LASSO GBR for Lingual Alveolar Ridge Augmentation

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Abstract:

This case report describes the use of lingual flap manipulation and release in conjunction with an internal suture-stabilized thick long lasting double ribose cross-linked barrier membrane and a tutoplast-derived cortico-cancellous bone allograft for management of lingual alveolar ridge deficiency prior to implant placement. A 42-year-old patient was referred to the University of Florida Center for Advanced Periodontology & Implant Dentistry in March of 2017 for implant consultation regarding a missing left mandibular first molar. The patient had lost the tooth because of decay about ten years prior to presentation. Patient stated that the extraction was very difficult and traumatic. Clinical examination revealed significant horizontal resorption of the lingual aspect of the alveolar ridge with limited amount of keratinized gingiva. CBCT (cone-beam computed tomography) images showed on coronal cross-section views an adequate height but an extensive resorption of the lingual alveolar wall. Periosteal release, lingual flap manipulation, membrane stabilization (LASSO technique) and guided bone regeneration were performed in order to obtain implant site development. Staged surgical approach consisting of guided bone regeneration with lingual flap manipulation and LASSO stabilization of the graft/barrier membrane complex seems to be a viable treatment approach for treatment of lingual alveolar ridge deficiencies.

Keywords: *bone graft, bone regeneration, soft tissue scaffold, lasso technique.*

Introduction

The edentulous alveolar ridge undergoes natural bone remodeling after tooth loss. This physiological phenomena leads to an atrophic alveolar ridge that may prevent adequate implant placement[1]. Atraumatic extraction should always be considered with the intent of preservation of the residual ridge for a future local rehabilitation using implants or conventional dentures[2].

Mandibular anatomy shows some peculiar aspects, like the lingual wall of the alveolar bone proper which usually presents as a thin bony wall. For that reason, some traditional techniques for dental extraction are based on lingual movements for luxation of the tooth to be extracted and/or for bone expansion. Procedures may be extremely challenging when root lacerations or extremely long roots are present and complications may happen after conventional exodontia. Significant amount of bone may have to be removed in order to obtain success and to avoid resorption or even an accidental fracture of the lingual wall. These would be some of the complications which could jeopardize a future proper implant placement.

Alveolar ridges with some kind of deficiency are commonly found. The causes for loss of bone height or width are trauma, post-surgical healing, congenitally missing tooth or previous disease process as periodontitis and end endodontic infection.

Bone volume loss following edentulism follows a general pattern in humans. The mandible resorbs lingually, while the maxilla resorbs palatally[3]. After initial loss, the mandible then continues apically, sometimes assuming an inverted crestal configuration. The posterior maxilla loses bone volume faster than any other region and is therefore most often in need of augmentation prior to implant placement.[4]

Seibert was the first to classify the alveolar ridge based on the morphology of the defect. A class I defect includes soft and/or hard tissue loss bucco-lingually with no loss in height. Class II includes loss in height but normal width. Class III combination defects include loss of both height and width[5]. Wang and Al- Shammari developed a therapeutically-oriented classification of defects that was based on Seibert's original classification. They sub-classified each defect type based on severity and provided recommendations for treatment for each one[6].

This case report documents an alternative approach for treatment of lingual horizontal ridge deficiency for implant site development, using lingual flap manipulation[7] and a graft/barrier membrane stabilization technique (LASSO). The materials used in this case consisted of a thick long lasting ribose cross-linked soft tissue scaffold stabilized with absorbable 4-0 chromic-gut sutures.

Case Report

A 42-years-old patient was referred to the University of Florida Center for Advanced Periodontology & Implant Dentistry in March of 2017 for implant consultation regarding a missing left mandibular first molar. The patient had lost the tooth because of decay about ten years prior to presentation. Patient stated that the extraction was very difficult and traumatic. Clinical examination revealed a significant horizontal resorption of the lingual aspect of the alveolar ridge with a limited amount of keratinized gingiva. CBCT images showed on coronal crow-section view an adequate height but an extensive resorption of the lingual alveolar wall. Due to these anatomical limitations, a staged surgical approach consisting in guided bone regeneration with lingual flap manipulation and stabilization of the graft and the soft tissue scaffold were planned for this case.

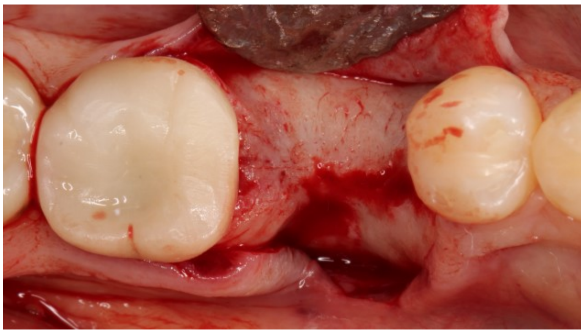
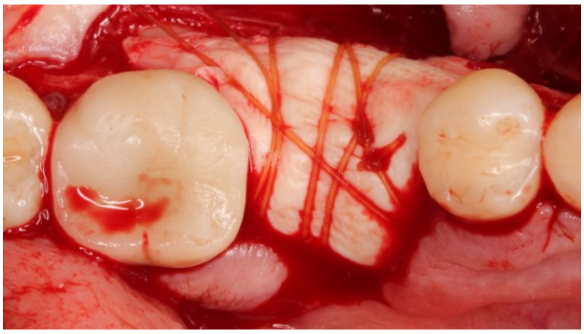
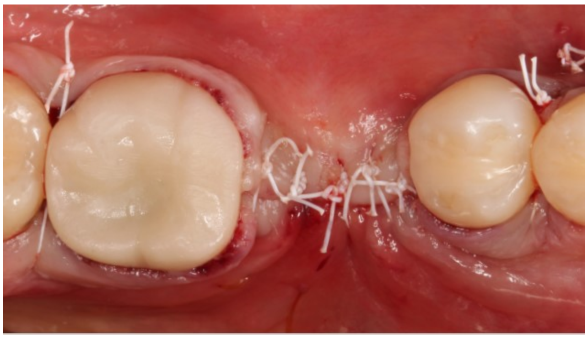
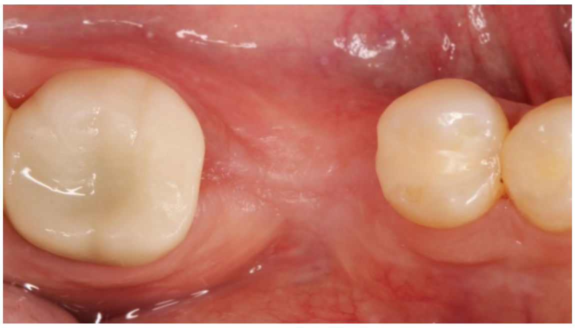
The patient signed a written informed consent, and local anesthesia was achieved via 0.5% bupivacaine 1:200.000 epinephrine for the inferior alveolar nerve block, and 4% articaine 1:100.000 epinephrine for buccal/lingual infiltrations. Intra-sulcular and crestal incisions were placed and full mucoperiosteal flaps were elevated over edentulous site #19 and extended from the distal of #18 to the mesial of #22. Periosteal release of the buccal flap was obtained by a sharp and single periosteal incision on the apical portion of the flap. This was followed by a blunt dissection of the lingual flap, where the flap was separated from the mylohyoid muscle to allow for passive closure and reduce the chances of postoperative complications affecting deep anatomical spaces[7]. A template from the barrier membrane was fabricated for an accurate placement of the periosteal dissection (buccal) and for the correct amount of mylohyoid reflection (lingual). With this, a perfect adaptation of the membrane under a periosteal (buccal) or a milo-hyoid pouch could be achieved.

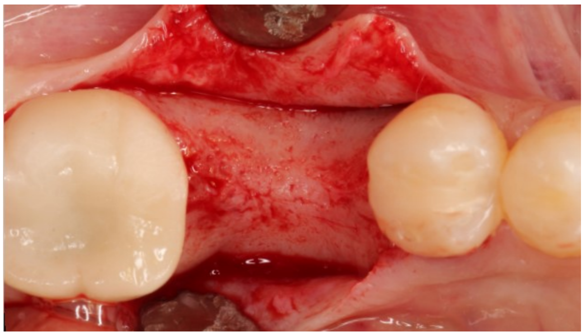
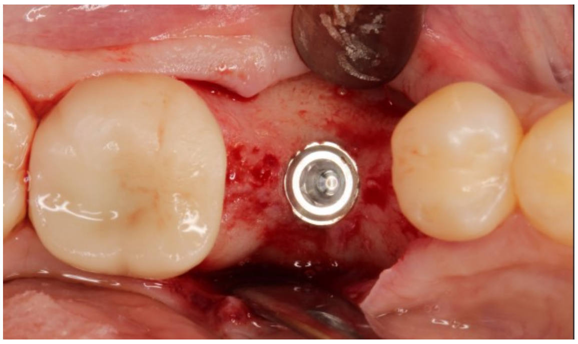
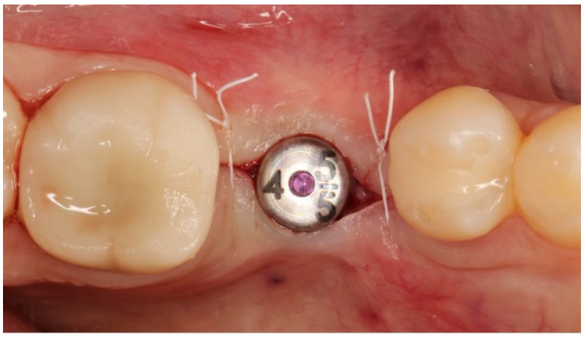
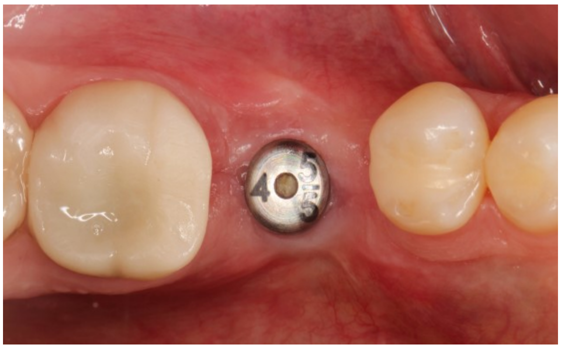
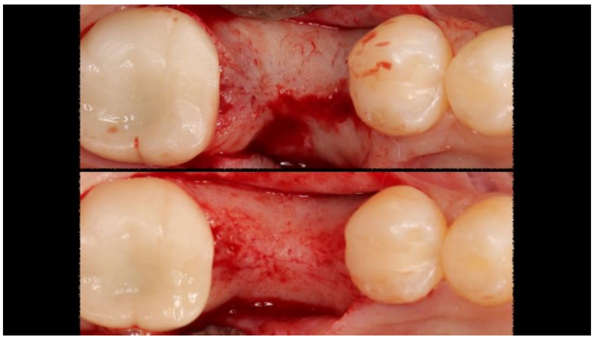
Cortical perforations were performed on the lingual aspect of the ridge in order to promote some bleeding. The soft tissue scaffold was accommodated (Ossix Volumax, Datum Dental). The scaffold was stabilized by a novel approach called "Lasso Technique", which consists of stabilization of the graft materials by internal periosteal sutures. This continuous periosteal suture allows the combined graft/membrane apparatus to remain completely stable during the initial phase of healing (proliferation), which is the critical time for complications as suture dehiscence or membrane and graft exposures. Simple interrupted 4-0 PTFE sutures were used for tension-free primary closure.

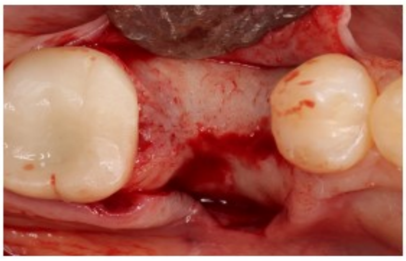
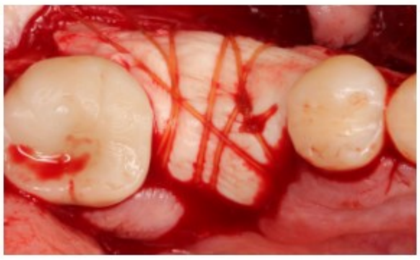
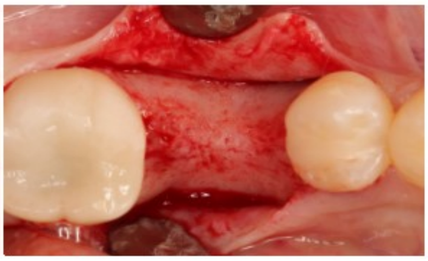
Postoperative instructions were printed and verbally given to the patient. Dexametasone 2mg (4 tablets night before, 2 tablets on days 2 and 3, 1 tablet oh days 4 and 5), Amoxicillin 500mg (3x/day for 10 days), Ibuprofen 800mg (4x/day for 10 days) and Chlorhexidine 0.12% oral rinse (2x/day for 14 days) were prescribed. Sutures were removed after 14 days of uneventful healing.

Four months later a cone bean CT scan was taken for an appropriate implant placement planning. The implant was installed and no additional graft on the augmented site was needed. Good bone quality was found at implant insertion and primary stability was achieved. A titanium custom abutment (Atlantis, Dentsply) was fabricated and a porcelain crown with screw access was cemented to the abutment.

This technique was used to allow for retrievability of the restoration. Cementation was achieved to prevent cement remnants to be left behind in the sulcus, in order to avoid future complications as chronic inflammation (mucositis) and bone loss (periimplantitis).



Discussion and Conclusion

With the techniques and materials available nowadays it is unacceptable to choose implant size based only on bone availability. Any defect in the alveolar ridge that does not allow for the placement of an implant with ideal size, stability, or position must be considered for augmentation prior to or at the time of implant placement.

Several different methods have been suggested to attempt to increase the rate of bone apposition to an area. Guided tissue regeneration, or GTR, refers to the use of barrier membranes to exclude epithelium and allow proliferation of bone and PDL growth. The term guided bone regeneration, or GBR, was adapted from this principle to include augmentation of an alveolar ridge, generally for implant restoration[8]. Murray was the first to demonstrate that osseous defects, when protected from soft tissue invasion resulted in complete bone fill, while soft tissue invasion was predominant when osseous defects were not protected[9]. The space maintained by the membranes allowed all defects to heal[10]. This concept has proved to be efficacious in the management of alveolar defects and has gained widespread use, with or without bone graft materials.

Bone replacement grafts can be divided into 2 major categories: autogenic and xenogenic. An autogenic/autogenous graft comes from within the same organism. A xenogenic graft is derived from another source other than the host organism. This can be further classified as allografts (derived from the same species but different organism), xenografts (derived from different species) and alloplasts (synthetic graft materials). An ideal bone graft material should be replaced by patients own bone after serving purpose in order to achieve optimal bone quality[11, 12].

The use of a long lasting barrier membrane is crucial for a successful augmentation. A longer period of healing under a proper cell excluded environment will allow the site to regenerate. These membranes lack of tissue affinity and a higher incidence of complication is expected. Complications as suture dehiscence, membrane exposure, contamination and localized infection have been described[13]. Most of these complications can be related to mobility of the GBR apparatus (graft and membrane). Undesirable outcomes rates may be decreased by membrane/graft stabilization techniques, as use of tacking devices, screws or periosteal suture stabilization.

The membrane stabilization technique used in this case is called LASSO. This technique can be described as a periosteal stabilization of the long-lasting membrane and the bone graft with resorbable internal sutures under both buccal and palatal flaps. On the buccal side, a periosteal incision is placed so a pouch is created on the apical portion of the membrane. This membrane is then inserted under this periosteal pouch for a better adaptation and containment of the bone particles. A continuous suture is performed connecting the buccal periosteal pouch and the apical portion of the palatal flap. On the palatal side a special consideration has to be made, where the sutures are stabilized by a "transfixation" of the flap towards the outside and a way back into the palatal flap is mandatory in order to avoid the suture to cross the incision line, jeopardizing passive and tension-free closure.

The use of LASSO technique and lingual flap manipulation appeared to enhance lingual horizontal augmentation for implant site development. Subperiosteal adaptation and stabilization of the membrane with resorbable sutures prevents graft mobility during the healing period. Periosteal release both on the buccal and lingual flaps is required for a tension-free primary closure.

This procedure may be very technique sensitive and the professional must be comfortable with bone graft techniques and soft tissue manipulation. Patient compliance, oral hygiene and smoking could directly affect outcomes. Future controlled clinical trials are needed to confirm these hypotheses .

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