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Treatment of Endodontic Perforations Using Guided Tissue Regeneration and Freeze-Dried Bone Allograft: Two Case Reports with 2-4 Year Post-Surgical Evaluations

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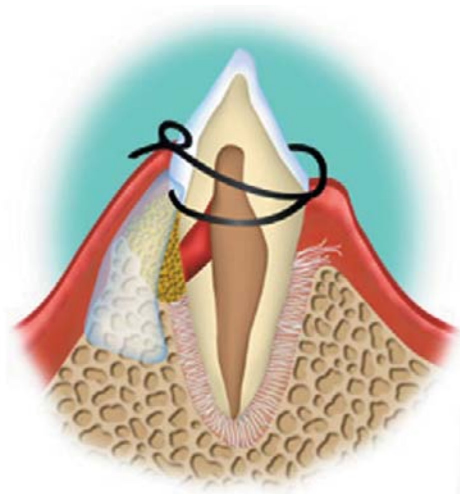

Abstract

Clinicians often have difficulty with the diagnosis and treatment of root perforation. This paper reports two patients with root perforation treated with periodontal surgery associated with guided tissue regeneration (GTR) and demineralized freeze-dried bone allograft (DFDBA). This combined treatment resulted in minimal probing depths, minimal attachment loss, and radiographic evidence of bone gain after follow-up evaluations that ranged from 2 to 4 years. These case reports show a correct diagnosis and removal of etiologic factors can restore both periodontal and endodontic health.

Keywords: Endodontic perforation, guided tissue regeneration, GTR, freeze-dried bone allograft, DFDBA, periodontal surgery, root perforation

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Introduction

Although endodontic perforation and cervical root resorption are not common, they represent a serious problem that significantly decreases the prognosis of endodontic treatment.[1] Perforation of root walls may be provoked by iatrogenic causes, caries, or resorptive processes. A non-surgical approach to repairing endodontic perforations is preferred. However, extrusion of repair material, such as gutta-percha, calcium hydroxide, and endodontic cements in the periodontal space may interfere with healing. A surgical approach may be useful when non-surgical treatments such as filled root perforations, subgingival restorations, crown lengthening, and/or orthodontic extrusion techniques are limited or inefficient.[2-4]

Root perforation may cause bone defects with varying degrees of periodontal tissue damage. Recent case reports have demonstrated the use of guided tissue regeneration (GTR) can be successfully applied for the surgical treatment of endodontic lesions.[5-7] GTR can promote or guide the proliferation of periodontal ligament cells onto denuded root surfaces, thereby, demonstrating extensive regeneration of the attachment apparatus. In addition, the association of demineralized freeze-dried bone allograft (DFDBA) may allow osteoconduction and facilitate the bone regeneration process.

The purpose of this article is to present two case reports with periapical osseous defects treated by a combination of DFDBA and GTR.

Figure 1a. Pre-surgical presentation showed a probing depth of 7 mm and bleeding on probing.

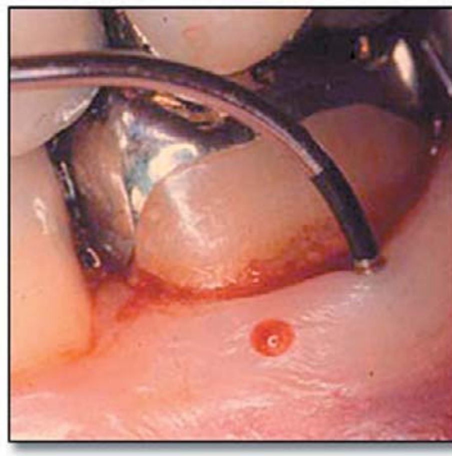

Figure 1b. Furcation area defect.

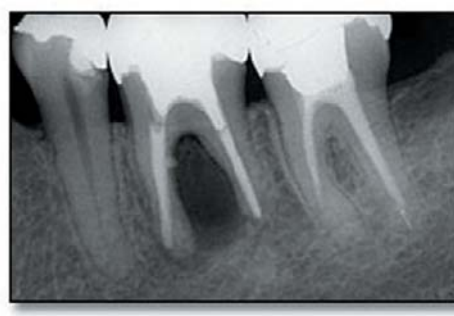

Figure 1c. Periapical radiograph view demonstrating the furcation bone defect and the root perforation.

Case Reports

Case 1

A 45-year old patient presented without contraindications for dental treatment. His previous dental history included non-surgical root canal therapy performed 1 year earlier on tooth #30. The patient presented a probing depth of 7 mm and a Class 2 furcation defect (Figure 1). A metal crown was present. A periapical radiograph showed radiolucency in the furcation area.

After administration of local anesthesia, a reverse full-thickness flap including the mesial papilla and the periosteum was raised. At the apical extent, the lesion measured 9.0 mm in depth and 5.0 mm in width. (Figure 2a) A large buccal defect was observed. The level of interproximal bone was normal.

The defect was then thoroughly debrided and residual granulation tissue was completely removed. The bone defect was carefully lavaged with sterile saline solution, and adequate bleeding points were established by intramarrow penetration prior to the placement of the bone graft. DFDBA (Dembone, Pacific Coast Tissue Bank,

Figure 2a. Facial view of the defect after debridement.

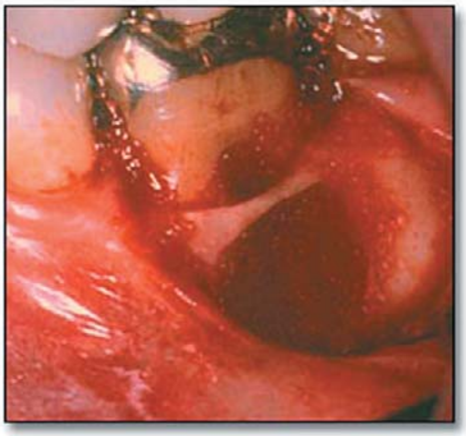

Figure 2b. DFDBA is placed in the defect.

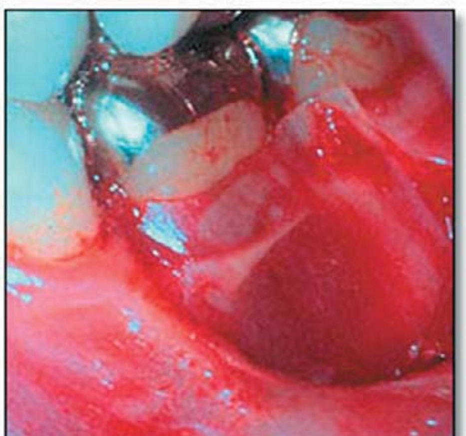

Figure 2c. Collagen periodontal membrane contains the DFDBA in the defect.

Los Angeles, CA) was rehydrated with saline solution and placed in incremental steps into the defect. Once placed, the graft was compressed with saline gauze to avoid excessive air spaces between the particles (Figure 2b). A resorbable collagen membrane of a suitable size was selected and trimmed so the barrier extended over the lesion by 2 to 3 mm in all directions onto sound bone. (Figure 2c)

Figure 3a. Periapical radiograph at follow-up 6 months later.

Figure 3b. Radiographic view 12 months-post treatment.

Figure 3c. Clinical view 12 months-post treatment. Note the decrease in probing depth.

Care was taken to avoid contact of the membrane with the adjacent teeth. Complete wound closure was obtained by means of single interrupted sutures at the cementoenamel junction. Postoperative care consisted of the use of a 0.12% chlorhexidine mouthrinse twice a day for 7 days without mechanical cleaning at the surgical area. Acetaminophen, 75 mg twice a day or as needed, for pain control and amoxicillin, 1500 mg per day for 7 days, were prescribed.

The patient was seen once a week during the first month. After follow up at 6 and 12 months (Figures 3a & 3b, respectively), radiographic evaluation suggested new bone formation and a decrease in the probing depth from 7 to 3 mm (Figure 3c).

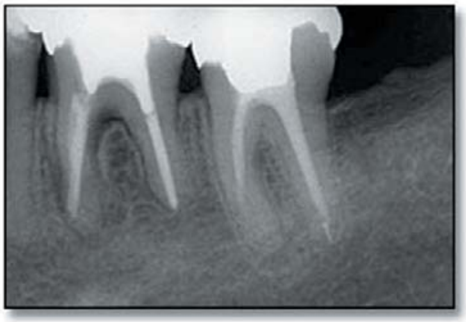

Figure 4. Radiograph at 48 months. Note the obvious bone fill in the furcation area and absence of a radiolucent area.

Figure 5a. Clinical view using a gutta perha point to show a fistula in the mesio-buccal surface of tooth #12.

Figure 5b. Radiographic view of a sinus tract stoma traced to a lesion in the palatal root.

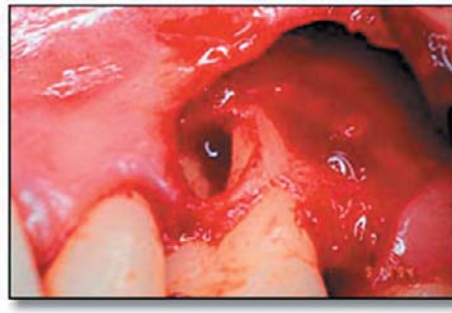

Figure 6a. Clinical view after reflection of the mucoperiosteal flap.

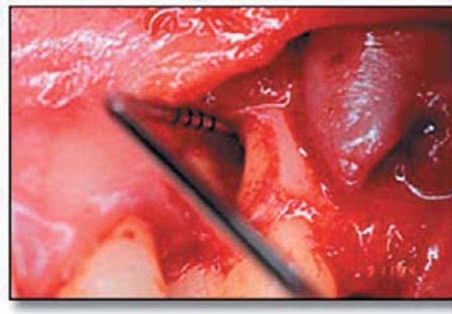

Figure 6b. Measuring the width of the lesion using the periodontal probe.

Figure 6c. Defect filled with DFDBA.

At 48 months post-surgically, the patient returned for dental treatment for esthetic restoration. The radiograph demonstrated complete bone regeneration (Figure 4).

Case 2

In this case a 37-year old woman presented with a fistula in the mesiobuccal surface of tooth #12 after endodontic treatment. Her previous dental history included root canal therapy two years previously with a root perforation in the palatal root. A sinus tract stoma was traced to a lesion in the mesiobuccal face. (Figures 5a & 5b)

After reflection of a full-thickness mucoperiosteal flap, intact bone was observed on the mesial and distal surfaces of the tooth but bone tissue was absent in the furcation. (Figures 6a & 6b)

After degranulation, the site was treated with tetracycline-HCl. The saline solution was added to tetracycline, and the tooth was burnished for 30 s. The root surface was washed with saline solution for 1 minute and burnished again with tetracycline solution for 30 s. The defect was then filled with DFDBA. (Figure 6c)

A resorbable periodontal membrane (Pacific Coast Tissue Bank, Los Angeles, CA) was then used to cover the defect.

At follow-up 2 years later, the tooth was asymptomatic with normal probing depths (3 mm). (Figures 7a to 7c)

Figure 7a. Clinical view 12 months post operative.

Figure 7b. Radiographic view at 12 months post operative.

Figure 7c. Radiographic view of tooth #12 with no fistula or bleeding, 24 months after surgery.

Discussion

The results of these case reports indicate that GTR associated with a DFDBA graft can be successfully used to reconstruct large alveolar bone defects of endodontic origin. Until recently, successful outcomes of endodontic surgery have ranged from 50 to 70%.[8-9]

In this report the use of a barrier prevents contact of the connective tissue not only with the osseous defects but also with the denuded root surface, protecting and stabilizing the blood clot, and, consequently, the wound.[6,7] Douthitt et al.[10], on the basis of their histological observations, suggested the use of an absorbable barrier seems to allow the ingrowth of periodontal ligament cells into the periradicular area, resulting in new connective tissue attachment. This new attachment includes the formation of new cementum and new bone.

In addition the use of biomaterial associated with an absorbable barrier played an important role in the alveolar bone regeneration in these reported cases. The DFDBA works as a space-maker for the blood clot to prevent barrier collapse into large osseous lesions and allowing osteoconduction for bone regeneration. These characteristics are essential for formation and the attachment gain seen in these clinical reports.

Complementary, the flap design and reflection necessary for proper defect access precluded the need to free the periosteum further from the inner aspect of the flap before membrane placement. This procedure allows tension-free flap apposition and closure of the flaps.[11]

These results also demonstrate the technique can be effective for enhancing the treatment of extensive periapical lesions, cervical root resorption, and root perforations.[12] The clinical success of this procedure has been proven radiographically during 2 to 4 years of follow-up.

Another important factor in the procedure is the root perforation. Root perforation is not a defect of homogenous structures. It involves different interrelated tissue types. Treatment considerations for this defect require the use of materials consistent with the characteristics of dentin and periodontum.[11-13]

In addition the size of an alveolar bone lesion may surpass the critical defect size for complete bone regeneration even when the wound is enclosed within bone. A success rate of 40% was found for lesions exceeding 15 mm in diameter, whereas small lesions of 5 mm had a success rate of 62%.[9,14]

Conclusion

These case reports may be an additional demonstration of the efficiency of GTR associated with DFDBA. Further studies are needed to better evaluate the success criteria by volumetric measurement of osseous defects caused by endodontic perforation.

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