

# 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

# 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



# 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, 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

# Chloropercha

## Properties:

Good adhesivity

Shrinkage

Toxicity

# Calciumhydroxide sealers

Base ( powder)

Calcium hydroxide

Zinc oxide

*Other components and vehicula*



# Calcium hydroxide sealers

Catalyst (paste)

Zinc stearat

Titanium dioxide

Baryum sulphate

or

Eugenol, Eukalypt

others

# Calciumhydroxide 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

➤ Resorcin phormaldehyd

➤ Epoxide

➤ Polyketone

➤ Metacrylate

# Epoxide resin

➤ Base (powder, paste)

Bismuth oxid

Titanium dioxide

Hexametylentetramine

(Silver)

➤ Catalyst (liquide, paste)

Bisphenoldiglycidylether

# Epoxi resins

## *(advantages)*

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

# Epoxi resin

*(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 bis- 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 fillings - forms

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

# Instruments

- Lentulo
- Compactors
- Compactors - carriers
- Others

# Root canal filling Methods

# Filling

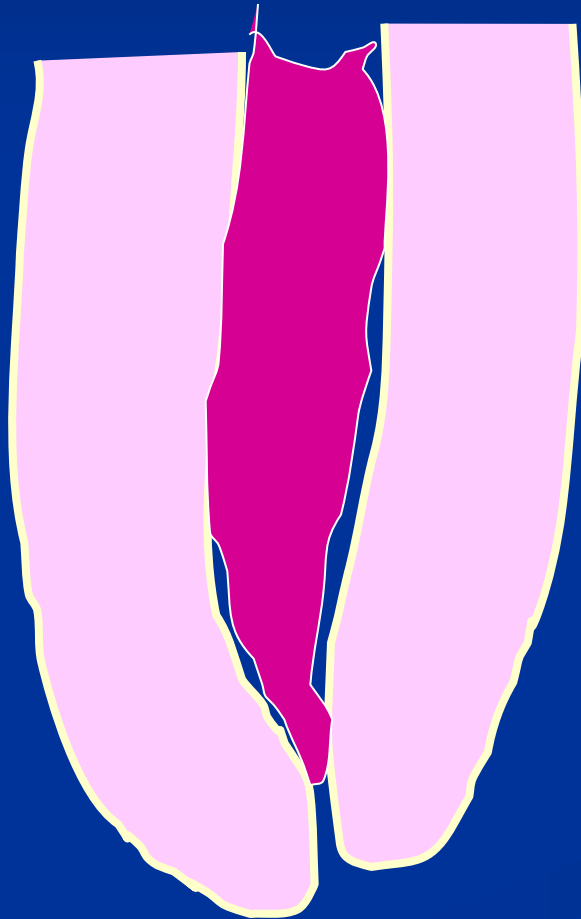
Always combination

- Plastic material – sealer
- Guttapercha



# Paste only

No good seal, today only temporary filling using calcium hydroxide

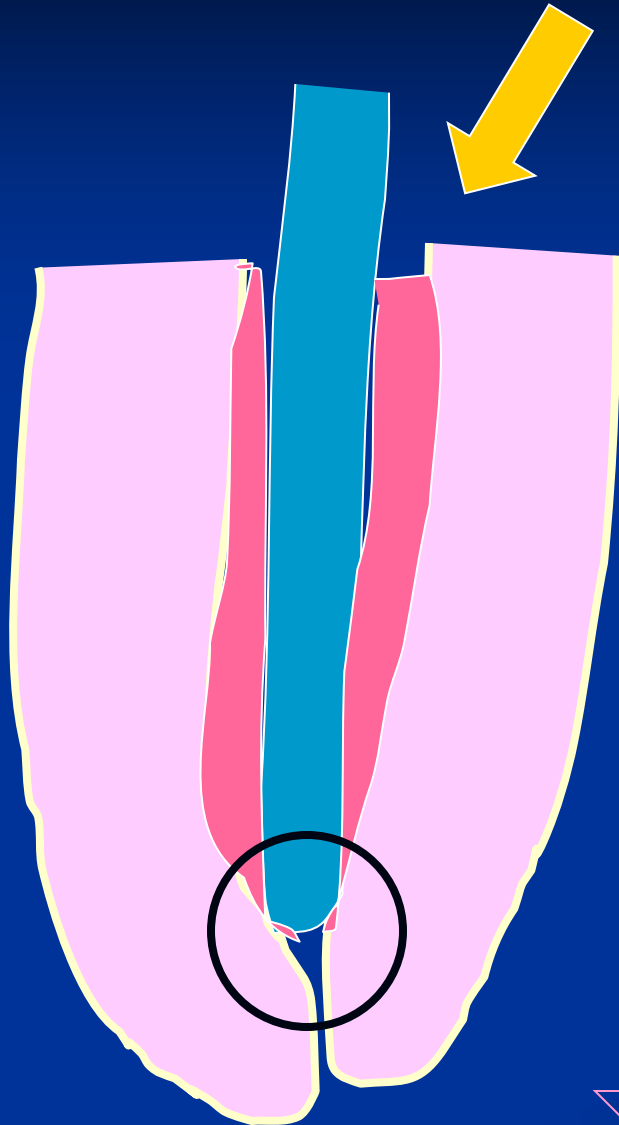


# Cold techniques

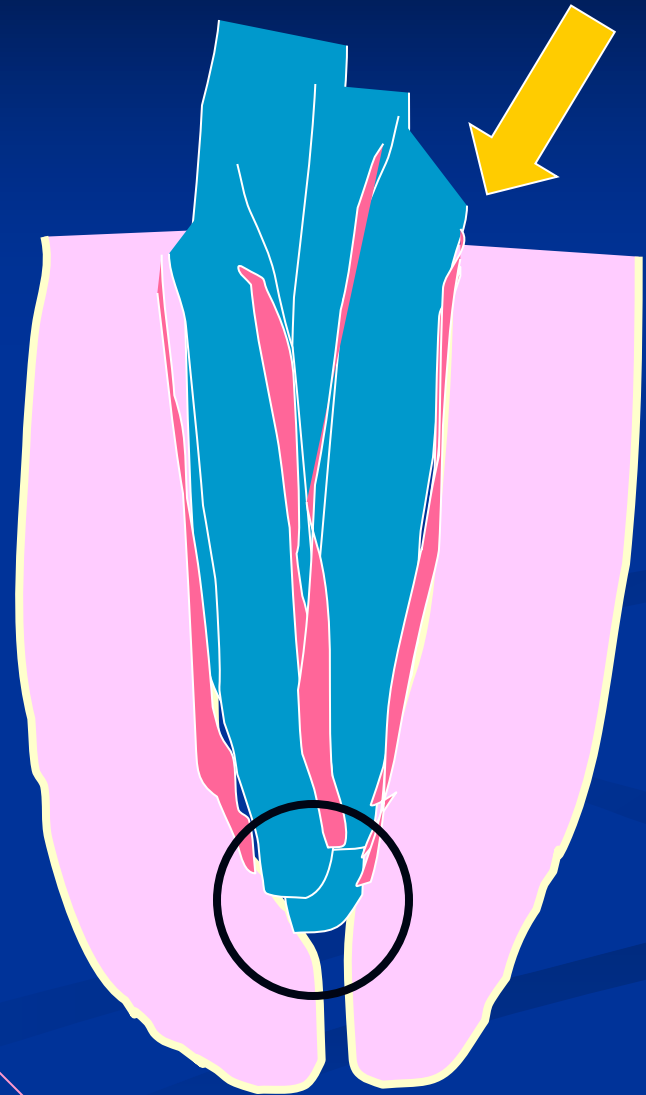
- Single cone technique
- Lateral condensation

Guttapercha cone (cones) and sealer

Single cone

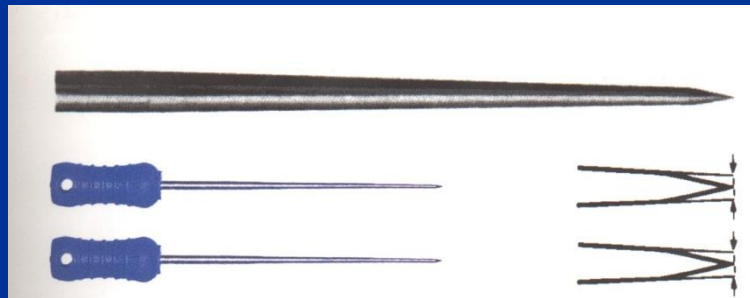


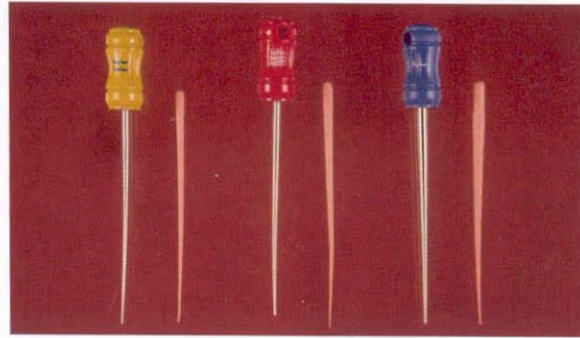
Lateral condensation



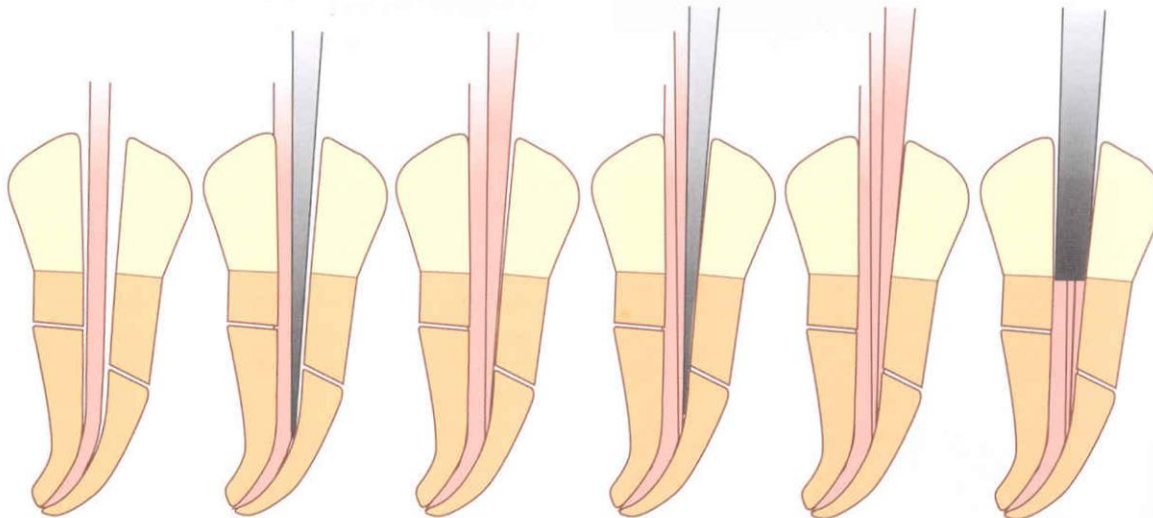
# Compactor for lateral condensation

## Spreader

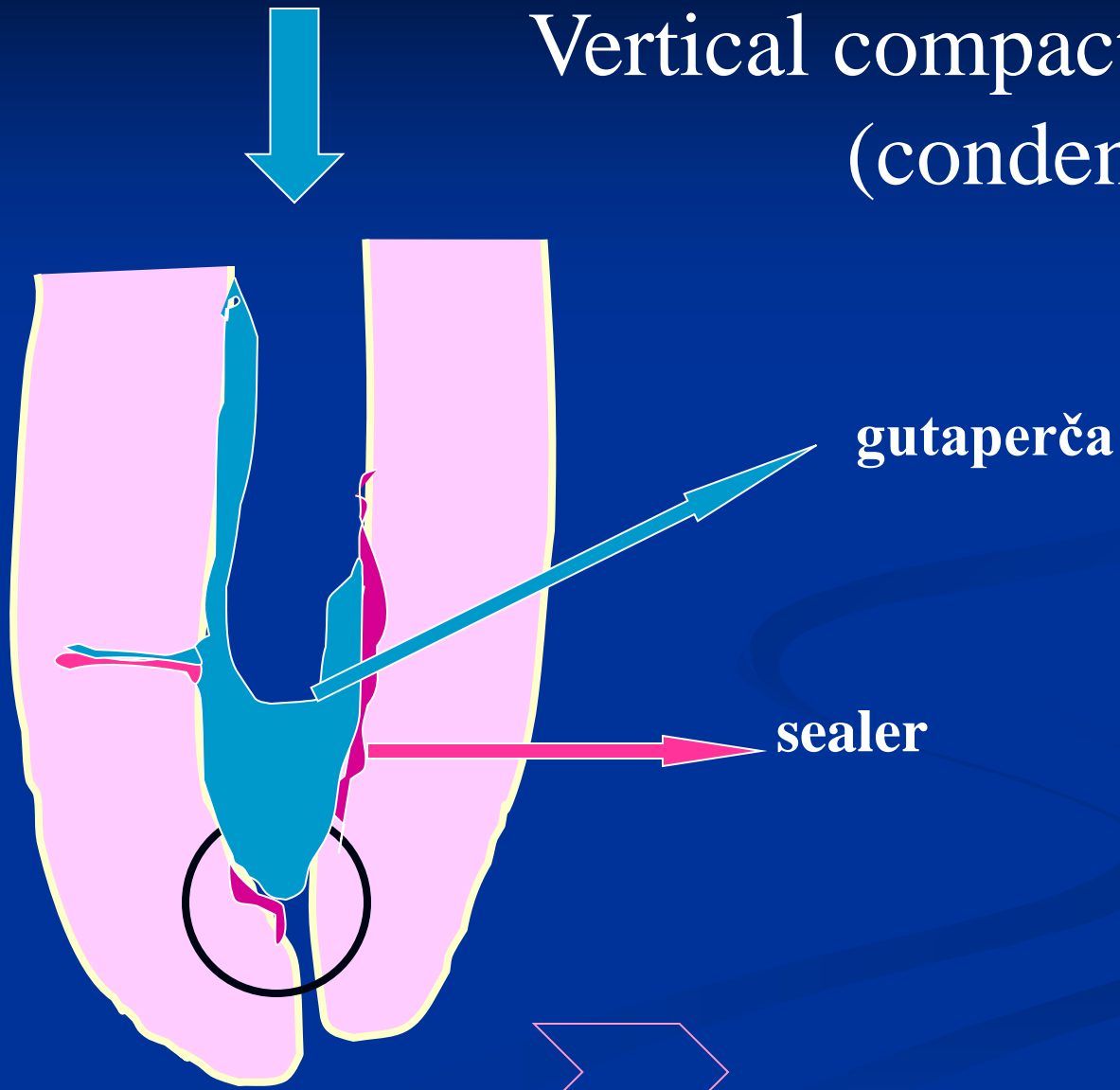




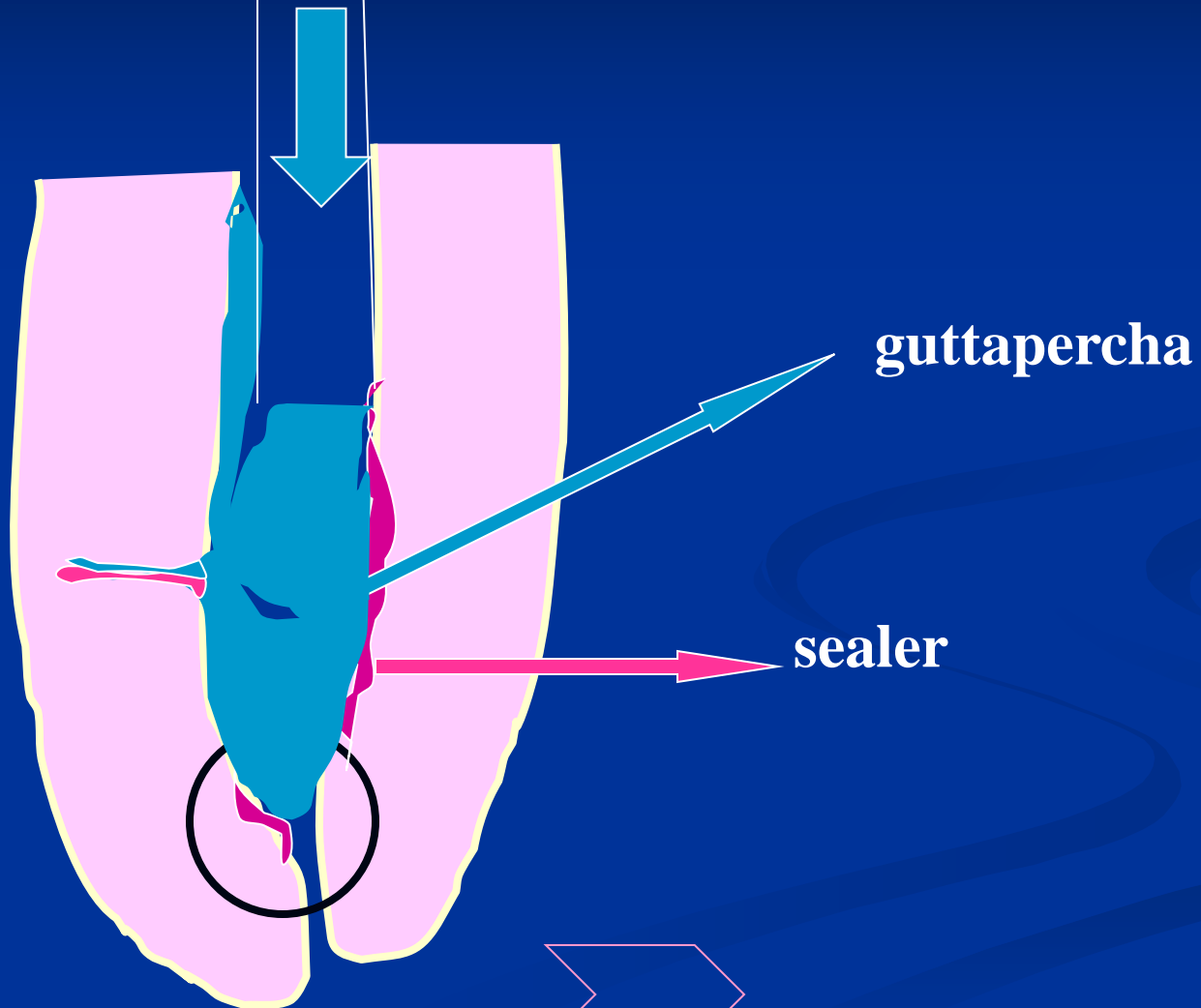
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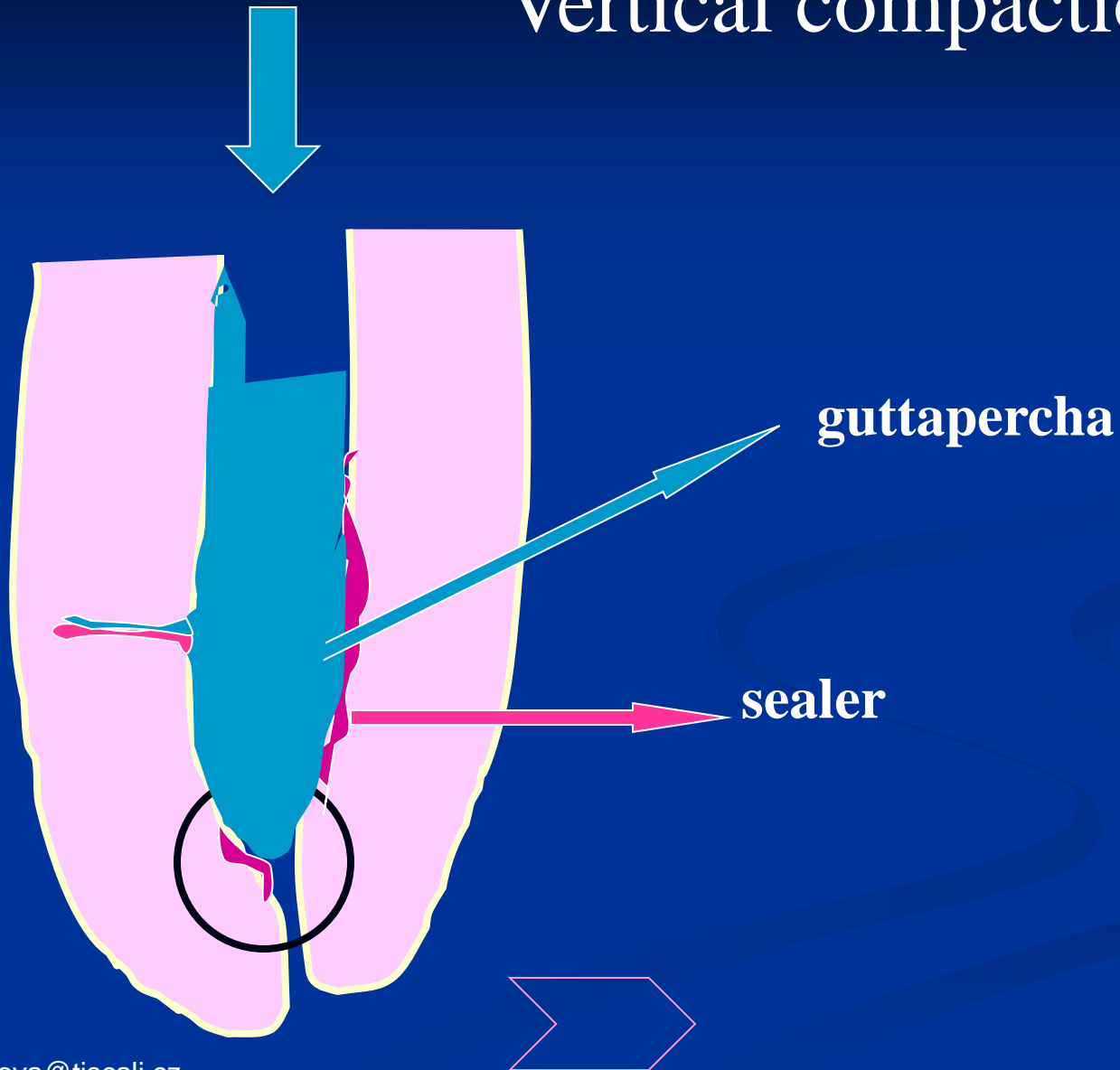
# Vertical compaction (condensation)



# Injection



# Vertical compaction





# Warm techniques – using heated guttapercha

Compactor  
- plugger



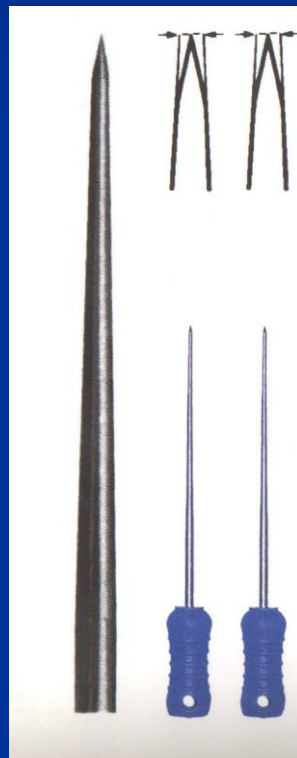
## Paste carrier -Lentulo



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

# Compactors

Kořenové cpátko  
- spreader



Hladký povrch, špička

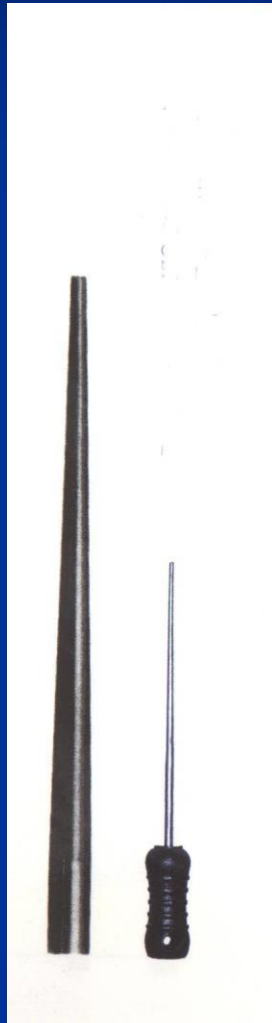
Zasunutí do kořenového  
kanálku vertikálně



*Laterální kondenzace  
gutaperčových čepů*

# Compactors

Kořenové cpátko  
- plugger



Hladký povrch, rovné čelo

Zasunutí do kořenového  
kanálku vertikálně

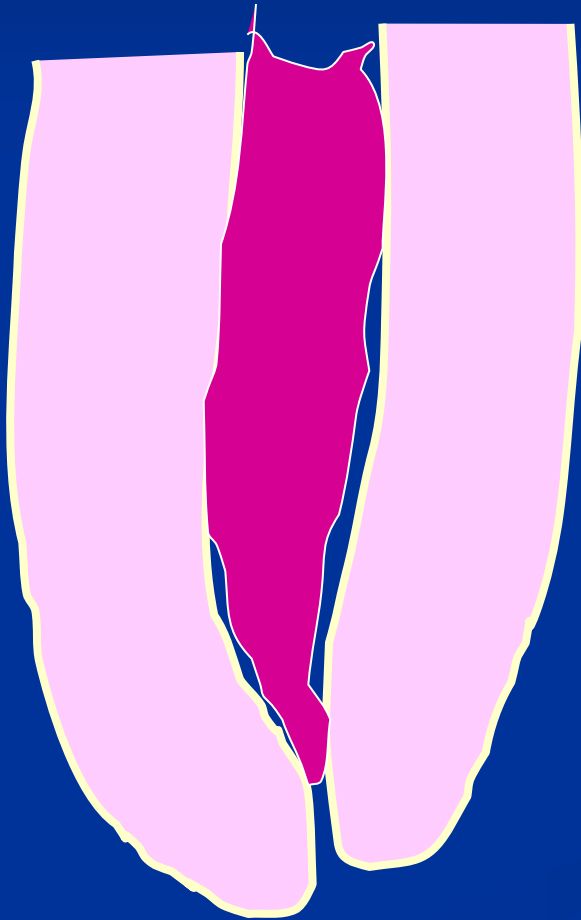
*Vertikální kondenzace  
kondenzace gutaperči*

# Root canal filling Methods

# Filling

- Plastic material – sealer
- Guttapercha

# Paste only



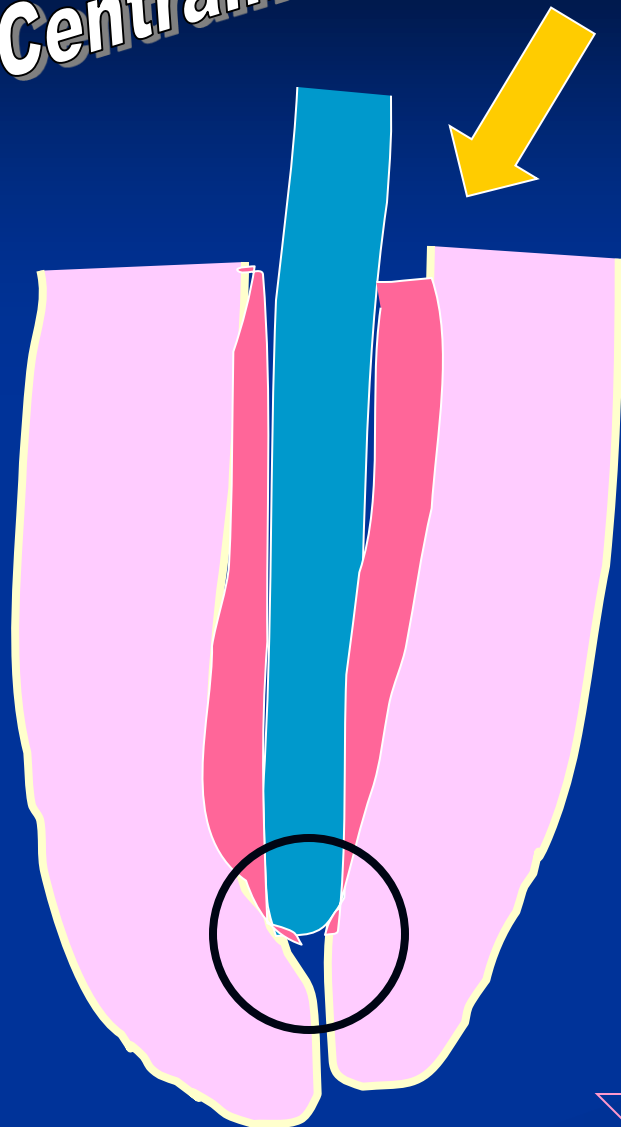




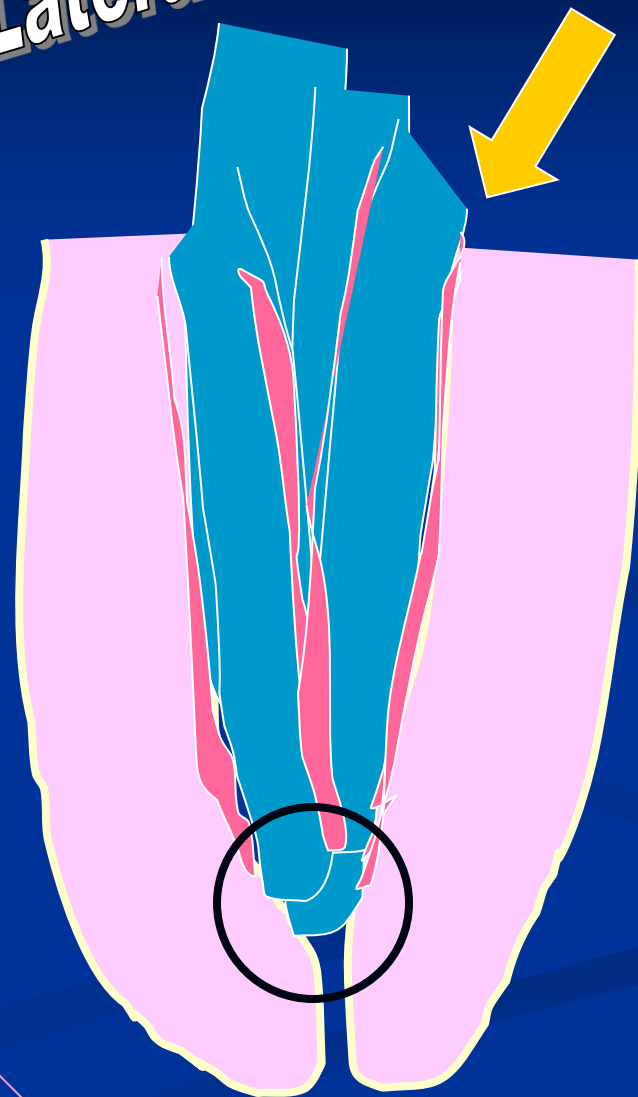
# Cold techniques

- Single cone technique
- Lateral compaction (lateral condensation)

Centrální čep



Laterální kondenzace



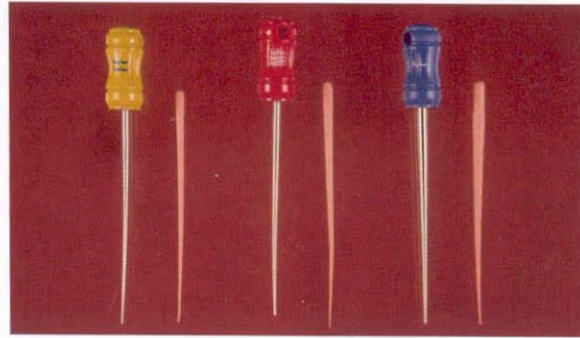
# Compactor

# Spearader

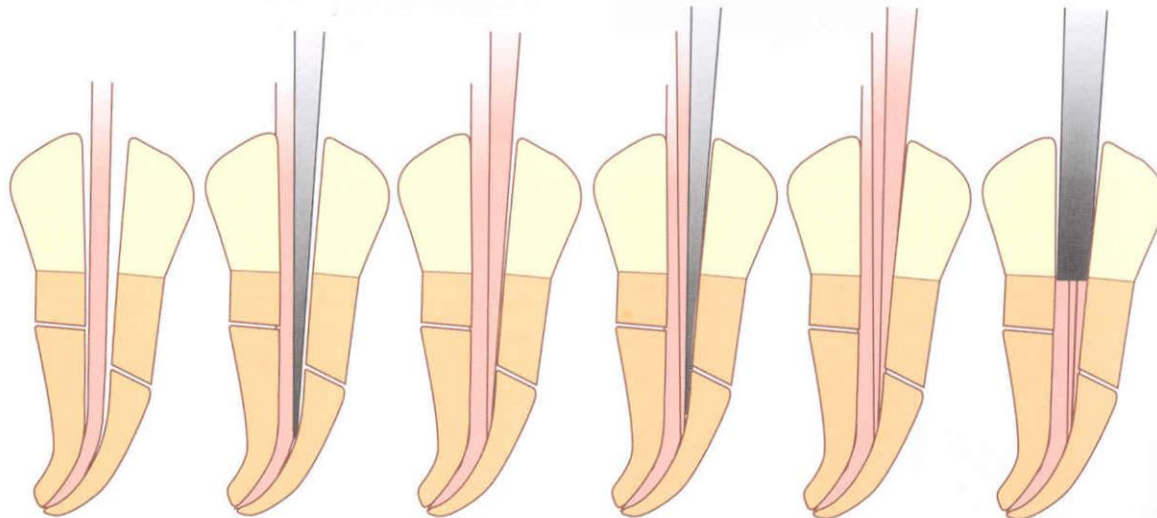


# Warm techniques

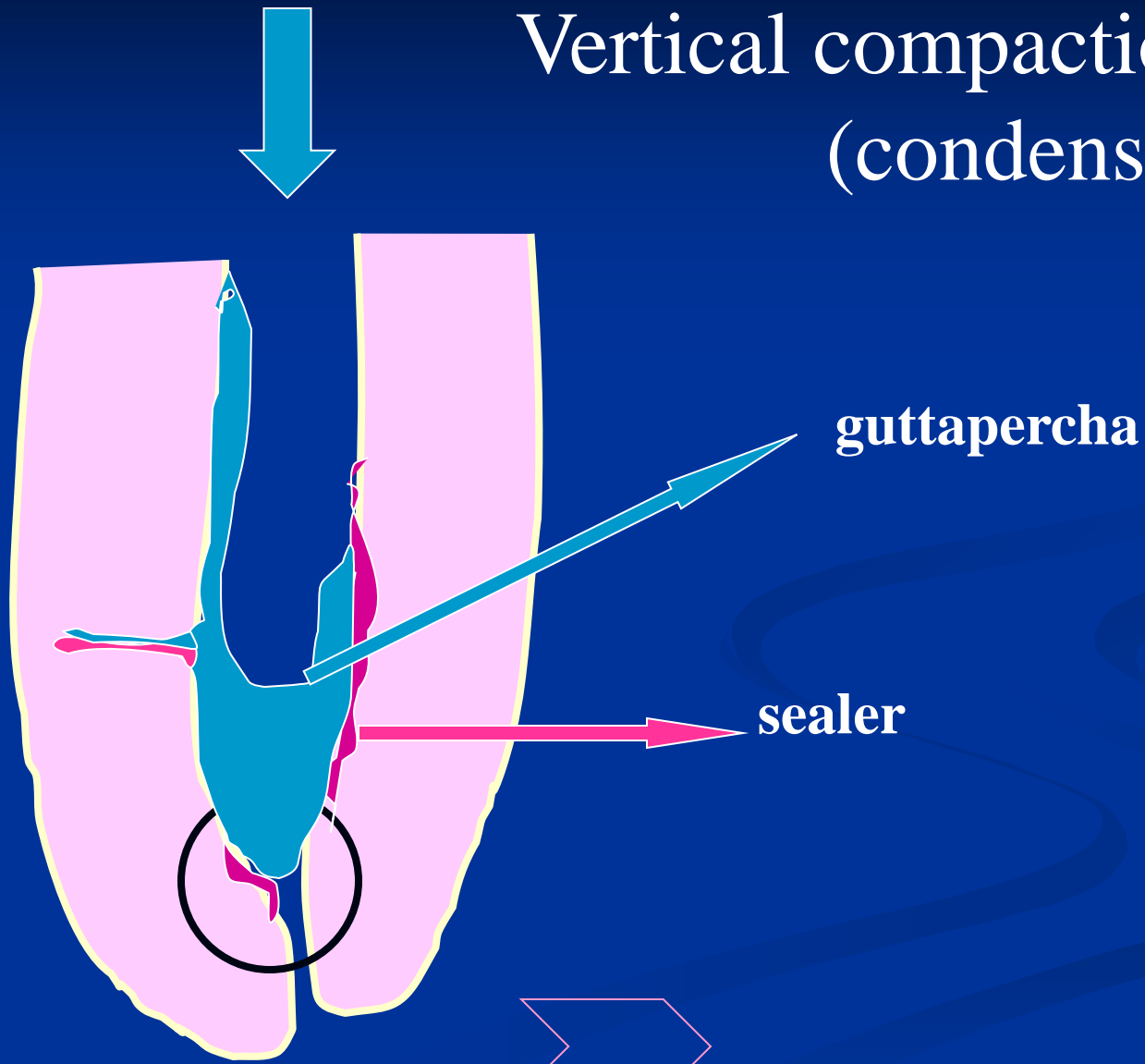
- Warm lateral compaction
- Vertical compaction
- Injection
- Thermafil (guttapercha is on the carrier)
- Thermomechanical compaction – Mc Spadden



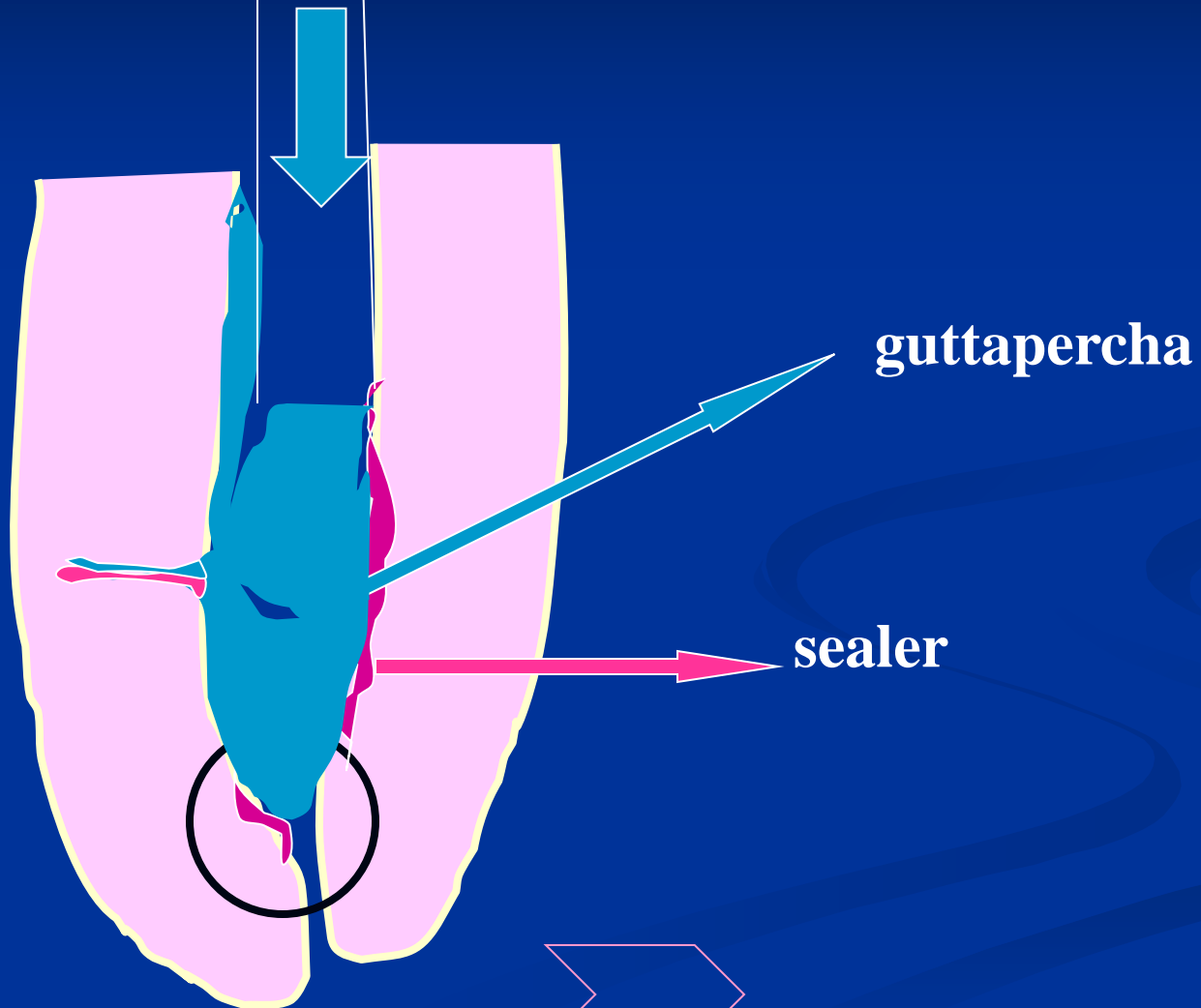
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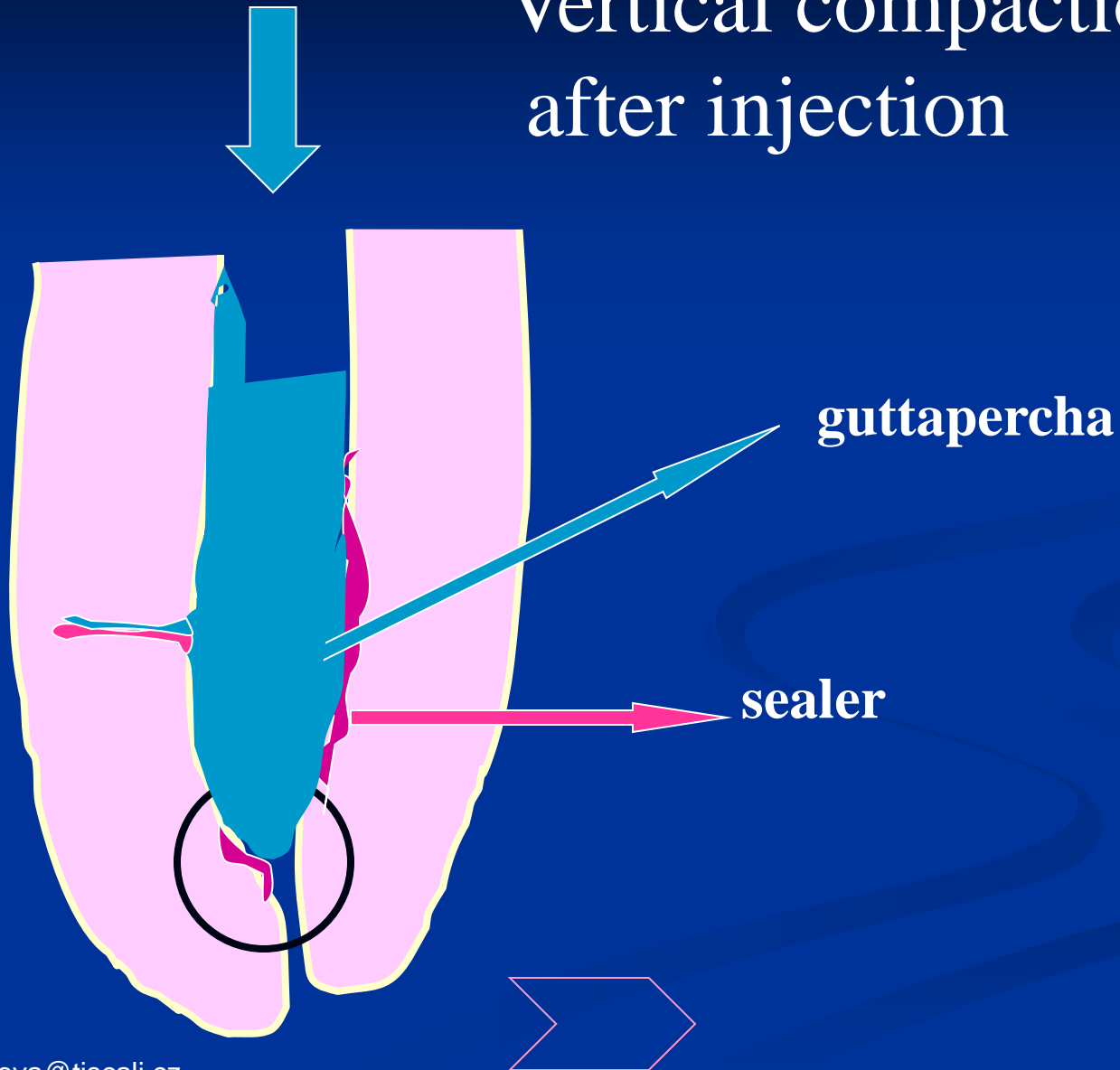
# Vertical compaction (condensation)



# Injection

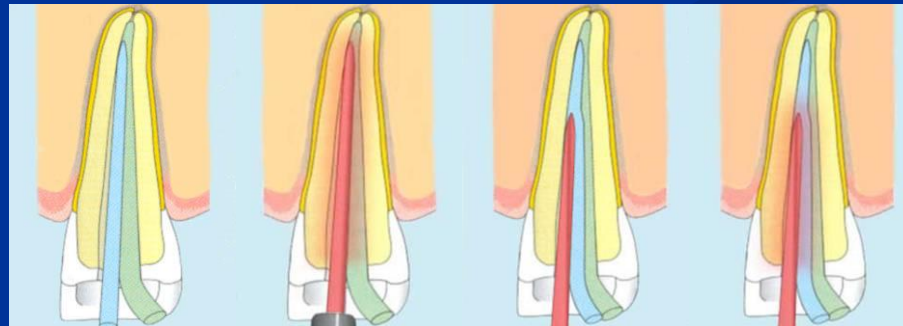


# Vertical compaction after injection

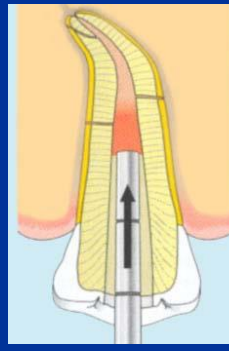
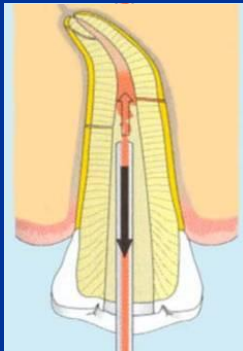
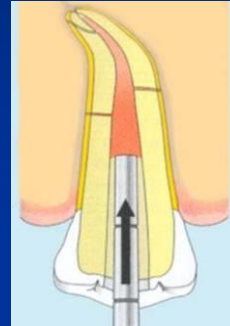
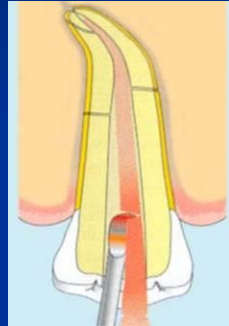
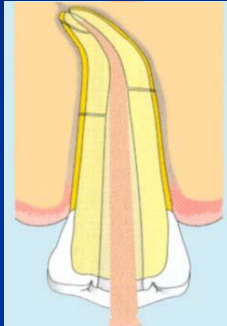


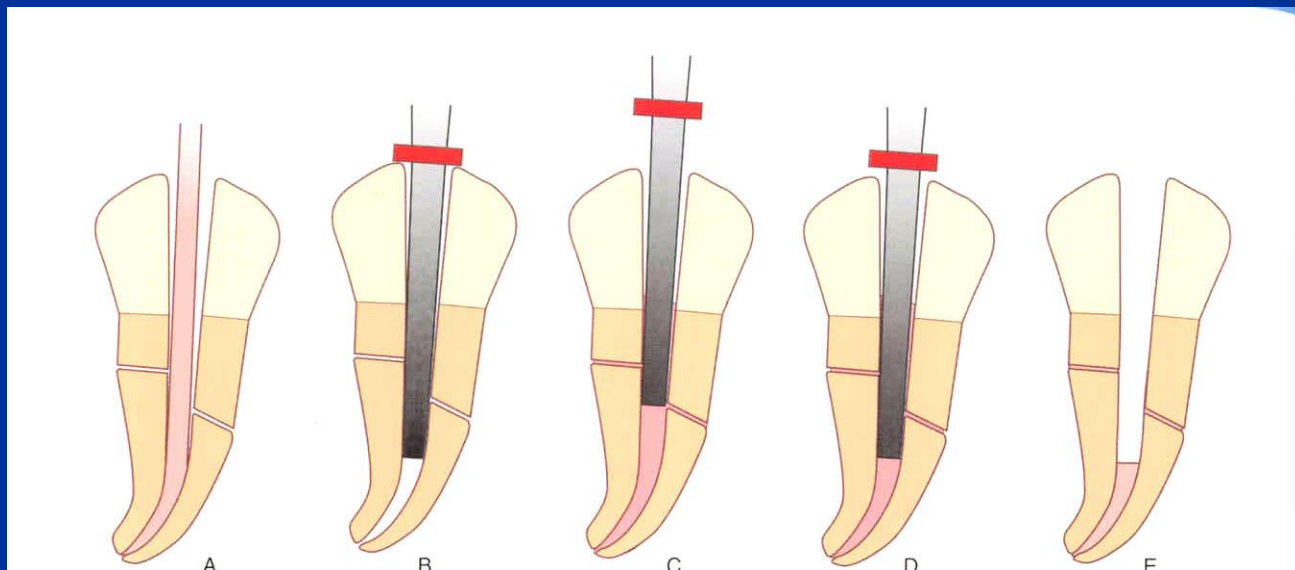


# Warm lateral condensation

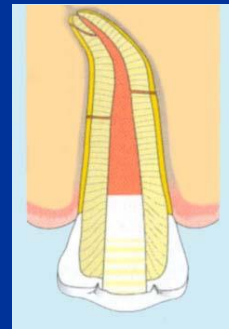
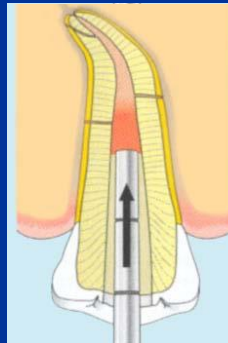
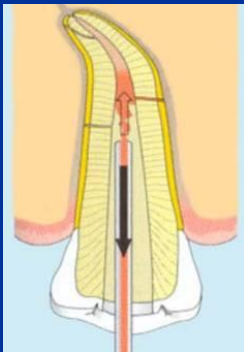


# Vertical condensation





# Injection of heated guttapercha



# Thermafil

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

