Abstract

Regenerative endodontics is a biologically based procedure designed to replace damaged dentin and root structures, necrotic pulp cells, utilize stem cells, growth factors, organ-tissue culture, and tissue engineering scaffold materials. This clinical case report details the treatment of a trauma-induced necrotic, immature, permanent central incisor by a regenerative approach, instead of the conventional apexification technique. After the diagnosis of necrosis with symptomatic apical periodontitis, the tooth was accessed and profuse drainage noted. The canal was disinfected with copious amounts of sodium hypochlorite utilizing the EndoVac irrigation system and an interim treatment of a triple antibiotic paste (Zephrin, Nondent) was placed. After the disinfection protocol was complete and the patient was asymptomatic, the canals were dried with paper points. An antibiotic paste (ProRoot MTA, Dentsply De Trey) was placed followed by access of the crown. After the disinfection protocol was complete and the patient was asymptomatic, the tooth #7 was placed with subsequent access of the crown. The tooth had slight percussion sensitivity, and thermal tests were all normal. After sensitivity testing was completed, it was concluded that the treatment plan would include extraction of the primary cuspid and regenerative endodontic procedure for tooth #7.

Treatment

First Appointment – 5-09-09
- A periapical radiograph (PA) was taken (Figure 1). Local anesthesia 2% lidocaine (.018 mg ep) was administered, and rubber dam isolation placed with subsequent access of the crown.
- Irrigation with 20 ml 2.5% NaOCl using an irrigation system that minimizes extrusion of irrigation solution into the parulis was performed. A triple antibiotic paste (ProRoot MTA, Dentsply De Trey) was placed. After irrigation with 20 ml of EDTA, then normal saline were used. The canals were dried with paper points.
- Bleeding was created into the periapical tissues (closed end and side vented needles and EndoVac was used).
- The access was sealed with 3 mm of temporary restoration starting at CEJ followed by temporary restorative material.
- The patient was scheduled for 3-4 weeks follow-up.

Second Appointment – 07-02-09
- Initial treatment was assessed. Patient was asymptomatic with no swelling or sinus tract present. No percussion sensitivity associated with tooth #7. A periapical radiograph was taken.
- Vitality tests were normal. There were no symptoms of persistent infection. A primary diagnosis of an immature permanent maxillary lateral incisor.
- Local anesthesia with 3% mepivacaine without vasoconstrictor was administered and rubber dam isolation was placed followed by access of the crown.
- Irrigation solutions with 20 ml of EDTA, then normal saline were used.
- The canals were dried with paper points.
- Bleeding was created into central canal system by over-instrumentation with a sterile endodontic file and irrigation solution was stopped 3 mm from CEJ.
- A resorbable matrix (collagen barrier) was placed at the orifice followed by 3-4 mm of white MTA starting at CEJ.
- A permanent bonded restoration was placed in the access (Figure 2).

6 Month Follow-up - 12-16-09
- Patient returned asymptomatic and PA taken (Figure 3). Continued root development can be seen with resolution of periapical radiolucency.
- No swelling or sinus tract clinically present, and tooth #7 tested normal to percussion, mobility, probing, and palpation.

18 Month Follow-up – 1-11-11
- Patient returned for follow-up. A PA taken (Figure 4). Complete root development can be seen with tooth #7 and intact periodontal ligament. No pathosis detected.
- No swelling or sinus tract clinically present, tooth #7 asymptomatic to percussion, and response to thermal tests is normal. Probing, mobility, and palpation are normal.

Conclusions

The predictability and success of this procedure has not yet been determined. Only case reports, case series, and controlled animal studies are available for review at this time. However recent case reports have demonstrated that recarization of necrotic immature infected root canals is possible in vivo. With further development this new procedure may be a replacement treatment for the aplication procedure allowing the patient to retain their natural tooth whereas with aplication this would likely not occur. This case report confirmed that successful regeneration of previously necrotic-infected canals is possible provided the canal can be effectively disinfected.

Case Report

Dental History/Sensibility testing

An eight year old patient presented to her general dentist two months after experiencing trauma to her anterior maxilla. The patient was referred to Indiana University Graduate Endodontic Clinic and was seen as an emergency patient on 6/11/09 (Figure 1). The patient presented with swelling in the perapical area of #7 and radiographic evidence of a periapical radiolucency. Tooth C (right primary maxillary cuspid) and tooth #7 had +1 mobility, and there was slight mobility with hot/cold tests. Clinical findings included tooth #7 was percussion sensitive, no response to thermal testing, and no response to EPT testing. Tooth #8 had slight percussion sensitivity, and thermal tests were all normal. After sensitivity testing was completed, it was concluded that the treatment plan would include extraction of the primary cuspid and regenerative endodontic procedure for tooth #7.

Recommended treatment of these teeth includes thin dentinal root walls, poor crown-root ratio, increased risk of fracture, and an open apex. Apexification is the traditional method to induce a calcified barrier in a root canal. When this method was planned for tooth #7, the patient requested more recent techniques of mineral trioxide aggregate as an artificial barrier. Following the apexification protocol, the mineral trioxide aggregate was placed on root of the blood clot followed by a dentin bonded resin. After 18 months, both clinical and radiographic evidence suggested a favorable biological response with this newly developed treatment protocol. This reports illustrates a successful use of a new endodontic technique for the management of immature necrotic permanent teeth.

References