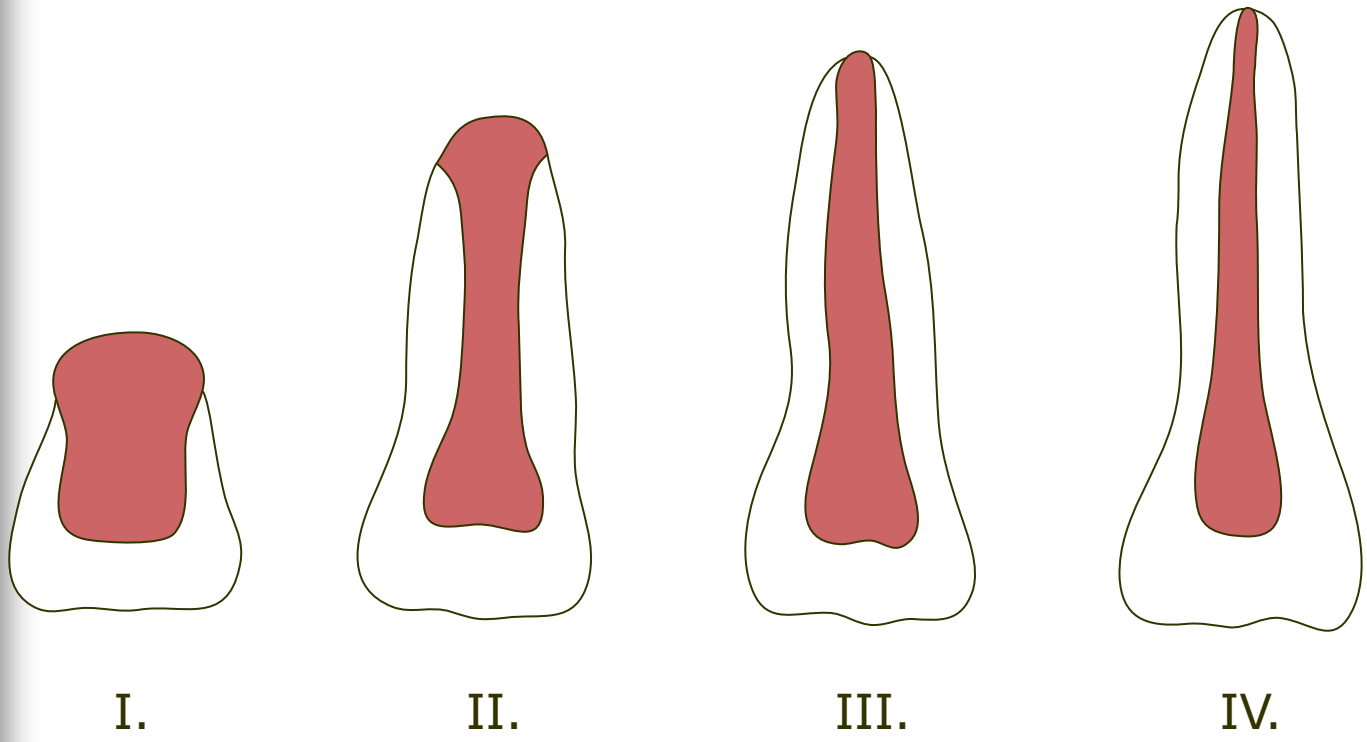
Paediatric Dentistry IV

Endodontics in primary dentition

Developmental stages of root



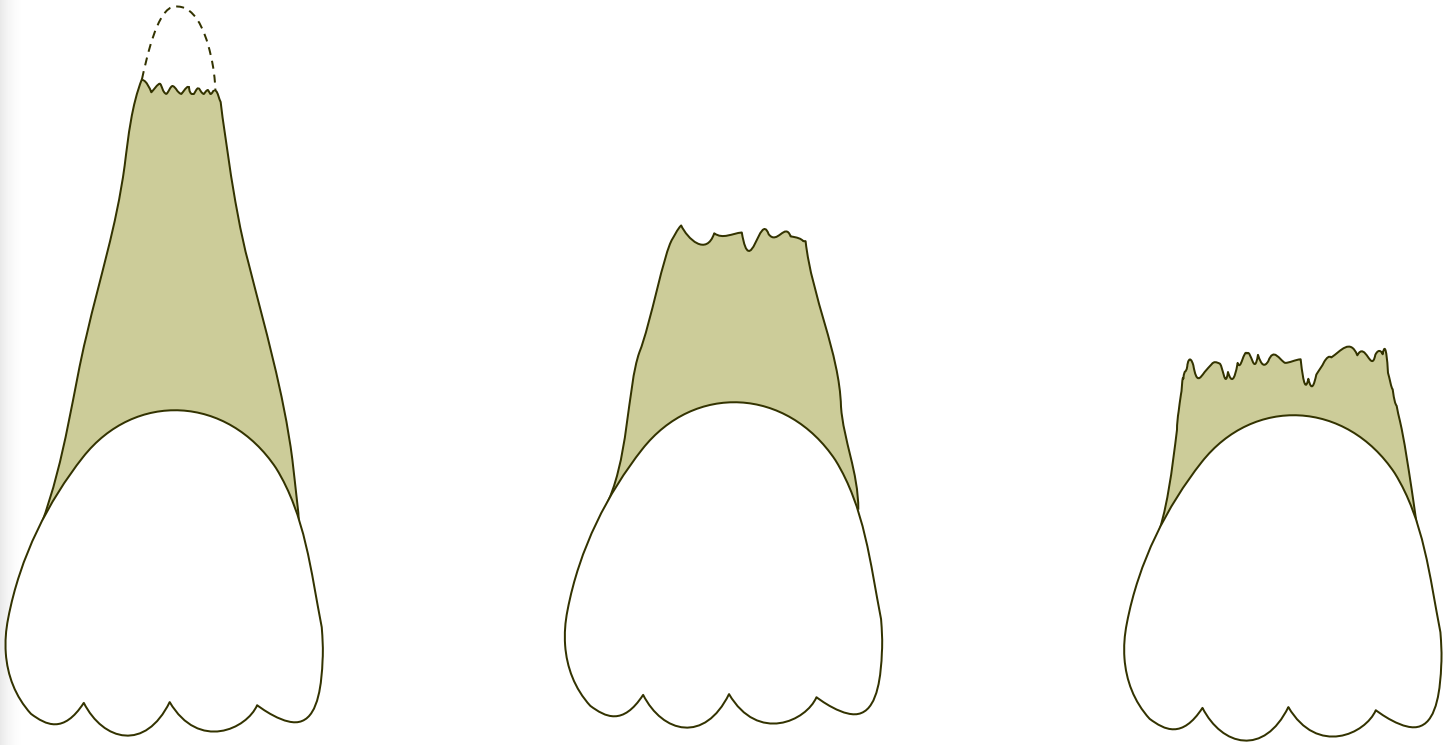
Stages of root development

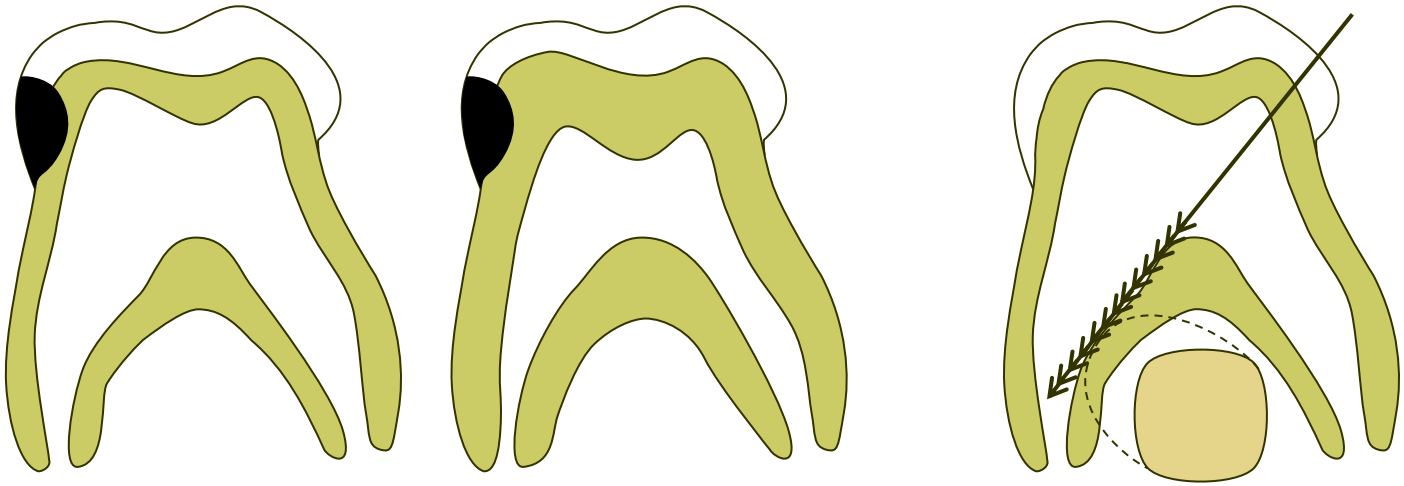
normally – 7 stages, for our purposes only 4 are of significance– crown is out of the bone and is present in the oral cavity (the remaininr 3 are intraosseal)

- **The first stage of development** – the root is shorter than the crown, maximally of the same length (1:1). Dentine layer s very thinn, dental pulp cavity is large, dentinal wall are divergent apically and the foramen apicale is very large (open apex) – shape mesenchymal papilla
- **The second stage of development** – the root is longer than the crown, dental pulp is large, dentinal walls of the root are divergent apically, foramen apicale is large (open), dentine layer is very thinn
- **The third stage of development** – the root reched almost its expected length, dentine is thicker than in previous stages, dentinal walls are parallel in the apical part, dentine layer is thinn,
- **The fourth stage of development** – the root has reached the expected length (2:1), foramen apicale is closed (physioloical constriction), dentine is thicker, but the dental pulp cavity remaines large.

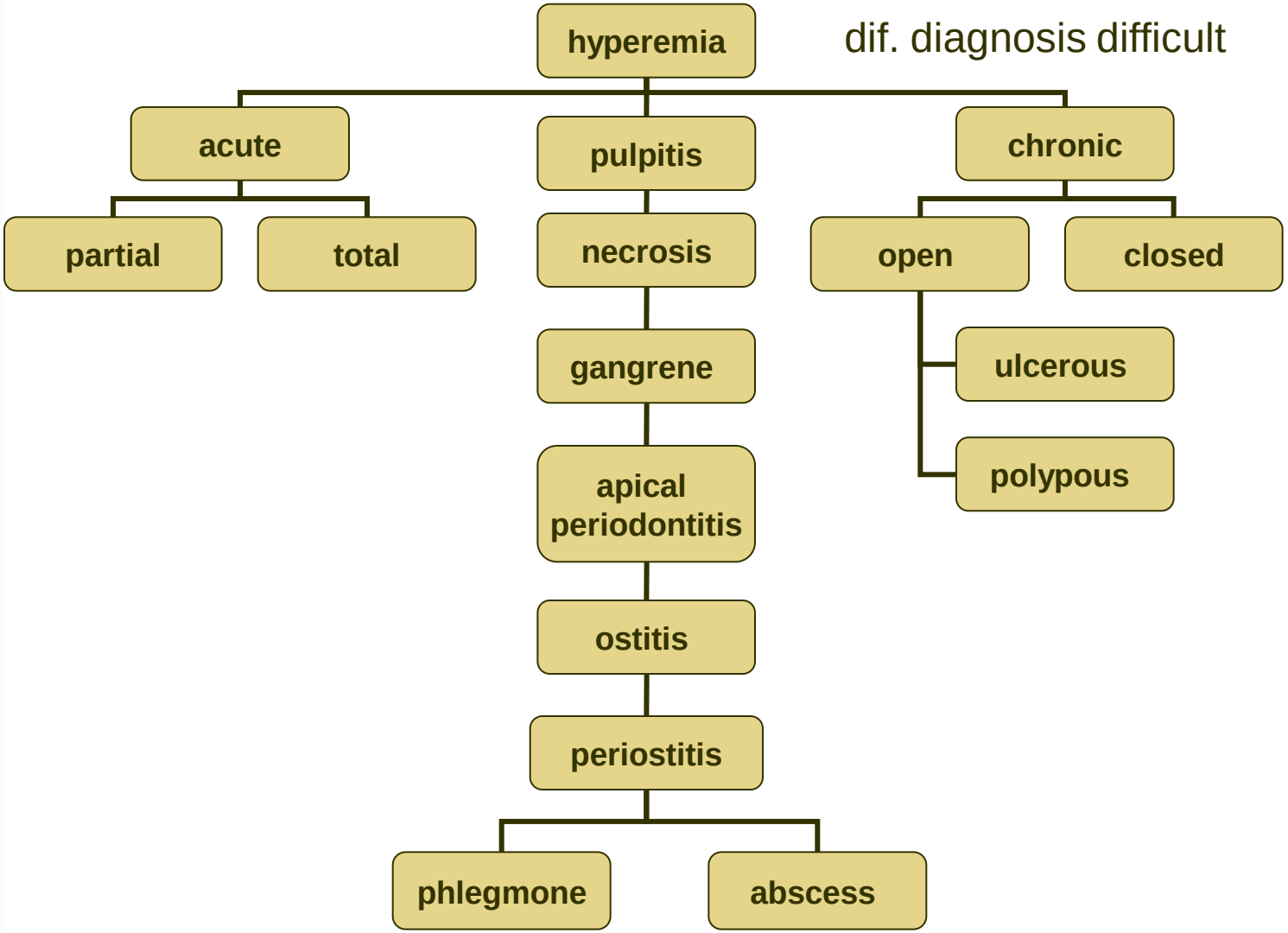
Resorption of root

- The fourth stage of development persists for a certain time and it is called **the rest stage**
- Beginning of resorption – in frontal teeth the resorption starts orally and apically, in molars from the interradicular space and apically
- Advanced resorption – substantional part of the root was resorbed – cave- in molars mainly from the interradicular space, so that the roots may seemingly be long, but the resorption may expose the dental pulp cavity – danger of irritatioon of periodontium and damage of tooth bud of the permanent tooth on endodontic treatment
- Resorption reached the area of foramen circulare – tooth is before elimination





Dental pulp diseases in primary dentition



Hyperemia

- reversible state
- Pain – short duration
- Evoked by stimuli (cold, warm, sweet, on biting)

  objectively
- caries pulpae proxima
- recent filling
- physiologic resorption

Hyperemia

Therapy

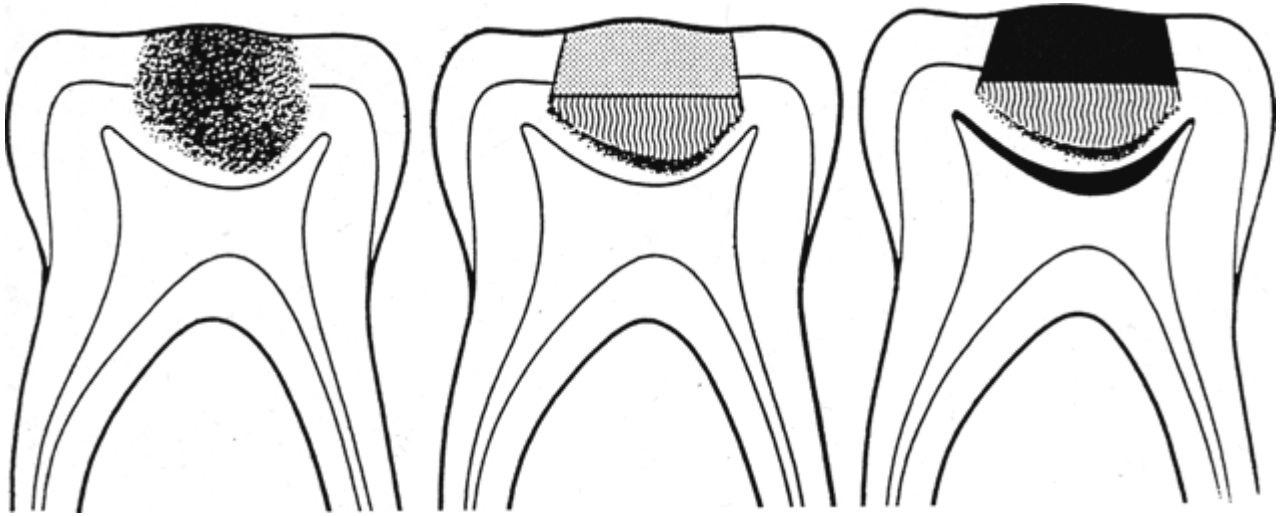
removal of inficated masses

indirect capping - permanent filling

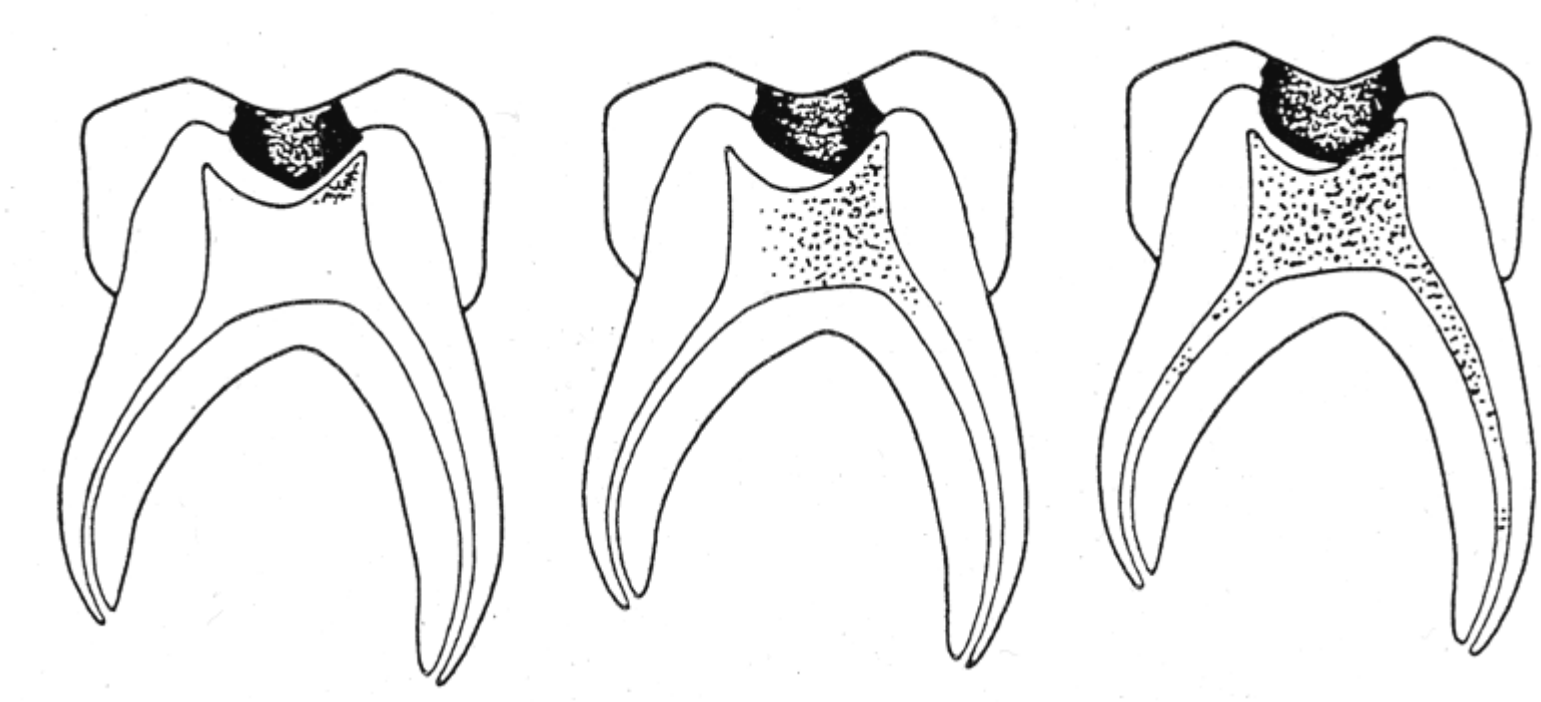
or

intermitent excavation - temporary filling

4 - 8 weels - permanent filling



Pulpitis



Pulpitis

Acute pulpitis

- spontaneous pain
- intervals without pain
- tooth - not able to localize
- pain - radiating (ear, eye, head)
- pulsating character
- neuralgiformic character

Pulpitis

serous pulpitis

- cold increases the pain (in case the pain is present)
- warm milders the pain

suppurative pulpitis

- warm increases the pain (in case the pain is present)
- cold milders the pain

Pulpitis

Symptoms last longer than 24 h ------ pulpitis totalis

pain intensity

- different, individual
- in children usually rapid course
- sometimes symptomless
- sometimes sensitivity to percussion (sign of spreading beyond for. apicale – beginning of periodontitis)
- partial pulpitis – pain of lower intensity, no sensitivity to percussion

objectively

- caries pulpae proxima
- filling lacking a base
- crown fracture
- root resorption – communication with the oral cavity

Pulpitis

Differential diagnosis

- acute exacerbation of chronic pulpitis
- periodontitis (sensitivity to percussion)
- papilitis (neighbouring tooth sensitive to percussion, pain on biting)

- incipient
  - otitis media
  - tonsilitis
  - varicela
  - aphta
  - herpetic gingivostomatitis
  - gingivitis/stomatitis accompanying inf. diseases

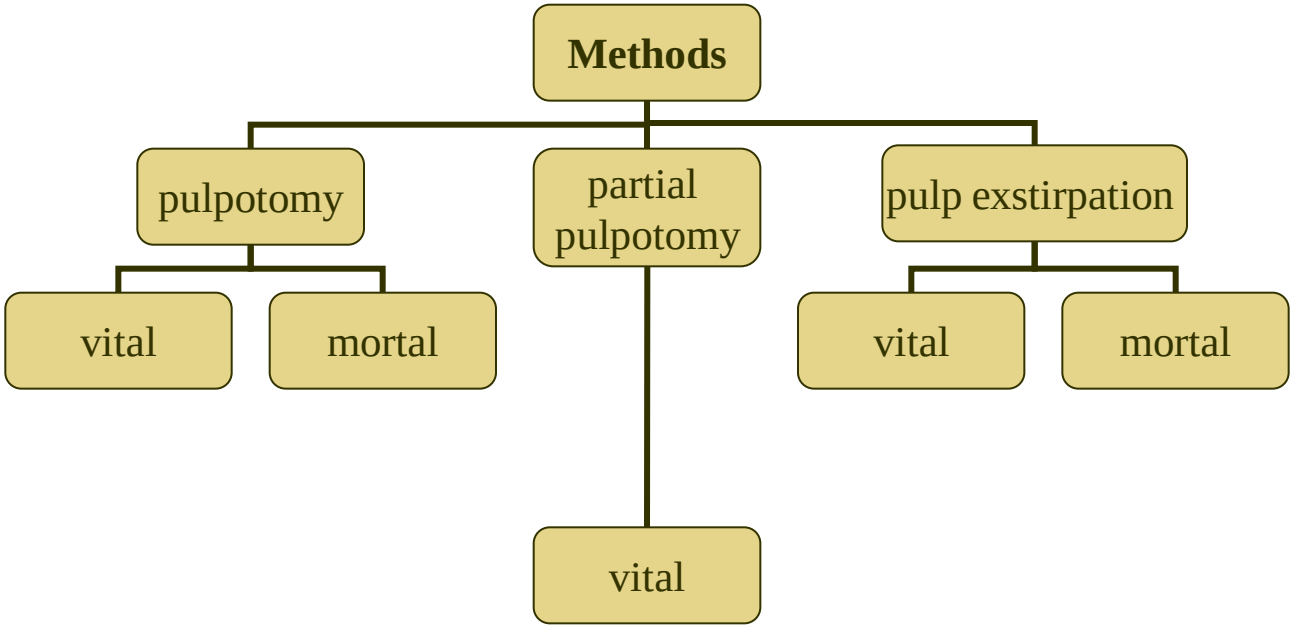
Pulpitis

therapy

necessity

- to remove the diseased tissue
- to treat the mesenchymal wound
- to fill the root canal

Treatment of the dental pulp



Pulpitis

Coronal pulpotomy (amputation of the dental pulp)
coronal dental pulp is removed – orifices of canals

Vital pulpotomy
methods with calcium hydroxide (MTA or Biodentine may be used instead of C-H)

- incompletely formed apex
- molars – anatomically unfavourable root canals
- advanced root resorption

Procedure:

- Anesthesia, absolute dry field isolation
- sterile instruments
- removal of carious dentine
- trepanation of the tooth (access opening)
- removal of the coronal dental pulp (round bur, excavator)
- bleeding stop
- calcium hyxdoxide application
- ZnO eugenol, ZnO phosphate cement
- permanent filling(crown)

complication: internal resorption (51 - 69%)

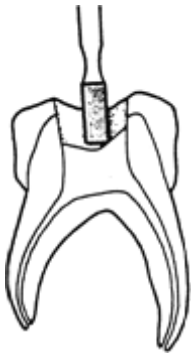
Partial pulpotomy
pulp horn removed only (part of the removed pulp - app. 1 mm)
The same procedure
indication:

- crown fracture
- dental pulp exposure in carious dentine

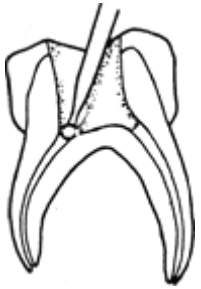
Pulpitis

Pulpotomy using calcium hydroxide

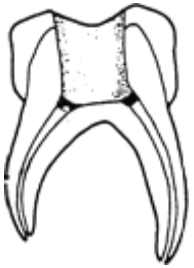
1. trepanation,removal of the dental pulp ceiling



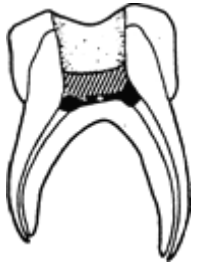
2. removal of the coronal dental pulp



3. calcium hydroxide on the canal orificia



4. calcium hydroxide on bifurcation, zinkoxid-eugenol, hermetic filling



Pulpitis

Formocresol technique

- no dentine barrier formation
- zone of fixation (of various thickness, resistent to autolysis, no bacteria)
- zone of vital reactions (vital tissue, slight inflammation, cell proliferation)
- no internal resorption reported

Composition

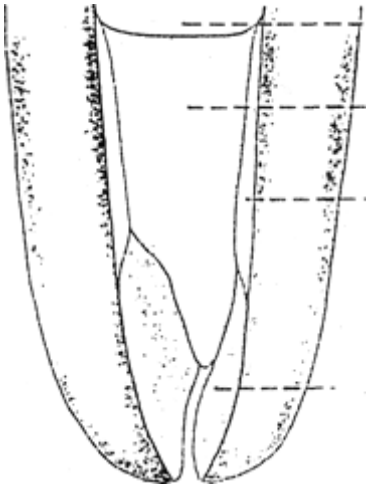
Sol. formald.conc.	19,0
Tricresoli	35,0
Glyceroli	15,0
Aq.dest ad	100,0
m.f.sol.	

This stock solution is diluted 1:5

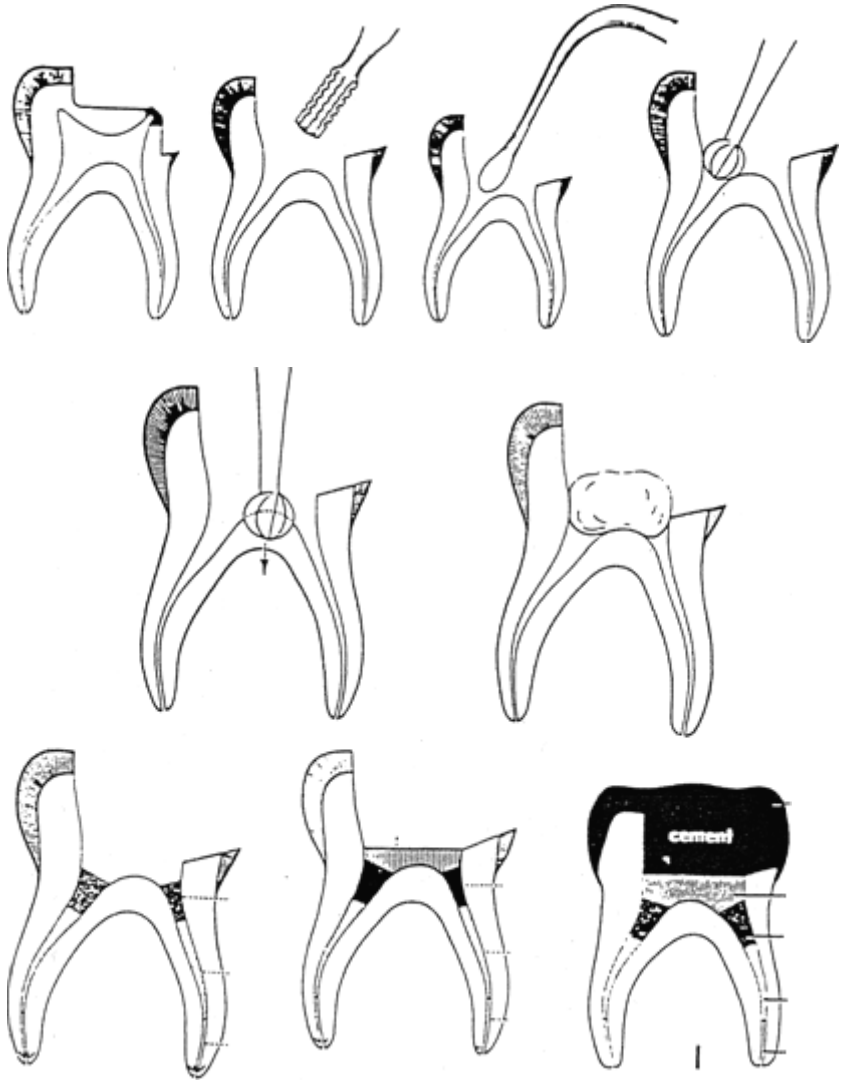
Pulpitis

Formocresol technique

Working procedure



zone of fixation
zone of coagulation
vital tissue



Pulpitis

Formocresol technique

Working procedure

- local anaesthesia (block),absolute dry field isolation
- carious dentine removal
- access opening (trepanation)
- dental pulp removal
- bleeding stop
- coton pelet soaked in formocresol for 5 minutes on the pulp
- drying
- zinkoxideugenol paste application
- cement
- permanent filling (crown)

Pulpitis

Calcium hydroxide alternative

Principle of amputation wound treatment – bleeding arrest

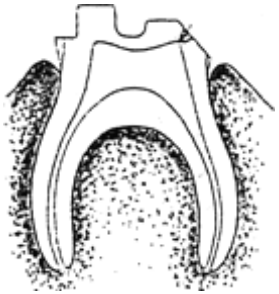
- Ferric sulphate $Fe_2 (SO_4)_3$ — 15,5% solution
  (used also for gingiva retraction before impression)

- chemical reaction with blood - agglutination of ferric and sulphate ions with blood proteins
  formation of a mechanical barrier at the end of cut blood vessels

- application 10-15 seconds (cotton wool pledget)
- Rinsing (water, saline – sterile)
- Drying, application of $Ca (OH)_2$, zinkoxideugenol cement, phosphate cement, permanent filling
- Root dental pulp remains vital

Possibilities of the dental pulp treatment - survey

1. Indirect capping

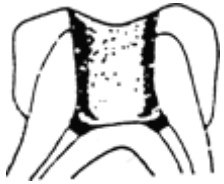


2. Intermitent excavation

3. Direct capping

4. partial pulpotomy

5. pulpotomy



Mortal pulpotomy

Primary molars

- Rest stadium with unfavourable anatomical conditions
- Root resorption

Working procedure

- devitalization: paraformaldehyd paste
- application directly on the dental pulp + temporary filling
- after 5-7 days coronal dental pulp removal
- Root canal orificia – covered with a paste containing paraformaldehyd or
- Some of amputation pastes - Walkhoff, iodoform,
- cement + filling (crown)

Root filling

Root filling materials for primary dentition

requirements

- Resorption of the material – resorption of the root
- Inert to periodontium
- Inert to buds of permanent teeth
- Antiseptic properties
- Easy to applicate to the canals
- No shrinkage on setting
- Easy to remove when necessary
- Adherence to the walls
- X-ray opacity
- No discoloration of tooth structure

No ideal material at the present time

Materials used

- ZnO –eugenol cements
- Calcium hydroxide – only temporary filling
- Iodophorm based materials

1. **Zinkoxid-eugenol**
   - Most frequently used
   - Application by spiral filler
   - Pressed in by a cotton pellet
   - Frequently –not sufficiently filled
   - Advantage – syringe application
   - Overfilling – foreign body reaction in periapical tissues
   - Resorption – slower than the root

2. **Calcium hydroxide**
   - Alone - rarely
   - Mixture – calcium hydroxide + iodophorm (Vitapex), paste in syringe
   - resorption – more slowly than the root

Almost ideal root canal filling material

3. **Iodophorm**
   - Walkhoff 1928
   - Jodoform, ZnO, thymol, phenol,(chlorphenol), tricresol, tricresol-formalin
   - KRI pasta (Pharchemie): iodophorme 80,8%, camphora 4,9%, alpha-chlorphenol 2%
   - Different pastes: ioodophorm, parachlorphenol, camphora, menthol, ZnO, thymol, lanoline

Gutta-percha ???

- non resorbable
- Until now – no usage in primary dentition
- Absolutely inert, no harm to tissues and tooth buds

Exstirpation of the dental pulp

Vital

- Single rooted teeth
- foramen apicale closed (rest stadium)
- Slight resorption only

Greatest importance - canines (long rest period)

The same procedure as in vital pulpotomy

- Dental pulp removed totally by barbed broach

Root filling - resorbable

- Walkhoff paste
- iodophorm paste
- zinkoxideugenol cement
- calcium hydroxide
- Vitapex (iodophorm+ calcium hydroxide)

Never the filling material for permanent teeth

Procedure: access opening, exstirpation of the dental pulp, root canal shaping and cleasing

root filling

cement base

glassionomer cement, composite resin,

compomer material, crown

Endodontic therapy – root filling (pulp exstirpation)

Exstirpation in molars – only in the rest stage, resorption is individual, always necessary to asses the dental age on X-ray

Resorption can be expected in:

- primary molars **about 6 years of age**
- **primary incisors** **about 5 years of age**

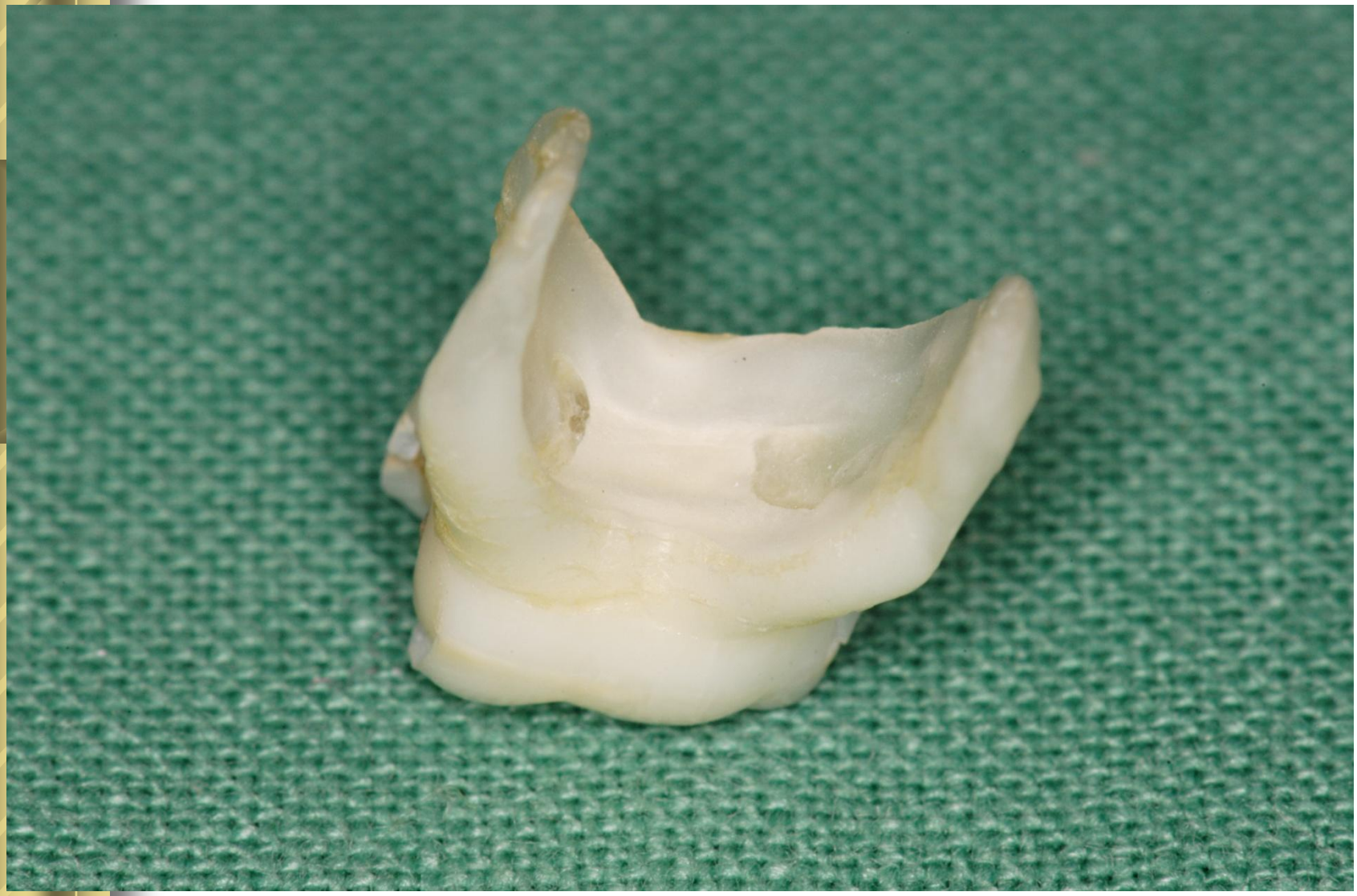
later - pulpotomy

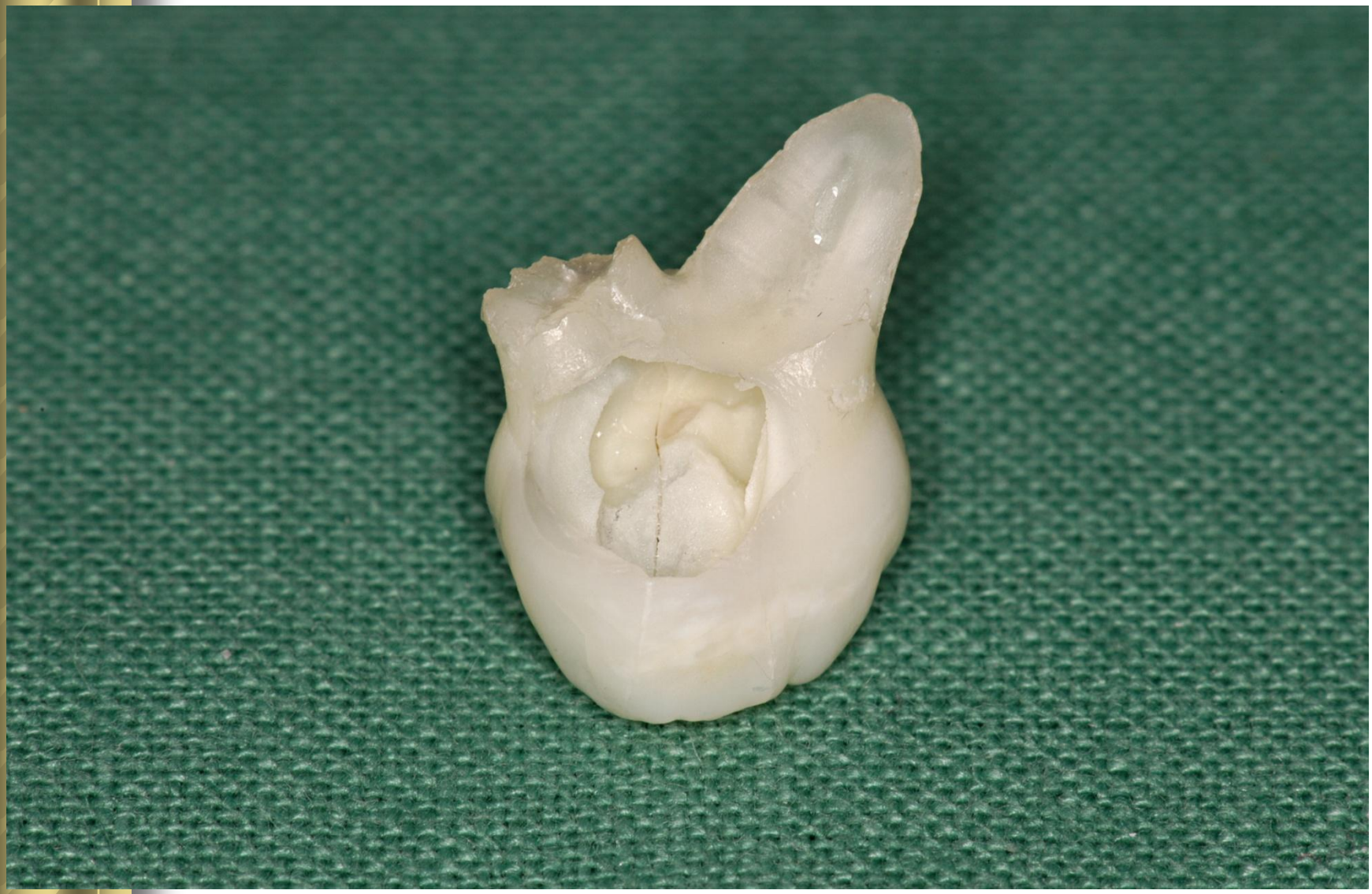
irritation of periodontium and bud of permanent teeth

both mechanically and chemically

Resorption of primary teeth

- In the following pictures you can observe the resorption of primary molars roots reaching into the dental pulp cavity





Exstirpation of the dental pulp

mortal exstirpation

- removal of decayed dentine
- paraformaldehyde paste 5-7 days
- removal of the dental pulp - barbed broache
  - root instrument
- root canal filling (resorbable)

Generally valid:

primary molars:

- exstirpation cannot be performed to the foramen physiologicum
- unfavourable anatomical conditions – long, narrow and curved canals with many ramifications

For these reasons – the term may be rather deep amputation (pulpotomy) than exstirpation

Necrose and a gangrene of the dental pulp in primary teeth

sequale of non treated pulpitis

necrose + infection = gangrene

clinical symptoms

- poor, no complains

gangrene

- disagreable odeur if the tooth is open
- tooth is closed – diagnosis difficult

suspicious teeth

- deep caries,dark discoloration
- loss of opacity
- no sensitivity to percussion
- no sensitivity to warm stimuli
- no response to cold
- no pain on preparation

therapy 4 possibilities

- root canal filling
- tooth is left open
- permanent drainage
- extraction

Decisive factors

- state of the root resorption
- anatomy of root canals
- cooperation of the child
- health state of the child

Root canal filling

under favourable anatomical conditions
mostly in single rooted teeth

- root canals can be endodontically treated
- rest period
- no resorption or incipient

method → one appointment
method → more appointments

root canal filling

- iodophorm paste
- Vitapex
- zincoxideugenol
- Gysi triopaste

1. appointment
   - necrotic (gangrenous) content removal
   - root canal shaping (gently)
   - irrigation with antimicrobial substance (NaOCl, chlorhexidin)
   - disinfectant dressing (calcium hydroxide)
   - hermetic filling

2. appointment
   - root canal rinsing,drying
   - root canal filling (resorbable paste)
   - permanent filling (possibly temporary filling, permanent filling in the 3. visit)

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Decisive factors

- state of the root
- anatomy of root canals
- cooperation of the child
- health state of the child

Tooth is left open: exceptionally

- tooth crown is not destroyed
- points of contact mentained (mesio-distal dimension)
- good health state
- single tooth with gangrene

Carious dentine removed

gangrenous contents removed (from the crown)

tooth impregnation (silver nitrate)

Permanent drainage

Modification of the previous therapy

the same indications

Possibility of tooth reconstruction

- gangrenous content removed
- root canals disinfected
- Calcium hydroxide on the cavity floor
- layer of phosphate cement
- amalgam filling
- large communication from the vestibular surface – into the dental pulp cavity – along the gingival margin
- calcium hydroxide rinsed out
- cavity can be cleansed

Advantage (against the previous method)

- improved oral hygiene
- improved masticatory function
- improved function as space- maintainer

Permanent drainage

Contraindications of endodontic treatment in primary dentition

- teeth which cannot be restored
- uncooperative patient
- systemic disease
- orthodontic reasons for extraction

Pulpitis acuta partialis

frontal and distal teeth

stadium

- incomplete root development -very rarely – because of age of the child
- rest period
- resorption

Coronal pulpotomy

incomplete root development	vital - very rarely
rest period	vital
molars also	mortal
resorption	vital
molars also	mortal

Pulpitis acuta totalis

-frontal teeth

incomplete root development

extraction

rest stadium

dental pulp exstirpation

-root resorption

-extraction

molars

exstirpation cannot be in reality performed, rather deep pulpotomy, considering that anatomic conditions are unfavourable

therapy - molars

- **incomplete root development**
  extraction
- ***rest stadium***

vital exstirpation (deep pulpotomy)

Root canal filling

root resorption

a. tooth after mortal devitalization is left open, remaining root dental pulp is mummified
b. mortal devitalization, orificia covered by iodophorm or Walkhoff paste (or others), filling or crown
c. tooth extraction

Pulpitis chronica aperta

b. polypous pulpitis

- treatment is not necessary (no complains)
- vital pulpotomy
- extraction

Necrose, gangrene

1. root filling - rest period, favourable conditions
2. permanent drainage
3. tooth is left open
4. extraction

Favourable conditions

1. cooperative child
2. good health state
3. good state of dentition
4. favourable anatomical conditions of root canals
5. root development completed
6. no or incipient root resorption

Apical periodontitis in primary dentition

Infection crossed the foramen apicale

process: acute chronic acute exacerbation (recrudescence)

acute apical periodontitis

- intensive pain, no rest intervals
- pacient is able to identify the causative tooth
- sensitive on biting, percussion, touch
- not possible to calm with analgetics
- slightly movable
- tooth is slightly elevated from the socket
- mild gingivitis

Apical periodontitis in primary dentition

Bone in children - enables easy penetration of infiltration
redness in apical region in vestibulum
incipient periostitis (periosteal inflammation)

Therapy - tooth trepanation
extraction

root canal treatment only
- single rooted teeth (no resorption)
- molars rarely

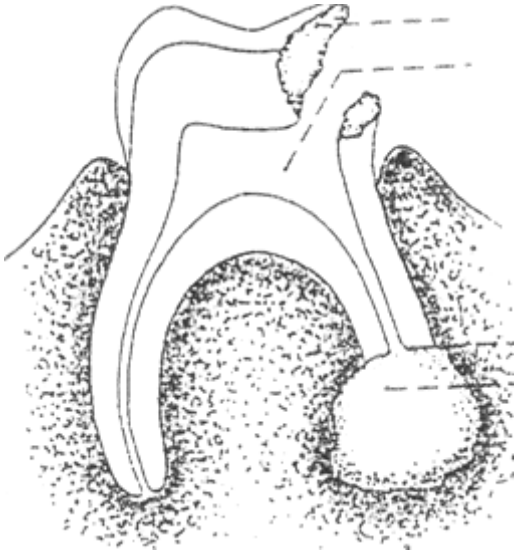
Extraction - immediately –if easy extraction is expected
in other cases trepanation + ATB
extraction postponed

Chronic apical periodontitis

no complains

- X-ray –enlargement of the periodontal space, radiolucency
- radiolucency of the adjacent bone = ostitis
- in primary dentition no granuloma

ostitis: extraction – danger for buds of permanent teeth



Periostitis in primary dentition

More frequent in primary dentition

Inflammation into spongious bone penetrates rapidly = incipient stage

Pain: increasing, pressure inside
mild swelling

Finding : non vital tooth
- expressed sensitivity to percussion, touch
- mobility of the tooth
- swelling of tissues
- infiltration sensitive - pain
- lymph nodes enlarged, swollen, sensitive
- alteration of the patient´s state

longer duration
- increasing pain
- spreading of the swelling
- fluctuation of infiltration

perforation of periosteum
- submucous abscess (relief)
  - into oral cavity-fistel
  - chronic periostitis
- perimaxillary inflammation
- perimandibular inflammation

course
- no problems
- extraoral fistel
- serious sepsis

danger
- spreading into fascial spaces

Cave – trigonum mortis!!!

therapy

- basic intervention = to enable escape of exsudation
- tooth trepanation
- incision
- extraction

causative tooth must always be extracted

tooth crown present, easy extraction expected
immediately+ ATB cover

other cases

- trepanation, incision, ATB
- postponed extraction – acute symptoms have subsided

submucous abscess

- immediate extraction,no incision necessary