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PRIKAZ SLUČAJA
CASE REPORT

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Retencija donje totalne proteze uporabom mini dentalnih implantata: Prikaz slučaja

Retention of the Lower Complete Dentures with the Use of Mini Dental Implants: Case Report

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Sažetak
Dentalni implantati smanjenog promjera koriste se dvadesetak godina, a sada su proizvođači ponudili i mini dentalne implantate (MDI) promjera samo od 1,8 do 2,4 mm. Oni su, zbog uglavnom uspješne oseointegracije, jednostavne operacijske tehnike i mogućeg imedijatnog opterećenja, dobra protetska rješenja u svojem indikacijskom području. Opisan je slučaj ugradnje četiriju MDI-a tipa Sendax (IMTEC, Ardmore, Oklahoma, SAD) u mentalnoj regiji kako bi se poboljšala retencija i stabilizacija donje totalne proteze te funkcija i fonacija. Uporaba tih implantata je, osim navedenih prednosti, i financijski vrlo prihvatljiva, pa tu implantološku mogućnost svakako valja uzeti u obzir u planiranju protetske terapije bezube mandibule.

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Ključne riječi
protetika, implantologija, mini dentalni implantati, pokrovne proteze

Uvod

Dentalni implantati smanjenog promjera upotrebljavaju se u različitim oblicima već dvadesetak godina. Ti implantati imaju promjer od 2,75 do 3,30 mm, a koriste se u slučajevima limitiranog koštanog volumena. Mini dentalni implantati (mini dental implants – MDI) još su manji - promjer im je od 1,8 do 2,4 mm (1,2).

Na početku se MDI uglavnom rabe kao pomoćno provizorno sredstvo za sidrenje privremenih nadomjestaka tijekom oseointegracije konvencionalnih implantata većeg promjera (3-5). Sve se temeljilo na pretpostavki da MDI ne može podnijeti žvačno opterećenje koje se javlja na protetskom radu sidrenom na implantatima (4,6). No, poslije je uočeno da su se ti implantati klinički dobro integrirali (3) te

Introduction

The use of dental implants of smaller diameters in various forms has been present for almost 20 years. Those are generally 2.75 mm to 3.3 mm in diameter, and they are frequently used in cases of limited bone volume. Mini dental implants (MDIs) are even smaller, with diameters ranging from 1.8 mm to 2.4 mm (1,2).

In the beginning, the main usage of MDIs was to serve as the remedy and provisional instrument for insertion of provisional restorations during the osseointegration phase of conventional larger-diameter endosseus implants (3-5). The assumption was that MDIs are unable to provide functional load of implant-supported prostheses (4,6). In the course of time, it was observed that those implants integrat-

ih je bilo teško ukloniti (4). Tako se shvatilo da se minimalno invazivnim implantološkim protokolom kod MDI-a ipak može postići zadovoljavajući protetsko-terapijski učinak (2,3).

Prednost uporabe MDI-a je minimalno invazivni postupak ugradnje - obavlja se u jednom posjetu (4,6). U usporedbi s MDI-em, ugradnja konvencionalnih implantata (promjera 3,5 mm i više) agresivan je kirurški postupak, jer zahtijeva rez gingive, degažiranje periosta (otvaranje flapa) i osteotomiju - preparaciju kosti do pune dimenzije implantata. Zato je potrebno i vrijeme za zarastanje tkiva, odnosno za njegovu regeneraciju, uspostavu vaskularne funkcije i samu oseointegraciju implantata. Minimalno invazivna tehnika ugradnje MDI-a sastoji se od uvrtanja implantata u kost kroz početni otvor, no bez potpune preparacije koštanog ležišta implantata (4,6). Zbog toga kost nije oštećena, a nema ni koštane rane tijekom implantacije. Smanjeno je također krvarenje i postoperativne tegobe (3), a što je najvažnije skraćeno je vrijeme zacjeljivanja. Zato se takav implantat može gotovo odmah opteretiti bez obzira na vrijeme potrebno za oseointegraciju (4).

Prikaz slučaja

Pacijent u dobi od 51 godine došao je na pregled u naš Klinički zavod nezadovoljan svojim potpunim protezama, posebice donjom. Već se prije informirao o mogućnostima implantološke terapije i o izradi fiksno-protetske konstrukcije, no financijski to nije mogao podnijeti.

Uzet je anatomski otisak ireverzibilnim hidrokoloidom (Aroma Fine DF III, GC, Tokijo, Japan) te izrađena prozirna akrilatna individualna šablona s olovnim markerima (Slika 1.), kako bi se na ortopantomogramskoj snimci (sa žlicom) ocijenilo je li moguće ugraditi mini implantate, te odrediti njihovu poziciju i veličinu (Slika 2.). Obavljena je i protetska ekspertiza s financijskom konstrukcijom te je predočena pacijentu. Kako je financijski bila znatno povoljnija od predlaganih implantatima sidrenih fiksnoprotetskih radova, pacijent se odlučio za donju totalnu (pokrovnu) protezu sidrenu s četirima MDI-ima tipa Sendax (IMTEC, Ardmore, Oklahoma, SAD) s kuglastim pričvrstcima (attachment).

S individualne šablone uklonjeni su olovni markeri, zatim je u skladu s nalazom na ortopanu (Slika 2.) obavljena korekcija mjesta ugradnje mini implantata te je na tim mjestima frezom probušena individulana šablona. Postavljena je u usta pacijenta. Kroz rupice su kirurškim markerom označena mjesta ugradnje MDI-a (Surgical Intra-Oral

ed very well clinically (3), and were difficult to remove (4). It became clear that, with minimally invasive implant insertion protocol with MDIs, they could provide satisfactory prosthodontic rehabilitation effect (2,3).

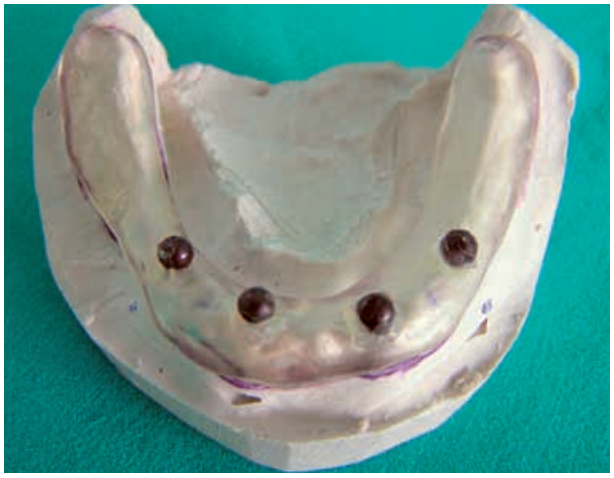
The advantage in use of MDIs is the minimally invasive, single stage placement procedure (4,6). Compared to MDIs, the insertion procedure for conventional implants (diameter 3.5 and wider) is an aggressive surgical procedure which requires a flap operation and full-depth bone preparation (osteotomy). Therefore, there is a need of recovery time during tissue regeneration, vascular function restoration and osseointegration. This minimally invasive technique of MDIs insertion consists of turning the implant into the bone through a starting opening, but not a prepared bone site (4,6). Therefore, there is no bone damage or bone wound during implantation. Bleeding and postoperative discomfort are reduced (3), and most importantly, healing time is shortened. So, such implants can be practically loaded immediately, with no need for waiting for osseointegration (4).

Case report

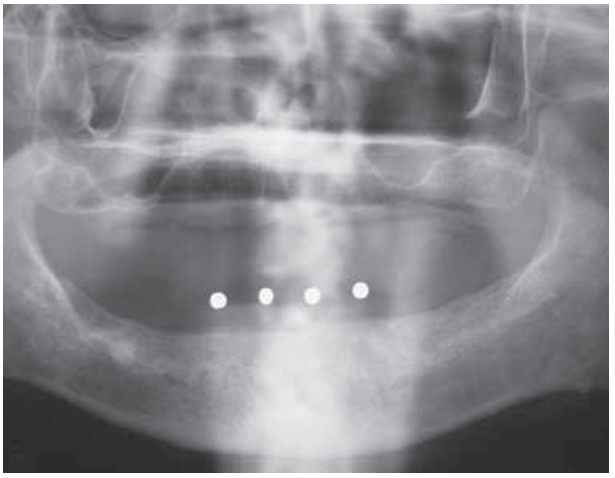
Patient in the age of 51 came for examination in our clinical department. He was not satisfied with the existing removable dentures, especially the lower one. He had been informed about the possibilities of implant therapy and fixed prosthodontic construction, but he could not afford it.

Anatomic impression with irreversible hydrocolloid (Aroma Fine DF III, GC, Tokyo, Japan) was taken, and transparent acrylic individual acrylic baseplate with lead markers was produced (Figure1). The orthopantomograph (with the tray) was taken in order to evaluate the possibility of mini-implant insertion, and to determine their position and size, Figure 2. The prosthetic expertise with financial construction was made for the patient. Since it was much cheaper than previously suggested implant supported by fixed prosthetic appliance, the patient decided to make lower removable denture (overdenture) supported with four MDIs Sendax type (IMTEC, Ardmore, Oklahoma, USA) with ball attachments.

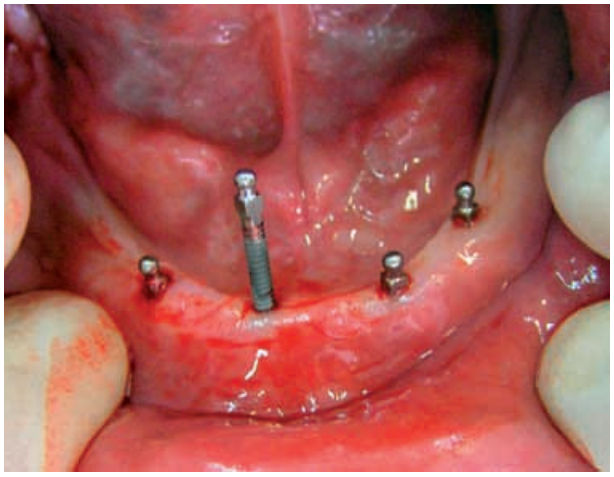
Lead marks were removed from the individual acrylic baseplate and, according to the orthopantomograph findings, correction of future implant sites was performed. The tray was punctured on selected spots by grinding bur and placed into the patient's mouth. The implant sites were marked through the holes in acrylic baseplate with surgical marker (IM-



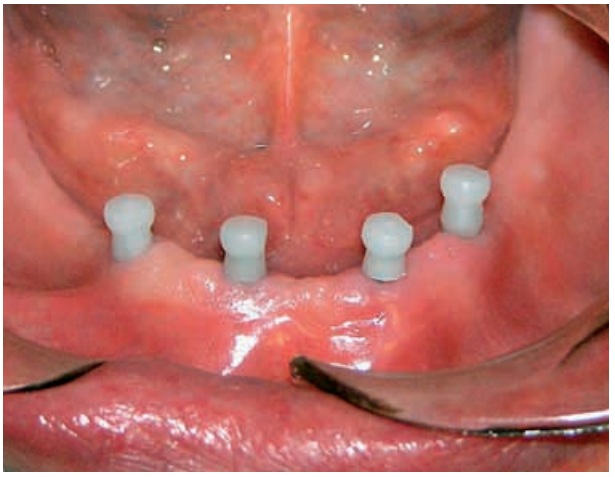
Slika 1. Individualna šablona s olovnim marekerima
Figure 1 Individual acrylic baseplate with lead markers



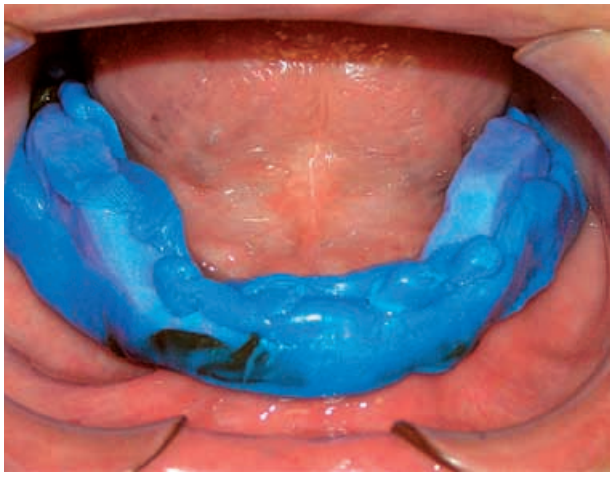
Slika 2. Ortopantomogram s vidljivim olovnim markerima
Figure 2 Orthopantomograph with visible lead markers



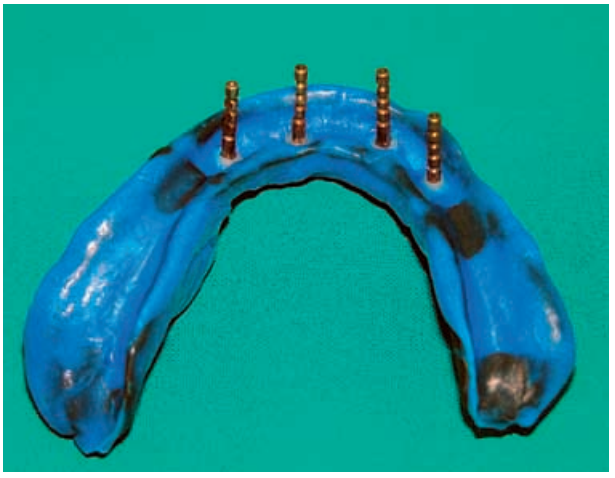
Slika 3. Ugradnja mini dentalnih implantata
Figure 3 Implantation of mini dental implants



Slika 4. Postava prijenosnih (otisnih) kapica na implantate
Figure 4 Positioning of transfer (impression) copings onto implants

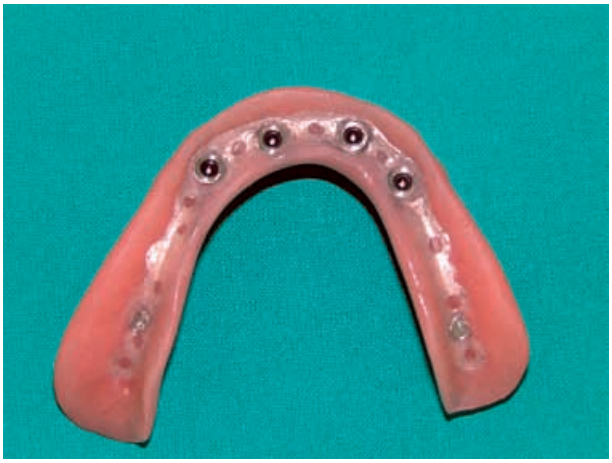


Slika 5. Funkcijski otisak uzet preko prijenosnih kapica
Figure 5 Functional impression taken over transfer copings

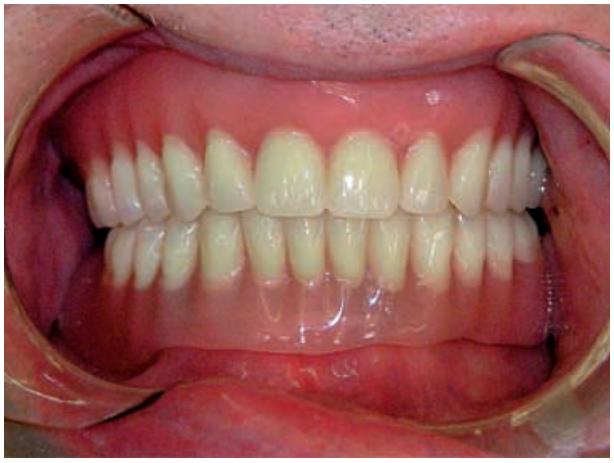


Slika 6. Funkcijski otisak s postavljenim laboratorijskim implantatima u prijenosne kapice
Figure 6 Functional impression with placed laboratory implants into transfer copings

Slika 7. Izliven radni model s ugrađenim laboratorijskim implantatima i postavljenim metalnim matricama
Figure 7 Pored working model with built in laboratory implants and placed metal housings



Slika 8. Metalne matrice ugrađene u donju totalnu protezu s metalnom bazom
Figure 8 Metal housings built in metal base lower denture



Slika 9. Totalne proteze u ustima pacijenta
Figure 9 Dentures in patient's mouth

Skin Market, IMTEC) te je obavljena transgingivalna implantacija (Slika 3.). Na označenim mjestima najprije je probijena gingiva i početno probušena kost svrdlom za lociranje mjesta ugradnje (Locator Drill, IMTEC) u skladu s oznakama učinjenima kirurškim markerom. Nakon toga je kost, prema uputama proizvođača, probušena jednokratnim kirurškim svrdlom (Surgical Drill, IMTEC) promjera 1,1 mm do dubine od ½ dužine implantata. Paralelizacija implantata obavljena je umetanjem steriliziranih, a već korištenih svrdala u izbušena ležišta. Nakon bušenja je u prvu šupljinu uvijen MDI i to najprije ručnim instrumentom (IMTEC-om), a zatim ključem s regulacijom snage zakretnog momenta (u ovom slučaju 35 N/cm^2). No, kako MDI nije bilo moguće uvrnuti do kraja cijele dužine implantata, on je izvađen. Nakon toga je prvotno bušenje produbljeno do 2/3 dužine implantata, te je u ponovljenom postupku bilo moguće potpuno uvrnuti MDI.

TEC) and transgingival implantation was performed (Figure 3). The gingiva was punctured on the marked spots, and the bone was initially drilled with the locator drill (IMTEC) according to the marks made with surgical marker. The bone drilling was performed by using disposable surgical drill (IMTEC) of 1.1 mm diameter to the depth of ½ length of implant as recommended by the manufacturer. Parallelization of the implants was achieved with the insertion of sterile, previously used, surgical drills into each drilled implant site. After drilling, the MDIs Sendax Classic Standard, O-Ball (IMTEC) dimensions 1,8 mm (diameter) x 15 mm (length) were screwed firstly by using manual screwing instrument (IMTEC), and afterwards with ratchet (torque 35 N/cm^2). Since it was not possible to screw MDI to the end of the length, it was unscrewed and displaced. For that reason, the primarily drilled holes were deepened to the depth of 2/3 of the implants length, and in repeated screwing,

Nakon uvijanja svih MDI-a, uzeti su otisci ireverzibilnim hidrokoloidom (Aroma Fine DF III) te su izliveni i zatim su na modelima izrađene akrilatne individualne žlice. Individualna žlica za donju čeljust imala je perforacije na mjestima implantata, a bile su dovoljno široke da bi kroz njih prošle prijenosne kapice (Impression Coping, IMTEC) postavljene na implantirane MDI-e (Slika 4.). Nakon toga su uzeti funkcijski otisci uporabom kondenzacijskog silikona Xantoprena L (Haereus Kulzer, Hanau, Njemačka). Funkcijski otisak donje čeljusti uključivao je i prijenosne kapice (Slika 5.) koje su otiskom skinute u točnom položaju kao što su bile pozicionirane na implantatima. U njih su umetnuti laboratorijski implantati (O-Ball Prosthetic Head Analog, IMTEC) (Slika 6.) te su modeli izliveni u tvrdoj sadri (Moldano, Haereus Kulzer, Dormagen, Njemačka).

Na laboratorijske implantate postavljene su mikro matrice (Micro Metal Housing MH-2, IMTEC) (Slika 7.) i izrađena je metalna baza donje pokrovne proteze (Slika 8). Daljnji klinički i laboratorijski postupak za izradu proteza tekao je prema uobičajenoj proceduri (7) te su mikro matrice tijekom postupka kivetiranja i polimerizacije ugrađene u donju totalnu protezu (Slika 8.). Postignuta je uobičajeno dobra retencija i stabilizacija gornje totalne proteze, a ugradnjom MDI-a i donje totalne proteze, što je pak rezultiralo i zadovoljavajućom funkcijom te fonacijom uz nezaobilaznu estetiku (Slika 9.).

Rasprava i zaključci

Najvažniji uvjet za uporabu svih implantata, pa tako i MDI-a, uspješna je oseointegracija što mogu potvrditi samo dugotrajne studije o uspješnosti i „preživljavanju“ pod opterećenjem tijekom žvačne funkcije**.** Tako su Shatkin i suradnici (2) u petogodišnjoj retrospektivnoj analizi, na uzorku od 2514 MDI-a koji su služili podjednako kao nosači i fiksnih i mobilnih protetskih radova, izvijestili o ukupnom rezultatu od 94,2% „preživljavanja“ implantata.

Za uspješnu oseointegraciju i postotak uspješnosti održanja impantata važna je primarna stabilnost, a ona je uvjetovana kvalitetom kosti, oblikom samoga implantata te primijenjenom kirurškom tehnikom ugradnje (8). Neki autori (9,10) preporučuju bušenje kosti do samo jedne trećine dužine MDI-a, no u ovom slučaju moralo se bušiti do čak 2/3 dužine MDI-a kako bi se mogli potpuno uvrnuti. Očit uzrok je kompaktna koštana struktura mandibule tretiranog pacijenta, ali baš je tako kompaktna kost i pridonijela dobroj primarnoj stabilnosti ugrađenih MDI-a.

it was possible to screw MDI to the end. After screwing of all the MDIs, the impressions with irreversible hydrocolloid (Aroma Fine DF III) were taken, poured in stone, and the acrylic individual impression trays were made on the models. Individual impression tray for mandible had the perforations on the implant sites, which were broad enough for the impression copings (IMTEC), placed on the implants, to pass through (Figure 4).

Afterwards, functional impressions were taken, by using condensation silicone Xantopren L (Haereus Kulzer, Hanau, Germany). Functional impression of the mandible contained impression copings (Figure 5) which were taken in the identical position as they were placed on the implants. The laboratory implants (O-Ball Prosthetic Head Analog, IMTEC) were inserted into the impression copings (Figure 6), and the models were poured in hard stone (Moldano, Haereus Kulzer, Dormagen, Germany). Micro metal housings (HM-2, IMTEC) were placed onto the laboratory implants (Figure 7), and the metal base of the lower overdenture was produced (Figure 8). Further clinical and laboratory procedures were performed according to the routine procedure (7) for lower denture production. Usual and adequate retention and stability of upper denture was obtained, but with the use of MDIs they were obtained for the lower denture, too. That resulted with the satisfactory function and phonation, and with unavoidable esthetics (Figure 9).

Discussion and conclusions

Essential condition for all implants use, therefore also MDIs, is successful osseointegration that can be confirmed only with the long-term studies of success and survival of MDIs under load in masticatory function. Shatkin et al (2), in their retrospective analysis over five years of 2514 MDIs, which equally supported fixed and removable prostheses, found the overall implant survival rate of 94.2%. Initial stability is important for the successful osseointegration and high implant success rate. It is stipulated with bone quality, implant design, and surgical technique that is used (8). Some authors (9,10) recommend bone drilling to the depth of only 1/3 of MDI's length. But in our case drilling to the depth of 2/3 of the MDI's length had to be performed in order to completely screw the implant. Obvious reason was the dense bone structure of mandible of the treated patient, but such dense bone structure contributed to the good initial stability of the implanted MDIs.

Study of Balkin et al. (4), in which they used histological analysis, revealed that the quality of MDIs

Studija Balkina i suradnika (4) dokazala je da se uporabom histološke analize može pokazati da se i kvaliteta oseointegracija MDI-a može uspoređivati s oseointegracijom implantata većeg promjera. Ertugul i suradnici (8) u svojoj su studiji in vitro dokazali da su implantati većeg promjera otporniji na lateralne sile od MDI-a. No, to je i logično zbog njihove gotovo dvostruko veće površine. U kliničkoj praksi taj se „nedostatak" rješava uspješnim planiranjem i uporabom više implantata (1,4).

MDI-i nisu zamišljeni kao zamjena za konvencionalne implantate, nego se mogu koristiti kada nema dovoljno kosti za ugradnju konvencionalnih implantata, ili kod nadoknade jednog zuba u slučajevima suženog prostora (na primjer donji sjekutići) (6,9). No, svakako je uporaba MDI-a najučinkovitija kod retencije i stabilizacije totalnih proteza, osobito donjih. Time se rješavaju problemi loše retencije i stabilizacije, smanjenja funkcije, teškoća u govoru te preosjetljivosti mekih tkiva (2,3). Griffits i suradnici (3) su, ocjenjujući ugodnost nošenja, retenciju, mogućnost žvakanja i govora kod nositelja pokrovnih proteza retiniranih s MDI-em, zaključili da su pacijenti iznimno zadovoljni tim protetskim radovima.

Ako uzmemo u obzir sve prednosti MDI-a (dobre postotke uspješnosti, operacijske tehnike, financijske prednosti, mogućnosti imedijatnog opterećenja) može se zaključiti da su MDI-i vrlo uspješna implantološka mogućnost za bezubu mandibulu. Tu činjenicu svakako valja imati na umu tijekom planiranja protetičke terapije, osobito kod mlađih pacijenata, slabije razvijenih alveolarnih grebena te kod onih koji financijski nisu u mogućnosti podnijeti terapiju skupljim konvencionalnim implantatima.

Zahvala

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osseointegration could be compared with the quality of larger diameter implants osseointegration. Ertugrul et al. (8), in their in vitro study, revealed that implants of larger diameter are more stable under lateral forces than MDIs. But it is logical, because of their almost doubly bigger surface area. In clinical practice, this „disadvantage" of MDIs can be solved with successful planning and using more implants (1,4).

The MDIs do not pretend to be substitute for conventional implants. They can be used in situations with lack of adequate bone tissue for conventional implant placement, or single tooth replacement with restricted space (lower incisors) (6,9), but the most effective use of MDIs is for the retention and stabilization of complete dentures, especially lower dentures. In this way the problems such as lack of retention and stability, decrease in function, difficulties in speech and soft tissue sensitivity, are solved (2,3). Griffitts et al. (3) were evaluating the patients' satisfaction with overdentures supported with MDI (comfort, retention, chewing ability and speaking ability), and they found that patients' satisfaction was excellent. Taking into consideration all advantages of MDI (success rates, surgical technique, financial advantages, possibilities of immediate loading), it can be concluded that MDI are highly successful implant option for edentulous mandible. This fact should be taken into consideration during prosthetic treatment planning, especially at younger patients, narrow alveolar ridges, and patients who are not able to withstand the costs of more expensive conventional implants of larger diameter.

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Abstract
Dental implants of smaller diameter have been used for almost 20 years, but recently, dental manufacturers have presented mini dental implants (MDIs) with diameter of only 1.8-2.4 mm. These implants allow very suitable prosthetic solutions within the range of their indication, due to good osseointegration success rates, simple surgical technique and immediate loading possibility. The case presents implantation of four Sendax type (IMTEC, Ardmore, Oklahoma, USA) MDIs in mental region, in order to obtain better retention and stability of the complete denture, and to improve function and phonation. The use of those implants, among afore mentioned preferences, is also very cost effective, so this implantological possibility should be taken into consideration during prosthetic treatment planning of the edentulous mandible.

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Key words
Prosthetics; Implantology, Mini Dental Implants; Overdentures

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