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CASE REPORT

SOFT TISSUE EXPANSION FOR TENSION FREE CLOSURE OF FLAP DURING GUIDEDBONE REGENERATION - A CASE REPORT

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Abstract

The compromised alveolar ridges preclude the placement of dental implants. The major problem with the regenerative procedures like block grafting, guided bone regeneration is flap opening during the initial healing period and exposure of the regenerative compartment. There is necessity for the tension free closure of the flap without relieving the periosteum or mucosa is required for the successful regeneration. The self-inflating osmotic tissue expander (Osmed) is used to expand the tissue prior to augmentation procedure. This report elaborates about the use of self-filling osmotic expander in severely compromised alveolar ridge defect cases (combined defect) prior to the augmentation procedure. The report concludes that the self-filling osmotic expander is a valuable tool in the efficient management of soft tissues prior to augmentation of severely compromised alveolar ridge cases.

Keywords: *Soft tissue expanders, Osmotic expander, Periosteum, Ridge defect.*

INTRODUCTION

The residual alveolar ridges undergo resorption throughout the life. The rate of the resorption varies according to the arches and the specific location. For instance, the mandibular anterior region undergoes four times rapid resorption compared to maxillary anterior region.[1] During the initial period after extraction, there is new bone formation with loss of almost all of the alveolar crest height and simultaneous reduction of approximately two-thirds of the ridge width. These changes continue over the initial ten to twelve weeks period.[2] The incidence of alveolar ridge deformities varies between 80-91% with the combined defect or class III defect is more common (55%).[3] The compromised alveolar ridges preclude the placement of dental implants and also it is difficult to rehabilitate the defective ridges both functionally and esthetically. The defective alveolar ridges are generally managed by various augmentation procedures like block grafting, guided bone regeneration with titanium mesh, distraction osteogenesis etc. the vertical ridge defects and the

combined defects requires extensive regenerative procedures.[4] The major problem with these regenerative procedures is flap opening during the initial healing period and exposure of the regenerative compartment.

The tension free closure of the flap is a prerequisite for successful regeneration of tissues underneath. The tension free closure is necessary to preserve the vascularisation of the tissues and to reduce the post-surgical infections (Wang and Boyapatti).[5] There are many techniques of flap advancements available at present, each techniques have its own advantages and disadvantages.

Most of these techniques scores or releives the periosteum. Periosteal stripping reduces the perfusion of the outer cortical blood supply. The releiving incision of the mucosa or periosteum compromises the revascularisation of the flap.[6] If the periosteum doesn't overlie the graft, the result is less new bone formation. The tensile stresses on the periosteum reduces the bloodvessel diameter and any flap tension more than 0.25N results in dehiscence of the flap.[7] The bone graft exposure is more common in 25-50% of ridge augmentation cases.[8] According to a meta-analysis by Machei et al, six times more bone gain achieved in non-exposed sites compared to exposed sites. Thus, the necessity for the tension free closure of the flap without relieving the periosteum or mucosa is required for the successful regeneration.[9]

The tension free closure of the flap can be achieved by expanding the soft tissues. The conventional expanders have many drawbacks like repetitive inflations, pressure peaks with impaired tissue perfusion, patient noncompliance, treatment time and cost. To overcome these difficulties, the self-inflating hydrogels was introduced by Weise et al in 1993.[10] The first-generation hydrogels without the silicon shells were used. These expanders lead to rapid expansion and tissue perforations were common. The rapid expansion didn't add to the tissue volume and the tissue tends to revert back to preexpansile state once the expander was removed. Then the second-generation expanders with silicon shell was introduced Osmed, Germany in 1999. The perforations in the semipermeable silicone shell allows the influx of the surrounding tissue fluids. The number of perforations controls the inflow rate which in turn limits the speed of expansion Kaner & Friedmann 2011.[11] Without affecting the quality of the original tissues, the tissue are expanded and the tissue expansion involves a combination of creep and biological stretch. Thus, the soft tissue expanders can be used prior to augmentation of ridges for the successful regeneration of lost tissues. This report elaborates about the use of self-inflating soft tissue expander in the management of severely compromised ridges (combined defect).

CASE REPORT 1

A systemically healthy forty-five years old female patient reported to the department of Periodontics, Saveetha dental college and hospitals, Chennai, India with the chief complaint of missing upper front teeth. The intra oral examination showed missing 21, 22 with grade I mobility in 11. The clinical examination showed that the ridge defect was of combined defect (both vertical and horizontal loss of bone) as shown in figure 1.

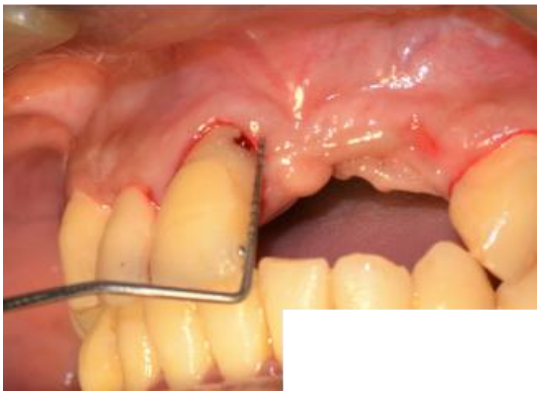

Figure 1. *Severe ridge defect*

There was gingival recession in relation to 11 and 23. All the treatment options were explained to patient, the fixed partial denture option with mock wax up also shown to patient. Patient wanted the implant supported prosthesis in 21, 22 regions. The cone beam computerised tomography (CBCT) analysis revealed that the ridge width was 2mm crestally and 3 mm below the crest. The ridge height was found to be 9mm from the crest to the nasal floor. The implant simulation in cbct showed the platform of implant was at 6mm below the cemen to enamel junction of the adjacent teeth. Thus, the ridge expansion with simultaneous placement of implant with vertical augmentation using titanium mesh and grafting was planned. In order to achieve tension free

closure of flaps, soft tissue expansion with osmed (Ilmenau, Germany) expanders were planned. The size of the expander was determined using the template. The cylinder dental expander of 1.3 ml was chosen and a semilunar incision in the alveolar mucosaregion was made as shown in figure 2.

Figure 2. *Soft tissue Expander (Osmed)*

A pouch was created with the blunt desertion using surgical scissors and the template was inserted to see whether it was sufficient for the soft tissue expander. The soft tissue expander was placed inside the pouch and stabilised using surgical screws as shown in figure 3.

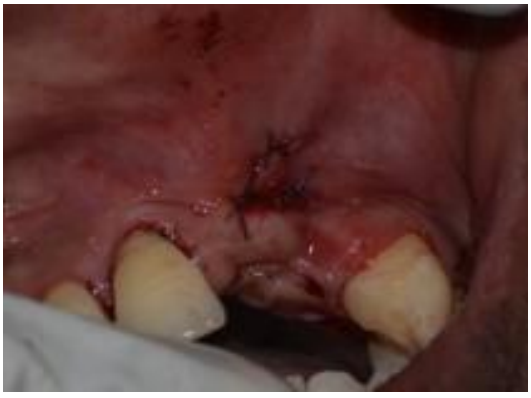

Figure 3. *Soft tissue Expander stabilised*

The expander was allowed to expand the tissues for 50 days as suggested by the company. On the 50th day, the surgery was done by rising a full thickness flap with horizontal crystal incision and two vertical releasing incisions. The encapsulated soft tissue expander was carefully removed as shown in figure 4.

The expanded tissue showed nice elasticity (figure 5).

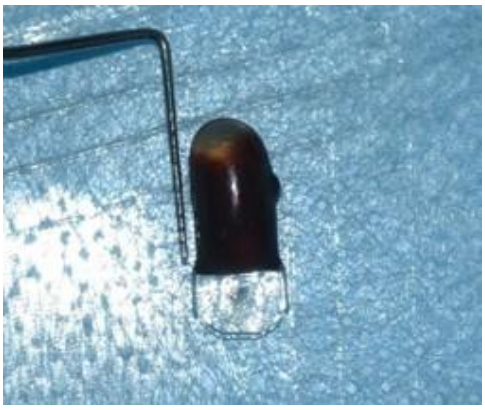

Figure 4. *After 30 days expander removed from the site*

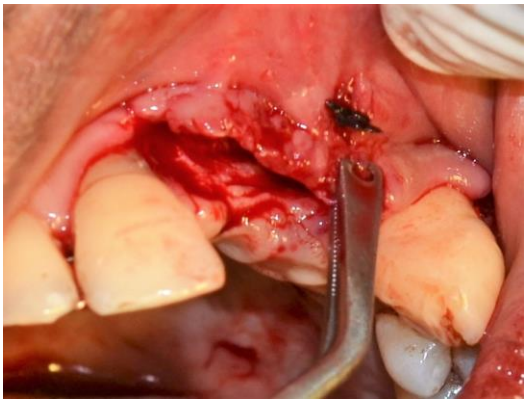

Figure 5. *Elastic nature of the expanded flap*

The ridge defect was managed with autogenous block graft procured from symphysis and remaining area covered with the xenogeneic graft (Bio-Oss®, Geistlich Pharma, Switzerland), the entire grafted site was covered with a collagen membrane (figure 6, 7). The flap was advanced without any perisoteal releasing incisions and the flap was checked for passive closure. The flap was approximated using horizontal mattress suture and interrupted simple loop sutures as shown in figure 8.

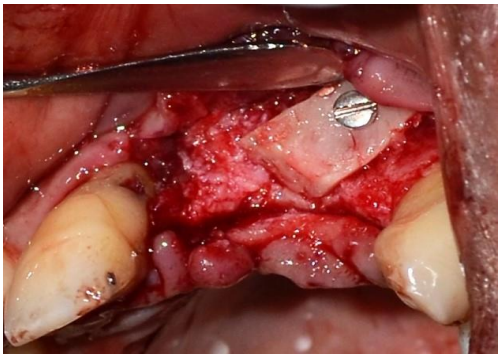

Figure 6*. Site augmented with autogenous and particulate graft*

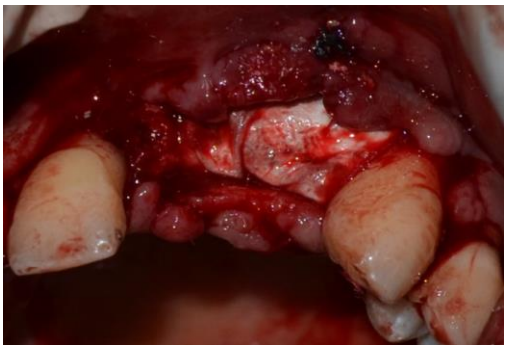

***Figure 7**. Ridge augmentation with graft and membrane*

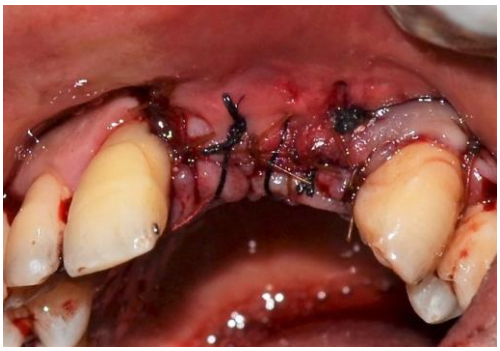

***Figure 8**. Tension free closure of flap*

The patient advised antibiotics for five days and analgesics for two days. Patient advised to continue regular toothbrushing and oral hygiene maintenance protocol. The surgical site healed nicely after ten days of follow-up. After five months the implant placement planning was done. The osteotomy sites were prepared for 3.75 by 13 mm implants and the implants were placed. The healing was satisfactory and then the implants were loaded.

CASE REPORT 2

A forty-two years old male patient reported with the chief complaint of missing upper front tooth. The patient was wearing removable partial denture and wanted to replace it with implant supported prosthesis. On clinical examination, 21, 22 was missing. The cone beam computerised tomographic analysis revealed the defect was combined type with the width was 2mm and the height also less compared to the levels of adjacent cement enamel junction. Thus, augmentation with bone grafts followed by implant placement was planned. To ensure proper closure of soft tissues, a self-inflating osmotic soft tissue expander of 1.3 ml was placed in the pouch created at the vestibular area of the edentulous site as shown in figure 9, 10, 11 & 12.

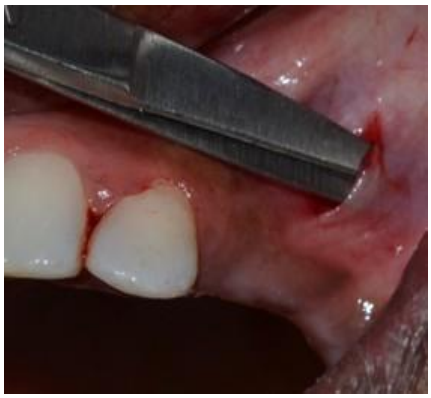

***Figure 9**. Case 2 - Pouch preparation for expander*

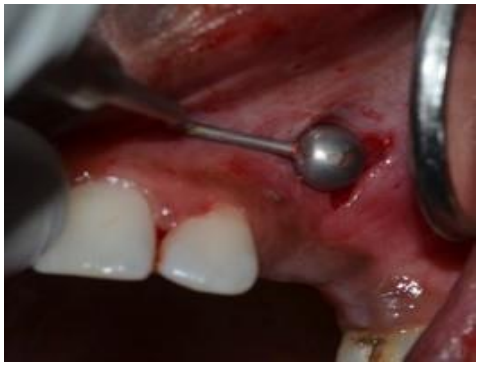

***Figure 10**. Template for expander selection*

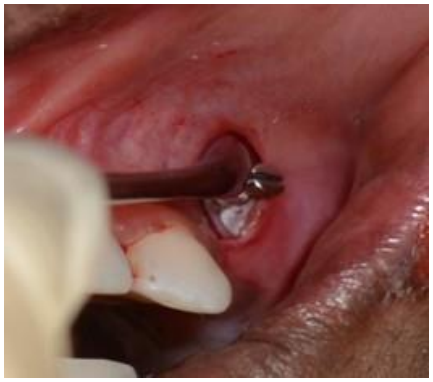

***Figure 11**. Expander stabilised with the screw*

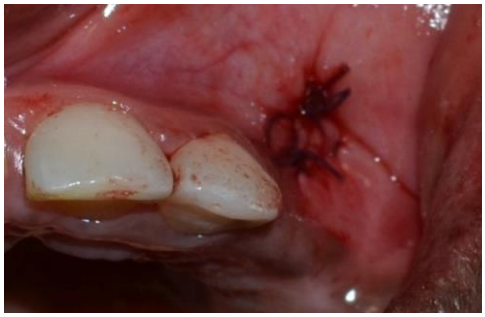

***Figure 12**. The site closed with sutures*

The tissue was allowed to expand for fifty days as suggested by the company and the ridge augmentation surgery with autogenous bone grafts was planned. The patient was unable to come on the 50th day. Patient came after ten days, there was exposure of the expander. The expander was removed and a full thickness flap was raised. Autogenous block grafts procured from the symphysis using piezosurgery and the grafts were stabilised using 1.5 by 8mm stainless steel screws. The particulate graft was placed in the gaps between block grafts and placed on the alveolar crest for 2mm. The entire area was covered with platelet rich fibrin membrane and the flap was checked for passive closure. The flap was approximated with horizontal mattress and interrupted simple loop sutures using vicryl resorbable sutures. The healing was satisfactory and the implants were placed after five months.

DISCUSSION

The necessity for the tension free closure of flap without releasing periosteum or mucosa stems from the fact that sufficient vascularisation to allow the influx of stem cells is a pre requisite for proper bone regeneration. According to Machtei et al, the exposure of guided tissue regeneration membranes during a 3 to 6 months healing period reduced the regeneration rate from 96% to 46%. [9] Similar results were shown in a systematic review by Yong Moo Lee et al with less regeneration in cases of early membrane exposure. [12] Thus the use of self-filling osmotic tissue expanders prior to augmentation procedures is required especially in severely compromised ridge defect cases. Kaner and Friedman first reported the proof of principle study using these expanders prior to vertical ridge augmentation and achieved about 7.5 ± 2.4 mm of vertical bone gain in twelve patients.[11] The other case series by Farak Asaad et al also claimed 3mm of horizontal augmentation achieved after using the osmotic expanders.[6] But in the report by Assad et al, two cases had exposure of the expanders. In this present case series, there was no incidence of expander exposure. This might be attributed to the selection of the correct size of the expander. And also, the placement of the expander might also play a role. Like Kaner et al study, the present report also placed the expander in the mucosal region supraperiosteally. On the other hand, Asaad et al report, it was subperiosteal placement. It is generally advised to place the expander in the movable tissue location like vestibular region rather than in the attached gingival region. Even though there was no expander exposure in the present report, there was flap exposure in one casepost augmentation procedure. This was not reported in the previous reports. The possible reason could be that minimal periosteal scoring was done in previous report by Assad et al. whereas in both the cases of the current report, periosteum was not released. The flap elasticity was very good, it was possible to extend the flap passively over the augmented sites without any tension. Thus, the flaps were approximated passively with the resorbable sutures. The present report dealt with the augmentation of combined defects and the sites were restored with implant supported prosthesis. Whereas the report by Assad et al dealt with horizontal augmentation defects alone and Kaner et al dealt with vertical augmentation. In this report both the horizontal and vertical augmentation was achieved. Thus, it can be concluded that the self-filling osmotic expander is a valuable tool in the efficient management of soft tissues prior to augmentation of severely compromised alveolar ridge cases and it reduces the mishandling of the periosteum to a large extent. Further studies with larger sample sizes and randomised controlled trials are required to firmly establish the result.

DECLARATIONS

Conflicts of interest and financial disclosures

The author declares that he has no conflict percent and there was no external source of funding for the research in question.

Ethical approval

The study was approved by the Institutional Ethics Committee and was conducted in accordance with the Declaration of the World Medical Association.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Source of funding

The work was not funded.

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