



**Case Series**

**A case series on two-stage disinfection in regenerative endodontics on permanent mandibular molar with blunderbuss canal**

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**ABSTRACT**

**Background:** Revascularization is a promising approach as it promotes root end closure forming healthy, thick root dentin at the apex which provides clinical and radiographic success due to the elimination of bacteria and disinfection of the canal, giving a 100% sterile environment to receive SCAP.

**Aim:** To examine the effect of a regenerative endodontic procedure on immature necrotic teeth with apical periodontitis

**Method:** Two medically fit patients were referred to the department with a lingering type of pain in the immature permanent mandibular first right molar. Bleeding was induced in the root canals at the third appointment. The blood clots (scaffolds) were covered with MTA, and the tooth was restored with a composite filling. Recall sessions were scheduled after one month and 3 months, when the tooth appeared asymptomatic clinically and radiographically, with considerable periapical healing.

**Conclusion:** An immature multirouted tooth with necrotic pulps and periapical radiolucency was managed with evident clinical and radiographic success, wherein non-setting calcium hydroxide paste and triple antibiotic paste were used sequentially to guarantee complete canal disinfection.

**Keywords:** *Immature permanent teeth, Regenerative endodontics, Nonvital teeth, Blunderbuss canal.*

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## INTRODUCTION

Revascularization is a promising approach as it promotes root end closure forming healthy, thick root dentin at the apex.<sup>1</sup> In revascularization, disinfection of the necrotic pulp canal is an important and major step for the success of treatment. A good barrier at the apical end is not completely possible with conventional apexification as it only ensures a calcific barrier at the root end, and doesn't promote root closure leaving blunder buss canal intact.<sup>2</sup> Treatment of necrotic immature molars in children has been a challenge in pediatric dentistry. The permanent first molars are one of the first teeth to erupt with non-coalesced pits and fissures that are prone to caries with pulpal involvement at an early age. At this age common encounter of incomplete root closure with discontinued development of dentinal walls after pulp necrosis can lead to weak root structures that are susceptible to fracture in the future.<sup>3,4</sup> Traditionally, apical barrier formation using calcium hydroxide was the treatment option in such teeth and was successful with some drawbacks of increased brittleness of root dentin and fracture. Alternatively, a different material in place of calcium hydroxide was used for apical barrier formation with a higher success rate with the same disadvantage of ceased root end closure.<sup>5</sup>

Regenerative endodontic procedure (REP) is one of the treatment modalities offered for necrotic teeth that allows the root completion of necrotic immature teeth.<sup>6</sup> It is a regenerative treatment and a biologically based alternative approach to treat necrotic immature teeth that, unlike apexification and artificial apical barrier techniques, allows the continuation of root development with the use of metaplastic cells or stem cells especially stem cells from human exfoliated deciduous teeth (SHED) or stem cells from apical papilla (SCAPs).<sup>7,8,9</sup> SCAPs are responsible for the continuation of root development as they are the source of primary odontoblasts<sup>10,11</sup> and, due to proximity to the periodontal blood supply, can survive pulp necrosis even in the presence of peri-radicular infection.

This procedure followed proper infection control protocol, providing a suitable matrix for fresh tissue in growth, and an adequate tight coronal seal.<sup>7</sup> The proper disinfection was reported with different methods, such as using calcium hydroxide or triple antibiotics paste (TAP). In this case report a slightly altered protocol with two-stage disinfection using both calcium hydroxide as a first dressing for 1 week followed by TAP suggested by Hoshino et al., as a second dressing for 2 weeks was used and coronal restoration was done followed by stainless steel crown restoration.

## CASE REPORT 1:

An 8-year-old medically fit boy was referred to the Department of Paediatric and Preventive Dentistry, for management of immature permanent mandibular first right molar with lingering type of pain. Clinical examination revealed extensive caries on the occlusal and distal sides with sensitivity to percussion. The vitality test resulted in a negative response. Periodontal probing was within the normal limits and no mobility was seen. Radiographic examination revealed an immature permanent mandibular molar with periapical radiolucency (Figure 1). A diagnosis of necrotic pulp with symptomatic apical periodontitis was reached. Among the various treatment options, Revascularization was suggested as the best possible option. The patient and his mother were informed about the new procedure its benefits and risks and consent was obtained for the procedure.



**Figure 1:** shows the pre-operative radiograph

At the first visit, caries removal and proper access cavity were prepared under rubber dam isolation and inferior alveolar nerve block with 2% lidocaine and 1: 100,000 epinephrine, and four canal orifices were allocated. AAE-prescribed irrigation protocol was followed. First, irrigate with 20 ml of 1.5% sodium hypochlorite (NaOCl) for 10 minutes followed by copious saline irrigation and then dried using paper points. The nonsetting calcium hydroxide was applied to the full length of the canals and the tooth was temporarily restored with Cavit. After a week, the access cavity was reopened to receive TAP dressing (Figure 2) before which calcium hydroxide was washed out using 20 ml of 1.5% sodium hypochlorite.



**Figure 2:** shows the TAP dressing placed in the entrance cavity

The triple antibiotic paste (TAP) was made from a mixture of three antibiotics (ciprofloxacin, metronidazole, and doxycycline) with normal saline until creamy consistency was obtained. TAP was introduced to the canal orifice and the cavity was restored with temporary restorative material, cavite cement. The third appointment was scheduled after three weeks. In this appointment, anesthetic infiltration of LA without vasoconstrictor was administered. The TAP was washed out and the canals were thoroughly irrigated with 20 ml of 17% EDTA. Following canal drying, bleeding was initiated by inserting a 25-K file beyond the apex by 2 mm in each canal. After the blood clot formation, MTA was placed until two-thirds of the canal (Figure 3) followed by composite restoration. Recall appointments were scheduled at one month, and at three months (Figure 4). Long-term follow-up was also advised. Twenty-four months of recalls were scheduled to check for the case's long-term success. There was no sign of infection or inflammation clinically. Radiographic evaluation (Figure 4) revealed obvious healing of periapical lesions.



**Figure 3:** show healing periapical lesion  
at 1 month



**Figure 4:** show healing periapical lesion  
at 3 months

#### **CASE REPORT 2:**

A 9-year-old medically fit girl was referred to the Department of Paediatric and Preventive Dentistry, for the management of an immature permanent mandibular first right molar with the lingering type of pain. Clinical examination revealed extensive caries on the occlusal-distal sides with sensitivity to percussion. The vitality test resulted in a negative response. Periodontal probing was within the normal limits and no mobility was seen. Radiographic examination revealed immature roots with periapical radiolucency concerning the suspected tooth (46) (Figure 6). A diagnosis of necrotic pulp with symptomatic apical periodontitis was reached. Among the various treatment options, REP was suggested as the best possible option. The benefits and risks of REP were fully explained to the patient and his mother, and consent was obtained for the procedure. The same procedure as in the first case was followed.



**Figure 7 and Figure 8** show the pre-operative and working length radiograph.



**Figure 5 and Figure 6:** show the pre-operative and working length radiograph.



**Figure 7:** shows triple antibiotic paste used for the procedure



**Figure 8:** show chronic periapical lesion  
at baseline



**Figure 9:** show healing periapical lesion  
at 3 months

## DISCUSSION

A small modification to the disinfection process was used to perform REP on an immature nonvital permanent molar tooth with periapical radiolucency. Favourable clinical and radiographic outcomes were revealed after the 3-month follow-up with further appointments scheduled. Previously published case reports followed a different management protocol that was mainly limited to the disinfection of the root canal system. Studies by Nosrat et al.<sup>11</sup> and Sonmez et al.<sup>12</sup> reported cases of necrotic immature molar teeth treated by revascularization using TAP alone. Cehreli et al.<sup>13</sup> and Chueh et al.<sup>14</sup> found successful outcomes in all teeth using calcium hydroxide paste. Moreover, da Silva et al.<sup>15</sup> noted positive outcomes with the help of apical negative pressure in disinfection of the canal. Resolution of signs and symptoms, regaining pulp vitality, radiographic evidence of continued root development, and apical narrowing are important goals of successful REP<sup>5,6</sup>. Many factors play a role in achieving successful REP, such as the presence of vital stem cells, disinfecting the root canal system, and the creation of blood clots in the canals which are critical for being disinfection of the root canal system. Then, the stem cells present in the apical papilla show collateral circulation that keeps them alive even with pulp tissue necrosis. Based on this, inducing bleeding in the periapical tissue allows the stem cells to enter disinfected canal space and act as scaffold. These autogenous cells along with the blood clot will facilitate both pulp regeneration and continuing root tissue formation. In this case, a few modifications were done based on a case report by Mohannad Alasqah<sup>16</sup>, which included the application of calcium hydroxide medication inside the root canals for one week before the TAP application as suggested by Hoshina et al. The treated cases showed successful outcomes. The coronal seal is an important part of any endodontic procedure to prevent infection of the canals. Due to its biocompatibility and excellent sealing ability, MTA was used above the blood clots followed by composite core built up.

## CONCLUSION

An immature multirrooted tooth with necrotic pulps and periapical radiolucency was managed with evident clinical and radiographic success, wherein non-setting calcium hydroxide paste and triple antibiotic paste were sequentially used to guarantee complete disinfection of the canals. Randomized clinical trials are required to warrant the feasibility of this disinfection protocol.

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Nil

## CONFLICTS OF INTEREST

There are no conflicts of interest

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