Pulp tissue regeneration in the treatment of immature premolars accompanied by infection: A case report

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ABSTRACT

Background: Young permanent teeth are one of the challenges in performing endodontic treatment. Revascularization is a good yet simple treatment option for pulp tissue regeneration to stimulate periapical lesion healing, continue root growth and restore pulp tissue function. Purpose: This case report describes management of pulp tissue regeneration in teeth with infection. Case: Female, 16 years old, came complaining of pain in the left lower back tooth accompanied by recurrent swelling. Radiograph showed an open apex with apical lesion on tooth 35. The diagnosis was pulpal necrosis accompanied by a chronic apical abscess. Case management: The treatment plan was revascularization and direct composite restoration. After accessing the cavity, the teeth were prepared, irrigated, and medicated with TAP, which was repeated for 2 visits. On the next visit, after the root canal was cleaned, over instrumentation was performed for bleeding and Collaplug was placed over the blood clot, covered with MTA, and composite resin for coronal sealing. Follow up was carried out for up to 9 months and was asymptomatic. Radiographs show healing of the lesion accompanied by closure of the root canal. Conclusion: Regenerative endodontics has been shown the successful in stimulating root canal closure to treat immature teeth.

Keywords: Regenerative endodontics; apexification; pulpal necrosis; mineral-trioxide-aggregate

INTRODUCTION

Pulpal tissue plays a very important role in tooth development because of its ability to become progenitor/stem cells (DPSCs) which have the ability to proliferate and differentiate into dentine-secreting-odontoblasts. When a tooth is traumatized and a bacterial infection (caries) can cause inflammation, and if it is not treated, pulpal necrosis and apical periodontitis can occur. One of the most serious problems in the event of pulpal death is when it occurs in young permanent teeth with roots that have not been covered. The occurrence of pulpal necrosis in young permanent teeth is a quite formidable challenge because the tooth structure is still thin and the roots are short, thereby increasing risk of fracture. When treating immature teeth with pulp necrosis, the main goals of treatment are to prevent and stimulate healing of apical periodontitis, stimulate root growth, and restore pulp tissue functionally, both from an immunological and sensory perspective.

Several published cases with exposed roots indicate REP is a good treatment option that can stimulate growth and increase in root thickness and length. This procedure requires good infection control, suitable matrix for tissue growth, and adequate coronal seal. Good infection control can be done in various ways, such as using CaOH or Triple Antibiotic Paste (TAP). MTA material is a type of cement with good sealing ability and good bio compatibility, and has the ability to stimulate the production of hard tissues such as dentin and cementum. This material is widely used as apexification material and sealing areas that experience perforations or boundaries between periodontal tissues. However, several studies demonstrated the ability of MTA in pulpal revascularization treatment and as sealing of pulpal sections. In this case, we tried to treat exposed roots with revascularization measures to stimulate apical closure and used MTA as coronal sealing above blood clot as a growth factor.

CASE

A 16-year-old woman came to the Department of Dental Conservation at RSKGM-P Airlangga University complaining of pain in her left lower back tooth and recurring swelling of the surrounding gums. She had
previously received medicine from the dentist to relieve her pain and the medicine had run out, the swelling had decreased but the patient still feels uncomfortable when used for eating. Previously there was a filling and it had been removed by the previous dentist and given a temporary filling. There was no history of trauma due to impact or biting on hard objects. There was no history of systemic abnormalities.

On clinical examination, tooth 35 was seen with temporary fillings and a sinus tract in the buccal part of the surrounding gingiva. There was no response to vitality checks. Percussion examination and bite test showed no pain response. On radiographic examination, an open apical tip was found with periapical lesions on tooth 35 (Figure 1). The diagnosis taken was pulpal necrosis accompanied by a chronic apical abscess. The treatment plan was REP with revascularization technique and composite final filling.

**CASE MANAGEMENT**

At the first visit, after isolation, cavity access was carried out using a round bur and 1 orifice was obtained. Then, channel negotiation and temporary length measurements are carried out using Kfile #25. The root canals were then irrigated using 1.5% NaOCl and saline and then dried using sterile paper points. Intra-canal medication using TAP then the cavity was closed using a temporary filling (Figure 2). At the next visit, the temporary filling was opened and irrigation and re-sterilization were carried out. adrenaline then the temporary filling is opened. The TAP was rinsed and the root canal was irrigated using 17% EDTA and saline. Over-instrumentation was performed using a Kfile #15 with a length of 1 mm above the working length. After the root canal was filled with blood and waiting for a blood clot to form, a resorbable matrix (Collaplug) was placed over

![Figure 1](https://e-journal.unair.ac.id/CDJ)

**Figure 1.** A. Clinical examination found a sinus tract in the buccal part between teeth 35 and 36. B. Radiograph showed an open apex of tooth 35 accompanied by a radiolucent appearance in the apical area extending to the mesial root of tooth 36.

![Figure 2](https://e-journal.unair.ac.id/CDJ)

**Figure 2.** At the first visit. A. Access cavity at tooth 35. B. Working length measurement with Kfile #25. C. Irrigation of the root canal with 1.5% NaOCl and saline. D. The root canal is dried with sterile paper points. E. Intra-canal medicament with TAP is inserted with a syringe. F. Post temporary fillings.
Figure 3. Visit 3. A. The temporary filling is opened, followed by root canal irrigation using EDTA to remove TAP and stimulate stem cell formation. B. Dry the root canal with a sterile paper point. C. Overinstrumentation was performed with Kfile #15 1 mm beyond the working length to induce bleeding. D. Wait for 15 minutes for a blood clot to form. E. Application of Collaplug over blood clot. F. 3 mm thick MTA application over Collaplug. G. Self-etch bonding application. H. Coronal section closed with composite resin restoration.

Figure 4. Final restoration after checking occlusion, finishing, and polishing of the composite.

Figure 5. A. Follow up after 20 days, the patient is asymptomatic and still looks radiolucent apical. B. Follow up after 5 months, it appears that the lesion has disappeared and there has been an increase in dentin thickness C. Follow up after 9 months showed apical closure of the apical premolars and there were no symptoms in the patient.
the blood clot, then coated with MTA, and closed using composite resin as a coronal seal (Figure 3). The occlusion was examined and finishing and polishing was carried out (Figure 4). Follow up was carried out on the 20th day, 5th month and 9th month after the filling. The patient was asymptomatic. Radiographic examination showed healing of the lesion with additional thickness and root coverage after 5 months (Figure 5).

DISCUSSION

The main goals of endodontic treatment of infected teeth are (1) to disinfect the root canal system and (2) to prevent re-infection. Both of these goals will lead to good bone tissue healing and periradicular tissue regeneration. Filling the root canal with biological tissue can avoid the various disadvantages of using synthetic materials, such as the possibility of loss of seal and toxicity to the surrounding tissue. In addition, treatment using biological materials has the advantage of preserving the body’s defense response against subsequent reinfection.

There are a variety of stem cells in the apical papilla where these cells have sufficient circulation to prevent cell death when pulpal necrosis occurs. Therefore, the act of creating bleeding in the periapical tissue is useful to allow stem cell influx to enter and accumulate in the disinfected root canal. These autogenous cells, along with blood clots, can facilitate the formation of pulp regeneration so that it is expected to continue the process of root tissue maturation. Root maturation can occur through 4 possibilities. First, stem cells of the apical papilla (SCAP) will migrate into the root canal space, differentiate into mesenchymal cells, proliferate, and differentiate into similar cells that can form dentine and cementum, covering the apical end. Second, Hertwig epithelial root sheath (HERS) that survives the inflammatory reaction can be stimulated to continue root formation. Third, multipotent dental pulp stem cells present in the dentin wall, can differentiate into odontoblasts and form tertiary dentin. Fourth, stem cells present in the dentin wall, can differentiate into similar cells that can form cementum and cover the apical foramen remaining open. (4) Calcification in the root canal.

REFERENCES


