

# Root canal treatment of premolars and molars:

(Part I)

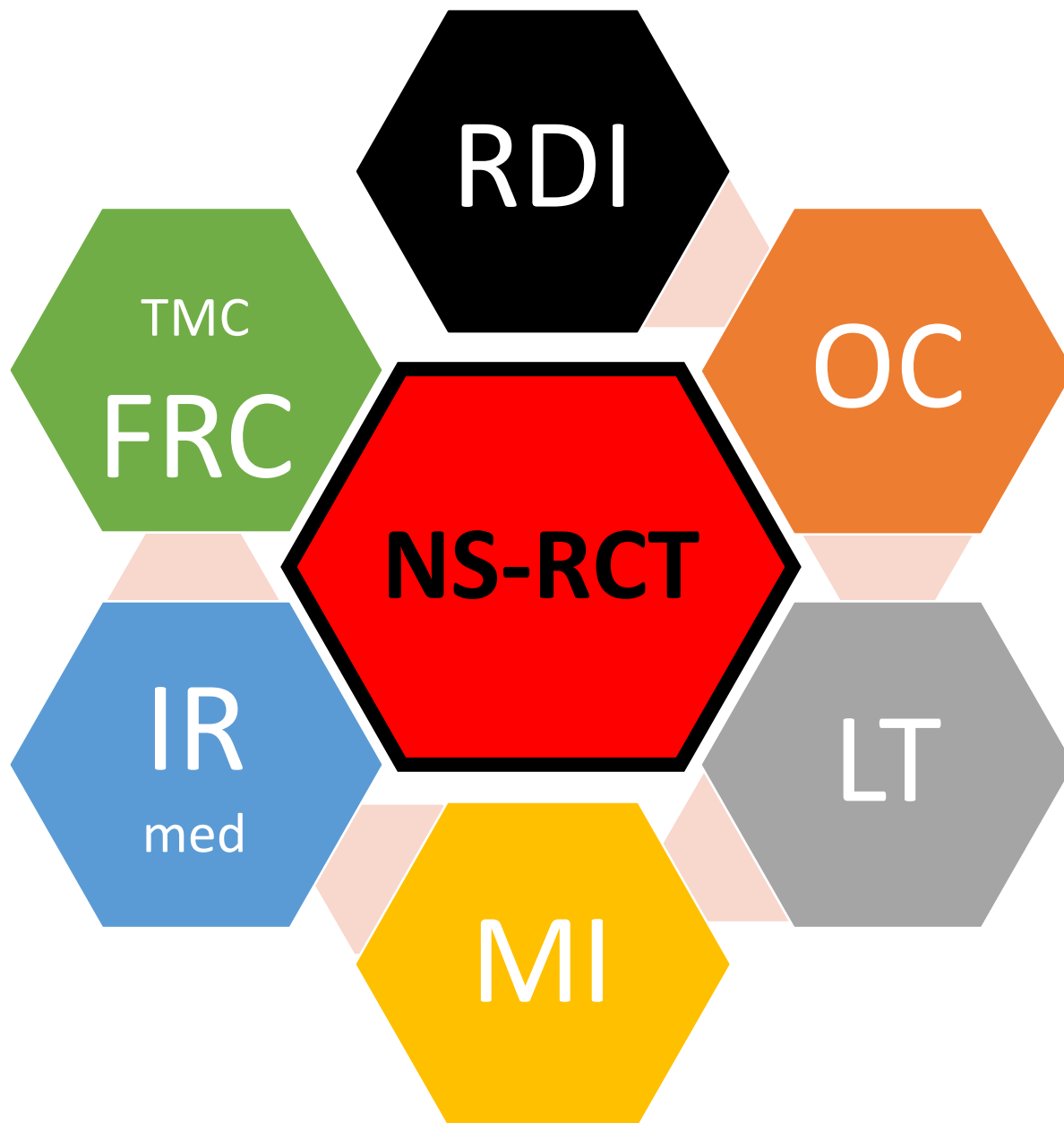
## A CLINICAL GUIDE FOR GENERAL PRACTICE

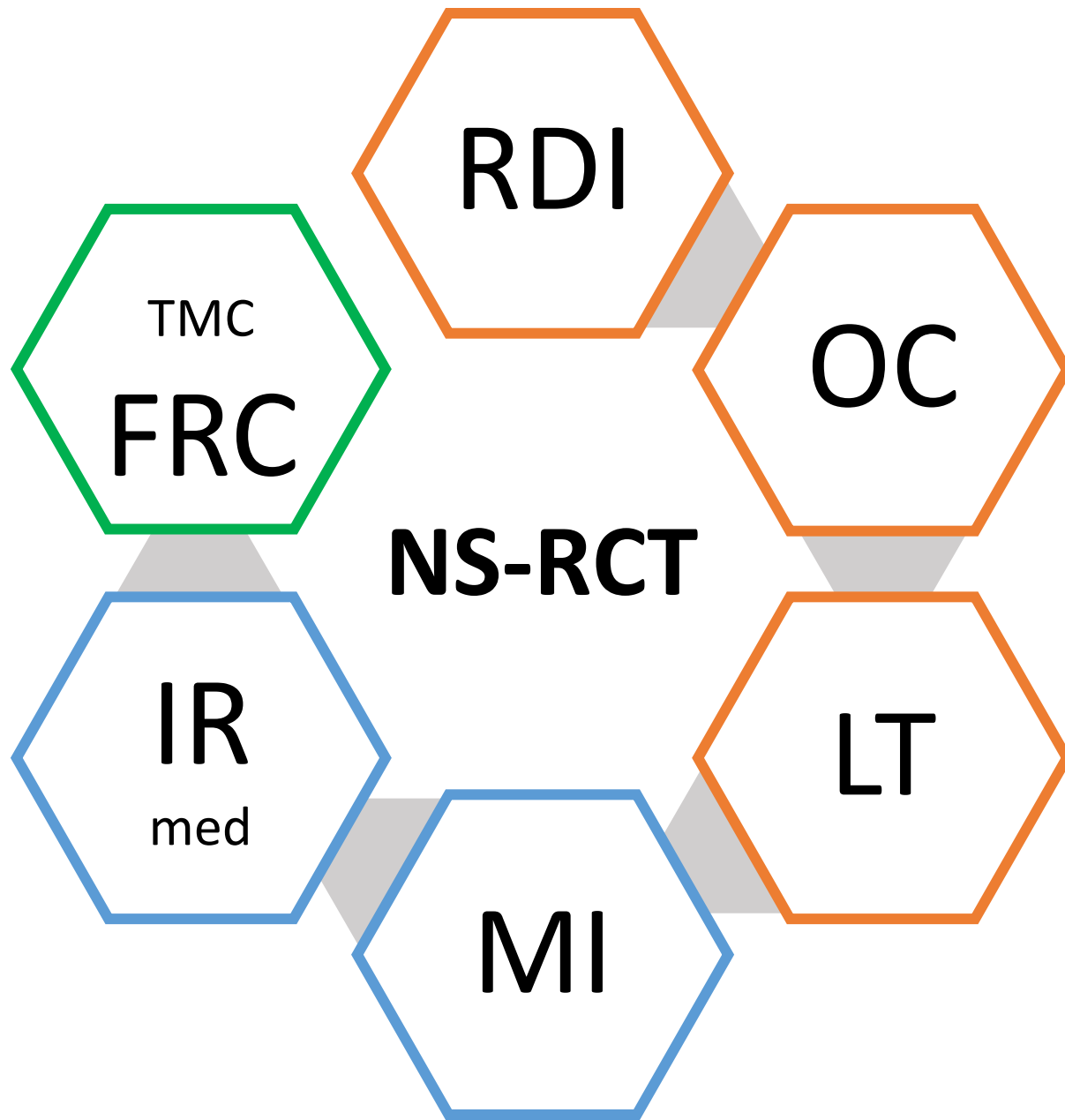


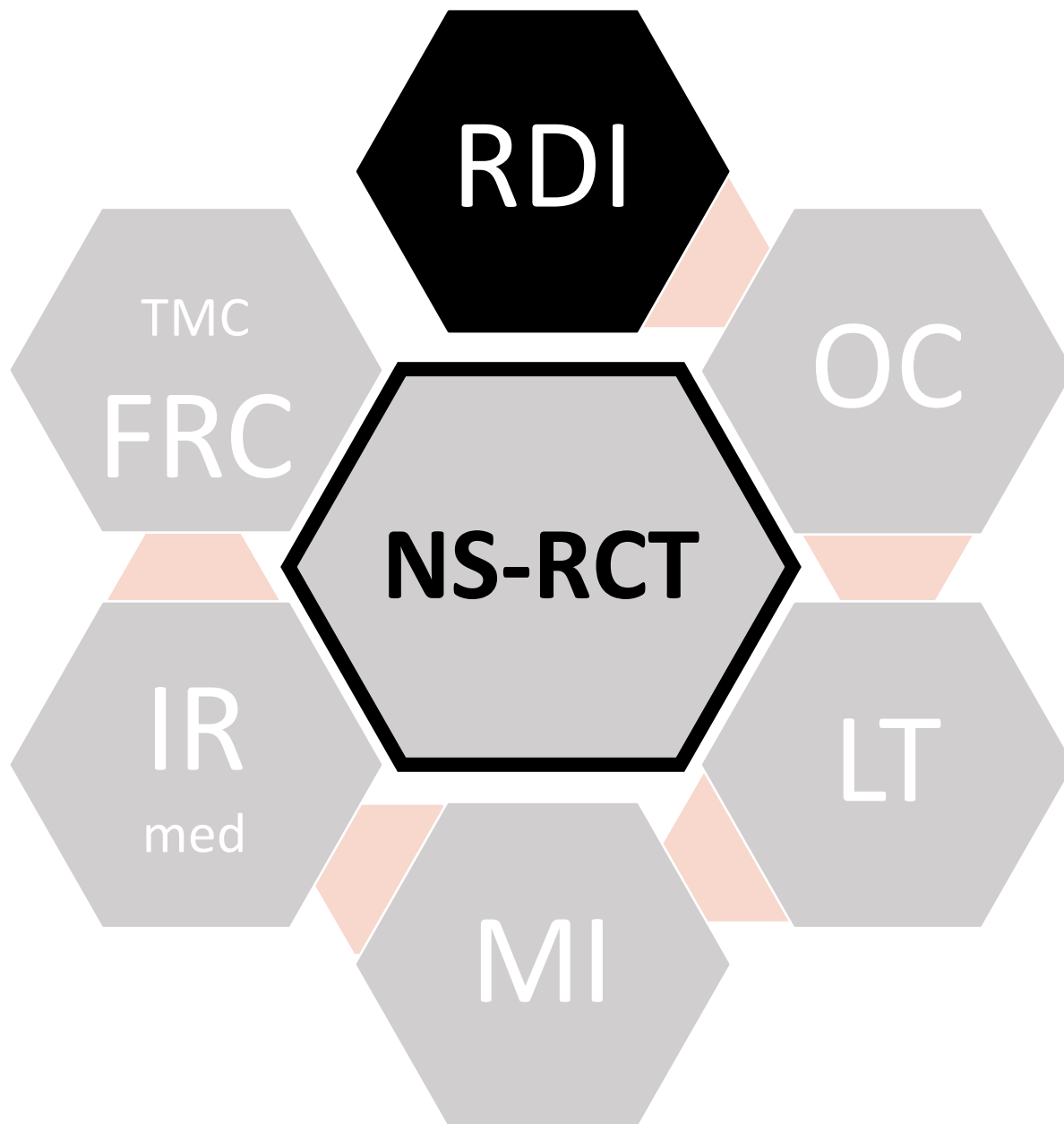
**Parichat Chinchayanont**

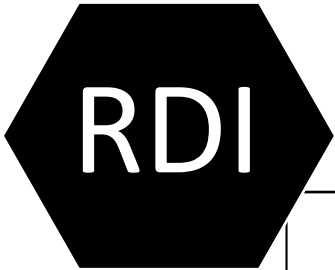
**Endodontist**

Taphanhin Crown Prince Hospital, Phichit




















# Rubber dam clamp

	Anterior	Premolar	Molar	
Upper	 #6  #9	 #00  #0	 #8	 #14 ★  #12A Q2, Q4
Lower	 #212	 #2	 #7	 #13A Q1, Q3

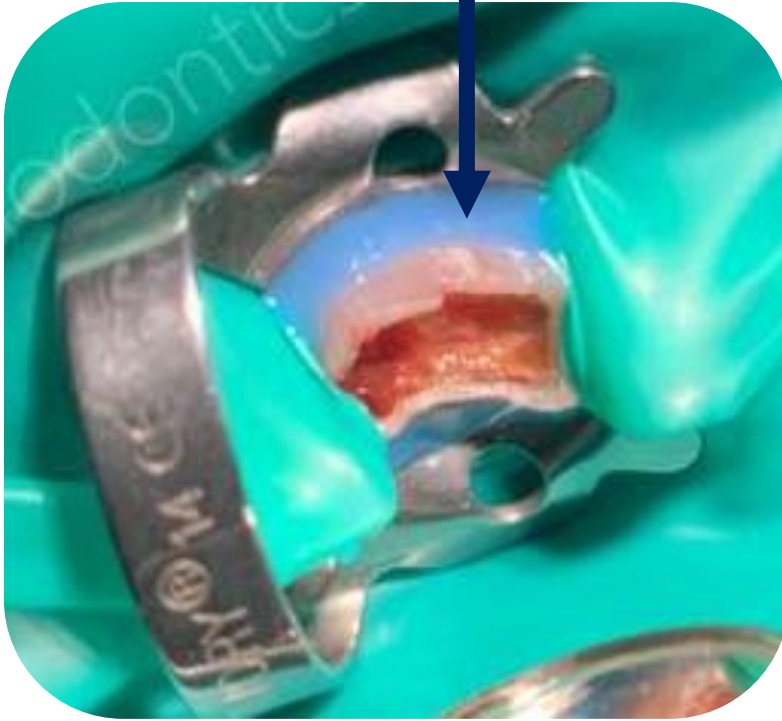
RDI

# Perfect tooth isolation

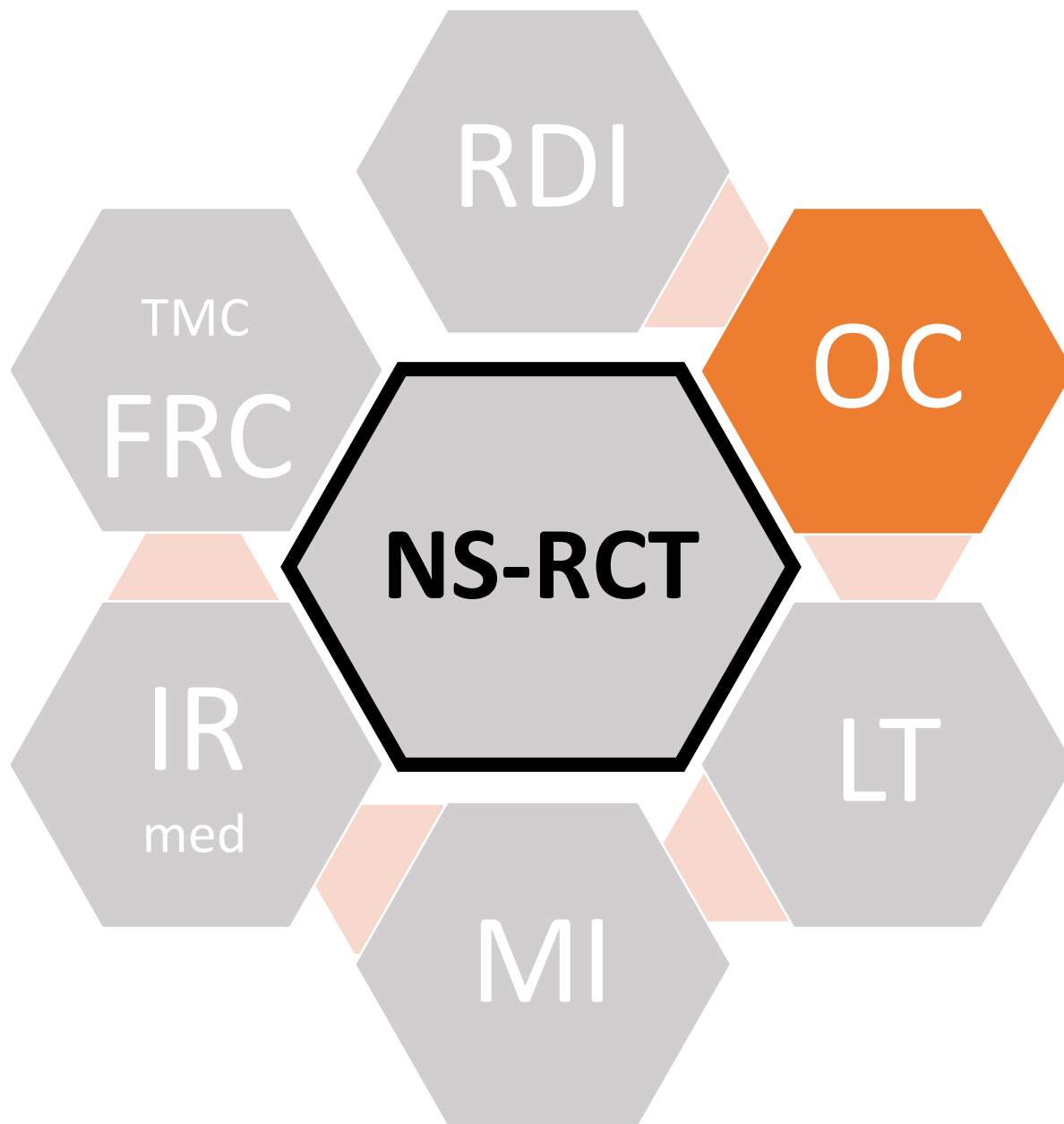


RDI

Opaldam



**Active clamp**  
**(A)**



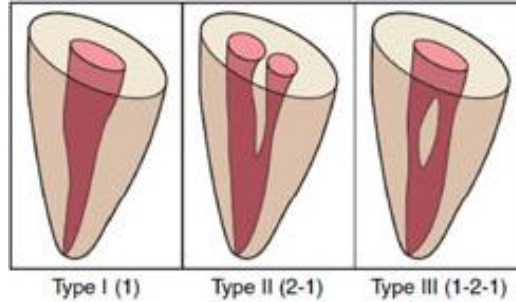


OC

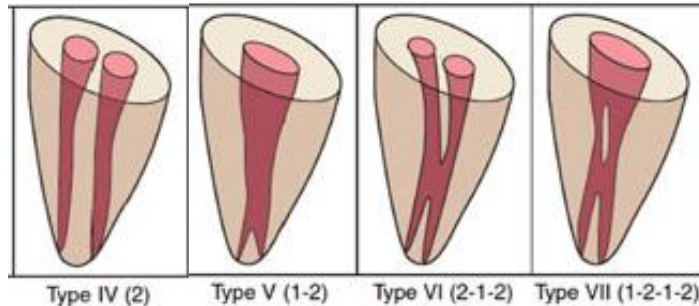
# Root canal configurations

(8 types of Vertucci, 1984)

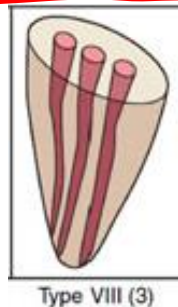
**1** canal at apex



**2** canals at apex



**3** canals at apex



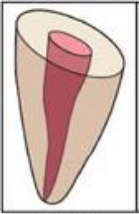


# Percentage of root canals in the maxillary teeth

Tooth type	Ant.	Premolar		Molar			
		1 <sup>st</sup>	2 <sup>nd</sup>	MB of 1 <sup>st</sup>	MB of 2 <sup>nd</sup>	DB	P
Major							
Minor							


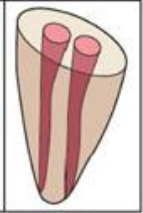
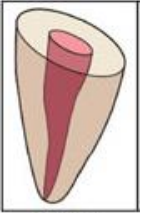
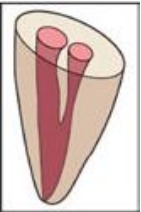
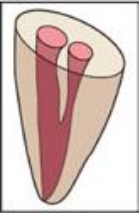
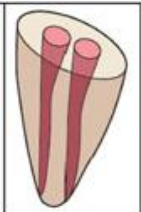


# Percentage of root canals in the maxillary teeth

Tooth type	Ant.	Premolar		Molar			
		1 <sup>st</sup>	2 <sup>nd</sup>	MB of 1 <sup>st</sup>	MB of 2 <sup>nd</sup>	DB	P
Major	 Type I (1) <b>100%</b>						
Minor							




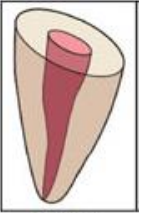
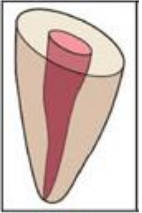

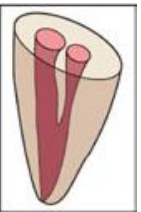
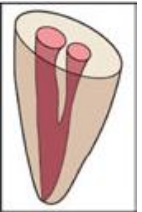
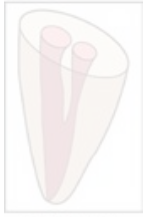

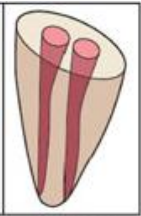
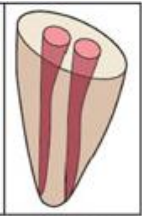


# Percentage of root canals in the maxillary teeth

Tooth type	Ant.	Premolar		Molar			
		1 <sup>st</sup>	2 <sup>nd</sup>	MB of 1 <sup>st</sup>	MB of 2 <sup>nd</sup>	DB	P
Major	 Type I (1) 100%	 Type IV (2) 60%	 Type I (1) 50%  Type II (2-1) 20% 70%				
Minor		 Type II (2-1) 20%	 Type IV (2) 10%				



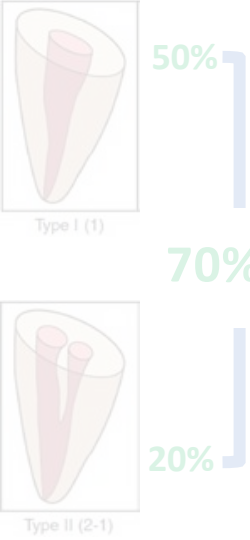
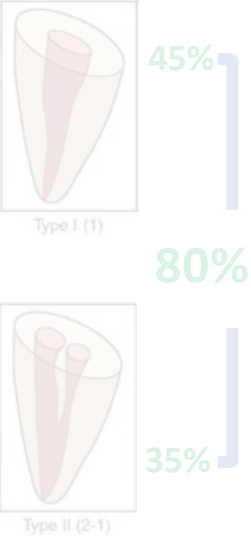
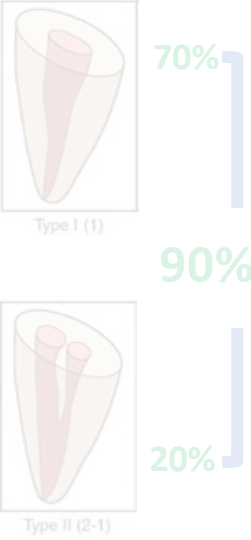
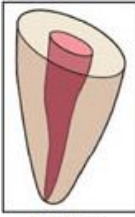
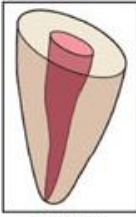






# Percentage of root canals in the maxillary teeth

Tooth type	Ant.	Premolar		Molar			
		1 <sup>st</sup>	2 <sup>nd</sup>	MB of 1 <sup>st</sup>	MB of 2 <sup>nd</sup>	DB	P
Major	 Type I (1) 100%	 Type IV (2) 60%	 Type I (1) 50%	 Type I (1) 45%	 Type I (1) 70%		
			 Type II (2-1) 70% 20%	 Type II (2-1) 80% 35%	 Type II (2-1) 90% 20%		
Minor		 Type II (2-1) 20%	 Type IV (2) 10%	 Type IV (2) 20%	 Type IV (2) 10%		

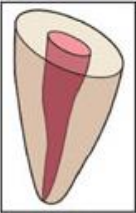
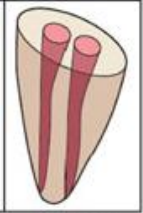
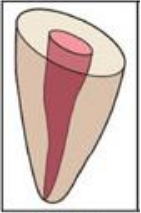
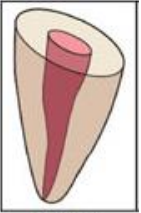
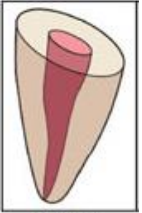
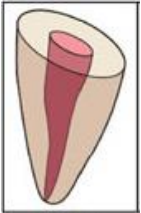
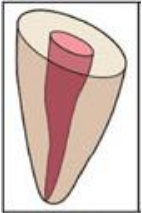
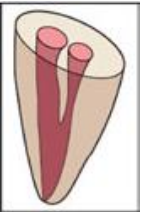
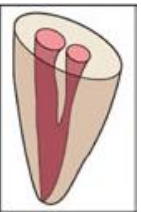
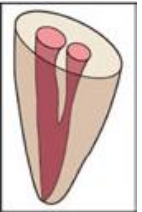
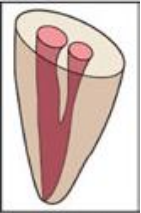
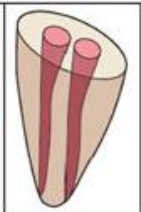
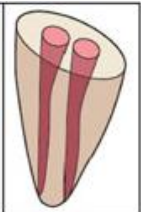
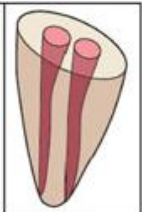


# Percentage of root canals in the maxillary teeth

Tooth type	Ant.	Premolar				Molar	
		1 <sup>st</sup>	2 <sup>nd</sup>	MB of 1 <sup>st</sup>	MB of 2 <sup>nd</sup>	DB	P
Major	 Type I (1) 100%	 Type IV (2) 60%	 Type I (1) 50% 70% 20%	 Type I (1) 45% 80% 35%	 Type I (1) 70% 90% 20%	 Type I (1) 100%	 Type I (1) 100%
Minor		 Type II (2-1) 20%	 Type IV (2) 10%	 Type IV (2) 20%	 Type IV (2) 10%		

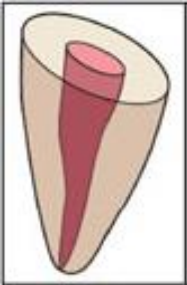
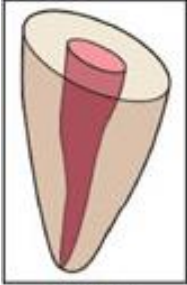
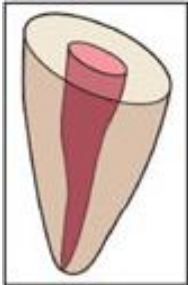
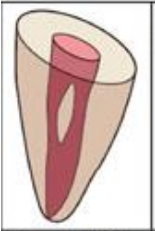
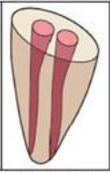
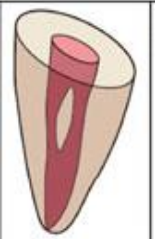
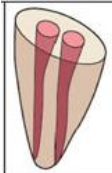
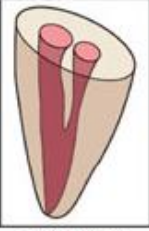


# Percentage of root canals in the maxillary teeth

Tooth type	Ant.	Premolar		Molar			
		1 <sup>st</sup>	2 <sup>nd</sup>	MB of 1 <sup>st</sup>	MB of 2 <sup>nd</sup>	DB	P
Major	 Type I (1) <b>100%</b>	 Type IV (2) <b>60%</b>	 Type I (1) <b>50%</b>	 Type I (1) <b>45%</b>	 Type I (1) <b>70%</b>	 Type I (1) <b>100%</b>	 Type I (1) <b>100%</b>
			 Type II (2-1) <b>70%</b> <b>20%</b>	 Type II (2-1) <b>80%</b> <b>35%</b>	 Type II (2-1) <b>90%</b> <b>20%</b>		
Minor		 Type II (2-1) <b>20%</b>	 Type IV (2) <b>10%</b>	 Type IV (2) <b>20%</b>	 Type IV (2) <b>10%</b>		



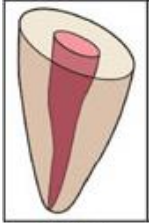
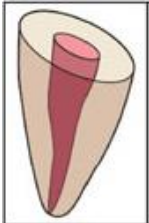
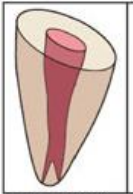
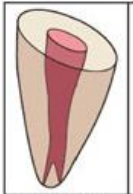
# Percentage of root canals in the mandibular teeth

Tooth type	Anterior		
	Central incisor	Lateral incisor	Canine
Major	 Type I (1) <b>70%</b>	 Type I (1) <b>75%</b>	 Type I (1) <b>80%</b>
Minor	 Type III (1-2-1) <b>20%</b>  Type IV (2) <b>3%</b>	 Type III (1-2-1) <b>20%</b>  Type IV (2) <b>2%</b>	 Type II (2-1) <b>15%</b>





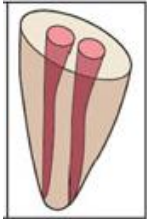
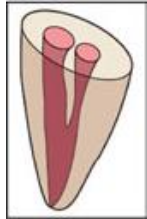
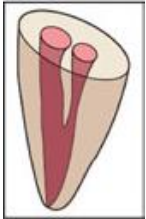
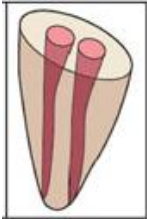




# Percentage of root canals in the mandibular teeth

Tooth type	Premolar		Molar			
	1 <sup>st</sup>	2 <sup>nd</sup>	1 <sup>st</sup>		2 <sup>nd</sup>	
			M	D	M	D
Major	 Type I (1) <b>70%</b>	 Type I (1) <b>98%</b>				
Minor	 Type V (1-2) <b>24%</b>	 Type V (1-2) <b>2%</b>				





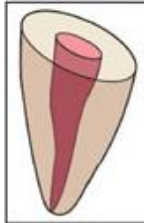


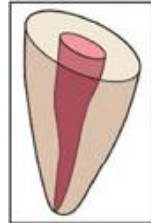


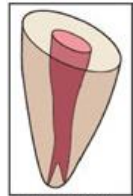


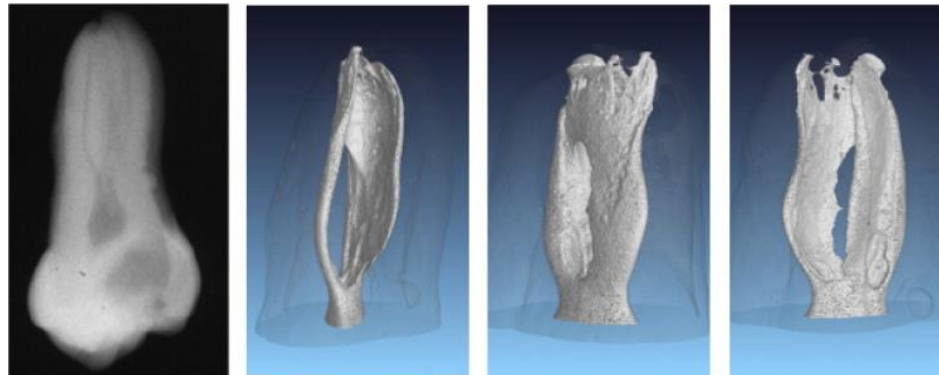
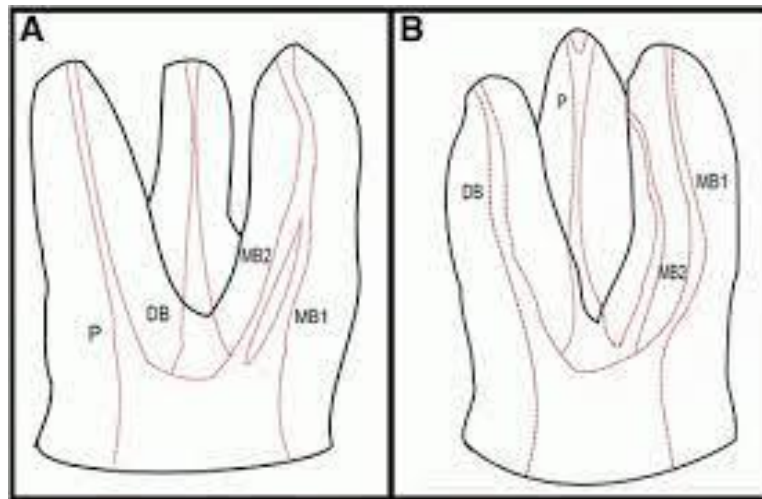
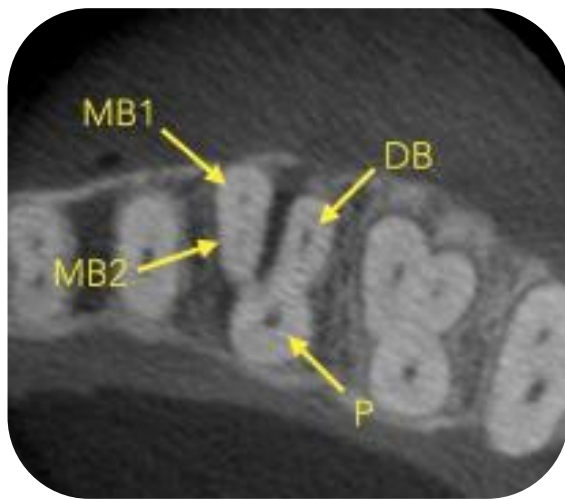
# Percentage of root canals in the mandibular teeth

Tooth type	Premolar		Molar			
	1 <sup>st</sup>	2 <sup>nd</sup>	1 <sup>st</sup>		2 <sup>nd</sup>	
			M	D	M	D
Major	 Type I (1) 70%	 Type I (1) 98%	 Type IV (2) 45%	 Type II (2-1) 30%	 Type II (2-1) 40%	 Type IV (2) 25%
Minor	 Type V (1-2) 24%	 Type V (1-2) 2%				



# Percentage of root canals in the mandibular teeth

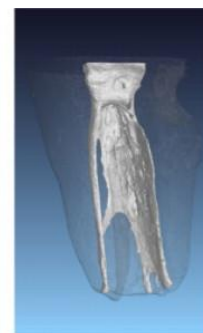
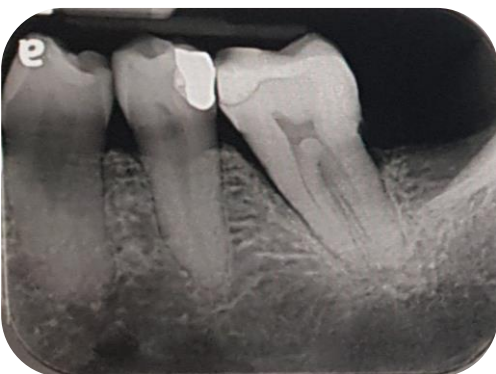
Tooth type	Premolar		Molar					
	1 <sup>st</sup>	2 <sup>nd</sup>	1 <sup>st</sup>		D	2 <sup>nd</sup>		D
			M			M		
Major	<div> Type I (1) 70%</div>	<div> Type I (1) 98%</div>	<div> Type IV (2) 45%</div>	<div> Type II (2-1) 30%</div>	<div> Type I (1) 70%</div>	<div> Type II (2-1) 40%</div>	<div> Type IV (2) 25%</div>	<div> Type I (1) 92%</div>
Minor	<div> Type V (1-2) 24%</div>	<div> Type V (1-2) 2%</div>			<div> Type V (1-2) 15%</div>			



## Please concern about...

- **Upper Molar – MB2 canal, C-shaped canal**
- Lower Molar – DL canal, MM canal, C-shaped canal
- Upper Incisor – DI
- Lower Incisor – Li canal
- Lower Premolar – Bi/Tri furcated canals, DE

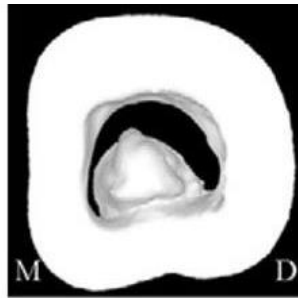
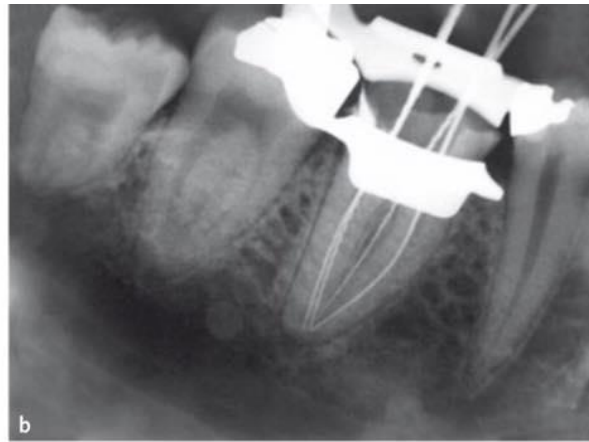
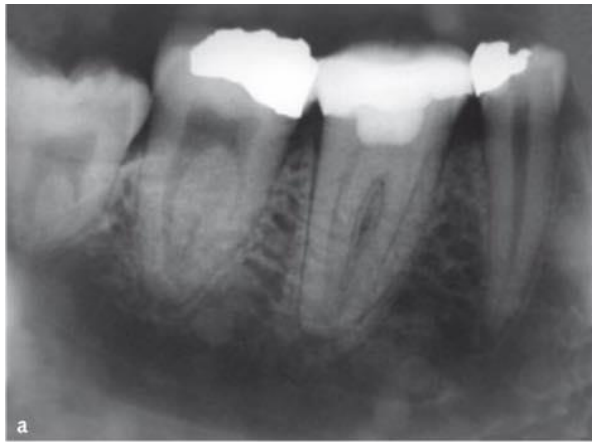




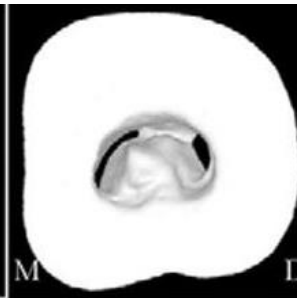
## Please concern about...

- Upper Molar – MB2 canal, C-shaped canal
- **Lower Molar – DL canal, MM canal, C-shaped canal**
- Upper Incisor – DI
- Lower Incisor – Li canal
- Lower Premolar – Bi/Tri furcated canals, DE

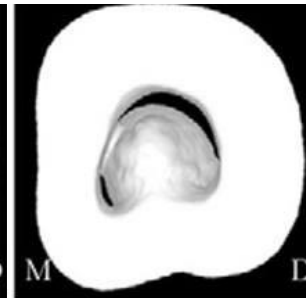




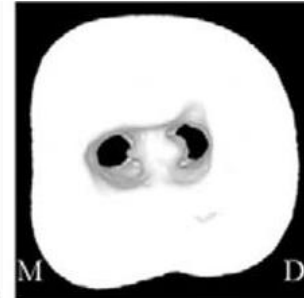
Type I



Type II



Type III



Type IV

## Please concern about...

- Upper Molar – MB2 canal, C-shaped canal
- **Lower Molar – DL canal, MM canal, C-shaped canal**
- Upper Incisor – DI
- Lower Incisor – Li canal
- Lower Premolar – Bi/Tri furcated canals, DE



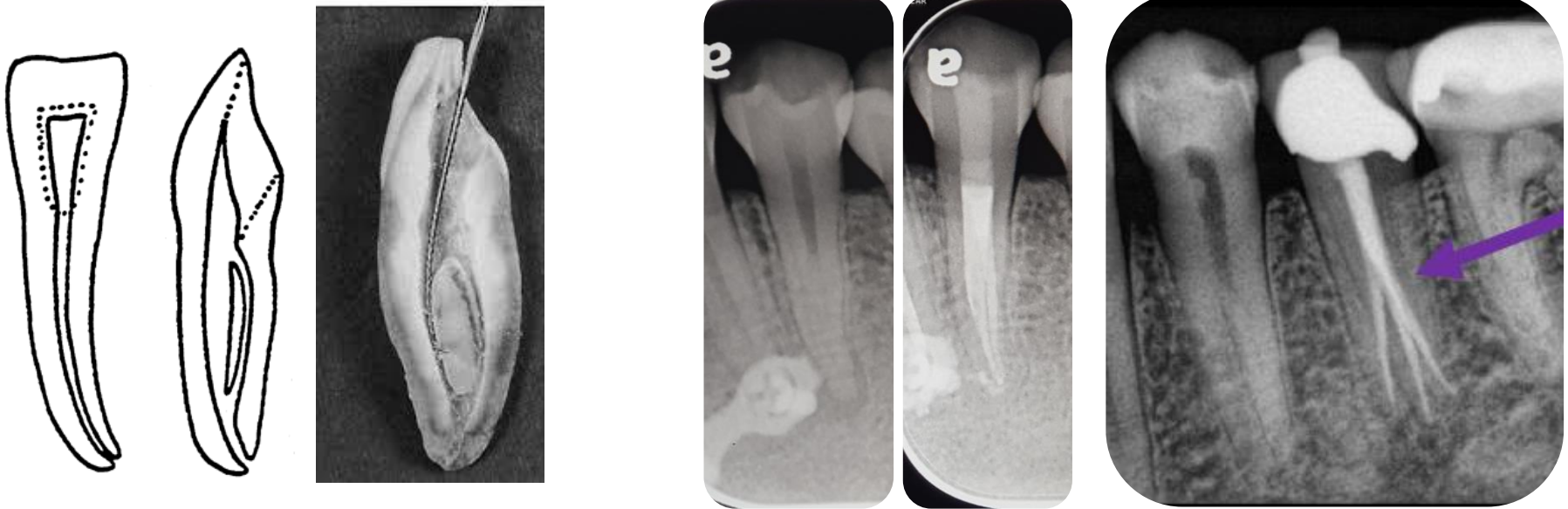




## Please concern about...

- Upper Molar – MB2 canal, C-shaped canal
- Lower Molar – DL canal, MM canal, C-shaped canal
- **Upper Incisor – DI**
- Lower Incisor – Li canal
- Lower Premolar – Bi/Tri furcated canals, DE





## Please concern about...

- Upper Molar – MB2 canal, C-shaped canal
- Lower Molar – DL canal, MM canal, C-shaped canal
- Upper Incisor – DI
- **Lower Incisor – Li canal**
- **Lower Premolar – Bi/Tri furcated canals, DE**







# Open access/canal

**Caries removal** is the 1<sup>st</sup> step of OC.



OC

# Open access/canal



**Tooth with  
large/deep filling**



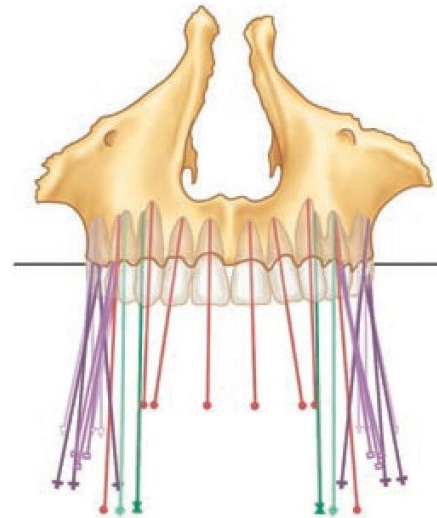
OC

# Anatomy assessment

- Long axis of tooth
- Tooth angulation
- Root eminence

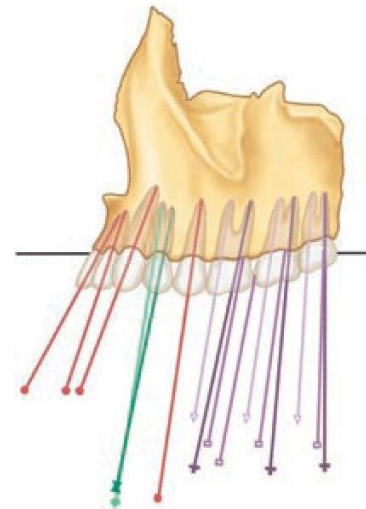
## SINGLE ROOTED TEETH

- Incisors
- Cuspids
- Upper II bicuspid



## BICUSPID I

- ◆ Buccal roots
- ◆ Palatal roots



## UPPER MOLARS

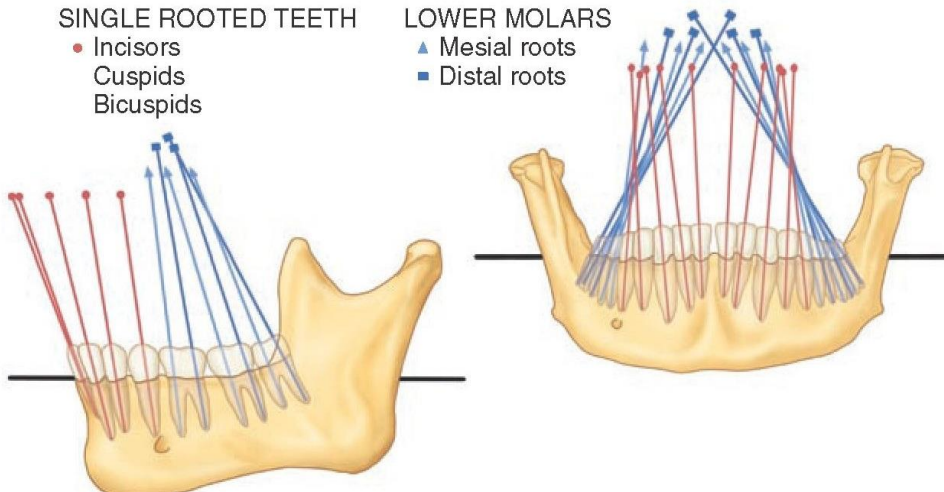
- ▽ Mesio Buccal roots
- + Distobuccal roots
- Palatal roots

## SINGLE ROOTED TEETH

- Incisors
- Cuspids
- Bicuspid

## LOWER MOLARS

- ▲ Mesial roots
- Distal roots



OC

# Anatomy assessment

## Point of OC

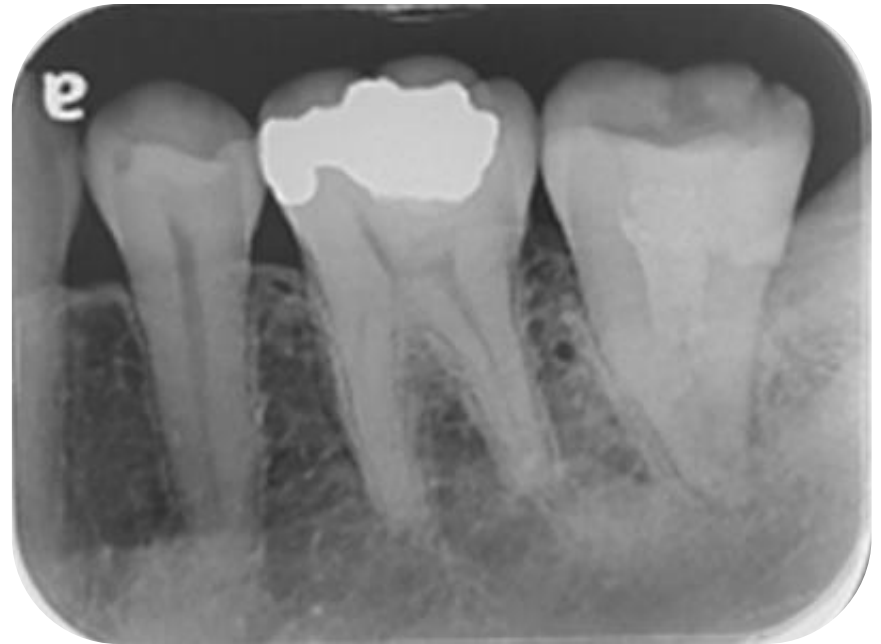
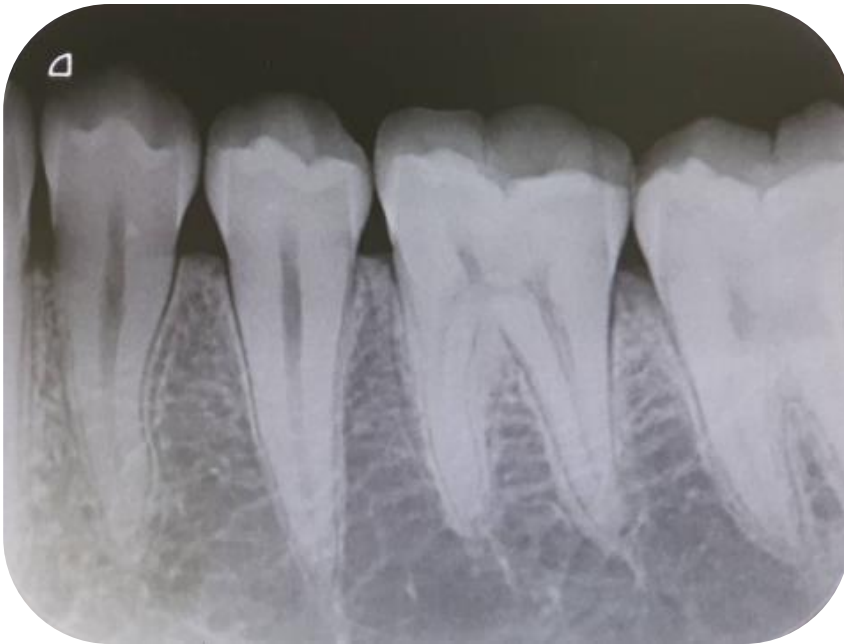






# Anatomy assessment

## Point of OC



OC

# Anatomy assessment

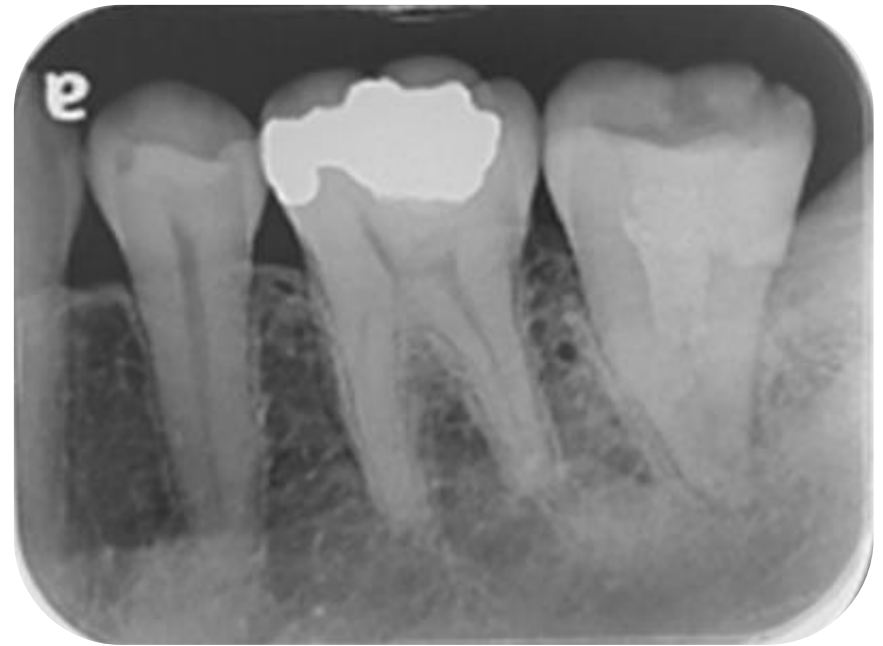
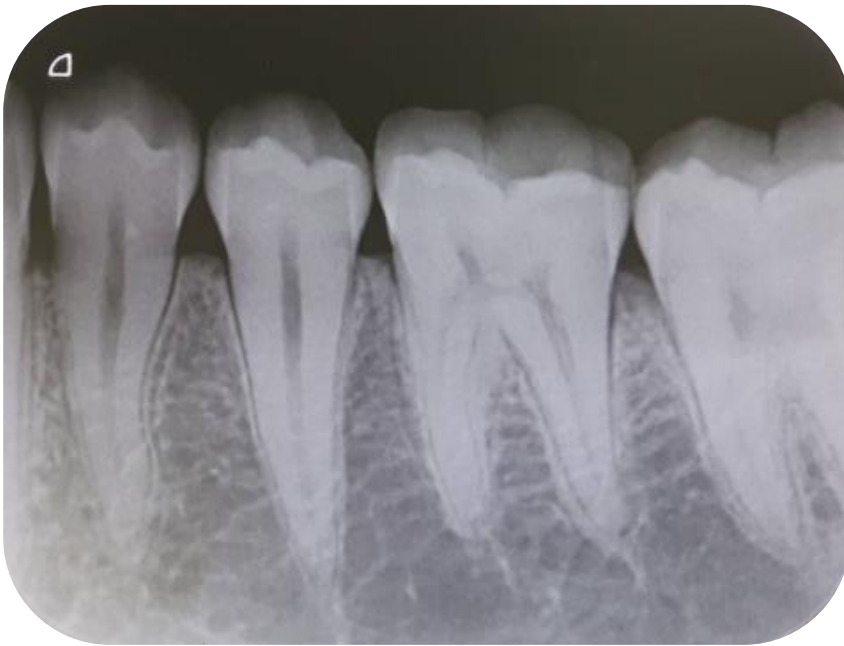
**Depth** of OC





# Anatomy assessment

## Depth of OC

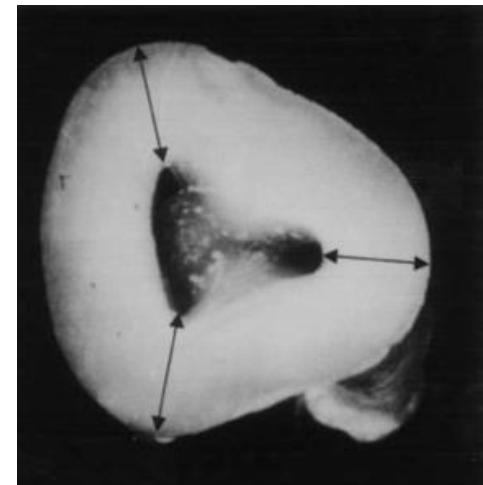




# Guideline for OC

To locate pulp chamber

The law of	Description
CEJ	the CEJ is the most consistent, repeatable landmark for locating the position of the pulp chamber
centrality	the floor of the pulp chamber is always located in the center of the tooth at the level of the CEJ
concentricity	the walls of the pulp chamber are always concentric to the external surface of the tooth at the level of the CEJ



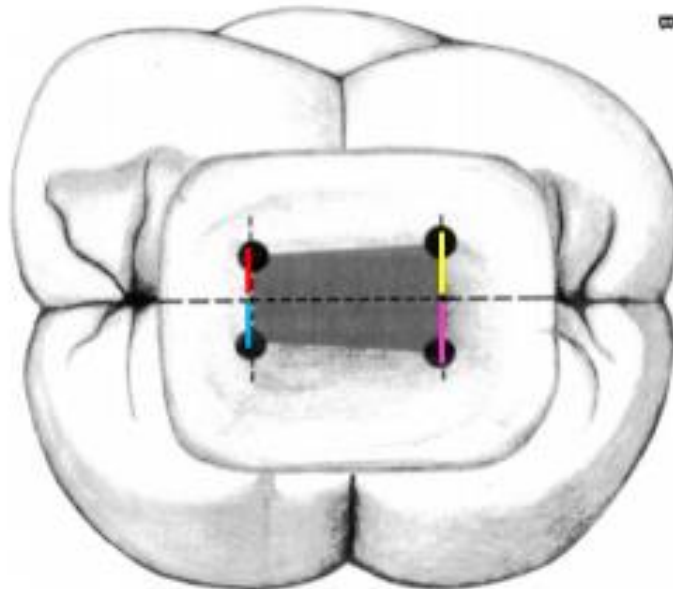




# Guideline for OC

To locate canal orifices

The law of	Description
Symmetry 1	the orifices are equidistant from a line drawn in a mesio-distal direction through the pulp-chamber floor
Symmetry 2	the orifices lie on a line perpendicular to a line drawn in a mesial-distal direction across the center of the floor of the pulp chamber

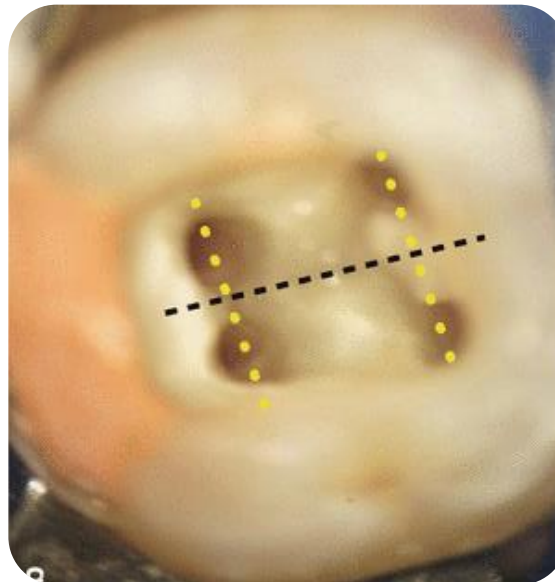




# Guideline for OC

To locate canal orifices

The law of	Description
Symmetry 1	the orifices are equidistant from a line drawn in a mesio-distal direction through the pulp-chamber floor
Symmetry 2	the orifices lie on a line perpendicular to a line drawn in a mesial-distal direction across the center of the floor of the pulp chamber





# Guideline for OC

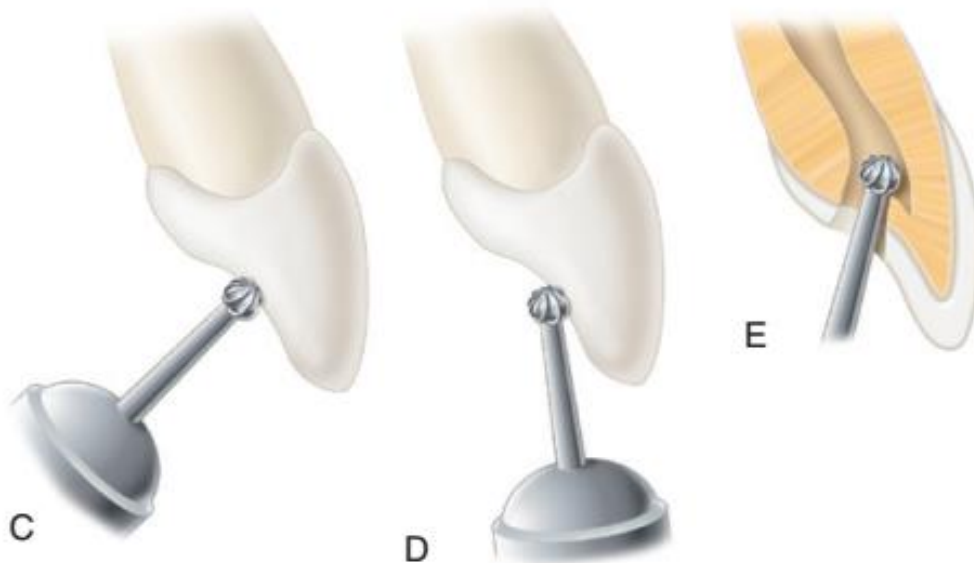
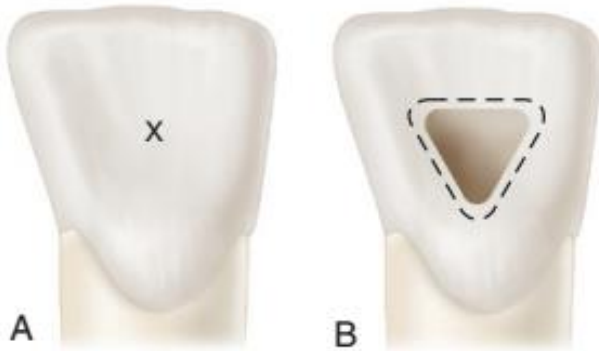
To locate canal orifices

The law of	Description
Color change	the color of the pulp-chamber floor is always darker than the walls
Orifice location 1	The orifices located at the junction of the walls and the floor
Orifice location 2	The orifices located at the angles in the floor-wall junction
Orifice location 3	The orifices located at the terminus of the root developmental fusion lines



OC

# Access of upper Ant. teeth



OC

# Access of upper premolar

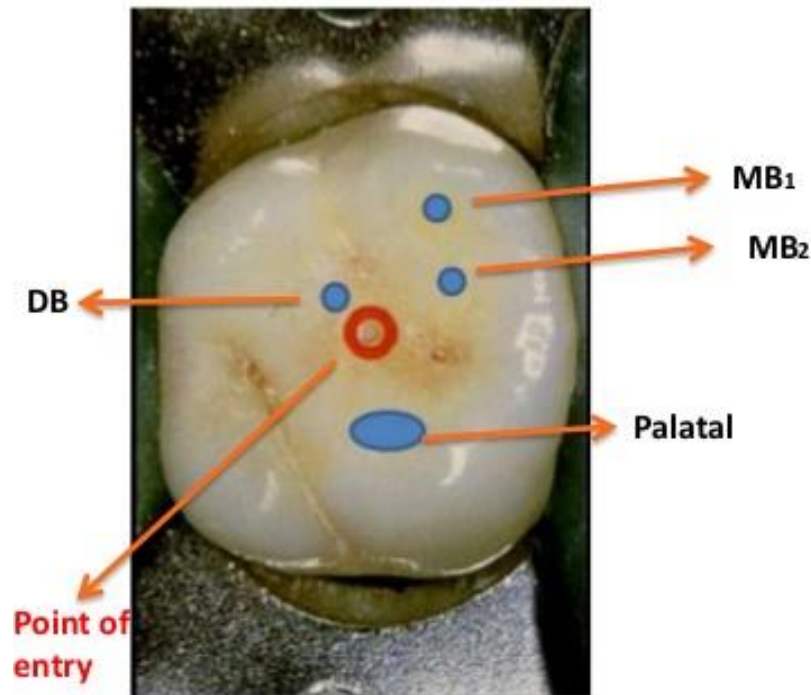


B



OC

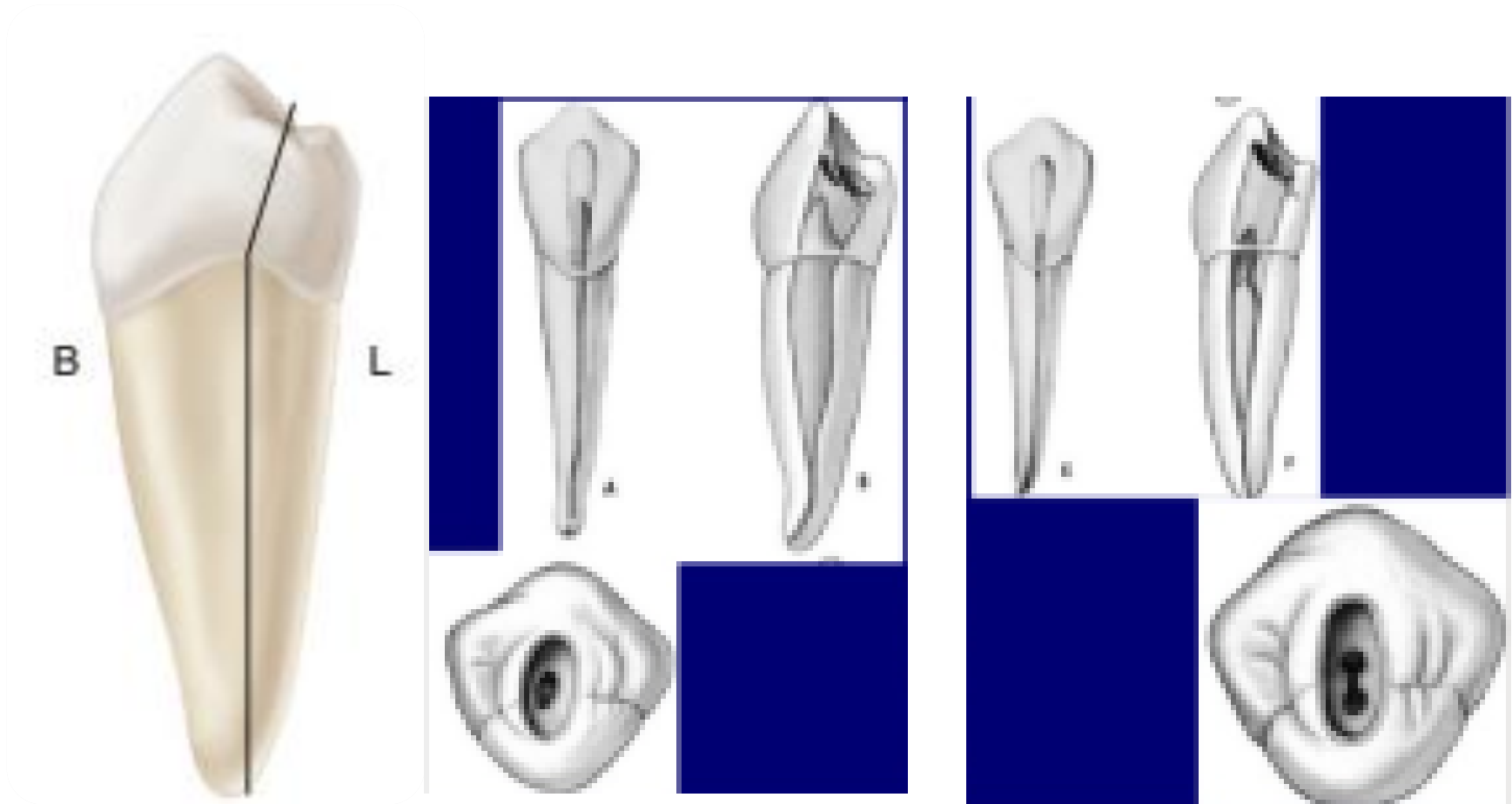
# Access of upper molar



- *MB1 is located under the buccal cusp tip.*
- *MB2 is located mesial and palatal to MB1 (at the end of a comma tail).*
- *DB is located under the central fossa.*
- *Palatal is located at the junction of mesiopalatal cusp and oblique ridge.*
- *Point of entry is the center of the occlusal table.*

OC

# Access of lower premolar

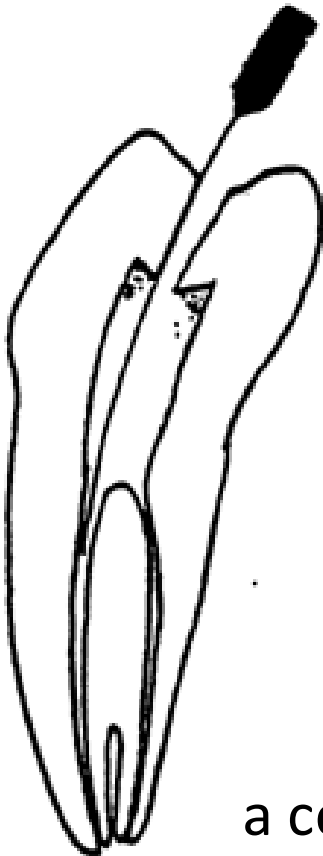




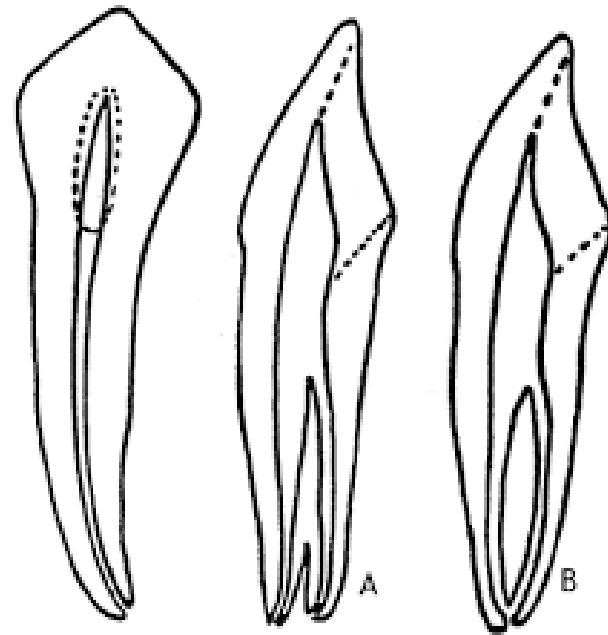
# Warning



**Lower premolar**



**Lower incisor**

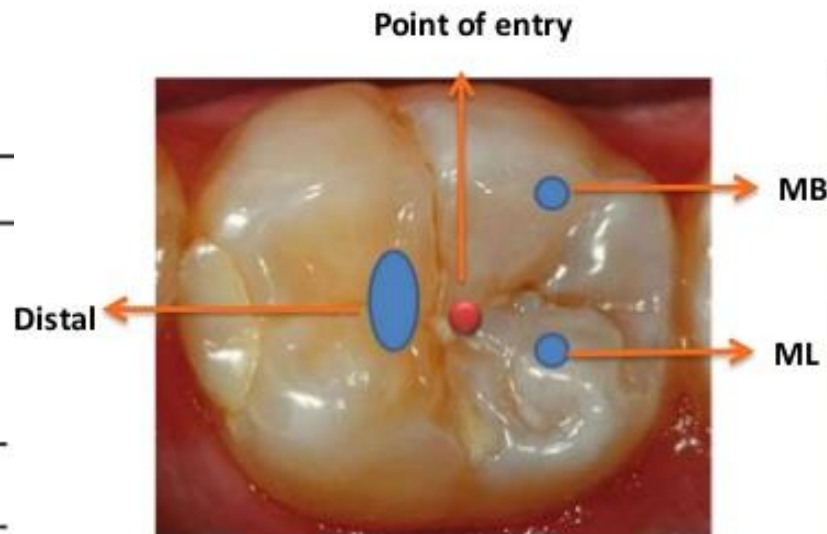
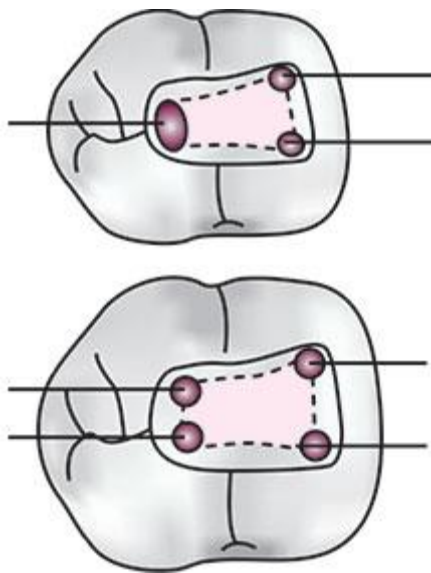


**Underextended access preparation** is  
a consequence to **leave missed canal**.



OC

# Access of lower molar

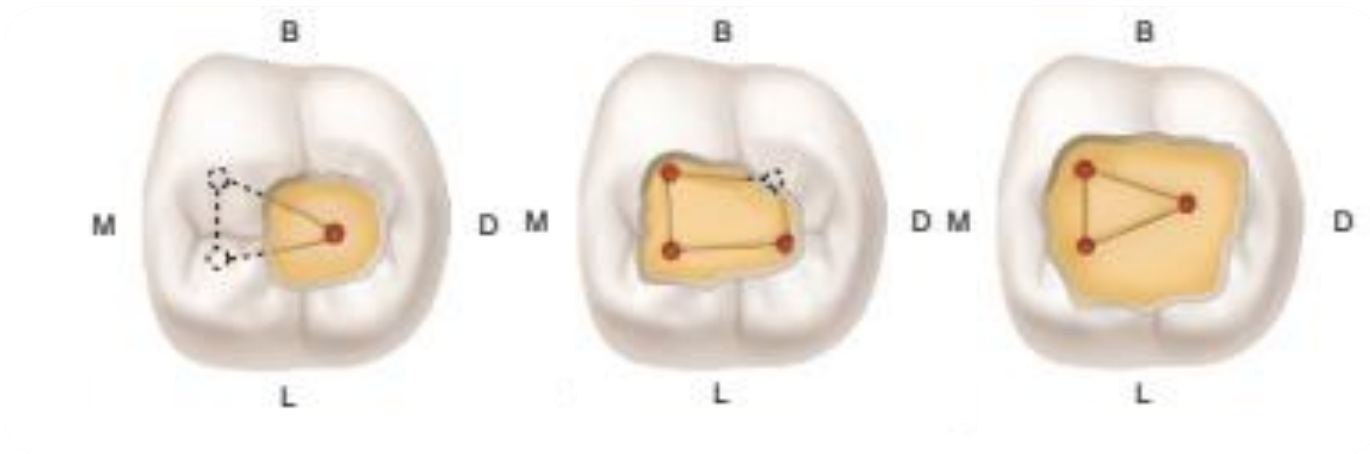
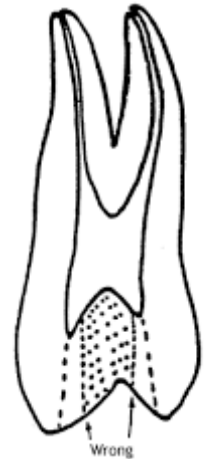


- *MB is located under the mesiobuccal cusp tip.*
- *ML is located at the same line lingual to the central fissure.*
- *Distal is located distal to the central fossa.*
- *Point of entry is the central fossa.*

OC

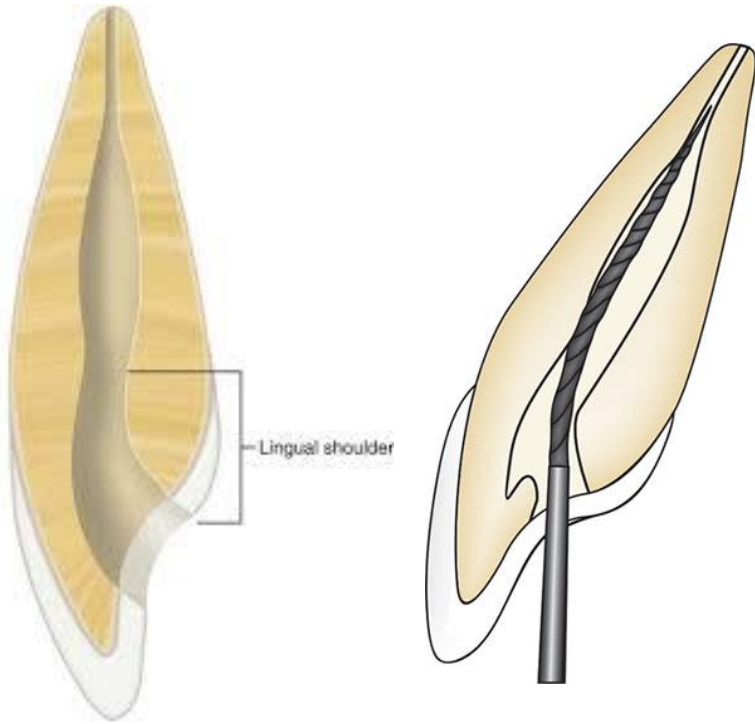
# Good access

- ✓ No remaining dental caries
- ✓ No remaining pulpal horn
- ✓ Be able to locate all orifices
- ✓ Not over-extended access
- ✓ Good straight-line access

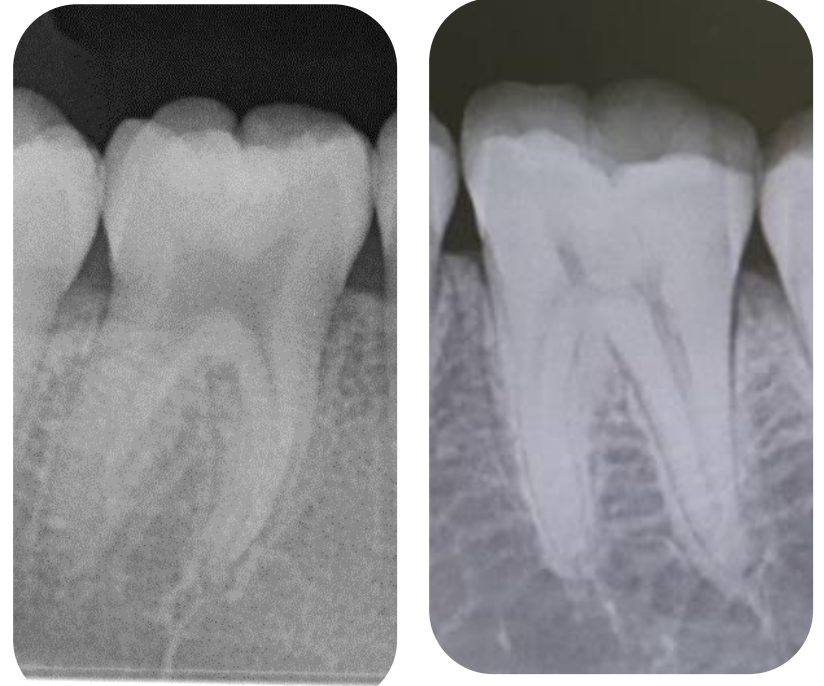


OC

# Orifice obstacle



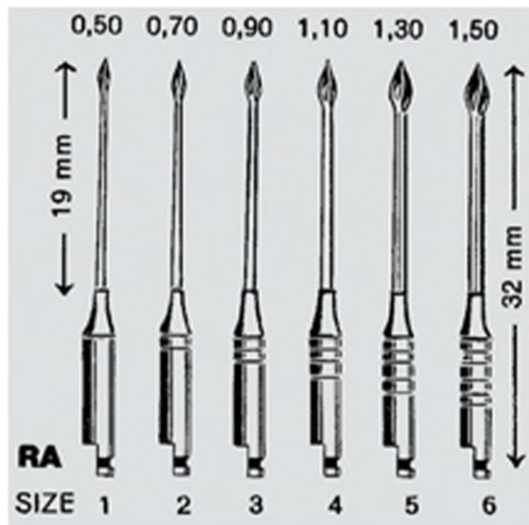
**Lingual shoulder**



**Cervical dentin  
or  
dentin shelf**

OC

# Coronal flare



Gate glidden drill



Orifice opener files



Ultrasonic tips

OC

# Straight line access

