RIDGE EXPANSION AND IMMEDIATE IMPLANT PLACEMENT IN POSTERIOR MANDIBLE: A CASE REPORT

A Case Report

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ABSTRACT

Endosseous dental implants may require bone augmentation before implant placement. Herein is described an approach to edentulous ridge expansion with the use of oscillating saw and immediate placement of implants. This may allow for a shortened treatment time and the elimination of donor-site morbidity. One case with single edentulous posterior region is reported. This technique uses an oscillating saw to cut the crestal and proximal facial cortices. Space is then created with osteotomes to widen the split ridge. This technique allows for expansion of narrow, anatomically limiting, atrophic ridges, creating space for immediate implant placement. The facial and lingual cortices provide support with vital osteocytes for osteogenesis. The implants were restored to a functional and esthetic outcome.

Keywords: Dental implant, Horizontal ridge augmentation, Ridge split, Ridge expansion

Received: 03-05-2017; **Review Completed:** 11-09-2017; **Accepted:** 26-12-2017

INTRODUCTION:

Edentulism is an incapacitating and irretrievable condition which can lead unswervingly to functional limitation, physical, psychological and social handicap. Maintenance of bone after tooth loss to improve retention, function, and performance of the restoration is a challenging task. The existence of a thin edentulous ridge signifies a clinical situation that is more complex for the placement of endosseous implants. Dental rehabilitation of the edentulous ridges with oral implants has become a routine treatment modality in the last few decades with consistent long term results.[1]

One of the most common conditions encountered in implant dentistry is the presence of deficient bone quantity to allow for the appropriate implant placement according to standard protocols. The atrophic edentulous ridges present an inimitable challenge to the implant surgeon. It has come to light that for a completely functional and esthetic restoration, a comprehensive hard and soft tissue harmony has to be achieved before and after implant placement. The present perspective is to place an implant in a prosthetically driven position.[1]

Various techniques for augmentation of the ridges have been addressed in the past which includes: onlay bone grafts harvested from the hip, maxillary tuberosity, symphysis of the chin, mandibular ramus and external oblique ridge. All these methods have their own shortcomings, the most important being the inevitability of a second surgical site for procuring the graft. Hence various alternative procedures were developed to minimize this morbidity. Splitting and expanding the edentulous ridge for bone augmentation and implant placement is considered as an innovative technique as it avoids the need for a second surgical site which further reduces the ailment of the patient.[1]

This ridge split technique was developed by Simionet al.[2] and Scipioni et al.[3] in the early 1990s. Simion et al.[2] aimed at creating a "self-space making defect" by splitting the atrophic crests in two parts with a longitudinal greenstick fracture displacing the vestibular cortical bone both in maxilla or mandible to create a gap, which was used to contain the inserted implants. The maxillary bone owing to the thinner cortical plates and softer medullary bone compared to that of the mandible is a good candidate for performing a ridge spilt procedure. In this procedure, the corticotomies can be performed using variousinstruments like beaver blade, razor-sharp chisel, round bur, fissure bur, diamond disk, reciprocal saw, piezoelectric device, or laser (erbium: yttrium–aluminumgarnet, erbium, chromium-doped: yttrium-scandium-gallium-garnet.[4]

This case report throws light on the use of a consistent technique for horizontal ridge augmentation namely the oscillating saw assisted ridge splitting followed by successful implant placement with subsequent prosthetic rehabilitation in the mandibular posterior edentulous area.

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CASE REPORT

The present case report is about a 23 year old female patient reported with chief complaint was missing teeth in lower right region of the jaw. She requested fixed prosthesis, preferably an implant-supported one. The medical/social and family history was noncontributory. Patient gave history of caries associated with lower right mandibular first molar which had been extracted three years ago.

Figure 1. Pre-operative atrophic edentulous ridge in relation to mandibular right first mo.

Figure 2. Pre-operative CBCT showing deficient horizontal bone.

Intra oral clinical examination revealed that the patient had missing lower right mandibular first molar (Figure 1). There was deficient ridge width Cone beam computed tomography was performed to evaluate the bone quality and quantity. Pre-operative CBCT images revealed a horizontal ridge width of about 3.3mm and vertical height of 16.3 mm in relation to right lower first molar (Figure 2). CBCT revealed inadequate buccolingual dimension of bone at the crest for implant placement. There was adequate cortical and cancellous bone to allow ridge expansion.

The treatment plan was decided to perform ridge splitting for horizontal ridge augmentation and Implant placement in relation to mandibular right first molar. The facial painting was done with providone iodine and draping was done. The surgical site was anesthetized using 2 % lignocaine HCl with adrenaline (1:80,000). A mid-crestal incision was given in the region of the molar and a vertical releasing incision was placed anteriorly to reflect a full thickness mucoperiosteal flap (Figure 3). Periosteal releasing incisions were given in order to relieve the tension on the flaps while suturing. The pre-operative horizontal ridge width measured was around 3 mm. A longitudinal mid-crestal osteotomy was performed using the oscillating saw in a side to side cutting motion. Two vertical bone incisions were made, one at the mesial and other at the distal aspect at least 2–3 mm from adjacent root (Figure 4). The osteotomy site was expanded usingosteotome. The osteotome is tapped and controlled lateral force should begin to be used to mobilize the buccal plate. (Figure 5). After the cortical plate had been separated a pilot drill 2.3 mm in diameter was used to prepare the osteotomy for the final length of the implant to be placed. A 3.75 mm diameter and 10 mm length implant was immediately placed within the bony envelope (Figure 6). The site was grafted with irradiated allogenic cortical particulates (Sybograf plus) (Figure 7). This was followed by the placement of collagen membrane in order to prevent the epithelial down growth and as a means to provide space for bone regeneration (Figure 8). After achieving primary closure of the flaps the site was sutured tension free with interrupted sutures using vicryl 3-0 suture material (Figure 9). Post-operative instructions were given and the analgesics (combination of paracetamol-500 mg and diclofenac-50 mg thrice daily for 3 days) and antibiotics (amoxicillin 500 mg thrice daily for 5 days) were prescribed. Healing was uneventful and within normal limits.

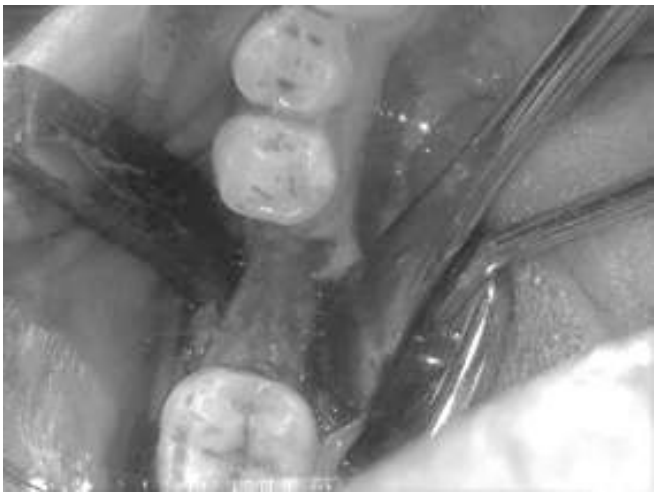

Figure 3. Minimal flap reflection to maintain periosteal attachment in apicalregion.

Figure 4. One horizontal and two vertical cuts are made on buccal plate with oscillating saw.

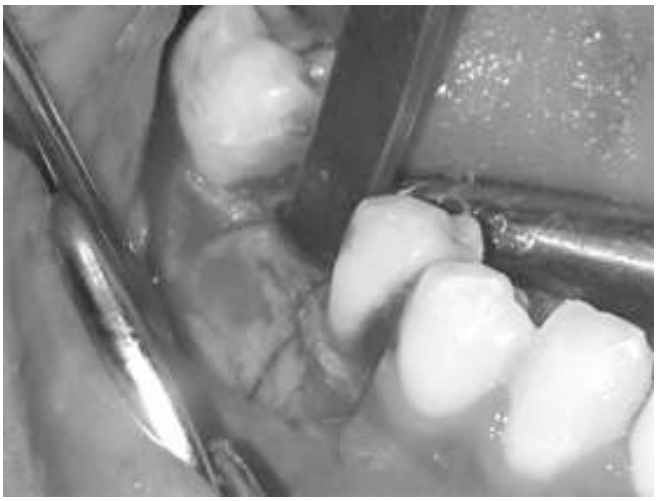

Figure 7. Bone graft placed in the gap between the implant and buccal plate.

Figure 8. Collagen membrane is placed over the implant and bone graft.

Figure 11. Definitive PFM prosthesis.

Figure 12. Final prosthesis.

The implants were allowed to osseointegrate for 4 months after which the site was exposed to place the healing caps to obtain the soft tissue contour around them. After 15 days the final impression was made followed by the placement of ceramic fused to metal fixed implant supported prosthesis which was checked for its precise fit(Figure 11,12). Patient was kept under regular follow-up with 3 months visit after placement of final prosthesis. The final radiograph taken after a period of 10 months showed no significant bone loss around the implant (Figure 14).

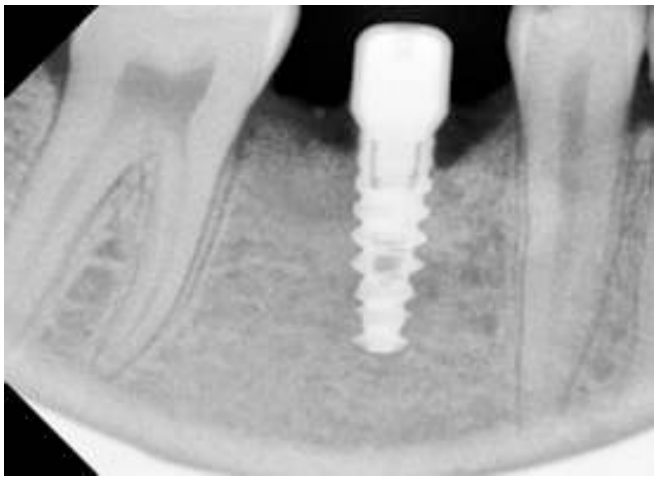

Figure 13. Post op radiograph after 4 months of implant placement.

Figure 14. Post op radiograph after 10 months shows minimal crestal resorption.

DISCUSSION

Bone loss is an ongoing process following tooth loss affecting the mandible four times more than the maxilla.[5] The loss of tooth structure causes impaired mastication, functional and sensory deficiencies of the oral mucosa, musculature and salivary glands. Apart from this it also affects the general health and quality of life of the patient.[6] Hence accurate restoration of the lost tooth structure is of prime importance. The four main surgical approaches for the augmentation of atrophic ridges includes guided bone regeneration, bone grafting, expansion and distraction techniques and a combination of these methods.[7]

Ridge split technique essentially reconstructs the alveolar bone by creating a green stick fracture which is a reliable and relatively non-invasive procedure. It principally consists of splitting the vestibular and buccal cortical tables while displacing the vestibular cortical bone.[7] Simion et al.[2] and Scipioni et al.[3] introduced this technique by aiming at creating a self-space making defect with the help of chisels which prevented the membrane from collapsing into the defect from which the osteogenic cells can be recruited.[2] The advantage of this ridge split technique is that the expansion created heals with rapid vascularization and bone remodeling in a manner similar to that occurring in fractures.[8] But the limitation of this technique is its inability to create bone vertically and the pre-requisite that there should be cancellous bone present between the buccal and lingual plates to allow separation.

Significant advantages of ridge expansion rather than Onlay grafting include simultaneous implant placement and grafting, lower cost, lower possibility of cross-infection from graft materials and lower morbidity. This technique has greater predictability, since the grafted area is essentially a five-wall bony defect, with excellent blood supply. This technique is only suitable for enhancing ridge width. There must be adequate available bone height for implant placement, and no vertical bone defect should be present. A minimum of 3 mm of bone width, including at least 1 mm of cancellous bone is desired to insert a bone chisel between cortical plates and consequently expanding the cortical bones. The thinner cortical plates and softer medullary bone make the maxillary ridge easier to expand. The risk of malfracture of the osteotomized segment is high in the mandible due to thicker cortical plates.[10]

Several modifications of the ridge splitting technique have been described. Ridge splitting is accomplished either with the use of osteotomes and chisels, or with the use of special equipment such as burs, micro-saws and horizontal spreaders. Compared to the osteotome technique, the use of spreaders provides better control of the amount of the expansion achieved, prevents excessive forces and patient discomfort produced by malleting.[11, 12, 13] On the other hand, the osteotome technique eliminates the need for special equipment. Strong evidence for the effectiveness and the predictability of the ridge splitting technique is available in the literature. Clinical trials have reported success rates ranging from 98 to 100%. The survival rates of implants immediately placed in expanded sites ranged from 91% to 97.3%, while the success rates varied from 86.2% to 98.8%.[3,6,14,15,16] Complications during the surgical procedure are very rare - fracture of the buccal bone plate being reported as a major complication of the technique49. Controlled force application and gradual expansion could prevent malfractures.[4,11] In addition, a thorough preoperative evaluation is very important. The thickness of the cortical plates and the amount of the intervening cancellous bone must be carefully assessed preoperatively by dental CT scans. Last but not least, fabrication of radiographic/surgical guide can prevent improper implant placement and angulation.

The grafting procedure done in the present case is an interpositional or "sandwich" grafting which is based on the theory that bone placed between 2 pieces of pedicled bone with internal cancellous bone will undergo rapid and complete healing and graft incorporation.[8] In the present case there was excellent bone formation after 4 months re-entry into the grafted site with no complications.

CONCLUSION

In this report, there was 3-4 mm of bone crestally, which did not allow implant placement with conventional technique. There was sufficient trabecular bone with cortical bone on either side. This was an ideal case for ridge splitting with bone expansion.

Learning Points

1. Use of ridge splitting technique offers great advantage of placing dental implant at same surgical appointment in ≥3 mm of bone width

2. Bone expansion allows condensation of softer bone quality to more condensed variety apical and lateral to prepared osteotomy

3. Since no drilling is required to prepare implant osteotomy. It prevents loss of patient bone associated with drilling

4. Bone expansion also helps to reduce any labial undercutand allows more favorable axial loading

5. Combined flap on labial side maintains integrity of labial bone by preserving intact periosteum over cortical bone.

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