Website:https://worldsiencepub.com/index.php/Imc Volume:6,Issue 01,October-2026

VITAL PULP THERAPY WITH CALCIUM SILICATE-BASED MATERIALS AS A METHOD OF PRESERVING FIRST PERMANENT MOLARS WITH INCOMPLETELY FORMED ROOTS

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Abstract. The article discusses vital pulp therapy as the leading method of preserving first permanent molars (16, 26, 36, 46) with incompletely formed roots in children. Keeping the radicular pulp vital allows physiological completion of root formation (apexogenesis), which determines the long-term prognosis of the tooth. The indications for indirect pulp capping, direct pulp capping, partial and full pulpotomy are described, and the advantages of hydraulic calcium silicate cements (MTA, Biodentine) over calcium hydroxide are summarised.

Keywords: first permanent molar; immature root; vital pulp therapy; pulpotomy; apexogenesis; MTA; Biodentine; children.

First permanent molars erupt at about six years of age and complete root formation only at nine to ten years [1]. During this period they are the permanent teeth most frequently affected by caries, and because of the wide pulp chamber deep lesions quickly reach the pulp. Pulp necrosis in an immature molar stops root development and leaves a tooth with short roots, thin walls and a high risk of fracture and loss. Early loss of a first permanent molar results in migration of adjacent teeth, overeruption of antagonists and occlusal disturbances. Therefore, methods that keep the pulp alive are of particular importance in paediatric dentistry.

Diagnosis. Before treatment, the stage of root development is assessed radiographically (root length, thickness of the dentinal walls, width of the apical foramen), and the condition of the pulp is determined from the pain history, clinical examination, cold testing, percussion, palpation and the absence or presence of periapical changes. In immature teeth sensibility tests are less reliable, because the nerve plexus is not fully developed, so the diagnosis is based on the combination of findings. Spontaneous, prolonged nocturnal pain traditionally indicated irreversible pulpitis; however, recent data show that even in such cases the radicular pulp of young teeth often remains healthy and can be preserved by pulpotomy [4, 5].

The choice of method depends on the depth of the lesion and the condition of the pulp. In deep caries without signs of irreversible pulpitis, selective removal of carious dentine with indirect pulp capping is preferred, as it reduces the risk of pulp exposure [3]. When a small exposure occurs in a clean field, direct pulp capping is possible. In cariously exposed pulp, partial (Cvek-type) pulpotomy, removing 2–3 mm of inflamed tissue [8], or full coronal pulpotomy is performed. The key clinical criterion is haemostasis achieved within a few minutes with a cotton pellet moistened with sodium hypochlorite.

Hydraulic calcium silicate cements (MTA, Biodentine) provide a tight seal, high biocompatibility and stimulate the formation of a dense dentine bridge, so they have largely replaced calcium hydroxide [4, 5]. Systematic reviews report high clinical and radiographic success of pulpotomy in cariously exposed permanent molars [6]. In immature molars the main benefit is that the remaining vital pulp continues root formation, increasing root length and wall thickness and closing the apex.

Clinical protocol. The procedure is carried out under local anaesthesia and rubber dam isolation, which is essential to prevent bacterial contamination of the exposed pulp. After removal of carious tissue, the inflamed coronal pulp is amputated with a sterile high-speed diamond bur under water cooling. The wound is rinsed and haemostasis is achieved with 1.5–5% sodium hypochlorite. A 2–3 mm layer of MTA or Biodentine is placed gently on the pulp stump without pressure. Biodentine sets in about 12 minutes and allows a permanent restoration to be placed in the same visit, which is convenient in children; MTA may require a temporary layer of glass-ionomer cement until it sets [7]. If

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haemostasis cannot be obtained after full pulpotomy, the pulp is considered irreversibly inflamed or necrotic, and apexification or regenerative endodontic treatment is indicated instead.

Success of treatment is evaluated by the absence of pain, swelling and sinus tract, a normal response to percussion, the absence of periapical radiolucency and internal resorption, the formation of a dentine bridge and, most importantly, continued root development on control radiographs. The decisive factor for long-term success is a durable coronal restoration placed immediately (composite or, in extensive destruction and MIH, a preformed metal crown), followed by clinical and radiographic control at 3, 6 and 12 months and then annually until the apex is closed.

Conclusion

Vital pulp therapy with calcium silicate cements is a minimally invasive, biologically based and effective method of preserving first permanent molars with incompletely formed roots. Its wider introduction into children's dental polyclinics allows completion of root development, reduces the need for complex endodontic treatment and prevents premature loss of these key teeth.

REFERENCES

1. Moorrees CF, Fanning EA, Hunt EE. Age variation of formation stages for ten permanent teeth. J Dent Res. 1963;42:1490–1502.
2. American Academy of Pediatric Dentistry. Pulp therapy for primary and immature permanent teeth. The Reference Manual of Pediatric Dentistry. Chicago, IL: AAPD; 2023.
3. Schwendicke F, Frencken JE, Bjørndal L, et al. Managing carious lesions: consensus recommendations on carious tissue removal. Adv Dent Res. 2016;28(2):58–67.
4. Duncan HF, Galler KM, Tomson PL, et al. European Society of Endodontology position statement: management of deep caries and the exposed pulp. Int Endod J. 2019;52(7):923–934.
5. Taha NA, Abdelkhader SZ. Outcome of full pulpotomy using Biodentine in adult patients with symptoms indicative of irreversible pulpitis. Int Endod J. 2018;51(8):819–828.
6. Aguilar P, Linsuwanont P. Vital pulp therapy in vital permanent teeth with cariously exposed pulp: a systematic review. J Endod. 2011;37(5):581–587.
7. Nowicka A, Lipski M, Parafiniuk M, et al. Response of human dental pulp capped with Biodentine and mineral trioxide aggregate. J Endod. 2013;39(6):743–747.
8. Cvek M. A clinical report on partial pulpotomy and capping with calcium hydroxide in permanent incisors with complicated crown fracture. J Endod. 1978;4(8):232–237.

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