

CASE REPORT

Maturogenesis of a cariously exposed immature permanent tooth using calcium hydroxide for pulpotomy treatment: a case report

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ABSTRACT

With all aseptic precaution successful pulpotomy treatment of cariously exposed permanent teeth with reversible pulpitis and incomplete apex formation can prevent the need for root canal treatment. A case report is presented which demonstrates the use of pulpotomy with calcium hydroxide in order to achieve apexogenesis and the teeth were restored with glass ionomer cement. Clinical and radiographic follow up demonstrated a vital pulp and physiologic root development in comparison with the contra lateral tooth.

Introduction:

Apexogenesis is a vital pulp therapy performed to encourage continued physiological development and formation of the root end; frequently used to describe vital pulp therapy includes pulp capping and pulpotomy treatment. Both procedure permit preservation of pulp tissue for continued root development. The goals of pulpotomy to produce apexogenesis are:

1. Sustaining a viable Hertwig's epithelial root sheath, thus allowing continued development of root length for a more favorable crown root ratio.

2. Maintaining pulpal vitality, allowing the remaining odontoblasts layer to lay down, producing a thicker root and decreasing the chance of root fracture.

3. Promoting root end closure, creating a natural apical constriction for obturation, if necessary.

4. Generating a dentinal bridge at the site of the pulpotomy; however, bridging is not essential for the overall success of the procedure¹.

Recently, the term maturogenesis gained new attention and has been defined as the physiological root development, not restricted to the apical segment. The continued deposition of dentine occurs throughout the length of the root, providing greater extent and resistant to fracture. A case report is presented in which the vitality of the pulp was maintained utilizing calcium hydroxide as pulpotomy treatment allowing physiologic root development¹.

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Case Report:

An 8 year old girl named Shuvra attended our department because of grossly carious and food lodging of her lower left first molar. The patient's medical history was non-contributory. No spontaneous pain was reported by the patient and her main complaint was sensitivity to cold and sweets. The pain and sensitivity were localized on the left and in the lower jaw. Clinical examination revealed gross occlusal caries on her lower left first molar with no signs of extra oral or intraoral swelling or sinus tract formation. The tooth tested negative to percussion and palpation test and the mobility was within normal limits. Pulp vitality tests using ethyl chloride spray cold sensation and warm gutta precha stick hot sensation, showed a normal positive response with no lingering sensation. The adjacent tooth also responded positive and within normal limits to cold sensation. Radiographic findings revealed caries in close proximity to the pulp and an undeveloped root with a wide open apex and no evidence of periradicular pathology.

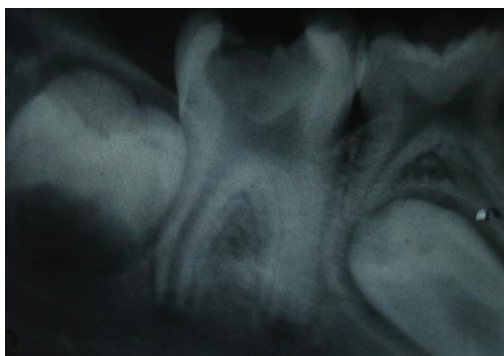


Fig. 01: Pre operative radiograph 10.12.2007



Fig. 02: Just after treatment

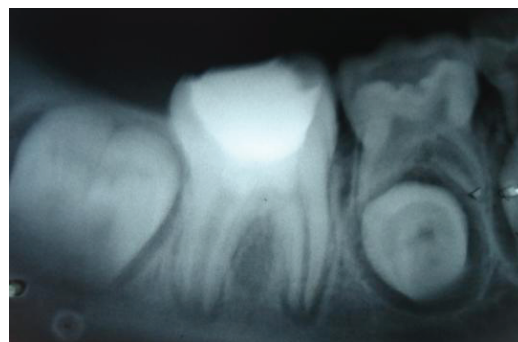


Fig-03: 2 weeks follow up



Fig-04: 1 month follow up



Fig-05: 3 months follow up 12.03.2008

The initial treatment plan included the removal of the carious lesion and clinical evaluation of the pulp exposure. Vital pulp therapy including either direct pulp capping or pulpotomy with calcium hydroxide or mineral trioxide aggregate (MTA) was planned for the anticipated pulp exposure. As the patient was a minor, informed verbal consent was obtained from her parents.

Following administration of local anesthesia, the tooth was isolated with cotton roll pellets. Peripheral caries is removed using a sterile large round diamond bur on a low speed hand piece

with copious water irrigation. After removal of caries, exposure of pulp horn with moderate bleeding was observed. After that a sterile fissure bur is used to remove the entire roof of the pulp chamber. The coronal pulp tissue is removed with the help of sharp sterile spoon excavator followed by sterile round bur up to the radicular pulp stumps. A sterile cotton pellet moistened with normal saline was used to apply moderate pressure to the exposed pulp for 5 min. and hemostasis was achieved. Sodium hypochlorite (5.25%) was then utilized as a rinse for 2 min. to disinfect the surgical exposure and the dentin. The prepared cavity was again gently rinsed with sterile normal saline to remove the superficial clot and debris. The cavity was lightly dabbed with a moist pellet to remove the excess moisture.

Calcium hydroxide commercially available Hydro C (Dentsply) was mixed according to the manufacturers instructions and a 1-2 mm thick layer of mixed calcium hydroxide was placed over the radicular pulp stumps and adjacent dentinal surface. The tooth was temporarily restored with Zinc oxide eugenol cement and advised to take a radiograph. The patient was scheduled after 7 days to evaluate any sign or symptoms. After one week the patient was asymptomatic, part of the temporary restoration was removed, the tooth was restored with Glass Ionomer cement.

The patient was scheduled for every month follow up in order to evaluate root development and to monitor any signs or symptoms.

One month later, clinical examination revealed an intact restoration and absence of any abnormal signs or symptoms. The tooth was tested positive and normal to thermal pulp stimulation with cold. A periapical radiograph showed continued development and maturation of the root.

Three months later, no abnormal findings were observed and the pulp tested within normal limits. A periapical radiograph showed continued development of the root. The patient was scheduled for routine recall visits every month. The parents were informed about the

potential need for root canal therapy in case of sign and symptoms.

Discussion:

Pulpotomy is generally regarded as the treatment of choice for immature permanent tooth with extensive exposed vital pulp tissue. This treatment preserves pulpal function, thus allowing continued root development.

Since the 1980s, calcium hydroxide has clearly been the material of choice because it elicits the formation of a dentinal bridge, following a number of phenomena. The pulp tissue adjacent to the calcium hydroxide was first necrotized by high PH (11 to 12) of the calcium hydroxide. This necrosis was accompanied by acute inflammatory changes in the underlying tissue. After 4 weeks, a new odontoblastic layer and eventually, a bridge of dentin developed. Later investigations showed three identifiable histologic zones under the calcium hydroxide in

4 to 9 days:

1. Coagulation necrosis
2. Deep-staining basophilic areas with varied osteodentin and
3. Relatively normal pulp tissue, slightly hyperemic, underlies an odontoblastic layer.



Fig-6: 6 months follow up

Initial reports by Berk and Brown indicated a success rate with calcium hydroxide for primary and young permanent tooth in the range of 30 to

90%. In contrast vital pulp therapy treated with MTA consistently demonstrated complete tubular bridge formation, lack of pulpal inflammation and its sealing ability and biocompatibility with subjacent tissues is attributed^{3,4}.

Conclusion:

The use of calcium hydroxide has been proven clinically and by various *in vivo* and *in vitro* studies to allow pulp healing after injury. Immature tooth, destined for endodontic therapy will be imparted an opportunity to complete maturation with conservative management. However the treatment outcome for carious exposed pulps is questionable and in case of failure, pulp revascularization and apexification should be considered.

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