Management of Longstanding Furcation Perforation Using a Novel Approach

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Abstract

Introduction: Iatrogenic furcation perforation may occur during the access preparation of the endodontic treatment. This may lead to periodontal defects and subsequent tooth loss. In this case report, we presented a new approach that may help salvage cases with a longstanding furcation involvement and substantial bone loss resulting from perforation. **Methods:** A mandibular molar case that had a furcation perforation and longstanding furcation bone loss with a probing depth of 10 mm in the buccal furcation area. We applied a novel approach, which used both nonsurgical and surgical interventions. We first reaccessed the tooth to reseal the perforation site with MTA followed by a newly designed surgical approach including the use of a stent, a reverse submarginal flap, Emdogain (Straumann USA, Andover, MA), guided bone regeneration, and postoperative isolation of the surgical site. The post-treatment follow-ups with up to 19-month recall showed favorable results with significant bone regeneration at the furcation and the probing depth reduced to 4–5 mm. **Conclusions:** Longstanding furcation perforations with periodontal involvement may be savable and have a better prognosis. This may require a modified flap design to access the defect, guided bone and periodontal regeneration, and postoperative isolation of the surgical defect. *(J Endod 2014;40:1255–1259)*

Key Words

Emdogain, furcation, guided bone regeneration, mineral trioxide aggregate, perforation, reverse submarginal flap

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0099-2399/$ - see front matter

http://dx.doi.org/10.1016/j.joen.2013.12.013

A perforation is a mechanical or pathologic communication between the root canal system and the external root surface, often a sequela of iatrogenic damage. Three main factors affect the prognosis for the affected tooth (1):

1. The location of the perforation
2. Time elapsed before the perforation is sealed
3. The possibility of sealing the perforation successfully

Coronally positioned perforation sites have a poor prognosis (2), with furcal perforations having the worst prognosis among all other locations. Microbial contamination of unsealed perforations in primates has been shown to damage the periodontium and destroy the surrounding bone structure (3).

Mineral trioxide aggregate (MTA) has undergone extensive investigation as a root-end filling material (4). Several studies showed that MTA has outstanding sealing ability (5, 6), has good marginal adaptation (7), and stimulates bone and cementum formation (8, 9). Additionally, clinical case reports have shown that MTA encourages long-term healing in furcation perforation cases (10, 11). However, no studies have reported the regeneration of furcal bone in areas of extensive furcal bone loss subsequent to iatrogenic perforation followed by repair with MTA.

Immediate sealing of furcation perforations appears to be a determining factor for success. Failure to seal the perforation immediately may result in furcal bone loss and persistent periodontal infection (1, 2). The prognosis of a tooth in such condition will be guarded, and tooth extraction would be the likely outcome. In the past decade, there have been significant advances in periodontal regeneration procedures. Bone grafting material and enamel matrix derivative (EMD), such as Emdogain (Straumann USA, Andover, MA), have been shown to promote periodontal regeneration and the re-establishment of tooth attachment in intrabony defects (12–14). Attempts to seal longstanding perforation using MTA together with bone and periodontal regeneration might promote healing and improve the overall outcome. This case report presents a novel approach to the management of a longstanding furcation perforation with a dual nonsurgical and surgical approach using guided bone regeneration (GBR) in combination with postoperative isolation of the surgical site.

Case Report

A 55-year-old black woman was referred for an evaluation of prior endodontic treatment. The patient complained of a dull pain localized to the posterior left mandibular area and a foul taste in her mouth. The patient had a history of nonsurgical root canal treatment performed on the left mandibular first molar by a specialist more than 1 year earlier, which was immediately restored with a ceramometal crown. The patient understood a furcal perforation had been created during initial canal identification by the patient's general dentist, which was addressed by the endodontist. Although the exact time elapsed between the perforation and subsequent repair could not be determined, the patient stated treatment by the endodontist occurred a few days after the general dentist started endodontic treatment.

The tooth exhibited tenderness to percussion and crevicular suppuration from the midfacial sulcus upon palpation. The periodontal examination revealed a 10-mm probing depth adjacent to the midbuccal groove. Probing depths on the lingual and proximal surfaces were 4 and 3 mm, respectively. Periapical radiographs revealed prior root canal treatment and a 5 × 3 mm radiolucency in the furcation area of the left mandibular first molar. The apical tissues appeared normal with an intact lamina dura. The periapical radiograph also revealed a radiopaque filling material to be occupying the floor of the pulp chamber and the furcation area (Fig. 1*A*). The sulcular defect was traced with a gutta-percha cone as a radiographic tracer, identifying involvement of the furcation area of the left mandibular first molar (Fig. 1*B*).

Tooth #19 was diagnosed as previously treated, and the apical diagnosis was normal apical tissues. As a result of a furcal perforation and a failed attempt at repair, tooth #19 was deemed to have a poor prognosis. The patient was informed about the risks, benefits, and alternative treatments, and extraction was advised. However, the patient requested that the tooth be saved. The patient understood the alternative approach and provided informed consent.

Treatment Plan

The treatment plan was as follows:

1. Reaccess and replace the existing perforation repair material with MTA.
2. Surgically clean the infected site and institute GBR.
3. Isolate the surgical defect postoperatively.

Replace the Old Perforation Repair Material with MTA

During the initial appointment, we took an alginate impression of the patient's lower left quadrant so that an acrylic surgical stent could be fabricated. This stent was later used as a guide during incision and to enable postoperative isolation of the surgical defect.

At the first treatment appointment, the patient was anesthetized, and tooth #19 was isolated with a rubber dam. The existing resin core was removed with a high-speed #2 round bur during access cavity preparation using a dental operating microscope until the previous perforation repair material was exposed. The repair material appeared to be gray MTA covering the entire pulp chamber floor. MTA appeared intact clinically despite the lack of homogeneity noticed radiographically. MTA was removed using size #4 Munce discovery bur (CJM Engineering, Santa Barbra, CA). The size of the perforation was 2 × 2 mm. The access cavity was disinfected with 5 mL 6% sodium hypochlorite (Chlorox Co, Oakland, CA). A custom-sized absorbable collagen wound dressing (CollaCote; Zimmer Dental, Carlsbad, CA) was adapted into the furcation area without overlapping the edges of the material onto the cavosurface of the perforation. The collagen matrix was used for hemostasis and to provide a matrix against which new MTA would be condensed. ProRoot White MTA (Dentsply Tulsa Dental Specialties, Tulsa, OK) was inserted into the perforated pulp chamber floor using the Micro-Apical Placement System (Dentsply Tulsa Dental Specialties). Then a moist cotton pellet was placed over the MTA. The access cavity was sealed provisionally (Cavit; 3M ESPE, St Paul, MN). An appointment for surgery was scheduled for 18 days later.

Surgical Approach to Clean the Infected Site and GBR

Before the surgical procedure, the tooth was isolated with a rubber dam and accessed. After confirmation that the MTA had set, the access cavity was sealed again with a temporary restoration (Cavit) (Figs. 1*C* and 2*A*). After local anesthesia, the sterile surgical stent was placed on the posterior left quadrant. An incision was made at the lower margin of the stent (4 mm apical to the sulcus) in the attached gingiva, extending from the mesial aspect of tooth #21 posteriorly to the distal of tooth #18. The vertical releasing incision mesial to tooth #21 extended coronally instead of apically, generating a "reverse submarginal flap" (Fig. 2*B*). A full-thickness mucoperiosteal flap was elevated coronally to expose the periodontal defect while not disturbing the gingival fibrous attachment at the papillae. Retraction of the coronal keratinized tissues was achieved using 3 sutures (Vicryl 5-0; Ethicon, Somerville, NJ) placed into the flap and held extraorally by the operator (Fig. 2*B*). The tissue apical to the horizontal incision was elevated apically to expose the entire bone defect. Periodontal curettes were used to remove the granulation tissue, scale the root surface, and recontour the recently placed MTA. The surgical defect was inspected under the dental operating microscope to ensure the removal of the granulation tissue (Fig. 2*C*). The root surface smear layer was removed with 24% EDTA (PrefGel, Straumann USA) (Fig. 2*D*) and rinsed with sterile saline followed by the application of Emdogain onto the exposed root surface. The surgical defect was then filled with a xenogeneic graft comprised of deproteinized bovine bone mineral (Bio-Oss; Geistlich, Wolhusen, Switzerland). The bone graft was covered with a resorbable membrane (BioMend, Zimmer Dental) (Fig. 2*E*), and the flap was reapproximated with 7 interrupted sutures (Vicryl 5-0).

Postoperative Isolation of the Surgical Site

The stent was created to cover the posterior left bicuspids and first and second molar teeth. The base of a hydrophobic putty polyvinyl siloxane impression material (Lab-Putty; Coltène/Whaledent, Cuyahoga Falls, OH) was loaded into the stent, without the addition of the catalyst component, and was used to stabilize the postsurgical site. Excess putty was trimmed intraorally using wax instrument, and the stent was secured with composite resin (Filtek Z250, 3M ESPE) plugs injected through retention holes created on the buccal and lingual surfaces of the surgical stent opposite teeth #20 and #18 (Fig. 2*F*). A postoperative radiograph was taken (Fig. 3*A*), and the patient was dismissed with postsurgical instructions. At the 1-week recall appointment, the stent

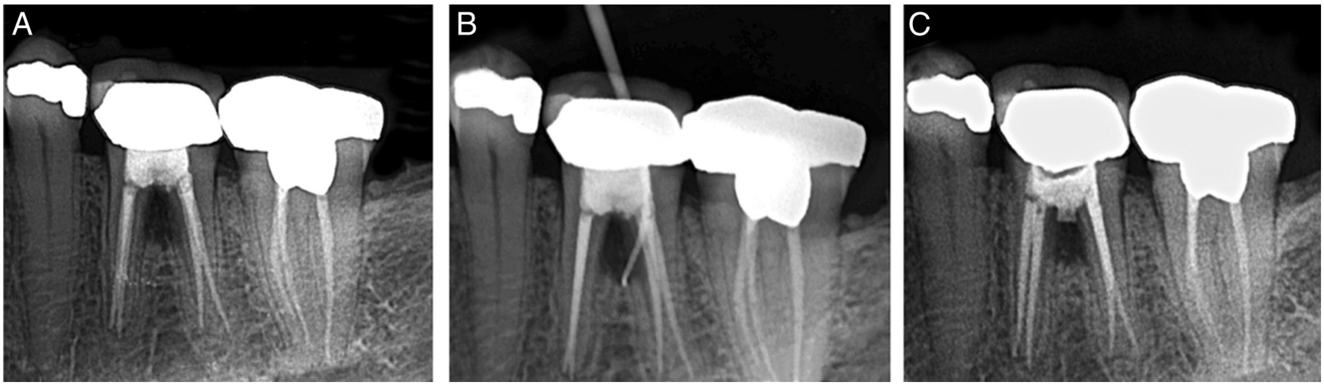

Figure 1. (*A*) A preoperative radiograph showing radiolucency associated with the furcation of tooth #19. (*B*) A radiograph with gutta-percha point placed in gingival sulcus sinus tract. (*C*) Pre-existing MTA removed and replaced with fresh and well-adapted MTA.