Pulp therapy for primary teeth

- Dr. V.K. Gopinath

Overview

- Aims/objectives of pulp therapy in primary teeth
- Indications and contraindications
- Pulp therapy options
- Pulp medicaments
- Procedures/techniques

Objectives

- To remove pathology
- Whenever possible, maintain the pulp vitality
- Facilitate recovery of the pulp from injury
- To maintain arch length for masticatory function and optimal development of occlusion

Considerations in Diagnosis and Treatment planning

- Child's overall health, growth & development
- Anatomy of the primary tooth pulp and its association with early onset of pathology
  - Thin enamel and dentine but large pulp chambers
  - Primary molar canals irregular/thin, accessory canals in the floor of the pulp chamber
  - Inter-radicular rather than periapical infection
  - Damage to permanent successor
- Child's background
    - Medical History
    - Socio-demographic
    - Child's behavior

Medical contraindications to pulp therapy

1. Congenital Heart Disease
    - Risk of infective endocarditis
2. Immunosuppressed
    - Oncology patients
    - Long-term corticosteroid users
3. Poor healing potential
    - Poorly controlled diabetes
4. Special needs/disability

Medical indications for pulp therapy

- Bleeding disorders and coagulopathies
  - Haempohilia
  - Von Willebrands

  Pulp therapy is a viable option to avoid extractions

Behavioral Factors

- Ability of clinician to manage the child
- Child's ability to cooperate
  - lengthy procedure
  - Radiographs
  - LA, RD, SSC
- Sedation/ no sedation

Tooth specific factors

1. Stage of dental development : is the tooth close to the date of exfoliation?
2. Pulpal status diagnosis?
3. Restorable / Un-restorable (Space management)

Status of the Pulp

- Healthy
- Reversible pulpitis
- Irreversible
- Total necrosis

Pulp diagnosis determines selection of treatment option

Indicators of pulp status

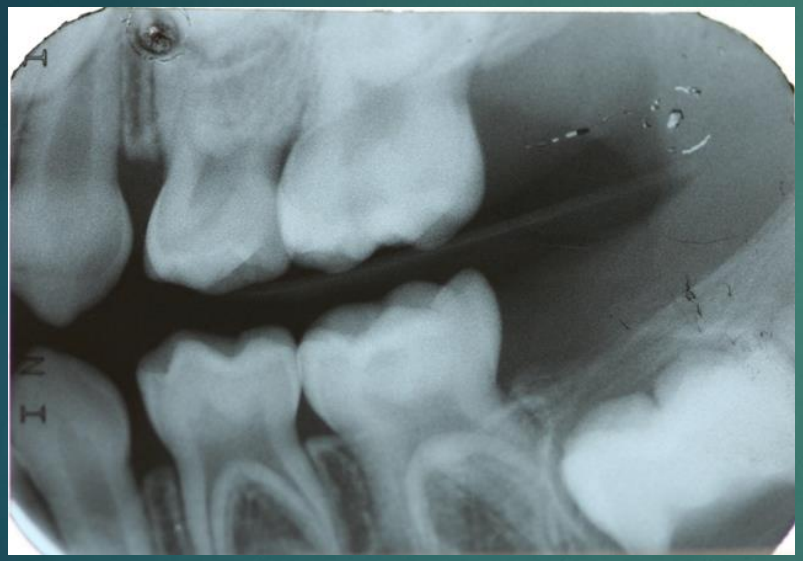
- 1. History of pain
- 2. Clinical examination
  - Extent of caries - breakdown of marginal ridge
  - Swelling/fistula
  - Mobility
  - Percussion
- 3. Investigation
  - Pulp sensibility test
  - Radiographs

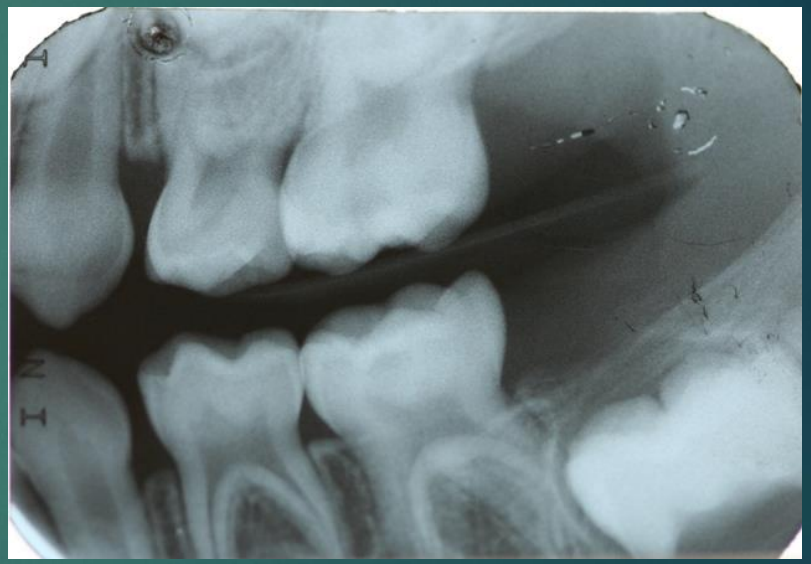
Pain

- Provoked pain: Reversible Pulpitis
  - Heat, cold, sweets, air, chewing
  - Intermittent: disappears when stimulus removed
- Spontaneous pain: Irreversible Pulpitis
  - Unprovoked pain - Wakes up at night
  - Persistent / Constant pain

Radiographic Assessment

- Depth of carious lesion
- Presence of permanent tooth bud





Radiographic assessment

- Inter-radicular pathology (primary molar)
  - Accessory canals
  - Dentine permeability
- Periapical pathology
- Internal/ External root resorption

Pulp treatment options

1. Indirect pulp capping
2. Direct pulp capping
3. Pulpotomy
4. Pulpectomy

Overview of technique for pulp therapy in primary teeth

1. Take radiograph
2. Anaesthetize
3. Isolation and moisture control
4. Prepare and complete appropriate cavity
5. Complete coronal seal
    - SSC in molars
    - Strip crown for anterior teeth

Indirect Pulp Capping

- Aim to maintain vitality where there is no direct pulpal involvement
- There is good reparative potential in primary teeth
- Requires careful case selection
  - No signs or symptoms of pulpitis
  - Requires coronal seal

Technique and materials

- Caries removal without exposing pulp
- 2 mm of sound dentine around periphery
- DEJ clear of caries
- Use biomimetic material
  - Calcium Hydroxide
  - GIC

Interim therapeutic restoration

- ITR is performed when traditional cavity preparation is not possible or when caries control is necessary prior to a definitive dental restoration .
- The tooth is prepared by removing caries without pulpal exposure by hand or rotary instruments and restored with an adhesive restorative material like glass ionomer.
- Leakage of a restoration can be minimized by maximum caries removal from the margin of the lesion.
- ITR reduces levels of cariogenic oral bacteria (e.g., Mutans Streptococci, lactobacilli) instantly after it is placed.

Ref: Ann Med Surg (Lond). 2018 Jan; 25: 21–29.

Direct pulp capping

Direct placement of a medicament on to the pulp with the intention of promoting a dentine bridge

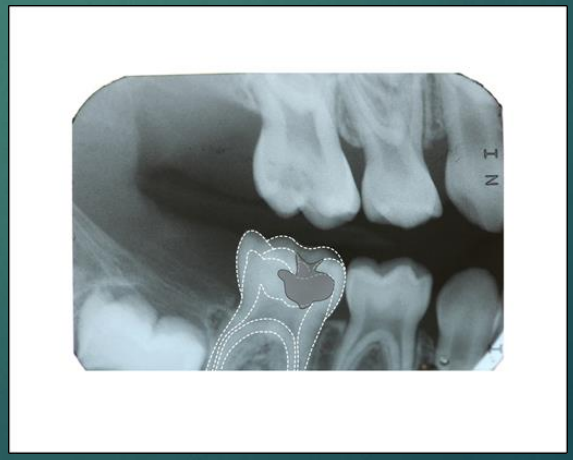
- Generally considered unsuccessful in carious primary teeth
  - Pulp already inflamed
  - Size of exposure irrelevant
  - High Frequency of internal resorption

Pulpotomy in Primary Teeth

Pulpotomy is the procedure of removing the coronal portion of the affected or infected dental pulp tissue and placement of a dressing to promote healing or fixation of the apical tissue to preserve its vitality and function (UK National Guidelines)

Pulpotomy: indications

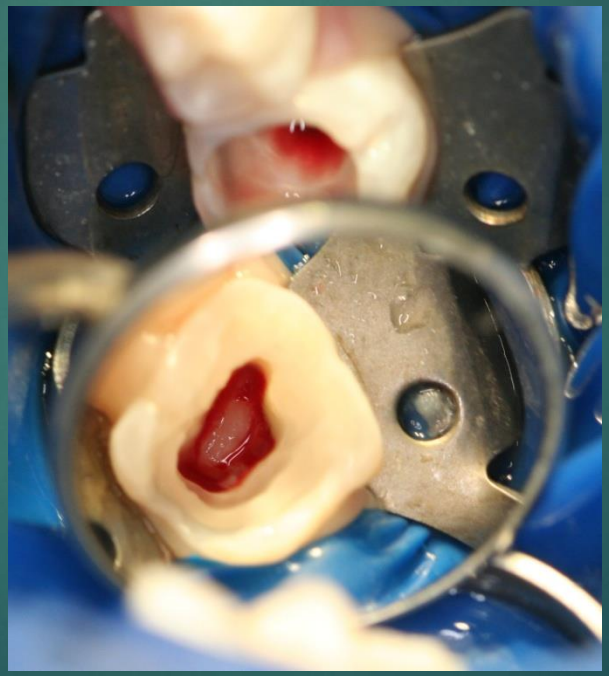
1. Pulp is reversibly and minimally inflamed
2. Destruction of marginal ridge in first primary molar
3. Radiographic evidence:
   - Caries extends >2/3 depth through dentine
   - No sign of pathological root resorption
4. Minimal haemorrhage on pulpotomy
5. Tooth is restorable



Pulpotomy: contraindications

1. Spontaneous pain
2. Signs of irreversible pulp pathology / necrosis
    1. Radiographic
    2. Intra-oral swelling
    3. Mobility
3. On coronal pulp removal:
    1. No hemorrhage - necrotic pulp
    2. Bleeding can not be stopped : irreversible pulpitis
4. Tooth close to the date of exfoliation
5. Non restorable tooth

Pulpotomy : technique



Final restoration

- Rationale for **stainless steel crown**
  - Pulpotomized teeth are usually more brittle and prone to fracture
  - A large amount of tooth structure needs replacing
  - Intracoronal restorations unable to provide sufficient flexural strength and wear resistance
  - Extracoronal restoration necessary for required coronal seal

Pulpotomy medicaments

- Forocresol
- Ferric Sulphate
- Electrocautery, laser
- Bone Morphogenic Protiens
- MTA

Formocresol Pulptomy: current concerns/controversies

- Safety considerations
  - Potential for toxicity
  - Systemic distribution from tooth site
- Toxicity only shown in animal studies using quantities far exceeding typical clinical use
- The international agency for research on cancer has recently classified formaldehyde as carcinogenic to human beings.
- Since Buckley's formocresol contains 19% formaldehyde in its full strength and alternatives have been achieved to replace it with Ferric Sulphate 15.5% concentration (Srinivasan et.al 2006)

Ferric Sulphate

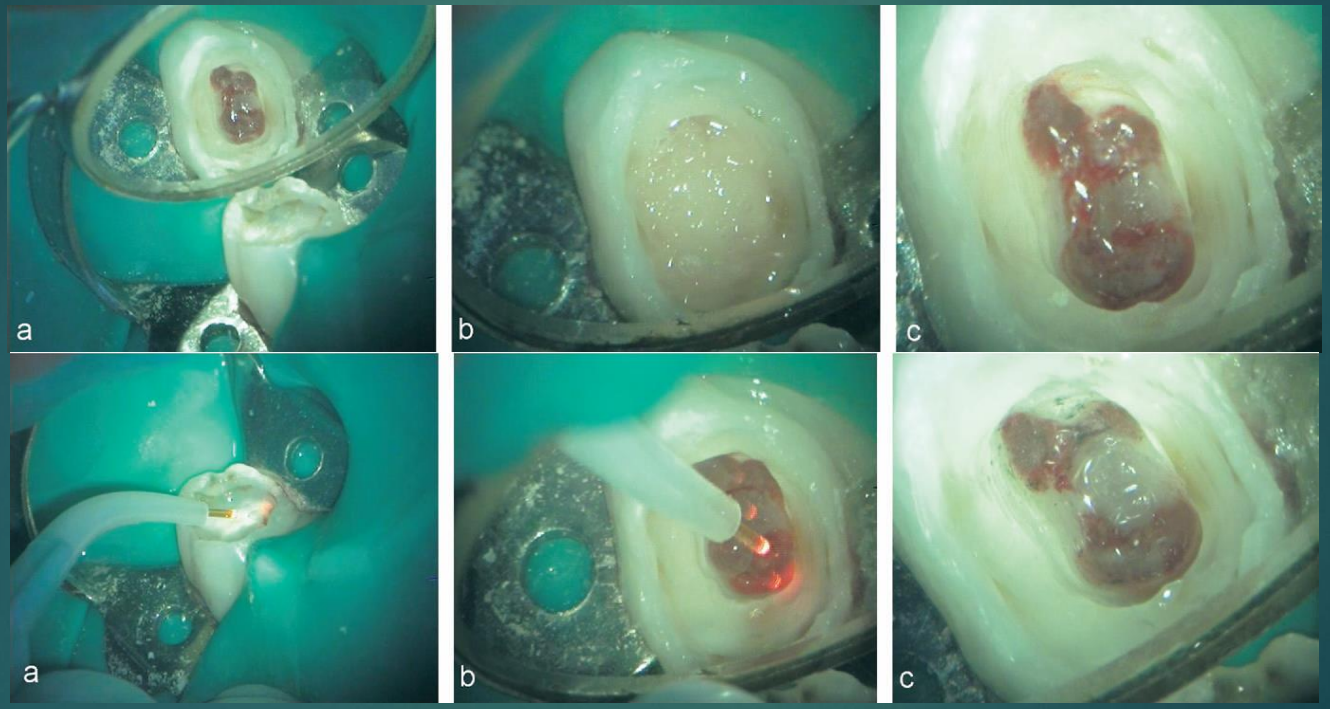
- Excellent haemostatic agent
- Has no bactericidal effect
- Significantly less toxic

Ferric Sulphate: action & outcome

- Used at 15.5%
- Ferric ion-protein complex forms on contact with blood, creates membrane that mechanically seals out blood vessels
- Success range 93%- 100% over 2 yrs follow up
- Success of ferric sulphate may ↓ over time:

Laser Pulpotomy

- Nd.YAG laser use repots clinical success rate 86% *(Odabas et.al 2007)*



MTA

- Marketed as ProRoot Grey or white
- Biocompatible, provides good seal
- Actively promotes hard tissue formation by stimulating cytokine release from bone cells

Material of choice for primary tooth pulpotomy

- The evidence suggests MTA may be the most efficacious medicament to heal the root pulp after pulpotomy of a deciduous tooth.
- As MTA is relatively expensive, future research could be undertaken to confirm if Biodentine, laser treatment are acceptable second choices.
- Formocresol, though effective, has known concerns about toxicity.

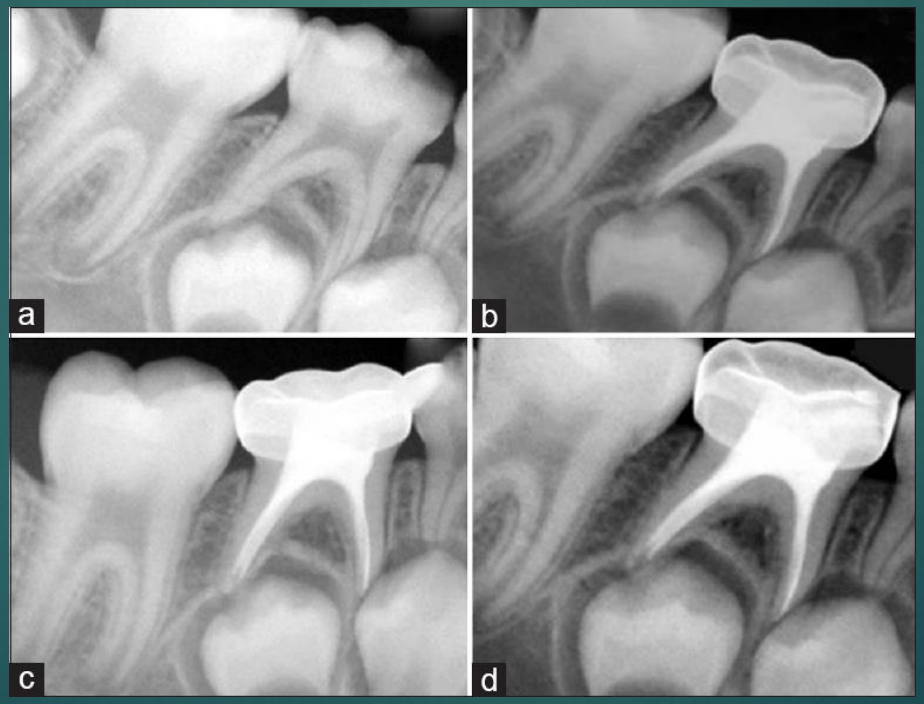
Ref: Cochrane Database Syst Rev. 2018 May; 2018(5): CD003220

Pulpotomy: Evidence of success

- Should maintain the vitality of the majority of the radicular pulp
- No prolonged adverse clinical signs and symptoms - such as prolonged sensitivity, development of pain and swelling
- No radiographic evidence of internal resorption
- No breakdown of peri-radicular tissue

Pulpectomy

Extirpation of soft tissue from coronal pulp cambers and root canals. The canal are filled with resorbable material



Indications

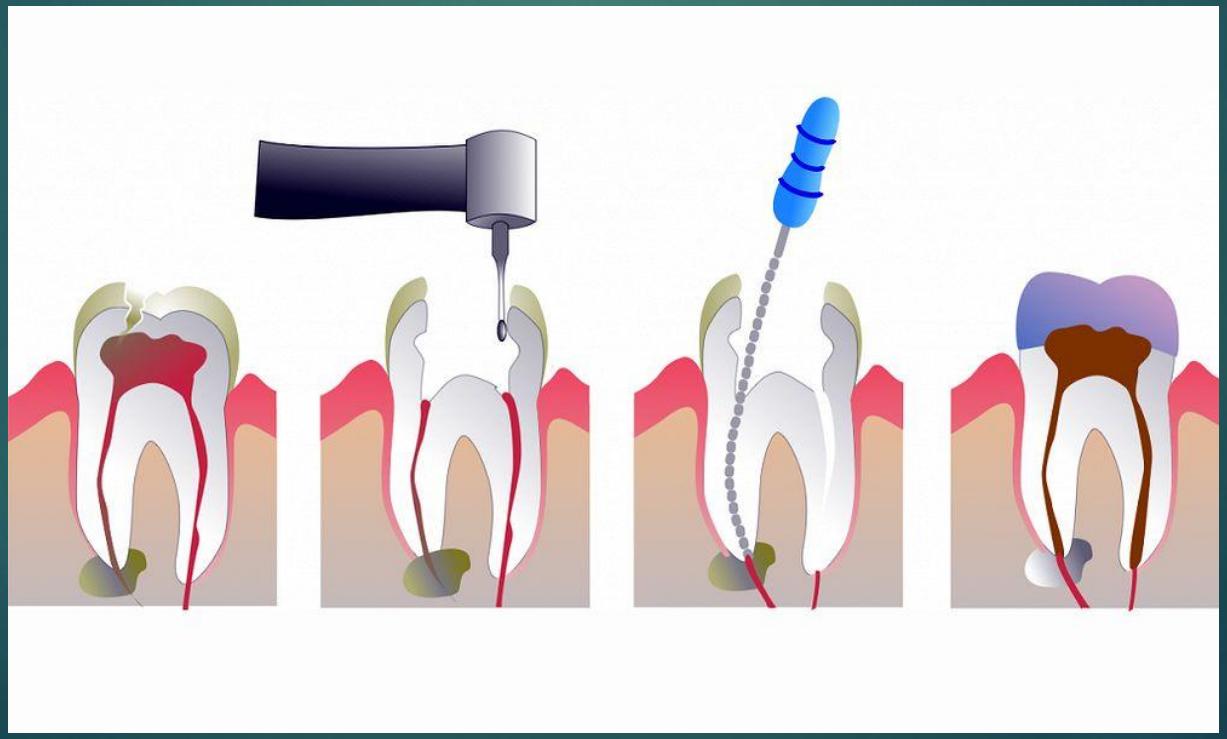
- Evidence of pulpal necrosis
- Hyperaemic pulp / irreversibly inflamed
- Evidence of periapical involvement on radiographs
- Spontaneous (unstimulated) pain

Contraindications

- Non restorable teeth
- Radiographically visible internal root resorption
- Mechanical or carious perforations of the floor of the pulp chamber
- Pathologic root resorption
- Excessive pathologic bone support loss
- Presence of dental or follicular cyst

Medicaments

- Useful agents include
  - calcium Hydroxide (Vitapex - CaOH + iodoform)
  - Zinc Oxide Eugenol (non - reinforced)
  - Iodoform paste (e.g. Kri paste)



Regarding Pulpectomy medication and technique

- There is no conclusive evidence that one medicament or technique is superior to another.
- Choice of medicament remains at the clinician's discretion.
- Research could be undertaken to confirm if ZOE paste is more effective than Vitapex and to evaluate other alternatives.

Ref: Cochrane Database Syst Rev. 2018 May; 2018(5): CD003220

Ideal requirements

- Resorb at a similar rate as the primary root
- Should be harmless to the periapical tissues and tooth germ
- Should have a disinfecting power
- Should be inserted easily into the root canal
- Should adhere to the wall of the canal and should not shrink
- Not be soluble in water
- Be radiopaque and not discolor the tooth

Summary

- Following endodontic treatment
  - Regular clinical and radiographic reviews
  - If therapy fails, then the tooth should be extracted.
- Where extracted consider space maintenance
- *Cause of failure of pulp therapy in primary teeth is inappropriate case selection (diagnosis)*
- Appropriate diagnosis in required in selecting cases
- *Long term success depends on adequate coronal seal*


Thank you