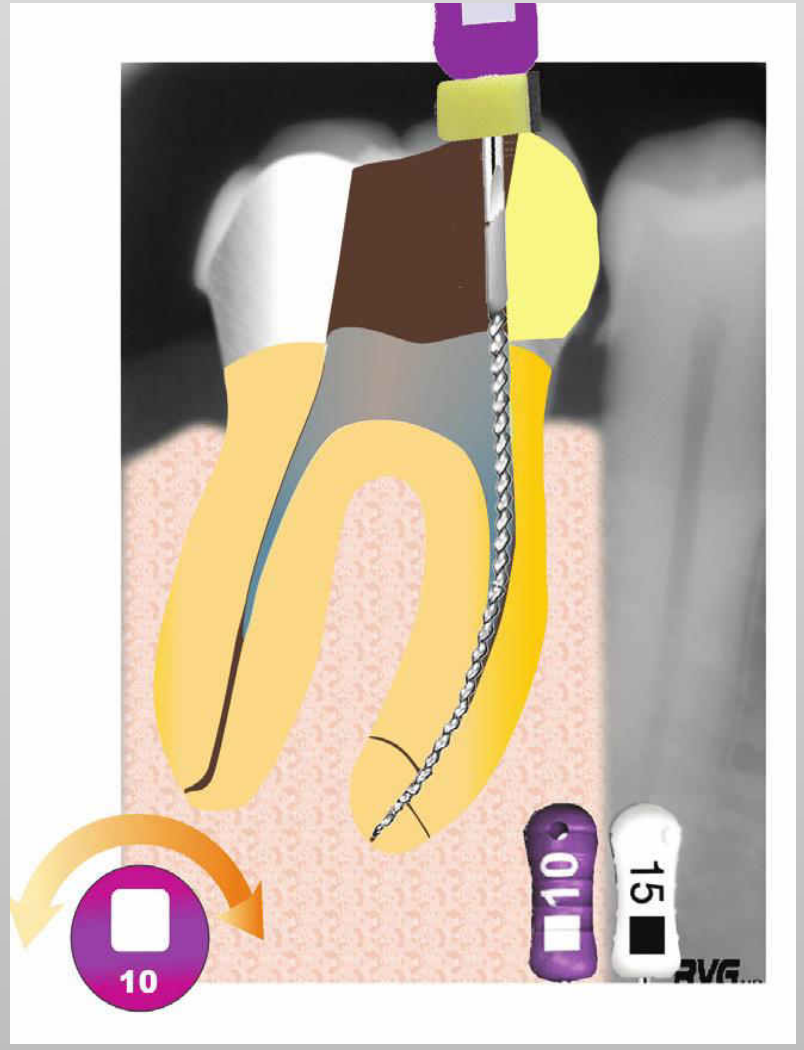
Determination of working length and step-back technique



Dr János Vág Phd
Department of Conservative Dentistry
Semmelweis University

Based on **Mahmoud Torabinejad, Richard E. Walton,**
ENDODONTICS: PRINCIPLES AND PRACTICE 4th edition

Anatomy of the apex

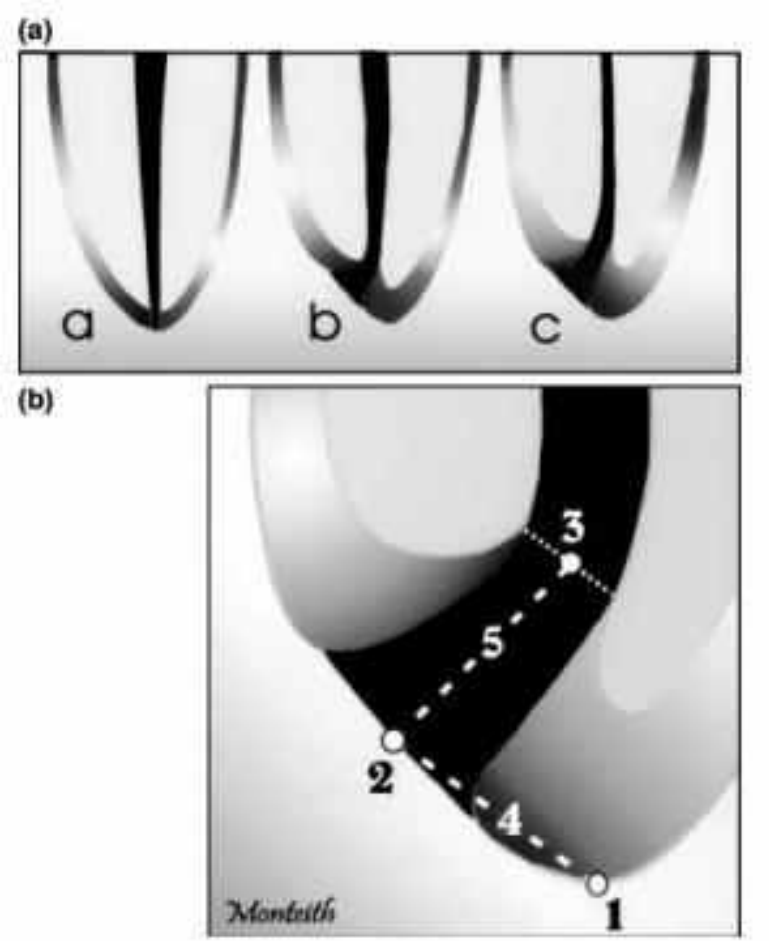


Figure 1 (a) Position of the apical foramen (adapted from Kuttler 1955). (b) Anatomy of the root apex (adapted from Kuttler 1955).

1. Radiological apex (anatomical)
2. Major foramen (foramen apicale)
3. Minor foramen (apical constriction, foramen physiologicum, CDJ)
4. Distances: 0.36-0.6 mm (but could be 3 mm)
5. Distances: 0.5-0.8 mm
6. age, tooth type, curvature


A

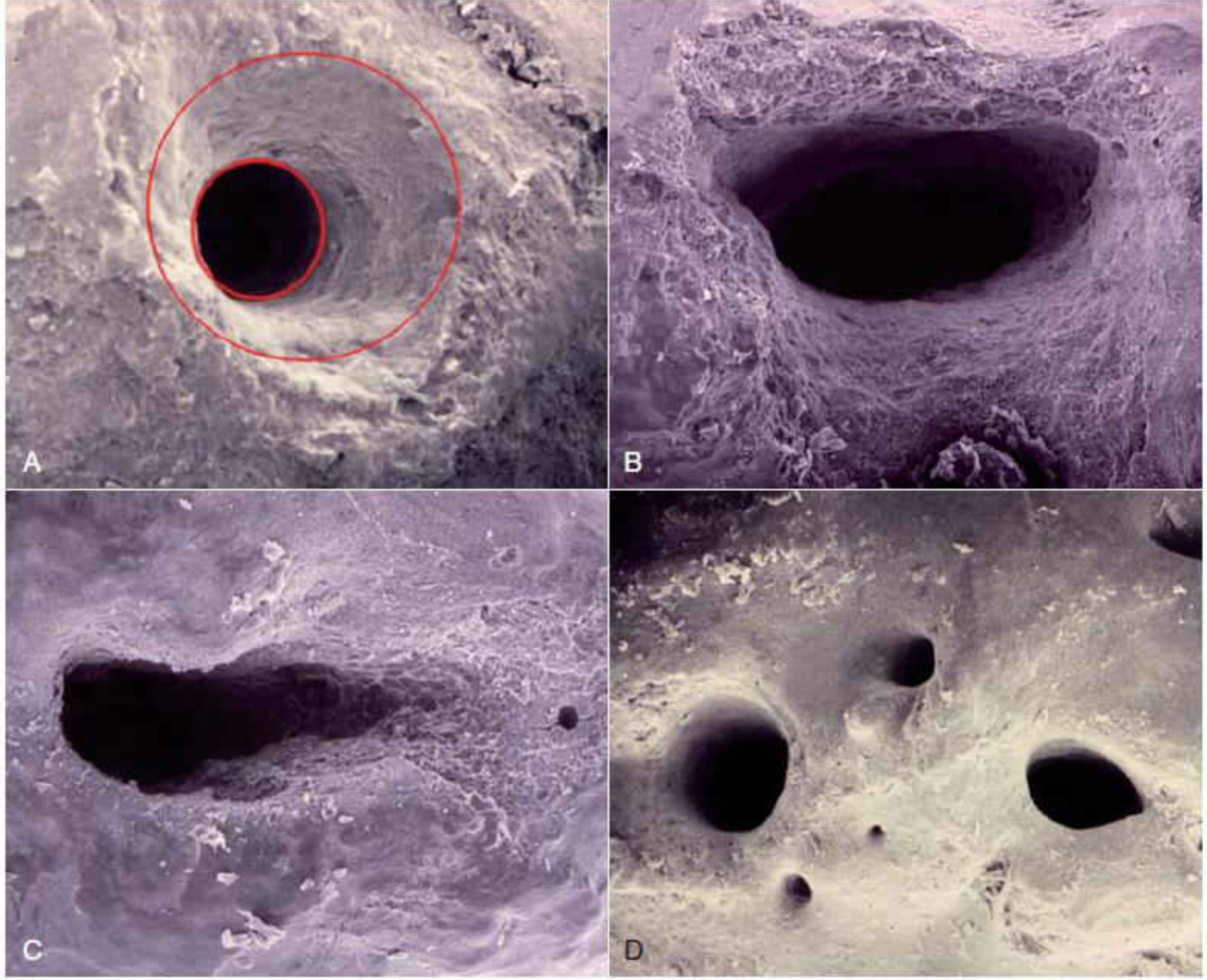


Figure 15-4 **A,** The classic apical anatomy consisting of the major diameter of the foramen and the minor diameter of the constriction. **B,** An irregular ovoid apical canal shape and external resorption. **C,** A bowling pin apical morphology and an accessory canal. **D,** Multiple apical foramina.

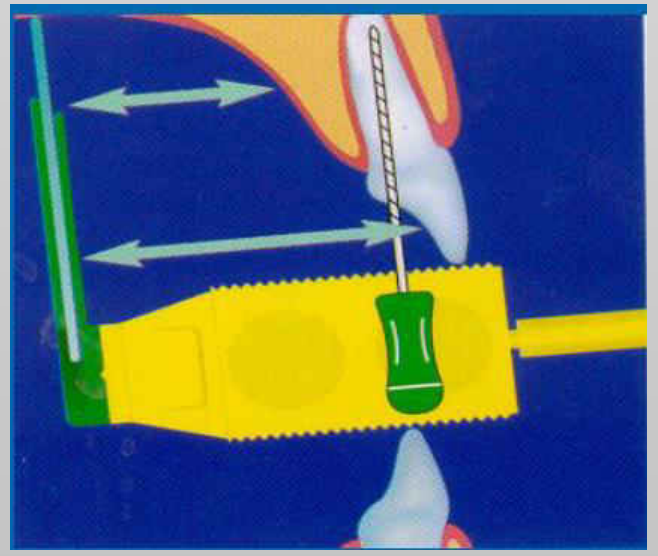
Working sheet

	Estimated WL	AL (-0.5mm)	Needle Control	Adjusted WL	MAF	enlargement	
MB	21 mm						
ML	21mm						
D	20mm						

Estimated working length

Parallel technique

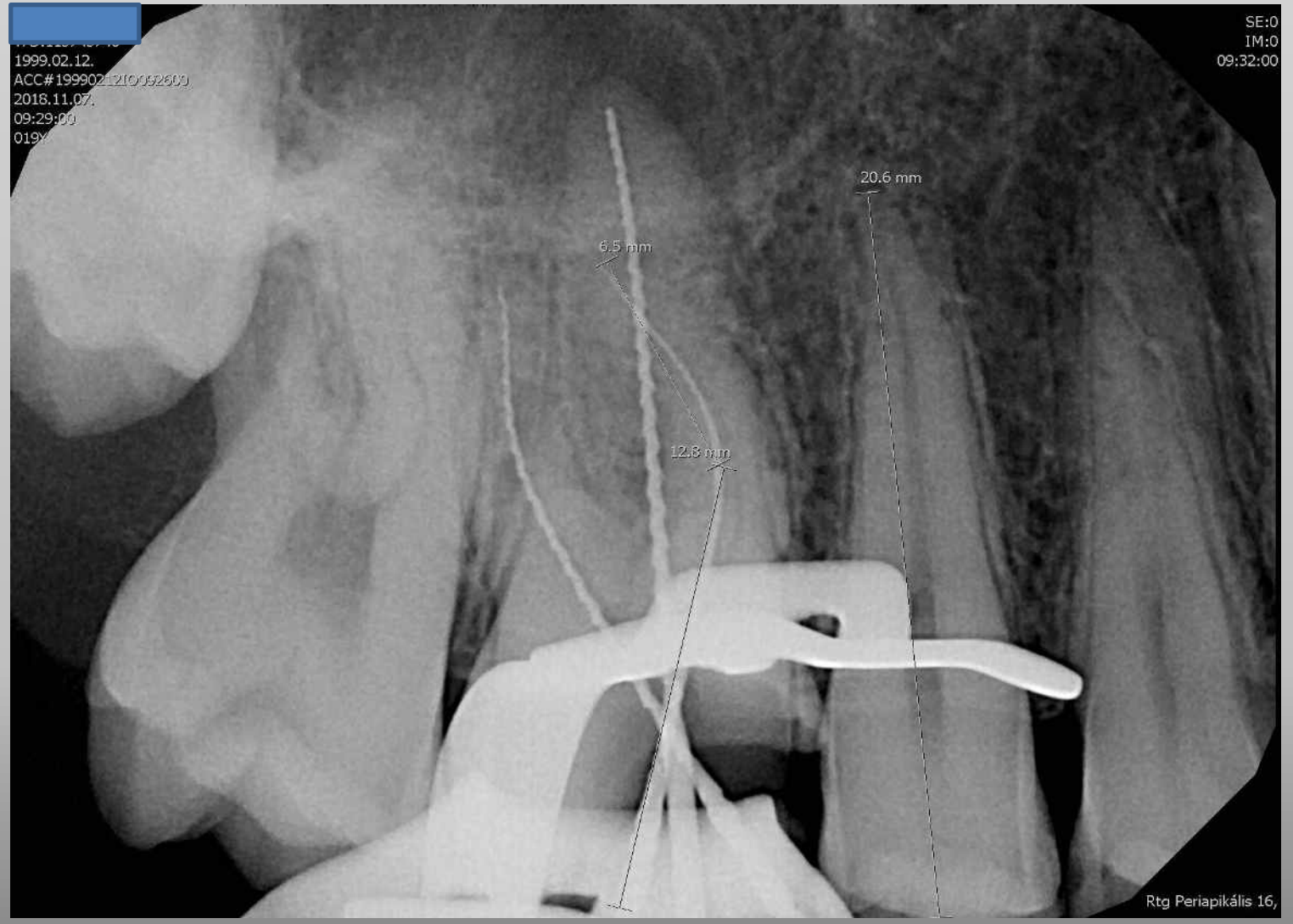
- Filmholder
- Long tube



Pre-operative x-ray

Calculation of estimated WL

- film: 3 mm
  - Magnification: 10% (at about 2 mm)
  - Distance: (radiological apex – apical constriction): 1 mm (or more)
- digital: 1 mm

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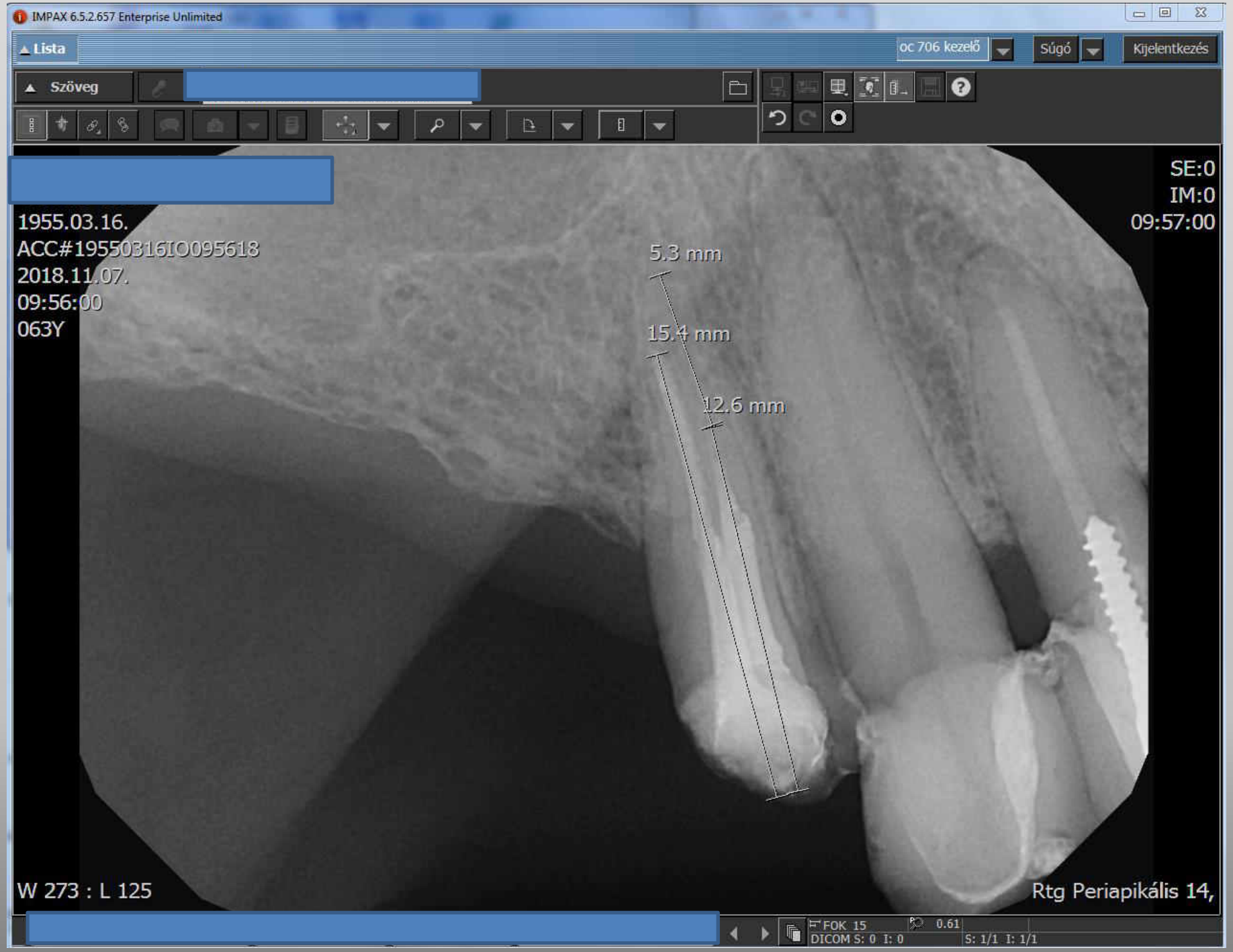

IMPAX 6.5.2.657 Enterprise Unlimited
Lista
oc 706 kezelő
Súgó
Kijelentkezés
Szöveg
1955.03.16.
ACC#19550316IO095618
2018.11.07.
09:56:00
063Y
SE:0
IM:0
09:57:00
5.3 mm
15.4 mm
12.6 mm
W 273 : L 125
Rtg Periapikális 14,
FOK 15
0.61
DICOM S: 0 I: 0
S: 1/1 I: 1/1

Apex locators

- 1918. Custer, idea
- 1942. Suzuki, the equation
- 1962. Sunada, the first working machine, First generation (direct current, sensitivity to fluid, calibration, painfull)
- 1972. Second generation (alternating current, one frequency, impedance, calibartion requirement: sensitivity to wet)
- 1994. Third generation
- (alternating current, several frequencies, difference or ratio of impedances)
- IV., V., VI. generations

Fig. 2. Simple d.c. ohmmeter for measuring the length of the root canal using direct electric current

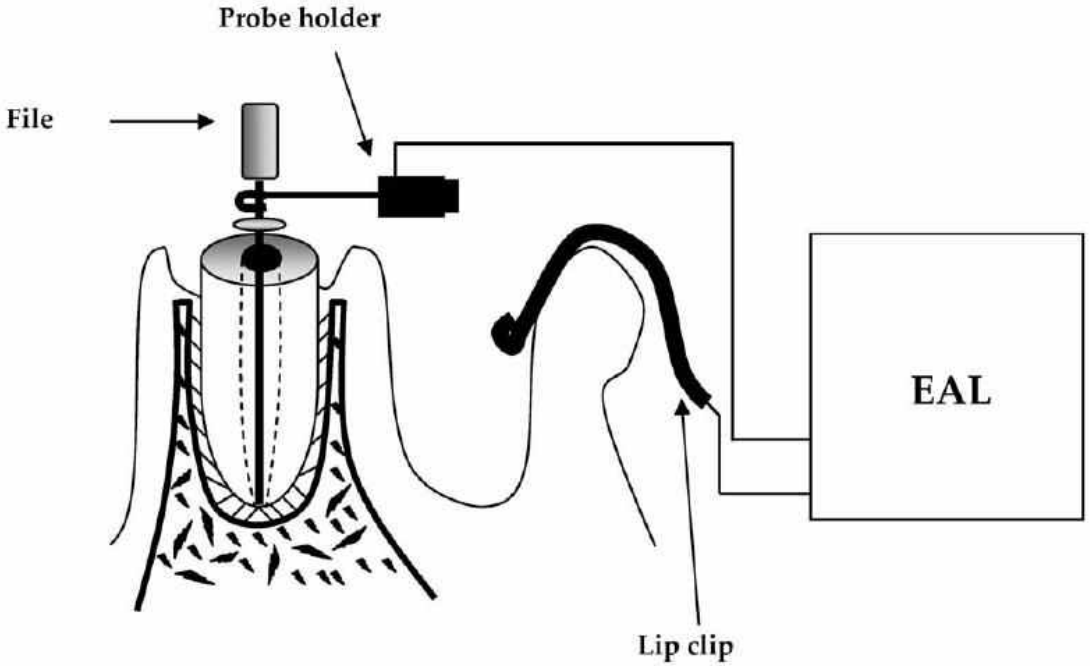
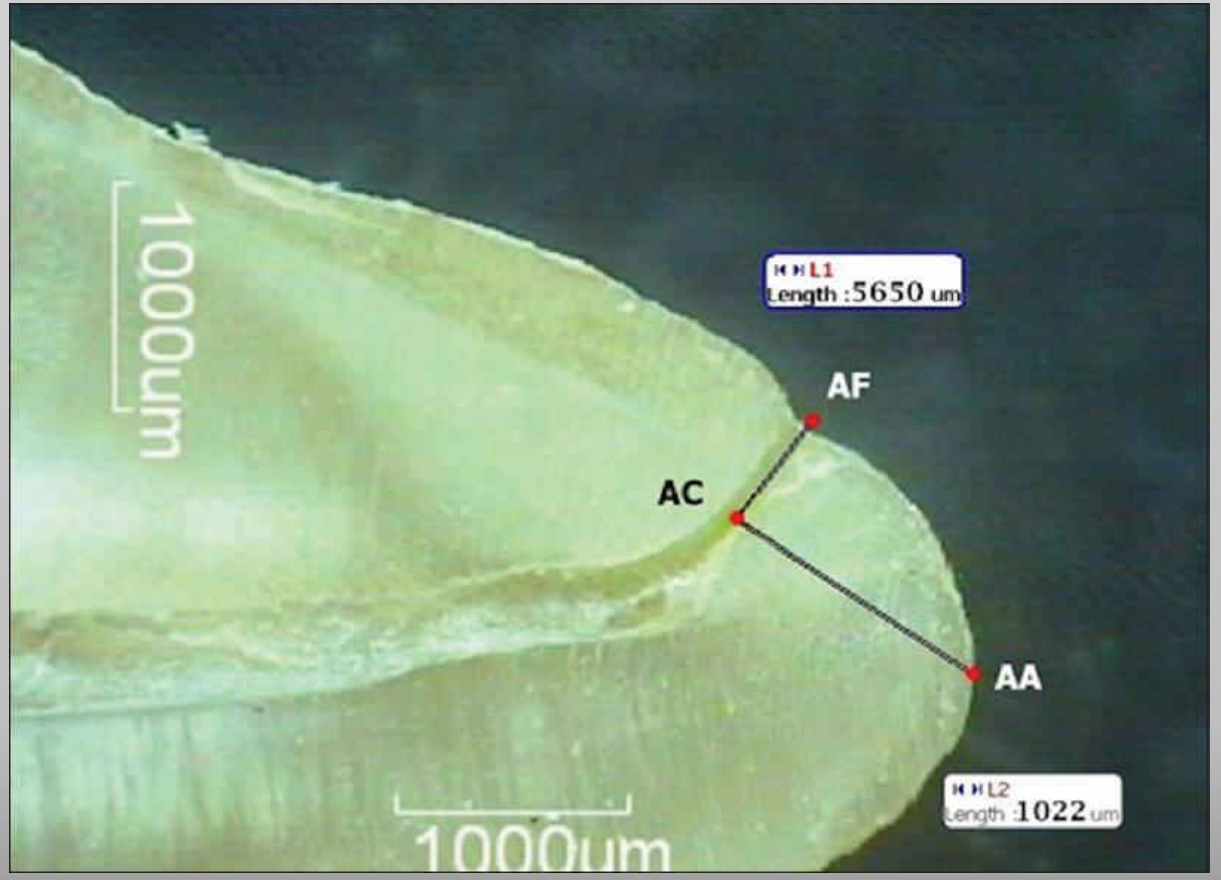
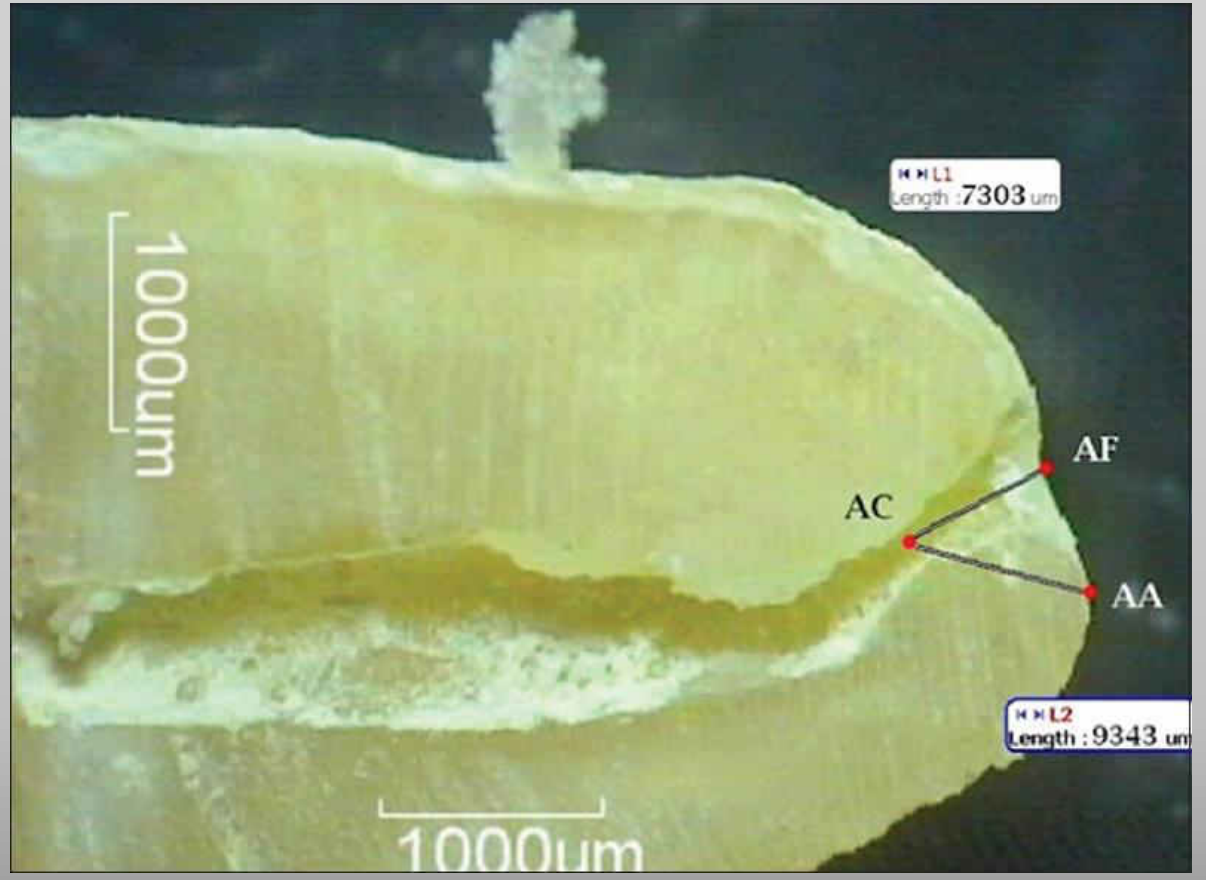
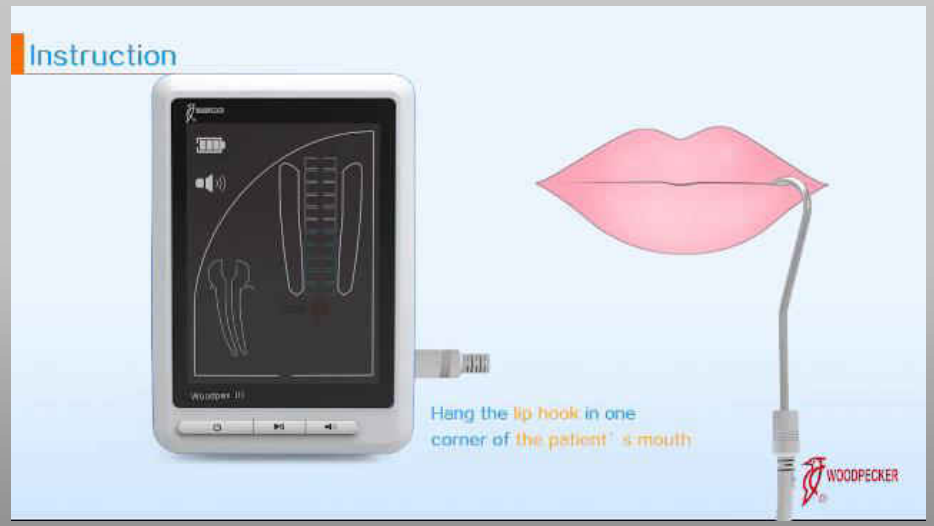


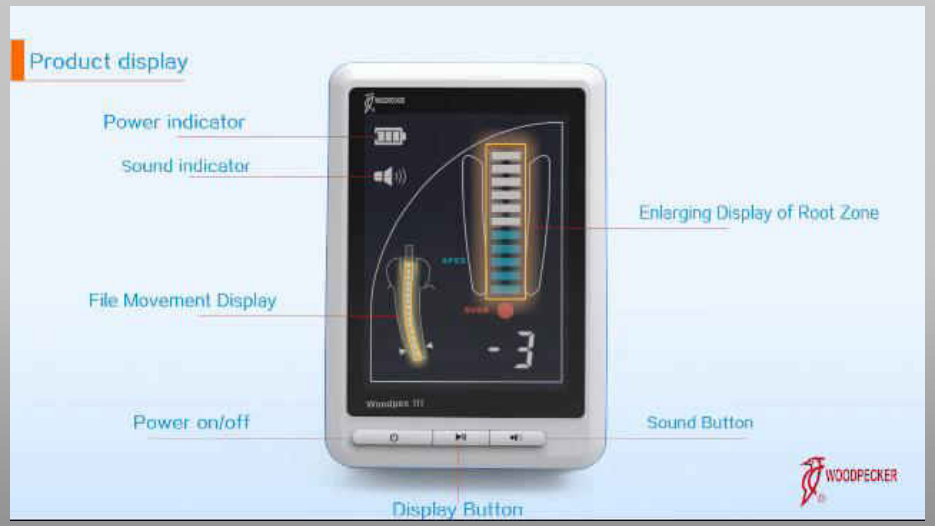
Fig. 3. Typical circuit for electronic determination of working length


1000um
L1
Length :5650 um
AF
AC
AA
L2
Length :1022 um
1000um

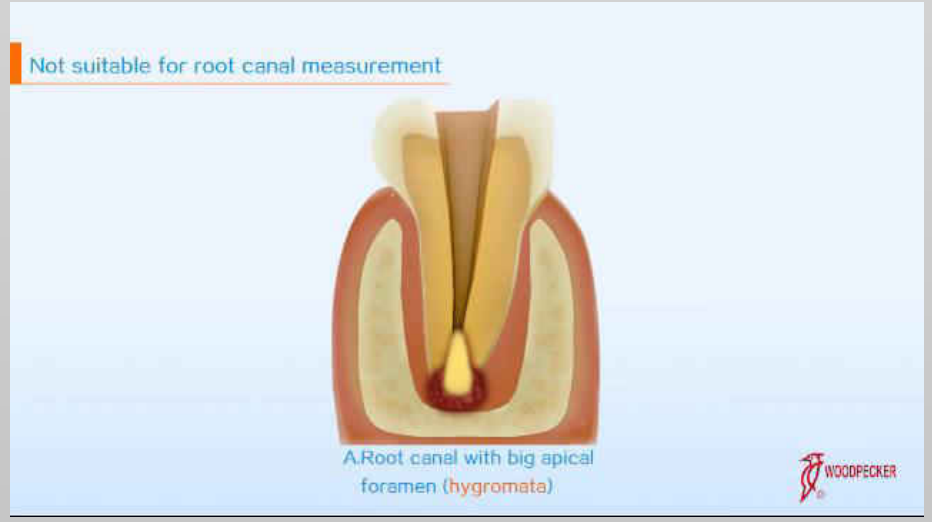

1000um
L1
Length :7303 um
AF
AC
AA
L2
Length :9343 un
1000um

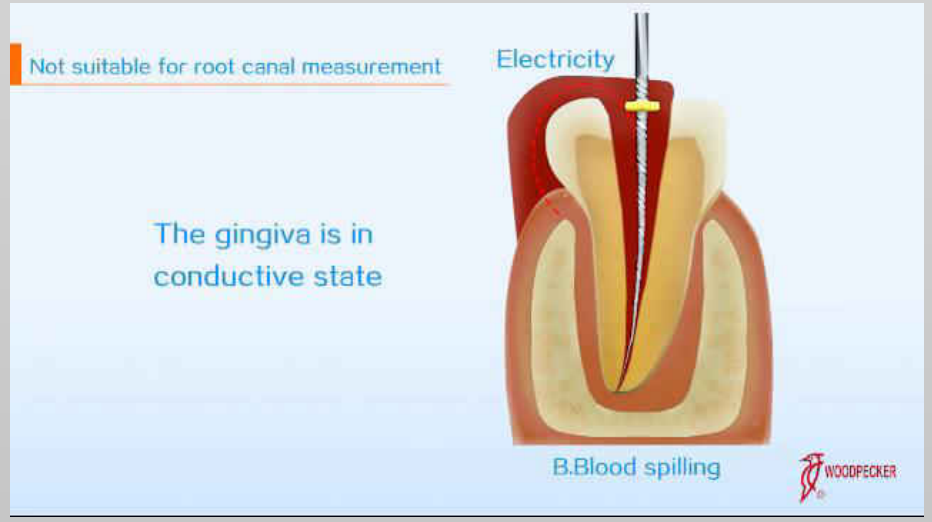
Apex locator

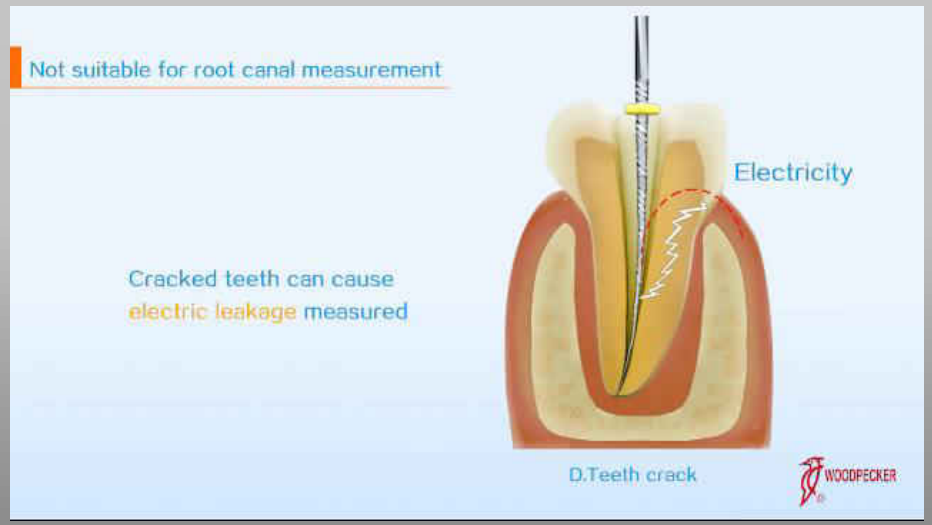


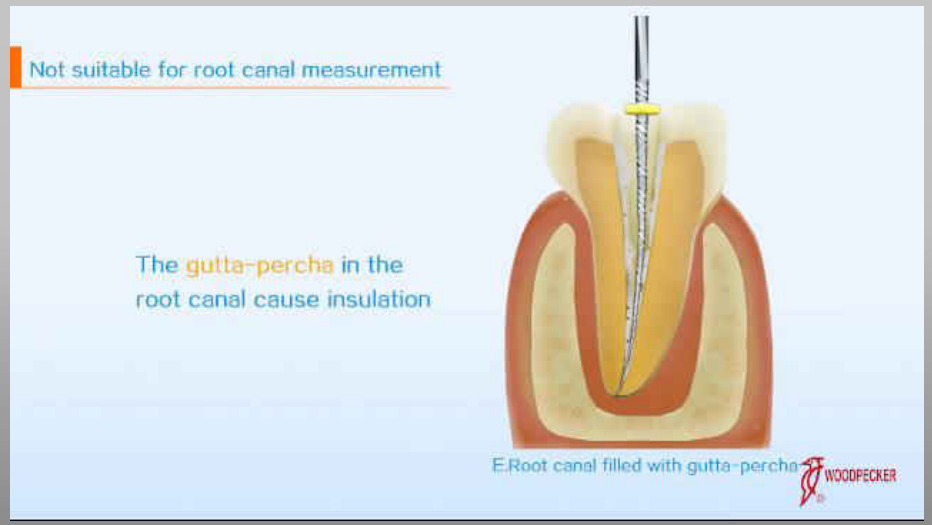


Problems


Not suitable for root canal measurement
A.Root canal with big apical foramen (hygromata)
WOODPECKER


Not suitable for root canal measurement
The gingiva is in conductive state
Electricity
B.Blood spilling
WOODPECKER

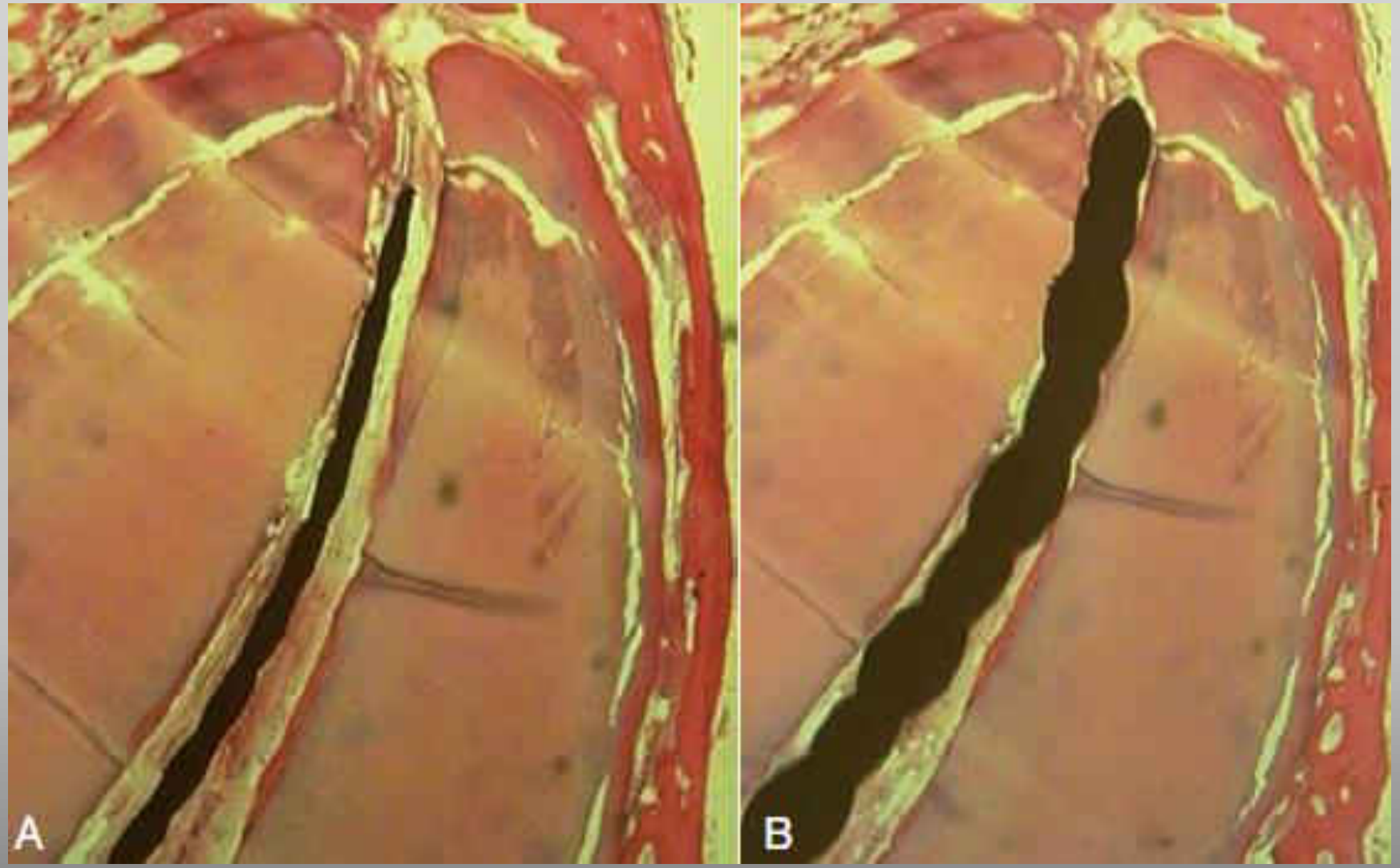

Not suitable for root canal measurement
Cracked teeth can cause electric leakage measured
Electricity
D.Teeth crack
WOODPECKER


Not suitable for root canal measurement
The gutta-percha in the root canal cause insulation
E.Root canal filled with gutta-percha
WOODPECKER

Instruction

WOODPECKER

Apical preparation, IAF and MAF



IAF

2 sizes more

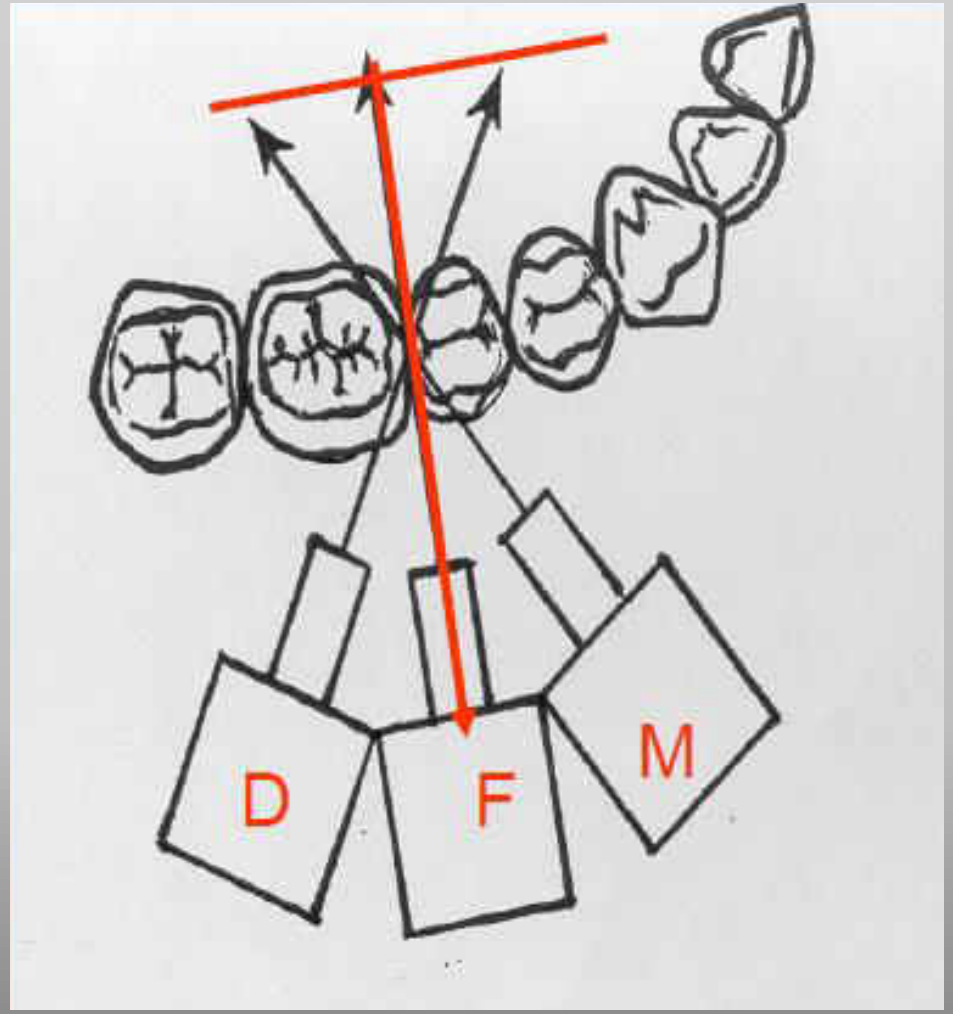
MAF

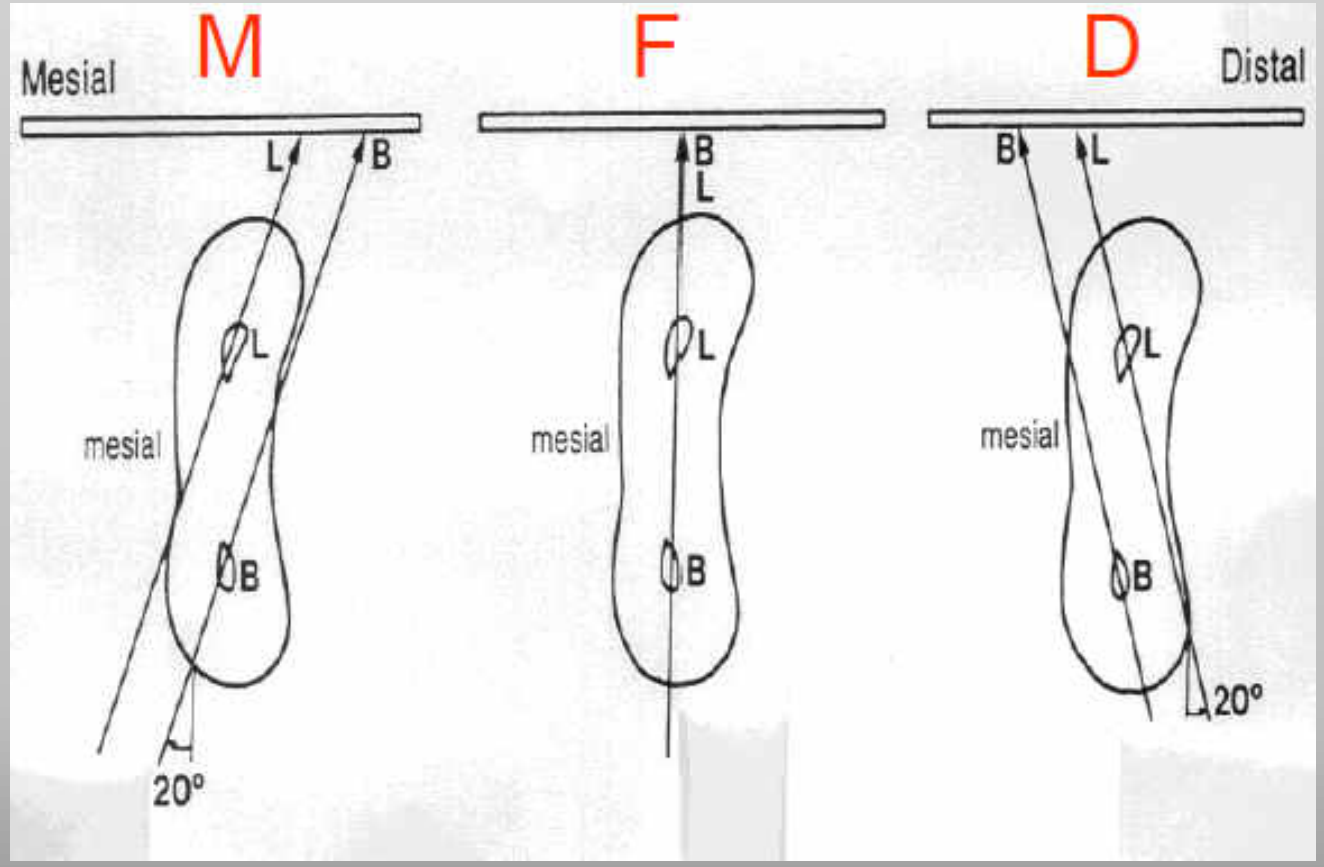
Working sheet

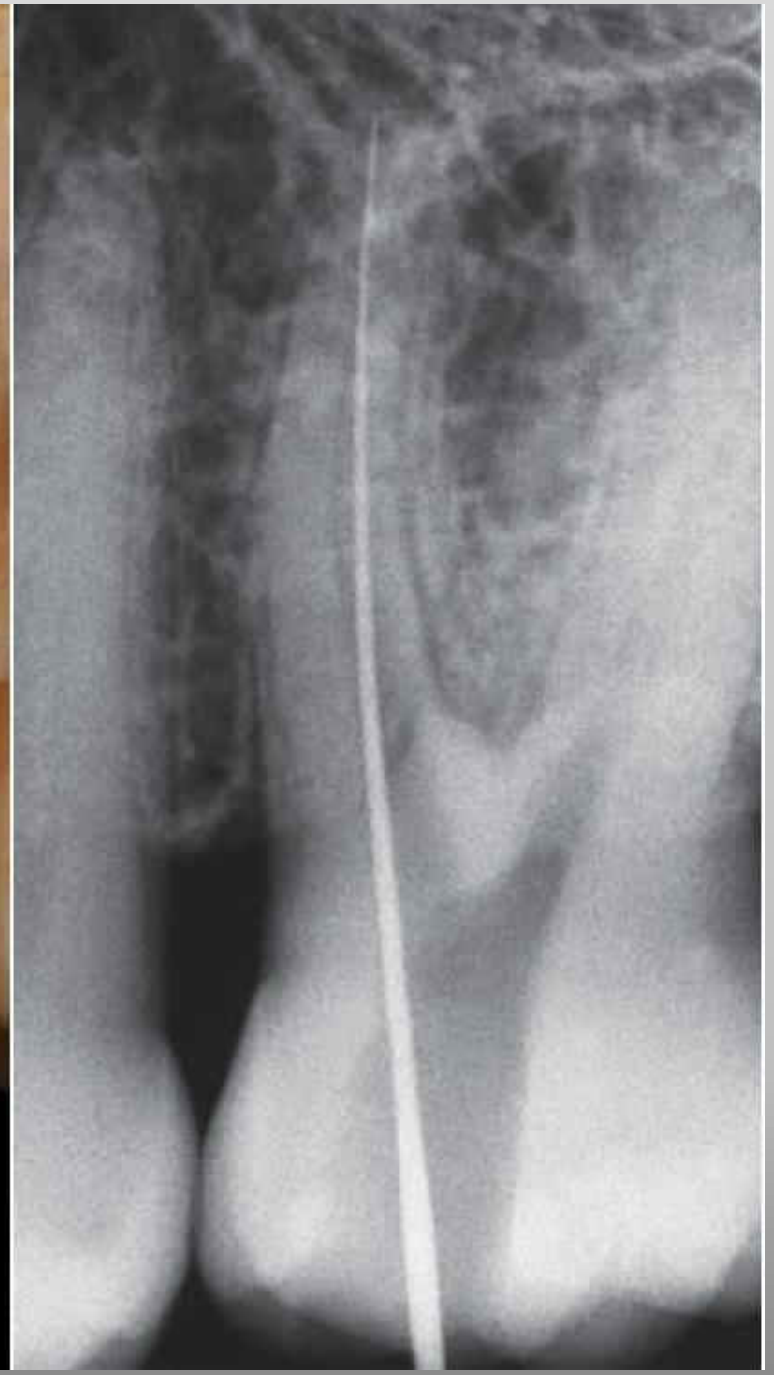
	Estimated WL	AL (-0.5mm)	Needle Control	Adjusted WL	MAF	enlargement	
MB	21 mm	19.5mm	19.5mm (15 Hedström)	19.5mm	25		
ML	21mm	19.5mm	19.5mm (15 K-file)	19.5mm	25		
D	20mm	21mm	21mm (20 K-file)	21mm	35		

Needle control

Excentric radiograph







Comparison of two methods

Radiological (needle control)	**Apex locator**
• distance 1-4 mm	• 0.5 mm
• Superimposition of anatomical structures	• -
• Exposure	• - (pregnancy)
• Multiple canals could be probelmatic	• -
• Rubber dam problematic	• neccessity
• calculation	• -

Cleaning and Shaping

(Chemomechanical preparation)

The criteria of canal preparation

– developing a continuously tapered tunnel

– maintaining the original shape of the canal

– maintaining the apical foramen in its original position

Proportionally enlarge

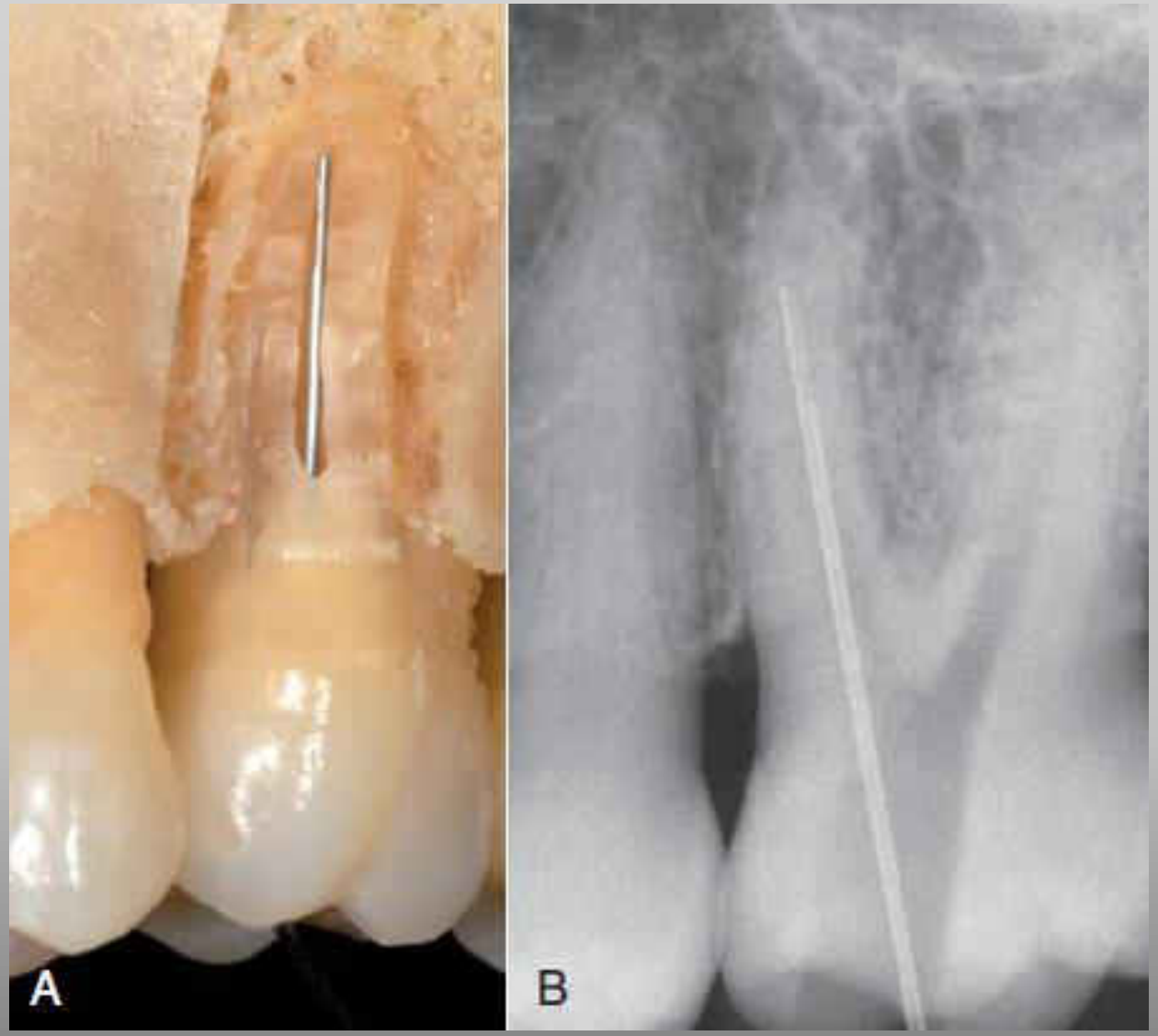
– keeping the apical opening as small as possible (prevention of reinfection, apical stop for obturation)

– developing glassy smooth walls

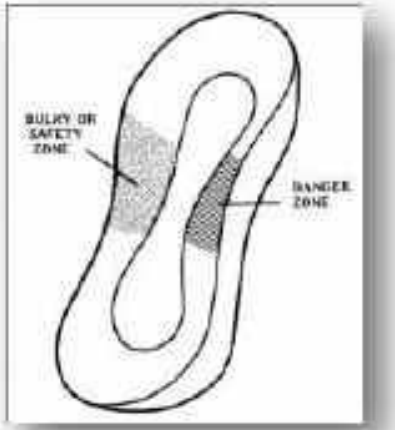
Reason of the tapered enlarged shape

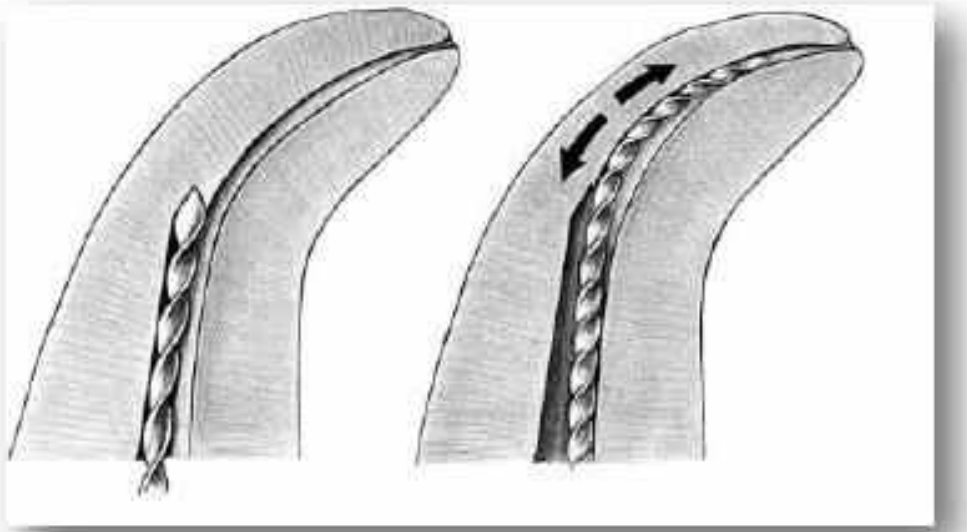
- Removing infected dentin
- Irrigation
- Obturation (condensation)

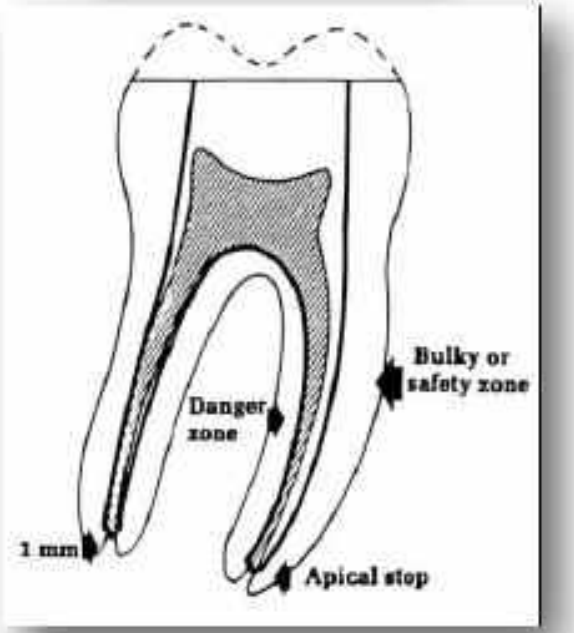
Effective irrigation



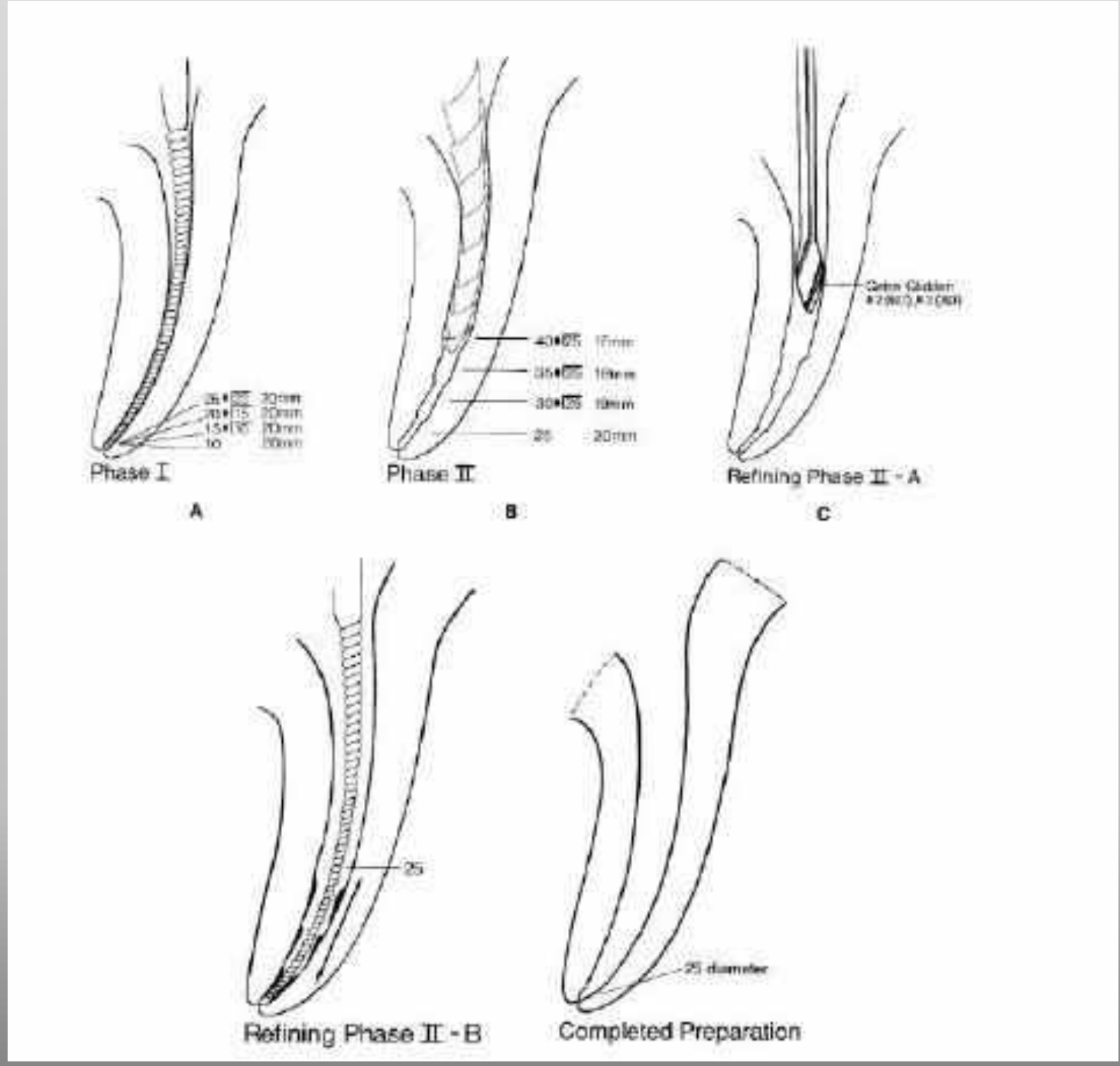
Considerations when Preparing Curved Canals





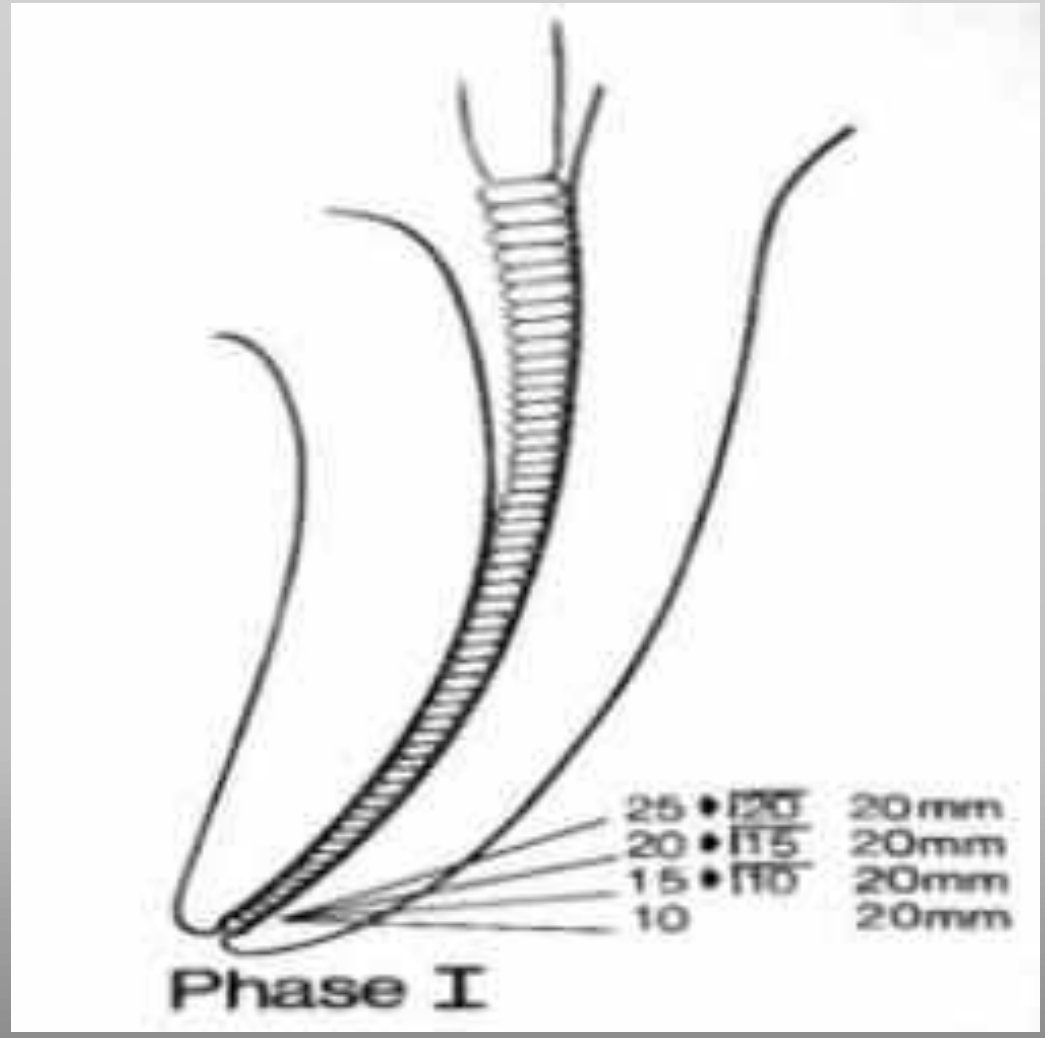


Step-back technique



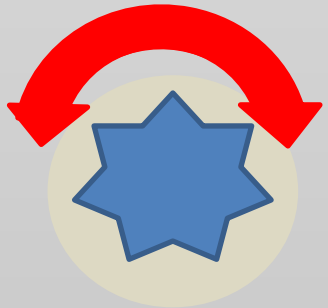
Phase I

- Apical preparation starting at the apical constriction
- Initial apical file (N 10-25)
- Enlargement at least three sizes more, master apical file



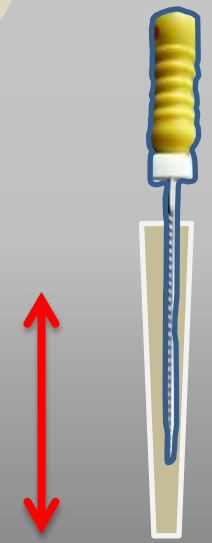
Movements for preparations

- Watch winding (clockwise/counterclockwise rotation, reciprocating)

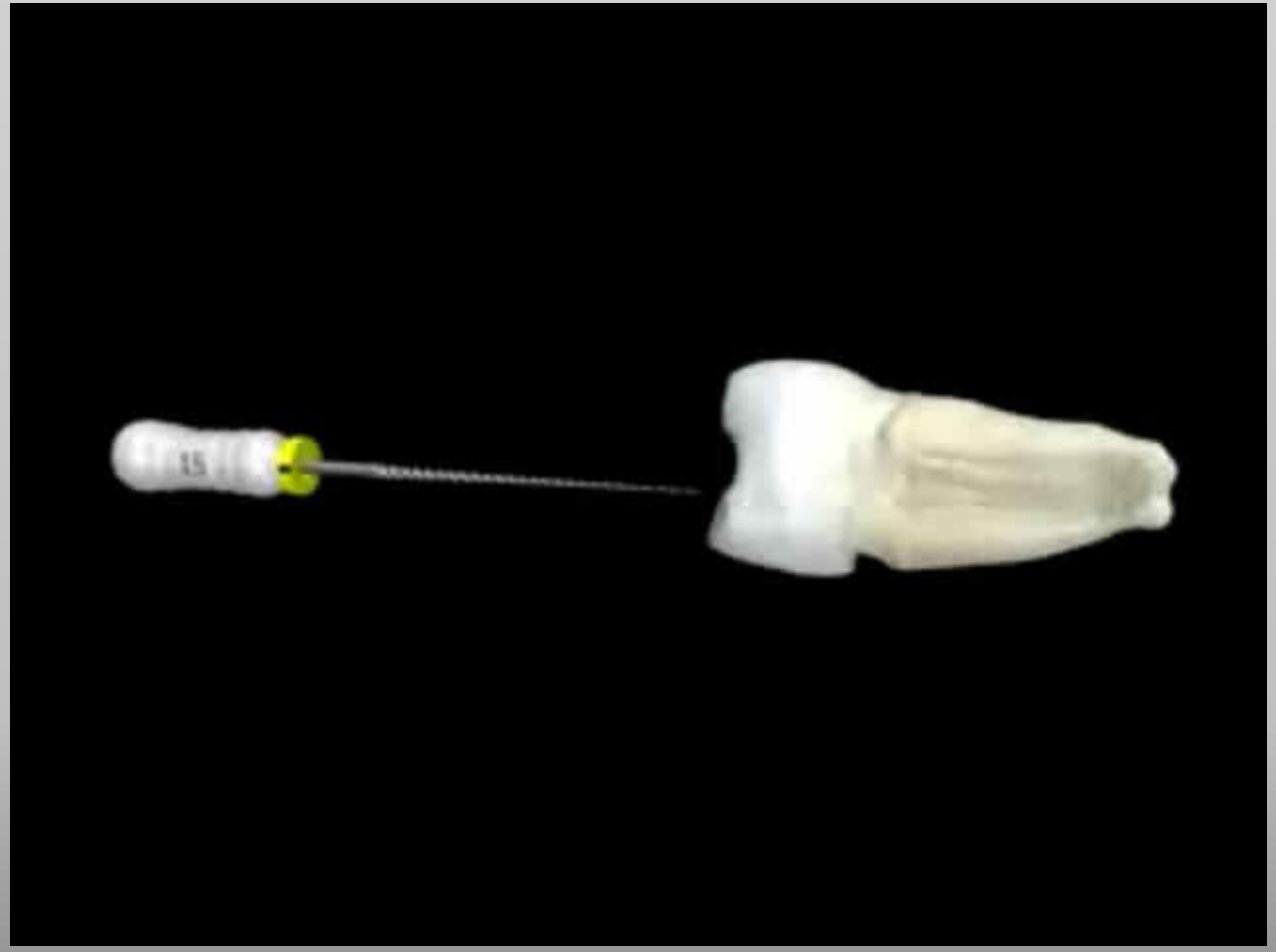


- Reaming (clockwise cutting rotation)

- Filing (scraping), Circumferential filing

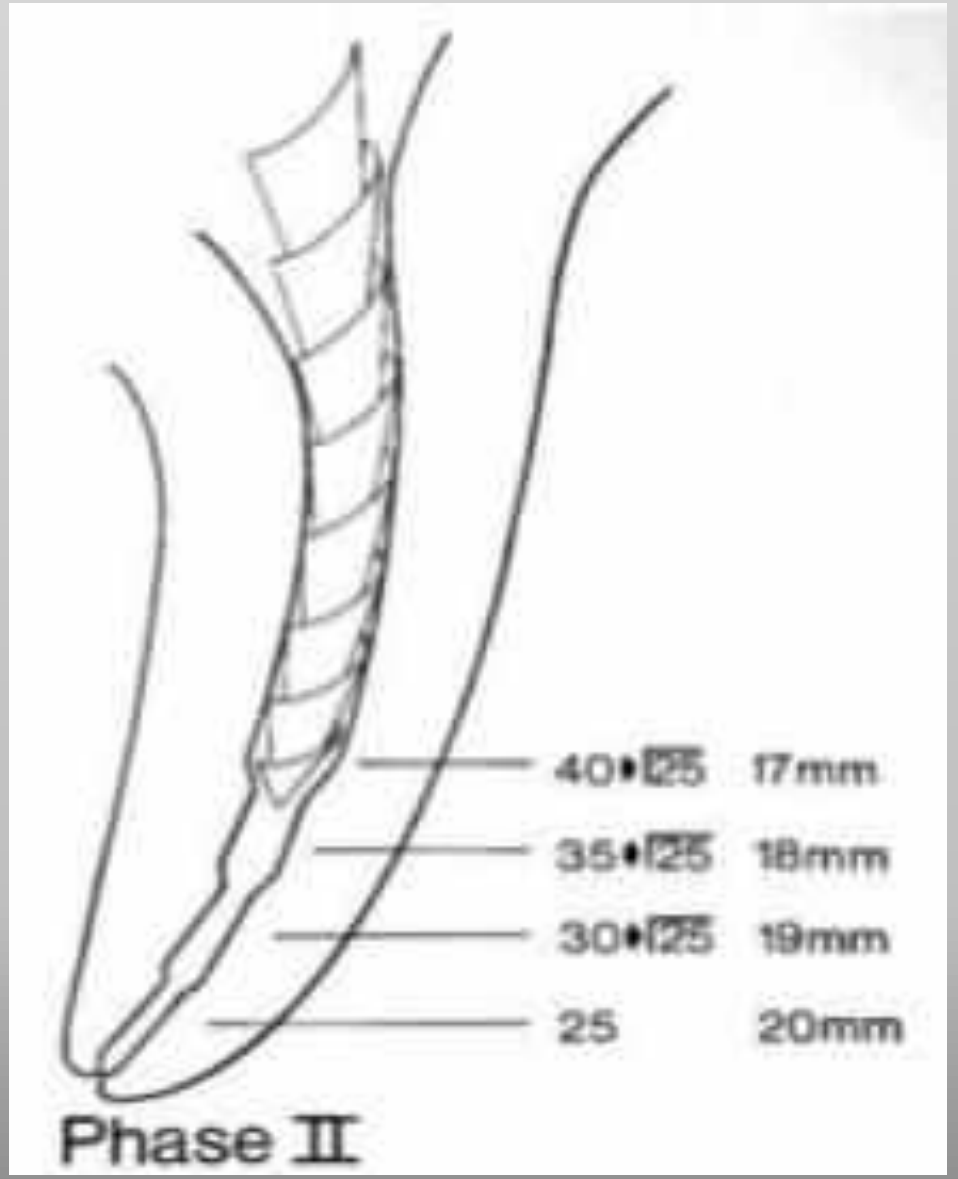


Watch-winding

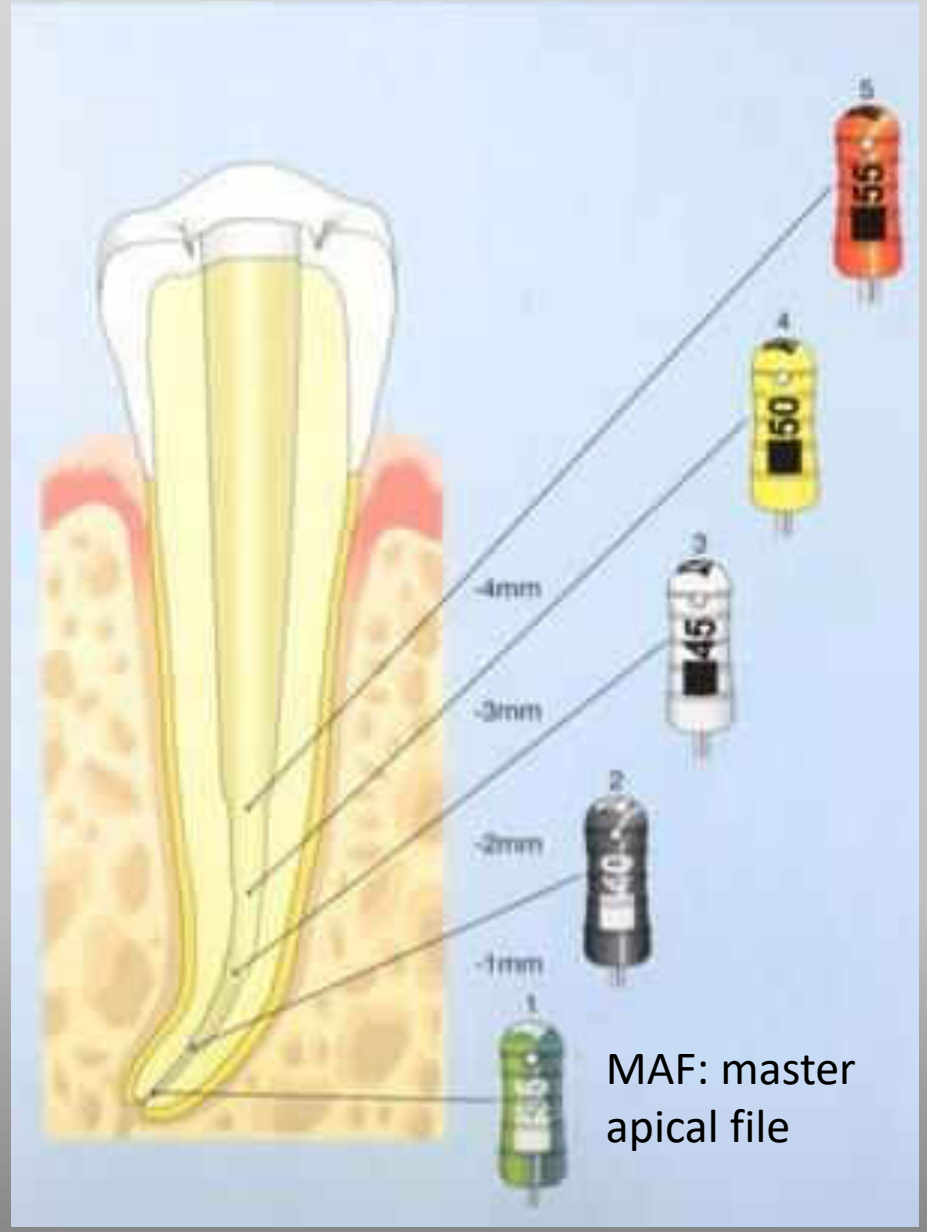


Phase II

- Increasing larger file shorter length (above N 25)
- 1, 2, és 3 mm short of working length
- Recapitulation: MAF is inserted to the WL to clear out any debris collecting in the apical part,



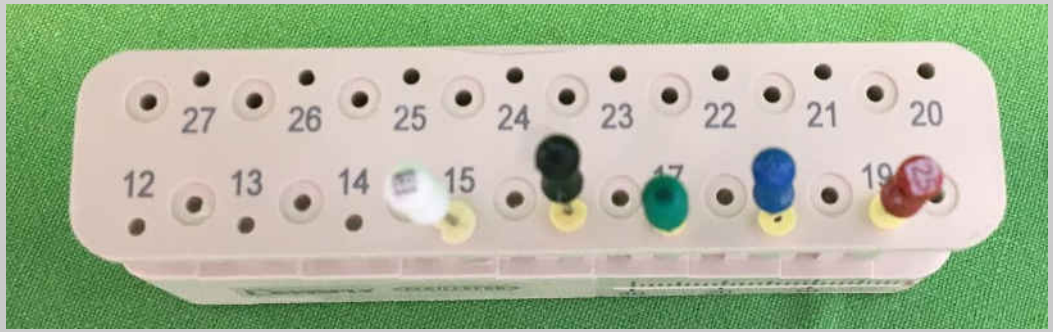
2018.11.05.	gyk	stepback	20mm (35-55)	CaOH	Üvegionomer



Working sheet

	Estimated WL	AL (-0.5mm)	Needle Control	Adjusted WL	MAF	enlargement	
MB	21 mm	19.5mm	19.5mm (15 Hedström)	19.5mm	25	40	
ML	21mm	19.5mm	19.5mm (15 K-file)	19.5mm	25		
D	20mm	21mm	21mm (20 K-file)	21mm	35		

File set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26
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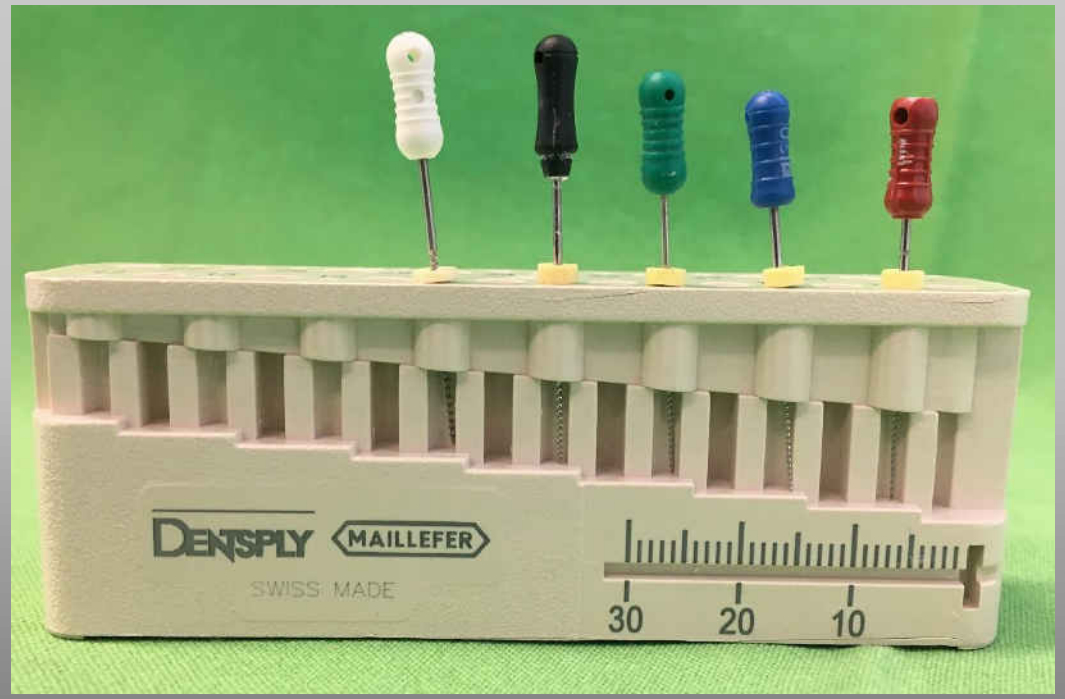
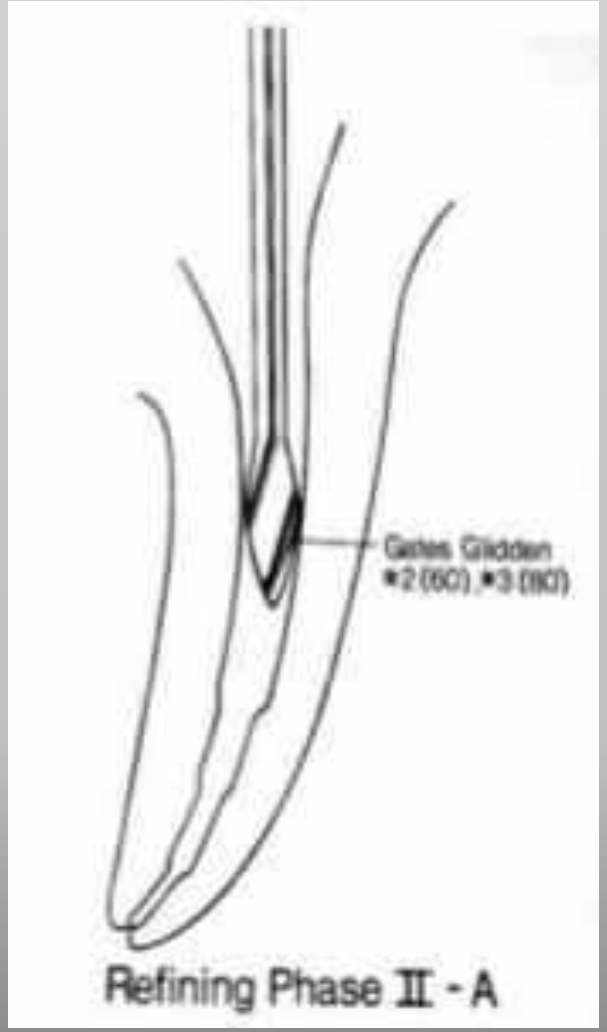

DENTSPLY
MAILLEFER
SWISS MADE
30
20
10

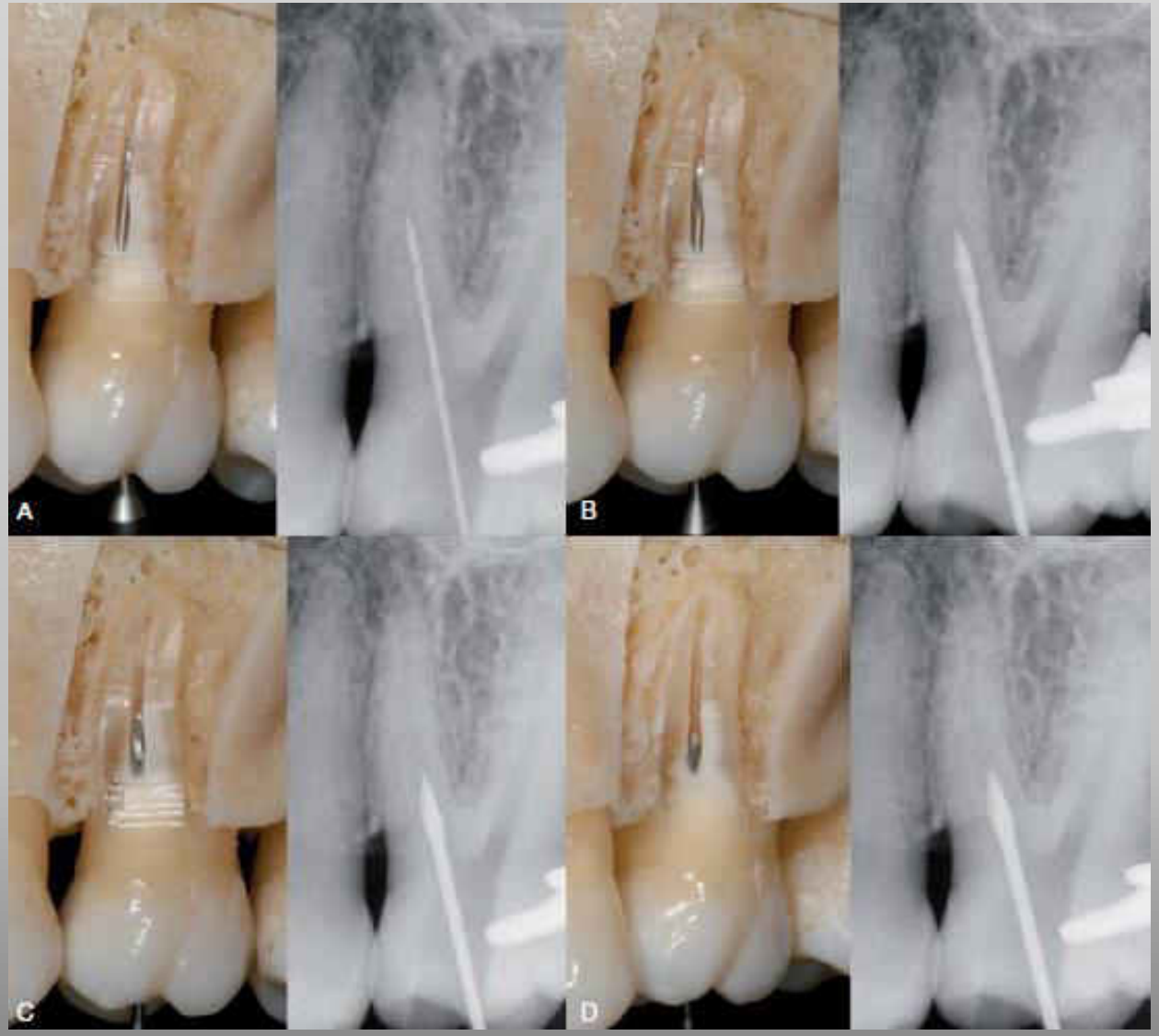
Refining phase II

- coronal flare
- mid root enlargement



Refining Phase II - A

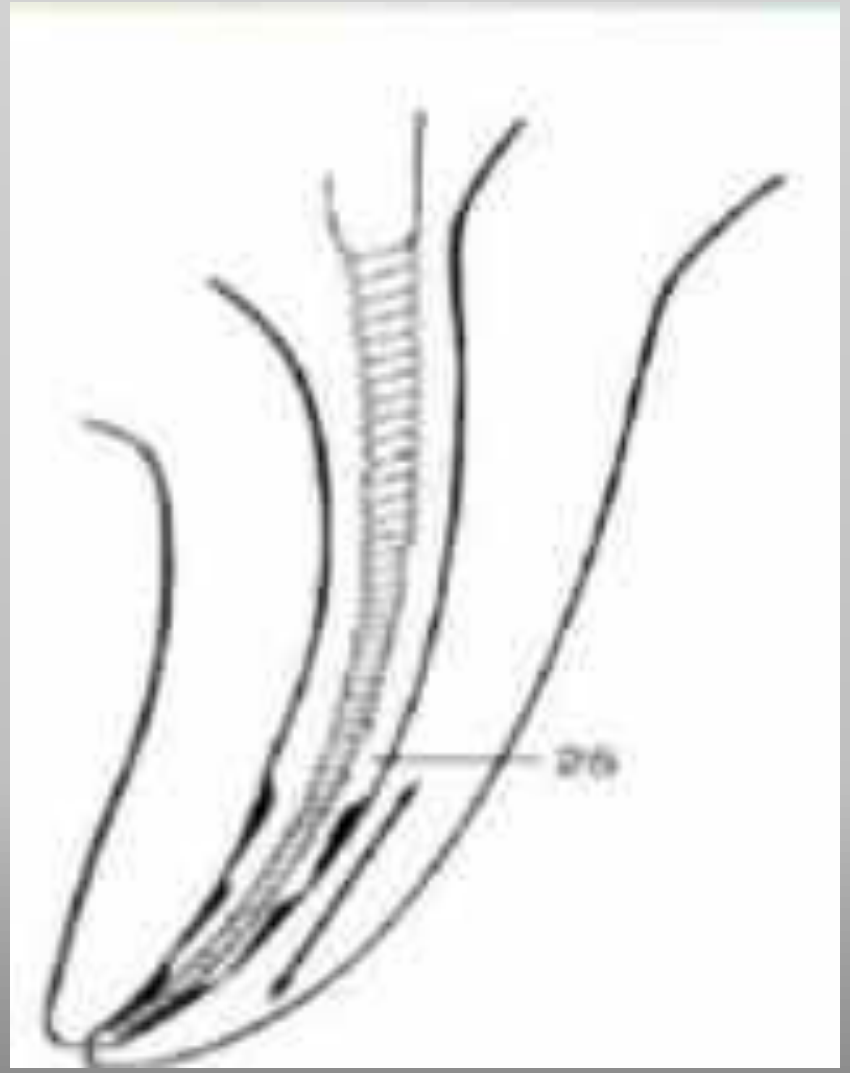
Coronal flare



The Diameter of Rotary Flaring Instruments

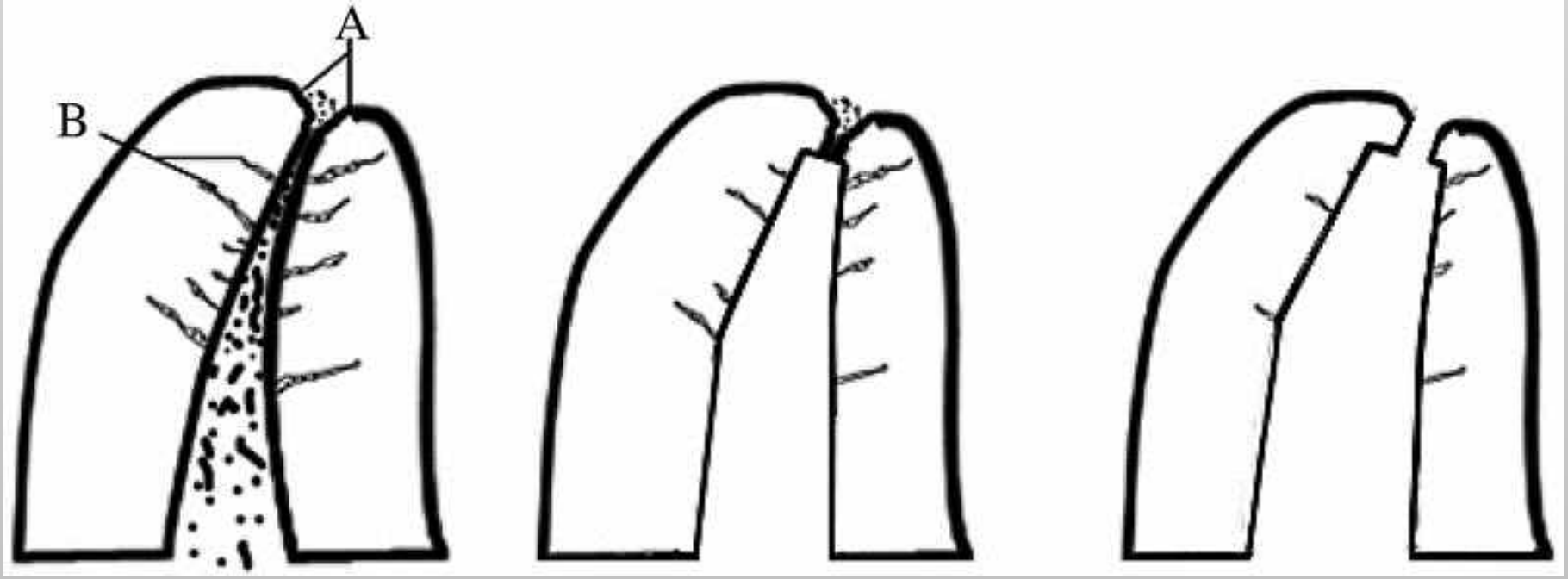
Size (No.)	Gates-Glidden Drills (mm)	Peeso Reamers (mm)
1	0.5	0.7
2	0.7	0.9
3	0.9	1.1
4	1.1	1.3
5	1.3	1.5
6	1.5	1.7

Recapitulation

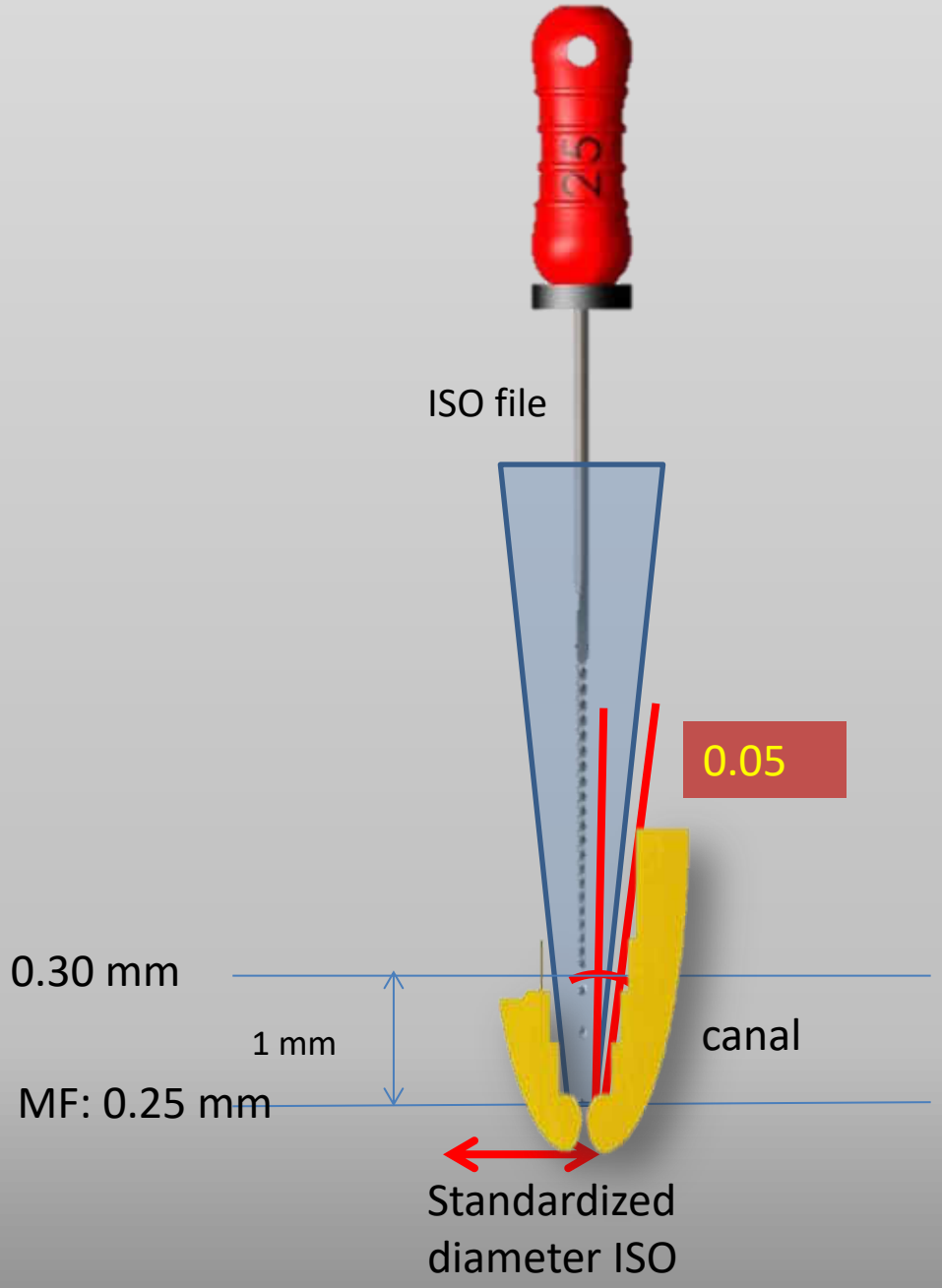


MAF

Apical clearing



Step-back technique



Aim: increase the diameter without procedural error

1. Filing (+apical last mm: rotation)
2. Incrementally reducing the working length when using larger and stiffer instruments
3. More tapering: Avoid procedural error, easier rinsing, compactable filling, better copying the non-rounded cross-section
4. Cons: procedural error still occur, apical dentin plug

Thank you for your attention