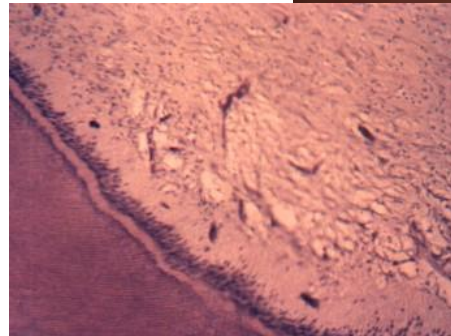
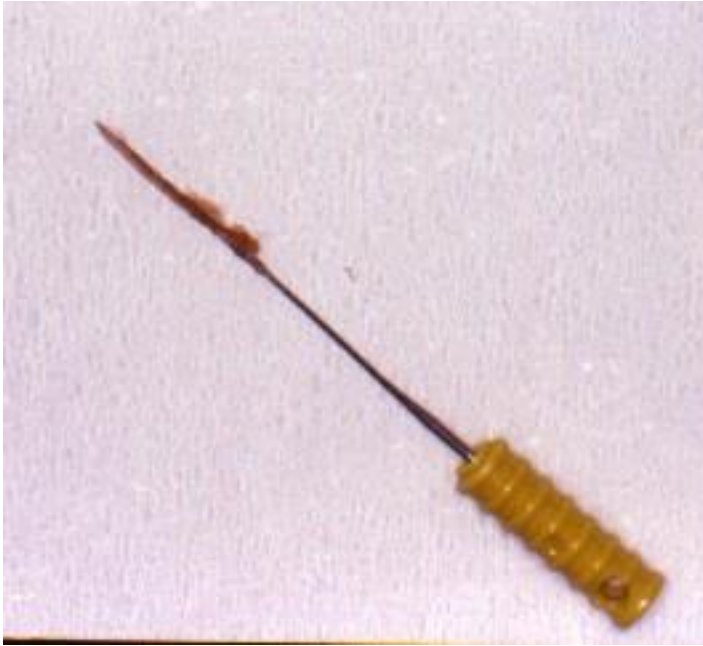


Pulpextractor



Soft wire
Prickles like harpune
Insertion
Rotation
Exstirpation

Canal shaping

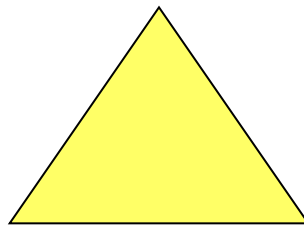
- Reamers (penetration)
- Files (shaping)

Reamer

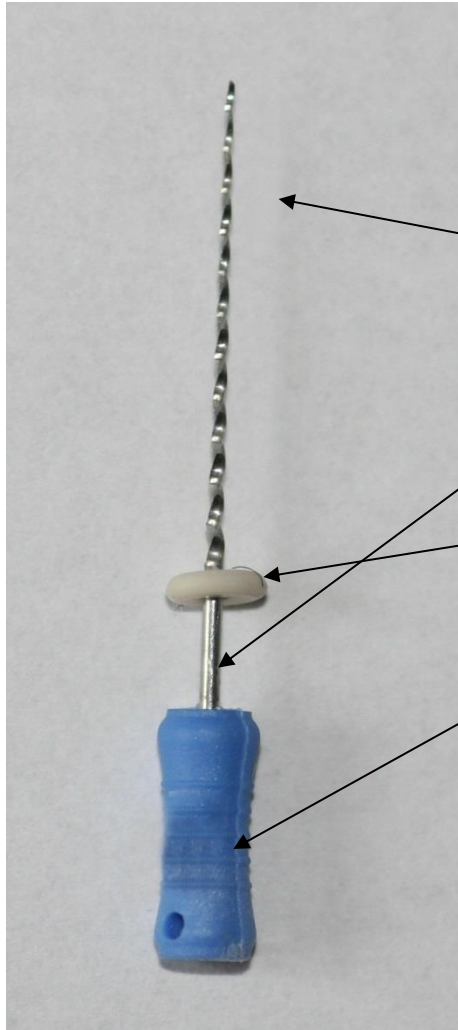
K -reamer

Triangl or square wire spun

Symbol



Reamer

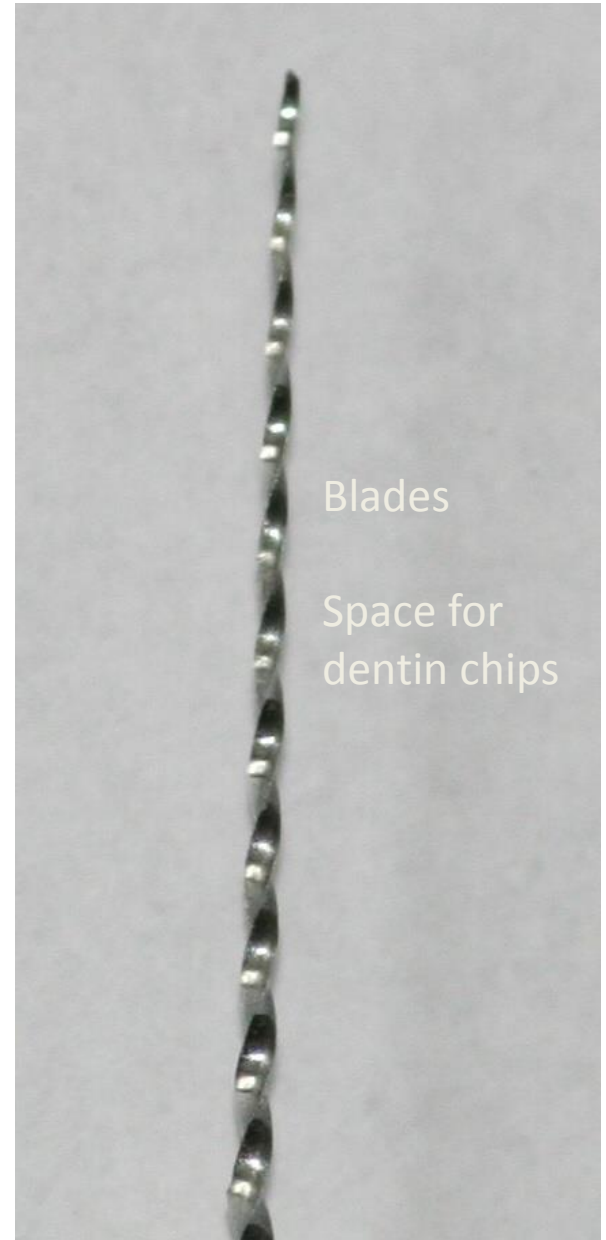


Bladed part

Shank

Stopper

Grip



Blades

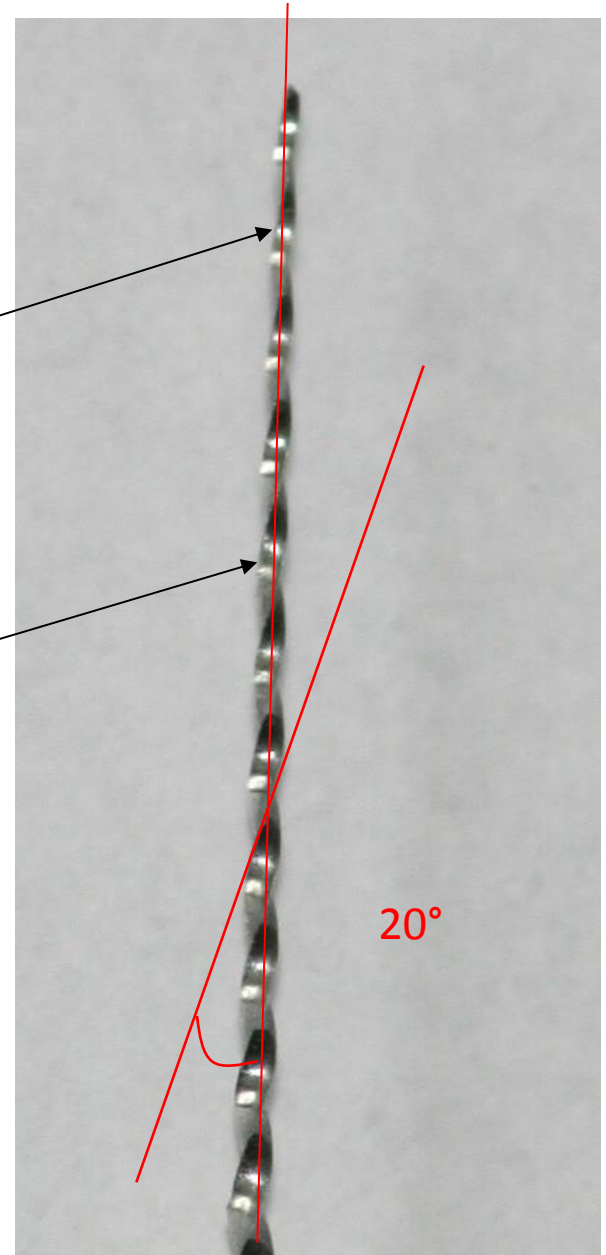
Space for dentin chips

Reamer

Blades

Space for dentin chips

Rotation – reaming action - penetration



Reamer

Rotation (clockwise) – penetration

**Application of plastic material
(counterclockwise)**

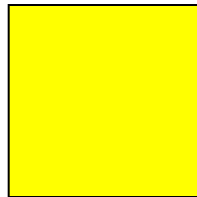
Files

- 1. K-file**
- 2. K-flexofile, flexicut, flex-R**
- 3. K-flex**
- 4. H-file, S-file**

K file

Wire trianagl or square

Symbol is always square

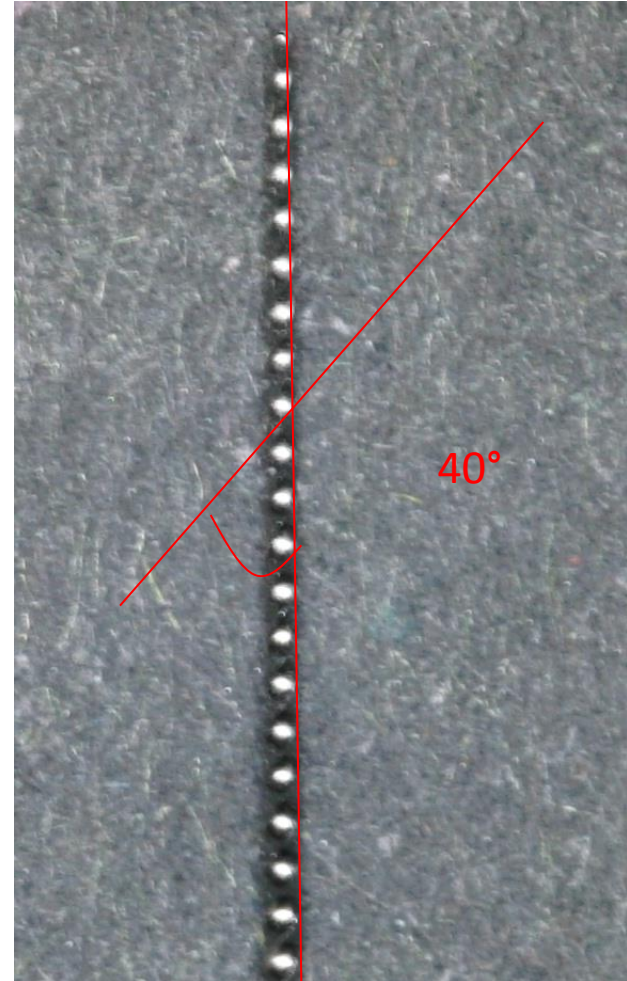


K-file

Filing

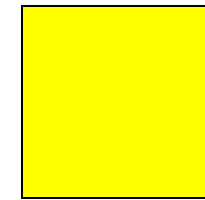
Also rotation

45° – 90°



K-flexofile, flexicut, flex-R

- Triangle wire always

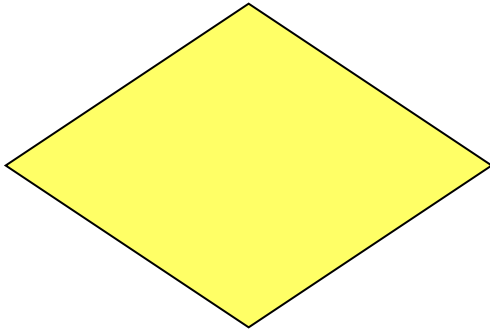


Flexibility

K- flexofile a flex – R file: non cutting tip and first blades are blunt

Like K-file

K- flex



Rhombus

Two blades in action

Enough space for dentin chips

Flexibility, efficacy

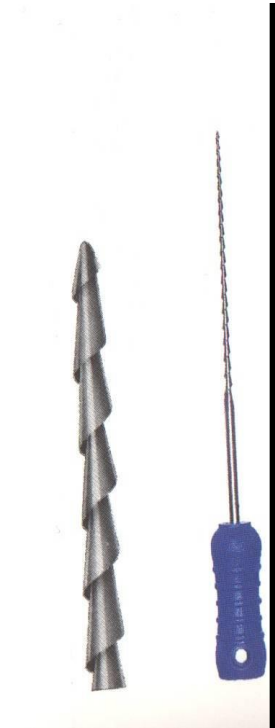
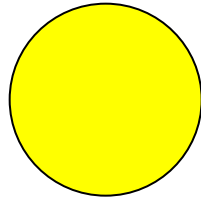
K-file a reamer: rozdíl



H-file

= Hedstroem file

Ring

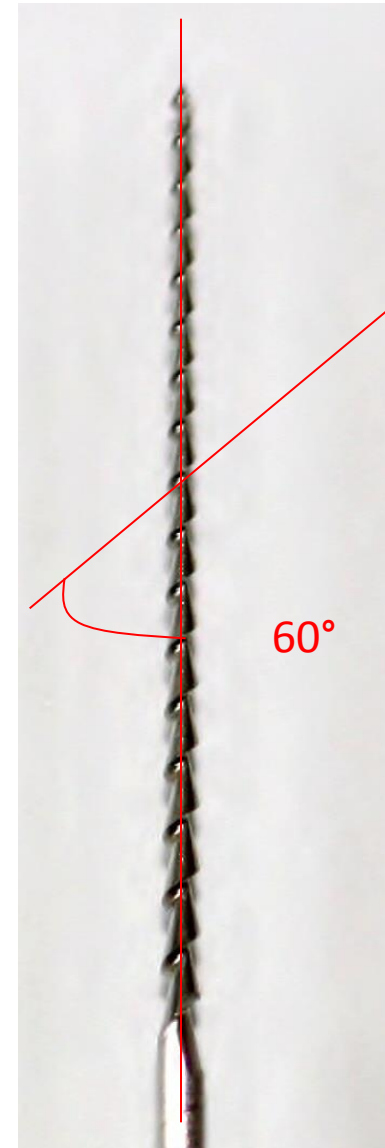
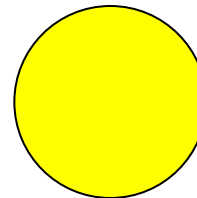


H- file

No rotation!!

Pull motion only!!

Risk of breakage in small sizes



ISO

- Diameter of the tip
- Length of the cutting part
- Taper

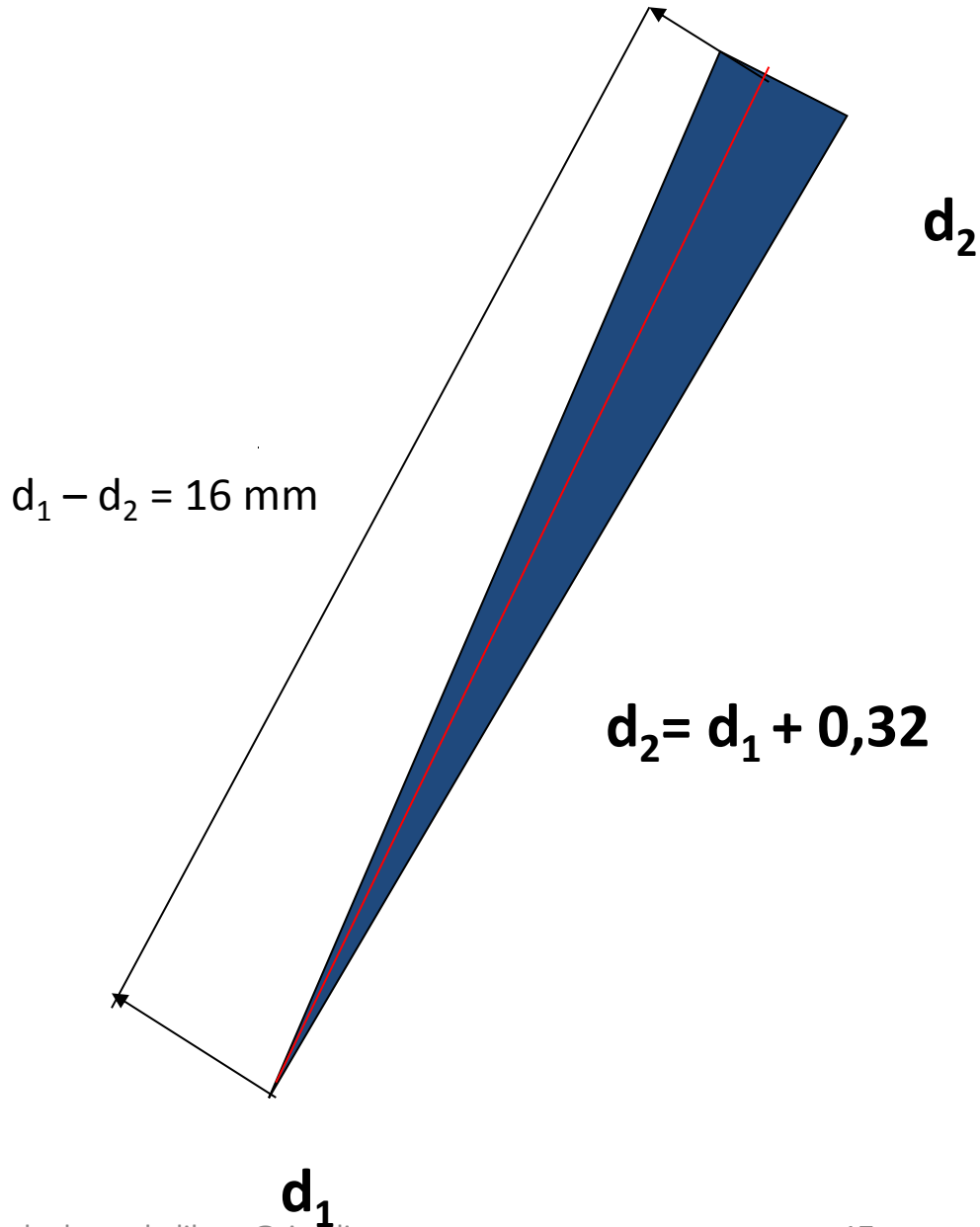


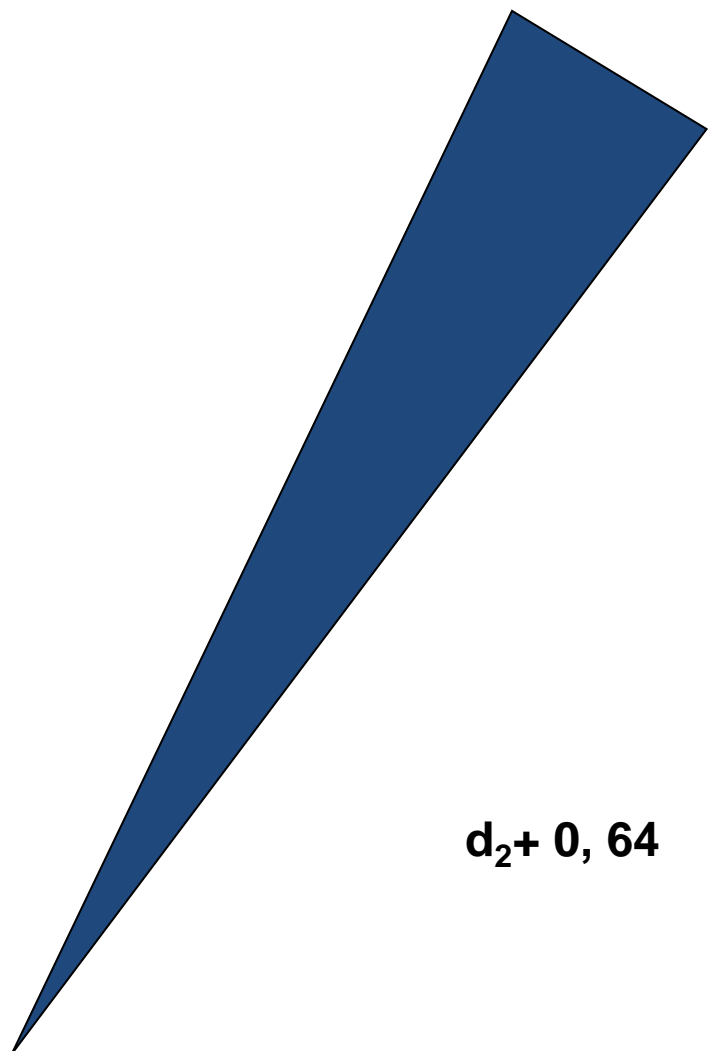
ISO standard

06	
08	
10	
15	45
20	50
25	55
30	60
35	70
40	80

Size – diameter at the tip

Taper 2%





d_2

Konus 4%

$d_2 + 0,64$

d_1

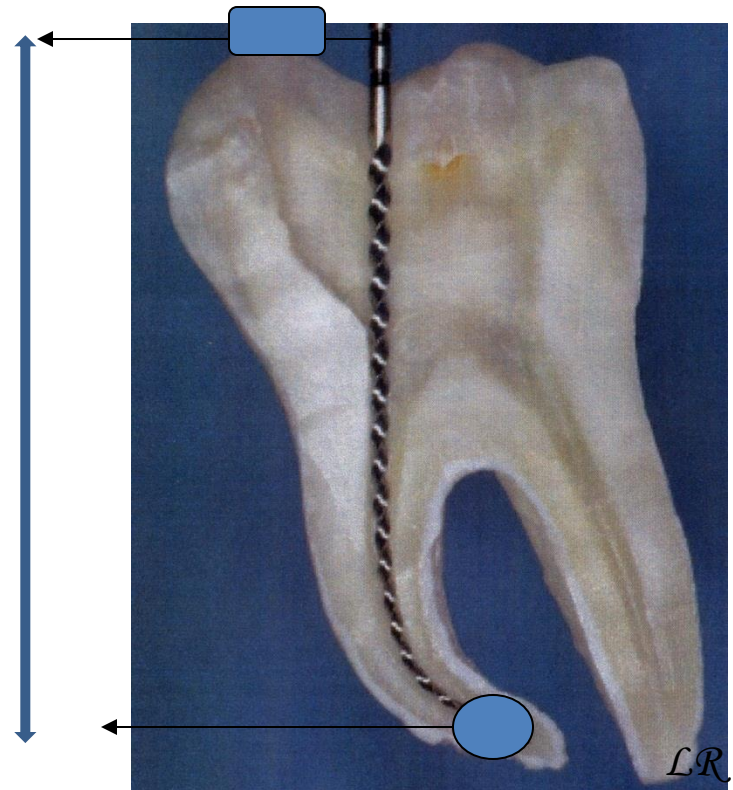
0,04mm na 1 mm

Initial flaring



Working length

- Distance between the referential point and apical constriction
- Radiographically
- Apexlocators
- Combination



Why apical constriction

- Small apical communication
- Minimal risk of damage of periodontium
- Prevention of overfilling
- Prevention of extrusion of infection
- Good decontamination
- Good condition for root canal filling

Radiogram

X-ray with inserted root canal instrument

Safe length: average length of teeth reduced for
2 – 3mm

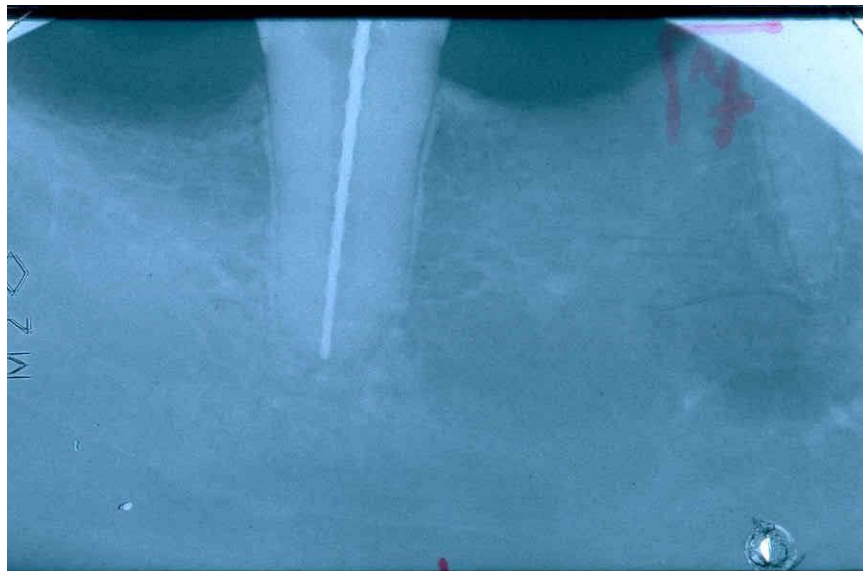
Tooth with clinical crown

Procedure

- Instrument ISO 15 introduced into the root canal, stop at the referential point
- Estimation of location of apical constriction (1 – 1,5 mm distance from x-ray apex.

If difference in the radiogram more than 23 mm
- repeat

If 2 mm or less – add to the safe length



Safe length

- Maxilla:

I1 20

I2 18

C22-24

P20

M 18 mkk, 20 P

Safe length

- Mandible

I 18

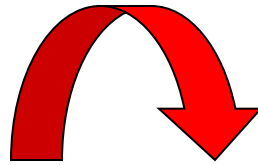
C20 -22

P18

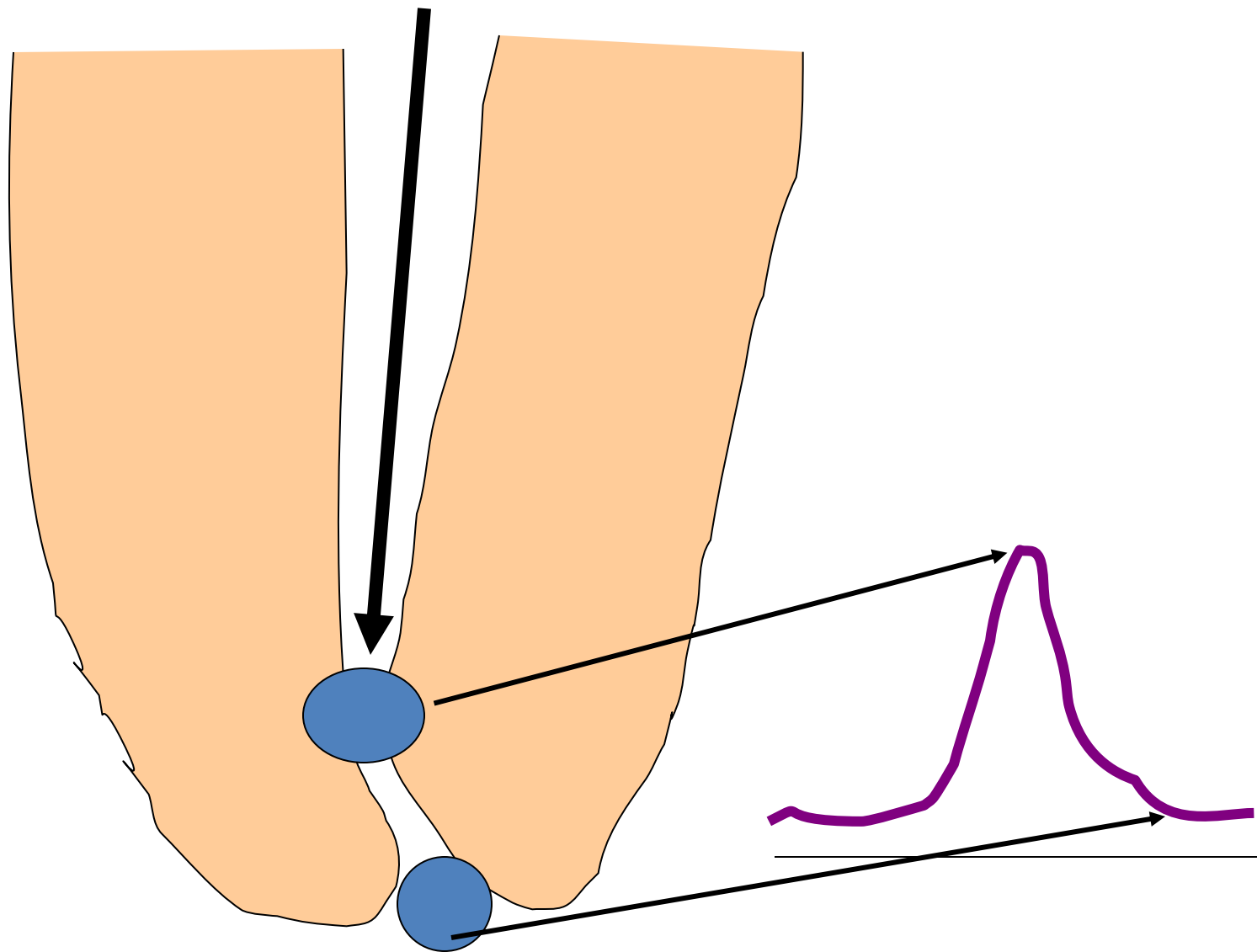
M18

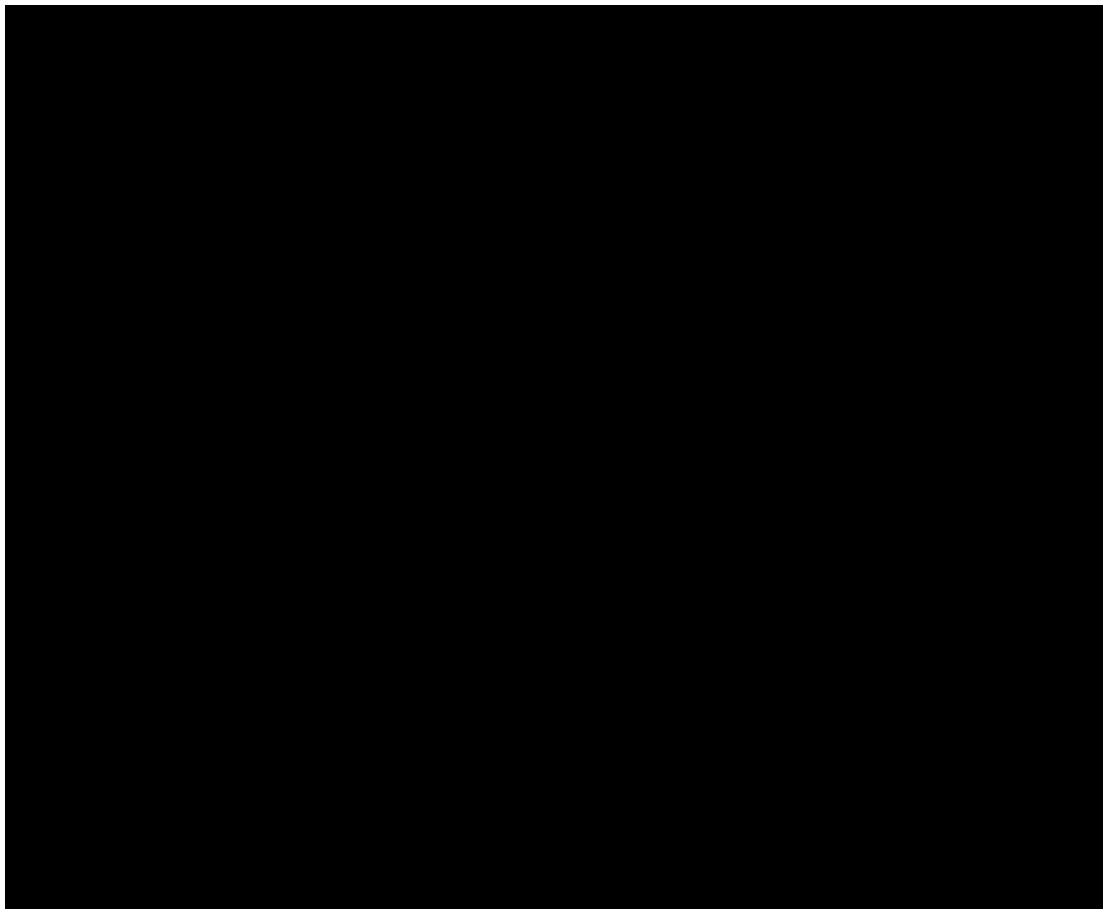
Endometry, odontometry

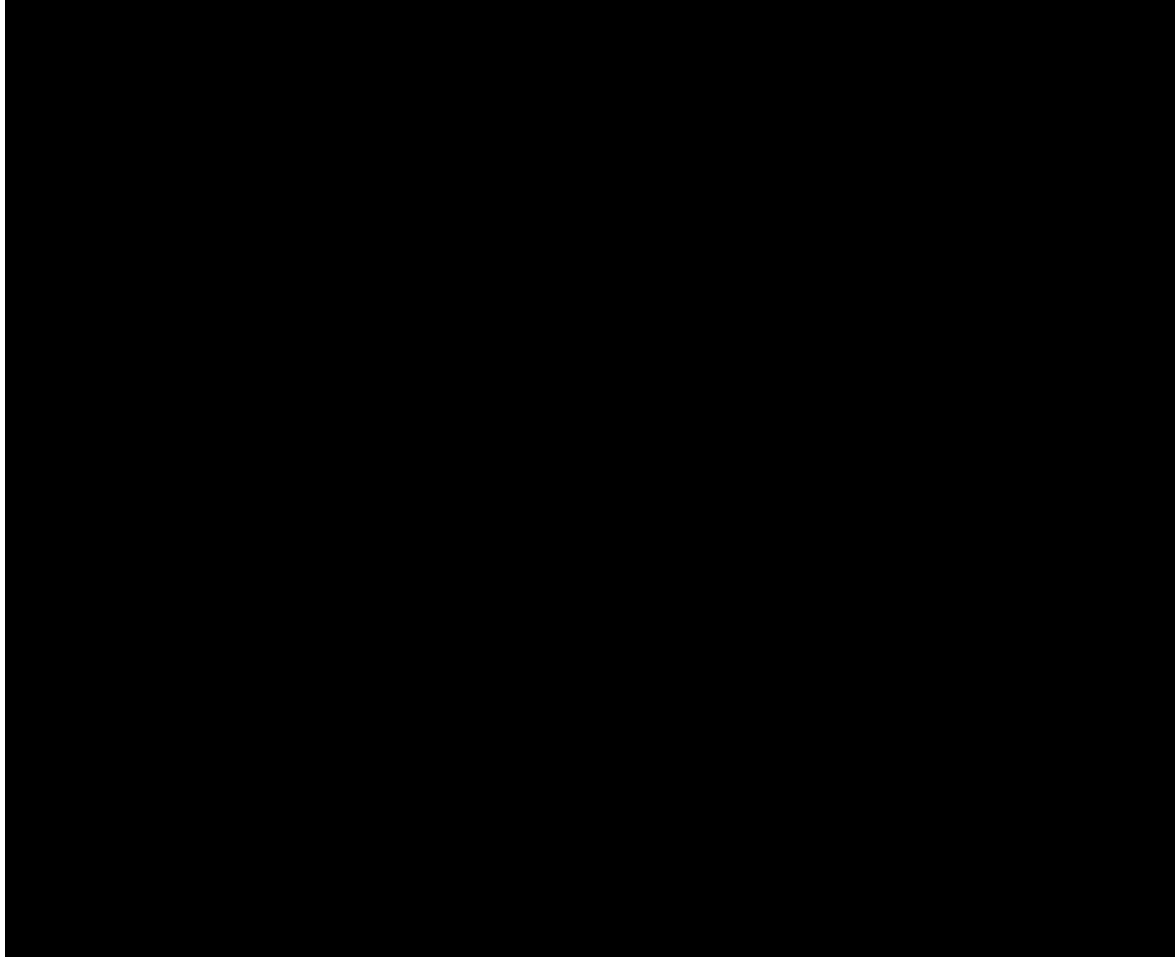
- Endometry

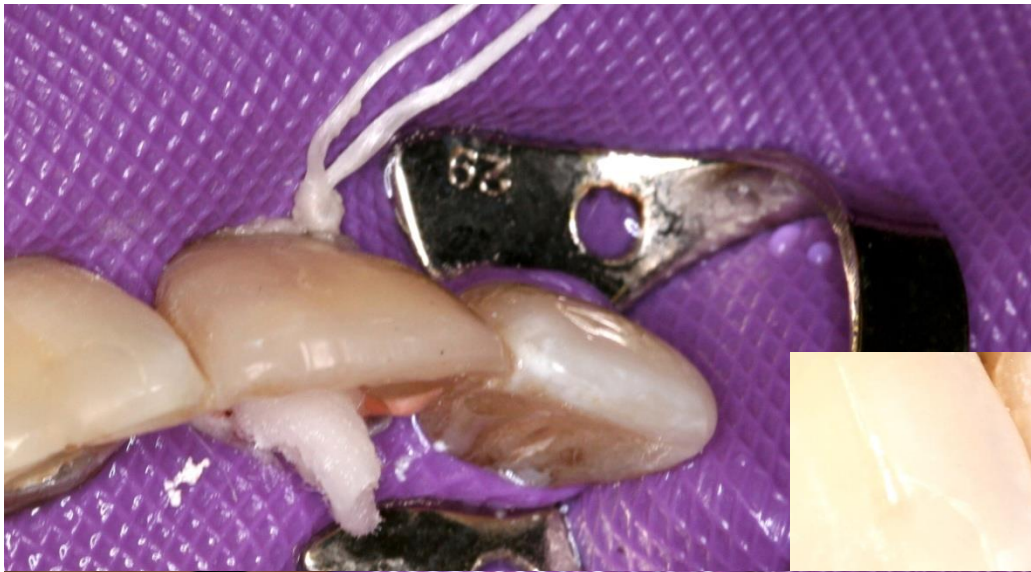


edevices based on measurement of electrical resistance





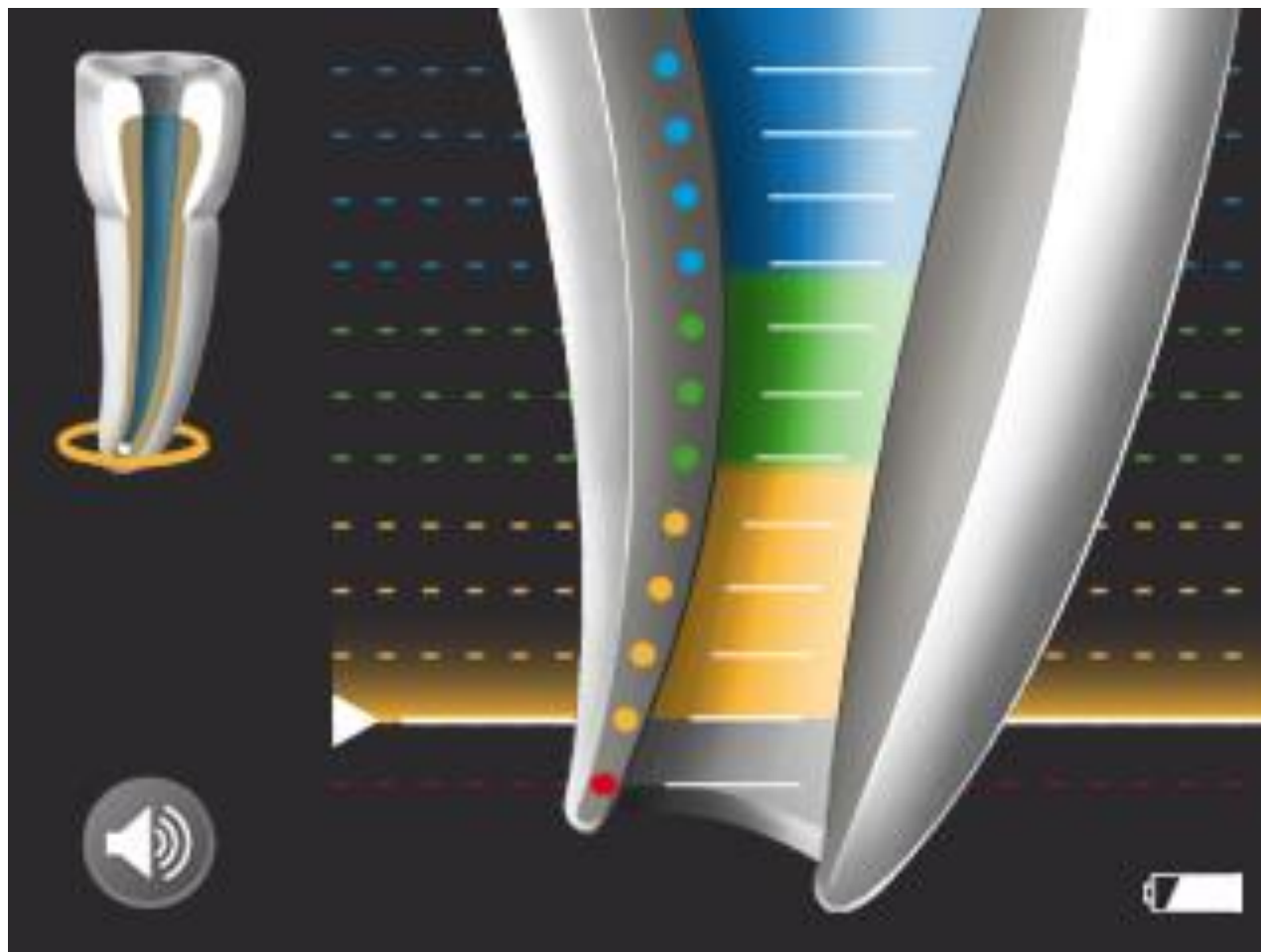




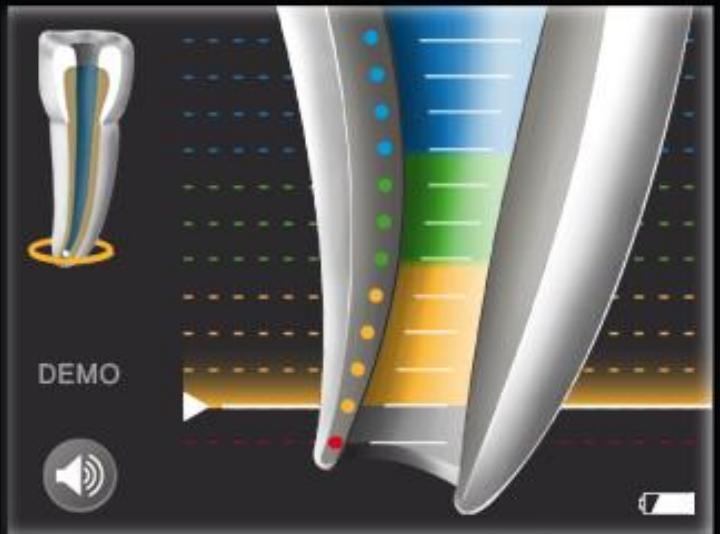
RAYPEX[®] 6



Měření – apikální zoom



VDW®



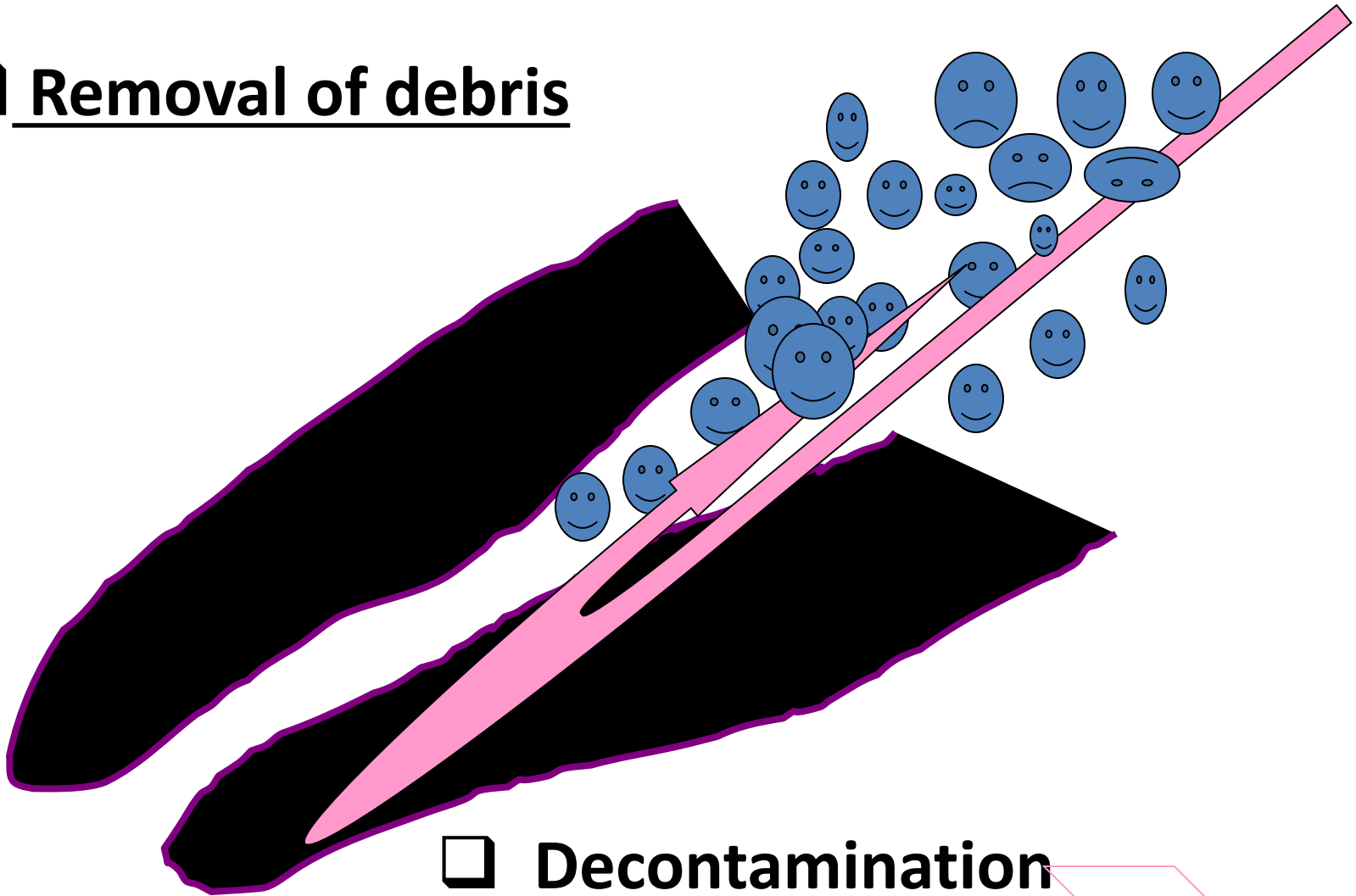
DEMO



RAYPEX® 6

Irrigation

Removal of debris



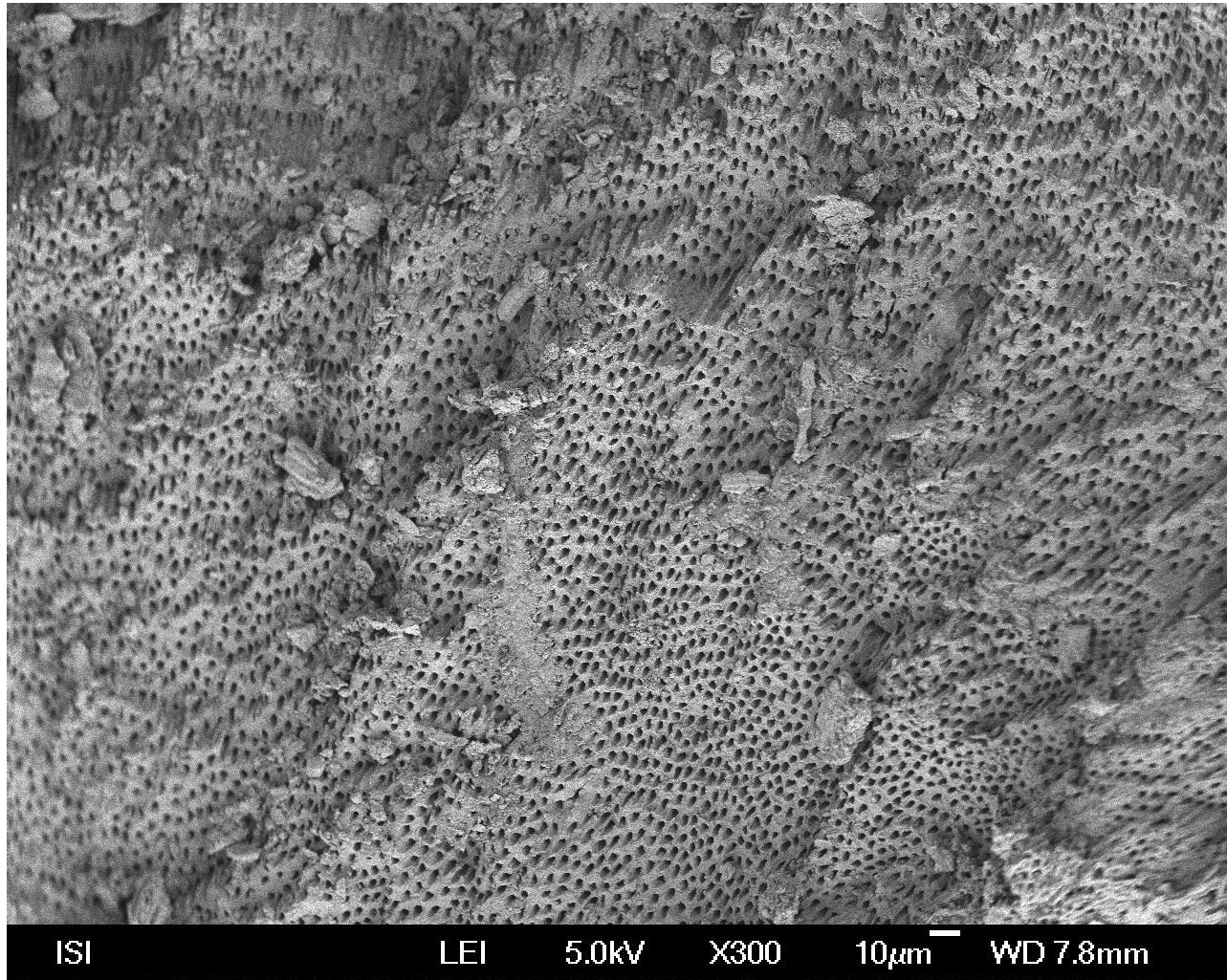
Decontamination

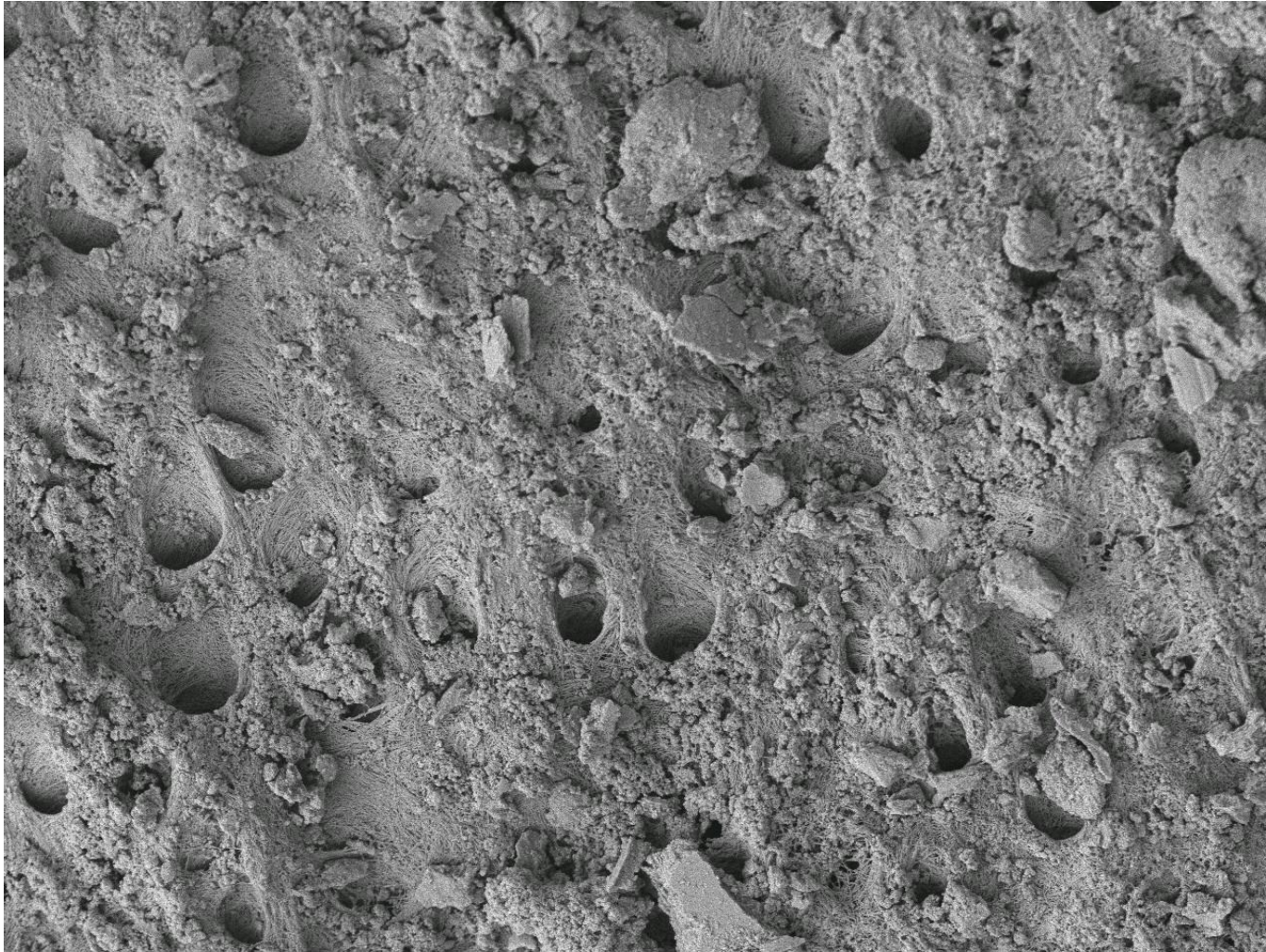


Irrigants

- **Sodium hypochlorite (1,5 – 5,5%)**
- **Chlorhexidin (0,12% - 0,2%)**
- **EDTA – etyléndiaminotetraacetic acid 17%**







ISI

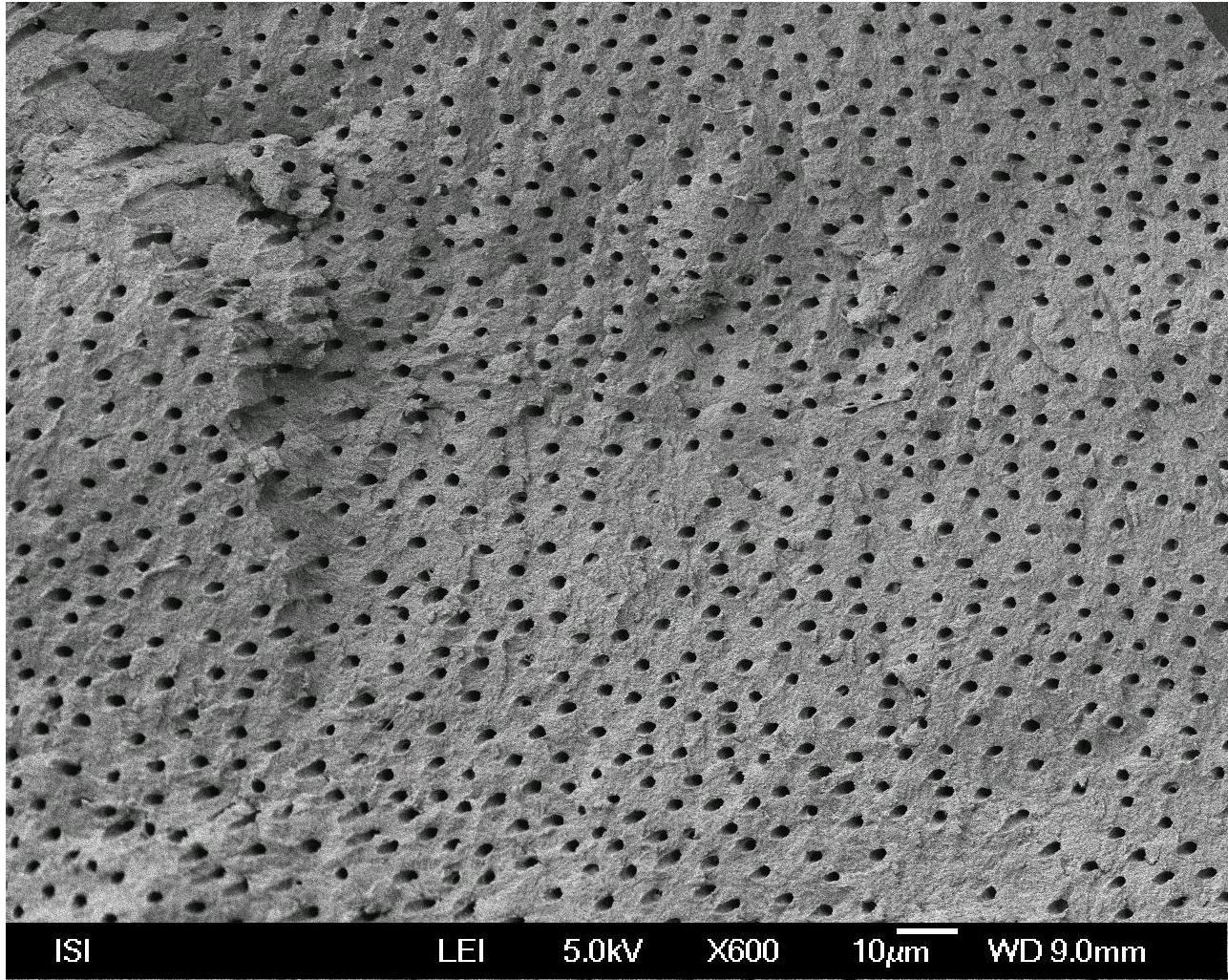
LEI

5.0kV

X2,000

10 μ m

WD 8.1mm



Irrigants

- Sodiumhypochlorite

2 – 6%

- Oxidation a chloration
- Dissolving efect
- Bad smell, irritant.

Syringe and cannula

- B
- N



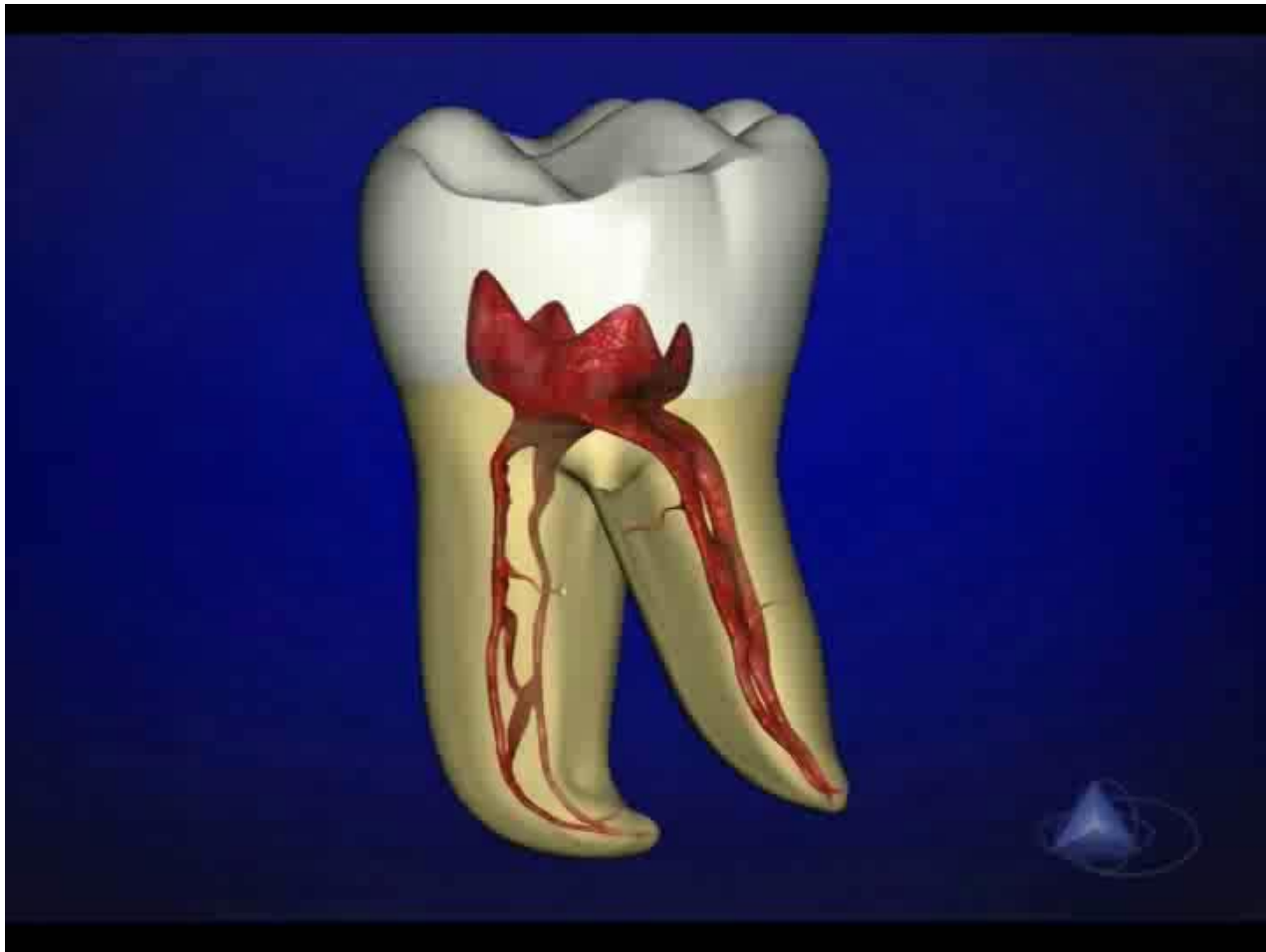
Activation of irrigation

- Increased effectivity

Vibration

Increasing of temperature

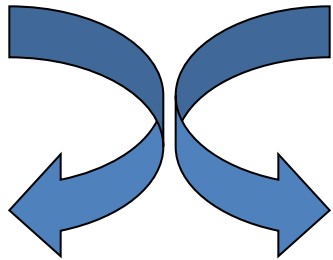
Decomposition of irrigants - dissociation





Shaping techniques

- Rotation – 45°

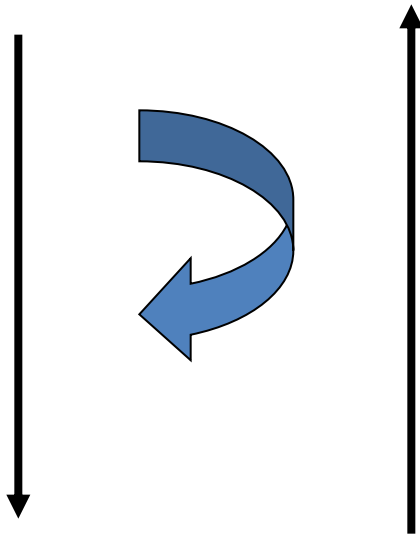


K – reamer

K- file

Shaping techniques

- Rotace 45° pressure and pull motion



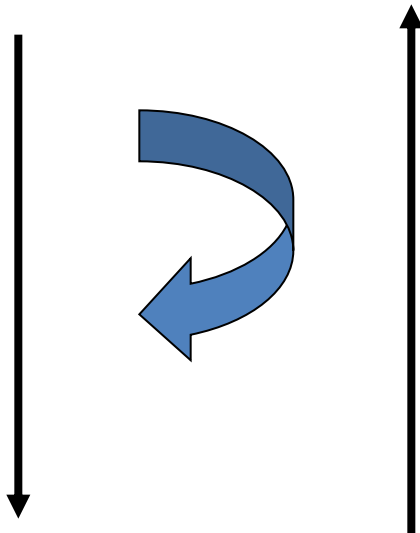
K – reamer

K- file

*Risk of ledging
Zip, elbow effect
Via falsa*

Shaping techniques

- Filing



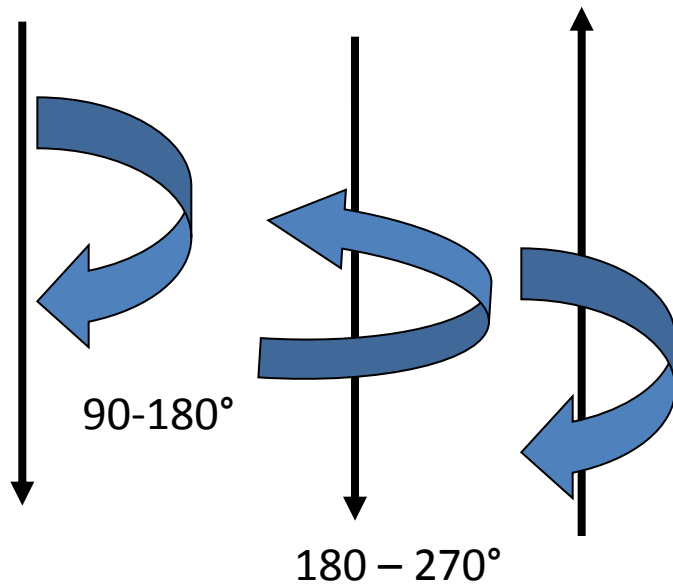
H- file

K – file

Risk of periapical infection
Risk of plug

Shaping techniques

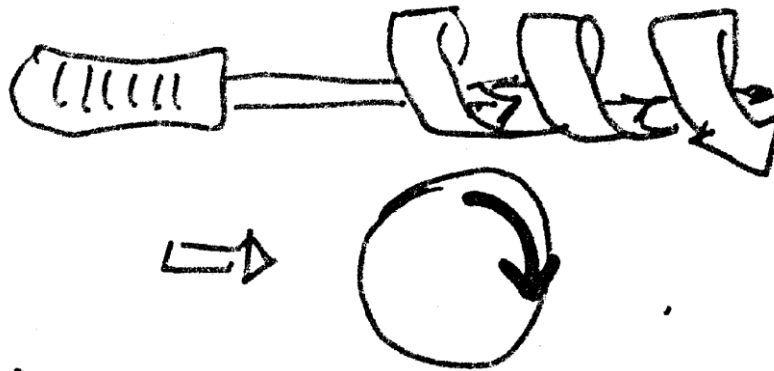
- Balanced force



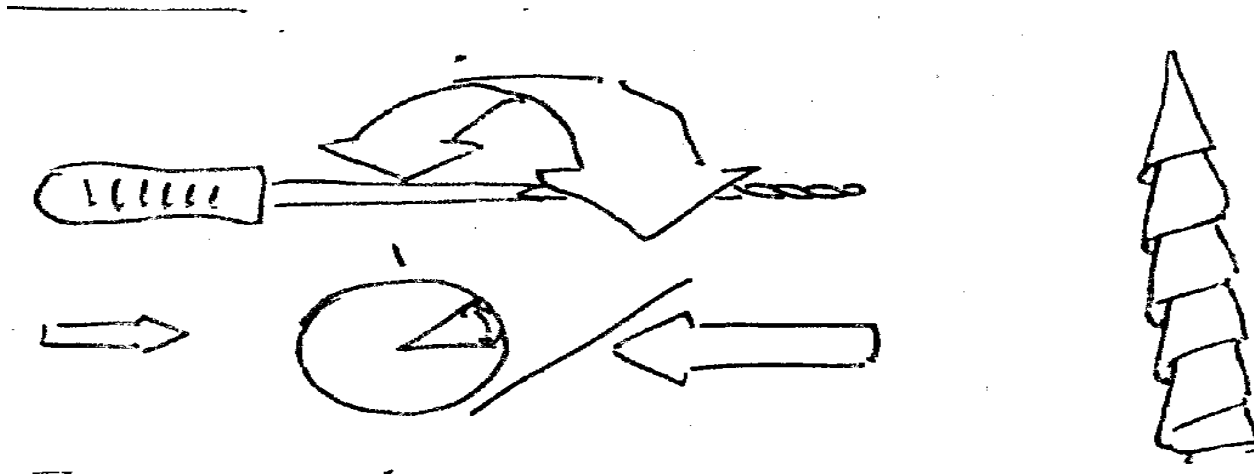
K- flexofile

K – file (?)

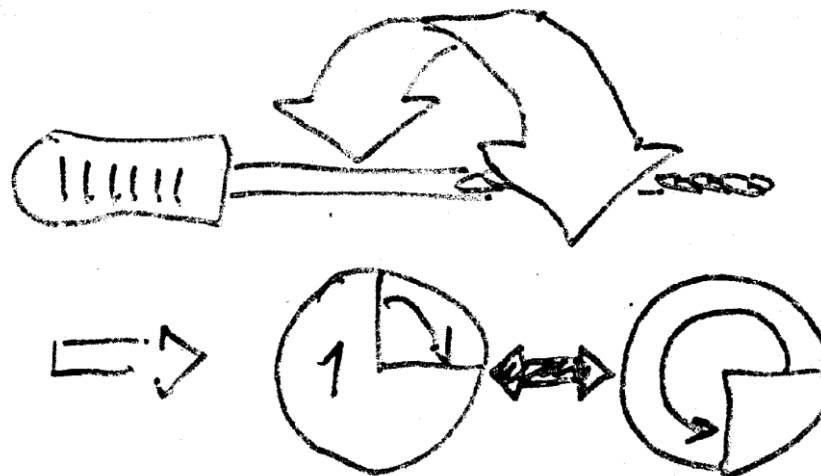
Reaming



Filing



Balance forced technique



Methods of shaping

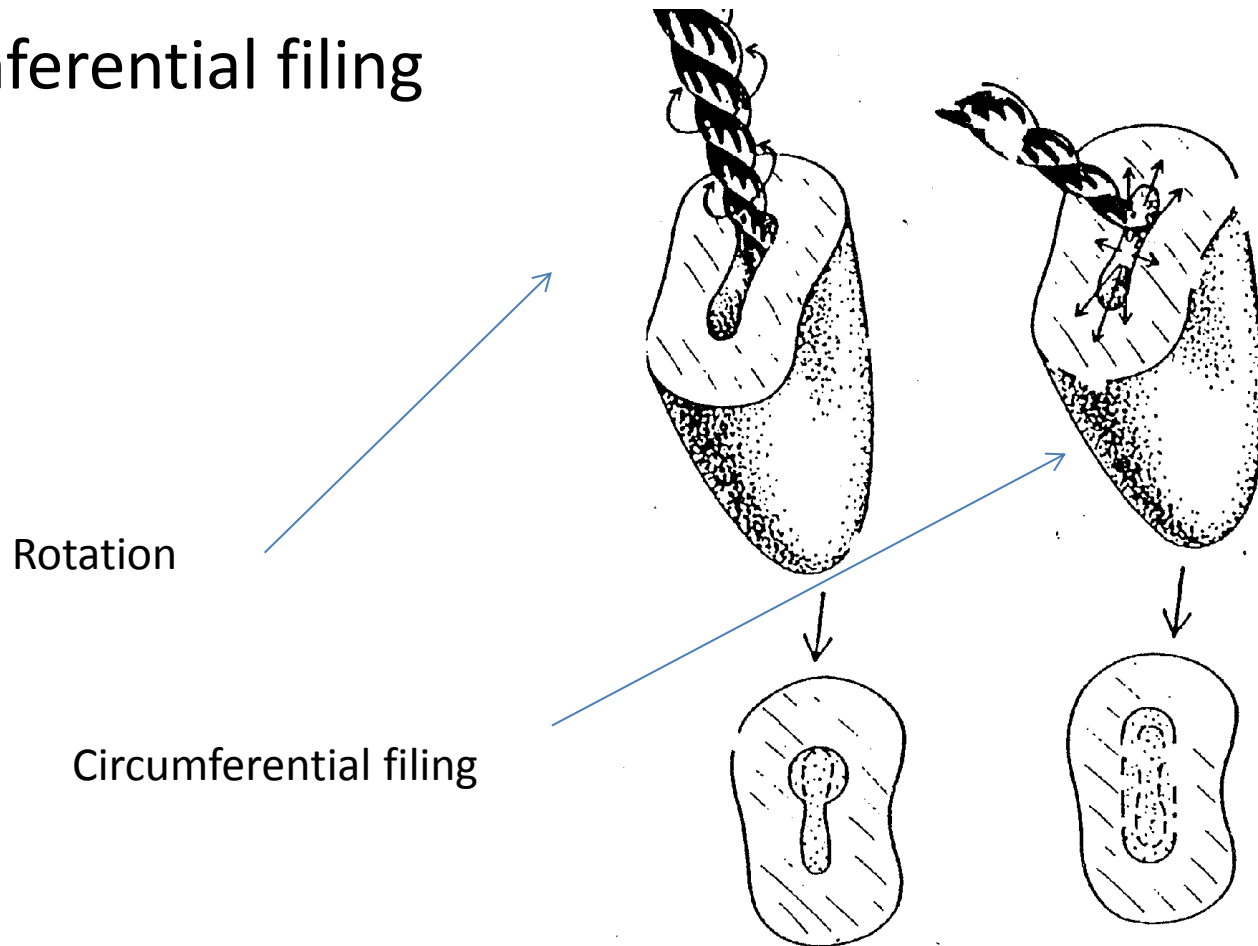
- Rotation and filing combined

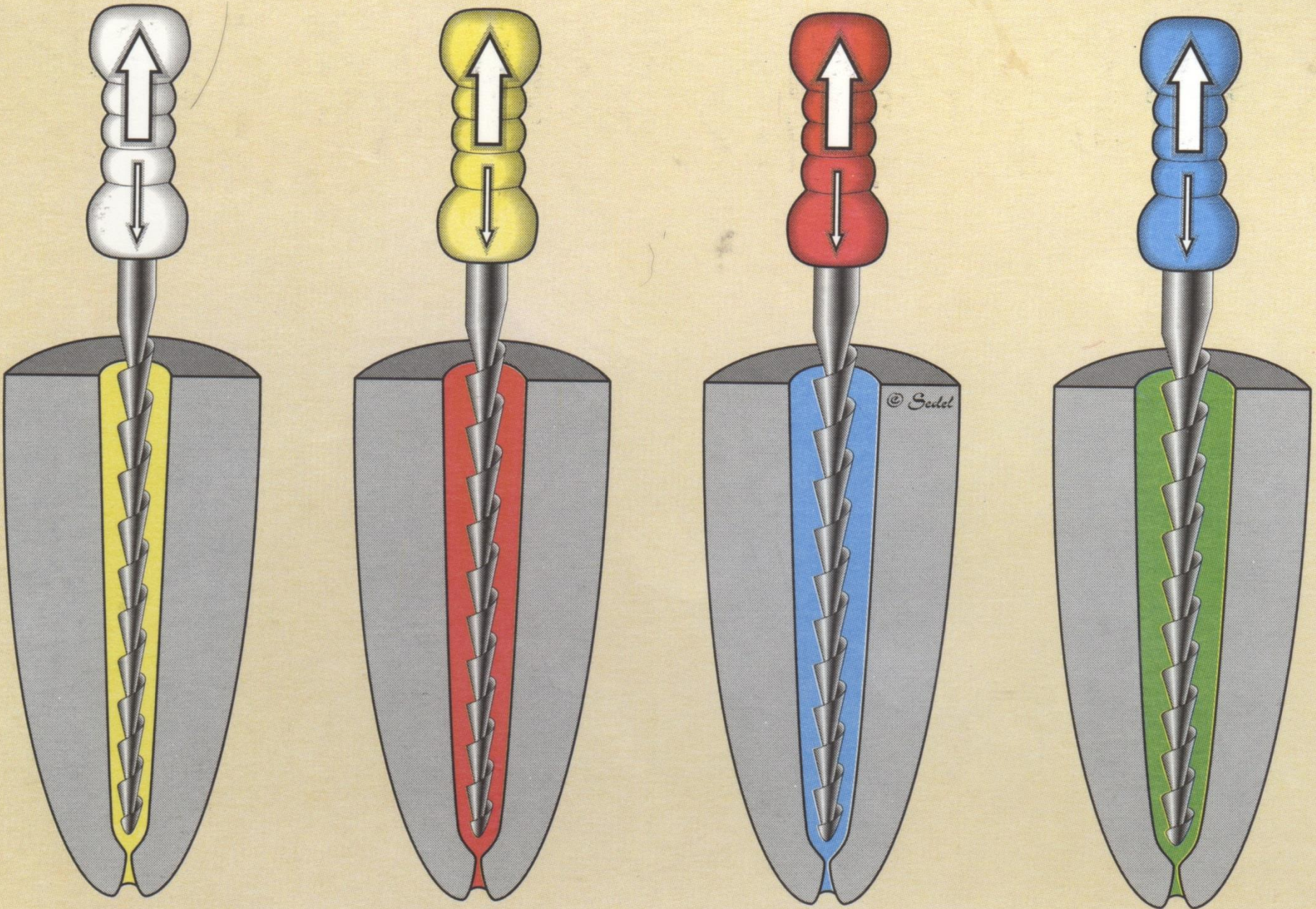
K - reamer

H- file

Methods of shaping

- Circumferential filing





Methods of shaping

- Combination of rotation and filing

Start with rotation

Finishing with filing

Suitable for straight root canals

Methods of shaping

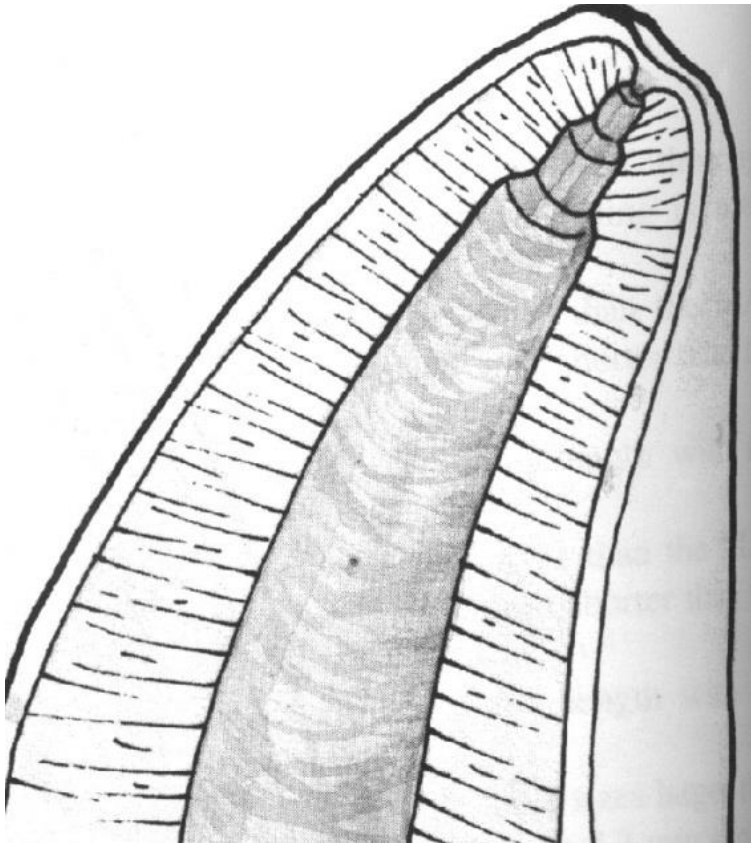
- Step back method

Increasing size with decreasing length.

Insertion of root canal instrument – WL

Next – 1 mm shorter

...



Taper
Final flaring with
the smallest instrument

H- File nebo K - Flexofile.

Method modified double flared

- I. Opening of root canal

- Coronal third

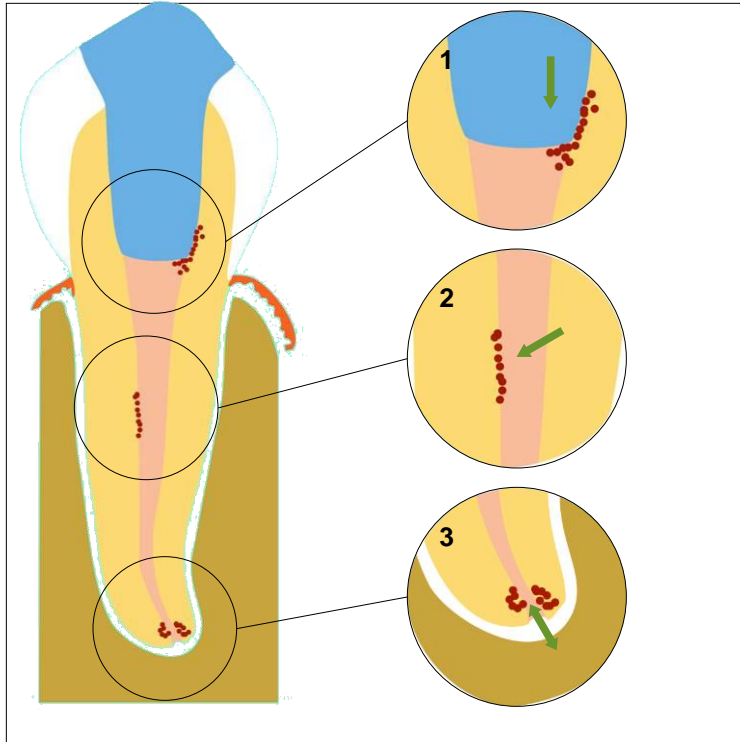
- II. Apical preparation

Cathetrization, measurement, shaping till ISO 30 – 35
balanced force. Master file – MAF (till WL)

- III. Step back

- Final flaring (MAF)

Root canal filling



**Good coronal,
Middle
Apical seal.**

Quality guidelines for endodontic treatment,
European Society of Endodontology (ESE), 1994

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 materials

(their consistency is paste, cements)

Good adhesion to root canal walls as well as solid cones

X- ray contrast

Biocompatibility

Sealers

Importance

Filling of the spaces between the solid cones



Seal of the root canal filling

Sealers

Zinc Oxide-Eugenol

Chloropercha

Calciumhydroxide

Resins

Glasionomer

Silicone

Zinc - Oxid Eugenol

Powder:

Zinc oxide

Liquid:

Eugenol

Acidic resins

Good adhesivity, antimicrobial effect, cytotoxicity?

Resorbable, no compatible with adhesive materials)

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

Calcium hydroxide sealers

Catalyst (paste)

Zinc stearat

Titanium dioxide

Baryum sulphate

or

Eugenol,. Eukalypt

Other components...

Kalciumhydroxide sealers

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

But!

Resorbable if not homogeneous

Not suitable for the single cone technique

Resins

- Rezorcin formaldehyd (toxic, obsolete)
- Epoxide
- Polyketone
- Metacrylate

Epoxide resin

➤ Base (powder, paste)

Bismuth oxid

Titanium dioxide

Hexametylentetramine

(Silver)

➤ Catalyst (liquide, paste)

Bisphenoldiglycidylether

Root canal filling

Epoxid resin (*advantages*)

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

Epoxid resins (*disadvantages*)

- Difficult removal
- Staining
- Initiatory toxicity

AH 26, AH Plus, 2 Seal



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

Calcium hydroxide

- Alkaline
- Antibacterial
- Stimulation of hard tissue formation
- Haemostatic and antiphlogistic

Calcium hydroxide

- Alkaline
- Antibacterial
- Stimulation of hard tissue formation
- Haemostatic and antiphlogistic

Calcium hydroxide

Temporary root canal filling

Subbase

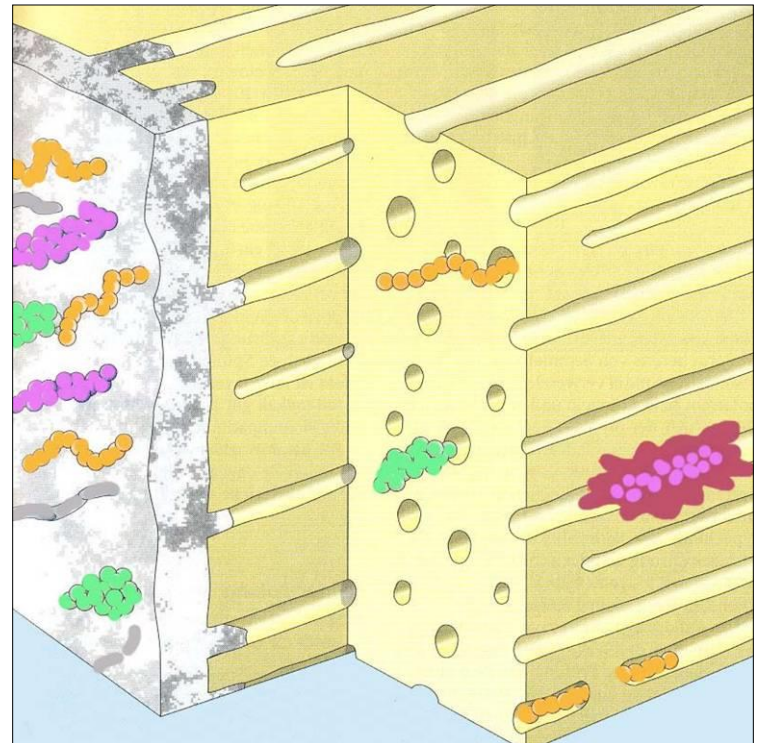
Component of sealers

Mode of action

- Release of hydroxyl ions
- Long term alkalization
- Stimulation of hard tissues formation



Dressing



Calcium hydroxide

- Short term action

1 – 2 weeks

Desinfection, haemostasis

Calcium hydroxide

- Middle term action

2 – 3 months

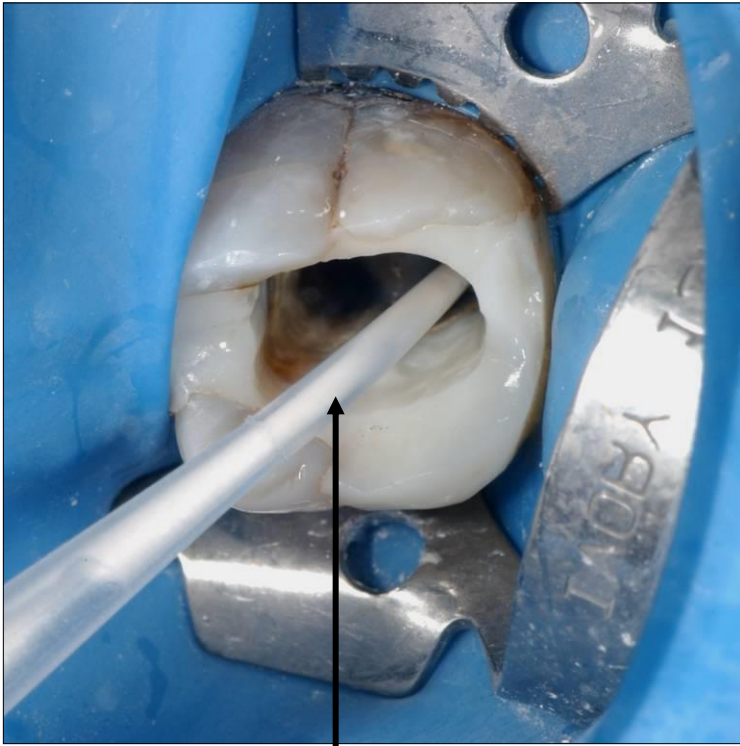
Apexification

Chronic form of apical periodontitis

Calcium hydroxide

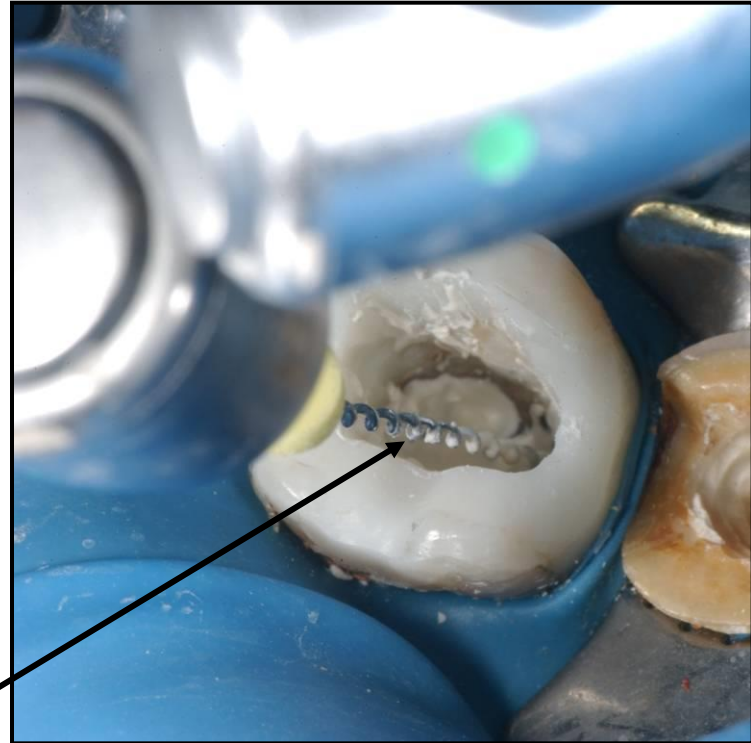
- Long term action
3 months and more

Prevention of resorption



Magistraliter

The powder is mixed with distilled water



Lentule 2 mm less than WL !!!!



Apexit® Plus

ApexCal®

Instruments

- Paste carriers - lentulo
- Compactors
- Compactors - carriers
- Others

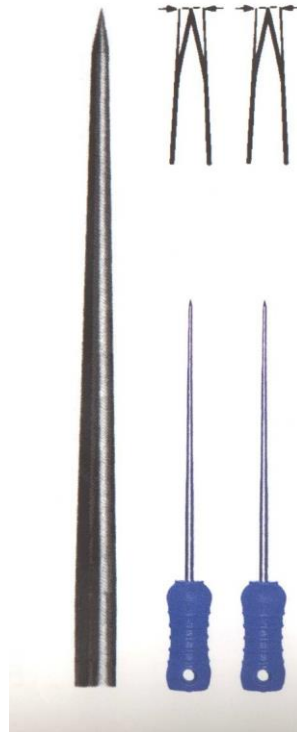
Lentulo



- delivers pastes
- 1,5 – 2 mm ahead
- for sealers

Compactors

Spreader



Pointed

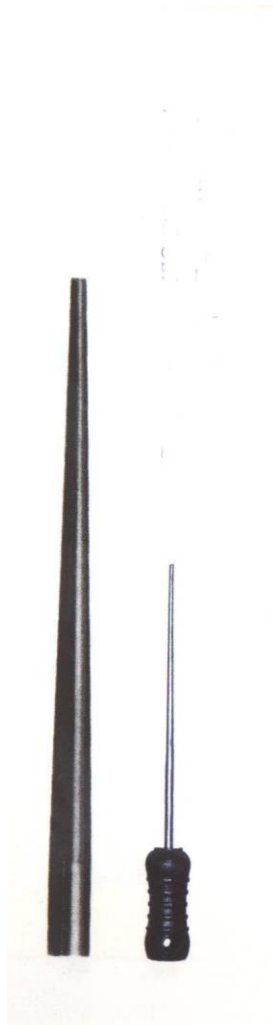
Vertical introduction

Lateral compaction technique

(cold, warm)

Compactors

Plugger

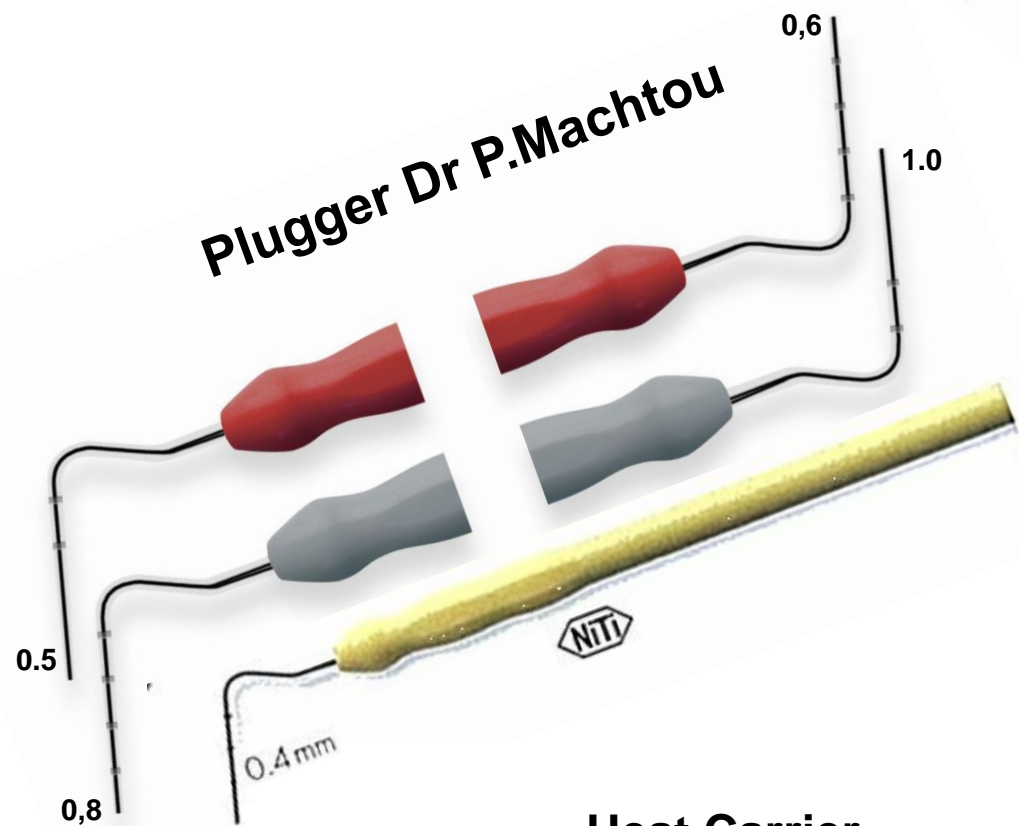


Not pointed

Vertical introduction

Vertical - compaction

Use of a selected Plugger to ensure homogeneity of the filling.

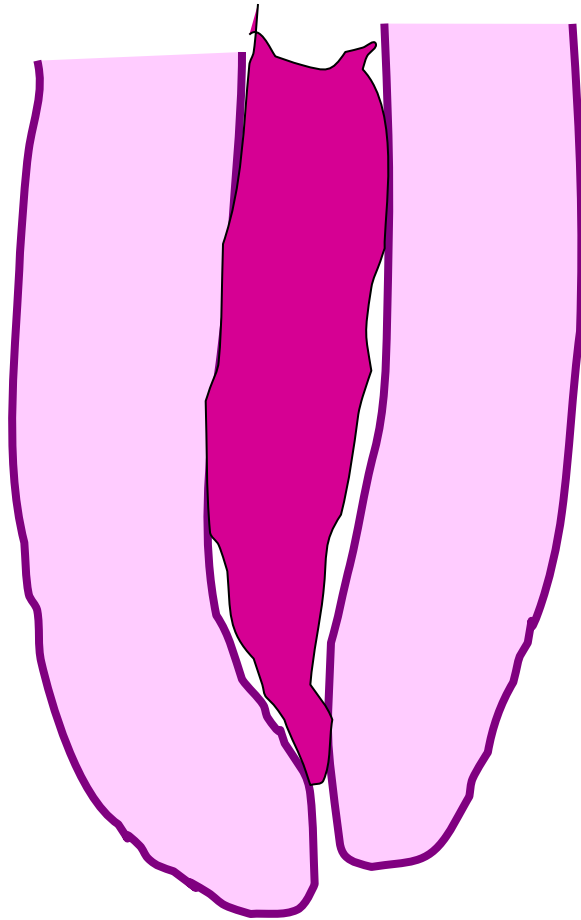


Filling techniques

Cold

Warm

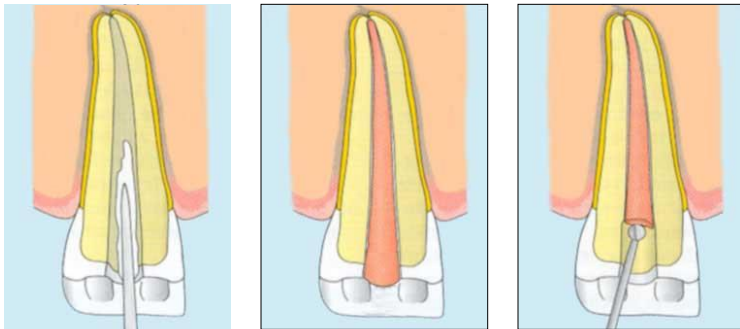
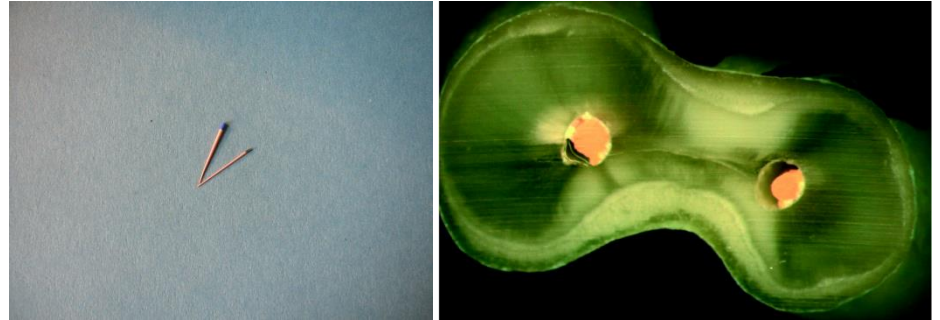
Paste only



**Shrinkage, difficult
removal**

Single cone technique

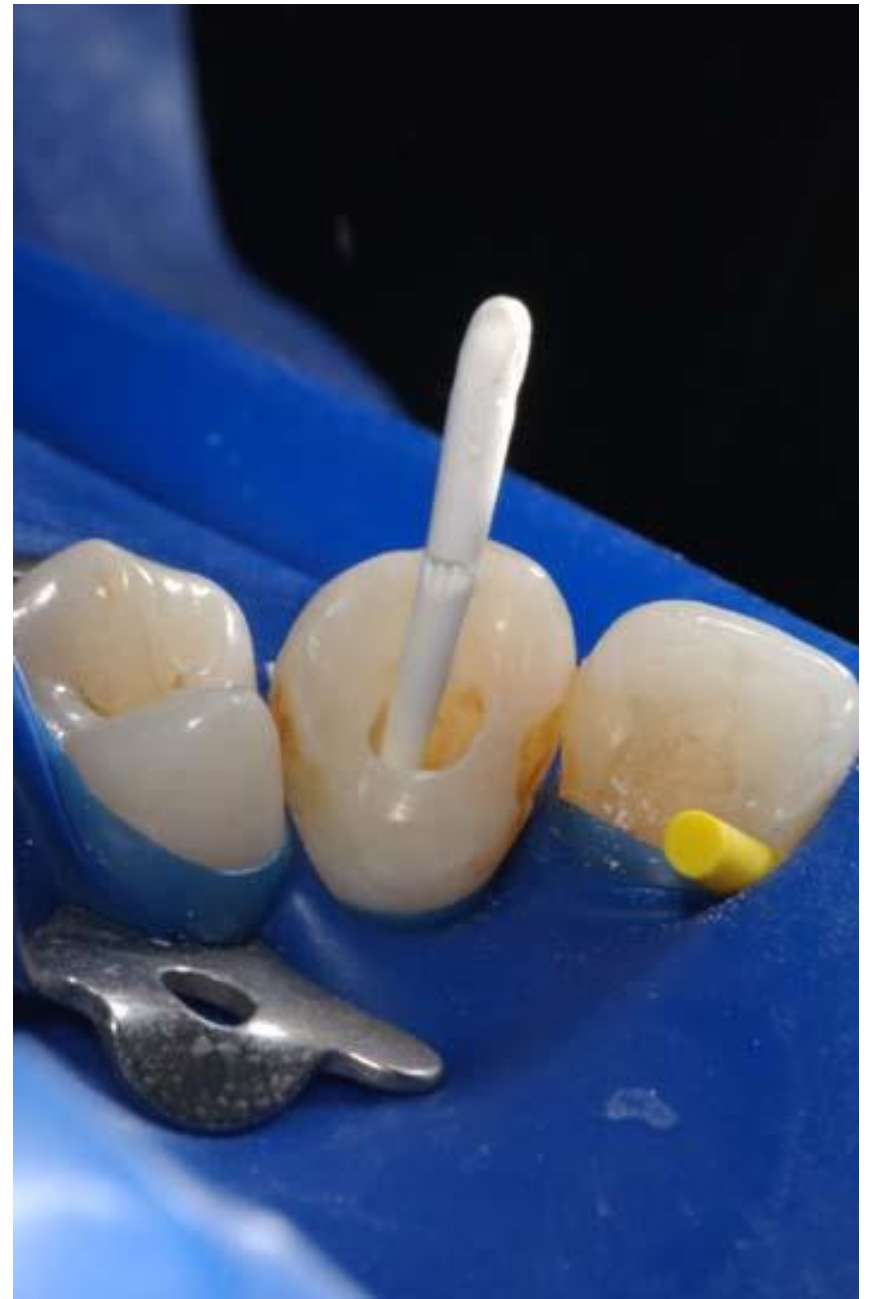
- Easy
- Fast
- Good control of WL
- Standard round preparation – risk of leakage



Wesselink, P.: Root filling techniques, Textbook of Endodontology; p. 286-299, Blackwell Munksgaard 2003, Oxford

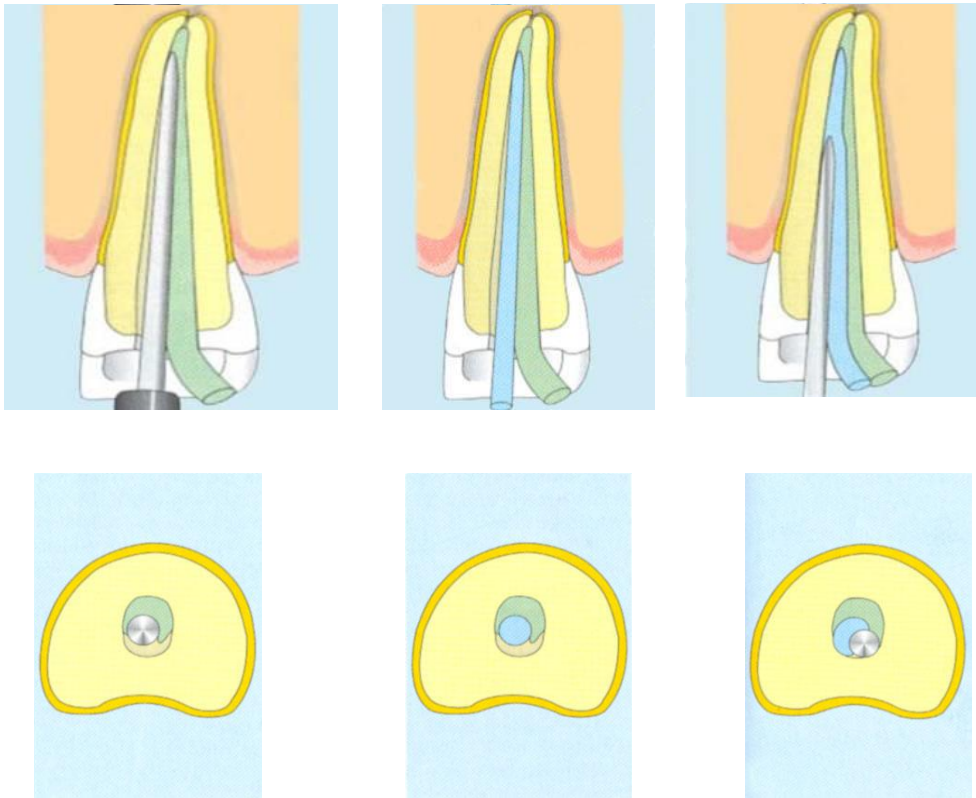


107

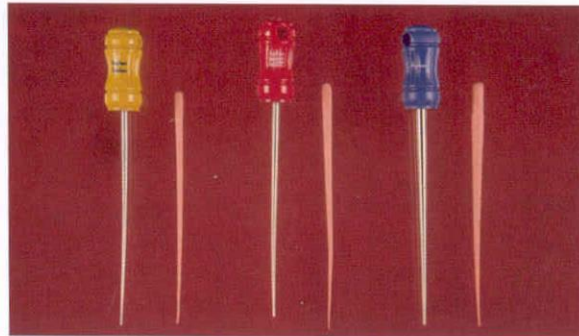


Lateral compaction

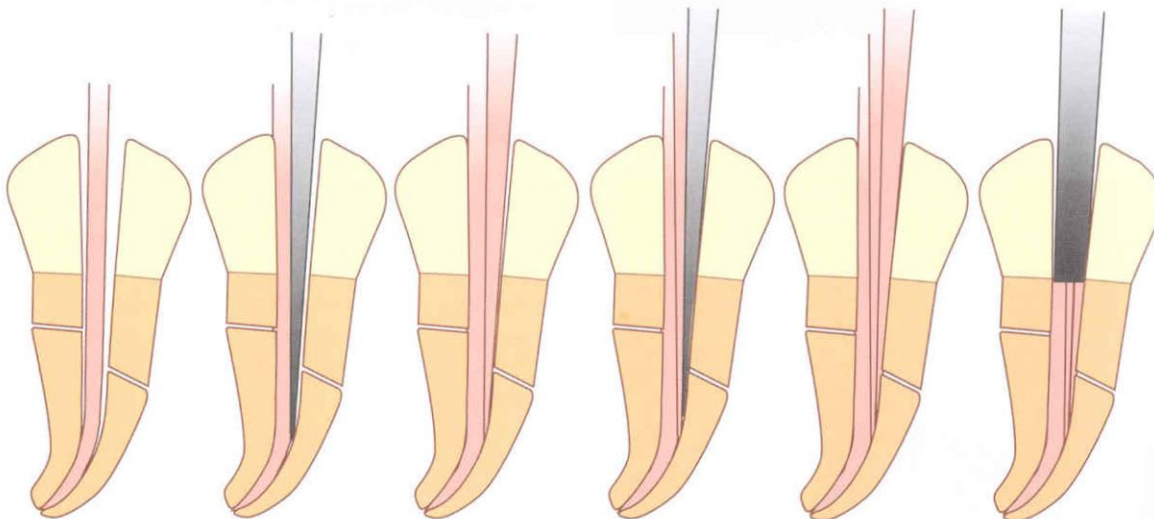
- Standard cold technique



Good control of WL
Risk of the root fracture

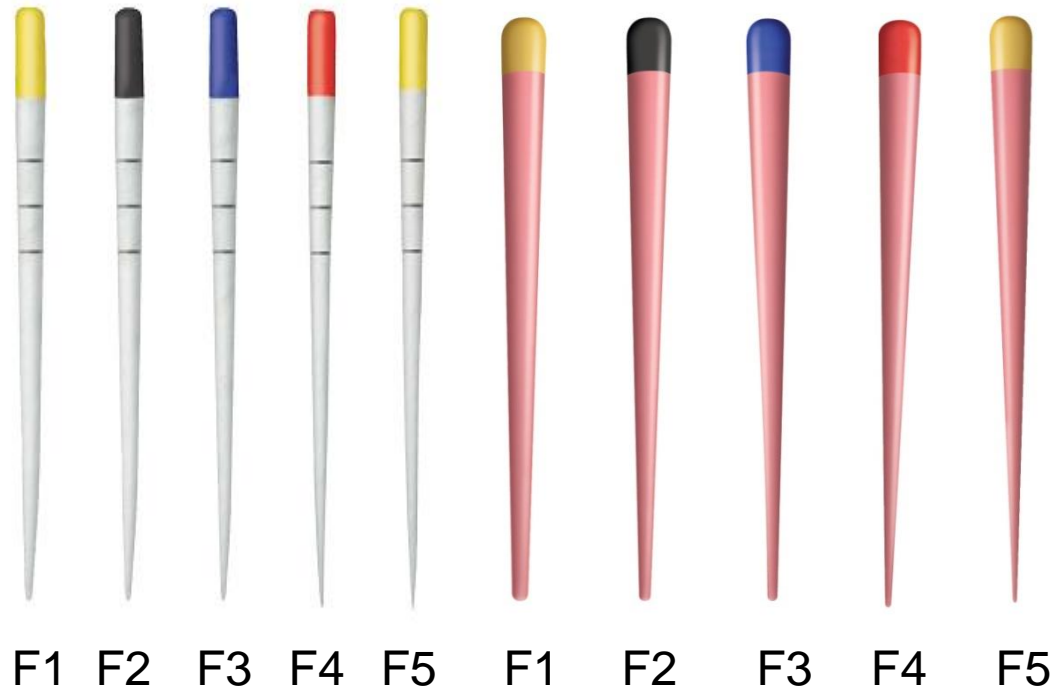


A



**LATERAL
CONDENSATION
(compaction)**

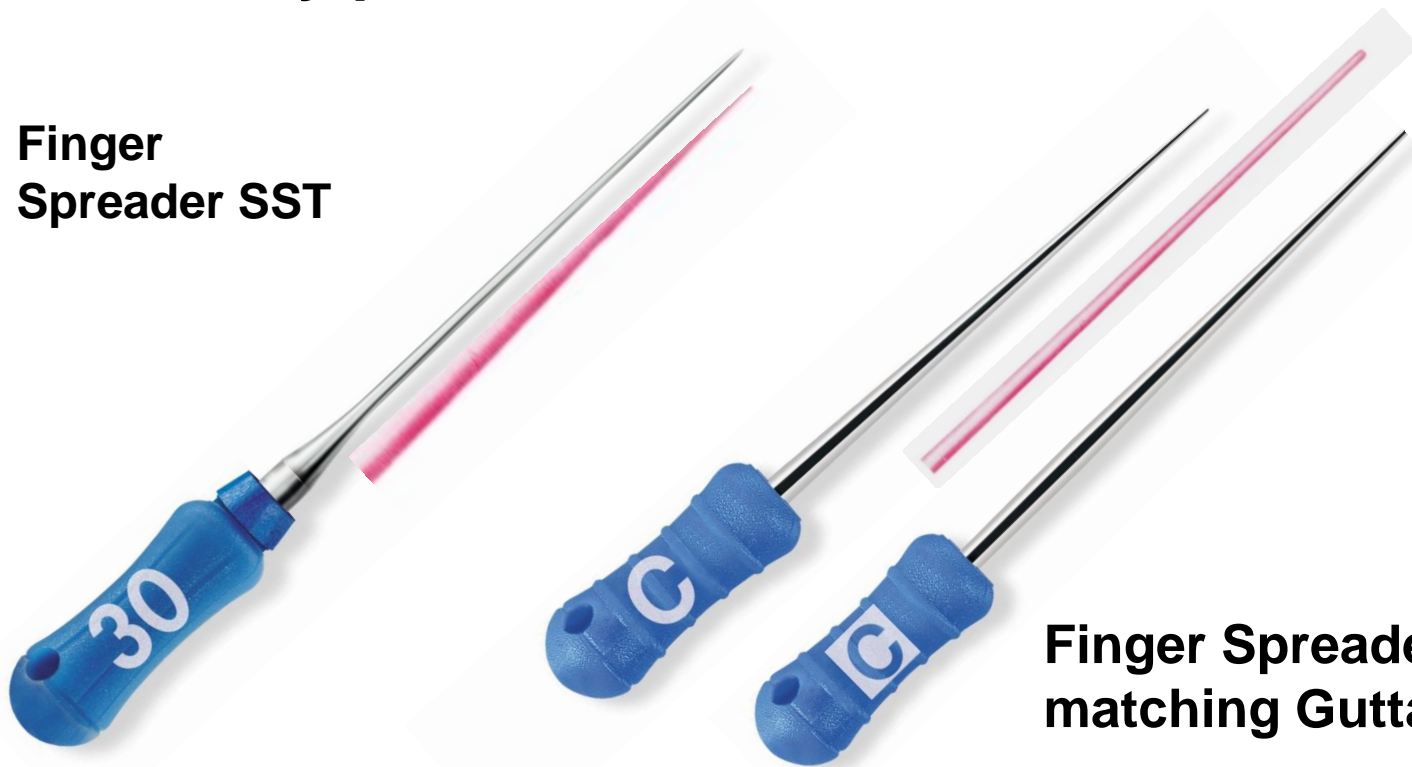
Standardized and non-standardized Paper Points and Gutta Percha Points



Lateral Condensation

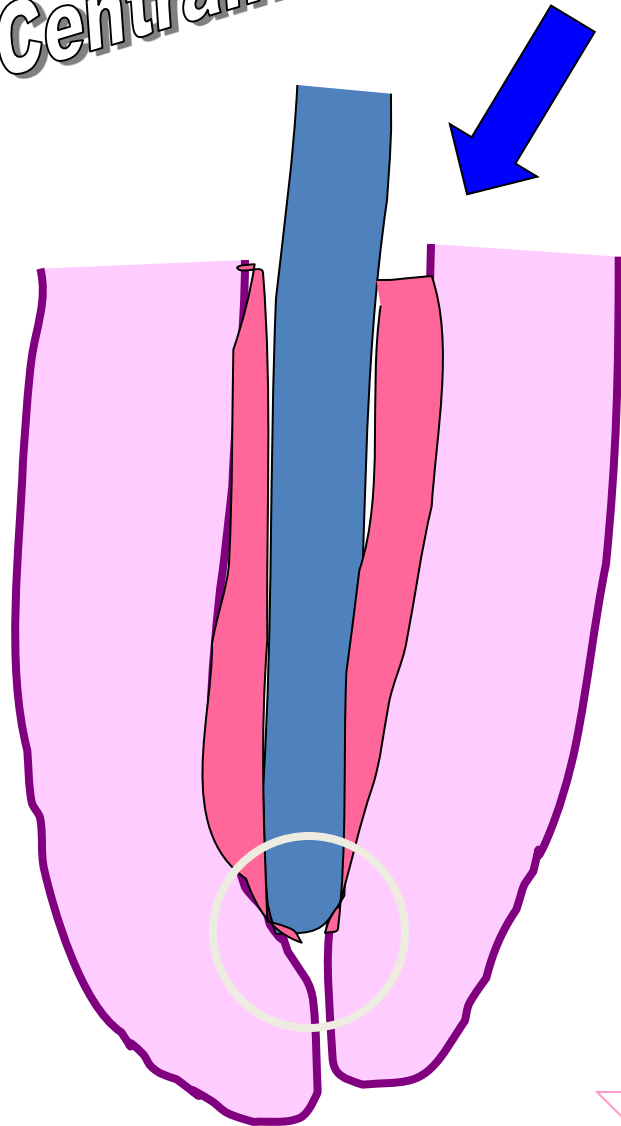
A sealer is placed in the canal followed by a fitted gutta percha Master Point compacted laterally by a tapering Spreader to make room for additional accessory points

Finger
Spreader SST

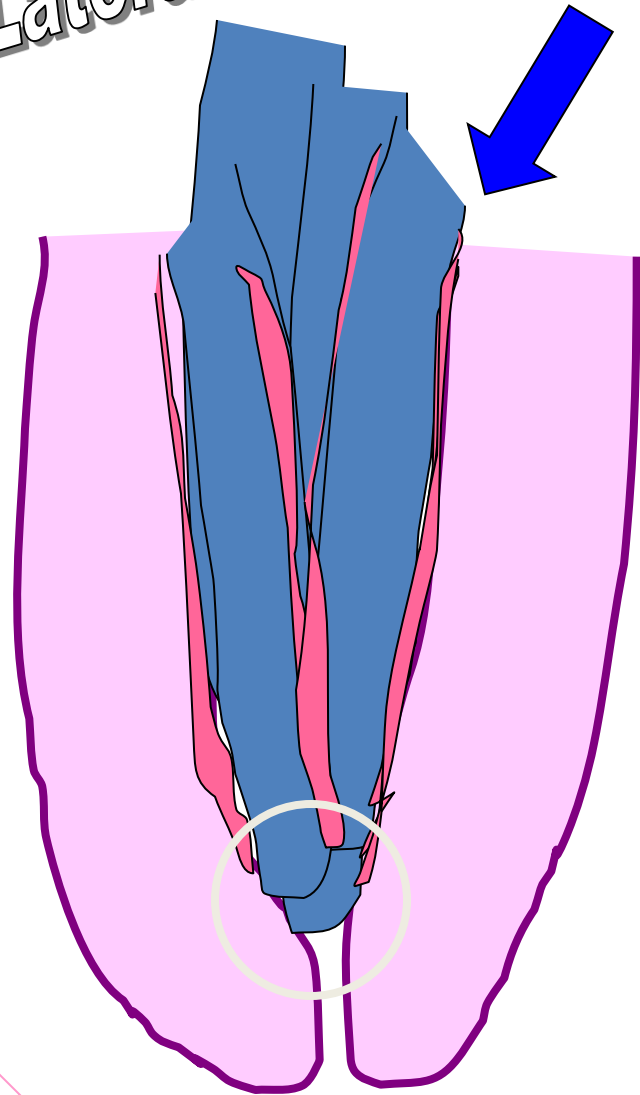


Finger Spreader SST and NiTi
matching Gutta-Percha A-D

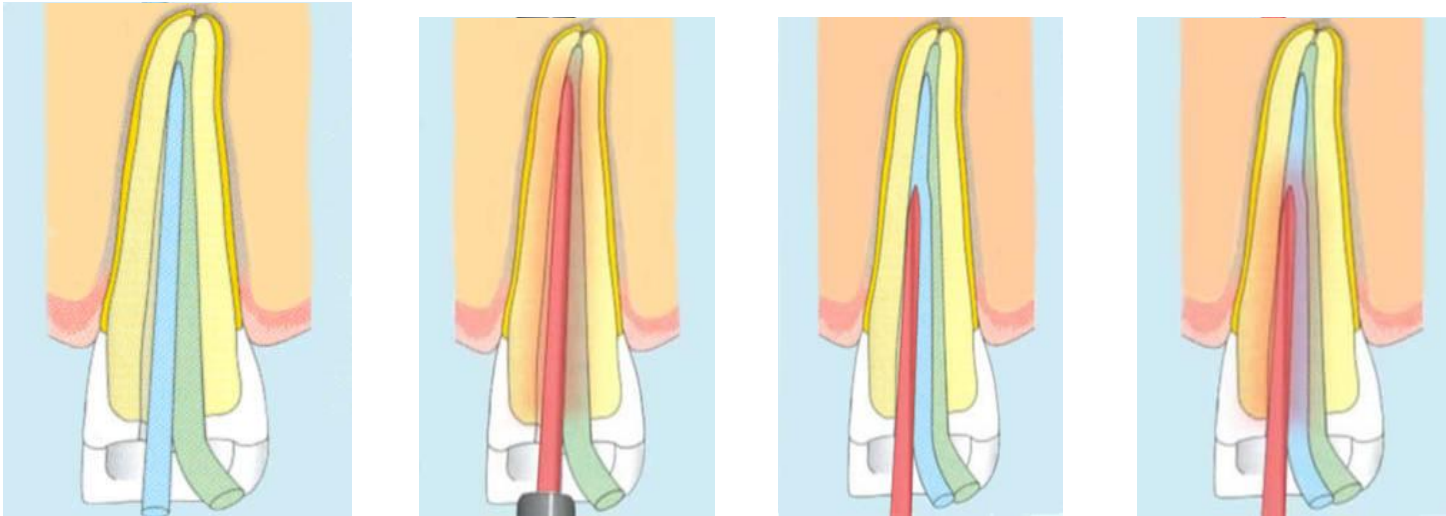
Centrální čep



Laterální kondenzace



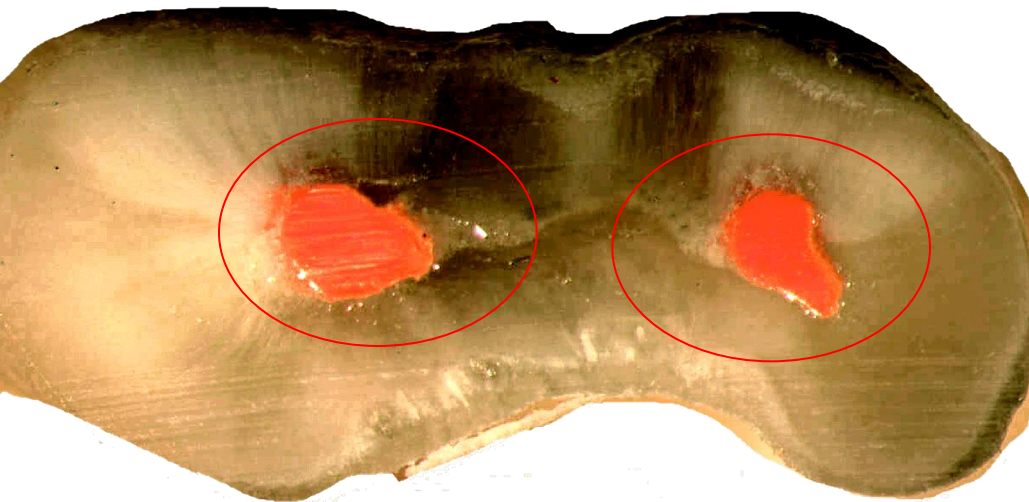
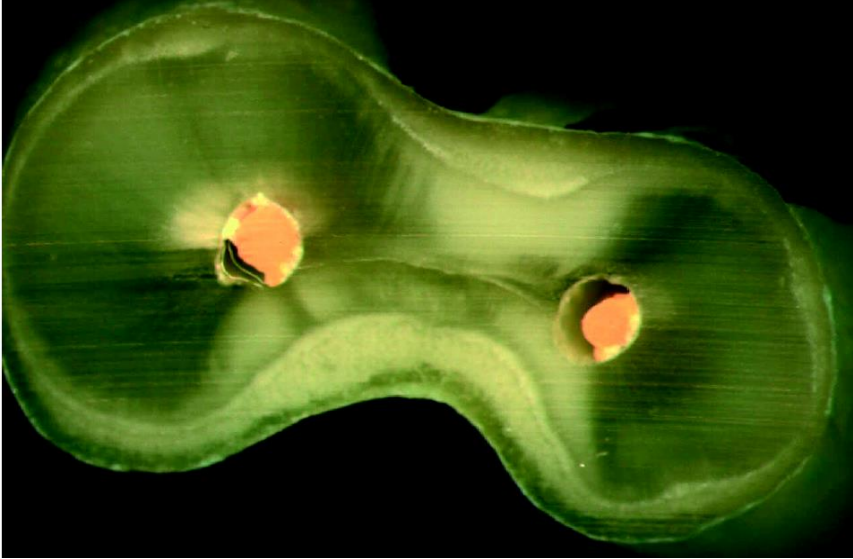
Warm lateral compaction



Heated spreader

Better 3D filling

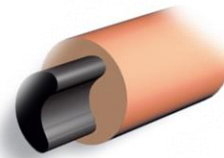
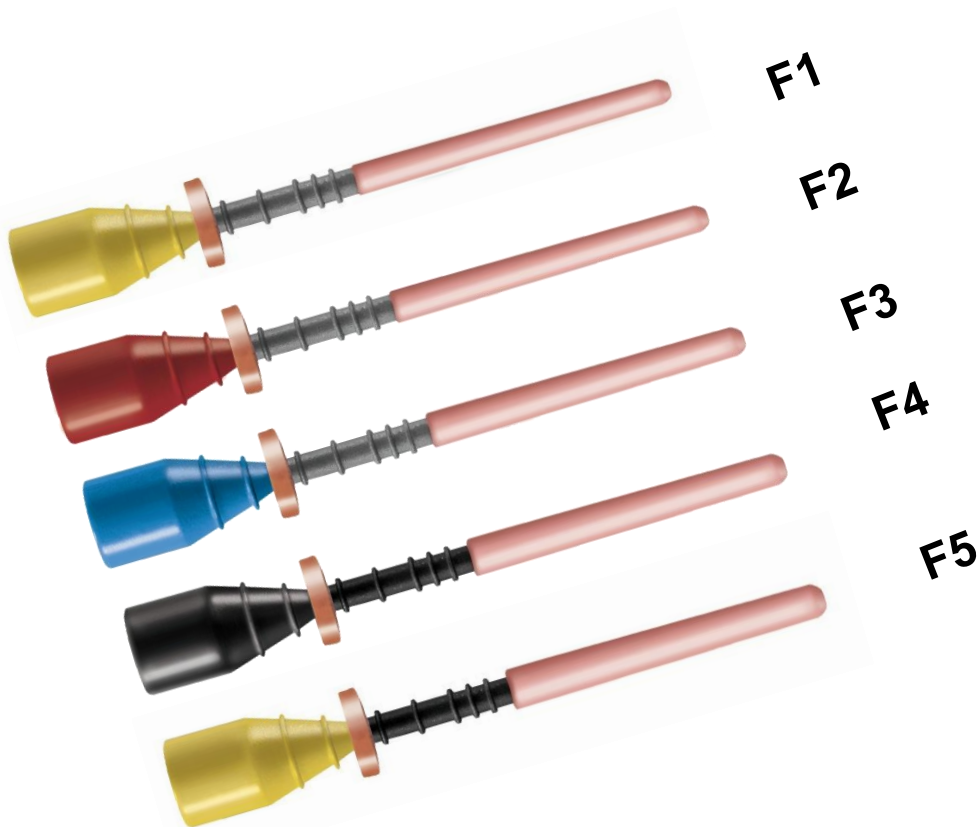


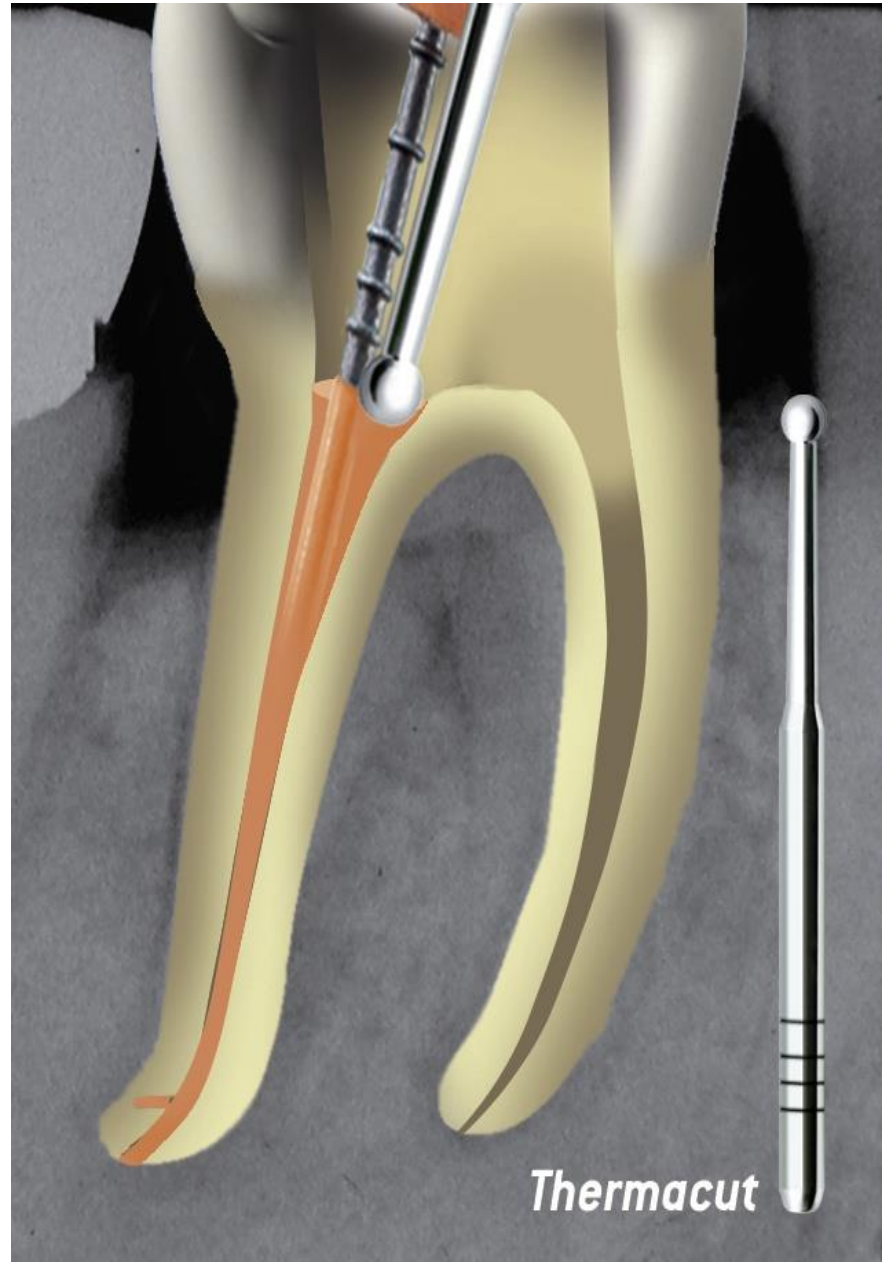
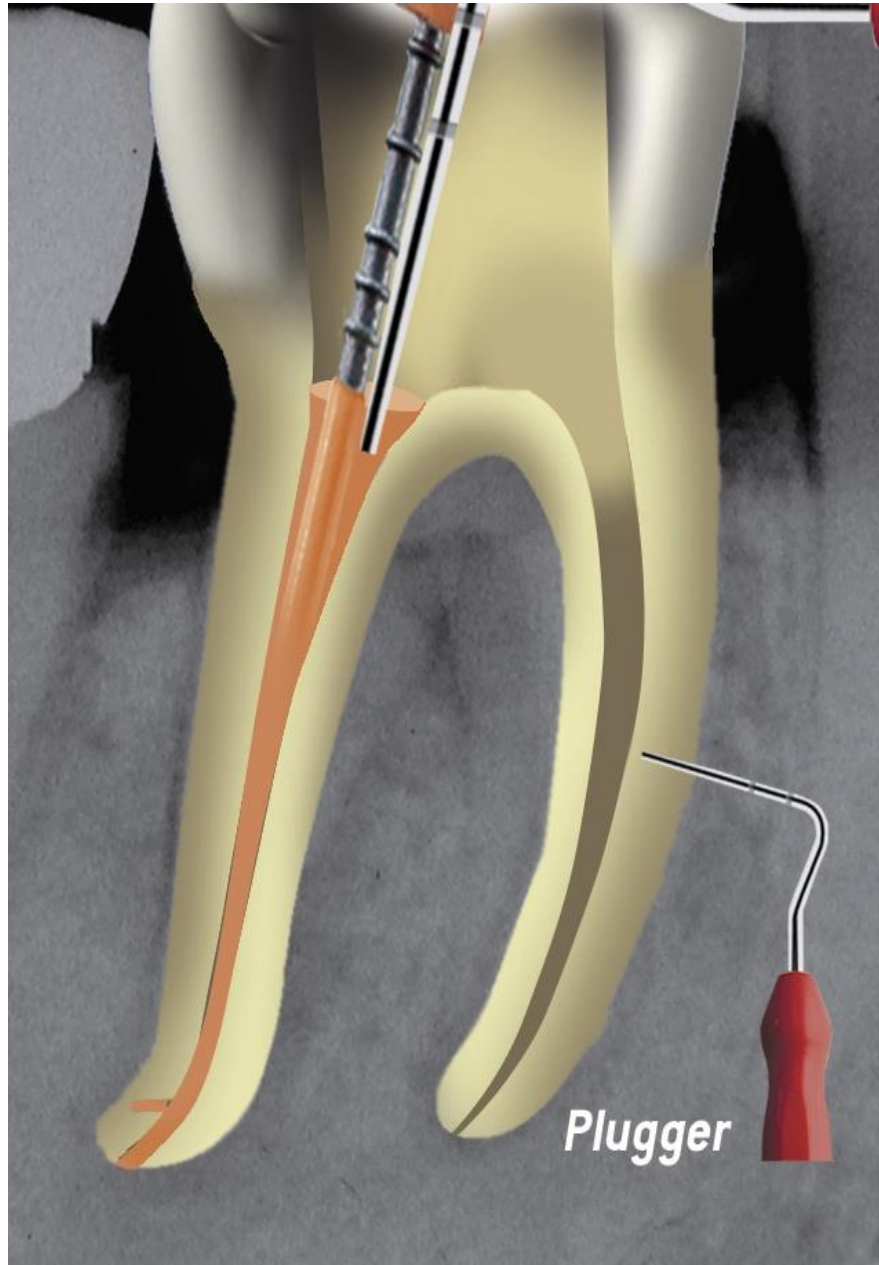


Core-Carrier (PP) - Gutta-Percha Filling Technique

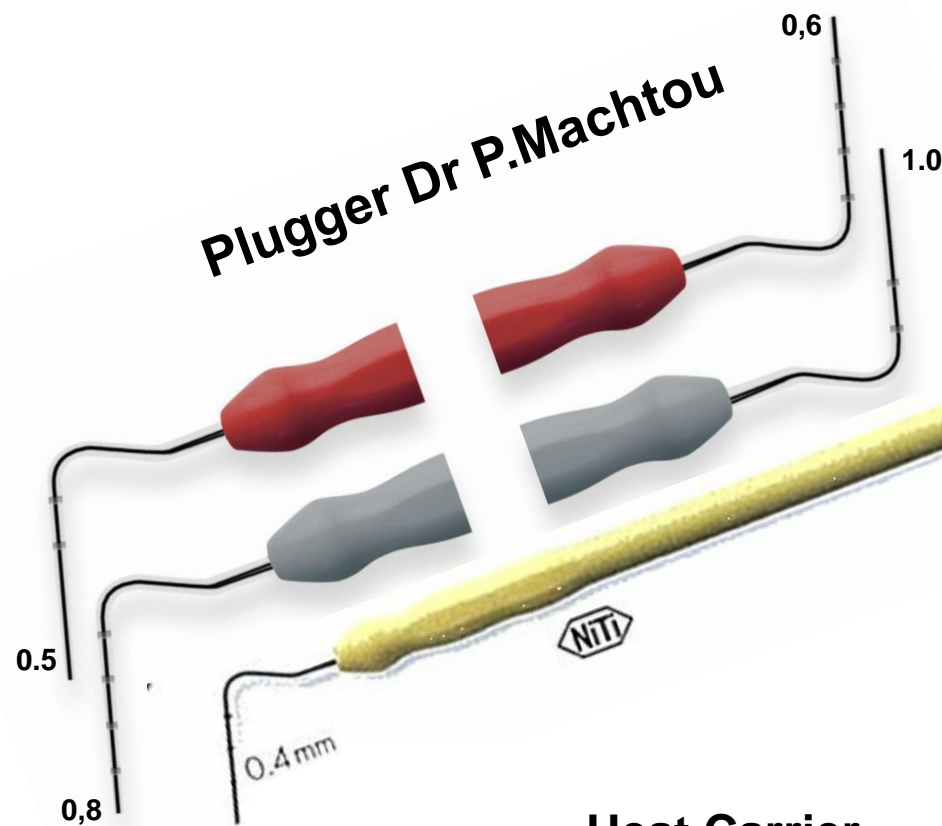


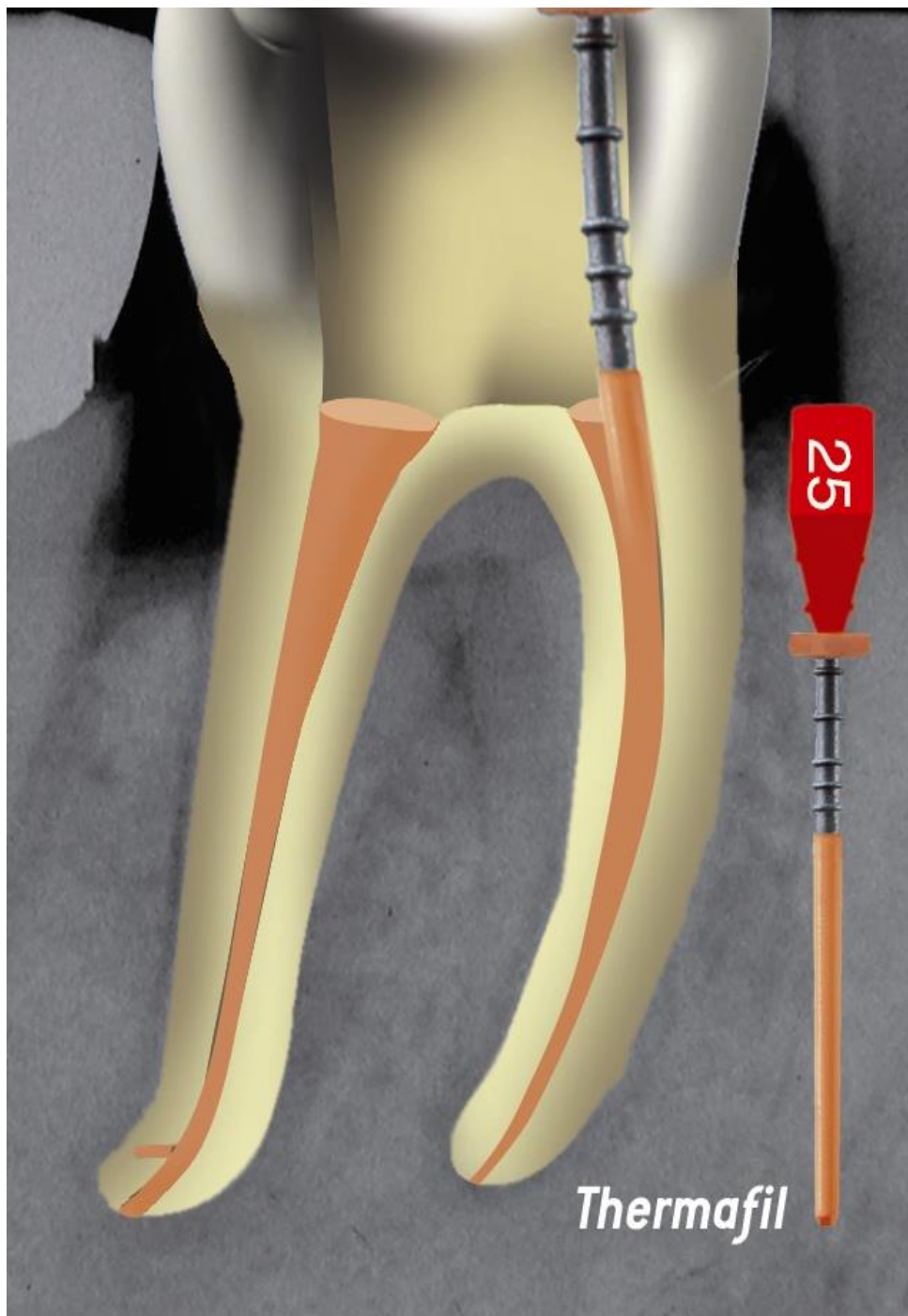
Obturator compatible with instruments





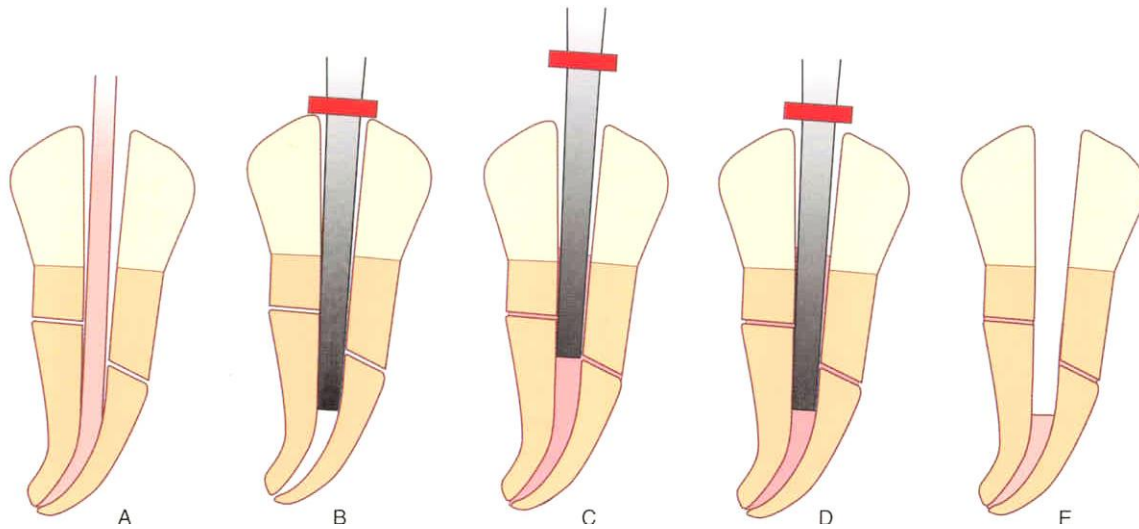
Use of a selected Plugger to ensure homogeneity of the filling.



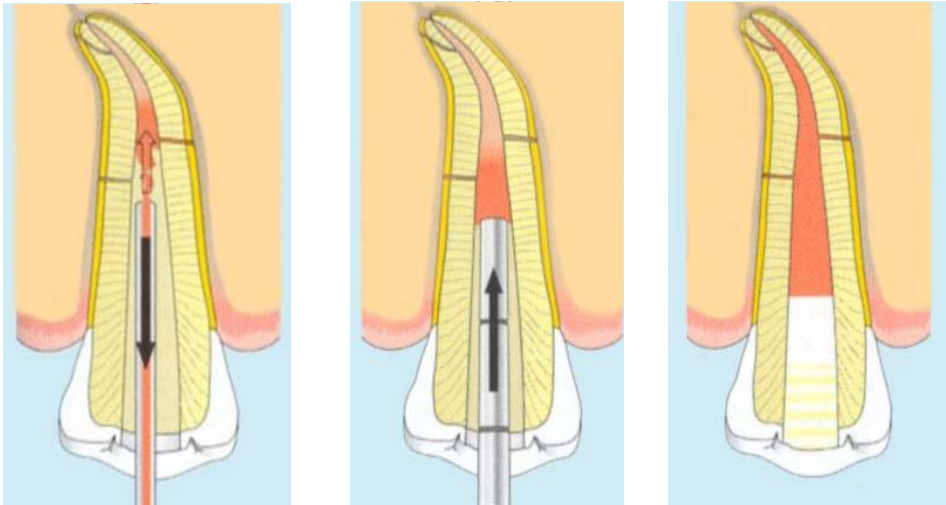




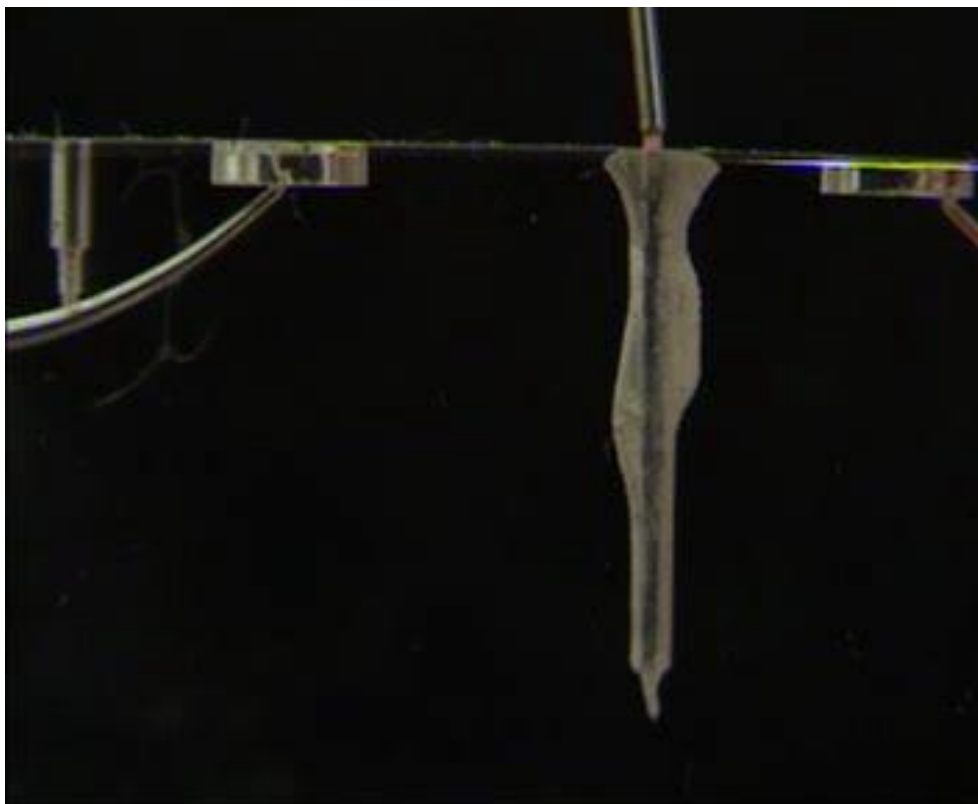
WARM VERTICAL COMPACTION



Injection



Fast technique
Possible extrusion of sealer
Risk of thermal damage of PL



plnění granulom



Warm Vertical Compaction Continuous Wave Technique

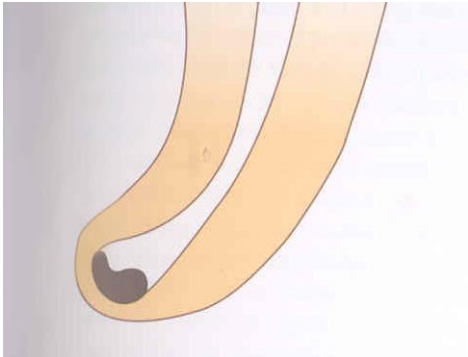
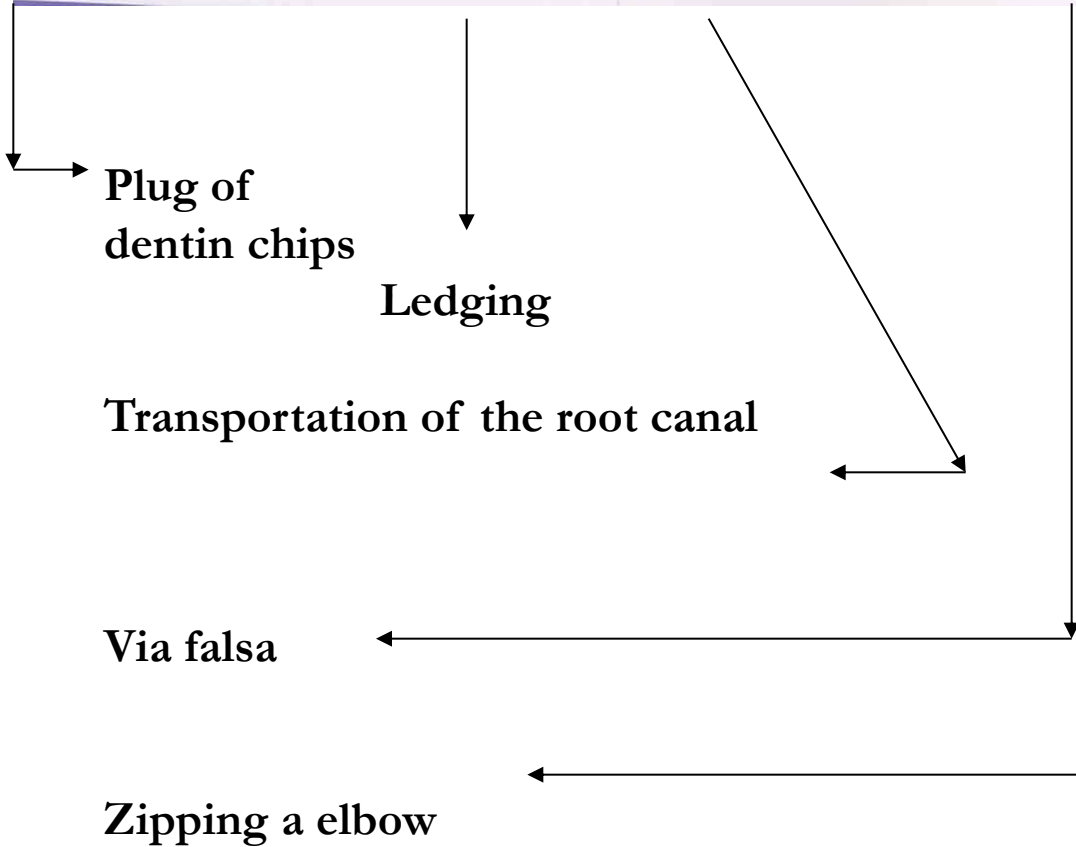
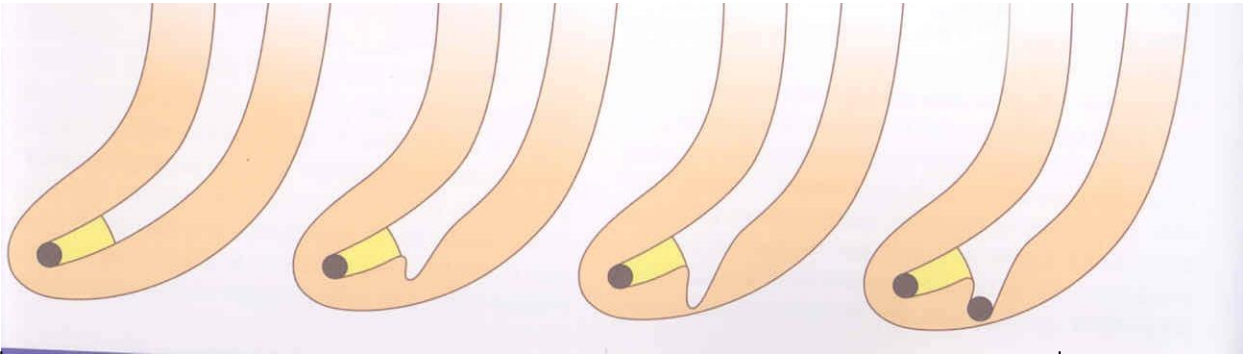


Complications of endodontic treatment

Local

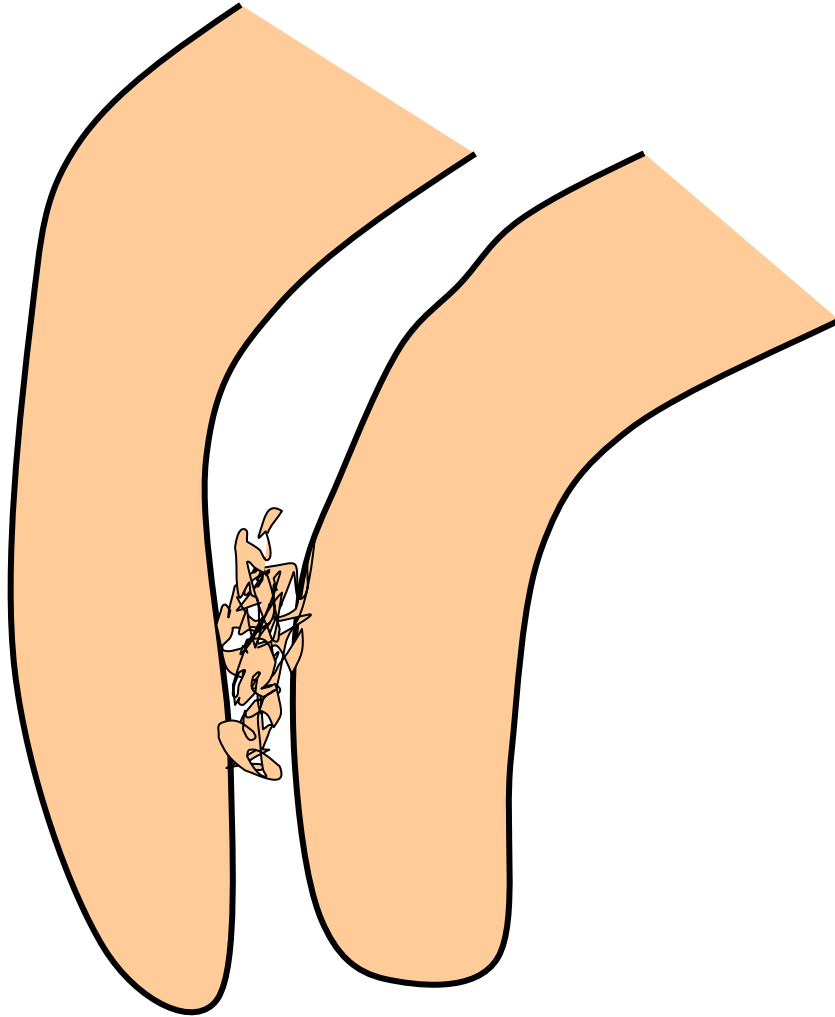
Regional

Systemic



Local complications

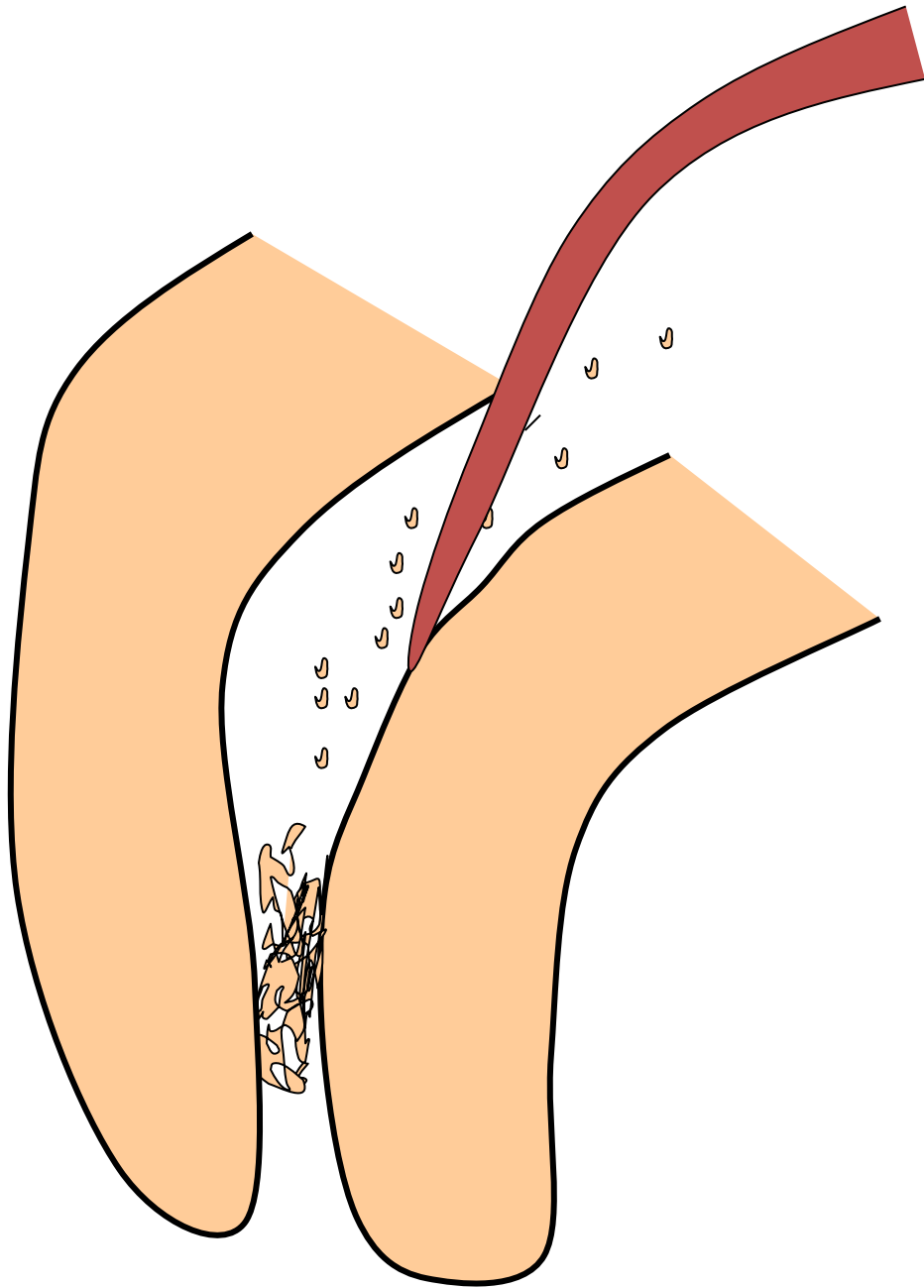
Plug



Reasons

**Insufficient irrigation and
recapitulation**

Loss of the working length

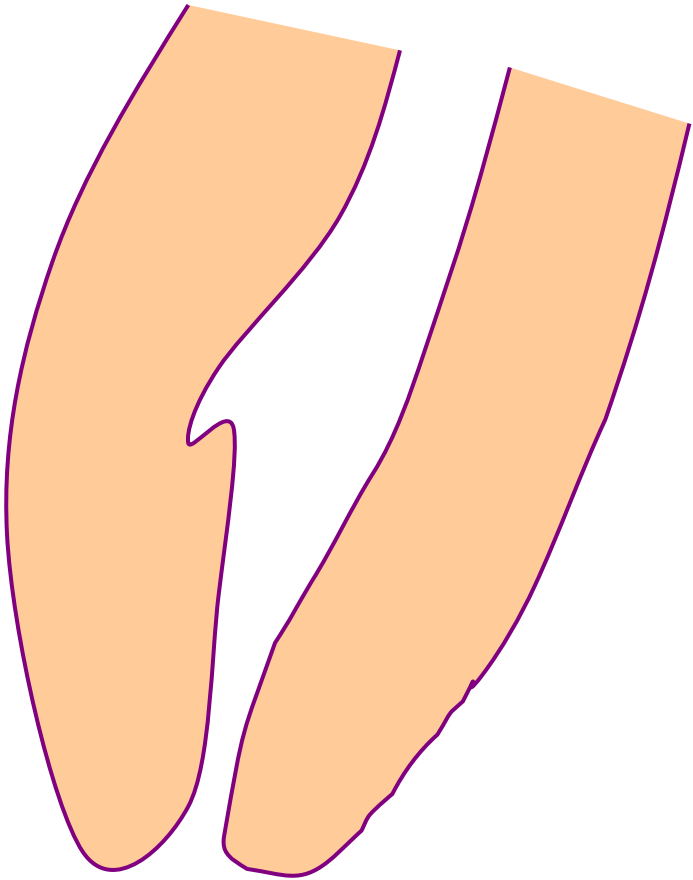


Solution

**Repeated careful
instrumentation
with a thin
instrument**

*Irrigation is not
effective in this
case!!!*

Ledging



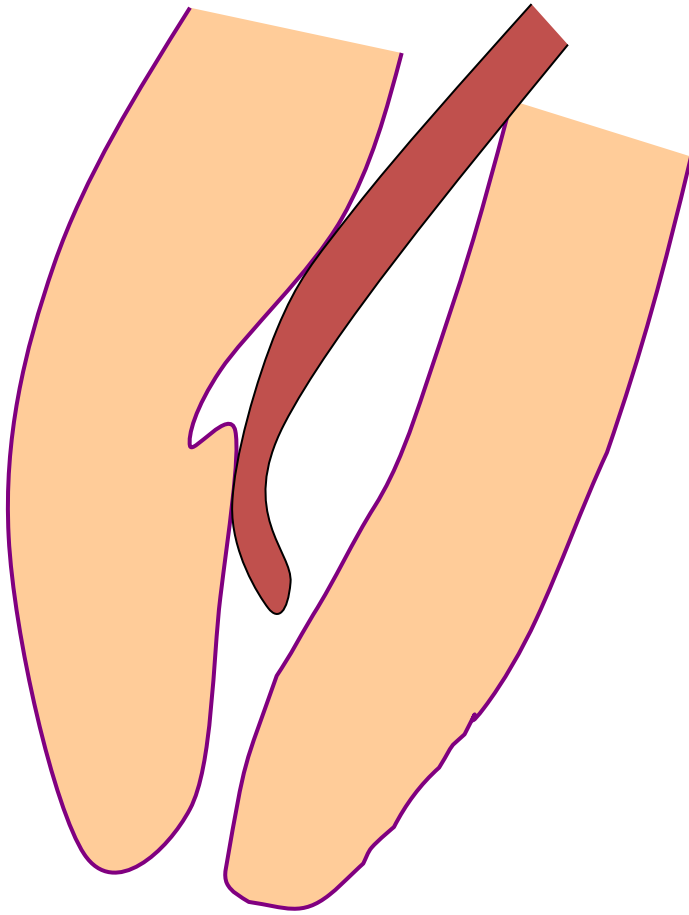
Reasons

The instrument is not bended in advance!

No control of the WL

=

No recapitulation Loss of the WL



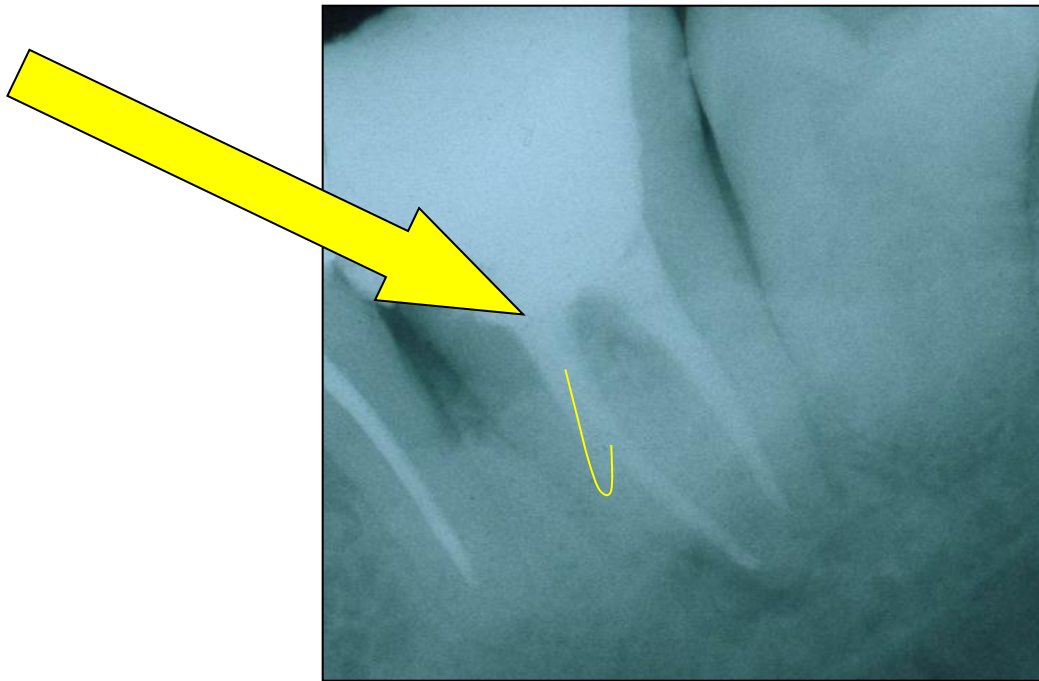
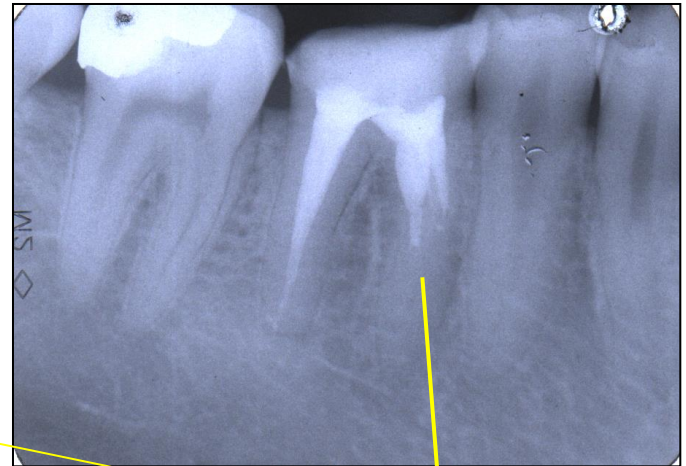
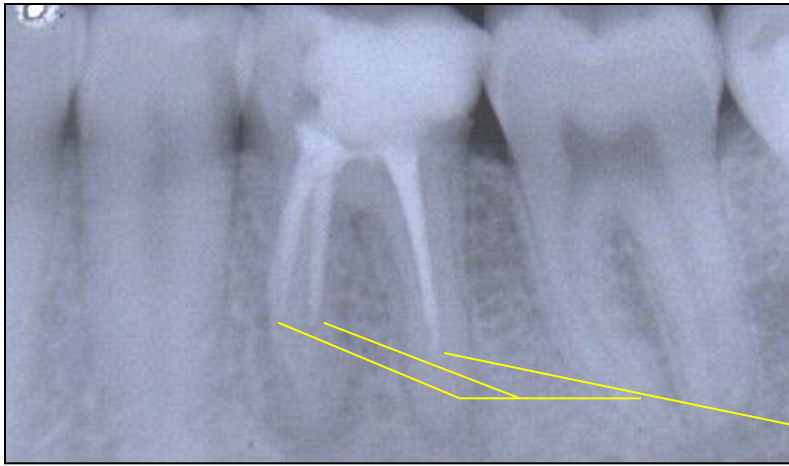
Solution

The instrument must be
bended in advance

Careful but complete rotation

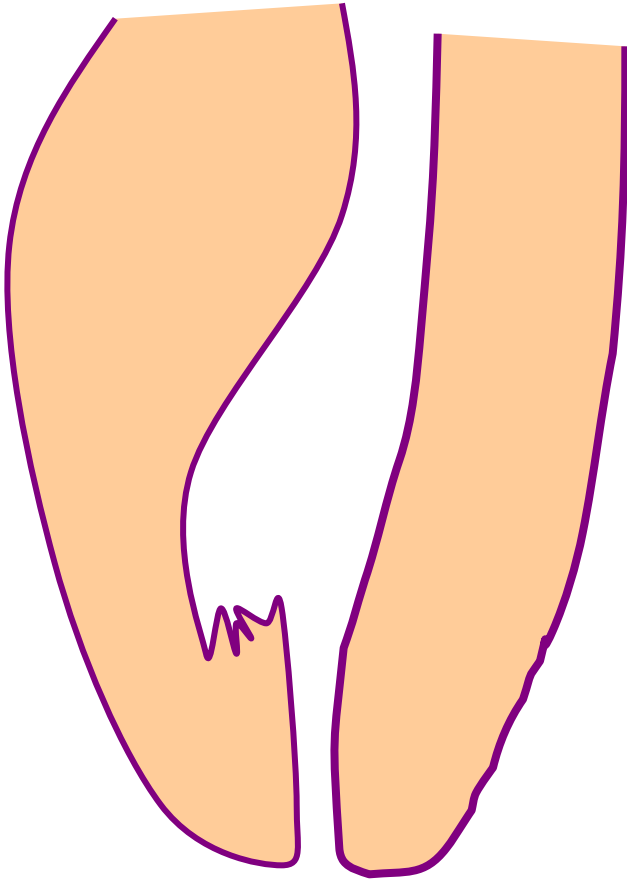
Finishing with the fine filing

No NiTi!!!



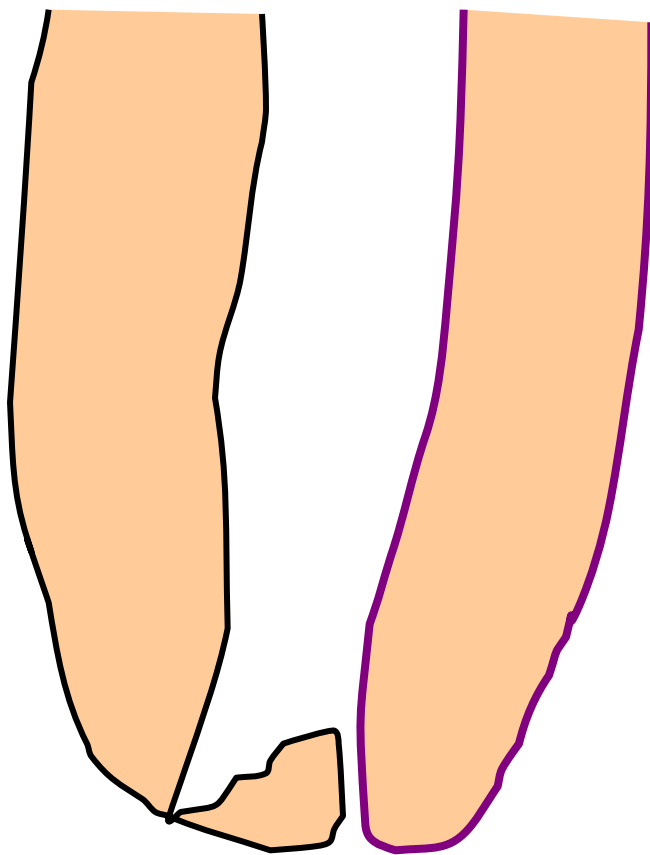
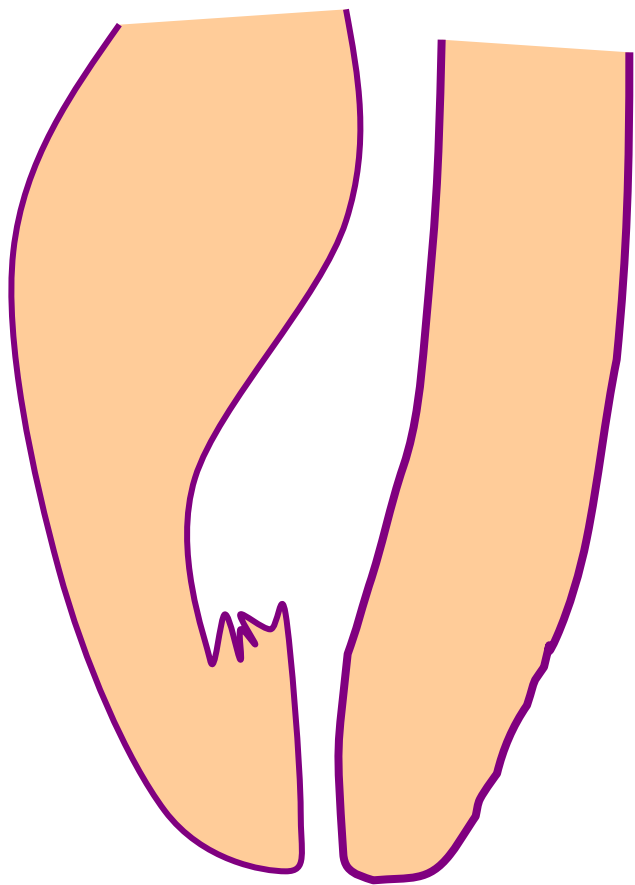
Ledging

Zippering a Elbow



The instrument is not bended in advance!

Rotation in curved canals



Stripping

Reasons

**Bad orientation in morphology – no diagnostic x-
Instruments are not bended
Rotary NiTi with a big taper**

Dangerous zones

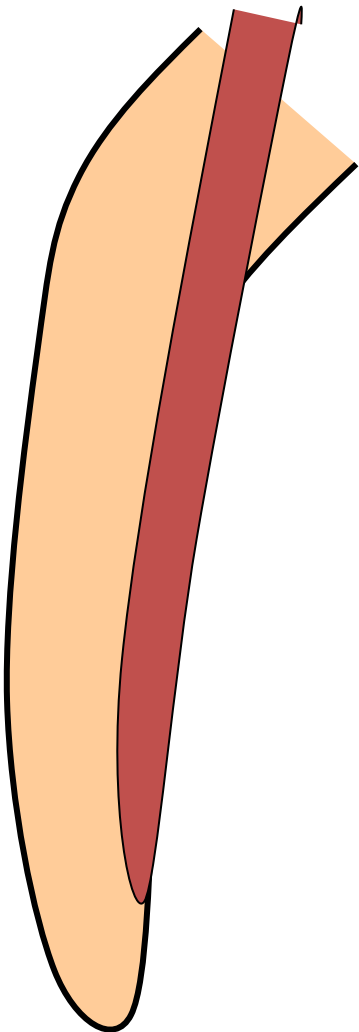
Mandibular molars – mesial roots

Premolars, esp. maxillar

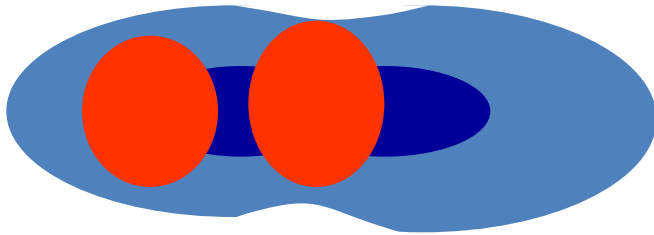
Mandibular incisors



Oblast isthmu



Stripping



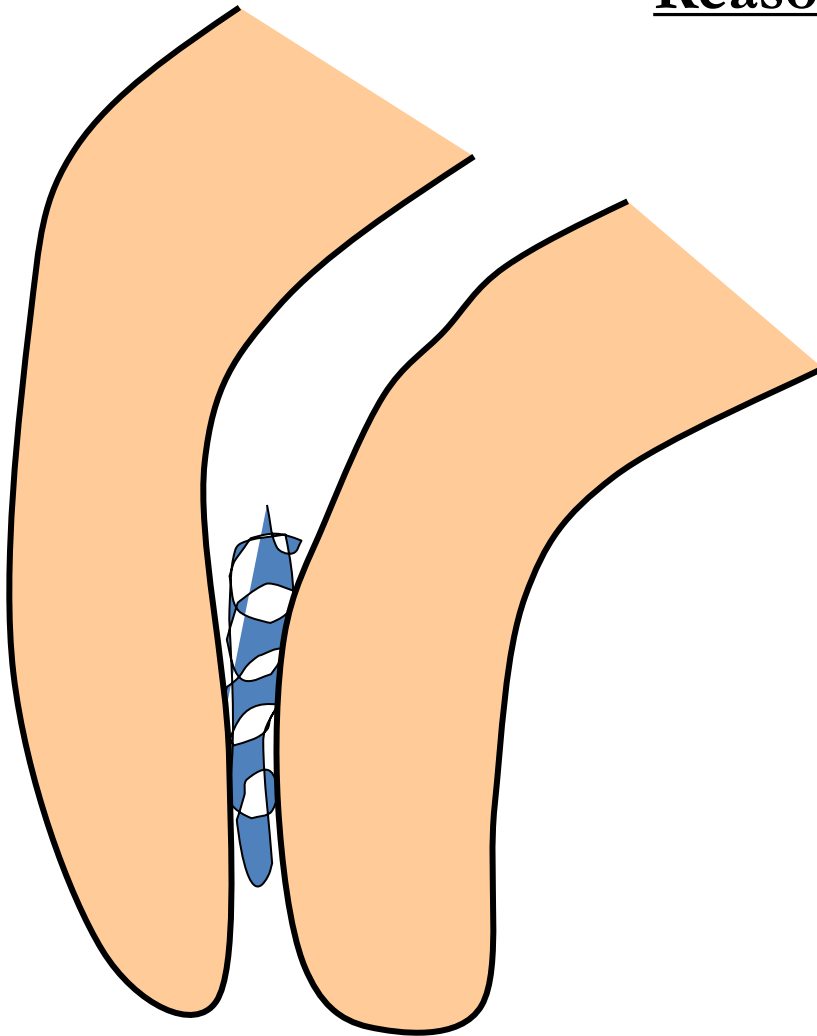
Stripping



Bend the instrument and eventually blunt it !

Fracture of the root canal instrument

Reasons



**Insufficient
coronal flaring**

**Old root canal
instrument**

Aggressive force

**Incorrect
movement of the
root canal
instrument**

Solution

Enlargement of the
root canal till the
instrument

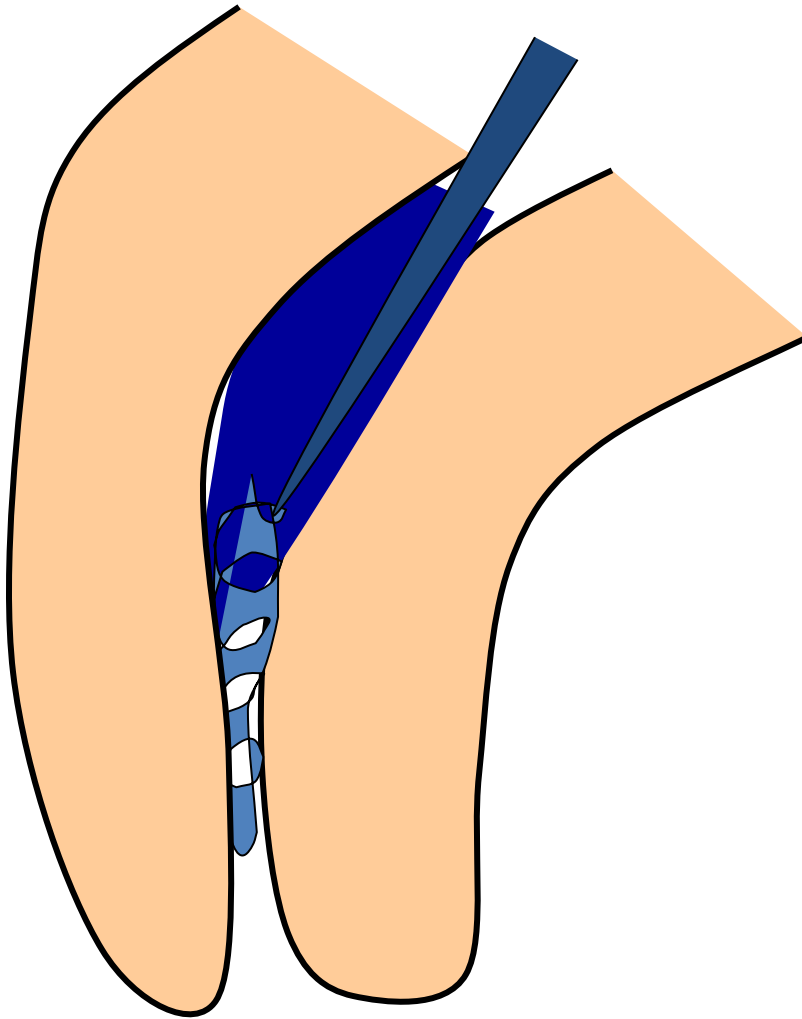
Ultrasound tips

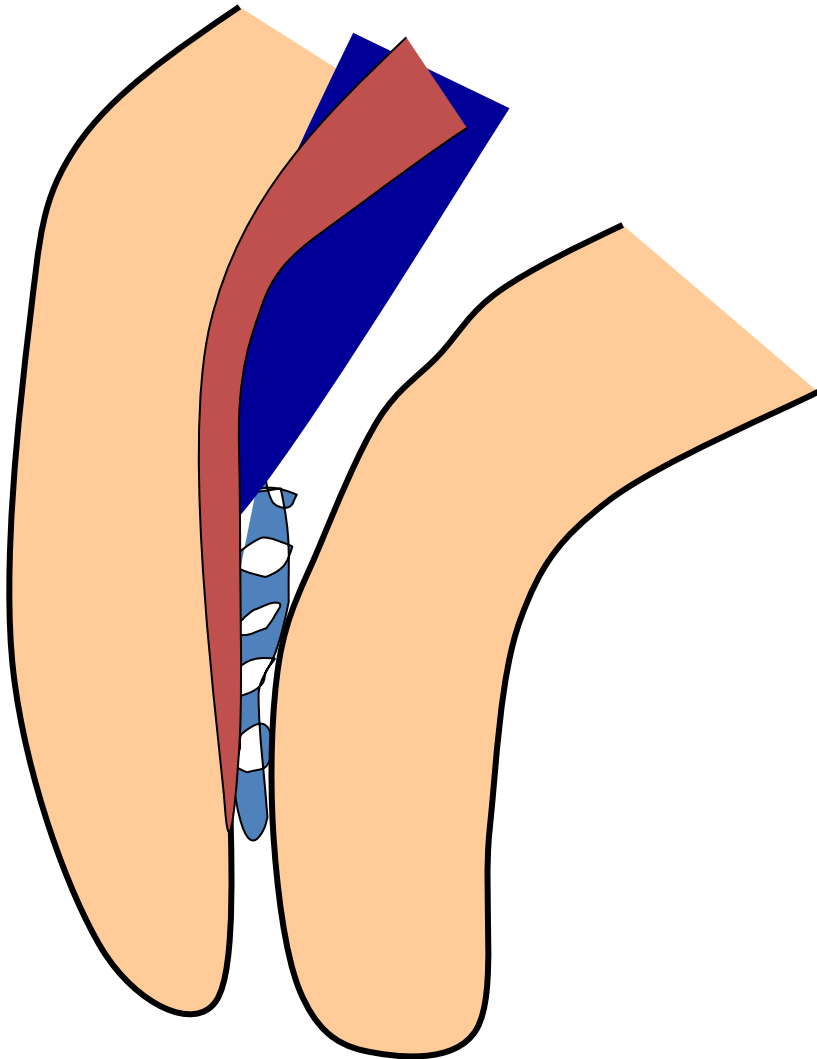
Rotating root canal
instrument – caution!

Bypass

Leaving in

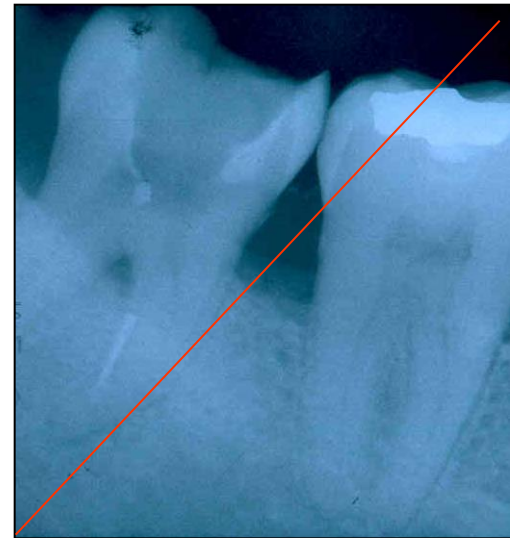
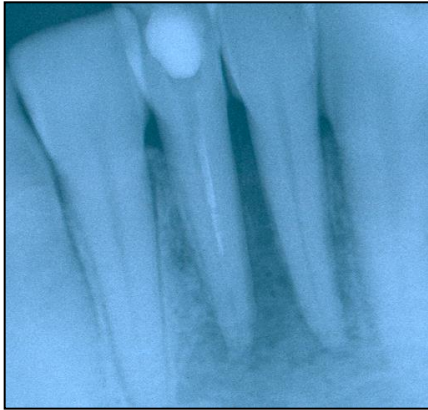
Surgical treatment





Bypass

Fractured instrument



Via falsa

- Perforation of the bottom of the pulp chamber or the coronal part of the root canal
- Perforation in the middle part of the root canal
- Apical perforation

LOT 000724 EXP 0507

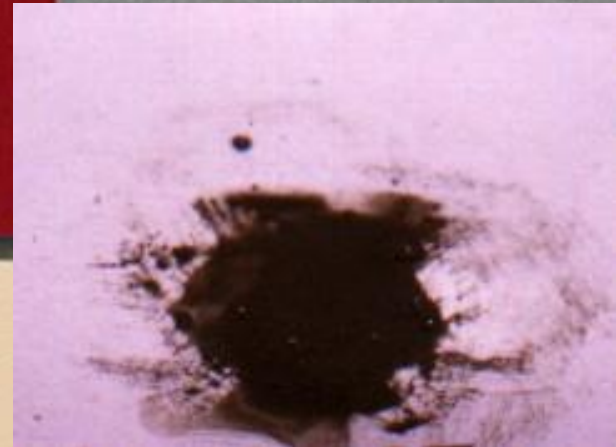
DENTSPLY

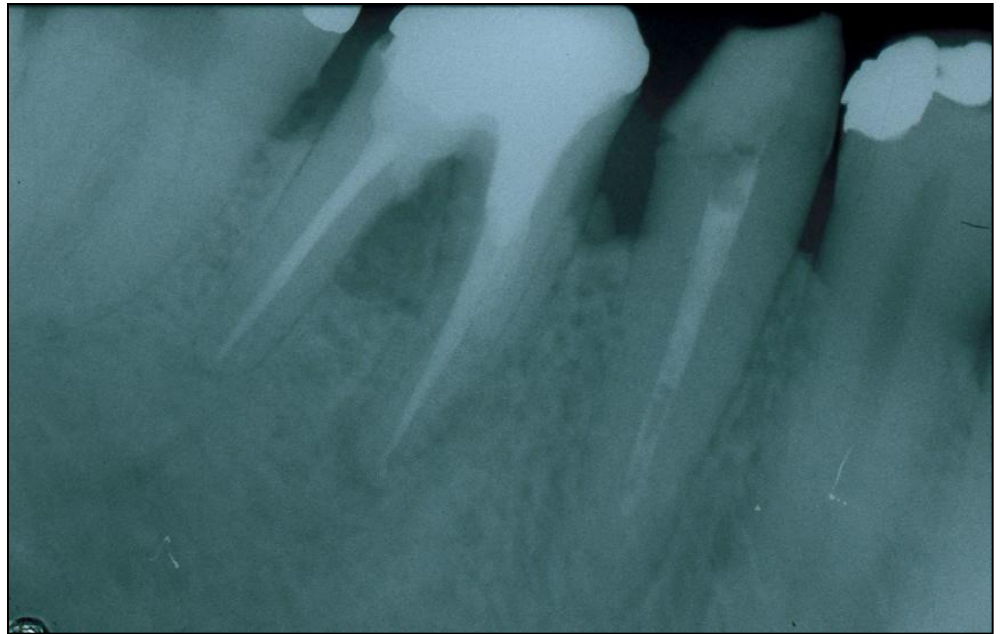
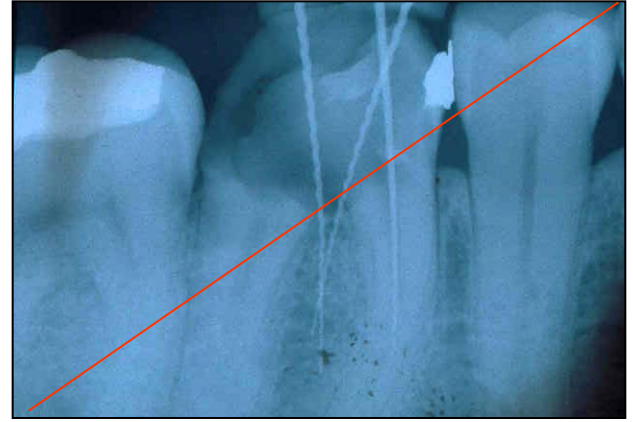
PRO ROOT™

*MTA (Mineral Trioxide Aggregate)
Root Canal Repair Material*

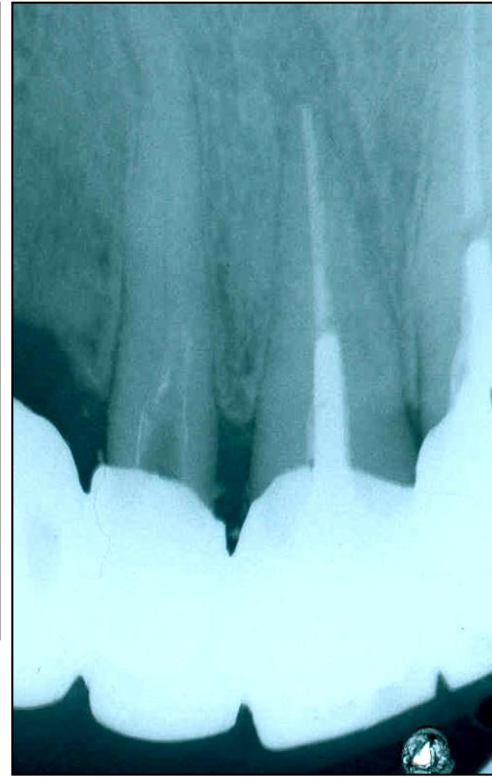
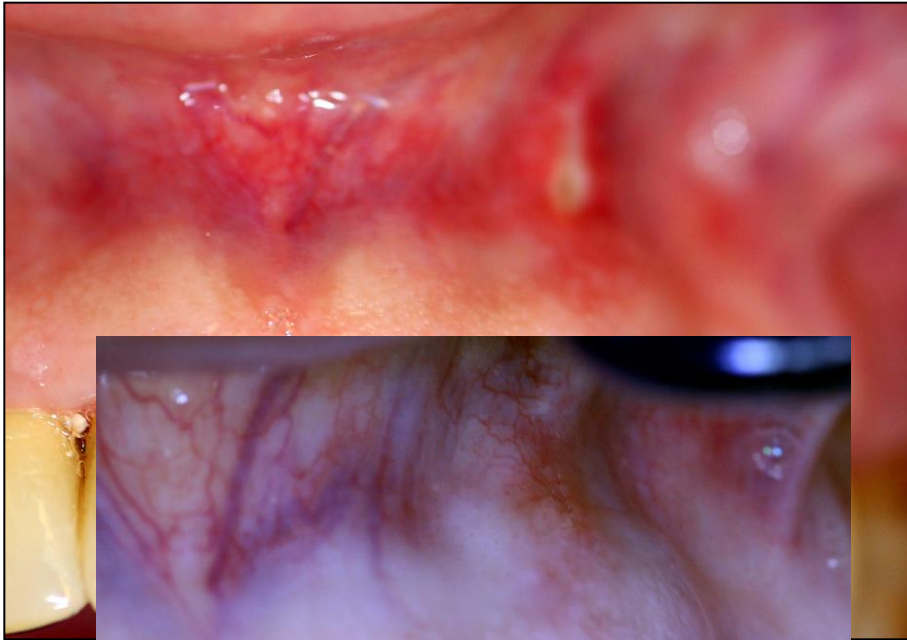
Contents: 1 gram (1 treatment)

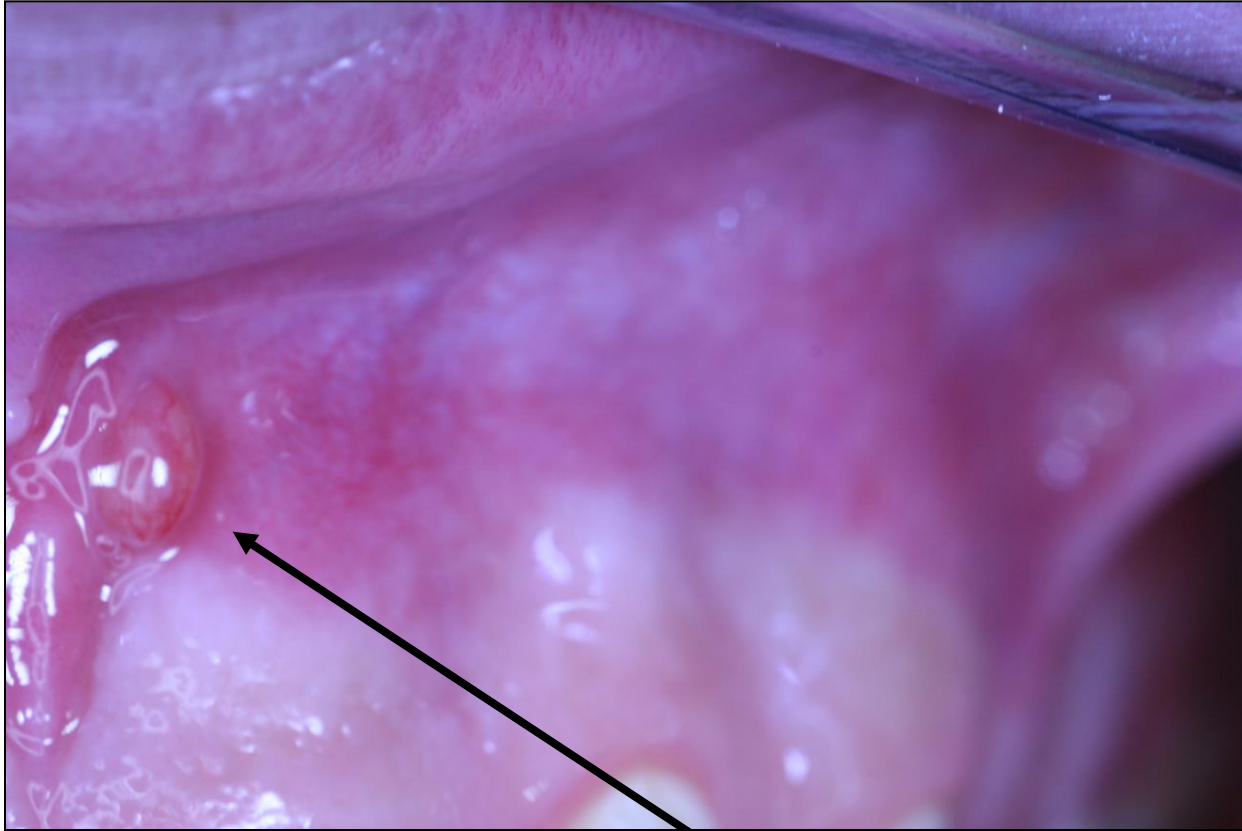
CE
0120





Regional complications



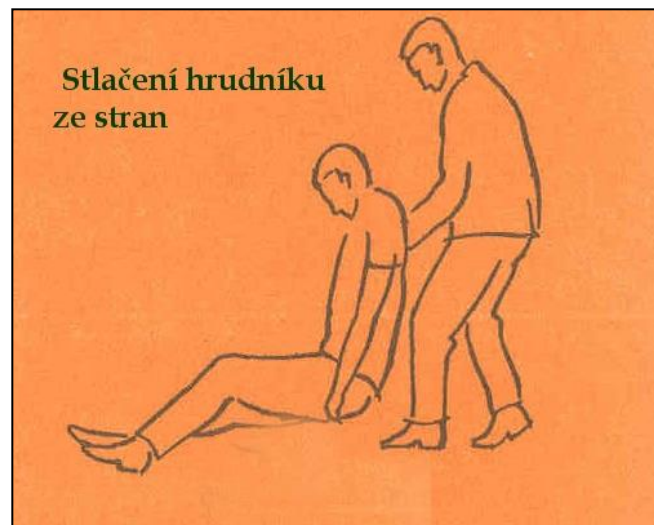


Píštěl

Systemic complications

Systemic complications

- Periostitis
- Inflammation of soft tissues (face, neck)
- Gulp of the instrument (X ray, remnant diet, information)- cough
- Aspiration of the instrument -emesis



Caution!

Always find the loss instrument !!!!!