A Case Report on Combination Therapy Using a Composite Allograft Containing Mesenchymal Cells With an Amnion–Chorion Barrier to Treat a Mandibular Class III Furcation

Paul S. Rosen*†

Introduction: Maintaining molars with Class III furcation invasion remains one of the greatest challenges in periodontics. Surgical treatment of these areas by any means has been disappointing. This case report describes a successful combined regenerative approach using a composite allograft with mesenchymal stem cells along with a barrier derived from human amnion–chorion to close a Class III furcation.

Case Presentation: The patient was a 62-year-old white male referred for the treatment of his periodontal and dental implant needs. The mandibular left required functional crown lengthening for the two premolars along with management of the Class III furcation on the first molar. The unopposed second molar with both an advanced osseous lesion and 1+ degree mobility was to be extracted. Surgical exposure allowed the furcation to be thoroughly scaled and planed, treated with tetracycline for root modification, followed by intramarrow penetration and recombinant platelet-derived growth factor applied to the roots. A composite allograft containing mesenchymal cells was used to fill the defect, and it was layered by a barrier derived from human amnion–chorion tissue. The flaps were coronally advanced and sutured with expanded polytetrafluoroethylene. Six months after the completion of surgery, the furcation was closed to a Nabers probe from both the buccal and lingual aspects and radiographically, the area was radiopaque suggestive of bone fill/containment.

Conclusion: This case report demonstrates the closure of a Class III furcation based on horizontal probing and radiographic bone fill, giving hope that this combined approach for regeneration may hold promise for treating this most challenging of clinical dilemmas. Clin Adv Periodontics 2013;3:64-69.

Key Words: Bone regeneration; bone transplantation; guided tissue regeneration, periodontal; mesenchymal stem cells.

Background
The long-term maintenance of molars with Class III furcation invasion remains one of the greatest challenges in periodontics. Treatment has involved debridement along with resective, tunneling, and restorative material insertion for blockage or regenerative efforts.1 The resective and tunneling approaches have been disappointing because severe root sensitivity or decay has left patients disappointed with the outcome.2,3 Open-flap debridement for accessing the area while placing the flap back over to its original position leaves the burdensome task of maintaining these cul-de-sacs for bacterial retention in a masked manner, and regeneration with even combined regenerative approaches has been somewhat inconsistent in achieving total furcation closure.4
Regeneration would be the optimal way to approach this problem. Certainly the scaffolding bone replacement grafts, biologics, and barriers available today give the clinician greater hope for positive regenerative outcomes. However, the difficulty still remains in getting the blood supply and progenitor cells necessary to regenerate this relatively avascular area.5

Recently, a commercially available cellular allograft bone matrix containing mesenchymal stem cells (MSCs) has become available that has been successfully used for both maxillary sinus augmentations6 and guided tissue regeneration for teeth with severe osseous lesions.7,8 Bowers et al.9 pointed out that the limiting factor to regeneration around teeth is often the formation of bone. If these cells could be harnessed to provide this component to attachment apparatus reconstruction, then the more advanced lesions, such as a Class III furcation, may have a better chance for successful regeneration.

Clinical Presentation

The patient was a 62-year-old white male referred to a private practice limited to periodontics (Yardley, Pennsylvania) for evaluation and treatment of his generalized periodontal and dental implant needs. Medical history was not contributory to his current problems because the patient reported that he had hypertension for which ramipril and hydrochlorothiazide were taken. Written informed consent was obtained from the patient prior to treatment. The mandibular left required functional crown lengthening for the patient’s two premolars along with the management of both the first molar with a Class III furcation and an unopposed second molar with an advanced angular osseous lesion (Figs. 1 and 2). The teeth in this quadrant had degree 1 mobility, with the second molar having degree 1+ mobility and the first molar having no mobility.

Case Management

The patient was instructed and reinforced in his oral hygiene efforts, and the area had already received scaling and root planing along with the entire dentition with no improvement seen for this area. The patient rinsed immediately before the surgery with a 0.12% chlorhexidine mouthwash. Anesthesia was obtained using both a mandibular block with 2% carbocaine with 1:20,000 levonordefrin and 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 and lingual aspects from tooth #18 distal to #19 mesial with inverse beveled full-thickness flaps around the premolars. After elevation of the flaps, the second molar was extracted, and the premolars received functional crown lengthening to facilitate their restoration. The Class III furcation lesion was visualized and thoroughly debrided, and the roots were scaled and planed with ultrasonic and hand instruments along with rotary instrumentation using finishing burs on a high-speed hand piece. The buccal and lingual crown margins of the first molars were in close proximity to the furcation (Figs. 3 and 4), and, in the future, it will be replaced because it probably helped contribute to the lesion on the tooth. A tetracycline solution (250 mg/5 mL) was applied to the roots of tooth #19 for additional debridement using cotton pellets vigorously burnishing this area for 2 minutes. The tetracycline solution was rinsed from the roots, and intramarrow penetration was performed in the furcation 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 surfaces through a cannula tip while carefully isolating the site to avoid any contamination by either blood or saliva. Before the procedure, the MSC allograft was prepared according to the manufacturer’s instructions. The graft was placed into the furcation defect using light incremental pressure (Fig. 5). An amnion–chorion barrier‖ was placed over the graft at both furcation

FIGURE 1 Pretreatment radiograph of the site suggests furcation invasion of the first molar along with an advanced intraosseous lesion at the mesial aspect of the second molar.

FIGURE 2 Pretreatment view of the first molar shows coverage of the furcation by soft tissue that appears slightly hyperplastic. PDs were 5 mm vertically, and a Nabers probe could access both the facial and lingual furcations and be advanced to the opposite side. Although no mobility was observed, wear patterns were noted.

‡ Osteohealth, Shirley, NY.
‖ Osteocel, NuVasive, San Diego, CA, distributed by ACE Surgical Supply, Brockton, MA and processed by AlloSource, Centennial, CO.

Rosen

Clinical Advances in Periodontics, Vol. 3, No. 2, May 2013
entrances (Fig. 6), and the flaps were advanced to cover the furcations with their respective barriers. The 6-0 expanded polytetrafluoroethylene suture and interrupted technique secured the flaps in place (Figs. 7 and 8).

Infection control consisted of prescribing 875 mg amoxicillin to be taken twice daily for the first 7 days. For analgesia, 600 mg ibuprofen was taken up to four times.

* Gore-Tex, W.L. Gore & Associates, Flagstaff, AZ.
The patient was seen approximately every 2 weeks for postoperative treatment during the first 3 months. Sutures were removed at the second visit. He was then seen every month for 6 months after surgery. Postoperative visits included plaque debridement, polishing to remove stains, and oral hygiene reinforcement. Chlorhexidine (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 he also 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.

**Clinical Outcomes**

At 6 months, an updated radiograph was exposed, suggesting mineralized tissue in the furcation along with the extraction site (Fig. 9). Furthermore, there was no suggestion of root resorption associated with the treatment. Probing depths (PDs) at the first molar were 1 to 2 mm, and a Nabers probe could not gain access into the furcation region, suggestive of its closure (Fig. 10). Three-dimensional imaging at 6 months using cone-beam computerized tomography (CBCT) suggested complete furcation closure based on slices taken from an occlusal view looking apically (Fig. 11) and sagittally at the midroot (Fig. 12).

**Discussion**

This case report adds to the growing evidence that a composite allograft composed of cancellous bone combined with demineralized cortical bone from the same donor and seeded with MSCs is capable of reconstructing the lost periodontium. The clinical results seen in this case report appear to mimic those obtained when autogenous hip marrow had been used. Although autogenous hip marrow continues to be considered the benchmark for comparison for bone
replacement graft materials because of its ability to achieve supracrestal regeneration along with complete fill of Class III furcations, its use unfortunately carries the added morbidity associated with its procurement along with root resorption that has occurred in a number of cases during the healing process, condemning the tooth that had been treated. There are several concerns surrounding the current treatment approach. Two of these include whether allogenic reactions might occur with the use of MSCs and whether these cells may indeed cause the same root resorption seen with hip marrow. MSCs appear to have an immune-privileged status that has been supported by at least one in vivo study. Regarding root resorption, the cases to date have not demonstrated this phenomenon and may indeed be related to the cryopreservation of the tissue, as was the circumstance with hip marrow in the past.

Summary

Why is this case new information?  ▪ This case demonstrates the closure of a Class III furcation based on horizontal probing and radiographic bone fill, giving hope that this combined approach that uses a composite allograft using stem cells for regenerative care may hold promise for treating this most challenging of clinical dilemmas.

What are the keys to successful management of this case?  ▪ Although this case focuses on the materials used to achieve this successful clinical result, it is the fundamentals of regenerative therapy that are paramount. These include proper patient selection, attaining a clean root surface, stabilizing the clot, maintaining space, modulating the biologics to achieve a favorable regenerative environment, and strict adherence to maintenance therapy with outstanding oral hygiene practiced throughout the healing process.

What are the primary limitations to success in this case?  ▪ There still remain certain key elements that are critical for regenerative success, including patient factors such as smoking and lack of compliance, the ability to access and achieve a root surface free of plaque and calculus, lack of occlusal control, which includes fremitus and mobility beyond degree 1, and close adherence to maintenance therapy.  ▪ Although the clinical result appears promising, confirmation with human histology is necessary to label it as a “regenerative” procedure.

Acknowledgments
The author thanks Dr. D. Walter Cohen, who has been inspirational in his commitment to dentistry and in particular the field of periodontics. Dr. Rosen has received lecture fees from Snoasis Medical (Denver, Colorado).
References


*indicates key references.