

# Working length

- Apexlocators – impedancy
- X – ray methods

# Working length

## ■ Apexlocators - advantages - disadvantages

Location of apical constriction

Errors

Servicing

## ■ X – ray methods

Satisfactory accuracy

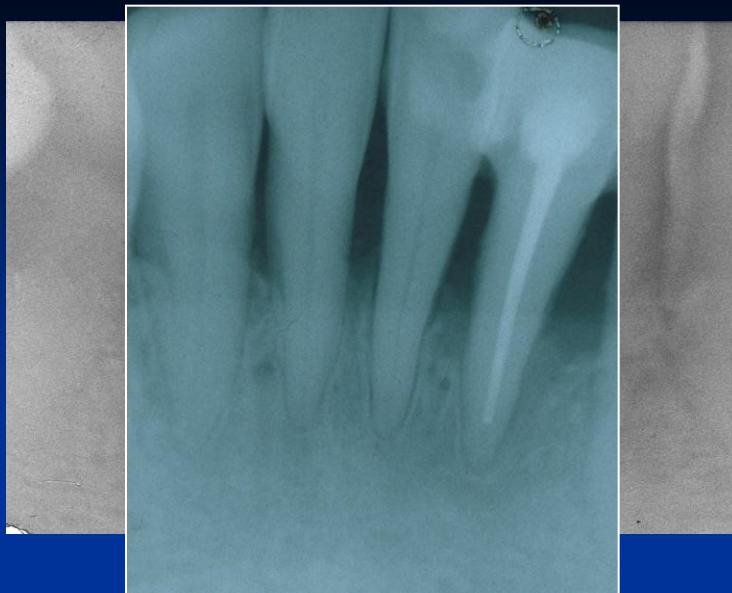
Irradiation



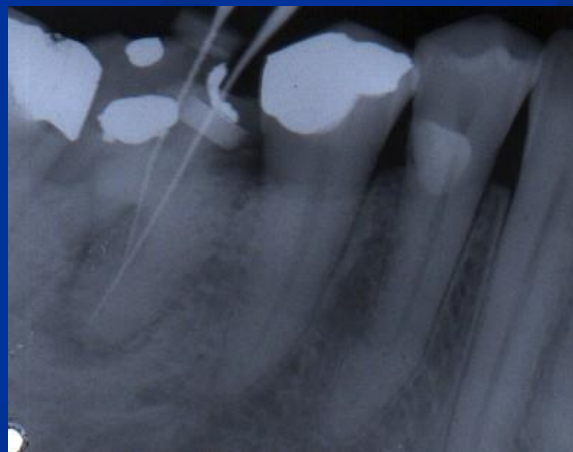
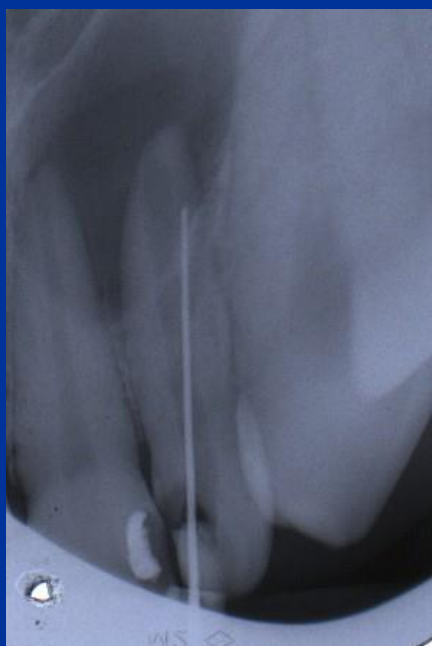
# Root canal filling

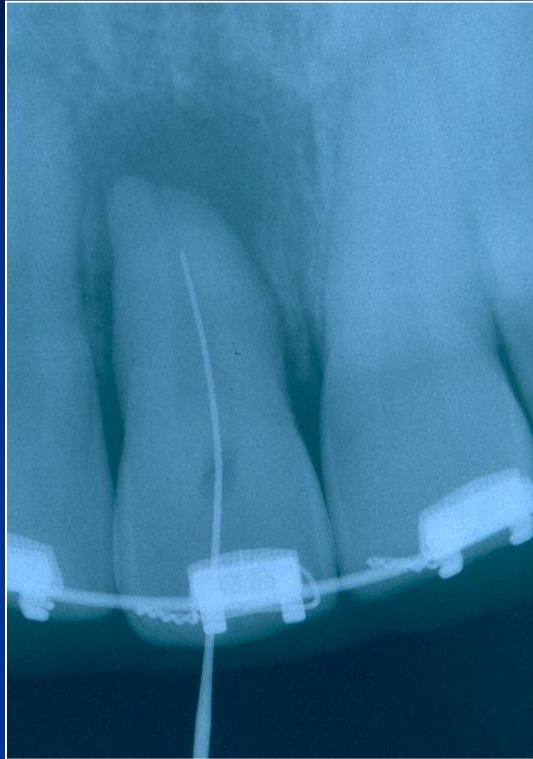




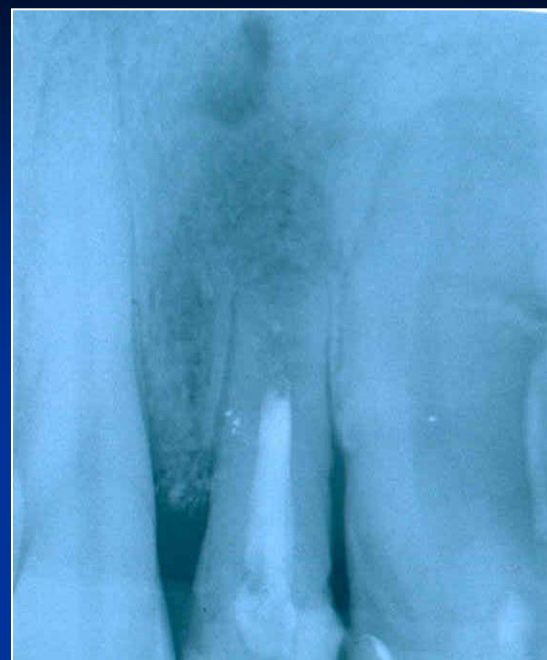




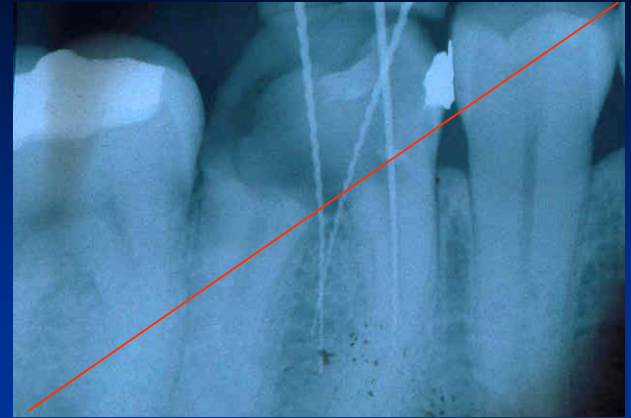






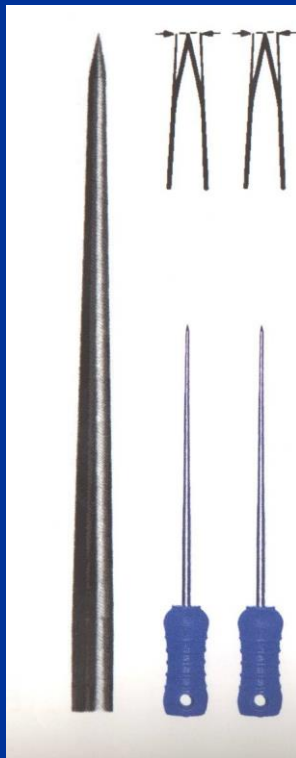






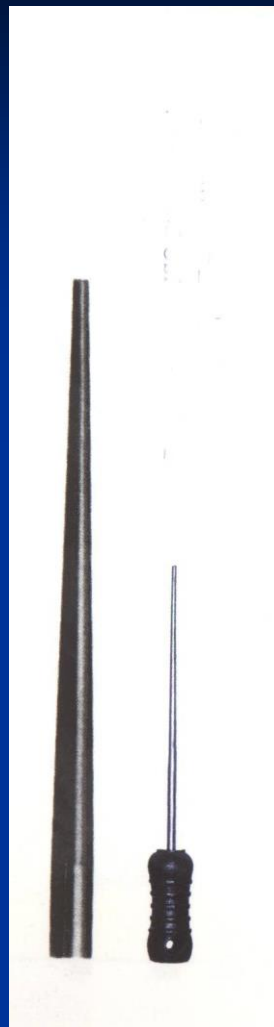
# Lentulo

# Spreader





# Plugger - compactor



# Root canal filling

- Guttapercha
- Sealer

# Root canal filling

# Ideal root canal filling (Grossman 1988)

1. Easy mixing
2. Sufficient working time
3. Good seal
4. X- ray contrast
5. Easy removal
6. No shrinkage
7. Long term volume stability
8. No bacterial growing
9. No permeability for fluids
10. Biocompatibility
11. No staining



# Classification of root canal fillings

- Solid
- Semisolid
- Pastes

# Guttapercha

Dried juice of the Taban tree (*Isonandra percha*)  
(gutta)

1,4 - polyisoprene

Crystallin structure (60%)

Brittle

# Guttapercha

## ■ Beta phase

## ■ Alpha phase 42 – 49 °C

- plastic

- **Gamma phase** 56 – 62° (amorfní)

## Cooling process

very slowly (less than 0,5°C) – alpha phase

normal cooling– beta phase

# Composition of guttapercha materials in endodontic

Guttapercha 19% – 22%

Zinc oxide 59 - 79%

Heavy metal salts 1% - 7%

Wax or resin 1% - 4%



# Resilon

*(Pentron)*

- Thermoplastic synthetic polymer
- Points or material for injection

## *Composition:*

*Polyester polymers*

*Bioactive glass*

*Radioopaque fillers (bismuthum oxichlorid a and baryum sulphate)*

# Silver or titanium cones

- No good seal
- Silver cones - corrosion

# Sealery

## Chemically curing plastic materials

*Good adhesion to root canal walls as well as solid cones*

*X- ray contrast*

*Biocompatibility*

# Sealers

Zinc Oxide-Eugenol

Chloropercha

Calciumhydroxide

Resins

Glasionomer

Silicone

# Sealers

## Importance

*Filling of the spaces between the solid cones*



*Seal of the root canal filling*

# Zinc - Oxid Eugenol

Powder:

Zinc oxide

Liquid:

Eugenol

Acidic resins

Good adhesivity, antimicrobial effect, cytotoxic.  
(resorbable)

# Zink Oxid Eugenol sealers

Pulp Canal Sealer (Kerr, USA))

Tubuli- Seal (Kerr, USA)

Caryosan (Spofa Dental, ČR)



# Chloropercha

Powder

Canadian balsam

Resins

Guttapercha

Zinc oxide

Liquid:

Chloroform

Resins

# Chloroperča

## Vlastnosti:

Good adhesivity

Shrinkage

Toxicity

# Calciumhydroxide sealers

Base ( powder)

Calcium hydroxide

Zinc oxide

*Other components and vehicula*

# Kalciumpolymerizované sealery

Catalystr (paste)

Zinc stearat

Titanium dioxide

Baryum sulphate

or

Eugenol, Eukalypt

others

# Kalciumhydroxide sealers

- Increase of the healing potential of periapical tissues
- Antibacterial effect
- Easy manipulation

*But!*

*Resorbable if not homogeneous*

*Not suitable for the single cone technique*

# Resins

➤ Rezorcin formaldehyd

➤ Epoxide

➤ Polyketone

➤ Metacrylate

# Rezorcín – formaldehyd resins

Toxicity

N2, Endomethason, Riebler's paste, Foredent



# Epoxide resin

➤ Base (powder, paste)

Bismuth oxid

Titanium dioxide

Hexametylentetramine

(Silver)

➤ Catalyst (liquide, paste)

Bisphenoldiglycidylether

# Epoxid resin (*advantages*)

- Long working time
- Hydrophilic (good penetration)
- Good adhesion to the root canal walls
- Volume stability
- No dissolution
- Antibacterial

# Epoxidové pryskyřice (disadvantages)

- Difficult removal
- Staining
- Initiatory toxicity

*No suitable for the single cone technique !*

# Polyketone

## ➤ Base

Zinc oxide

Bismuth phosphate

Hexametylentetramine

## ➤ Liquid

Bisphenolglycidylether and other components

# Polyketon resins

## Advantages

Good adhesion

No contraction

No dissolution

## Disadvantages

High stickness

Not removable

Products: Diaket, Diaket A (3M ESPE)

# Methacrylate resins

Endo ReZ (Ultradent) – UDMA

For injection – single cone technique

Epiphany (Pentron)

Bis- GMA, etoxy bif- GMA, hydrophilic bifunctional methacrylates

Calcium hydroxide, baryum sulphate, baryum glass silica.

*Sealer in combination with Resilon*

# Glasionomer sealers

- Base (powder)

Aluminium silicate glass

- Liquid

Polyacrylic acid, polymaleic acid, tartaric acid



# Glasionomer sealers

## *(Advantages and disadvantages)*

### Advantages:

Curing under wet conditions, chemical bonding to hard dental tissues, no staining

### Disadvantages

Short working time, difficult removal,  
porous

### Products

Ketac Endo (3M ESPE), Endion (VOCO)

# Silicon based sealers

Polyvinylsiloxane (ev. in mixture with powdered guttapercha)

Biocompatibility

Hydrophilic

*Further investigation desirable.*

# Root canal filling

- A cone inside the sealer – core material

Guttapercha

Resilon

Silver cones

Custom cones

# Root canal filling

Guttapercha

Trans isomer of polyisoprene

2 crystalline forms (alpha, beta)

Beta – room temperature

Alpha after heating

Various process of cooling

Extremely slow cooling: Alpha phase recrystallize.

65°.

Less shrinkage, more dimensionally stable

# Root canal filling

Guttapercha

20% gutta-percha

65% zink oxide

10% radioopacifiers

5% plasticizers

# Root canal filling

Guttapercha

Cones: conventional and standardized sizes

Conventional: dimension of the tip and body

Standardized cones are designed to match the taper of the instrument.

# Root canal fillings - forms

- **Points (Cones)**
- **Materials for injection**
- **Plastic materials**



# Instruments

- Lentulo
- Compactors
- Compactors - carriers
- Others

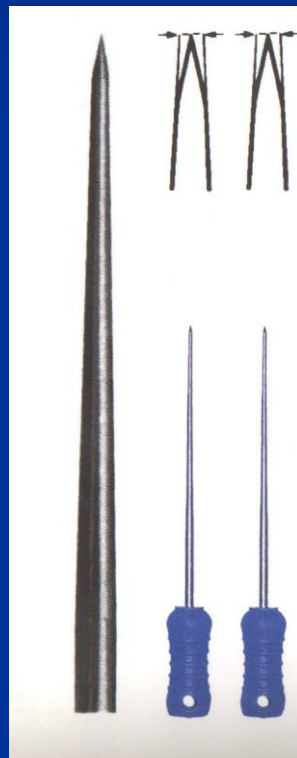
# Lentulo



- delivers pastes
- 1,5 – 2 mm ahead
- at most for  $\text{Ca}(\text{OH})_2$

# Compactors

Spreader



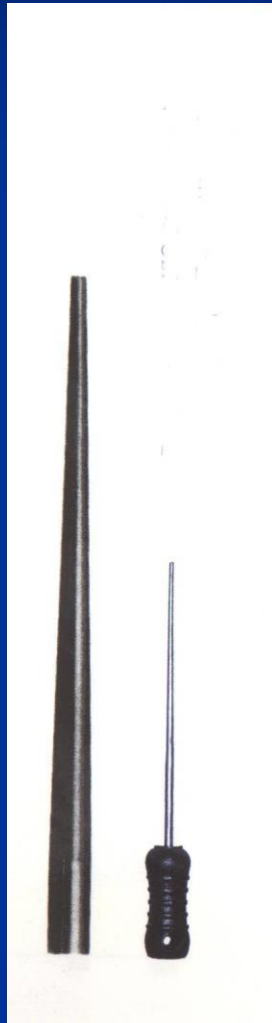
Pointed

Vertical introduction

*Lateral condensation*  
*technique* ↓

# Compactors

## Plugger



Not pointed

Vertical introduction

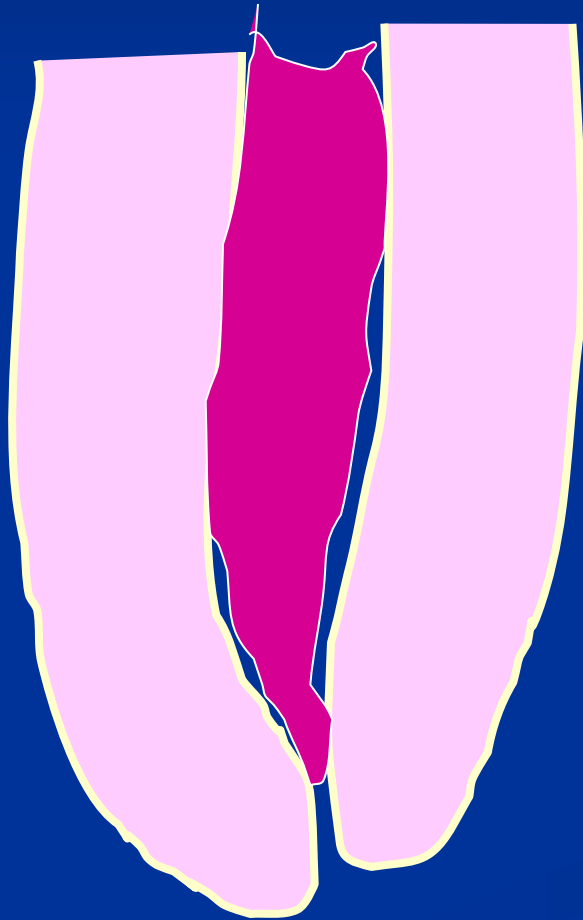
*Vertical condensatuion  
- compaction*

# Filling techniques

Cold

Warm

# Paste only



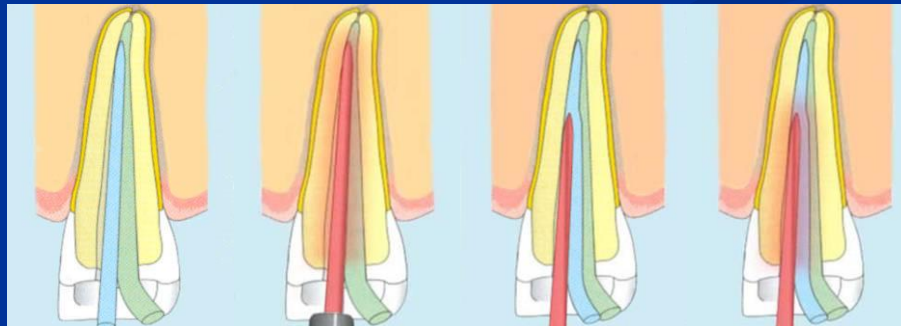
**Shrinkage, difficult  
removal**

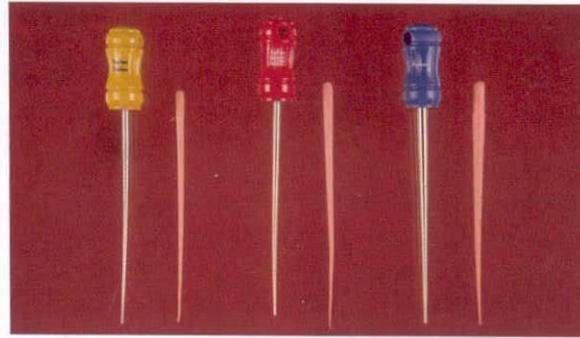




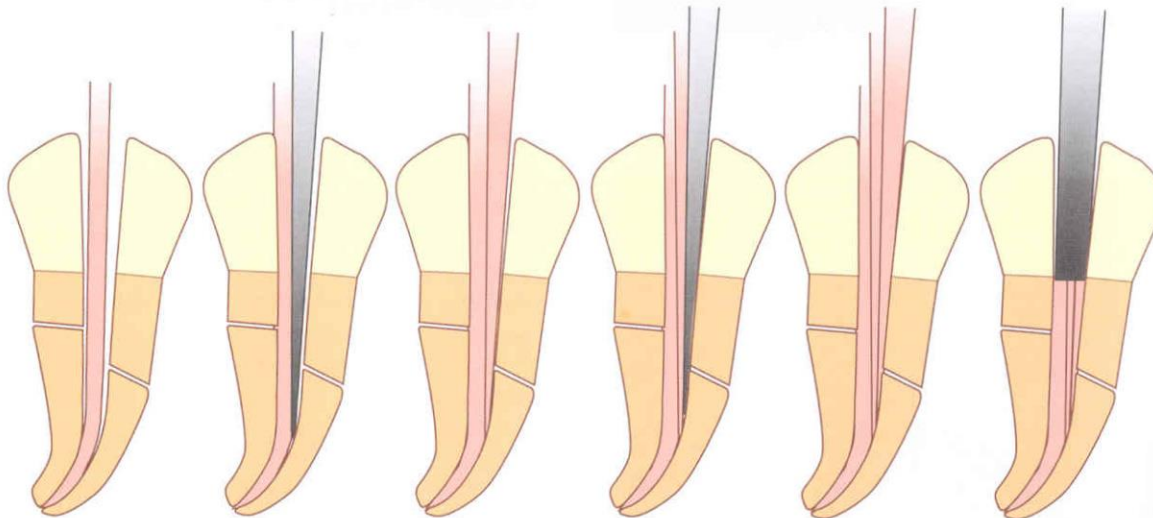


# Warm lateral condensation

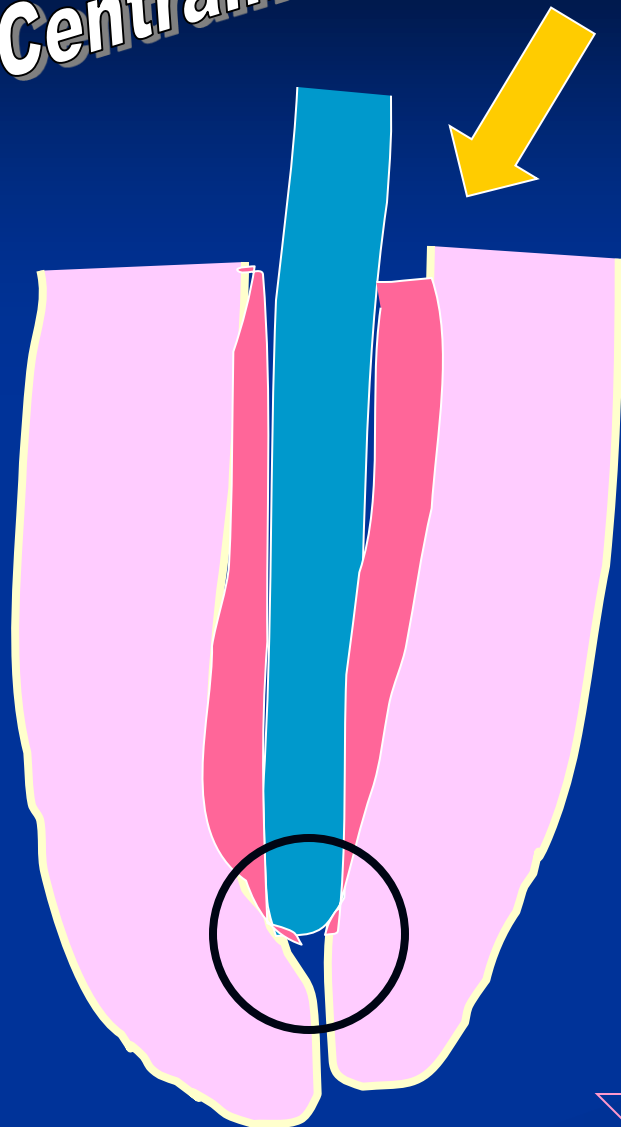




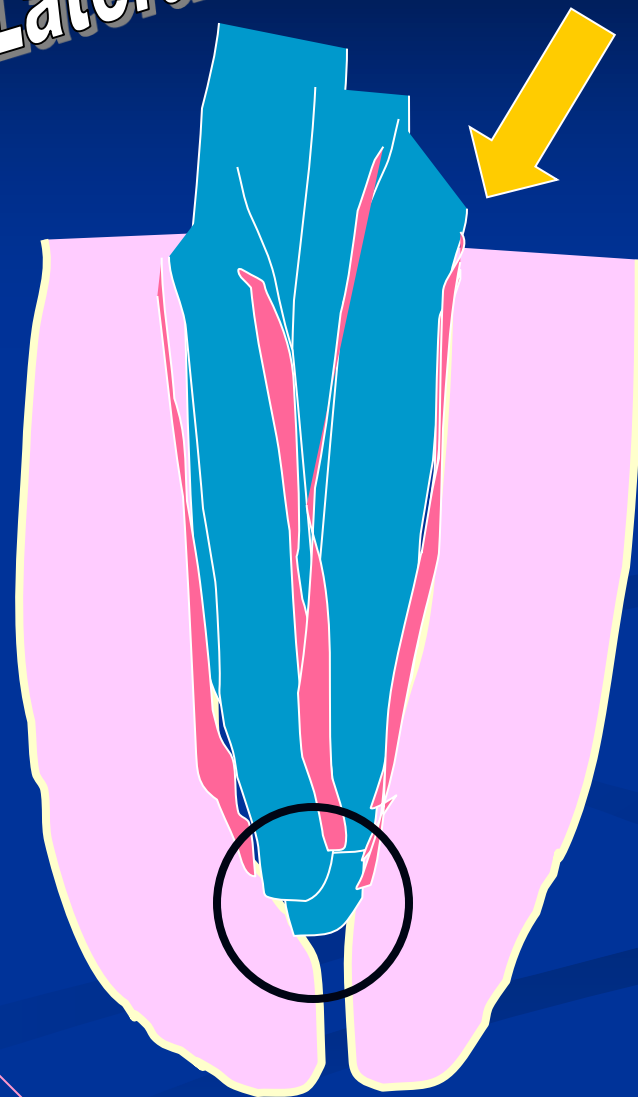
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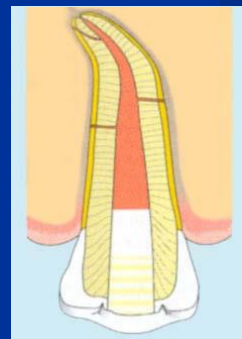
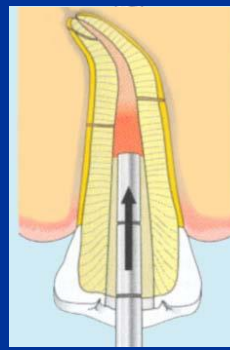
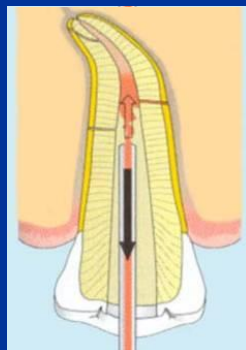
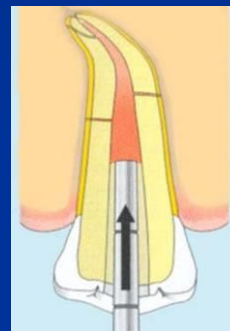
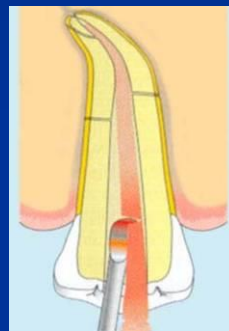
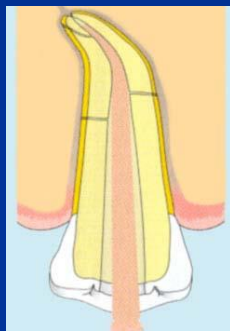
Centrální čep

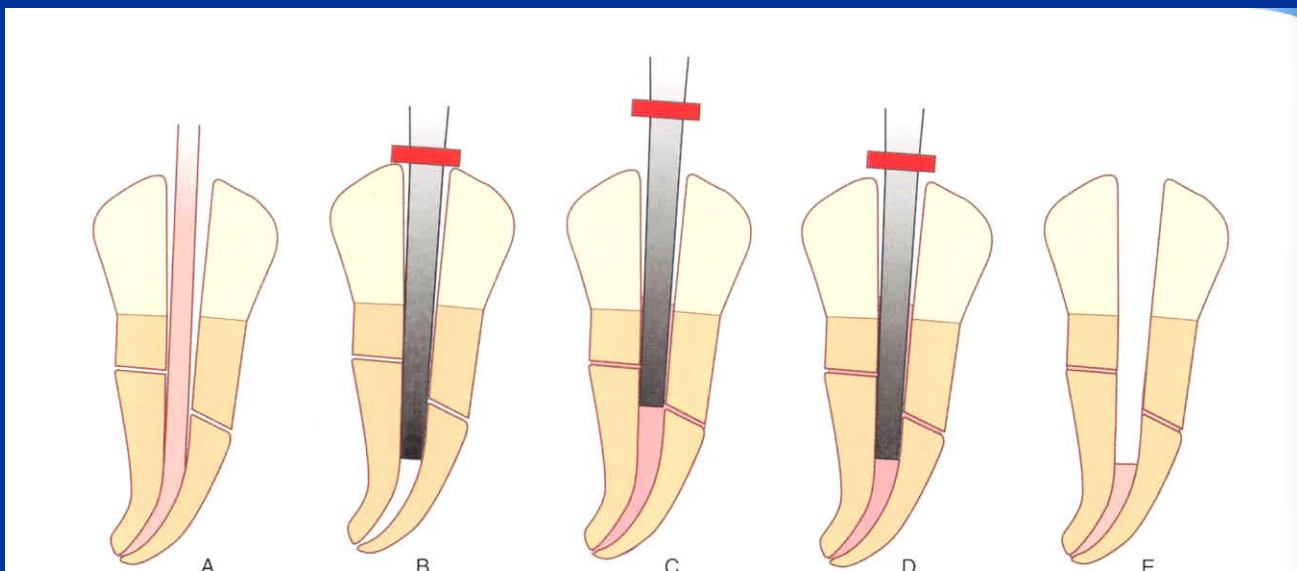
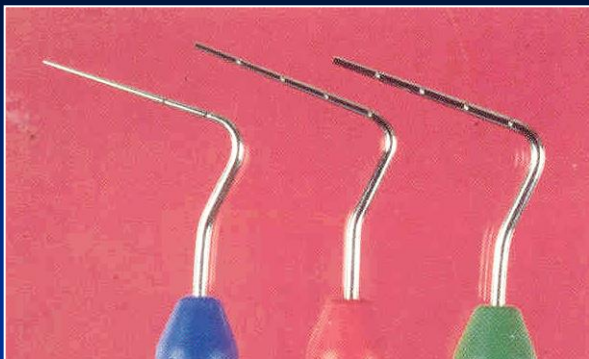


Laterální kondenzace



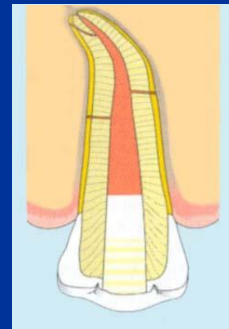
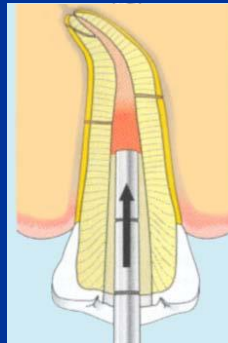
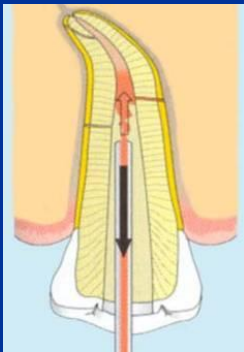
# Vertical condensation





# Injection

- Rychlá technika
- Možná extruze sealeru
- Teplo







Perfektní hermetický uzávěr i u kanálek s nepravidelným tvarem

## Fáze plnění 2. Backfill

BeeFiller hermeticky uzavřeme a zaplníme zbývající část kanálku kulatého i oválného a uzavřeme postranní ramifikace ve vrchních částech kanálku

