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CASE REPORT
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KLINIČKA PROCENA POVEĆANJA DIMENZIJE MEKOG TKIVA KORIŠĆENJEM OSMOTSKIH EKSPANDERA U PROCEDURI VOĐENE KOŠTANE REGENERACIJE

CLINICAL EVALUATION OF SOFT TISSUE DIMENSION INCREASE BY USE OF OSMOTIC EXPANDERS IN GUIDED BONE REGENERATION PROCEDURES

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Sažetak

Uvod: *Uspeh tehnika regeneracije tvrdih tkiva u fazi pre implantacije u korelaciji je sa primarnim zarastanjem hirurške rane. Stoga, ključni momenat u sprovođenju ovog postupka predstavljaju pasivacija primarnih režnjeva i njihova dovoljna mobilizacija.*
Cilj studije *bio je da se postigne povećanje volumena mekih tkiva korišćenjem hirurških ekspandera, a zatim nastavi sa tehnikama vođene koštane regeneracije.*
Prikaz slučaja*: U radu su predstavljeni slučajevi dvoje pacijenata koji su se javili za proceduru implantacije. Kod njih su kliničkim i radiološkim pregledom dijagnostifikovani atrofija koštanog tkiva i fibrozni ožiljci na mekim tkivima, koje je trebalo sanirati u pripremi pre implantacije. Korišćeni Osmed® ekspander sastoji se od hidrogela, kopolimera metil-metakrilata i N-vinilpirolidona, a nalazi se u cilindričnom perforiranom silikonskom omotaču. Konačna ekspanzija mekog tkiva posle četiri nedelje iznosila je oko 38% povećanja volumena.*
Zaključak: *Tehnika povećanja volumena mekog tkiva upotrebom ekspandera omogućila je povećanje mekih tkiva u zasebnom hirurškom postupku, oslobađajući operatora od relaksacije režnja tokom faze ugradnje veštačke kosti, a samim tim i isključenje mogućih faktora koji ometaju primarno zarastanje rane u toku pomenutog hirurškog postupka.*

Ključne reči: *meka tkiva, ekspanderi, koštana regeneracija*

Abstract

Introduction: *The success of hard tissue regeneration techniques in the pre-implantation phase is correlated with the primary healing of the surgical wound. For this reason, the essential moment in the implementation of this procedure is the passivation of the flaps and their sufficient mobilization.*
Aim: *The study aimed to obtain an increase in the soft tissue volume using surgical expanders and then proceed with guided bone regeneration techniques.*
Case presentation: *Two patients presented for implant procedures with clinically and radiologically confirmed diagnoses of bone tissue atrophy and fibrous scars on soft tissues which were to be healed in the phase of pre-implantation preparation. Osmed® expander, which was used in the procedure, consists of a hydrogel, a copolymer of methyl methacrylate and N-vinylpyrrolidone, and is contained in a cylindrical perforated silicone sheath. The final soft tissue expansion after 4 weeks was increased in volume by about 38%.*
Conclusion: *The technique of increasing the volume of soft tissue with the use of an expander enabled the increase of soft tissues in a separate surgical procedure, freeing the surgeon from the relaxation of the flap during the phase of implanting the artificial bone, and thus excluding possible disturbing factors that interfere with the primary healing of the wound during that surgical procedure.*

Key words: *soft tissues, expanders, bone regeneration*

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Uvod

Uspeh tehnika regeneracije tvrdih tkiva u fazi pre implantacije u korelaciji je sa primarnim zarastanjem hirurške rane. Stoga, ključni momenat u sprovođenju ovog postupka predstavljaju pasivacija primarnih režnjeva i njihova dovoljna mobilizacija. Rad predstavlja kliničku procenu potencijalnog povećanja mekog tkiva u složenim slučajevima dobijenog primenom osmotskog ekspandera tkiva, u toku preimplantološke procedure[1-6].

U slučaju prisustva frenuluma ili mišićnih insercija, ili čak ožiljaka nastalih usled prethodnih hirurških intervencija, rezidualno pomeranje tkiva može izazvati izloženost materijala za regeneraciju i posledičnu superinfekciju grafta. Postoje različite tehnike za rešavanje problema primarnog zarastanja i pasivizacije režnjeva u procedurama vođene koštane regeneracije, ali, budući da je operativni zahvat uvek otežavala nemogućnost ekstenzije palatinalnog režnja, nijedna od njih nikada nije garantovala značajno povećanje površine režnja u gornjoj vilici.

Cilj studije bio je da se postigne povećanje volumena mekih tkiva korišćenjem hirurških ekspandera, a zatim nastavi sa tehnikama vođene koštane regeneracije. Predložena tehnika imala je za cilj da omogući povećanje mekih tkiva u zasebnom hirurškom postupku, oslobađajući operatora od relaksacije režnja tokom faze ugradnje veštačke kosti, a samim tim i isključenje mogućih faktora koji ometaju primarno zarastanje rane u toku pomenutog hirurškog postupka.

Materijali i metode

U radu su prikazana dva klinička slučaja u kojima su intraoralnom procenom i radiografskim pregledima procenjeni količina preostale kosti i stepen koštane atrofije. Pacijenti su došli na pregled sa sledećim kliničkim karakteristikama:

- kod prvog pacijenta utvrđeno je odsustvo gornjeg levog centralnog i lateralnog sekutića, sa atrofijom kosti maksile koja prema Cawood–Howell klasifikaciji pripada klasi IV; osim toga, zapažen je ožiljak na pripojnoj gingivi na mestu zuba 11 kao posledica prethodne apikotomije (Slike 1 i 2);

- kod drugog pacijenta zapažena je umetnuta bezubost očnjaka i dvaju gornjih levih premolara, u ovom slučaju udružena sa atrofijom kosti gornje vilice koja prema klasifikaciji Cawood–Howell pripada klasi V;

Introduction

The success of hard tissue regeneration techniques in the pre-implant phase is in correlation with surgical healing by primary intention. A fundamental moment in the execution of this procedure is the passivation of the primary flaps and their sufficient mobilization. The following paperwork represents a clinical evaluation of the potential increase in soft tissue in complex cases obtained through the use of an osmotic tissue expander[1–6].

In the case of the presence of frenulum or coronal muscular insertions or even scarring due to previous surgical interventions, the residual translation of the tissues may be insufficient and cause the exposure of the regeneration materials and consequent superinfection of the graft. There have been various techniques proposed to solve the problem of closure by primary intention and passivation of the flaps in bone regeneration procedures but none has ever really guaranteed a significant increase of the surface area of the flaps in the upper sectors where the presence of an inextensible palatal flap has always created significant surgical difficulties.

The aim of the study was to obtain an adequate volumetric increase in the soft tissues through the use of the surgical expander, and then continue with bone regeneration techniques. The proposed technique aims to allow an increase in soft tissues in an independent surgical phase, freeing the surgeon from releasing the flaps during the regenerative phase and therefore eliminating possible disturbing factors of wound closure by primary intention during the surgical interventions.

Materials and methods

This paper describes two clinical cases where intraoral and radiographic examinations were used to determine the quantity of residual bone and the degree of atrophy. The patients presented to our office with the following characteristics:

The first patient presented with the missing upper left central and lateral incisors associated with maxillary bone atrophy belonging to Cawood and Howell class IV. Furthermore, scarring of the attached gingiva in site 11 originating from a previous apicectomy was noted (Figures 1 and 2).

The second patient had intercalated edentulism of the canine and the two upper left premolars associated with bone atrophy of the upper jaw belonging to Cawoode Howell class

takođe, dijagnostikovana je fibroza mekog tkiva kao posledica prethodnog peri-implantitisa na mestima gde su eksplantirani prethodno ugrađeni implantati (Slike 3 i 4).

I u jednom i u drugom slučaju bila je planirana implant-protetska rehabilitacija nakon regeneracije kosti, uz upotrebu osmotskog ekspandera tkiva.

Kod pacijenata nije bilo kontraindikacija za ugradnju implantata ni u vidu sistemskih oboljenja (poremećaji kao što su dijabetes melitus, intravenski farmakološki tretman bisfosfonatima, teški pušači) ni u vidu lokalnog nalaza (nelečeni gingivitis ili parodontitis, nezadovoljavajuća oralna higijena, zračna terapija).

Obe operativne intervencije izvedene su u lokalnoj regionalnoj anesteziji primenom mepivakaina 20 mg/ml sa adrenalinom 1 : 100.000. Napravljen je rez od 2 cm do 2,5 cm i postavljen na poziciju koja izbegava smetnje u budućem pozicioniranju ekspandera. Podignut je envelop režanj pune debljine, čime je stvoren subperiostalni džep u koji može da smesti ekspander (Slike 5 i 6).

Dimenzije reza i džepa unapred su planirane upotrebom hirurškog šablona kako bi se prilagodile dimenzijama ekspandera. Kod drugog pacijenta je zatim ekspander pozicioniran na vrh grebena sa ciljem da se naknadno izvede vertikalna regeneracija kosti[7,8]. U prvom slučaju pak pozicioniranje je izvršeno u vestibularnijem položaju sa ciljem da se izvrši horizontalna regeneracija kosti. Ekspander se održao u poziciji zahvaljujući zaštitnoj akciji reponiranog režnja, konaca i prisutnog subperiostalnog džepa (Slike 7 i 8).

Korišćeni Osmed® ekspander sastoji se od hidrogela, kopolimera metil-metakrilata i N-vinilpirolidona, a nalazi se u cilindričnom perforiranom silikonskom omotaču. Ekspander je imao početnu zapreminu od 0,045 ml, dužinu od 7,5 mm i prečnik od 3 mm; konačna zapremina bila je 0,24 ml, dužina 12 ml, a prečnik 6 mm (Slike 9 i 10).

Kada je ekspander pravilno pozicioniran, režnjevi su reponirani i zašiveni neresorptivnim svilenim koncem debljine 5.0, tehnikom pojedinačnih šavova (Slike 11 i 12).

Uklanjanje ekspandera izvršeno je u drugom hirurškom koraku, četiri nedelje kasnije. Trajanje tretmana procenjeno je prema veličini defekta i veličini ekspandera[9,10] (Slika 13).

Nakon operacije, pacijenti su ispirali usta 0,2% hlorheksidina tri puta dnevno, sve do uklanjanja šavova. Postoperativno nije ordinirana antibiotska profilaksa.

V. Finally, the patient presented fibrosis, linked to previous peri-implantitis involving two implants that were subsequently removed (Figures 3 and 4).

In both cases, implant-prosthetic rehabilitation was planned for the period after bone regeneration with the use of an osmotic tissue expander.

Data from the medical histories of both patients did not show any contraindications for the implant treatment, neither from a systemic point of view or disorders such as diabetes mellitus, intravenous pharmacological treatment with bisphosphonates, heavy smokers, nor locally (untreated gingivitis or periodontitis, insufficient oral hygiene, radiation therapy).

Both interventions were performed under local-regional anesthesia using mepivacaine 20 mg/ml with adrenaline 1:100,000. A 2−2.5 cm incision was made and placed in a position that avoids interference with the future positioning of the expander. A full-thickness envelope flap was elevated, creating a subperiosteal pocket capable of housing the expander (Figures 5 and 6).

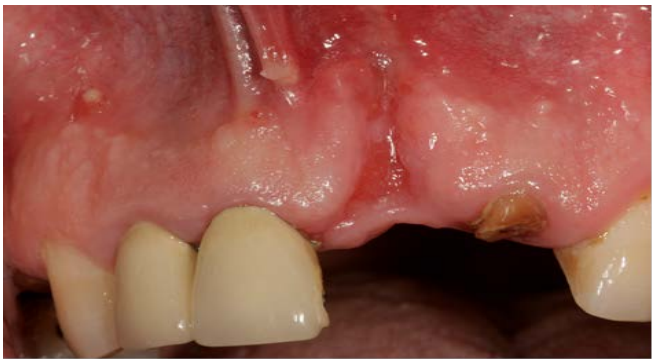
The dimensions of the incision and the pocket were assessed in advance thanks to the use of a surgical template to be adapted to the dimensions of the expander. The expander was then positioned on the crestal top in the second patient to subsequently carry out vertical bone regeneration[7,8]. In the first reported case, the positioning took place in vestibular position to carry out horizontal bone regeneration. The expander was kept in place thanks to the containment action implemented by the flaps, the suture and the presence of the subperiosteal pocket (Figures 7 and 8).

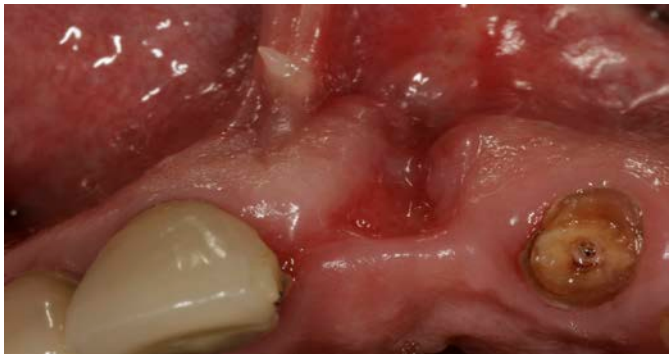
The Osmed® expander that was used is made up of hydrogel, a copolymer of methyl methacrylate and N-vinylpyrrolidone, contained in a cylindrical perforated silicone shell. The expander had an initial volume of 0.045 ml, length of 7.5 mm and diameter of 3 mm; and a final volume of 0.24 ml, length of 12 ml and diameter of 6 mm (Figures 9 and 10).

When the expander was correctly positioned, the flaps were repositioned and sutured using a non-absorbable 5.0 silk suture, with a detached stitch technique (Figures 11 and 12).

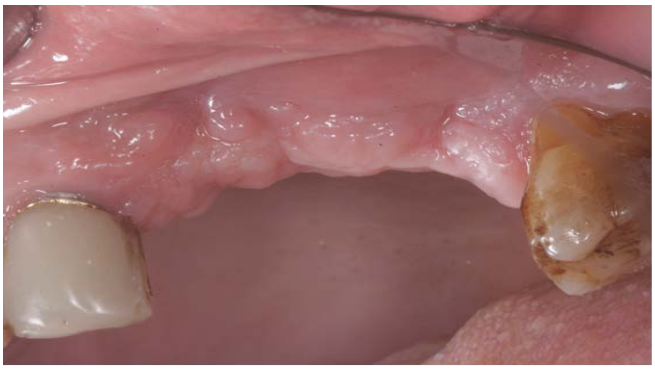
The removal of the expander was carried out in a second surgical step 4 weeks later. The duration of treatment was evaluated in relation to the size of the defect and the size of the device[9,10] (Figure 13).

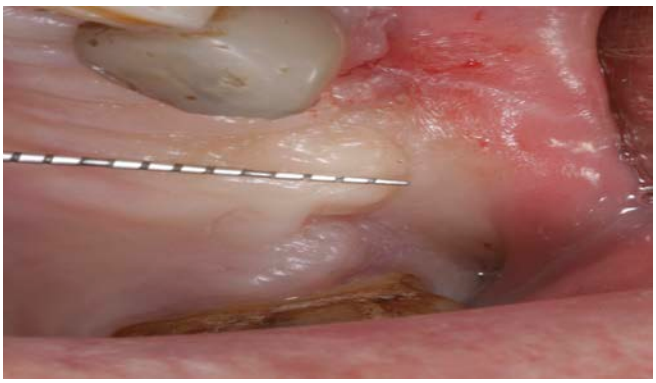
Following the operation, the patients were treated with 0.2% chlorhexidine rinses 3 times a day until the suture was removed. Antibiotic prophylaxis was not carried out.



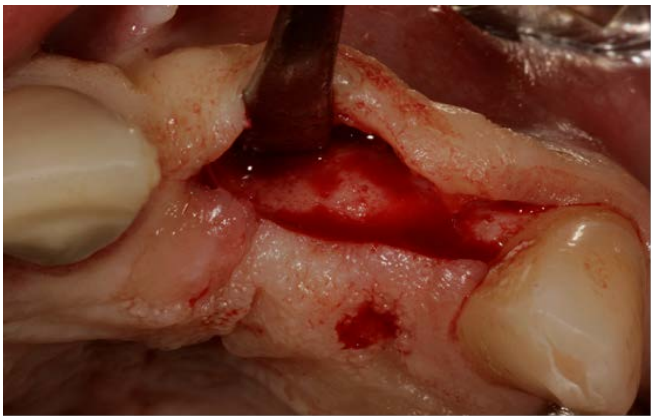


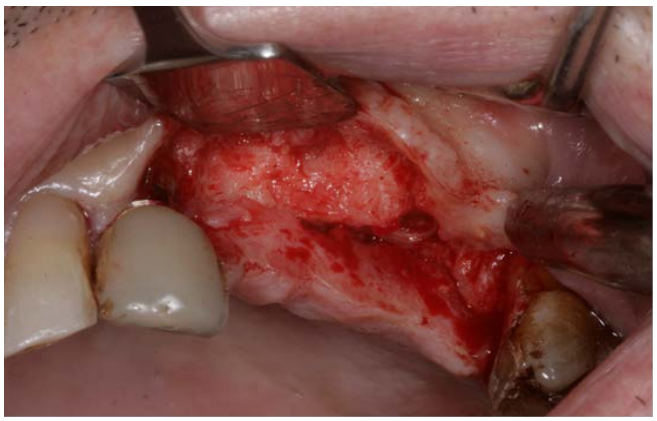
Slike 1 i 2. Ožiljak na pripojnoj gingivi u predelu zuba 11
Figures 1 and 2. A scar on the attached gingiva in the area of the tooth 11





Slike 3 i 4. Fibroza mekog tkiva posle eksplantacije implantata
Figures 3 and 4. Soft tissue fibrosis after implant explantation





Slike 5 i 6. Subperiostalni džep za postavljanje ekspandera
Figures 5 and 6. Subperiosteal pocket for placing the expander

Rezultati

Ni u jednom kliničkom slučaju nije bilo neželjene reakcije odbacivanja postavljenog stranog materijala, što ukazuje na biokompatibilnost ekspandera[11,12]. Postoperativne tegobe bile su uglavnom u vidu blagih bolova. Pacijenti su u fazi ekspanzije primetili blagi osećaj pritiska (napetosti) u tretiranom području, ali su, uopšte uzev, tretman veoma dobro podneli. Ekspander nije bio dislociran tokom tretmana; u trenutku uklanjanja izgledao je netaknuto, bez perforacija ili strukturnih promena. Proširena sluzokoža, procenjena u toku sekundarnog hirurškog zahvata, bila je ružičasta i bez dehiscencije. Došlo je do potpunog zarastanja i nije bilo prisutnih znakova upale. Mogao se uočiti blag konveksitet u predelu ekspandera. Procena povećanja zapremine urađena je henotaninskom kiselinom, kojom su napravljene dve pigmentacije, obeležene u vreme umetanja samog ekspandera (Slika 14).

Results

In both clinical cases, no reversed reactions to the material used were found, demonstrating the biocompatibility[11,12]. The postoperative period was characterized by mild pain. During the expansion phase, patients reported a slight sense of pressure (tension) in the treated area; in general, the treatment was very well tolerated.

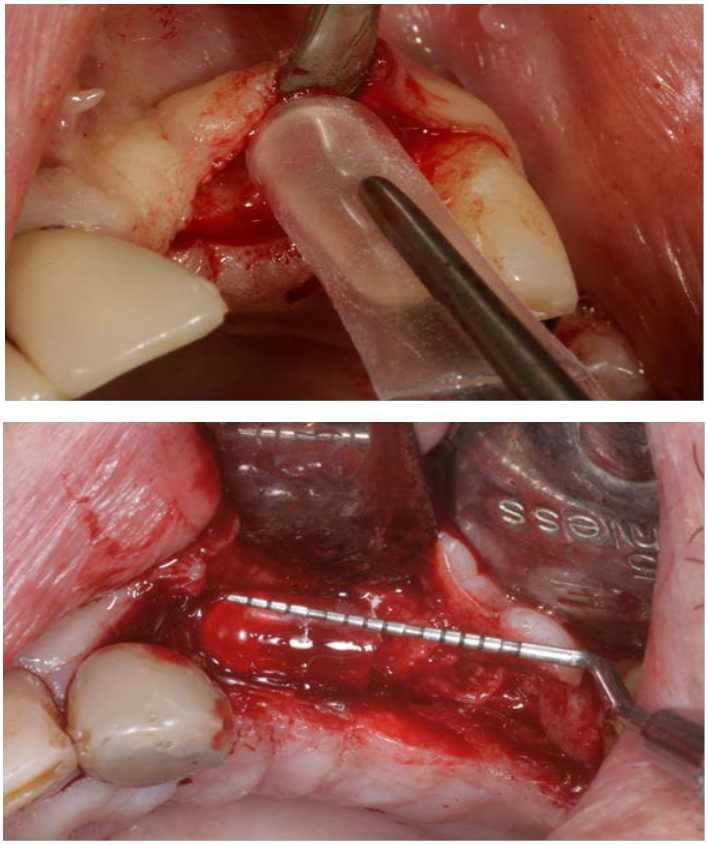
The expander did not undergo any dislocations during the treatment and at the time of removal, it appeared to be intact, showing no perforations or structural alterations.

The expanded mucosa, evaluated at the time of the second surgical step, appeared pink and without dehiscences.

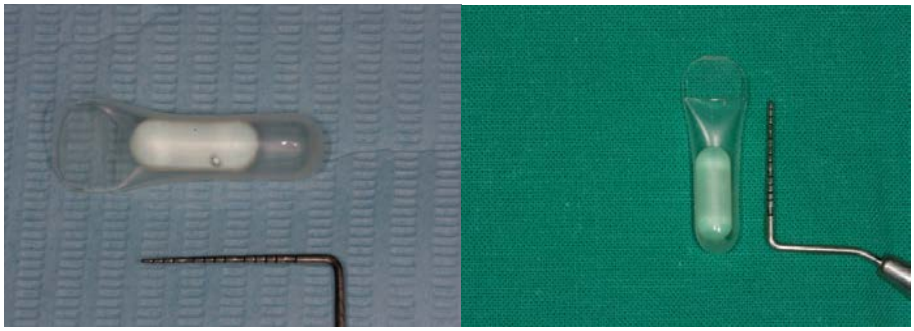
The healing was complete, the mucosa showed no signs of inflammation. Furthermore, it was possible to appreciate a slight convexity near the expander. The evaluation of the increased volume was carried out using two pigmentations, carried out at the time of insertion of the expander with hennotannic acid (Figure 14.).

Razmak između dveju pigmentacija izmeren je u koronalno-apikalnom i mezijalno-distalnom smeru, sa konačnom ekspanzijom od približno 38%. Kod prvog pacijenta zapažene su varijacije od 8 mm do 10 mm u koronarno-apikalnom smeru, odnosno od 5 mm do 8 mm u mezijalno-distalnom smeru. Kod drugog pacijenta povećanje je bilo od 10 mm do 13 mm u koronarno-apikalnom smeru i od 5 mm do 7 mm u mezijalno-distalnom smeru.

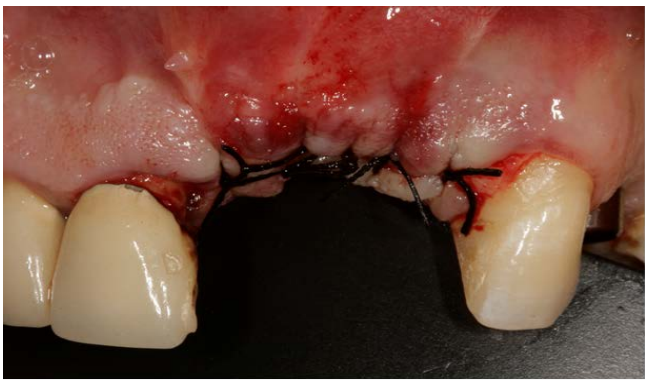
The distance between the two pigmentations was then measured in the coronal-apical and mesial-distal direction, obtaining an expansion of approximately 38%. In particular, variations from 8 to 10 mm in the coronal-apical direction and from 5 to 8 mm mesial-distal were detected in the first patient, in the second patient from 10 to 13 mm in the coronal-apical and from 5 to 7 mm in mesial-distal direction.

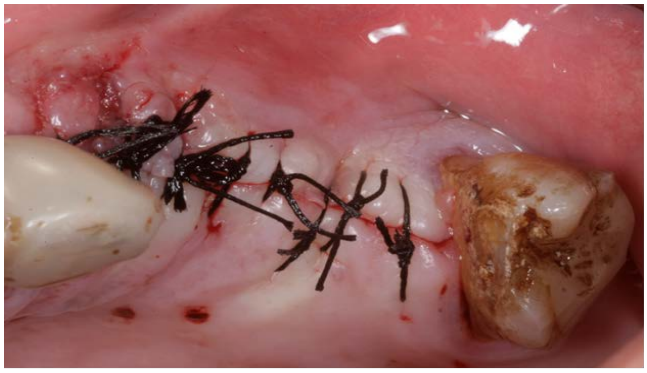


Slike 7 i 8. Pozicioniranje ekspandera
Figures 7 and 8. Expander positioning



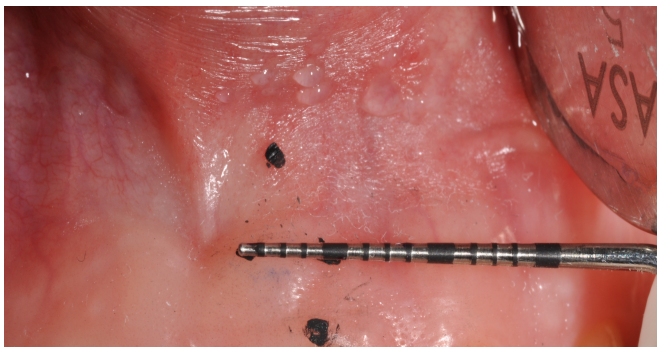
Slike 9 i 10. Ekspander pre povećanja volumena i posle njega
Figures 9 and 10. Expander before and after volume increase





Slike 11 i 12. Izgled rane posle završene operacije postavljanja ekspandera
Figures 11 and 12. Appearance of the wound after the expander placement operation was completed

Slika 13. Izgled ekspandera posle uklanjanja
Figure13. Appearance of the expander after removal



Slika 14. Procena povećanja zapremine mekog tkiva merenjem tačkastih pigmetacija
Figure 14. Assessment of soft tissue volume increasing by measuring point pigmentations

Diskusija

U današnje vreme, rad sa pacijentima koji imaju značajan nivo koštane atrofije vilice česta je pojava – u ovakvim slučajevima, predloženi rehabilitacioni tretman je često tipa implantata. Međutim, mogućnost sprovođenja implantološko-protetske rehabilitacije neizbežno je povezana sa upotrebom regenerativnih tehnika koje omogućavaju da se dobije zapremina kosti adekvatna za ugradnju implantata. Ove procedure zahtevaju da površina mekog tkiva bude dovoljna da pokrije implantat i postigne uspeh u terapiji. Tehnike tipa vođene koštane regeneracije, posebno vertikalne, zapravo su posebno povezane sa neuspehom koji izaziva upravo nedostatak mekih tkiva, sa posledičnom dehiscencijom tkiva i izlaganjem membrane. Upotreba ekspandera tkiva može pomoći u smanjenju komplikacija i morbiditeta kod ovih pacijenata.

Ova studija je pokazala da je uz pomoć lako izvodljive i relativno atraumatske tehnike moguće značajno povećati zapreminu mekih tkiva te stvoriti optimalnu situaciju za izvođenje tehnike vođene koštane rgeneracije. Ekspanzija zapravo poboljšava kvalitet i kvantitet mekih tkiva i olakšava zatvaranje primarnog režnja u toku regenerativne hirurgije[13,14,15].

Iako očigledno može izazvati dodatnu nelagodnost za pacijenta, uvođenje nove hirurške faze moglo bi garantovati izvesnost rezultata glavne hirurške faze, kao i faze regeneracije tvrdih tkiva. Pored toga, ova faza nesumnjivo sa sobom nosi operativne poteškoće; takođe, potrebu za dodatnim prilagođavanjima.

Upoteba okruglih ekspandera koje treba postaviti i imobilisati na ravnu površinu predstavlja prvu operativnu prepreku, pa bi izbor oblika koji je pogodniji za navedene slučajeve mogao biti prvi predlog modifikacije koji bi proizvođači trebalo da uzmu u obzir. Osim toga, pozicioniranje ekspandera već zahteva pasivizaciju režnja da bi se obezbedilo primarno zarastanje i u ovoj operativnoj fazi. S obzirom na to da brzina povećanja ekspandera i njegov terminalni volumen nisu sasvim predvidivi, čini se i da su neophodne kontinuirana kontrola i procena stepena proširenja ekspandera. U prethodnom periodu, upotreba ekspandera uglavnom je bila ekstraoralna, u oblasti plastične hirurgije, pa postoji obimna literatura na tu temu. Njihova primena u oralnoj hirurgiji pak novijeg je datuma, sa tek nekoliko prijavljenih slučajeva zubnih implantata sprovedenih uglavnom na životinjama.

Discussion

Nowadays, dealing with patients who present significant levels of bone atrophy of the jaws is an extremely frequent condition; in these cases, the proposed rehabilitation treatment is a dental implant procedure. The possibility of carrying out implant-prosthetic rehabilitation, however, is necessarily linked to the use of regenerative techniques that enable to obtain adequate bone volume for the insertion of the implant. These procedures require a sufficient soft tissue surface to cover the graft and achieve therapeutic success. Techniques such as GBR, especially vertical, are particularly associated with failure caused precisely by the lack of soft tissues, with consequent dehiscence and exposure of the membrane. The use of tissue expanders can help reduce complications and patient morbidity. This study demonstrates how, while using an easy-to-perform and relatively atraumatic technique, is possible to considerably increase the volume of the soft tissues, in such a way as to find an optimal situation for carrying out bone regeneration techniques. The tissue expansion in fact improves the quality and quantity of the soft tissues and facilitates the closure of the primary flap during regenerative surgery[13,14,15].

The possibility of introducing a new surgical phase, although it may apparently cause further discomfort for the patient, could guarantee the certainty of the result of the major surgical phase as well as the regenerative phase of the hard tissues.
In addition, this phase brings with it surgical complications and the need for the executive learning curve.

In the first instance, the usage of a round device placed and immobilized on a flat surface represents a first operational obstacle, therefore the choice of a shape that is more suitable for the cases could be a first proposal for modification to the manufacturers. Furthermore, the positioning of the expander already requires the passivation of the flaps to ensure closure by primary intention even in this surgical phase. Finally, the continuous control and evaluation of the degree of expansion of the expander appears necessary as the speed of increase of the expander is not yet well established and its terminal volume is not perfectly predictable. Over time, the use of expanders has mainly been extra-oral in the field of plastic surgery, in fact, there is a lot of literature data on the subject. The application in oral surgery is more recent, with few reported cases of dental implant experiments conducted mainly on animals.

Zaključak

Da bi se mogli pružiti statistički značajni zaključci, neophodne su dodatne informacije. Ipak, dobijeni rezultati omogućavaju da se primena ove tehnike za regeneraciju mekih tkiva smatra validnom tehnikom, koja može doprineti globalnom poboljšanju procesa regeneracije kosti vilice.

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Conclusion

Although the study requires further data to be able to provide statistically significant conclusions, the obtained results allow us to consider this technique as valid, in order to generate soft tissues and contribute to the global improvement in the regeneration processes of the jaw bones.

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