

Revascularization of an Immature Maxillary First Premolar with Necrotic Tissue: A Case Report

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Objectives The purpose of this study was to present a case of regenerative endodontic procedure.

Case The maxillary 1st premolar of a 9-year-old patient was diagnosed as necrotic. Since the tooth was immature, we decided to treat this tooth with regenerative endodontic procedure. After disinfection of the canal, bleeding was induced by lacerating the peri-apical tissues and a blood clot was formed. Orifice was sealed by MTA and the tooth was restored. 6-months and 1-year follow-ups showed increased root thickness and closure of the apical.

Conclusion It can be concluded that the regenerative endodontic procedure used in this study was successful since there was an evident development in root width.

Keywords : Dental Pulp, Necrosis, Regeneration, Endodontics

Introduction

The pulps of young permanent teeth are at risk of breakdown after traumatic injuries, dental caries, and restorative dentistry. Premature loss of a functioning pulp results in a fragile tooth with a compromised crown-to-root ratio, thin dentin walls, and a wide and often apically diverging root that presents significant endodontic and restorative challenges.¹ Frank advocated the use of Ca(OH)₂ to stimulate apexification.² Despite this technique's success, it has been indicated by Andreasen et al. that long-term calcium hydroxide as a root canal dressing weakens the root structure and may increase root fracture risk.³ Use of an artificial apical barrier was an alternative for apexification procedure. This technique allowed immediate obturation of the canal.⁴ MTA as an apical barrier was first introduced in 1996.⁵ It has been indicated that MTA apical barrier technique is a successful method for obturating teeth with pulp necrosis and immature apices.⁶ Nevertheless, none of the techniques mentioned above can induce root development.

Recently regenerative endodontic treatment has been introduced as biologically based procedures designed to replace damaged structures such as dentin, root structures, and cells of the pulp-dentin complex.⁷ Regenerative endodontic protocols result in continued root maturation which means the teeth and root are not as inherently weak and susceptible to fracture as the traditional techniques of Ca(OH)₂ apexification and MTA barrier placements. Studies which have compared REPs with the traditional approaches of calcium hydroxide apexification and MTA apical barrier techniques have shown comparable outcomes.⁸⁻¹⁰

In the past the possibility of regeneration and regaining vitality was thought to be low because of the infection caused by bacterial contamination.^{11, 12} Thus the most important factor for promoting pulpal regeneration is to properly disinfect the root canal system.^{13, 14} Several techniques and methods have been advocated to reach this

goal: Using NaOCl alone or NaOCl in combination with chlorhexidine or hydrogen peroxide as irrigation agent to chemically disinfect the root canal space, placing triple antibiotic mixture (metronidazole, ciprofloxacin and minocycline) or calcium hydroxide as an intracanal medicament between the first and second visits.¹⁵⁻¹⁹ If there are no signs of inflammation in the following visits, the intracanal medicament will be removed. The next step is to create a blood clot in the root canal system and seal the canal by placing MTA on the blood clot. Blood clot is formed by induced bleeding caused by irritating the periradicular tissue.¹⁹ Successful outcomes have been reported for the approach mentioned above.^{16, 20} The present report describes treatment of an immature, necrotic, permanent maxillary 2nd premolar with apical periodontitis by using regenerative endodontic therapy.

Case Report

In 2016 a healthy 9-year-old patient was referred to the Endodontic Department of the Dental School, Shahid Beheshti University of Medical Sciences. The patient had no remarkable medical history. Pain on chewing at the right side of the maxilla in the past two weeks was reported as chief complaint by the patient. Clinical and radiographic examination showed extensive caries of tooth #5 and amalgam filling of tooth #3 (Fig 1 and 2). Overall the patient's oral hygiene was good. Since there was extensive caries on tooth #5 it was assumed that this tooth might be the reason for patient's pain. The patient reported that the tooth in question only had pain on chewing. There was no facial asymmetry, no swelling and there was no enlargement of cervical and submandibular nodes present. No swelling and no sinus tracts were found relating to tooth #5. The tooth had normal mobility and periodontal pocket depth. Cold test by cold spray (Endo Frost, Roeko, Langenau, Germany) did not induce any response, while the response of teeth #4 and #28 to these tests were normal. Also the tooth was sensitive to percussion. Radiographic

examination showed periapical radiolucency and PDL widening of tooth #5 (Fig 2).



Figure 1- Clinical view of the tooth



Figure 2- Initial radiograph of the tooth

It also showed that tooth #5 has an immature apex. Based on the results of clinical and radiographic examination, the pretreatment diagnosis for tooth #5 was pulp necrosis with symptomatic apical periodontitis. Considering the stage of root development and its wide open apex, the optimal treatment plan was regenerative endodontic therapy. Treatment plan was explained to the patient and her parents, and then a written consent was acquired. After local anesthesia by 2% Lidocaine with 1/80000 epinephrine (Persocaine-E, Darou pakhsh Co, Tehran, Iran) and rubber dam isolation, the access cavity was prepared with fissure diamond bur (Tizkavan, Tehran, Iran). Root canals were minimally instrumented and gently irrigated with 20ml of NaOCL 1.5% throughout the process of canal preparation (not used once) followed by 20 ml of normal saline. Canals were dried with paper points. Using lentulo-spiral, aqueous mixture of triple antibiotics containing equal portions (by weight) of metronidazole (Pars Daru, Tehran, Iran), ciprofloxacin (Amin Daru, Tehran, Iran) and clindamycin (Pars Daru, Tehran, Iran) at the concentration of 1.0 mg/ml was placed in the canals. The access cavity was sealed with coltosol (Ariadent, Tehran, Iran) and the patient was asked to come back three weeks later. The tooth was asymptomatic at the 2nd visit. 3% mepivacaine without vasoconstrictor (Darou Pakhsh, Tehran, Iran) was used as local anesthesia to facilitate the ability to trigger bleeding into the canal system. Then the tooth was isolated with rubber dam and the temporary restoration was removed. Antibiotic paste was removed by gentle filing and irrigation

with 20ml of 17% EDTA (Sina Teb, Tehran, Iran). Then the canals were dried with paper points. A pre-curved size #25 k-file was extended beyond root apex and rotated to lacerate the periradicular tissue and induce bleeding. The bleeding was controlled up to 4mm from the CEJ. MTA was prepared by mixing MTA powder (MTA-Angelus, Londrina, PR, Brazil) and distilled water according to manufacturer's instructions. Roughly 4mm of white MTA was placed in the coronal third of the canal by MTA carrier (Medesy, Maniago, Italy) and condensed using paper points. The access cavity was rinsed with saline and then a wet cotton pellet was placed inside access cavity. Access cavity was sealed with glass ionomer (GC Fuji II, GC Corp, Japan) and patient was then referred to restorative department for composite filling of this tooth (Fig 3A). The patient came back for 6 months and 12 months follow-ups. The tooth was asymptomatic and functional at follow-up visits. Radiographs were taken (Fig 3B and 3C). Apical lesion had almost resolved at the 6-months visit. At the 12-months follow-up there was an increase in root thickness and an apical barrier has been established at the root apex.

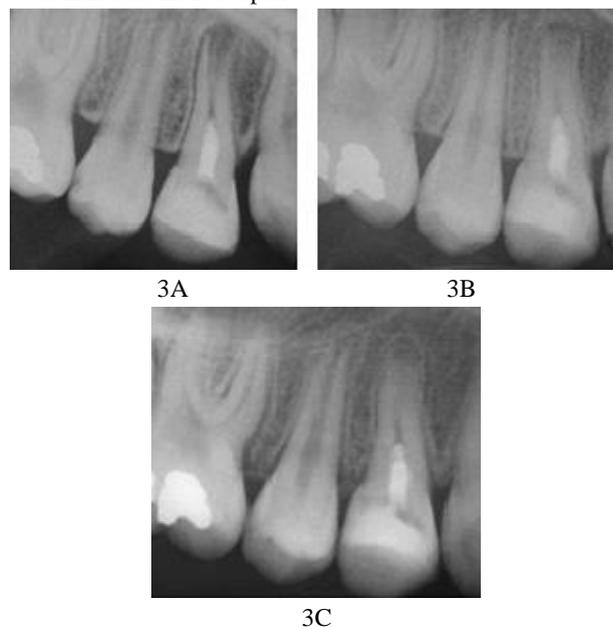


Fig 3- A: Post-regenerative endodontic procedure radiograph, B: 6 months follow-up, C: 12 months follow-up

Discussion

Based on the results of the present study, hydroalcoholic extract of aloe vera had antibacterial activity against cariogenic bacteria especially *S. mutans*, and with an increase in its concentration and duration of exposure, its efficacy increased; however, its effect was significantly lower than that of 0.2% CHX mouthwash.

Conclusion

It can be concluded that the regenerative endodontic procedure used in this study was successful since there was

an evident development in root width and establishment of an apical barrier.

Conflict of Interests

None Declared ■

Acknowledgement

The authors deny any conflicts of interest related to this study.

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