Comprehensive Periodontal Regenerative Care: Combination Therapy Involving Bone Allograft, a Biologic, a Barrier, and a Subepithelial Connective Tissue Graft to Correct Hard- and Soft-Tissue Deformities

Paul S. Rosen*

**Type of Case:** A 70-year-old white female was referred for evaluation and treatment of isolated periodontal lesions throughout her mouth. Her chief concern was the soft-tissue deformity that was present on her maxillary right canine. Radiographic evaluation of this area revealed that, along with this mucogingival defect, there was an intrabony lesion that required treatment.

**Case Presentation:** The ability to enhance the prognosis and appearance of this tooth by restoring the hard-tissue support and soft-tissue profile in the same procedure has rarely been reported in the literature. This case report focuses on a layered approach that simultaneously addresses both aspects of the patient’s problem. Treatment involved a mineralized allograft, a biologic agent, an amnion–chorion barrier, and a subepithelial connective tissue graft on a root treated with tetracycline.

**Conclusions:** The clinical and radiographic results at 6 months suggest a very favorable result. Efforts to treat teeth that have both hard- and soft-tissue deformities should consider combination therapies that address both concerns. Clin Adv Periodontics 2011;1:154-159.

**Key Words:** Case report; guided tissue regeneration, periodontal; platelet-derived growth factor.

**Background**

The ideal goal is to maintain the natural dentition in health, comfort, and function while preserving or enhancing the patient’s esthetic appearance. Historically, regenerative treatment for periodontal intrabony lesions has focused on the use of monotherapies1-4 to restore the lost hard tissues: bone, cementum, and a functional periodontal ligament. Combination regenerative approaches have been quite successful for treating the more challenging intrabony lesions, particularly as the size and complexity of the lesion increases.5-7 Typically, these efforts have included a bone replacement graft that has been covered by an exclusionary barrier. Although this approach to regeneration has been quite successful, there still remains a concern that the graft material may act strictly as a space filler and not have the intrinsic biologic capability to provide for regeneration.8 Furthermore, when the graft may be inductive, its regenerative capacity could still be limited by its ability to maintain space or to be contained.9

More recently, biologics have been introduced to enhance wound healing and recruit the appropriate cells needed for periodontal regeneration.10-12 Although the results in
a clinical trial and case reports have been encouraging, situations present themselves that require additional care, such as restoring soft-tissue recession on a maxillary anterior tooth. The subepithelial connective tissue graft has been the gold standard in providing for successful root coverage and, if it were to be combined with a bone graft—biologic in one surgery, perhaps both problems could be corrected. This case report provides preliminary evidence that the use of a layered reconstructive approach can be successful in addressing both the hard- and soft-tissue problems on a maxillary canine with an intrabony defect and a concurrent mucogingival deformity.

**Treatment**

The patient was a 70-year-old white female. Medical history included osteoporosis for which calcium was taken, prosthetic knee replacement, and mitral valve prolapse, the latter of which required 81 mg acetylsalicylic acid and clopidogrel. Her chief concern was the recession and root sensitivity present on her maxillary right canine (Fig. 1), although she still had residual pocketing elsewhere in her mouth after the completion of scaling and root planing in her initial therapy. Furthermore, a periapical radiograph revealed an intrabony lesion at the distal aspect of this tooth (Fig. 2) that had 3 mm of direct facial recession and a probing depth (PD) of 7 mm at its distofacial. Furthermore, the patient reported no previous periodontal surgical care for this lesion. Occlusal evaluation revealed a congenitally missing lateral incisor. Group function was noted in working movement with no fremitus. Mobility was 0 for all teeth in the quadrant. Before treatment, her oral hygiene efforts were reviewed and reinforced, and it was determined to treat this area first with a regenerative surgical approach.

The patient rinsed immediately before the surgery with a 0.12% chlorhexidine mouthwash and was premedicated with 2 g amoxicillin 1 hour before surgery. Anesthesia was obtained using local infiltration with 4% articaine with 1:100,000 epinephrine. A sulcular incision with coronal full thickness and apical partial thickness flap was elevated on the buccal from tooth #4 to tooth #8 with preservation of papillae at the interproximal between teeth #5 and #6, the site of the intrabony lesion. The papilla was elevated to the palate. Reflection revealed a three-wall intrabony lesion at the distal aspect of the canine. The defect was thoroughly debrided, and the roots were scaled and planed with ultrasonic and hand instruments (Fig. 3). This preparation of the roots attempted to both remove the outer affected surface and flatten the root to facilitate its coverage. A tetracycline solution was applied to the root of tooth #6 for additional debridement using moistened cotton pellets to vigorously burnish this area for 2 minutes. This solution was formulated by dissolving a 250 mg capsule into 5 mL sterile water. The tetracycline solution was rinsed from the root, and intramarrow penetration was performed in the lesion to enhance the blood supply to the site. Immediately afterward, a purified recombinant protein of platelet-derived growth factor-BB (PDGF-BB) was applied to the conditioned root through a cannula tip while carefully isolating the site to avoid any contamination from either blood or saliva. Before this root

![FIGURE 1](image1.png) Pretreatment of a maxillary right canine. There is a mucogingival deformity on the facial aspect with 3 mm of recession and clinical attachment loss and PD of 7 mm.

![FIGURE 2](image2.png) Preoperative radiograph of the site suggests that there is also an intraosseous lesion at the distal aspect of the canine.

![FIGURE 3](image3.png) Flap reflection at the time of the surgery shows a three-wall intrabony lesion at its distal roots that was aggressively planed to facilitate the removal of any plaque and calculus and to facilitate the root coverage.

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preparation, a mineralized freeze-dried bone allograft (FDBA) was reconstituted with PDGF-BB by adding enough of the purified solution to minimally wet the graft particles. This graft—biologic was placed in the lesion with light incremental pressure to fill or slightly overfill it (Fig. 4). A chorion—amnion barrier was placed over the FDBA—PDGF-BB to contain it should there be any postsurgical flap dieback and to prevent any gingival connective tissue from entering into it (Fig. 5). A subepithelial connective tissue graft was harvested from the right palate in the region of the premolar teeth using the technique described by Bruno. PDGF-BB was applied immediately to the graft after its removal from the donor site, and it was immediately secured at the recipient site with 6-0 chromic gut using an interrupted suturing technique (Fig. 6). The connective tissue graft was placed up the cemento-enamel junction in hope of complete root coverage. The flap was coronally positioned to cover the connective tissue graft in its entirety and was secured with a monofilament 7-0 polytetrafluoroethylene suture using an interrupted technique (Fig. 7). Care was taken to ensure that the flap was passively held over the treated site.

Infection control consisted of prescribing 875 mg amoxicillin to be taken twice daily for the first 7 days. For analgesia, acetaminophen with codeine #3 was taken as needed every 4 to 6 hours. The patient was seen approximately every 14 days for postoperative treatment during the first month. Sutures were removed at the first visit (Fig. 8). She was then seen every other week for months 2, 3, and 4 and then at 6 months after surgery. Postoperative visits included plaque debridement, polishing to remove stains, and oral hygiene reinforcement. Chlorhexidine at 0.12% was topically applied with a cotton swab to the site by the patient for postoperative plaque management for the first 30 days when she refrained from both brushing and flossing to provide wound quiescence. After the first 30 days, mechanical oral hygiene was reinstated, and the patient began rinsing with an essential oil mouthrinse twice daily. At 6 months, an updated radiograph was exposed, suggesting favorable improvement in hard tissue (Fig. 9), and the clinical parameters mirrored this favorable outcome.
with complete root coverage, shallow PDs of 2 to 3 mm, and a gain in clinical attachment level of better than 50% (Figs. 10 and 11).

**Discussion**

The ability to maintain periodontally diseased teeth with regenerative efforts is now more predictable than ever as a result of refined techniques, biologic agents, and scaffolds that are at our disposal. Today, the question should not be how soon should we be removing a tooth with periodontal disease, but rather how early should regenerative care be applied when we see intraosseous lesions.

The use of a biologic agent such as PDGF-BB when combined with a bone graft has provided clinical regenerative outcomes that are quite favorable. Placing a barrier material over the graft—biologic composite was performed to reduce the likelihood of exposure to the oral environment during the period of postoperative wound healing. For this patient, a chorion—amnion barrier was selected to not only contain the graft but to also prevent the ingrowth of connective tissue into the future developing attachment apparatus. The advantages of this particular barrier are that it is extremely thin, measuring 300 μm after full hydration, with the major non-collagenous components being laminins, proteoglycans, and fibronectin, further enhancing its tissue-friendly nature.

Considering that the lesion was located at the interproximal region, dieback of the papilla could have been a real possibility, exposing the graft material to the oral environment and diminishing its efficacy.

The need for treating the facial recession related to both the patient's concern with the poor esthetic appearance and experiencing tooth sensitivity. Although the use of coronal flap advancement may have provided a solution for this problem, the thin nature of the gingiva may have been suboptimal to both achieve and maintain this goal.

The subepithelial connective tissue graft has been a very predictable method for achieving root coverage, and it is the standard to which other techniques are compared. Case reports have demonstrated regeneration in humans after the use of a subepithelial connective tissue graft. An added benefit, if procured with an intact periosteum, might be its ability to serve as an exclusionary barrier-graft containment device. The use of the PDGF-BB may have further enhanced the viability of the connective tissue because this agent promotes angiogenesis, complementing the actions of vascular endothelial growth factor in vessel formation.
Although this combined regenerative approach obtained a very favorable clinical outcome in this one case, it is important to remember that success is still strongly related to adequate root debridement and stringent follow-up maintenance care. Additional case series and randomized controlled trials need to be performed on a much larger scale with more challenging vertical bony and soft-tissue defects to determine the efficacy of this approach over a larger number of patients.

Conclusions
This case report, in which a combined approach that included a mineralized bone allograft, recombinant PDGF, and a chorion–amnion barrier covered by a subepithelial connective tissue graft, was successful for correcting both the hard- and soft-tissue deformities around a maxillary canine. Additional prospective controlled studies are needed to determine how this compares to other methods more traditionally used.

Summary

<table>
<thead>
<tr>
<th>Why is this case new information?</th>
<th>Combines soft- and hard-tissue regenerative procedures to treat a mucogingival deformity and intrabony defect simultaneously</th>
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<tbody>
<tr>
<td></td>
<td>Layers four types of care: 1) use of a biologic (recombinant PDGF); 2) a bone replacement graft; 3) a chorion–amnion barrier; and 4) a subepithelial connective tissue graft</td>
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<td>What are the keys to successful management of this case?</td>
<td>Proper diagnosis and treatment planning</td>
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<td>Preoperative occlusal management</td>
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<td>Thorough root preparation</td>
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<td>Graft containment/clot stabilization</td>
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<td>Strict adherence to maintenance</td>
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<td>What are the primary limitations to success in this case?</td>
<td>Poor handling of soft tissues</td>
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<tr>
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<td>Inadequate root preparation</td>
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<td>Strict adherence to postoperative maintenance care, particularly during the earlier stages of healing</td>
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Acknowledgment
Dr. Rosen serves on the Clinical Advisory Board to Snoasis Medical and is a consultant for LifeNet Health.

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References


indicates key references.