Tissue Movement for Better Results in Preprosthetic Reconstructive Surgery

by Agung Krismariono

Submission date: 05-Nov-2019 03:36PM (UTC+0800)
Submission ID: 1207420750
File name: t_for_Better_Results_in_Preprosthetic_Reconstructive_Surgery.pdf (332.53K)
Word count: 3180
Character count: 17636

SL 2.11

CASE REPORT

Tissue Movement for Better Results in Preprosthetic Reconstructive Surgery

Britaria Theressy*, Agung Krismariono**
*Resident of Periodontics, Faculty of Dentistry, Airlangga University Surabaya
**Department of Periodontics, Faculty of Dentistry, Airlangga University Surabaya

ABSTRACT

***Background**: Alveolar bony defects can occur due to advance periodontal disease. These defects often cause a significant problems in dental treatment and rehabilitation. Many techniques exist for hard tissue augmentation. These techniques are based on specific procedures to perform preprosthetic rehabilitation. This article presents case report of preprosthetic surgery with severe bone loss in two different techniques. **Purpose:** To determine the superior techniques of two methods in preprosthetic surgery with severe bone loss. **Case and case management:** A nonsmoker 40 years old male was first examined in author's department in August 2015with severe anterior mandible bone loss. The diagnosis was chronic periodontitis. His treatment plan included tooth extraction of hopeless teeth, bone augmentation and implant. Nonsurgical treatment was performed on all teeth, preprosthetic surgery with severe bone loss performed in anterior mandible. The first technique, incision made circularly right on each tooth sulcus without any horizontal incision on the apical of interdental papillae. Whereas the second technique, horizontal and vertical incision on the apical of interdental papillae was performed. **Results:** Three months post surgery, clinically the alveolar ridge level has increased. Radiographic evaluation: there are better bone formation after the second surgery either increasing of bone level condition as well as bone density and periodontal space recovery. **Conclusion**: The surgical technique with incision right on each sulcus of tooth and incision horizontally and vertically on the apical of interdental papillae led to novel possibilities to regenerate alveolar bone.*

***Keywords:** Alveolar bony defects, chronic periodontitis, preprosthetic surgery techniques*

***Correspondence:** Britaria Theressy, Resident of Periodontics, Faculty of Dentistry, Airlangga University, Jalan Mayjen Prof. Dr. Moestopo no. 47 Surabaya, Phone (031) 5030255, 5020256*, E-mail:Iyad1519@gmail.com

BACKGROUND

The hallmarks of periodontal disease are inflammation and alveolar bone loss. Gingival inflammation can resolve but alveolar bone loss leads to eventual tooth loss. Resorption of alveolar bone is a common sequel of tooth loss and presents a clinical problem, especially in the esthetic zone.[1] Advanced alveolar bone loss (>7 mm) may result in esthetically and functionally compromised dental prosthesis like removable and fixed partial dentures and ideal implant placement in prosthetically driven position.[2] The deficient alveolar ridges always present with numerous challenges to the clinician for achieving predictable augmentation.[3-9] The end goal of the therapy is to provide a functional restoration that is in harmony with the adjacent natural dentition. Thus augmentation of bone is often necessary. [1] Advances in biologic understanding of different bone regenerating materials and continuous innovations in surgical techniques have led to increased predictability in reconstruction of alveolar ridge defect.[10]

Bone is a dynamic structure with a continuous remodeling to ensure renewal of form and function.[1] Although bone tissue exhibits a large regeneration potential and may restore its original structure and function completely, bony defects may often fail to heal with bone tissue.[11] In order to facilitate and/or promote regeneration of lost bone, a variety of techniques may be employed, including particulate grafting, membrane use, block grafting, and distraction osteogenesis, either alone or in combination.[1] The biologic mechanisms forming the basis of bone augmentation include three basic processes: osteogenesis, osteoconduction, and osteoinduction. [11] Bone augmentation techniques may be used for the applications of extraction socket defect grafting, horizontal ridge augmentation, vertical ridge augmentation, and sinus augmentation.[1] Many of these reconstructive efforts are limited in the efficacy due to inadequate flap coverage and vascular perfusion. Procedures to prevent the collapse of the alveolar ridge are highly technique sensitive and require different surgical designs depending upon the size of the defect.[12] Several flap techniques have a general concept associated with alveolar ridge augmentation. This include generating blood supply, protected shape of bone growth and achieving tension free flap in wound closure. [13] In this article we presents two different techniques of flap design in preprosthetic surgery with severe alveolar bone loss for optimizing dental implant placement.

CASE REPORT

A nonsmoker 40-years-old male patient was first examined in Author's department in August 2015 with mobility in central incisors of mandible since 6 months, due to trauma wanted a permanent replacement of his mobile teeth. Clinical examination [Figure 1], radiographs [Figure 2], and a thorough history were obtained from the patient. On clinical examination were found as follows: grade III mobility of #32, grade II mobility of #34, generalized probing pocket depth 6-8mm of teeth on the mandible, missing teeth of #36 and #46 and generalized malposition

of teeth. The mandible anterior ridge deficiency was noticed. To evaluate the bone loss, panoramic radiographs was performed. The condition of periodontal tissues were found to be as followed: lack of bone density and supraposition of #32 and angular bone loss of #34. A final diagnosis of Generalized Chronic Periodontitis with severe bone loss on the mandible was established.

We decided his treatment plan included dental health education, scaling and root planning, splinting, occlusal adjustment, tooth extraction of hopeless 32, bone augmentation and dental implant. Finding that the available bone condition was inadequate for an implant, we decided to horizontally augment the implant recipient site which is on region 32 with a suitable substitute. Either on 34, we decided to horizontally augment the angular bone loss. The complete treatment plan was explained to the patient and signed informed consent was obtained. After completion of initial treatment, surgical procedure was carried out at a later appointment.

Figure 1. clinical examination on first examined

Figure 2. radiographic examination before treatment

CASE MANAGEMENT

Surgical Procedure was performed 1 week after nonsurgical procedure.
Procedure of surgical I, bone augmentation on #32

1. After local anesthesia, a full thickness flap was performed which is incision made right on sulcus of #33 [Figure 3,4]. An incision at the sulcus was used to preserve interdental papillae.
2. #31 was extracted [Figure 5], followed by curettage of granulation tissue in tooth socket post extraction.
3. Incision was performed using Gracey curette instrument. While at incised, smoothing and scrapping was performed to get rid of existing granulation tissue on the root surface using Gracey.
4. Bovine bone grafts, product of tissue bank of Dr. Soetomo Hospital Surabaya, was applied after all soft tissues were thoroughly removed from the recipient site. Once properly positioned, grafts was covered by released mucosa and then sutured [Figure 6,7].
5. For oral administration, amoxicillin 500mg t.i.d 3 days, doxycycline 20mg b.i.d 30 days, mefenamic acid 500 mg t.i.d Bio ATP s.i.d, calcitrol s.i.d and hyaluronic acid gel, were initiated.

Figure 3. flap incision using Gracey curette on the sulcus of #33

Figure 4. flap incision on the sulcus

Figure 5. The socket post extraction of #32

Figure 6. Bone grafts applied into the socket post removal of granulation tissues

Procedure of surgical I of bone augmentation #34

Bone augmentation on #34 was perfomed 3 weeks after augmentation #32. The flap design and techniques of bone augmentation #34 was similar to #32 augmentation. The incisision of flap was made right on each sulcus on #33 and #34 using Gracey curette followed by smoothing and scrapping on the tooth surface. This flap design was used to preserve te interdental papillae [Figure 8,9].

Figure 7. sutured using non absorbable silk 5.0

Figure 8. Tthe flap incision on #33 and #34

Figure 9. bone grafts applied after removal of granulation tissues

After 5 months of healing post first surgery, on clinical evaluation there is a concave shape on the labial side of region #32 [Figure 10,11]. This means still has bone defect on the labial side of region #32. On radiographic evaluation, the alveolar bone density on region #32 has not increased. The alveolar bone on #34 has increased [Figure 12]. Based on these results, we decided to perform second surgery of alveolar bone augmentation on region #32 and #34 in order to achieve adequate ridge width and bone density to facilitate the placement of implant.

Figure 10. the result after 5 months post first surgery. Clinically there is concave shape on the labial side (arrow)

Figure 11. the result after 5 months post first surgery. Clinically there is concave shape on the labial side (arrow)

Procedure of surgery II, bone augmentation of region #32

1. After local anesthesia, a full thickness flap was performed which is incision made horizontally along alveolar ridge of region #32 [Figure 13] using blade number 15C. The vertical incision was made 5mm apically from the margin gingiva of #31 [Figure 14]. After the flap was reflected there was still bone defect on region #32 which this

made a concave shape on the labial side of the bone.

2. Bone grafts was applied after all soft tissues were thoroughly removed from the recipient site. Bone grafts was applied at the concave shape on the labial side [figure 15,16]. Once properly positioned, grafts was covered by released mucosa and then sutured [Figure 17]

Figure 13. flap was performed with horizontal incision on along alveolar

Figure 14. vertical flap incision on 5 mm apically from the margin gingiva of

Figure 15. the process of applying bone graft into the concave shape on the labial side of bone defect

Figure 16. bone graft on properly position before sutured

Figure 17. the flap was sutured using non absorbable suture

Procedure of surgery II, bone augmentation on #34

1. After adequate local anesthesia, a full thickness flap was performed with incision made horizontally along #33, #34, #35 included 3 mm apically of interdental papillae [Figure 18].
3. Bone graft was applied after all soft tissues were thoroughly removed from the recipient site [Figure 19]. Once properly positioned, grafts was covered by released mucosa and then sutured [Figure 20].

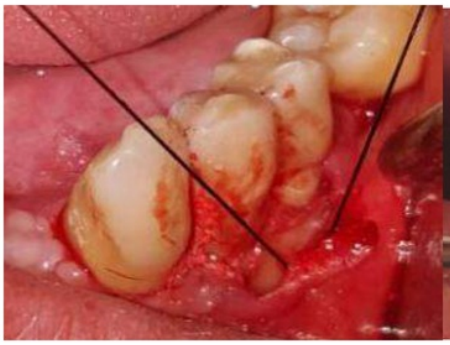

Figure 18. flap design on augmentation II of #34. A full thickness flap was performed with incision made horizontally along #33, #34, #35 included 3 mm apically of interdental papillae

Figure 19. The process of applying bone graft on the defect

Figure 20. sutured using non absorbable suture

RESULTS

The results of 3 months after second surgery of region #32 and #34 were as followed:

1. On clinical evaluation, there was an increased of alveolar ridge level on region #32 [Figure 21,22] and there was not any concave shape on the labial side on the region #32 [Figure 23,24]

Figure 21. The result 4 months after first surgery

Figure 22. The result 3 months after second surgery

Figure 23. The concave shape post first surgery

Figure 24. there is no concave shape after second surgery

2. On radiographic evaluation, there was an increased of bone density on region #32 and there was a significant alveolar bone and periodontal space recovery on #34 compare to the results of first surgery [Figure 25, 26, 27]

Figure 25. The radiographic examination before treatment

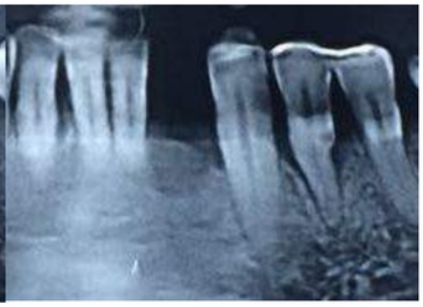

Figure 26. The radiographic evaluation 4 months post first surgery

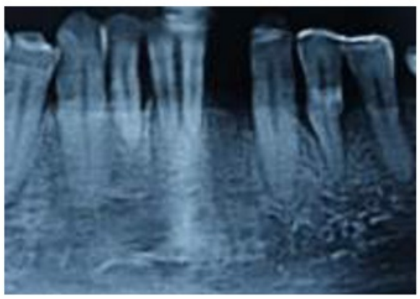

Figure 27. The radiographic evaluation 3 months post second surgery

3. On CBCT evaluation, the width of alveolar bone (axial) is 5.98 mm, 5.90 (coronal). There is severe bone loss on the interdental of #31 and #33. Intedental space between #31 and #33 is 5.93 mm. The average of bone profile with the region of interest 17x35 is 906.4 HU

Figure 28. The width of alveolar bone is 5.98 mm (CBCT evaluation, axial)

Figure 29. The width of alveolar bone is 5.90 mm (CBCT evaluation, coronal). .

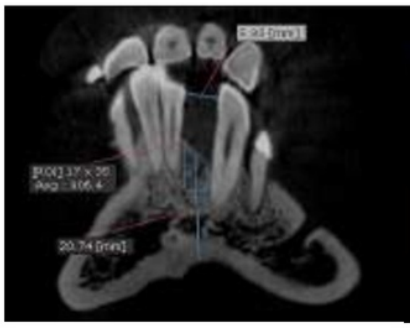

Figure 30. There is severe bone loss on the interdental of #31 and #33. Intedental space between #31 and #33 is 5.93 mm. The average of bone profile with the region of interest 17x35 is 906.4 HU

Figure 31. The 3D profile of present alveolar bone on region #32 and #34

DISCUSSION

The purpose of the present case report was to compare two different flap designs in preprosthetic surgery in the treatment of advanced alveolar bone defect. The treatment plan of this case after tooth loss is included dental implant. The clinician is obligated to perform augmentation procedures to reconstruct lost bone in order to achieve adequate ridge width to facilitate the placement of implant in a prosthetically driven positioned. Surgical reconstructive procedure in preprosthetic surgery have become more numerous and complex. Depending on the size and morphology of the defect, various augmentation procedure can be used including particulate grafting, membrane use, block grafting, and distraction osteogenesis, either alone or in combination. All the proven techniques must be followed to achieve good results including the flap management techniques. These include generating a blood supply, maintaining a stable, protected space of bone growth and achieveing tension-free flap wound closure.

On the first surgery, the clinician was intended making a minimally invasive surgery in order to save more blood supply so there was not any vertical incision performed. This include one of general concept for flap management associated with alveolar ridge augmentation. The use of vertical incisions, although often required for surgical access, should be minimized. The absence of horizontal and vertical incision on the first surgery may either interfered the flap tension while at wound closure which led to unsatisfied results. On the second surgery, either horizontal and vertical incision were performed. This flap design was intended to open more access for smoothing and scrapping the root surface and bone defects from granulation tissues, easier bone graft placement and also reduce the tension of flap. Wound closure depends on how to adapt wound edges with suturing techniques. Good sutured depends on the free flap tension which is increase flap elasticity. This permits complete closure without stress on the wound margin. V.

Soft tissue management is a critical aspect of bone augmentation procedures. Incisions, reflection and manipulation should be design to optimized blood supply and wound closure. The design and management of mucoperiosteal flap must consider to increased dimensions of the ridge after augmentations as well as esthetics and approximation of the wound margins. Various surgical techniques have been investigated with the aim of achieving simultaneous complete wound closure of preprosthetic surgery and perfectly normal appearance related to the tissue of the adjacent teeth. Selection of the appropriate surgical technique depends on different factors, some of which are related to the patients while others related to anatomical characteristics of the defect. The surgical procedure must be executed with the utmost of care in order to preserve the vascularity of the flap and to minimized tissue injury.[13] In this case, the flap design performed on second surgery which is included vertical and horizontal incision is more superior than flap design on the first surgery. The results of the second surgery is more significant than on the first surgery. The formation of alveoar bone included bone density and recovery of

periodontal space is better on the second surgery. The surgical technique performed with horizontal and vertical flap design led to novel possibilities to regenerate alveolar bone.

CONCLUSION

The surgical technique performed with vertical and horizontal flap design led to novel possibilities to regenerate alveolar bone.

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