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Case Report

Revascularization of a necrotic immature permanent central Incisor: a case report

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ABSTRACT

Revascularization is a technique for management of immature necrotic teeth with open apex. In this article, a successful stem cell-based pulp revascularization procedure is described. In this instance, the tooth was asymptomatic after a two-year follow-up. The dentinal walls on the recall visit were thicker, the roots were longer, and the apex had closed.

***Keywords:** Immature teeth, Open apex, Pulp revascularization, Stem cells, Apical papilla*

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INTRODUCTION

A dentist faces a particularly difficult situation when treating a necrotic tooth with an immature open apex. Apexification with calcium hydroxide is the preferred method since it is intended to create a hard tissue barrier at the apex.[1] Single visit apexification accomplished by placing a synthetic wall in the root canal's apical section, is an alternative to calcium hydroxide apexification. The recommended material strategy is MTA, It also has a significant success rate and therefore will reduce the number of required clinical visits.[2,3] The identical drawback of these two apexification techniques is that they both prevent further root development, which results in brittle root structure.

Revascularization is an excellent option today to treat necrotic immature teeth to have a better prognosis. It permits root development to continue, in contrast to apexification and artificial apical barrier approaches.[3]

CASE REPORT

A left central incisor of the maxilla that was stained in an 8-year-old child was examined and treated at the dental office.[4] The patient's father, who was present, said that his kid had fallen at school unintentionally two months prior. There was no significant contribution from the medical history. Upon percussion or palpation, tests showed that teeth were not tender. Mobility was not present.[5] An examination of the tooth's radiographs revealed periapical radiolucency and insufficient root development (Fig.1). Using cold and electric pulp testing, the pulp's vitality proved negative.

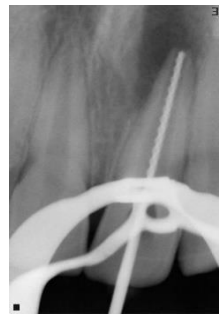
Figure 1: Pre-operative radiograph of 21

It was diagnosed that 21 had asymptomatic irreversible pulpitis with apical periodontitis. Revascularization as a therapeutic option was explained to the father, who gave his informed consent after being aware of its drawbacks and benefits.

TREATMENT PROCEDURE

The tooth was isolated with a rubber dam after being anaesthetized with 2% lidocaine.[6] A diamond bur was utilized to prepare an access cavity (KG Sorensen, Barueri, Brazil). Size 60 K-file was used to establish the working length (Fig.2). The coronal third of the root canal was passively widened with a Gates Glidden drill no. 4. (Dentsply Maillefer, Tulsa, OK, USA). Using large, sterile absorbent tips, the canal was dried after passive irrigation with 20 mL of 5.25% NaOCl for 20 minutes (Dentsply Maillefer). An antibiotic paste that contained ciprofloxacin, metronidazole, and minocycline (100 mg of each medication in volume of 0.5 mL) was freshly prepared and employing a lentulo-spiral, inserted into the canal. The access opening was sealed after a sterile cotton pellet was put on top of the triple antibiotic paste.

Figure 2: Working length determination.



The patient had no symptoms, and the tooth was no longer sensitive to pressure or palpation after three weeks. Under local anaesthesia, the temporary restoration was removed while being isolated with a rubber dam. With the help of 10 mL of 5.25% NaOCl and 10 mL of saline, the triple antibiotic paste was eliminated. The canal was made dry with paper points following the final treatment with 17% EDTA (10 mL) (Dentsply Maillefer). After causing new bleeding by lacerating the periapical tissue of the tooth with an ISO 60 K-file, a blood clot developed apically 3 mm from the cementoenamel junction. After 15 minutes, the blood clot was wrapped with white MTA (Dentsply Tulsa Dentistry, Tulsa, OK, USA). The tooth was temporarily fixed with Cavit, and the MTA was shielded by a moist cotton pellet (3M ESPE). The temporary restoration was taken out a day later, and the access cavity was sealed with glass ionomer cement (Fuji IX; GC Company, Tokyo, Japan) (Fig. 3).

Figure 3: Immediate post-op radiograph

At the 6-month recall, the tooth was still intact, showed normal periodontal indications, and wasn't sensitive to pressure or touch (Fig.4).

Figure 4: 6-month recall

The tooth was still functioning and asymptomatic at the 24-month recall. Along with an extension of the root, closure of the apex, and hardening of the dentinal wall were both seen (Fig.5). Finally, the patient had the choice of cosmetic treatment of the tooth with a crown.

Figure 5: 24-month recall

DISCUSSION

Revascularization is an advancement of regenerative endodontic procedures. The key ingredients for regenerative endodontic success include the absence of intracanal infection, a robust coronal seal, a physical environment that fosters cell development and differentiation, and signaling molecules that encourage stem cell multiplication.[7] According to revascularization protocol, irritation to the pulpal tissue induces bleeding and later this blood clot acts as scaffold and supplies growth factors for regeneration.[8,9]

In revascularization operations, instrumentation is urged to be avoided. In the current instance, GG drills were passively employed in the coronal third to simplify irrigation, the administration of a triple antibiotic dressing, and the MTA cement placement on the blood clot. Because the walls of the dentinal tubules in the roots are so thin, any instrumentation weakens them and increases the risk of future fractures. Recent research by Trevino et al in 2009 revealed that irrigation procedures using 17% EDTA may help to remove smear layers, link stem cells to the dentinal wall of the root canal, and release growth factors from the dentin.[10] A triple antibiotic paste, also known as Hoshino's paste, is typically used during pulpal regeneration treatments. The formula, which must be blended with propylene glycol to form a creamy paste, comprises 200 mg of ciprofloxacin, 500 mg of metronidazole, and 100 mg of minocycline.[11] Some revascularization reports state that the clinical crown has discoloured, which may be related to the use of grey MTA and/or the inclusion of minocycline in the triple antibiotic paste.[12] In order to reduce coronal discolouration, Reynolds et al. advocated using a unique tool (Root Canal Projector) when introducing triple antibiotic pastes in 2009[13] Cefaclor was successfully substituted for minocycline in triple antibiotic paste according to Thibodeau et al. in 2007 and Trope et al. in 2010,[14] which may be a useful strategy to avoid the discoloration that minocycline causes. According to one theory, the severity of the discolouration caused by the administration of triple antibiotics might be reduced or avoided by use of a dentin-bonding agent and sealing of the dentinal tubules inside the chamber.[13]

In intracanal cementum-like tissue, which develops along the inner dentin wall when dentinal walls are reinforced, according to animal studies, the lumen is commonly filled with bone-like tissue.[15,16] Collateral circulation ensures the survival of apical papilla stem cells even in necrosed pulp. These stem cells have the capacity to develop into primary odontoblasts and produce dentin in vivo when provoked by the induction of bleeding.[17,18]

CONCLUSION

The effectiveness of revascularization today is mostly dependent on stem cells from the apical papilla, an appropriate blood clot scaffold, and a good coronal seal with a biomaterial, such as MTA. In this instance, recall visits revealed indications of the effective revascularization of juvenile necrotic permanent teeth with apical periodontitis, including signs of root lengthening, apical closure, and gradual thickening of the dentinal walls.

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