A Novel Treatment for Propagated Crown Fractures

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Abstract

Introduction: A major complication after endodontic treatment is persistent pain on biting or chewing. Although unsuccessful endodontic treatment can account for such pain, pain to chewing and biting can also be a result of an unsupported or propagated crown fracture. Crown fractures that extend apically result in deterioration of the localized periodontium and ultimate loss of the tooth. To date, no predictable treatment for apically extending crown fractures exists. **Methods:** Three cases of nonsurgical excision of a propagated crown fracture and the repair of the subsequent iatrogenic perforation are presented. **Results/Conclusions:** This case report series describes a novel treatment for apically progressive crown fractures that results in patient comfort and maintenance as well as improved periodontal status of the tooth. *(J Endod 2015;41:130–134)*

Key Words

Crown fracture, mineral trioxide aggregate repair, treatment

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Functional survival of endodontically treated teeth has been reported to be 97% over an 8-year period (1). However, crown or vertical root fractures and periodontal issues account for the vast majority of teeth requiring extraction (2–4). At present, the recommended treatment for teeth with crown fractures is cuspal coverage prepared with appropriate ferrule because it has been shown that adequate ferrule increases resistance to fracture in teeth with and without endodontic treatment (5). In teeth that presented with crown fractures and were diagnosed with a reversible pulpitis, placing cuspal coverage crowns resulted in the alleviation of symptoms without endodontic treatment for about 80% of those teeth (6). In practice, those patients who have persistent pain to biting and chewing as well as spontaneous pain after crown placement would require root canal treatment. If the patient's symptoms were not completely alleviated by endodontic therapy, a clinician would often be at a loss for further treatment options other than extraction and restoration of the space (7). This case report series describes a novel treatment for patients who have persistent pain to chewing and biting as well as spontaneous pain from teeth with previous endodontic treatment and existing full coverage crowns. The treatment involves locating the crown fracture nonsurgically, removal of the fracture, and repair of the iatrogenically created perforation. This technique has provided relief for the patient, and the periodontium has improved or remained stable for a significant amount of time.

Case Reports

Case 1

The patient is a 63-year-old woman who presented for elective root canal treatment of tooth #19 before having a new crown placed. The patient was asymptomatic. Nonsurgical root canal treatment was performed in 1 visit without complication (Fig. 1*A*). No internal fractures were noted. The patient failed to present for standard recalls at 6 and 12 months after treatment. At 18 months, the patient presented for recall with mild spontaneous pain and percussion sensitivity. Upon examination, tooth #19 was mildly tender to percussion and nontender to palpation, and the periodontal probing depths were within normal limits except for the mesial surface, which was 9 mm with bleeding on probing. A widened periodontal ligament space and angular defect were noted on radiographic examination (Fig. 1*B*). No apical pathology was noted. Tooth Sleuth (Professional Results, Inc, Laguna Niguel, CA) testing was responsive only to the mesial marginal ridge. A diagnosis of a previous root canal treatment with symptomatic apical periodontitis with probable mesial marginal ridge fracture was determined.

The patient was given the following options: titration of the fracture by its removal because the rest of the tooth appeared healthy, extraction, or intentional replantation. The patient was informed of a questionable prognosis for tooth #19. She elected to have the fracture removed nonsurgically. The tooth was anesthetized via infiltration. The tooth was isolated with a rubber dam and disinfected with 70% isopropyl alcohol, and an endodontic access was created. The fracture was located on the mesial aspect of the tooth (Fig. 1*C*). The fracture was removed with a #2 surgical length bur with water irrigation, resulting in a linear iatrogenic perforation of the mesial root surface (Fig. 1*D*). The site of the coronal aspect of the iatrogenic perforation was estimated at the osseous crest. A Gates Glidden bur was used to remove 2 mm of gutta-percha apical to the perforation site. The area was soaked with 2% chlorhexidine (Inter-Med, Inc, Racine, WI) for 5 minutes. The area was copiously irrigated with sterile saline. The perforation was dried with cut paper points and repaired with gray mineral trioxide aggregate (MTA) (Tulsa Dental Specialties, Tulsa, OK) (Fig. 1*E*). The access was cleaned with 95% ethyl alcohol. Sterile cotton was placed over the MTA and access etched with 32% phosphoric acid. The area was irrigated with water, the sterile cotton

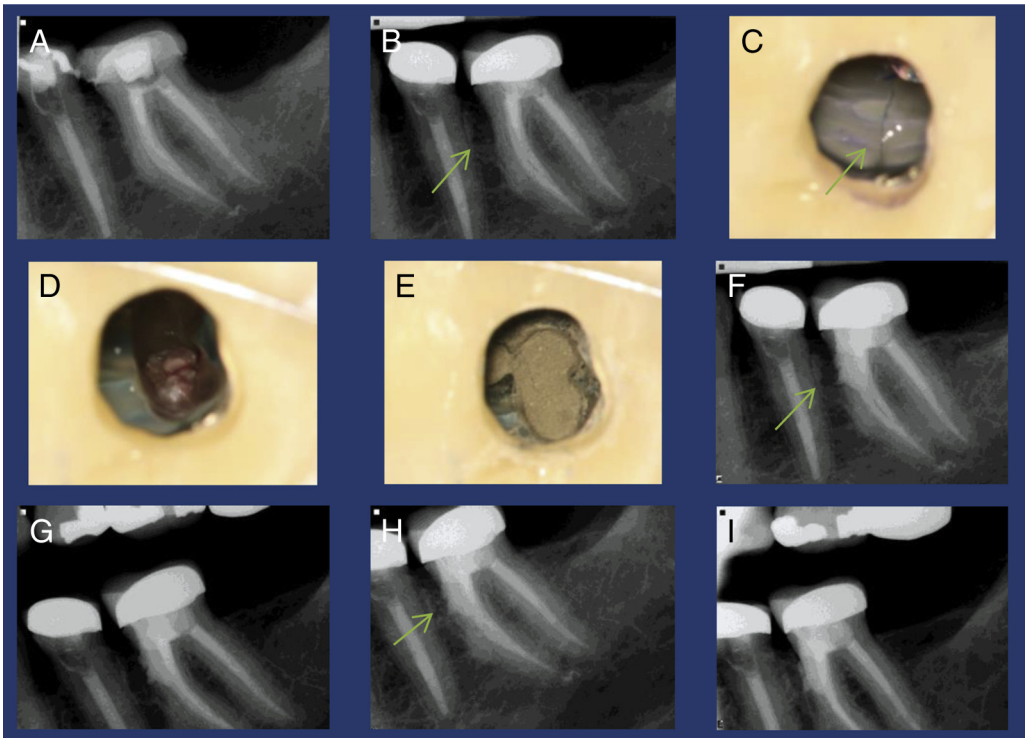

Figure 1. (*A*) Completion of the initial root canal treatment. (*B*) The 18-month recall from the initial treatment showing an angular defect on the mesial (*arrow*). (*C*) Methylene blue staining of the mesial fracture (*arrow*). (*D*) Iatrogenic perforation of the mesial fracture. (*E*) MTA repair of the iatrogenic perforation. (*F*) The periapical radiograph after fracture removal. (*G*) The bitewing radiograph after fracture removal. (*H*) The 2-year recall periapical radiograph showing resolution of the angular defect on the mesial surface (*arrow*). (*I*) The 2-year recall bitewing radiograph showing resolution of the angular defect.

was removed, and Clearfil Prime and Bond (Kuraray Noritake Dental, Inc, Okayama, Japan) and Geristore (DenMat, Lompoc, CA) were placed over the MTA repair and 2 mm into the mesial canals. A Build-It Core Restoration (Pentron Clinical, Orange, CA) was placed over the Geristore. The occlusion was adjusted. The restoration was polished and the tooth radiographed (Fig. 1*F* and *G*).

The patient presented at 1 month after fracture removal. The patient was asymptomatic and nontender to percussion. The patient could eat on the tooth, which was not possible before the procedure. The mesial periodontal probing depth had improved to 6–7 mm. No deterioration of the bone was noted on a radiograph. It was decided to place Arestin (Orapharma, Horsham, PA) in the 6- to 7-mm pocket to see if that would help improve the periodontal status. At 2 months after fracture removal, the tooth was asymptomatic. The periodontal probing depths had decreased to 5 mm without bleeding. No deterioration of the bone around tooth #19 was noted. At 6 months after fracture removal, the tooth remained asymptomatic, and the periodontal probing depth on the mesial aspect was 3 mm without bleeding. No deterioration of the bone around tooth #19 was noted. At 2 years after fracture removal, the tooth was asymptomatic with normal periodontal probing depths and signs of repair of the angular defect noted before fracture removal (Fig. 1*H* and *I*).

Case 2

The patient was a 44-year-old man who presented for root canal treatment. Tooth #19 was diagnosed with an irreversible pulpitis with a symptomatic apical periodontitis (Fig. 2*A*). Tooth #19 had a shallow restoration and a visible distal marginal ridge fracture. At treatment, the distal marginal ridge fracture was visualized but did not appear to enter the distal canals (Fig. 2*B*). Two millimeters of a nickel-titanium instrument was separated in the distolingual canal. The author was able to bypass the instrument but not remove it. The patient was advised of the separated instrument and the distal marginal ridge fracture, and endodontic treatment was completed in 1 visit (Fig. 2*C*). The patient failed to present for standard recalls at 6 and 12 months. At 18 months, the patient presented for recall. Tooth #19 was mildly tender to percussion and nontender to palpation. The patient had mild spontaneous pain. A 6-mm distal periodontal probing depth was noted along with an angular defect (Fig. 2*D*). A diagnosis of a previous root canal treatment with a symptomatic apical periodontitis secondary to propagation of a distal marginal ridge fracture was determined. The patient was advised of the questionable prognosis.

The patient was given options of nonsurgical fracture removal, extraction, or intentional replantation. The patient opted for nonsurgical fracture removal. The tooth was anesthetized via infiltration. The tooth was isolated with a rubber dam and disinfected with 70% isopropyl alcohol, and an endodontic access was created. The fracture was located on the distal aspect of the tooth (Fig. 2*E*). The fracture was removed with a diamond ultrasonic tip (Pear Diamond Tip; EIE2, San Diego, CA) with water irrigation, resulting in a linear iatrogenic perforation of the distal surface of the root (Fig. 2*F*). The site of the coronal aspect of the iatrogenic perforation was estimated at the osseous crest. A Gates Glidden bur was used to remove 2 mm of gutta-percha apical to the perforation site. The area was soaked with 2% chlorhexidine for 5 minutes. The area was copiously irrigated with sterile saline. The perforation was dried with cut paper points and repaired with gray MTA (Fig. 2*G*). The access was cleaned with 95% ethyl alcohol. Sterile