



RESEARCH ARTICLE

VITAL PULP THERAPY

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ABSTRACT

The unaffected, exposed vital pulp possesses an inherent capacity for healing through cell reorganization and bridge formation when a proper biological seal is provided and maintained against microbial leakage. Throughout the life of a tooth, vital pulp tissue contributes to the production of secondary dentin, peritubular dentin and reparative dentin in response to biological and pathological stimuli.

INTRODUCTION

Maintenance of pulp vitality should always be the goal in treatment planning, and considerable interest is developing in the concept of regenerative endodontics for complete or partial pulp tissue regeneration. With mechanical exposure of the dental pulp by trauma or during cavity preparation, the pulp may be protected and its vitality maintained by immediately covering it (pulp capping) and placing a restoration, thereby avoiding root canal treatment. If the exposure is large or seriously contaminated, it may be possible to remove the more superficial diseased part of the pulp (pulpotomy), cap the remaining pulp and place a restoration. This approach probably has the best prognosis in incompletely formed teeth (especially primary teeth) when the root has not yet reached its full length (apexogenesis).

Vital Therapy Procedures

- Indirect Pulp Capping
- Direct Pulp Capping
- Pulpotomy
- Apexogenesis

Requirements of an Ideal Pulp capping Agent

- It should maintain pulp vitality
- It should stimulate reparative dentin formation

- It should be either bactericidal or bacteriostatic in nature and should be able to provide bacterial seal.
- It should adhere well to both the dentin and the overlying restorative material.
- It should be able to resist the forces under the restoration during the lifetime of restoration.
- It should be sterile.
- It should be preferably radiopaque.

Materials Used

The three materials that are currently recommended on the basis of in vitro and clinical research are

- Calcium Hydroxide
- MTA (mineral trioxide aggregate)
- Biodentine

Calcium Hydroxide: It serves as a protective barrier for pulpal tissues, not only by blocking patent dentinal tubules but also by neutralizing the attack of inorganic acids and their leached products from certain cements and filling materials. The examples of calcium hydroxide products that have been widely used are Pulpdent paste and Dycal. Calcium hydroxide has the unique potential to induce mineralization even in tissues that have not been programmed to mineralize.

Mineral Trioxide Aggregate: M.T.A not only appears to demonstrate biocompatible behavior but also exhibits

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acceptable in vivo biological performance when used for root end fillings, perforation repair, pulp capping, pulpotomy, and apexification treatment.

Biodentine: The biocompatibility and bioactivity of the material, which are important since the material involves indirect and direct pulp capping and pulpotomy. It also preserves pulp vitality and promotes its healing process. It can also be used for repair of perforations and resorption, apexification, and root-end filling.

Vital Pulp therapy: It is the treatment initiated on an exposed pulp to repair and maintain the pulp vitality. The aim of vital pulp therapy is to treat reversible pulpal injuries in order to maintain pulp vitality in both primary and permanent teeth. It includes two distinct therapeutic approaches:

Indirect pulp capping: Advocated in cases of deep carious lesion.

Direct pulp capping: Advocated in cases of pulp exposure.

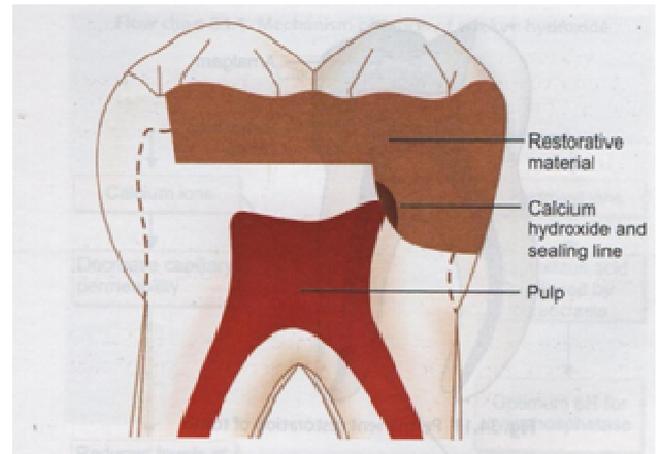
Indirect Pulp Capping: It is defined as a procedure wherein the deepest layer of the remaining affected carious dentin is covered with a layer of biocompatible material in order to prevent pulpal exposure and further trauma to the pulp. Indirect pulp capping should be contemplated only if there are no clinical signs and symptoms of irreversible pulpitis. In a deep dentinal lesion, there is already a high likelihood of pulpal involvement from the carious challenge, but it is the level of carious activity that is probably the greatest determinant of successful outcomes for indirect pulp capping. In slowly progressing lesions or those in which caries has been either arrested or reduced in activity, a better prognosis is likely. The use of a step-wise technique for excavation of caries, in which caries is removed in increments over several visits rather than in one visit, reduces the risk of accidental mechanical exposure of the pulp and may also slow or arrest lesion development, leading to an improved prognosis for pulp vitality. Current evidence favors use of a step-wise excavation technique over indirect pulp capping.



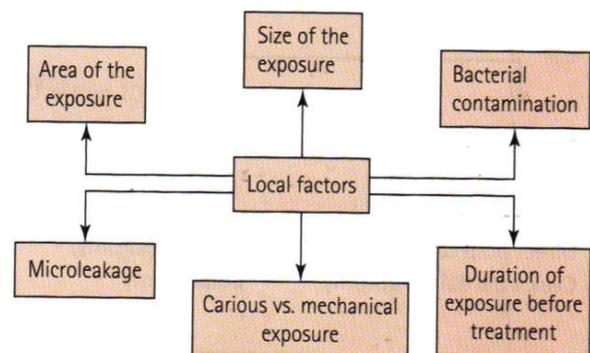
Deep carious lesion in a Mand Molar

Objective: The ultimate objective is to preserve the vitality of the pulp by completely removing the carious infected dentin followed by placement of material that would enable the

affected dentin to remineralize by stimulating the underlying odontoblasts to form tertiary dentin.



Direct Pulp Capping: It is defined as a procedure in which the exposed vital pulp is covered with a protective dressing or base placed directly over the site of exposure in an attempt to preserve pulpal vitality. Calcium hydroxide has been used as a capping agent for nearly a century and highlights dentistry's position as a pioneer in regenerative medicine. However, outcome studies show that direct pulp capping of carious exposures with calcium hydroxide has an unfavourable long term prognosis. Mineral trioxide aggregate (MTA) is increasingly finding favour for its easier handling properties and more predictable hard tissue formation. However, as with indirect pulp capping the prognosis is heavily dependent on pulp vitality and the extent of infection and inflammation. Case selection for direct pulp capping should focus on asymptomatic tooth with no clinical signs or symptoms of irreversible pulpitis.



Factors affecting prognosis of Direct pulp capping



Direct pulp capping with Biodentine

Indications

- Asymptomatic (no spontaneous pain, normal response to thermal testing, and pulp is vital before the operative procedure).
- Small exposure, less than 0.5 mm in diameter.
- Hemorrhage from the exposure site is easily controlled (within 10 minutes)
- The exposure occurred is clean and uncontaminated.
- Atraumatic exposure and little desiccation of the tooth with no evidence of aspiration of blood into the dentin (dentin blushing)



Pulp exposure in a Max C.I



MTA capping done



Composite Resin Restn

Pulpotomy: It is defined as a procedure in which a portion of the exposed coronal vital pulp is surgically removed as a means of preserving the vitality and function of the remaining radicular portion.

It is an alternative to direct pulp capping when carious exposure occur in deciduous and young permanent teeth and the inflammation may be restricted to the crown. The pulp must be vital and asymptomatic. All the carious dentin and the pulp to the level of radicular pulp are removed. An alternate approach is partial pulpotomy. After excision of 2mm of the coronal pulp tissue, the technique is very similar that for direct pulp capping, involving hemorrhage control, capping with calcium hydroxide or MTA and use of a permanent restoration to provide a good marginal seal.



Coronal Pulpotomy



MTA placed over the



Interim Restn with GIC



2.8 Preoperative (A) and postoperative (B) radiographs demonstrating pulpotomy procedures on both incisors.

Pulpotomy procedure on both Incisors

Objectives

- Preservation of vitality of the radicular pulp
- Relief of pain in patients with acute pulpalgia and inflammatory changes in the tissue.
- Ensuring the continuation of normal apexogenesis in immature permanent teeth by retaining the vitality of the radicular pulp.

Classification

The pulpotomy procedure can be classified on the basis of the following:

- Amount of pulpal tissue removed
- Partial pulpotomy (Cvek's pulpotomy)
- Complete pulpotomy (cervical pulpotomy)

Type of medicament employed

- Calcium hydroxide pulpotomy
- MTA pulpotomy
- Formocresol pulpotomy

Partial pulpotomy (Cvek's pulpotomy): A kind of pulpotomy in which only a portion of the coronal pulp is removed or removal of tissues until normal tissue that is free of inflammation is reached before placing a medicament.

Complete Pulpotomy (Cervical pulpotomy): It involves the complete removal of the coronal portion of the dental pulp, followed by placement of suitable dressing or medicament that will promote healing and preserve the vitality of the tooth.

Apexogenesis: It is defined as a vital pulp therapy procedure performed to encourage continued physiologic development and formation of the root end. The objective is to maintain the vitality of the radicular pulp; therefore the pulp must be vital and capable of sustaining continued development. A small exposure can be treated by pulp capping. With more extensive pulpal exposure, an attempt is made to remove the inflamed tissue (partial Pulpotomy) or (complete pulpotomy). With both pulpotomy techniques, the remaining pulp may be capped with a hard set calcium hydroxide or preferably MTA.

Conclusion

Traumatic pulp exposures tend to have a better prognosis than mechanical exposures during caries excavation or carious exposures due to reduced infection risk. It is important, however to consider not simply the extent of tissue involvement with caries, but also lesion activity and the rate of caries progression. A significant constraint on treatment planning is the lack of reliable or accurate diagnostic tools for clinical assessment of inflammation in the pulp. Pulp sensibility is an important guide to case selection for vital pulp therapy. It is also a critical step of post treatment monitoring, along with radiographic examination.

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