

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

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, antimikrobial 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

Chloroperca

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

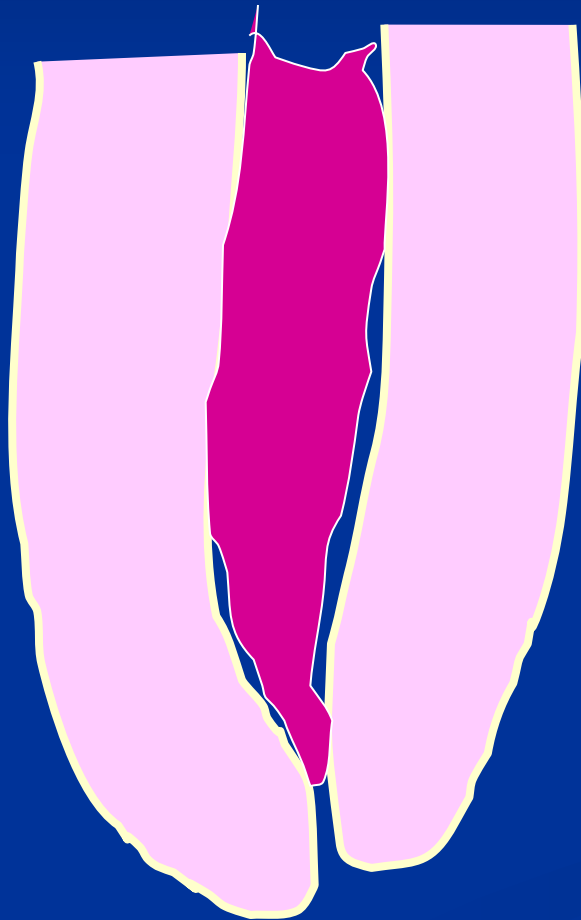
Filling

Always combination

- Plastic material – sealer
- Guttapercha

Paste only

No good seal, today only temporary filling using calcium hydroxide

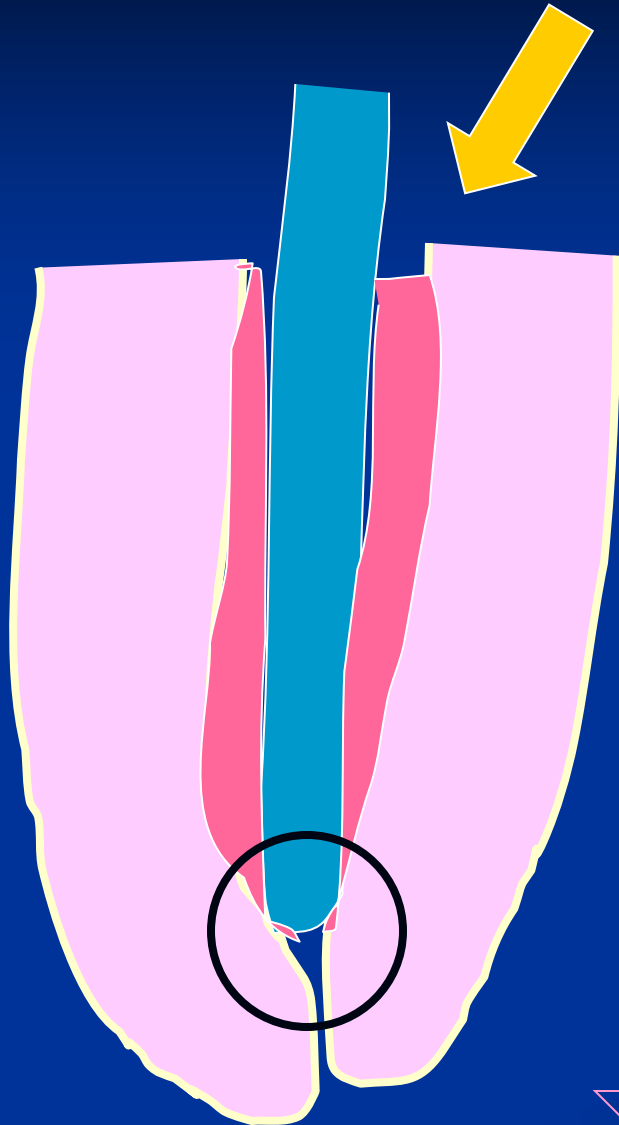


Cold techniques

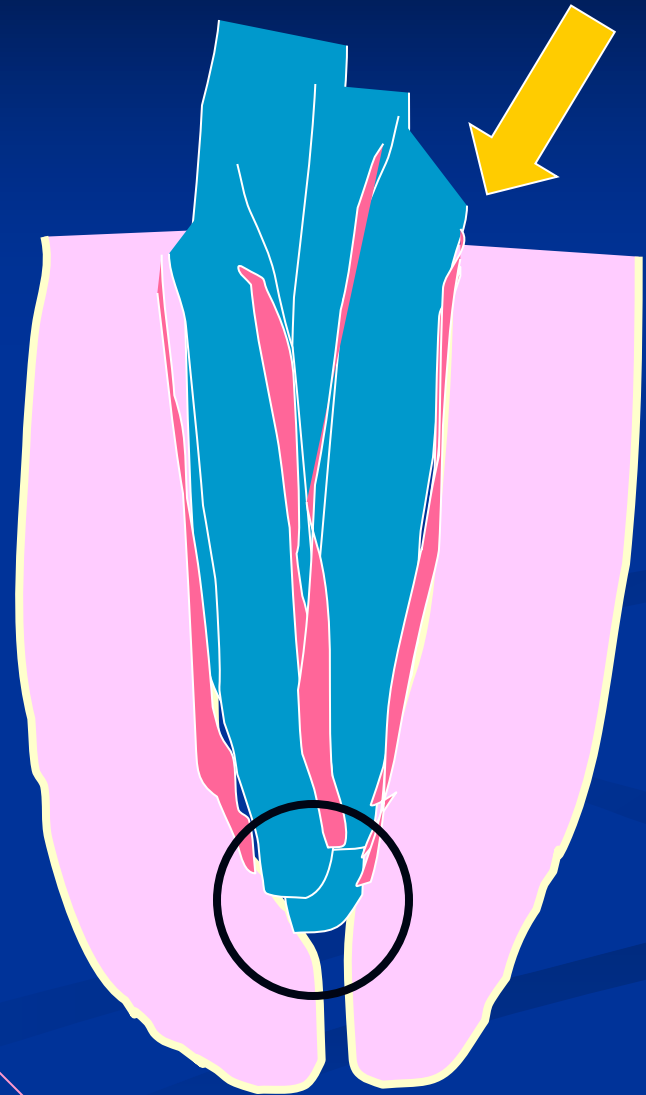
- Single cone technique
- Lateral condensation

Guttapercha cone (cones) and sealer

Single cone

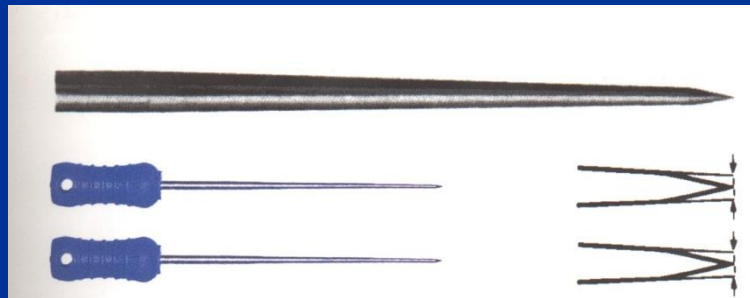


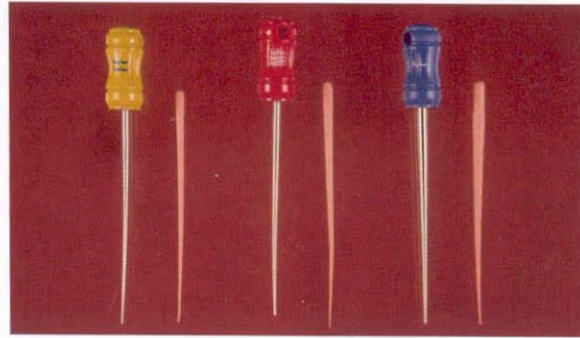
Lateral condensation



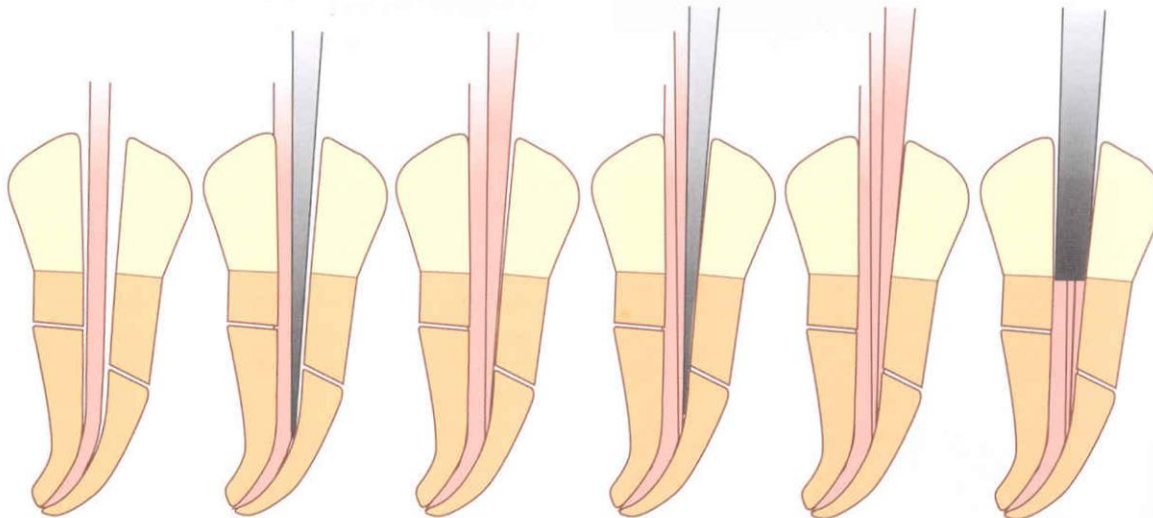
Compactor for lateral condensation

Spreader

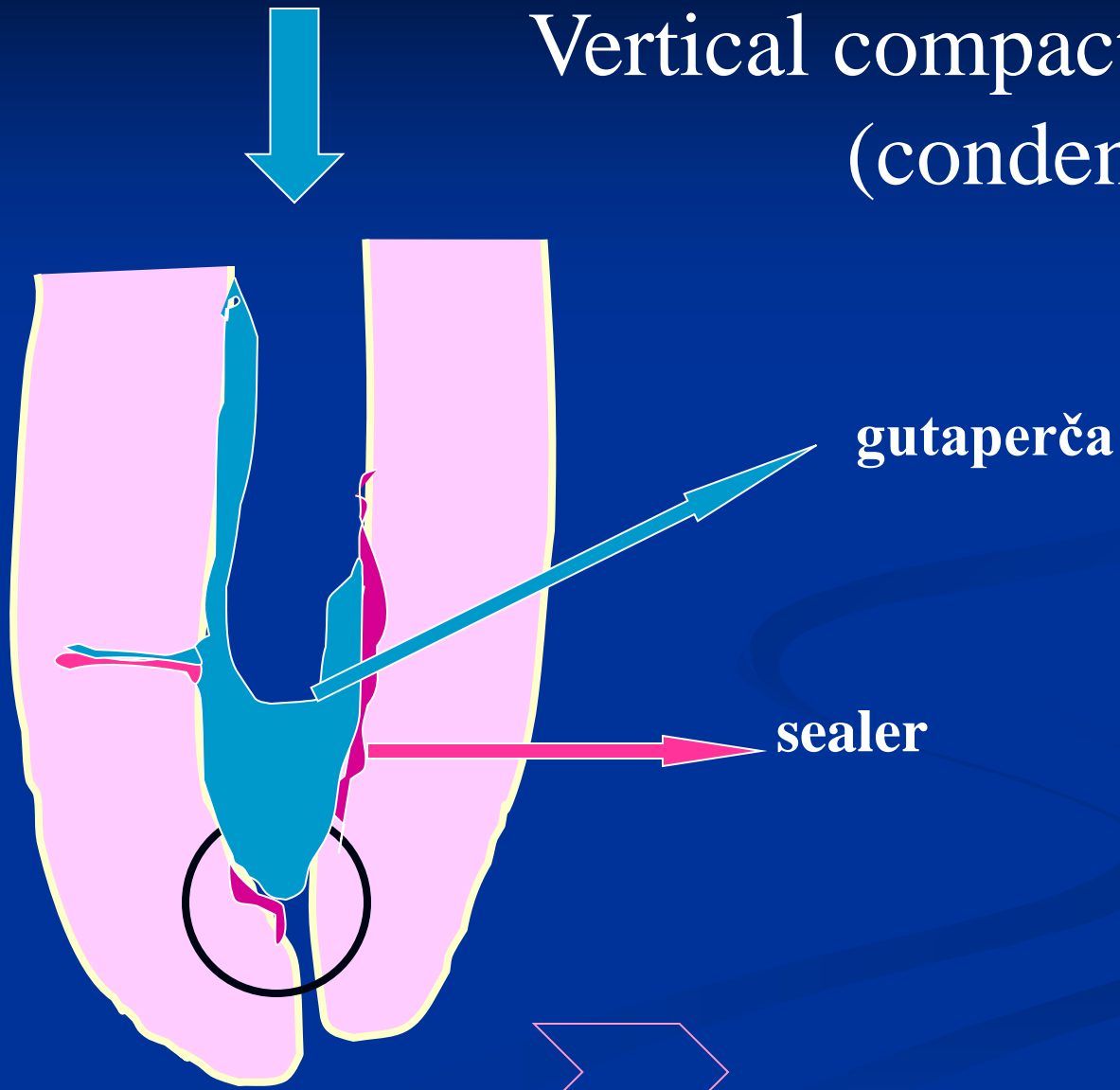




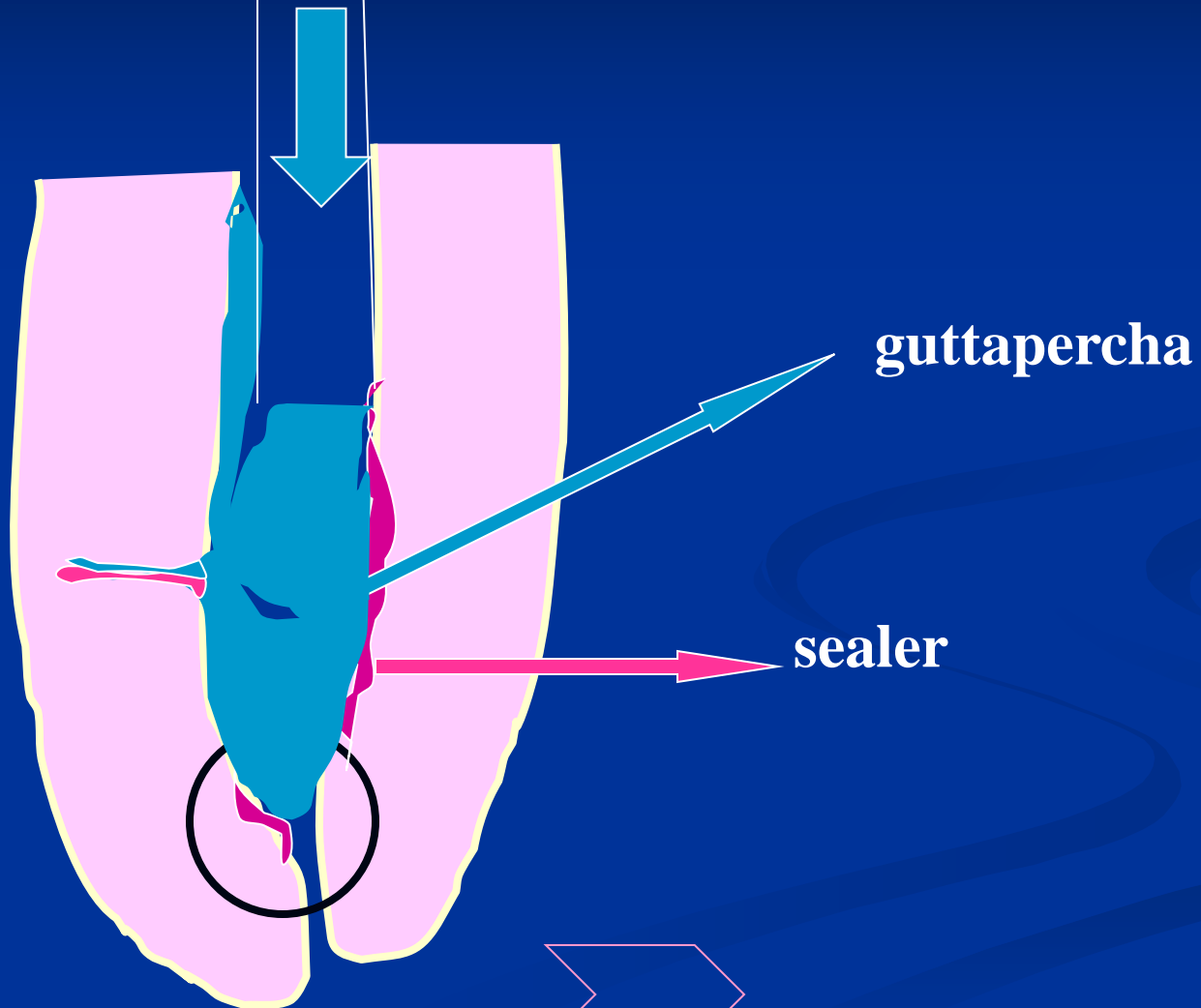
A



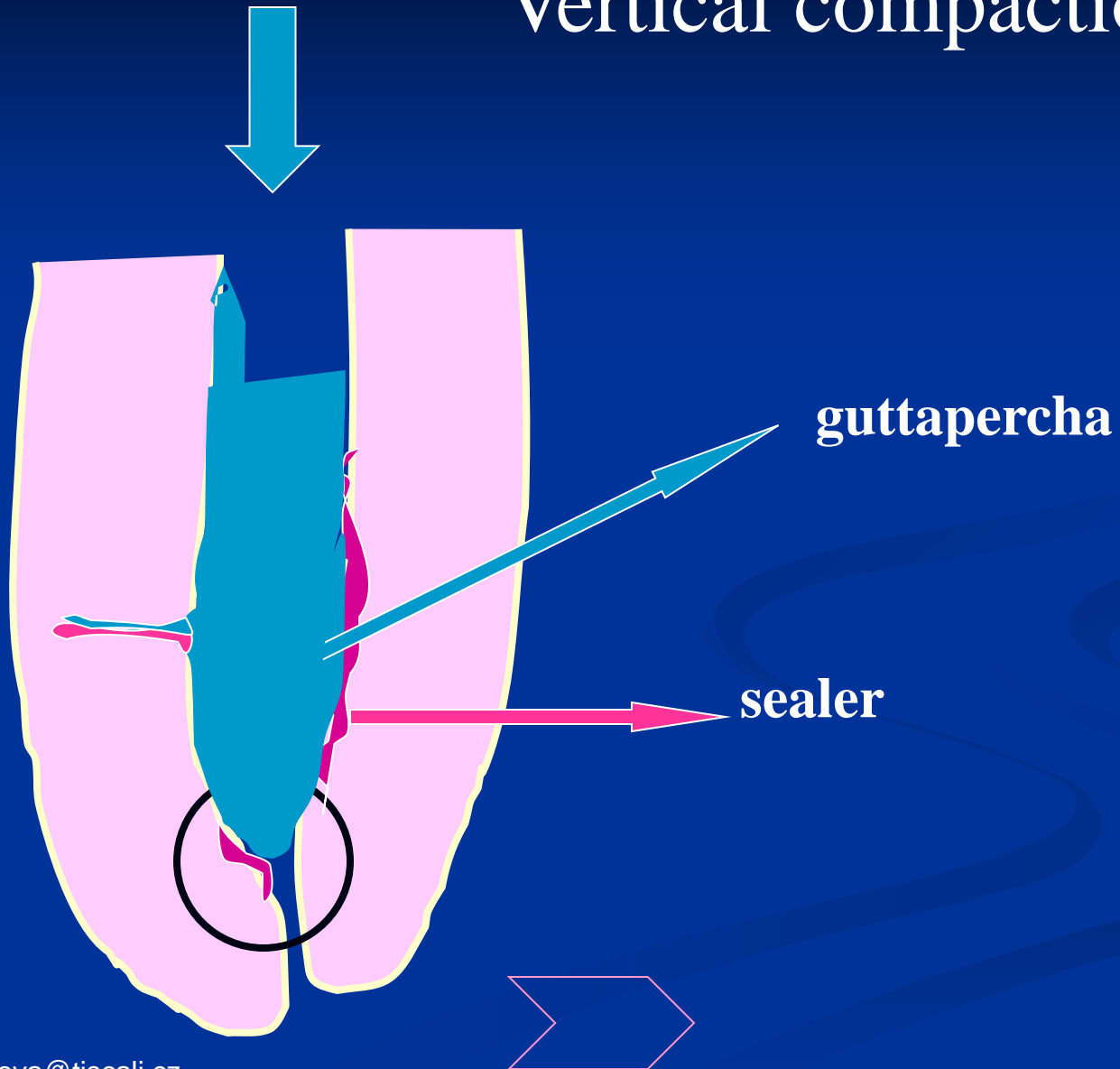
Vertical compaction (condensation)



Injection



Vertical compaction



Warm techniques – using heated guttapercha

Compactor
- plugger



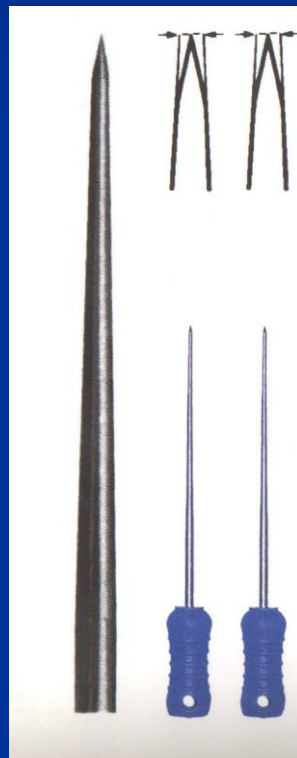
Paste carrier -Lentulo



- 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

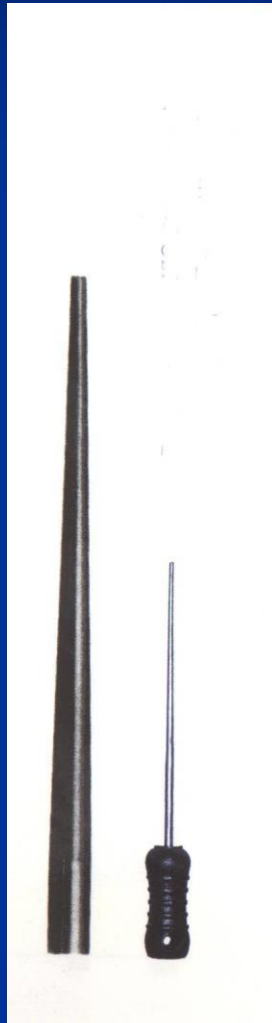
Zasunutí do kořenového
kanálku vertikálně



*Laterální kondenzace
gutaperčových čepů*

Compactors

Kořenové cpátko
- plugger



Hladký povrch, rovné čelo

Zasunutí do kořenového
kanálku vertikálně

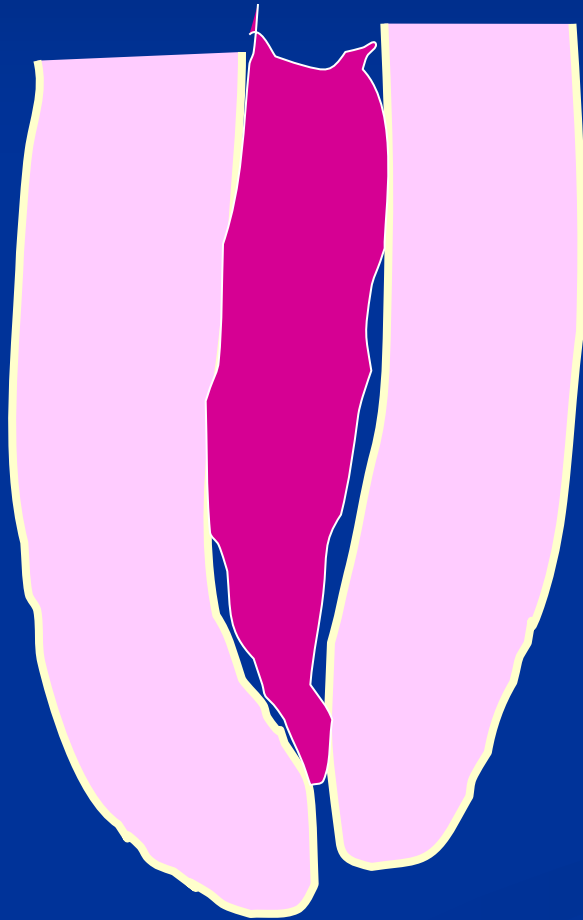
*Vertikální kondenzace
kondenzace gutaperči*

Root canal filling Methods

Filling

- Plastic material – sealer
- Guttapercha

Paste only

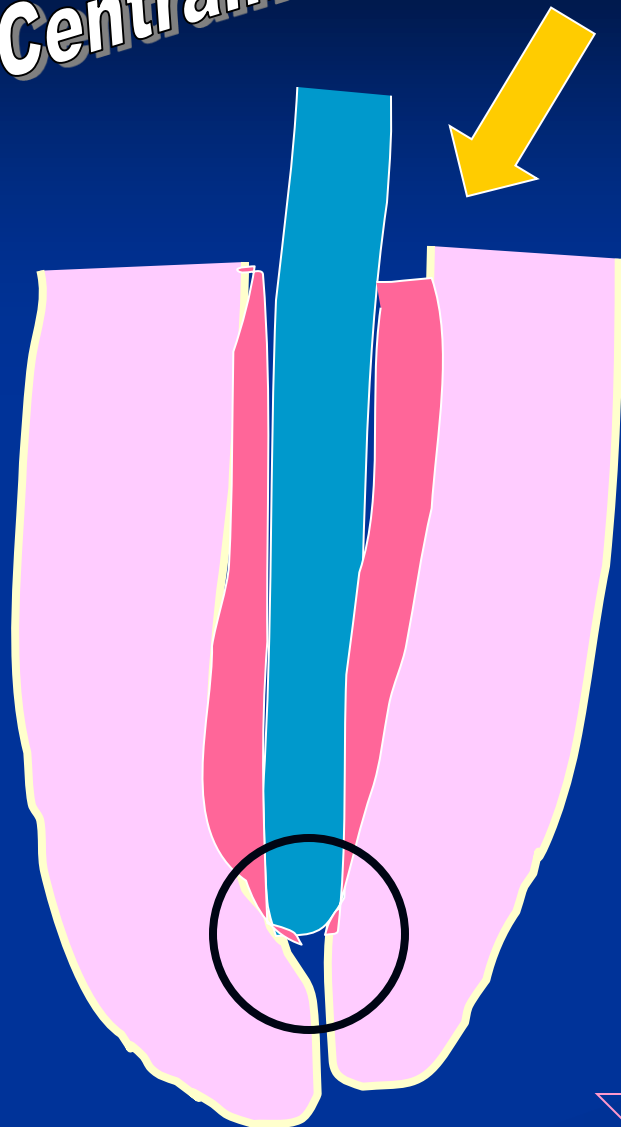




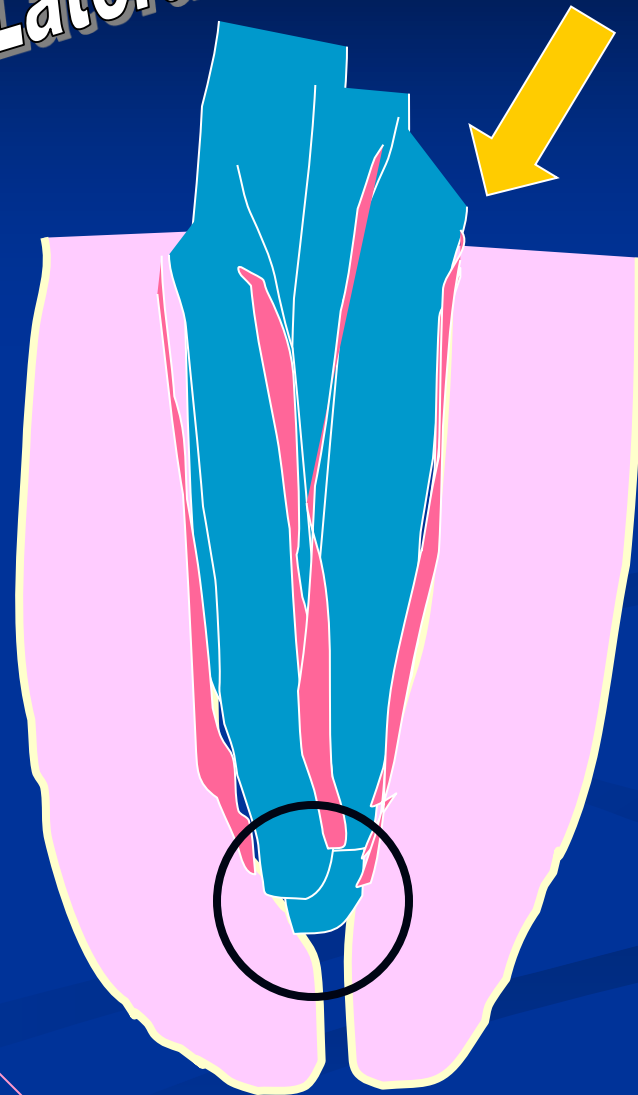
Cold techniques

- Single cone technique
- Lateral compaction (lateral condensation)

Centrální čep



Laterální kondenzace



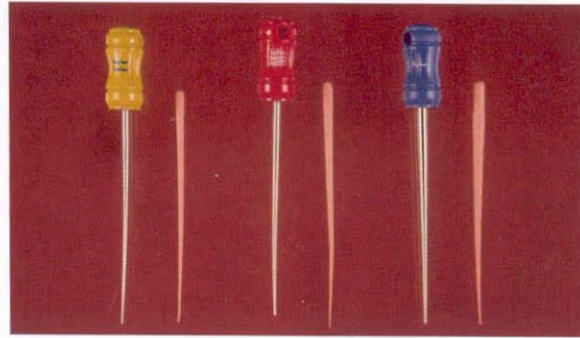
Compactor

Spearader

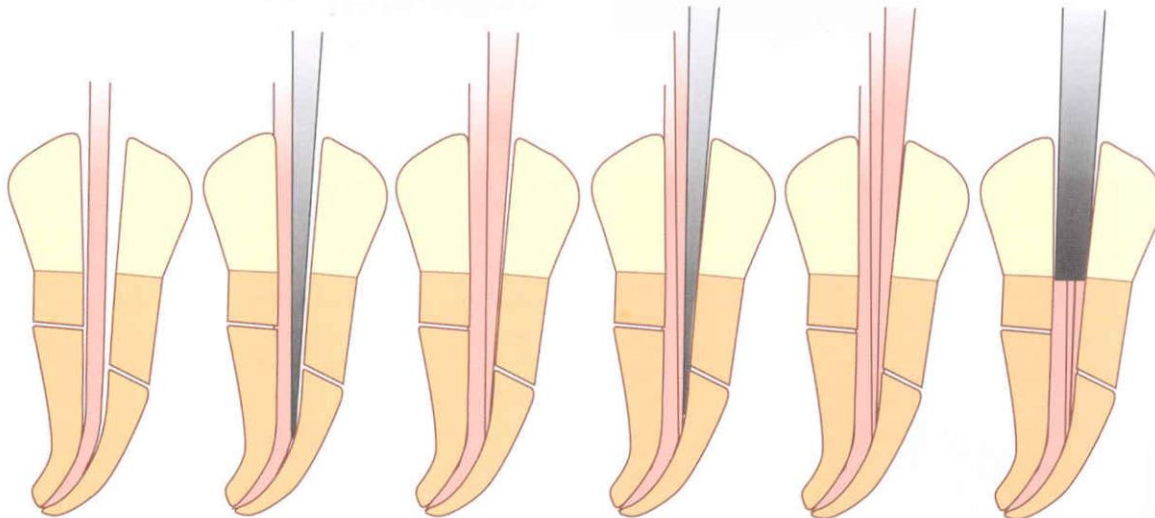


Warm techniques

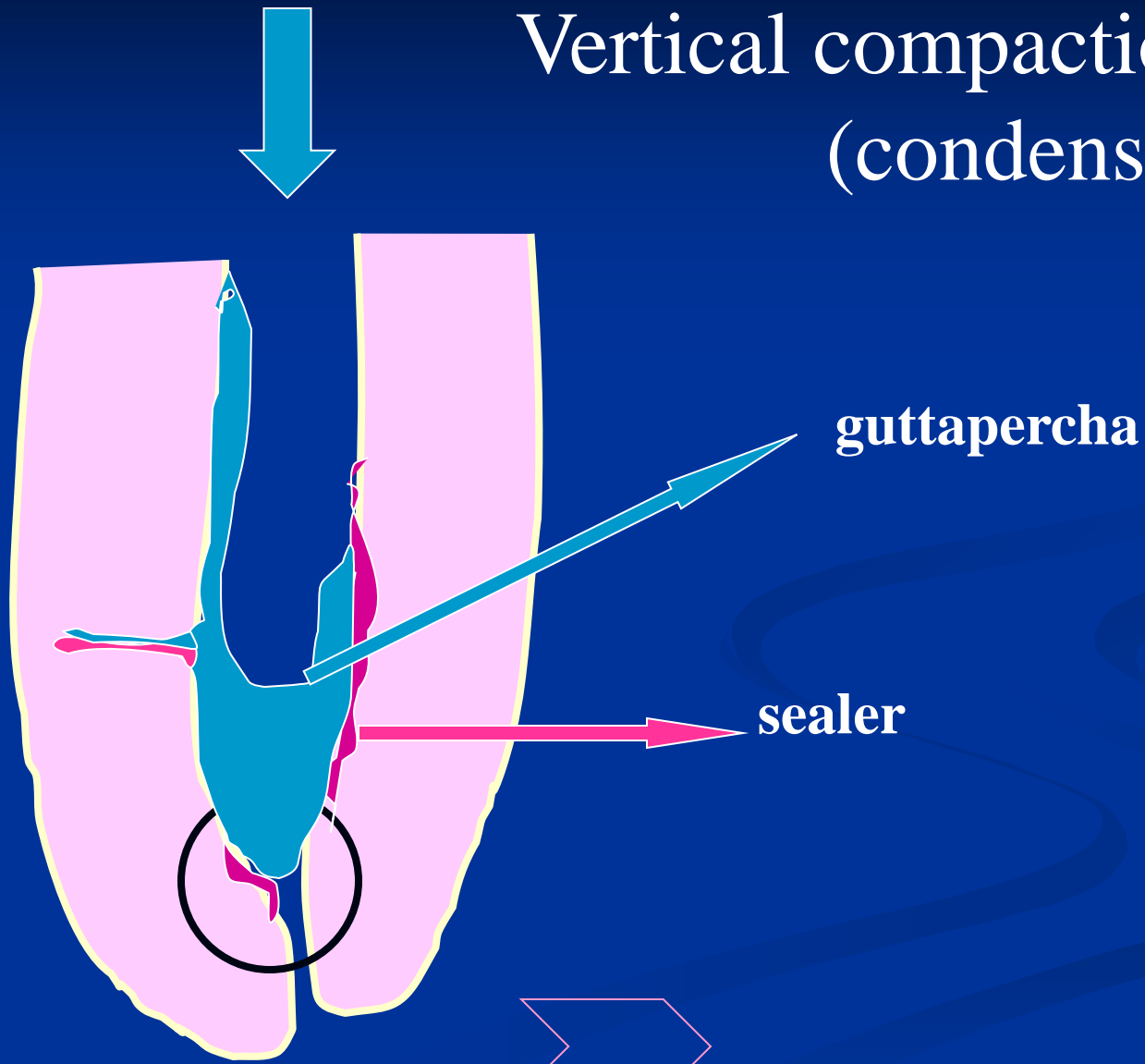
- Vertical condensation
- Injection
- Thermafil
- Thermomechanical condensation – Mc Spadden



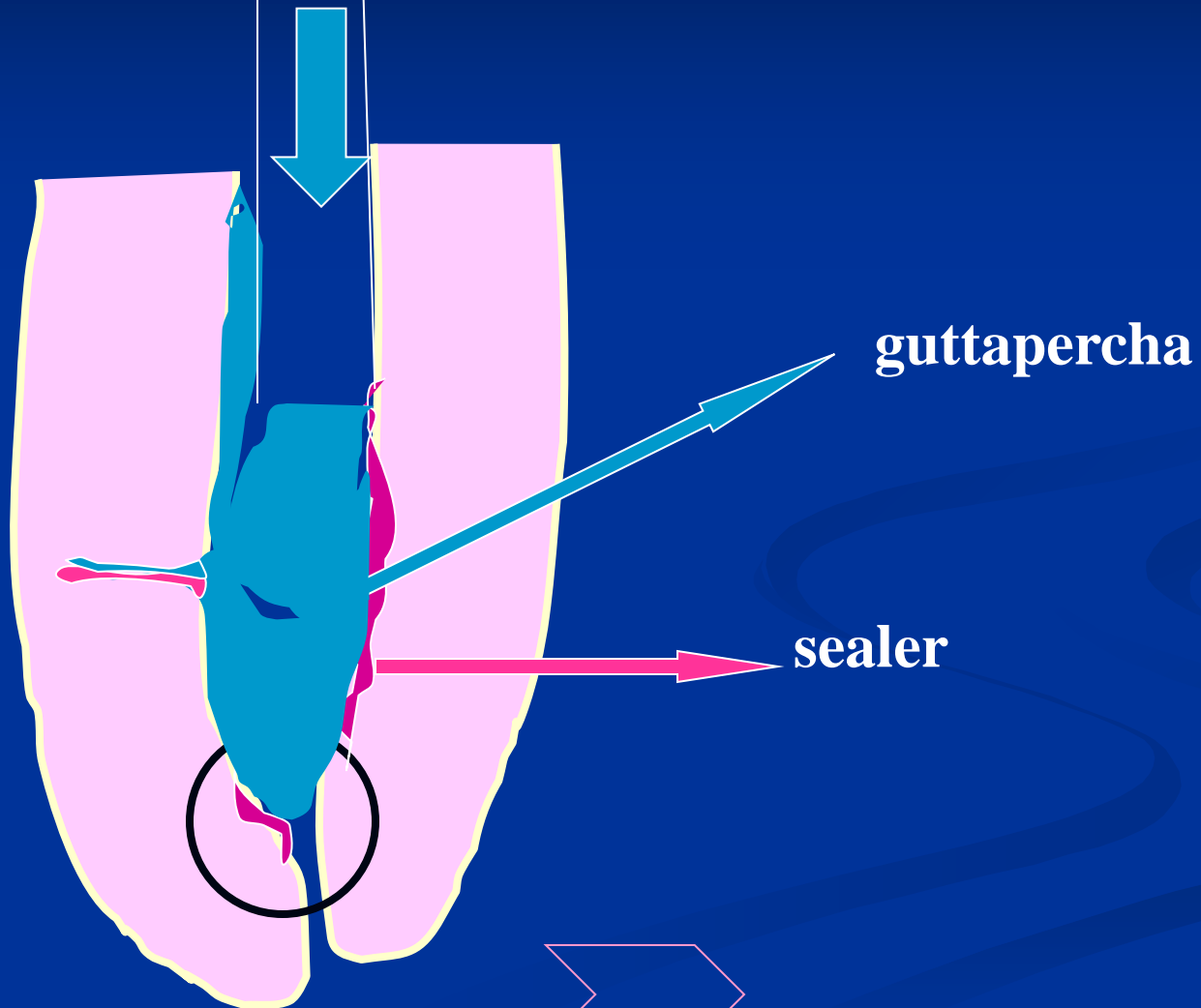
A



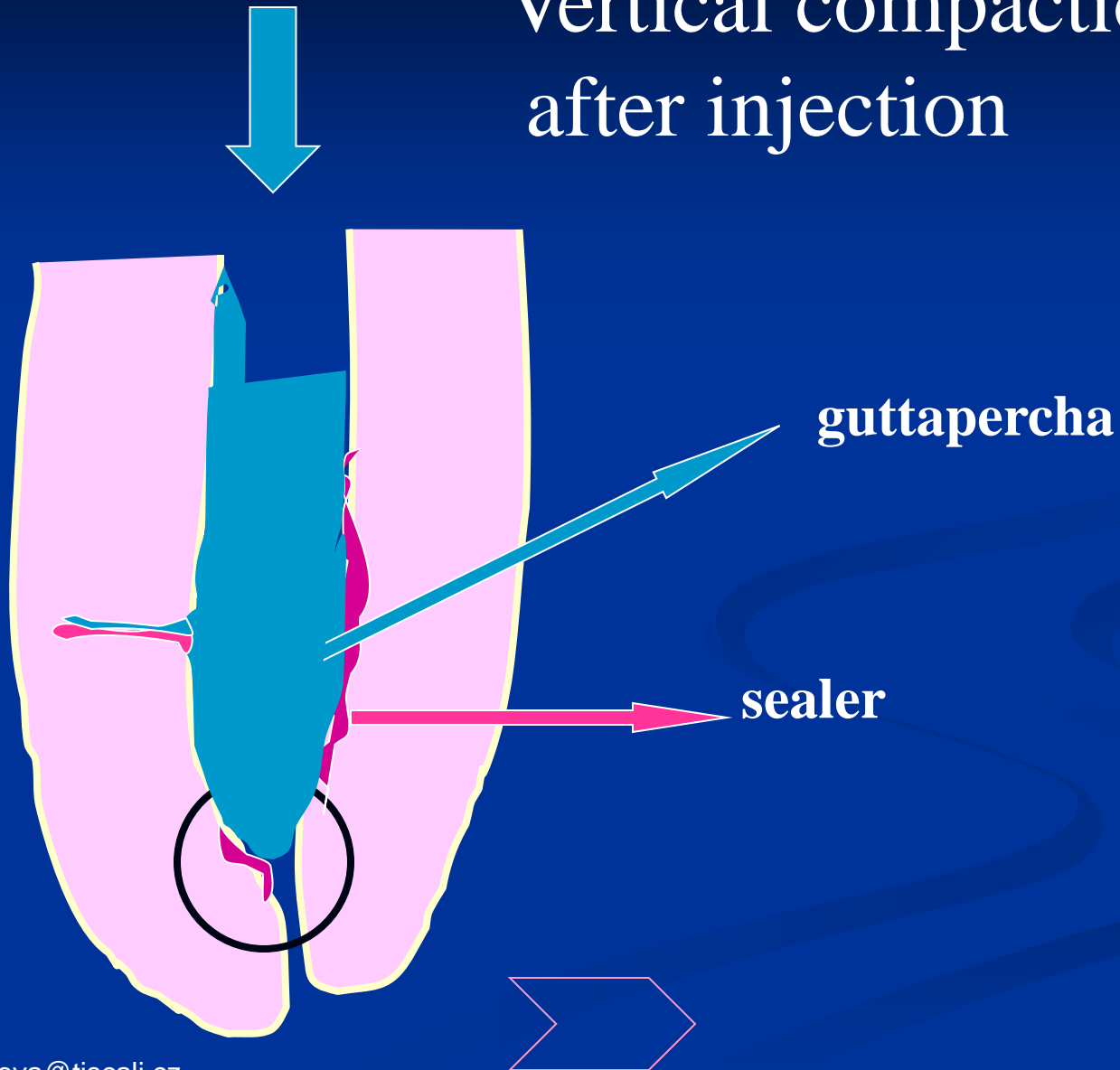
Vertical compaction (condensation)



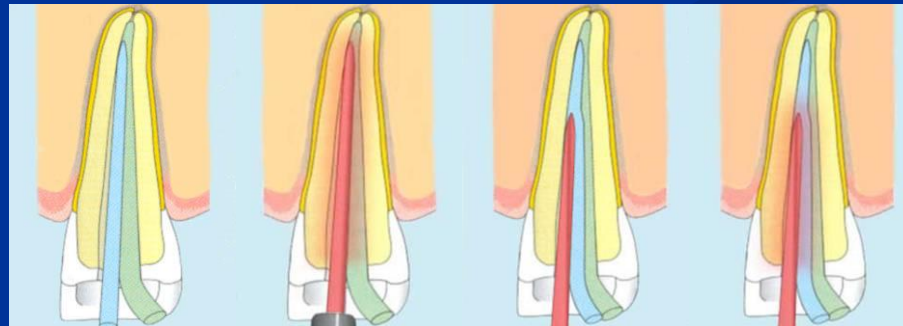
Injection



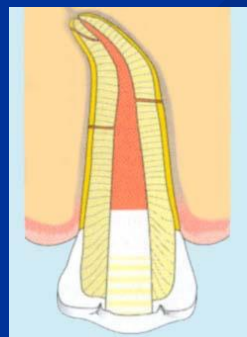
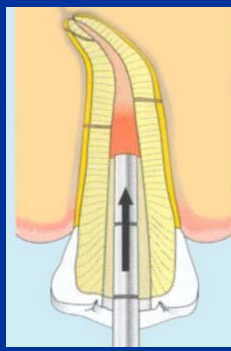
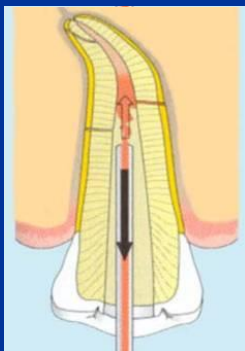
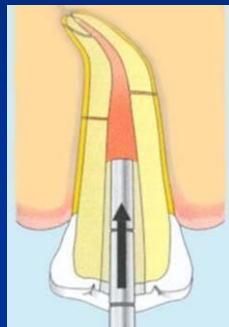
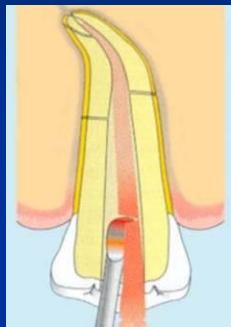
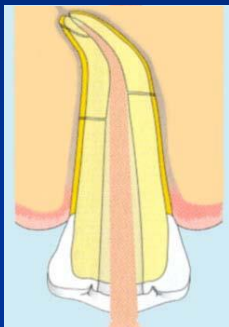
Vertical compaction after injection

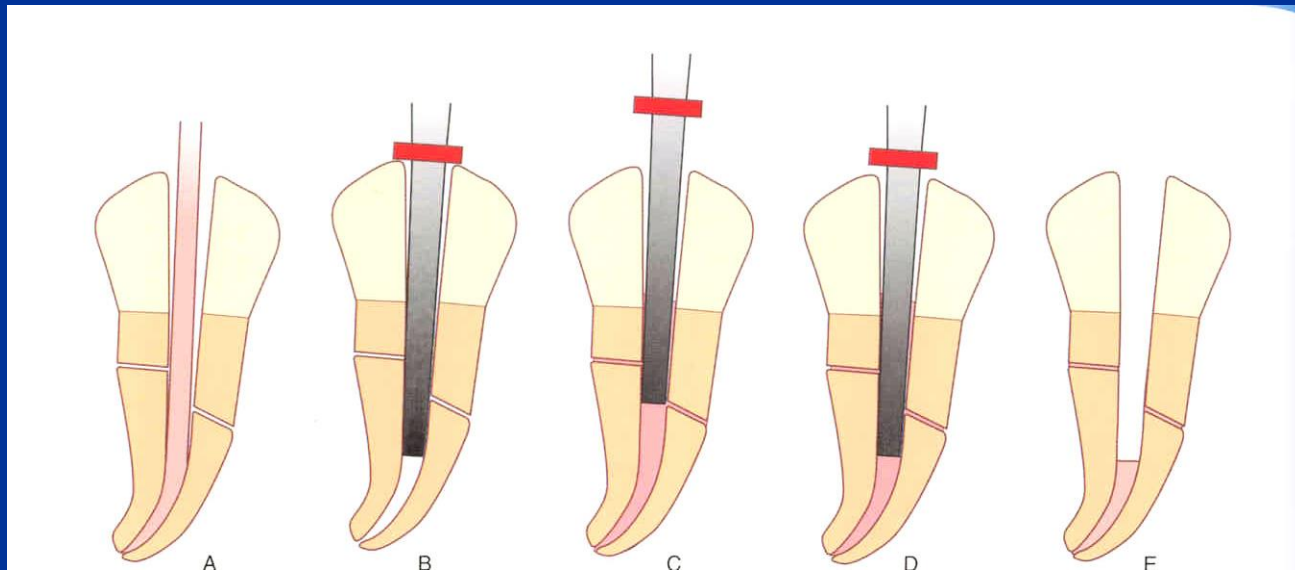


Warm lateral condensation

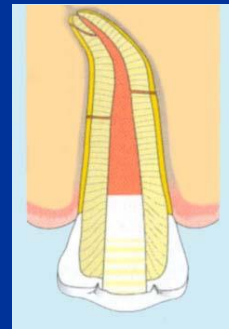
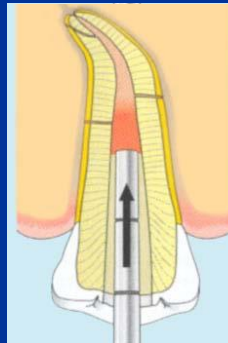
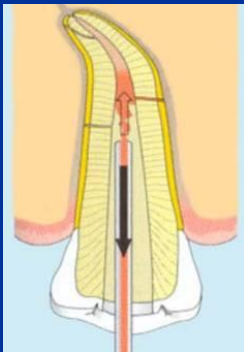


Vertical condensation



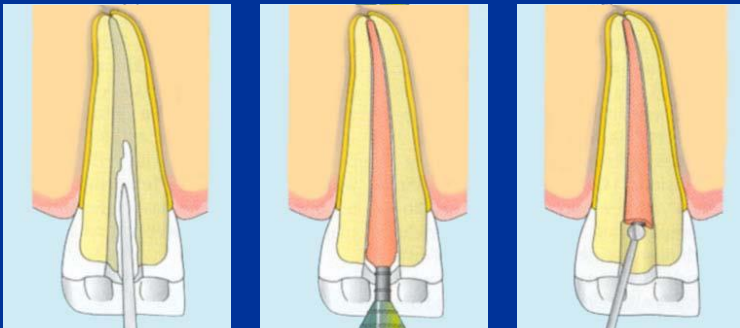


Injection of heated guttapercha



Thermafil

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



Compactor for vertical condensation - plugger



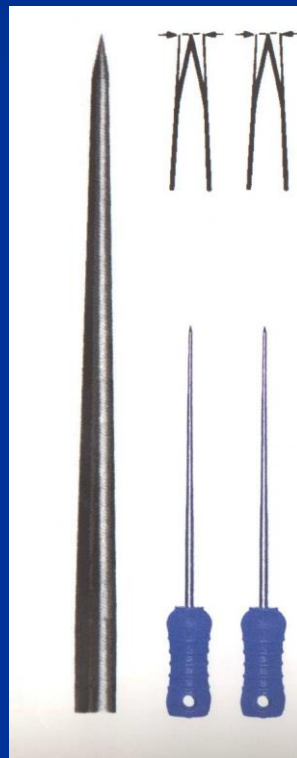
Power driven filling - lentulo



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

Compactors

-
Spreader



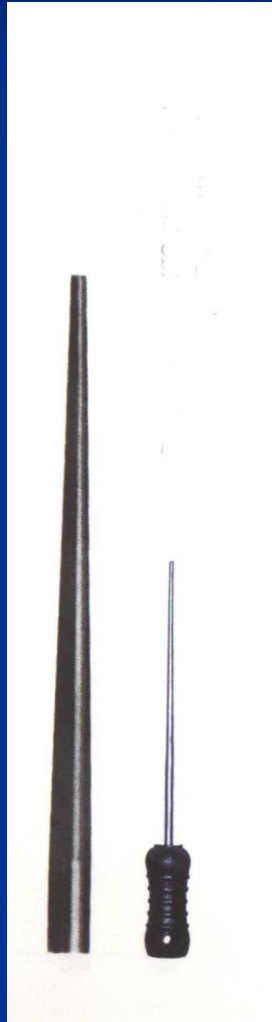
Pointed instrument

Lateral condensation



Compactors

Plugger



Straight front

Vertical action - condensation