ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)
IJDSIR : Dental Publication Service
Available Online at: www.ijdsir.com
Volume – 2, Issue – 1, January - February - 2019, Page No. : 228 - 232

Combination Of Periosteal Pocket Flap And Tenting Technique For Implant Site Preparation

[1]Beeravolu Mounika , [2]Atchuta Abhinav, [3]Jagadish Reddy Gooty, [4]Ravikiran Reddy Vundela, [5]Rajababu P

[1, 2,4] Senior Lecturer, Department of Periodontics, Kamineni Institute of Dental Sciences, Sreepuram, Narketpally, Nalgonda, Telangana. India.

[3]Reader, Department of Periodontics, Kamineni Institute of Dental Sciences, Sreepuram, Narketpally, Nalgonda, Telangana. India.

[5]Professor and Head, Department of Periodontics, Kamineni Institute of Dental Sciences, Sreepuram, Narketpally, Nalgonda, Telangana. India.

Corresponding Author: Atchuta Abhinav, Department of Periodontics, Kamineni Institute of Dental Sciences, Sreepuram, Narketpally, Nalgonda, Telangana. India.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

This is a case report of modified periosteal pocket flap and tent pole technique applied in combination for ridge augmentation to attain satisfactorily functional expectations. The flap design results in a periosteal pocket, which allows filling of bone-grafting material while facilitating primary tension-free soft tissue closure by splitting of the mucosa and gives stability to the augmented bone volume. It is suggested that the periosteal pocket flap design in combination with implant tenting could be a predictable alternative approach for correction of severe or localized horizontal and vertical bone deficiencies.

Keywords: Augmentation, dental implant, bone graft, tent-pole

Introduction

Aesthetics and long term prognosis of the dental implants is mainly determined by the dimensions of the bone at the edentulous site which is to be rehabilitated. In cases where the teeth were lost due to trauma, infection or advanced gum disease, the level of bone was found to be insufficient,replacement of which would require horizontal or vertical bone augmentation prior to or along with implant placement, for a favorable outcome.

Guided bone regeneration (GBR) has proven to be effective in regenerating deficient alveolar bone to allow for proper implant placement. Despite the success of GBR in implant dentistry, vertically deficient and knife-edged alveolar ridges remain as two major obstacles because of their unpredictable outcomes.[1]

Several bone grafts and substitutes are used to treat bone destruction or bone defects caused by various diseases. Autogenously bone has been regarded as the gold standard for these demanding indications with or without growth factors.[2] However, with autogenous bone the stability of the augmented volume cannot be guaranteed because of its faster rate of resorption, on the contrary the use of slowly resorbing biomaterial without any type of growth factor is found to be effective in achieving the desired clinical results.

Biologically accepted periosteal membrane can be used as a substitute to the existing resorbable barrier membranes which are less rigid and lack embedded support structure.

In general medical treatment, there has been widespread use of autogenous periosteum and the results obtained have been promising, opposed to which, the use of periosteum for regeneration is limited in dentistry. Periosteum is used as a membrane for horizontal ridge augmentation because of it being a rich cell source for bone tissue engineering and its immense regenerative potential and the implant is used as a tent pole for vertical augmentation in the present case report.

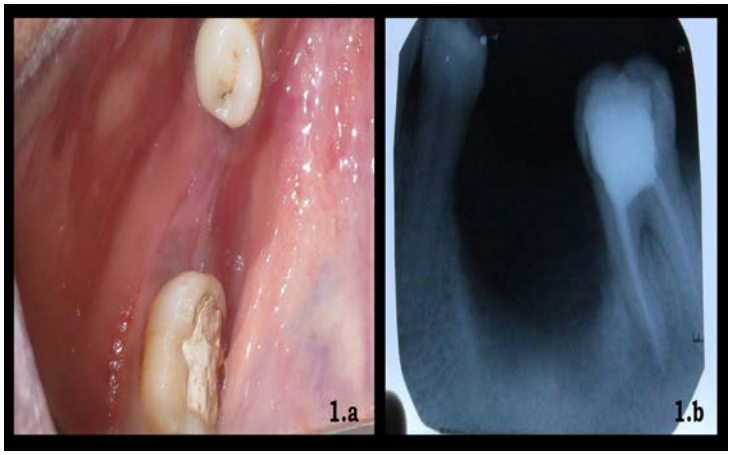
Case Report

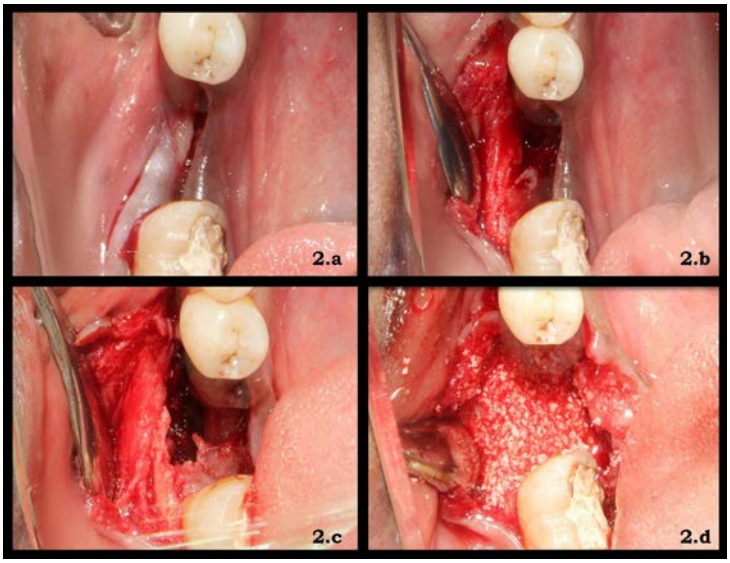
A 38 year old systemically healthy female patient reported with missing right lower molar teeth with bone defect. On clinical and radiographic examination the potential implant site had a shallow vestibule and a horizontal and vertical bone defect, (Figure 1-Pre operative pictures) it was felt that the patient would benefit from ridge augmentation surgery.

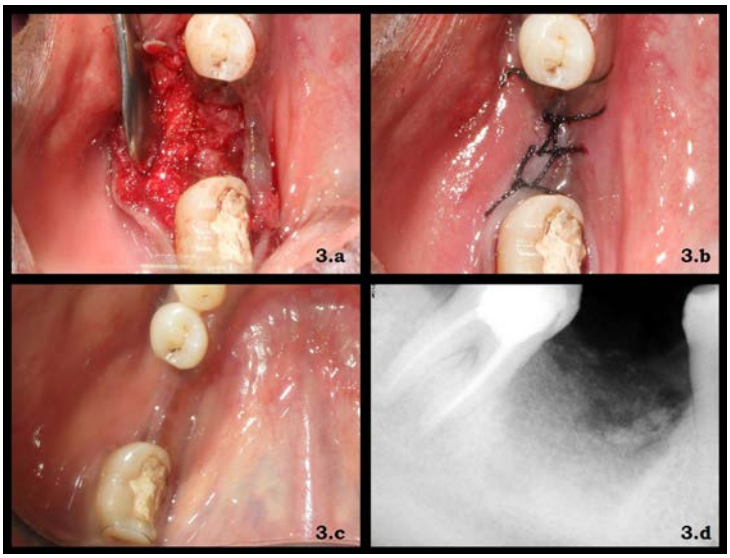
After adequate anaesthesia a modified periosteal pocket flap technique was planned for horizontal ridge augmentation. A 45-degree angle partial-thickness mid crestal incision was made in the keratinized mucosa. (Figure 2a- Periosteal pocket flap technique) and a partial thickness releasing incision was made.The buccal and lingual portions of the flap were split, separating the periosteum from the buccal and lingual mucosa for eight to ten mm apically, according to the implant length. (Figure 2b- Periosteal pocket flap technique). Adequate measures were taken in order to preserve the periosteum on the bone. After which a periosteal incision was made at the crest and a periosteal elevator was used to detach the periosteum from the bone the extension of which ranges from eight to ten mm apically, thereby forming a pocket between the buccal and lingual bone plate and the elevated periosteum. (Figure 2c - Periosteal pocket flap technique)

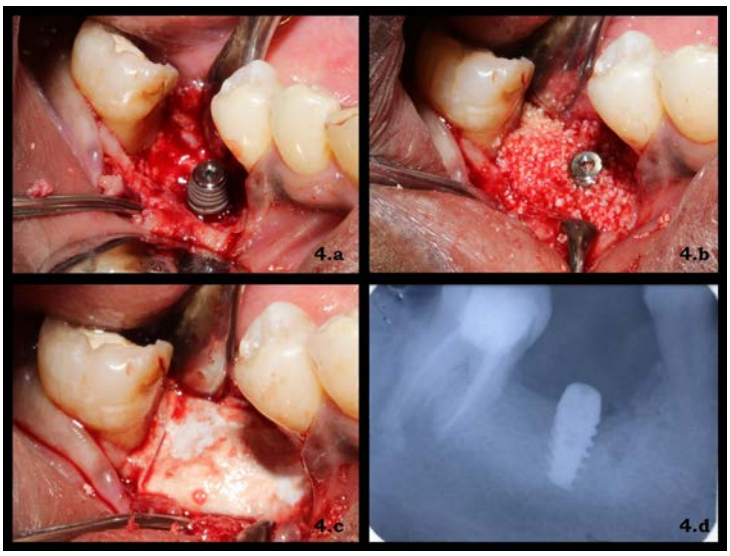
The vertical depth was determined by the shape of the bone and the planned implant. A slowly resorbing graft material [Xenograft (G-graft-Surgiwear®) and Bioactive synthetic bone graft (Novabone®)] (Figure 2d - Periosteal pocket flap technique)was then filled in the periosteal pocket and an absorbable collagen membrane was then placed to cover the crestal portion of the graft material not covered by the periosteum. Suturing was performed in two steps. Resorbable sutures were used for the closure of periosteum of buccal and lingual bone plates. (Figure 3a - Suturing and post-operative pictures) Silk sutures were used to approximate the buccal and lingual flaps.(Figure 3b - Suturing and post-operative pictures)

20 weeks after the horizontal ridge augmentation, 5x10 dimension implant which was placed was used as a tent pole for 3-4 mm of vertical ridge augmentation. Exposed threads of the implant were grafted [Xenograft (G-graft-Surgiwear®) and bioactive synthetic bone graft (Novabone®)] and covered by a resorbable membrane.(Figure 4-tent pole technique)Approximation of the tissues was obtained with silk sutures and prosthesis was delivered after 25 weeks. (Figure 5- post operative and prosthesis pictures)









Figures:

Figure 1- Pre operative pictures

Figure 2a, 2b, 2c, 2d - Periosteal pocket flap technique

Figure 3a, 3b, 3c, 3d - Suturing and post-operative pictures

Figure 4 - tent pole technique

Figure 5 - post operative and prosthesis pictures

Discussion: When the ridge anatomy does not allow for an ideal three dimensional implant placement, a two-step procedure is recommended where the implant placement will be the second step after hard tissue reconstruction. Many studies had shown that GBR using membranes and bone substitutes could regenerate bone before implant placement.[2]

Moses et al.[3] showed a 35% soft tissue dehiscence rate while treating horizontal deficiencies with GBR. Hiatt and Schallhorn[4] showed that the degree of regeneration increased when the adequacy of soft tissue coverage also increased.

The Periosteal Pocket Flap technique increases the mobility of the soft tissue and allows for tension-free primary closure hence; in this case a modified periosteal pocket flap technique was performed for horizontal ridge augmentation.

The periosteum is a connective tissue membrane that has a rich vascular plexus and is regarded as the "umbilical cord of bone".[5] It is composed of an inner cellular or cambium layer close to the bone, and an outer fibrous layer. The inner layer contains numerous osteoblasts and osteoprogenitor cells, and the outer layer is composed of dense collagen fiber, fibroblasts, and their progenitor cells [6]; osteogenic progenitor cells from the periosteal cambium layer may work with osteoblasts in initiating and driving the cell differentiation process of bone repair and subsequent remodelling.

Hirata et al.[7] described the ability of vascularized periosteum to form new bone. Literature so far has suggested the use of periosteum as GTR, although long-term results are still awaited to establish the regular and the most effective use of periosteal grafts as barrier membranes.[8]

Steigmann et al.[1]in a case series stated that using periosteal pocket flap technique allows for tension-free soft tissue closure which is demanding in horizontal bone-grafting procedures. In this case report autogenous periosteal membrane is used, which maintains its vascular supply and is important for the healing and maintenance of the vital cambium layer, which has the potential to stimulate bone formation and played an important role in bone remodelling by helping in bone formation and resorption.

The tenting pole technique was first described by Dr. Marx in 2002. This technique involves expanding the soft tissue volume and using implants as "tent poles" for the surrounding particulate graft. This prevents the soft tissues from contracting around the particulate graft and subsequently displacing it or causing physiologic resorption.[9] The main advantages of the tent pole or soft tissue matrix expansion technique are stable gain in vertical alveolar bone height, successful retention of the implant prosthesis, and the lack of pathologic fractures of the mandible associated with the procedure.[10]

Although the ridge width was not a measured parameter in this case, the ridge form produced by the tent pole procedure at the time of implant fixture uncovering was observed to be consistently broad and wide. [Figure 3c &3d - Suturing and post-operative pictures]

Soft tissue matrix expansion with iliac crest cortico-cancellous bone grafting using dental implants to act as "tent poles," has been well documented, with successful surgical outcomes and minimal morbidities.[10]Le et al. conducted a study to evaluate the effectiveness of using titanium screws in combination with particulate human mineralized allograft, in a "tenting" fashion, to augment large vertical alveolar ridge defects for implant placement and showed that this technique offers predictable functional and esthetic reconstruction of large vertical defects without the use of autogenous bone and is capable of osseointegration.[9]

Conclusion

Ridge augmentation using periosteal flap with graft has been shown to be a successful technique to increase the ridge width for dental implant placement. Further exploration into the use of periosteum in various dental treatments which require either bone or soft tissue regeneration, would positively affect the future of these procedures and their outcomes. Although numerous studies have indicated the effective use of periosteum in regeneration, its use as graft or membrane is still limited.

References

1. Steigmann M, Salama M, Wang HW. Periosteal pocket flap for horizontal bone regeneration: A Case Series. Int J Periodontics Restorative Dent 2012; 32: 311-320.

2. Buser D, Dula K, Belser UC, Hirt HP, Berthold H. Localized ridge augmentation using guided bone

regeneration. II. Surgical procedure in the mandible. Int J Periodontics Restorative Dent 1995; 15: 10-29.

3. Moses O, Pitaru S, Artzi Z, Nemcovsky CE. Healing of dehiscence-type defects in implants placed together with different barrier membranes: A comparative clinical study. Clin Oral Implants Res 2005; 16: 210-219.

4. Hiatt WH, Schallhorn RG. Intraoral transplants of cancellous bone and marrow in periodontal lesions. J Periodontol 1973; 44: 194-208.

5. Chanavaz M. The periosteum: the umbilical cord of bone. Quantification of the blood supply of cortical bone of periosteal origin. Rev Stomatol Chir Maxillofac. 1995; 96: 262-267.

6. Anthony H. Melcher, Christopher A.H. McCulloch. Periodontal Ligament. In: Orban's Oral Histology and Embryology. Bhaskar SN. 11th edn. 2002. St.Louis, Elsevier: 209.

7. Akiko Hirata M.D, Yu Maruyama M.D, Kiyoshi Onishi M.D, Akiteru Hayashi M.D, Michio Saze M.D, Emi Okada M.D. S-IV-04 A Vascularized artificial bone graft using the periosteal flap and porous hydroxyapatite; basic research and preliminary clinical application. Wound Repair and Regeneration 2004; 12:A4.

8. Lekovic V, Kenney EB, Carranza FA, Martignoni M. The use of autogenous periosteal grafts as barriers for the treatment of Class II furcation involvements in lower molars. J Periodontol. 1991; 62: 775-780.

9. Le, Rohrer, Prassad. Screw "Tent-Pole" Grafting technique for reconstruction of large vertical alveolar ridge defects using human mineralized allograft for implant Site J Oral Maxillofac Surg 2010; 68: 428-435.

10.Marx RE, Shellenberger T, Wimsatt J, et al: Severely resorbed mandible: Predictable reconstruction with soft tissue matrix expansion (tent pole) grafts. J Oral Maxillofac Surg 2002; 60: 878-888.