rather then throughout the entire surface of implant. Objective of our study is to evaluate 2-years results of short implants (6 mm) in posterior single tooth replacement.

Material and methods: Our 2-years controlled, randomized and multicenter clinical study evaluated the survival and clinic-radiographic results of Straumann® SLA short implants in posterior single tooth replacement. The project include 60 implants: 30 test (6 mm long) and 30 control (10 mm long) in 49 patients. Among 30 test implants, 9 were placed in the maxilla and 21 in the mandible; among 30 control implants, 17 were maxillar and 13 mandibular implants.

Results: Three test (9.9%) and one control implants (3.3%) were lost: three before loading and one test implant was lost after 2-year loading. Test implants insertion torque was: ≤ 15 Ncm in 18 implants, between 15 and 35 Ncm in 6 and ≥ 35 Ncm in 5; control implants insertion torque was equally divided. At 2-years control no complications and bone loss differences between test and control group were registered.

Conclusion: Short implants (6 mm) may be considered a good alternative to longer implants. Clinical results were good in spite of low values (≤ 15 Ncm) of insertion torque in 28 implants. These 2-year values will be completed with values and registrations of 3 and 5-years follow-up.

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Peri-implant bone resorption in irradiated versus non-radiated mandibular bone

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Objective: To assess the rate of marginal bone resorption around mandibular dental implants placed in patients who have received a high dose radiation therapy and in non-radiated tumour patients.

Material and methods: Radiologic follow-up 1 to 3 years was carried out in twenty-nine patients. Briefly, sixty-three implants were placed in twenty patients who had previously undergone external radiation therapy due to advanced head and neck cancer. The radiation dose varied from 45–65 Gy. Thirty-two implants were placed in nine patients with wide-spread ameloblastomas of the mandible treated with local resection. The radiologic status was registered with narrow-beam radiography (Scanora®, Orion Diagnostics) at the baseline and 1- and 3 years after the start of loading. The marginal bone level was measured per implant at the mesial and distal sites using a magnifying scope.

Results: One implant in a non-radiated group was lost during the third year of loading. In addition, four patients passed away during the follow-up. Thus, 43 implants in the irradiated group and 27 implants in the non-radiated group were followed up to 3 years.

	The Mean resorption	
	1 year	3 years
Irradiated patients	0.34 mm (CI – 95% 0.23–0.45)	0.32 mm (CI 0.19–0.45)
Non-radiated patients	0.08 mm (CI 0.02–0.14)	0.29 mm (CI 0.16–0.42)

Conclusions: The early marginal bone resorption around implants placed in irradiated crest seems to be more rapid than around implants placed in non-radiated patients. On the long-term, the resorption tendency in radiated patients seems to cease without compromising the implant survival.

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Clinical and radiographic evaluation of seven® implants – preliminary results

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Aim: The aim of this paper is to present the preliminary results of an ongoing, clinical and radiographic, study regarding

osseointegration rate and peri-implant bone level changes of Seven® implants (Medical Implant System, Shlomi, Israel).

Material and methods: 684 patients (336 male, 348 female), with no medical history, participated in the study, so far. In total, 2450 implants were placed. The diameter of the implants was: a) 3.75 mm, 463 implants (18.90%), b) 4.2 mm, 1109 implants (45.27%), c) 5 mm, 878 implants (35.84%). The length of the implants was: a) 8 mm, 293 implants (11.96%), b) 10 mm, 744 implants (30.37%), c) 11.5 mm, 731 implants (29.84%), d) 13 mm, 682 implants (27.84%). 1196 implants (48.82%) were placed in host bone and 1254 implants (51.18%) in augmented bone (with guided bone regeneration methods). The evaluation period was 6–36 months. All patients had a detailed clinical and radiographic examination every 3–6 months.

Results: Osseointegration was achieved in the great majority of the cases examined (2438 implants, 99.51%) ($p < 0.001$). Only 12 implants failed to osseointegrate (0.49%). Out of them, 7 implants were placed in augmented bone and 5 implants in host bone ($p > 0.05$). Marginal bone loss around implants ranged from 0.08 mm ($\pm$ 0.05) in cases of host bone, to 0.11 mm ($\pm$ 0.06) in cases of augmented bone ($p > 0.05$). Peri-implantitis was revealed in 63 implants 2.57%), mostly after the 24th month (53 implants, 84.13% in this group).

Conclusions: a) the preliminary results of this study showed exceptional osseointegration rate (99.51%), b) the application of bone regeneration methods, prior or in conjunction with implant placement, does not seem to interfere with osseointegration, c) marginal bone loss around implants was minimal, d) no statistical significant differences were observed regarding the sex and age of the patients.

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Periimplant bone level around implants with platform-switched abutments

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Objectives: The purpose of this clinical trial was to evaluate, if the crestal bone height around dental implants could be influenced using a platform-switch protocol and if the bone levels remain stable within one year after final prosthetic reconstruction.

Material and methods: 37 patients were treated with fixed implant retained prosthesis. 68 implants were supplied with platform-switched abutments and served as test group. 23 implants were reconstructed with conventional abutments and formed the control group. Standardized digital radiographs were taken for evaluation of marginal bone levels at the time of installation of the restoration and at 1-year follow-up. Marginal periimplant bone levels were assessed using digital image analysis.

Results: The mean values of crestal bone loss at baseline were 0.09 $\pm$ 0.6 mm for the platform-switched implants and 1.8 $\pm$ 0.5 mm for the non-platform-switched implants. One year after final restoration mean value of crestal bone loss were 0.26 $\pm$ 0.5 mm for the test group and 1.92 $\pm$ 0.5 mm for the control group. When tested with ANCOVA, the differences were statistically significant for baseline and for follow-up ($p \leq 0.0001$). Mean bone loss from baseline to 1-year follow-up was 0.12 $\pm$ 0.4 mm for the test group and respectively 0.27 $\pm$ 0.4 mm for the control group.

Conclusion: The use of abutments with reduced diameters in relation to the implant diameter seems to be able to preserve periimplant bone level.

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Success of non-submerged, early-loaded implants and prostheses: retrospective study of 7-year follow-up

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The use of osseointegrated implants as an endoestal anchorage device to provide support for dental prostheses is a reliable and widely accepted treatment modality.

The purpose of this study was to evaluate the clinical performance of non-submerged implants.

A total of 1032 implants were placed in 294 patients (140 women, 154 men, mean age 45). The cases were examined retrospectively in order to evaluate the clinical efficiency of non-submerged implants and to determine the success rate of implant retained/supported prosthesis after a 7-year period. All implants were assessed clinically and radiographically on a yearly basis.

The 7-year cumulative success rates for implants were 98.8%, respectively. The most common prosthetic complication was abutment accompanied by screw loosing.

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Parameters influencing bone resorption around dental implants

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Aim: This prospective study evaluated marginal bone resorption in relation with several implant characteristics, such as length, diameter, supported rehabilitation, insertion torque, bone quality, implant site.

Material and methods: A total of 97 implants (Nobel Replace® Select, Nobel Biocare) were placed in 43 patients. They were rehabilitated only for single teeth replacement or partial rehabilitation, following delayed loading protocol. A surgical form was filled during surgical phase, reporting implant and bone characteristics. Bone level evaluation was assessed by image

software (Image Tool® 3.0, UTHSCSA), analyzing intraoral radiographs obtained through individual positioning device.
Results: Cumulative implant survival rate of evaluated implants was 95.84% after three years of follow-up. Marginal bone loss averaged 1.04 ± 0.24 mm at 6 months, 1.36 ± 0.41 mm at 12 months, and 1.43 ± 0.4 mm at 24 months and 1.59 ± 0.6 mm at 36 months evaluation. No significant statistical differences ($p < 0.05$) in marginal bone loss was recorded by considering parameters such as implant diameter, length and insertion torque, but significant difference were recorded by comparing implant sites (upper jaw vs lower jaw, anterior vs posterior), type of supported rehabilitations (single crown or bridge) and bone qualities (Lekolm & Zarb's classification).
Conclusions: This study suggests that several implant and site parameters can influence marginal bone resorption. Data are in accordance with Literature findings, and confirm viability of Replace® implant system in the long-term period. Accurate parameters evaluation might lead to modify operative protocols in order to reduce bone resorption.

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Immediate loading in expanded platform implants in maxilla and madible

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Purpose: The aim of thisstudy was to report on our experience and outcomes with Certain Prevail Implants with immediate loading in mandible and maxilla during 2 years follow-up period.
Material and methods: Over 2 year evaluation period, 212 (112 maxilla, 100 mandible)expanded-platform implants were placed in 18 patients (15 females, 3 males; 55.97 ± 7.25 years). Resonance frecuency analysis (RFA) was measured on the day of placement and at 3, 12 and 24 months. All prostheses were screw mounted on standard abutments. The follow-up time varied between 3 up to 24 months.
Results: 6 maxillary implants (2.8%) failed during final prosthetic placements. The RFA (ISQ) measurements for 4 mm-diameter implants were: 74.96 ± 5.42 at day 0; and 76.13 ± 5.0 at 24 months. The same RFA (ISQ) for 5 mm-diameter implants was: 75.17 ± 3.48 at day 0; and 76 ± 7.77 at 24 months.
Discussion: Peri-implant soft tissue condition, bone resorption, and ISQ values indicated satisfactory results. The cumulative implant survival rate during the follow-up period was 97.8%.
Conclusions: Immediate loading on expanded platform implants is a reliable and effective technique for edentulous patients in the maxilla and mandible with 0.1 mm bone resorption after 2 years follow-up.

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Bone level changes in single tooth implants

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Aim: The objective of this study was to retrospectively analyze the marginal bone loss in single tooth implants.
Methods: Inclusion criteria were 1) missing single tooth with the presence of adjacent dentition, 2) minimal mesiodistal space on the top of the bone crest 6.0 mm (range 6–12 mm). 26 Patients received 32 Ankylos Plus implants (Dentsply, Friadent, Mannheim, Germany) in healed sites. Implant length ranged from 8 mm to 14 mm. The implant diameter distribution was: 62,5% of ∅ 3.5 mm, 31.25% of ∅ 4.5 mm and 6.25% of ∅ 5.5 mm. All implants were inserted at least 1 mm below the vestibular plate. Marginal bone level using standardized periapical radiographs were evaluated at the implant loading, 6, 12 and 24 month later. Before II stage surgery, soft tissue thickness was clinically measured and all complications were noted.
Results: 1 implants was removed 3 weeks after implantation. After 3–4 months of submerged healing, all other implants were osseointegrated and were loaded with cemented crowns. After at least 24 months of function (24–32 months), no implant was lost and the cumulative survival rate was 97%. Radiographic mean bone loss evaluating both interproximal surfaces was 0.48 mm (range 0.35–1.43 mm). Only 12% of the sites showed a crestal bone loss > 1 mm.
Conclusions: the implant-prosthetic replacement of single tooth implant has proved to be a predictable treatment. The characteristic design of the implant-abutment connection produces a not relevant microgap and significantly influence the peri-implant soft tissue and bone level stability. In case of thin gingival tissue, we can expect crestal bone loss in the process of biologic width formation.

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Immediate non-occlusal loading in partially edentulous patients

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Aim: To report the efficacy of immediate non-occlusal loading in partially edentulous patients.
Methods: 63 Ankylos implants (Dentsply,Friadent,Mannheim,-Germany) were inserted in 32 partially edentulous patients (18 Female,14 Male). Age at implants placement ranged between 22 and 64 years (mean 39.9 years). 21 implants were loaded with single crowns in anterior Maxilla, 42 implants with 10 bridgework. The total number of units replaced was 79. Implants in the mandible and in the maxilla were 23.8% and 76.2% respectively. 26 implants were placed consecutive to tooth extraction. Implant length ranged from 9.5 mm to 14 mm. All implants were immediately restored with acrylic non-occluding temporary restoration. 2 months nutritional limitations are advised.

After 3–6 months full occluding restorations were provided. Patients were scheduled for follow-up at 6 months, 1 year and annually. mPlI, mSBI, standardized periapical radiographs, technical complications and patients satisfaction were recorded.

Results: 1 single implant restoration was removed for mobility five weeks after placement. 1 implant supporting bridgework in Maxilla was removed 9 months after placement. After a total observation period of 24.6 months (range 12–39 months) the overall survival rate was 96.8%.

All implants presented a healthy peri-implant soft tissue conditions (mSBI > 1; mPlI>1), and stable gingival contour. Radiographic mean bone loss evaluating both interproximal surfaces was 0.56 mm (range 0.34–1.63 mm). No technical complication occurred. All patients appreciated treatment modality,1 patient was not satisfied with the aesthetic.

Conclusions: Implants can be successfully loaded immediately in partially edentulous patients.

The implant design and surface make a significant contribution to the primary stability of the implant.

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Survival rate of short implants in oral rehabilitation

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Objectives: The aim of the present clinical study was to report the clinical performance and survival rate of short implants with at least 1 year of function.

Methods: In this prospective study 29 consecutive patients treated with at least one short implant (8 mm) were enrolled. A total of 87 Ankylos implants (Dentsply, Friadent, Mannheim, Germany) were inserted. Implant length ranged from 8 mm to 14 mm. 33 (37.9%) were short implants. Clinical and radiographic parameters, patient' satisfaction, and technical complications were recorded.

Results: After 10 days of implantation, one short implants was removed in posterior mandible for suppuration. After conventional submerged healing period all others implants were osseointegrated. 19 implants were loaded with single crowns, in particular 9 of them were short implants. 42 implants with 19 bridgework, 21 implants to support 3 full arch bridges and 4 implants to retain 2 ball-attachment denture in mandible. During a total loading period of 18,4 months (range 12–30 months), no implant was lost. The majority of implants presented healthy peri-implant soft tissue conditions (mPlI = 1, mSBI>1). Radiografic mean bone loss evaluating both interproximal surfaces was 0.58 mm. No significant differences was found in clinical and radiographic parameters between short implants and all others implants.

Conclusions: The prognosis of short implants is comparable with that of long implant. Implant-prosthetic treatment using short implants instead of performing extended augmentation procedures before installation of long implants might be considered as an alternative treatment options.

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Immediate loading with overdenture in the edentulous jaws: long-term results

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Aim: To evaluate clinical efficacy of immediate loading with overdenture retained by prefabricated conical copings in the edentulous jaws.

Methods: A total of 336 Ankylos implants (Dentsply, Friadent, Mannheim, Germany) were placed in 39 edentulous mandibles and in 45 edentulous maxilla (four implants in each jaw) and immediately loaded. Implant length ranged from 9.5 mm to 17 mm 76 patients (mean age 61 years) were monitored in this study. Eight patients received the same treatment in both jaws. Following surgery all implants were connected with prefabricated conical abutments, that are manufactured with a precise fit to secondary conical copings. These prefabricated copings are polymerised into denture base directly in the mouth of the patients. Clinical and radiographic parameters, patient' satisfaction, and technical complications were recorded.

Results: 2 implants in the mandible and 4 implants in the maxilla were removed during observation period and could be successful replaced but are not included in our statistics that lead to an implants cumulative survival rate of 98.2% (mandible 98.7%, maxilla 97.8%), the prosthesis survival rate was 100%. After a total observation period of 30 months (range 18–72 months) all other implants presented healthy peri-implant hard and soft tissue conditions (mSBI > 1; mPlI = 1). Radiographic examination showed an excellent bone healing and stable bone level. Five patients were not satisfied with aesthetic; all other appreciated function, aesthetic and retention of the restoration.

Conclusions: Basing on the present long-term data it was concluded that four implants with high primary stability, may support immediate loading in edentulous mandible as well as in edentulous maxilla.

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Prefabricated conical copings for implant-supported overdenture in edentulous maxilla

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Aim: To present the technique and outcome of prefabricated conical copings to retaining the implants-supported maxillary overdenture.

Methods: 21 patients (13F, 8M) with edentulous maxilla were included in this study. 4 Ankylos implants (Dentsply, Friadent, Mannheim, Germany) were placed in each maxilla. At the implant placement, patient mean age was 67 years (range 48–82 years). No augmentation was used, only remaining bony structures. 5 implantations were performed with flapless technique.

Panoramic radiographs, mSBI, mPlI, technical complications and patient satisfaction in different time intervals were recorded.

Sinus penetration of 2–3 mm was tolerated and occurred in 6 implants.

Result: After 4–6 months of submerged healing all implants were osseointegrated from clinical and radiographic point of view. Prefabricated conical abutments and secondary copings were selected for retaining the overdenture. These prefabricated copings are polymerised into denture base directly in the mouth of the patients. After 2 months of function one implant was lost but it did not affect the denture. The implant was successful replaced but is not included in our statistics that lead to an implant survival rate of 98.8%, after total observation period of 20,4 months (12–49 months). Perimplantitis were not observed (mSBI > 1; mPlI = 1). Radiographic examination showed an excellent bone healing and stable bone level. The patient's acceptance on function and aesthetic on this restoration was high.

Conclusions: Conical anchorage of implant supported removable denture is a good alternative to bar solutions as it offers splinting effect but with supreme hygiene and reduction of treatment time and costs.

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A retrospective analysis of implants placed in the irradiated mandible

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Objective: To evaluate the long-term success and efficiency of mandibular implants in irradiated and non-radiated tumour patients.

Material and methods: Forty-four patients, who had previously undergone surgical resection of the jaws or surrounding soft tissues were included. Thirty-two patients with advanced head and neck cancer had received pre-(26) or postoperatively (6) high-dose radiation therapy in the implantation field (range 65–45 Gy), whereas 12 patients had due to malignangy or widespread benign tumour local resections, only. One-hundred-twenty implants were placed in irradiated patients and 33 implants in non-radiated patients. Hyperbaric oxygen was applied if the radiation dose exceeded 60 Gy.

Results: All 153 implants were osseointegrated. In the irradiated group, one patient died before loading, 5 patients during the follow-up and one couldn't tolerate the prosthesis due to extreme xerostomia. Complications included soft tissue necrosis (1), delayed soft tissue healing (5) and one implant loss. In the non-radiated group, one implant was lost. The mean marginal bone resorption in the irradiated and non-radiated groups after 3-years follow-up was 0.32 mm (CI 0.19–0.45) vs. 0.29 mm (CI 0.16–0.42). Thus, after 5-years mean clinical follow-up (range 1–16 yrs), the survival and success rates of the loaded implants in the irradiated group were 99.2% and in the non-radiated group 97%, respectively.

Conclusions: In spite of delayed soft tissue healing, implants placed in the irradiated mandible show excellent long-term prognosis and most patients can be rehabilitated adequately.

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Clinical outcome of immediately loaded BTI dental implants bioactivated with PRGF

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Objectives: The aims of this study were to describe a procedure for immediate loading of dental implants, to evaluate the long-term survival rates of 1139 immediately loaded dental implants (BTI implants, Biotechnology Institute BTI, Vitoria, Spain) and to analyze the influence of different items on implant survival.

Methods: A retrospective cohort study design was used. 241 patients received 1139 immediately loaded implants during the years of 2001–2005 in Vitoria, Spain. All implant installations were performed by one experienced surgeon and rehabilitations were done by 4 prostodontists. Each implant failure was carefully analyzed. The potential influence of demographic factors, clinical factors, surgery-depending factors and prosthetic variables on implant survival was studied. Implant survival was analysed using a life-table analysis.

Results: The overall survival rates were 99.3%, 96.8% and 96.9% for the implant, surgery and patient-based analysis respectively. The mean follow-up period was 28 ± 15 months. A total of 5 out from 1139 implants were lost during the observation period. None of the variables studied resulted to be statistically associated with implant failure.

Conclusions: Based on these results, the procedure described for immediate loading of implants can be considered safe and predictable if used under strict clinical protocols.

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Comparison of primary stability between immediate and delayed/mature implants using resonance frequency analyses

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Introduction: Patients often demand an esthetic and fast implant treatment. These demands are highly expected after tooth extraction. Therefore, immediate implant placement can be an excellent treatment option in this type of situations. However, implant stability in fresh extraction sockets may be compromised due to lack of implant engangement into the bony walls. If a delayed approach is chosen, and tooth extraction site is left to heal and mature, primary implant stability should be expected.

Objective: Measure and compare the primary stability of immediate implants (II) and delayed/mature (DI) implants placed into the maxillary bone and determine the factors that affect the implant stability quotient (ISQ) obtained with resonance frequency analysis.

Material and methods: Implant stability (ISQ), was measured in both groups (II and DI) at implant placement (ISQ0), at 3 months (ISQ3) and at 6 months (ISQ6) by Osstell Mentor.

Results: There were no significative differences between ISQ0, ISQ3 and ISQ6, and also there was no significative between the two groups.

Conclusions: A good planning of the case, an adequate surgical technique and primary stability are the requisites for the success of immediate implants.

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Survival of small-diameter implants compared with standard-diameter implants

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Implants with small-diameters may be used where bone width is reduced but sufficient vertical bone height is available, or in single-tooth gaps with limited mesio-distal space, such as for the replacement of frontal and lateral maxillary or mandible incisors. The purpose of this study was to compare the prognosis of narrow implants (2.8–3.8-mm-diameter) to standard (3.8–4.5-mm-diameter) implants.

Over 24 month period, 102 narrow and 174 standard implants were inserted in 62 patients to support partial fixed prostheses and single-tooth crowns. Clinical and radiographic assessment data were provided. 2 (1.96%) out of 102 narrow implants failed, 1 in the maxilla and 1 in the mandible and 5 (2.9%) out of 174 standard implants failed. Cumulative survival and success rates were calculated with life-table analyses processed by collecting clinical and radiographic data. For narrow implants, the cumulative survival rate was 97.7% for the maxilla and 97.2% for the mandible. Standard-diameter implants showed a cumulative survival rate of 97.8% in the maxilla and 97.5% in the mandible. Cumulative survival and success rates of small-diameter implants and standard-diameter implants were not statistically different ($P > 0.05$).

We suggest from these results, that there seems to be no difference between narrow and standard diameter implant-types regarding the osseointegration. An important advantage seems to be, that by using a small-diameter implant on patients with reduced bone width, dental practitioner can forgo a lateral augmentation.

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Periimplant bone and soft tissue stability after lateral ridge augmentation

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In a retrospective clinical long term study, the periimplant bone and soft tissue stability after lateral ridge augmentation exclusively with BioOss®/BioGide® around Ankylos® implants was investigated (Geistlich and Dentsply-Friadent, Germany). Presented in this preliminary report are the results of implants inserted simultaneous to the lateral ridge augmentation.

The results are based on data acquired from a standardised examination sheet, performed at annual controls. We examined all the patients who received a lateral ridge augmentation with simultaneous implantation between 2001 and 2005. The follow up period was seven years (2001 to 2008). 44 patients, 32 women and 12 men with an average age of 48.5 years (range 17 to 73) were included in this study. We inserted 66 implants.

The clinical and radiographic examination was performed on the day of the final prosthetic treatment and annually there after until January 2008. None of the implants was lost. The average time of the implants in situ was 43 months ($+/-15.3$) and the average mean loading time was 31 months ($+/-16.3$). After the last control approximately 82% of the implants showed minimal or no horizontal and/or vertical periimplant bone resorption. Only one implant showed severe resorption of 75% of the implant. The gingival stability was proportional to the bone stability with a rate of 75%.

Due to the high gingival and bone stability of lateral ridge augmentations with BioOss®/BioGide in combination with the Ankylos®-Implant system, we can label this method as predictable, safe and the morbidity is very low.

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Immediate provisionalization of maxillary premolar single implants: 4-year prospective study

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Although recent studies have reported high success rates following immediate provisionalization of single implants in the maxillary anterior region, there is very limited information regarding immediate provisionalization in the maxillary premolar area. This 4-year prospective study evaluated the implant success rate and marginal bone changes of immediately provisionalized maxillary premolar single implants in edentulous ridges.

Ten implants with a porous surface TiUnite® were placed and provisionalized immediately. The 10 patients were evaluated clinically and radiographically with standardized periapical radiographs at implant placement and at 6, 12, 24, 36 and 48 months after implant placement. Means and standard deviations were calculated for each clinical parameter at each time interval where applicable. Data were analysed using repeated-measured 1-way analysis of variance (ANOVA). Statistical significance was denoted when $P < 0.05$.

All implants remained osseointegrated. The cumulative implant success rate in this study was 100% after at least 4 years of function with a follow up period up to 60 months. The mean marginal bone change from the time of implant placement to 6 months, 12 months, 24 months, 36 months and 48 months were -0.68 ± 0.33 mm, -0.91 ± 0.43 mm, -1.06 ± 0.44 mm, -1.13 ± 0.38 mm, -1.18 ± 0.42 mm, respectively.

The results of this study suggest that favorable implant success rate and marginal bone changes can be achieved with immediately provisionalized maxillary premolar implants in edentulous ridges. Although statistically significant marginal bone changes were noted after 4 years of function, they were smaller than those observed with implants loaded in the usual delayed protocol after 4 years of function.

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A 18 month study of standard and TE straumann dental implants using osteotome technique

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Purpose: 1) to evaluate in a prospective way the stability patterns using the Resonance Frequency Analysis (RFA) (Osstell®) of SLA surface TE® and standard ITI dental implants with the osteotome technique; 2) to assess the level of bone gain obtained by atraumatic sinus floor elevation with the use of osteotomes and 3) to study the response of peri-implant tissues (marginal bone level) along the study.

Material and methods: This study was made in the clinic of the Master in Periodontics at Sevilla University.

Patient selection. 24 patients were recruited from the clinic for implant treatment in maxillary posterior areas without enough bone height and treated between January 2003 and June 2004. Clinical procedure. After flap elevation, bone preparation was made using a 3.5 mm external diameter trephine until 1–2 mm of sinus floor in order to obtain autogenous bone graft. Sinus floor elevation was made using progressive osteotome technique and was impacted autogenous bone graft obtained previously. Following implant insertion, stability measures (ISQ values) using the RFA method (Osstell®). The flaps were placed and secured with sutures in such a way that the healing cap was exposed (non-submerged technique) to the oral environment. A panoramic radiography was taken immediately postoperatively. The following appointments for taking data were established at 12 weeks (fixed implant-supported prosthesis insertion)(ISQ values and radiographic evaluation), 6 and 12 months (radiographic evaluation) after implant surgery.

Results: 57 Straumann dental implants (33 maxillary sinus)(-SLA surface, 19 implants TE®, 25 standard 4.1 mm diameter implants and 13 standard 4.8 mm diameter implants) were inserted in 24 patients (13 male and 11 female).

ISQ values mean at implant surgery was 54.37 (range 28–77) and 62 (range 50–75) at 12 weeks. For standard 4.1 mm implant, ISQ values mean at implant surgery was 50,2 and 60 at 12 weeks. For standard 4.8 mm diameter implant, ISQ values mean at implant surgery was 55.3 and 62.9 at 12 weeks. For TE® implants, ISQ values mean at implant surgery was 59.6 and 65 at 12 weeks.

Preoperatively bone height mean was 6.55 (range 3–11) and the bone gain mean was 3.5 mm (range 1–6) at 6 months postoperatively.

3 implant were lost at 4 weeks after surgery and the remaining 54 implants remained stable. The marginal bone level remained stable in all implants along the study.

Conclusions: The use of osteotome technique in the management of maxillary posterior areas with insufficient bone height may obtain good success rates, although is needed more long-term studies. TE® ITI dental implants seems to produce better primary stability in comparison to standard ITI dental implants in maxillary posterior areas.

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Three year results utilzing zirconia-oxide-ceramic implants with augmentation procedures

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The replacement of missing teeth with a white implant can now be performed with the use of ZrO-ceramic as implant material. ZrO shows a high wear resistance and has a high mechanical stability. Due to the mechanical properties only one-piece implants are available at the moment, which requires a specific treatment sequence.

Between 2005 and 2008 11 patients were treated with a total of 36 implants (whiteSky, Bredent and Z-Lock, Z-Zystems, Konstanz). Due to the transgingival healing even in moderate ridge defects a two stage augmentation (hip-graft or sinus-floor elevation) was performed. Except of one all implant were immediately restored after placement. Three month later the final superstructure was delivered.

One edentulous mandible was treated with 5 implants, 5 free end situations were treated with 15 implants and 16 implants were used for long bounded gaps or single tooth replacement. Simultaneous augmentations were performed as sinus floor elevation or lateral grafting.

One implant in a free-end situation failed due lack of temporary restoration and second implant failed after loss of stabilization by fracture of the temporary. Kaplan-Maier survival rate is 93.7% after 36 month. All other implant showed no signs of peri-implant infection like bleeding on probing or peri-implant bone destruction.

Even when considering the limitation of the moderate structured implant surface and the one-piece implant a successful treatment in the aesthetic zone or for allergic and hyposensitive patients is possible.

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Five-year retrospective volumetric evaluation of periimplant crestal hard and soft tissues of immediate single implant restorations

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Introduction: The immediate post extraction one-stage flapless surgical approach combined with immediate provisionalisation, aims to maintain the preoperative soft tissue morphology

surrounding the single implant restoration. This approach has successfully been used in periodontally compromised sockets thus immediately transforming the periodontal tissues into healthy periimplant tissues (Tripodakis 2001, 2002). The positive results have also been confirmed microbiologically (Tripodakis & Nakou 2004).

The aim: Of the present retrospective study is the volumetric tomographic evaluation of the relationship between the crestal bone surrounding the implant and the overlying soft tissue profile five years postoperatively.

Material and methods: Thirty anterior teeth and first premolars severally periodontally involved (class II or III osseous defects), in healthy individuals, non smokers, successfully restored with implant restorations by the above mentioned surgical protocol were clinically evaluated at least five years postoperatively. Three-dimensional volumetric analysis was accomplished by the Morita Accuitomo tomographic system, after covering the labial surface of the clinical crown of the restoration and the surrounding soft tissues with radiopaque tin foil (Dry foil, Jelenco USA). Sagital and coronal slices were made parallel to the long central axis of the implant and measurements of the distance of the soft tissue margin to the crestal bone level and the implant-abutment interface were performed. Thus the height of the unsupported by bone soft tissue adaptation around the abutment was assessed.

Conclusion: The soft tissue height above the bone level was found to be equal or greater than 4 mm labialy. It was therefore exceeding the 3 accordingly found in the normal natural dentition or implant restorations after wound healing of an open flap surgical approach.

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Long term follow-up of 1626 dental implants at a periodontal private practice

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Private Practice, Kfar Saba

Advanced periodontal disease is characterized by loss of hard and soft tissues which leads to loss of periodontal attachment. Dental implants are widely used today for restoring missing teeth while the scientific literature support this trend with very high percentage of survival and success rates. But the information and knowledge about using dental implants in periodontal patients especially for the long run is very limited.

I would like to present a study of more than 10 years follow-up of 1626 dental implants inserted to 475 patients. 311 patients with 1171 were treated for moderate, severe and aggressive periodontal diseases. 77 implants in 58 patients were lost during the study. While the failure rate in the periodontally compromised group was 5.2% (61implants in 43 patients) the failure rate at the periodontally healthy patients was1.36%.

More data and statistics of implants survival will be presented for smoking, diabetics and non-maintained sub-populations.

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A five-year evaluation of Straumann implants: results from private practice

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Objectives: The aim of this study was to determine the five to six-year survival and success rates of 528 Straumann implants placed between 1995 and 2000 in a private practice. Success rate was evaluated from radiographs.

Material and methods: 528 implants were placed with no exclusion criteria. Of the sample size 47.3% were equal to or shorter than 10 mm in length. All available patients were contacted after five to six-years for intraoral radiographs and crestal bone loss (CBL) measurements were made. The baseline reference was identified as the interface between the rough-smooth surface. Various parameters were investigated for their influence on CBL. Statistics included ANOVA regression analysis and Pearson Chi square test.

Results: Radiographs of 411(77.8%) implants qualified for analysis. The overall survival and success rates were 99.2% and 93% respectively. CBL was 1.16 $\pm$ 1.03 mm (range 0–5.41 mm). Four factors influenced CBL ($p < 0.001$): Implant surface texture (TPS > SLA), smoking status (smoking > non-smoking), implant location (anterior > posterior), and vestibular bone lamella width at surgery (VBL) (VBL < 1 mm showed greater bone loss than VBL > 1 mm). Other factors such as the diameter of the implant or the type of suprastructure did not have a significant effect. Short implants showed a limited bone loss, with no significant difference when compared to longer ones ($p > 0.05$).

Conclusions: The success and survival rates presented hereby from a private practice compared well with related previous studies. TPS-surfaced implants, anterior arch location, smokers and VBL < 1 mm were parameters which significantly increased CBL. Moreover, short implants can be considered as a long term reliable treatment option.

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A retrospective evaluation of implant installation with maxillary sinus augmentation by lateral window technique

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Purpose: The aim of this study was to evaluate the clinical results of implants which were installed with maxillary sinus elevation by using lateral window technique.

Material and methods: We performed the maxillary sinus elevation by lateral window technique to 87 patients who visited Department of Oral & Maxillofacial Surgery, Chonnam National University Hospital from January, 2003 to January, 2007. The mean follow-up period was 28.5 months.

Results: 1. The sinus elevation and simultaneous implant installation was performed in 89 sinuses and 249 implants were installed. The sinus elevation and delayed implant installation was performed in 44 sinuses and 141 implants were installed. The total number of implants were 390 in 133 sinuses. The average healing period after sinus elevations was 6.1 months in delayed implant installation.

2. Only autogenous bone, autogenous bone mixing with allografts or autogenous bone mixing with xenografts were used as graft materials.

3. The average period from first surgery to second surgery was about 7.2 months.

4. Some patients complications, such as perforation of sinus membrane, swelling, infection and exposure of cover screw. Two implants were removed in the infected sinus.

5. The survival rate of implants with maxillary sinus elevation by lateral window technique was 99.5% and the success rate of implants was 95.1%.

Conclusions: These results indicated that the implants which were installed with maxillary sinus elevation by lateral window technique showed high survival and success rates.

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Paradigm shift of sinus lifting: success rate of consecutive 307 implants in 137 sinuses with sinus lifting and simultaneously placement up to 5-years

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Introduction: When there is less than 4 mm of residual bone in posterior maxilla, two stage operation has been recommended. Recently, taper-designed implant having microthreads has been developed to gain initial stability in severely resorbed posterior maxilla. In this study, we evaluated clinical and radiographic success rate of implants installed simultaneously with sinus lifting.

Patients and methods: From 2003 to 2006, total 307 implants (Implantium, Dentium Co., Korea) had been placed with simultaneous sinus lifting in 137 sinus (M:F = 86:51). Same surgical protocol had been applied in all cases. Same brand implants with three different diameter (3.8 mm, 4.3 mm 4.8 mm, same length (12 mm) and Bio-Oss (Geistlich, Swiss) only graft had been performed. Second surgery was performed after 6 months and progressive loading had been applied for 2 months. Average follow-up months was 39.1 ± 11.7. Clinical and radiographic examination was performed to evaluate the success rate according to Albreksson's criteria.

Results: 41% of installed implants had been placed in the maxilla where the residual bone was less than 4 mm. Only one implant was removed on the day of second surgery. Six implants out of 3 patients showed 2 mm marginal bone loss. The cumulative survival rate was 99.7% and success rate was 97.4%.

Conclusion: With the advancement of implant design and surface treatment, one stage operation in severely resorbed maxilla is reliable even the residual bone is less than 4 mm. One-stage surgery could reduce the total treatment time and operation.

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Prosthetic complication on implants in private practice. A 12-year experience

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Long-term prosthetic complication data issued from private practice are rather scarce. This paper documents the prosthetic complications that occurred over a 12-year experience with implants loaded for at least 1 year.

Between 01.1995 and 12.2005, 2319 implants were placed to rehabilitate 968 patients. Mandible/maxilla implant distribution was 1174/1145, 69.9% were inserted in the posterior area. Rehabilitations included 701 single crowns (SCs), 502 short-span bridges, 9 full-arch bridges and 171 overdentures (ODs), distributed into 133 ball- and 38 bar-anchored prostheses. Most implants (81.0%) supported cemented prostheses. Fixed prosthesis (FP) complications were: abutment fracture, abutment loosening, prosthesis debonding, major-and-minor veneer fracture. OD complications included: adjustments (reactivation of attachments/clips), foreseeable (attachment/clip change) and unforeseeable complications (teeth, bar or prosthesis fracture).

FP group: 1(0.05%) abutment fractured, 4(0.2%) became loose. Debonding happened to 14 prostheses, screw loosening to 4 (1.8%). Veneer fracture occurred to 47 (3.8%), most (72.3%) minor. Complication rate was 4.7% for SCs vs. 4.0% for bridges; 5.7% for posterior SCs; 4.6% in the anterior region vs. 6.7% in posterior; 3.6% for screw-retained implants vs. 6.5% for cemented. 94.0% of the fixed prostheses were complication-free.

OD group: 66.2% of the prostheses were complication-free, ball- (66.2%) and bar-anchored (68.4%) were similar. Adjustments and foreseeable events were repetitive up to 6 times but not the unforeseeable.

Conclusion: FP undergo rare complications compared to ODs. Cementation of prosthesis is reliable on the long-term. In the OD group, a clustering effect contributes to complication increase.

Straumann AG is acknowledged for the partial support of the study.

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Life table analysis of ITI implants in extraction sockets: private practice experience

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Introduction: Since the first report from Schulte al. 1978, there has been an increasing interest for the placement of dental implants into fresh extraction sockets.

Immediate implant placement offers several advantages including reduction in the number of procedures, shorter treatment time. However, lacks of soft tissue closure and flap dehiscence over the extraction site are serious disadvantages.

Material and methods: Since February 1998, 180 immediate dental implants (4.5% of overall implants) were placed in 126 patients (44.44% males, 55.56% females, mean age = 56.3 y) in the mandibule (55 imp., 30.5%) and the maxilla (125 imp., 69.5%). 57.2% of them were placed in the anterior region, 36.7% in the premolar region and 6.1% in the molar region. 33 implant, 18.4% were immediately loaded. 61 implants, 33.9%, had simultaneous alveolar bone augmentation.

Survival criteria were lack of: implant mobility, peri-implant radiolucency and recurrent peri-implantitis.

Results: Following surgery 2 complications during healing period were noted (necrosis of the mucosa and superficial infection). 6 (3.34%) implants were early failures and no late failure was recorded. Cumulative success rate over 9 years is 96.7%.

Conclusion: The survival rate and radiographic and clinical results were comparable to those obtained with the standard protocol. Within the limits of the present investigation, immediate restoration of implants placed in fresh extraction sockets can be considered a valuable option to replace a missing tooth. However, this method should be employed in selected cases (patient demand, low esthetic situation).

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Implant-supported distal extensions in severely resorbed posterior alveolar ridges

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The application of implant-borne rehabilitations in residual alveolar ridges may be restricted by various anatomic conditions, as available bone height and characteristics. Here we report the clinical outcome of implants placed in severely resorbed posterior ridges, in addition to various implant-supported treatment modalities.

Extra Oral implants (Straumann, Basel, Switzerland) with the intraosseous length of 2.5–5 mm were installed in the posterior alveolar ridges. Following the healing period of 4–6 months, implants were exposed and included in the distal extensions of fixed and removable prosthesis. At recall appointments were collected surgical, clinical and radiological variables, including the evidence of adverse effects. An 8-years life table analysis was calculated.

The treatment protocol was applied in thirty-five patients, presenting 31 removable and 4 fixed complete implant-supported dentures. A total of 61 Extra Oral implants were placed posterior to the distal implants, at the mean distance of 29.8 mm (range 15.6–62.7 mm). Three implants failed during the osteointegration phase, yielding an 8-year cumulative success rate of 92.24%. Following the osteointegration period, no major bone loss or other adverse events were found.

The clinical results indicated that the Extra Oral implants may be successfully used in addition to the other, longer implants. Thus, a relatively long extension in the posterior region may be employed. With careful preoperative planning, this technique offers a simple and beneficial complementary treatment option for removable and fixed complete dentures.

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Evaluation of narrow diameter implants placed in anterior and posterior regions

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Introduction: Narrow diameter implants (NDIs) are designed for replacing small incisor teeth or to be used connected with regular diameter implants. However the predictability of NDIs is questionable in high load bearing conditions. Peri-implant bone resorption (PBR) and post-loading complications for NDIs placed in the anterior and posterior regions was evaluated in this study.

Material and methods: Study group consisted of 31 patients (80 implants) each with at least one freestanding single narrow implant in the anterior and posterior region placed between 1999 and 2007. Peri-implant bone loss (PBL) was screened on standardized x-rays taken by 6 month intervals. Probing depth (PD), bleeding on probing (BOP) and screw loosening (SL) were also recorded. Data were analyzed with student-t test.

Results: No implants were lost during the follow period. Mean function time was 62 months. PBL was 1.42 vs. 1.62 mm for anterior and posterior implants respectively ($p = 0.11$). PD, BOP and SL was 3.15 vs.3.45 mm ($p = 0.45$), 0.25 vs. 0.88 ($p = 0.002$) and 6 vs. 7 ($p = 0.32$) for anterior and posterior implants respectively. Student-t test showed no significance for all parameters except BOP.

Conclusion: NDIs placed in the posterior region showed similar success to the ones in anterior zone in this study. BOP reveals better hygiene of implants in the anterior region. Despite the favorable results obtained in this study, it should be emphasized that NDIs have lower mechanical endurance and further studies are required to ensure the safe use of NDIs in the posterior region.

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External validity of clinical study results – the German astra bone level study

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Objectives: The aim of this study was to evaluate marginal bone resorption at two different implant shapes focussing on differences between high recruiting implant centers and low recruiting implant centers.

Material and methods: Inclusion criteria were two missing teeth in the lower jaw distal of the incisor. No augmentation procedures and a planned fixed restauration. In all patients one straight Astra implant (3.5 or 4.0 mm) and one conical Astra (4.5 or 5.0 mm) were inserted. 18 centers participated and included 125 patients with 318 implants. Panoramic X-ray images were taken at 5, 12 and 24 months.

Results: Mean insertion depth at implant insertion was 0.18 mm subcrestal for straight implants and 0.27 for conical implants. One implant loss was observed. The table lists mean radiologic bone resorption in mm:

	6 months	12 months	24 months
	Implant shape		
Straight implants	0.83	0.83	0.96
Conical implants	0.71	0.63	0.95
	Center		
≤ 15 implants	0.71	0.61	1.46
> 15 Implants	0.83	0.79	0.81

No significant differences were found for the different time points.

Discussion: Conical or straight implant shape did not lead to different bone resorption. There was also no difference between high and low recruiting centers. Thus the result show a high external validity.

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Patients' satisfaction with implant-supported fixed partial dentures

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Aim: To analyse the patients' satisfaction with implant-supported fixed partial dentures.

Material and methods: The researched were 51 patients during follow-up period 0.5–3.1 years after finished implant therapy. The study based on questionnaire consisting of closed questions and addition to each of them enclosed visual analogue scale (VAS). Result from the qualified questions answered were then compared with those obtained from VAS analysis.

Results: The vast majority of the patients–84% affirmed painless implants procedure (means VAS 8 +/− 11). 9 per 10 respondents (mean 93 +/− 12) were satisfied with chewing comfort and 88% patients (mean VAS 89 +/− 12) declared better phonetic function. Eight per ten patients had no problems with cleansing the implant reconstruction (mean VAS 87 +/− 14). A great majority of respondents (92%, mean VAS 92 +/− 12) were satisfied with the restoration in general and appearance, which fulfilled the patient's expectation in implant therapy in 90% (mean VAS 89 +/− 14). Only one patient declared that he would not be willing to undergo the same treatment again.

Conclusion: 92% patient with implant-supported fixed partial dentures were satisfied with implant therapy, both from functional and aesthetic point of view. 98% respondents would be willing to undergo the same treatment again in spite of expensive therapy. The answers in questionnaire were confirmed in VAS.

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5-year clinical evaluation of implant with SLA surface and external connection

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Purpose: The aim of this retrospective study was to provide long-term data on the Neoplant® implant, which features a sandblasted and acid-etched surface and external connection.

Material and methods: 96 implants placed in 25 patients in Yonsei University Hospital were examined to determine the effect of the factors on marginal bone loss, through clinical and radiographic results during 18 to 57 month period.

Results: 1. Out of a total of 96 implants, two fixtures were lost, resulting in 97.9% of cumulative survival rate. 2. The survival rates were 96.8% in the maxilla/98.5% in the mandible and 97.6% in the posterior regions/100% in the anterior regions. 3. The mean bone loss for men were significantly higher than that of women. 4. The group with no posterior teeth distal to the implant prosthesis showed significantly more bone loss compared to the group with presence of posterior teeth distal to the implant prosthesis. 5. The mean annual bone loss after the first year was more pronounced in posterior regions compared to anterior regions. 6. No significant difference in marginal bone loss was found in the following factors: jaws, type of prostheses, type of opposing dentition, and submerged/non-submerged implants.

Conclusion: On the basis of these results, the factors influencing marginal bone loss were gender, type of edentulism, and location in the arch. In the present study, the cumulative survival rate of the implant was 97.9% up to a maximum 57-month period.

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Multiple zygomatic implants in reconstruction severely atrophied maxilla – useful modification of the standard protocol

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Purpose: The zygomaticus implants can be an effective solution in rehabilitation of the severely resorbed maxilla. Using zygomatic implants makes it unnecessary to apply onlay bone grafts or open sinus augmentation for reconstructing in a posterior region.

It is possible to simplify procedure in severely atrophied maxilla in frontal region (Class V) by placing multiple zygomatic implants, rigidly support of superstructure and reducing number of regular platform implants under piriform.

Material and methods: 12 patients were treated with multiple zygomatic implants in some combinations with regular platform implants and bone reconstructions.

Results: No implants were removed before and after superstructure fabrication and fixation. Each patient underwent careful CT analyze before operation.

Controlled X-rays, CT scans and endoscopic examination detected only one case of sinusitis after multiple zygoma implantation and it was treated successfully in a standard way. All the patients were fully satisfied with stable bridges screwed to the implants, although superstructures were constructed more palatally.

Discussion: The present surgical technique allows patients to achieve stable prosthetic solution in easy way by involving medial bone level in facial skeleton. It is an alternative to more complicated reconstructive procedures.

Conclusions: Application of multiple zygomatic implants shortened time and simplified procedure. In most cases, it also reduced necessity of bone grafts application.

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Long-term results of maxillary and mandibular reconstruction after tumor resection with autogenous bone grafts and oral implants

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Objectives: To evaluate: a) the clinical outcome of non-vascularized bone grafts in the reconstruction of defects following tumor resection; b) the clinical outcome of implants and implant-supported prostheses placed in the reconstructed areas; c) patients' satisfaction after oral rehabilitation.

Material and methods: In a 10-year period (1995–2005), 35 patients were referred for the surgical treatment of tumors affecting the maxillo-mandibular complex or for the surgical reconstruction of defects following tumor resection or irradiation by means of autogenous bone grafts. Among these patients, 21 received 83 oral implants for the prosthetic rehabilitation of the reconstructed edentulous areas.

Results: No total failure of the graft was observed, while partial loss of the graft was observed in 3 patients. The mean follow-up after the reconstruction was 100 months (range: 48–144 months). Cumulative success rate of the grafts was 94.3%. The mean follow-up of patients treated with oral implants was 92 months (range: 36–132 months). Survival and success rates of implants were 96.4% and 91.6%, respectively. Prostheses surival rate was 100%. Sixteen out of 21 patients who received implants were fully satisfied; 5 patients were only partially satisfied due to reduction of proshetic units or insufficient esthetics of the prosthetic restoration.

Conclusion: The reconstruction of defects following tumor resection with autogenous bone grafts has demonstrated to be a reliable procedure, which allows not only the restoration of facial bone continuity and contour, but also the placement of implants to support fixed prosthetic restorations, with high levels of patients' satisfaction.

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Occlusal stability of three-unit implant-FPDs after dynamic loading

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Objectives: The presence of an occlusal screw access hole is a major morphological difference between screw- and cement-retained implant restorations. The aim of the study was to compare the occlusal integrity of the ceramic veneer of cemented and screw-retained implant superstructures with unrestored screw access holes after dynamic loading.

Experimental methods: Four groups ($n = 5$) of three-unit implant fixed partial dentures (FPDs) were fabricated (cementable-repositioning impression; cementable-pick up impression; screw-retained-burn out plastic coping; screw-retained-cast to gold cylinder). After dynamic loading, the fluorescent penetrant method was applied for detecting microcracks at the occlusal aspects of the FPD abutments. For statistical analysis, t-tests were performed (alpha: 0.05).

Results: No significant difference in number of occlusal cracks could be detected within the respective type of retention (cementable FPDs $p = 0.356$; screw-retained FPDs $p = 0.343$). The screw-retained FPDs made from burn out plastic copings revealed significantly lower numbers of occlusal cracks than did the cementable FPDs made on the basis of repositioning impressions ($p = 0.037$). For all other cases the differences between cementable and screw-retained restorations were not significant.

Conclusions: Only in one case a significant difference between cementable and screw-retained restorations could be detected, with less damage occurring in the screw-retained samples. It can be concluded that the occlusal screw access hole does not form a weak point of the ceramic veneer.

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Evaluation of resorption and bone formation in biphasic ceramics by SEM

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Background: Different techniques have been developed with the aim of evaluating the behaviour of different materials. In this way, we used SEM as alternative to histological and histomorphometrical analysis.

Objective: To compare the effect of two biphasic ceramics, BCP1 (80% HA/20% BCP) and BCP2 (80% TCP/20% HA), on the bone healing by SEM.

Methods: Twelve beagle dogs were divided randomly into three groups based on their time of sacrifice (4, 12 and 26 weeks). After 3 months of extraction, four cylindrical implants were placed in both edentulous mandibular premolar regions of the 12 dogs. The harvested samples were processed for the ultraestructural analysis.

The quantity of resorbed ceramic was determined using the computer-based image analysis system (MicroImage 1.0) from SEM observations of implant surfaces obtained with the secondary electron mode. Three surface tissue components (ceramic, soft tissues and newly formed bone) were identified using artificial colours. Their respective areas were automatically calculated and expressed as a percentage of the total surface area. The degradation rate was calculated as the difference between the bone contact percentage before and after implantation.

Results: In SEM images, newly-formed bone appeared to be qualitatively similar for both BCP ceramics.

Analysis of implant surfaces from SEM images indicated that all implants were partially degraded and the statistical study showed that the degradation rate was significantly greater for BCP 2 than for BCP 1 at 26 weeks ($p < 0.05$).

Conclusion: These dates conclude that varying the components of our biphasic ceramics we improve its osteoconductive potential.

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Nanotubular titanium surface supports osteoblast differentiation

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Objectives: TiO_2 thin films with nanoporous structures are desirable for biomedical applications due to controllable pore size, good uniformity, and conformability over large areas at low cost. As osteoblasts are pivotal in their control of bone remodeling, a biological response needs to be elucidated to clarify the action of TiO_2 nanotubular surfaces on titanium *in vitro*.

Methods: This experiment was performed to elucidate cellular events after fetal rat calvarial cell adhesion to TiO_2 nanotube surfaces on titanium by scanning electron microscopy (SEM), cell proliferation, enzyme-linked immunoabsorbant assay (ELISA), alkaline phosphatase (ALPase) activity analysis and reverse transcription polymerase chain reaction (RT-PCR) analysis.

Results: In SEM images, cells could adhere and grow well on the surface of all titanium specimens. On TiO_2 nanotubular surfaces, they exhibited cuboidal and elongated morphology and filopodial extension into nano-pores and were able to respond to the nanoscale structure. Cell proliferation rate on TiO_2 nanotubular surface was lower, when compared to other specimens. In comparison to cp-Ti (commercially pure titanium), TiO_2 nanotubular surfaces enhanced ALPase activity ($p < 0.001$). In ELISA analysis, osteocalcin concentrations of TiO_2 nanotubular and surfaces were seven to eight times higher than cp-Ti surface at day 7 ($p < 0.001$). In RT-PCR analysis, bone sialoprotein mRNA expression on TiO_2 nanotubular surfaces increased approximately 1.7-fold when normalized to cp-Ti. Osteocalcin mRNA expression on TiO_2 nanotubular surfaces increased approximately 1.5-fold when normalized to cp-Ti.

Conclusions: These results suggest that TiO2 nanotubular surfaces would stimulate osteoblasts differentiation, potentially contributing to rapid osseointegration.

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Analysis of fractured commercially pure titanium implants

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The purpose of this study was to investigate biomechanical effects on fracture of implants connected to superstructures.

In two clinical cases, in both of which two implants (3.75 mm diameter; 11.5 mm length) had been placed in lower molar region and the superstructures was cemented, the fracture of the implants occurred. The fracture surfaces were examined with stereoscopic microscopy, SEM, and elemental analysis by EPMA. Longitudinal sections of those implants were also prepared to observe details of their structure.

Stereoscopic microscope observations revealed that a fatigue crack started at the lingual site developing to the buccal site. Being divided by the fracture line, the lower implant part was osseointegrated whereas the upper part was not osseointegrated. The longitudinal sections demonstrated that the thinnest part of implant

body was 500 um, at which the fracture line started. Subsequent SEM analyses showed striation of metal fatigue.

Based on these results, we speculated the following. Corrosion of titanium should not be relevant to the fracture, due to the detection of no chlorine by EPMA analysis. The buccal alveolar bone serving as the fulcrum, continuous tensile stress accumulated on the lingual side of the implant. When the bone resorption around the implant progressed to the level of the thinnest part, this repeated stress might result in fatigue fracture. Obviously, controlling the stress to the implant and bone is important to prevent the bone loss and implant fracture. Furthermore, implant design reducing the weakest part between outer and inner screw threads should be considered.

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New methods of increasing titanium and its alloys biotolerance

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Objectives: In oral implantology, titanium and its T4A6V alloy are the main materials used. A ionic transfer accompanies the superior tolerance of titanium; this tolerance can be improved by stabilization process: coatings with nanostructured ceramic layers and subsequent thermal treatments.

Material and methods: For a sample of titanium and its alloy T4A6V it was realised the electrochemical polarization in Ringer solution. From electrochemical point of view, it is pursued the spontaneous passivation and ohmic behaviour improvement, the increase of the mixed corrosion potential and the minimising of the passivity current, against unprocessed titanium and its T4A6V alloy.

Results: In the case of T4A6V alloy, the cyclic voltammetry, applied with a sweep rate of 100 mV/s., in a large potential domain, from -1000 to $+4000$ mVs.c.e., and the transmission electronic microscopy investigations show that the samples anodically oxidized and thermally untreated posses a thin, nanostructured, stable oxidic layer, with an ohmic behavior. Instead, titanium shows a typical behavior of electrochemically passivable metal. That is why, by polarization, for titanium, it is evidenced a critical passivation potential and a corresponding critical current.

Conclusions: The electrochemical reactivity for titanium and T4A6 V alloy is unfavorably raised by thermal processing at 350°C and 600°C in air. The thermochemical treatment at this temperature and the resulted crystalline nanostructures ensure an increase of the interface stability and an improvement of the ohmic behavior for the oxidic layers achieved for titanium and its T4A6 V alloy.

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The study of antibiotics resistance for some specific microorganisms

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Objectives: The objective is to study the phenotipic resistance to antibiotics of some experimental monospecific biofilms (*Pseudomonas aeruginosa* and *Staphilococcus aureus),* from oral cavities with periimplantitis infections.

Material and methods: The clinical and microbiological study was realised for six strains of *Pseudomonas aeruginosa and* six strains of *Staphilococcus aureus,* isolated in oral cavity with periimplantitis, during a four years period. The identification of bacterial strains was realised with automatic VITEK 2 system. Then, was determined the spectrum of sensibility to antibiotics (colistin and gentamicin) for planktonic cells, with diffusing method (CLSI/NCCLS). Afterwards, it was realised a model of biofilm development in plates with 96 holes, staining with violet crystal and reading the absorbency at 490 nm.

Results: The development of biofilms for *Pseudomonas aeruginosa,* on plastic, in the presence of colistin is caracterized by similar numbers of cells and relative stable cells. For *Staphilococcus aureus,* in the presence of gentamicin, the results were similar. Nevertheless, *S. aureus* has a great variability of temporal dynamic, with variable intervals of maturity, depending of tested strain (48, 72 or 96 hours).

Conclusions: The results suggest that administration of antibiotics, indifferent of concentration, encourage the presence of early biofilms, even their persistence in the organism, for a long time.

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Early loading of chemically modified titanium implants in maxillary molar region

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Patients' expectations have tremendously increased in the last years and have stimulated a widespread tendency to embrace early/immediate loading protocols, without rigorous testing. Careful investigation is, instead, necessary, especially in posterior maxilla where bone density is often low. The aim of this prospective study was to assess if chemically modified titanium implants are suitable for loading, 3 weeks after surgery, in the maxillary molar areas and to monitor the periimplant conditions over time.

Material and methods: The study is a prospective, 2-center, clinical trial on consecutively selected healthy patients, who needed at least one implant in the maxillary molar areas. Drilling was limited and most of the site preparation was produced with osteotomes. Solid screw non-submerged

chemically modified titanium implants (SLActive®; Institut Straumann AG, Basel, Switzerland) were manually inserted in a self-tapping fashion. All implants had a surface area greater than 125 mm² Abutment connection was carried out at 15 Ncm 21 (± 2) days after surgery and provisional restoration was fabricated in occlusion. Further abutment tightening at 35 Ncm was performed after 4–6 additional weeks, for final prosthesis.

Results: A total number of 35 patients were treated. No major adverse event was registered during and/or after surgery. Primary stability was always achieved. At abutment connection, 6 of the 35 patients reported minor pain and provisional placement was postponed for 4 additional weeks. Clinical and radiographic measures were taken at baseline and at 1-year follow-up. No patient dropout and no implant loss were registered, during the first 12 months of observation. No significant differences ($p < 0.05$.) between baseline and 1-year examination were recorded for any outcome measure (PD, Bone Loss, Pl and BOP).

Conclusions: The results suggest that, by means of the surgical and restorative technique presented, chemically modified titanium implants are suitable for loading at 3 weeks, in the maxillary molar areas. Limited implant spinning, occasionally found at abutment connection, produces no detrimental effect, if properly handled. After this important step forward a definition of early-loading protocols, RCTs should be encouraged to confirm that SLActive surface may faster osseointegration and reduce the risk of early failure in areas of low density bone.

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Influence of titanium implant surface hydrophilicity on saliva adsorption

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a) Recently, hydrophilicity has been recognized to influence early interfacial reactions of osseointegration.

This study focuses on the influence of hydrophilicity on macromolecular conditioning of transgingival dental titanium implant surfaces. Human saliva adsorption on biosensors with titanium surfaces differing in their hydrophilicity was analyzed by a quartz crystal microbalance-dissipation system (QCM-D) connected to a flow-system.

b) 5-MHz quartz crystals with moderately hydrophilic titanium reference (Q_{ref}, contact angle theta = 63°), very hydrophilic (Q_{active}, RFGD-plasma activation, theta = 18°), and hydrophobic (Q_{phob}, fluorosilanization, theta = 115°) modifications were used as biosensors. The resonant frequency (f) and dissipation shifts (D) of the QCM-D relative to a signal-baseline (Hanks solution) were measured online during saliva adsorption (60 min) and subsequent desorption (60 min Hanks solution) experiments (n = 5). Adsorbed mass and layer thickness were quantified by Sauerbrey calculations, respectively.

c) The mean adsorbed mass on Q_{ref} was 798 ng/cm² (8 nm layer thickness) after adsorption and 625 ng/cm² (6.3 nm) after desorption. On Q_{active}, 96% mass and thickness (adsorption), and 93% (desorption), compared to the reference, were calculated. Q_{phob} reached only 66% (adsorption) and 57% (desorption) compared to the reference. Less rigidly adsorbed films on hydrophobic surfaces were identified by the respective dissipation changes.

d) Different mass and thickness of adsorbed protein layers indicate that adsorption depends on surface hydrophilicity. Further in-vitro studies are needed to reveal in which way this effect on transgingival conditioning will influence subsequent bacterial adhesion.

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Biocompatibility of titanium carbo-nitride coatings with fetal rat calvarial cells and human gingival fibroblasts

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TiN coatings on Ti-6Al-4V alloy is expected to increase the life expectancy of surgical implants and prosthesis. However, cellular responses to TiN on Ti-6Al-4V alloy are poorly understood. Titanium carbo-nitride coating had been deposited on Ti-6Al-4V alloy by arc ion plating. The biocompatibility of TiN and TiCN coating on Ti-6Al-4V alloy with fetal rat calvarial cells (FRCC) and human gingival fibroblasts (HGF) was assessed by SEM, enzyme linked immunoabsorbent assay (ELISA), alkaline phosphatase activity (ALPase), and reverse transcription polymerase chain reaction (RT-PCR). In ELISA analysis, there was no statistical difference between control and different thin coating surfaces. Mean level of ALPase activity on TiN and TiCN surface was similar to that seen on commercially pure titanium (cp-Ti). RANKL mRNA expression level was similar in all samples whereas, RANKL mRNA expression level was increased approximately 2.5-fold when induced with IL-1beta (1 ng/ml). OPG mRNA was expressed uniformly in all samples. IL-6 mRNA expression level was similar in all samples whereas, IL-6 mRNA expression increased approximately 2.8-fold when induced with IL-1beta. COX-2 gene was also expressed uniformly in all samples. To evaluate the effect of TiN and TiCN coating on osteoblast differentiation, the mRNA expression of type I collagen, bone sialoprotein, and osteocalcin mRNA was assessed in FRCC. The expression level of COL-I and BSP mRNA level was similar on glass, cp-Ti, TiN, and TiCN at day 7. These results suggest that Ti-based surface coatings, such as TiN and TiCN have good biocompatibility. This property could make carbo-nitride coatings on Ti-6Al-4V alloy suitable for orthopedic and dental implants.

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Cost-effectiveness modeling of dental implant 1st line strategy versus bridge

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Objective: We assess the cost-effectiveness of dental implant 1st line strategy versus fixed partial denture (and denture) in patients suffering of one single missing tooth.

Method: The model used a simulation decision framework over a 20-year period. Potential treatment switches can occur every 5 years. Transition probabilities come from literature, epidemiological reports or expert opinions. They have been programmed using specific distribution ranges to simulate the patients and practice variability, and to take into account parameters uncertainty. Direct medical costs have been assessed according to a specific cost survey in France. Probabilistic sensitivity analyses were conducted using 5000 Monte-Carlo simulations generating confidence intervals of model outcomes.

Results: The cost distribution indicates a peak at 3000€ for the bridge strategy. The distribution for the implant strategy is more flat, showing the maximum ranging from 2500 to 3500€. The model simulations establish that total mean cost of the bridge 1st line strategy is 4385€ per patient over 20 years (1850€ to 17267€), providing 69% of success rate. Total mean cost of the implant 1st line strategy is 3517 Euros per patient over 20 years (1990€ to 10221€), with 92% of success rate. Differences are statistically significant for both total mean costs ($p < 0.001$) and success rate ($p < 0.001$). The mean cost-effectiveness indicates that the bridge strategy is significantly higher ($p < 0.001$) than the implant strategy with 6286€/success versus 3819€/success respectively.

Conclusion: This simulation modeling approach is the very first robust model in the field of implantology. Implant as the 1st line strategy appears to be the ''dominant'' strategy, considering the lower overall costs and the higher success rate.

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Determination of implant loading timing in human: A pilot study

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The immediate and early loading of implants appear to be a viable treatment option in the fully edentulous ridges. Some reports have shown clinical results successfully. Various designs of implant and prosthetic components are recommended by different manufacturers for immediate and early loading of implants. Though histomorphometric studies in humans as well as in animals have been reported for some implant systems, a few show remarkable results, it is not possible to extrapolate these results to other implant designs.

The aim of this study was to perform a histologic and histomorphometric analysis of the peri-implant tissue reaction and the bone-implant interface in three early loaded implants (5 days, 20 days, 50 days after surgical treatments) and an unloaded implant in the edentulous maxilla, and to compare these results for determining proper timing of supra-structure placement.

GS-II implant(Osstem, Korea) was used for this study. GS-II implant fixture is a dual-threaded internal connection type with upper microthreads and Cell-Nest surfaces (anodic oxidation treatment).

The histologic data showed that the osseointegration was achieved well in both loaded and unloaded conditions. The time of loading implants did not affect the oseeointegration much. Implant design modifications and implant surface treatments can affect bone responses in loading timing of implants. Maybe these developments could lead to favorable bone responses. However, in order to have a more proper and faster way of loading implants, more prospective studies and randomized controlled trials are needed.

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Titanium hydride and hydrogen concentration in acid etched titanium implants

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Titanium acid etching is popular to texture the surface of dental implants. During etching, the titanium oxide protective layer of the implants dissolves while native Hydrogen ions (H^+) are released in the bath. H^+ ions may form a titanium hydride (TiH) layer at the implant surface and lead to formation of TiH needles embritling titanium. The aim of this study was to measure the concentration of H in the implants and TiH at the surface of cp titanium and alloyed implants.

Five implant systems were investigated. Implants were made of cp titanium (Straumann-SLA, Ankylos-Cell Plus, 3i-Osseotite) or titanium alloy (3i-Prevail, MIS-Biocom). TiH concentration was determined by X-Ray diffraction, H concentration by thermodesorption.

TiH_{2-x} was present on all cp titanium implants, concentration varied between 5% to 32%. No hydride was found in titanium alloy. H concentration varied between 56 to 105 ppm, whatever cp titanium and titanium alloy.

Low solubility of H in α-Titanium is responsible for precipitation of H into TiH. The surface is enriched in TiH_{2-x} according to the vigor of the etching conditions. High solubility of H in the β phase of the α-β titanium alloy prevented H precipitation into TiH.

Measurement of H showed that all implants, even those lacking TiH_{2-x} at the surface, were enriched in H. In all implants, Hydrogen concentration was within the normative limits of 130 ppm.

TiH needles are expected to be present in cp titanium and therefore must be investigated in these implants, but not necessarily in titanium alloy.

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A prospective clinical investigation of a skeletal orthodontic anchorage system®

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Aim: Of this prospective study was to evaluate the success rate of the Orthodontic Skeletal Anchorage System® – a new anchorage device.

Material and methods: Nineteen patients (4 male, 15 female) were included in this prospective clinical study after ethic commission approval. 30 plates of the Orthodontic Skeletal Anchorage System were inserted in the maxilla in the area of the zygomatic buttress and in the mandible in the canine or molar area. The plates were loaded for orthodontic purposes either directly or indirectly after a healing period of the surrounding soft tissues of 2–3 weeks. For each plate the loading type, the force magnitude and the eventual loss rate was documented. 4 weeks after placement the patients' acceptance was evaluated.

Results: 25 plates were placed in the upper, 5 in the lower jaw. 21 were used for mesialisation of a tooth segment, 5 for distalisation of the whole arch, 2 for intrusion of molars and 2 for extrusion of impacted teeth. 2 plates got lost before loading, in one case an inflammation of the surrounding tissue was registered in the other case primary stability was not accomplished. 79% of the patients would agree again in the placement of a plate as part of their orthodontic treatment if necessary.

Conclusions: The results of the present investigation showed a comparable success rate (93.3%) with data reported in literature. Due to the apical screw position the Orthodontic Skeletal Anchorage System offers efficient possibility without risking interference between the roots and the anchoring device.

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Bone healing response to different implant surface topographies in dogs

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Objective: This study was to evaluate the effect of surface topographies to the bone healing by analyzing histologically and histomorphometrically and compare the bone healing process between micro roughened surfaces and nano-micro roughened surfaces periodically.

Material and methods: Eight different surface topographies of dental implants were designed to mandibles of dogs and installed on them. Machined surface implants (Exfeel, Megagen, Korea) were used as the control group. 4 nano-treated surface implants (TiO_2 sputter coating, Heat-treated TiO_2 sputter coating, CaP sputter coating, Heat treated CaP sputter coating) and 3 micro-treated surface implants[resorbable blast media (RBM), sandblast and acid-etched (SAE), anodized RBM] were used as experiment groups. All 72 implants were installed on the mandibles of 9 dogs. 3 dogs were sacrificed respectively at 2, 4, 8 weeks. After making the histology sample, they were analyzed histologically and compared with BIC (Bone to implant contact) for the histomorphometrical analysis.

Result: In histological analysis, there were a large number of new bone formations on the adjacent area of all implants in the 2 weeks group. At 4 weeks, although there were general bone formations, the new bone was distinguished from the basal bone. At 8 weeks, the new bone became matured and connected tightly to the basal bone.

In histomorphometrical analysis, 2 weeks group had lower value than 4 and 8 weeks group, and there was no difference between 4 and 8 weeks group. There were no differences between the 8 experiment groups.

Conclusion: There were no differences depending on surface topographies.

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The effects of nanotubular structure on cell response and osseointegration

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This study was performed to evaluate the wettability, to assess the cell response *in vitro* and to evaluate osseointegration of the titanium surface with nanotubular structure *in vivo*. For the wettability and cell response, four different kinds of surface-treated titanium discs (polished surface, micro-roughened surface, nanotubular surface and nanotubular micro-roughened surface) were fabricated. Nanotubular structure was fabricated by anodic oxidation. For the wettability test, the image was captured after a single drop of solution (distilled water and plasma) and contact angle was measured. MC3T3-E1 osteoblast cell was incubated during 6 hours for cell response. The cell morphology was evaluated using the scanning electron microscope. The cell viability was assessed using the XTT assay. ALP level was measured using colorimetric assay. For the test of osseointegration, nanotubular surface and nanotubular micro-roughened surface implants (2.0 × 5.0) were inserted into the tibia of Wistar rats. After 3 weeks, the tibias were harvested

and the specimens were stained with haematoxylin and eosin. The wettability was improved by anodic oxidation. Extension of cell process was more observed in anodized surface compare to non-anodized surface. A decreased viability was significantly shown in non-anodized surface. Alkaline phosphatase activity was 3.5 times higher in anodized surface than in non-anodized surface. In the histology, the new bone formation was observed along the implant surface in cancellous bone as well as cortical bone. Nanotubular micro-roughened surface can provide the more favorable cell responses, enhance hydrophilicity and osseointegration.

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Clinical evaluations of new alloplastic material in sinus bone grafting

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Objectives: The objective of this study was to clinically evaluate the use of OSTEON® as a sinus graft material and to measure the effect of healing at 4 and 6 months after surgery.

Methods: After sinus graft using OSTEON® in 17 patients, bone specimens were collected from lateral sinus using 2.0-mm trephine bur at the time of 4 or 6 months after surgery. Histology of the bone specimens was prepared and the percentage of newly-formed bone fraction, lamellar bone/woven bone ratio (LB/WB) and newly-formed bone/graft material ratio (NB/GM) were measured in order to indicate the suitability of the materials and the successful healing of the graft.

Results: The morphology of OSTEON® was observed to be interconnected, with 77% porosity and a pore size of 300 to 500 μm. After implantation, the mean percentage of newly-formed bone fraction after 4 months and 6 months surgery was 40.6% and 51.9%, respectively. Statistical analysis indicated no significant difference ($p = 0.135$) in the newly-formed bone fraction between the two post-operative periods. The mean lamellar bone/woven bone ratio (LB/WB) after 4 months and 6 months surgery was 0.14 and 0.45, respectively, with significant difference observed between the two post-operative periods ($p = 0.027$). Additionally, the mean newly-formed bone/graft material ratio (NB/GM) after 4 months and 6 months surgery was 1.95 and 7.72, respectively, with significant difference observed between the two post-operative periods ($p = 0.046$).

Conclusion: It was concluded that OSTEON® is suitable for use in sinus graft application since desirable time-dependent healing was demonstrated.

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Evaluation of crestal bone resorption of tiunite® anodized implant system

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Purpose: The purpose of this study was to examine the aspects of crestal bone resorption and to evaluate the clinical outcomes of TiUnite® (Nobel Biocare, Sweden) anodized implant system.

Material and methods: From the 67 patients (211 fixtures) who were treated with TiUnite® implants in Seoul National University Bundang Hospital between March 2004 and January 2007, 26 patients (91 fixtures) were included in this study. The radiographic evaluation of crestal bone resorption was performed by measuring the change of crestal bone level between the crest level at the time of surgery and that of 1 year after loading. Panoramic view and periapical view were used. On the base of radiographic findings, the shapes of crestal bone resorption were classified as 10 types.

Results: The average amount of crestal bone resorption after 1 year of functional implant loading was 0.30 mm.There was no saucerization in 40 implant fixtures (43.9%), though more than one thread were exposed in 51 implant fixtures (56.6%). Success rate of the implants was 94.5% and survival rate was 100%.

Conclusions: Good clinical outcomes and mild degree of crestal bone resorption were examined in this study. Saucerization, for the establishment of the biologic width, was not general finding in TiUnite® anodized implant system.

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Statins and bone formation, a meta-analysis of the literature

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Aim: Statins are a largely used anti-cholesterol drugs, since 1999 the pleiotrofic effect to trigger bone formation has been observed. We summarized the current scientific literature about the correlation between statins and bone formation and we investigated further for its potential use in implant dentistry.

Material and methods: A computerized search was conducted on MEDLINE, EMBASE, and the Cochrane databases using the keywords statins, bone formation and bone methabolism.

Results: Meta-analysis of clinical trials demonstrated that statins increase bone mineral density in human beings; *in vitro* studies showed that statins stimulate the production of BMP-2 protein by osteoblast cell lines and new bone formation in explant bone culture.

The possible utilization in bone regeneration into alveolar defects was explored through the review of studies where statins were locally applicated in bone defects of animal models; histomorphometric findings were meta-analysed and the bone formation rate resulted significantly greater where statins were used than in controls.

No *in vivo* studies of local application of statins on human bone defects were found.

Conclusions: Studies on human beings are still needed, but current evidence suggest that local application of statins may have therapeutic implications in regenerating isolated bony defects, such as those found with periodontitis or alveolar ridge defects, prior to dental implant placement.

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Nanocrystalline diamond implant surface

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In recent years, nanocrystalline diamond (NCD) has attracted important attention as a promising material for advanced biomedical applications. Biocompatible NCD films could be a suitable coating for medical implants. NCD films were grown on special glass (with about 9 at.% Al, 2.5 at.% Ca, 2 at.% Ba) quadrate substrates (9×9 mm) by a microwave plasma enhanced chemical vapor deposition (PECVD) method in an ellipsoidal cavity reactor. The nucleation procedure was followed by PECVD growth using H_2/CH_4 gas mixtures. A constant methane concentration (1% CH_4 in H_2) at a total gas pressure of 30 mbar was used. The substrate temperature was 860° C. The glass substrates were overcoated with an NCD film on top side. The Raman spectra of nanocrystalline diamond films deposited on silicon substrates displayed a dominant peak centered at 1333 cm^{-1}, which confirms the diamond character of the deposited films. The high ratio of carbon in sp^3 hybridization at the NCD surface was confirmed by XPS, and amounted to more than 95%. The crystal size varied from 20 to 30 nm. No significant crystal faceting was observed. The water drop contact angle was approximately 30°, which confirmed that the NCD films were relatively highly wettable. After the physical testing, the basic biological tests–test of cytotoxicity, adhesion and proliferation were done. The samples were cultured with 3T3 murine fibroblasts in DMEM medium. We found that our material in not cytotoxic at all and that it is an attractive material for fibroblasts' growth.

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Treatment of peri-implantitis with carbon dioxide laser

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The purpose of this study was to examine the effect of the decontamination of CO_2 laser in treatment of peri-implantitis in dogs. The treatment outcome was evaluated by histomorphometric analysis of the BIC within the treads which were lost bone contact. A total 24 implants with SLA surface was inserted in six dogs. After a 3-month healing period, experimental peri-implantitis was induced. And then surgical treatment involving flap procedure + debridement (group 1), flap procedure + GBR with BioGide and BioOss (group 2), and flap procedure + CO_2 laser application + GBR (group 3) was performed. The animals were killed 8 weeks and 16 weeks after treatment. A histomorphometric analysis confirmed statistically considerable BIC in group 3 compared with group 1 at 16 weeks ($P < 0.05$). And intragroup analysis showed considerable increase of BIC in group 3 at 16 weeks compared with 8 weeks ($P < 0.05$). The present study demonstrates considerable reosseointegration after treatment of experimental peri-implantitis with flap procedure, CO_2 laser application and GBR.

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The effects of peptide-coated surface on osseointegration of titanium implants

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Objective: The aim of the present study was to evaluate the effect of peptide(including fibrin binding site of Fibronectin) coated titanium implant on the osseointegration in rabbit tibia by removal torque test and histomorphometric analysis.

Method: In the this experiment, the devices were designed with two different surface characteristics: (1) control group: rough surface (Advanced Blasting and Etching) (2) test group: rough surface (ABE) with synthetic oligopeptide coating. Four mature New Zealand white rabbits were used for the experiments. On the right leg of rabbit, two implants without coating were installed, and on the left leg, two implants with synthetic oligopeptide coating were installed. The proximal one of two implants was for the histomorphometric analysis, and the distal one was for evaluation of the removal torque value in each leg.

Result: The RTVs (removal torque value) of test group had a tendency to be higher than that of control group. The difference between test and control of 2-week healing was largest. In the case of 4, 8, 12-week healing, the difference was small. The BIC of peptide-coated implants had a tendency to be higher than that of control group. The difference between test and control of 2-week healing was largest. In the case of 4, 8, 12-week healing, both groups showed similar trend.

Conclusion: Synthetic oligopeptide coated surface implants showed higher RTV and BIC in the early stage of healing than uncoated ones.

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Effect of titanium surface topography on fibroblastic behavior and function

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Objectives: To evaluate the effect of different titanium topography on behavior and function of gingival fibroblasts.

Material and methods: Titanium surfaces; machined (M), acid-etching with sulfuric acid (AE1) and acid-etching with hydrofluoric acid (AE2) were analyzed using scanning electron microscopy (SEM). Rat gingival fibroblasts were cultured on different surfaces. Cell spread and morphology of extracellular matrix were evaluated using SEM. Cell attachment and proliferation were examined by comparing the number of attached to detached cells and cell count, respectively. Gene expression was analyzed via a reverse transcription-polymerase chain reaction. Collagen production and deposition were examined via Sirius red stain and confocal laser scanning microscopy.

Results: Machined surface showed a flat profile with isotropic grooves, while AE1 showed a uniformly micro-scale roughened surface. AE2 surface had a grooved profile with moderate surface roughness. Cell attachment was weaker on machined surface than on AE1 and AE2 surfaces ($p < 0.05$), which showed no differences ($p > 0.05$). Cells counts on machined and AE2 surfaces were higher with parallel orientation, while cells count was lower and randomly distributed on the AE1 surface. The expression level of fibroblastic genes was similar among different groups. Collagen production was highest on machined surface, followed by AE2 and AE1 surfaces. Collagen deposition displayed a parallel pattern on machined surface, while it was multidirectional on AE1 and AE2 surfaces.

Conclusions: Titanium topography affects behavior and function of gingival fibroblasts as well as deposition pattern of collagen. The regulation of fibroblastic collagen deposition properties dependent upon titanium surface topography may be feasible.

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Clinical evaluation of sinus bone graft using allograft and xenograft

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Objective: The objective of this study was to evaluate the sinus bone graft resorption and marginal bone loss around the implants in cases using allograft and xenograft.

Methods: Sinus bone graft and implant placement (Osstem® Korea) were performed in twenty eight patients from Sep, 2003 to Jan, 2006. Bone grafts were performed using anorganic bovine bone (BioOss®) as well as a little amount of autogenous bone in group I, and equal amount of allograft (Regenaform®) and BioOss® as well as a little amount of autogenous bone in group II.

Results: Three failure of initial osseointegration occurred in 3 patients(Group I: 1 patient, 1 implant, Group II: 2 patients, 2 implants), but prosthodontic treatments were finished after replacement of new implants. The mean height of residual alveolar bone before surgery, after surgery and in 1 year after surgery were 4.9 mm, 19.0 mm and 17.2 mm each other in group I, 4.0 mm, 19.2 mm and 17.8 mm in group II. The mean marginal bone loss in 1 year after prosthodontic loading and in 20.8 months follow-up, were 0.6 mm and 0.7 mm each other in group I. Three implants showed bone resorption more than 1.5 mm within 1 year after loading, which resulted in 93.9% success rate. On the other hand, the mean marginal bone loss in 1 year after prosthodontic loading and in 19.7 months follow-up, were 0.7 mm and 1.0 mm each other in group II. Four implants showed bone resorption more than 1.5 mm within 1 year after loading, which resulted in 83.3% success rate.

Conclusion: Maxillary sinus bone graft using mixture of demineralized bone matrix might be considered to have little effect on bone healing and the stability of implant from this study.

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The effects of polyhydroxybutyrate (PHB) in bone regeneration

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Purpose of the study: Polyhydroxybutyrate (PHB), a bioresorbable polyester, is biocompatible and suitable for medical use. However its bone regenerative potential is not widely reported.

Material and methods: The material tested was PHB granules. Fifteen critical size defects of 15×10 mm were created in mandibles bilaterally on eight adult rabbits. Nine defects were grafted with PHB (Test), three with autogenous bone (Positive Control) while three were left empty (Negative Control). At twelve weeks post-implantation, the condition of operated sites was recorded before the mandibles were harvested. Histomorphometric evaluation on bone formation was carried out on undecalcified specimens.

Results: Rabbit 5 was observed to have a soft tissue swelling on the left side. However this site and all other sites did not reveal any inflammation or foreign body reaction. In all test sites and positive controls, some bone formation occurred at the periphery of the defects. PHB granules were evident in all test sites. Histomorphometric calculation showed new bone formation in test group was 20% to 40% while it was 30% to 50% in the positive control group. This difference was found to be not statistically significant. In the negative control group, there was no bone formation, and these defects were lined by fibrous connective tissues. The difference between test sites and negative controls was statistically significant ($P < 0.0002$).

Conclusions: This study suggests PHB has osteoconductive effect and therefore a potential bone regenerative material. Further research into its ideal configuration to enhance osteoconductivity and biodegradation is warranted.

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A robotic chewing simulator with a sensorized implant set-up

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Aims: To measure in vitro the chewing load forces transmitted through crowns made of different prosthetic restorative materials onto the dental implant.

Methods: A masticatory robot was used. Two types of test were carried out. The sample crowns were put under 350 masticatory cycles, occluding in the first test with the flat surface of the masticatory robot in order to evaluate the vertical forces transmitted, while in the second test occluding with the cusps of a chrome-cobalt steel upper arch in order to evaluate the transversal forces transmitted.

Results: In the first test, the statistical evaluation of the force peaks recorded on the vertical z-axis showed median values of 59.784 kg for the Empress 2 ceramic, 36.484 kg for Experience, 29.130 kg for Adoro, and 22.429 kg for Signum, with all comparisons within materials significant with p-value < 0.0001. In the second test, the statistical evaluation of force peaks recorded on the horizontal x- and y- axes showed median values for the Empress 2 ceramic of 17.782 kg and 7.438 kg respectively, of 11.228 kg and 4.388 kg respectively for Experience, of 8.499 kg and 3.606 kg respectively for Adoro, and of 6.568 kg and 2.930 kg respectively for Signum. Analysis of variance revealed significant differences between the materials and each comparison within materials for each axis is significant with p-value < 0.0001.

Conclusion: It was found that the ceramic crowns transmitted to the implant significantly greater forces (up to $+63.06\%$) than the composite crowns tested.

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Specific peptides for functionalization of GaN and Ti6Al4V

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Peptides have exhibited the ability to specifically bind to and/or control the synthesis of diverse inorganic and metallic materials. In this work we address the functionalization of the semiconductor GaN (0001) for biosensing applications, and the functionalization of Ti (Ti6Al4 V) for biomaterial applications. Due to its good biocompatibility and chemical stability, GaN could evolve in a new class of implantable biosensors, and Ti with binding peptide open great perspective with actual implantable material for medical applications.

The technology chosen to elaborate specific peptides of each materials, is the combinatorial phage-display method. An M13 bacteriophage library has been used to screen 10^{10} different peptides against the GaN surface and the Ti surface to finally isolate one specific peptide of each semiconductor.

The preferential attachment of the peptides has been demonstrated by fluorescence microscopy. Further physicochemical studies have been initiated to evaluate the semiconductor-peptide interface and understand the details in the specific recognition of peptides for semiconductor substrates. Our Atomic Force Microscopy (AFM) studies on the morphology of the surface after functionalization revealed that once the GaN – peptide binding established, it could not be removed with usual cleaning procedures (HCl, SDS), as well as for one Ti-peptide binding. The interactions between the peptide and the surface have been measured by AFM in force mode.

The obtained specific peptide reveals typically a hydrophobic and a hydrophilic part. This suggested us that apart of the interactions due to the electronegativity of the surface there should be also other driving events of the molecular recognition.

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Determination of solubility isotherm of anorganic bovine bone by solid titration

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Objective: Bio-Oss® (anorganic bovine bone, ABB) is a carbonated hydroxyapatite commonly used in treating alveolar bony defects. There is lack of agreement in the literature as to its rate of degradation *in vivo*, and little is known about the dissolution behaviour *in vitro*, which is relevant to the mechanism of degradation of calcium phosphate biomaterials in general. Therefore, this study was undertaken to measure the effective solubility isotherm of ABB using the established solid titration method and to identify the equilibrium solid phase.

Methods: The solid titration used powdered ABB in 100 mM KCl solution at $37.0 \pm 0.1^{\circ}C$, using a diode laser and light-scattering detector to identify the end-point. Total added calcium was plotted against final pH to construct the solubility isotherm. The crystal structure and Ca/P ratio of ABB were determined by X-ray diffraction (XRD) and energy-dispersive X-ray spectroscopy (EDX), respectively. The equilibrium precipitate was examined using XRD and transmission electron microscopy (TEM).

Results: The Ca/P ratio of ABB was found to be 1.64 and the structure confirmed to be apatitic. The solubility curve was found to lie lower than reported for hydroxyapatite (HAp) using the conventional 'excess solid' approach, but higher than that determined by solid titration from pH 4.0 to 6.0. Nano-scale HAp was the only equilibrium phase found at pH 3.6, 4.08 and 4.8; the crystallinity decreased slightly with decreasing pH.

Conclusions: Solid titration is considered a more precise approach for evaluating the solubility of calcium phosphate

biomaterials. The higher apparent solubility of ABB may be due to both the low Ca/P ratio, i.e. relative excess of phosphate, which has been shown to raise the isotherm, and to the presence of carbonate, which also complexes Ca in solution. Although poor crystallinity and small particle size drives dissolution, equilibrium precipitation of HAp, even with carbonate, is expected to shield further rapid dissolution and lead to erratic degradation rates. (Supported by National Natural Science Foundation of China, 30500570).

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Scaffold modification affects degradation profile and bone formation in rabbits

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Traditionally, PCL-based scaffolds tend to degrade at a slow rate. Increasing porosity values and pre-treatment of polycaprolactone-20% tricalcium phosphate (PCL-TCP) scaffolds under alkaline conditions can be utilized to increase the degradation rate and enhance early bone formation. 4 groups of test PCL-TCP scaffolds with varying porosities and pretreatment exposures with sodium hydroxide (NaOH) were studied in a rabbit calvaria model. (Group A: Untreated (75% porosity), Group B: Untreated (82% porosity), Group C: 3M NaOH for 48 hours (82% porosity) and Group D: 3M NaOH for 96 hours (82% porosity)). Scaffolds of 6 mm diameter and 2 mm height are randomly inserted into similarly created defects in the calvaria and are analyzed at 4, 8 and 12 weeks. Micro-CT analysis demonstrated that increased porosity (A vs B) had a greater impact on the overall scaffold volume loss than increased surface roughness (B vs C and D). In contrast, increased surface roughness had a greater effect on the amount of new bone formation than increased porosity values. Scaffolds with a lower porosity value and increased surface roughness generally reported a higher push out test values (3.4–27.6% and 23.2–52.4% respectively). Data from compressive strength testing showed gains of 2.1–45.1% in scaffolds with increased surface roughness. Interestingly, both push out and compressive test results displayed a decline in values at 12 weeks in the modified groups (B, C and D), suggesting a favourable breakdown or weakening of PCL-TCP scaffolds tailored for early replacement by new bone formation.

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Corrosion resistance and biocompatibility of new Ti-based nanocomposites

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Application of biomaterials such as implants increases steadily. Aim of our studies is to develop new titanium-ceramic bionanocomposites by producing the porous structures with strictly specified chemical and phase compositions, porosity and surface morphology such that will well adhere to the substrate, show high hardness, high resistance to biological corrosion and good biocompatibility. Mechanical alloying and powder metallurgy process are developed for the fabrication of titanium-ceramic nanocomposites with a unique microstructure.

Our research, shows that Ti-hydroxyapatite (Ti-HA) nanocomposites possess better mechanical and corrosion properties than microcrystalline titanium. The Vickers hardness strongly increases for Ti-10 vol% HA nanocomposite (1500 $HV_{0.2}$) and is six times higher than of pure microcrystalline Ti (250 $HV_{0.2}$). The corrosion test results indicated that the microcrystalline titanium possesses lower corrosion resistance and thus higher corrosion current density ($I_C = 1.31 \cdot 10^{-5}$ A/cm²) in Ringer's solutions. The result indicated that there was no significant difference in corrosion resistance among Ti-3 vol% HA ($I_C = 9.06 \cdot 10^{-8}$ A/cm²) and Ti-20 vol% HA ($I_C = 8.5 \cdot 10^{-8}$ A/cm²) although there was a significant difference in porosity. The biocompatibility of studied Ti-based nanocomposites and microcrystalline Ti, were analyzed studying the behaviour of Normal Human Osteoblast cells. It is expected that the studies may supply useful indirect information about the influence of the ceramic on the osseointegration ability of fabricated nanocomposites. New type of bulk 3-Dimensional porous Ti-based bionanocomposites with desired size of porous are developed.

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Evaluation of osteogenic activity of biomimetic peptides on dental implants

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Introduction: Biomimetic strategy by utilizing synthetic biological materials for biocompatible surface formation of dental/orthopedic implants has shown very effective to promote osteoblast adhesion, proliferation and differentiation, and consequently accelerating the integration process between surgically placed implants and biological tissues. Using synthetic peptides inspired from BMP on Titanium oxide implants and a mandible bone defect model with the micro pig, we observed that the

osseointegration process around bone defected areas was effectively enhanced.

Material and methods: Two control and four experimental groups were prepared by utilizing GSII CellNest fixtures (OSSTEM IMPLANT Co., Ltd. Korea): control 1, uncoated fixtures; control 2, BMP-2 coated fixture (dip and dry method); experimental 1, and 2, synthetic peptide coated fixtures (dip & dry method); experimental 3, and 4, synthetic peptide covalently immobilized fixtures. Four fixtures for each sampling group were implanted mandible in micro pigs and bone tissue responses were evaluated by histomorphometrical analysis at 2 and 4 weeks after implantation.

Results: In all of the experimental 1 to 4 groups, osteogenic activity was significantly accelerated compared to the control group 1. Furthermore, the experimental groups of 1–4 were showed about equal or better activities comparing the control group 2, which is covered with intact BMP-2 proteins. The relative BA ratios (%) are as follows; uncoated to the synthetic peptide coated fixture is 1:1.5, whereas BMP-2 treated to synthetic peptide fixture is 1:1.1. The osteogenic activity of synthetic peptide coated fixtures was significantly higher than that of the uncoated control fixture and slightly better to these of BMP-2 treated fixtures. In this study, we found that the application of synthetic peptides directly coated or chemically immobilized on the implant surfaces can be utilized to facilitate osseointegration so that minimizes the bone healing process.

Conclusion: These results suggest that application of biomimetic synthetic peptides on implant surface can be served as the effective replacement of whole proteins for accelerating the osseointegration.

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Biomechanical comparison of fresh-frozen vs embalmed bone for implants

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As formalin is an extremely reactive electrophilic chemical that reacts with tissues, the purpose of this study was to explore whether formalin-fixation could potentially alter the mechanical properties of bone tissue. In this regard, ∅ 3.3 × 8 mm, ∅ 4.1 × 8 mm and, ∅ 4.8 × 8 mm implants were placed into sockets prepared into the anterior surface of the radius of two fresh-frozen human cadavers. The insertion torque of each implant was quantified using a strain-gauged torque-wrench connected to a data acquisition system at a sample rate of 10 KHz and resonance frequency analysis measurements were also undertaken for each implant. The cadavers were then subjected to embalm with 10% formalin for 3 months and the same experiments were undertaken on the contralateral radius of the cadavers. The ITV before and after fixation were similar for ∅ 3.3 mm ($P>.05$), and higher values were obtained for ∅ 4.1 mm and ∅ 4.8 mm implants after fixation ($P<.05$). The resonance frequency analysis values before and after fixation were similar for all implants ($P>.05$). Formalin-fixation strongly affects the mechanical properties of bone tissue and therefore, would not provide reliable results in comparison with fresh human bone.

Keywords: Bone, formalin, screw implant, torque, resonance frequency analysis.

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Edentulous bone crest morphology related to three-dimensional implant placement

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Aim of the present paper was to establish the relationship between residual bone crest morphology prepared for implant placement and implant head-neck macrodesign.

24 implant sites, prepared for implant placement on partially not severely adsorbed edentulous crests from premolar to premolar 16 on maxilla and 8 on mandible, were selected during routinary fixed implant supported restorations planning. Implant sites were developed using the Replace Select (Nobel Biocare) surgical kit according to the best compromise between artificial tooth position and residual crest volume and current protocols for two piece implants.

After the last drill and immediately before implant insertion, photographs were taken using two perpendicular specifically designed millimetric probes. Measurements were taken on the digitalized photographs using a computer program, to evaluate distance between the most coronal and the most apical point of the bone on apico-coronal direction. Difference in height was found of mean value 1.65 mm (0.4–3.00), showing that bucal crest margin is on a more apical position than the inter-proximal one.

On this kind of crest shape, flat-top implant placement following current recommendations for three-dimensional implant positioning, does not seem to be ideal. Considering bone crest contour after site development, bone and soft tissue changes following implant placement, and the physiologic gingival contour of natural and artificial teeth, use of the scallop shaped implant can be an alternative to prevent metal exposure and complications on the aesthetic zone on particular clinical situations.

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Numerical study of mandibular implant retained overdenture behaviour

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The main goal of the present study was to analyze the influence of the attachment resilience and implant position on the behaviour of a mandibular implant-retained overdenture (IRO). The chosen

configuration was based on two implants (Nobel Biocare) with ball abutments and Dalbo Plus® (Cendres et Métaux) attachments.

This was done by developing a complete three-dimensional finite element model of a mandible with its IRO that was used to simulate the mastication. The geometry of a mandible and overdenture was obtained using a CT-scan. The effect of bone anisotropy was taken into account. Several configurations were analyzed including different parameters: foodstuff location (incisors, canine and first molar), implant position (incisor, canine and first premolar) and two retention mechanisms (rigid and resilient). To this end, a special attention was given to an accurate modeling of muscular actions, temporomandibular joint and contact management between the different components. The IRO behaviour was studied on the base of different results including overdenture motions, load repartition between implants and mucosa, and stress states in both bone and implants. This study allows to conclude that the most favourable configuration was obtained for implants in canine position and resilient attachments. Indeed, it was the one that leaded to the largest mucosa participation in the mastication load support. In this case, more than 80% of the reaction force generated during the mastication was supported by the mucosa. This has for consequence to minimize the stress at the bone-implant interface and then to improve the prognostic of the mandibular IRO.

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Biodegradation of different synthetic hydrogels made of polyethylene glycol

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Aim: The aim of the present study was to investigate the pattern of biodegradation of different polyethylene glycol (PEG) hydrogel/RGD-peptide modifications in rats.

Material and methods: Two different hydrogels were employed: i) a combination of 4-arm PEG-thiol, and 8-arm PEG-acrylate (PEG1), and ii) a combination of 4-arm PEG-thiol, and 4-arm PEG-acrylate (PEG2). Both PEG 1 and PEG2 were either used alone or combined with a 9 amino acid cys-RGD peptide (RGD). A non cross-linked porcine type I and III collagen membrane (BG) served as control. Specimens were randomly allocated in unconnected subcutaneous pouches separated surgically on the back of 60 wistar rats, which were divided into six groups (1, 2, 4, 8, 16, and 24 weeks). Specimens were prepared for histological (tissue integration, foreign body reactions, biodegradation) and immunohistochemical (angiogenesis) analysis.

Results: All materials investigated revealed unimpeded and comparable tissue integration without any signs of foreign body reactions. While BG exhibited transmembraneous blood vessel formation at 1 week, all PEG specimens were just surrounded by a well vascularized connective tissue. The hydrolytic disruption of PEG1 and PEG1/RGD specimens was associated with an ingrowth of blood vessels at 4 weeks. Biodegradation times were highest for PEG1 (24 weeks) > PEG1/RGD (16 weeks) > BG (4 weeks) > PEG2 = PEG2/RGD (2 weeks).

Conclusion: Within the limits of the present study, it was concluded that (i) all materials investigated revealed a high biocompatibility and tissue integration, and (ii) hydrogel biodegradation was dependent on PEG composition.

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Dimensional ridge bone changes after immediate implant placement in dogs

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Objective: To study dimensional alterations of the alveolar bone ridge that occurred following tooth extraction as well as processes of bone modelling and remodeling in immediate immediate placement.

Material and methods: Six Beagle dogs were included in the study. In both quadrants of the mandible and maxilla incisions were made in the crevice region of the 3rd and 4th premolars and molar 1st. Minimun buccal and lingual flaps were elevated. The third, fourpremolars and first molar were hemi-sected. The distal roots were removed and 72 implants were placed. The extraction sites were covered with the mobilized gingival tissue. The extractions of the roots and the sacrifice of the dogs were staggered in such a manner that all dogs contributed with sockets representing 2, 4 and 8 weeks of healing. The animals were sacrificed and tissue blocks containing the extraction socket were dissected, decalcified in EDTA, embedded in paraffin and cut in the buccal–lingual plane. The sections were stained in haematoxyline–eosine and examined in the microscope.

Results: It was demonstrated that small dimensional alterations occurred during the first 8 weeks following the extraction of mandibular premolars and molars. Thus, in this interval there was a slowly osteoclastic activity resulting in resorption of the crestal region of both the buccal and the lingual bone wall. The reduction of the height of the walls was pronounced at the buccal than at the lingual aspect of the extraction socket. The height reduction was accompanied by a ''horizontal'' bone loss that was caused by osteoclasts present in lacunae on the surface of both the buccal and the lingual bone wall. No implants were lost.

Conclusions: The resorption of the buccal/lingual walls of the extraction site occurred in different phases. The first finding was the bundle bone was resorbed and replaced with woven bone. The second finding was is to a 0.5 up to 1 mm less diameter implant respect to bone ridge, less buccal bundle bone resoption occurs. The third findings was to place an implant al lingual as can to reduce bone resorption.

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Electric potential of restorative alloys coupled to dental implant

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Background: Dental implants are commonly used to restore edentulous jaws. The couple of titanium implants and restorative alloys generate changes in the electric potential of implants. The effect of machined-titanium, cobalt-cromium alloy and gold alloy were studied when coupled to a titanium dental implant in vitro. The objective of our study was measure the electric potentials of those couples.

Material and methods: The sample of 20 dental implants (Microdent System) was coupled with three abutment materials: machined-titanium, cobalt-cromiun alloy and gold alloy.

The test solution used was artificial saliva at 37°C. The measurements device is composed by one electronic redox-potential meter, one periodontal probe and one referential electrode (Ag/AgCl, KCL). The electric potentials were measured on implants with 12 mm length and 3.75 diameter (N = 20).

Results: The mean potential found was 391 mV for Ti-machined/Ti-implant couple, 393 mV for Co-Cr alloy/Ti-implant and 152 mV for gold alloy/Ti-implant.

Two significant differences ($P < 0.05$) (one way ANOVA) were found between the groups: gold alloy/Ti-implant and Ti-machined/Ti-implant. As well as gold alloy/Ti-implant and Co-Cr alloy/Ti-implant. There isn't significant differences between Ti-machined and Co-Cr when coupled to a titanium implant.

The electric potential of the implant and the abutment were similar in every measurement when implant and abutment were coupled.

Conclusion: Gold alloy showed lower electric potential when coupled to a titanium implant. No differences in potential were found for implant and abutment when coupled.

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Considerations in measuring the electric potential of titanium implants

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Background: The behaviour of titanium implant's electric potential has been already studied ''in vitro'' before. However there isn't any clinical study that evaluates ''in vivo'' the electric behaviour of those implants.

The methodology used previously ''in vitro'' in the analysis of potential has not application inside the oral cavity. Our objective is to present a method for measure electric potential with clinical application and to test two different metal probes.

Material and methods: We used a combined probe of platinum and one of stainless steel. In both cases the reference electrode was Ag/AgCl in KCl solution. The combined probe has a fixed distance between the platinum tip and the reference electrode, which restricts his clinical uses.

The test solution used was artificial saliva at 37°C. Both probes were connected to a electronic redox-potential meter (high-impedance voltmeter, Hanna Inst). The electric potential was measured 25 times with each probe on a titanium implant (Microdent System) coupled to a machined titanium abutment (Microdent System).

Results: The mean potential measured was 276 mV with the stainless steel probe and 210 mV with the platinum probe.

Statistical analysis showed that both samples have normality (Kolgomorov-Smirnov), but the platinum probe showed greatest extreme differences in values.

Conclusions: The stainless steel probe showed values more reliable. This method has clinical application in measure electric potential of titanium implants.

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Effect of implant length and diameter on electric potential

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Background: The couple of titanium implants and restorative alloys generate changes in the electric potential of implants. The effect of implant length and diameter on electric potential has not been reported before.

Cobalt-chromium alloys are commonly used as restorative material in implant dentistry. The effect of both length and diameter are studied when coupled dental implants to a Co-Cr abutment.

Material and methods: The sample of 60 dental implants (Microdent System) includes 12 groups with different sizes (N = 5). Every implant was coupled with one Co-Cr abutment. The test solution used was artificial saliva at 37°C. The measurements device is composed by one electronic redox-potential meter, a periodontal probe and one referential electrode (Ag/AgCl, KCL).

The electric potential was measured on implants with 12 mm length and different diameter (3.3/12 mm, 3.5/12 mm, 4.0/12 mm, 5.0/12 mm), with 3.75 mm diameter and different length (3.75/08 mm, 3.75/10 mm, 3.75/14 mm, 3.75/16 mm) and with both length and diameter dissimilar (3.5/10 mm, 4.0/10 mm, 4.2/10 mm, 4.0/16 mm).

Results: The mean potential found was 308 mV for implants 12 mm length, 282 mV for implants 3.75 mm diameter, and 316 mV for implants with length and diameter variables. One significant difference was found between groups 3.75/08 mm and 3.75/16 mm ($P < 0.05$)(one way ANOVA), which shows a

clear relationship with length sizes. Another significant difference was found between groups 3.3/12 mm and 3.5/12 mm. Any other difference was found between the 12 groups.

Conclusion: There is a clear relationship between length and potential on titanium implants. With bigger length, the potential increases. No relationship between diameter and potential were found.

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One-piece implant-retained overdentures–retentive forces

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Objectives: This study evaluated the retentive force of several retainers for the one-piece tapered implant (Nobel Direct: ND; Nobel Biocare, Sweden) – retained overdentures.

Material and methods: Two sizes of O-rings [O3 (2.8-mm dia.), O4 (3.8-mm dia.) SAN-EI, Japan], and protection caps (PC; Straumann, Switzerland) were prepared for attachment matrixes. Alternatively, a Konus telescope system (KT) was applied so that the abutment head of the ND (RP, φ4.3 mm diam.) was used as an inner crown. As a control, the PMMA resin (RE) was directly used to connect the abutment head to the denture base resin without retainers.

After ND and matrix were joined under four different loads: 1, 2, 5, and 10 kg force, they were mounted on a screw-driven mechanical testing machine (Model UTM II, Tokyo Boldwin, Japan). The retentive force ($n = 5$, N) was measured at a crosshead speed of 40 mm/min up to 10,000 insertion/removal times. Obtained data was analyzed by analysis of variance (ANOVA)/Scheffé's test.

Results: O4 indicated significantly less retentive force than O3 ($p < 0.05$) and KT showed comparable retentive force to O3 ($p < 0.05$). Although the retentive forces of KT tended to increase as the connecting load increased, the force of the O-ring did not vary according to the connecting loads.

Conclusion: For the one-piece implant-retained overdentures, not only the O-rings and resin cap but also the Konus telescope demonstrated sufficient retentive force. Partially supported by Nobel Biocare research grant (2007-556).

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Comparison of 8 instruments for implant cleaning

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This *in vitro* study aimed to evaluate the effects of 8 implant cleaning instruments on the structures of 3 implant surfaces as well as the cleaning efficacies.

A layer of *streptococcus mutans* was cultivated on titanium discs with 3 implant surfaces ($n = 40$): as machined (M), grit blasted (B) and grit blasted/acid etched (BE). 5 discs of each surface were cleaned with manual carbon and plastic curettes, rubber cup, sonic driven plastic tip as well as prophylaxis brush, ultrasonic driven carbon curette, subgingival airpolishing powder and VectorSystem respectively. Specimens were stained and analysed lightmicroscopically as well as by REM to assess variations of the surface structure and cleaning efficacy. Surface roughnesses R_A were measured before and after cleaning using laser profilometry. Statistical analysis was carried out (Mann-Whitney test).

M surfaces (R_A 0.4 µm before cleaning) could be cleaned using all instruments except of carbon curette. Instruments increased R_A values significantly ($p < 0.05$) except of sonic brush and airpolishing. R_A of B surfaces did not differ significantly before (2.9 µm) and after cleaning ($p > 0.05$). Only airpolishing, ultrasonic carbon curette and Vector system offered good cleaning, yet ultrasonic curette performed surface destructions. Manual and ultrasonic carbon curette, rubber cup and airpolishing enhanced R_A of BE surfaces from 1.5 µm significantly ($p < 0.05$). Best results were obtained for cleaning BE surface without surface variations using airpolishing and sonic plastic tip.

The effects of implant cleaning instruments varied regarding implant surface structures. For cleaning of rough surfaces airpolishing, sonic or ultrasonic driven instruments should be preferred.

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Marginal bone loss around polished-neck and rough-neck implants. A prospective, comparative, 1-year clinical study

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Background: The annual rate of marginal bone loss (MBL) was proposed by Albrektsson et al.(1986) as a predictor of implant failure. They proposed bone loss of 1.2 mm in the first year of service and another 0.2 mm in each succeeding year as thresholds for implant success. Although these thresholds are accepted widely in defining a successful implant, there is no consensus regarding the rate of bone loss necessary to define the failure of an implant. Recently, a growing number of rough neck implants emerged in the market, claiming to better maintain the marginal bone level than the traditional polished-neck implants.

Aim: The aim of the present study was to compare bone loss around polished neck vs. rough neck implants during the first year of function.

Methods: 56 pairs of implants, one with polished neck (Lance, MIS) and one with rough neck (Seven, MIS) were inserted into the posterior mandibles of 48 patients. Bone level measurements were carried out using panoramic x-rays at insertion, 4 months after insertion, as well as 6 and 12 months after loading. Implant stability was measured using Periotest at the same time intervals.

Results: The results indicated that MBL was significantly greater around implants with polished-neck compared to rough-neck implants. Multi-variant analysis suggests that the only factor affected MBL was implant-type, with no correlation to the initial stability of the implant. No gingival irritation was noted,

although some of the rough necks were exposed to the soft tissue.
Conclusions: The results suggest that the rough-neck design may be superior to polish-neck design, at least in the short-term. More long-term studies are needed to confirm the present results. (Partially supported by MIS Implants, Israel).

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Bone-implant interface around fiber-reinforced composite implants under different polymerization conditions

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Objectives: The aim of this study was to investigate the biological performance of bioactive fiber-reinforced composite (FRC) implants under a different of polymerization conditions to estimate the scope of their potential applications as bone implant material.
Material and methods: Two experimental FRC implants with various polymerization conditions were fabricated for this study: a) FRC rods with bioactive glass (BAG) were implanted, and polymerized in situ with hand light-curing unit for 40s, and b) The cylindrical prefabricated FRC implants with BAG coating, were fabricated with polymerization in a light curing oven at 80°C for 1hour and post-cured at 120°C for 24 hours. Ten implants were implanted in the tibia of three pigs using the press fit technique. Animals were sacrificed after 12 weeks. Light microscopy and SEM analyses were performed to characterize bone-implant interface.
Results: In general, only mild foreign-body reactions with no accumulations of inflammatory cells to either prefabricated FRC implants or in-situ polymerized were observed during the follow-up period. The prefabricated FRC implants appeared biologically fixed by a newly formed woven bone arranged in the thin bone trabeculae filling the gap between the implant and the host bone. While for the in-situ polymerized FRC material, which were almost completely surrounded by a fibrous capsule.
Conclusion: Our results suggest that the biocompatibility of the FRC material is of great importance and a predictor of osseointegration, as it is essential to establish stable fixation with direct bone-implant contact. This underlines the impact of improved polymerization is required for FRC implant materials.**Keywords:** bioactive glass, fiber-reinforced composite, implant, in-situ polymerization, osseointegration.

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Preparation and chemical-physical characterization of porous nanostructured HA scaffold

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Purpose: The aim of this study was the synthesis of nanostructured hydroxyapatite HA particles and the determination of chemical–physical properties of material based on HA.
Material and methods: The synthetic nanostructured HA powder was prepared by the reaction of calcium hydroxide $Ca(OH)_2$ aqueous solution and phosphoric acid H_3PO_4.

The ultrasound apparatus was used for the separation of the particles during the coagulation process.

The foaming process was carried out in water bath. The synthetic scaffolds were dried for three hours at 120, 150, 300, 400, 500, 700°C. The porous structure of the samples was formed by the decomposition of the H_2O_2.

Mechanical strength was estimated by defined compression of cylinder filled with granules of HA porous samples.

Elemental analysis, X-ray diffraction, chemical analysis, differential thermal analysis, scanning electron microscopy, gas adsorption and mercury porosimetry were used to characterize the precipitate and the synthetic scaffolds. In-vitro cytotoxicity test and the preclinical evaluation of this material were performed.
Results: Porous and phase pure hydroxyapatite granules were successfully prepared. HA granules exhibited interconnected macro and micro porosity. The Specific surfaces areas of the scaffolds were from 25.41 ± 0.11 $[m^2.g^{-1}]$ to 78.33 ± 0.34 $[m^2.g^{-1}]$. The porosity was from 64 to 83%. In-vitro cytotoxicity test proved the granules to be non toxic.
Conclusions: The process of precipitation and coagulation can be applied to obtain pure nanostructured HA powder.

Foaming with H2O2 represents a method suitable to produce HA scaffold with higher surface area and porosity.

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Variations in thread diameter on the performance of abutment screws

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Objectives: Implant components need to offer biomechanical security. With cement retained single tooth reconstructions, loosening of the abutment screw can cause a major clinical complication. Although multifactorial, no studies have been undertaken to evaluate manufacturing machining tolerances of abutment screws and the effect of this screw joint stability.

The purpose of this study was to investigate variations in abutment screw thread diameter on the *in vitro* stability of implant assemblies.
Methods: Test assemblies were constructed by placing 3.75 mm diameter Osteocare fixtures into aluminium alloy holders. Custom 8 mm abutments were secured to the fixtures by abutment screws manufactured to four different thread diameters. The screws consisted of one diameter (1.52 mm) representing the manufacturers specification, two diameters at the limits of machining tolerance (1.49 and 1.55 mm) and one diameter produced to a substandard specification (1.46 mm). Loosening torque values (LTV) were recorded after repeated tightening. LTVs were also recorded following 30 degree offset compressive bending at pre-designated loads and cyclic loading at 300N at pre-designated cycles.
Results: No significant differences were observed between the performances of the abutment screws with varying diameters

subjected to strength challenges. Thread diameter may however have significance when repeatedly loosened.

Conclusion: Strength challenges to an implant assembly can have a significant affect on the clamping force within the implant-abutment connection and on abutment screw preload. This study has shown that *in vitro* strength challenges on abutment screws with manufacturing variances have no effect on the stability of this internal bevel implant connection. Further investigations are necessary to extend this finding amongst abutment connections with differing geometry.

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A novel method to quantify bone loss around implants

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Objectives: The aim of the present study was to test the ability of a new method to quantify bone loss around implants. The new method contrasts with the use of peri-apical radiographs which can only assess interproximal marginal bone level.

Material and methods: A dedicated software program (QT 1.0.0.2 by Inspektor Research Systems BV Amsterdam, The Netherlands) was developed to quantify circumferentially bone levels from an implant reference point to where bone first radiographically contacts the implant. CT images in DiCom format with voxel size of $0.2 \times 0.2 \times 0.2\,mm^3$ from patients with one or more implants were used. For each set of DiCom images the center bottom and top of the implant of interest was located to store its (x,y,z)-position. A 3D-rotation was calculated by the software and horizontal (xy) bitmap planes perpendicular to the long axis of the implant were constructed. Each xy-bitmap showed a circular cross section in the center of the image. Four transversal bitmaps parallel to the long axis of the implant were constructed from each cross section. It is then possbile to position a reference from where bone levels are calculated. Marginal bone levels (D) are set on the 4 transversal sections on each side of the implant resulting in 8 circumferential measurements.

Results: Measurement repeatability of D was 1.5 mm.

Conclusions: QT seems to be a promising method for quantitative longitudinal measurement of circumferrential bone loss around implants. Buccal and lingual measurements provide important information for evaluation of aesthetical parameters or biological complications.

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Bone regeneration in rabbit calvaria with novel monetite granules

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The aim of this study was to evaluate whether local application of monetite granules would induce bone regeneration in critical size defects on rabbits calvaria.

Novel monetite granules were synthesized by thermal conversion of preset brushite cement. Twelve female New Zealand rabbits were used for this study. Two identical 10-mm-diameter bi-cortical cranial defects were created in each animal. One of the defects was grafted with monetite granules while the contralateral was left unfilled as negative control. Animals were sacrificed at 4 and 8 weeks after surgery, biopsies were taken for histological and histomorphometrical evaluation under light microscopy. Wilcoxon test was used for statistical analysis.

The histological observations showed signs of graft resorption as newly formed bone tissue grew surrounding and penetrating the monetite granules. Histomorphometric evaluation showed that the augmented bone volume as well as the augmented mineral tissue was higher in the defects treated with monetite granules ($p < 0.05$) 8 weeks after the intervention. In this animal model, local application of the novel monetite granules in bone defects enhances bone healing significantly.

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A new oral implant (straumann bone level) for implant-prosthetic rehabilitation: preliminary results

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Background: Oral implants have become an extremely reliable tool for prosthetic rehabilitation of partially or totally edentulous patients. Both submerged and transmucosal implants demonstrated very high long-term survival and success rates. Recently, Straumann has developed a new implant which very peculiar characteristics (SLActive®, Bone Control Design® and full rough surface).

The purpose of this ongoing clinical study on humans is to evaluate the short-term success and survival rate of this new implant.

Material and methods: Thirty-nine patients, have been included in this study from January 2007 to February 2008. Sixty-seven Bone Level® implants were placed in the edentulous areas; of these, 30 implants were inserted in the maxilla and 37 in the mandible.

Out of 67 implants, 15 were placed in edentulous healed sites with no need of reconstruction; 5 implants were inserted immediately after tooth extraction; 20 implants were placed in association

with GBR techniques for the correction of horizontal and/or vertical defects; and, finally, 34 implants were placed following previous reconstructions with autogenous bone grafts. Sixty-three implants were loaded after a mean healing period of 10 weeks, while 4 implants were loaded immediately after placement. Periapical radiographs were performed at the time of: implant placement (T0), prosthetic loading (T1), 6 (T2) and 12 (T3) months thereafter. Measurements have been performed mesial and distal to each implant, measuring the distance between the implant shoulder and the most coronal point of direct contact between bone and implant surface (BIC). Peri-implant parameters (MPI, MBI, PD, CAL) have been recorded.

The assessment of survival and success rates of implants was performed according to the criteria proposed by Albrektsson.

Results: After a mean follow-up of 9 months (range: 6–12 months), the cumulative survival and success rates were 100% and 98%, respectively.

Conclusions: Within the limits of this study (short follow-up period and limited sample of patients and implants) Straumann Bone Level Implants seem to be a very reliable tool for the rehabilitation of partially or total edentulous patients with implant-supported prostheses.

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Sinus augmentation with nanocristalline-hydroxyapatite (Ostim®) in comparision with established bone substitute (Bio-Oss®)

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Ostim®, an aqueous paste of synthetic nanoparticular hydroxyapatite, was recently introduced to serve as a bone substitute for sinus augmentation. At present, however, studies comparing Ostim® with established bone substitute in clinical relevant animal models are lacking.

We evaluated the consolidation of Ostim® together with Bio-Oss®, a deproteinized bovine bone mineral, in the maxillary sinus of ten minipigs using a split-mouth design. Histologic and histomorphometric analysis were performed at 6 and 12 weeks.

Sinuses receiving Ostim® had significant higher rates of graft consolidation compared to those receiving Bio-Oss®. At 6 weeks, the bone volume per tissue volume [BV/TV] of the sinus augmented with Ostim® and Bio-Oss® was 19.6% ± 8.7 and 8.3% ± 3.7, respectively ($P < 0.05$). However, at 12 weeks, the mean difference between the sinus augmented with Ostim® (28.7% ± 3.9) and Bio-Oss® (18.6% ± 9.6) in BV/TV was not considered significant. Remaining Ostim® in the augmented area decreased from 26.7% ± 16.7 to 22.2% ± 4.5 within the 6 weeks. In the same time period, the relative amount of Bio-Oss® in the sinus remained almost unchanged (24.5% ± 4.5 and 24.1% ± 3.7). Histologic findings are in agreement with the histomorphometric observations that Ostim® but not Bio-Oss® shows visible signs of degradation. Histologic analysis support the osteoconductive properties of both materials.

These findings suggest that, in the minipig sinus, the early phase of graft consolidation occurs faster in the Ostim® group than that in the Bio-Oss® group, while after 4 months, this difference was neglectable.

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Characterization, removal torque/ histomorphometric evaluation of bioceramic blasted and etched surfaces

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The objective of this study was to compare the biomechanical fixation and bone-toimplant contact (%BIC) between a bioceramic grit-blasted and acid-etched surface (BGB/AA, Test), versus a dual acid-etched implant surface (Control) in a beagle dog model.

Methods: Control and BGB/AA implants ($n = 3$) were subjected to a series of physico/chemical characterization tools including scanning electron microscopy (SEM), atomic force microscopy (AFM), and auger photoelectron spectroscopy (APS). The animal model comprised the placement of 72 implants along the proximal tibiae of 6 beagle dogs (36 per surface, 6 per limb, through bilateral sequenced procedures), which remained for 2 and 4 weeks implantation time. After euthanization, half the specimens were biomechanically tested (removal torque), and the other half was nondecalcified processed to ~ 30 µm thickness slides for histomorphologic and histomorphometric (%BIC) evaluation. ANOVA at 95% level of confidence and Tukey post-hoc test was utilized for multiple comparisons.

Results: The SEM and AFM showed that surface microtextures were qualitatively and quantitatively different, and that the BGB/AA surface presented higher submicrometer Ra and RMS values compared to Control surfaces. Ca and P was detected at the BGB/AA surface by APS. Higher degrees of bone organization were observed along the perimeter of the BGB/AA surface compared to Control, despite the non-significant differences in %BIC between surfaces ($p > 0.25$). Significantly higher removal torque was observed for the BGB/AA implants at both implantation times ($p < 0.0001$).

Conclusion: according to the biomechanical and histomorphologic results, early biomechanical fixation was positively affected by the BGB/AA surface compared to the dual-acid etched surface.

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Biomechanical/histomorphometric evaluation of a nanobioceramic surface on plateau root form implants

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Objective: to evaluate the biomechanical fixation, bone-to-implant contact, and bone morphology of a Ca- and P-based 300–500 nm thickness bioceramic deposition on a previously alumina-blasted/acidetched Ti-6Al-4V implant surface in a dog model.

Methods: Thirty-six 4.5 × 11 mm plateau root form implants were divided in Control (alumina-blasted/acid-etched-AB/AE) and experimental groups (AB/AE + 300–500 nm bioceramic coating, Test-NanotiteTM), and were placed bilaterally along the proximal tibia of 6 beagle dogs remaining for 2 and 4 weeks in vivo (n = 3 animals per time in vivo). Following euthanization, the implants were torqued to interface failure at ~ 0.196 radians/sec until a 10% maximum load drop was detected. The implants in bone were nondecalcified processed for bone-to-implant contact (BIC) determination. Torque and BIC statistical analyses were performed using ANOVA at 95% level of significance.

Results: No significant différences in BIC and Torque was observed between Test and Control implants at 2 weeks implantation time. At 4 weeks in vivo, significantly higher torque to interface fracture was observed for the Test implant surface ($P < 0.02$). Histomorphologic analysis showed higher degrees of bone organization between the plateaus of experimental group implants at both times in vivo.

Conclusion: The torque to interface failure and increased bone maturity obtained in the present study support that the surface modification comprising a 300–500 nm biomceramic coating resulted in an enhanced wound healing pattern around pleateau root form implants.

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Bone implant interface following immediate implant installation in tooth extraction socket

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Several studies showed that marked hard tissue alterations occurred following tooth extraction and implant installation in the socket due to the resorption of bundle bone (Botticelli et al. 2004, Araújo et al. 2005, 2006), however in all these studies surgical preparation of the alveolus was performed.

The objectives of the investigation: was to study the bone-implant interface following tooth extraction and immediate implant installation using a root shape implants with and without the preparation of the recipient site.

Experimental methods used: In the current experiment 8 beagle dogs were used. The mandibular premolars were extracted. In one side of the mandible immediate implant installation (n = 16) (3.3x9 mm CV® Exacta Dental Implant, Italy) was performed without preparation of the recipient site (test) in the contralateral side the implants (n = 16) were inserted following the preparation of the recipient site (control). After 3 months of healing the animals were sacrificed and the mandible were processed for ground section in buccal lingual direction. Histometric measurements were performed by a blind investigator.

Results: A buccal bone loss of 1.78 mm was recorded (test) and 1.95 in the (control). The bone implant contact was 68% and 65%. The percentage of bundle in direct contact with the implant surface was 35% in the test group and 5% in the control group ($p < 0.05$).

Conclusions: The results of the present study revealed that after 3 months of healing bundle bone was in direct contact with the implant surface (test), therefore the biological mechanisms of bone loss in not related to the bundle bone.

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Influence of surface characteristics on bone integration of titanium implant surface design; resonance frequency analysis and histomorphometric analysis study in minipig

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The aim of the present study is to investigate the effect of anodized surface to osseointegration of implant by using of resonance frequency analysis(RFA), quantitative and qualitative assessment of an anodically modified implant type with regard to osseous healing qualities. A total of 96 screw-shaped implants were prepared to this study. 72 implants were prepared by electrochemical oxidation with different ways. 24(Group1 SP) were prepared at galvanostatic mode in 0.25 M sulfuric acid and phosphoric acid, 24(Group 2 GC) were prepared at galvanostatic mode in calcium glycerophosphate and calcium acetate and 24(Group 3 CMP) were prepared at galvanostatic mode in 0.25 M sulfuric acid and phosphoric acid followed by Calcium metaphosphate (CMP) coating. Rest of 24(Control Group RBM) were control group of RBM surface. Histomorphometric evaluation demonstrated significantly higher bone-to-implant contact for Group 2 GC. Significantly more bone was found inside the threaded area for Group 2 GC.

It was concluded that Group 2 GC (Anodized surface with calcium glycerophosphate and calcium acetate implants) had influence on bone tissue responses than RBM surface. In addition, Calcium metaphosphate(CMP) showed a tendency to promote bone tissue responses.

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Effect of statins on guided bone regeneration in ovariectomized animals

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Dental implant treatment is often planned for patients with significant alveolar bone loss, which makes immediate implantation impossible. It takes an average time of 6 to 9 months to reconstruct the bone with bone substitute materials and prepare it for implantation. There have been attempts to find a way to make that time shorter. One of such ways is the use of bone morphogenetic proteins. Especially BMP-2 has proven to be highly osteoinductive. Statins are one of the groups of factors which activate the promotor region of the BMP-2 gene.

Objectives: The aim of this study was to evaluate the possibility of accelerating the process of bone reconstruction with the use of Cerasorb and Bio-Oss as bone substitute materials and oral administration of statins.

Material and methods: A group of female Wistar rats was included in this study. The animals were divided in 3 groups, 2 of which were ovariectomized. In the femurs of all the animals two separate cavities were prepared and both bone substitute materials were placed in them separately. The cavities were then covered with absorbable membranes fixed with 2 mm long titanium pins. Animals in the group No. 2 were treated with atorvastatin for 3 months (10 mg/kg/d per os). After the treatment, femurs were retrieved for analysis of resistance to experimental fractures and durability of titanium pins. The triple point durability test was used for analysis of the biomechanical parameters of the bone. The method of the titanium pins durability examination was adjusted to the PN74/D-0424 standard (screw durability assessment). Instron test machine, model 4206 was used in the examination.

Results: Histomorphometric analysis revealed significant effect of atorvastatin on new bone formation and greater osseus integration of Cerasorb than Bio-Oss. Bones proved more fracture-resistant and bone-titanium attachment higher in the atorvastatin-treated group.

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Dental titanium iplants modification by Ti3P surface layer

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Titanium dental implants are mostly coated by titanium oxide and differ one to another by the macroscopic shape and surface topography. There are some trials of modifying implant surface by diffusion surface layer, among them surface containing phosphorus.

The aim of this study was the assessment of biomechanical properties of the composite surface layer Ti_3P + (Ti-Ni) type produced on the titanium alloy Ti6Al4V.

The composite surface layers Ti_3P + (Ti-Ni) type were produced by duplex method. The properties of Ti_3P were characterized by analysis of chemical composition, and measurement of microhardness, surface roughness, wear and corrosion resistance. The bioactivity of this layer was tested in SBF and its biocompatibility with the Saos-2 osteoblast-like cells in range of cell proliferation, cell viability, adhesion and fibronectin production and fibronectin receptor $\alpha 5\beta 1$ expression and release of alkaline phosphatase (ALP).

The Ti_3P + (Ti-Ni) layer produced on titanium alloy Ti6Al4V has a diffusion character and improves frictional wear resistance and microhardness, and exhibits high corrosion resistance. It protects against release of titanium alloy elements into biological environment and exhibits high bioactivity. The Ti_3P + (Ti-Ni) activates human osteoblast-like cells adhesion and proliferation, and synthesis of fibronectin, expression of fibronectin receptors, producing of ALP.

Composite surface layer Ti_3P + (Ti-Ni) type produced on the titanium dental implants remarkably could improves their biomechanical properties. This new surface layer produced on the titanium alloys may change contemporary indication for inserting of long dental implants and significantly improve biomechanical and bone regeneration aspects in patients treated with dental implants.

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In vitro biological response of si-based electrochemical treated titanium surface

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Objectives: Electrochemical treatment has been used to modify the implant surface, aiming at increasing osteoconductive property of the titanium (Ti). We have recently modified an anodic spark deposition (ASD) to obtain a thickened titanium oxide layer doped with calcium (Ca), phosphorus (P), and silicon (Si). This study was designed to evaluate the biological response to this novel Si-based treated titanium, using two human cell models; alveolar osteoblast (aHOB) and mesenchymal stem cells (MSCs).

Material and methods: ASD with Si based (ASDSi) and conventional ASD (BioSpark™, BS) were investigated and compared to the two controls, which were chemically-etched Ti (BioRough™, BR) and commercially pure Ti (cpTi; non-treated surface). All surfaces were scanned by scanning electron microscopy (SEM), energy dispersive x-ray spectroscopy (EDS), and atomic force microscopy (AFM) for physicochemical characterisation. aHOB cells and MSCs were seeded directly onto the test discs (ASDSi, BS, BR, cpTi) and

controls (Thermanox® and polyvinylchloride). Cells were fixed and processed for morphological assessment using SEM. Cell proliferation was determined using alamarBlue™ and cell differentiation assays were performed, including alkaline phosphatase (ALP) and osteocalcin (OCN).

Results: SEM images showed cell layers on all surfaces with active cell visible, and cell filopodia extending across surface. All test samples showed comparable proliferation for both cell types compared to the controls, and the differentiation assays showed pronounce ALP and OCN.

Conclusion: This novel treated modified titanium surface had a nano-topographic texture consisting of micro-pore structure, together with added element; Si, favouring cell attachment, proliferation, and differentiation, which may enhance osseointegration.

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A novel concept of anchoring permanent implants into bone

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The BoneWelding® Technologie has proven to be an attractive alternative for resorbable polymer screws in the CMF osteosynthesis. This animal study was performed to validate the concept of titanium-polymer hybrid implants for permanent dental implant applications. A cylindrical titanium core was partially coated with polylactide PLA, type R208 or LR708, referenced by a non-coated implant. Samples were evaluated biomechanically and histologically in a sheep pelvis model. Observation periods ranged from acute to long term (14 days to 1 year). Implants equipped with polymer showed superior torque release forces and excellent biocompatibility at all observation periods. New bone was build up continually, enclosing the implants. Bone mass development, found in this study was following the dynamics of healthy bone healing. The new bone was covering the PLA and Titanium surface directly without soft tissue capsule. The percentage of bone-implant-contact was also increasing steadily, even faster for the polymer coated implants. It was shown, that the hybrid concept lead to improved osseointegration and new bone formation at the titanium surface with a high contact area between bone and implant.

The research work was supported by New Dent AG, metalordental Group Oensingen, Switzerland.

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Enhanced osseointegration of implants with a nanostructured bioactive coating

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Objectives: In this study we tried to investigate weather it is possible to use the properties of the bone grafting material NanoBone® for coating of dental implants to improve their osseointegration.

Material and methods: The implants (group A: Semados®, sand blasted surface; group B: ixx2®, sand blasted and acid etched surface) were coated with a silica matrix covering nanocrystalline hydroxyapatite by sol-gel technique. The implants showed differences in screw thread and roughness. Coated (n = 18) and uncoated (n = 18) implants were inserted in the frontal bone of 8 minipigs. Specimens were excised after 2, 4 and 6 weeks and processed according to the sawing and grinding technique. The bone to implant contact (BIC) was measured by semiautomatic software.

Results: All coated implants showed a higher rate of BIC compared to the uncoated implants.

The mean percentage of BIC for coated implants of group A was 60.2%–2 weeks, 66.6%–4 weeks and 74.5%–6 weeks. The uncoated implants of this group reached 57.0%–2 weeks, 61.3%–4 weeks and 64.4%–6 weeks. In group B the BIC was 73.4%–2 weeks, 70.6%–4 weeks and 78.0% for the coated ones. The uncoated implants in this group reached a BIC of 68.5%–2 weeks, 60.9%–4 weeks and 45.8%–6 weeks.

Conclusion: The applied coating of implants enhances the BIC. Earlier loading of such modified implants can be considered.

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New laser engineered titanium surfaces in oral implantology

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In the field of oral implantology, is now widely recognised and accepted that the chemical-physical and morphological properties of the implant surface take on a role of primary importance in determining bone tissue response and therefore the nature of its osseointegration.

It's therefore evident that the development of a surface treatment which is able to create highly controlled topography which can be replicated and has excellent dimensional characteristics which stimulate the adhesion and the differentiation of osteoblastic cells, can accelerate, regulate and make more predictable the healing process and the formation of new bone after the insertion of the implant. Another goal was to obtain the morphological characteristics which have just been described at the same time as eliminating any risk that residues deriving from roughening treatments

remain on the surface or that dangerous corrosion reactions are provoked with the discharge of metal ions.

The technology presented uses a Nd:YAG diode pumped laser (DPSS laser) in Q-Switching (Geass, Synthegra®). The brief time span (nanoseconds), the short wave length (UV) and the excellent quality of the optical band (TEMoo mode) have allowed us to create for the first time ever perfectly controlled topography in terms of dimension, distribution and reproducibility of the micrometric porosity on devices which have particularly small dimensions and extremely complex geometry like dental implants.

Chemical analyses of this surface have also allowed us to verify that the technology presented does not introduce any form of contamination and does not alter the chemical-physical characteristics of the titanium.

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New laser implant surfaces: in vitro effect of bone cells adhesion, proliferation and differentiation

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Aim: In order to define the precise patterning characteristics (diameter, depth, and spacing of the pores) to be created on the implant surfaces, ''in vitro'' testing was carried out with immortalised osteoblastic cells, comparing different laser treated surfaces (Geass, Synthegra® Nd:YAG surface) with traditional surfaces.

Material and methods: Titanium samples were created and treated with the laser with pores of 5, 10 and 20 μm in diameter. These surfaces were compared to smooth surfaces without pores MAC and sandblasted surfaces SAB.

All of the titanium samples ''sterile cylinders'' were analysed in a SaOS-2 suspension in McCoy's medium and incubated. The following in vitro testing was carried out: 1) Cell adhesion testing. The samples were incubated for 6 h/24 H and observed with the SEM to describe the morphology.

2) Cell proliferation and differentiation testing with incubation for 3;7 and 10 days, subsequent washing with trypsina-EDTA to separate the cells. The possible presence of alkaline phosphates was evaluated by its transformation in nitrophenolate, quantified by the relationship between absorption and number of cells at the spectrophotometer.

Results and conclusions: For adhesion testing for the laser treated samples, those treated with 20 μm pores sustained the highest osteoblastic proliferation intensely adhering entirely to the superficial pores while the MAC samples shows fibroblastic phenotypes and not osteoblastic cells and the SAB surfaces showed osteoblastic cells with flattened and polygonal morphology with a slower colonisation process. The laser treated surfaces (20 μm pores) promote enzymatic activity (compared to the sandblasted ones) which indicates elevated proliferation and differentiation of the SaOS-2 osteoblastic lines. In conclusion, this innovative laser surface treatment seems to respond advantageously in the surface-cell relation, guaranteeing significant cell adhesion, proliferation and differentiation.