






**SEMMELWEIS UNIVERSITY**  
**BUDAPEST**  
**Department of Dentistry for Children**  
**and Orthodontics**

**SECONDARY DISEASE OF CARIES**  
**IN PRIMARY DENTITION**



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# PULP THERAPY IN PRIMARY DENTITION

## Favouring factors:

- reduced enamel-dentin thickness;
- variable mineralisation qualities of pre- and postnatal enamel;
- overdimensioned pulp



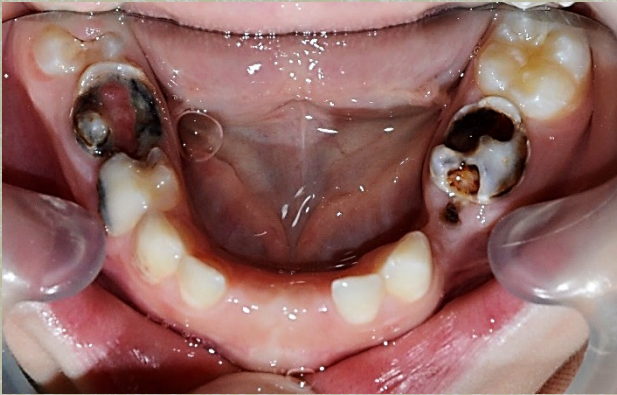
# ROOT RESORPTION



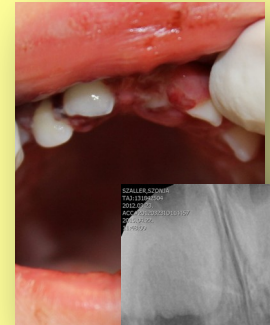
- Physiological and pathological root resorption in primary molars



# ETIOLOGY:



- **caries;**
- **secondary caries;**
- **unsuccessful therapy (fillings);**
- **trauma in primary front teeth.**





# CLINICAL DISEASE FORMS

- **PULPITIS**
- **APICAL PERIODONTITIS  
(PARODONTITIS, PERIOSTITIS)**
- **ASYMTOMATIC GANGRAENA**





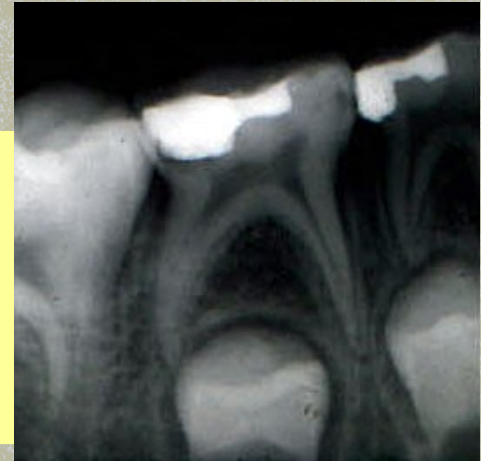
# GENERAL SYMPTOMS OF INFLAMMATION

- **DOLOR** – pulpitis, periostitis;
- **CALOR** – microthermometer,  
no diagnostical value;
- **RUBOR** – pulpitis: hyperemia localized on the  
gingiva propria and fornix;
- **TUMOR** – intra- or extraoral swelling -  
periostitis;
- **FUNCTIO LAESA** – all three disease forms.

# DIAGNOSTIC PROCEDURES

## ■ PULPITIS

- **FRONT TEETH:** - relative rare, periapical changes;
- **MOLARS:** diagnostical difficulties.

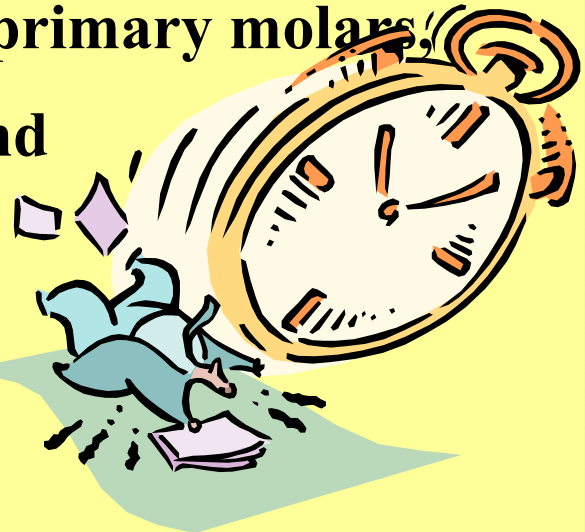


**Fillings: Rtg- and clinical aspects.**



# TIME FACTOR

- **The progression of pathological pulpal process from pulpitis to periostitis is faster in case of affected first primary molars than in case of the second primary molars;**
- **Initiation and duration of pain.**



# DIAGNOSTIC PROCEDURES

## ■ GANGRAENA – „asymptomatic G.”

- **FRONT TEETH:** - caries circularis - ECC;
- **MOLARS:** various therapeutical possibilities.

### • Symptoms



- pulp chamber is often penetrable;
- development of a sinus (fistula);
- persistence or initiation of pain;
- excessive mobility.

# DIAGNOSTIC PROCEDURES

## ■ PERIOSTITIS

- intra- or extraoral swelling;
- radiolucency in the apical area;
- pain.



**Front teeth - therapy**



# DIAGNOSTIC PROCEDURES

## ■ PERIOSTITIS

- excessive mobility;
- intra- or extraoral swelling;
- pain.



**Molars**

# DIAGNOSTIC PROCEDURES

## ■ PERIOSTITIS

- punctum maximum of the swelling;
- evaluation of tooth condition,
- excessive mobility.



54

Molars



75

# DIAGNOSTIC PROCEDURES

## ■ PERIOSTITIS

- temperature;
- prostration;
- lack of appetite.



54, 55



Molars



74, 75

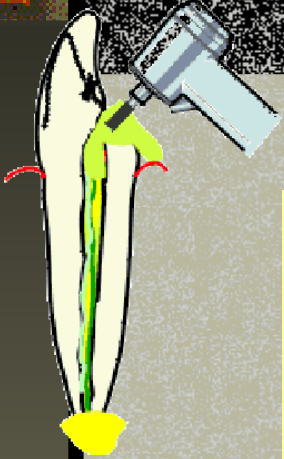


# RESOLUTION OF THE ACUTE PROCESS

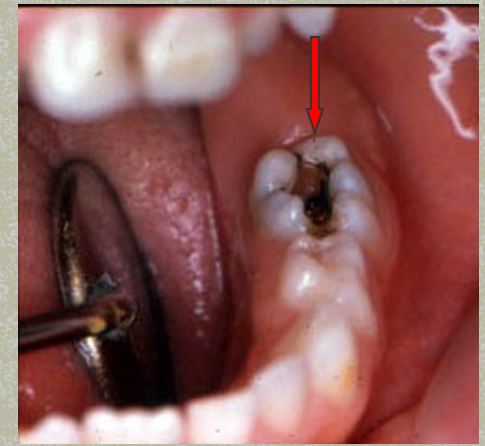
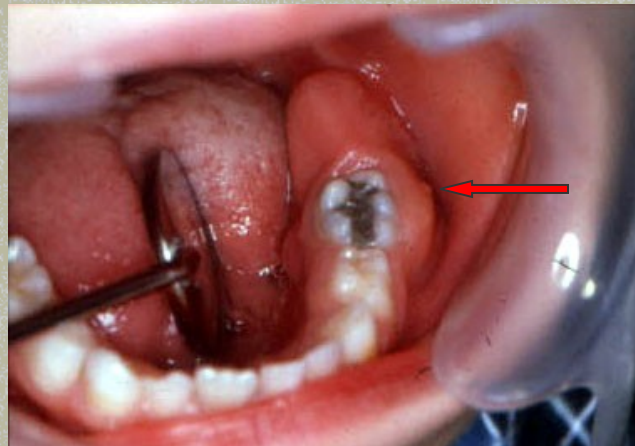
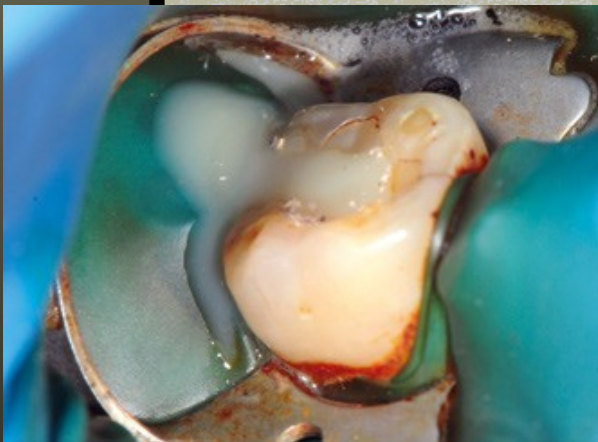


- **TREPHINATION AND DRAINAGE:**
  - periostitis → asympt. gangraena
- **necessity of conservative therapy:**
  - persistence of the cariogenic environment;
  - masticatory problems;
  - repeated acute process ;
- **medication: antibiotherapy, antiinflammatory, antipyretic therapy, pain release;**
- **RTG??: so-called root canal filling, trauma, DD of swelling;**
- **monitorising, controll: 48 h.**

# TREPHINATION



- penetration of pulp chamber should be rapid, effective and painless;
- access opening should be sufficiently large;
- purulent discharge: „pus bonum et laudabile” – no AB-therapy is necessary;
- opening from buccal – occlusal restoration;
- irrigation with sodium hypochlorite solution ;
- alimentary debris should not obliterate the access opening.





# PULP THERAPY

- **Indirect pulp cap:** - thin, but 100% intact, cariesfree dentin;  
-  $\text{Ca}(\text{OH})_2$ ;
- **Direct pulp cap:** **pulp necrosis!!** – low pulp reactivity.
- **Vital amputation, pulpotomy:** - preventive vital amputation: first primary molars, caries profunda .





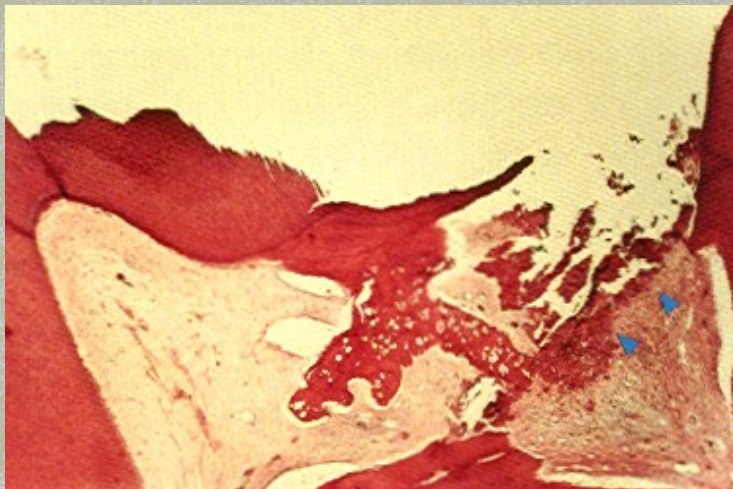
# PULP THERAPY

- **Partial pulpectomy, so-called high amputation:**
  - pulpitis incipiens;
  - pulpal hyperemia;
  - no possibility of hemorrhage control during pulpotomy.
- **Total pulpectomy:**
  - nonvital pulp;
  - degenerative pulpal changes with involved radicular tissues.


# VITAL AMPUTATION (PULPOTOMY)

## INDICATION

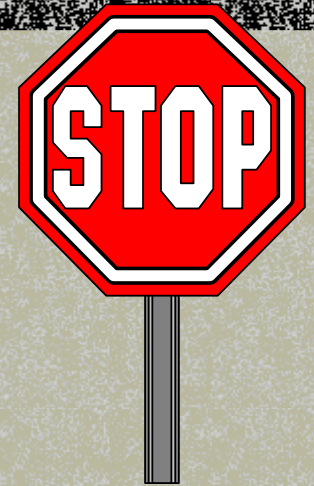
- vital primary teeth whose pulp have been exposed;
- coronal pulpitis.



Chr. pulpitis after direct pulp cap using  $\text{Ca(OH)}_2$



# VITAL AMPUTATION (PULPOTOMY)



## CONTRAINDICATION

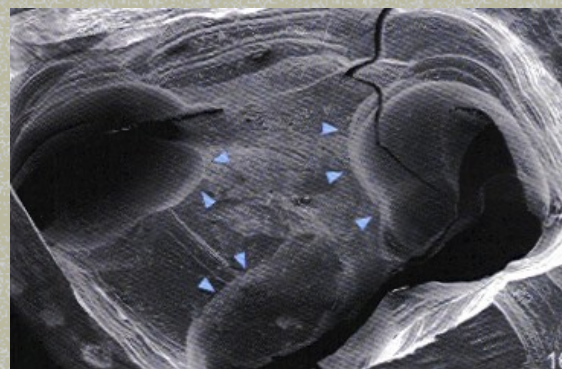
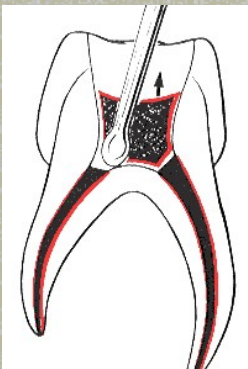
- **physiological root resorption more than 1/3-rd of the natural root length;**
- **pathological internal or external resorption;**
- **periapical and/or inter-radicular radiolucency;**
- **fistulas, sulcular drainage;**
- **spontaneous pain or putrescent odor;**
- **swelling, abnormal mobility.**



# VITAL AMPUTATION (PULPOTOMY)

## ■ TECHNIQUE

- Lokal anesthesia;
- Isolation, rubber dam;
- Coronal pulp amputation: sterile spoon excavator, medium sized round bur.



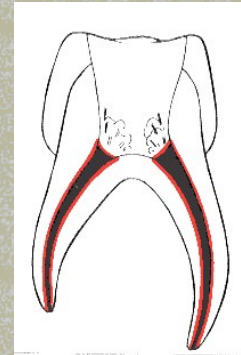
**Large round bur:**  
Pulpal floor perforation

REM

# VITAL AMPUTATION (PULPOTOMY)

## TECHNIQUE

- Fast hemostasis;
- Avoid **coagulum**.



**= Key of successful pulpotomy:**

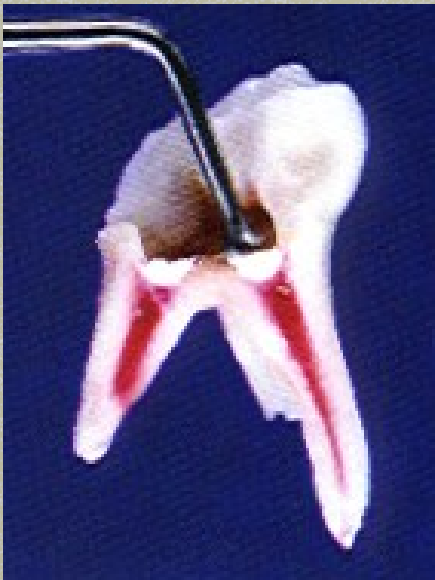
- no contact between vital pulp tissues and pulpotomy materials,
- favors inflammatory process, internal resorptions and pulp necrosis,
- no secondary dentin (dentin bridge) formation.

# VITAL AMPUTATION (PULPOTOMY)

## TECHNIQUE

- Treatment medicaments for damaged primary pulps.

**= controvers discussion for many years:**



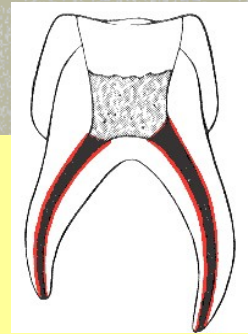
- Calcium hydroxide  $\text{Ca}(\text{OH})_2$ ;
- Iron sulphate  $\text{Fe}_2(\text{SO}_4)_3$ ;
- Formocresol after Buckley (1904);
- Glutaraldehyde 2-5%.



# VITAL AMPUTATION (PULPOTOMY)

## TECHNIQUE

- **Glassionomer cement-base;**
- **Final restoration:**



- composite or amalgam filling;
- stainless steel crown





# FORMOCRESOL BUCKLEY FORMULA

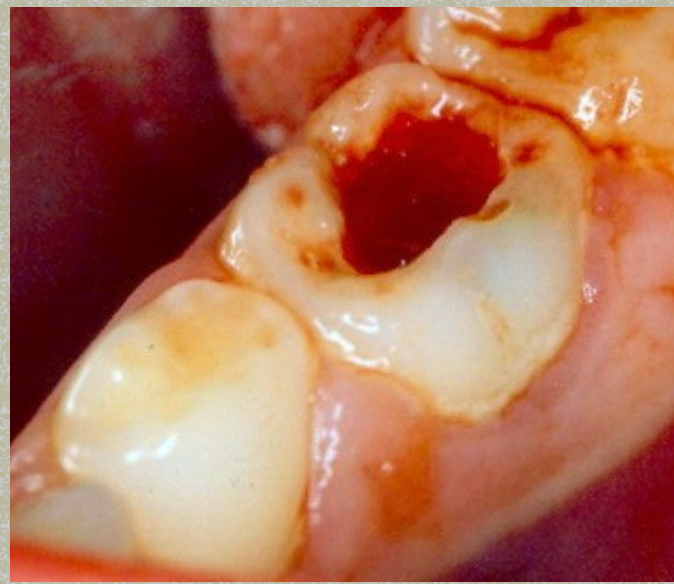
**Technique  
1930 SWEET**

- **Formaldehyde  
19%**
- **Cresol 35%**
- **Glycerine 15%**
- **Aqua dest. 31%**

**1 : 5**



# PULPOTOMIY, FORMOKREZOL



From: SE-FOK Gyermekfogászati és Fogszabályozási Klinika



# MINERAL TRIOXIDE AGGREGATE MTA

*Torabinejad et al. - 1995*

 1993 – lateral rootperforation

 retrograde rootfilling,

 direct pulpcapping,

 bifurcal perforation,

 apexifikation.

**WHITE  
GREY**

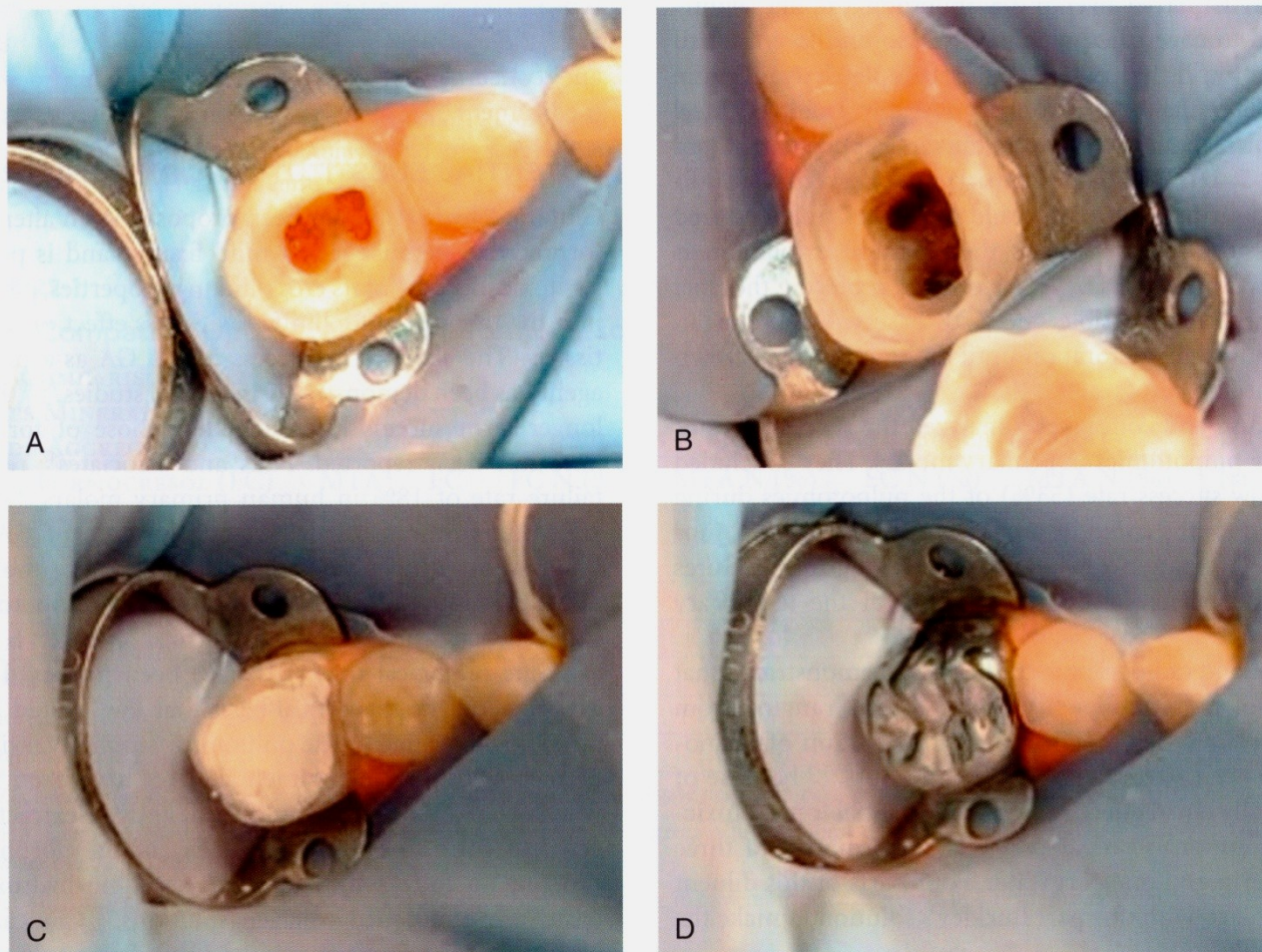


**MTA**

**pH = 12,5 ~ Ca(OH)<sub>2</sub>**

- tricalcium-silicat
- dicalcium-silicat
- tricalcium-aluminat
- calciumsulfat-dihidrat
- bismutoxid
- tetracalcium-aluminoferrit

# PULPOTOMIA, FORMOKREZOL



■ **FIGURE 22-5 Pulpotomy Technique Steps.** A, Pulp chamber after coronal pulp amputation; wide access opening prevents leaving tissue tags. B, After hemostasis and formocresol application, the tissue at the entrance of the canals shows dark color, a sign of tissue fixation. C, The pulps stumps are covered by a ZOE base. D, The tooth is restored with a stainless steel crown. (Courtesy Nathan Rosenfarb, DDS)



# PULPOTOMIA, VAS-SZULFÁT



$\text{FeSO}_4$  - Pulpotomiya



ZOE



Crownrestoration




# BIODENTINE™

*Septodont*

 **2009 –Portlandcement**


 **retrograde rootcanal filling**

 **direct/indirect pulpcappig,**

 bifurcal perforation,

 **apexification,**

 resorption,

 pulpotomy of primary teeth.

Pulver:

- **dicalcium-silicat**
- **\_tricalcium-silicat**
- Oxid - filling
- **calciumcarbonat**
- **zirkoniumoxyd: Rtg-opaque**
- **color: ferumoxyd**

Liquid:

- calciumclorit – akcelerator
- **watersoluble polymer**





# PULPOTOMY - BIODENTINE™

*Septodont*

: Goupy L. Biodentine™: Neuartiger Dentinersatz für die konservierende Kinderzahnheilkunde. 2012.



- 55 approx. caries





# PULPOTOMY - BIODENTINE™

*Septodont*

*Goupy L. Biodentine™: Neuartiger Dentinersatz für die konservierende Kinderzahnheilkunde. 2012.*

- Biodentine™ applic.
- X-ray: 1 month

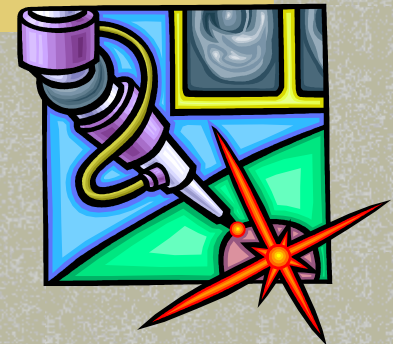
*Septodont*





# PULPOTOMY LASER

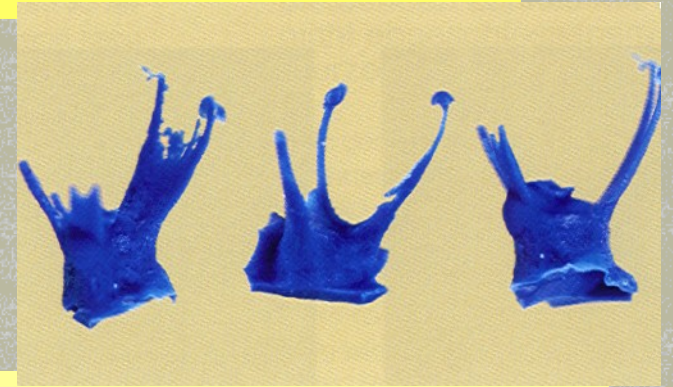
- ✂ 1960, 1985 SHOJI et al. Carbon dioxid lézer
- ✂ Nd:YAG, E:YAG, Ar-Laser, Ga-As
- ✂ Liu J, Chen IR, Chao SY.: *Laser pulpotomy of primary teeth.* J Pediatr Dent 21:128, 1999
- ✂ Elliot RD, Roberts MW, Burkes J, Phillips C.: *Evaluation of the carbon dioxid laser on vital human primary pulp tissue,* Pediatr Dent 21:327, 1999





# PULPECTOMY ROOT CANAL THERAPY

## INDICATIONS



- **Chronic inflammation and necrosis of root pulp.**

## TECHNICAL PROBLEMS:

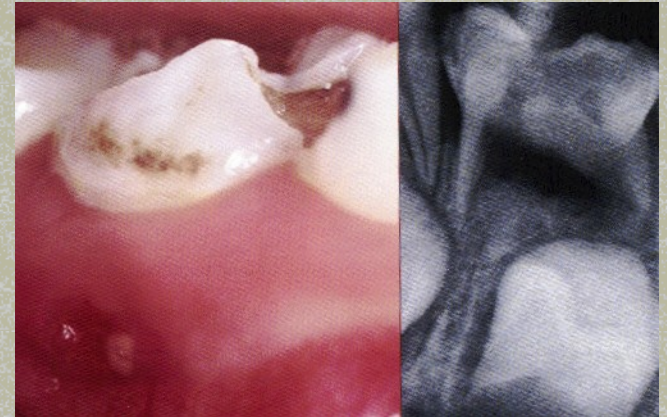
- access, debridement and filling of the mostly narrow, curved root canals;
- the child's cooperative ability.

# PULPECTOMY ROOT CANAL THERAPY

## CONTRAINDICATIONS

- resorption of natural root length more than 1/3;
- severe internal and external resorptions;
- severe periapical or interradicular inflammatory process with bone loss near the permanent germ.

**Chronic inflammatory process  
with severe bone loss**







# PULPECTOMY ROOT CANAL THERAPY

## TREATMENT PROCEDURES



**Coronal pulp  
amputation**

**Enlargement**



**Debridement  
and filing**



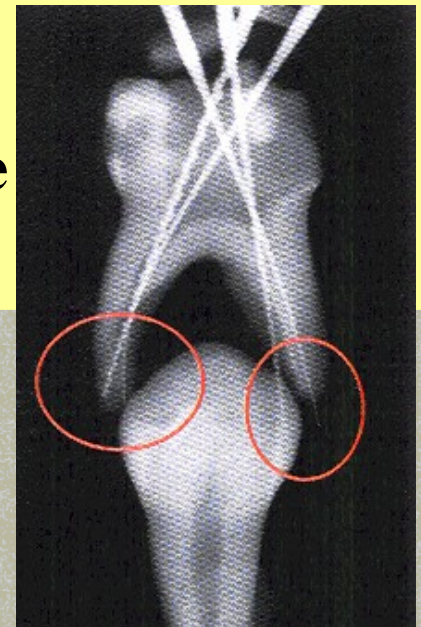
# PULPECTOMY ROOT CANAL THERAPY

## TREATMENT PROCEDURES



- Endodontic files are adjusted to stop 2 mm short of the radiographic apex;
- files and reamers max. ISO-35;
- irrigation: 0,5% sodium hypochlorite

Apical damage by  
overinstrumenting





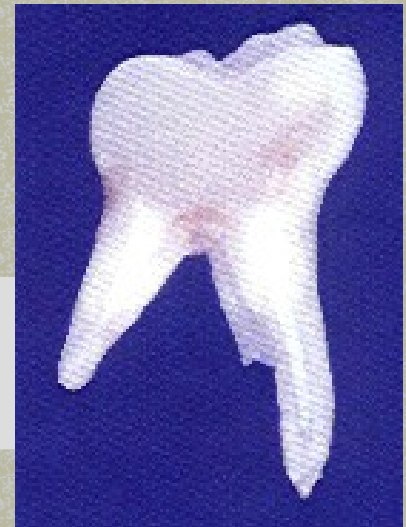
# **PULPECTOMY ROOT CANAL THERAPY**

## **TREATMENT PROCEDURES**



**Resorbable  
root canal filling**

**Final  
restoration**





# PULPECTOMY ROOT CANAL THERAPY



## ROOT CANAL FILLING MATERIAL

- **resorbable – primary root resorption;**
- **radioopacity;**
- **not water solubable;**
- **wall coating;**
- **physiologically tolerable;**
- **the disinfection qualities should not be damaging to the permanent germ.**

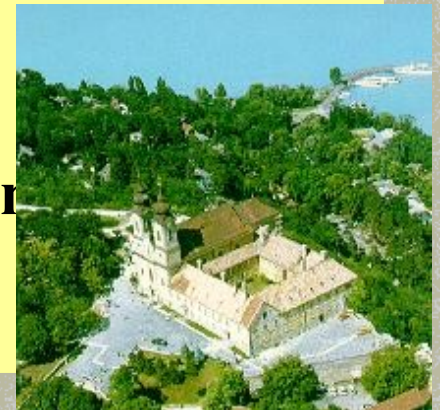




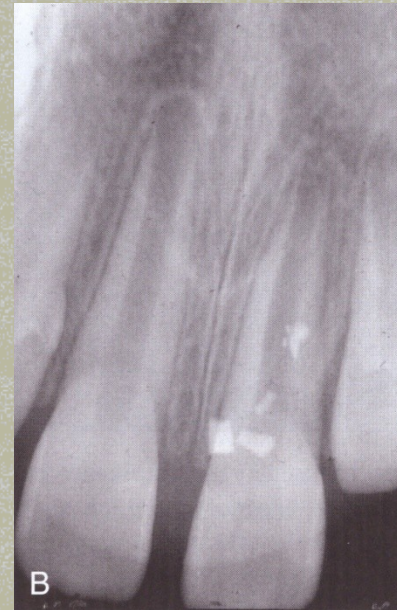
# PULPECTOMIE ROOTCANAL THERAPIE

## ROOT CANAL FILLING MATERIAL

- zinc oxid and eugenol;
- iodoform;
- calcium hydroxide;
- mixtures:
  - ex.: „mixture from TIHANY” :
  - - klion (metronidazole),
  - colophony,
  - barium sulphate – powder and
  - alcohol - liquid.



# ROOT CANAL FILLING MATERIAL



*From: Fuks AB: Pulp therapy in the primary dentition. In: Casamassimo et al. Pediatric dentistry.*



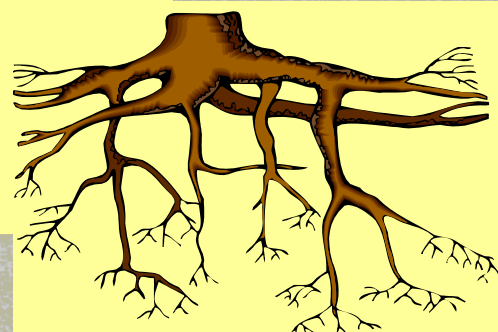


# PULPECTOMIE ROOTCANAL THERAPIE

## ROOT CANAL FILLING MATERIAL

### ■ Contraindication:

- guttapercha-;
- silver-;
- ceramic points.

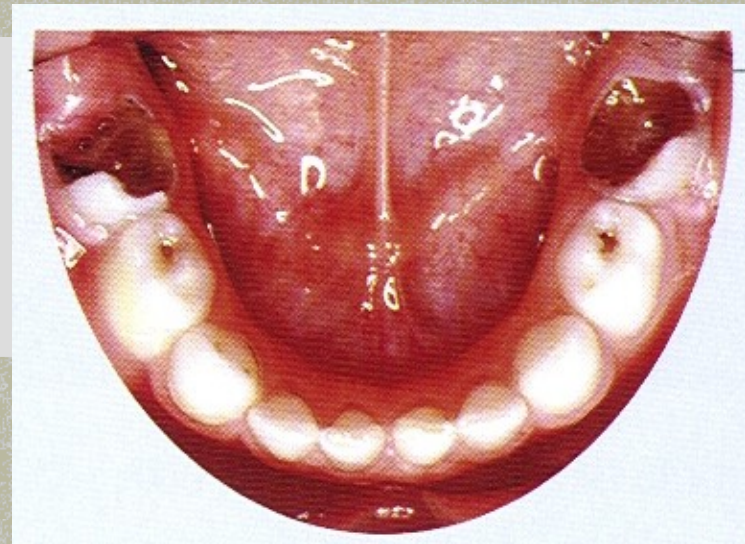
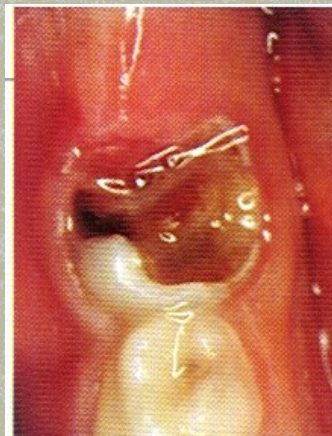




# PULPECTOMIE ROOTCANAL THERAPIE

## TREATMENT PROCEDURES

**55, 65 –  
asymptomatic  
gangraena**





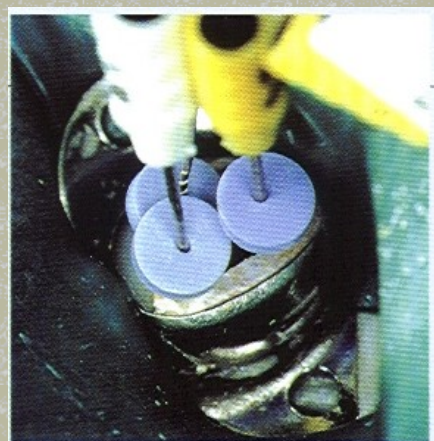


# PULPECTOMY

## ROOT CANAL THERAPY

### TREATMENT PROCEDURES

clinical steps





# ROOT CANAL FILLING



- A, B – acceptable root canal fillings;
- C – excess in the distal root canal.

# COMPROMISE SOLUTION

- Resolution of the acute process only;
- Extraction;
- Amputation and so-called root canal filling.



# COMPROMISE SOLUTION

- **Asymtomatic primary molars with necrotic pulp are left in place**



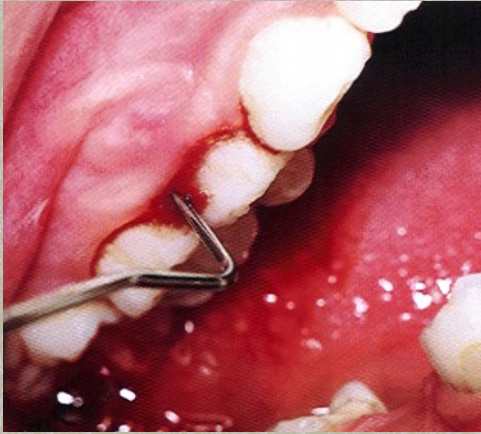
- **successfull trephination;**
- **trephination can be effectuated from buccal direction;**
- **„pus bonum et laudabile”.**





# COMPROMISE SOLUTION

## ■ EXTRACTION

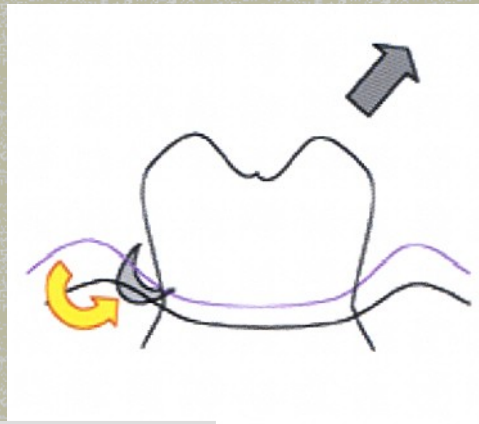


**Probe**

**Rootfracture!**



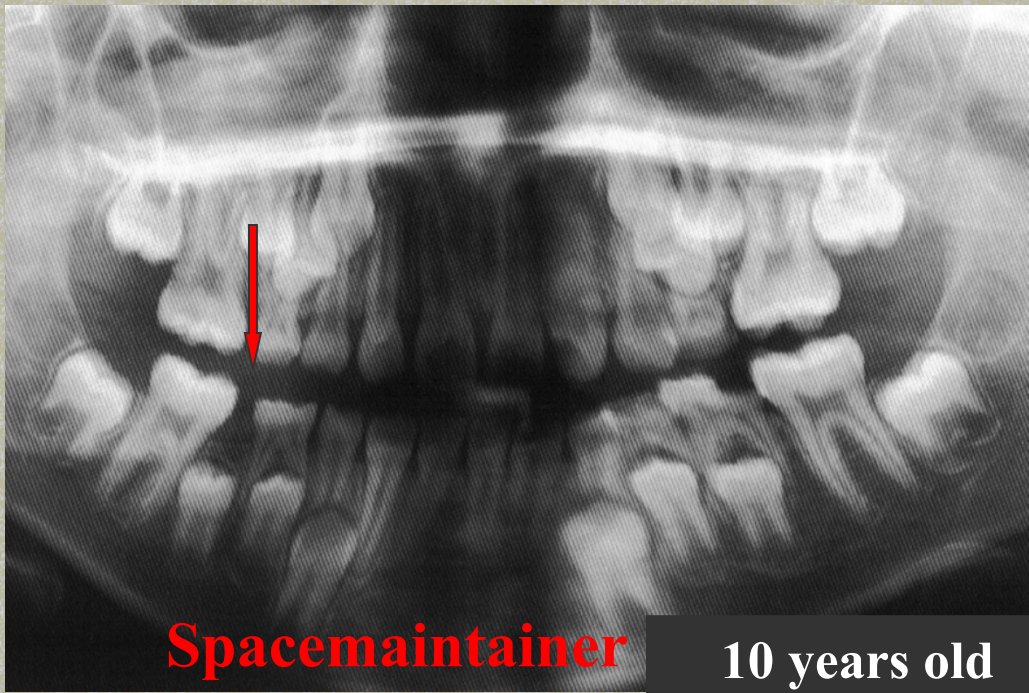
**Slight rotation**





# COMPROMISE SOLUTION

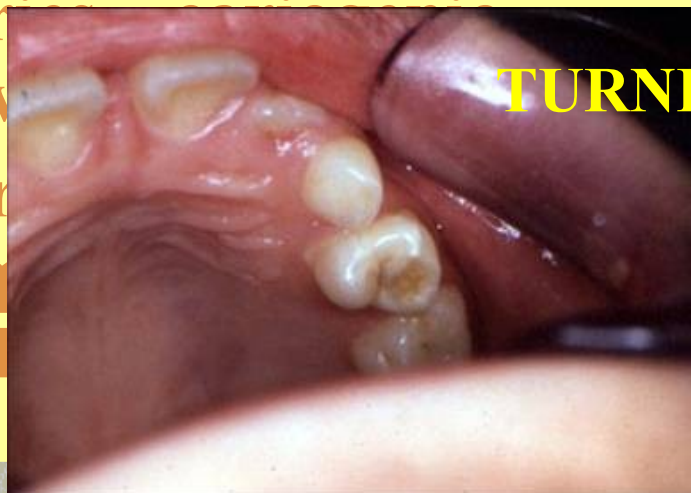
- Premature primary tooth extraction: 1-1,5 year before dentition of h. permanent





# Consequences for permanent dentition

- TURNER tooth – gangraene;
- space loss – premature tooth extraction;
- caries
- env
- per
- seq
- foll
















TURNER tooth



# REFERENCES



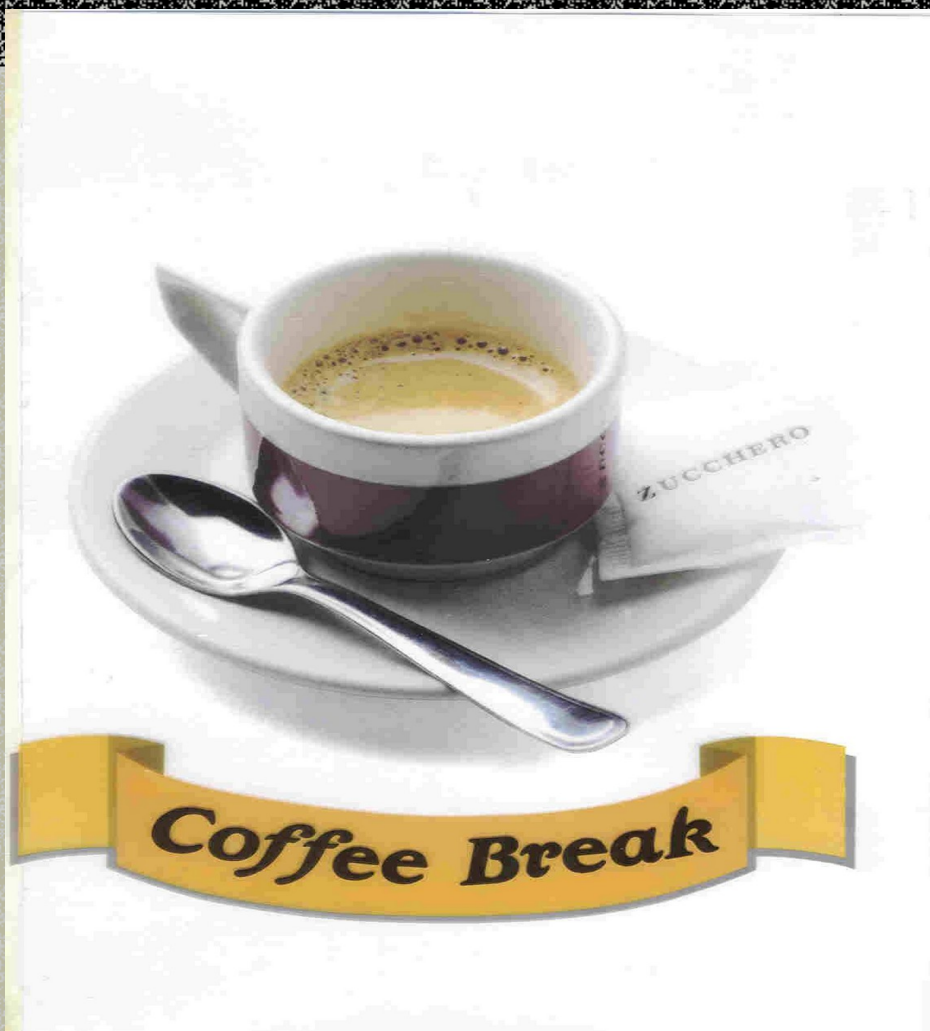
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DO YOU HAVE ANY  
QUESTIONS?



"Does the Tooth Fairy  
*recycle* the teeth?"





**Coffee Break**

**THANK YOU FOR YOUR KIND  
ATTENTION**



