Regenerative Endodontic Treatment with Orthodontic Treatment in a Tooth with Dens Evaginatus: A Case Report with a 4-year Follow-up

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Abstract

Dens evaginatus is a developmental tooth anomaly in which an extra cusp or tubercle protrudes on the occlusal surface of the tooth along with some pulpal tissue. Because of the fragile nature of the protrusion, these teeth are often at risk of pulpal exposure. When this occurs in an immature tooth, regenerative endodontic treatment may be a good treatment approach to promote root formation. There is limited literature that documents the occurrence of orthodontic treatment in teeth that have undergone regenerative endodontic therapy using triple antibiotic paste. Here we present a case of an immature premolar tooth with dens evaginatus that was diagnosed with pulp necrosis and chronic apical abscess. The tooth was treated with regenerative endodontic treatment; after which, the patient received orthodontic treatment with fixed appliances for 2 years. The tooth responded favorably to the regenerative endodontic treatment and orthodontic tooth movement. Clinically and radiographically, all the follow-up examinations revealed an asymptomatic tooth with evidence of periapical healing with stunted root development. The tooth remained asymptomatic even after 4 years. The regenerative endodontic procedure (REP) was successful in treating an immature permanent premolar with pulp necrosis and apical periodontitis with dens evaginatus. In this case, the tooth treated with an REP responded to orthodontic treatment similar to the non-endodontically treated teeth. Further studies are recommended to clarify the precise effects of orthodontic treatment on teeth treated with an REP. *(J Endod 2018;■:1–4)*

Key Words

Dens evaginatus, orthodontic treatment, regenerative endodontic therapy, repair, root formation

Significance

This article will be a great addition to the current literature because it describes the treatment and long-term results of a tooth with dens evaginatus that was treated successfully with regenerative endodontic treatment followed by orthodontic treatment with fixed appliances.

Dens evaginatus is a developmental dental anomaly consisting of a protruding cusplike tubercle that usually contains a pulp extension. Physiological occlusal wear or intentional removal of the tubercle during occlusal adjustment can result in pulpal horn exposure leading to pulpal necrosis and apical periodontitis (1, 2). Many recent publications have shown that regenerative endodontic procedures (REPs) have become a preferable treatment option for immature permanent teeth with pulp necrosis and apical periodontitis (3–6). REPs aim to induce apical growth and promote thickness of the dentinal walls (3, 4). A crucial step in this therapy modality is the disinfection of the canal system using triple antibiotic paste (TAP), a mixture of metronidazole, ciprofloxacin, and minocycline or calcium hydroxide, as an intracanal medicament (7, 8). At a subsequent appointment, the intracanal disinfecting medication is removed, and bleeding is induced. The canal is then sealed with mineral trioxide aggregate (MTA) or some other bioceramic material at the cementoenamel junction (CEJ). The bioactivity of bioceramic materials will promote the action of growth factors and stem cells to induce pulp regeneration and root maturation (9–11). Finally, a tight coronal seal with glass ionomer or composite will preserve the canal free of bacteria, maintaining the ideal conditions for tissue regeneration. Published case reports and case series on immature permanent teeth with pulp necrosis have shown that REP is an effective therapy for conserving these teeth with compromised structural integrity (7, 11–13). Moreover, taking into consideration that the age of the patient population treated with REP is generally between 6 and 17 years of age, it is possible that those patients may undergo orthodontic treatment. The literature is not very clear regarding the precise effects of orthodontic tooth movement on endodontically treated teeth. Root resorption and apical blunting are common iatrogenic effects of orthodontic treatment in many patients. However, endodontically treated teeth show minimal root resorption if the canal is well sealed in all 3 dimensions. Also, it has been reported that teeth with incomplete root formation show a lesser degree of root resorption when moved orthodontically (14). However, to the best of our knowledge, there are no reports on cases treated with orthodontic treatment on teeth previously treated with regenerative endodontic therapy.

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Case Report

A 14-year-old female presented to the endodontic department at Rutgers School of Dental Medicine, Newark, NJ, with discomfort in her lower left premolar. The patient reported that the pain started around 3 weeks after her general dentist "ground" her tooth (pointing to tooth #20). Her medical history was noncontributory. Clinical examination revealed a circular well-defined dentin zone in which dens evaginatus was present (Fig. 1*A*) There were buccal and lingual sinus tracts in front of the apex of tooth #20 (Fig. 1*B* and *C*). There was no evidence of any carious lesion. Tooth #20 had a negative response to cold test with Endo-Ice (Coltene, Cuyahoga, OH) and responded positively to both percussion and palpation. Periodontal probing exhibited probing depths that were less than 3 mm. Radiographic examination showed periapical radiolucency associated with tooth #20 with an immature apex and absence of any caries (Fig. 1*D*). Tooth #20 with dens evaginatus was diagnosed with pulp necrosis with chronic apical abscess. The other second premolars (#4, #13, and #29) also presented with dens evaginatus; however, the patient did not have any pain or discomfort associated with these teeth. Pulp tests were performed on all of them, and we observed normal responses. Radiographically, teeth #4, #13, and #29 also presented with immature apices but without any apical radiolucencies.

After reviewing the risks, benefits, and treatment options with the patient and her parent, informed consent was obtained to perform an REP on tooth #20. The tooth was anesthetized with 2% lidocaine with 1:100,000 epinephrine. Access opening was performed under rubber dam isolation (Fig. 2*A*), and purulent and hemorrhagic drainage was noted. All subsequent procedures were performed under an operative microscope (Global Surgical Corporation, St Louis, MO). The root canal was gently irrigated with 5 mL 1% sodium hypochlorite and dried with paper points. TAP (Champs Pharmacy, San Antonio, TX) was mixed with saline solution in a 1:1 ratio until a pasty consistency was obtained. TAP was placed along the entire length of the root canal space by using a 20-G needle up to the level of the CEJ. To avoid crown discoloration, the pulp chamber was prepared using 35% phosphoric acid (Ultra-Etch; Ultradent, South Jordan, UT), and Adper Single Bond Plus Adhesive (3M ESPE, St Paul, MN) was placed and light cured. Special attention was also taken to remove the extra TAP from the pulp chamber walls, and a temporary glass ionomer restoration was placed (Ketac Cem; ESPE America, Norristown, PA). The patient was scheduled to return after 1 week for a quick follow-up; she was asymptomatic, and the sinus tracts had noticeably reduced in size (Fig. 2*B*). A periapical radiograph was taken, and no signs of intracanal medication were apically evident (Fig. 2*C*).

Two weeks later, the tooth was asymptomatic, and the buccal and lingual sinus tracts had completely healed. The tooth was anesthetized with 3% mepivacaine without vasoconstrictor. After isolation with a rubber dam, the temporary restorative material was removed. TAP was flushed out using gentle irrigation with 1% sodium hypochlorite, dried with sterile paper points, irrigated with 17% EDTA, and dried again. A #40 K-file was introduced into the canal through the apical foramen with a counterclockwise push-and-pull motion to induce apical bleeding. The blood was allowed to fill the entire canal space (Fig. 2*D*). White MTA (Tulsa Dental, Tulsa, OK) was prepared according to the manufacturer's instructions and then placed directly in contact with the clot using small increments and gently condensed with the thicker side of a coarse paper point to a depth of approximately 3 mm apically to the CEJ (Fig. 2*E*). A moist cotton pellet was placed over the MTA in the pulp chamber, and the access opening was closed with glass ionomer cement (Ketac Cem) (Fig. 2*F*). Postoperative radiographs were taken. A small piece of MTA remained at the apex (Fig. 2*G*). The patient was discharged with instructions to take acetaminophen 200 mg (4 times a day for 7 days) if needed for any postoperative discomfort. After 24 hours, the patient was given a follow-up phone call. The parent reported that the patient was completely asymptomatic and was doing well. The patient was asked to return after 2 weeks. The tooth was asymptomatic, and there was no evidence of the sinus tracts. However, the crown of tooth #20 exhibited slight discoloration. Local anesthetic and rubber dam isolation was placed. The glass ionomer and cotton pellet were removed. MTA was set, and the tooth was restored with composite.

Follow-up Examinations

The patient was scheduled for follow-up visits and was seen again at 4 months (Fig. 3*A* and *B*) and thereafter approximately every 6 months during the next 4 years. At 4 months, the radiograph exhibited resolution of the periapical radiolucency. At the 1-year follow-up (Fig. 3*C* and *D*), it was noted that the patient had begun orthodontic treatment that lasted for 2 years. At each of these follow-up visits, the tooth continued to be free of symptoms but did not respond to either thermal or electric pulp tests (Fig. 3*D* and *E*). The tooth was not sensitive to percussion or palpation and was completely functional. Radiographic evaluation of tooth #20 showed no evidence of any further root development. During the subsequent follow-up appointments, clinical and

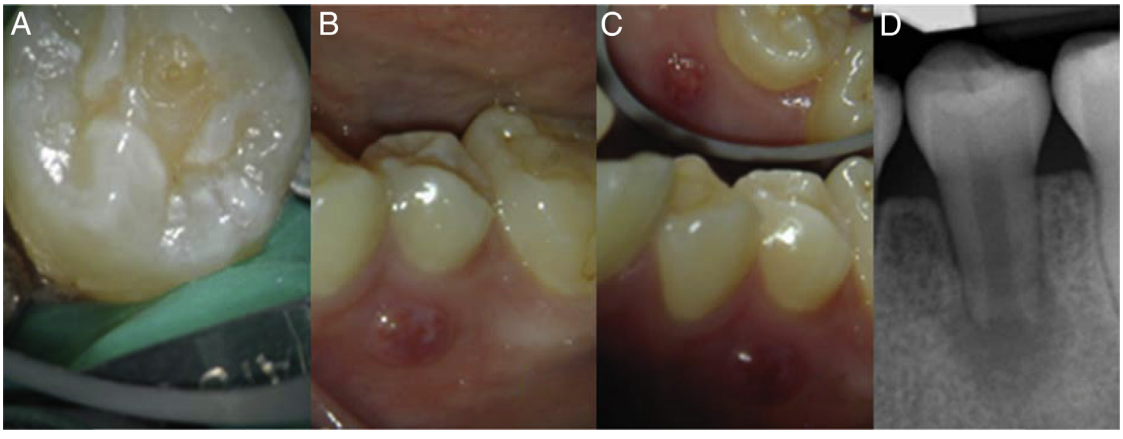

Figure 1. Preoperative photographs and radiographs. (*A*) Dens evaginatus with tooth #20. (*B* and *C*) Buccal and lingual sinus tracts associated with tooth #20. (*D*) A periapical radiograph depicting periapical radiolucency associated with tooth #20 with an immature apex and the absence of any caries lesions.