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Original Research Paper

Dental Science

# GUIDED BONE REGENERATION - AN EFFICIENT TOOL IN REHABILITATION OF DEFICIENT PARTIALLY EDENTULOUS MAXILLARY RIDGE

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**ABSTRACT** The predictability of oral implants in the treatment of both total and partial edentulism depends to a great extent on sufficient bone quantity and quality. Partial edentulism leads to loss of function and aesthetics. Alveolar ridge resorption after tooth loss is a common phenomenon resulting in decrease width and height very rapidly, with as much as 50% loss in width during the first year and two-thirds of which occurs in the initial 3 months. Bone resorption in the maxillary ridge often results in a knife-edged deformity, which complicates implant placement and rehabilitation. Guided bone regeneration has been documented to be highly effective in reconstructing jaw anatomy, restoring esthetics and providing biomechanical support for the 3D placement of dental implants. Guided bone regeneration has proven to be successful in a variety of experimental animal models. The efficacy of membranes in conjunction with bone healing and reconstructive therapy is probably the result of a combination of different mechanisms namely mechanical, cellular, and molecular. Although success rates of various GBR techniques are high, inherent disadvantages of augmentation procedures include prolonged treatment times, raised treatment costs and increased surgical invasion associated with patient morbidity and potential complications. This paper presentation will describes the rehabilitation of deficient maxillary ridge with guided bone regeneration and implant placement.

**KEYWORDS :** deficient ridges, GBR, implant, augmentation

## INTRODUCTION

Loss of teeth deeply impact on the quality of life, affecting individuals' physiological, biological, social, and psychological state due to disturbances in speech, esthetics and mastication. The rehabilitation of the lost tissues can be with either fixed or removable prosthesis. Implants supported restorations are one of the recent treatment modalities in partial and complete edentulism. Alveolar ridge resorption is inevitable after extraction that causes decreases in width and height very rapidly, as much as 50% in width during the first year, 75% during the initial 3 months along with deficiency of soft tissues.[1] There is frequently a lag of months to years before an edentulous site is rehabilated owing to various reasons that leaves very few options for treatment. Hard tissue ridge augmentation aims to increase bone volume prior to dental implant placement and restoration. Several treatment modalities have been described for osseous augmentation of edentulous ridges prior to implant placement such as guided bone regeneration with or without particulate bone grafting, ridge splitting, distraction osteogenesis, orthodontic tooth movement through a deficient ridge and grafting of bone blocks harvested intraorally, extraorally, or from cadaveric (allogeneic) sources. Each treatment modality has its own indications and contraindications, as well as advantages and disadvantages.[2,3,4, 5, 6, 7&8]

### Case I

A 21-year-old female reported to the outpatient department with the chief complaint of Consciousness of appearance while speaking due to missing right front tooth since last 8 year due to RTA. On intraoral examination, Kennedy's class III edentulous space irt 12 with Siberts class B ridge deficiency was observed.[Fig 1] The patient was moderately built and nourished with no signs of any systemic illness. A complete case history with preoperative procedures consisting of a CBCT [Fig2], study cast for ridge mapping, oral prophylaxis and routine blood, and urine investigations were done. Guided bone regeneration was planned in order to achieve adequate ridge width to facilitate implant placement. The complete treatment plan was explained to the patient, and written consent was duly obtained.

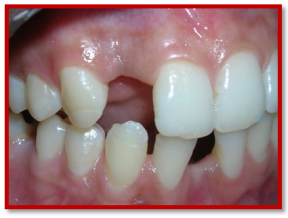

Fig1

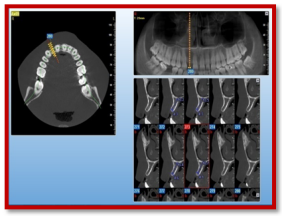

Fig2

### Surgical Procedure

### Stage I

Recipient site preparation – Crestal incision was placed and a full thickness flap was reflected to assess and measure size, volume and shape of bone block(s) required to achieve the desired result.[Fig 3]

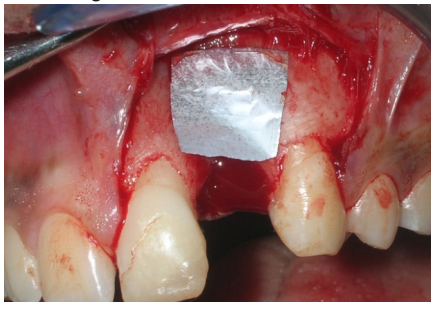

Fig3

Graft site preparation -

Vestibular incision was made through the mucosa 1-2mm below the mucogingival junction followed by partial thickness

dissection apically for 3mm. Below this point a full thickness incision was made and full thickness reflection was done. Soft tissues were deflected away from the anterior mandible by blunt dissection below the periosteum. Recipient site was re-measured and measurements transferred to the symphysis to indicate the desired block size by making notches in the bone at the corners of the block outline.[Fig 4] Osteotomy was performed with a rotary bur to penetrate the cortical layer,[Fig5] Once cuts were complete, narrow chisels were used to refine the outline of the block and to shear the cortico-cancellous block off of the underlying trabecular bed. After block removal an absorbable collagen sponge was placed in recipient site for hemostasis . The harvest site was grafted with Freeze Dried Bone Allograft (FDBA). For closure a resorbable suture was first used to secure the mentalis muscle to the 3mm periosteal/ muscle layer left on the bone during the initial incision. This was achieved by interrupted sutures at regular intervals across the mentalis release. The overlying mucosa was then closed with a nonwicking continuous interlocking suture.

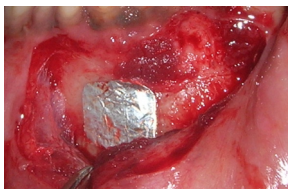

Fig4

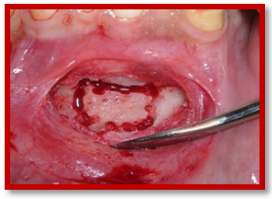

Fig5

Recipient site prepration

Decortication was first done at recipient site.The block was carefully shaped to assist in close adaptation to the recipient bed and fixed with one fixation screws to ensure stability and anti-rotation The periphery of the bone block was mortised with freeze dried bone allograft (FDBA) [Fig 6] and a collagen membrane was placed over the entire graft, extending 3mm beyond the block in all directions. The overlying mucosa was then closed with a nonwicking continuous interlocking suture. After a healing period of six months patient was again evaluated for Stage II surgery for implant placement

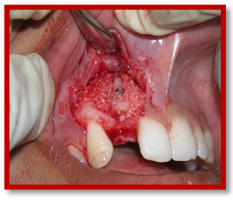

Fig6

**Stage II**

The site was anesthetized using 2% lignocaine with 1:100,000 epinephrine. A sharp palatal to midcrestal incision was placed and full thickness flap was raised to expose the ridge crest, The retaining screw was removed and sequential osteotomies was done with profuse irrigation and one equinox 3.5 mm × 11 mm implant was subsequently placed.[Fig7] Surgical site was closed with non resorbale sutures and periodontal pack was placed. Postoperative instructions were explained to the patient. Antibiotics and analgesics were prescribed with chlorhexidine mouth wash 0.2% for 5 days. Pack and sutures was removed after 7 days. Patient was periodically reviewed for 6 months, and further rehabilated with PFM crown [Fig 8]

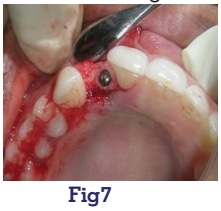

Fig7

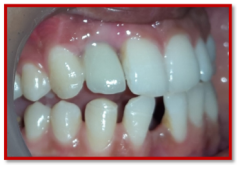

Fig8

**Case II**

A 30-year-old female reported to the outpatient department with the chief complaint of Consciousness of appearance while speaking due to missing right front tooth since last 10 year due to RTA. On intraoral examination, Kennedy's class IV edentulous space irt 21,22 with Siberts class C ridge deficiency was observed.[Fig 9] The patient was moderately built and nourished with no signs of any systemic illness. A complete case history with preoperative procedures consisting of a CBCT [Fig10], study cast for ridge mapping, oral prophylaxis and routine blood, and urine investigations were done. Guided bone regeneration was planned in order to achieve adequate ridge width to facilitate implant placement. The complete treatment plan was explained to the patient, and written consent was duly obtained.

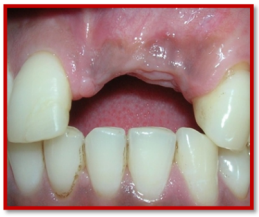

Fig9

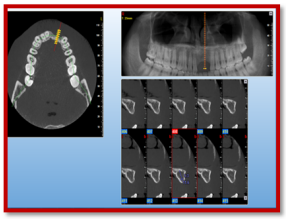

Fig10

**Surgical Procedure**

**Stage I**

Surgical periodontal therapy (Ridge augmentation) was done after bone mapping. Paracrestal & releasing incisions were given and a mucoperiosteal flap was raised. A tin foil template was made. Guided bone regeneration was done using titanium mesh.(Fig 11) Titanium mesh was adapted and stabilized at one end using miniscrews. Decortication was done, Allograft(DFDBA) & Alloplastic graft (Perioglass) was filled beneath the block graft and titanium mesh finally stabilized. GTR membrane was adapted above the titanium mesh and flap was sutured using 4-0 polypropylene suture and periodontal pack was placed (Fig 12). After a healing period of six months patient was again evaluated for Stage II surgery for implant placement.

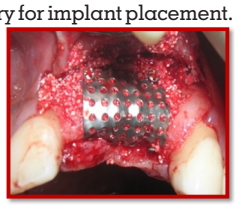

Fig11

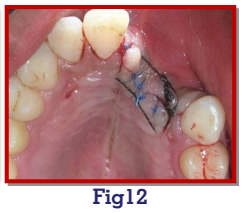

Fig12

**Stage II**

The site was anesthetized using 2% lignocaine with 1:100,000 epinephrine. A sharp palatal to midcrestal incision was placed and full thickness flap was raised to expose the ridge crest, The titanium mesh was removed and sequential osteotomies was done with profuse irrigation and two equinox 3.5 mm × 11 mm implant was subsequently placed.[Fig 13] Surgical site was closed with non resorbale sutures and periodontal pack was placed. Postoperative instructions were explained to the patient. Antibiotics and analgesics were prescribed with chlorhexidine mouth wash 0.2% for 5 days. Pack and sutures was removed after 7 days. Patient was periodically reviewed for 6 months, and further will be rehabilated with PFM crown [Fig 14]

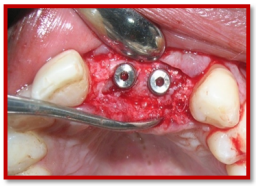

Fig13

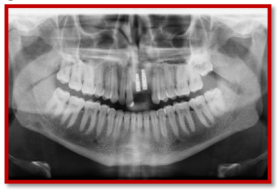

Fig14

## DISCUSSION

Osseous grafting has been shown to be clinically successful in the management of bone defects. The pattern, rate, and quality of new bone substitution are determined, in part, by complex reactions between the healing processes of the host and the nature of the graft material. Three theories have been postulated to explain the influence of bone grafts on new bone formation.[9] In the osteoconduction model, host osteoprogenitor cells and vascular elements utilize the graft as a scaffold to generate across the defect. As the host cells differentiate and mature within the graft, a functional skeletal network develops and replaces the graft through a "creeping substitution" process. In the osteogenesis model, surviving osteoprogenitor cells within the graft proliferate and mature into centers of new bone formation In the osteoinduction model , the graft actively recruits pluripotent host cells that differentiate into chondroblasts and osteoblasts to help in bone formation.

An important prerequisite for a predictable, long-term prognosis in implant dentistry is adequate bone volume. However, some patients present with insufficient horizontal or vertical bone, which frequently precludes the successful outcome of an ideal implant placement.[10]

Data represented in the literature seem to demonstrate that GBR procedures are a reliable means for augmenting bone in cases of vertical and/or horizontal defects in partially edentulous patients. These data suggest that GBR should be considered a reliable technique for obtaining bone formation and placing dental implants in cases in which it would otherwise not be possible.[11]

An important aspect in criticism of these studies is the fact that the success of the GBR procedure is assessed through a two-dimensional measurement of the mesial and distal radiographic bone level at the implant site and further clinical parameters. However, in the majority of these GBR procedures, the bone augmentation was performed mainly on the buccal aspect of the implants. Hence, there is limited date available for long-term controlled clinical studies assessing the bone dimensions at the buccal aspect of the implants, which have been placed simultaneously with bone regeneration procedures.[12] A very recently published prospective, cross-sectional study reported on the long-term outcome of implants placed simultaneously with GBR procedures. Stable perimplant hard and soft tissues at the buccal aspect were reported after a follow-up time of 5–9 years.[13] It has been reported that the membrane barrier is one of the reconstructive treatments of choice used in a variety of different conditions, such as dehiscence, and adjunctive to immediately replace dental implant. The membrane barrier should be biocompatible, giving a space maintenance tissue integration.[14] The goal of contour augmentation is the establishment of a facial bone wall of sufficient height and thickness to serve as a support for aesthetic soft tissues. The dimensions of this facial bone wall can be examined only by 3D radiographic imaging. Today, CBCT technology offers excellent image quality with a clearly reduced radiation dose risk for the patient when compared with dental CTs. The concept of GBR for the reconstruction of the alveolar ridge defect prior to implant placement has been developed in an effort to optimize treatment outcomes. Research from animal and clinical studies in this field is still ongoing in order to establish an ideal membrane for treatment.

## CONCLUSION

Based on our result, combined with the information already available in the literature, we may state that GBR is a safe and effective technique for obtaining bone formation and placing dental implants in cases in which it would otherwise not be possible, even if an ideal membrane for treatment is not yet established.

The technique of GBR, with non-resorbable membranes, is a very predictable technique and with excellent results, provided that you comply with the universally accepted surgical procedure, the surgeon should have extensive experience in handling especially surgical soft tissue to cover the non-resorbable membrane, which is the key to success.

Literature has recently confirmed the importance of the presence of keratinized gingiva around the implants, in order to ensure their survival and to cope with peri implantitis.

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