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Guided bone regeneration and implant placement – A case report

Shabnaz N. S.
shabnaz1988@gmail.com
PMS College of Dental Science and Research, Thiruvananthapuram, Kerala

Seba Abraham
sebapazhoor@gmail.com
PMS College of Dental Science and Research, Thiruvananthapuram, Kerala

Vishnu J. S.
drvishnu731@gmail.com
PMS College of Dental Science and Research, Thiruvananthapuram, Kerala

Arunima P. R.
aruniabi@gmail.com
PMS College of Dental Science and Research, Thiruvananthapuram, Kerala

Reejamol M. K.
drreejamk@rediffmail.com
PMS College of Dental Science and Research, Thiruvananthapuram, Kerala

ABSTRACT

Guided Bone Regeneration is a predictable method to enhance the volume of the bone in deficient recipient sites prior to the implant placement. Crestal bone resorption is an inevitable consequence of extraction. Guided Bone Regeneration (GBR) can be done to regenerate adequate bone for successful implant placement. GBR can be performed by two different approach: Simultaneous approach in which GBR performed simultaneously with implant placement and Staged approach in which GBR is done prior to the implant placement. Adequate blood supply plays a critical role in the regeneration

Keywords— *Guided bone regeneration, Bone resorption, Implant, Membrane, Augmentation*

1. INTRODUCTION

Dental implants are considered as the first line treatment modality for replacing the missing teeth nowadays. There should be adequate quantity and quality of alveolar bone at the implant recipient site because prosthetically driven implants require adequate bony support for their success and survival. One of the main challenges in implant placement is the resorption of bone following extraction. In case if there is any pre-existing periodontal or endodontic pathology or if the tooth is removed traumatically the bone resorption will get exacerbated.[1,2] So a careful pre-surgical evaluation is necessary to understand the height, width and the quality of the bone. If the evaluation reveals an inadequate width of bone at the desired implant locations, augmentation surgery is indicated at the site. There are a variety of ridge augmentation techniques to restore the resorbed bone. These include only veneer grafting, Guided Bone Regeneration (GBR), distraction osteogenesis, ridge splitting technique and inter-positional inlay grafting.[3,4,] Among this guided bone regeneration, is the most commonly used procedure for hard tissue reconstruction.

According to the concept of guided bone regeneration, the application of occlusive membranes, that can mechanically exclude the non-osteogenic cell populations from the surrounding soft tissues and allowing osteogenic cell populations originating from the parent bone to inhabit the osseous wound leads to regeneration of bone. The barrier membrane prevents the in the growth of soft tissue into the defect site and promotes the bone-forming cells that originate from adjacent bone to populate and regenerate these defects with bone.

GBR can be performed by two different appraoch:
(1) Simultaneous approach- GBR performed simultaneously with implant placement
(2) Staged approach - In staged approach the GBR is done prior to the implant placement in order to increase the alveolar ridge followed by placement of implants 6 months later into the newly augmented alveolar ridge in a separate surgical procedure.

The PASS (Primary wound closure, Angiogenesis, Space maintenance, Stability) principle outlines the fundamental rationale and stages of successful barrier membrane regeneration, both for bone and other tissues, and a guide to the physiological processes central in tissue regeneration.

- Primary wound closure to ensure undisturbed and uninterrupted wound healing,
- Angiogenesis to provide necessary blood supply and undifferentiated mesenchymal cells,
- Space maintenance/creation to facilitate adequate space for bone in growth,
- Stability of the wound and implant to induce blood clot formation and uneventful healing events.

GBR has been recommended for defects associated with dental implant placement or isolated localized bone defects. There are several defects associated with dental implants and can be divided into several categories: dehiscence defects, fenestration defects, residual intraosseous defects and extraction socket defects. All these defects can adversely affect the prognosis of an implant through the lack of bone volume and quality.

1.1 Surgical Factors to Achieve Predictable Results with GBR Procedures

Hermann and Buser in 1996 discussed five factors.[6]

- Achievement of primary soft tissue closure and healing
- Use of an appropriate barrier membrane
- Stabilization and close adaptation of the membrane to the surrounding bone
- Creation and maintenance of a secluded space
- The sufficiently long healing period for nine months

2. CASE REPORT

A 32 years old female patient reported to the clinic with a chief complaint of missing upper right back teeth region for 5 years. Teeth were extracted due to caries. The patient had no relevant medical history. Detailed case history was taken. An extraoral and intraoral examination done. Bone mapping revealed insufficient bone width.

Table 1: Cone Beam Computed Tomography (CBCT)

Region/Tooth number	Height (in mm)	Width in subcrestal region (in mm)
14 (figure 1)	13.5	3.4
15 (figure 2)	9.4	5.5
16 (figure 3)	6.9	4.2
17 (figure 4)	7.2	7.5

CBCT also shows a sparse bony trabecular pattern with thin buccal and palatal cortices and D3/D4 type of bone. The preliminary treatment plan was made based on the clinical and radiographic evaluation. Staged approach GBR technique was planned.

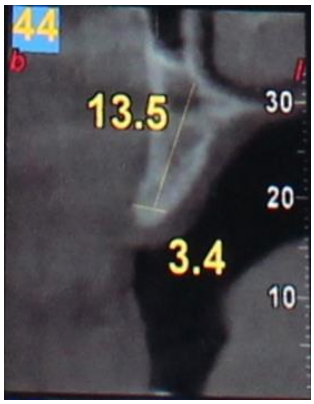


Fig. 1

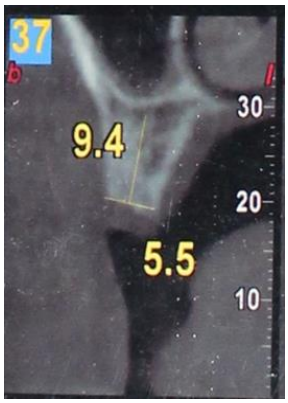


Fig. 2

Fig. 3

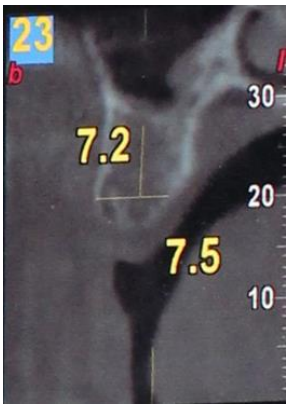
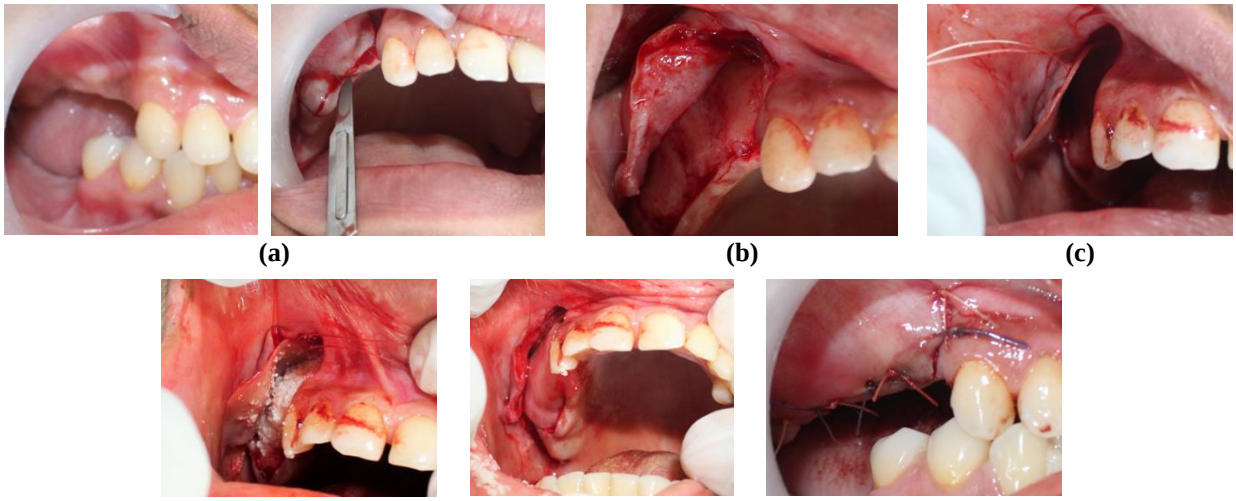


Fig. 4

3. PROCEDURE

3.1 Guided bone regeneration procedure

- Oral rinse of chlorhexidine digluconate (0.2%) [Clohex plus] for 1 minute given prior to the surgery.Disinfection of the perioral skin with betadine done prior to the surgery.
- 14,15,16,17 region anesthetized under local anesthesia.
- Crestal incision and vertical releasing incision is given (figure 5a)
- Full thickness mucoperiosteal flap reflected beyond the alveolar mucosa. (figure 5b)
- Decortication did with round bur at slow speed with copious saline irrigation. This opens the marrow cavity which acts as a source of angiogenic and osteogenic cells. So this activates bone formation by the release of local and other bone-inducing factors.
- Resorbable membrane (Healiguide- Advanced Biotech, USA) placed over the defect, which was stabilized by periosteal sutures on the buccal aspect. (figure 5c) The space between the membrane and the defect was filled with the bone graft (Osseograft-Advanced Biotech, USA) (figure 5d). Then the membrane covered over the graft (figure 5e). The flap was coronally repositioned for complete wound coverage without tension and to prevent membrane exposure. Suturing done using resorbable 5-0 vicryl suture. (Figure 5f).Periodontal dressing placed with coe pak.
- Post-operative instructions are given and analgesics and antibiotics were prescribed.



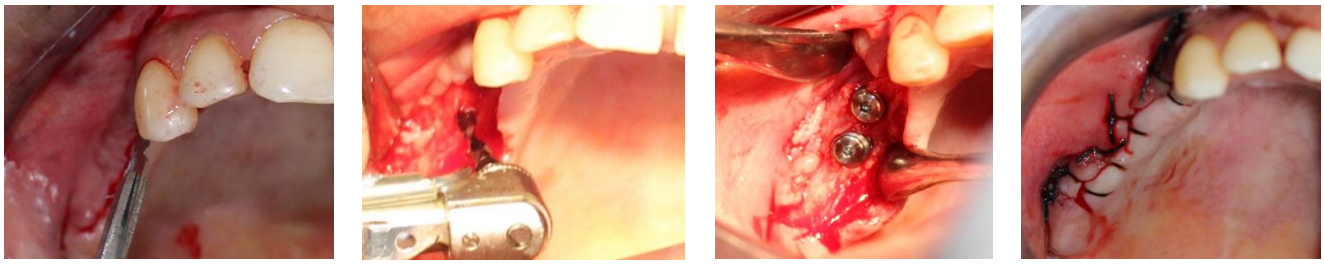
(a) (b) (c)

(d) (e) (f)

Fig. 5: Guided bone regeneration procedure (a) incision, (b) mucoperiosteal flap reflection, (c) Healiguide membrane, (d) Osseograft, (e) membrane covered over the graft, (f) suturing

3.2 Implant placement

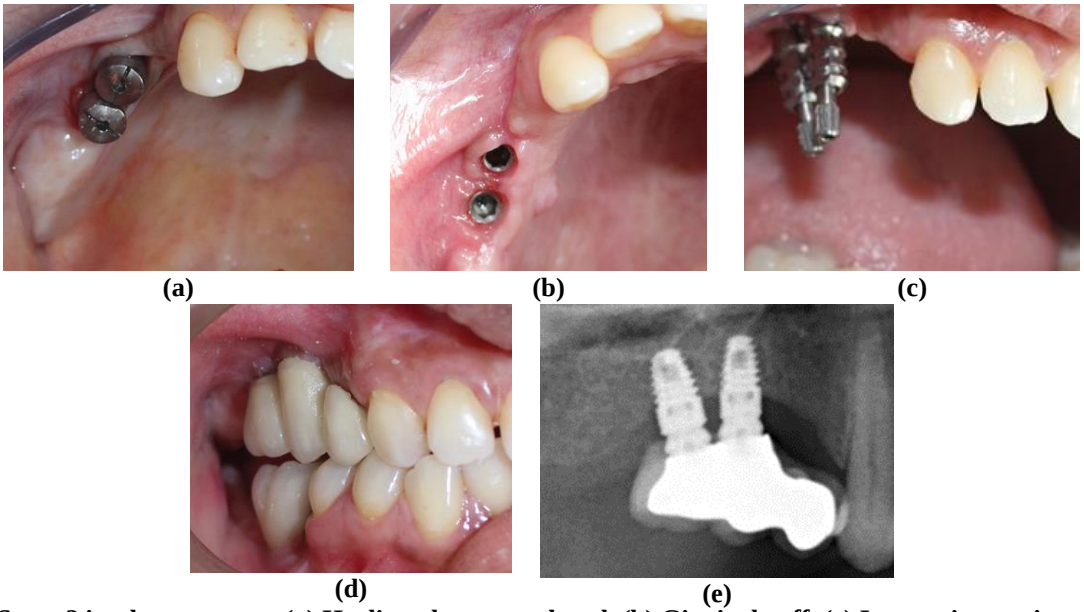
Implant placement was done 6 months after the guided bone regeneration procedure. The bone regenerated was evaluated by clinical methods. Then stage I implant surgery was performed. Crestal incision given in relation to 14,15,16,17 region (figure 6a). Full-thickness muoperiosteal flap reflected. The sequential osteotomy was done in relation to 15, 16 region (figure 6 b). Implant size of 3.75 x 8mm placed in relation to 15 regions and 4.25 × 8mm placed in relation to 16 regions. (figure 6 c)The primary stability was attained. Suturing done using 3-0 black silk suture. (Figure 6 d). Post operative instructions are given and analgesics and antibiotics were prescribed.



(a) (b) (c) (d)

Fig. 6: Stage I implant surgery; (a) Incision, (b) Osteotomy, (c) Implant placement, (d) Suture

- Stage 2 implant surgery performed 3 months after stage 1 implant surgery. Crestal incision placed to expose the implant in relation to 15,16 region. Cover screw removed and healing abutment placed. Then sutured with 3-0 black silk suture. (figure 7a)
- After 2 weeks a well-formed gingival cuff was evident (figure 7b). After placing the impression coping the impression was taken (figure 7c). Then the working model was made. Desired modifications were done to achieve good emergence profile. The abutment was placed followed by cementation of the ceramic crown in the to 14,15,16 region in the patient's mouth (figure 7d). The patient was given proper supportive periodontal therapy and recalled every three months for one year to evaluate the periodontal status.



(a) (b) (c)

(d) (e)

Fig. 7: Stage 2 implant surgery; (a) Healing abutment placed, (b) Gingival cuff, (c) Impression coping, (d) Crown placement, (e) Post-operative radiograph

4. DISCUSSION

The guided bone regeneration is a method in which the growth of bone is enhanced by preventing soft tissue ingrowth into the defect site and space maintenance. It can be achieved by the use of either resorbable or non-resorbable membrane. There are various membranes available for the GBR. However, there is a certain prerequisite for choosing the membrane. They are (1) Biocompatibility, (2) Cell occlusive properties, (3) Integration by the host tissues, (4) Clinical manageability and space making ability.[7,8,9]

Resorbable membranes undergo enzymatic degradation compared to non-resorbable membrane when it is placed in the living body. So now resorbable membrane requires a second surgery to remove it. Moreover, the use of a non-resorbable membrane can lead to membrane exposure. The advantages of bioresorbable membranes include the elimination of the need for membrane removal, greater cost-effectiveness and decreased patient morbidity. Lekovic et al. evaluated the clinical effectiveness of a resorbable membrane made of polyglyclic acid (PGA) and polylactic acid (PLA) copolymers in alveolar ridges preservation. Results at 6 months re-entry showed that use of a bioresorbable membrane presented with significantly less loss of alveolar bone height, less horizontal resorption of the alveolar bone width, and more internal socket bone fill, compared to non-membrane controls.[11]

For the choice of different materials, minor alveolar ridge defects suggest the use of an allograft material in a simultaneous approach, while moderate horizontal ridge defects require the use of more predictable grafting procedures such as autogenous grafts in a staged approach. In cases of combined severe horizontal and vertical alveolar ridge defects, the use of reconstructive devices such as tenting screws, mesh and/or re-inforced membranes will be mandatory to ensure more predictable regenerative results.[12]

This clinical case report illustrates restoration of a maxillary posterior ridge with a dental implant. Guided bone regeneration was performed because of a lack of adequate bone. The defect was augmented with osseograft and healiguide membrane. Evaluation after 6 months following GBR showed adequate bone regeneration for the success and survival of the implant.

5. CONCLUSION

The implant should always be placed according to the prosthetic design and needs which will in turn increase the esthetic and functional results. Bone resorption following extraction is one of the major challenges in implant dentistry. This makes it difficult for ideal implant placement. So hard and soft tissue augmentation prior to implant placement is needed. Many techniques are there for the augmentation. The solution of each case requires a combination or customization of these techniques.

6. REFERENCES

[1] Schropp L, Wenzel A, Kostopoulos L, Karring T (2003) Bone healing and soft tissue contour changes following single-tooth extraction: a clinical and radiographic 12-month prospective study. Inter J Perio Restor Dent 23: 313-323.
[2] Linda G, Belser UC (2009) Implant loading protocols for the partially edentulous esthetic zone. Int J Oral Maxillofac Implants 24: 169-179.
[3] Duncan JM, Westwood M (1997) Ridge widening for the thin maxilla- A clinical report. Int J Oral Maxillofac Implants 12: 224-227.
[4] Elian N, Jalbout Z, Ehrlich B, Classi A, Cho SC, et al. (2008) A two-stage full arch ridge expansion technique. Review of the literature and clinical guidelines. Implant Dent 17: 16-20.
[5] Guirado JL, Yuguero MR, Carrión del Valle MJ, Zamora GP (2005) A maxillary ridge splitting technique followed by immediate placement of implants: a case report. Implant Dent 14: 14-20.
[6] Hermann, J.S. and Buser, D. Guided bone regeneration for dental implants. Current Opinion in Periodontology 1996; 3: 168-177.
[7] Sandberg E, Dahlin C, Linde A (1993) Bone regeneration by the osteopromotion technique using bio-absorbable membranes: an experimental study in rats. Int J Oral Maxillofac Surg 51: 1106-1114.
[8] Urban IA, Jovanovic SA, Lozada JL (2009) Vertical ridge augmentation using guided bone regeneration (GBR) in three clinical scenarios prior to implant placement: a retrospective study of 35 patients 12 to 72 months after loading. Int J Oral Maxillofac Implants 24: 502-510.
[9] Simion M, Trisi P, Piattelli A (1994) Vertical ridge augmentation using a membrane technique associated with osseointegrated implants. Int J Perio Restor Dent 14: 496-511.
[10] Hammerle CH, Jung RE. Bone augmentation by means of barrier membranes. Periodontology 2000. 2003;33:36–53
[11] Lekovic V, Camargo PM, Klokkevold PR, et al. Preservation of alveolar bone in extraction sockets using bioabsorbable membranes. J Periodontol. 1998;69:1044–9.
[12] Sumi Y, Miyaishi O, Tohnai I, et al. Alveolar ridge augmentation with titanium mesh and autogenous bone. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000;89:268–70

