WORLD SCIENCE PUBLISHING
LONDON LTD
LONDON
London International Monthly Conference on Multidisciplinary Research and Innovation

REGENERATIVE ENDODONTIC TREATMENT AND APEXIFICATION IN THE MANAGEMENT OF NECROTIC FIRST PERMANENT MOLARS WITH INCOMPLETELY FORMED ROOTS

Nurullayeva Iroda Ramat qizi
Olmaliq City Children's Dental Polyclinic, Olmaliq, Uzbekistan

Abstract. The article compares two approaches to the treatment of first permanent molars (16, 26, 36, 46) with necrotic pulp and incompletely formed roots: apexification with an apical plug of mineral trioxide aggregate (MTA) and regenerative endodontic procedures (revascularisation). Indications, the main stages of each protocol, their advantages and limitations are described, and criteria for choosing between them in paediatric practice are proposed.

Keywords: first permanent molar; open apex; pulp necrosis; apexification; MTA apical plug; regenerative endodontics; revascularisation; children.

When pulp necrosis develops in a first permanent molar before root formation is complete, the tooth is left with a wide canal, thin dentinal walls and an open apex. Conventional root canal treatment is difficult because there is no apical stop for the filling material, and the weakened root is prone to fracture. For a long time the only option was multi-visit apexification with calcium hydroxide, which requires 6–24 months and may weaken the root dentine [1]. Modern endodontics offers two alternatives: one-step MTA apexification and regenerative endodontic procedures.

To compare the possibilities of MTA apexification and regenerative endodontic treatment and to define criteria for their use in necrotic immature first permanent molars.

Position statements of the European Society of Endodontology, guidelines of the American Academy of Pediatric Dentistry, reviews and clinical reports on the treatment of immature necrotic permanent teeth were analysed [2–6], with consideration of the conditions of a municipal children's dental polyclinic.

Diagnosis. Pulp necrosis in an immature molar is diagnosed on the basis of a history of pain or trauma that has subsided, the absence of response to cold and electric testing, tenderness to percussion, swelling or a sinus tract, and periapical or furcal radiolucency on the radiograph. In immature teeth a negative sensibility test alone is not sufficient for the diagnosis, so all signs are considered together. The radiograph also determines the stage of root development: root length relative to the crown, the thickness of the dentinal walls and the diameter of the apical foramen. These parameters are decisive in choosing the method of treatment [2].

MTA apexification consists of chemomechanical disinfection of the canals, short-term calcium hydroxide dressing and placement of a 3–5 mm apical plug of MTA or another calcium silicate material, after which the canal is obturated and the tooth is sealed coronally [2]. The method is predictable, takes one or two visits and is suitable for children with limited cooperation. Its main limitation is that it does not increase root length or the thickness of the dentinal walls.

Regenerative endodontic treatment is based on minimal instrumentation, gentle irrigation with 1.5–3% sodium hypochlorite and 17% EDTA, intracanal medication with calcium hydroxide or a low-concentration antibiotic paste, and at the second visit induction of bleeding from the periapical tissues to form a blood clot, which is covered with a calcium silicate material and a tight coronal restoration [3–5]. Stem cells of the apical papilla can then contribute to continued root development, thickening of the walls and apical closure. Successful outcomes have been described for necrotic immature molars [6].

© 2026 London International Monthly Conference on Multidisciplinary Research and Innovation. All Rights Reserved.

Limitations include the complex anatomy of multirooted teeth, possible tooth discoloration, less predictable root growth and the need for good patient cooperation and long-term follow-up.

In multirooted first permanent molars, regenerative treatment has specific features. Access to all canals must be ensured, irrigation is performed passively with side-vented needles placed 1 mm short of the working length to avoid damage to the apical papilla, and triple antibiotic paste containing minocycline is avoided or replaced by a double paste or calcium hydroxide because of the risk of crown discoloration [7]. Bleeding is induced in each canal, and the blood clot is covered with a 3 mm layer of calcium silicate cement placed at the level of the canal orifices. Platelet-rich fibrin may be used as an alternative scaffold when bleeding is insufficient [8].

Outcomes are evaluated according to three levels of success: the primary goal is the elimination of symptoms and healing of apical periodontitis; the secondary goal is increased thickness of the root walls and/or root length; and the tertiary goal is a positive response to sensibility testing [4]. For apexification, success means absence of symptoms, periapical healing and a stable apical barrier.

On this basis, regenerative treatment is advisable for molars with very short roots, thin walls and a wide apex in cooperative patients, while MTA apexification is preferable when the root is nearly formed, in difficult cooperation, or after failure of regeneration. In both cases, a durable coronal restoration and follow-up at 3, 6 and 12 months and then annually are mandatory.

MTA apexification and regenerative endodontic procedures are complementary methods for preserving necrotic first permanent molars with incompletely formed roots. A differentiated choice based on the stage of root development and the patient's cooperation allows the tooth to be kept in a functional state and its premature extraction to be avoided.

REFERENCES

1. Cvek M. Prognosis of luxated non-vital maxillary incisors treated with calcium hydroxide and filled with gutta-percha. A retrospective clinical study. Endod Dent Traumatol. 1992;8(2):45–55.
2. Torabinejad M, Chivian N. Clinical applications of mineral trioxide aggregate. J Endod. 1999;25(3):197–205.
3. Banchs F, Trope M. Revascularization of immature permanent teeth with apical periodontitis: new treatment protocol? J Endod. 2004;30(4):196–200.
4. Galler KM, Krastl G, Simon S, et al. European Society of Endodontology position statement: revitalization procedures. Int Endod J. 2016;49(8):717–723.
5. Kim SG, Malek M, Sigurdsson A, Lin LM, Kahler B. Regenerative endodontics: a comprehensive review. Int Endod J. 2018;51(12):1367–1388.
6. Nosrat A, Seifi A, Asgary S. Regenerative endodontic treatment (revascularization) for necrotic immature permanent molars: a review and report of two cases with a new biomaterial. J Endod. 2011;37(4):562–567.
7. American Association of Endodontists. AAE Clinical Considerations for a Regenerative Procedure. Revised 2021. Chicago, IL: AAE; 2021.
8. Shivashankar VY, Johns DA, Maroli RK, et al. Comparison of the effect of PRP, PRF and induced bleeding in the revascularization of teeth with necrotic pulp and open apex: a triple blind randomized clinical trial. J Clin Diagn Res. 2017;11(6):ZC34–ZC39.

© 2026 London International Monthly Conference on Multidisciplinary Research and Innovation. All Rights Reserved.