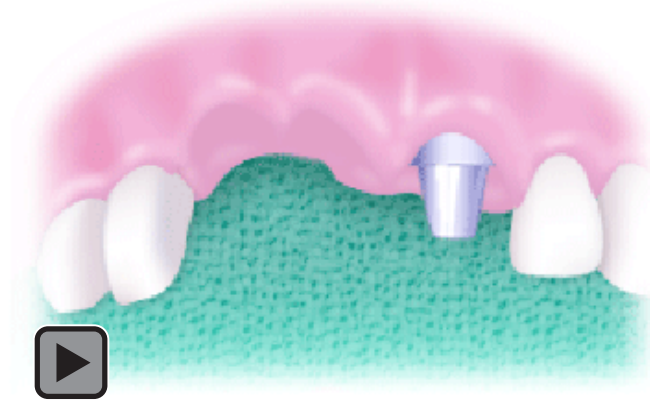


Fixed Prosthetics with a Connective Tissue and Alloplastic Bone Graft Ridge Augmentation: A Case Report

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Abstract

Augmentation of the partially edentulous ridge can significantly improve the final prosthodontic rehabilitation. For enhancing soft tissue contours in the anterior region, the subepithelial connective tissue graft is the treatment of choice. The combination of connective tissue grafts with alloplastic bone graft material can optimize the ridge augmentation and reduce post extraction defects. The aim of this clinical report is to describe the use of subepithelial connective tissue in conjunction with an alloplastic bone graft for augmentation of a maxillary anterior ridge prior to prosthetic rehabilitation.

Keywords: Alloplastic bone, alveolar ridge augmentation, connective tissue graft, esthetics, fixed partial denture, HTR

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Introduction

Critical esthetic problems arise when an anterior fixed prosthesis is fabricated over a deformed, collapsed edentulous ridge.¹ When ridge deformation occurs, a standard pontic size and shape will not maintain a normal tooth to gingiva relationship with a resultant unattractive restoration.¹ The most common causes of alveolar ridge deformities include developmental defects, advanced periodontal disease, traumatic removal of teeth, and surgical injury.² Reconstructive periodontal procedures permit the restoration of the hard and soft tissues of the alveolar ridge to their former dimensions and gives the restorative dentist the opportunity to provide their patients with a functional and improved esthetic prosthesis.³

Reconstructive procedures for the deformed edentulous ridge have evolved from the use of free soft tissue autografts⁴ and "onlay" type grafts⁵, to subepithelial connective tissue grafts^{6,7} with and without supplemental bone replacement materials and implants.^{2, 8-10}

Onlay grafts are thick free gingival grafts derived from partial or total thickness palatal grafts.⁵ They can be used to gain ridge height and are very useful in replacing tissue disfigured from amalgam tattoos, previous trauma, or oral surgery.⁵ The onlay graft procedure was designed to augment the difficulty in restoring apicocoronal ridge defects.⁵ The major disadvantage is they are generally pale in color and will present an esthetic challenge. Depending upon the thickness, onlay grafts will undergo moderate to severe post-surgical shrinkage.¹¹ Onlay grafts also require an abundant blood supply and rapid capillary proliferation.⁵ Therefore, this technique is contraindicated in areas of previous surgical trauma with compromised vascular support.⁵

Recently, the concept of Guided Bone Regeneration (GBR) has been developed to augment the volume of alveolar bone prior to placement of implant fixtures.¹²⁻¹⁴ Still, the most commonly used procedures are those which augment the soft tissues associated with ridge defects.^{3, 5}

Bioplant HTR (Hard Tissue Replacement) (Bioplant Inc., South Norwalk, CT) is a synthetic bone alloplast consisting of a calcified copolymer (polyhydroxyethylmethacrylate and polymethylmethacrylate) and calcium hydroxide.¹⁵ HTR has

been shown to be effective in preserving ridge height and width after tooth extraction and has demonstrated success when used for ridge augmentation.^{8, 16}

Following anterior tooth extraction without some type of ridge preservation, alveolar ridge resorption occurs at a rate of 40% to 60% during the first 2 to 3 years.^{16, 17} The resultant ridge defect commonly presents a difficult prosthetic challenge.

Seibert^{3, 5} classified three types of ridge deformities. Class I is a buccolingual loss of tissue contour with a normal apicocoronal height. Class II is an apicocoronal loss of tissue with normal buccolingual contour. Class III is a combination of buccolingual and apicocoronal loss. Allen² modified Seibert's original classification with a quantification of the amount of tissue loss. Type A is an apicocoronal loss of ridge contour. Type B is a buccolingual loss of ridge contour. Type C is a combined buccolingual and apicocoronal loss. The ridge is further described by assessing the depth of the defect: Mild less than 3 mm; Moderate 3 - 6 mm; and Severe greater than 6 mm.

This case report will describe the use of subepithelial connective tissue supplemented with an alloplastic bone graft to augment a moderate apicocoronal and buccolingual ridge defect. The combined use of these procedures enhanced the final prosthetic restoration, a fixed partial denture, significantly improving restoration esthetics.

Case Report

A male 23-year old soldier was referred to the Department of Periodontics for evaluation of his maxillary anterior ridge prior to prosthetic rehabilitation. Ten weeks previously, at a previous duty assignment, the maxillary right central and lateral incisors (#7 and 8) were extracted due to root fractures and infection following blunt trauma (Figure 1).

The patient originally presented to the Department of Prosthodontics with an interim fixed prosthesis. His anterior ridge demonstrated significant bone loss expressed clinically by loss of approximately 4 mm height and 6 mm width 10 weeks post extractions (Figure 2). The patient was then referred to Periodontics for an anterior ridge augmentation prior to final prosthetic rehabilitation.



Figure 1. Periapical radiograph demonstrating root fracture and infection of the maxillary central and lateral incisors.



Figure 2 and 3. Deformed residual ridge, ten weeks post extractions.



Figure 4. Clinical view of the defect after full thickness flap.

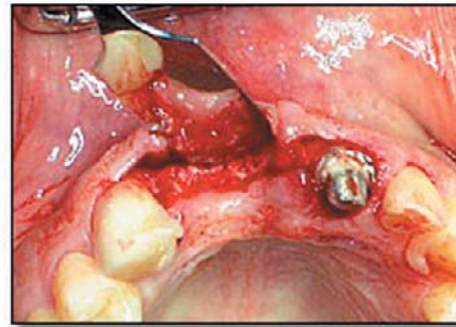


Figure 5. Placement of HTR bone graft.

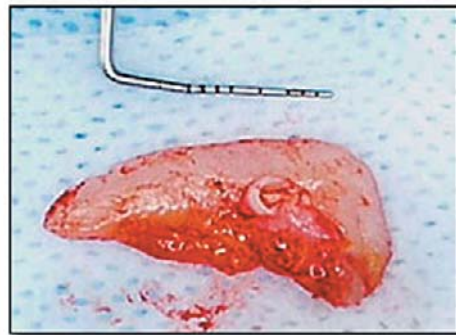


Figure 6. Connective tissue graft (approximately 30 mm x 15 mm x 4 mm).

A clinical examination of the maxillary alveolar ridge revealed a moderate Seibert Type C ridge defect (combined buccolingual and apicocoronal loss of tissue height) (Figure 3). Rehabilitation with a conventional fixed partial denture (FPD) of the right maxillary canine through left central incisor (teeth numbers 6 to 9) was planned. As this patient was due to report with his unit in 3 months for desert training, dental implants were not a treatment consideration. Surgical options were discussed with the patient, and it was decided to augment the ridge with a subepithelial connective tissue graft harvested from the palate combined with an alloplastic bone graft.

Following a pre-surgical rinse with chlorhexidine and administration of local anesthesia (2% lidocaine with 1:100,000 epinephrine), a labial full thickness flap was elevated and the ridge defect was exposed. The residual bone defect of the labial plate was well visualized (Figure 4).

Biopant HTR was condensed in the apical aspect of the labial flap increasing the width in the buccolingual aspect (Figure 5). A subepithelial connective tissue graft was then harvested from the palate mesial to the right canine and extending to the distal of the first molar. Care was taken to avoid the greater palatine nerve and artery (Figure 6).

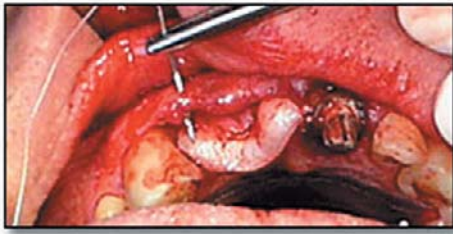


Figure 7. Connective tissue graft sutured over labial defect and HTR bone graft.



Figure 8. Occlusal view demonstrating good fill of the buccolingual defect.



Figure 9. Interim fixed prosthesis is relieved for post-surgical edema.

The graft was placed under the labial flap and over the bone graft to increase the width as well as the apicocoronal height of the ridge. The sub-epithelial connective graft was sutured with 4.0 plain gut sutures (Ethicon, Johnson & Johnson, Somerville, NJ). The labial flap was then sutured with 3.0 Vicryl (Ethicon, Johnson and Johnson, Somerville, NJ) (Figures 7 and 8).

The interim prosthesis was modified to fit over the expanded ridge with minimal pressure (Figure 9).

Palatal hemostasis was obtained with Gelfoam Gauze USP (Upjohn, Kalamazoo, MI) secured with an acrylic surgical stent.

Home instructions included daily chlorhexidine mouthrinsing as well as the administration of oral



Figure 10. Ten days after surgery. Good initial healing is demonstrated.



Figure 12. Final healing at 12 weeks.

dexamethasone tablets (8 mg—2 tabs, 1 hour prior to surgery; then 1 tab each day for 3 days post-surgery) to reduce post-surgical edema. Acetaminophen with codeine (1 to 2 tabs every 4-6 hours as needed for severe pain) as well as Naproxen (1 tab every 12 hours for moderate pain) were administered as analgesics.

The sutures were removed 10 days after the periodontal surgery, and the patient presented with a good soft tissue healing (Figure 10).

Three months after the ridge augmentation (Figures 11 and 12) the final prosthesis was cemented (Figures 13 and 14).

Results

Although augmentation did not result in 100% restoration of this deficient ridge, a significant improvement was obtained. Approximately one-half of the apicocoronal ridge loss (2 mm) was regained with an almost 90% gain (4-5 mm) in



Figure 13. Final prosthesis cemented.



Figure 14. Facial view of final prosthesis.

the buccolingual dimension. Additionally, if this patient were not being deployed with his military unit, a second connective tissue graft would have provided additional improvement in ridge width and height.

Discussion

Connective tissue grafts for ridge augmentation preserve the coloration and characteristics of overlying mucosa⁷ resulting in a better esthetic blend in a potentially highly visible area. In contrast onlay grafts retain their palatal mucosal characteristics, which may compromise tissue esthetics.⁵ As a result, the natural coloration and texture that is maintained by connective tissue grafts may reduce the need for secondary procedures.¹¹ Ridges augmented with connective tissue have demonstrated stability ranging from 7 to 12 years.^{3,11} However, when faced with severe apicocoronal ridge defects, connective tissue alone may not be able to completely augment the ridge defect. Other materials such as Bioplant HTR or other bone alloplasts may be indicated in these more challenging situations.

The major disadvantage of connective tissue grafts is they require a second surgical site. Although leaving palatal donor epithelium with a base of connective tissue will generally allow the site to heal by primary intention, thereby, minimizing post-surgical complications.¹¹

HTR has been shown to be effective in both ridge preservation immediately following extractions^{17,19,20} as well augmentation procedures.^{8,21} The material is extremely biocompatible^{10,21,22}, osteoconductive^{21,23}, and efficacious

in periodontal defects.^{23,24} In addition, HTR has demonstrated histologically to be surrounded by dense collagen in areas where there is a low potential for bone growth.¹⁵ This indicates an additional use of HTR as a filler for connective tissue expansion in areas where bone regeneration is not possible.¹⁵

Finally, if dental implants are part of the restorative treatment plan, GBR will predictably restore both width and height to a deformed ridge.⁷ GBR can be used alone or combined with bone graft materials such as demineralized freeze dried bone allograft (DFDBA) to prevent the collapse of the ridge following extraction.⁷ GBR is based on the principle that through selective exclusion of non-osteogenic tissues by a barrier membrane, the initial blood clot that fills the space under the membrane will be replaced with bone allowing the placement of implant fixtures.⁷

Summary

This case illustrates the treatment of a deformed maxillary anterior ridge with a subepithelial connective tissue combined with an alloplastic bone graft. The apicocoronal and buccolingual augmentation of this ridge provided a functional and improved esthetic result.

The combined use of an alloplast bone graft provided additional augmentation not achievable with either procedure alone. Bioplant HTR was technically easy to use and resulted in good clinical healing. Although an additional augmentation procedure would have improved the final prosthetic result, the patient was satisfied with his final restoration.

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