



## Guided Bone Regeneration and Guided Tissue Regeneration in Maxillary Aesthetic Zone - Reconstruction of Post-Traumatic Defect in A Single Procedure

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### Abstract

Vertical regeneration of resorbed alveolar ridges in aesthetic areas is a challenging procedure with several anatomic limitations. To allow immediate implant placement with less interference in tissue aesthetics, detailed planning is needed. A few methods of bone reconstruction have been suggested to be performed simultaneous with implant placement, for example given in fresh extraction sockets, guided bone regeneration ensures bone formation in the peri-implant spaces and function as a framework for tissue remodeling. Combining the use of a resorbable membrane as a barrier during tissue regeneration, dehiscences are prevented, and buccal bone resorption is reduced more effectively. In the present case report, a male patient presented with severe root exposure in the anterior region of the maxilla due to post-traumatic resorption of the buccal plate.

The study aimed to demonstrate the use a technique of association between pedicled roll flap and interpositional bone graft with the objective of making the bone resorption region uniform in a single procedure and improving the aesthetic results. After opening an intrasulcular flap with care taken to preserve the keratinized mucosa on both sides of the incision, a full-thickness mucoperiosteal flap was reflected on the buccal side, and a pouch was created on the palatal side to place the membrane, allowing the performance of an atraumatic extraction. Using the interproximal bone plates as depth reference and the adjacent teeth for three-dimensional positioning, the implant was inserted with apical anchorage. For the collection of the tissue graft, a straight palatal incision was made to remove the subepithelial tissue, which was divided to harvest a connective tissue graft. To overcome treatment limitations, such as poor blood supply, it was chosen to maintain the connective tissue pedicled, and a subperiosteal soft tissue pocket was created at the deformed ridge interface. The combination of two types of grafts was applied, autogenous particulate bone graft associated with xenogenous bone graft (BioOss®) covered with resorbable collagen membrane (BioGide®). Allied to this technique, aiming to improve tissue regeneration of the aesthetic zone and soft tissue volume with keratinized tissue gain, the subepithelial connective tissue flap was then reflected and rotated, traversed through the pouch to cover the defect and increase the soft tissue thickness.

The results demonstrated an increase in bone thickness, confirming the efficacy of guided bone regeneration using composite bone graft (autogenous bone graft and anorganic bovine bone graft [BioOss®] along with resorbable collagen membrane [BioGide®]). A substantial gain in tissue thickness was also observed, showing the quality of local blood supply maintenance. This combined technique may mean a new approach to the use of the roll flap in association with interpositional grafting in order to reduce the number of surgical interventions and obtain more favorable aesthetic results.

**Keywords:** Reconstructive Surgical Procedures; Alveolar Ridge Augmentation; Guided Bone Regeneration; Guided Tissue Regeneration; Immediate Dental Implant Loading

### Introduction

Satisfying the high oral aesthetic needs, a harmonious relationship between teeth and the surrounding soft tissues is

crucial. However, alveolar ridge defects can be caused by trauma or advanced periodontal disease, which negatively modifies the periodontal profile of emergency, and the prolonged length of

the clinical crown with black spaces [1]. Vertical regeneration of resorbed alveolar ridges, when associated with tooth loss in anatomical limitations, is a challenging procedure for dental implant placement.

Numerous techniques for bone height gain have been proposed, even in cases with limited support and reduced blood nutrition. One of the main principles of regenerative and augmenting regenerative procedures is space maintenance in a rigid support system. Even so, he may not be able to maintain his desired shape due to the forces placed on it, resulting a bone growth below the desired [2]. Some of these reconstruction methods have been performed with implant placement to ensure maintenance of bone volume and formation in the peri-implant spaces [3].

The aim of this study was to demonstrate the combination of two types of grafts to overcome this problem. A technique of association between pedicled roll flap and interposition bone graft with the objective of making the bone resorption region uniform in a single procedure and improving the aesthetic results. Seeking to improve blood supply, bone regeneration of resorbed alveolar structures and increase in soft tissue volume with keratinized tissue gain.

Case Report

A male patient presented with severe root exposure in the anterior region of the maxilla due to post-traumatic resorption of the buccal plate. Throughout the anamnesis, the patient reported not having systemic diseases, being a smoker for more than 10 years, and having suffered trauma in this region a few years earlier. Intra-oral examination revealed severe periodontal deficiency in the tooth 11 (upper central incisor – right), with 6 mm recession (Seibert Class III alveolar ridge defect). Upon clinical examination, after removal of orthodontic braces, used for splinting the dental elements, they presented increased mobility. In a periodontal survey, a vestibular intrasulcular bag with 9 mm depth was found and regressed at 6 mm deep in the mesium and distobuccal walls (Figure 1).

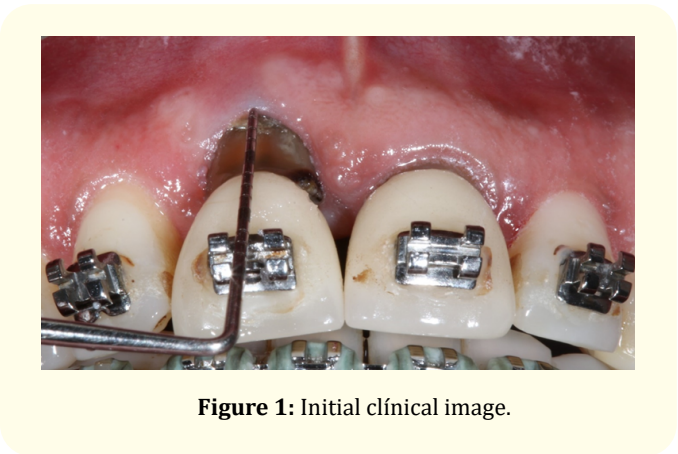


Figure 1: Initial clinical image.

Planning

Analyzing the bone level of the adjacent teeth and the condition of the donor site, one single surgical plan was established: Atraumatic extraction of element 11 and immediate implant cone morse with bone graft protected by a reasorbable membrane, associated with a pedicled roll flap with keratinized mucosa of the palate; Temporary crown in immediate aesthetics, splattered to adjacent elements.

Prior to surgery, the patient had antisepsis of the oral cavity with chlorhexidine digluconate at 0.12%. After disinfection, the area subjected to surgery was anesthetized in regional block by infiltration with Articaine at 4% and adrenaline 1: 100,000 (Articaine® - DFL Indústria e Comércio Ltda., Rio de Janeiro, Brazil). Firstly, intra-sulcular incisions using scalpel blade No. 15C were performed on teeth 13, 12, 11, 21, 22 and 23; taking care of preserving the keratinized mucosa on both sides of the incision. A full thickness mucoperiosteal flap was reflected on the buccal side and the palatal side to insert the membrane (Figure 2).

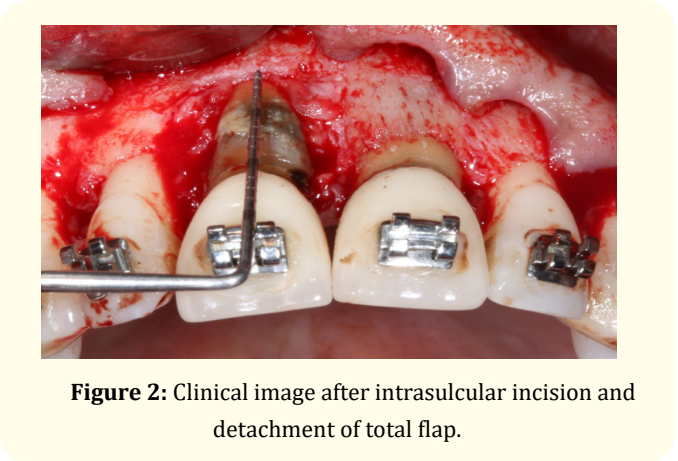


Figure 2: Clinical image after intrasulcular incision and detachment of total flap.

Due to reabsorption of the buccal wall, during tooth extraction, a surgical instrument - Periotomo was used to facilitate root removal and reduce trauma to the adjacent bone (Figure 3). Confirming the total loss of the mesiobuccal bone wall, it was necessary to empty the nasopalatine foramen with total removal of the tissue to position the implant properly and search a primary stabilization (Figure 4). The cone morse implant was installed with a palatal approach, having as reference the mesial and distal bone level of the adjacent elements.

A palatal incision was performed to remove the subepithelial tissue, which was divided (Figure 5) and then made parallel to the first incision in the same management as harvesting, a pedicled roll flap with keratinized mucosa, it was used of connective tissue graft. A soft tissue subperiosteal pouch was created at the edge interface (Figure 6). The subepithelial connective tissue flap was then reflected and rotated through the pocket to cover the defect and

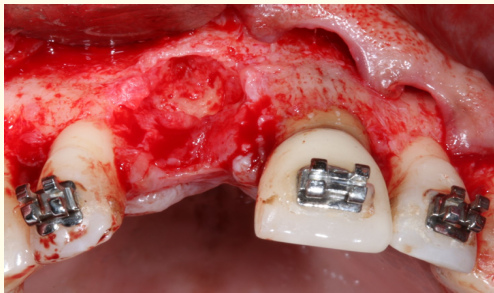


Figure 3: Clinical image after exodontia.

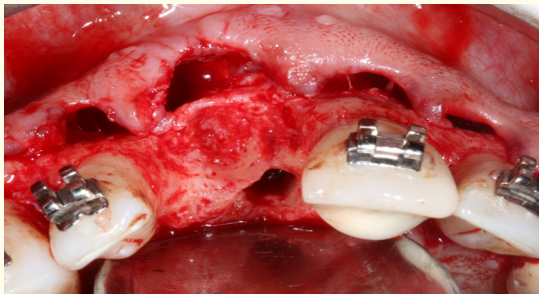


Figure 4: Clinical image after total tissue curettage.

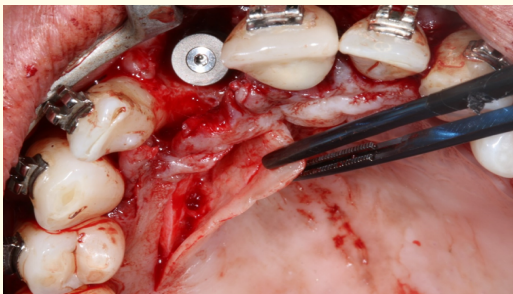


Figure 5: Clinical image after implant installation and palatine incision.

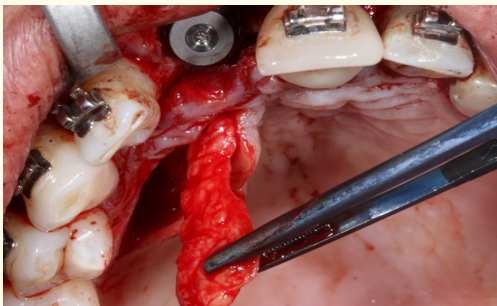


Figure 6: Clinical image of pedicled connective tissue.

increase soft tissue thickness. Since only one flap of subepithelial connective tissue was removed, the palatal wound at the donor site could be closed by first intention.

After finishing roll procedure, the receiving site was prepared and a graft containing Bio Oss® with spongy granules (0.25 -1.0 mm) was inserted over the entire vestibular surgical site (Figure 7). A measurement of the approximate membrane length and width required was obtained using a periodontal probe and sterile leaf cut to the defect size. A barrier membrane (Bio Gide®) was inserted around the graft, to prevent growing epithelium to the intact bone walls and bleeding points was induced, to increase blood supply (Figure 8).

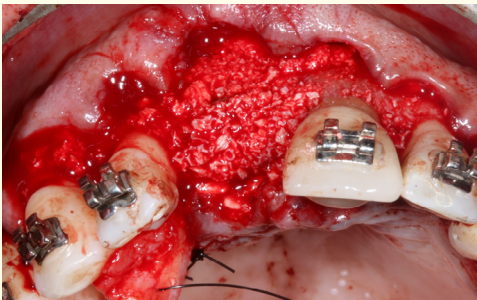


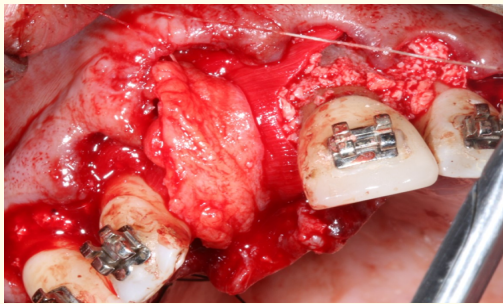
Figure 7: Clinical image after placement of BioOss®.



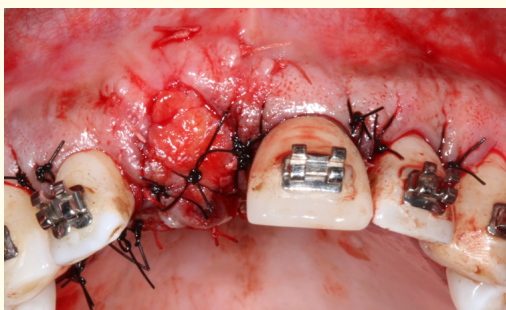
Figure 8: Clinical image after the placement of the membrane BioGide®.

The flap was coronally repositioned for complete wound coverage without tension (Figure 9), then the gingival graft was adapted and held in position with an interrupted suture. For best results, the gingival margins were closely adapted and sutured, allowing the membrane to be covered and primary healing of the surgical wound without tension (Figure 10). Primary closure was then obtained using a non-resorbable monofilament (Vicryl, Ethicon, 4.0). Full coverage was performed with periodontal surgical cement (COE-PAK, GC), then a temporary crown was installed.

The patient received a 500 mg amoxicillin drug prescription, 3 times a day for 7 days; ibuprofen 400 mg, 3 times daily for 3 days; and chlorhexidine 0.12% as a mouthwash, twice a day for 2 weeks.



**Figure 9:** Clinical image of the gingival graft being placed in position.



**Figure 10:** Clinical image after suture.

Results and Discussion

Exposure of the root surface when the edge of the gum (gingiva) moves apically away from the crown of the tooth. Resorption of the tooth-supporting bone associate with the loss of periodontal tissue, may be caused by destructive periodontal diseases or by injury. The treatment of the underlying periodontal disease and the seeding of periodontal ligament cells, involving procedures for enhancing and directing tissue repair and renewal processes The surgically implanting growth conducive tracks or conduits at the damaged site, enable the creating of new attachment, to stimulate and control the location of cell repopulation and repair is achieved by guiding the progenitor cells.

To reproduce in the desired location, blocking contact with surrounding tissue, substitutes like gingival grafts or membranes has been used to cover extraction cavities since 1994. Those techniques for enhancing and directing cell growth, to repopulate specific parts of the periodontium damaged, have some difficulties like their blood supply [4]. The pedicled connective tissue flap technique of the palate seeks to improve local blood supply and provide graft containment, serving as a membrane barrier for bone regeneration processes. Although the hypothesis that this relationship could increase the bone graft barrier and conduction capacity, this case report was performed with the addition of a resorbable barrier membrane.

Gingival recession is closely related to the vertical reduction of the buccal bone plate, so preserving this structure is key to a long-term reliable outcome, making the bone graft procedure necessary to increase soft tissue thickness and compensate for bone resorption [5]. This combined technique may mean a new approach to using the pedicled flap in combination with interpositional graft, reducing surgery time and obtaining favorable aesthetic results with improved tissue levels and gingival contour recovery, but the patient's postoperative care and hygiene will define the long-term results of the interventions undertaken.

The desired contour of the interdental papilla between the maxillary central incisors and upper left lateral incisor, although maintained, was not fully recovered in this case (Figure 11). This was predicted to be a possible result of improper flap design that the adjacent interdental papilla was not completely enclosed within the flap, or by exposure with a membrane collapse, and even poor patient hygiene during the pre and postoperative periods.



**Figure 11:** Clinical image of post-surgical follow-up 10 days.

Defects in the alveolar walls, associated or not with gingival recessions, require stable surgical techniques to restore their anatomy, and immediate function implants in these cases for some authors are contraindicated [6]. For those, the use of autogenous particulate bone associated with xenogenous bone graft (BioOss®) covered by collagen membrane (BioGide®) has been shown to be an excellent treatment option for these defects [7], information that agrees with the methodology applied in this case report. The study results demonstrated an increase in bone width (Figure 12 and 13), proving the effectiveness of guided bone regeneration using composite bone graft (autogenous bone graft and inorganic bovine bone graft (Bio Oss®).) However, successful rehabilitation with implants dental surgery depends on some morphological characteristics of the alveolar bone.

For Buser, *et al.* [7], immediate or early implant installation in compromised alveoli is considered a complex procedure. However, implant placement at the time of tooth extraction or early is currently increasingly common due to the aesthetic appeal and rapid resolution of the case requested by patients, in addition to the attempt to preserve maximum bone height and width.



**Figure 12:** Clinical image of vestibular volume in the postoperative period 90 days.



**Figure 13:** Clinical imaging of postoperative follow-up after 6 months.

However, one of the walls of the socket, especially the buccal, is often absent after implantation in fresh or early healing alveolar bone. For this, the use of autogenous particulate bone associated with xenogenous bone graft (Bio Oss®) covered by collagen membrane (Bio Gide®) has been shown to be an excellent treatment option for these defects [7-15]. The results of these study confirmed an increase in bone thickness, confirming the efficacy of guided bone regeneration using composite bone graft (autogenous bone graft and bovine bone graft [Bio Oss®] along with resorbable collagen membrane [Bio Gide®]). A substantial gain in tissue thickness was also observed, showing the quality of local blood supply maintenance. This combined technique may mean a new approach to the use of the roll flap in association with interpositional grafting in order to reduce the number of surgical interventions and obtain more favorable aesthetic results.

Conclusion

Successful peri-implant regenerative treatments require areas of stable soft tissue, primary implant stability, and good blood supply at the surgical site. In this case, damage to the buccal bone wall found at the time of implant placement represented a significant risk factor. Connective tissue grafting is known to have a high degree of clinical success when performed on dental surfaces,

but it is a delicate procedure involving periodontal support tissues, with different characteristics from peri-implant tissues, therefore, its results on implants cannot be guaranteed. Although there are no precise criteria for selecting soft tissue graft or hard tissue graft, the extent of the alveolar ridge defect, the state of the donor site, whether or not the implant will be installed, and especially the patient's hygiene conditions, should be considered comprehensively.

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