

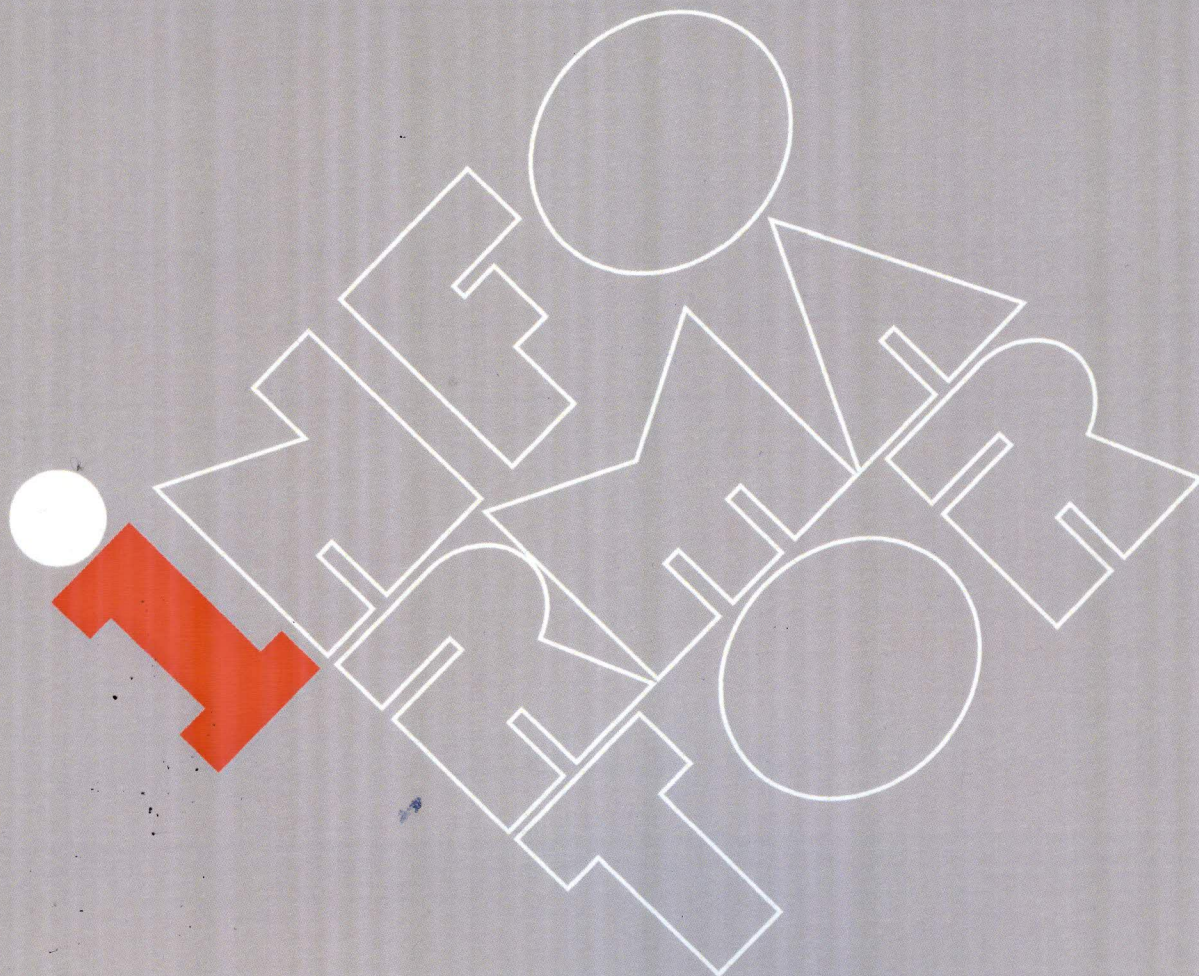
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ORIGINAL STUDIES

University of Zagreb, Croatia

School of Dental Medicine & Clinical Hospital Centre Zagreb, Department of Prosthodontics¹School of Dental Medicine University of Zagreb, Croatia, Department of Prosthodontics²University of Split, Croatia, School of Medicine, Study of Dental Medicine, Department of Prosthodontics³Private Dental Office Jordan, President of the international academy of cortical implantology Rome, Italy⁴**FLAPLESS INSERTION OF MINI DENTAL IMPLANTS – HOW PATIENTS PERCEIVE POST-OPERATIVE PAIN?****INSERCIJA MINI DENTALNIH IMPLANTATA BEZ ODIZANJA REŽNJA – KAKO PACIJENTI DOŽIVLJAVAJU POSTOPERATIVNU BOL?****Asja ČELEBIĆ¹, Ines KOVAČIĆ², Josip KRANJČIĆ², Renata POLJAK GUBERINA³,
Dino BUKOVIĆ², Adel ABU SHARKH⁴ and Sanja PERŠIĆ²**

Summary – Self-perceived pain on the operative day, as well as on the 1st, 3rd, 5th, 7th and the 10th post-operative day after flapless mini dental implant (MDI) insertion were assessed using the 0-10 visual analogue scale in 205 patients (each patient receiving 1-8 MDIs). Low to moderate pain on the day of insertion and low level of pain on the 1st postoperative day with very low pain thereafter were reported. Pain increased only with a number of mini dental implant insertions, while gender, jaw of insertion and age showed no significant effects. One third of patients did not take painkillers at all, over 80% of patients stopped with painkillers on the 3rd post-operative day. Tooth extraction elicited more pain in 80% patients than mini dental implant insertion; 99% of patients reported that they would repeat the procedure. It seems that flapless mini dental implant insertion is a suitable option regarding low pain level. Patients should receive such information before treatment to minimize their fear of a surgical procedure.

Key words: Pain Perception; Pain Measurement; Pain, Postoperative; Dental Implants; Tooth Extraction; Analgesics; Surgical Flaps

Introduction

Anxiety and/or fear of pain have been the most frequent reasons why patients avoid dental treatment, especially surgical dental implant insertion. Slim mini dental implants (MDI) inserted by a flapless technique have been advocated as ideal solution to avoid invasive procedures. It may be assumed that postoperative discomfort and healing time will be reduced in comparison to open-flap standard size implant insertion [1]. Prior the surgical treatment patients have number of concerns, however not understanding the procedure may result in increased anxiety and stress [2]. Recently one study reported that insertion of 4 MDIs elicited more severe pain than insertion of 2 standard size implants [3]. However, MDIs in that study were inserted after a flap reflection [3]. It has been reported that patients who received standard size implants with flapless procedure experience pain less intensely and for shorter periods of time than patients who receive implants after open-flap surgery [4, 5].

The aim of this study was to assess patients' self-perception of pain after flapless MDI insertions. The aim was also to compare pain intensity after flapless MDI insertion with previous experience of pain after teeth extraction, and to assess effects of a number of MDI insertions, jaw of insertion, gender and age on self-perceived pain levels.

Material and Methods

The institutional ethical board approved the study. A signed consent was obtained from 205 patients (143 females, 62 males) before receiving one to 8 MDIs (a total of 711 MDIs were inserted). The inclusion and exclusion criteria together with the procedure are listed in **Table 1**. Patients assessed the level of a self-perceived pain on the day of insertion, as well as on the 1st, 3rd, 5th, 7th and the 10th day by using a visual analogue scale (VAS) from 0-10. After receiving dentures and denture adjustments, patients were asked about their willingne-

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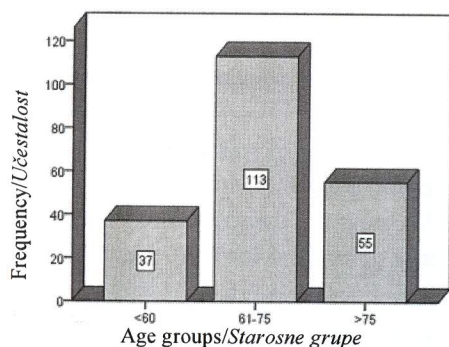


Figure 1a. Distribution of patients depending on their age group

Slika 1a. Distribucija pacijenata u zavisnosti od njihove starosne grupe

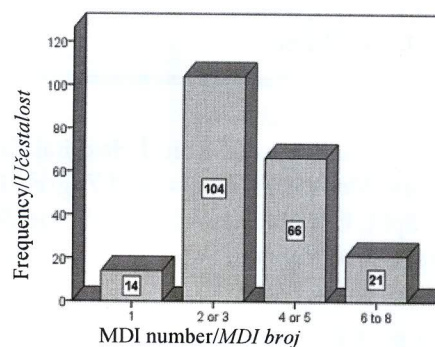


Figure 1b. Distribution of patients depending on a number of MDI insertions

Slika 1b. Distribucija pacijenata u zavisnosti od broja MDI umetaka

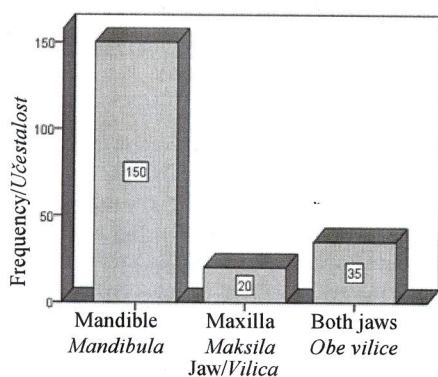


Figure 1c. Distribution of patients depending on the jaw of MDIs insertion

Slika 1c. Distribucija pacijenata u zavisnosti od udara MDI

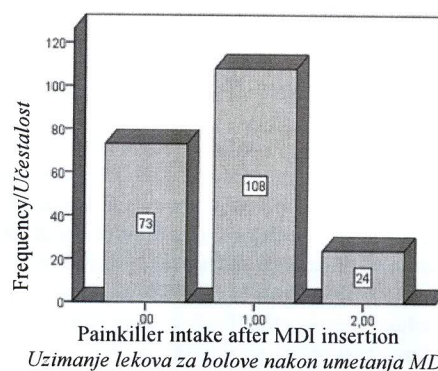


Figure 1d. Distribution of patients depending on a quantity of painkiller intake on the operative day

Slika 1d. Distribucija pacijenata u zavisnosti od količine unosa lekova za bolove na dan operativnog zahvata

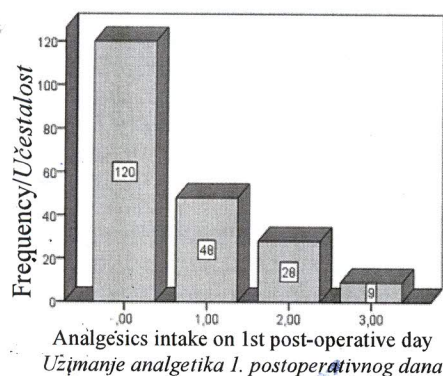


Figure 1e. Distribution of patients depending on a quantity of painkiller intake on the 1st postoperative day

Slika 1e. Raspodela pacijenata u zavisnosti od količine unosa lekova za bolove prvog postoperativnog dana

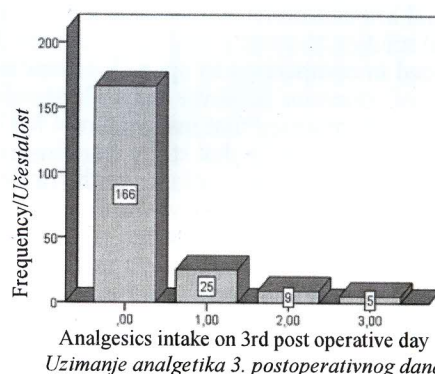


Figure 1f. Distribution of patients depending on a quantity of painkiller intake on the 3rd postoperative day

Slika 1f. Raspodela pacijenata u zavisnosti od količine unosa lekova za bolove trećeg postoperativnog dana

ss to repeat the procedure. They compared overall pain experience with pain after teeth extraction. The SPSS 22 software for Windows was used for statistical analysis (descriptive statistics, ANCOVA).

Results

Distribution of patient age groups, groups depending on a number of MDIs inserted, jaw of insertion, number of painkiller intake on the operative, the 1st and the 3rd postoperative days are presented in **Figure 1 (a-f)**,

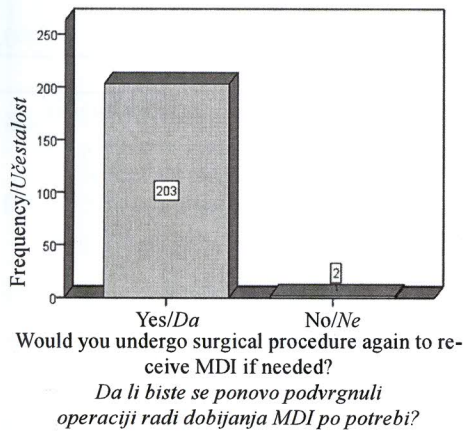


Figure 1g. Distribution of patients depending on their willingness to repeat the procedure
Slika 1g. Distribucija pacijenata u zavisnosti od njihove spremnosti da ponove postupak

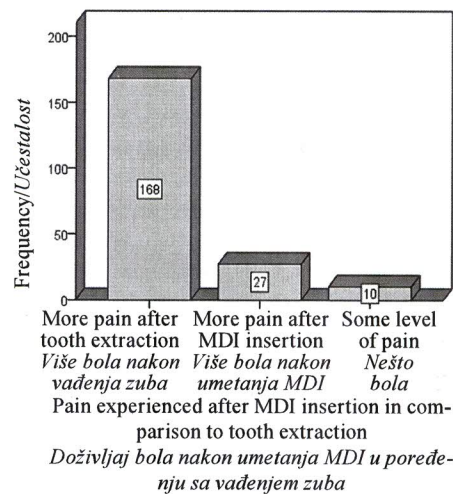


Figure 1h. Distribution of patients depending on their self-reported pain after MDI insertion and teeth extraction
Slika 1h. Raspodela pacijenata u zavisnosti od bolova sa samoprijavlivanjem nakon MDI umetanja i ekstrakcije zuba

Figure 1a-h. Distribution of patients depending on their age group (a), number of MDIs inserted (b), jaw of insertion (c), quantity of painkiller intake on the operative day (d), on the 1st (e), and on the 3rd postoperative day (f), their willingness to repeat MDI insertion (g) and their self-reported pain after MDI insertion and teeth extraction (h)
Slika 1a-h. Raspodela pacijenata u zavisnosti od starosne grupe (a), broja ubačenih MDI-a (b), vilice ubacivanja (c), količine unošenja lekova za bolove operativnog dana (d), prvog (e) i trećeg (f) dana, spremnost pacijenata na ponovnu inserciju MDI (g) i njihov bol sa samoprijavom nakon unošenja MDI-a i ekstrakcije zuba (h)

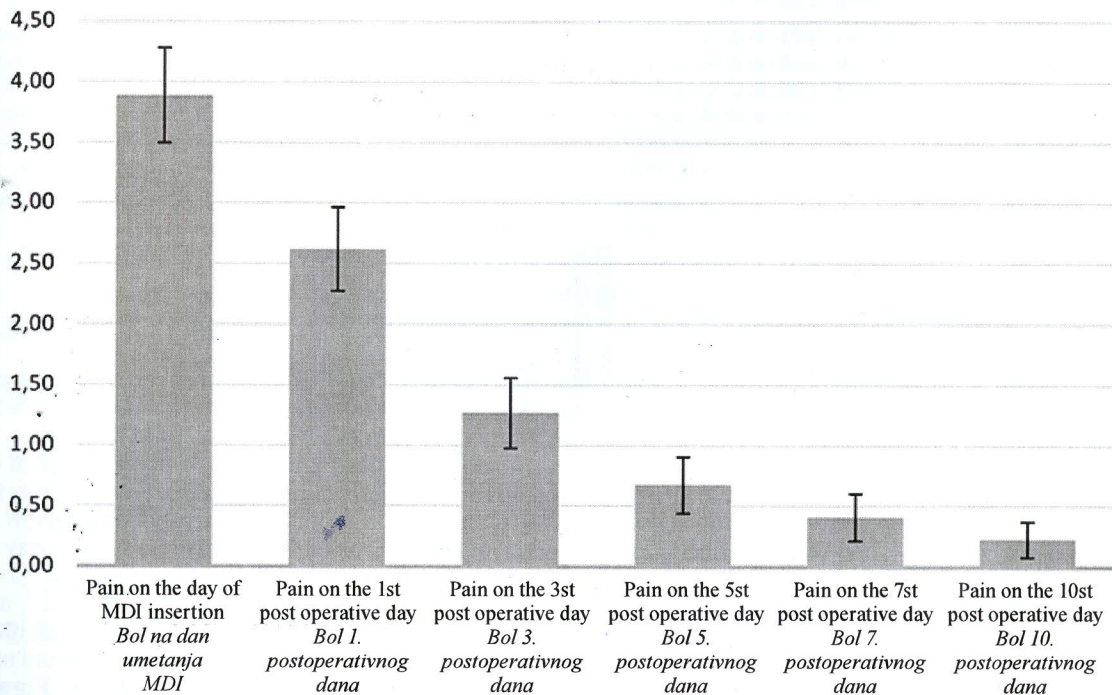


Figure 2. Mean values and 95% confidence intervals of a self-perceived pain after MDI insertion assessed by the visual-analogue scale (VAS) from 0-10
Slika 2. Srednje vrednosti i intervali pouzdanosti od 95% samoprocenjenog bola nakon umetanja MDI-a prikazani vizuelno-analognom skalom (VAS) 0-10

Table 1. Inclusion and exclusion criteria together with a description of MDI insertion by a flapless technique
Tabela 1. Kriterijumi inkluzije i isključivanja zajedno s opisom postupka MDI umetanja bez pomoćne tehnike

Inclusion criteria/Kriterijumi za uključivanje	
1.	No medical contraindication for dental implantation/ <i>Nema medicinske kontraindikacije za implantaciju zuba</i>
2.	Sufficient bone width and length to place MDIs without augmentation procedures or bone remodeling <i>Dovoljna širina i dužine kostiju za postavljanje MDI bez procedura povećanja ili prepravke kostiju</i>
3.	Written informed consent to participate in the study/ <i>Pismena saglasnost za učestvovanje u studiji</i>
4.	MDI insertion (1.8, 1.9, 2.0, 2.4 or 2.5 mm wide and 10, 12 or 14 mm long) for the purpose of retention of an overdenture or fixed partial denture (in place of mandibular incisors) <i>Umetanje MDI-a (1,8 mm, 1,9 mm, 2,0 mm, 2,4 mm ili 2,5 mm širine i 10 mm, 12 mm ili 14 mm dužine) s ciljem zadržavanja prekrivača ili fiksnih parcijalnih zuba (umesto mandibularnih sekača)</i>
Exclusion criteria/Kriterijumi za isključenje	
1.	Poor general health (Class III-IV according to the classification of the American Society of Anaesthesiology (ASA), severe renal/or liver disease, history of a radiotherapy in the head region, chemotherapy at the time of surgical procedure, non-compensated diabetes mellitus, HIV) <i>Slabo opšte zdravlje (klasa III-IV, prema klasifikaciji Američkog udruženja za anesteziologiju (ASA), ozbiljne bolesti bubrega ili jetre, istorije radioterapije u glavnom regionu, hemoterapija u vreme hirurške procedure, kompenzovani dijabetes melitus, HIV);</i>
2.	Ongoing intravenous bisphosphonate therapy/ <i>Kontinuirana intravenska bisfosfonatna terapija</i>
3.	Mental disorders (anamnesitic)/ <i>Mentalni poremećaji (anamnestički)</i>
4.	Drug abuse (anamnesitic)/ <i>Zloupotreba droga (anamnestički)</i>
5.	Patients who needed flap reflection for any reason/ <i>Pacijent treba da razmišlja o zamahu iz bilo kog razloga</i>
6.	Mucosa overlying residual ridge of > 3.5 mm height/ <i>Prekrivač ostatka grebena iznad > 3,5 mm visine</i>
7.	Patients who did not sign informed consent/ <i>Nije potpisana saglasnost</i>
Procedures of MDI insertion/Procedure MDI umetanja	
1.	Panoramic radiograph and/or CBCT analysis together with clinical examination prior MDI insertion <i>Panoramska radiografija i/ili CBCT analiza zajedno s kliničkim ispitivanjem pre uvođenja MDI</i>
2.	Antibiotic prophylaxis (2 g of Amoxicillin or 600 mg of Clyndamicin)/ <i>Antibiotička profilaksa (2 g amoksicilina ili 600 mg klindamicina)</i>
3.	Local anesthesia (Ubistesin forte 4% or Mepivastesin 3%, 3M, Germany) <i>Lokalna anestezija (Ubistesin forte 4% ili Mepivastesin 3%, 3M, Nemačka)</i>
4.	Use of calibrated drills (slightly narrower than the diameter of an implant); bone preparation using a physiodispenser (W&H Implantmed, GmbH, Austria) and a saline solution for drill cooling (slow speed after cortical bone punching); in cases of a dense bone depth of preparation was same as the length of an implant, in cases of a less dense bone depth of preparation was the two-thirds of the implant length <i>Upotreba kalibriranih bušilica (malo užih od prečnika implantata); priprema kostiju korišćenjem fiziološkog dozatora (V & H Implantmed, GmbH, Austrija) i fiziološkog rastvora za hlađenje bušilice (spora brzina nakon udaranja kostiju). U slučajevima duboke gustine kostiju dužina je bila ista kao i dužina implantata, a u slučajevima manje gustine kostne dubine iznosila je dve trećine implantata</i>
5.	MDI insertion; in cases of a torque less than 30 N/cm ² late loading (3 month); in cases of a torque > 30 early loading (6-8 weeks) <i>MDI umetanje; u slučajevima obrtnog momenta manje od 30 N/cm² kasnog opterećenja (tri meseca), a u slučaju obrtnog momenta > 30 ranih opterećenja (šest do osam nedelja)</i>
6.	Advice to take a painkiller 1 hour after surgery and if necessary up to 7 days <i>Savetovanje da se uzmu lekovi za bolove sat nakon operacije i, ako je potrebno, do sedam dana kasnije</i>

as well as frequencies of willingness to repeat the procedure (**Figure 1g**). Distribution of patients depending on pain intensity after MDI insertion and after tooth extraction is shown in **Figure 1h**. X^2 test showed that more patients reported more intense pain after tooth extraction than after flapless MDI insertion ($p < 0.05$).

Mean values and 95% Confidence Intervals of patient-centered outcomes regarding self-perceived pain on the operative day and on the 1st, 3rd, 5th, 7th, and the 10th postoperative day are presented in **Figure 2**. Patients reported the highest pain intensity on the operative day upon cessation of local anesthesia, which was only moderate to low (mean values were not higher than 4) and which turned to low pain intensity as early as on the first post-operative day (mean values were < 2.7) and further decreased to zero thereafter.

Mean values and 95% Confidence Intervals of self-reported pain on the operative and on the 1st, the 3rd, and the 5th postoperative days in different age groups are presented in **Figure 3a**. Mean values and 95% Confidence Intervals of pain on the operative and on the 1st, the 3rd, and the 5th postoperative day in patients who received different number of MDIs are presented in **Figure 3b**, in different jaw of insertion in **Figure 3c**, and in different gender in **Figure 3d**. The analysis of covariance (ANCOVA) with pain on the operative day as dependent variable, number of MDIs inserted, jaw and gender as fixed factors and age as a covariate revealed only significant effect of a number of MDIs ($F=4.07$, $p < 0.01$), while other factors showed no significant effects (Age: $F=1.57$, $p=0.21$; Jaw: $F=1.32$, $p=0.27$; Gender: $F=0.83$, $p=0.36$). Similar results were obtained for the 1st post-operative day (Number of MDIs: $F=5.05$, $p < 0.01$; Age: $F=0.20$,

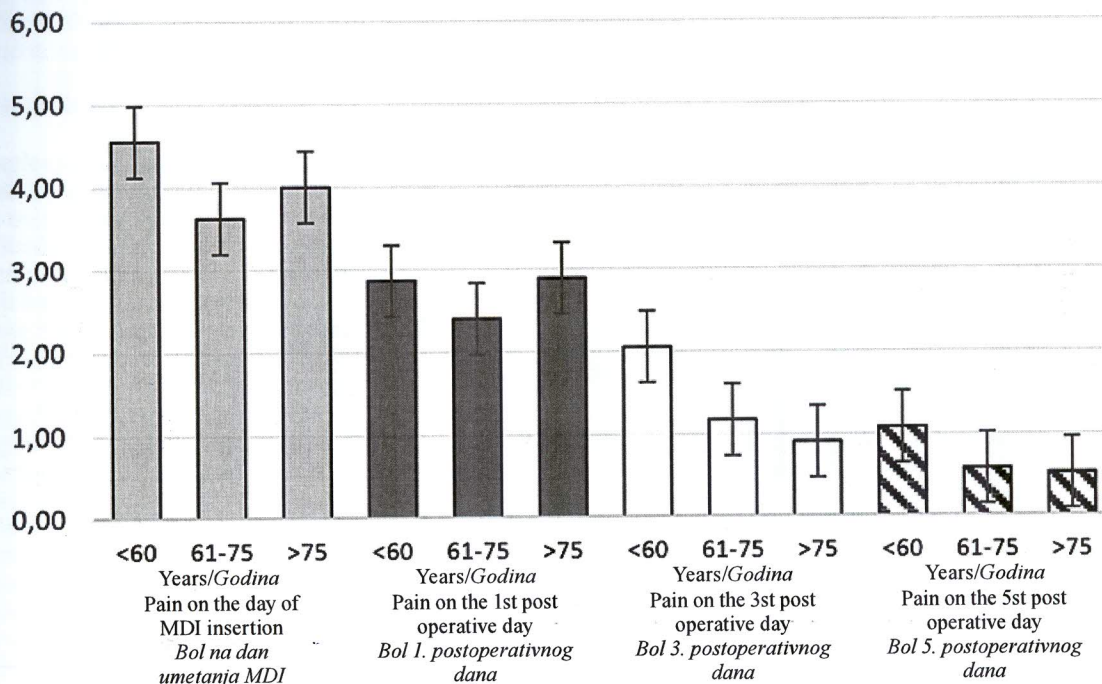


Figure 3a. Mean values with 95% confidence intervals of a self-perceived level of pain after mini dental implant placement depending on patients' age group

Slika 3a. Srednje vrednosti i intervali pouzdanosti od 95% samoprocenjenog nivoa bola nakon umetanja mini dentalnih implantata u zavisnosti od starosne grupe

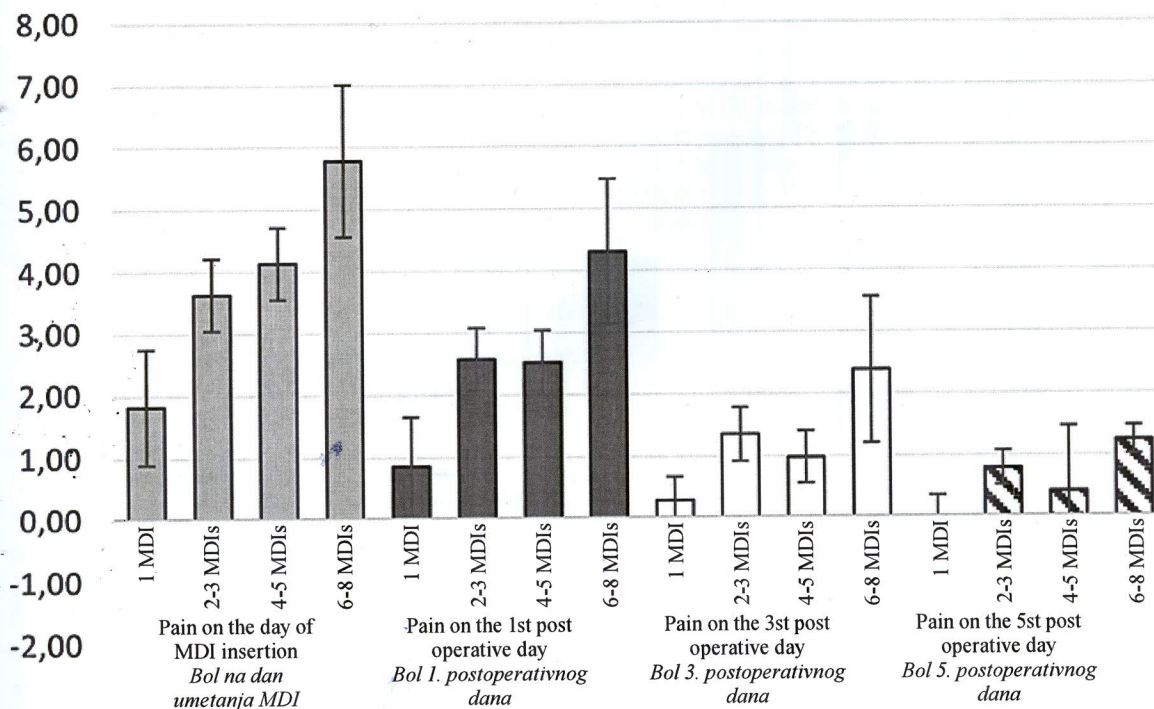


Figure 3b. Mean values with 95% confidence intervals of self-perceived level of pain after mini dental implant (MDI) placement depending on number of MDIs

Slika 3b. Srednje vrednosti i intervali pouzdanosti od 95% samoprocenjenog nivoa bola nakon umetanja mini dentalnih implantata u zavisnosti od broja MDI

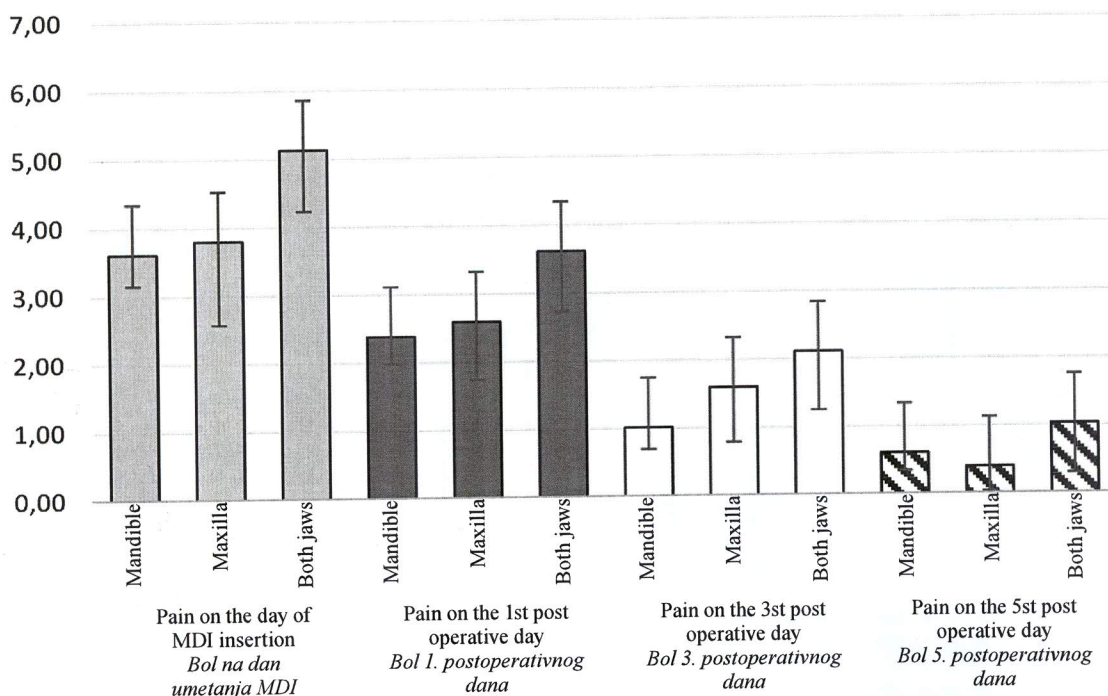


Figure 3c. Mean values with 95% confidence intervals of self-perceived level of pain after mini dental implant placement depending on the jaw of insertion

Slika 3c. Srednje vrednosti i intervali pouzdanosti od 95% samoprocenjenog nivoa bola nakon umetanja mini dentalnih implantata u zavisnosti od vilice u koju se umeće

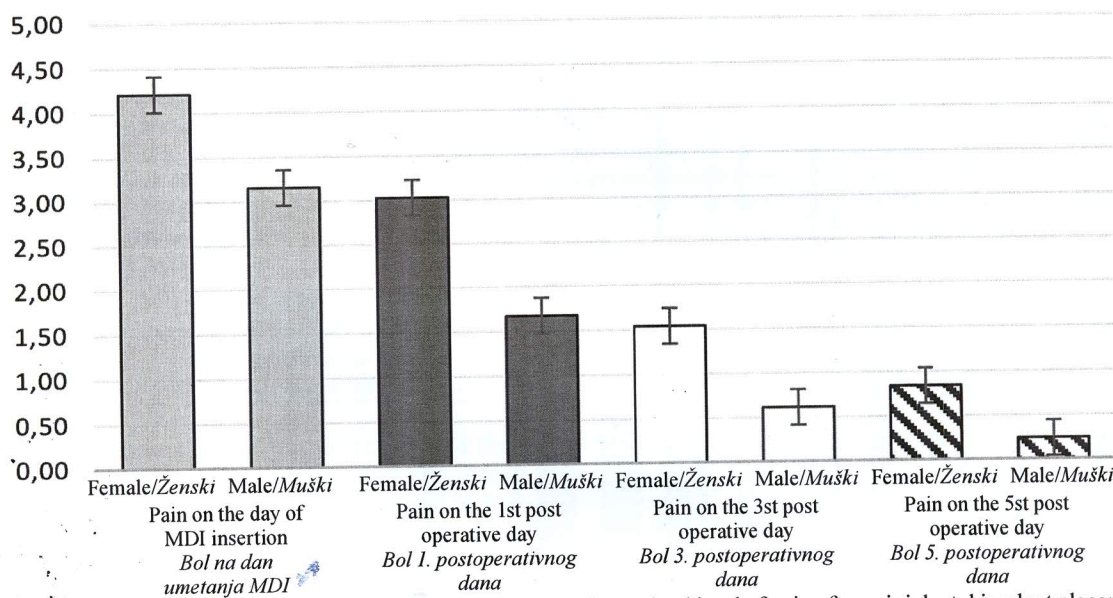


Figure 3d. Mean values with 95% confidence intervals of self-perceived level of pain after mini dental implant placement in different gender

Slika 3d. Srednje vrednosti i intervali pouzdanosti od 95% samoprocenjenog nivoa bola nakon umetanja mini dentalnih implantata kod različitih polova

Figure 3 a-d. Mean values with 95% confidence intervals of self-perceived level of pain after mini dental implant placement in different age groups (a), different groups depending on a number of MDIs inserted (b), jaw (c) and different gender (d).
Slika 3 a-g. Raspodela pacijenata u zavisnosti od starosne grupe (a), broja ubačenih MDI-a (b), vilice ubacivanja (c), količine unošenja lekova za bolove na operativni dan (d) te prvog (e) i trećeg postoperativnog dana (f), spremnost da se ponovi postupak ubacivanja MDI (g), zavisno od intenziteta bola nakon ubacivanja MDI-a u poređenju s bolovima nakon iskustva sa zubom

$p=0.65$; Jaw: $F=0.49$, $p=0.62$; Gender: $F=2.05$, $p=0.16$), as well as for the 3rd post-operative day (Number of MDIs: $F=3.05$, $p<0.01$ and Age: $F=7.6$, $p<0.01$ revealed significant effects). On the 5th postoperative day pain level was very low and none of the observed factors showed significant effects ($p>0.05$).

Discussion

Flapless MDI insertion showed low to moderate pain level on the day of insertion and low pain level on the 1st postoperative day and further thereafter. However, self-perceived level of pain increased with a number of MDIs insertions, which is in accordance with another study [3]. Obviously, a greater number of MDI insertions in multiple sites in patients' mouth elicited more tissue trauma and probably therefore patients experienced increased perception of pain. Pain persisted a bit longer in younger patients, but the difference was not statistically significant in comparison to older patient groups ($p>0.05$). Females reported a little bit more pain than males, however the difference was not significant, as well ($p>0.05$). The effects of gender, age, number of MDIs and jaw of insertion were observed only throughout the first five days, as afterwards self-reported pain almost dropped to zero. Despite the recommendation to take painkillers on the operative day, one third of patients did not take analgesics at all. Over 80% of patients stopped with painkillers on the 3rd day and took less than 7 pills throughout the 3 days. More than 80% of patients stated that tooth extraction elicited higher pain than MDI insertion; 99% of patients would repeat the procedure. One study reported that after simple placement of a standard-size implant by reflecting a flap, the observed pain was equal as after tooth extraction [6]. Our results showed that self-perceived pain after MDI insertion was lower than after tooth extraction in great majority of patients. The intensity of pain was much higher after surgical removal of a wisdom tooth, associated with reduced oral health related quality of life [7].

Fear of pain can be a reason for implant therapy refusal. Overdentures retained by four MDIs show even better oral health related quality of life (OHRQoL) than overdentures retained by 2 standard-size implants [8-11]. The stabilization of a lower complete denture with four MDIs is a feasible minimally invasive and economical approach to improve oral function and OHRQoL, especially in elderly patients with limited bone support [11]. Our results reveal low levels of pain after a flapless MDI insertion. The pain is even lower than pain reported after tooth extraction. These facts could place overdentures retained by four MDIs in front of a treatment involving 2 standard size implants for overdenture retention, especially in elderly patients with limited bone support and fear of pain. However, the limitation of the present study have to be reported, as some personal traits of patients and levels of their overall anxiety were not assessed and included in this research, however that should be a topic of a further study.

Conclusions

Moderate or low level of pain was experienced after flapless MDI insertion on the operative day. Low level of pain was experienced on the first post-operative day and afterwards. The pain intensity was higher in patients with more MDI insertions. However, the level of pain after MDI insertions was lower than pain experienced after tooth extraction in 80% of patients. Almost all patients stated that they would repeat the procedure. Flapless MDI surgical procedure could be a treatment of choice in elderly patients with increased fear and associated co-morbidities.

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Sažetak

Doživljeni bol na dan operativnog zahvata, kao i prvog, trećeg, petog, sedmog i desetog dana nakon insercije mini-implantata (MDI) bez odizanja režnja pacijenti su procenili pomoću vizuelno-analogne lestvice 0–10. Učestvovalo je 205 pacijenata (svaki pacijent dobio je 1–8 MDI). Zabeleženi su niski do umereni nivoi bola na dan operativnog zahvata, te niski nivoi bola prvog postoperativnog dana, s vrlo niskim nivoom bola nakon toga. Doživljeni bol bio je intenzivniji u slučajevima kad je ugrađeno više mini-implantata, dok pol, vilica i godine života nisu pokazali statistički bitne učinke. Trećina bolesnika nije uopšte uzela analgetike nakon zahvata, a više od 80% pacijenata prestalo je da ih uzima trećeg postoperativnog dana. Vađenje zuba izazvalo je kod 80% pacijenata više bola od insercije MDI; 99% bolesnika izvestilo je da bi ponovili postupak ugradnje MDI. Čini se da je insercija MDI bez otvaranja režnja prikladna opcija, jer izaziva nizak nivo bola. Pacijenti bi trebalo da dobiju takve informacije pre lečenja kako bi smanjili strah koji osećaju zbog hirurškog zahvata.

Ključne reči: *percepcija bola; merenje bola; postoperativni bol; dentalni implantati; ekstrakcija zuba; analgetici; hirurški režnjevi*

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