

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° (amorphous)

Cooling process

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

normal cooling– beta phase

Sealers

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, antimikrobiale Wirkung, zytotoxisch.
(resorbierbar)

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

Chloropercha

Vlastnosti:

Good adhesivity

Shrinkage

Toxicity

Calciumhydroxide sealers

Base (powder)

Calcium hydroxide

Zinc oxide

Other components and vehicula

Kalciumhydroxidové 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

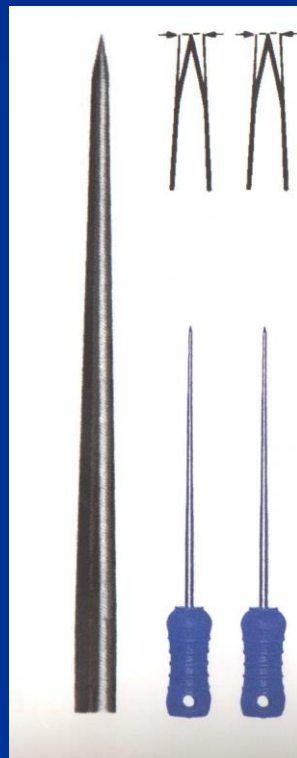
Lentulo



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

Compactors

Spreader



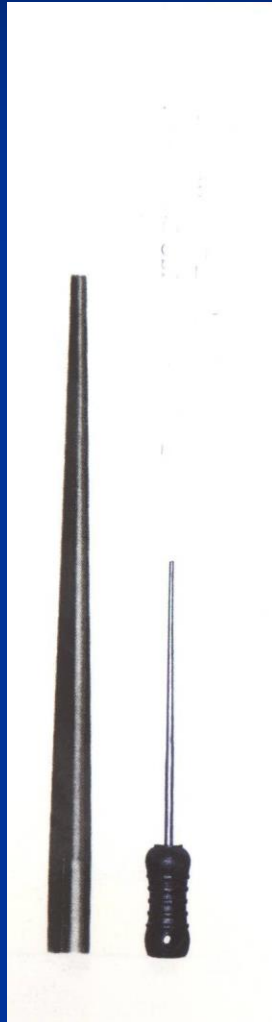
Pointed

Vertical introduction

*Lateral condensation
technique*

Compactors

Plugger



Not pointed

Vertical introduction

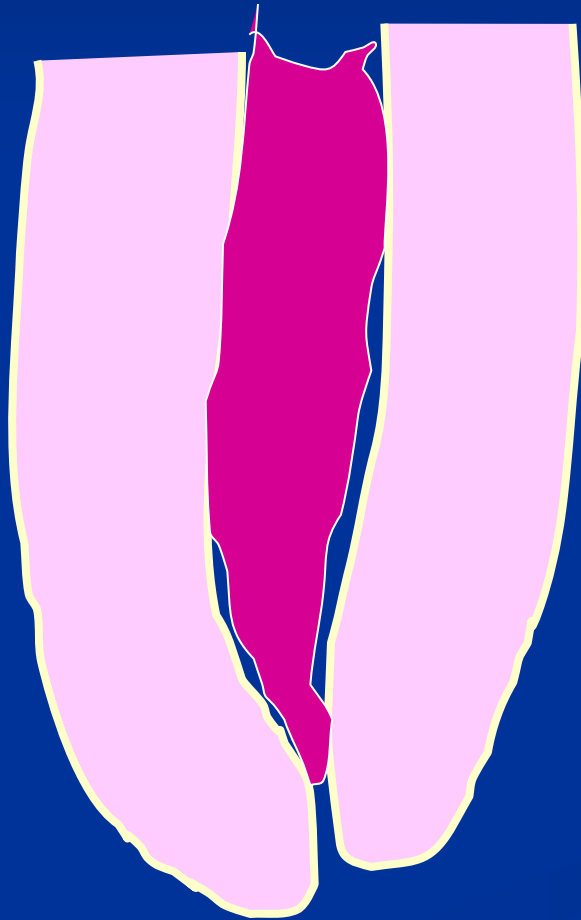
*Vertical condensation
- compaction*

Filling techniques

Cold

Warm

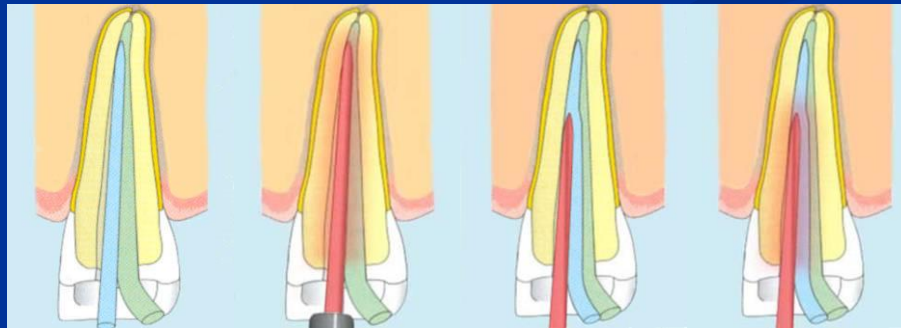
Paste only

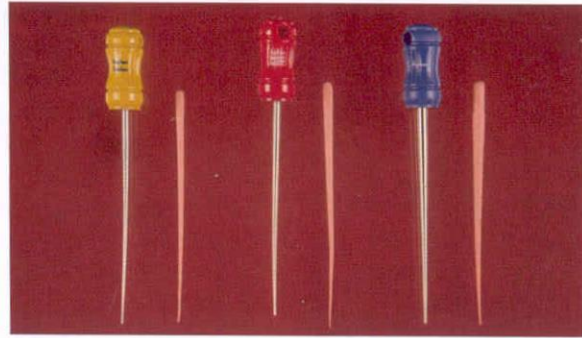


**Shrinkage, difficult
removal**

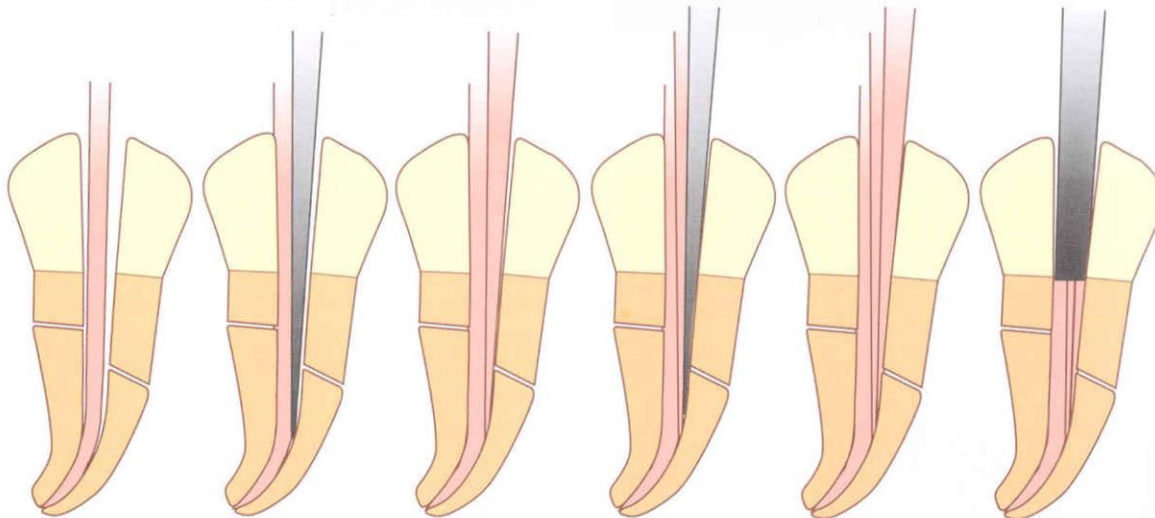


Warm lateral condensation



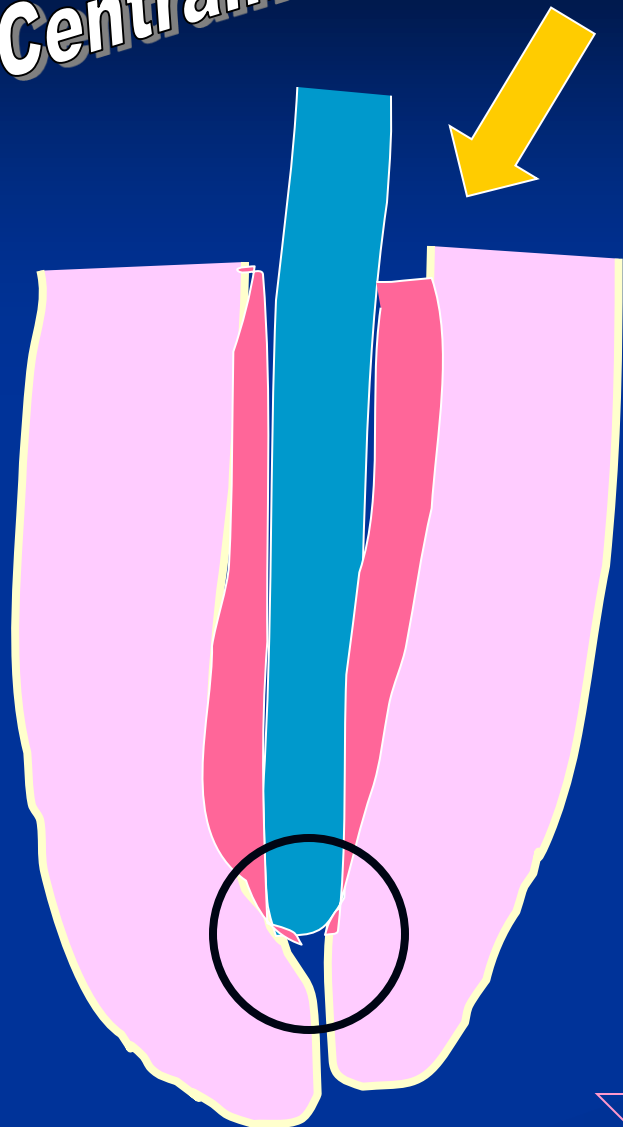


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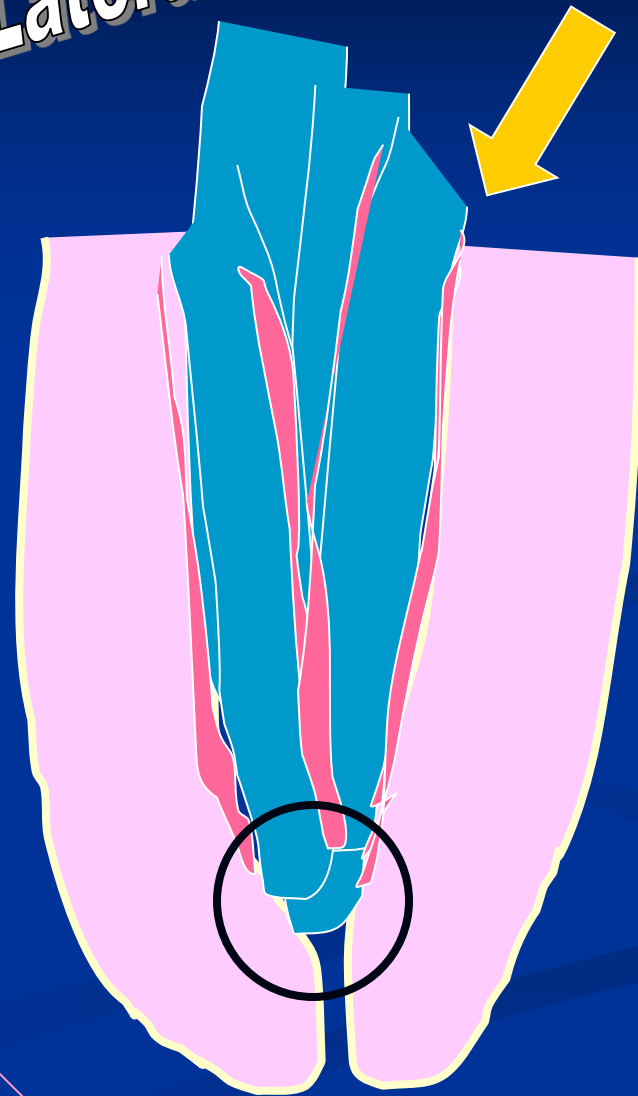




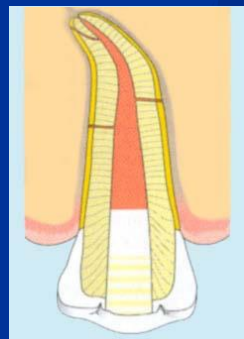
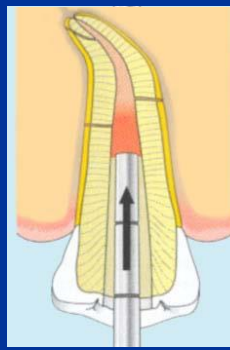
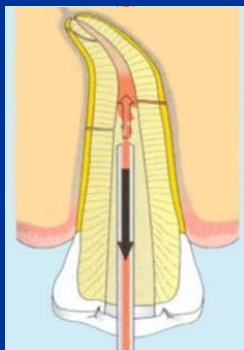
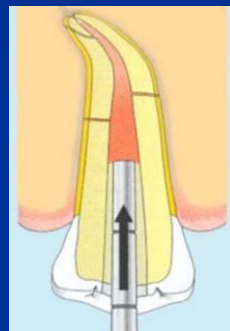
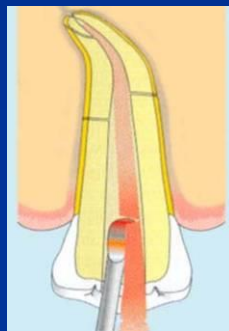
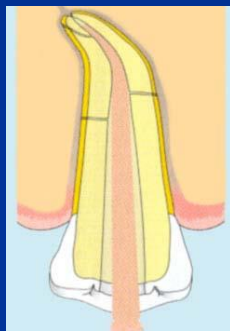
Centrální čep

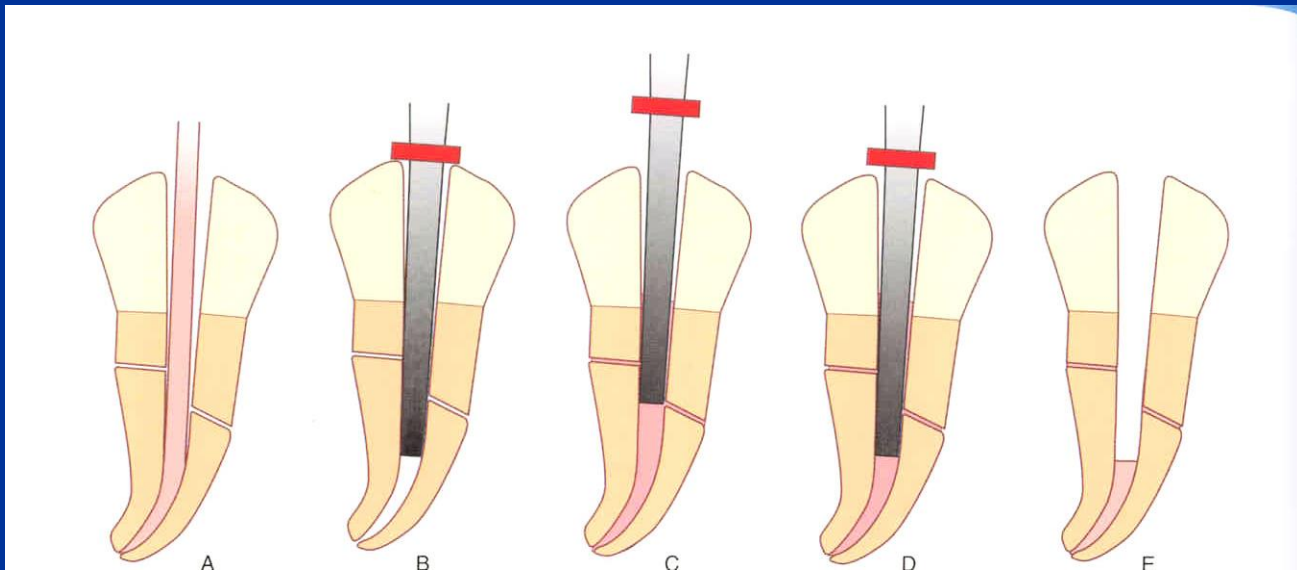


Laterální kondenzace



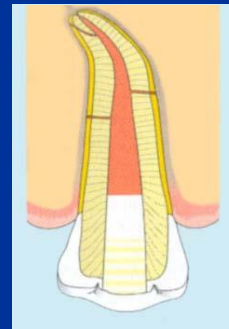
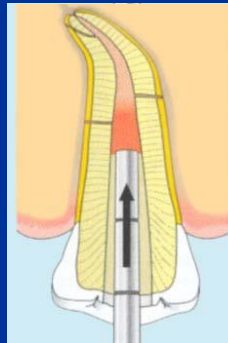
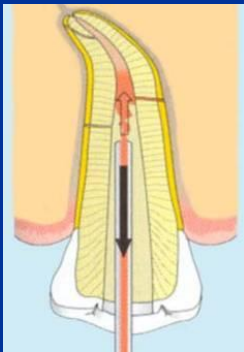
Vertical condensation





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



Root canal filling Methods

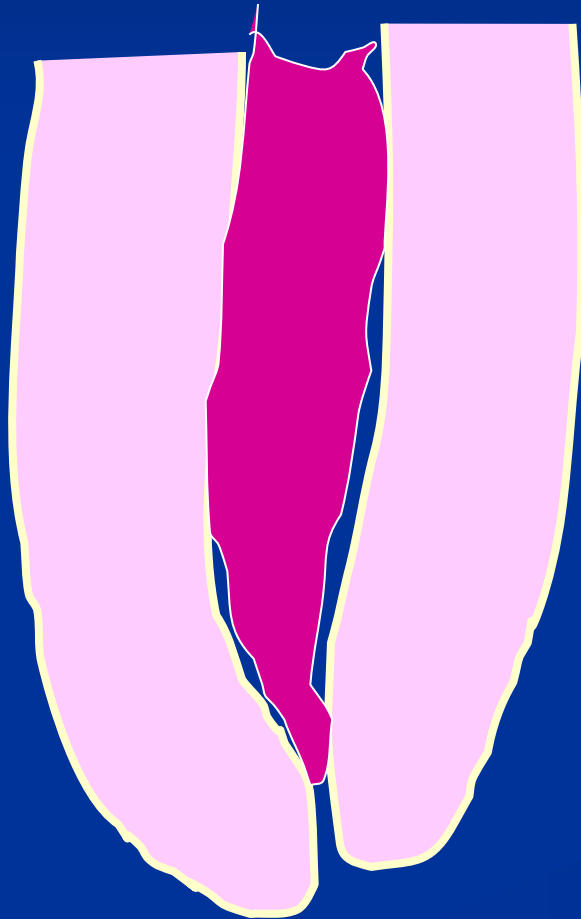
Filling

Always combination

- Plastic material – sealer
- Guttapercha

Paste only

No good seal, today only temporary filling using calcium hydroxide

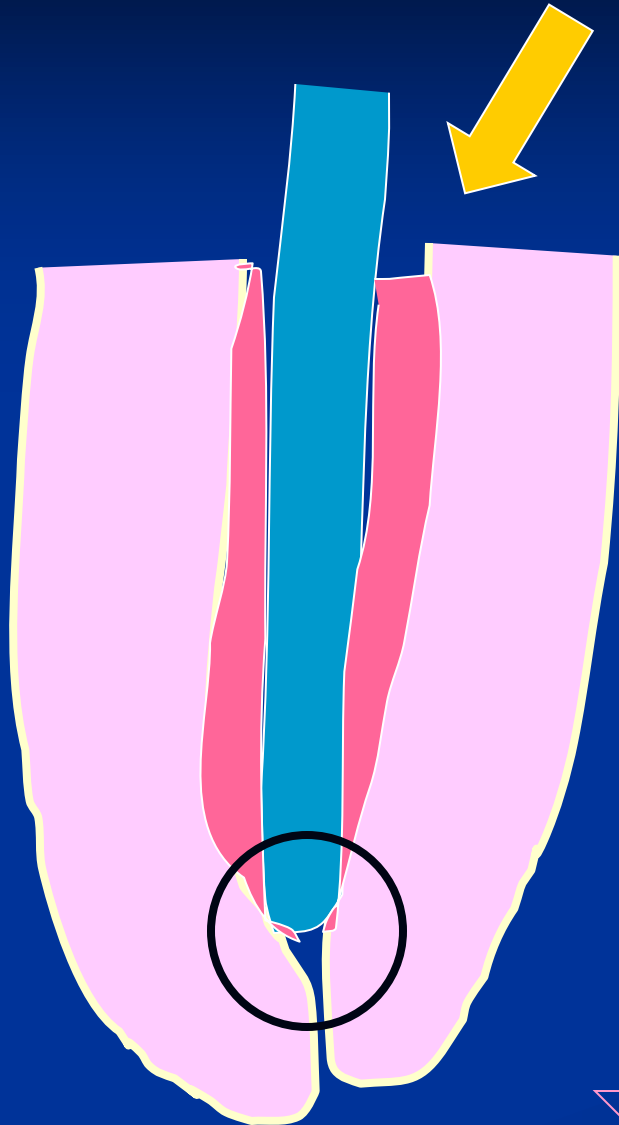


Cold techniques

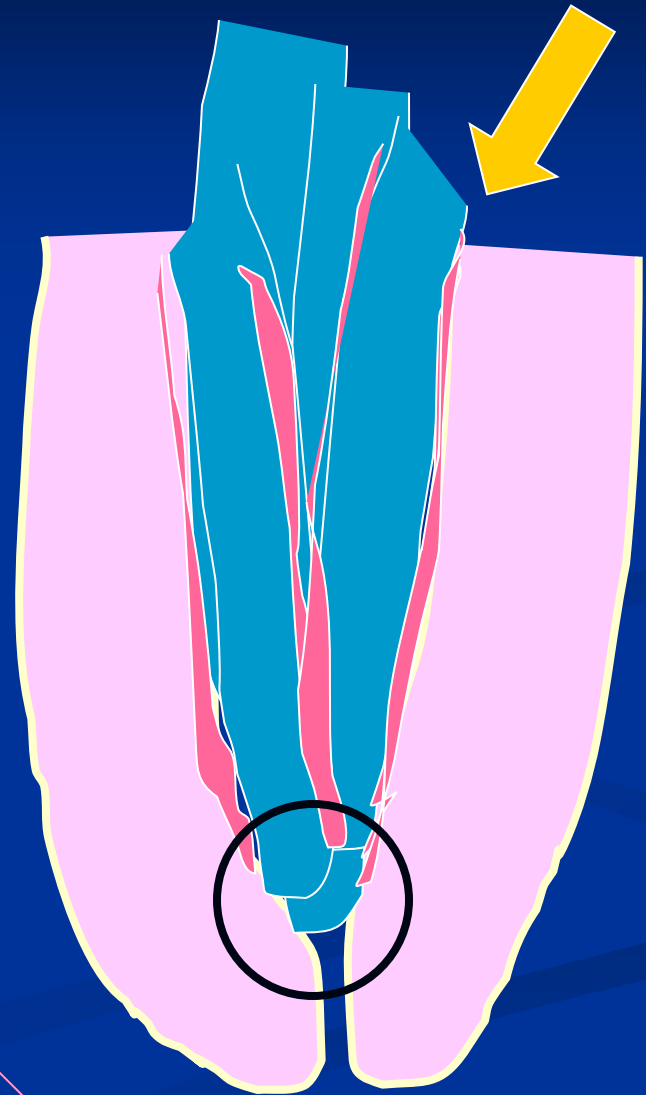
- Single cone technique
- Lateral condensation

Guttapercha cone (cones) and sealer

Single cone

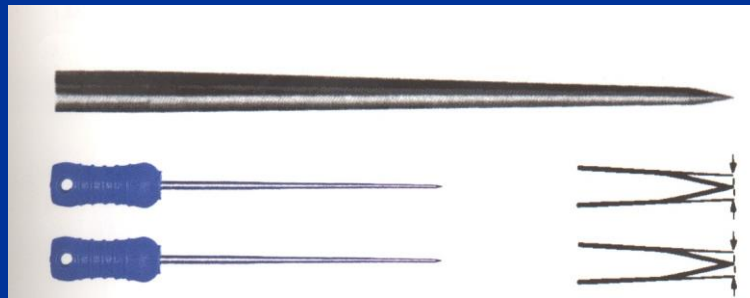


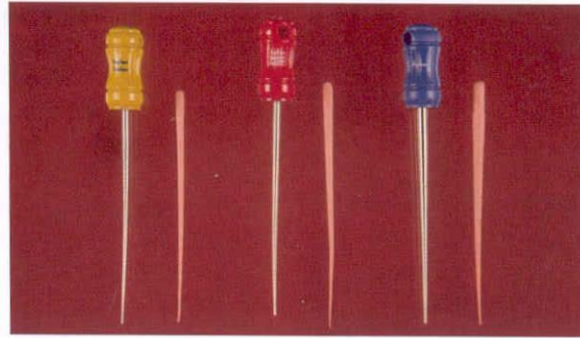
Lateral condensation



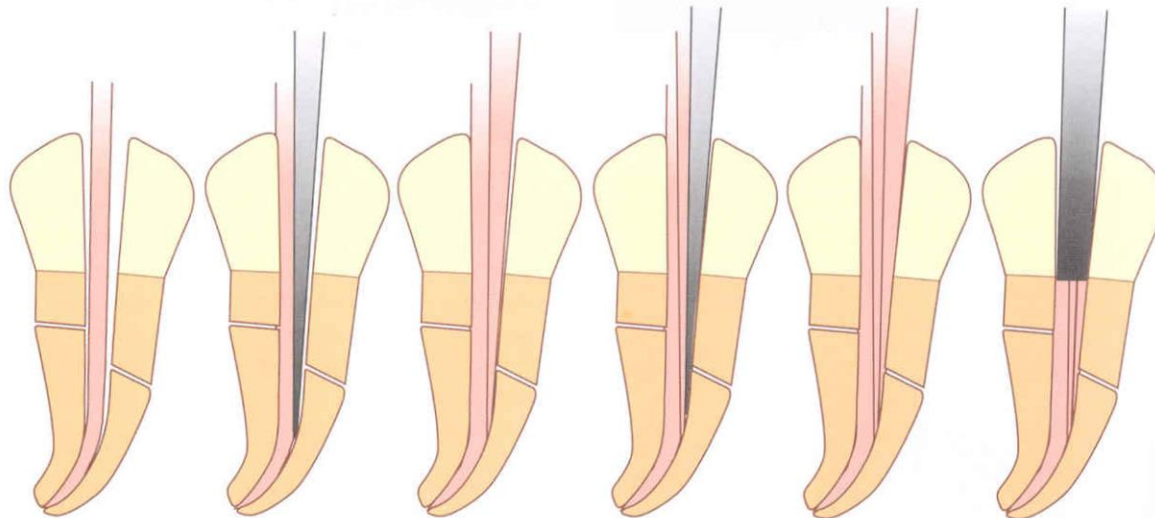
Compactor for lateral condensation

Spreader

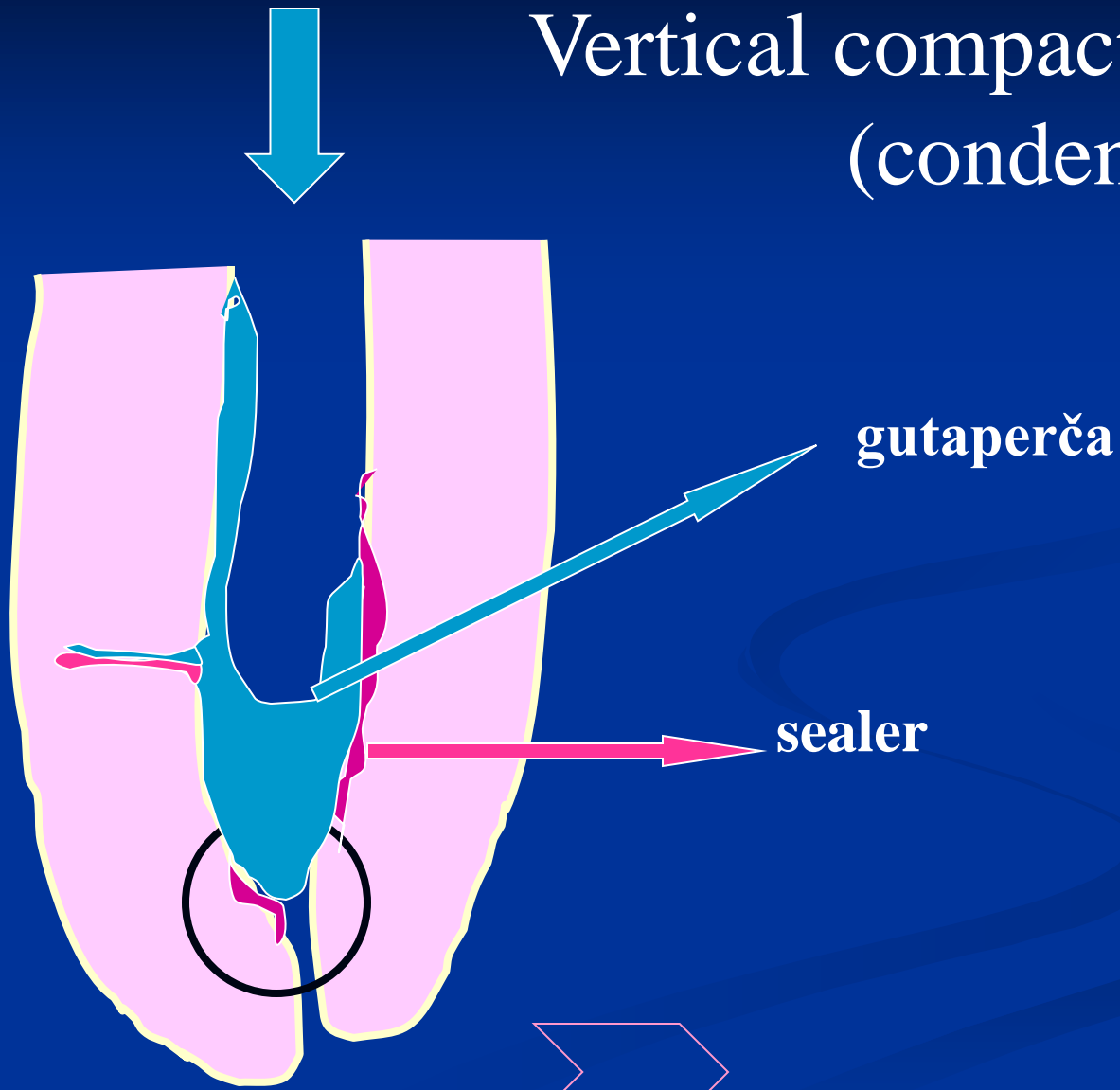




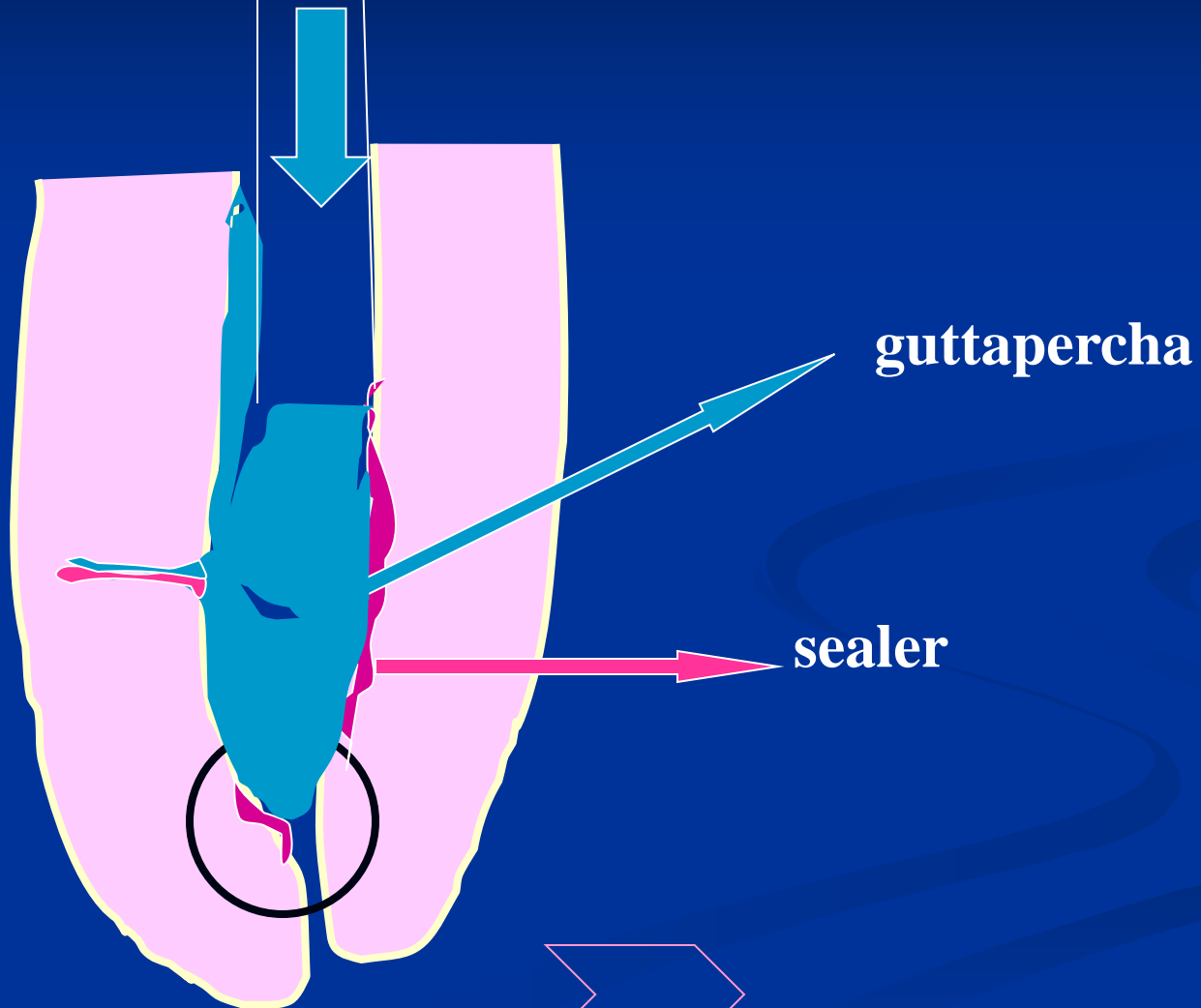
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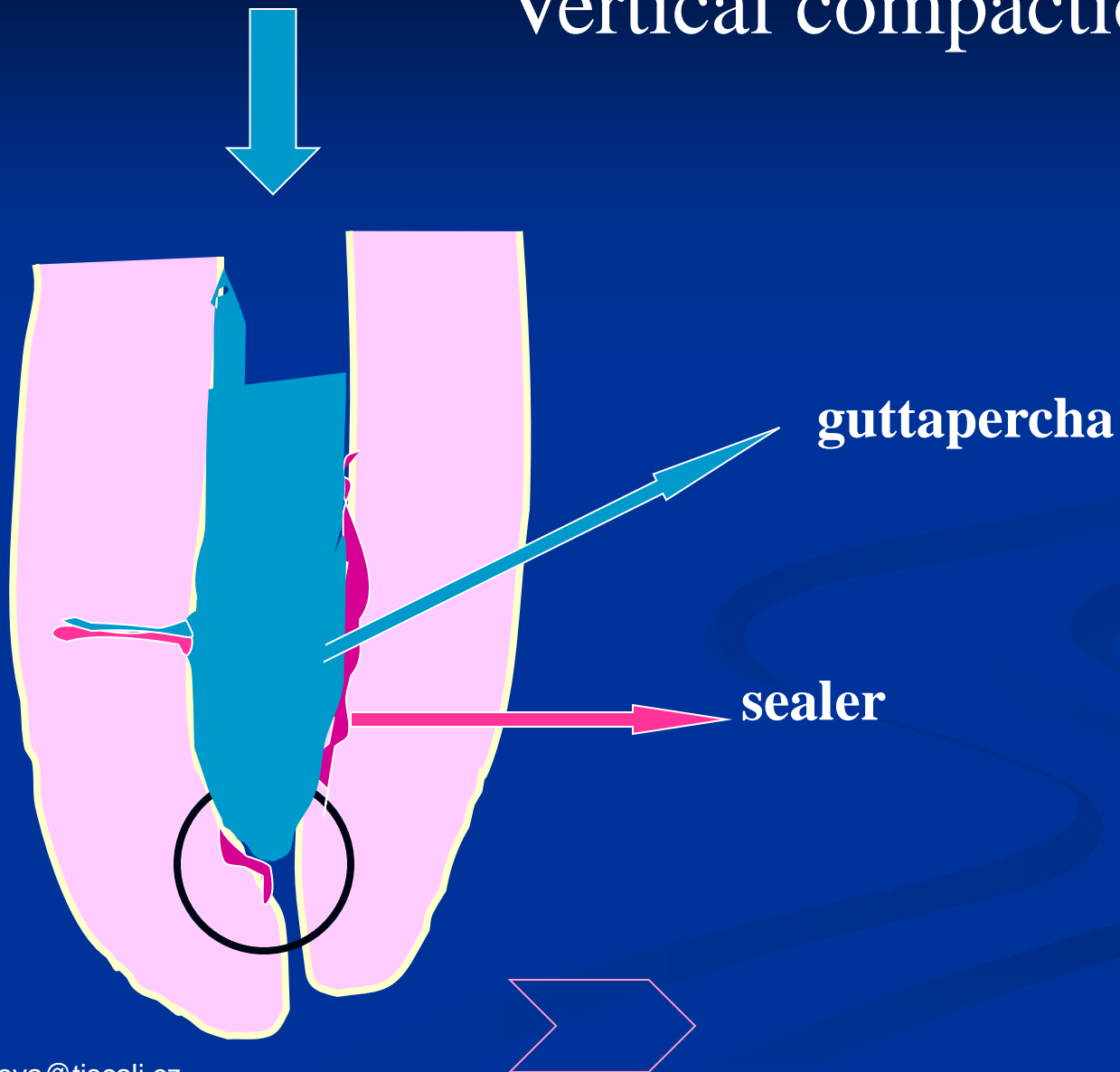
Vertical compaction (condensation)



Injection



Vertical compaction



Warm techniques – using heated guttapercha

Compactor
- plugger



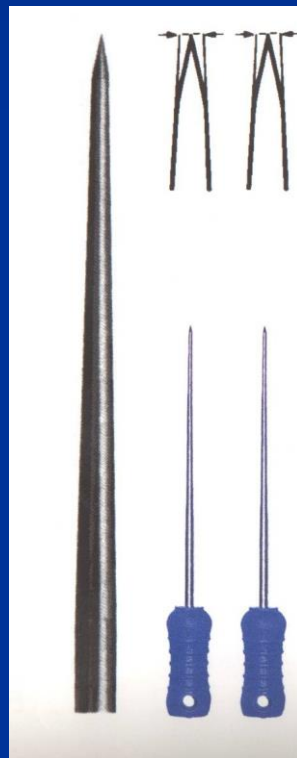
Paste carrier -Lentulo



- Delivers the plastic material forward
- 1,5 – 2 mm before the front
- Most often for $\text{Ca}(\text{OH})_2$

Kompaktory

Kořenové cpátko
- spreader



Hladký povrch, špička

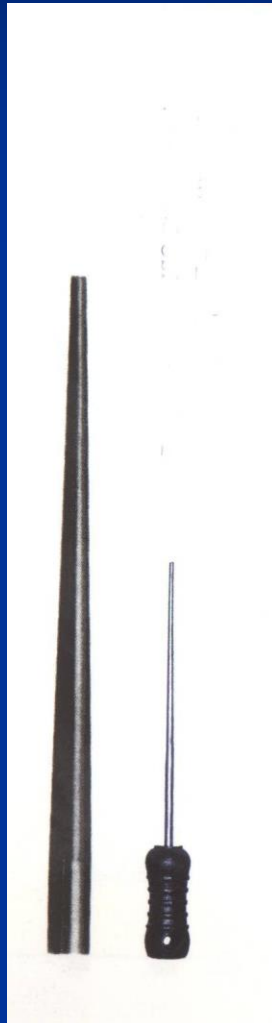
Zasunutí do kořenového
kanálku vertikálně



*Laterální kondenzace
gutaperčových čepů*

Kompaktory

Kořenové cpátko
- plugger



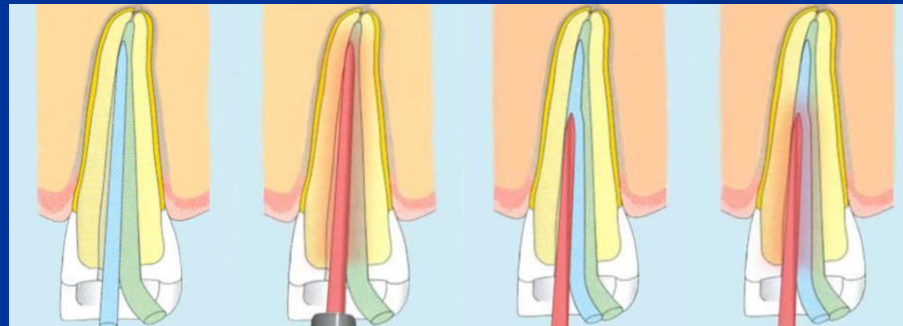
Hladký povrch, rovné čelo

Zasunutí do kořenového
kanálku vertikálně

*Vertikální kondenzace
kondenzace gutaperči*

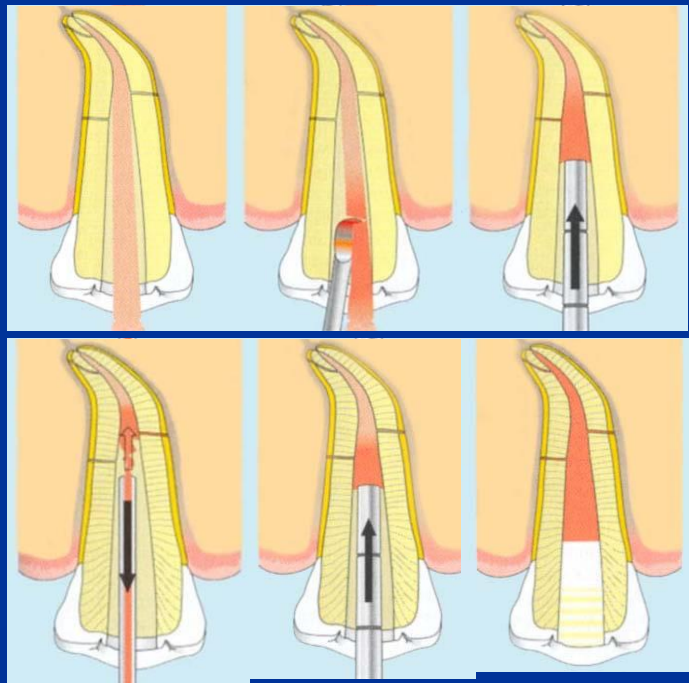
Teplá laterální kondenzace

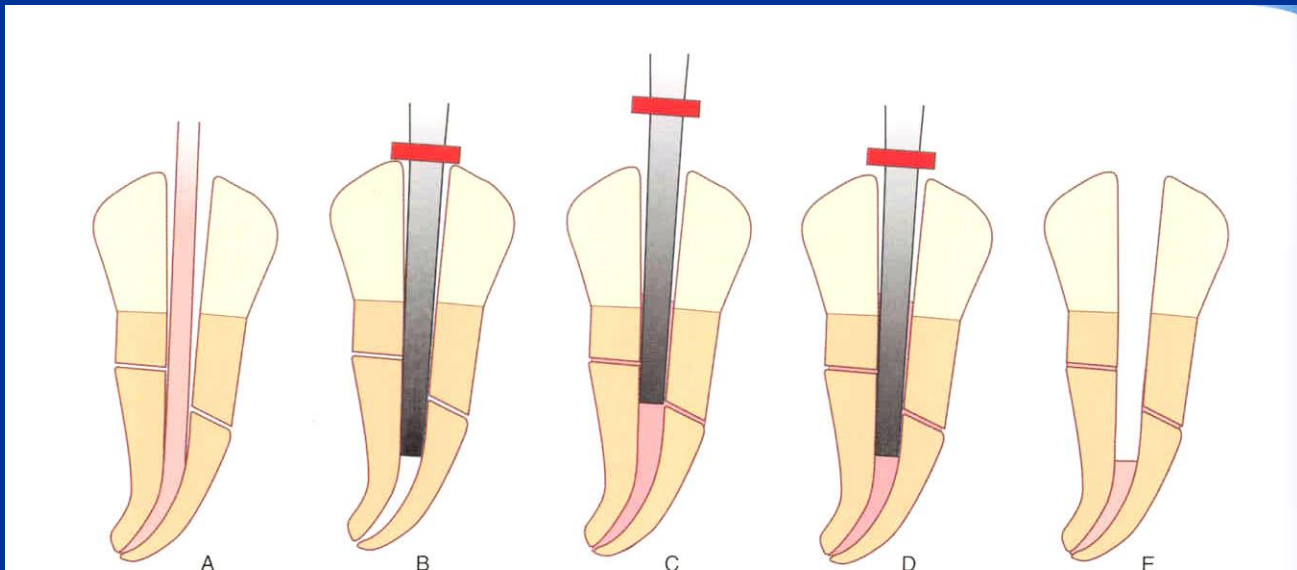
- Horší kontrola pracovní délky
- Časová náročnost
- Teplo



Vertikální kondenzace

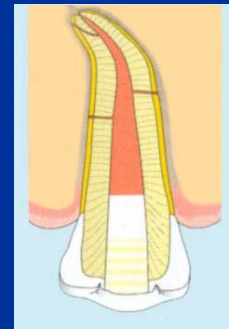
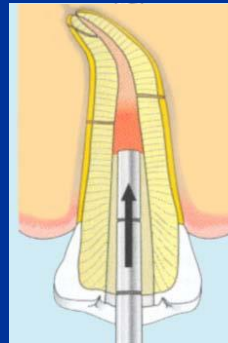
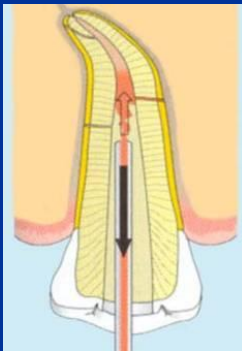
- Obtížnější kontrola pracovní délky
- Možná extruze sealeru
- Teplo





Injekční aplikace rozehráté gutaperči

- Rychlá technika
- Možná extruze sealeru
- Teplo

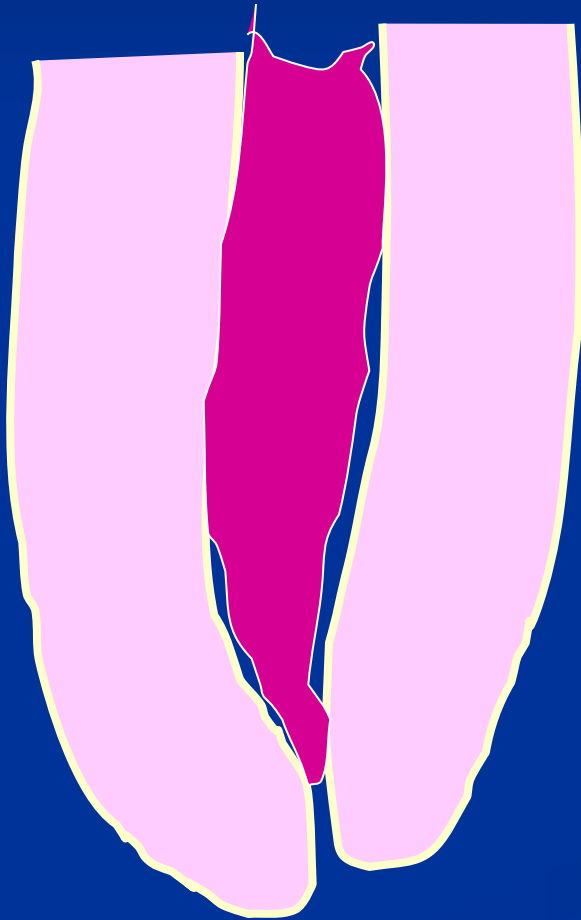


Root canal filling Methods

Filling

- Plastic material – sealer
- Guttapercha

Paste only

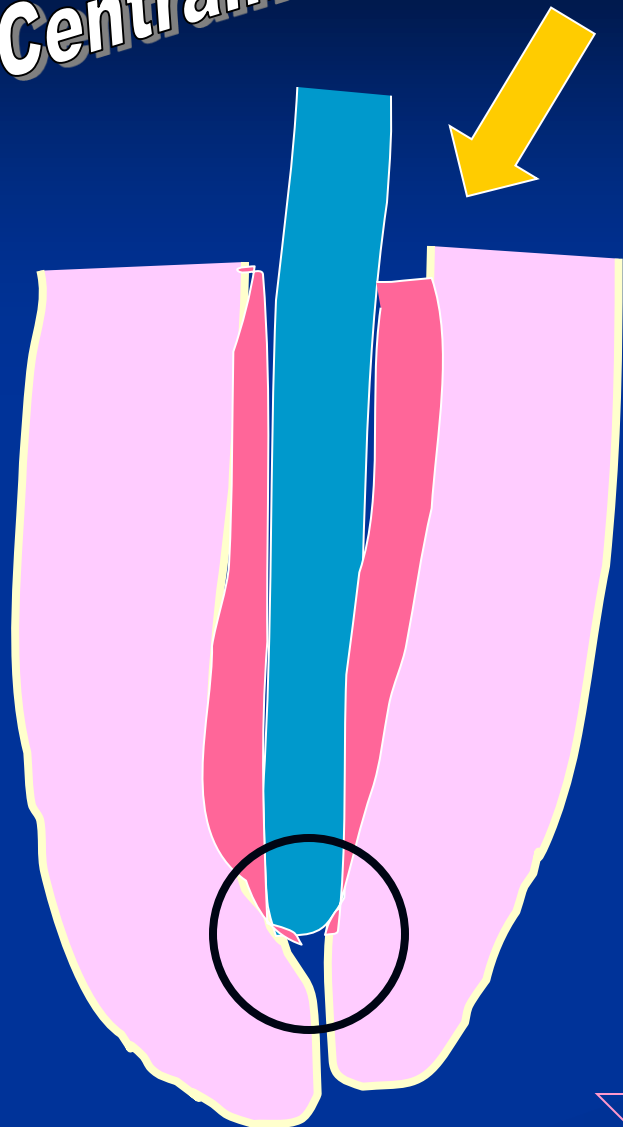




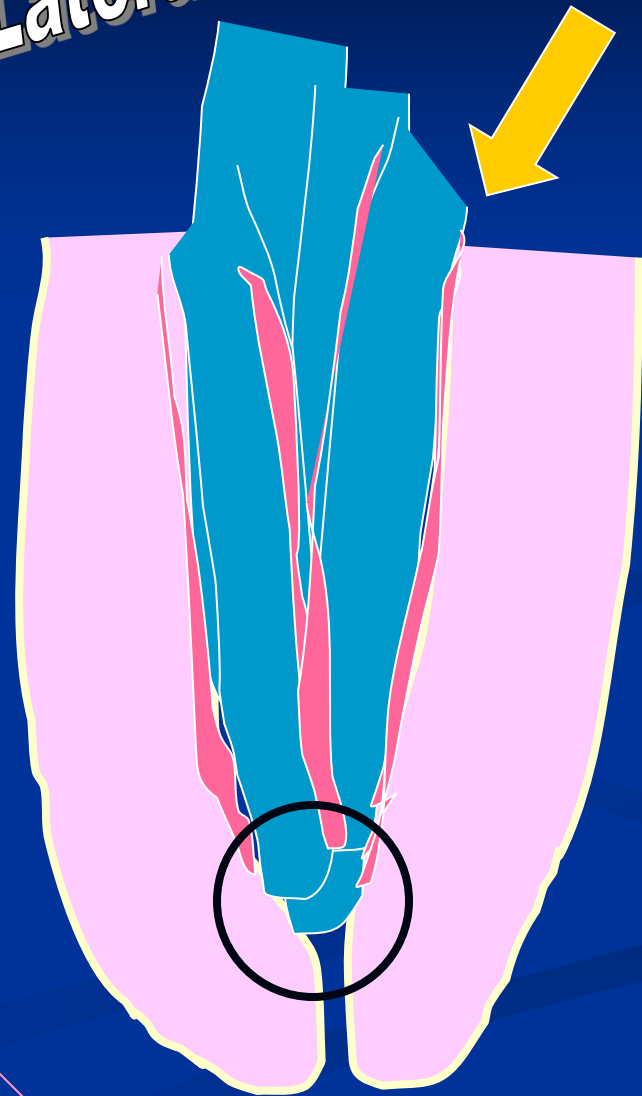
Cold techniques

- Single cone technique
- Lateral condensation

Centrální čep

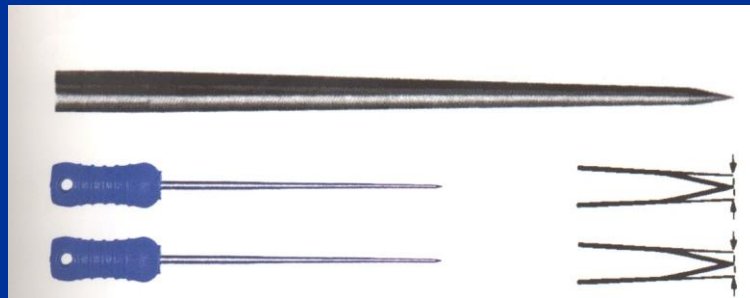


Laterální kondenzace



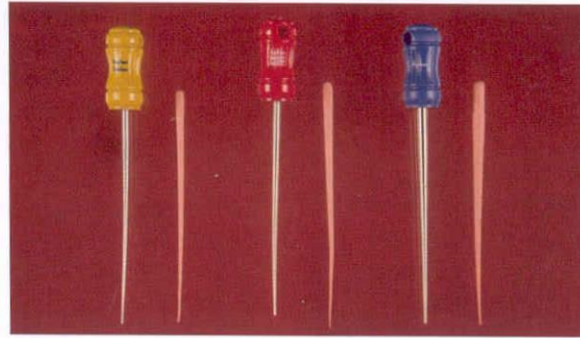
Compactor

Sperader

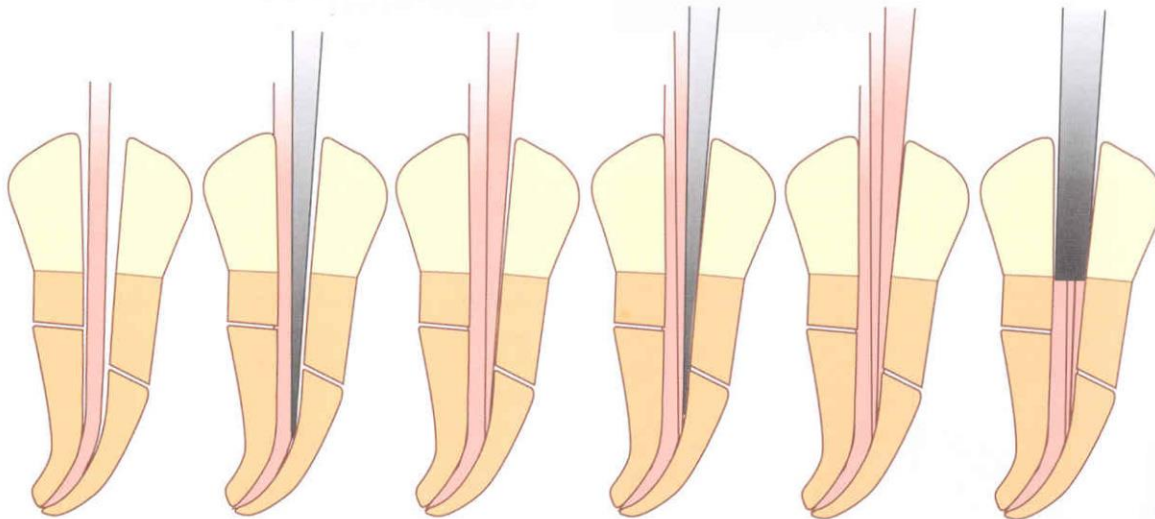


Warm techniques

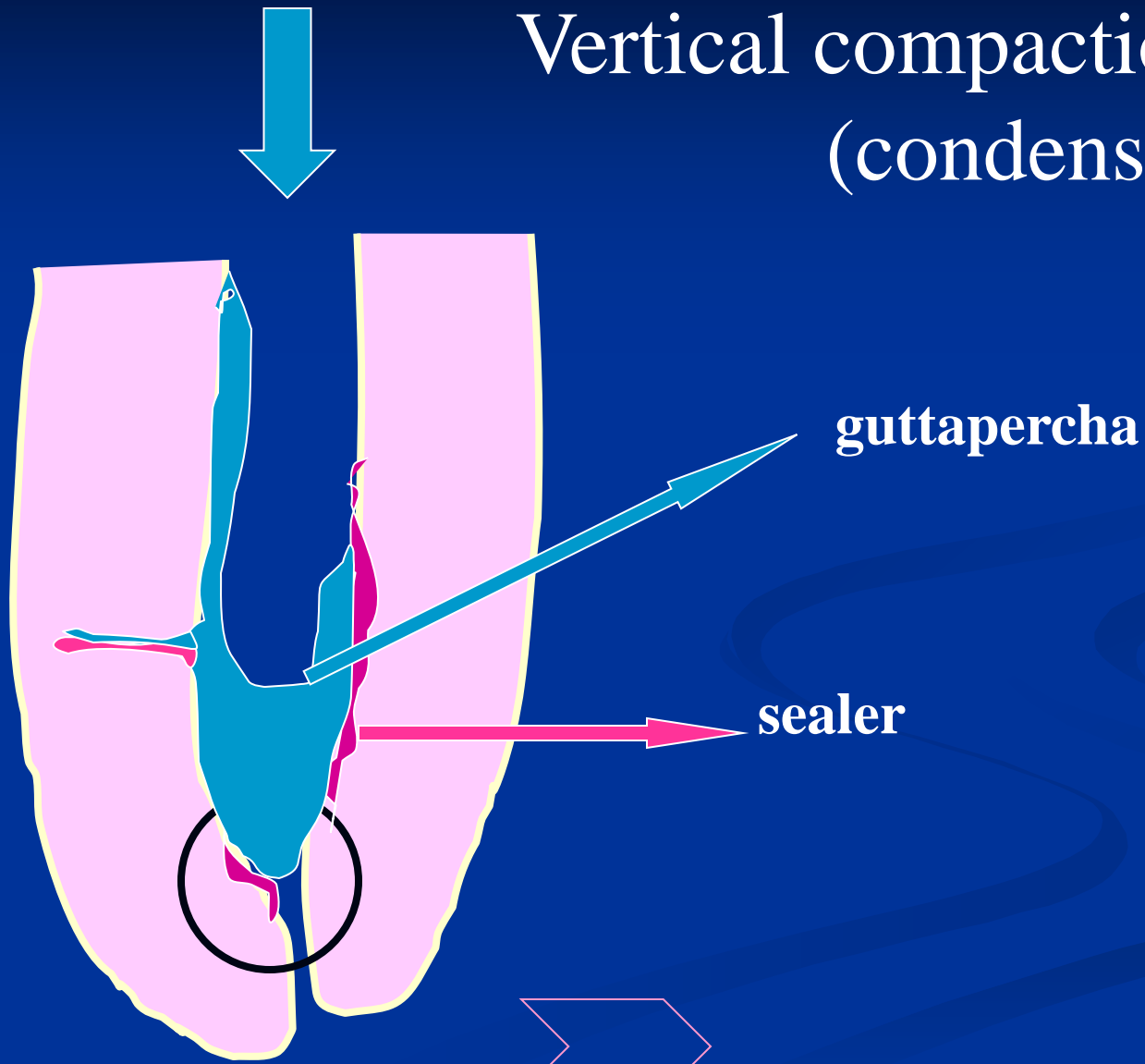
- Vertical condensation
- Injection
- Thermafil
- Thermomechanical condensation – Mc Spadden



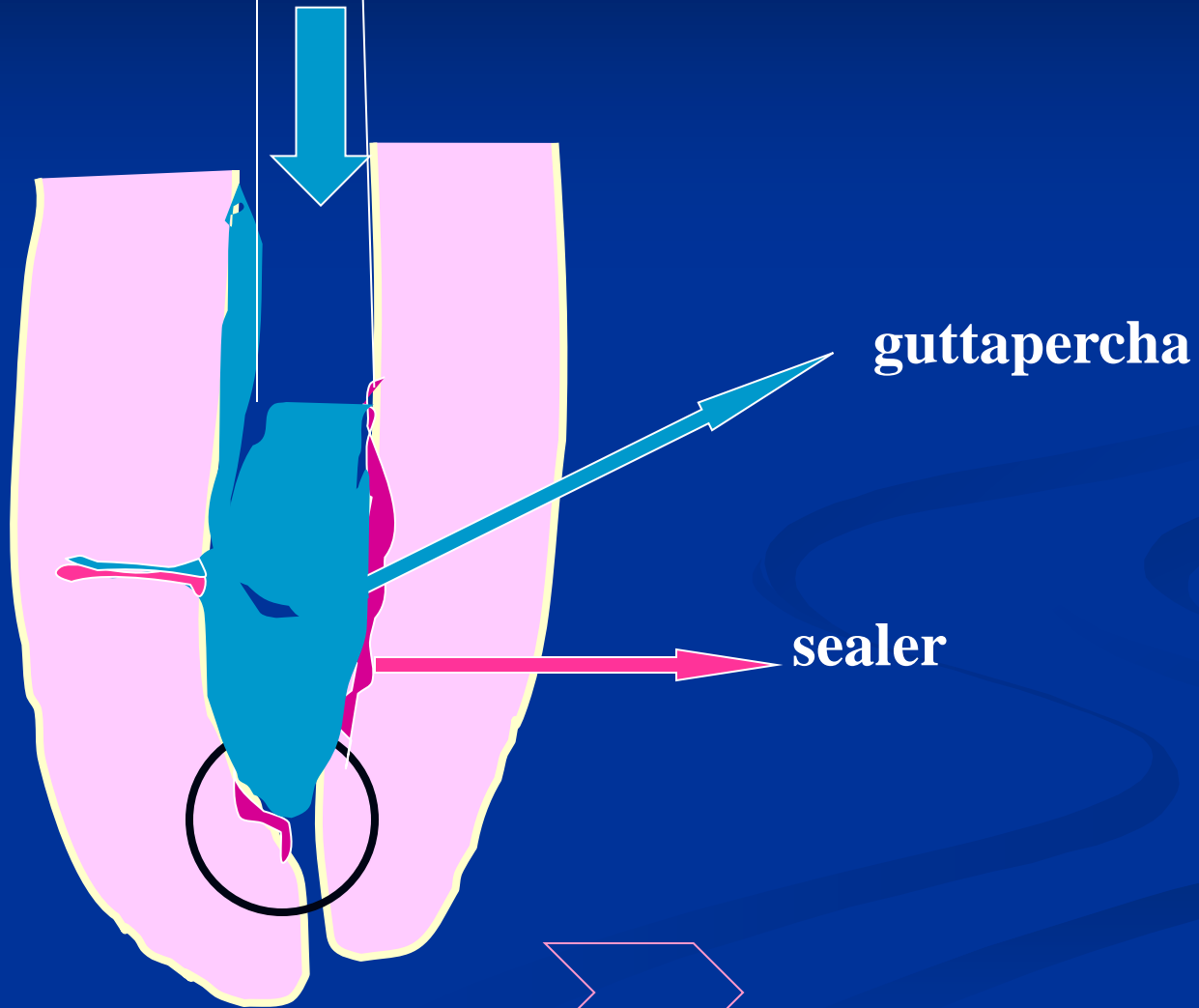
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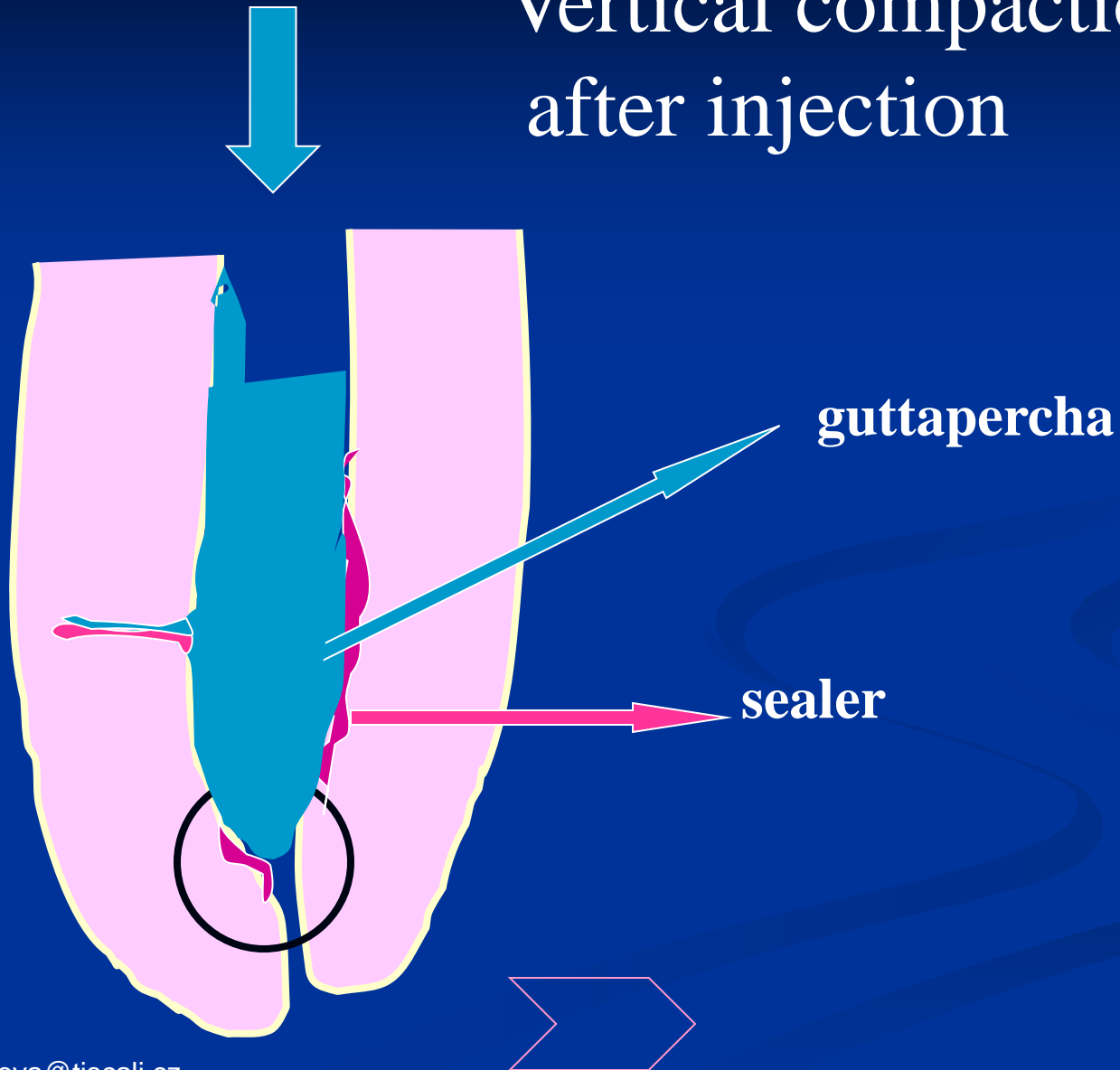
Vertical compaction (condensation)



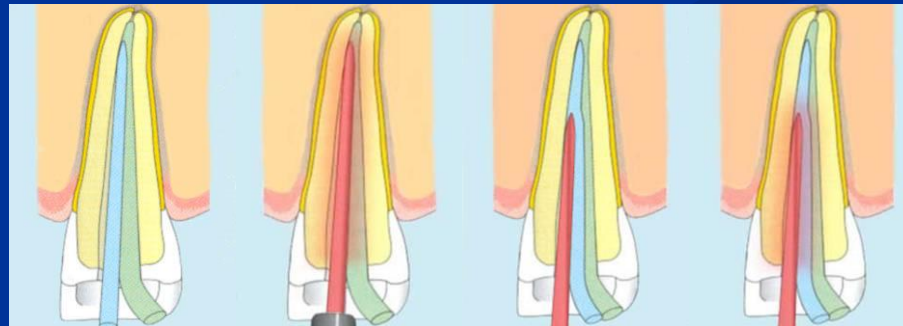
Injection



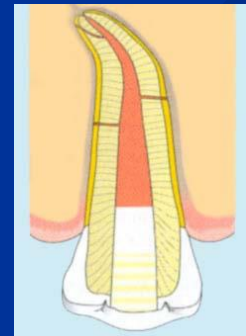
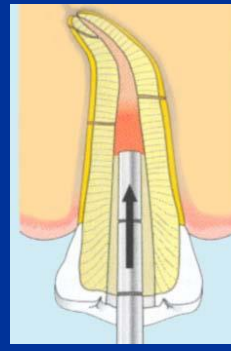
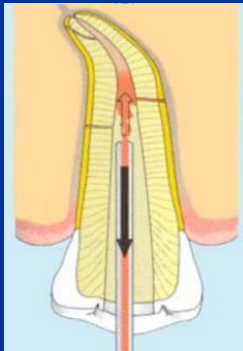
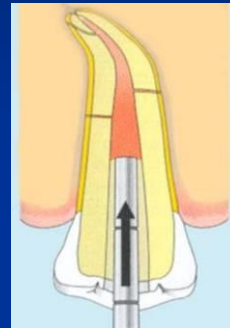
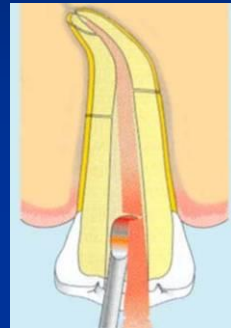
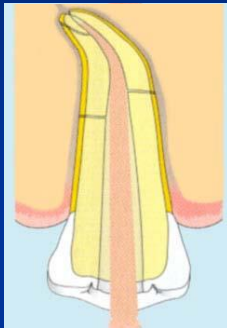
Vertical compaction after injection

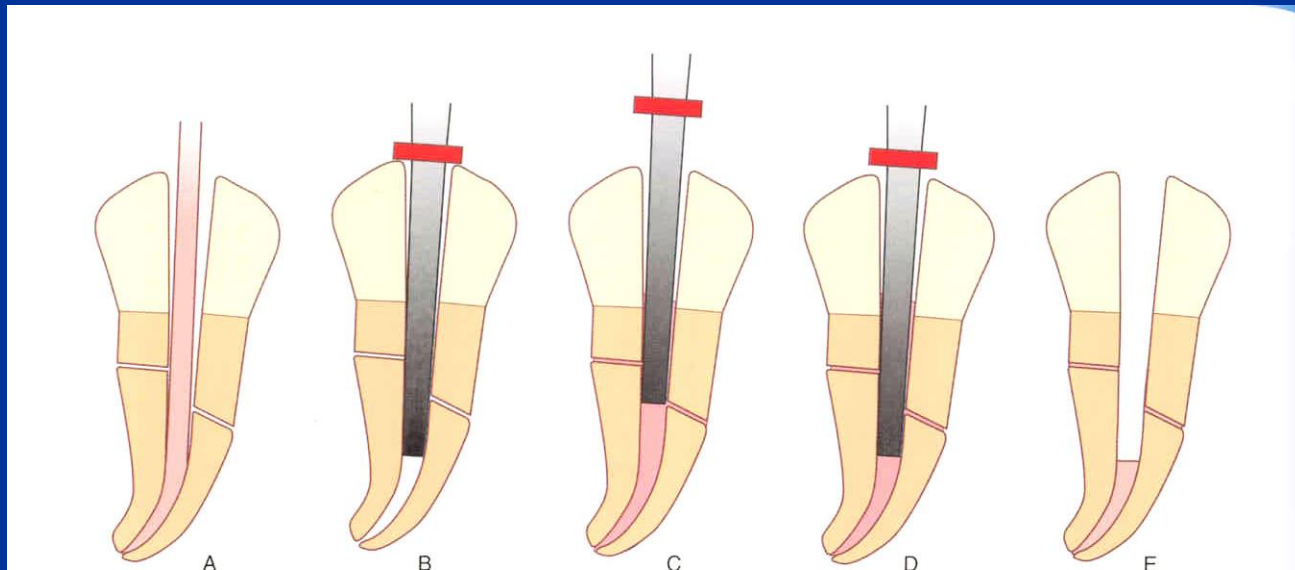


Warm lateral condensation

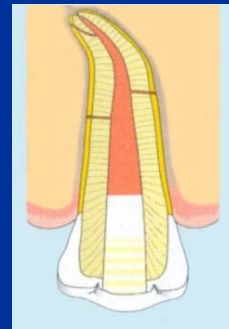
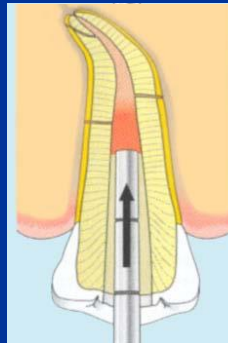
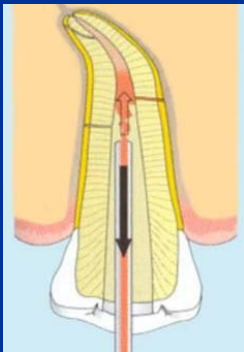


Vertical condensation



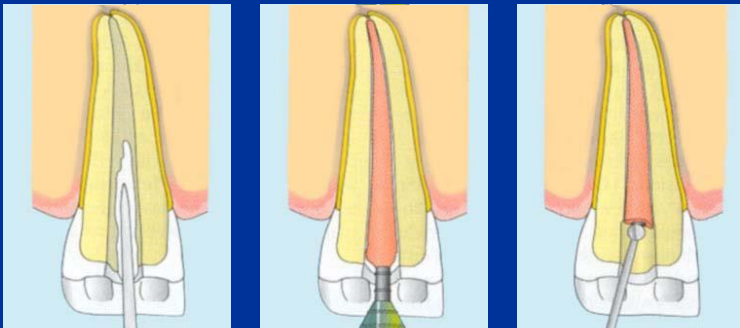


Injection of heated guttapercha



Thermafil

- Guttapercha on plastic carrier is heated in a special oven and put into the root canal.



Compactor for vertical condensation - plugger



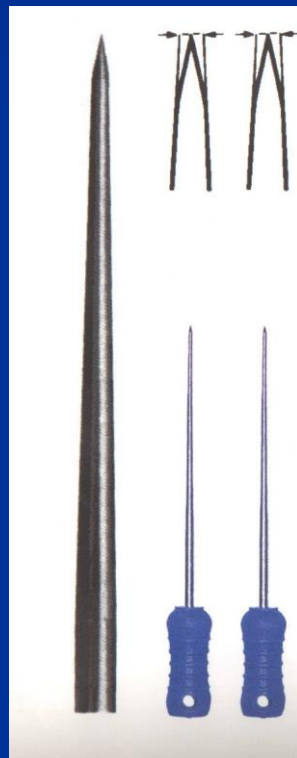
Power driven filling - lentulo



- Delivers the paste forward
- 1,5 – 2 mm before the front
- Mostly for $\text{Ca}(\text{OH})_2$

Compactors

-
Spreader



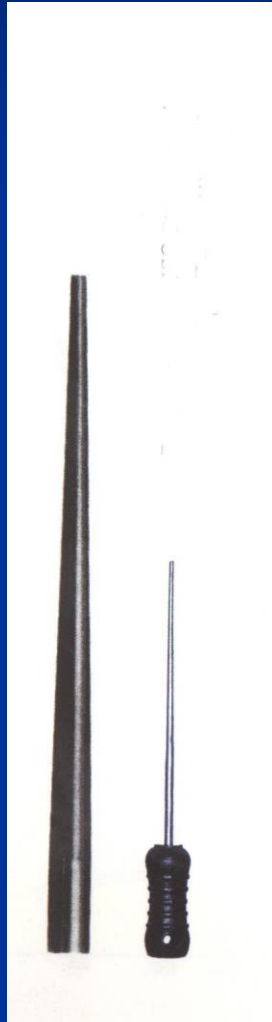
Pointed instrument

Lateral condensation



Compactors

Plugger



Straight front

Vertical action - condensation