ALVEOLAR RIDGE SPLITTING: A PARADIGM SHIFT IN HORIZONTAL RIDGE AUGMENTATION TECHNIQUE

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ABSTRACT

Tooth loss due to trauma or even traumatic extraction leads to undesirable consequence like deficient alveolar ridge. This not only compromises the availability of adequate bone for placement of dental implant, but also jeopardise the esthetic outcome in fixed partial denture especially in high smile line patients. Ridge augmentation is the only treatment modality to restore the lost bone. But conventional ridge augmentation procedure has some limitation which can be overcome by alveolar ridge splitting technique. In this article, we will discuss about this technique with special emphasis of the methods and advantages of this.

Keywords: Ridge split technique, alveolar ridge augmentation, ridge expansion

INTRODUCTION

Endosseous dental implants have been proved to be a reliable and established alternative for replacing teeth in both partially or fully edentulous mouth. But the biggest hurdle, the dental surgeon encounters while planning to place an implant is the inadequate bone width which needs to be addressed properly. This is more often seen in maxillary anterior region which is more prone to trauma that causes loss of alveolar bone, especially in sagittal section. About 6 mm width is necessary for most standard implants to have favorable outcomes\textsuperscript{1}. Scipioni and co-workers recommended that, whatever dental implant we place, there should be at least 1-1.5 mm bone both labially/buccally and palatally/lingually to ensure a predictable outcome\textsuperscript{2,3}. So, Augmentation of the narrow ridge before implant placement becomes an essential part of the treatment plan.

From prosthetic treatment point of view, localized alveolar ridge defect is also a challenge to overcome\textsuperscript{4}. Ridge augmentation is needed to avoid the late complications of trauma\textsuperscript{5}. As a case study, the author hereby analyzes the present situation as a case study.
CASE STUDY

1. BASIC INFORMATION

1.1 PATHOPHYSIOLOGY OF ALVEOLAR BONE RESORPTION

We all know that, alveolar bone is the housing for the teeth and its integrity also depends on the presence of teeth. As long as teeth are there, they are maintained (unless affected by periodontitis or trauma from occlusion) and after the tooth is lost, they start resorbing. The reason behind this is the blood supply to this alveolar bone is properly maintained until the proprioceptive senses from the teeth are maintained only.

Alveolar bone resorption following tooth loss follows some pattern. It resorbs most rapidly in the first year following loss of tooth. Extraction of upper anterior teeth shows a pattern of bone loosing mainly from the labial side. After tooth loss due to trauma, the labial site is resorbed first, hence the reduction in width occurs first, followed by reduction in height. The loss is about to be 40-60% in first 3 years and after that undergoes an annual loss of 0.25-0.5%.

1.2 VARIOUS TECHNIQUES

There are so many techniques available to restore the lost contour of the bone with different success rates, e.g., onlay bone graft, guided bone regeneration (GBR), distraction osteogenesis, ridge splitting techniques etc.

Maxillary sinus lifting procedure with bone graft placement can increase the height of alveolar bone in premolar and molar regions.

Distraction osteogenesis and block graft are also able to vertical augmentation of alveolar bone. But vertical bone augmentation is always more challenging than the horizontal one.

Bone grafting and GBR can perform horizontal and to some extent vertical bone augmentation.

Ridge split technique can only perform the horizontal bone augmentation.

1.3 RIDGE SPLITTING TECHNIQUE

After giving local anesthesia, a full thickness muco-periosteal flap is raised by giving the horizontal incision slightly palatal to the crest of the ridge along with sulcular incision around the adjacent teeth. Two vertical incisions are made remotely from the narrow ridge segment to be splitted to avoid complications. The palatal/lingual flap is minimally raised to maintain the blood supply. The crestal horizontal corticotomy is started 1-2mm away from the adjacent teeth. The length of the site depends on the length of the ridge that needs augmentation and the no of implants to be placed. Now, with fine round bur, holes of 2mm depth are prepared on alveolar crest and they are joined with fine fissure bur. The perforations are made 1mm apart and it is ensured that they are at least 1.5mm from the buccal cortical plate. Now, a fine osteotome/chisel is placed on the groove created on the crest and tapped gently with a mallet. The bone can be expanded gradually by the gradual increase in the thickness of the osteotome used.
As an additional aid, one or two vertical grooves, 2 mm in depth, can be placed on the buccal plate to enable the easy expansion of the ridge. Occasionally, in anterior mandible, it may be necessary to create a shallow horizontal cut (2-3 mm deep) to join the apical end of these vertical grooves, as the bone in mandible more cortical (mostly type I) and therefore less flexible than that of maxillary bone. If we want to place implants immediately, we can place it after preparing the osteotomy site by implants drill. After the implant is placed, the residual gap may/may not be filled with bone graft as there is controversy in literature while adding bone graft really gives any added advantages or not. Endosseous implant reduces the stress on the expanded ridge and prevents its collapse by acting as the wedge. If implant is not placed, the defect should be filled up with the bone graft and resorbable membrane should be placed over it. Though De Wijis et al reported that membrane do not necessarily improve the prognosis. Flap is closed and secured with sutures.

2. ANALYSIS

2.1 ADVANTAGES OF THE TECHNIQUE

As narrow as 2mm alveolar crest has been shown to be suitable for alveolar ridge splitting (Sethi et al 2000). But at least 3mm ridge is favorable. It affords a surgical bed with full of blood of marrow origin. This blood is highly enriched with osteogenic progenitor stem cells. Hence it has better osteogenic potential unlike other horizontal augmentation procedures. It comes with better predictability as the grafted area is a 5 walled bony defect, within excellent vascular bed. If implant is placed immediately. We can avoid an extra surgical procedure of bone augmentation. Implant serves as a wedge and prevents the collapse of the expanded ridge. Primary stability of implant can be achieved by involving the osteotomy site by the drills at more apical position than the expanded ridge. The grafting is optional, hence we can avoid the morbidity of procuring autogenous bone graft, the cross infection from grafted material, and the extra cost of the bone graft. We can avoid the extra period of 4-6 months as here healing of augmented site and osseointegration go on simultaneously.

2.2 LIMITATIONS OF THE TECHNIQUE

This procedure cannot correct the vertical ridge defect. It is difficult to be performed in highly cortical bone devoid of the cancellous part (type I bone). The expanded bony part may be fractured separated if not performed judiciously. It is not suitable for narrow ridge as ≤3mm. Single stage implant (though not a contraindication) should better be avoided in ridge-splittered alveolar bone.
DISCUSSION

Summers RB showed that the minimum width for alveolar splitting should be 3mm, assuming that spongy bone is found between cortical plates. Engelke et al proved that grafting between the fractured cortical lamellae is better integrated and opening of marrow spaces improve vascularization and healing. Implants inserted in ridge splitted alveolar bone showed success rate of 86-97% as reported by Engelke et al and Sethi et al. Chiapasco et al reported that the surgical success and implant survival rate is as high as guided bone regeneration and only graft procedure. Ignatius reported that The gap is filled with blood clot, which is organized and replaced with woven bone and further matures into load bearing lamellar bone at the implant interface. Suh et al reported that the procedure has high predictability and low morbidity compared with those techniques which use autologous donor zone.

CONCLUSION

it is quite evident from the above discussion that the ridge splitting technique is a predictable method of horizontal ridge augmentation with some added advantages over the other procedures, especially if immediate implant is placed. It not only ensures a highly vascular bed full of osteoprogenitor cells that is essential for regeneration of bone, but also reduces the total time period for implant therapy in deficient ridge. This being a new techniques needs further evaluation and long term follow up.

COMPETING INTERESTS

There is no conflict of interest.

REFERENCES