

Split crest technique - an effective method in dental implantology for narrow ridges: a case report

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SUMMARY

Introduction Implant placement with simultaneous bone augmentation presents procedure with high risk of complications. In those situations, one of the surgical procedures with promising outcomes is the split crest technique.

Case report A 69-year-old edentulous patient was referred to the Clinic of Oral Surgery, at the Faculty of Dentistry in Pancevo. The width of the mandibular alveolar ridge in the inter-canine region was 2 mm. For the ridge splitting and expansion, a special split and expansion kit was used (Esset Kit[®], Osstem, South Korea). The procedure started with crestal remover carbide cylindrical bur of 7 mm diameter for flattening of the alveolar ridge to the width of 4 mm. Then, a sharp lance drill was used to mark the places for implant osteotomies and placement. After that, 1.8 mm twist drill was used to prepare a bed of 10 mm depth, and a 13 mm saw was directed vertically. Set of expansion drills were used to expand the alveolar ridge gradually. Two implants 3.5x10 mm each (TSIII SA[®], Osstem, South Korea) were inserted in the region of lower canines and the space between split buccal and lingual bone lamellae remained empty. Initial stability of inserted implants was assessed by implant stability quotient (ISQ). The values for implant stability were high for both inserted implants (98 and 93). After the surgical procedure, a control CBCT was done. The wound healed uneventfully.

Conclusion Split crest technique seems to be a predictable alternative for implant placement in narrow alveolar ridges.

Keywords: split crest technique; ridge splitting; dental implants

INTRODUCTION

Dental implants present excellent solutions for replacement of missing teeth and rehabilitation of edentulous jaws. In some patients, especially those with long-standing edentulism and unstable dentures, residual alveolar ridges can become sharp and narrow. In those situations, placement of implants proves challenging without bone augmentation procedures, which are costly and traumatic for patients, with risks of complications [1, 2]. One of the surgical procedures which shows promising outcomes is the split crest technique.

CASE REPORT

A 69-year-old male patient was referred to the Clinic of Oral Surgery, at the Faculty of Dentistry in Pancevo, with edentulous lower jaw, with the aim to find the best solution for his unstable and troublesome lower complete denture. Clinical examination revealed narrow residual alveolar ridge with limited width of keratinized mucosa and shallow vestibules. Additionally, the 3D CBCT

investigation, showed extremely narrow residual bone in the inter-foraminal region, and low height in posterior parts of the mandible. On the base of clinical and radiographic examination, the treatment plan was made, which included the split crest technique for horizontal ridge augmentation and placement of two intraosseous implants for an implant-supported complete overdenture. The plan was explained to the patient in details and informed consent was obtained.

Surgical procedure

Local infiltration anesthesia, using 4% articaine with adrenaline 1:100 000, was injected supraperiostally in the vestibulum and as submucous injection lingually in the frontal region of the edentulous mandible. Mid-crestal incision was performed in the inter-canine region, with minimal relieving incisions of 3 mm at the end of the mid-crestal incision (Figure 1). The full thickness mucoperiosteal flap was elevated in order to access the residual alveolar bone. The width of the alveolar ridge was measured clinically with a UNC-15 periodontal probe (2mm) and on the CBCT scan on cross-section images



Figure 1. Mid-crestal incision in the inter-canine region, with minimal relieving incisions of 3 mm at the end of the mid-crestal incision
Slika 1. Rez po sredini grebena u međuočnjačkom regionu, sa minimalnim relaksacijama od 3 mm na kraju reza

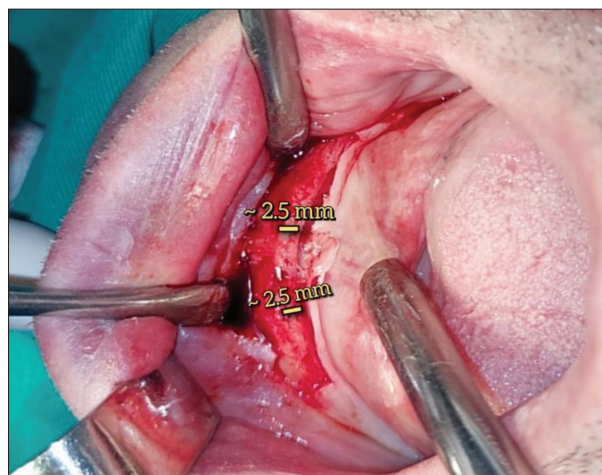


Figure 2. The full thickness mucoperiosteal flap was raised and the width of the alveolar ridge was measured.
Slika 2. Mukoperiostealni rezanj pune debljine je podignut i izmerna je širina alveolarnog grebena.

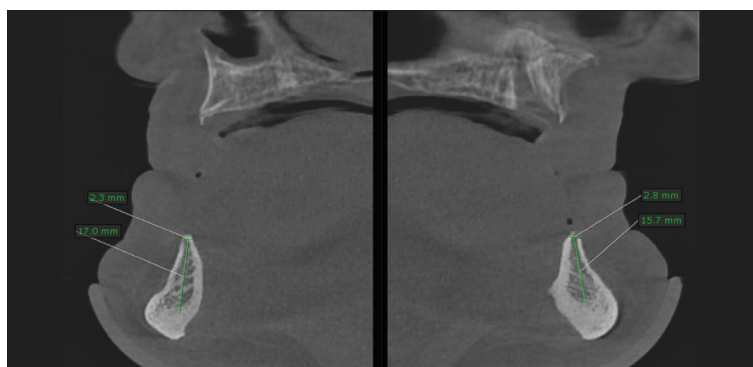


Figure 3. CBCT measurements of the width of alveolar bone
Slika 3. CBCT merenja širine alveolarne kosti

(2.3 mm) (Figures 2 and 3). For the ridge splitting and expansion, a special split and expansion kit was used (Esset Kit®, Osstem, South Korea). First, crestal remover carbide cylindrical bur of 7 mm diameter and speed of 1500 rpm, was used for flattening of the alveolar ridge to the width of 4 mm (Figure 4). Then, a sharp lance drill was used

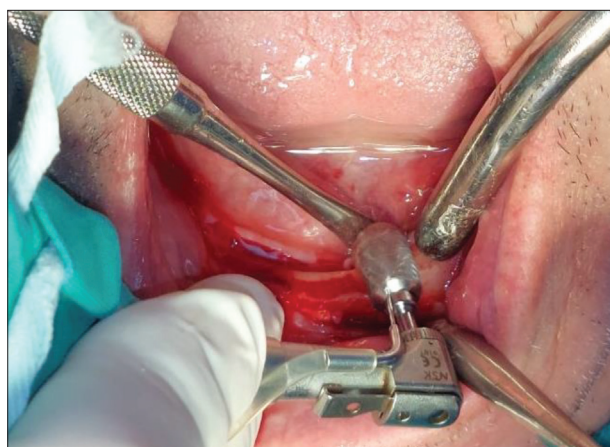


Figure 4. Flattening of the alveolar ridge to the width of 4 mm with crestal remover carbide cylindrical bur
Slika 4. Ravnanje alveolarnog grebena do širine 4 mm sa karbidnim cilindričnim borerom za uklanjanje grebena



Figure 5. A 13mm saw was directed vertically to the depth of 5 mm and then mesial and distal centrally, alongside the alveolar ridge
Slika 5. Testera od 13 mm je usmerena vertikalno do dubine od 5 mm, a zatim mezijalno i distalno centralno, duž alveolarnog grebena

to mark the places for implant osteotomies and placement. After that, 1.8 mm twist drill with average speed of 1500 rpm was used to prepare a bed of 10 mm depth, and a 13 mm saw was directed vertically to the depth of 5 mm and then mesial and distal centrally, alongside the alveolar ridge (Figure 5). Set of expansion drills 1.6/2.8 and 2.2/3.6 mm with 50Ncm/35rpm were used to expand the alveolar ridge gradually (Figure 6). Two implants 3.5x10mm each (TSIII SA®, Osstem, South Korea) were inserted with 50Ncm/35rpm in the region of lower canines (Figure 7) and the space between split buccal and lingual bone lamellae was not filled with any bone substitutes (Figure 8).

Initial stability of inserted implants was assessed by implant stability quotient (ISQ) measured using the special apparatus (Osstel mentor®) and smart pags previously fixed to dental implant body. The values for implant stability were high for both inserted implants

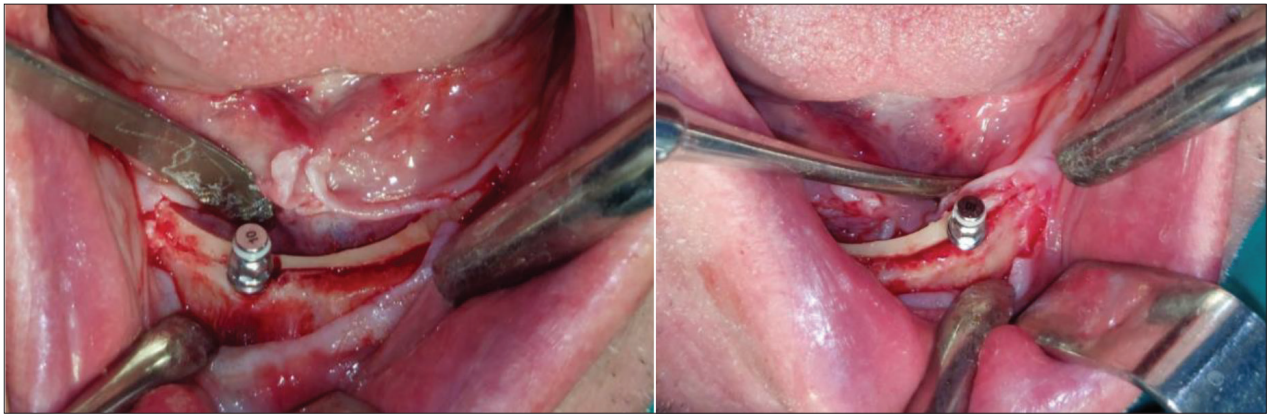


Figure 6. Expansion drills were used to expand the alveolar ridge gradually
Slika 6. Ekspanzione bušilice su korišćene za postepeno širenje alveolarnog grebena

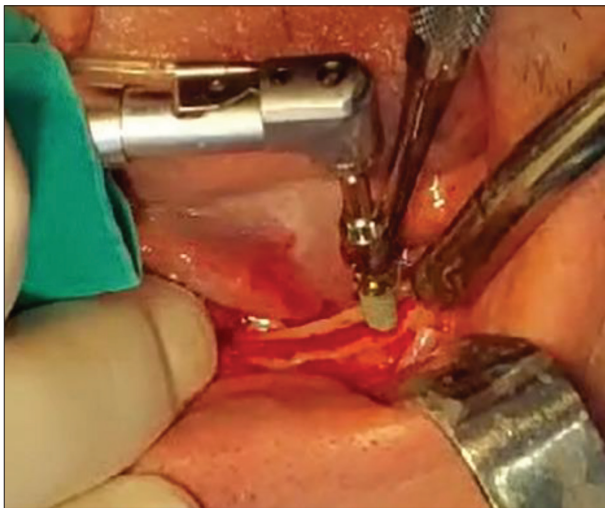


Figure 7. Implants insertion in the region of lower canines
Slika 7. Ugradnja implantata u predelu donjih očnjaka



Figure 8. Two inserted implants with no bone damage
Slika 8. Dva ugrađena implantata bez oštećenja kosti

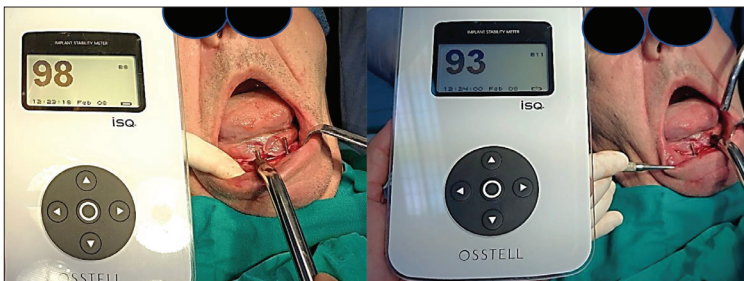


Figure 9. The measurement of implant stability quotient (ISQ)
Slika 9. Merenje koeficijenta stabilnosti implantata (ISQ)

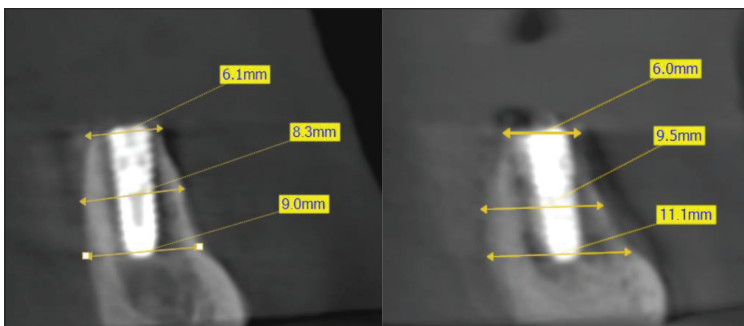


Figure 10. Ideal implant position was confirmed on cross-section CBCT
Slika 10. Idealan položaj implantata potvrđen je na CBCT preseku

(98 and 93) (Figure 9). After the surgical procedure, a control CBCT was done, and ideal implant position was confirmed on cross-section (Figure 10). Postoperative measures included systemic antibiotics (Amoxicillin caps. 500mg x 3 per day for 7 days) and analgesics. Sutures were removed after 7 days. The wound healed uneventfully.

DISCUSSION

Narrow alveolar ridges present a clinical challenge for dental implants insertion. In such cases, common procedure includes simultaneous implant placement with bone grafting and collagen membrane coverage [3, 4]. Bone grafting is associated with many possible complications and high cost [5]. One of the best solutions in such cases for the patient may be split cast technique with simultaneous implant placement [6]. Split cast technique with special expansion kit allows clinician to avoid vertical osteotomy

and prevent cortical bone breakage. With this approach, alveolar splitting is done gradually, with special expanders which expand the bone by self-tapping. This was confirmed in our patient where the buccal bone remained intact after bone expansion. This is in agreement with previous studies [7, 8]. Strong initial stability of inserted dental implants is obtained by elasticity of the expanded bone, as was the case in our patient (ISQ 98 and 93). Very high ISQ allows immediate loading of the inserted implants [9]. Additionally, 3-wall bony defect permits fast ingrowth of stem cells toward implant surface and excellent healing, without need for additional bone grafting. Scipioni et al. 1994 demonstrated 98% of implants success rate for over the 5 years with ridge splitting [10]. Bone possesses viscoelastic properties, so when more trabecular bone is present, the more viscoelastic nature of the alveolar ridge is expected. Some authors showed better success rate with ridge splitting in the maxilla than in the mandible [11].

Split crest with expansion technique seems to be a safe and simple procedure in cases with narrow alveolar ridges.

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Tehnika ekspanzije alveolarnog grebena – efikasna metoda u dentalnoj implantologiji za uske grebene: prikaz slučaja

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KRATAK SADRŽAJ

Uvod Ugradnja implantata uz istovremeno presađivanje kosti predstavlja proceduru sa visokim rizikom od komplikacija. U tim situacijama jedna od hirurških procedura sa obećavajućim ishodima je tehnika podeljenog (ekspanzije) grebena.

Prikaz slučaja Pacijent bez zuba, star 69 godina, upućen je na Kliniku za oralnu hirurgiju Stomatološkog fakulteta u Pančevu. Širina alveolarnog grebena donje vilice u međuočnjačkom regionu bila je 2 mm. Za cepanje i proširenje grebena korišćen je poseban komplet za cepanje i proširenje (Esset Kit[®], Osstem, Južna Koreja). Procedura je započeta karbidnim cilindričnim svrdlom prečnika 7 mm za izravnavanje alveolarnog grebena do širine 4 mm. Zatim je korišćena oštra bušilica za označavanje mesta za osteotomiju i postavljanje implantata. Posle toga je korišćeno spiralno svrdlo od 1,8 mm za pripremu ležišta dubine 10 mm, a testera od 13 mm je usmerena vertikalno. Za postepeno širenje alveolarnog grebena korišćen je set ekspanzionih borera. Dva implantata po 3,5 × 10 mm (TSIII SA[®], Osstem, Južna Koreja) umetnuta su u predelu donjih očnjaka i prostor između podeljenih bukalnih i jezičnih koštanih lamela nije bio ispunjen nikakvim koštanim zamenama. Inicijalna stabilnost ugrađenih implantata procenjena je koeficijentom stabilnosti implantata (ISQ). Vrednosti ISQ bile su visoke za oba ugrađena implantata (98 i 93). Nakon hirurškog zahvata urađen je kontrolni CBCT. Rana je zarasla bez problema.

Zaključak Čini se da tehnika ekspanzije grebena predstavlja predvidljivu alternativu za postavljanje implantata u uske alveolarne grebene.

Cljučne reči: tehnika *split crest*; ekspanzija alveolarnog grebena; zubni implantati

UVOD

Zubni implantati predstavljaju odlično rešenje za nadoknadu nedostajućih zuba i rehabilitaciju bezubih vilica. Kod nekih pacijenata, posebno onih sa dugotrajnom bezubošću i nestabilnim protezama, rezidualni alveolarni grebeni mogu postati oštri i uski. U takvim situacijama ugradnja implantata se pokazuje kao izazovna, bez procedura koštane augmentacije, koje su skupe i traumatične za pacijente, uz rizik od komplikacija [1, 2]. Jedna od hirurških procedura koja pokazuje obećavajuće rezultate je tehnika podeljenog grebena.

PRIKAZ SLUČAJA

Pacijent star 69 godina upućen je na Kliniku za oralnu hirurgiju Stomatološkog fakulteta u Pančevu sa bezubom donjom vilicom, sa ciljem da pronađe najbolje rešenje za svoju nestabilnu i problematičnu donju totalnu protezu. Kliničkim pregledom utvrđen je uski rezidualni alveolarni greben sa ograničenom širinom keratinizovane sluzokože i plitkim vestibulima. Pored toga, 3D kompjuterizovana tomografija s konusnim snopom (CBCT) pokazala je izuzetno usku kost alveolarnog grebena u interforaminalnoj regiji i nisku visinu u zadnjim delovima donje vilice. Na osnovu kliničkog i radiografskog pregleda napravljen je plan lečenja koji je obuhvatao tehniku podeljenog grebena za horizontalnu augmentaciju grebena i ugradnju dva intrakoštana implantata za totalnu protezu na implantatima. Plan je detaljno objašnjen pacijentu i dobijen je informisani pristanak.

HIRURŠKA PROCEDURA

Lokalna infiltraciona anestezija, primenom 4% artikaina sa adrenalinom 1 : 100 000, ubrizgana je supraperiostalno u vestibulum i kao submukozna injekcija lingvalno u frontalni region bezube donje vilice. Rez po sredini grebena je urađen u interkaninom regionu, sa minimalnim relaksacionim urezima od 3 mm na kraju reza (Slika 1). Mukoperiostalni režanj pune debljine je podignut da bi se pristupilo rezidualnoj alveolarnoj kosti. Širina alveolarnog grebena je merena klinički pomoću parodontalne sonde UNC-15 (2 mm) i na CBCT skeniranju na slikama poprečnog preseka (2,3 mm) (slike 2 i 3). Za cepanje i proširenje grebena korišćen je specijalni komplet za cepanje i proširenje (Esset Kit[®], Osstem, Južna Koreja). Za ravnjanje alveolarnog grebena do širine od 4 mm prvo je korišćen cilindrični borer od karbida prečnika 7 mm i brzine 1500 obrtaja u minuti (Slika 4). Zatim je korišćeno oštro svrdlo za označavanje mesta za osteotomiju i postavljanje implantata. Nakon toga, korišćeno je spiralno svrdlo od 1,8 mm sa prosečnom brzinom od 1500 obrtaja u minuti za pripremu ležišta dubine 10 mm, a testera od 13 mm je usmerena vertikalno na dubinu od 5 mm, a zatim mezijalno i distalno centralno, uz alveolarni greben (Slika 5). Za postepeno širenje alveolarnog grebena korišćen je set ekspanzionih borera 1,6/2,8 i 2,2/3,6 mm sa 50 Ncm/35 rpm (Slika 6). Dva implantata po 3,5 × 10 mm (TSIII SA[®], Osstem, Južna Koreja) ugrađena su sa 50 Ncm/35 rpm u predelu donjih očnjaka (Slika 7) i prostor između razdvojene bukalne i jezične koštane lamele nije bio ispunjen nikakvim zamenicama za kosti (Slika 8). Početna stabilnost ugrađenih implantata procenjena je koeficijentom stabilnosti implantata (ISQ) izmerenim pomoću specijalnog aparata (Osstel mentor[®]) i nastavaka

(smart pag), koji su prethodno fiksirani na telo zubnog implantata. Vrednosti stabilnosti implantata bile su visoke za oba umetnuta implantata (98 i 93) (Slika 9). Nakon hirurškog zahvata urađen je kontrolni CBCT i na poprečnom preseku je potvrđen idealan položaj implantata (Slika 10). Postoperativne mere su uključivale sistemske antibiotike (Amokicillin caps. 500 mg × 3 na dan tokom sedam dana) i analgetike. Šavovi su uklonjeni nakon sedam dana. Rana je zarasla bez problema.

DISKUSIJA

Uski alveolarni grebeni predstavljaju klinički izazov za ugradnju zubnih implantata. U takvim slučajevima uobičajena procedura uključuje istovremeno postavljanje implantata sa presađivanjem kosti i pokrivanjem kolagenom membranom [3, 4]. Koštana augmentacija povezana je sa mnogim mogućim komplikacijama i visokim troškovima [5]. Jedno od najboljih rešenja u ovakvim slučajevima za pacijenta može biti ekspanzija grebena uz istovremenu ugradnju implantata [6]. Ceganje grebena sa specijalnim kompletom za proširenje omogućava kliničaru da izbegne vertikalnu osteotomiju i spreči lomljenje kortikalne kosti. Ovim pristupom alveolarno širenje

grebena se vrši postepeno, specijalnim ekspanderima koji samourezivanjem proširuju kost. Ovo je potvrđeno kod našeg pacijenta, kod koga je bukalna kost ostala netaknuta posle proširenja kosti, i u skladu je sa prethodnim studijama [7, 8]. Snažna početna stabilnost ugrađenih dentalnih implantata postiže se elastičnošću ekspandirane kosti, kao što je to bio slučaj i kod našeg pacijenta (ISQ 98 i 93). Veoma visok ISQ omogućava imedijatno opterećenje ugrađenih implantata [9]. Pored toga, koštani defekt sa tri zida omogućava brzo urastanje matičnih ćelija ka površini implantata i odlično zarastanje, bez potrebe za dodatnim nadoknadama kosti. Scipioni i sar. [10] 1994. pokazali su 98% uspešnosti implantata tokom pet godina sa tehnikom ceganja i ekspanzije alveolarnog grebena. Kost poseduje viskoelastična svojstva, tako da kada je prisutno više trabekularne kosti, očekuje se viskoelastičnija priroda alveolarnog grebena. Neki autori su pokazali bolji uspeh ove tehnike u maksili nego u mandibuli [11].

ZAKLJUČAK

Središnja osteotomija alveolarnog grebena sa tehnikom ekspanzije pokazala se kao siguran i jednostavan postupak u slučajevima sa uskim alveolarnim grebenima.