

# Pulp Therapy for Primary and Young Permanent Teeth: Foundational Articles and Consensus Recommendations, 2021

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## IAPD Consensus Recommendations

In the primary dentition, pulp therapy aims to preserve the teeth until they exfoliate naturally. In the young permanent dentition, it aims to preserve pulp vitality and allow root development to continue, helping to achieve a favorable crown-root ratio. It also aims to achieve wider dentinal walls for long-term retention and function of the teeth.

Indications and type of pulp therapy depends on the status of the pulp: healthy, reversible pulpitis, irreversible pulpitis, or necrosis. Clinical diagnosis can be achieved from the medical and dental history; pain history (location, intensity, whether spontaneous, duration, aggravating and relieving factors); clinical signs (extra- and intra oral); radiographic examination (crown, furcation, periapical areas, and the adjacent bone); and in permanent teeth with closed apices testing the sensibility of the pulp (electric pulp testing, cold test and heat test). The correct diagnosis affects the treatment and prognosis.

**1.** Teeth with pain of short duration that is not spontaneous are likely to have a vital pulp that may have reversible pulpitis, and therefore should be treated with vital pulp therapy. In contrast, teeth with spontaneous pain or pain that lasts after the removal of an aggravating factor, a sinus tract, soft tissue pathology or gingival swelling and inflammation (not associated with periodontal disease), excessive mobility (not from exfoliation), and radiographic signs (apical/furcational radiolucency, internal/

external root resorption) suggests irreversible pulpitis and/or necrosis, and therefore should be treated with non-vital pulp therapy.

**2.** Patients' medical history and restorability of an affected tooth should always be considered when determining the type of pulp therapy. If pulp therapy is not recommended, then an alternative treatment options such as extraction should be considered.

**3.** In primary teeth, pulp therapy options include vital pulp therapies such as placing a protective lining, indirect pulp treatment (selective caries removal), direct pulp capping, pulpotomy, and non-vital pulp therapies such as pulpectomy, and lesion sterilization tissue repair.

*a. Protective liners include calcium hydroxide, dentine bonding agents, glass ionomer cements.*

*b. Indirect pulp treatment, to avoid pulpal injury or exposure, involves selective caries removal that consists of excavating to hard dentine on the peripheral walls of deep lesions, while leaving the firm caries-affected dentine on the pulpal floor. (Selective caries removal to soft dentine on the pulpal floor may be appropriate with deep lesions impinging on the pulp). Glass ionomer cement, resin modified glass ionomer cement, calcium hydroxide, zinc oxide/eugenol, or MTA are placed over the remaining dentine to enhance pulp healing and repair. Long-term studies have shown higher*

success rates for teeth treated with indirect pulp treatment compared to pulpotomy.

- c. Direct pulp capping has limited evidence for the management of carious pulp exposures in the primary dentition. Calcium hydroxide, or MTA may be used as pulp capping agents in primary teeth with traumatic or iatrogenic pulp exposures.
- d. Pulpotomy involves removal of the coronal pulp tissue, achieving hemostasis, and treatment of the pulp stumps with either MTA, Biodentine, or formocresol. While formocresol pulpotomies have shown success, practitioners and parents may be concerned about its potential association with nasopharyngeal carcinoma.
- e. Pulpectomy involves removal of the coronal and radicular pulp followed by debridement of the root canal(s). Resorbable materials such as zinc oxide, iodoform and calcium hydroxide (Endoflas®), non-reinforced zinc oxide eugenol, and iodoform and calcium hydroxide paste (Vitapex®, Metapex®), are commonly used as root canal obturating materials for primary teeth.
- f. Lesion Sterilization Tissue Repair (LSTR) is a procedure used to treat necrotic primary teeth that includes disinfection of root canals with an antibiotic mixture (e.g., ciprofloxacin, metronidazole, and clindamycin). Evidence suggests that LSTR has a better prognosis than conventional pulpectomy in primary teeth with root resorption.

**4.** In young permanent teeth pulp therapy options include protective liners, indirect pulp treatment, direct pulp capping, pulpectomy, pulp revascularization, and pulpotomy.

- a. Protective liners include calcium hydroxide, zinc oxide and eugenol, dentine bonding agents,

and glass ionomer cements. They are placed on the cavity floor to seal dentine before placing a restoration.

- b. Indirect pulp treatment does not remove the affected dentine tissue adjacent to the pulp in deep cavities. This technique can support the pulp to recover and reduce the risk of pulp exposure.
- c. Direct pulp capping is indicated in permanent teeth with small exposures of pulp tissue resulting from caries removal or fracture of the tooth from traumatic injury. The exposed pulp should be capped with either calcium hydroxide or MTA, and sealed from rest of the oral environment by placement of a suitable restoration.
- d. Partial pulpotomy is indicated for pulpal exposure in a young permanent tooth resulting from caries or trauma (Cvek pulpotomy). The exposed pulp tissue is removed with a high speed bur to a depth of one to three millimeters; hemostasis; covering the pulp with calcium hydroxide, MTA or Biodentine; and restored.
- e. Pulpectomy, apexification or MTA apical barrier (root end closure) and apexogenesis (further development of the root) are treatment choices for immature permanent teeth with non-vital pulp.
- f. Pulp revascularization is an alternative treatment option for immature permanent teeth with non-vital pulp. However, the evidence to support this treatment option is still evolving.
- g. Coronal pulpotomy for management of mature carious permanent teeth with reversible or irreversible pulpitis is a treatment option. However, the evidence to support this option is based on heterogeneous studies with high risk of bias.