Pulpal treatment of primary teeth

5.DM - Pedo
Pulpal treatment of primary teeth

The preservation of the primary teeth whose pulp has been endangered by deep carious lesions or trauma is a major problem in primary teeth dental treatment.

Preserved primary tooth: fulfils its role as a useful component of primary dentition

- important role in mastication
- ideal space maintainer
Pulpal treatment of primary teeth

- The preservation of the primary teeth whose pulp has been endangered by deep carious lesions or trauma is a major problem in primary teeth dental treatment.

- The aim of endodontic treatment is to preserve the tooth until the time of physiological exchange, without pathological changes in periapical space.

- Extraction versus Endodontic treatment

  - Pro extraction – difficulties in instrumentation in deciduous root canals, risk of permanent follicle damage, multiple ramifications and accessory canals, (un)cooperation of child makes diagnostic process difficult, hard to set exact diagnose.

  - Pro endodontic th – keeping continuous dental arch, prevention of orthodontic anomalies, growth support.
Criteria to consider in decision for endodontic treatment (or extraction):

- The length of time the tooth will be present in oral cavity
- Root resorption- physiological, pathological
- Anodontia of successor in permanent dentition
- Value of the tooth in keeping the length of dental arch
- X-ray pathology – periapical lesion (or in molars the lesion in the area of furcation)
Criteria to consider in decision for endodontic treatment (or extraction):

- Possibility to restore the tooth after endodontic th (great loss of HDT – extract)
- General health status
- Dental status – no multiple endo treatment
- Child cooperation and interest in th of parents, length of treatment
Despite modern advances in the prevention of dental caries, many teeth still become carious and may require some form of pulpal therapy.

The four goals of pulp therapy in primary dentition are:

1. Successful treatment of the cariously involved pulp, allowing the tooth to remain in the mouth in a nonpathologic state

2. Maintenance of arch length and tooth space

3. Restoration of comfort and the ability to chew

4. Prevention of speech abnormalities and abnormal habits
Diagnostic criteria for evaluation of dental pulp condition

Exact dg is essential for the treatment plan (which method to choose)

hard to obtain history of problems from a child
the symptoms are often misleading:
  ▸ young age, communication problem, unable to describe type of pain
  ▸ fear
  ▸ parental involvement
  ▸ vitality testing is very unreliable in children
Diagnostic criteria for evaluation of dental pulp condition

1. relation of bottom of the cavity towards pulp chamber
   - Only a thin layer of dentine, pulp „shines“ through (decision between pulp capping and pulpotomy)

2. Pain
   - Positive pain means that pulp is affected, whilst negative pain does not exclude affection – dissesases often asymptomatic
   - Reaction of pulp to stimulus if instant and short suggests inflammation only in coronal part of pulp
   - Persistent pain – process spreads into root part of pulp
   - Spontaneous or night pain – total pulpitis
   - Intensive throbbing pain – massive infection, purulent inflammation
   - Pain when biting – deep dental caries or periodontal involvement

3. Percussion
   - Pain on percussion positive – total pulpitis, periodontal involvement – test is unreliable in uncooperating children, confront with healthy tooth)
Diagnostic criteria for evaluation of dental pulp condition

4. Vitality test
   - Examine repeatedly
   - Confront with healthy tooth
   - Less valuable information, since intact teeth do not have to react
   - Also based on cooperation as percussion test

5. Tooth mobility
   - Physiologic / pathologic (inflammation of periodontium)
   - Advanced resorption or periapical inflammation (rtg-granuloma) are CI of endo th
Diagnostic criteria for evaluation of dental pulp condition

6. Edema
   - Inflammation spreading into neighbouring soft tissues – indicated for extraction

7. Resorption
   - Internal resorption – untreated chronic pulpitis or after previous pulpotomy
   - External resorption – physiol. – periodontal membrane present
   - pathol. – radiolucency in periapical region (or furcation)
Assess for clinical signs of pulpal degeneration, such as – CI for endo th:

- Excess mobility
- Soft tissue swelling
- Exposed pulpal tissue
Pulp therapy techniques in primary teeth:

- **VITAL METHODS**
  - Indirect pulp capping
  - Direct pulp capping
  - Pulpotomy – vital amputation

- **NON-VITAL METHODS**
  - Pulpectomy – vital extirpation
  - Mortal amputation – mortal pulpotomy
  - Mortal extirpation – mortal pulpectomy
Indirect Pulp Capping

Goal / Aim:
- reverse the bacterial invasion
- treat the carious dentin, provoke formation of tertiary dentine
- maintain a normal and healthy pulp

Indications:
- deep caries
- hyperemia pulpae

Pain history:
- Intermittent pain
- seconds in duration
- non spontaneous (CI in pulpitis)

Clinically:
- no abscess/fistula
- no mobility
- large carious lesion

Radiographic:
- probable carious exposure
- normal bony structures
Indirect Pulp Capping

- is indicated when a deep carious lesion is close to the pulp – total removal of all carious dentine would most certainly result in a pulp exposure

Working procedure
- remove the dentin up to the last thin hard layer, with round bur or excavator
- Remove all carious dentine from cavity side walls
- a calcium hydroxide paste is used over the dentin surface to promote remineralisation and the formation of tertiary dentin, cement lining, temporary filling
- re-excavation after 8 weeks – dentine bridge formation, then permanent restoration

Failure of th:
Reparative ability of milky tooth is decreased when root resorption starts (1-1,5years) before shedding
Direct Pulp Capping

Goal:
• provoke formation of tertiary dentine
• maintain vitality of the tooth

Indications:
• accidental or traumatic pulp perforation in healthy dentine (size of perforation less then 1 mm²)

Working procedure:
• Sterile condition, stop bleeding, apply Ca(OH)2 over the perforation, place permanent filling.

• In case of trauma – crown fracture with pulp exposure - Ca(OH)2 on perforation, celluloid/plastic protective crown for 3 months, after that final treatment
Direct Pulp Capping

- placement of calcium hydroxide on a small (pinpoint) pulpal exposure
- high relationship to internal resorption in primary teeth
- limited to the exposures during cavity preparation or by the trauma
- only when no hyperemic or inflamed pulp
- requires aseptic procedure
Primary Tooth Pulpotomy

1. Partial Pulpotomy:
- Removal of part of coronal part of dental pulp, Aim is to preserve vitality and provoke formation of dentinal bridge
- maintain a functional tooth

Indications:
- Deep caries, pulp exposure in carious dentine
- Hyperemia pulpae (success only when exact diagnose is set)

Contraindications:
- Spontaneous pain for several days
- Heavy destruction of HDT, not sufficient for restoration

Radiographic:
- carious exposure
- normal bony structures
- normal root development
- no internal or external root resorption
Primary Tooth Pulpotomy

Partial Pulpotomy:
Working procedure:

- anesthesia, sterile removal of part of a pulp (pulp horn) by rounded bur (excavator), careful stopping of bleeding (hydrogen peroxide, iron sulphate - 3%H2O2, 15,5% Fe2(SO4)3) is a prevention of internal resorption.
- Fe2(SO4)3 – protein-ion complex, that closes opened cappilaries
- Covering of amputation wound by Ca(OH)2, permanent filling
Primary Tooth Pulpotomy

2. Deep Pulpotomy

- Removal of all coronal part of pulp to the root canals entrances. Aim is to preserve the pulp in root canals in non-pathologic state.

Working procedure:

- Local anesthesia, removal of coronal part of the pulp by sterile round burs, stopping of bleeding (hydrogen peroxide, iron sulphate - 3%H2O2, 15,5% Fe2(SO4)3).
- In case of prolonged excessive bleeding which cannot be stopped – that is a sign of root part of pulp involvement – inflammation....pulpectomy needed
- Cover the amputation wound
Primary Tooth Pulpotomy

Medicaments used to cover the amputation wound:

1. **Calcium hydroxide Ca(OH)2**

   Antimicrobial effect
   Alkaline ph
   Release of ions
   Enzyme activation – phosphatase
   Support of tertiary dentine formation

   - In the form of water suspension (powder+H2O2)
   - Paste
   - Liner
   - CaOH due to alcalic pH has bactericidal effect
   - For success – precise dg, precise hemostasis before CaOH placement
The effect of Ca(OH)$_2$ on pulpal tissue

Layers:

1. Remnants of necrotic tissue
2. Calcified fibrous tissue
3. Osteodentine
4. Tertiary dentine
5. Predentine
6. Odontoblasts
7. Vital pulp
Primary Tooth Pulpotomy

Medicaments used to cover the amputation wound:

2. **Formocresol – Buckley paste**

- Sol. Formalini 40% 1,9g
- Kresoli saponati 3,5g
- Glycerini 1,5g
- Spiriti 96% 43,1g
- m.f.sol

FC has carcinogenic and mutagenous properties, and can be allergen.
Primary Tooth Pulpotomy

Medicaments used to cover the amputation wound:

3. **Glutaraldehyde** – less effective than FC, less toxic, lower penetration ability, 1-3min 2% glutaraldehyde

4. **MTA (mineral trioxid aggregate)** - It has the ability to encourage hard tissue deposition similar to Calcium hydroxide effect.

5. **Ferric sulphate**
Primary Tooth Pulpotomy

Effect of formocresol on pulpal tissue:

- Zone of fixation
  - Coagulation necrosis
  - Vital tissue

Working procedure of FC pulpotomy:
Primary Tooth Pulpotomy

Treatment Procedure:

1. Identify pulpal exposure, local anesthesia

2. Remove the roof of the pulp chamber.

3. Remove the coronal portion of inflamed pulp.

4. Control hemorrhage.

5. Place cotton pellet dampened with formocresol for 5min.

6. Assess clinically for condition of pulpal tissues – non bleeding dark brown

7. Place amp.paste or ZOE into pulpal chamber and filling to restore the tooth.

Amputation paste: ZnO, eugenol, formocrezol
Primary Tooth Pulpectomy

- involves the extirpation of the pulpal tissue and filling the canals with an inert medicament
- inflammation affects the whole dental pulp
- vital methods – removal of pulp after deposition of anesthetic solution
- mortal method – removal of devitalised pulp by paraformaldehyd paste
- necrosis, gangraena
Pulpectomy in primary dentition

- DIFFERENCES IN ENDODONTHIC IN PRIMARY DENTITION
  - Thinner root canals, harder for instrumentation, difficult mechanical-chemical preparation
  - Precise instrument length – overinstrumentation leads to damage of permanent follicle
  - Resorbable root canal filling material
  - No gutta-percha points

Indications of pulpectomy in primary dentition:
- Total pulpitis

Materials used: calcium hydroxide, ZOE paste, Iodine paste
Pulpectomy

Materials used for root canal treatment:

1. Ca(OH)2
2. ZOE paste
   - Eugenol is the effective agent
   - Rezorbes with root, but somewhat slower
3. Iodine pastes (Iodoform)
   - Soft, resorbable paste
   - Pure iodine or combination with other agents as in KRI paste (chlorophenol camphor mint iodoform paste)
   - More equal resorption than ZOE
4. MTA (mineral trioxid aggregate)
Necrosis and gangrene of dental pulp

- Endodontic treatment of infected RC has doubtful prognosis

General and local conditions:

- general health status, oral health status
  - local factors (single-rooted, multirooted)
    - x-ray findings
    - root resorption
  - presence of fistula
  - degree of crown destruction
  - value of the tooth
Kontraindikácie endodontického liečenia

PatoLOGICKÁ RESORCIA KORUNA
PREJASŇENIE
V OKOLÍ HROTU
Necrosis and gangrene of dental pulp

Necrosis pulpaee

Gangrena non complicata

A) I. a II. stage of development
Th: observation of tooth
B) III. a IV. stage of development
Th: endodontic treatment
C) Resorption of 1/3 RC
Th: extraction
Necrosis and gangrene of dental pulp

Gangrena complicata (radiolucency, RC exudation)

III. a IV stage of development
Th: extraction

Gangrena non complicata

III. a IV stage of development
Th: endodontic treatment
Apical periodontitis in MD

- Pain symptoms together with x-ray finding of periapical pathology - Extraction of tooth is indicated

- Persistent chronic periapical infection can lead to permanent tooth damage – TURNER S TOOTH – dysplasia of HDT

- Leaving trepanated milky tooth with empty root canal can lead to dentogenic absces in orofacial region
Endodontic treatment

1. Less successful in milky dentition
   - Multiple ramifications in root
   - Root canal walls very thin
   - Apical foramina not always clearly distinguished
   - Overinstrumentation can damage the follicle of permanent tooth
   - Frequent internal resorption in milky dentition after endodontic treatment (mechanism not clearly explained)

2. Endodontic decontamination
   - Usage of antimicrobial (in lowest effective concentration) and tissue fixating agents (amputation pastes)