Pediatric endodontics

Diagnosis, Direct and Indirect pulp capping

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WHY TO PRESERVE PRIMARY TEETH?

• The preservation of the primary dentition until their normal anticipated exfoliation can be justified on the following grounds
  • Maintenance of arch length
  • Maintenance of arch length
  • Maintenance of a healthy oral environment
  • Preservation and relief of pain
  • Maintenance and improvement of appearance
ASSESSMENT

Medical conditions

• Space management decisions and parental attitudes toward dental health

Assessment of individual tooth

• Can the tooth be restored if the pulp therapy is performed?

• Does the dental age of the child warrant retention of the particular tooth?

• Is the pulp status amenable to pulp therapy?

• No single type of pulp therapy will be uniformly applicable or successful. The success of the treatment used depends mainly upon an accurate preoperative assessment of pulp status.
DIAGNOSTIC FEATURES

• Pain- (subjective)
• Duration
• Frequency
• Location
• Spread
• Aggravating factors
• Swelling- intraoral / extraoral
• Mobility- physiological / pathological
• Percussion
• Vitality tests
• Radiograph-
  • Position of the succedaneous tooth,
  • Pulp calcification,
  • Internal resorption,
  • External root resorption,
  • Bone resorption.
• Depth of the lesion
• The exposure site
• The amputated pulp stumps
PRIMARY ROOT CANAL ANATOMY
Classification of pulp therapy

- **Vital technique**
  - Indirect pulp capping
  - Direct pulp capping
  - Coronal pulpotomy
  - Apexogenesis (young permanent tooth)

- **Non-vital technique**
  - Pulpectomy
  - Apexification (young permanent tooth)
Indirect Pulp Capping

• The procedure in which only the gross caries is removed from the lesion and the cavity is sealed for a time with a biocompatible material is referred to as indirect pulp treatment.

• It is defined as application of suitable medicament over a thin layer of remaining affected dentin, after deep excavation of infected dentin with no exposure to pulp.
Direct pulp capping

The procedure in which the small exposure of the pulp which is encountered.

- During cavity preparation,
- Following a traumatic injury
- Due to caries, with sound surrounding dentin is dressed with an appropriate biocompatible radiopaque base

is termed as direct pulp capping
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| Ideally, used when pulpal inflammation has been judged to be minimal and complete removal of caries would cause a pulp exposure | Small mechanical exposure less than 1mm which is surrounded by sound dentin  
Light red bleeding from the exposure site that can be controlled by cotton pellet  
Traumatic exposure in a dry, clean field, which report to the dental office within 24 hrs |
| **Contraindication**        | **Contraindication**    |
| Any signs of pulpal or periapical pathology  
Soft leathery dentin covering a very large area of the cavity, in a non restorable tooth | Pain at night  
Spontaneous pain  
Tooth mobility  
Thickening of PDL  
Intra radicular radiolucency  
Excess bleeding at the exposure site  
Purulent or serious exudate |
objective

• Arrest the carious process
• Promote dentin sclerosis (reducing permeability)
• Allow carious dentin to remineralize
• Preserve the vitality of tooth
• No harm to succedaneous tooth
• No pathological evidence
Koper identified 3 dentinal layers in active caries

1 - outer layer, soft necrotic dentin with bacteria and not painful while removing.

2 - firm, discoloured dentin with fewer bacteria but painful while removing.

3 – innermost layer, hard discoloured sound dentin with minimal amount of bacterial invasion and painful to instrumentation.
**Infected dentin**
- Superficial layer
- Lacks sensation
- Dye 1% acid red in propylene glycol stains only irreversibly denatured collagen.
- Soft necrotic tissue, dry leathery dentin flakes away with instrument
- Cannot remineralize
- Collagen irreversibly denatured

**Affected dentin**
- Deeper layer
- Sensitive
- Does not stain with caries detecting Dye.
- Soft normal dentin discoloured but does not flake easily.
- Has a template for remineralization
- Collagen cross linking remains
Massler’s Theory

Indirect pulp capping is based on the theory that zone of affected dentin exists between outer infected layer and pulp, when the infected dentin is removed, this affected dentin can remineralize thus avoiding pulp exposure.
Rationale

- Indirect pulp capping is based on the knowledge that decalcification of the dentin precedes bacterial invasion.

- Softened Dentin close to the pulp has no bacteria

- Therapeutic pulp capping material aid in bridge formation

- Absence of substrate inactivates the left out bacteria
Procedure for IDPC

- Administer LA and isolate the tooth with a rubber dam.
- Remove the majority of soft, necrotic, infected dentin with a large round bur in a slow-speed hand-piece without exposing the pulp.
- Remove peripheral carious dentin with sharp spoon excavators. Irrigate the cavity and dry with cotton pellets.
- Cover the remaining affected dentin with a hard-setting calcium hydroxide dressing.
- Fill the cavity with a reinforced ZOE cement.
Re- Entry..is it necessary....?

- May not be necessary if the tooth is asymptomatic.
- If the tooth is within 2 yrs of exfoliation re-entry is not needed.
- It depends on the experience of the clinician
- If the clinician had left considerable amount of carious dentin, re-entry is advised.
- Recommended Stepwise excavation
Response to Treatment

three types of new dentin in response to IDPC.

- At 2 months after treatment- cellular fibrillar dentin
- At 3 months-irregular dentin
- After 4 months-Tubular dentin in a more uniformly mineralized pattern.

Normal pulp with a slight increase in fibrous element.
Failure of DPC in primary teeth

Reasons for failure

- Chronic pulp inflammation
- Necrosis
- Internal resorption
- Difference in primary pulp histology and physiology
- Procedural considerations
Procedure for DPC

Pulp Exposure
  ↓
Debridement
  ↓
hemostasis
  ↓
Calcium hydroxide
  ↓
IRM
  ↓
Final Restoration
Factors that affect outcome of pulp capping

- Size of the exposure
  - Larger the area of exposure, less favorable the prognosis
  - If the exposure occurs on the axial wall of the pulp, with pulp tissue coronal to the exposure site, this tissue may undergo necrosis, causing a failure.

- Saliva Exposure
  - Long periods of exposure is harmful.
  - Micro organisms will gain a foot hold in the injured tissue
• Marginal Leakage
  • If restoration leaks, inflammation persists and repair cannot occur.

• Systemic Factors
  • Harmonal disturbances – Cortisone therapy
  • Nutritional deficiencies - Vitamin C
  • Systemic diseases – anemias, liver diseases, colitis, diabetes.

• Age and status of the pulp
  • Younger & uninflammed pulp heals faster
Prognosis

• Pulp that was mechanically exposed and was asymptomatic in the preoperative period without symptoms of pulpitis has good prognosis

• Prognosis is poor for carious exposures due to previous infection
Pulp Capping Agents

- Bio compatible
- Provide biologic seal
- Prevent bacterial microleakage

- Calcium hydroxide
- Mineral trioxide aggregate (MTA)
- Zinc oxide eugenol
- Corticosteroids and antibiotics (ledermix)
- Cyanoacrylates
- Collagen
- Tricalcium Phosphate
- Dentin Shavings
- Enzymes and Matrix Components
- Resin bonding agent
- Laser
Salient features of a successful pulp capping

- Dentin bridge
- Pulp vitality should be maintained
- Lack of pain
- Minimal inflammatory response
- Absence of progressive degeneration, internal resorption