



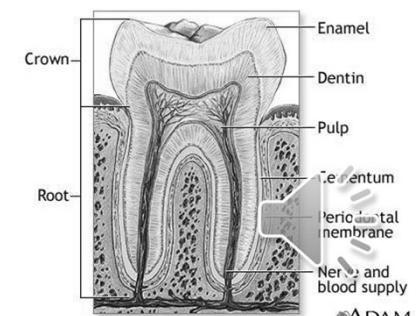
Morphology of R.C systems

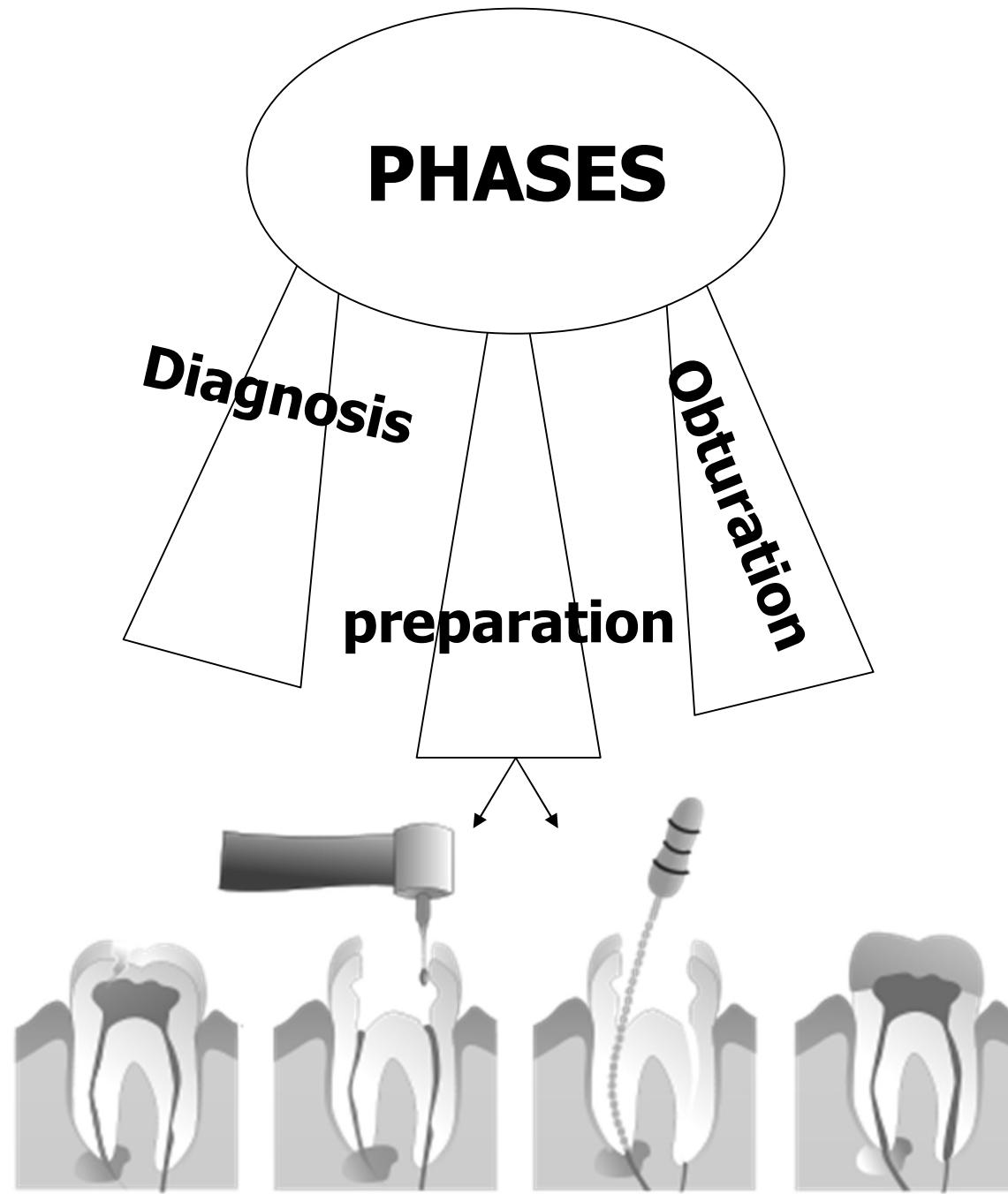
&

How to gain access to

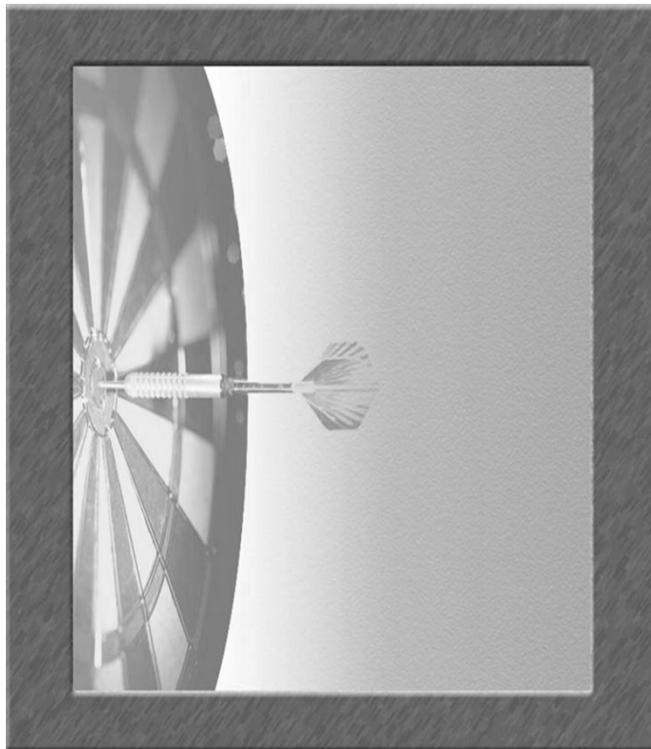
BDS,MSc,PhD

Lecturer in Endodontics





Our Goal

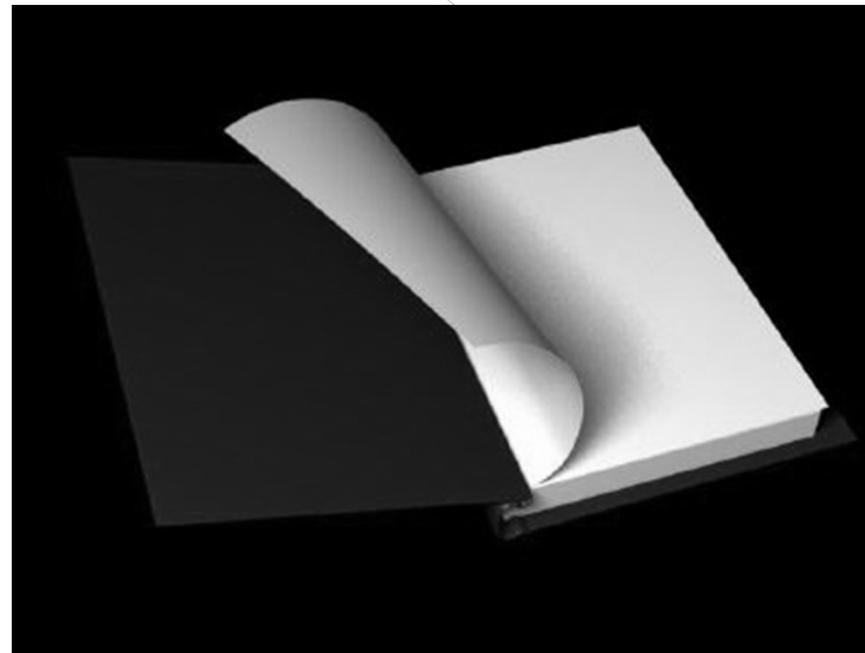


Three-dimensional, fluid-tight seal to the prepared pulp space
both coronally and apically.

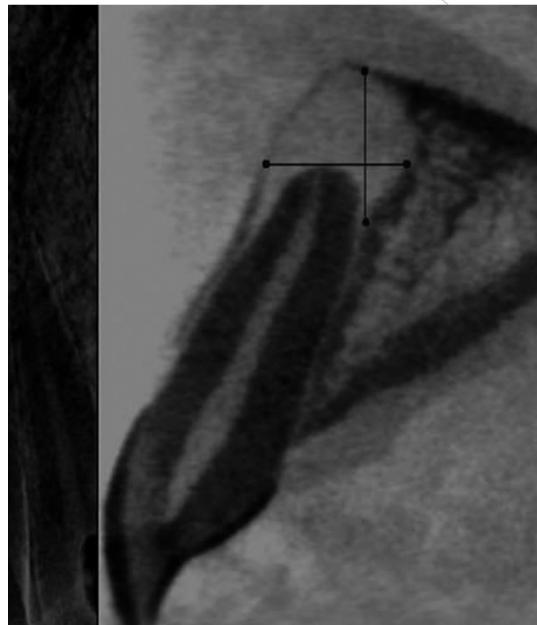


Methods of determining the root anatomy:

knowledge



Methods of determining the root anatomy:



**Radiographic
evidence**





exploration

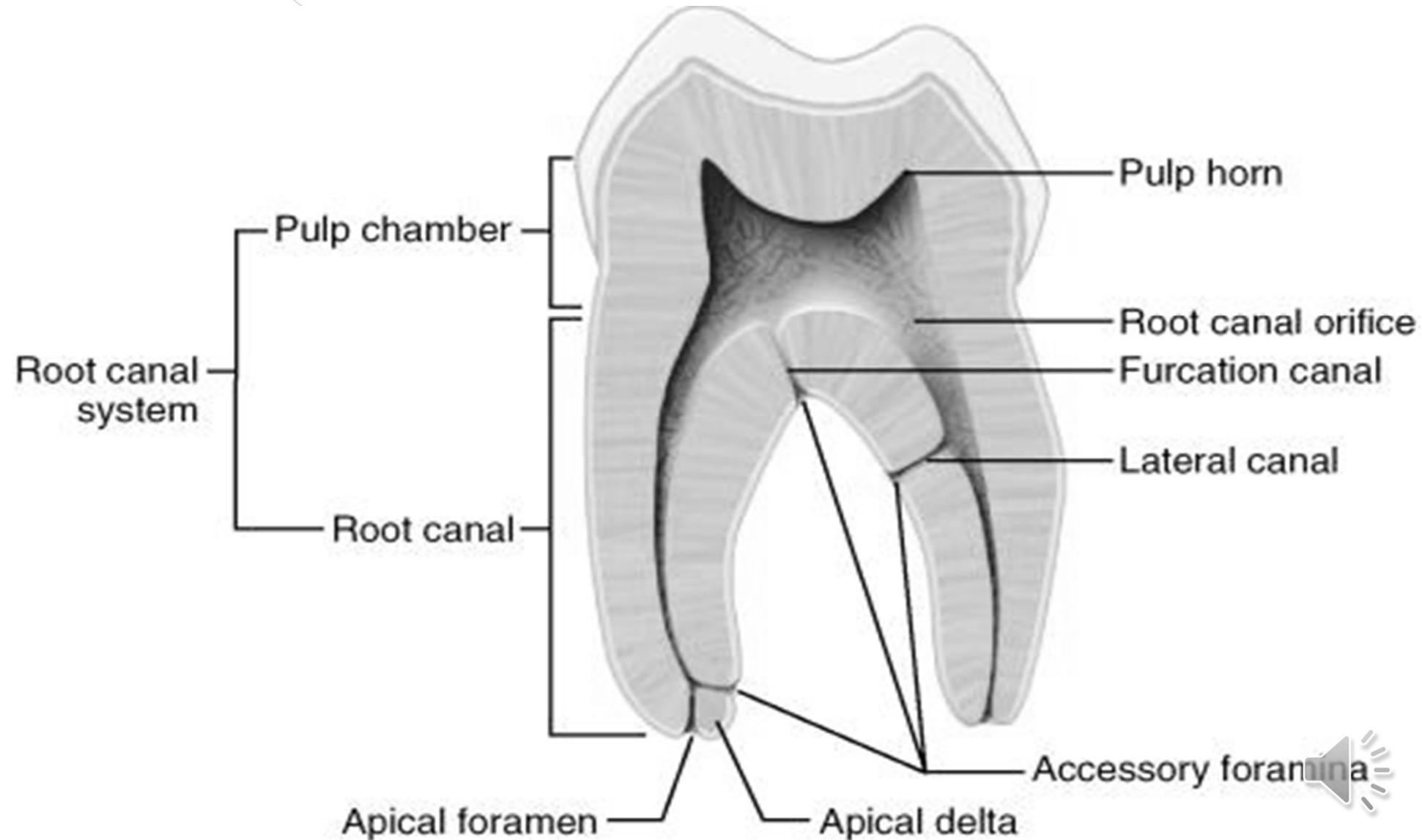


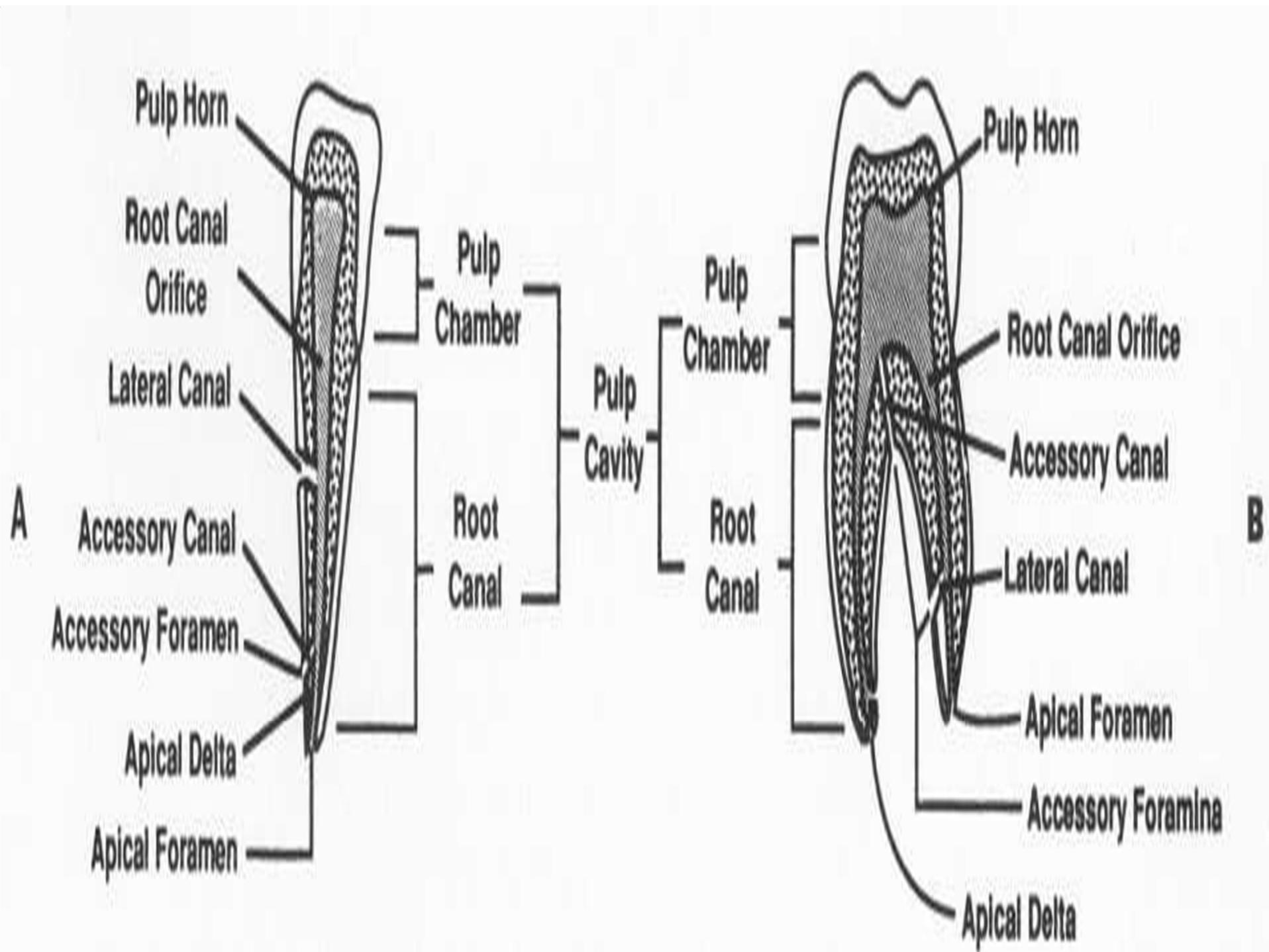


exploration

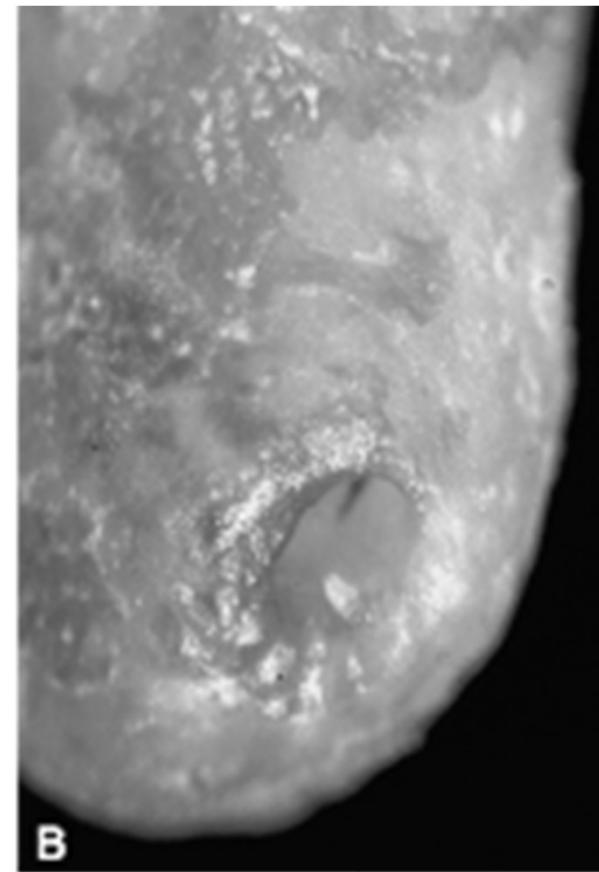
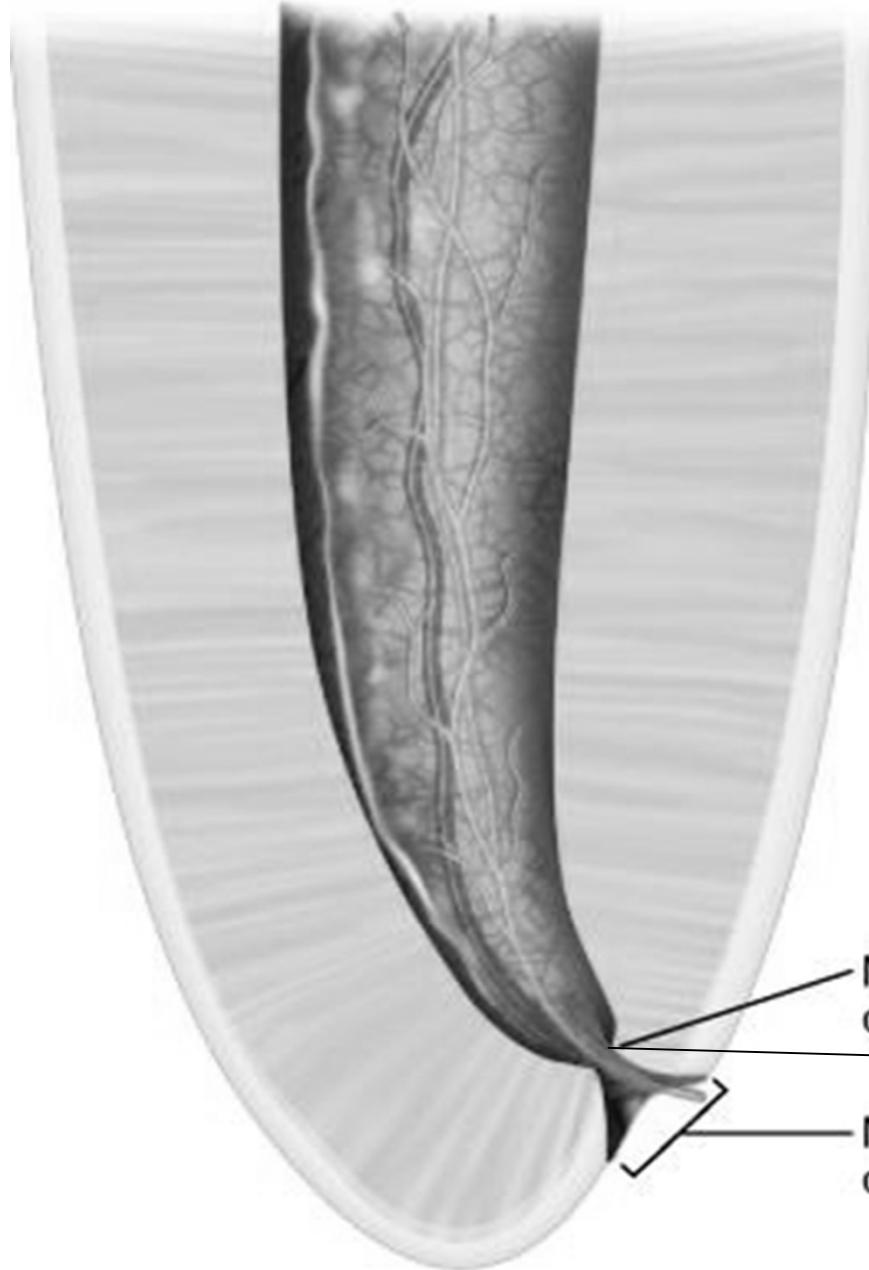


Components of the root canal system





Anatomy of the apical root



Minor apical diameter

Apical constriction

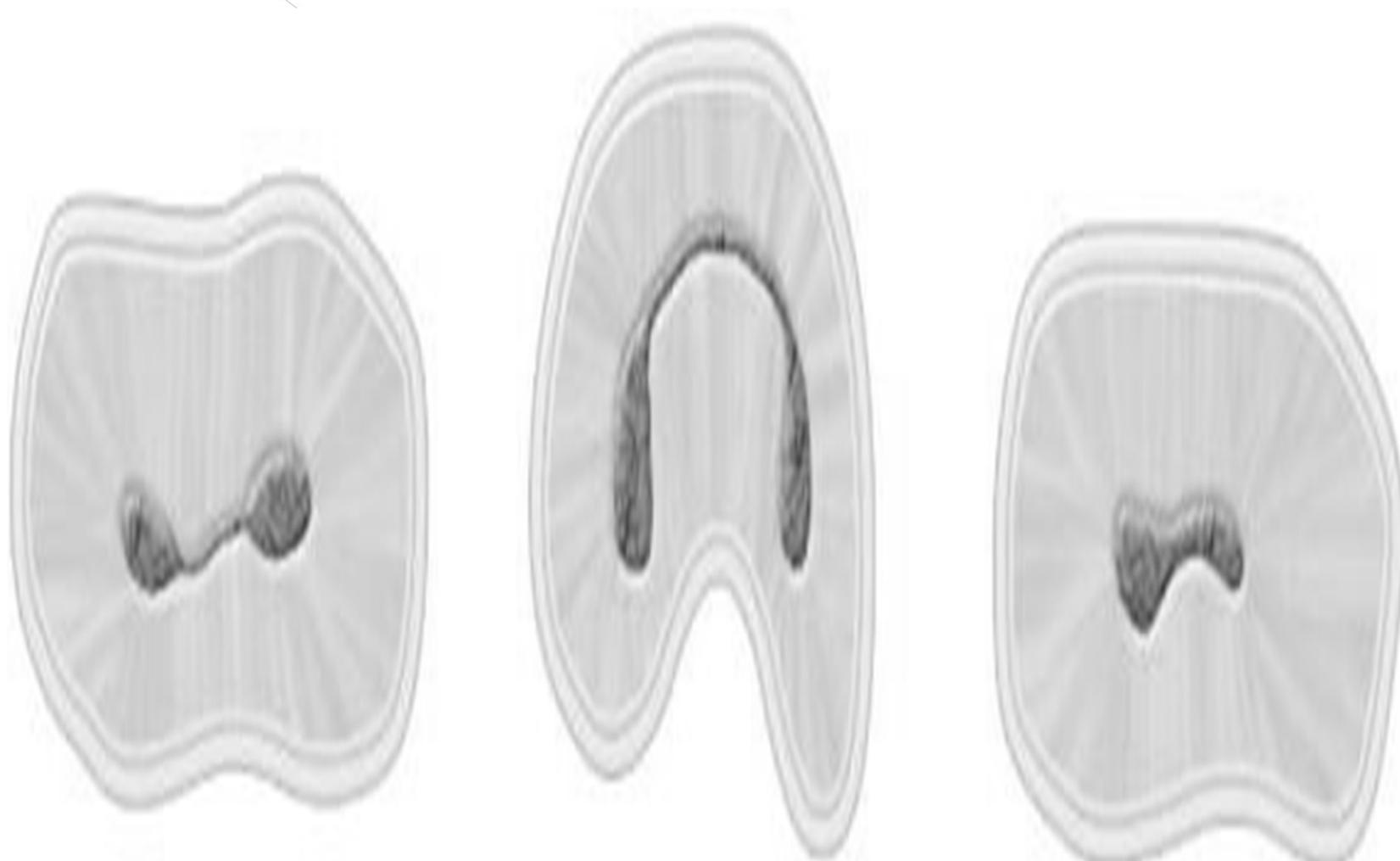
Major apical diameter

CDJ

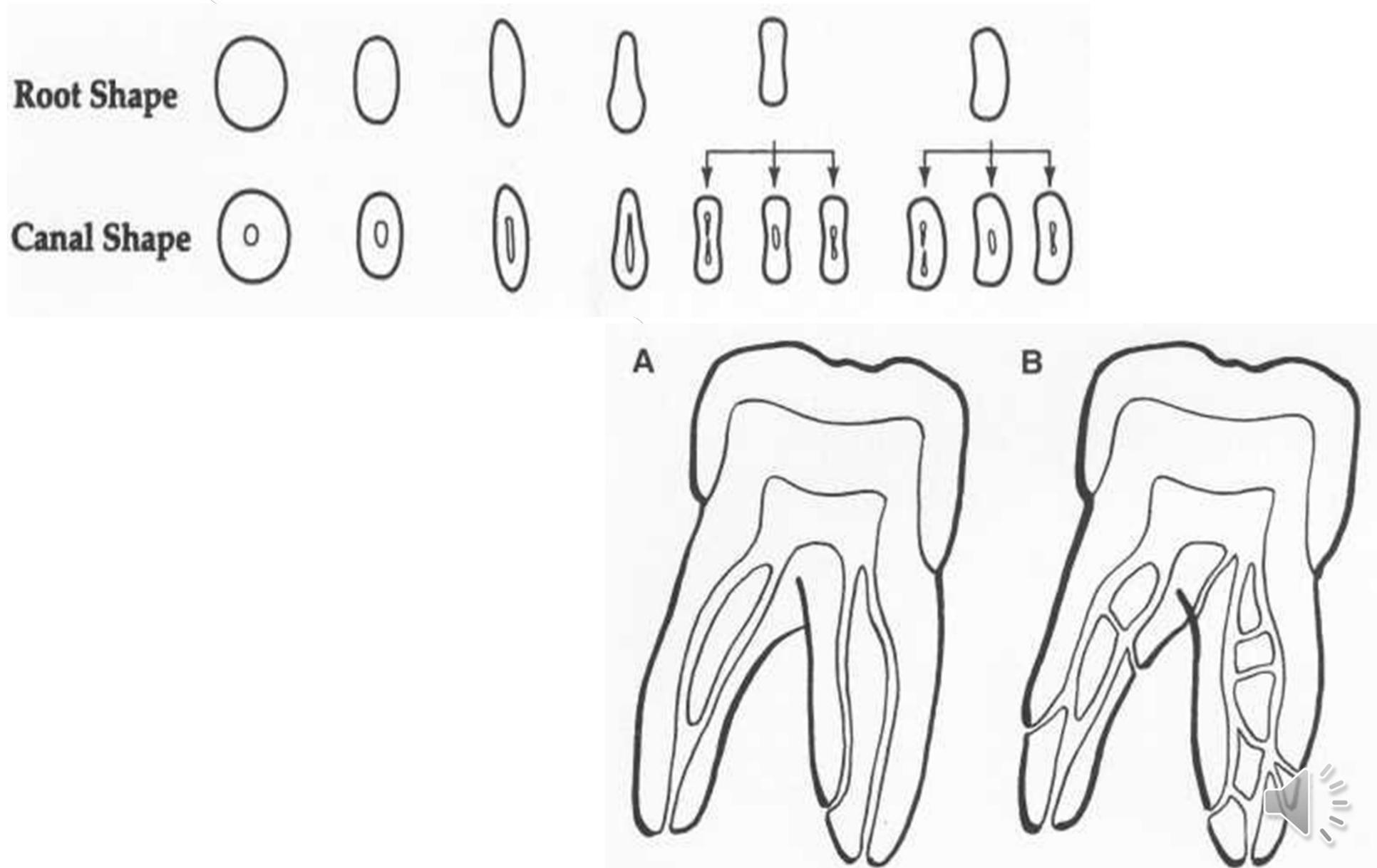
Apical foramen



Isthmus

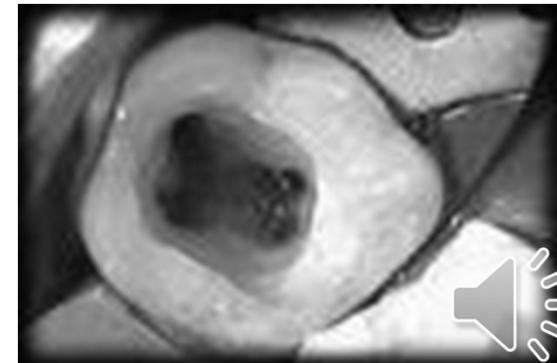


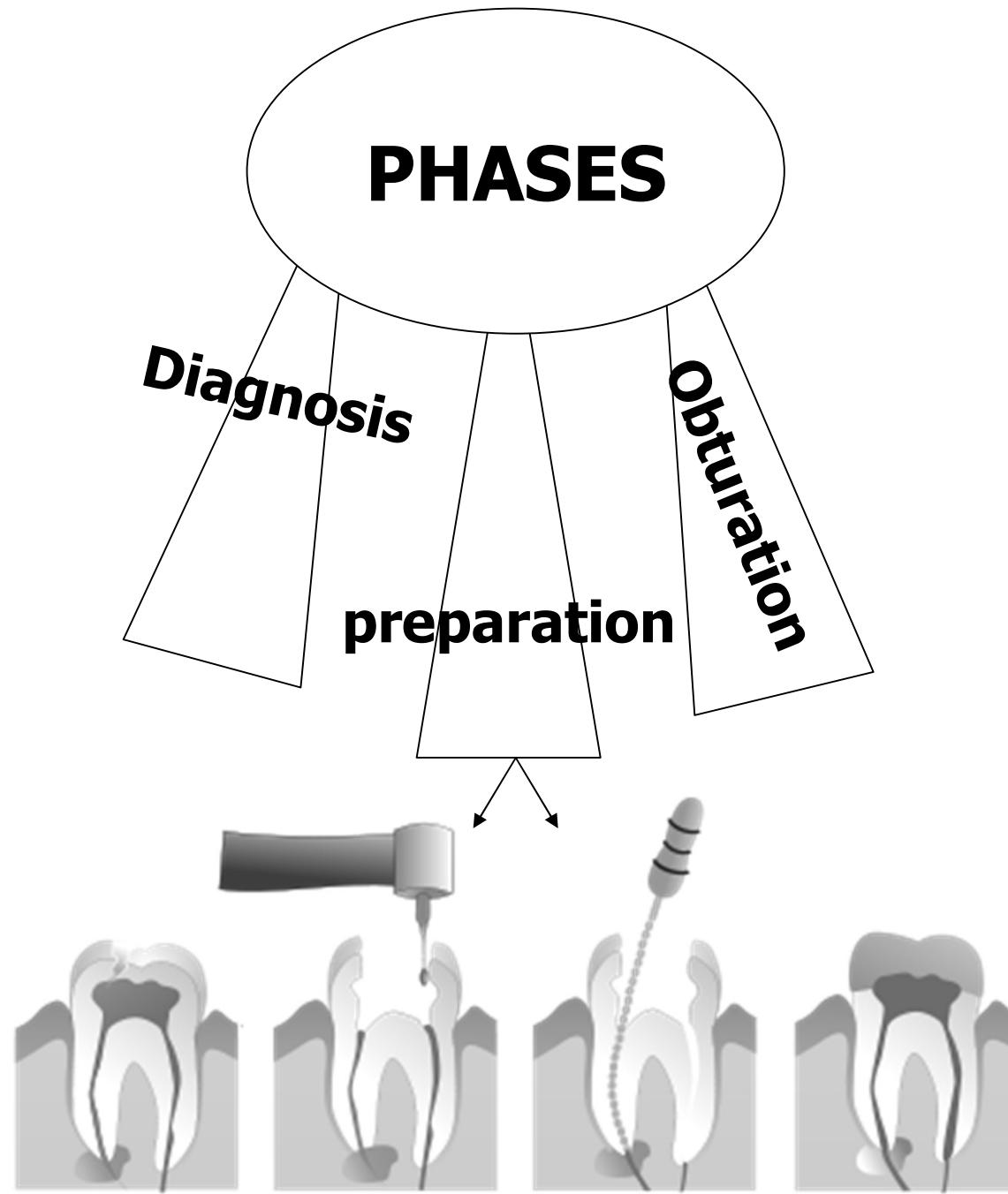
Root canal anatomy



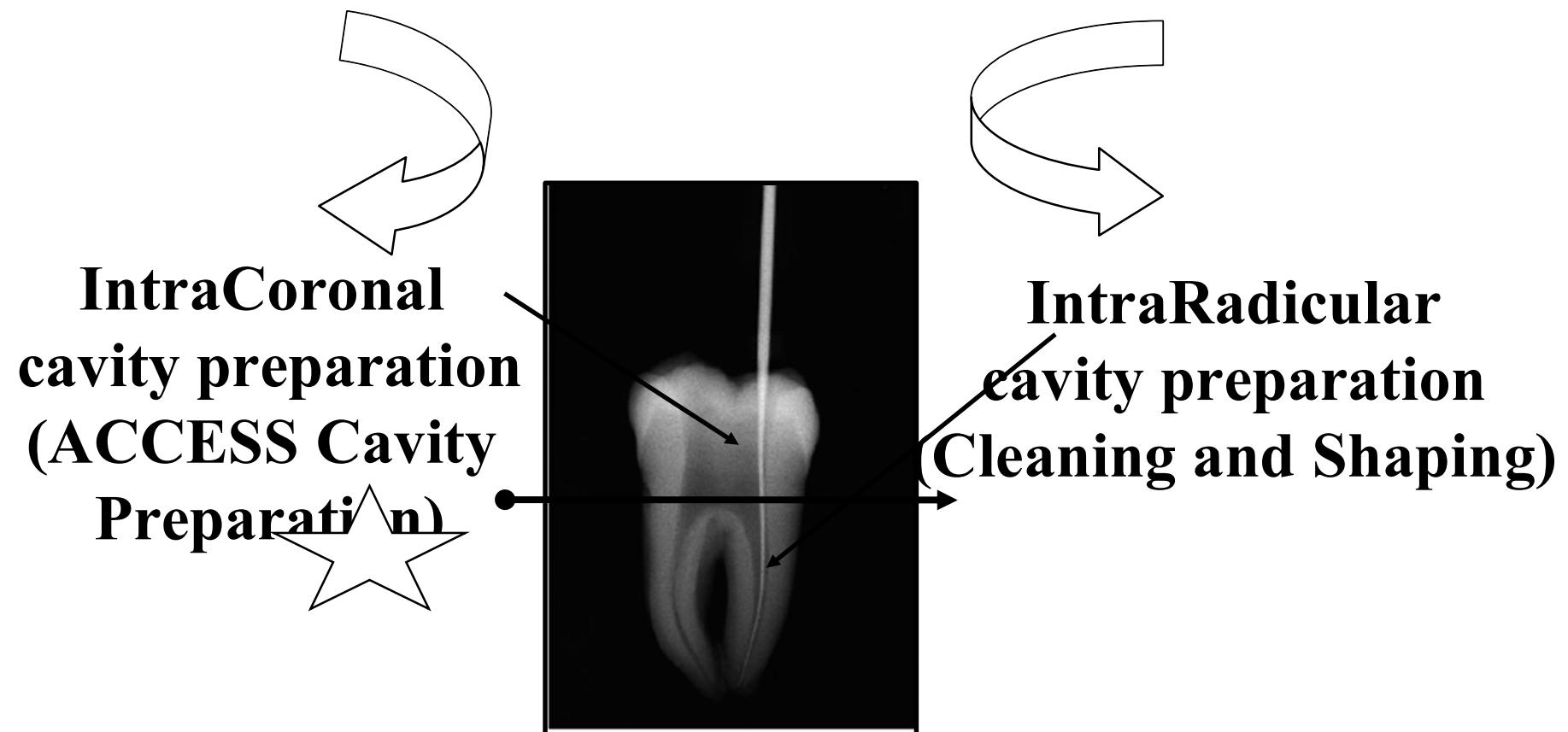


Access Cavity Preparation





Endodontic Cavity Preparation



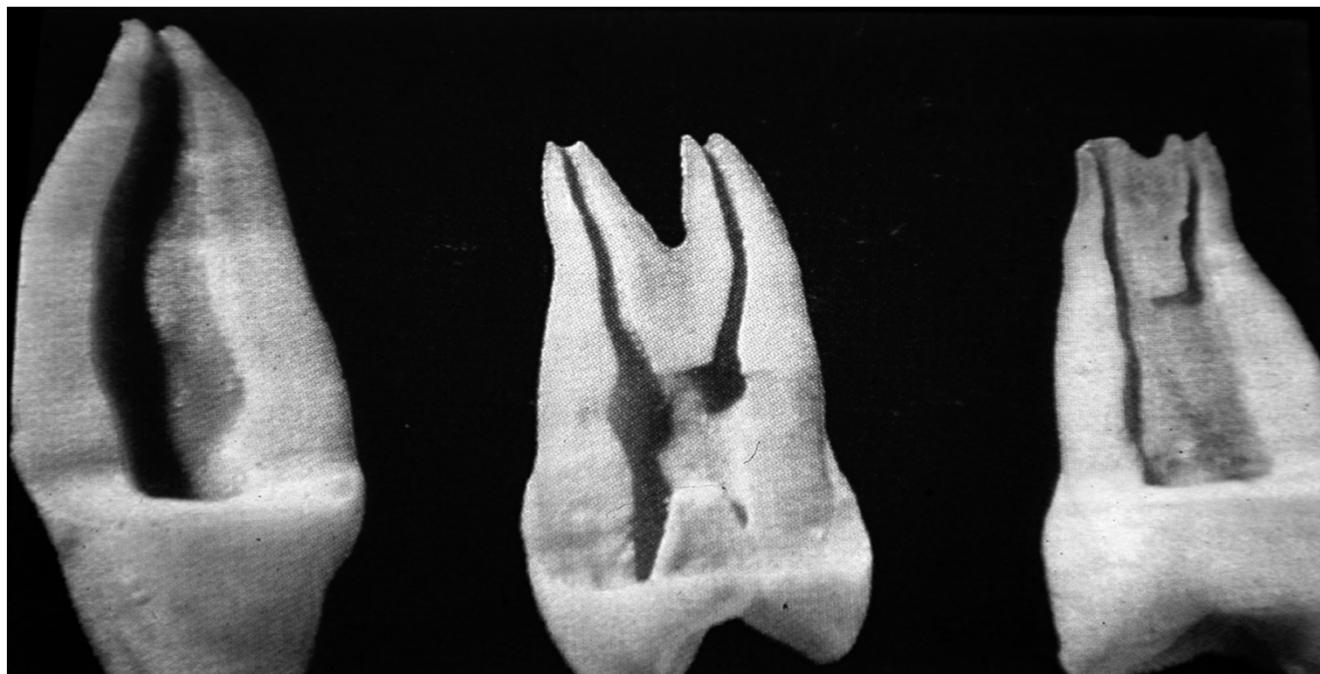
What is Endodontic access?

**Creation of an opening from the external
surface of the tooth to the pulp chamber
projecting out
its side walls and internal anatomy to the outside**



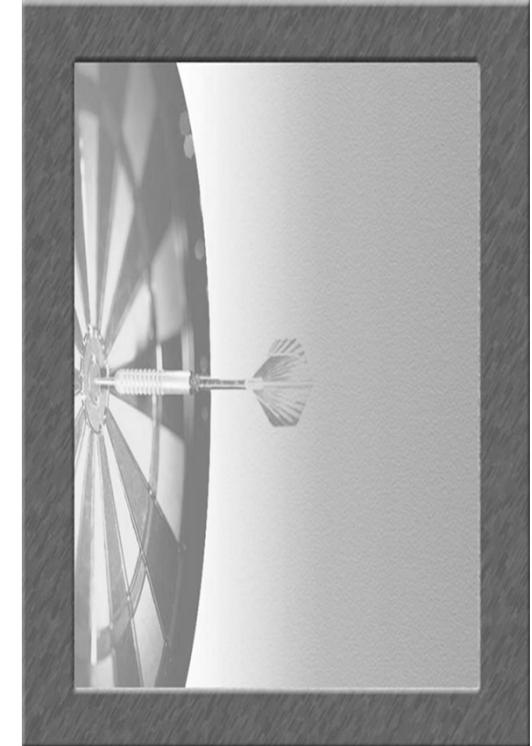
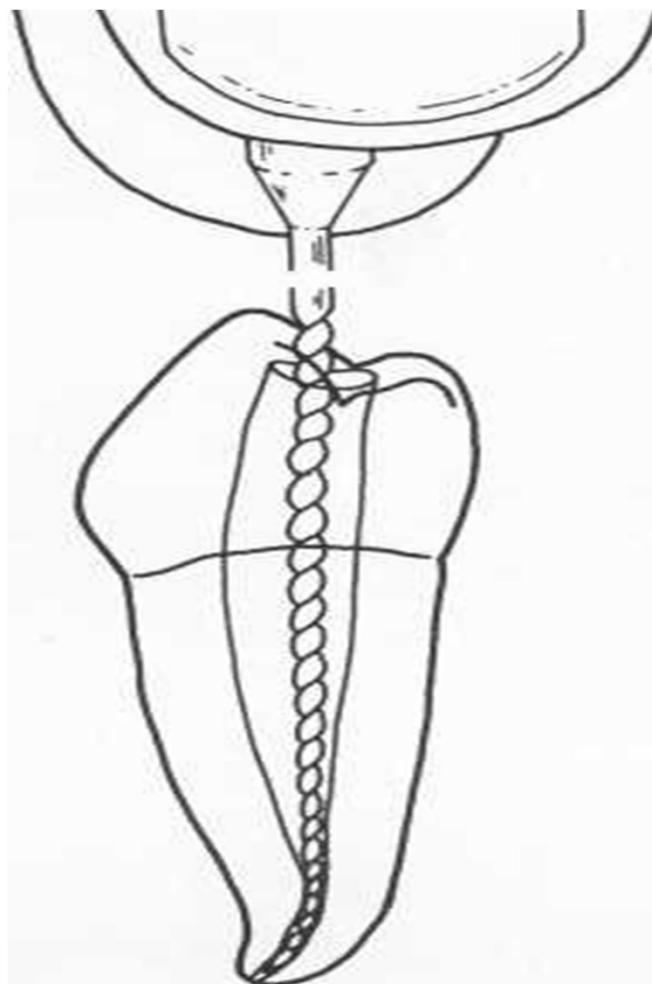
Pulp Anatomy in relation to Cavity Preparation

* Development three dimensional image of the tooth internal anatomy from pulp horn to apical foramen.



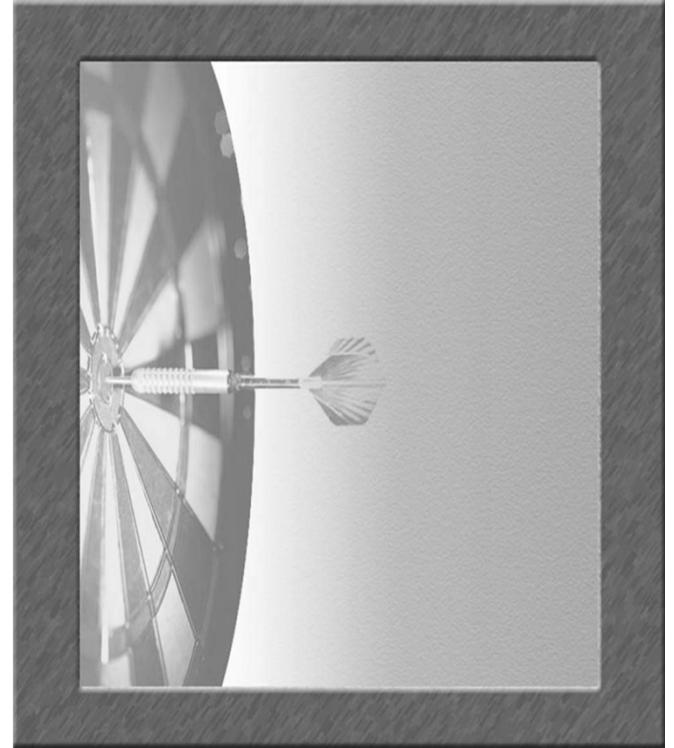
Objectives:

- 1) Obtaining straight line access to RC orifices & direct access Apical foramen.



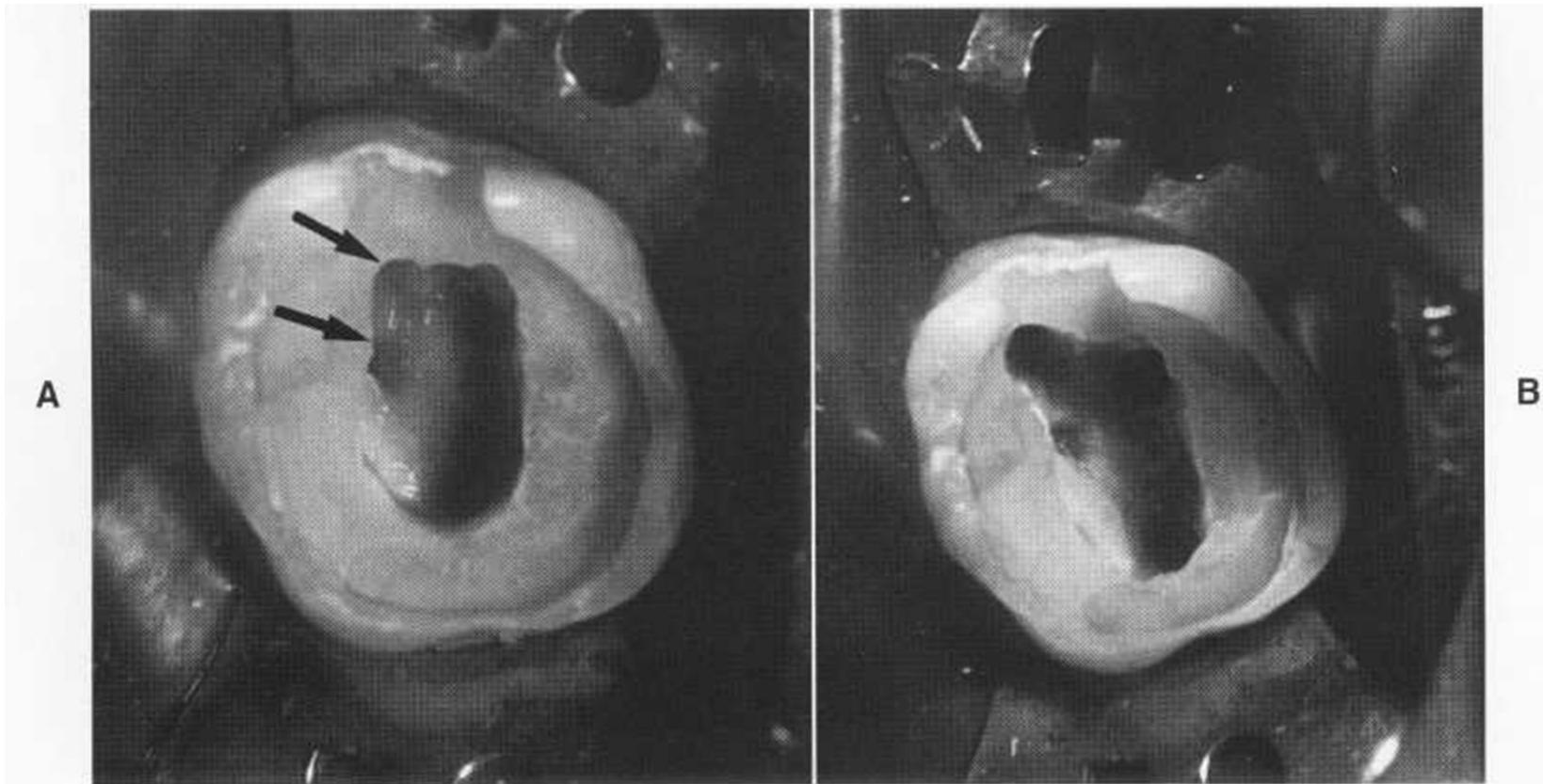
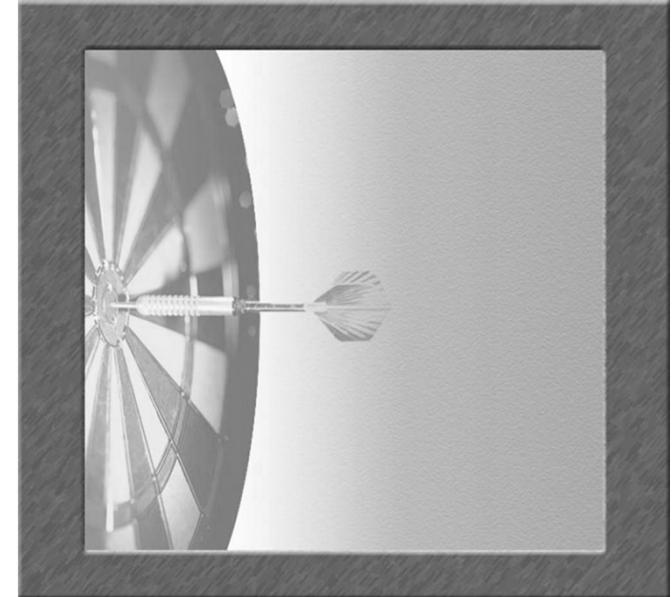
Objectives:

2) Conservation of tooth structure.



Objectives:

3) Locating all the canal orifices.



Principles of Access cavity preparation



Principles of coronal cavity preparation:-

- Outline form (Access cavity)
- Convenience form
- Removal of carious dentine and defective restorations
- Toilet of the cavity (Irrigation)



- **Outline form** → size } Pulp
 shape } chamber

 number & curvature → Root
and location of canals

- Convenience form 4

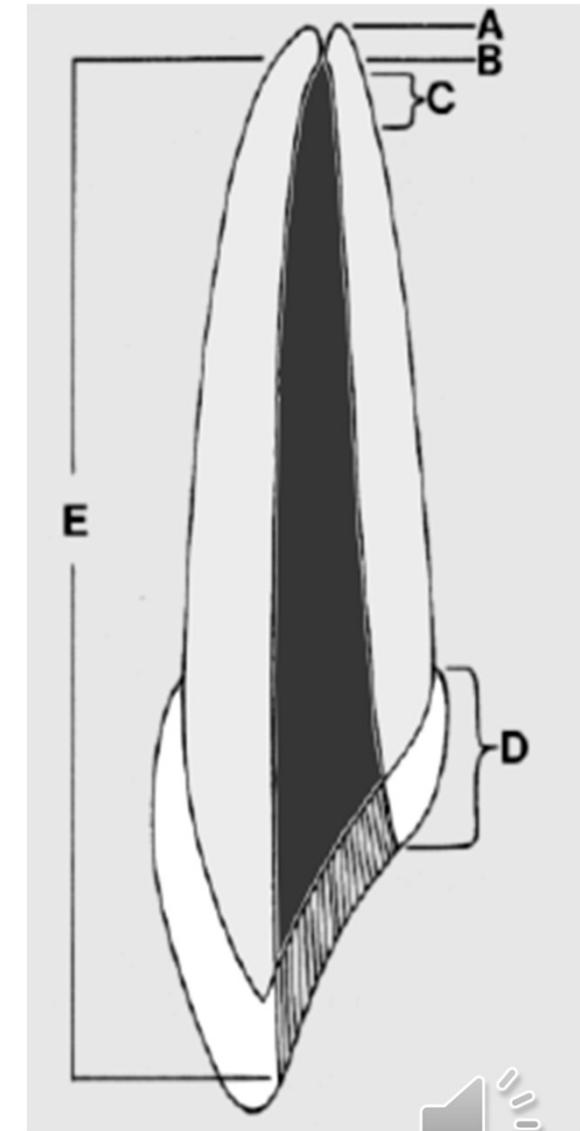
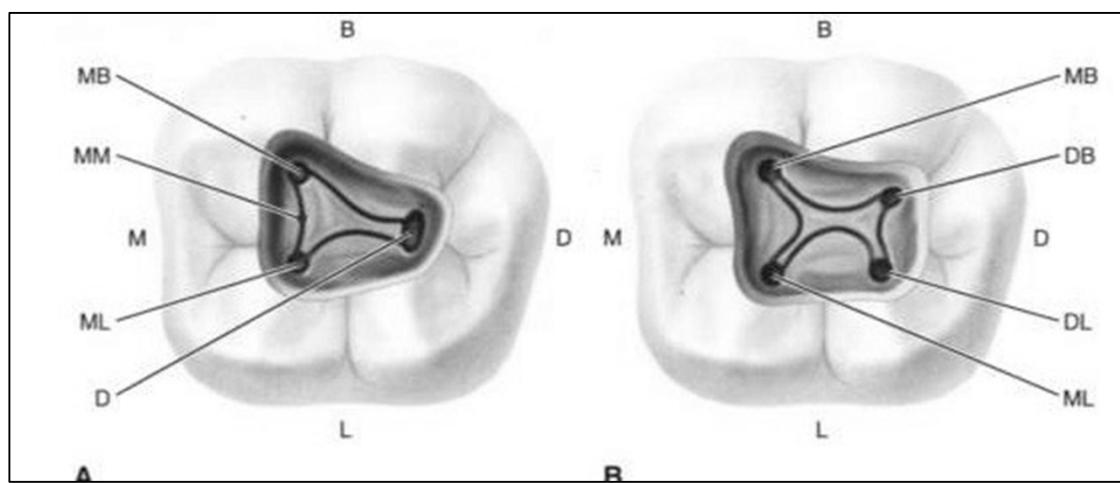
Benefits

- Direct access to the root canal orifice
- Unobstructed access to the apical foramen
- Complete authority over the enlarging instrument.
- Accommodation of the obturating instruments



Principle I: Outline Form:

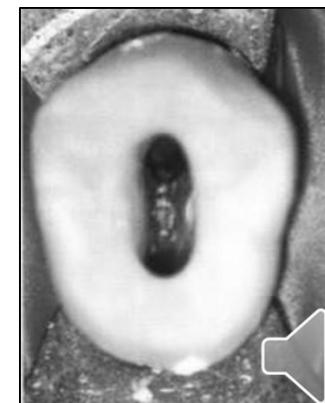
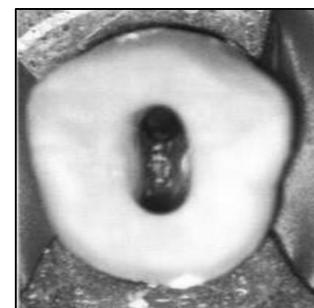
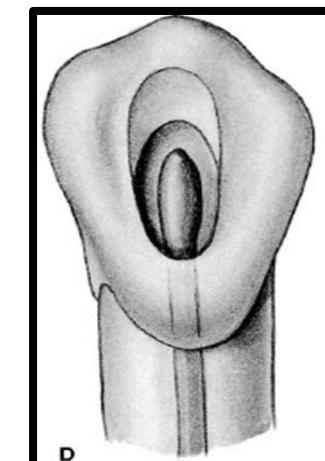
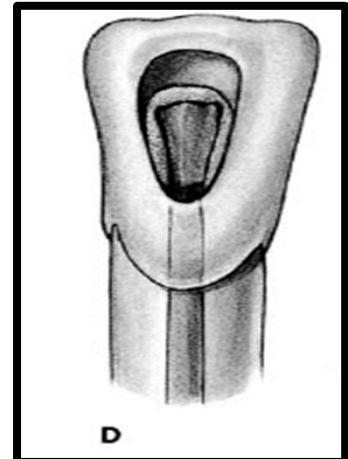
The external shape of the endodontic cavity positioned to establish complete access for instrumentation from cavity margin to the apical foramen.



External outline form is established by mechanically projecting the internal anatomy of the pulp; the shape of pulp chamber & location of RCs orifices) onto the external surface of the tooth.

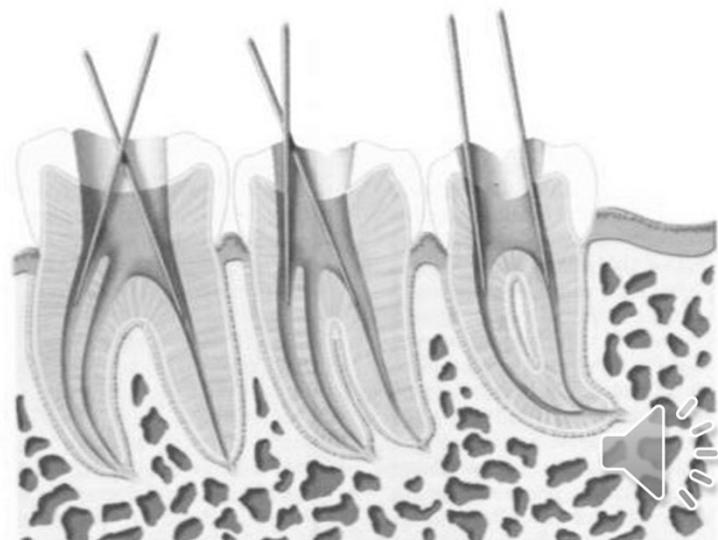
e.g.

- * Incisor ---} Triangular in shape based incisally & apex cervically.
- * Canines ---} Oval Inciso-cervically



Factors affecting Outline Form

- 1) Shape of the pulp chamber.**
- 2) Size of the pulp chamber.**
- 3) Number, Position & Curvature or Direction of each individual root canals.**



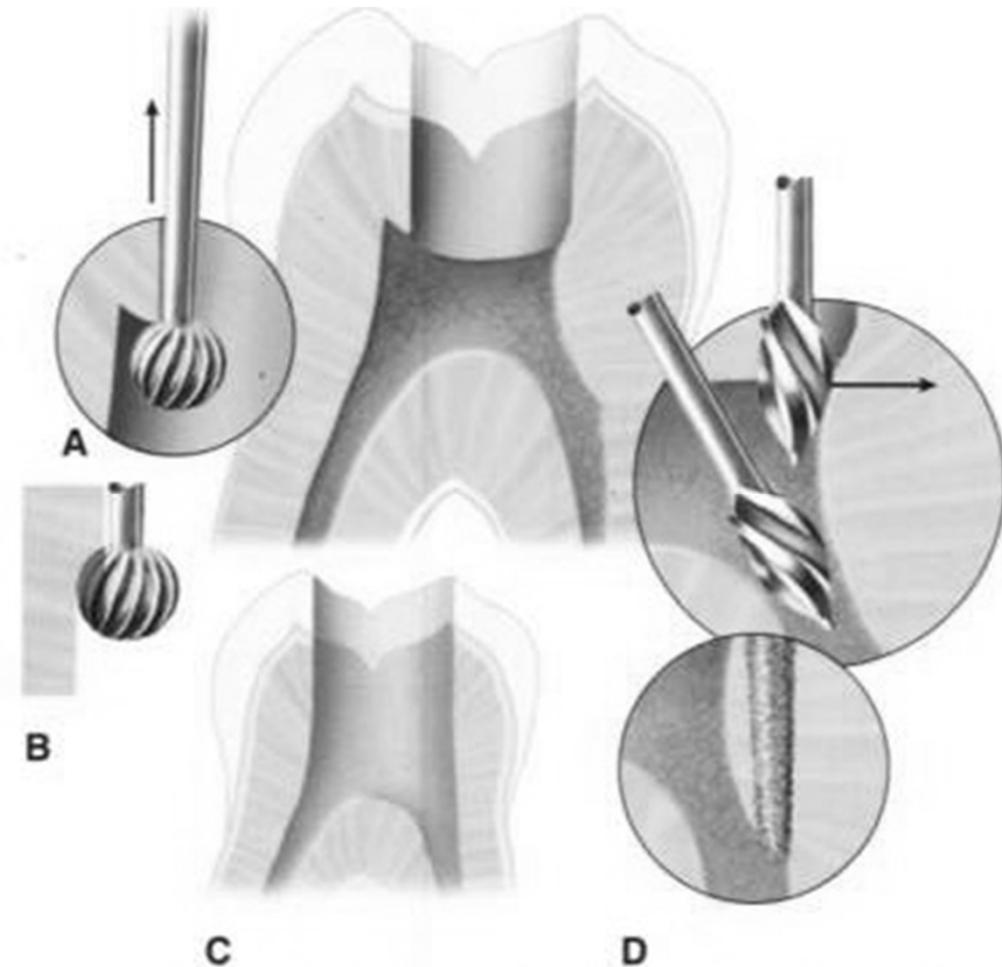
Principle II: Convenience Form:

**Modification of the cavity
outline form to establish greater
convenience (visibility and
accessibility) in the preparation
as well as obturation of the root
canals**



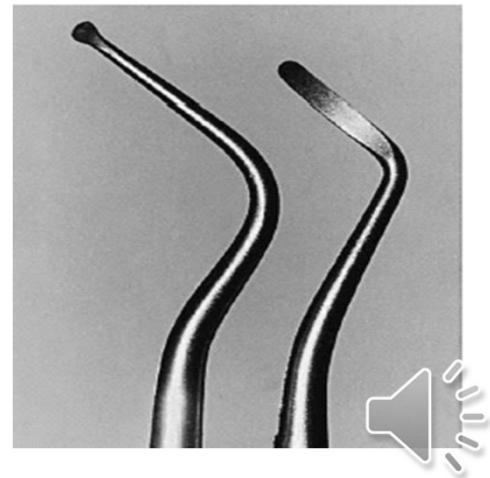
Benefits of Convenience Form:

- 1) Unobstructed (Strait Access) to the canal orifice searching for extra canals.**
- 2) Direct access to the apical foramen.**
- 3) Complete authority of enlarging instruments.**
- 4) Cavity expansion to accommodate filling techniques**



Principles III: Removal of the Remaining Carious Dentin & Defective Restorations:

All carious & loose or fractured restorations must be removed & the cavity is sealed with hard restoration before Endodontic cavity preparation is established.



Benefits of Removal of Carious Dentin & Defective Restorations:

- 1) To eliminate mechanically as many micro-organisms as possible from the interior of the tooth.**
- 2) To eliminate the discolored tooth structure.**
- 3) To eliminate the possibility of micro-organisms coming with saliva leakage through defective restoration.**
- 4) To avoid detached tooth or restoration particles from entering & occluding the RCs.**



Principle IV: Toilet of the cavity: (Irrigation of the Cavity)

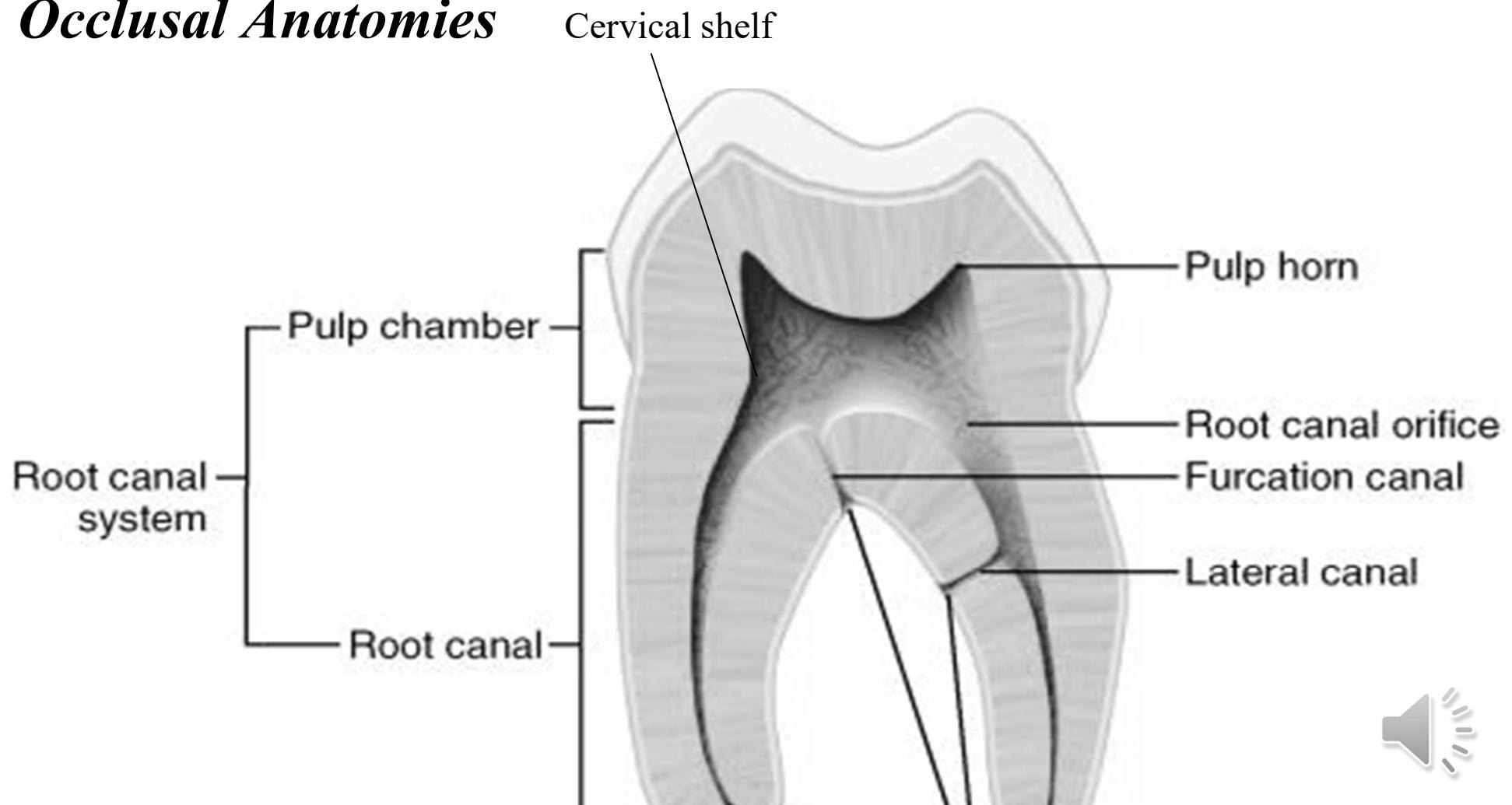
Using certain irrigants for debris flushing



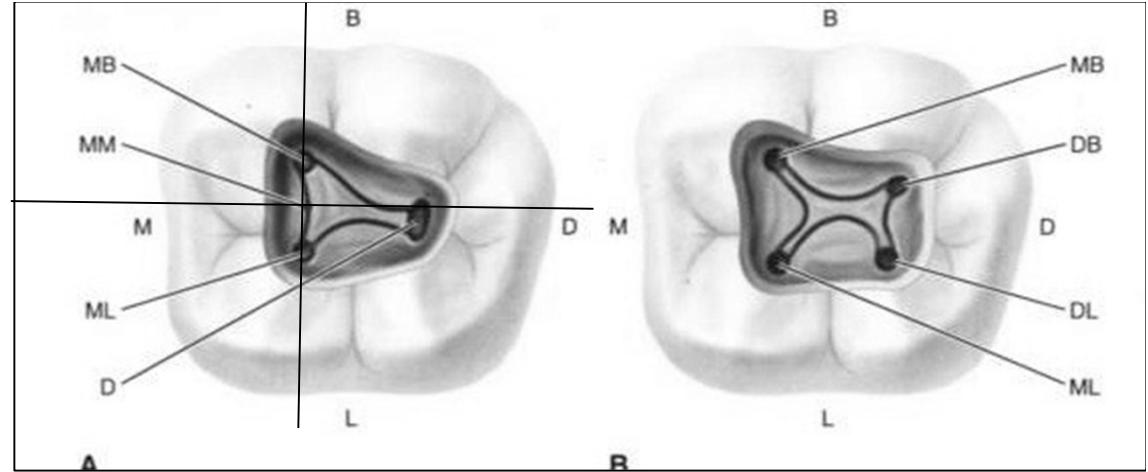
Guidelines in Access cavity preparation:

1. *Visualization of the Likely Internal Anatomy*

2. *Evaluation of the Cementoenamel Junction and Occlusal Anatomies*



First law of symmetry
Second law of symmetry

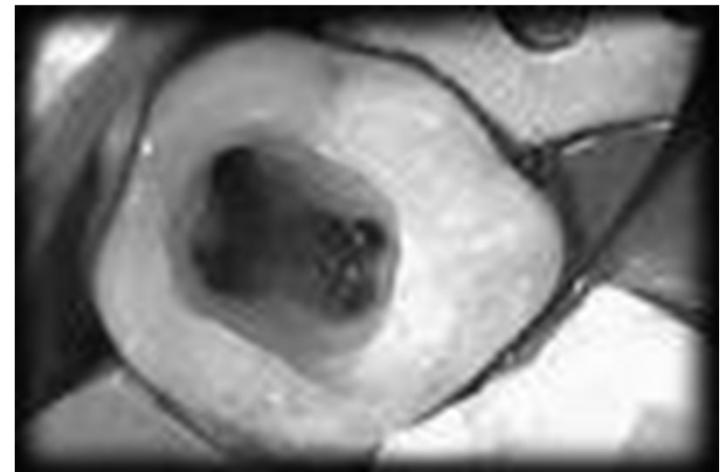
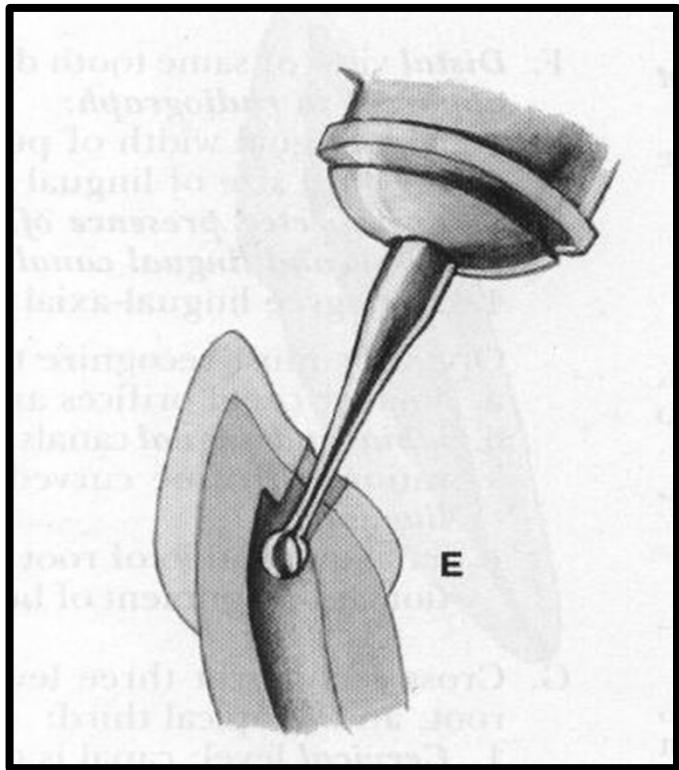


First law of orifice location
Second law of orifice location
Third law of orifice location

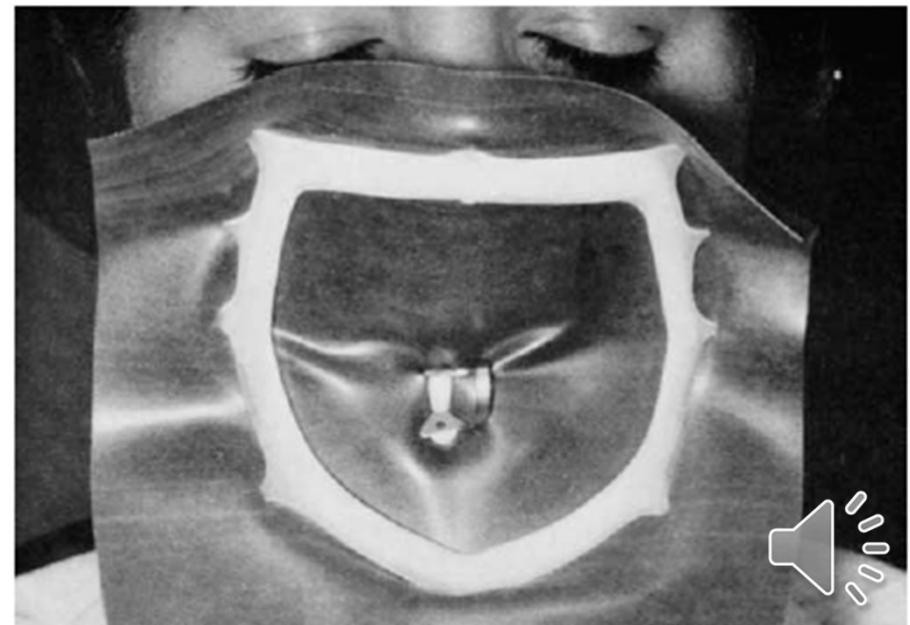
Law of color changes



1.Preparation of the Access Cavity through the Lingual and Occlusal Surfaces

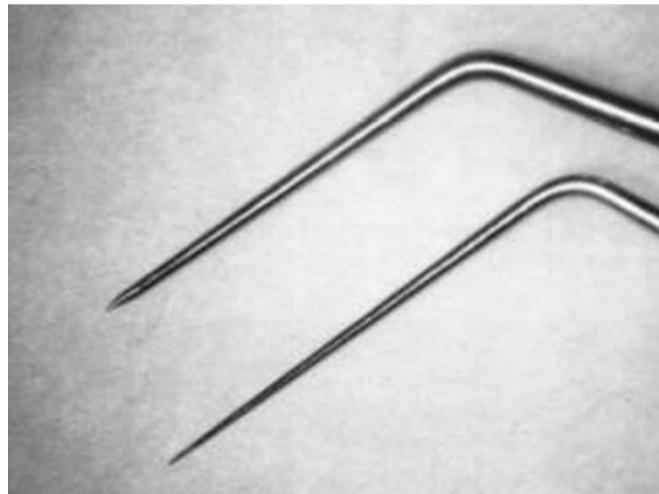


- Removal of Unsupported Tooth Structure
- Delay of Dental Dam Placement until Difficult Canals Have Been Located and Confirmed

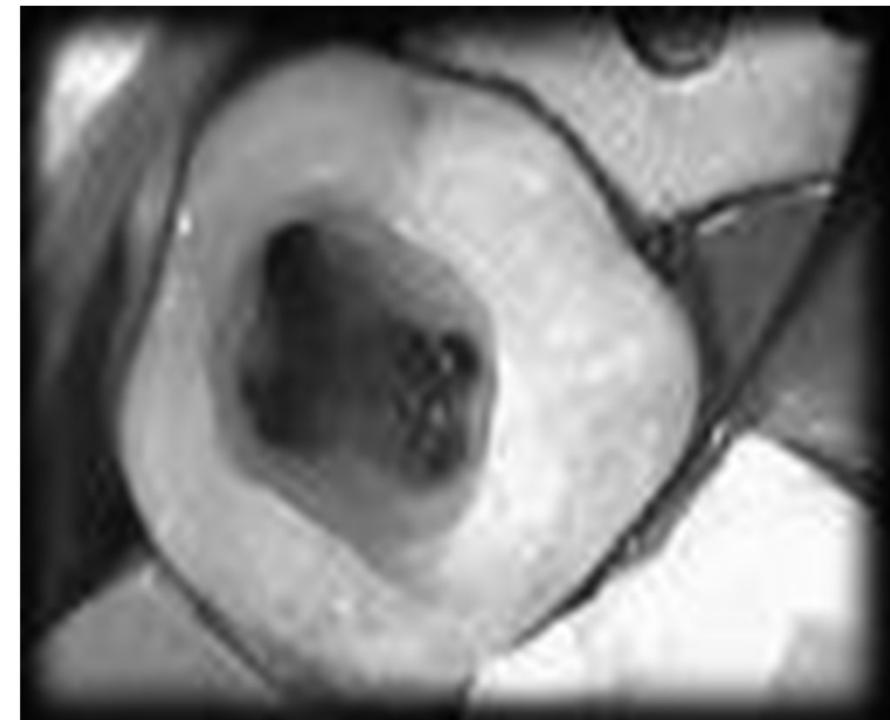


- Location, Flaring, and Exploration of All Root Canal Orifices

D/E # 5
Explorer

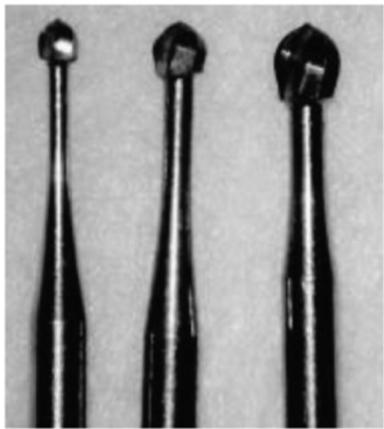


- Inspection of the Pulp Chamber Using Magnification and Adequate Illumination

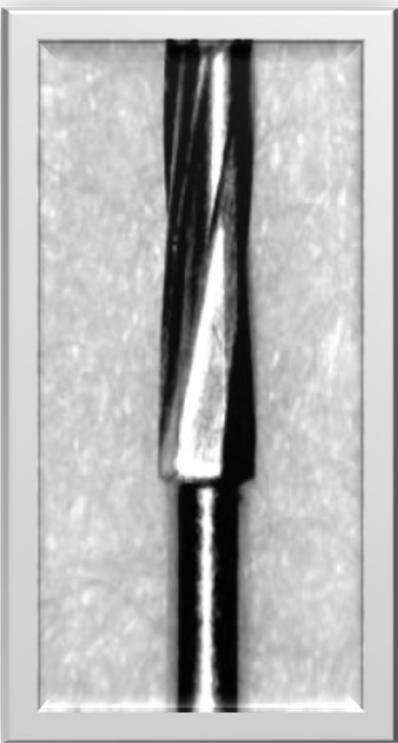


- Tapering of Cavity Walls and Evaluation of Space Adequacy for a Coronal Seal



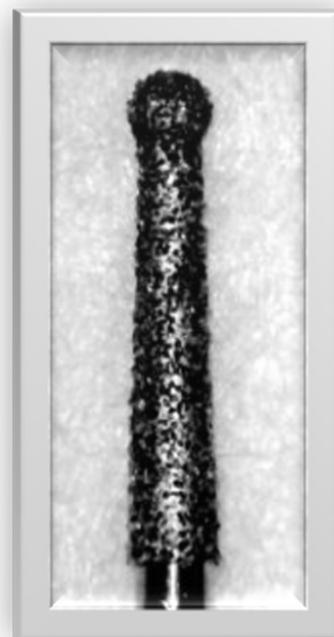


Carbide round burs



Carbide fissure bur

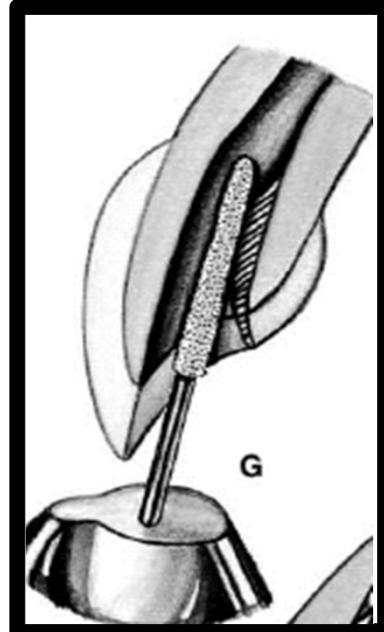
Gaining access & deroofing



Tapered diamond bur w/round end



Tapered diamond stone w/ safety end



deroofing
&Flaring



Carbide fissure bur

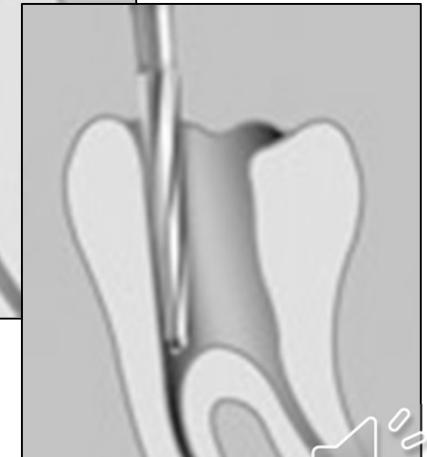
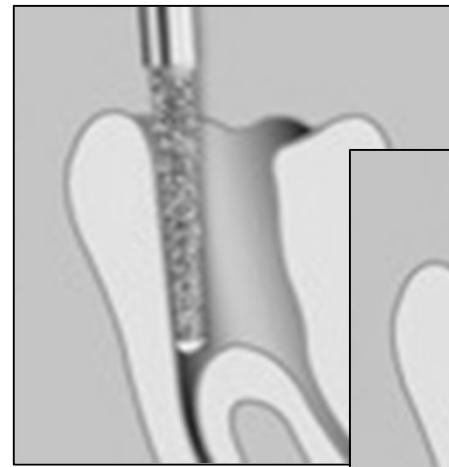
Endo Z

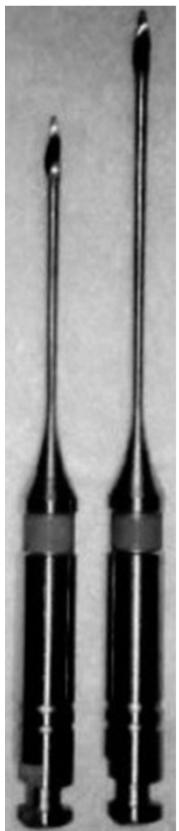
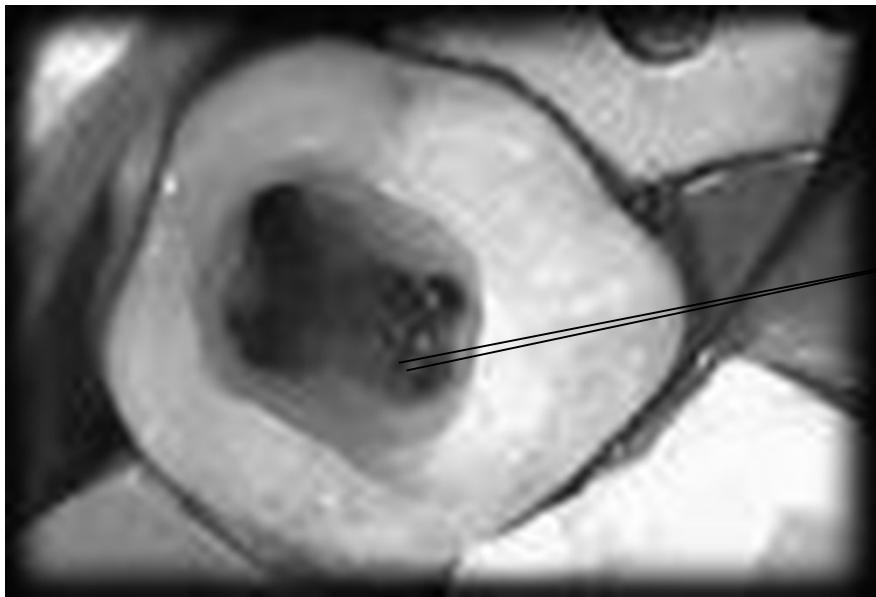


Diamendo

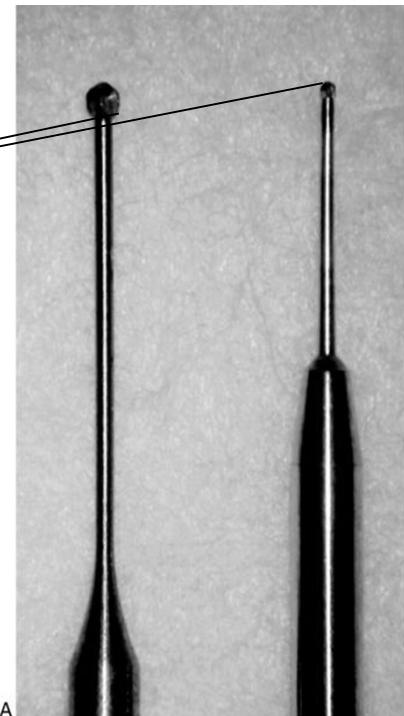
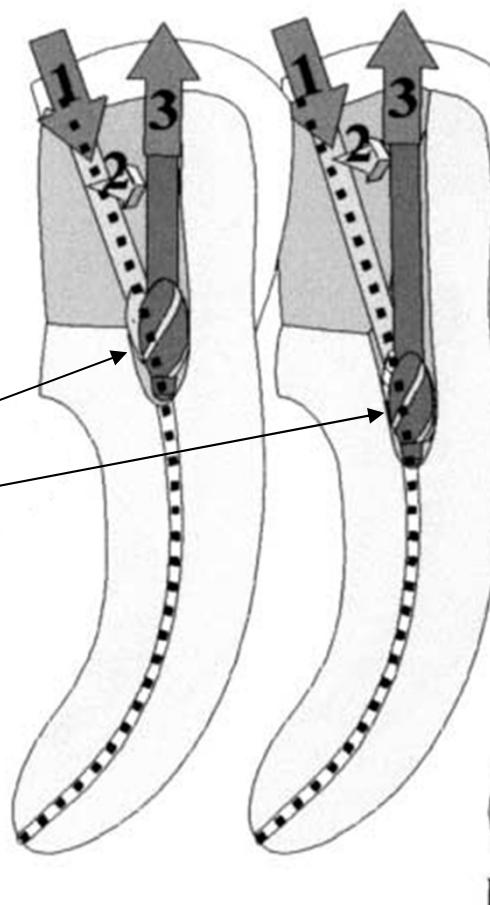


Endo Acess



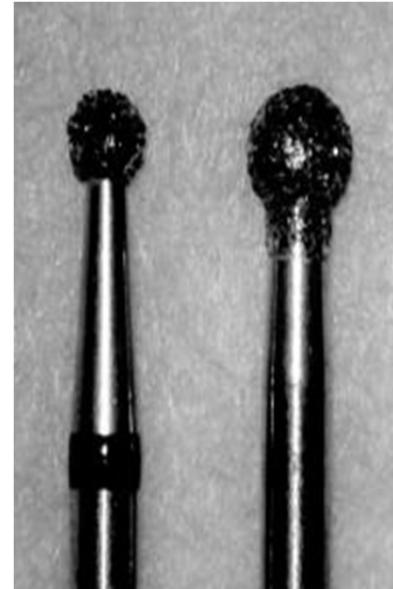
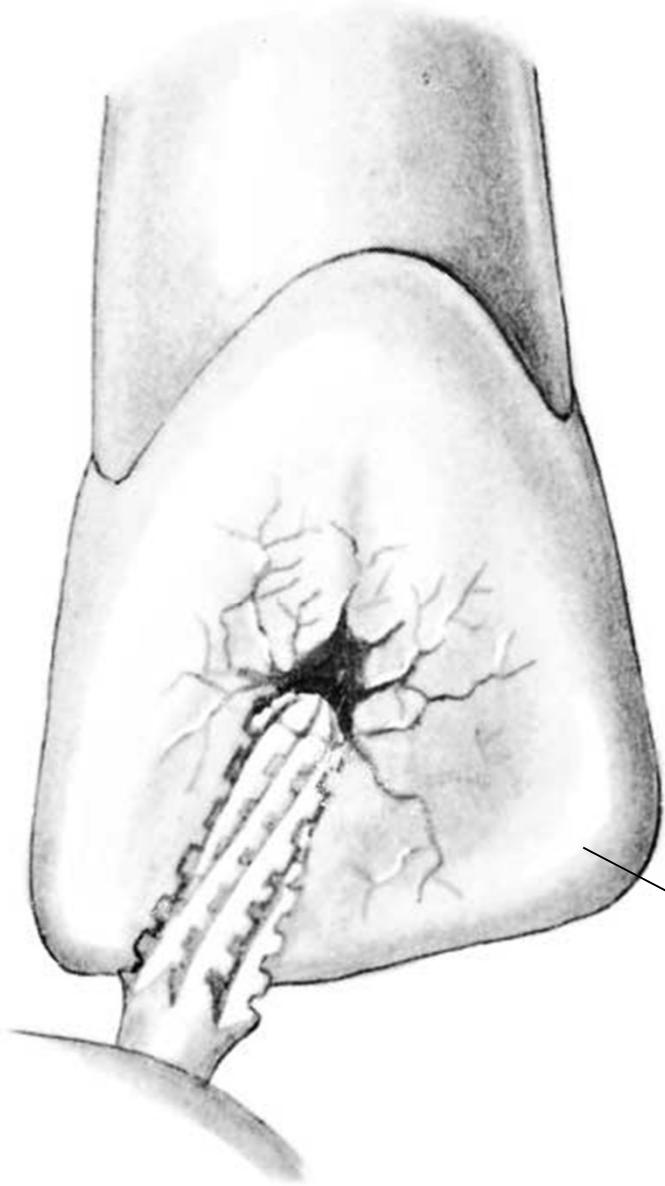


Gates Glidden



Muller & LN bur





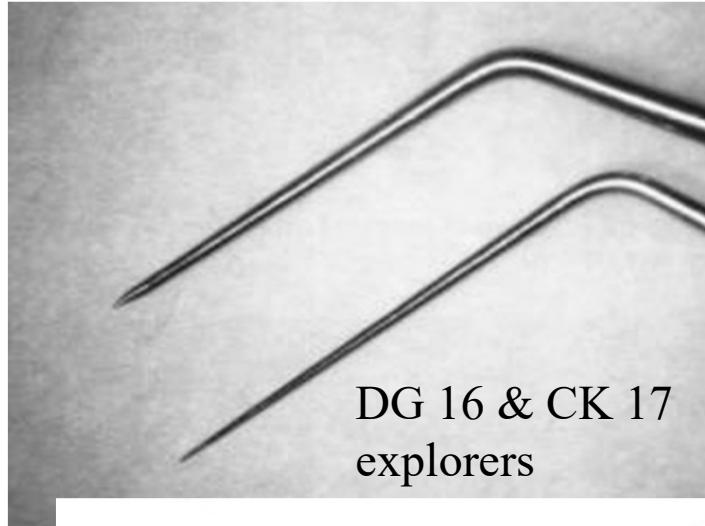
Diamond round burs



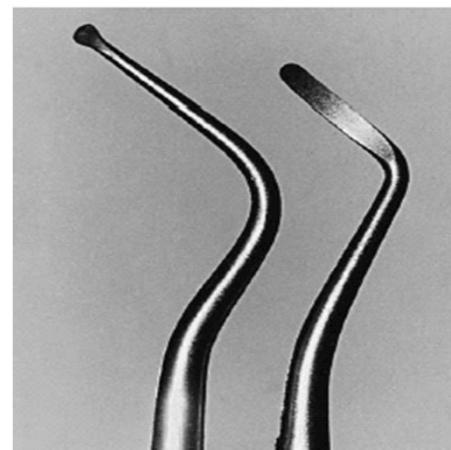
Transmetal bur

PFM CROWN





DG 16 & CK 17
explorers



#31L excavator



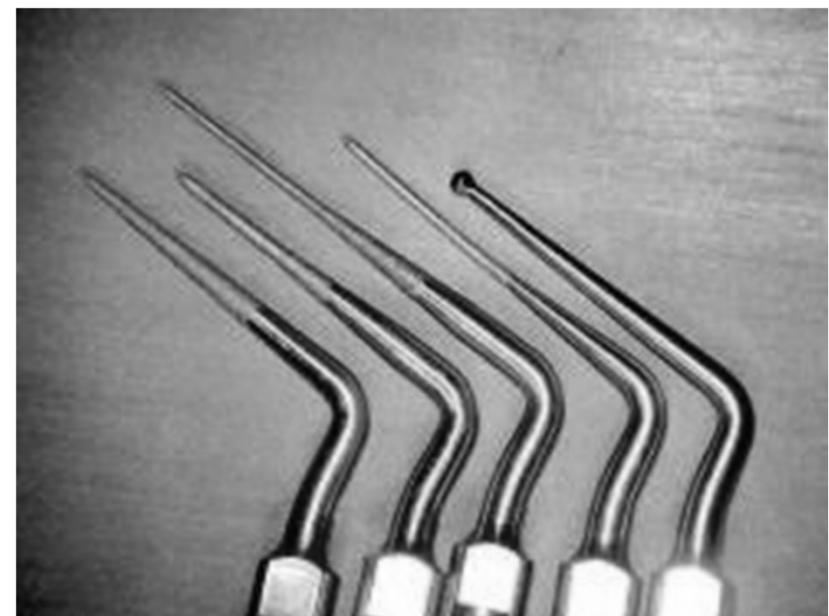
D/E # 5
Explorer



Endodontic ultra sonics



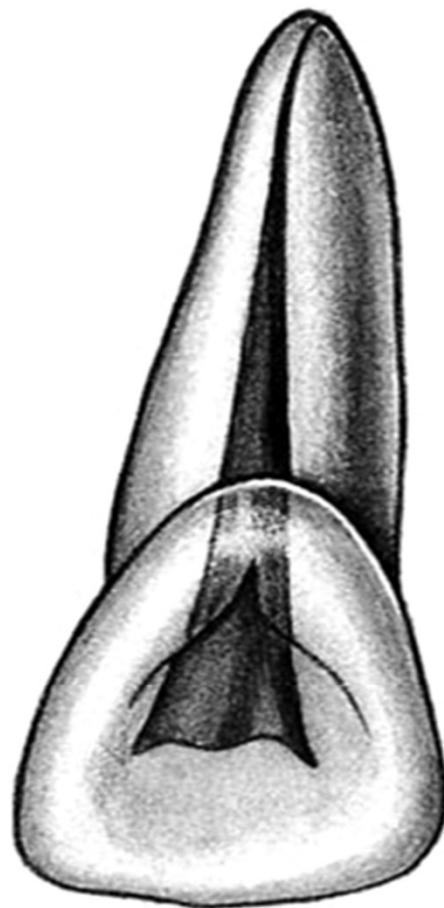
Used for troughing to reveal the 2nd missed & calcified canals



23.5 mm, crown= 10.5 mm and root=13mm.

Pulp anatomy of each individual tooth

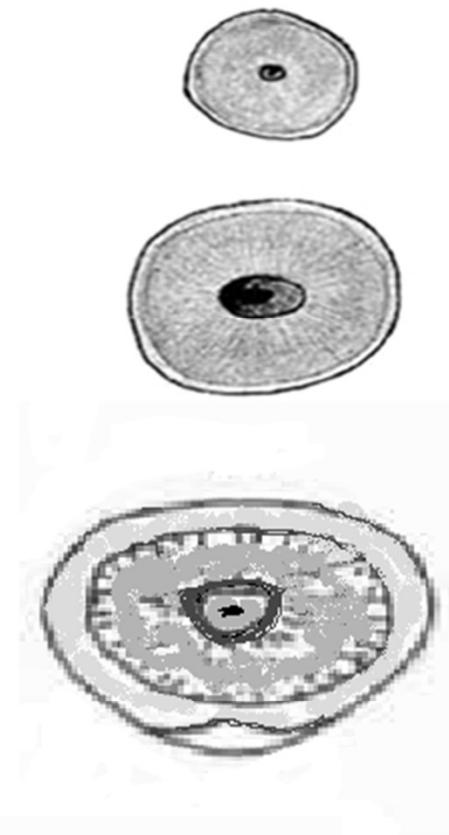
Maxillary central incisor



A



B

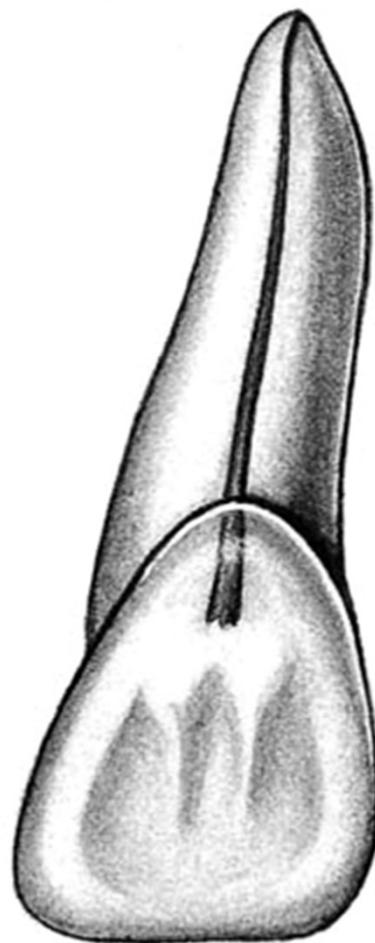


1 canal: 100%



Pulp anatomy of each individual tooth

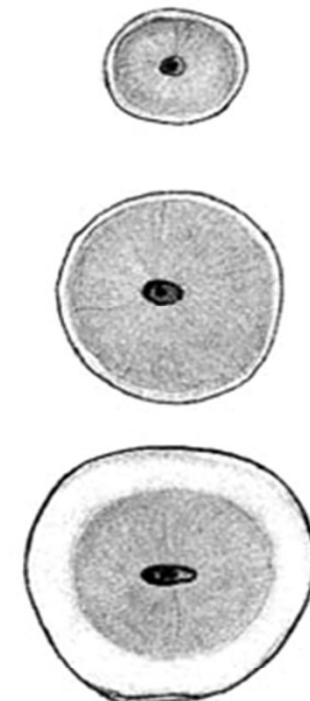
Maxillary central incisor



E



F



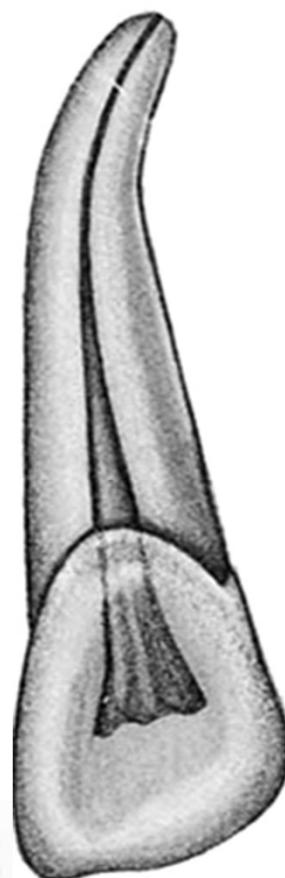
G



22mm, crown= 9mm and root=13mm.

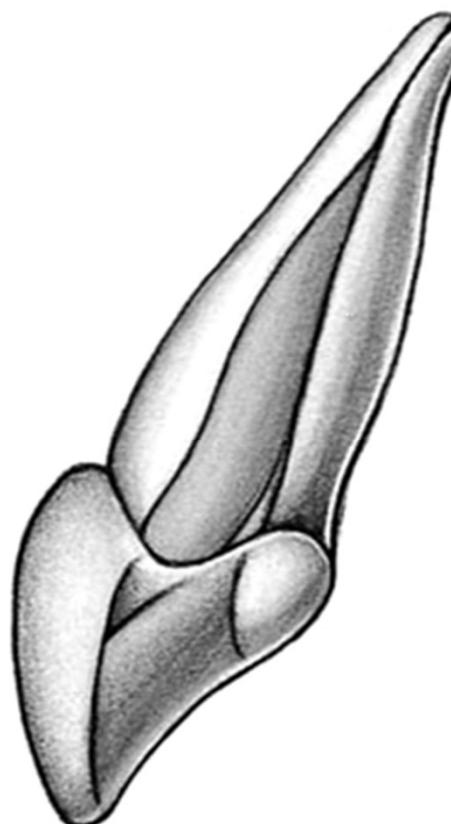
Pulp anatomy of each individual tooth

Maxillary lateral incisor



1 canal: 100%

A



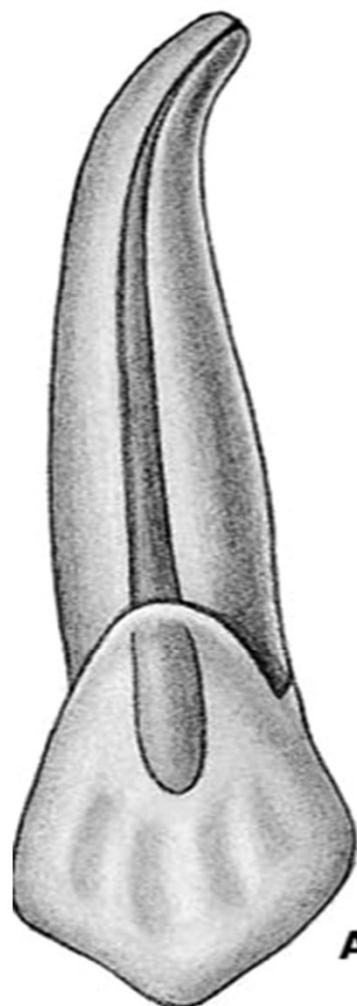
B



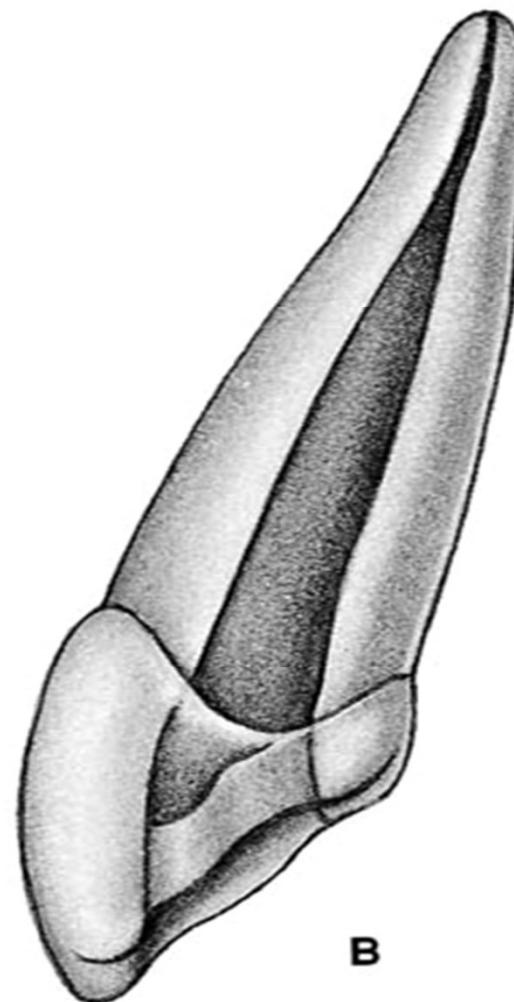
27, crown= 10mm and root=17mm.

Pulp anatomy of each individual tooth

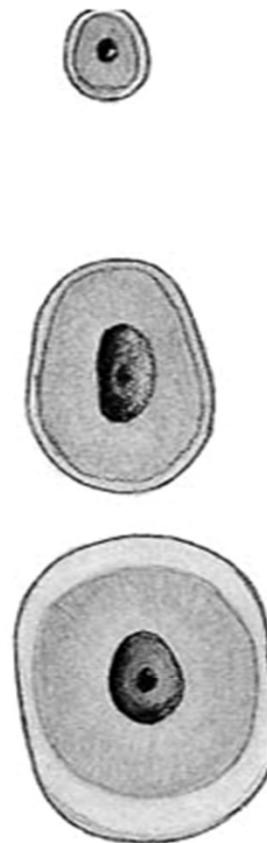
Maxillary canine



A



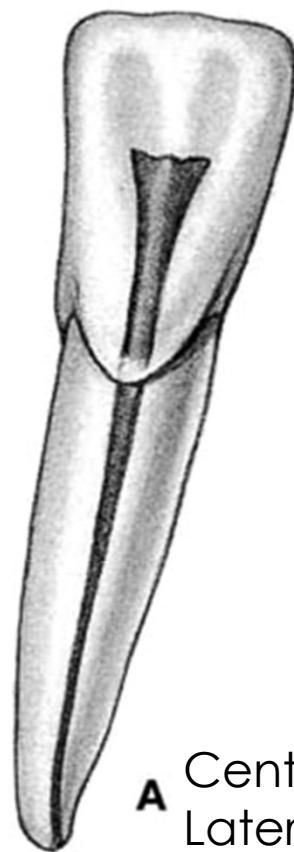
B



21.5, crown= 9mm and root=12.5mm.

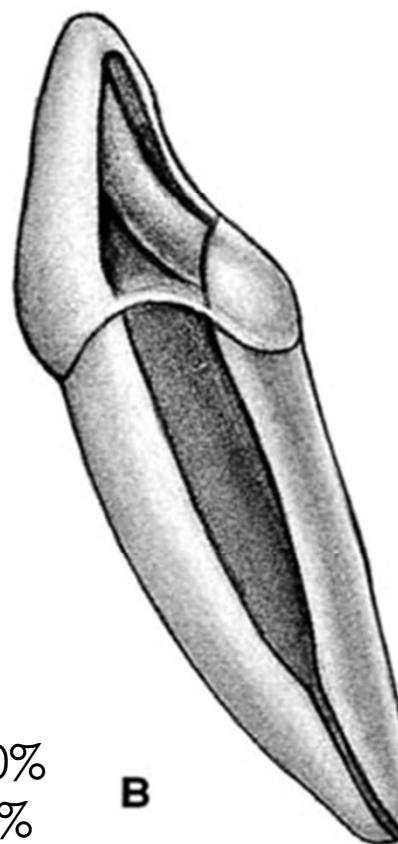
23.5, crown= 9.5mm , root= 14mm

Pulp anatomy of each individual tooth Mandibular incisors



A

Central incisor: 70%
Lateral incisor: 55%



B

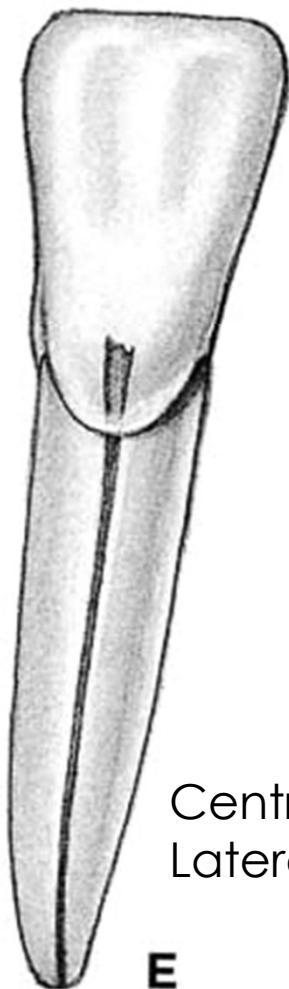


C

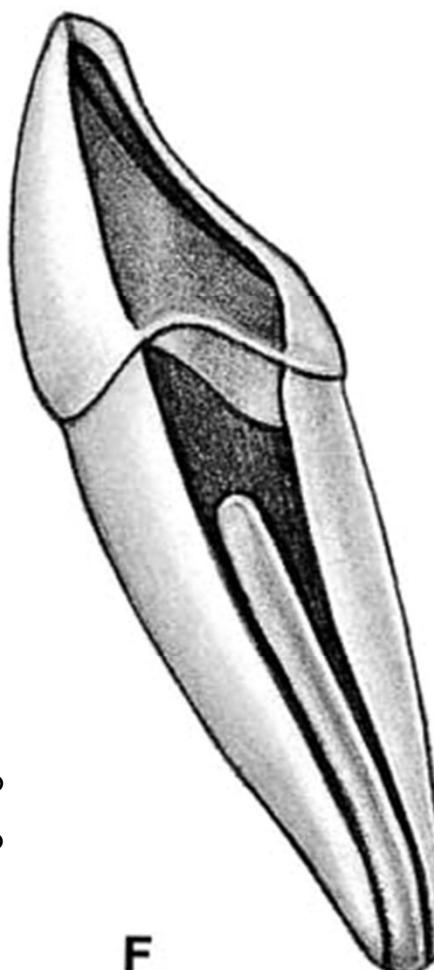


Pulp anatomy of each individual tooth

Mandibular incisors

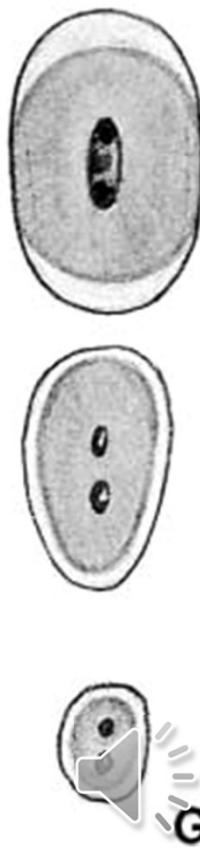


E



F

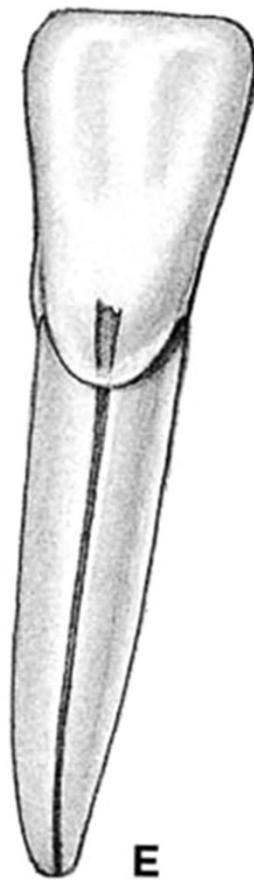
Central incisor: 5%
Lateral incisor: 15%



Pulp anatomy of each individual tooth

Mandibular incisors

Central incisor: 25%
Lateral incisor: 30%



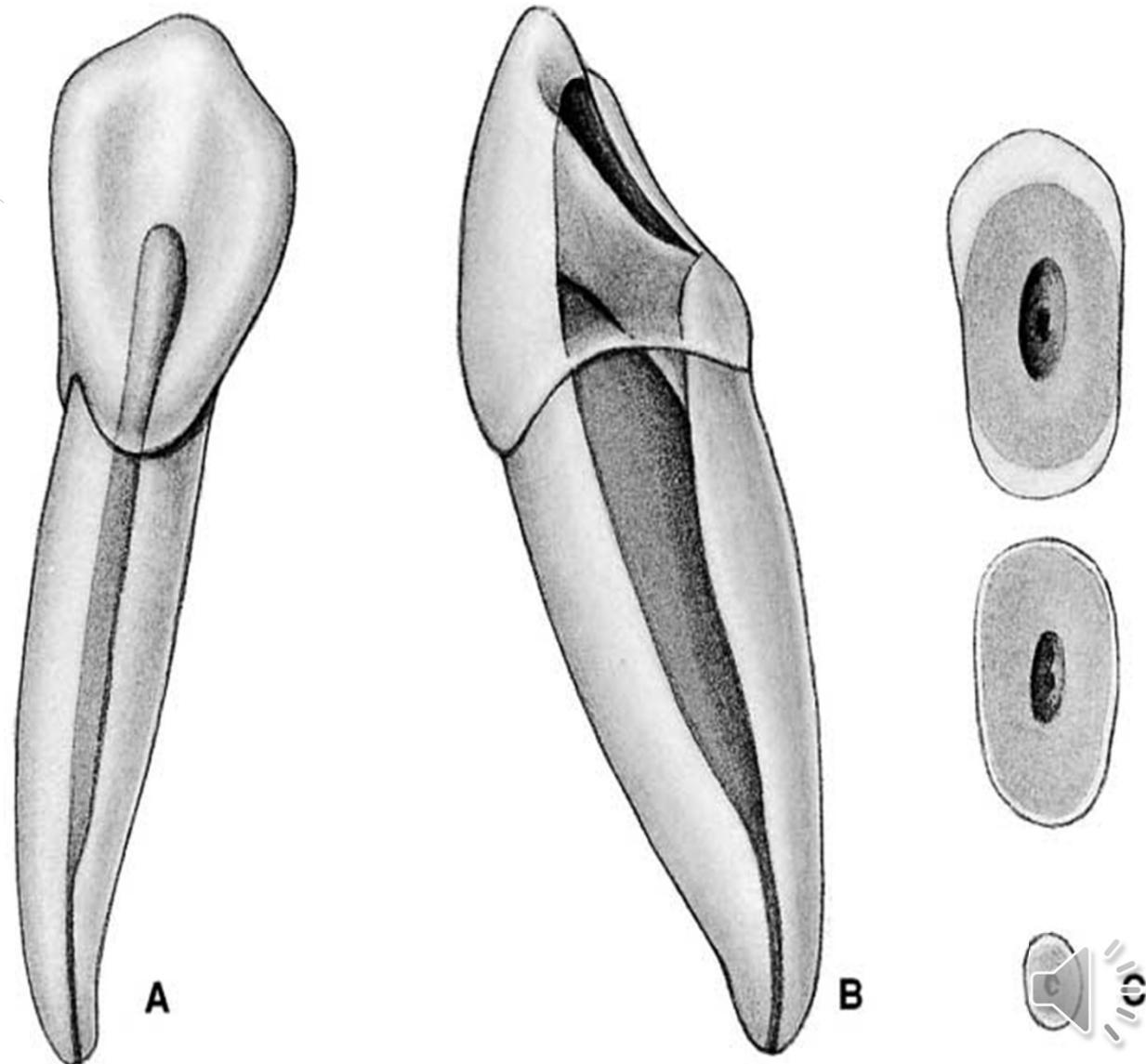
Dentin bridge



27, crown= 11mm and root=16mm.

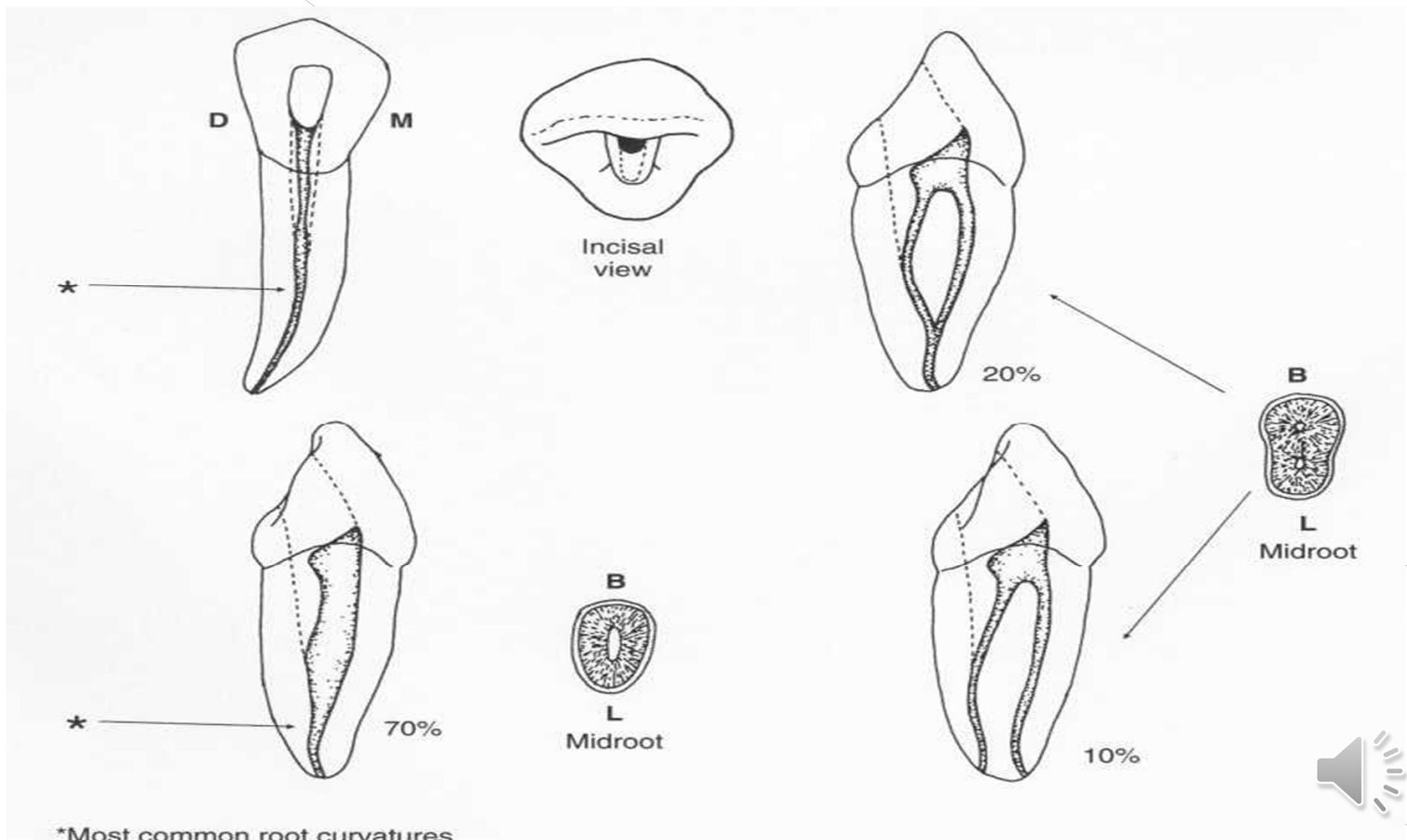
Pulp anatomy of each individual tooth

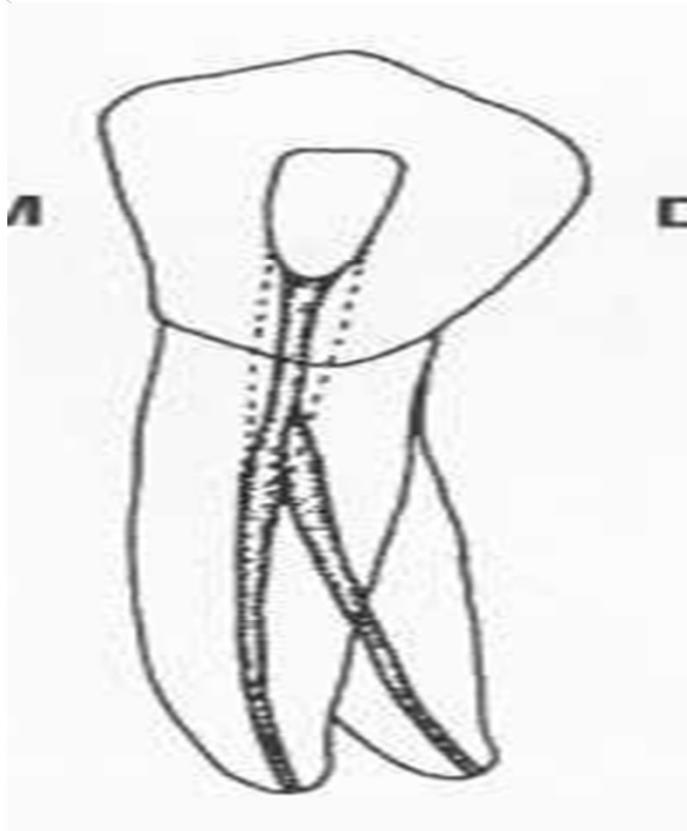
Mandibular canine



Pulp anatomy of each individual tooth

Mandibular canine





Access Cavity Preparation (Step by Step)

Shape

1. Gaining Access

Site (Location)

2. Deroofing

Size (Extent)

3. Flaring

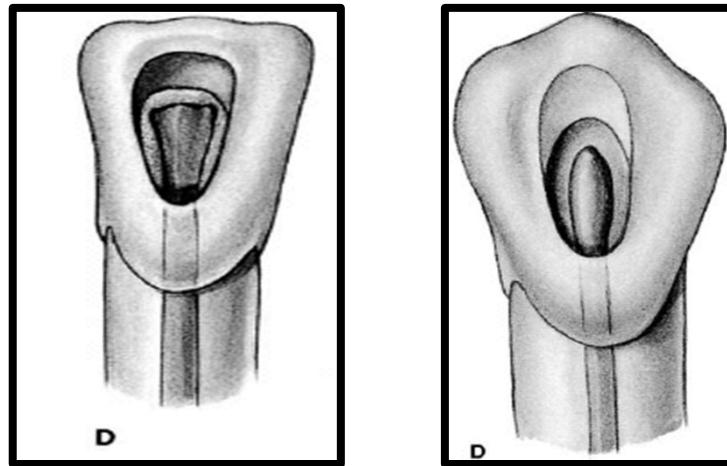


Access Cavity Preparation for Anterior Teeth (Step by Step)

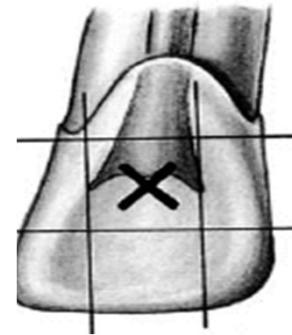


Practical steps (Anterior teeth)

✿ Shape:



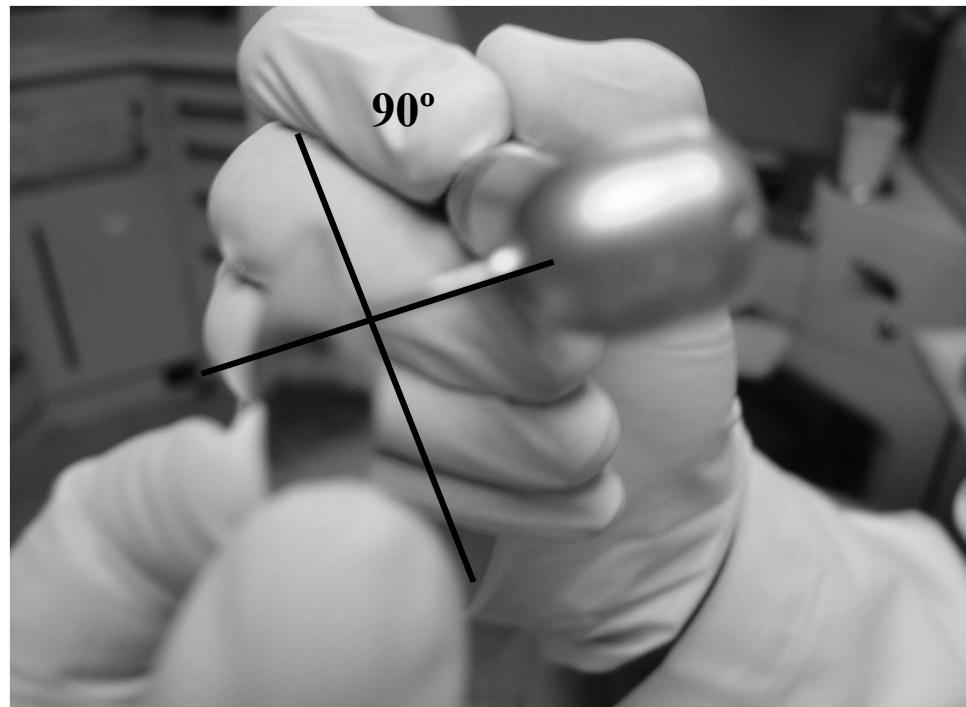
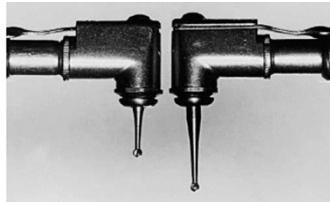
✿ Location:



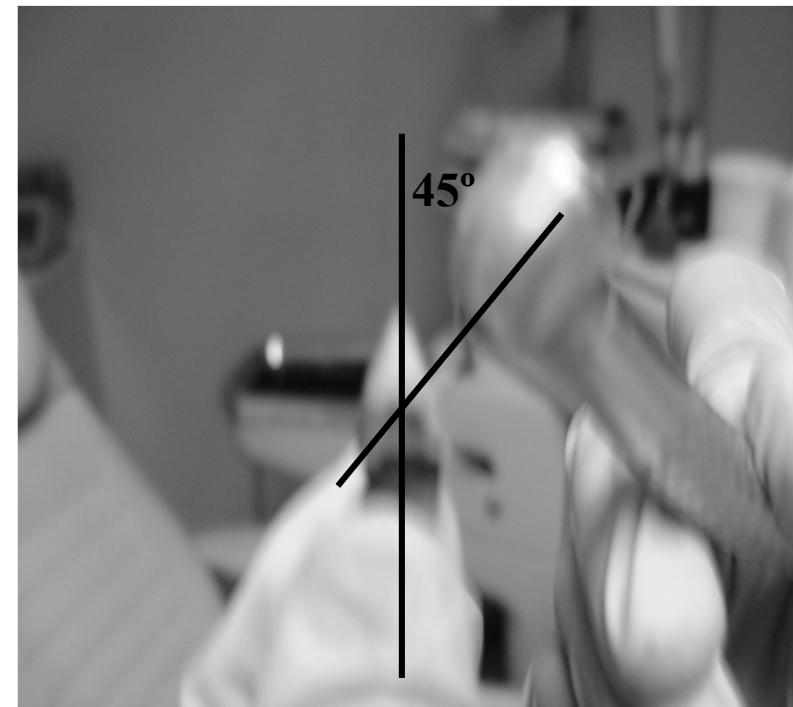
✿ Extent: *Ridges + Cingulum*



1a



1b



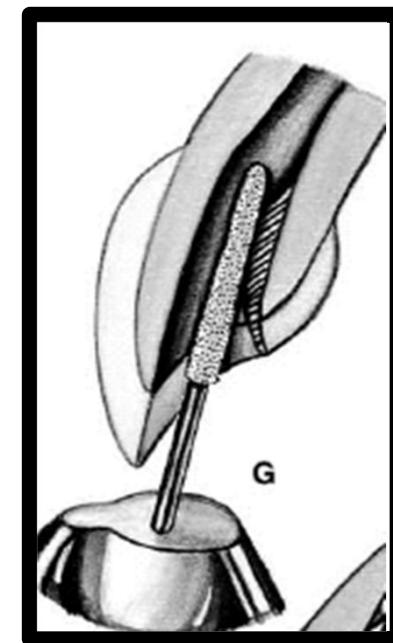
Gaining Access



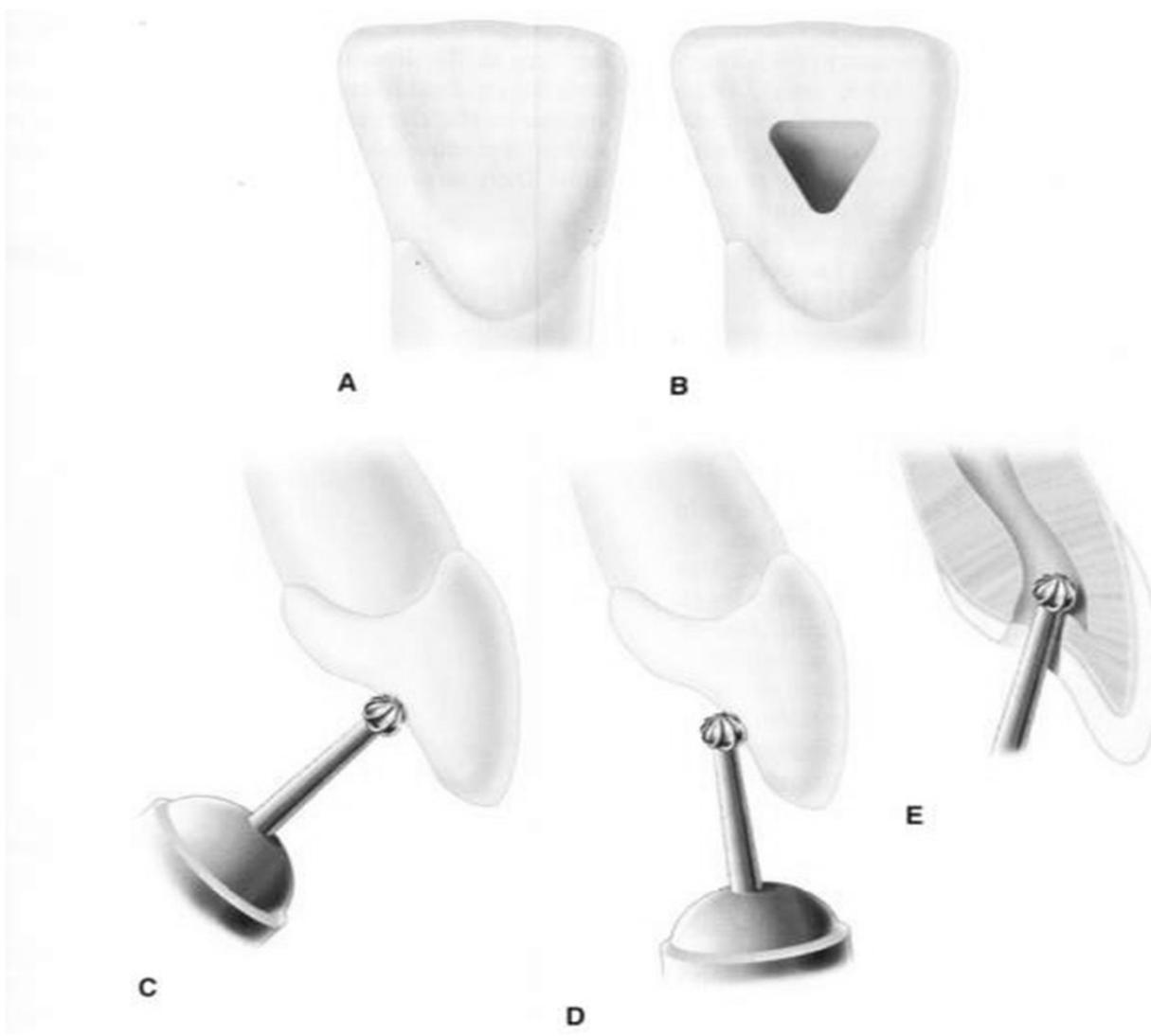
2 Deroofing

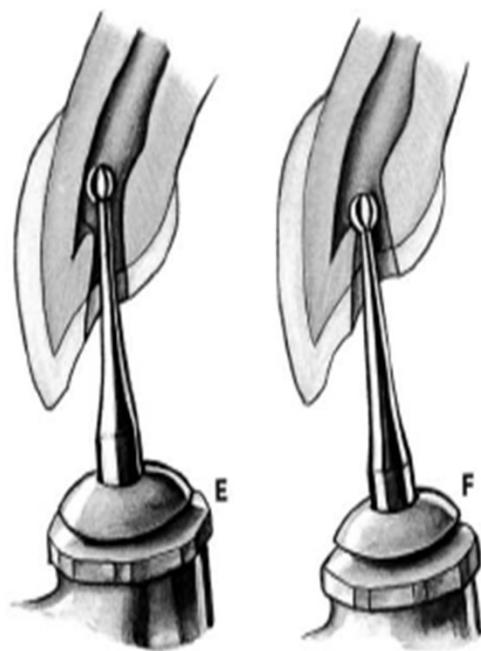
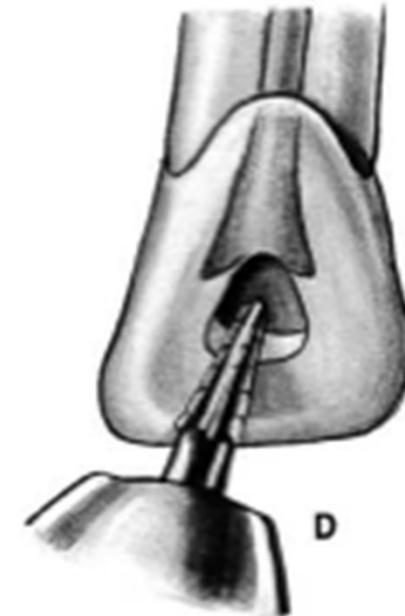
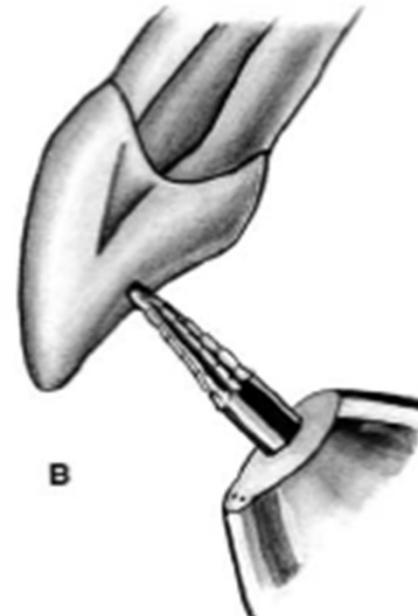
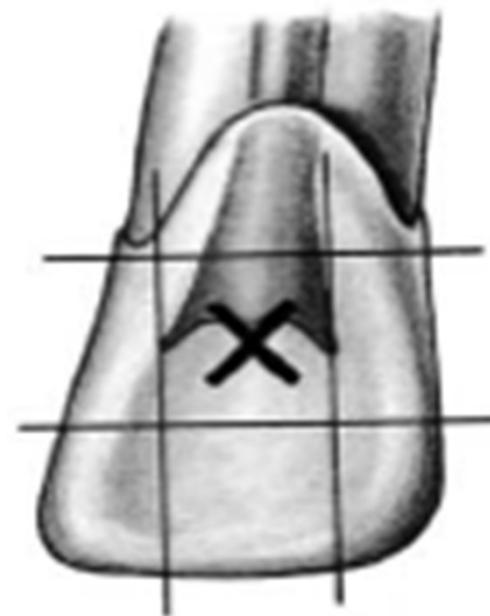


3 FLARING

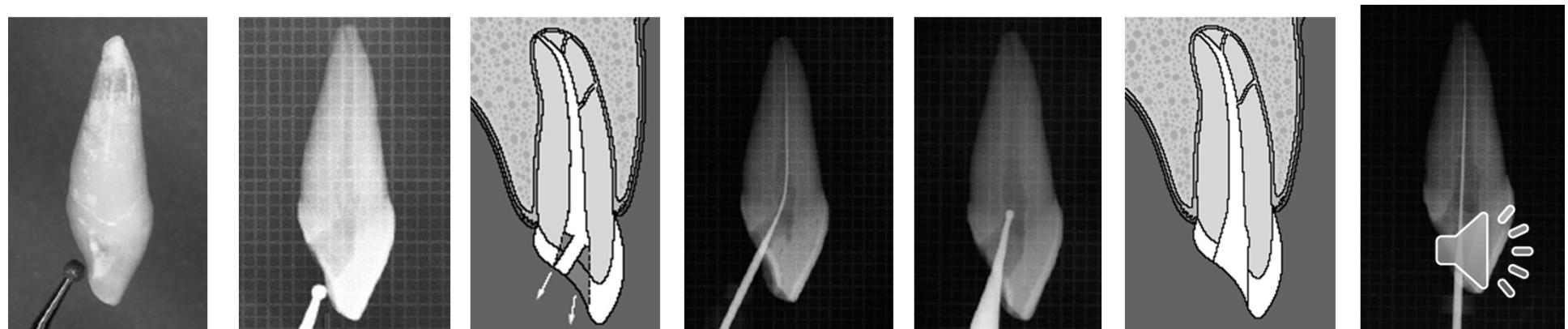
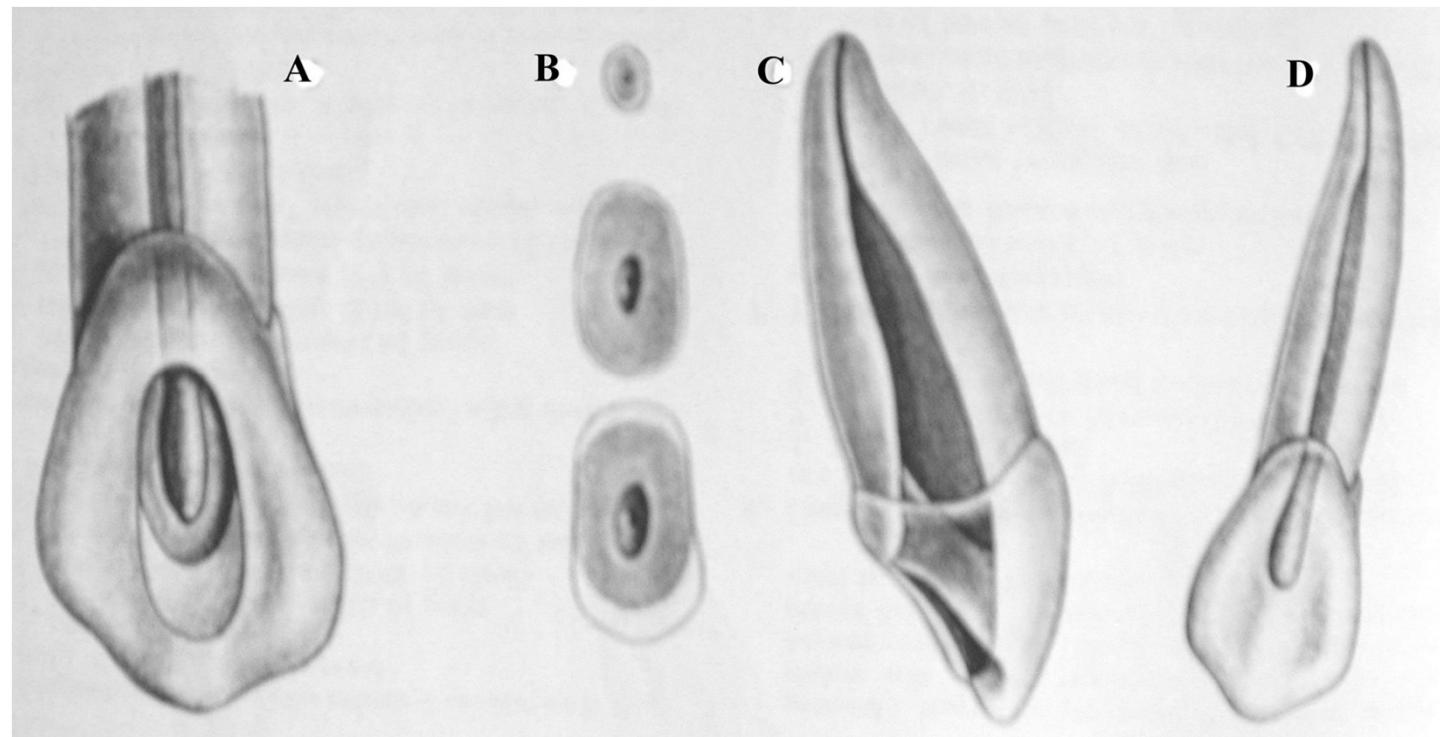


Step by step (Ant. Teeth)

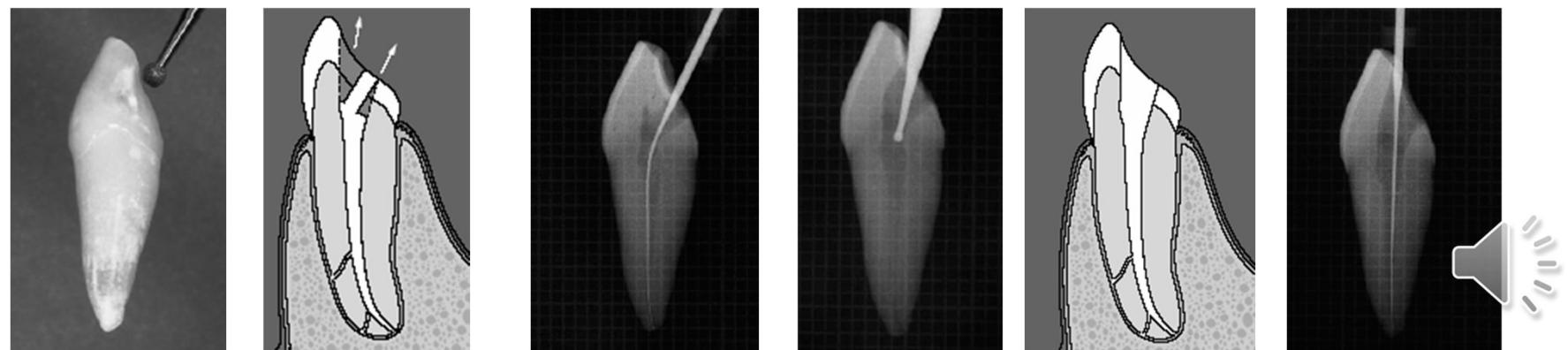
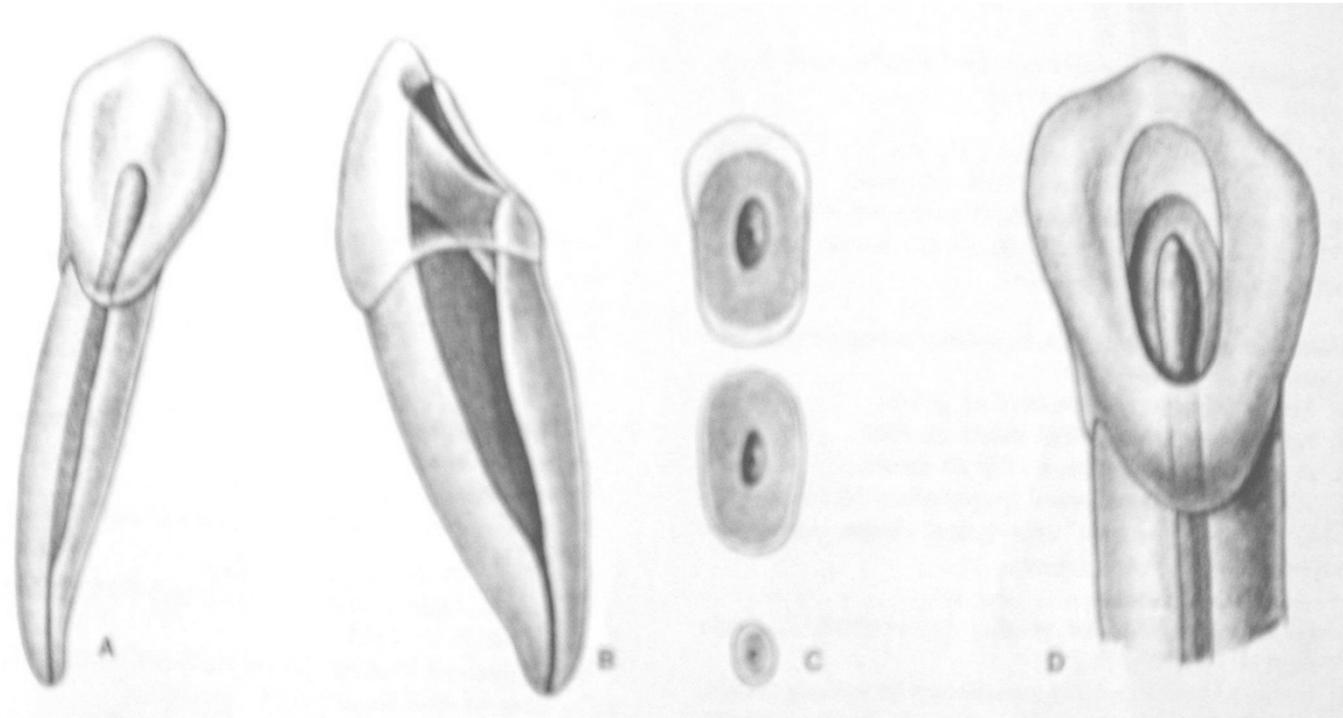




Maxillary Cuspid (Canine)



Mandibular Cuspid (Canine)



Access Cavity Preparation (Step by Step)

Shape

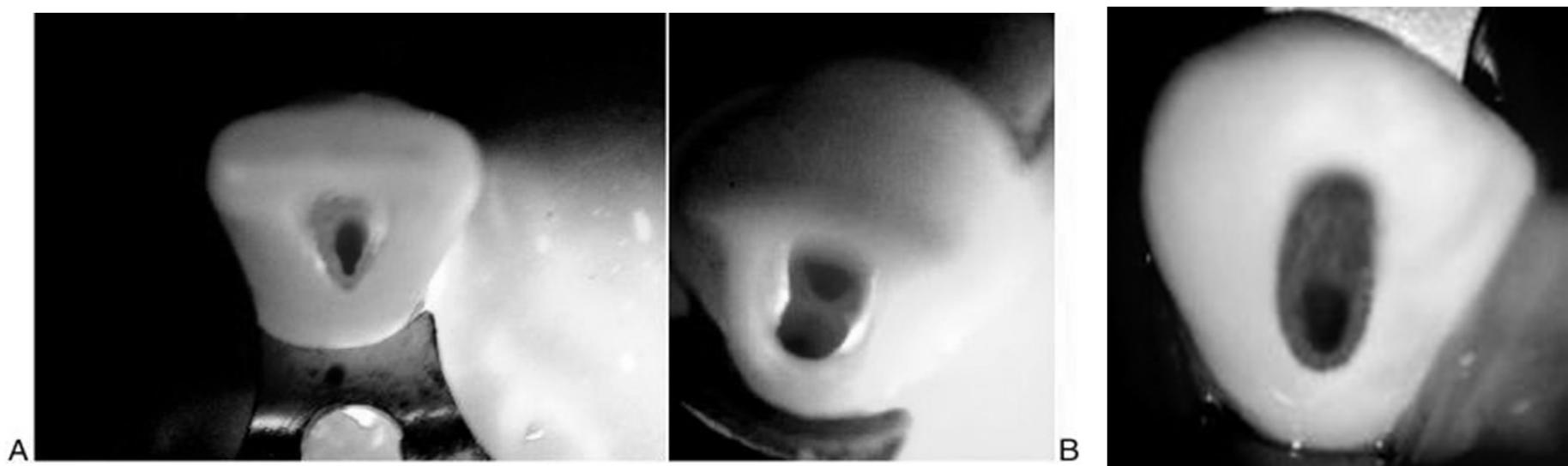
1. Gaining Access

Site (Location)

2. Deroofing

Size (Extent)

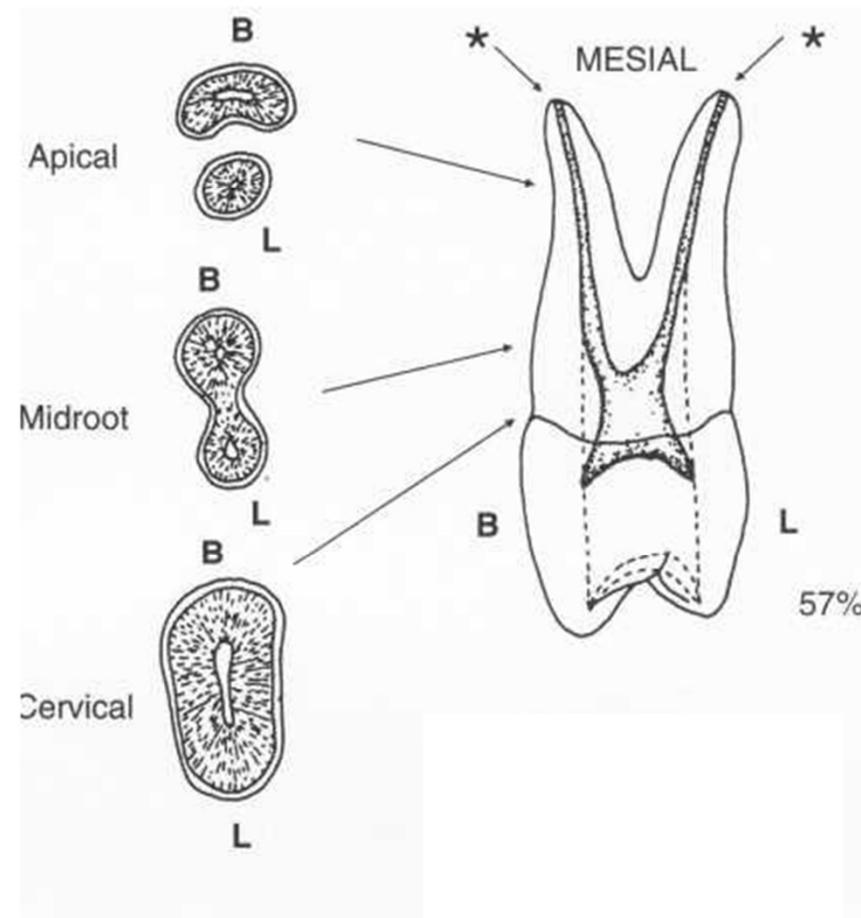
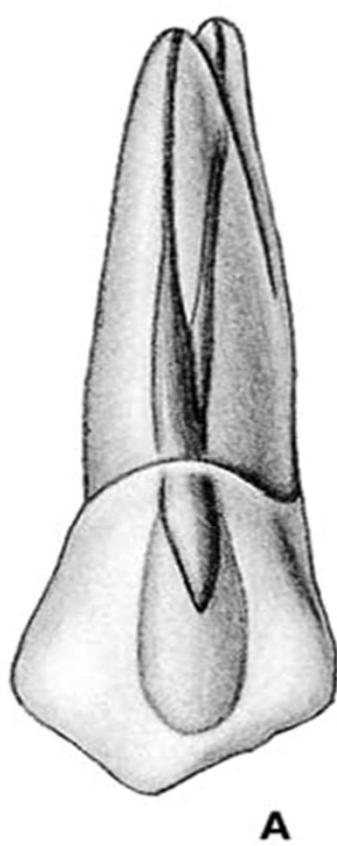
3. Flaring



22.5, crown= 8.5mm and root=14mm.

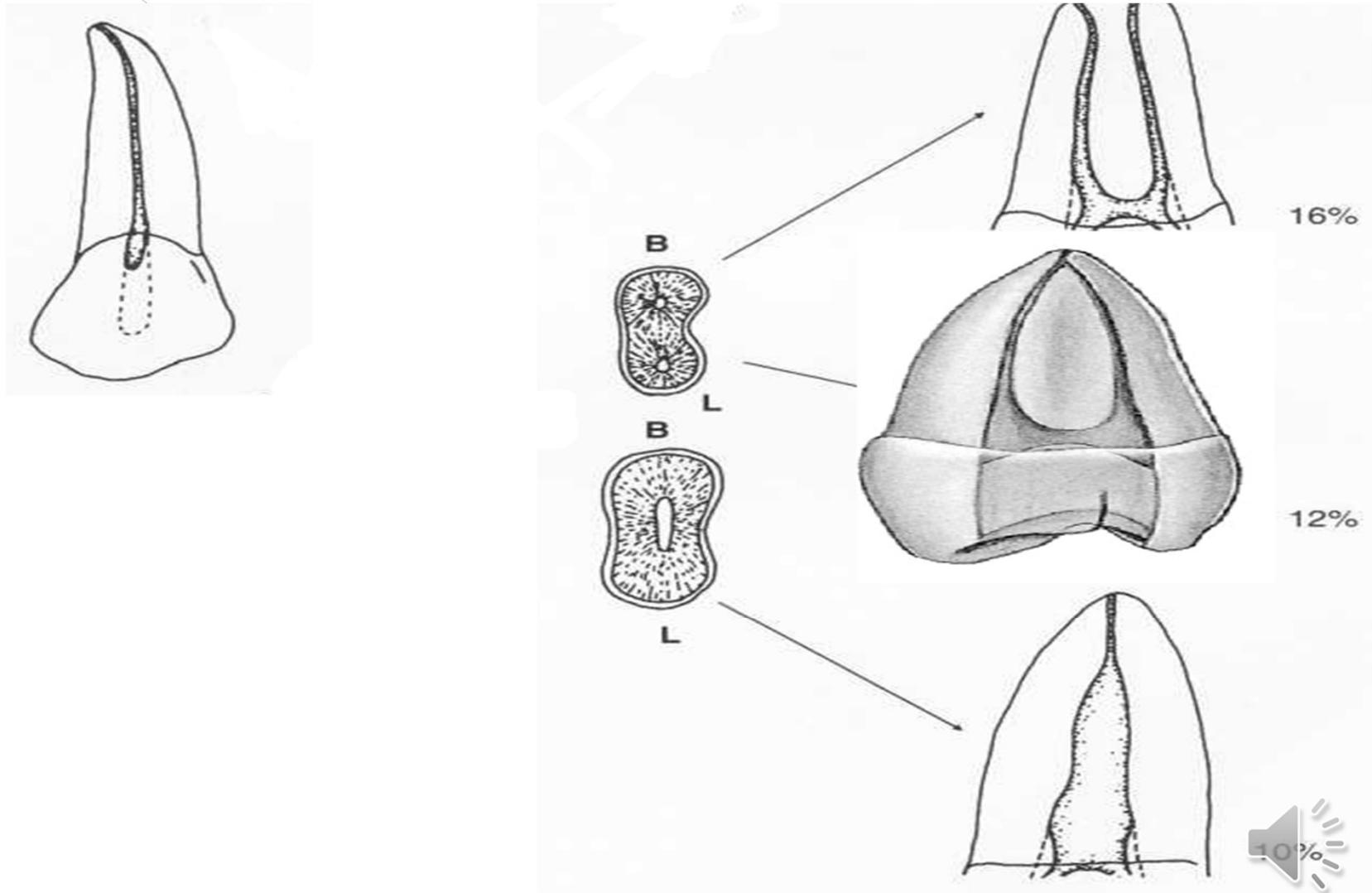
Pulp anatomy of each individual tooth

Maxillary first premolar



Pulp anatomy of each individual tooth

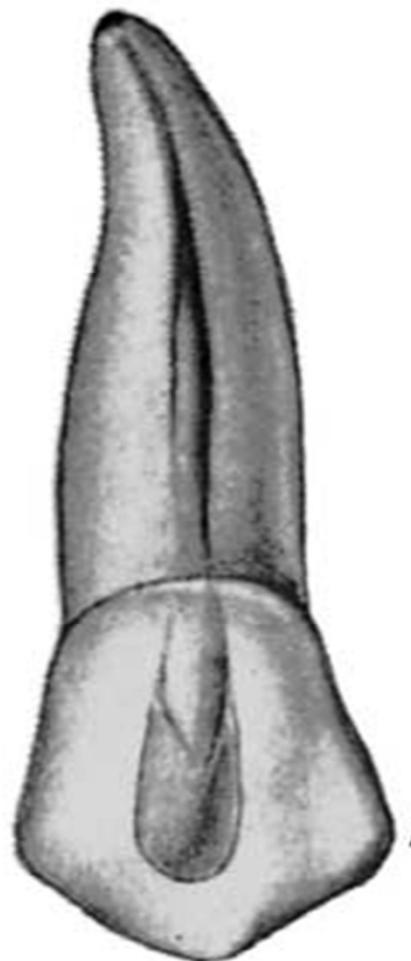
Maxillary first premolar



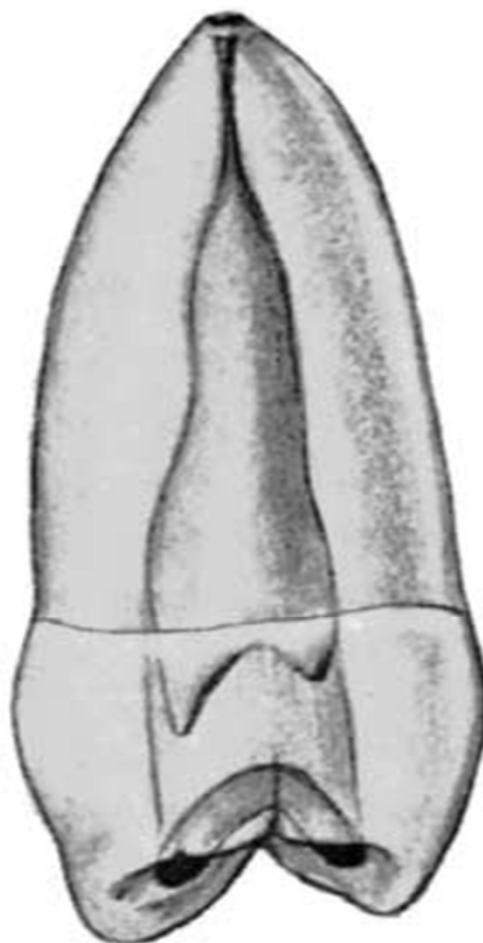
22.5, crown= 8.5mm and root=14mm.

Pulp anatomy of each individual tooth

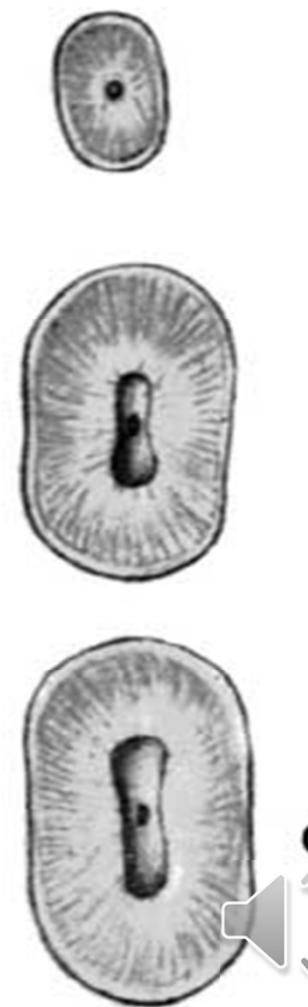
Maxillary second premolar



A



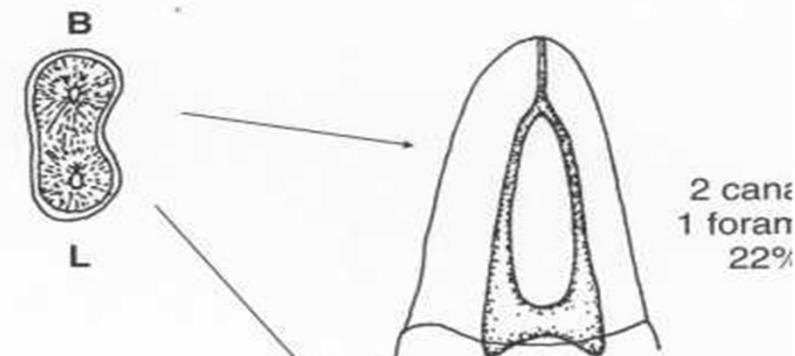
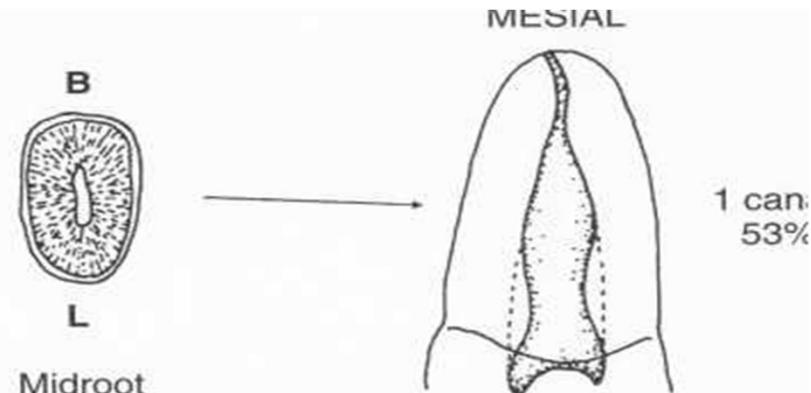
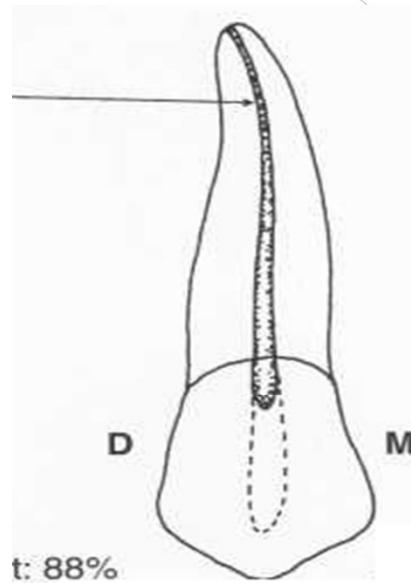
B



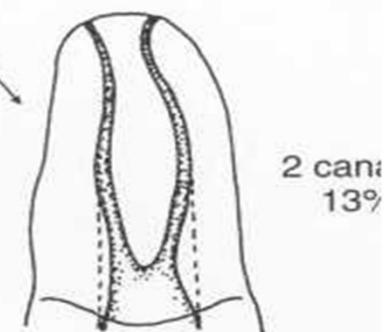
C

Pulp anatomy of each individual tooth

Maxillary second premolar

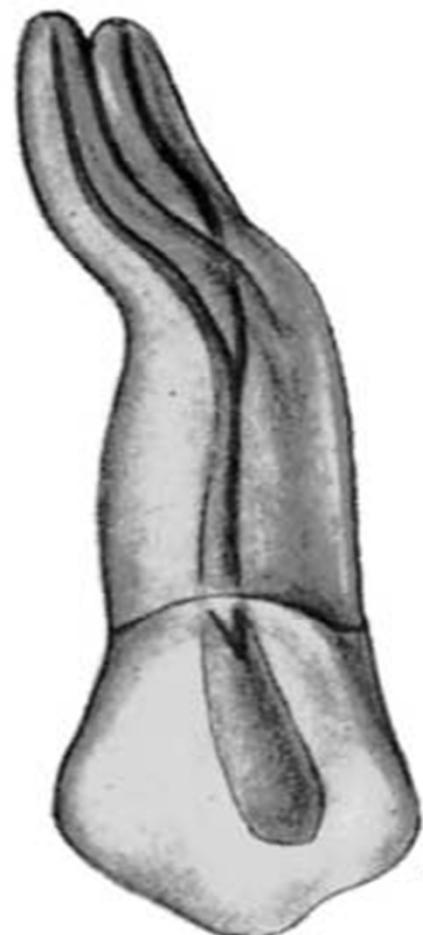


11% 2 roots as in the 1 st premolar

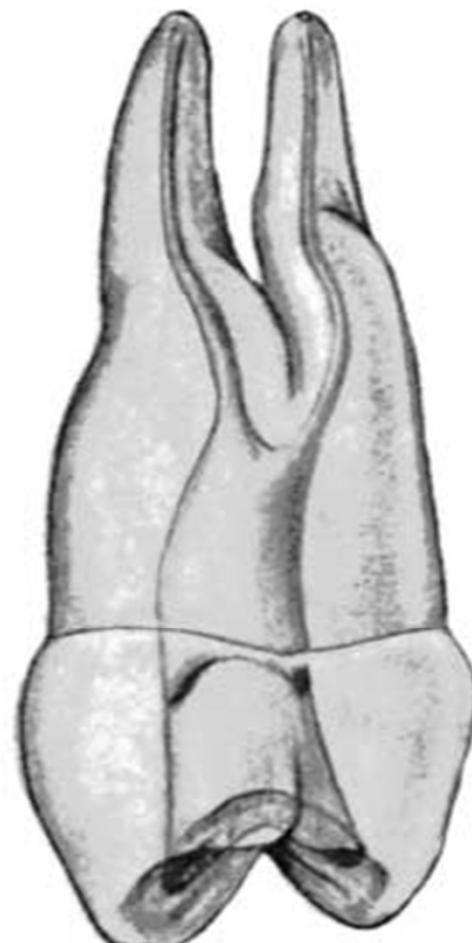


Pulp anatomy of each individual tooth

Maxillary second premolar



E



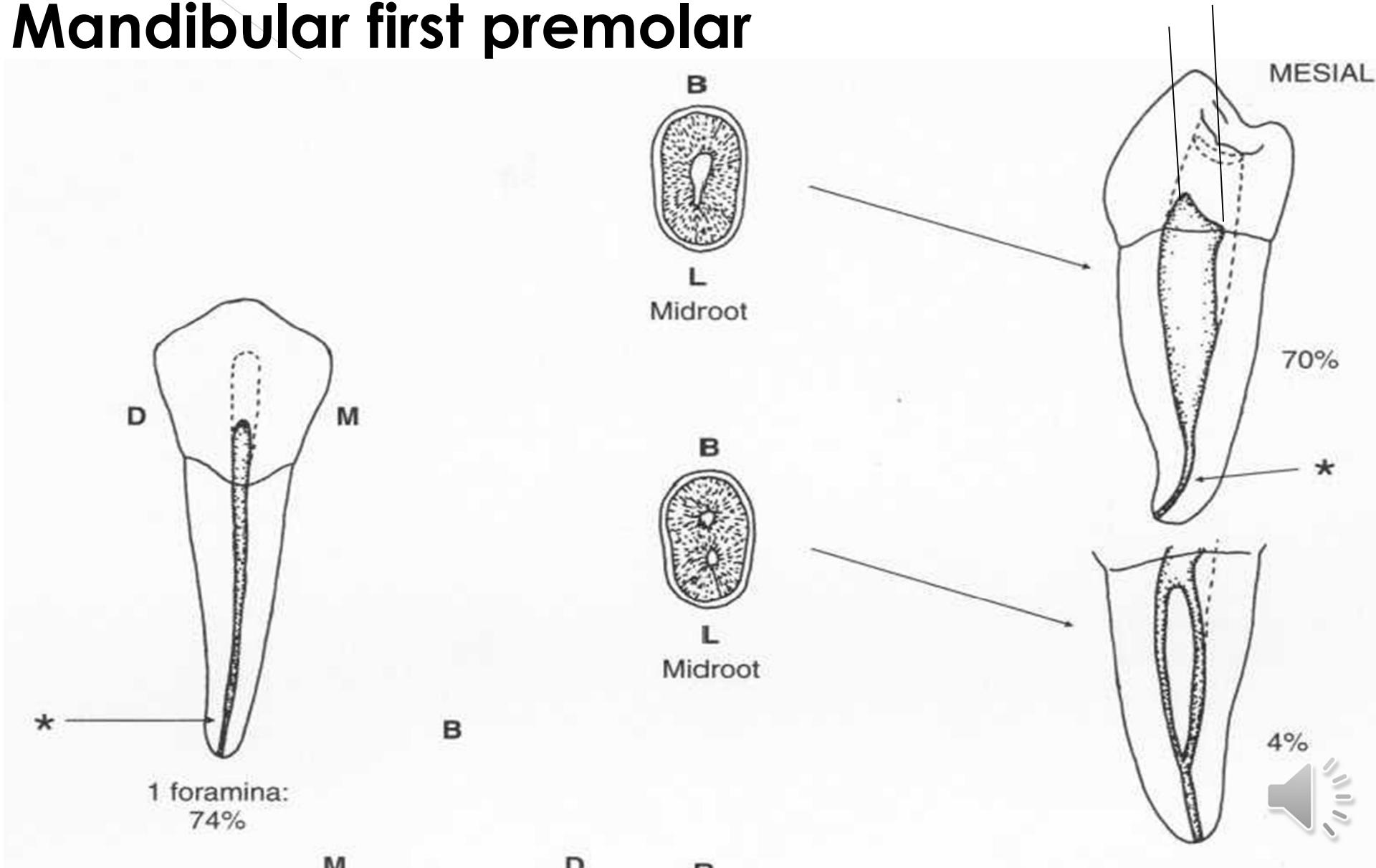
F



22.5, crown= 8.5mm and root=14mm.

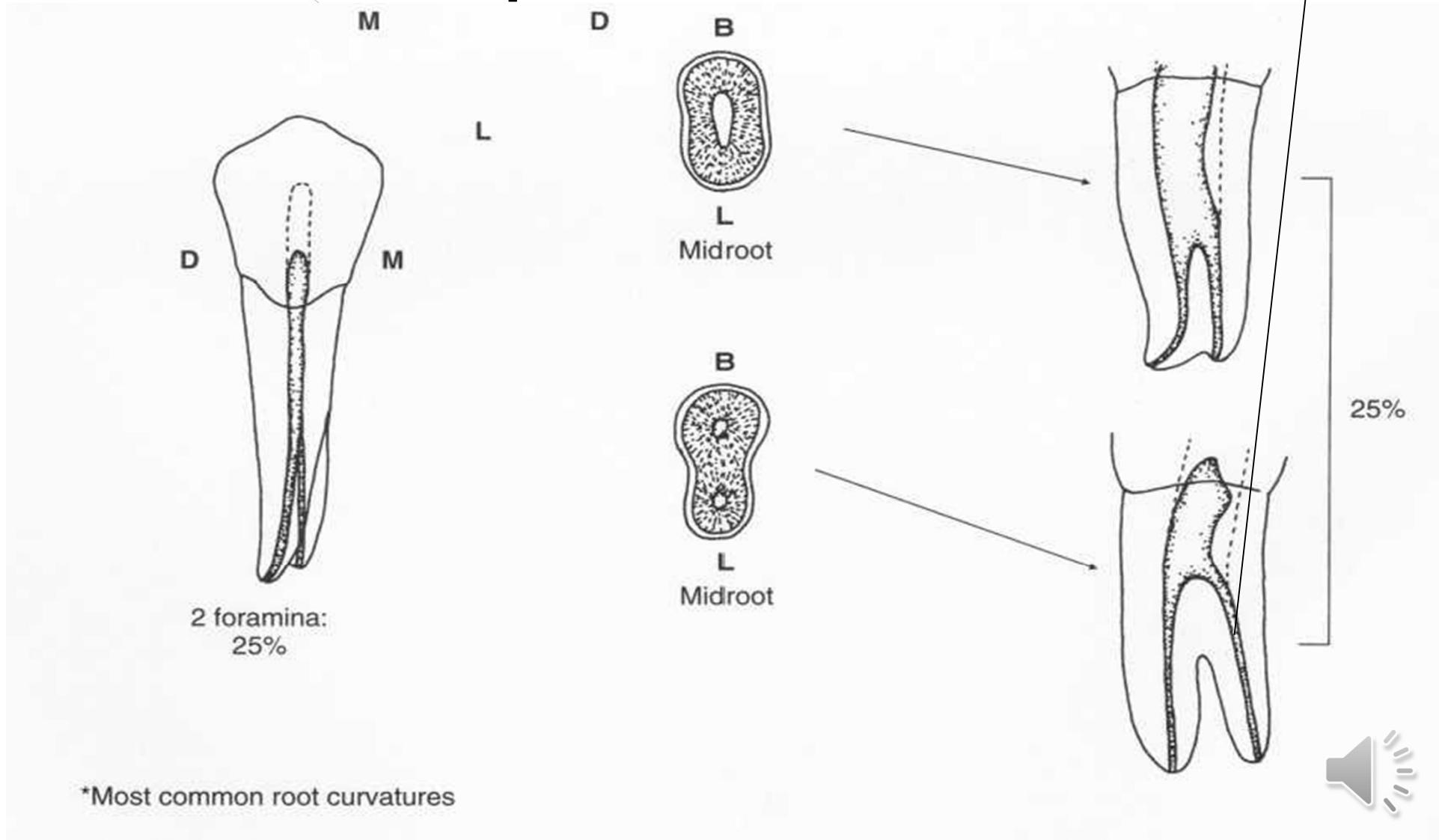
Pulp anatomy of each individual tooth

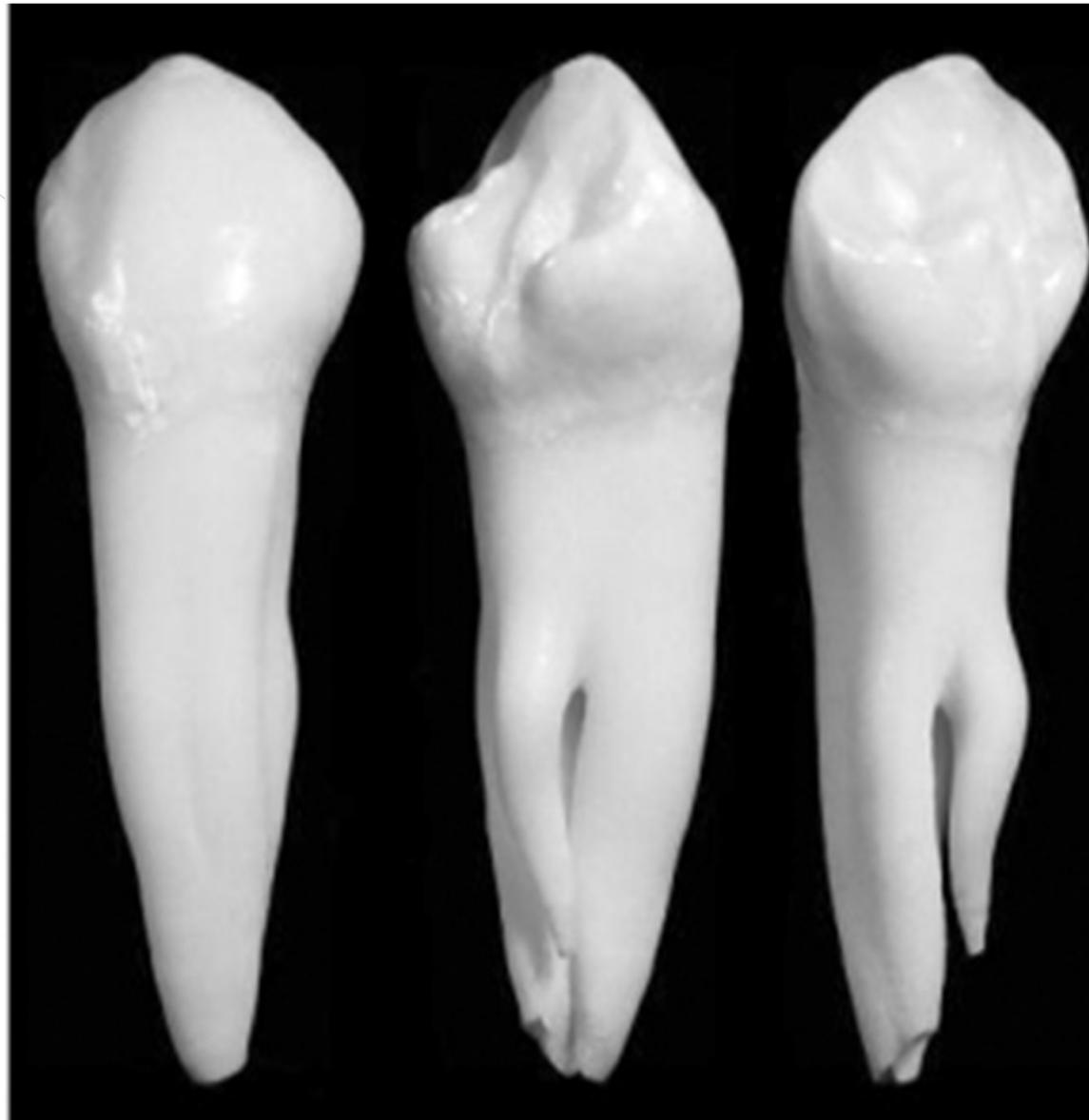
Mandibular first premolar



Pulp anatomy of each individual tooth

Mandibular first premolar

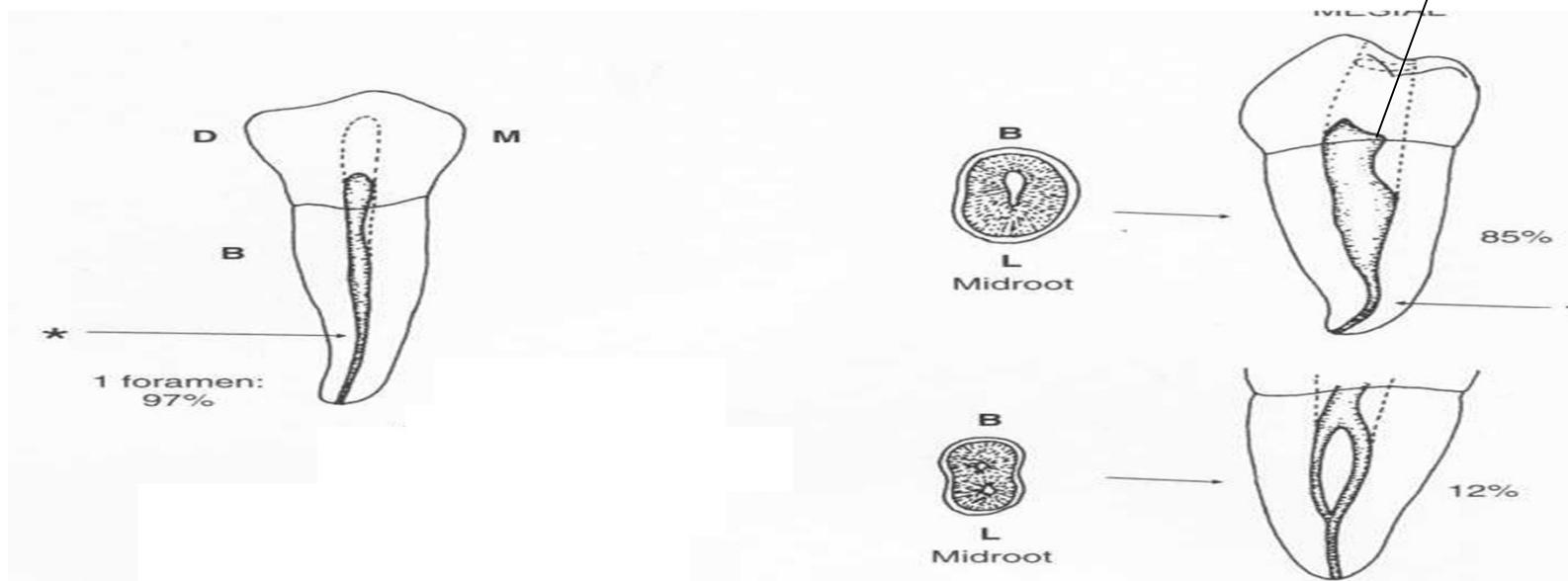




22.5, crown= 8mm and root=14.5mm.

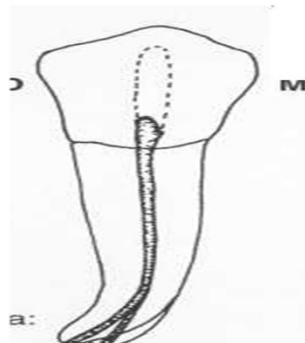
Pulp anatomy of each individual tooth

Mandibular second premolar

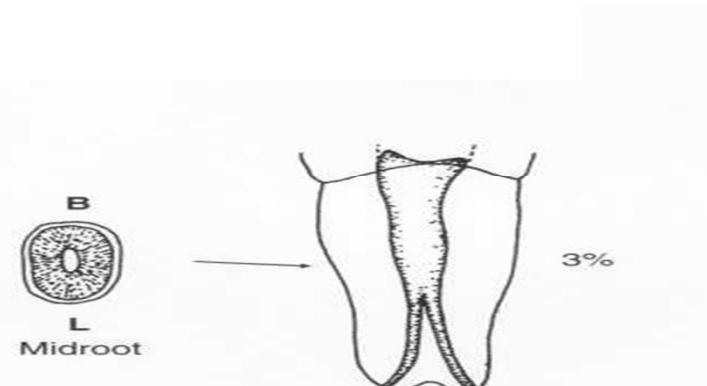


Pulp anatomy of each individual tooth

Mandibular second premolar



Common root curvatures



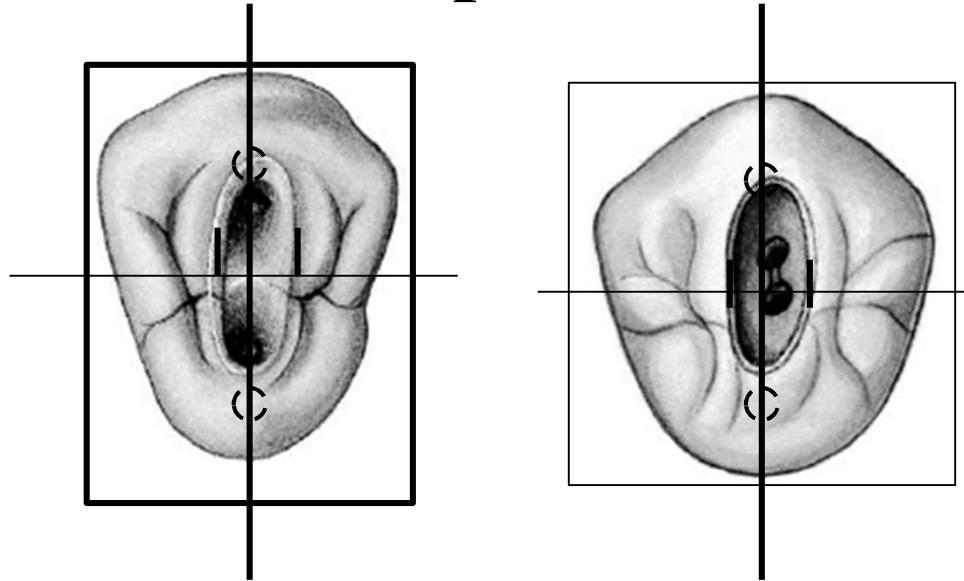
Access Cavity Preparation for Premolar Teeth (Step by Step)



Practical steps

✿ Shape:

Distal



Mesial

✿ Site
(Location):

Center

slightly buccal slightly mesial

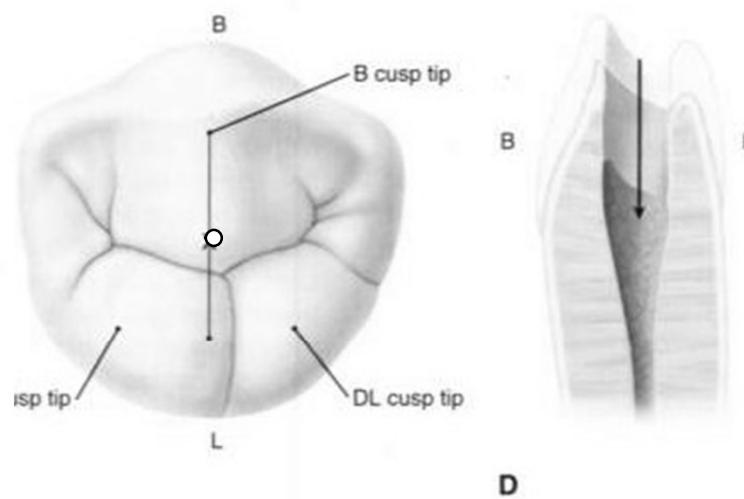
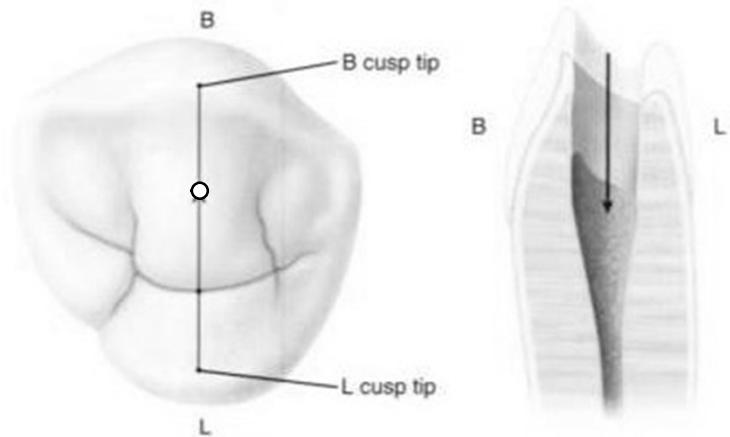
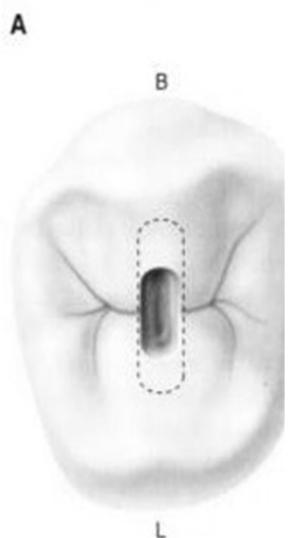
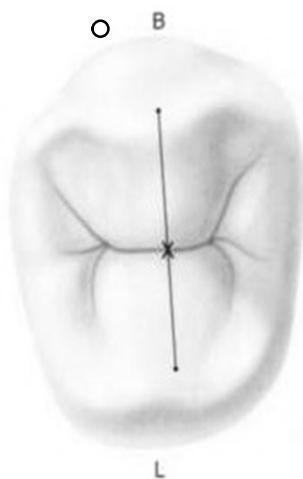
✿ Size (Extent):

Ridges



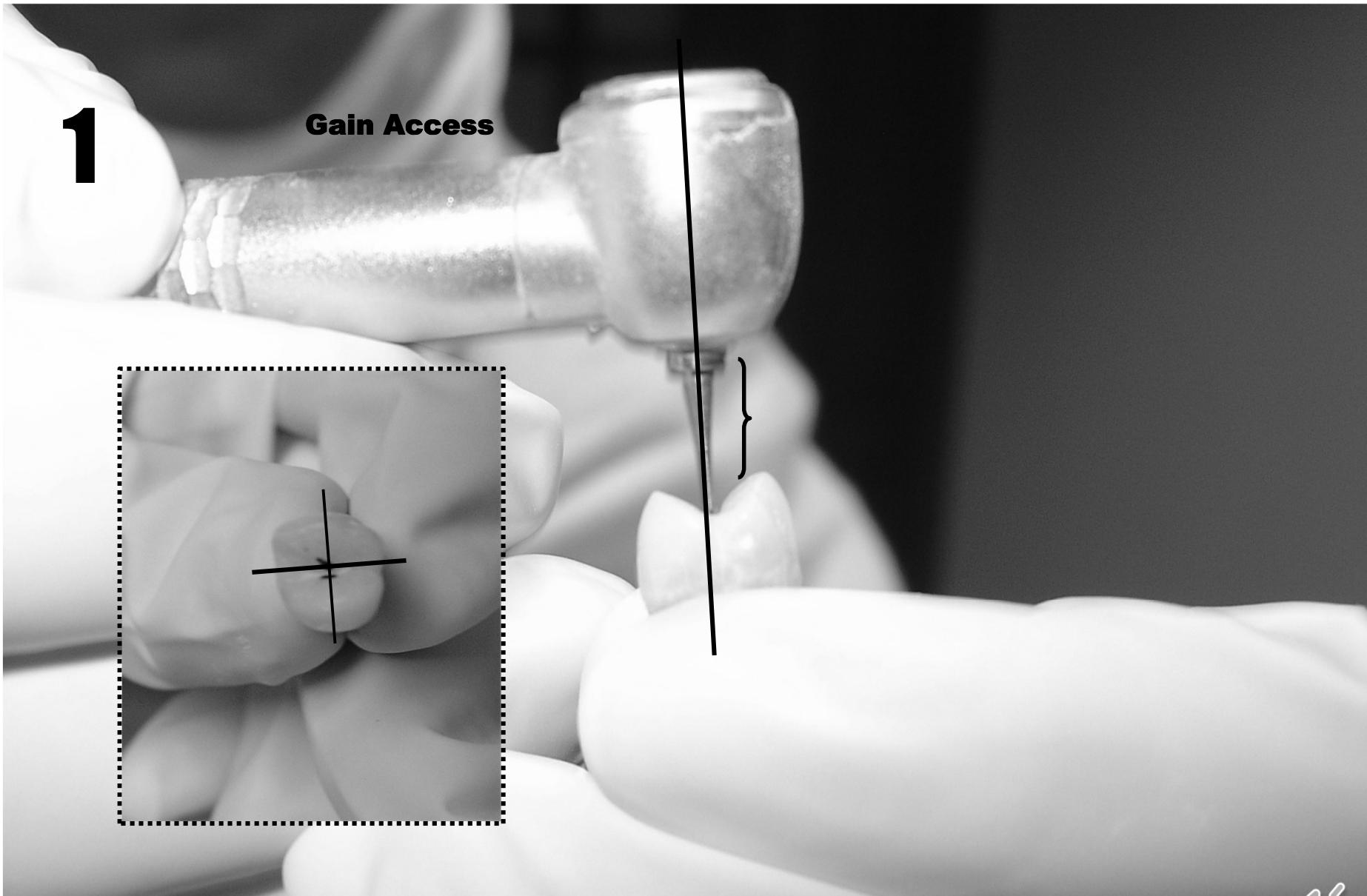
1

Gain Access



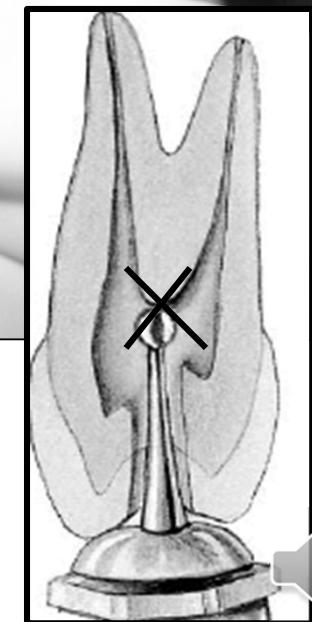
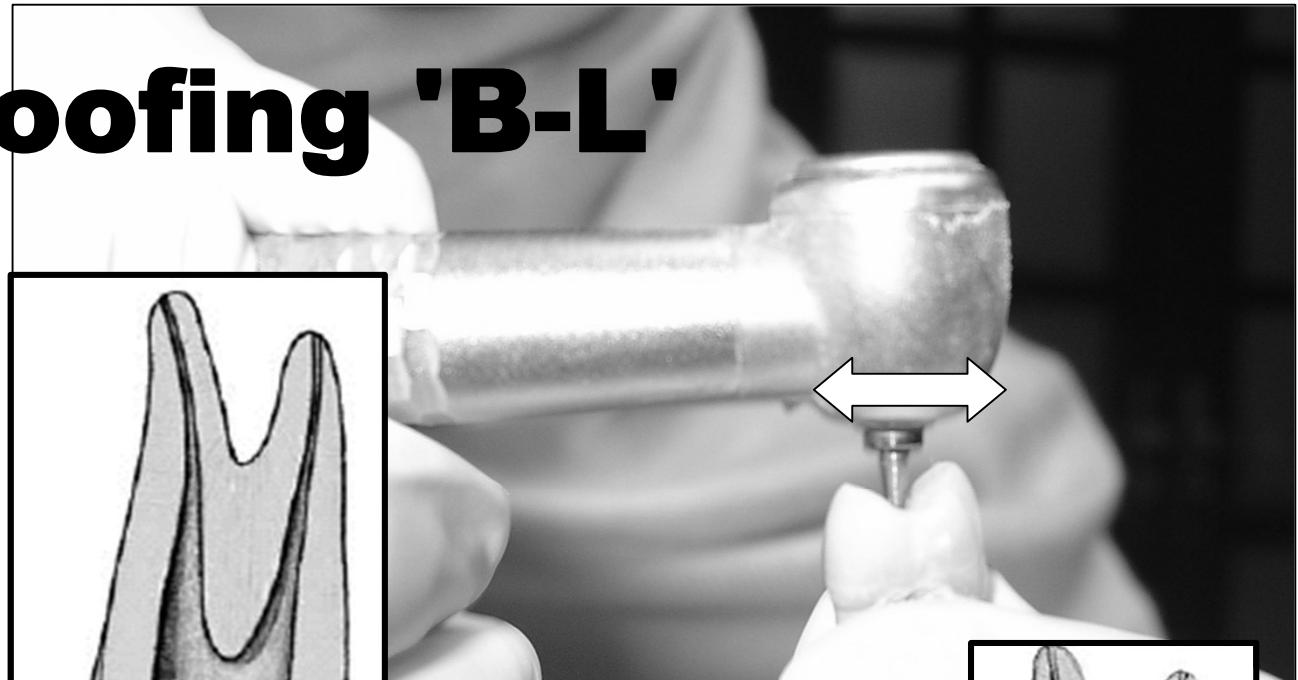
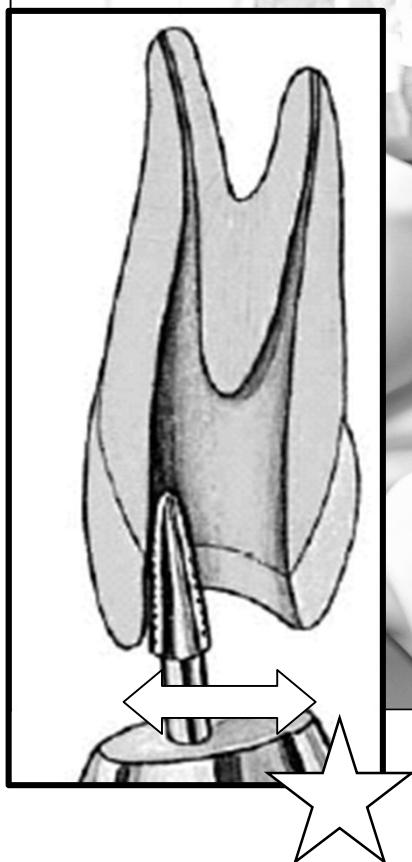
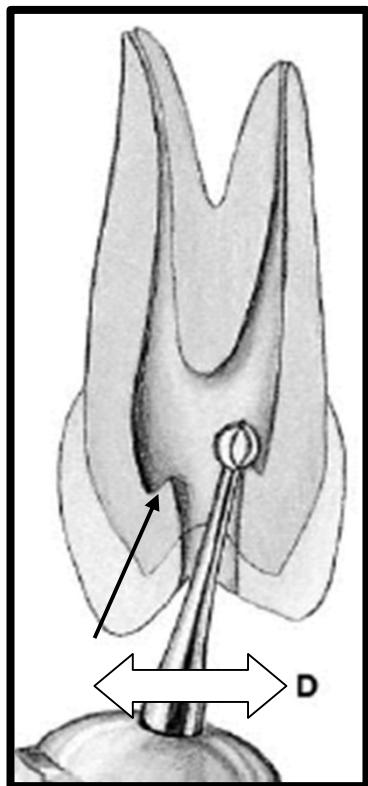
1

Gain Access



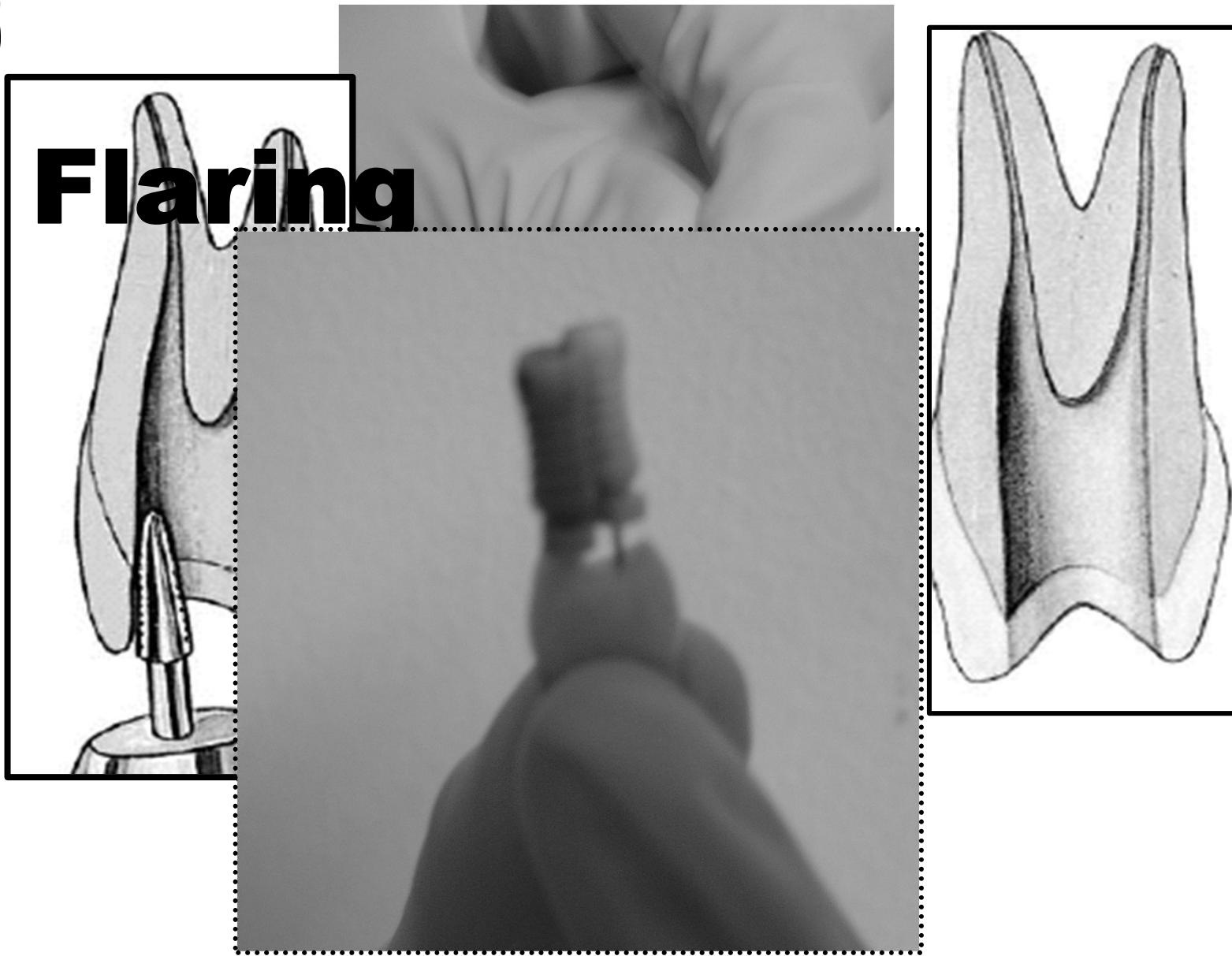
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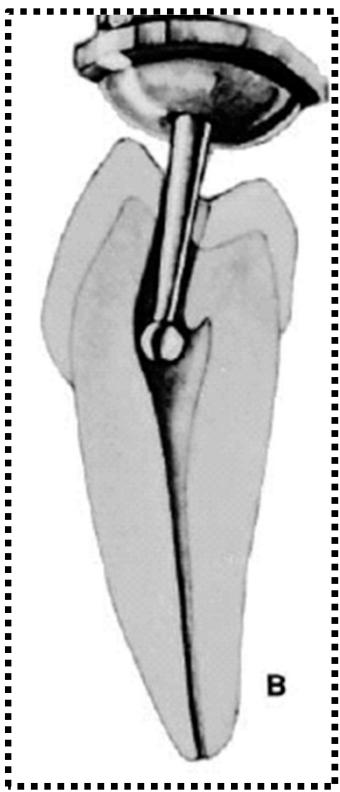
Deroofing 'B-L'



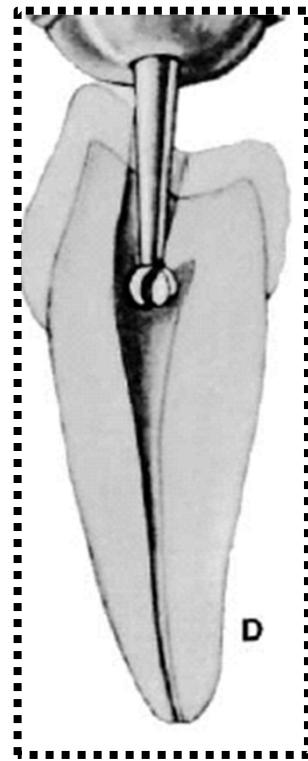
3

Flaring

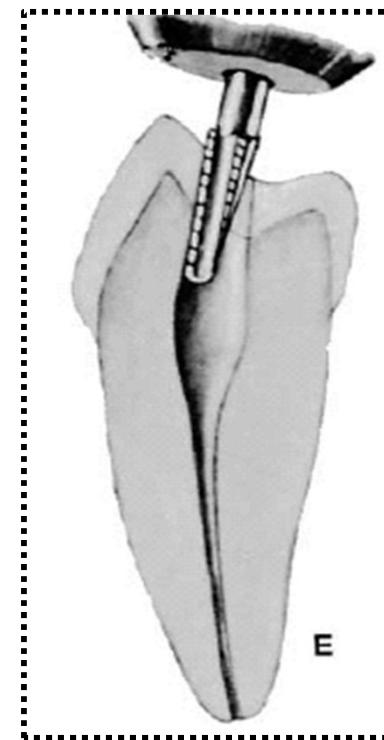




Gain Access

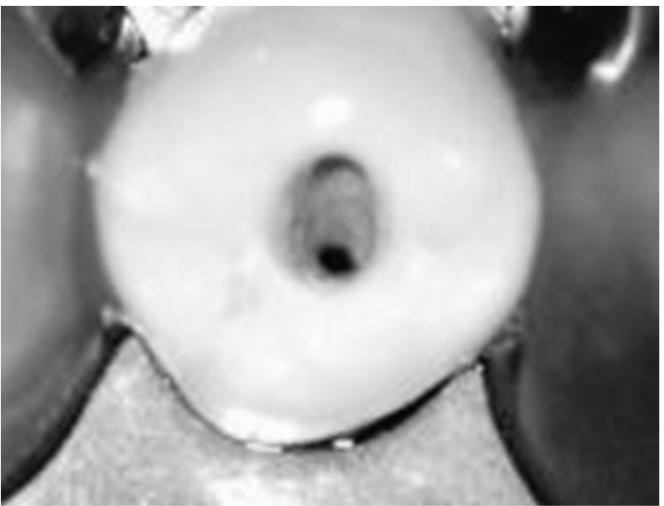
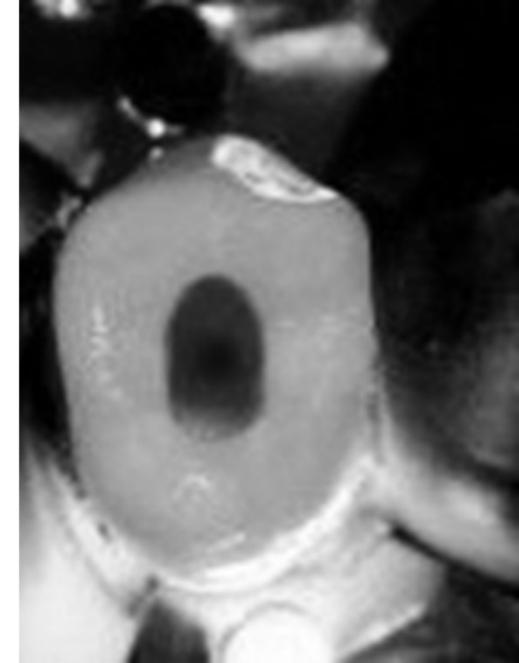
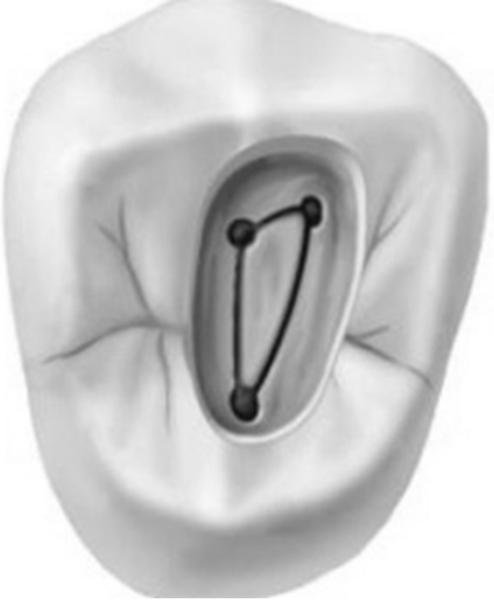


**Deroofing
'B-L'**



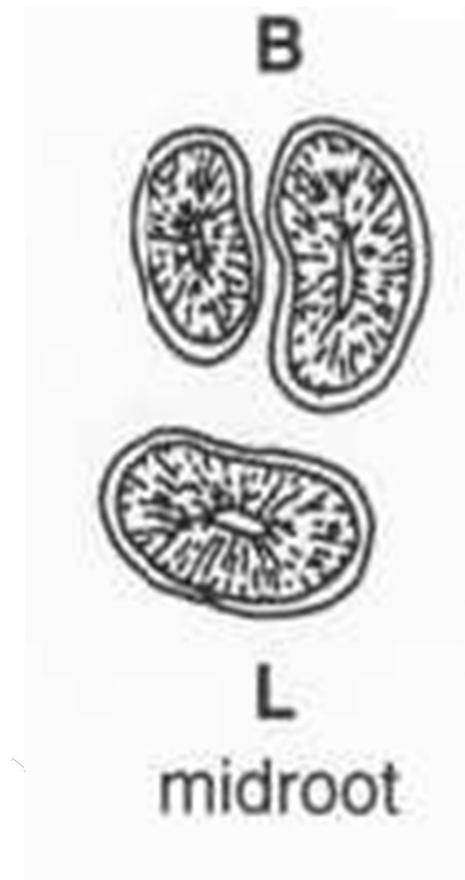
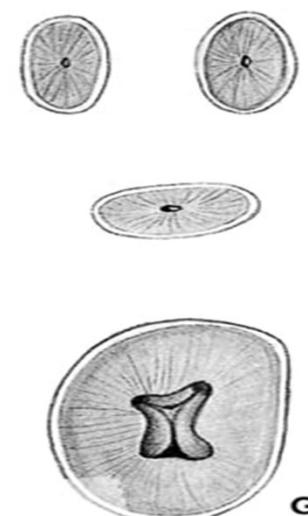
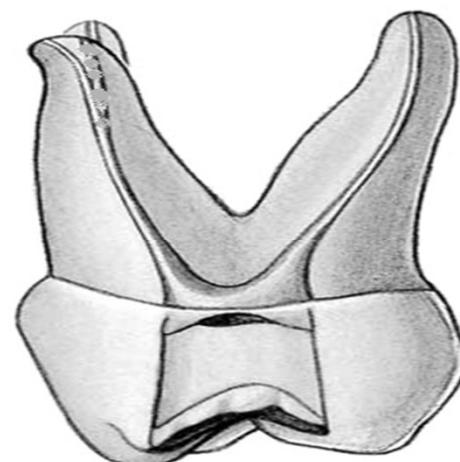
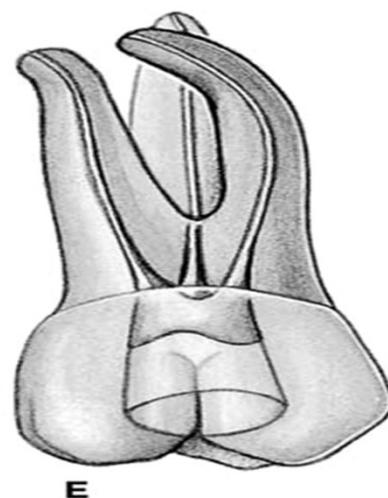
Flaring





Pulp anatomy of each individual tooth

Maxillary first molar

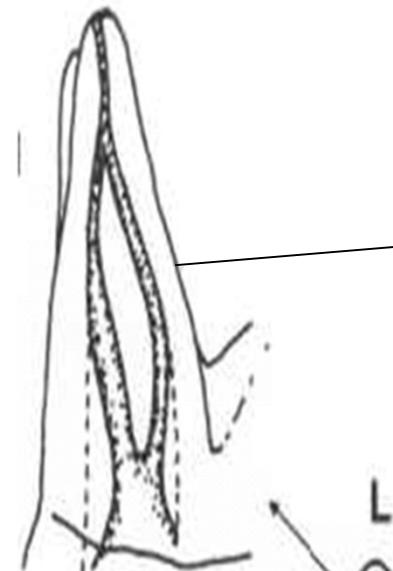


3 canals 40 %

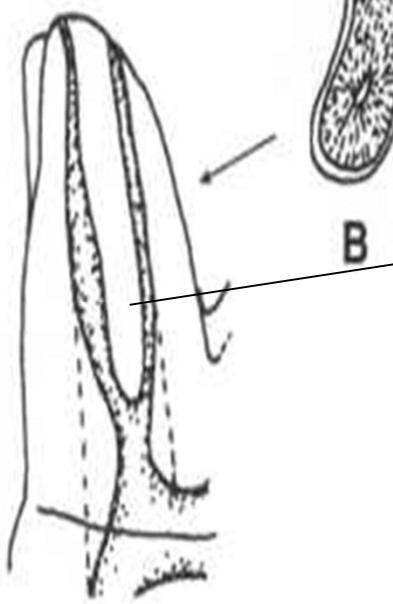


MESIAL

4 canals 60%



Single foramen 80%



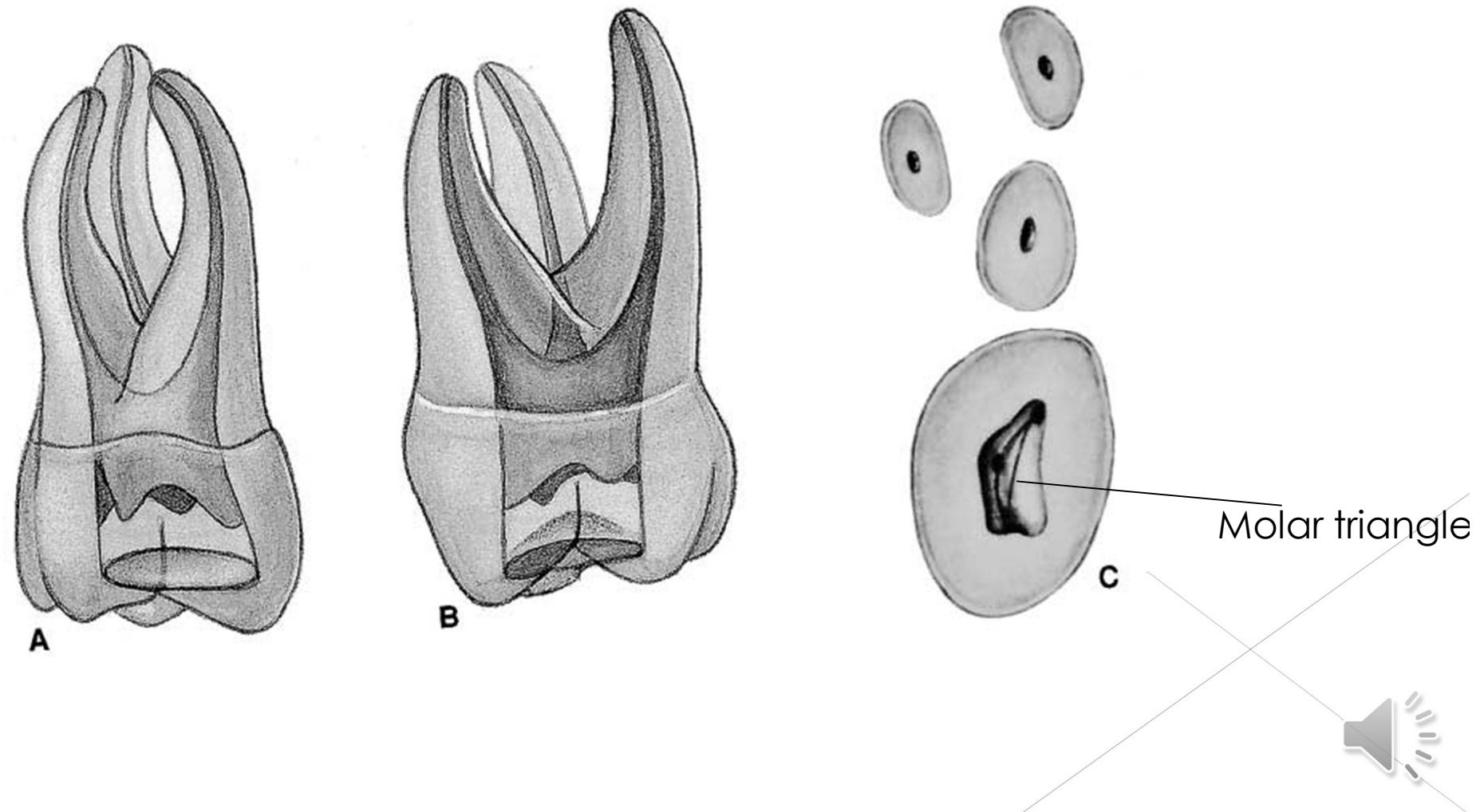
Two foramina 20%



Pulp anatomy of each individual tooth

Maxillary second molar

3 roots 60%

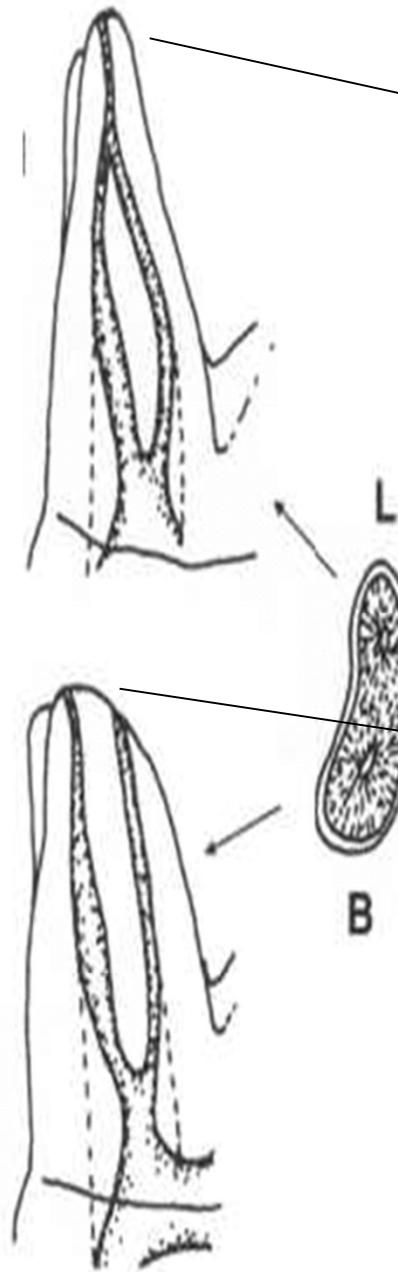


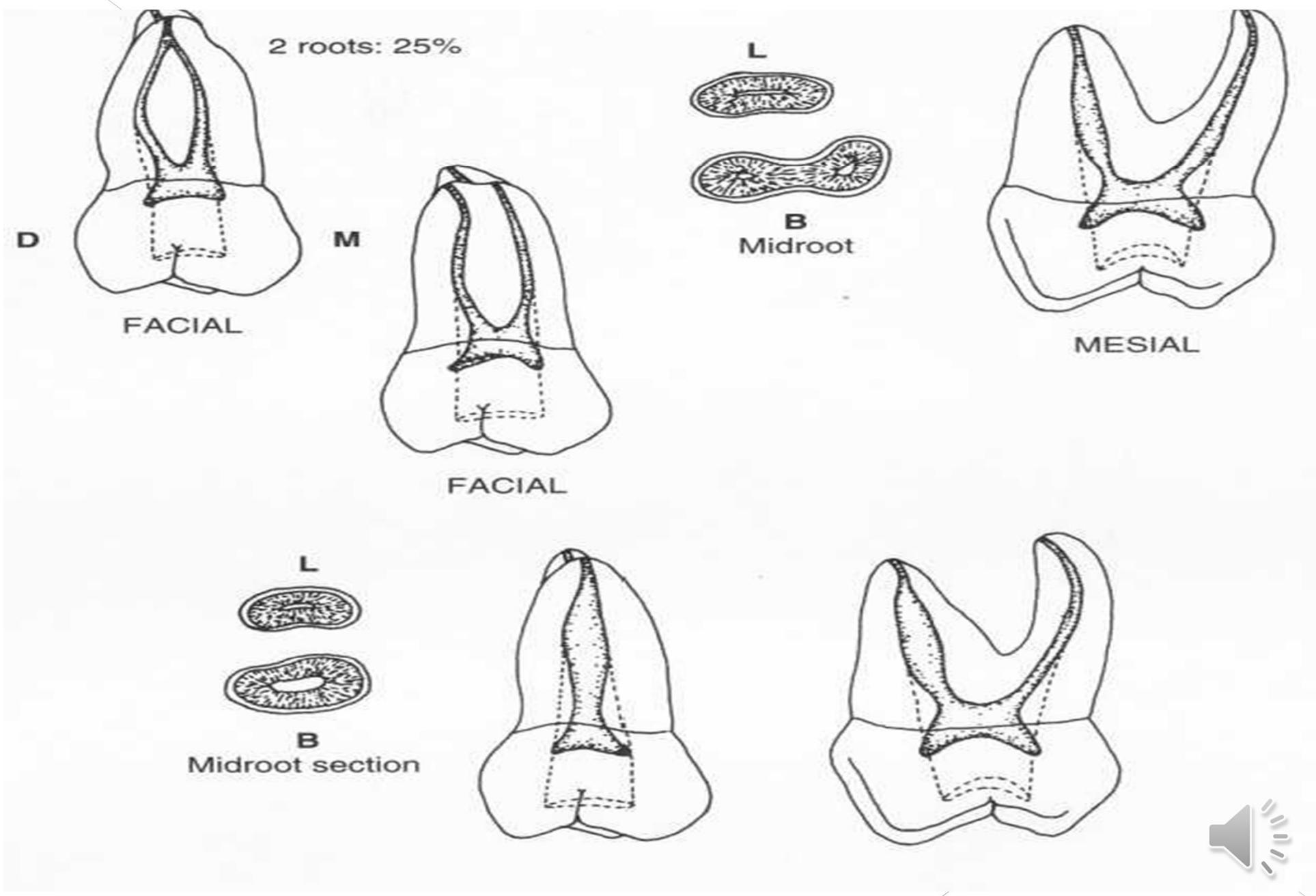
MESIAL

4 canals 38%

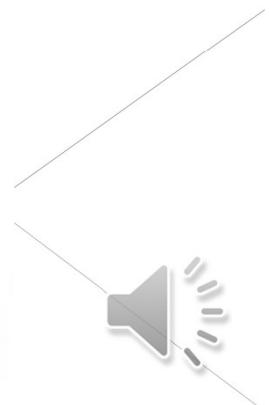
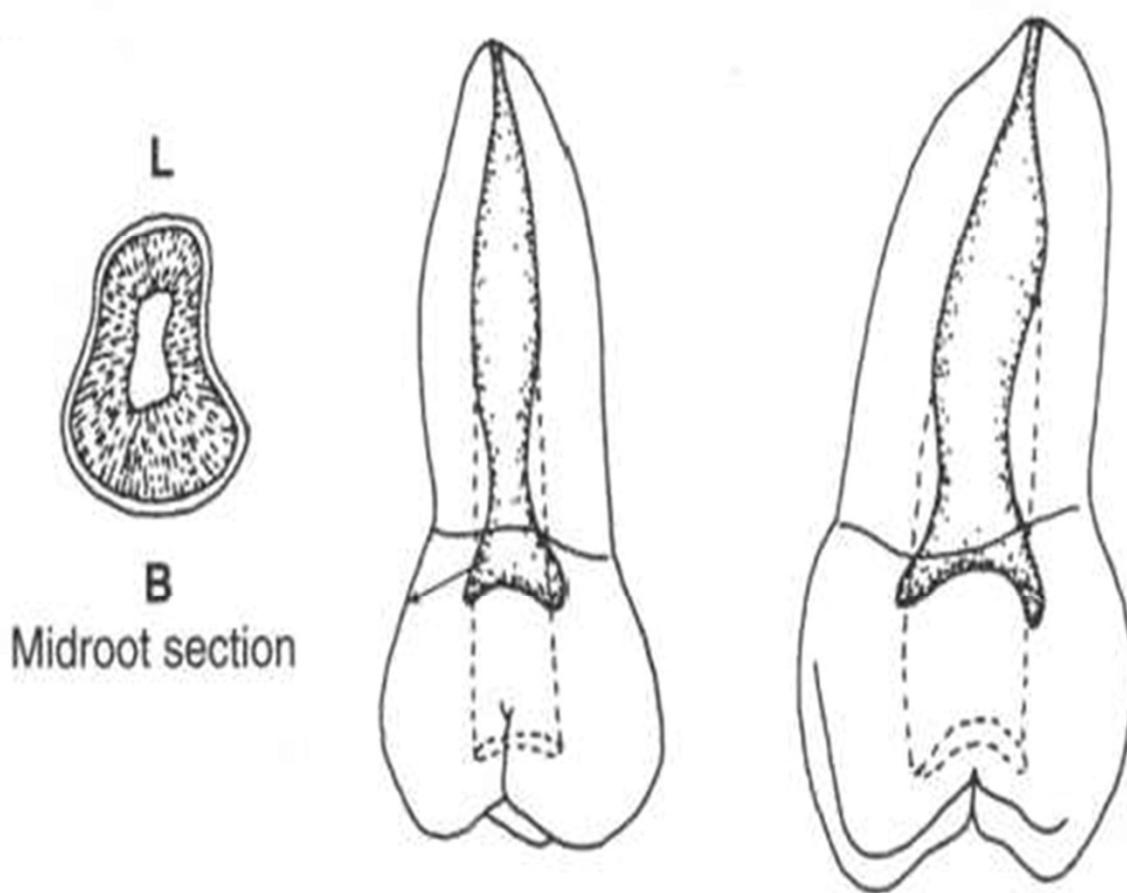
1 foramen 15%

2 foramina 10 %



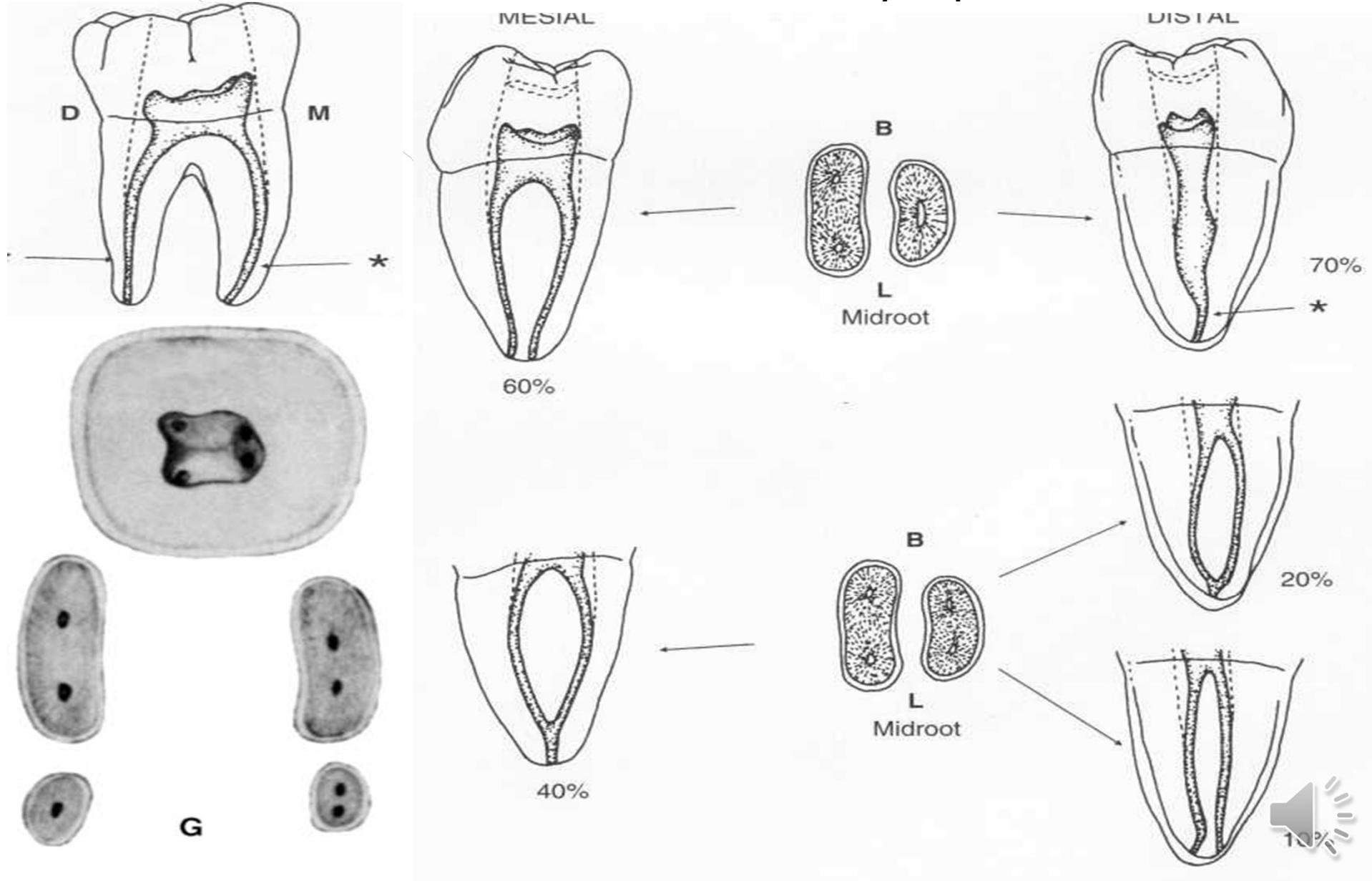


1 root 15 %



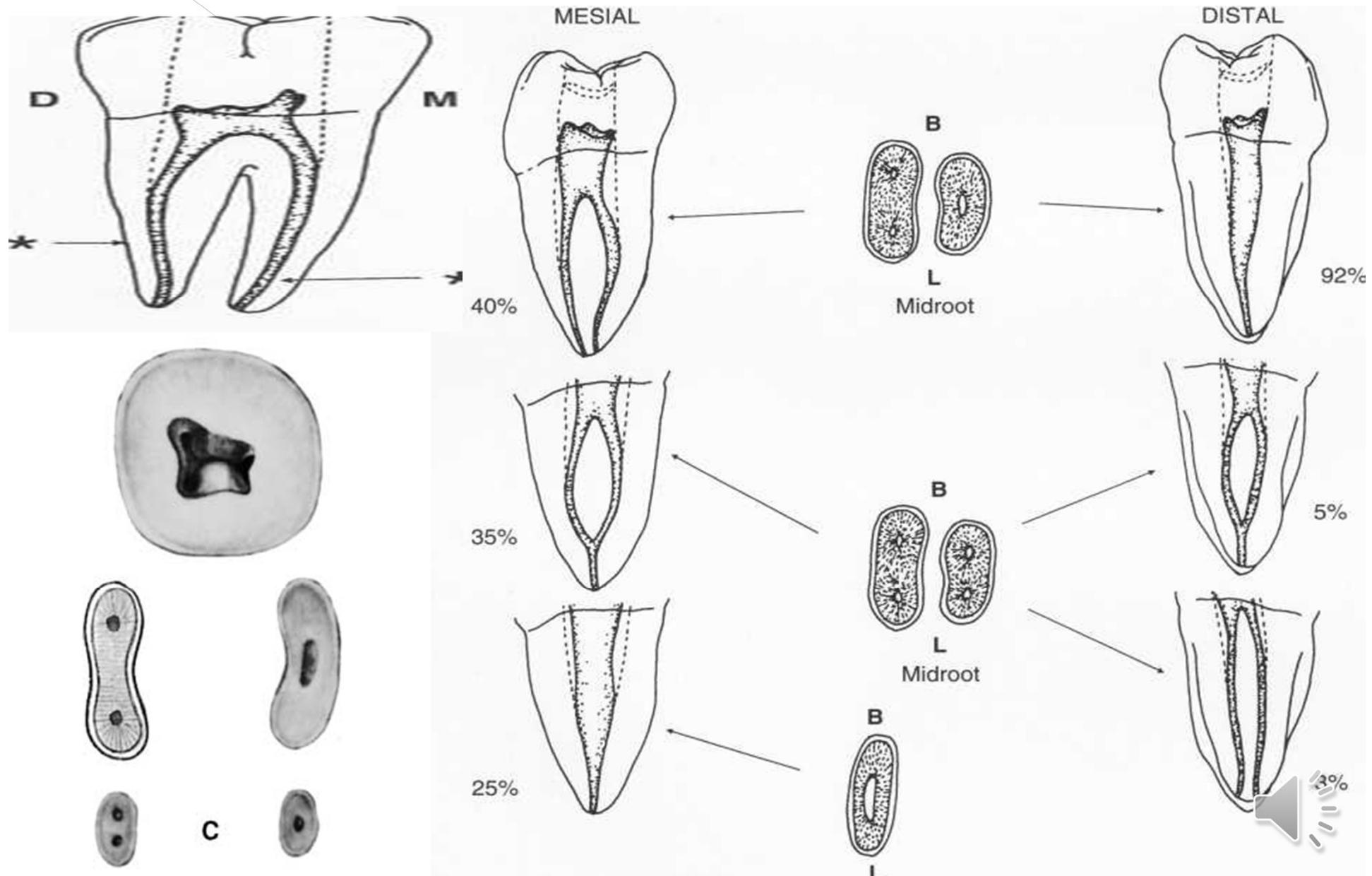
Pulp anatomy of each individual tooth

Mandibular first molar 3 rd root may be present, 3 rd rc

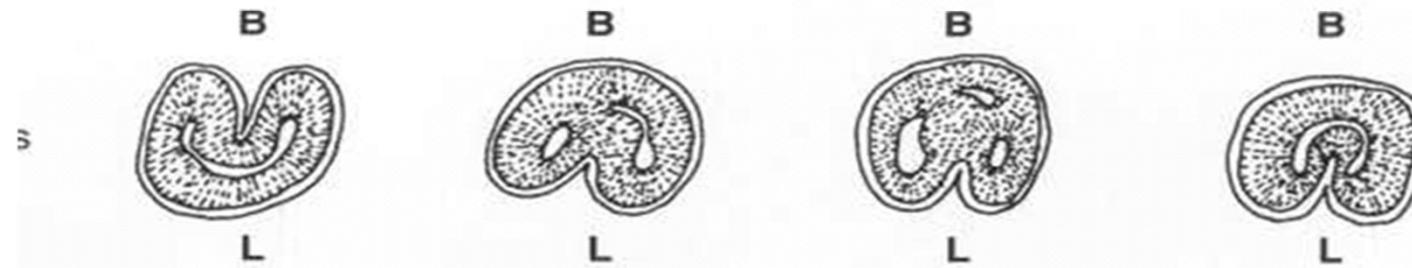
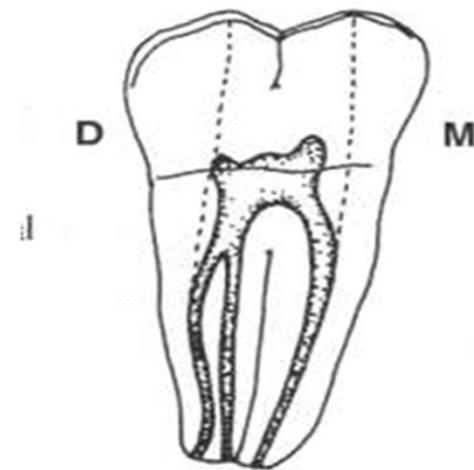


Pulp anatomy of each individual tooth

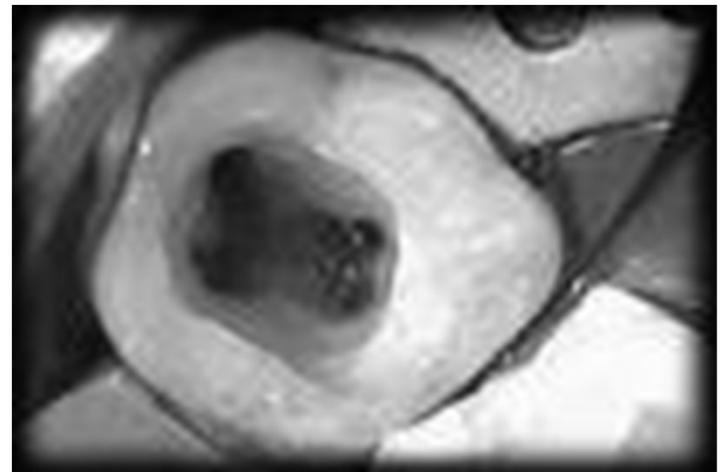
Mandibular second molar



C-shaped canal

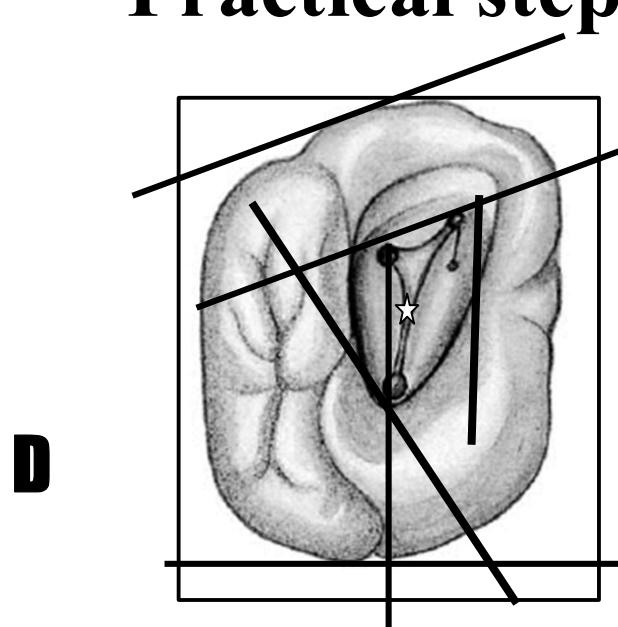


Access Cavity Preparation for Molar Teeth (Step by Step)

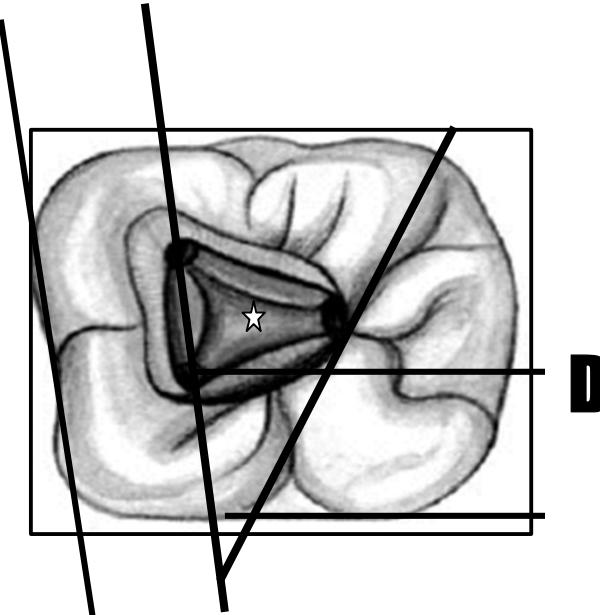


Practical steps

✿ Shape:



M



D

✿ Site:

Upper

→ Mainly in the **MB 3/5**

Lower

→ Mainly in the **MB 2/3**

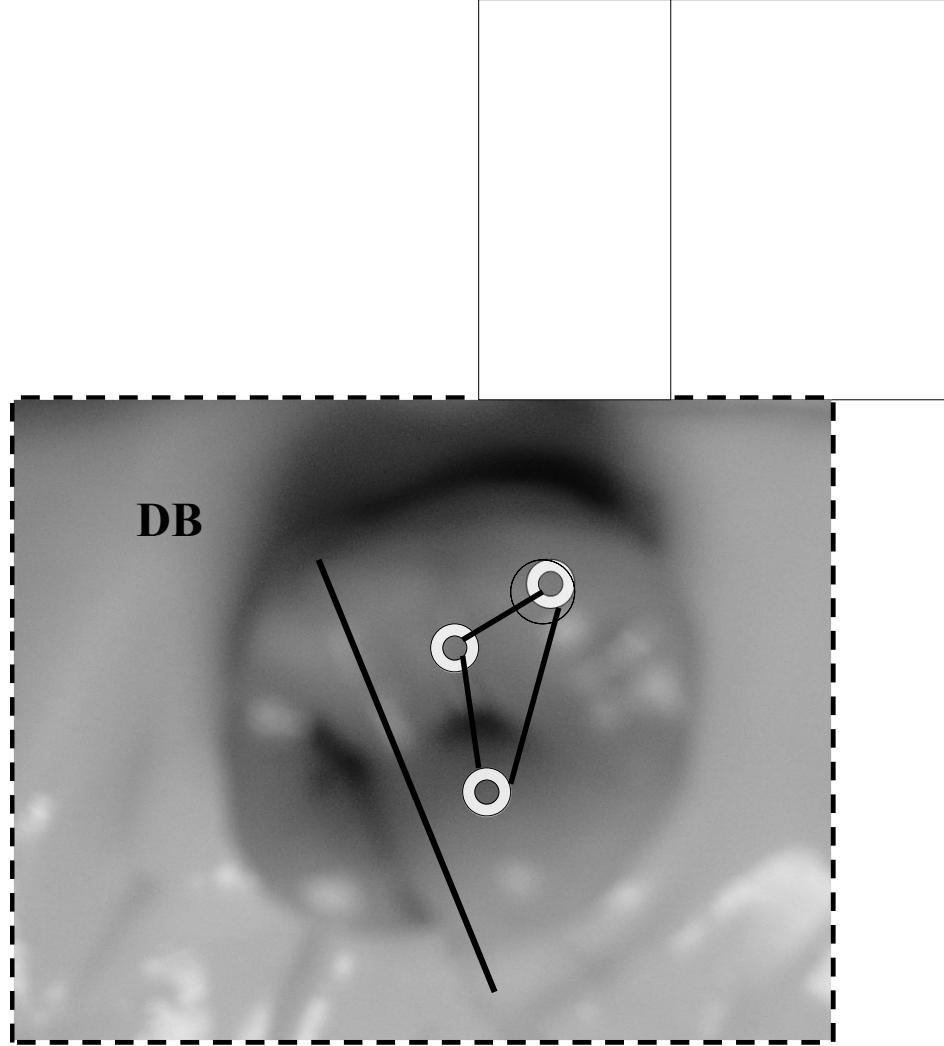
✿ Size:

Ridges



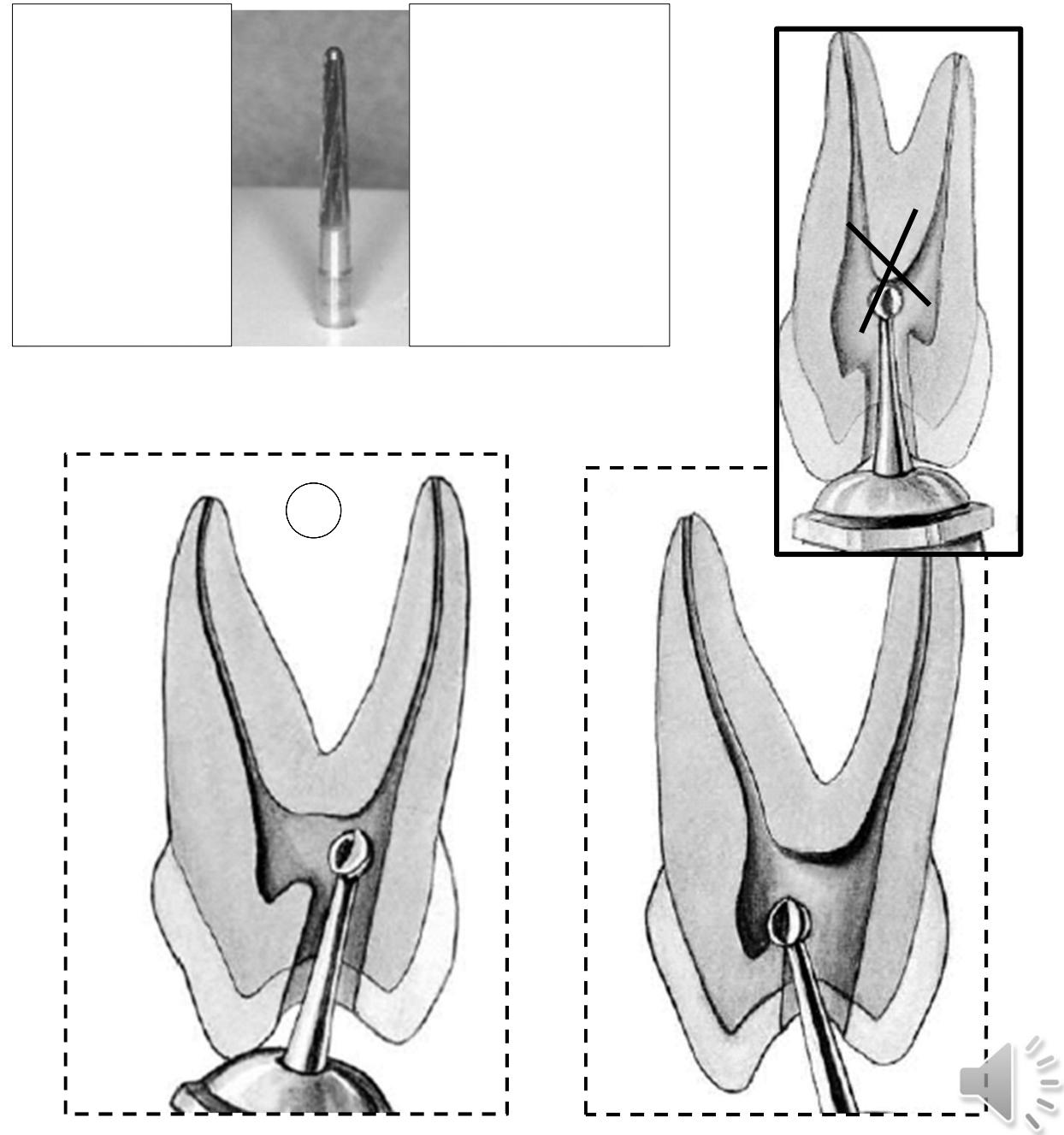
Gain Access

1



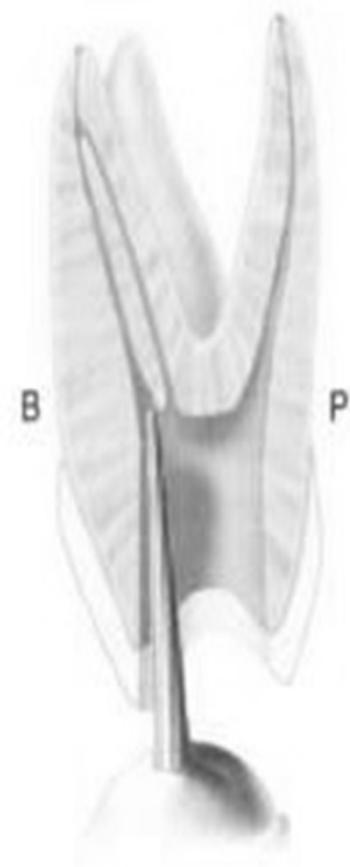
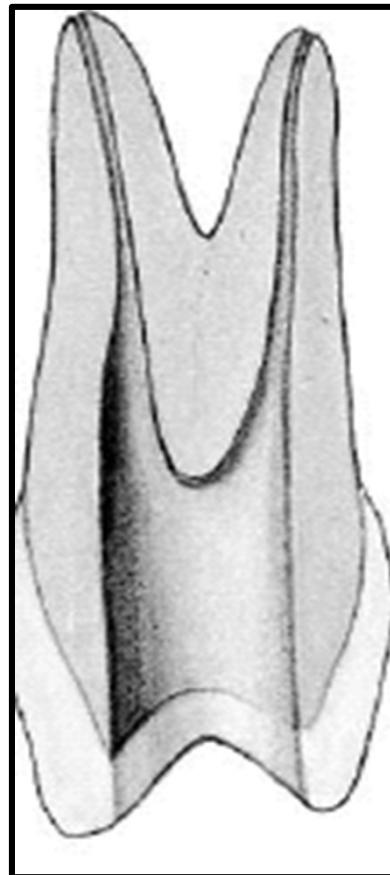
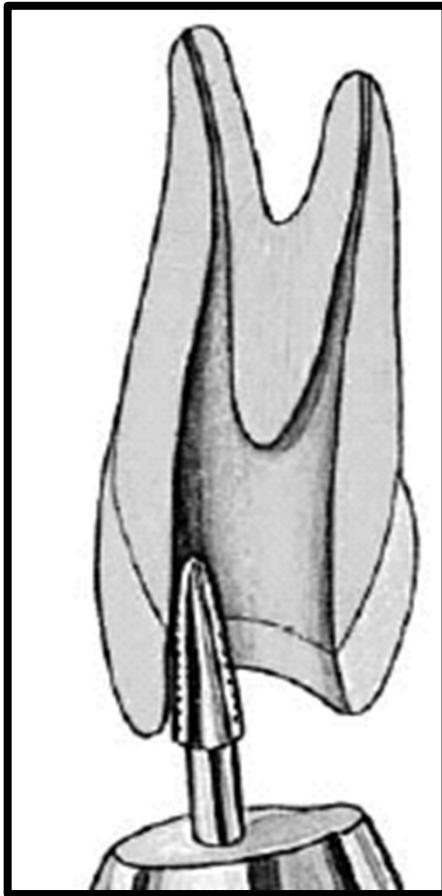
Deroofing "follow the map"

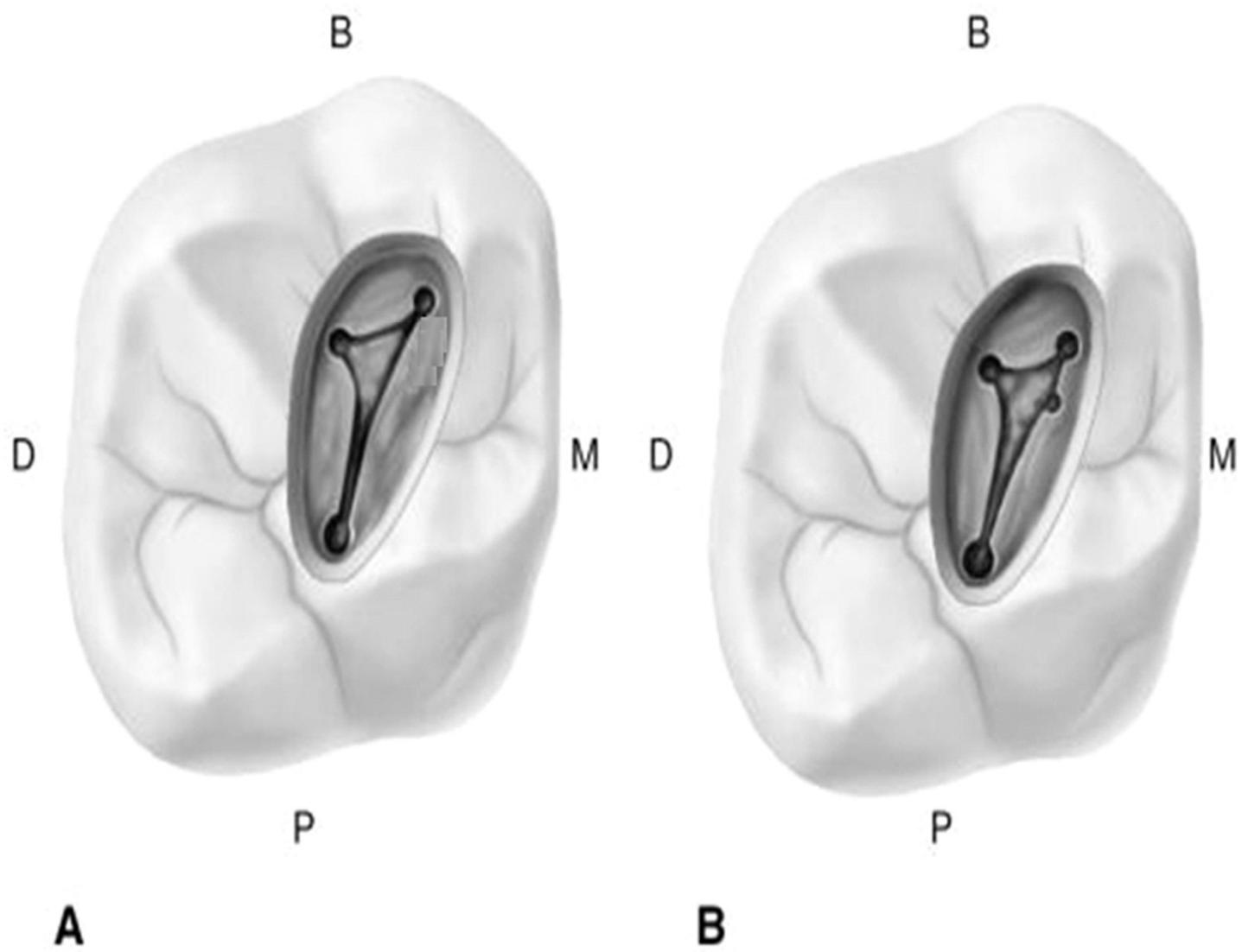
2



Flaring

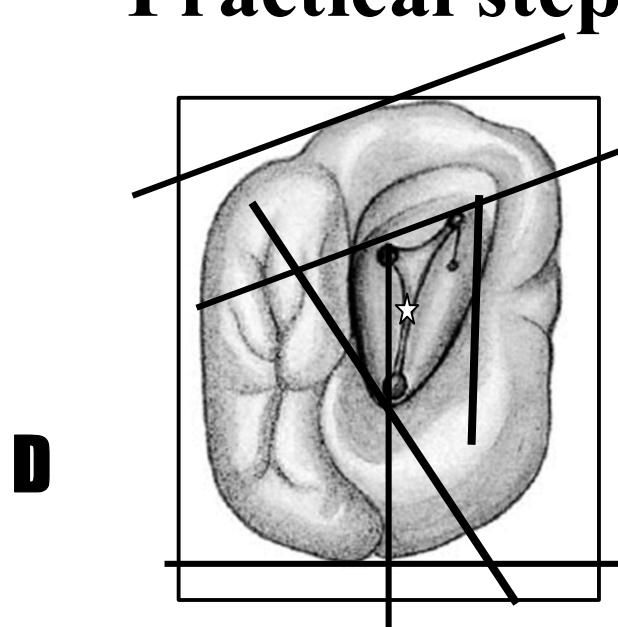
3



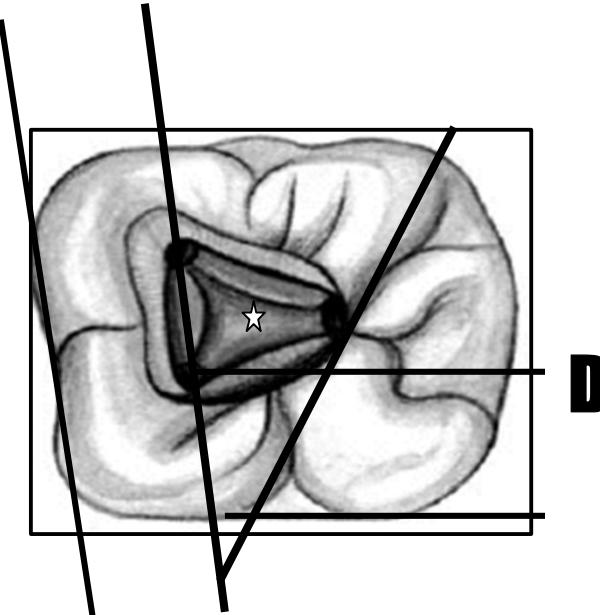


Practical steps

✿ Shape:



M



D

✿ Site:

Upper

→ Mainly in the **MB 3/5**

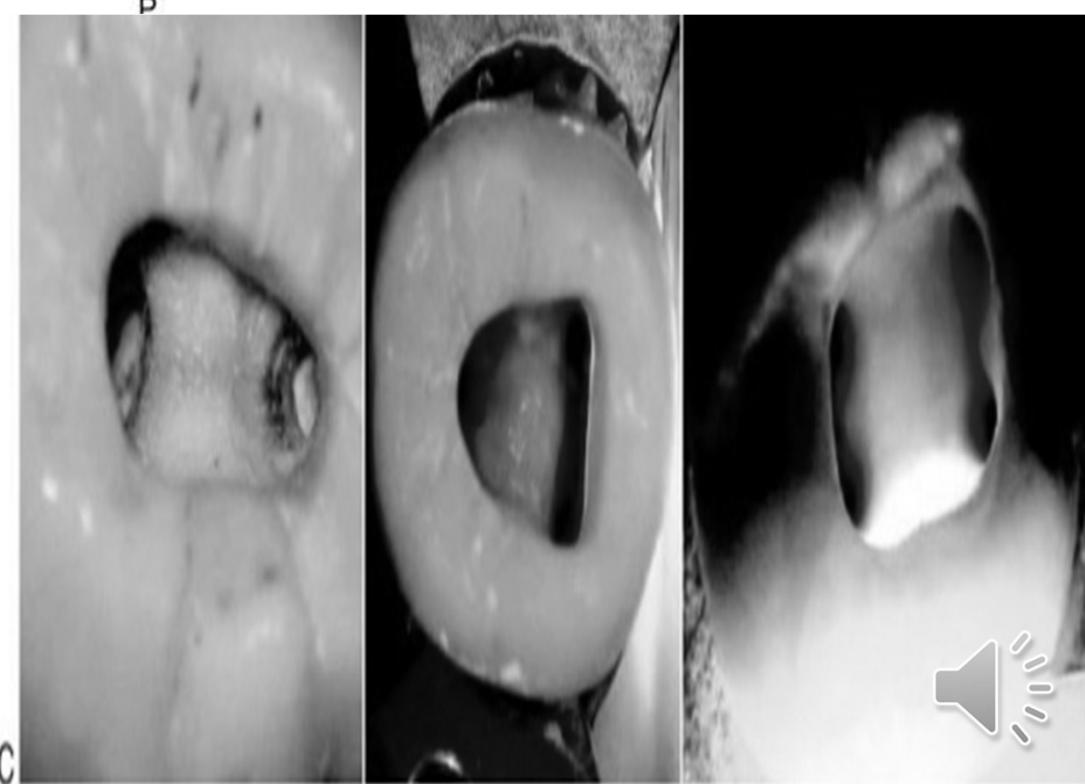
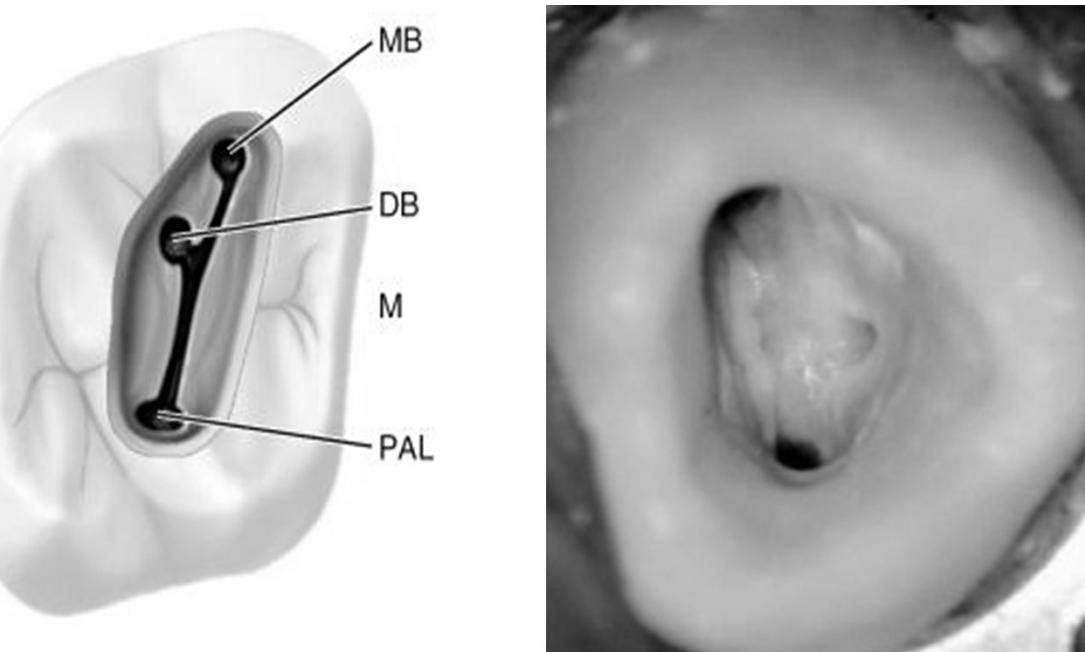
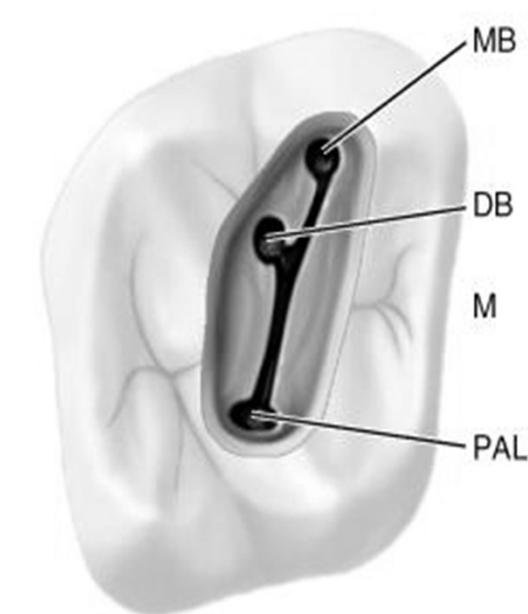
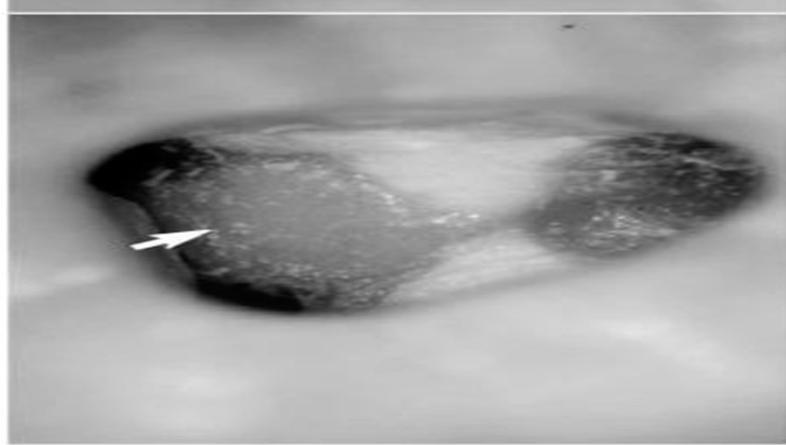
Lower

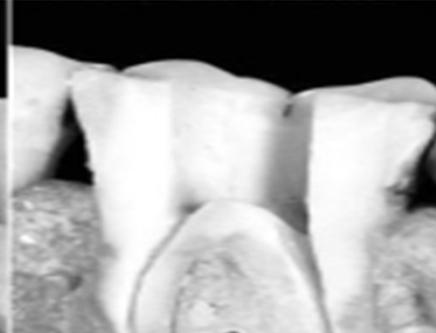
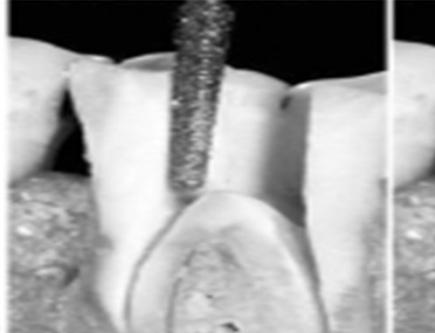
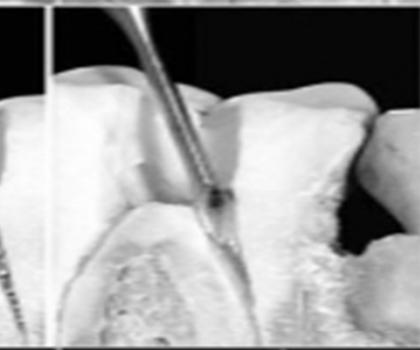
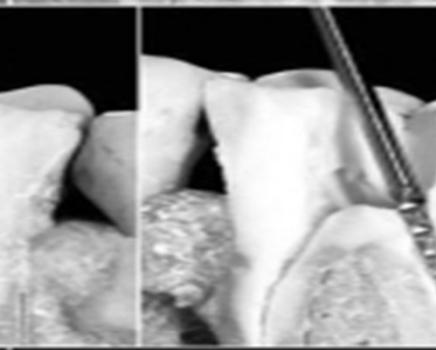
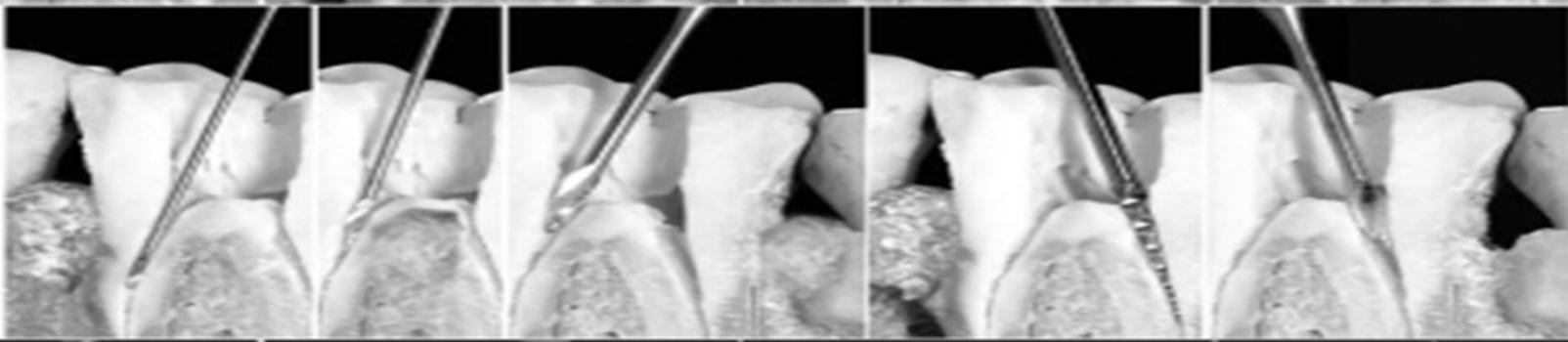
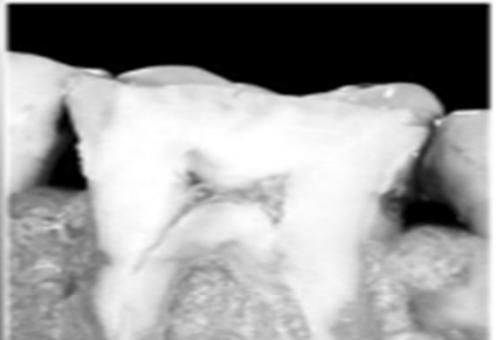
→ Mainly in the **MB 2/3**

✿ Size:

Ridges



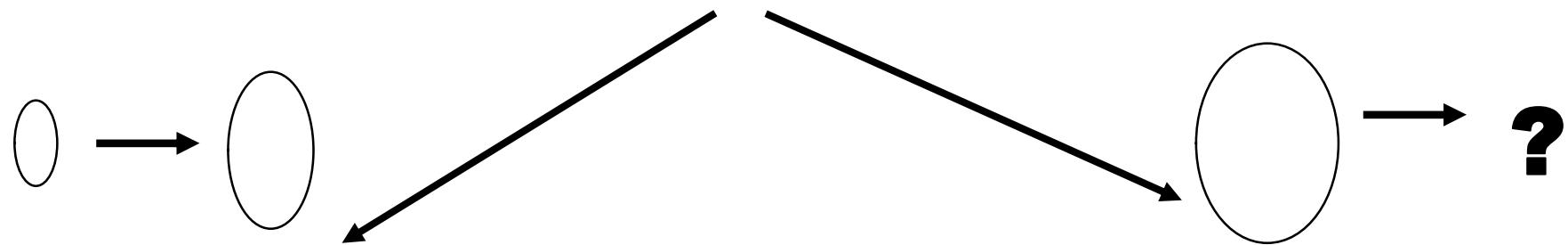




ERRORS in Access cavity preparation



Errors of access cavity preparation



Correctable

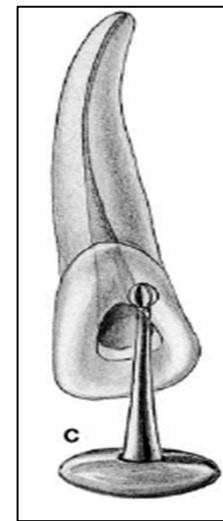
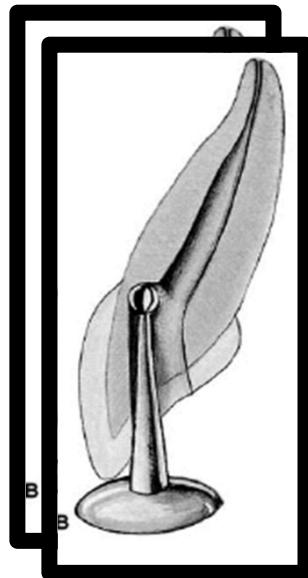
- 1- Underextended (Too constricted) cavity**
- 2- Pulp horn remains**
- 3- Lingual shoulder remains**
- 4- Incomplete deroofing of posterior teeth**
- 5- Mousehole effect (posterior)**
- 6- Rough margins**

Non-correctable

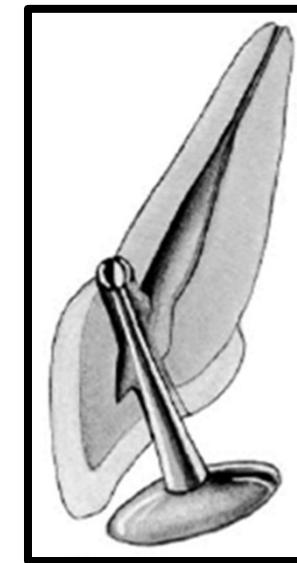
- 1- Overextended cavity**
- 2- Gouging**
- 3- Perforation**
- 4- Long Bevel (anterior)**



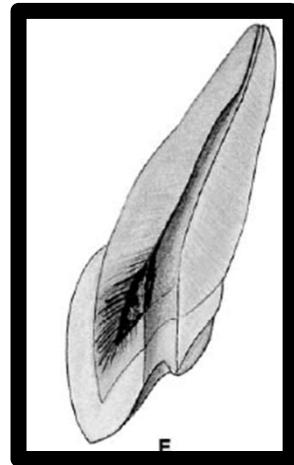
Gouging



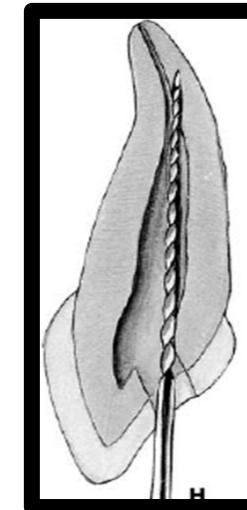
Perforation



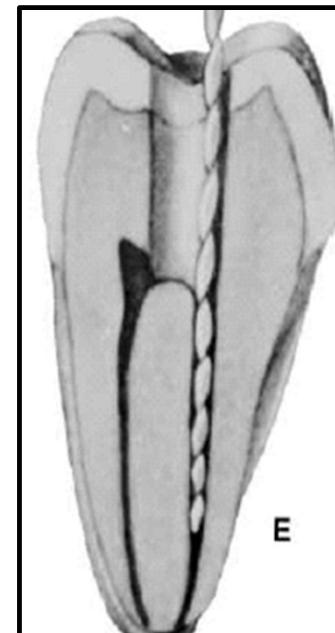
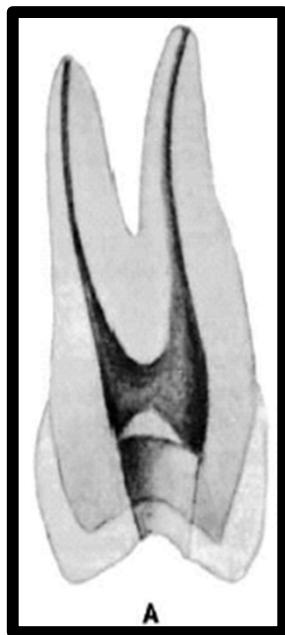
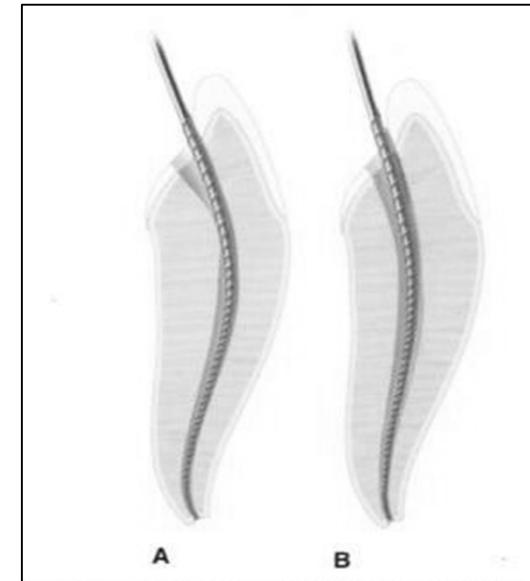
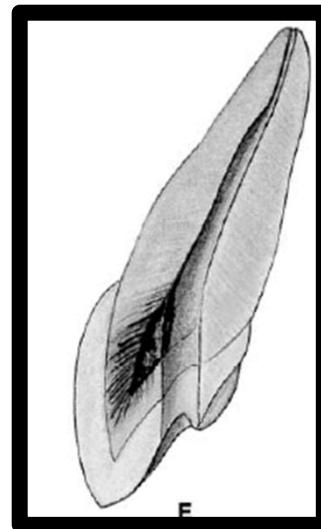
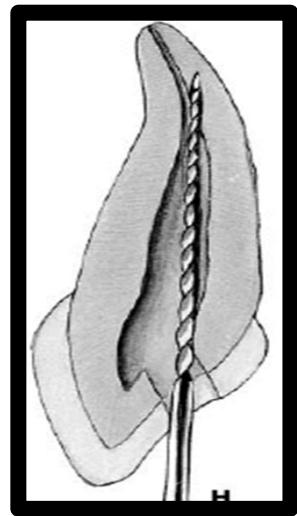
Discoloration



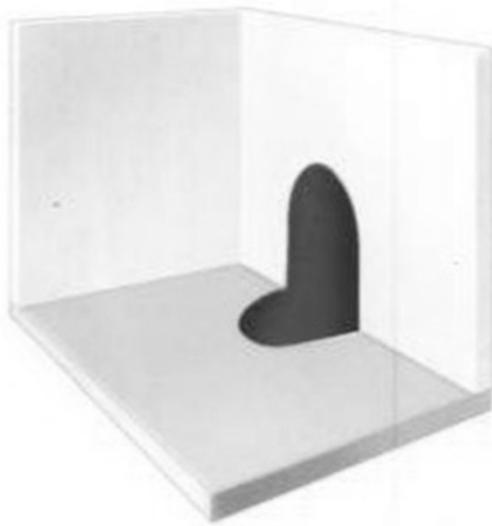
Ledge



Correctable errors



Correctable errors



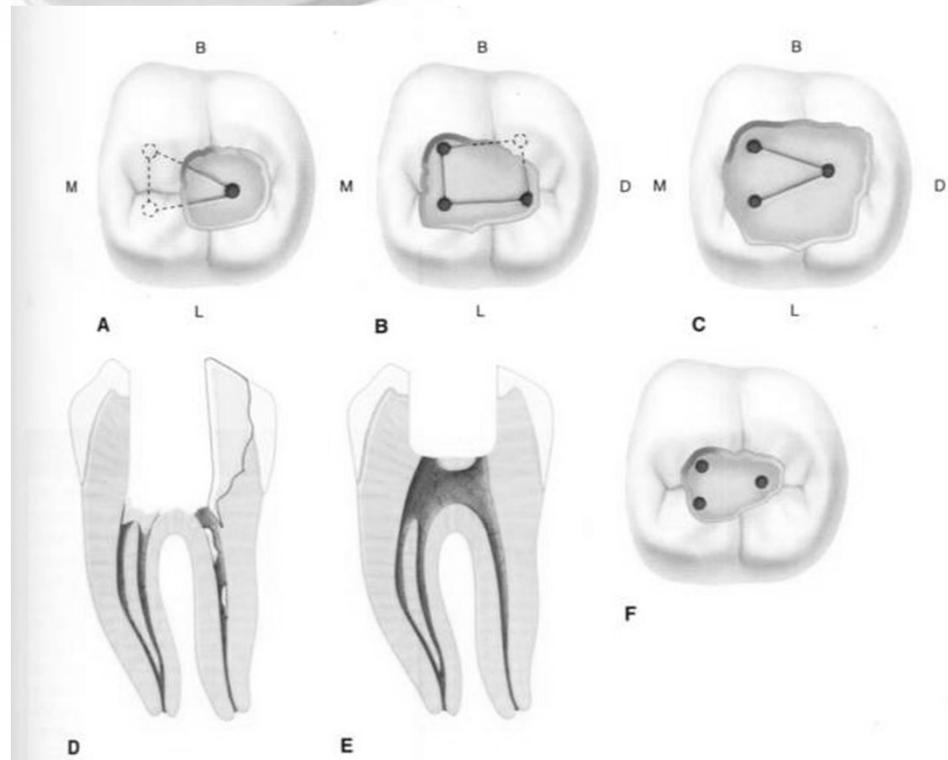
A

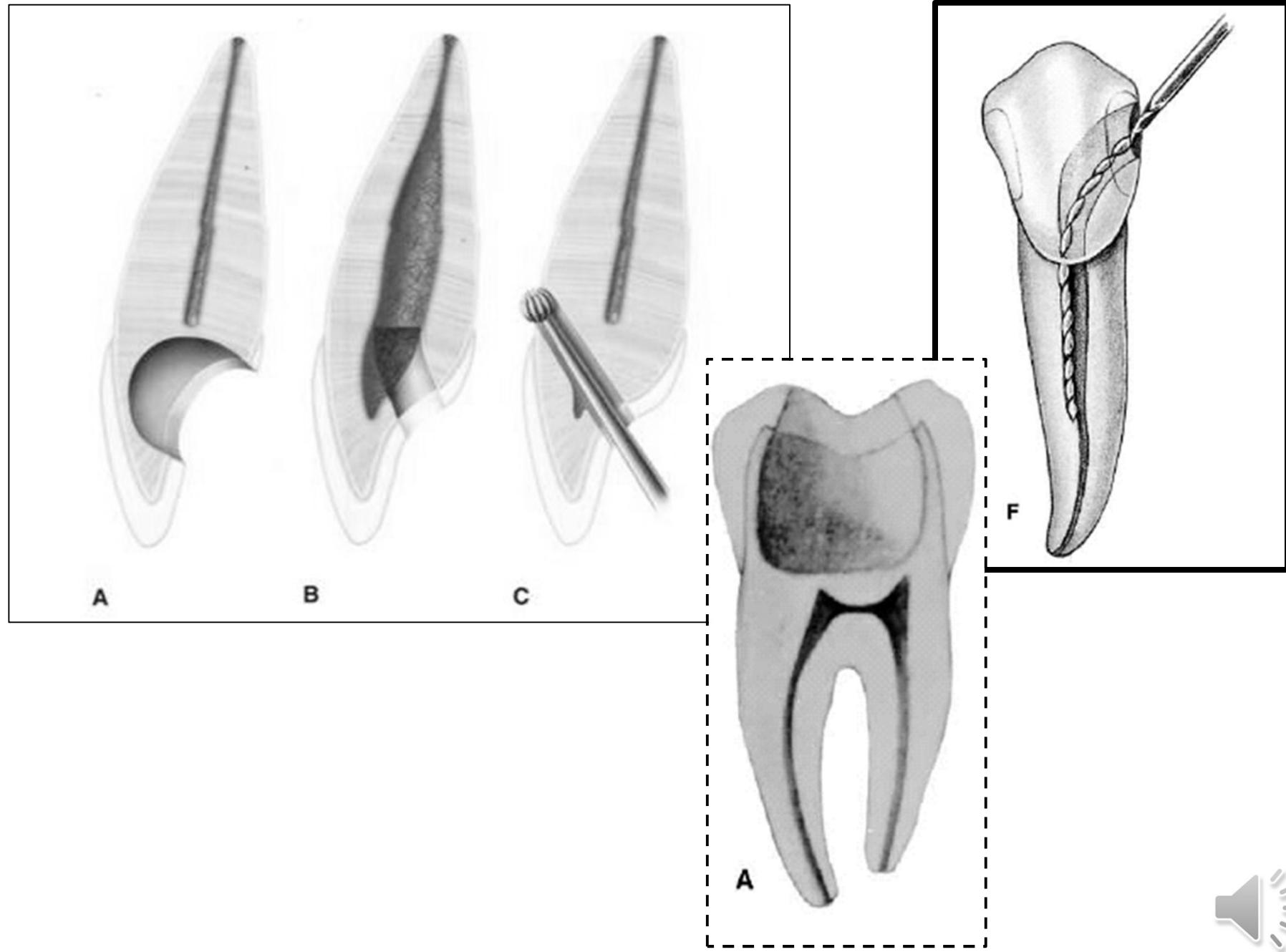


B

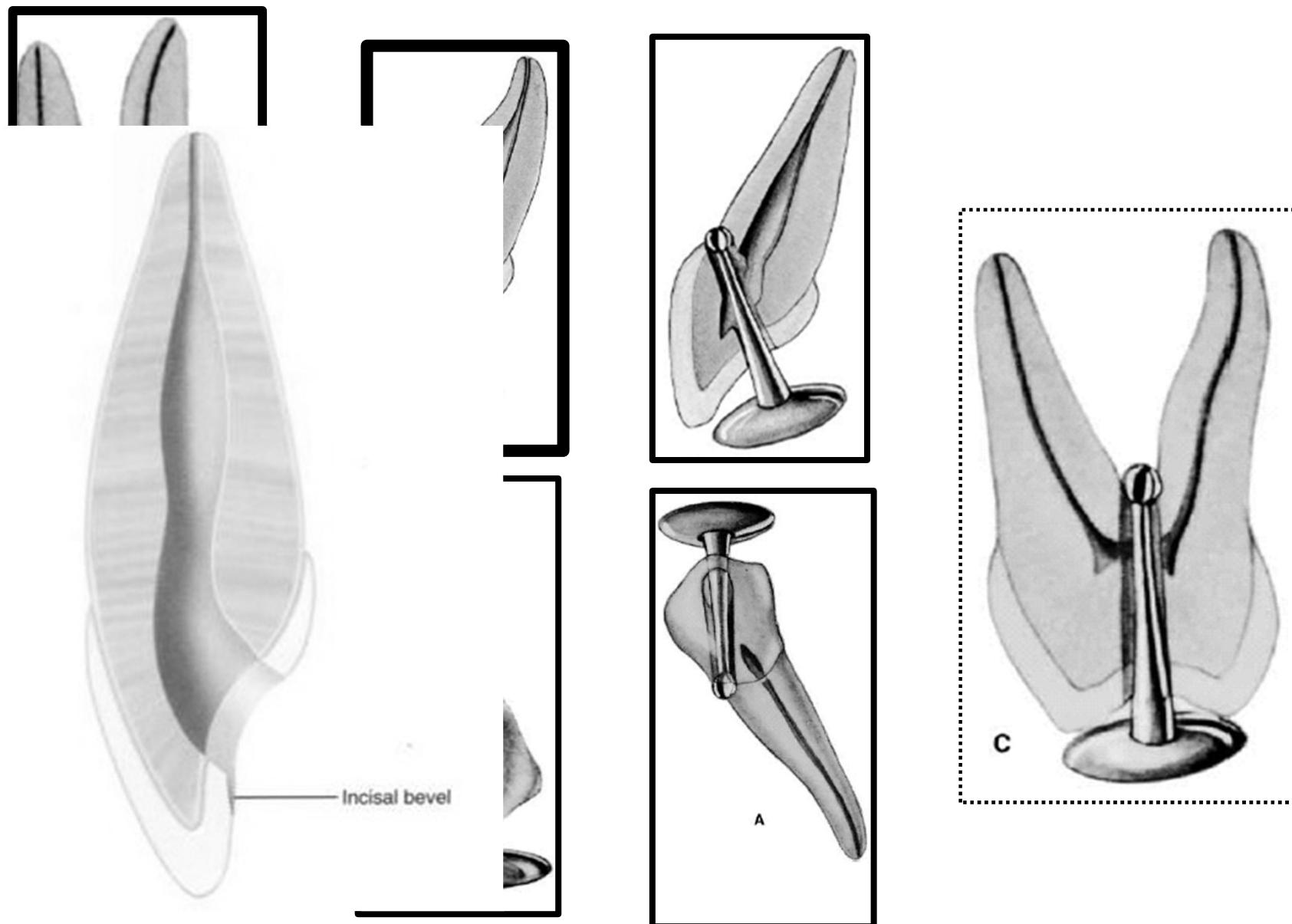
Mousehole effect

Incomplete
Deroofing





Non- Correctable errors



Errors in access preparation for Upper Anterior Teeth

A) Labio-cervical perforation.

B) Labial Ledge.

C) Disto-cervical perforation.

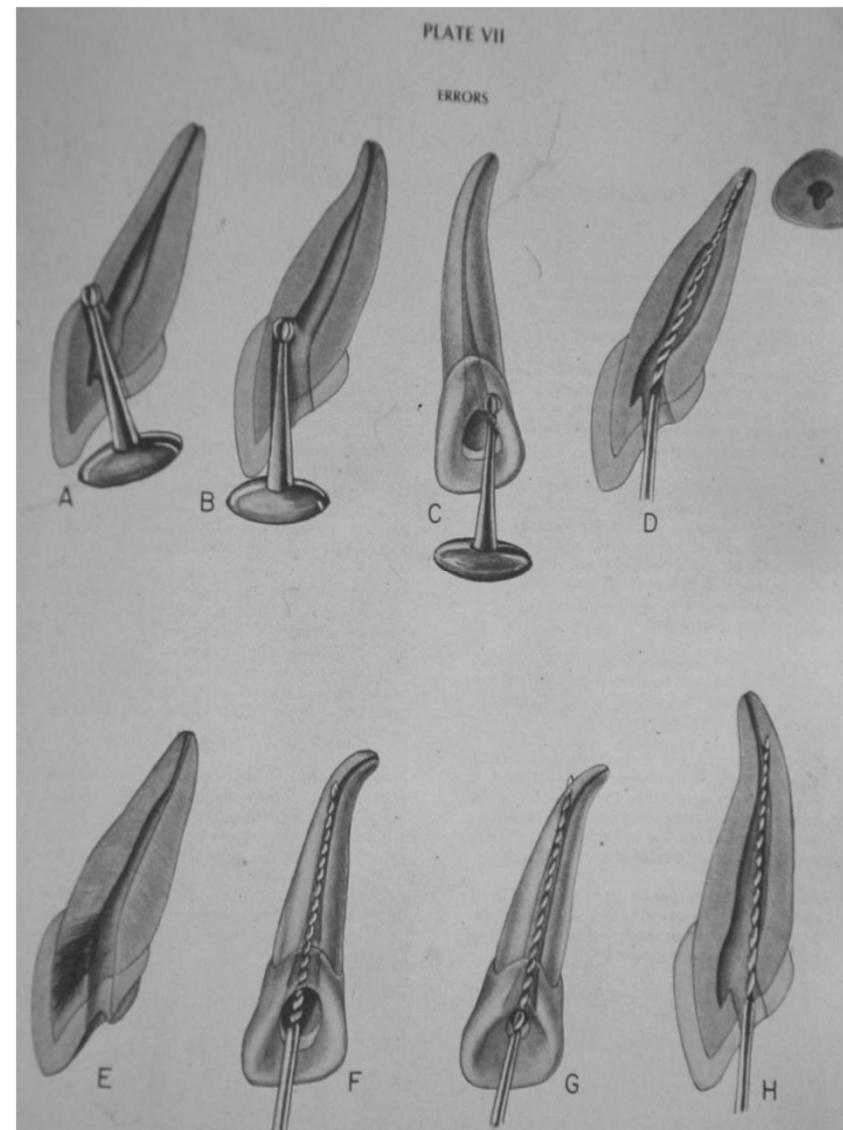
D) Pear shape (Zipping) of
apical perforation.

E) Coronal discoloration.

F) Apical ledge.

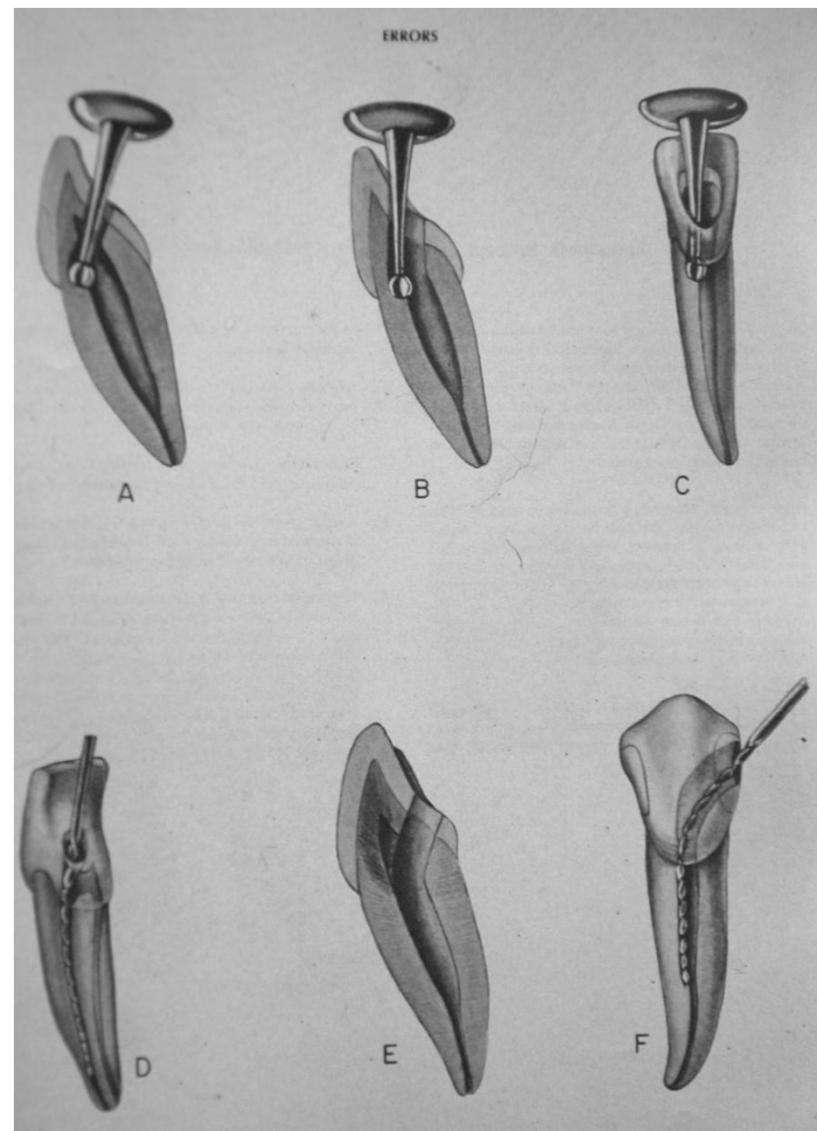
G) Apical perforation
(Transportation).

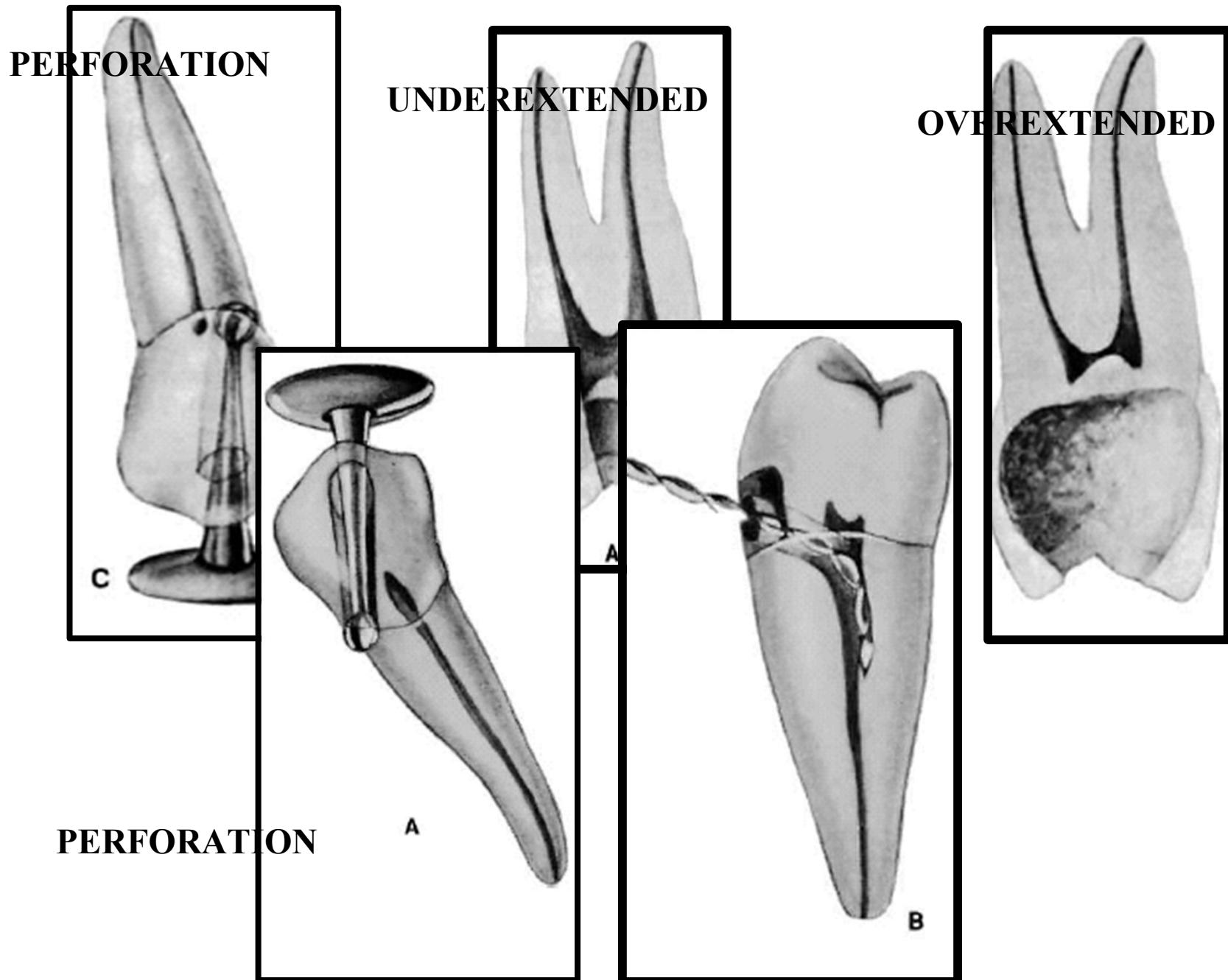
H) Apical perforation
(Transportation).



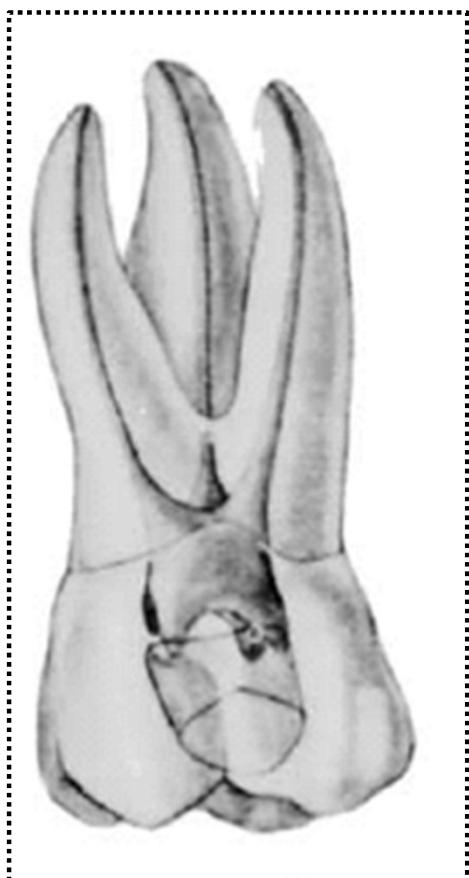
Errors in access preparation for Lower Anterior Teeth

- A) Labio-cervical perforation.
- B) Labial Ledge.
- C) Mesial ledge.
- D) Missing of Root Canal.
- E) Coronal discoloration.
- F) Incorrect Access

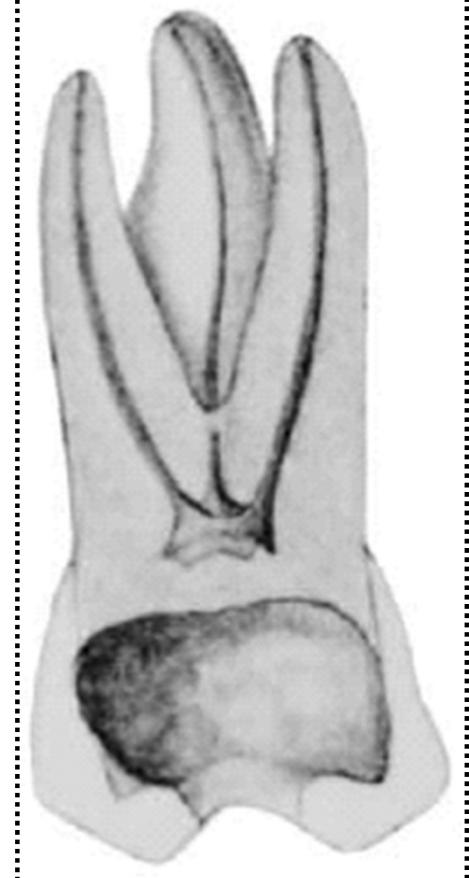




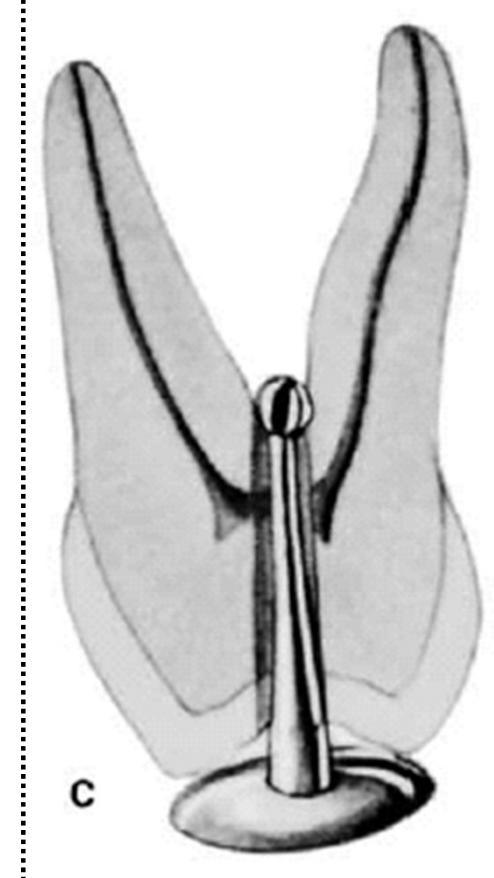
Underextended

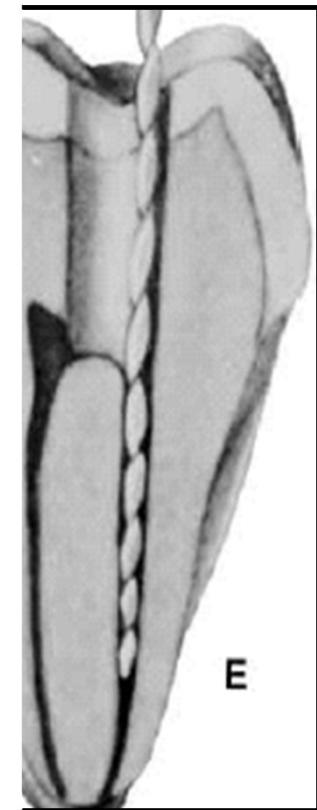
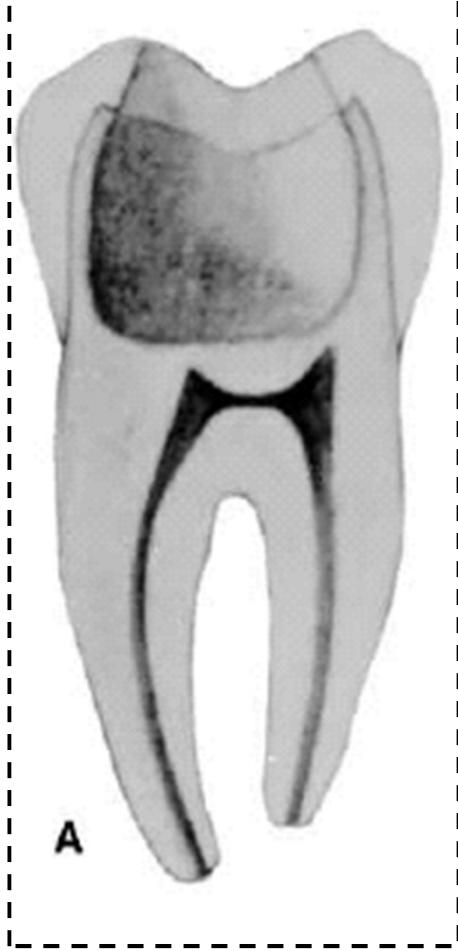


Overextended



Perforation





CHALLENGING ACCESS PREPARATIONS

- ***Teeth with Minimal or No Clinical Crown***

- Root angulation on preoperative radiographs and examine the cervical crown anatomy with an explorer .

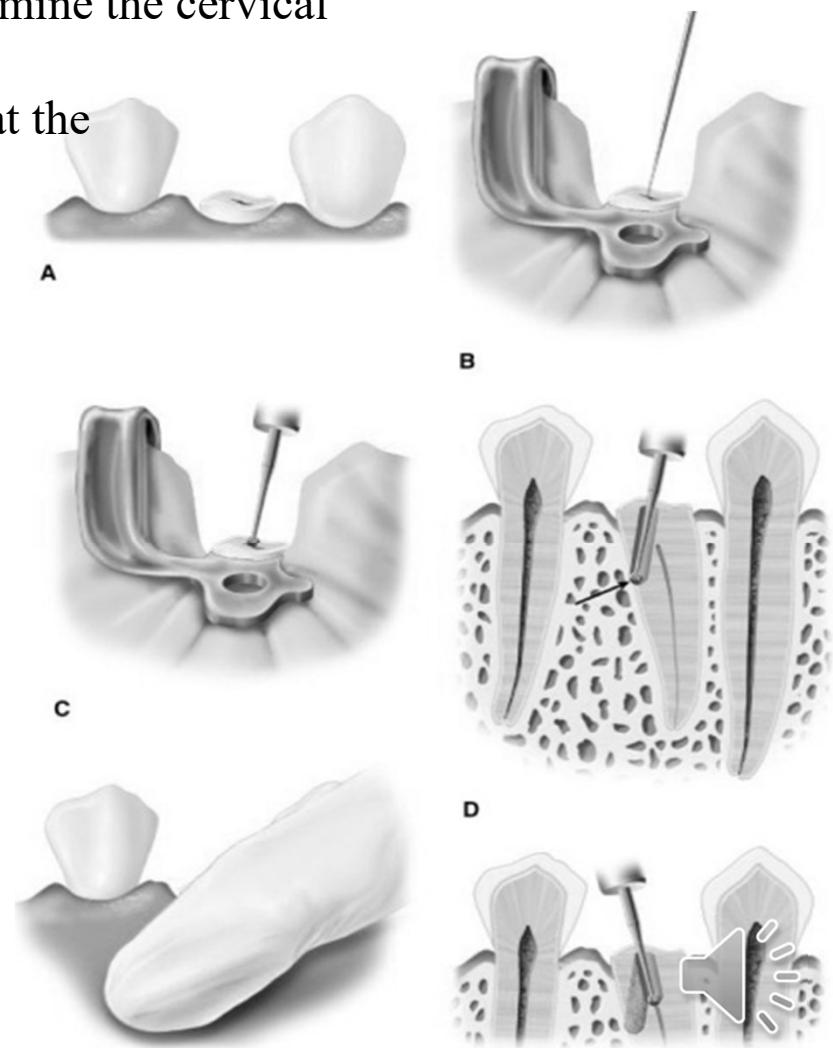
- Pulp chambers are located at the center of the crown at the level of the CEJ.

- Access often is started without a dental dam in place so that root eminences can be visualized and palpated.

- The depth of penetration needed to reach the pulp canal is measured on a preoperative radiograph.

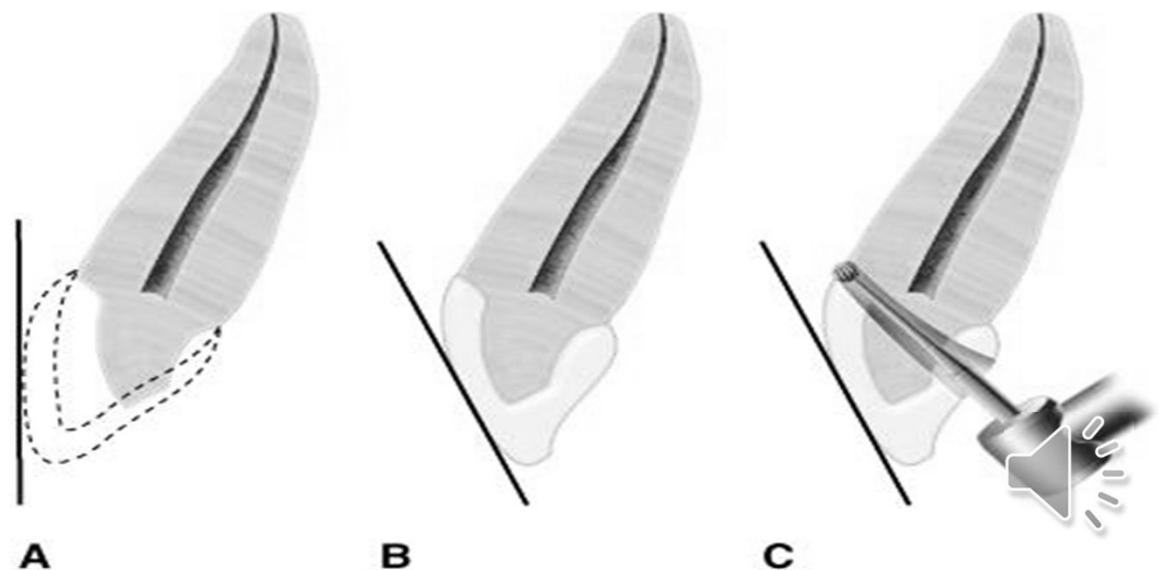
- If not, two radiographs should be taken before the process proceeds.

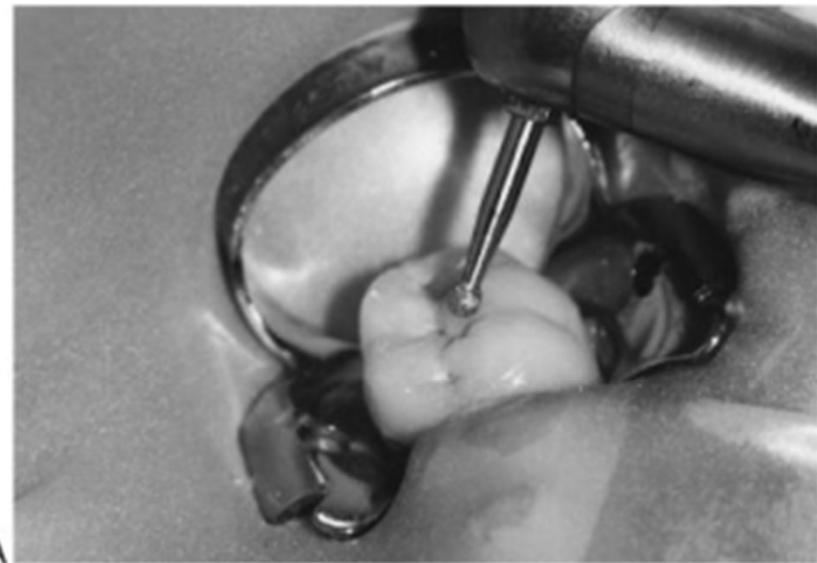
- After checking these radiographs, the clinician can redirect the penetration angle if necessary and move the preparation apically.



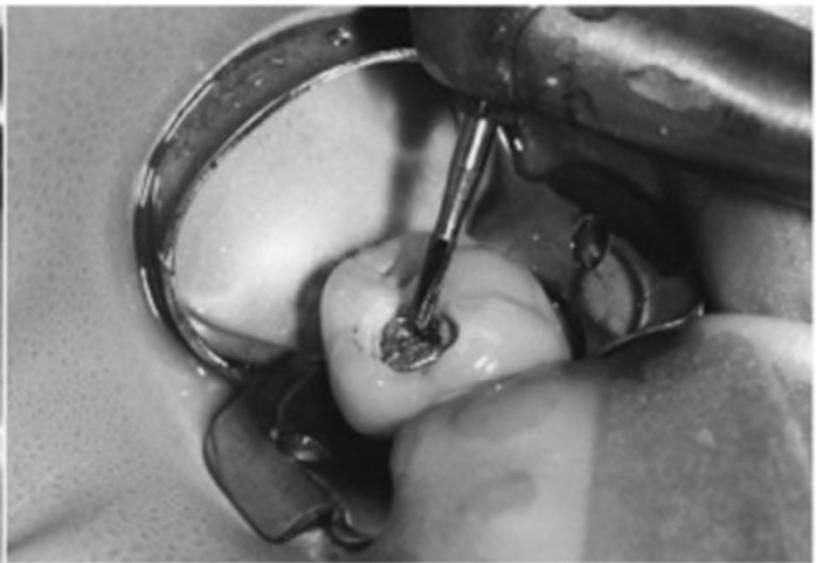
Heavily Restored Teeth (Including Those with Full Veneer Crowns)

Restorative materials and full crowns rarely reproduce the original tooth anatomy in the exact same position. The crown/root angulation often is altered when large restorations or crowns correct occlusal discrepancies. The OM and transillumination of the cervical area of a heavily restored tooth can greatly improve visibility and reveal landmarks that otherwise would be missed





A



B



C

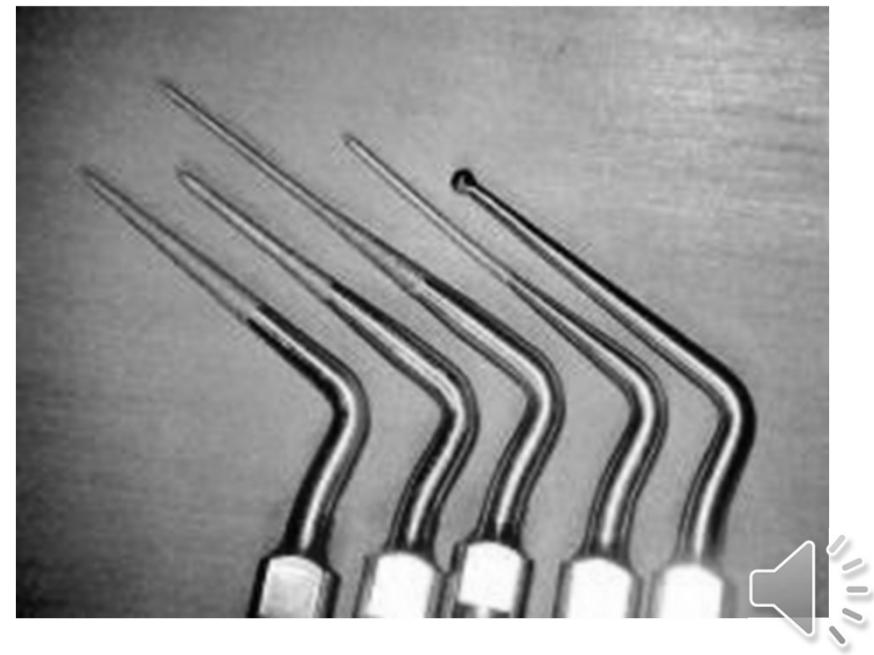


D

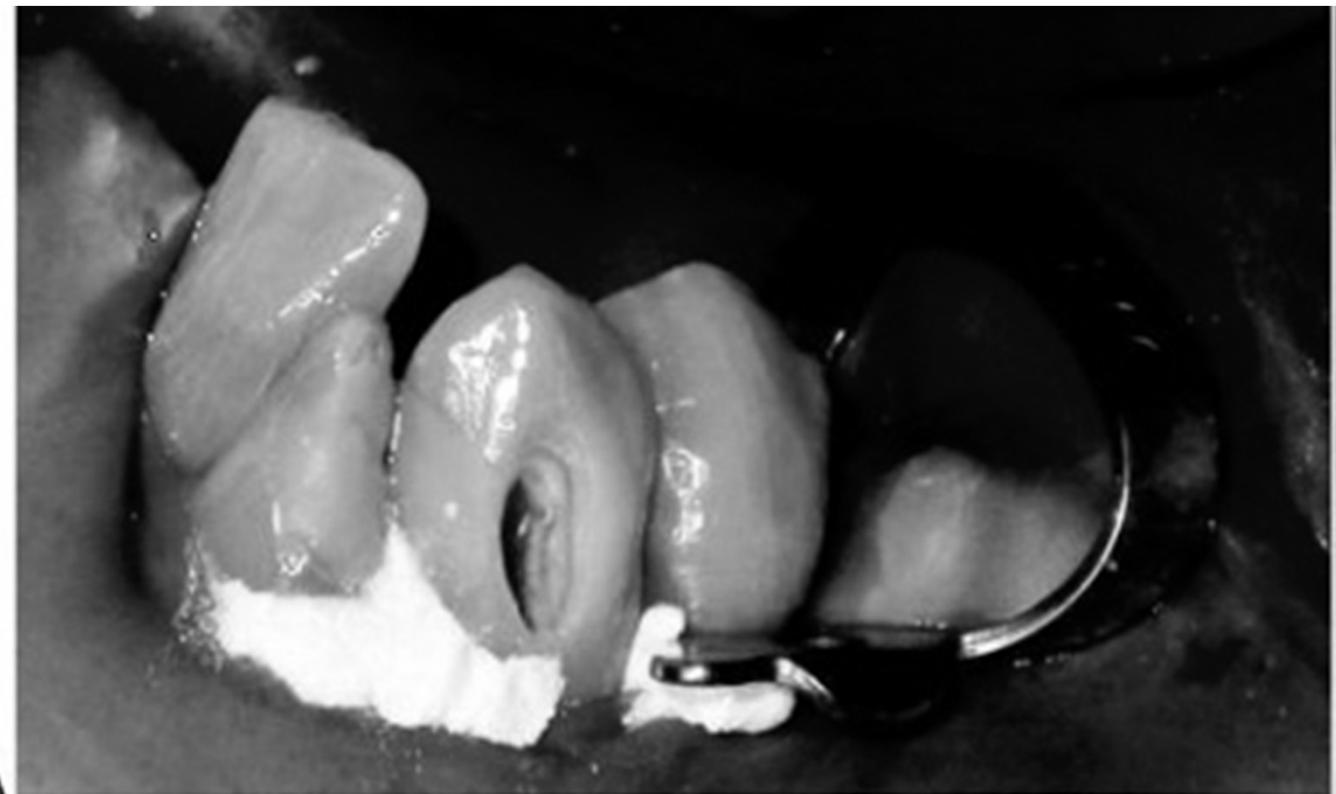
Teeth with Calcified Canals



removal of small amounts of dentin with the aid of the OM and radiographic confirmation has proved to be the safest approach.+ using chelating agents



Crowded Teeth



Rotated Teeth



Thank
You

Sandals

Vacations

