

***PULPAL PATHOLOGY OF PRIMARY AND PERMANENT
TEETH IN CHILDREN. ETIOLOGY. PATHOGENESIS.
CLASSIFICATION. DIAGNOSIS. DIFFERENTIAL
DIAGNOSIS. CLINICAL PRESENTATION.
TREATMENT OPTIONS.***



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Pulp

- formative organ of tooth
- builds primary dentin during development of tooth
- secondary dentin after tooth eruption
- reparative dentin in response to stimulation as long as *odontoblast* remain vital

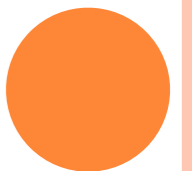
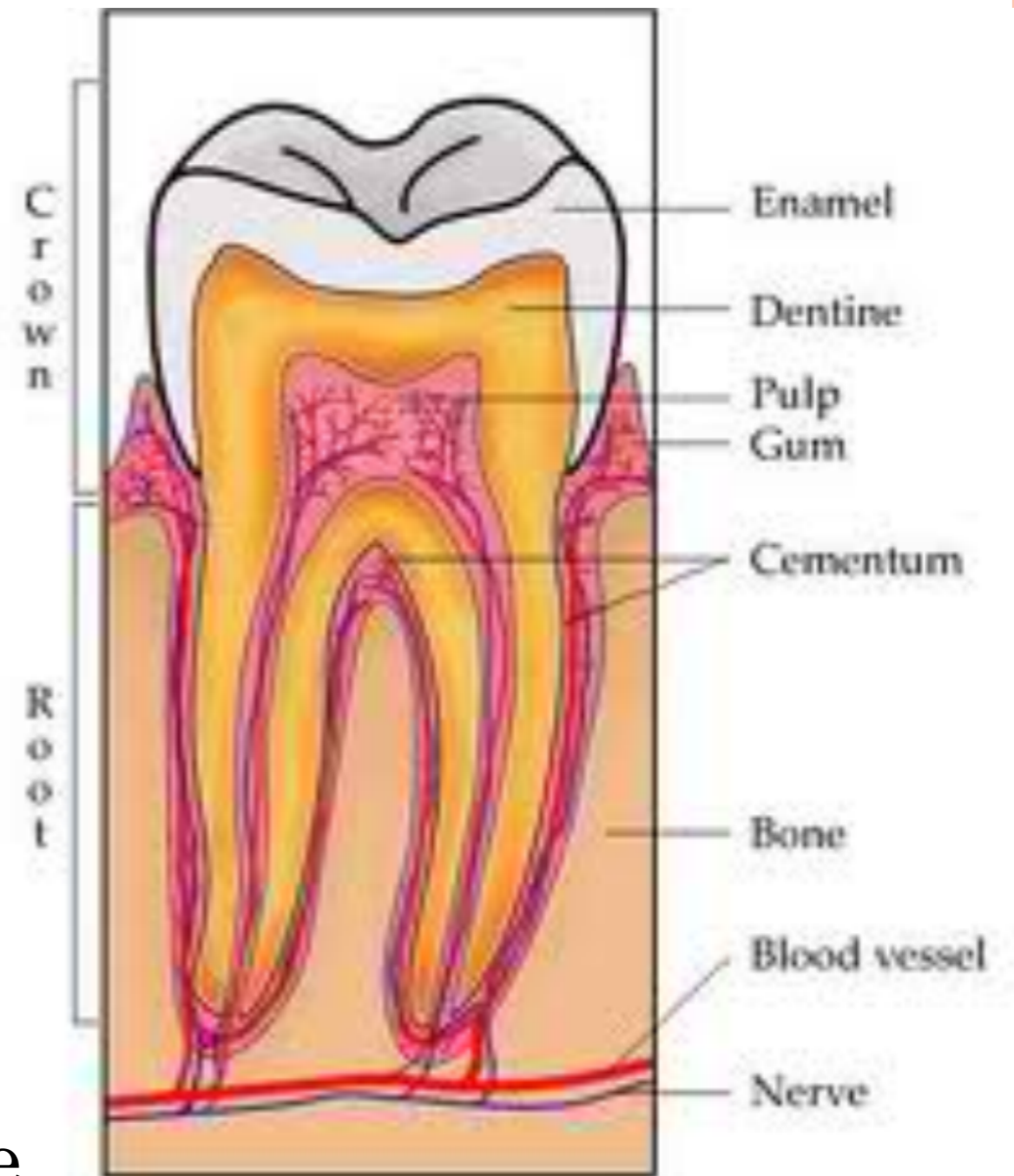


Table 9: Deciduous teeth*Upper*

Longer
 Crown is wider mesiodistally

 Crown is blunt
 Cingulum prominent

 Molar has 3 roots—mesiobuccal,
 distobuccal and palatal
 Wider labiolingually

Lower

Shorter
 Crown is narrow
 mesiodistally
 Crown is more pointed
 Cingulum is more
 prominent
 Molars has 2 roots—
 mesial and distal
 Narrower labiolingually

Table 10: Deciduous and permanent teeth*Deciduous teeth*

Total 20 teeth
 2 incisors + 1 canine
 2 molars
 No premolars
 Smaller teeth

 Cusps are more pointed
 and crowns are bulbous
 Contact areas are smaller
 Enamel is less translucent
 White color
 Roots are shorter delicate
 Roots are more flared
 Dentin is less thick
 Pulp cavity is larger
 Pulp horns arise high
 Enamel is less calcified and
 shows more attrition
 Set perpendicularly in jaw
 Eruption starts at 6 months

Permanent teeth

Total 32 teeth
 2 incisors + 1 canine
 3 molars
 2 premolars
 Larger than deciduous

 Crowns are blunt.

 Contact areas are broader
 Enamel is more translucent
 Color is yellowish white
 Roots are longer and strong

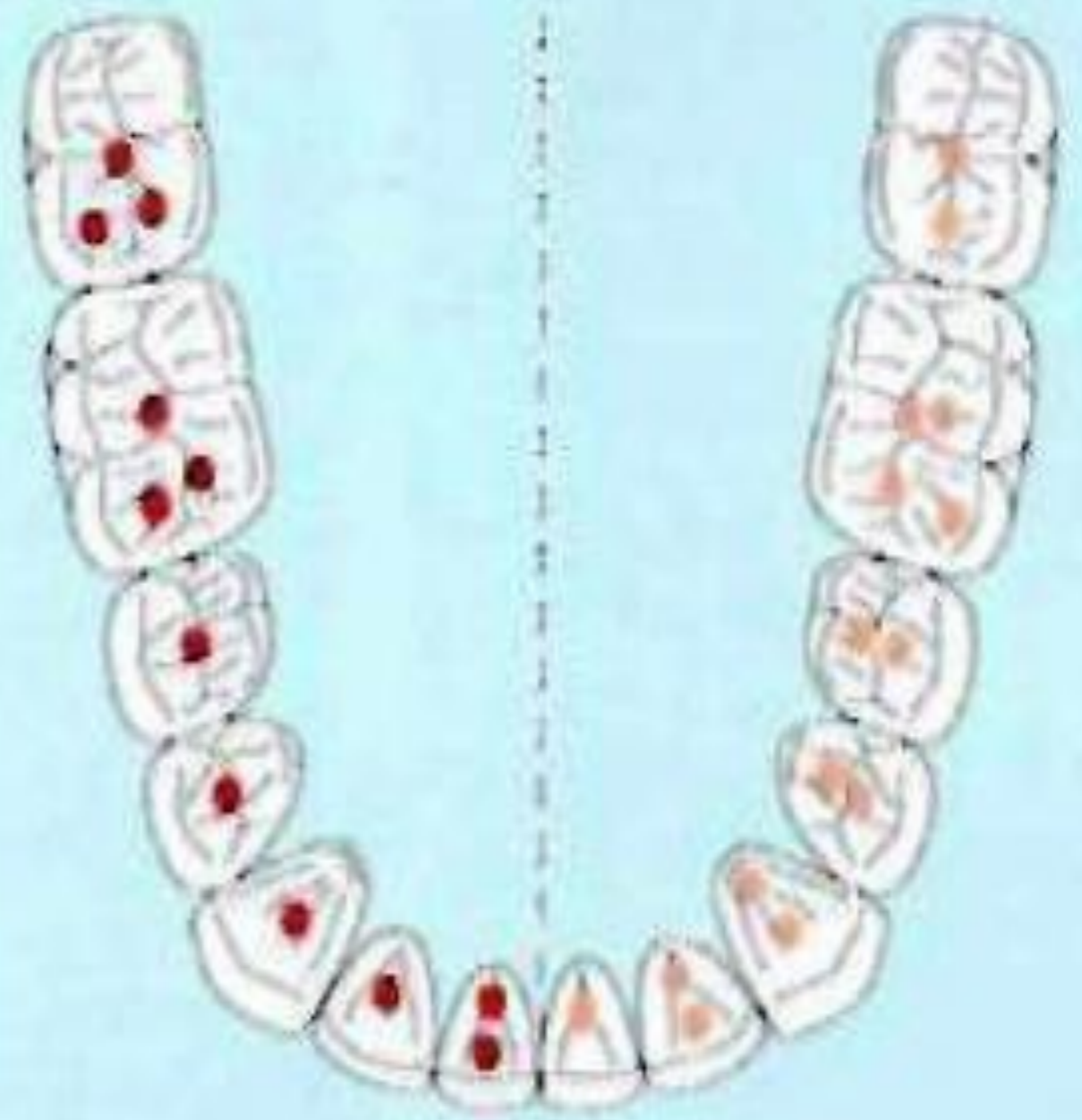
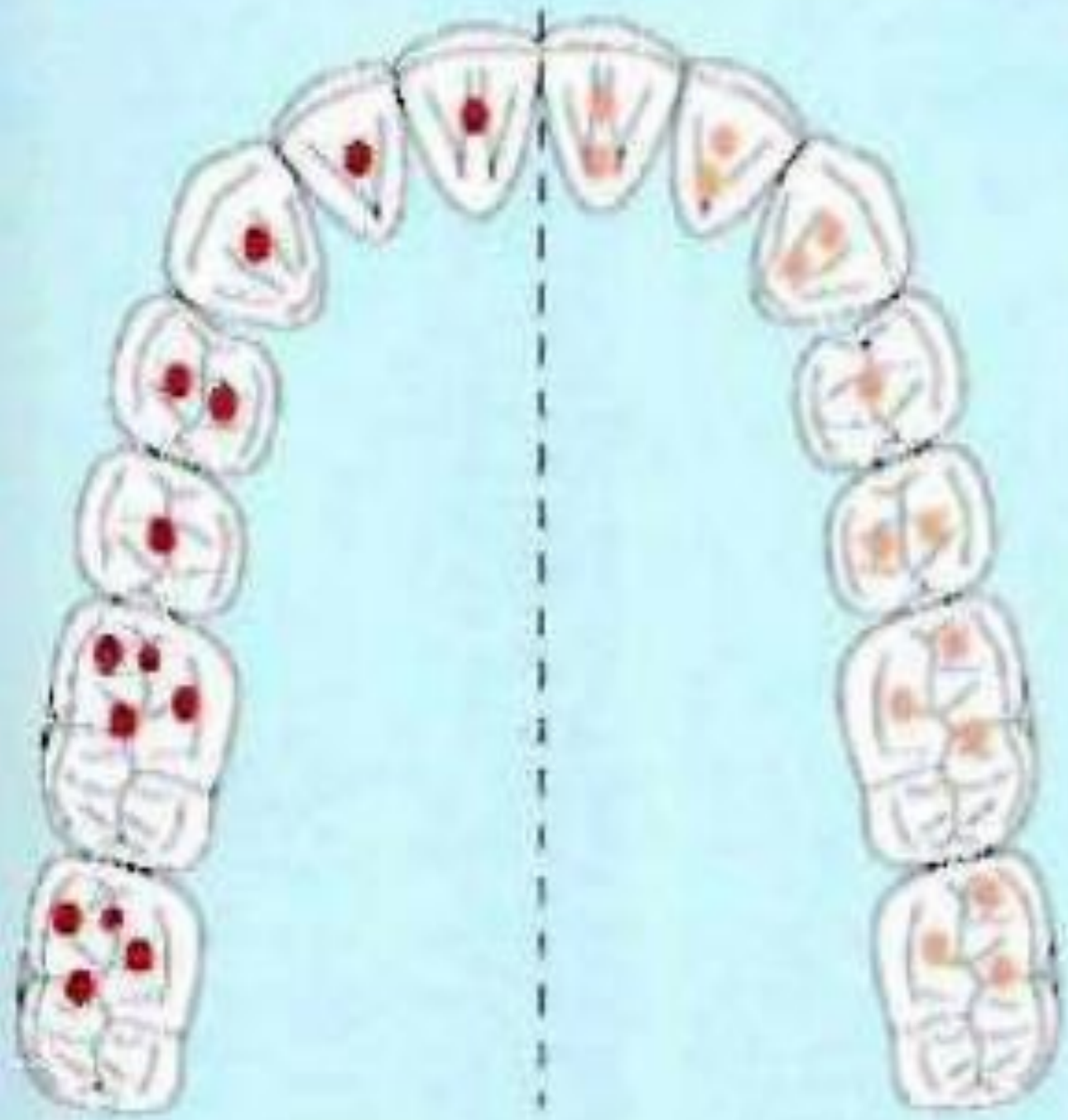
 Dentin is thicker.
 Pulp cavity is smaller
 Pulp horns are lower
 Enamel is less permeable more
 calcified.
 Placed obliquely in jaws
 Eruption starts at 6 years

Anatomy of the root system of temporary teeth

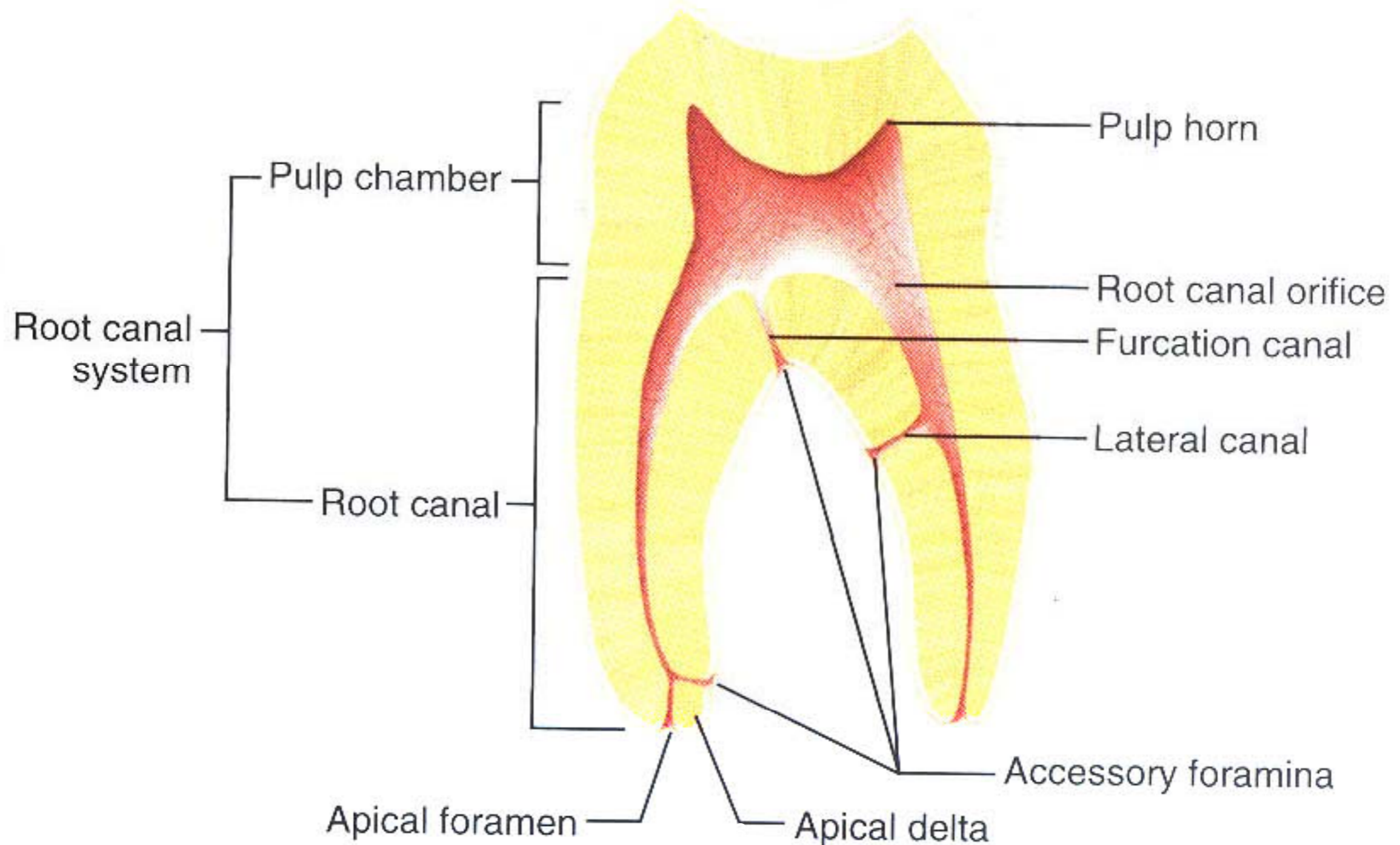
TEETH	AGE	LENGTH OF TOOTH	The rate of detection of root canals (%)			
			1	2	3	4
U.I	3-5	17,0-19,0	100	-	-	-
L.I	3-5	15,0-19,0	92	8	-	-
U.II	3-5	14,5-17,0	100	-	-	-
L.II	3-5	15,0-19,0	92	8	-	-
U.III	5-7	17,5-22,0	100		-	
L.III	5-7	17,5-22,0	100			-
U.IV	5-7	14,0-17,0	-	5	19	76
L.IV	5-7	14,0-17,0	-	22	78	-
U.V	5-7	17,5-19,5	-	2	15	83
L.V	5-7	17,5-19,5	-	18	82	-

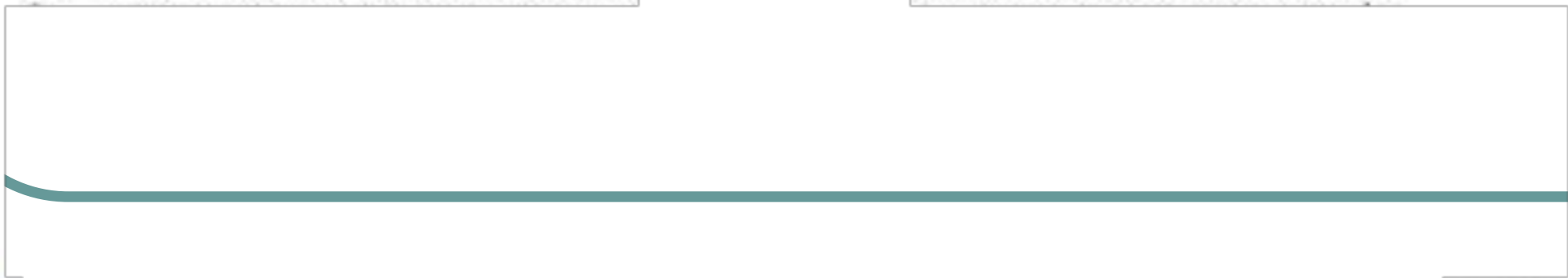
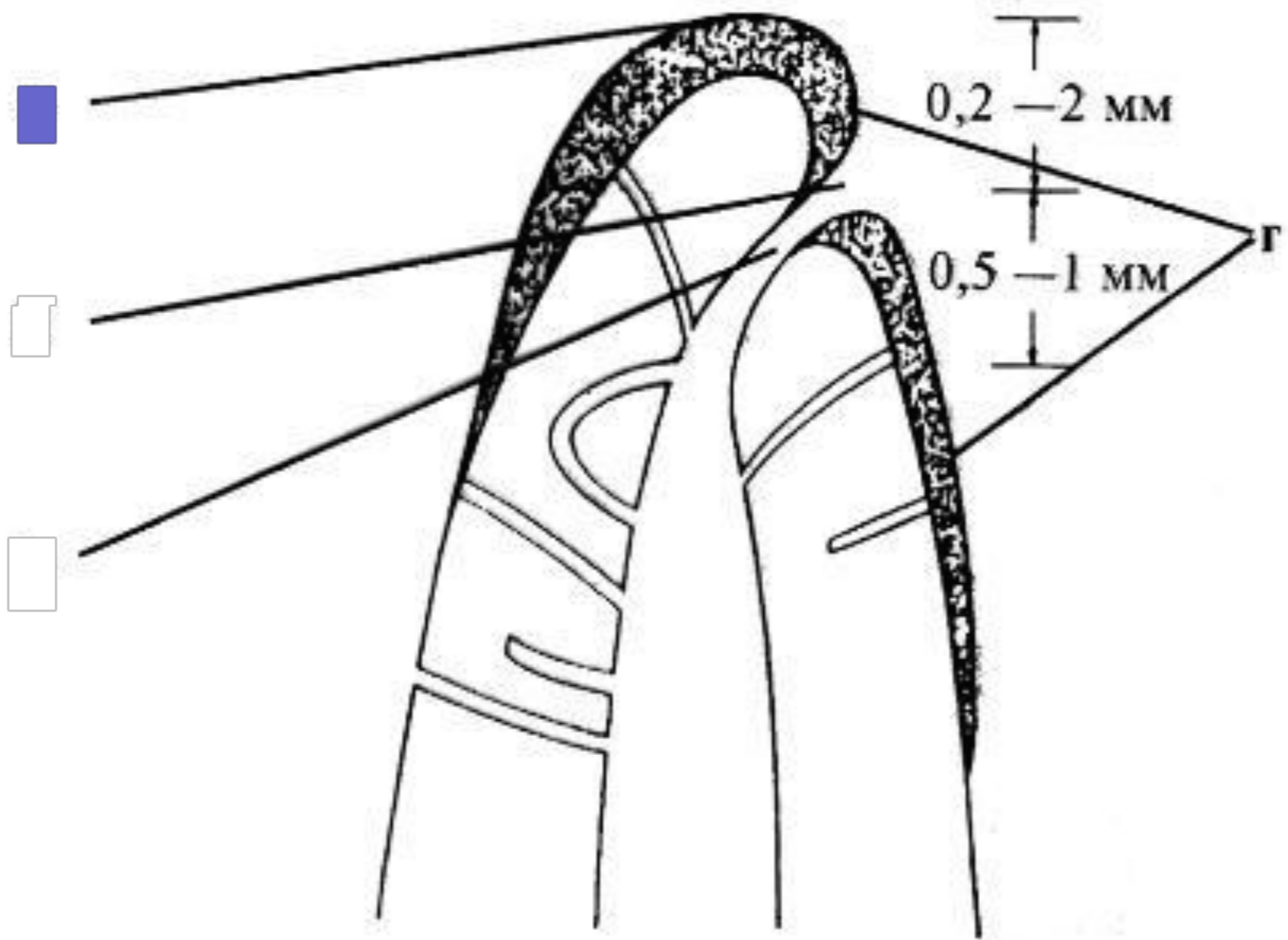
Tooth	Average Length	No. of roots	No. of canals
Maxillary anteriors			
Central incisor	22.5 mm	1	1
Lateral incisor	22.0 mm	1	1
Canine	26.5 mm	1	1
Maxillary premolar			
First premolar	20.6 mm	1	1 (6%)
			2 (95%)
			3 (1%)
Second premolar	21.5 mm	1	1 (75%)
			2 (24%)
			3 (1%)
Maxillary molars			
First molar	20.8 mm	3	4 (93%)
			3 (7%)
Second molar	20.0 mm	3	4 (37%)

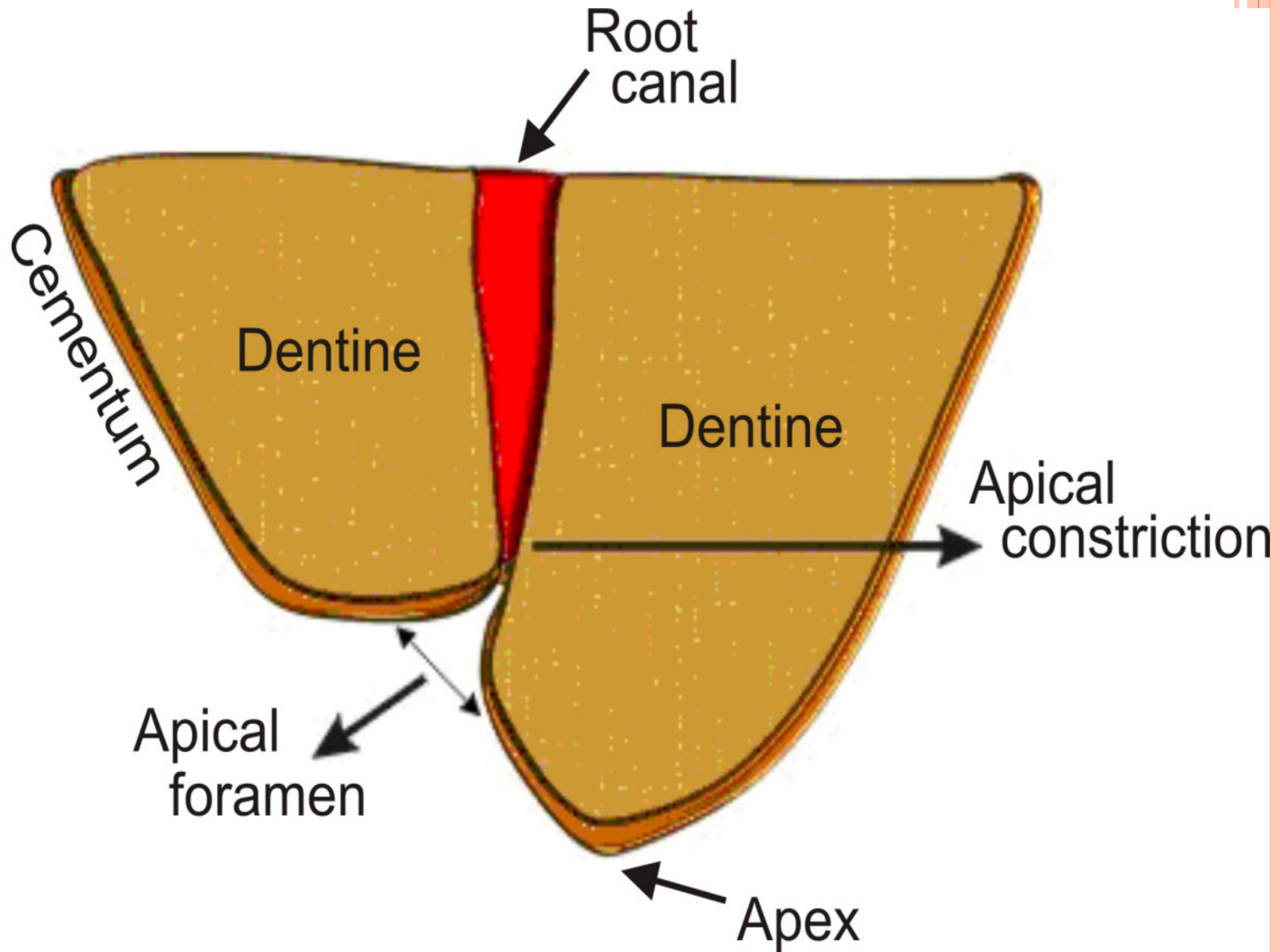
Mandibular anteriors			
Central incisor	20.7 mm	1	1 (58%)
			>2 (42%)
Lateral incisor	20.7 mm	1-2	1 (58%)
			2 (42%)
Canine	25.6 mm	1	1 (94%)
			2(6%)
Mandibular premolars			
First premolar	21.6 mm	1	1 (73%)
			2 (27%)
Second premolar	22.3 mm	1	1 (85%)
			2 (15%)
Mandibular molars			
First molar	21.0 mm	2	3 (67%)
			4 (33%)
Second molar	19.8 mm	2	2 (13%)

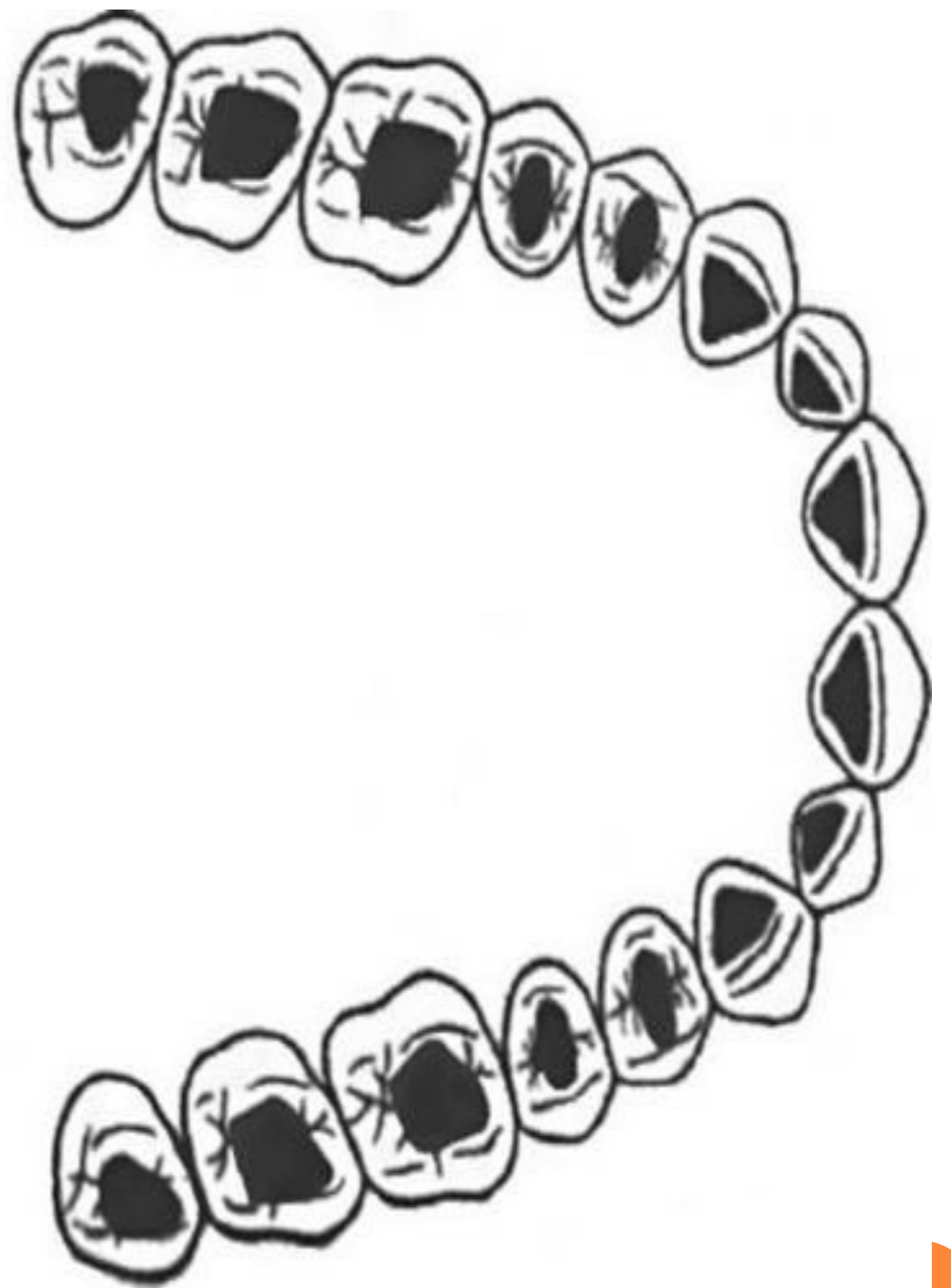
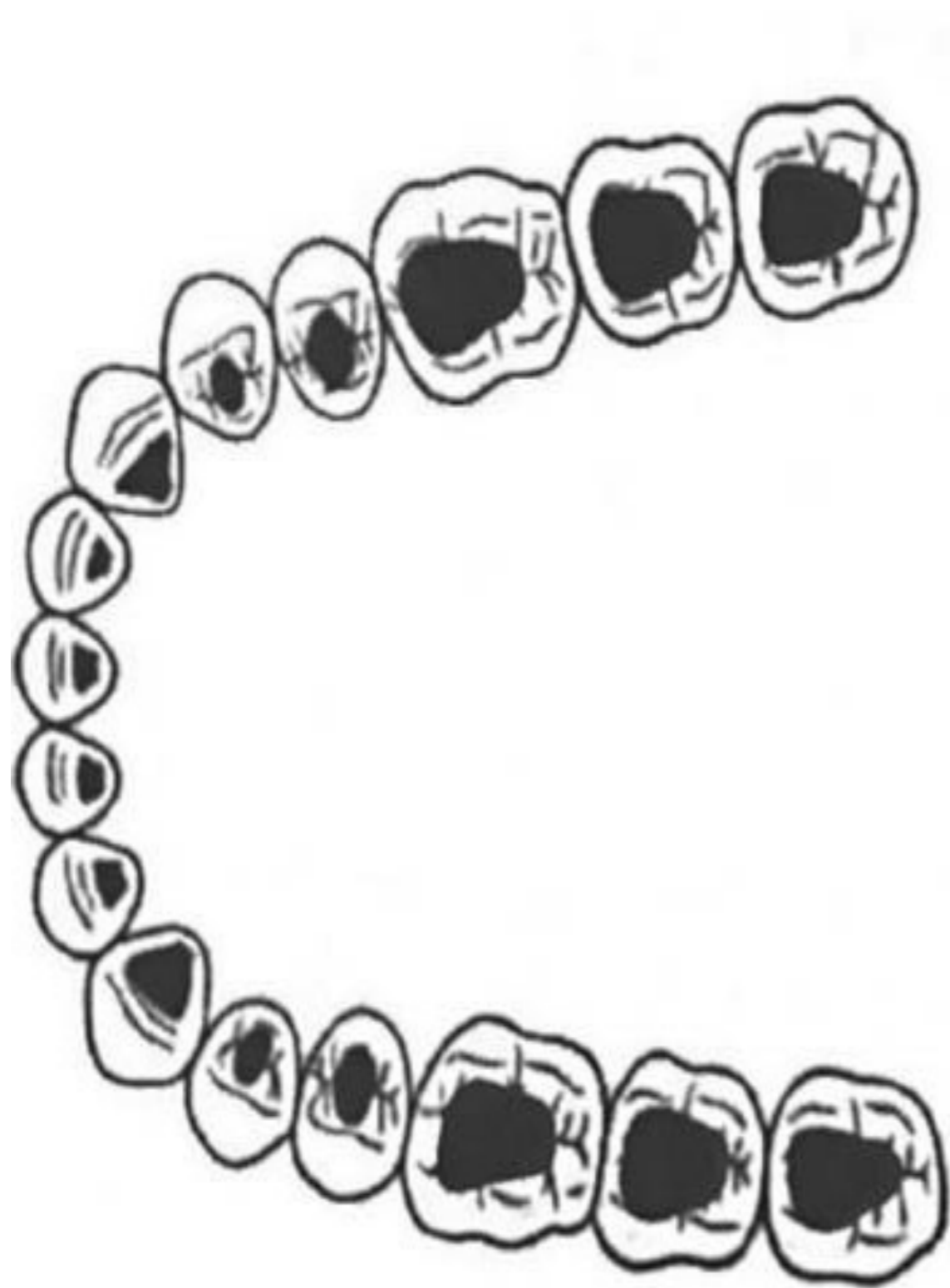


Root canal system









Etiology

- 1. Microbial**
- 2. Chemical**
- 3. Thermal**
- 4. Traumatic**

Reversible Pulpitis is based upon subjective and objective findings indicating that the inflammation should resolve and the pulp return to normal following appropriate management of the etiology. Discomfort is experienced when a stimulus such as cold or sweet is applied and goes away within a couple of seconds following the removal of the stimulus. Typical etiologies may include exposed dentin (dentinal sensitivity), caries or deep restorations. There are no significant radiographic changes in the periapical region of the suspect tooth and the pain experienced is not spontaneous. Following the management of the etiology (*e.g.* caries removal plus restoration; covering the exposed dentin), the tooth requires further evaluation to determine whether the “reversible pulpitis” has returned to a normal status. Although dentinal sensitivity per se is not an inflammatory process, all of the symptoms of this entity mimic those of a reversible pulpitis.

Symptomatic Irreversible Pulpitis is based on subjective and objective findings that the vital inflamed pulp is incapable of healing and that root canal treatment is indicated. Characteristics may include sharp pain upon thermal stimulus, lingering pain (often 30 seconds or longer after stimulus removal), spontaneity (unprovoked pain) and referred pain. Sometimes the pain may be accentuated by postural changes such as lying down or bending over and over-the-counter analgesics are typically ineffective. Common etiologies may include deep caries, extensive restorations, or fractures exposing the pulpal tissues. Teeth with symptomatic irreversible pulpitis may be difficult to diagnose because the inflammation has not yet reached the periapical tissues, thus resulting in no pain or discomfort to percussion. In such cases, dental history and thermal testing are the primary tools for assessing pulpal status.

Asymptomatic Irreversible Pulpitis is a clinical diagnosis based on subjective and objective findings indicating that the vital inflamed pulp is incapable of healing and that root canal treatment is indicated. These cases have no clinical symptoms and usually respond normally to thermal testing but may have had trauma or deep caries that would likely result in exposure following removal.

Pulp Necrosis is a clinical diagnostic category indicating death of the dental pulp, necessitating root canal treatment. The pulp is non-responsive to pulp testing and is asymptomatic. Pulp necrosis by itself does not cause apical periodontitis (pain to percussion or radiographic evidence of osseous breakdown) unless the canal is infected. Some teeth may be non-responsive to pulp testing because of calcification, recent history of trauma, or simply the tooth is just not responding. As stated previously, this is why all testing must be of a comparative nature (*e.g.* patient may not respond to thermal testing on any teeth).

Pulpitis



UNTREATED



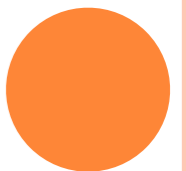
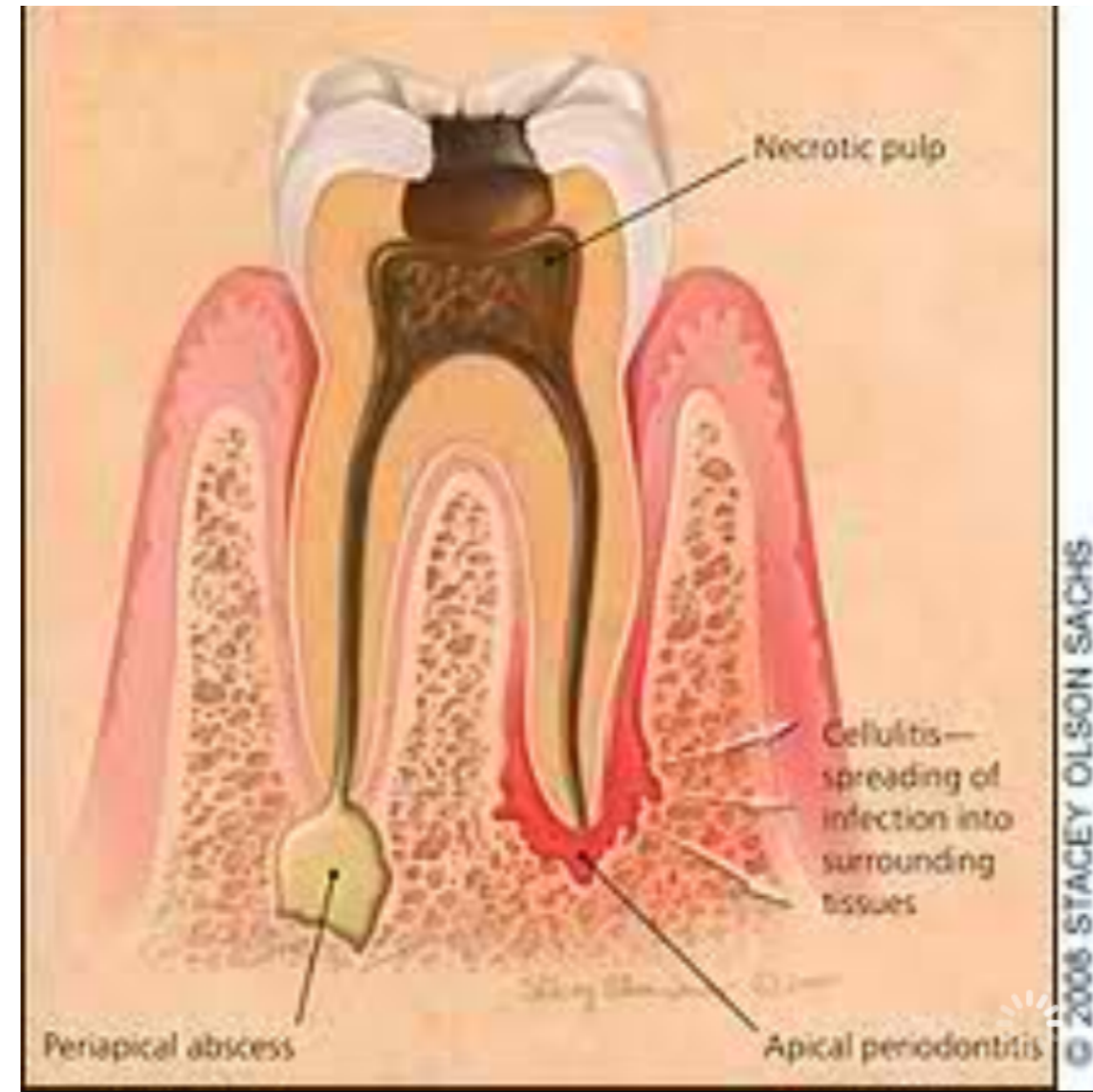
Death of pulp



**Spread of Infection through
apical foramina into periapical
tissues**



Causes Periapical Periodontitis



Examination procedures required to make an endodontic diagnosis (8)

Medical/dental history	Past/recent treatment, drugs
Chief complaint (if any)	How long, symptoms, duration of pain, location, onset, stimuli, relief, referred, medications
Clinical exam	Facial symmetry, sinus tract, soft tissue, periodontal status (probing, mobility), caries, restorations (defective, newly placed?)
Clinical testing: pulp tests	Cold, electric pulp test, heat
periapical tests	Percussion, palpation, Tooth Slooth (biting)
Radiographic analysis	New periapicals (at least 2), bitewing, cone beam-computed tomography
Additional tests	Transillumination, selective anesthesia, test cavity

Thermal Tests

- Isolate area with cotton rolls
- Dry teeth to be tested
- Ask patient to:
 - “Raise hand on feeling cold”
 - “Lower hand when cold feeling goes away”
- Record:
 - + or – sensitivity to cold
 - Time until cold sensitivity was felt
 - Time that cold sensitivity lingered



Thermal Tests

Classic Responses to Thermal (cold) Testing:

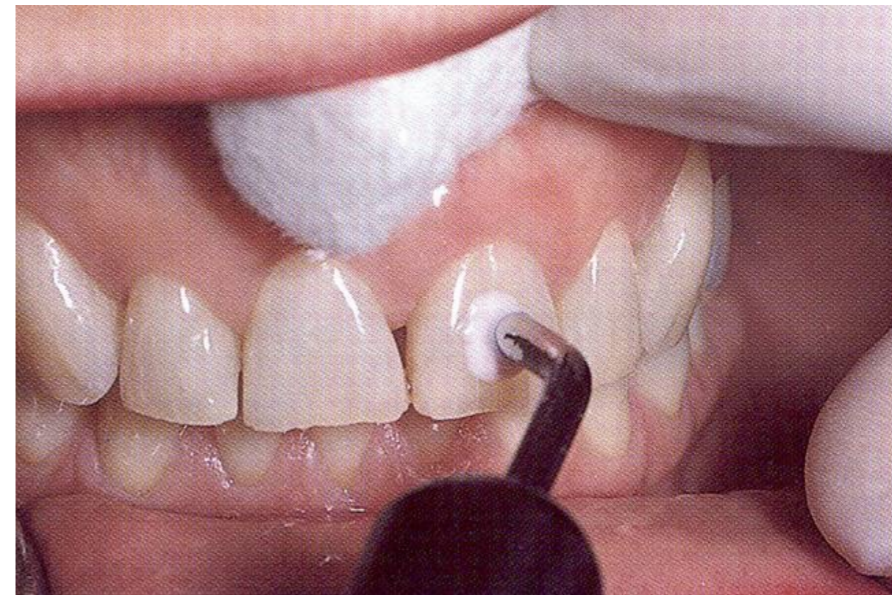
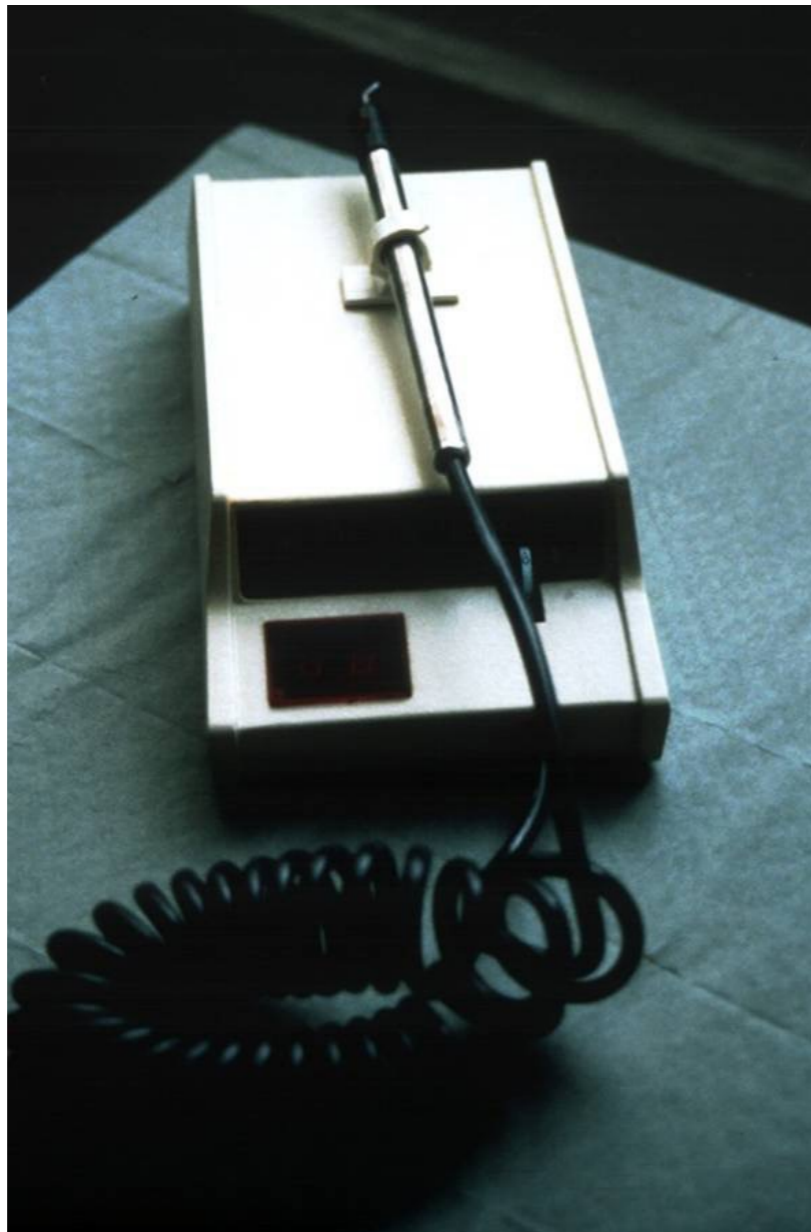
- **Normal Pulp:** Moderate transient pain
- **Reversible Pulpitis:** Sharp pain; subsides quickly
- **Irreversible pulpitis:** Pain lingers
- **Necrosis:** No response

(Note false positive and false negative responses common)

Electric Pulp Test

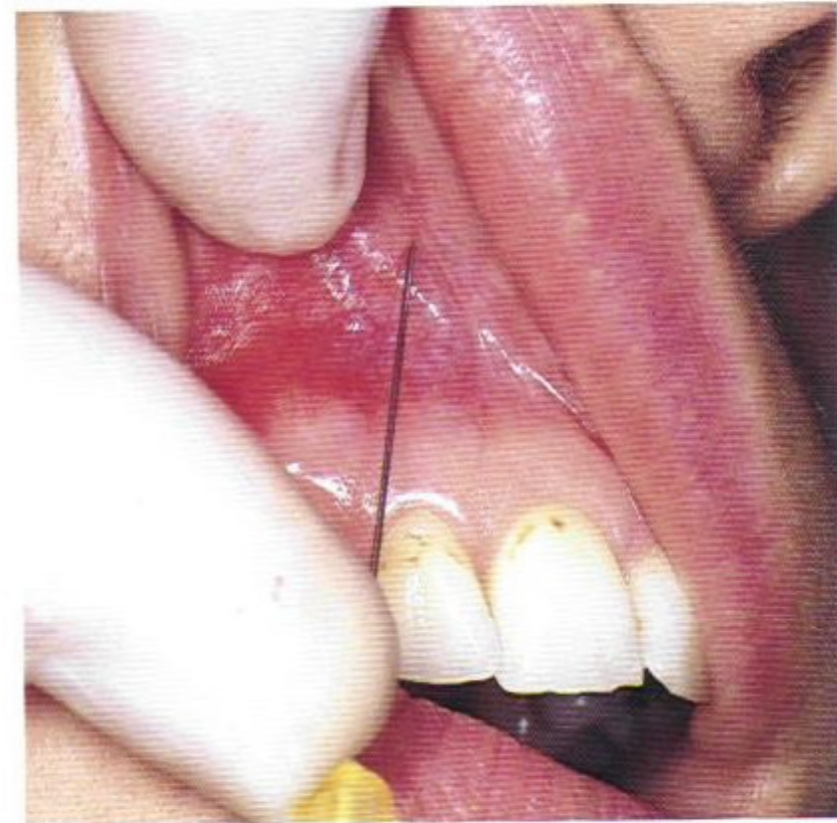
- A direct test of nerve elements of pulpal tissue
- Vitality versus non-vitality only – not whether vital pulp is normal or inflamed
- In multi-rooted teeth, where one canal is vital – tooth usually tests vital
- False positives and false negatives may occur

Electric Pulp Test



Selective Anesthesia

- May help to identify the possible source of pain
- An IDN block can localize pain to one arch
- Ability to anesthetize a single tooth has been questioned



Possible Pulpal Diagnoses

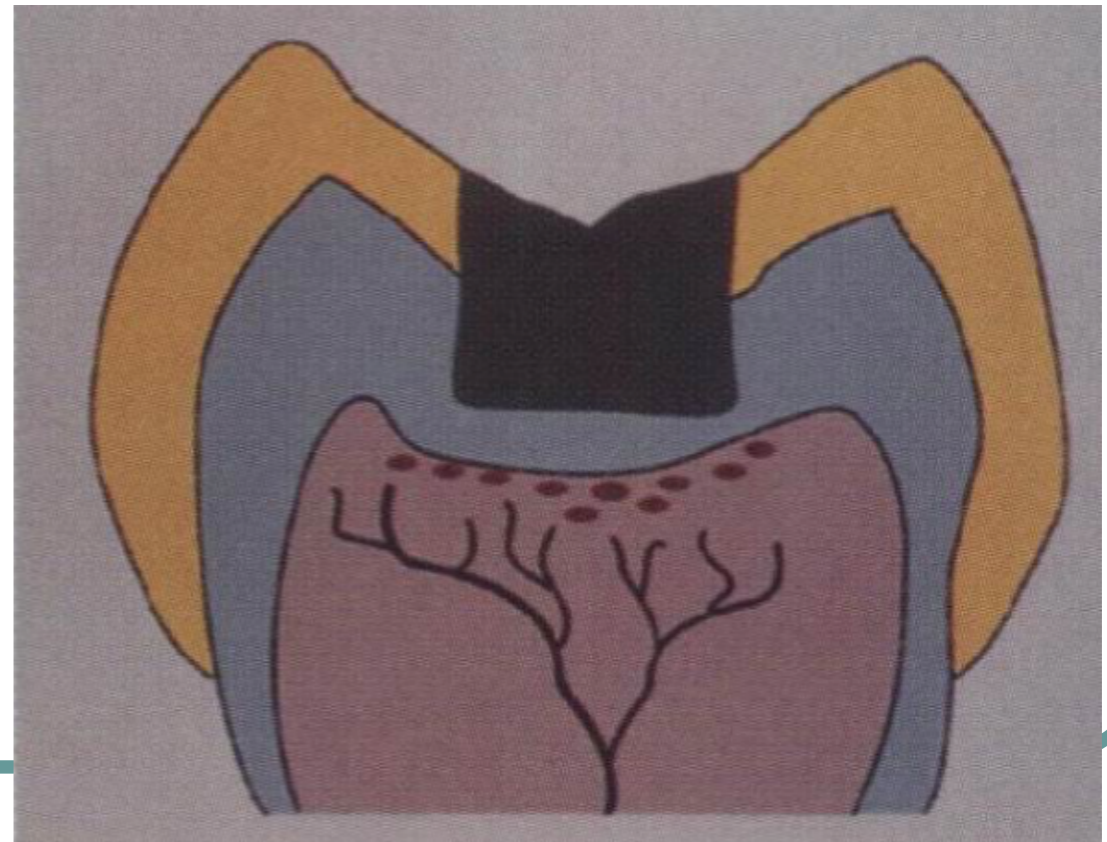
- Normal
- Reversible pulpitis
- Irreversible pulpitis
- Necrosis
- Previous endodontic treatment

Normal Pulp

- Symptoms None
- Radiograph No periapical change
- Pulp tests Responds normally
- Periapical tests Not tender to percussion or palpation

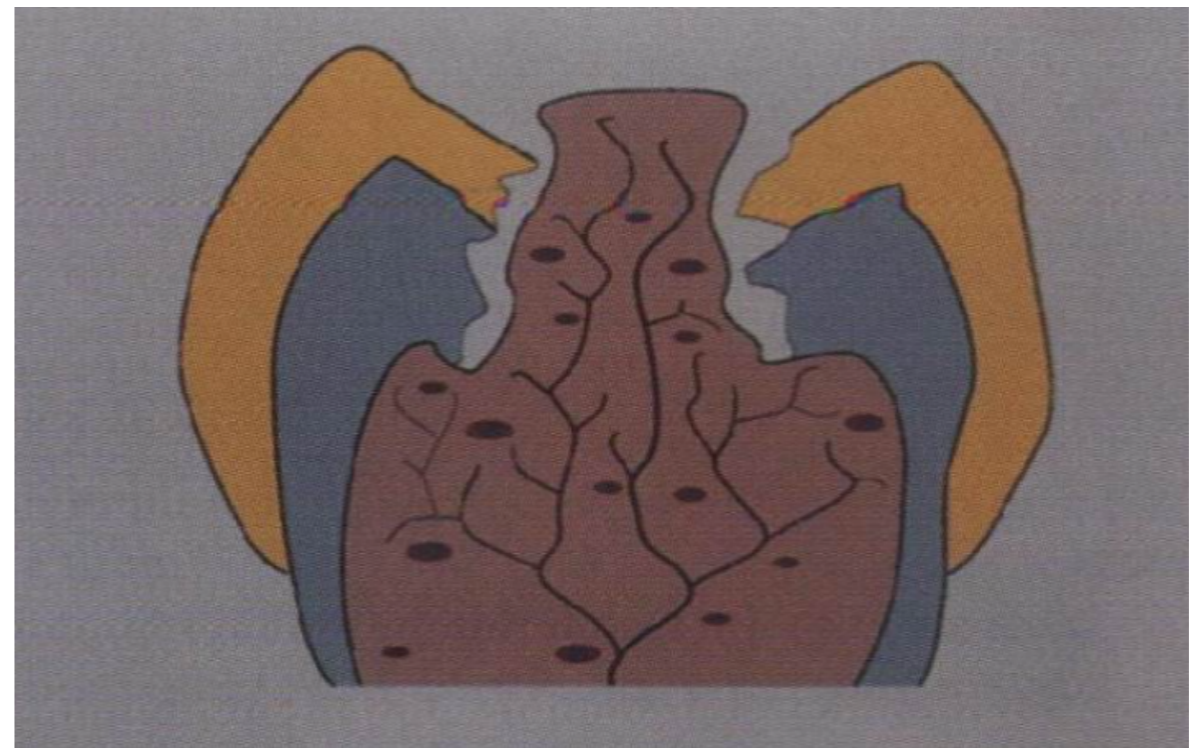
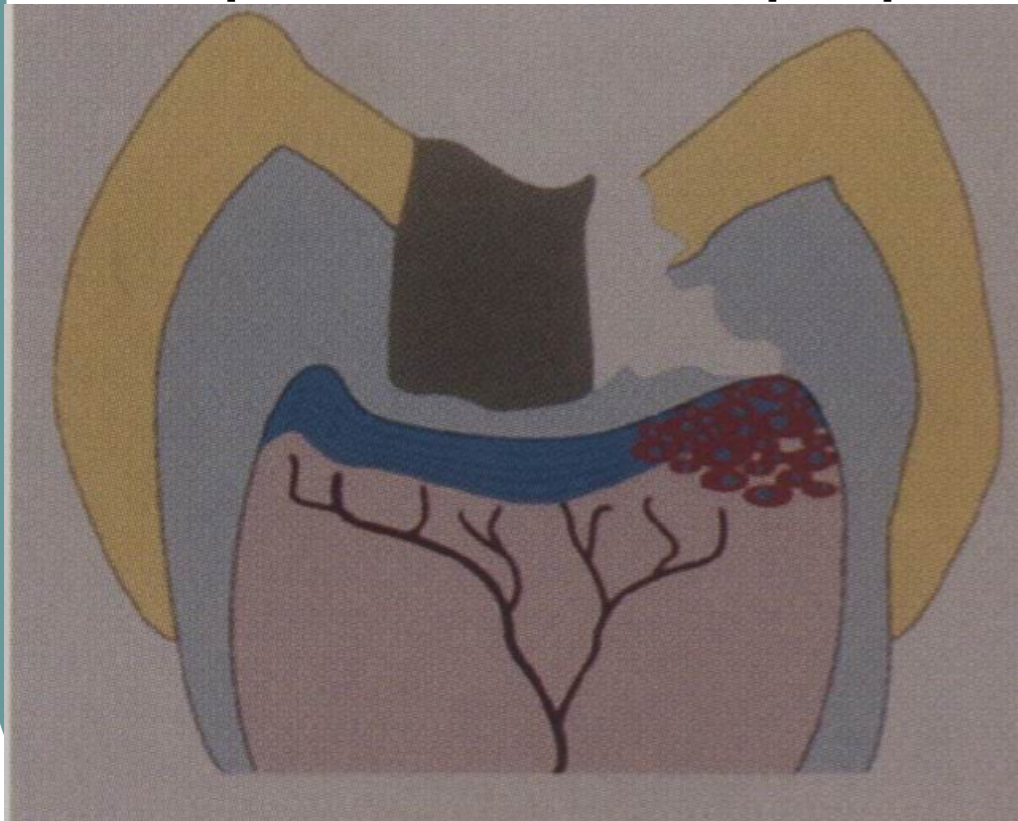
Reversible Pulpitis

- Symptoms May have thermal sensitivity
- Radiograph No periapical change
- Pulp tests Responds – sensitivity not lingering
- Periapical tests Not tender to percussion or palpation



Irreversible Pulpitis

- Symptoms Spontaneous, long-lasting, irradiating, nocturnal pain
- ★ Radiograph No periapical change
- Pulp Tests Pain that lingers
- Periapical tests Generally not tender to percussion or palpation



Necrotic Pulp

- Symptoms No thermal sensitivity
- Radiograph Dependent on
 periapical status
- Pulp tests No response
- Periapical tests Dependent on
 periapical status



Treatment Planning

- Treatment decisions are based on:
 - Pulpal diagnosis
 - Periapical diagnosis
 - Restorability of tooth
 - Periodontal considerations
 - Difficulty of case
 - Financial considerations
 - Patient's cooperation

Four basic treatment options

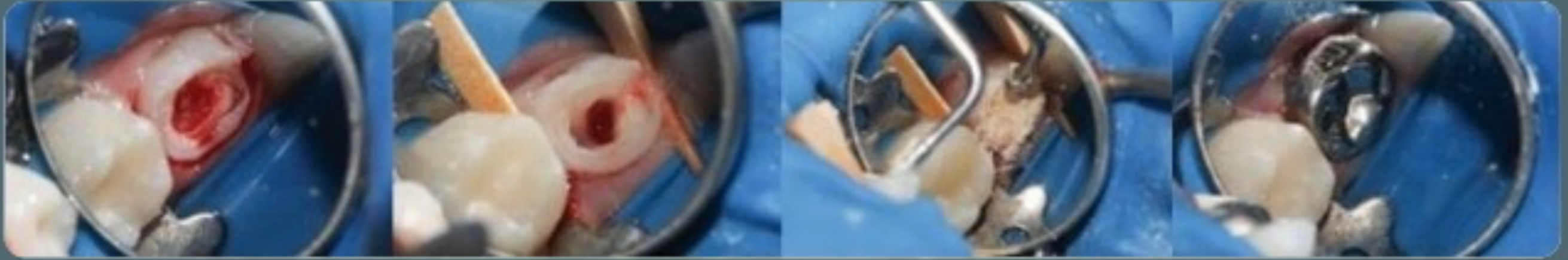
- 1. indirect pulp capping**
- 2. direct pulp capping**
- 3. pulpotomy**
- 4. pulpectomy**



**Indirect pulp
capping with
Biodentine**



**Direct pulp capping with
Biodentine**





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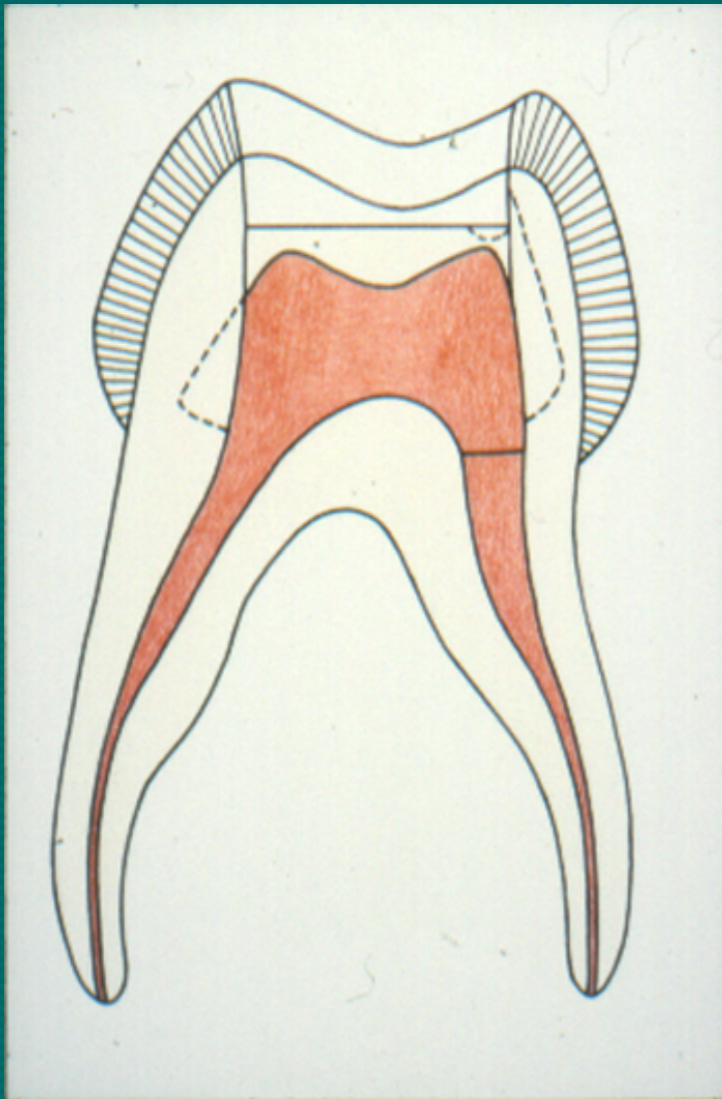
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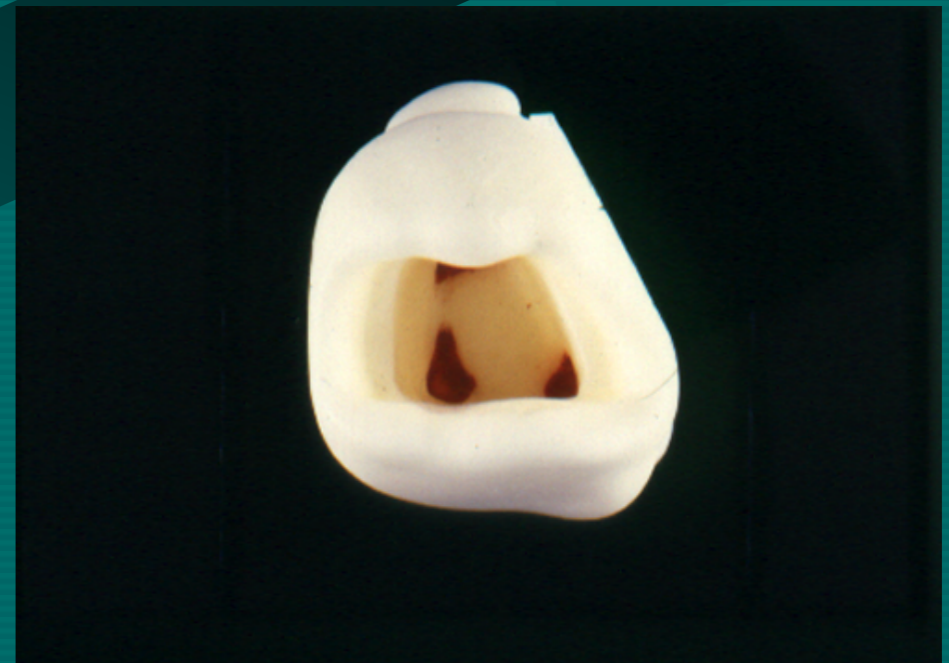
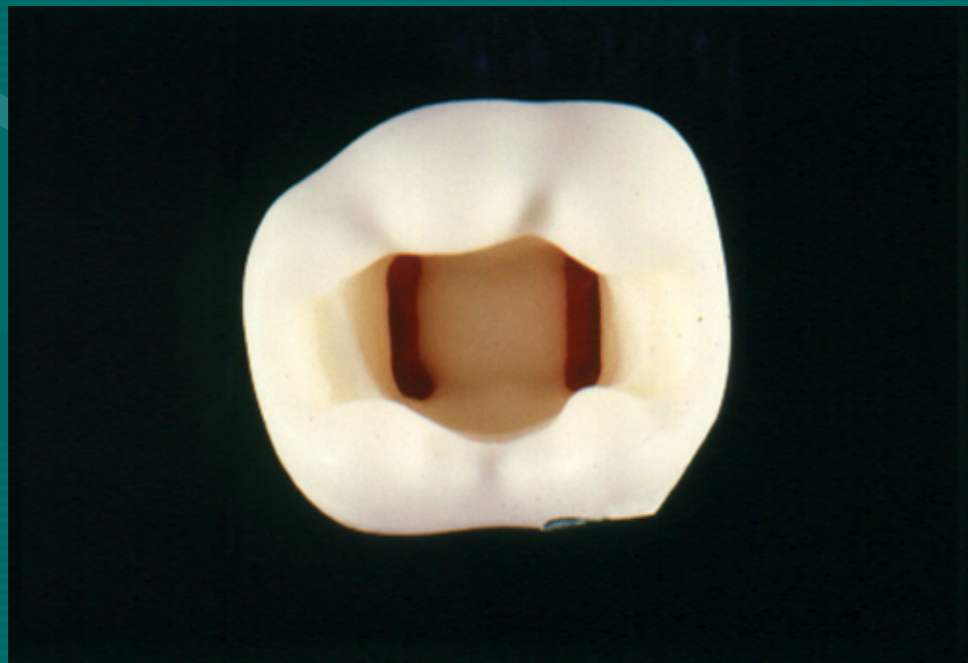
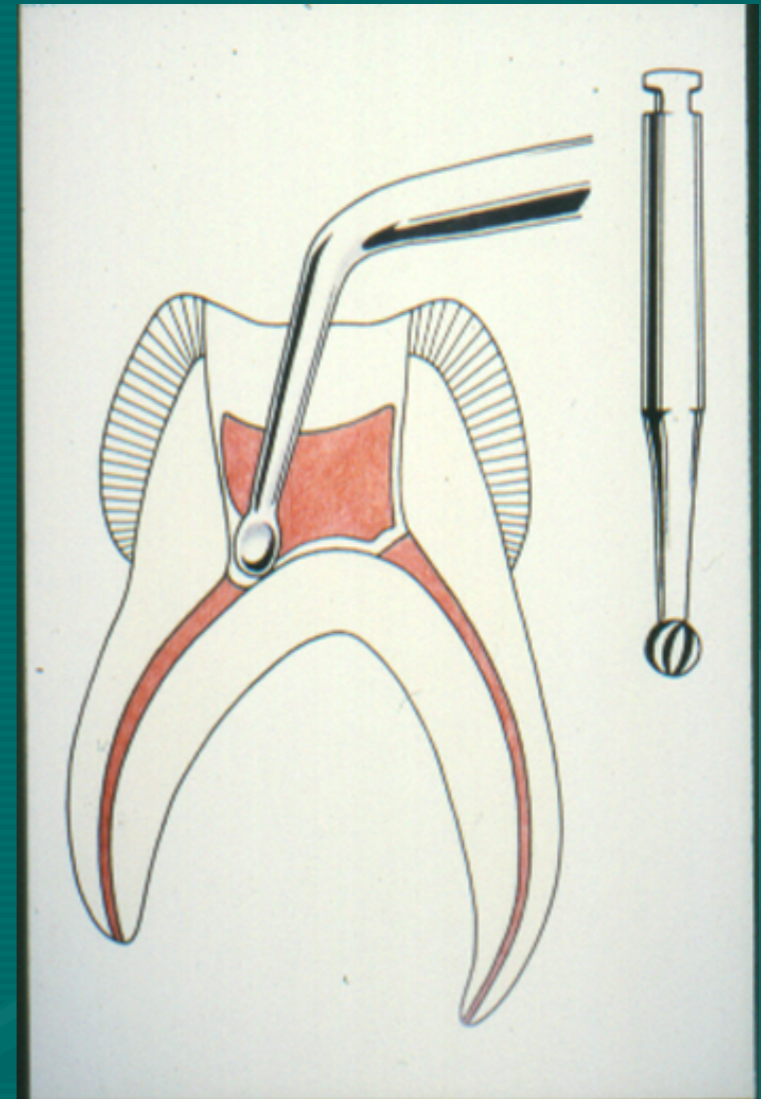
Aim of a pulpotomy

**removal of coronal pulp
while the radicular pulp
remains vital**

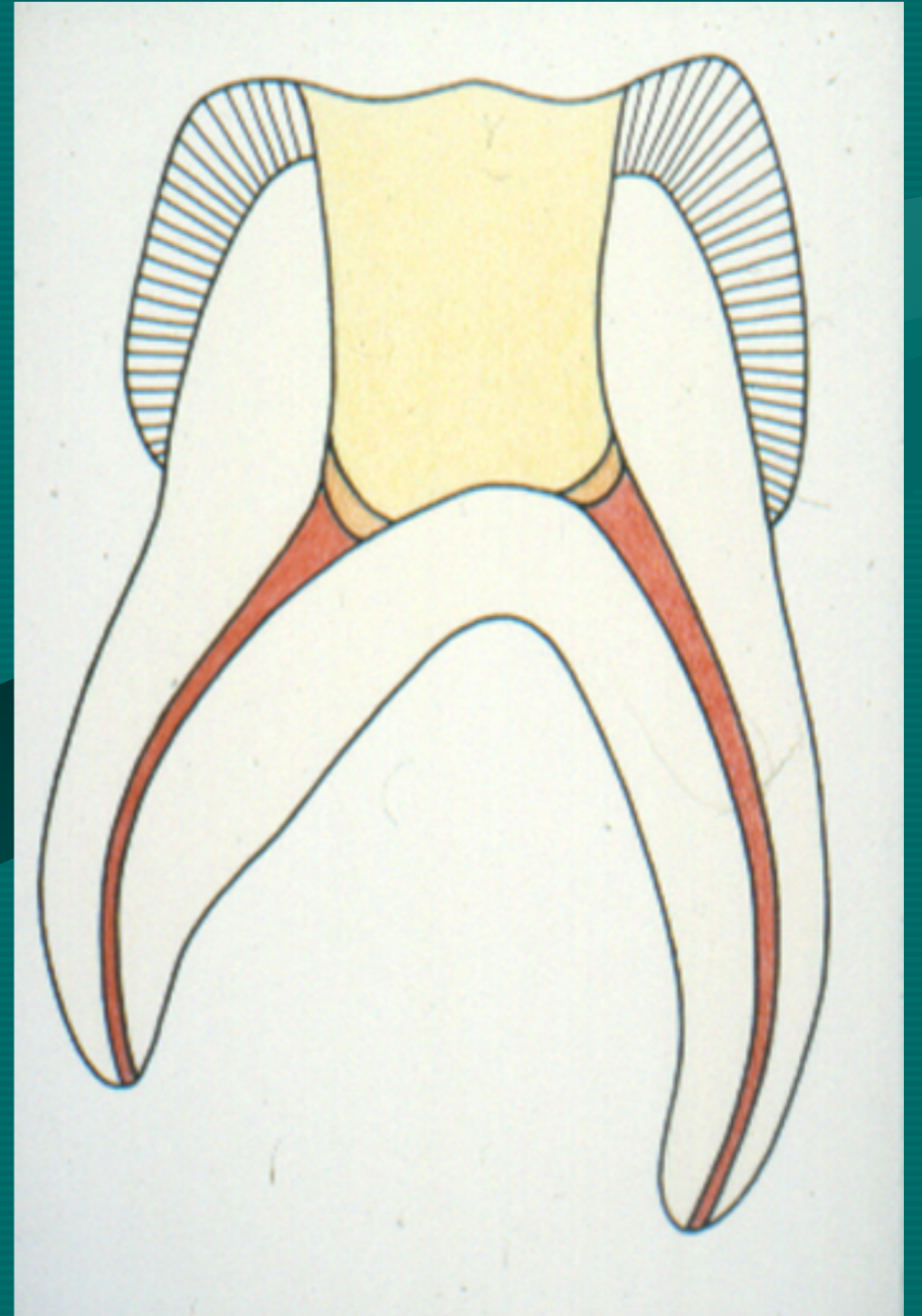
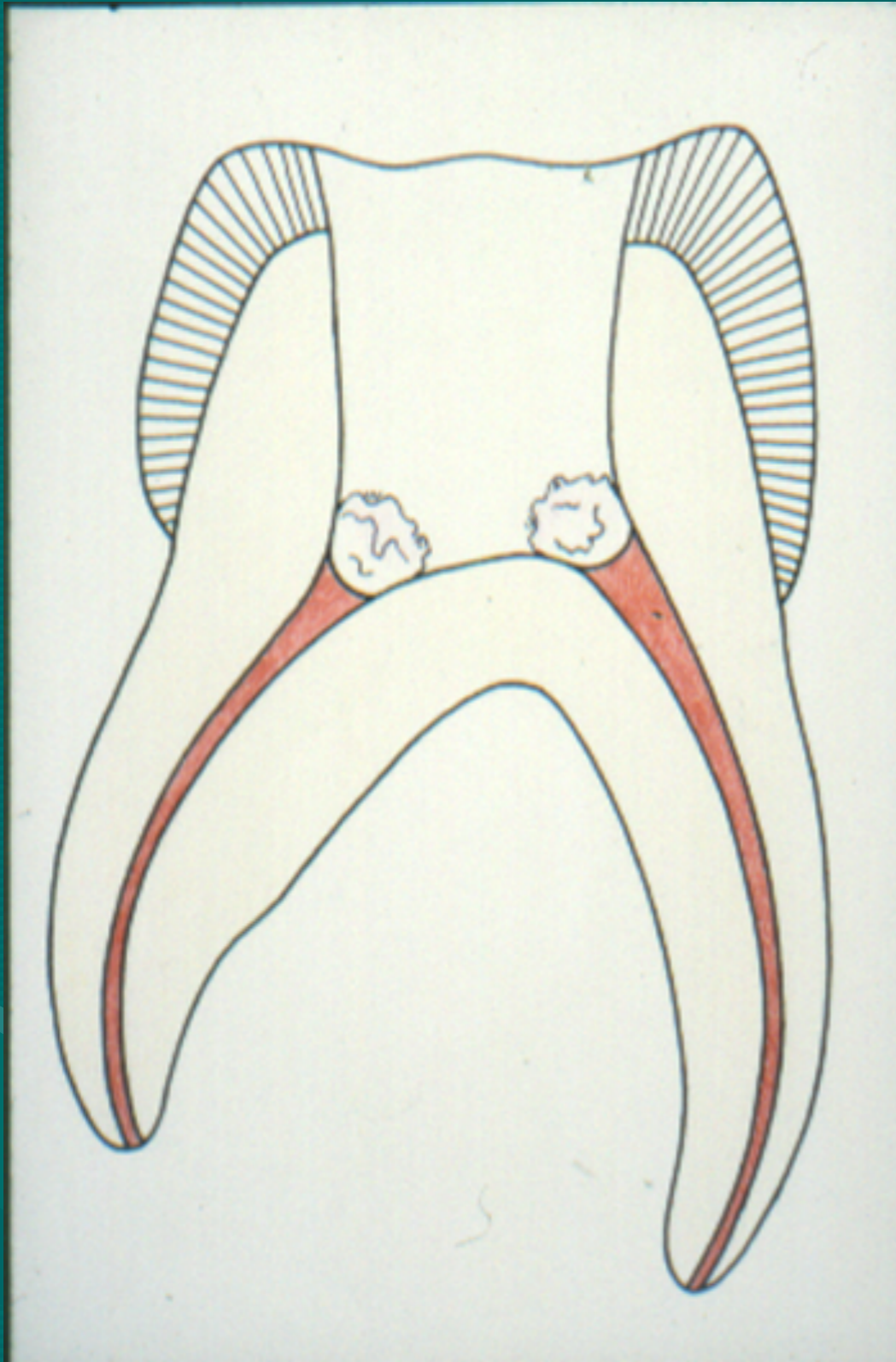
**to stimulate the formation
of a dentin bridge
for protection**



TECHNIQUE

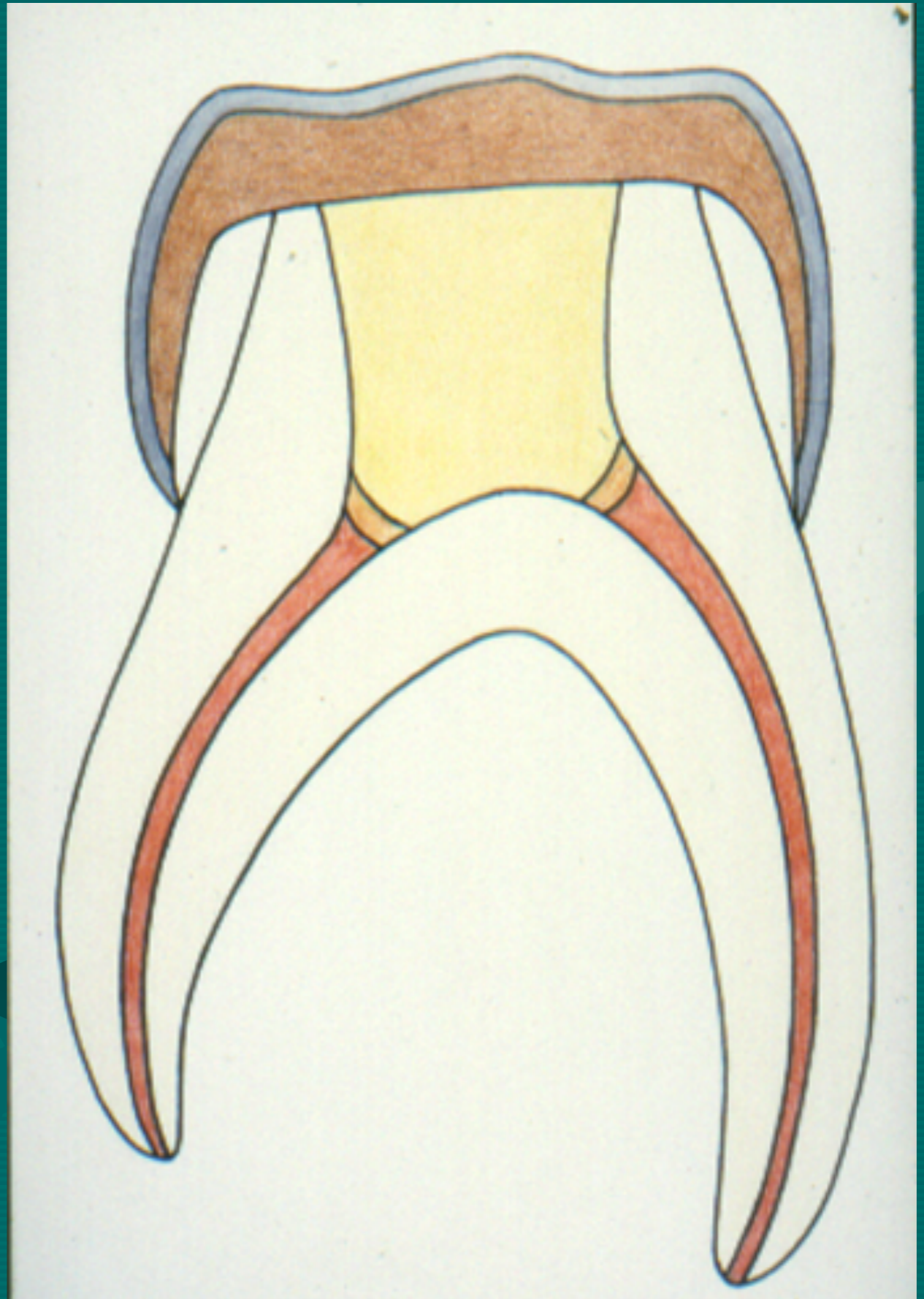


CHOICE OF MEDICATION

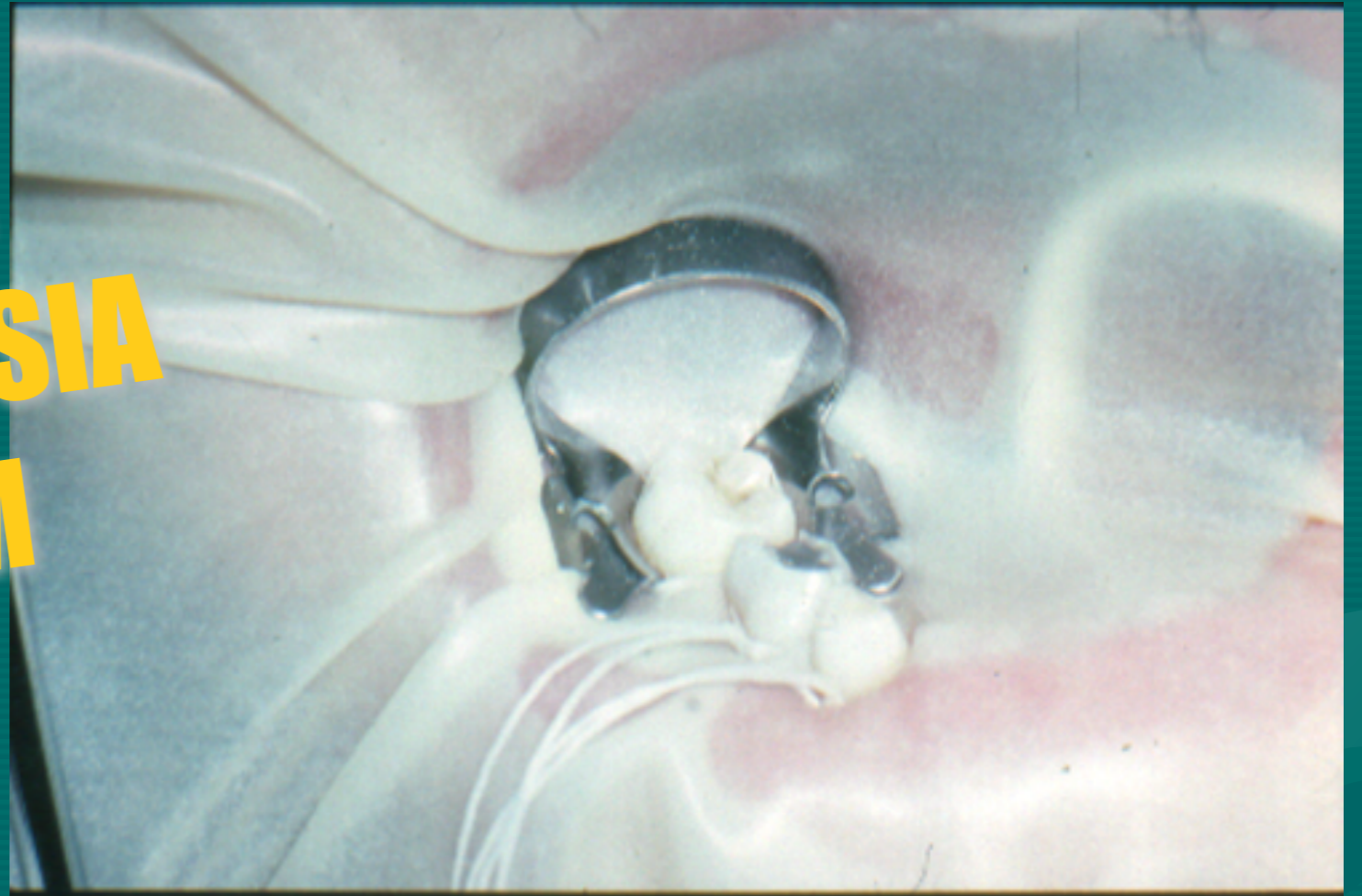


THE MOST RELIABLE RESTORATIO N

BUT UNAESTHETIC

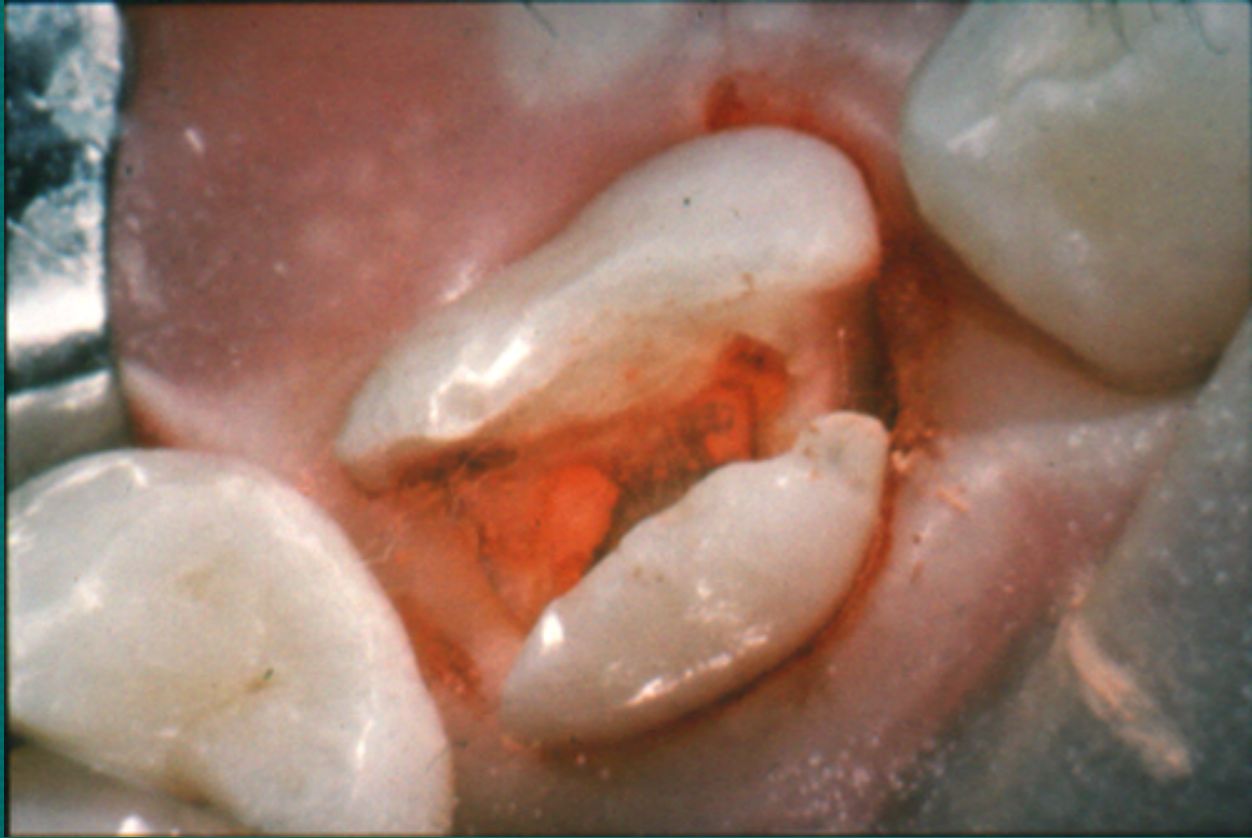


RADIOGRAPH
LOCAL ANESTHESIA
RUBBER DAM

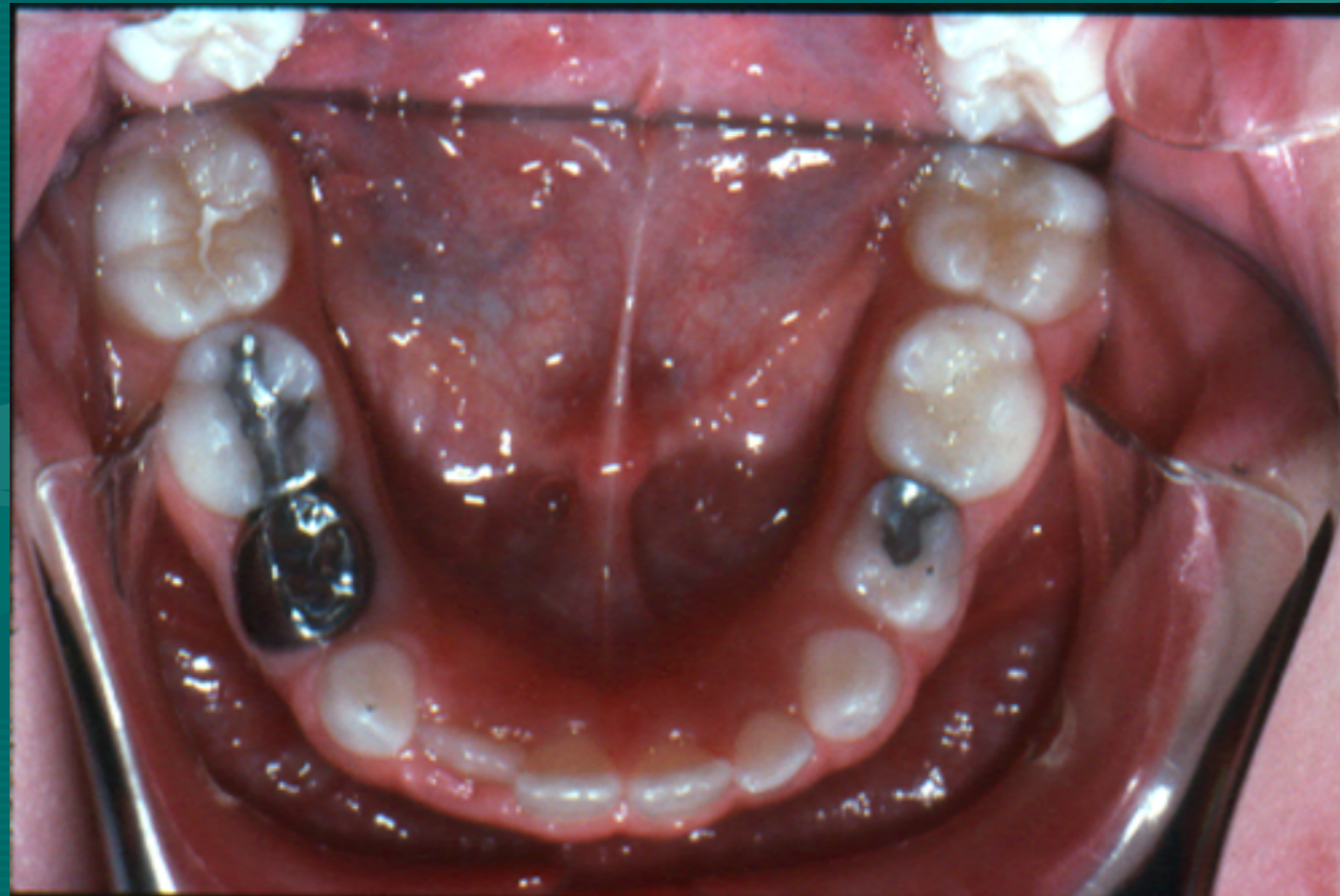
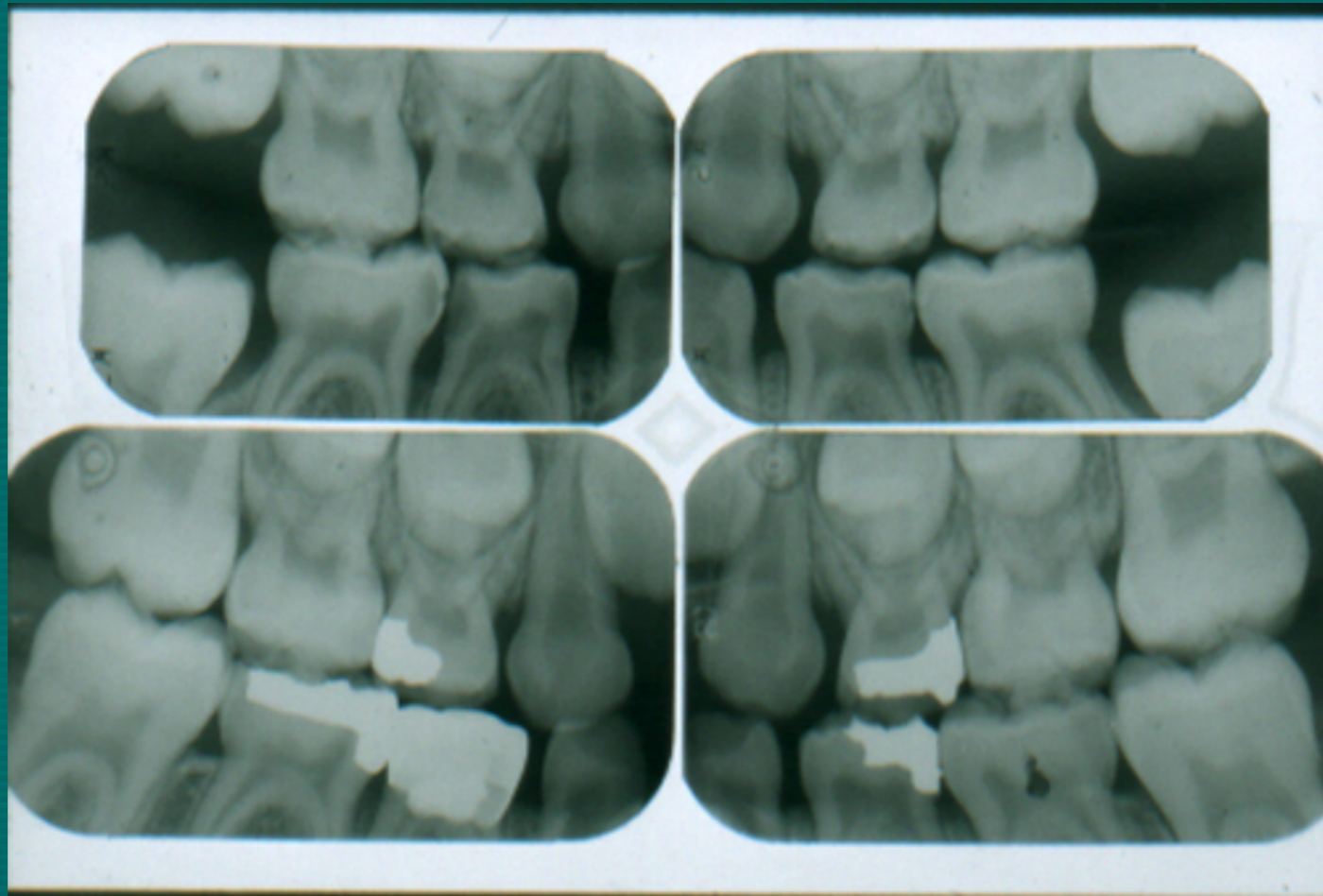


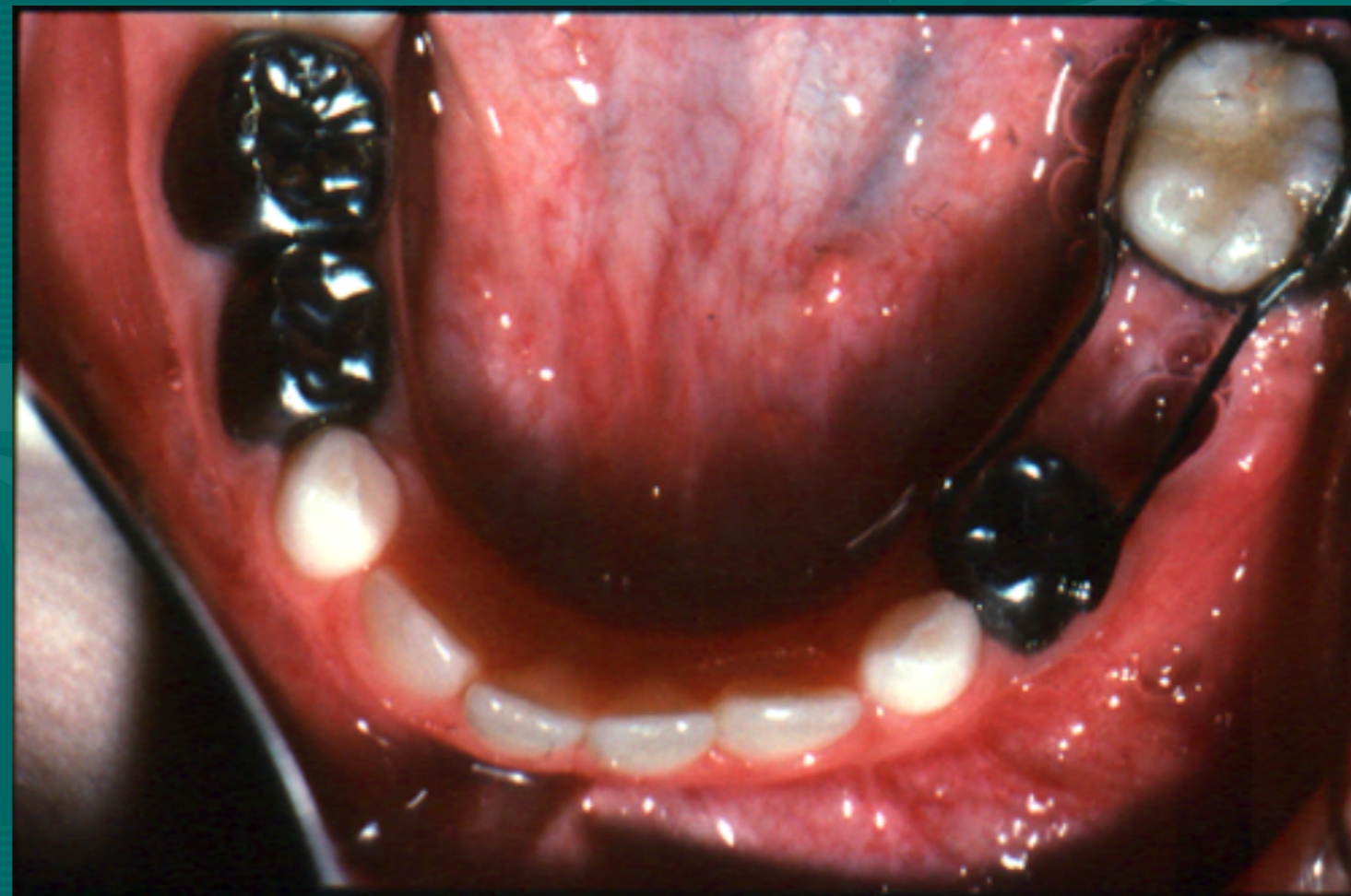
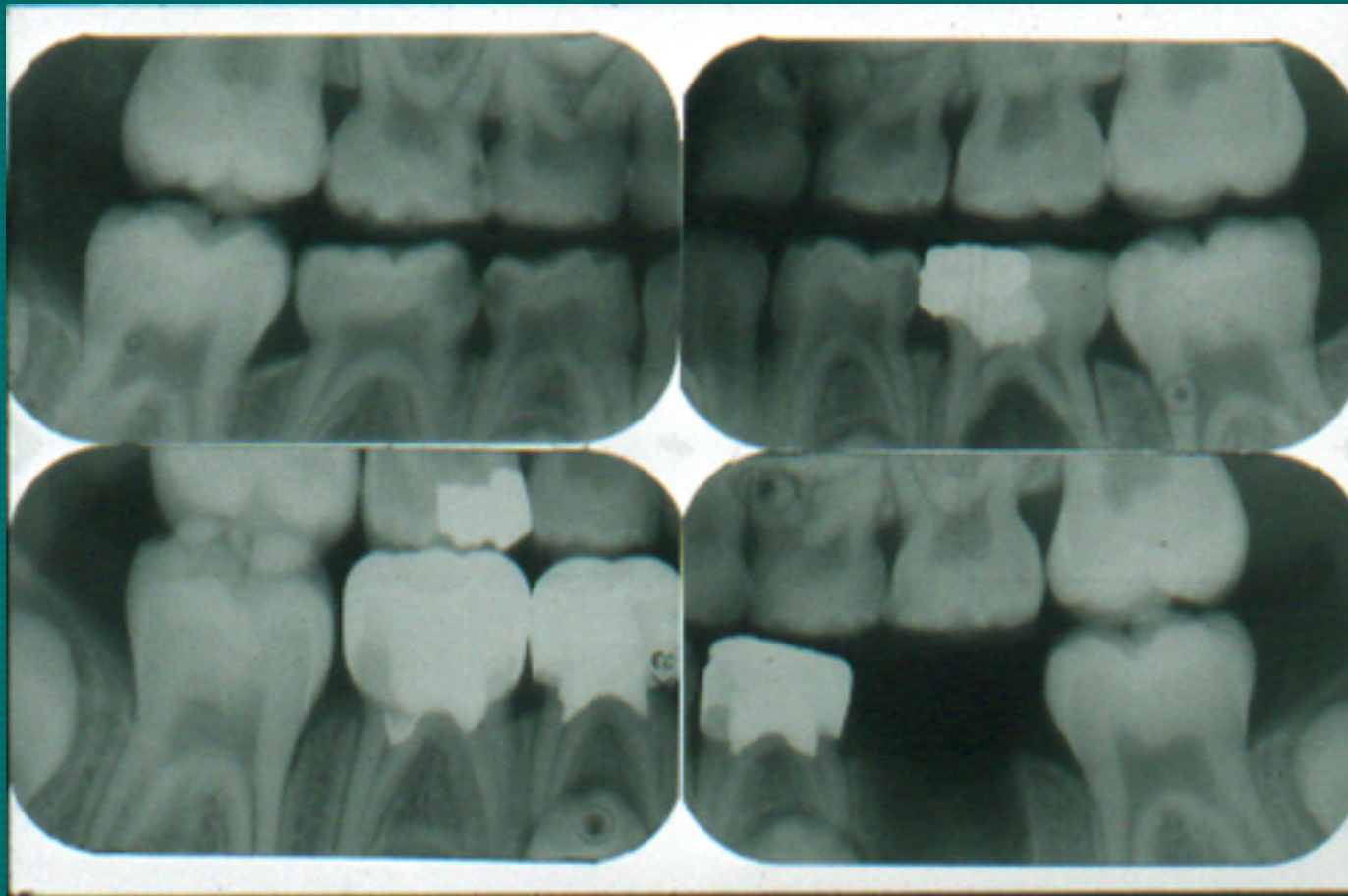
CAVITY
PREPARATION

**CHOICE OF
MEDICATION:
FORMOCRESOL
Ca(OH)₂**



M.T.A.



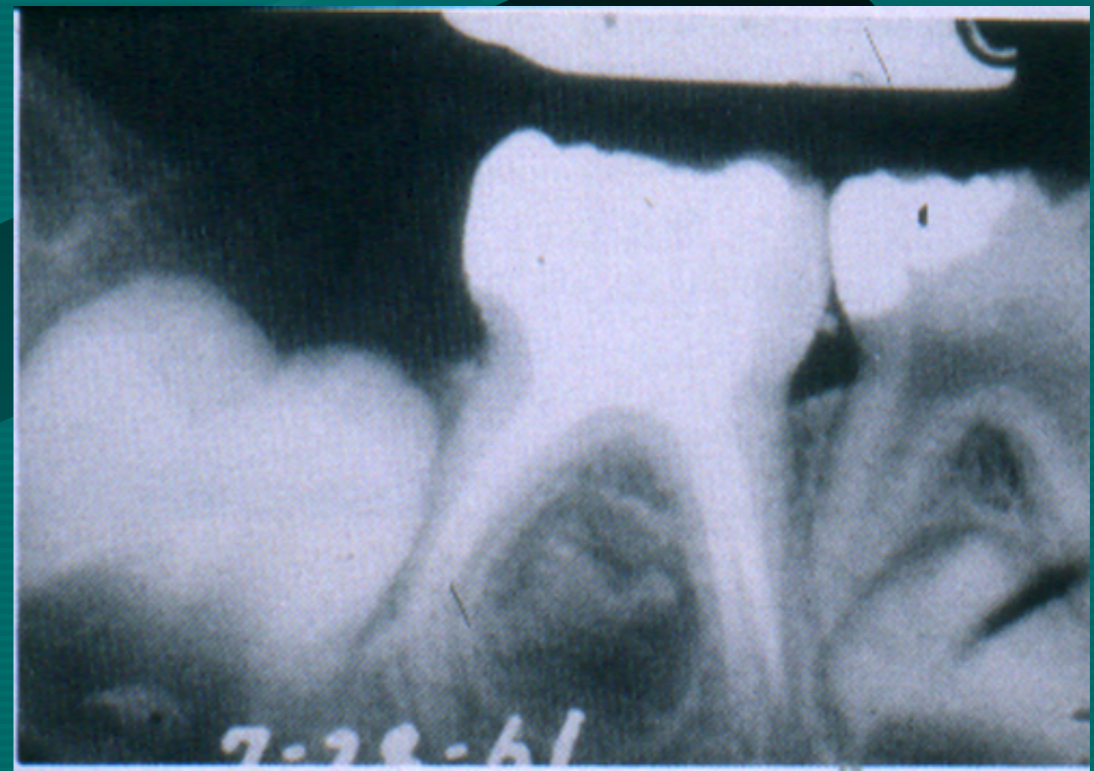


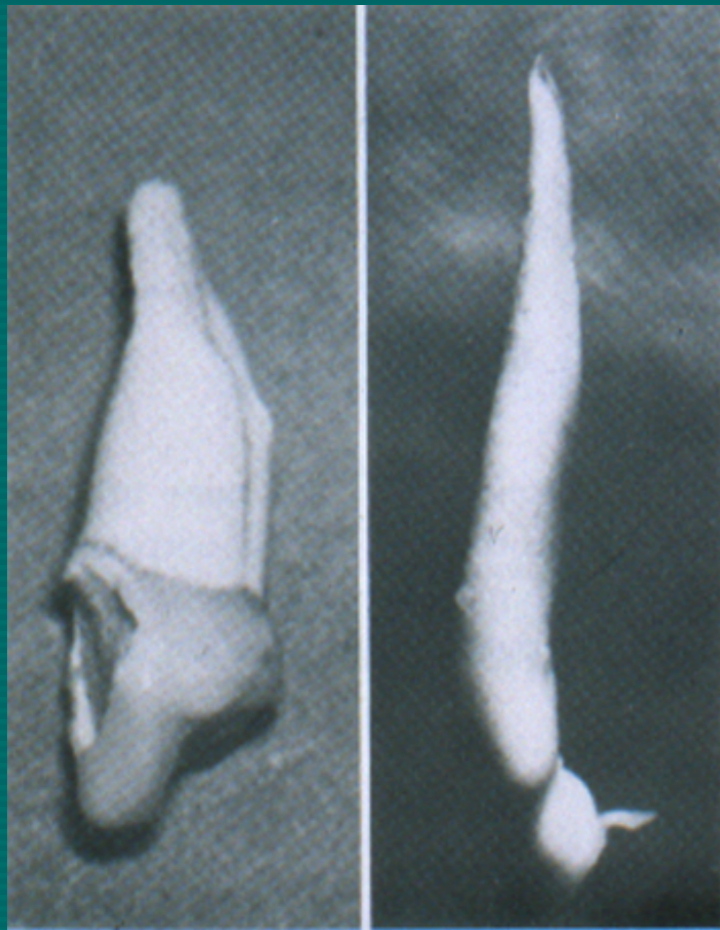
**IF WITH THE REMOVAL
OF THE CORONAL PULP
THE HEMORRHAGE
CANNOT BE
STOPPED**

**THEN THE PULPOTOMY
IS CONTRA-INDICATED**

THE AIM OF A PULPECTOMY IN PRIMARY MOLARS

**TOOTH REMAINS FUNCTIONAL
NO PAIN, INFECTION, RADIOGRAPHIC SIGNS
NORMAL RESORPTION
NO DEVELOPMENTAL DISTURBANCES**



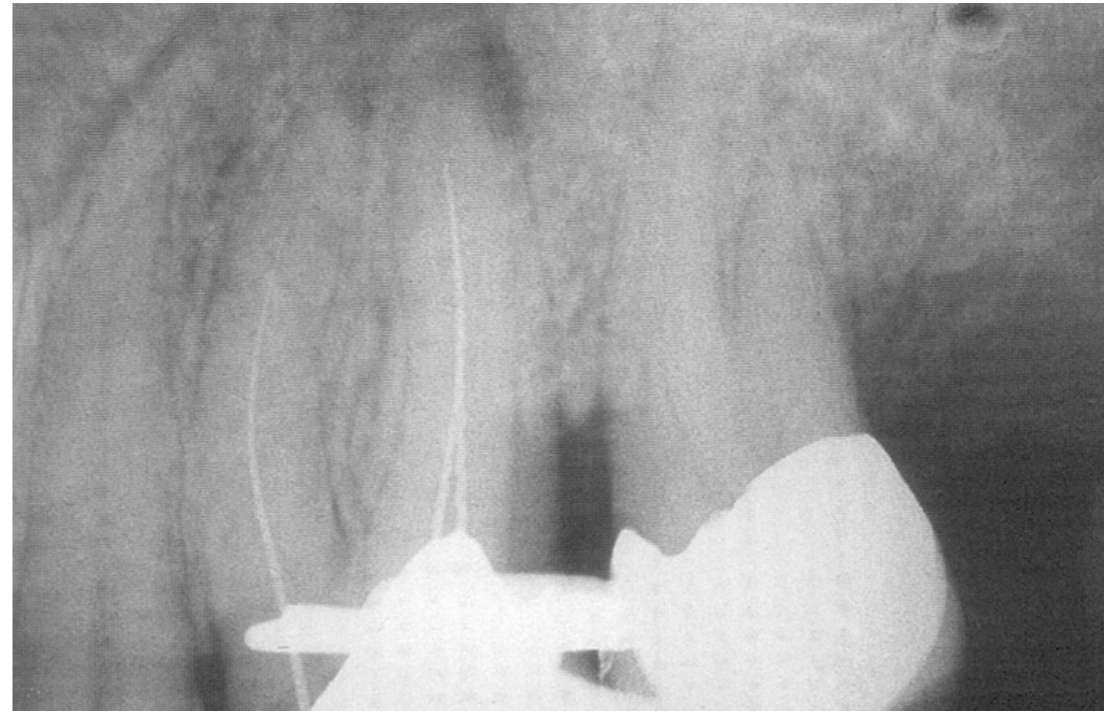


**ROOT CANAL FILLING
OF A PRIMARY TOOTH
PULPECTOMY
SHOULD BE:**

resorbable + underfilled

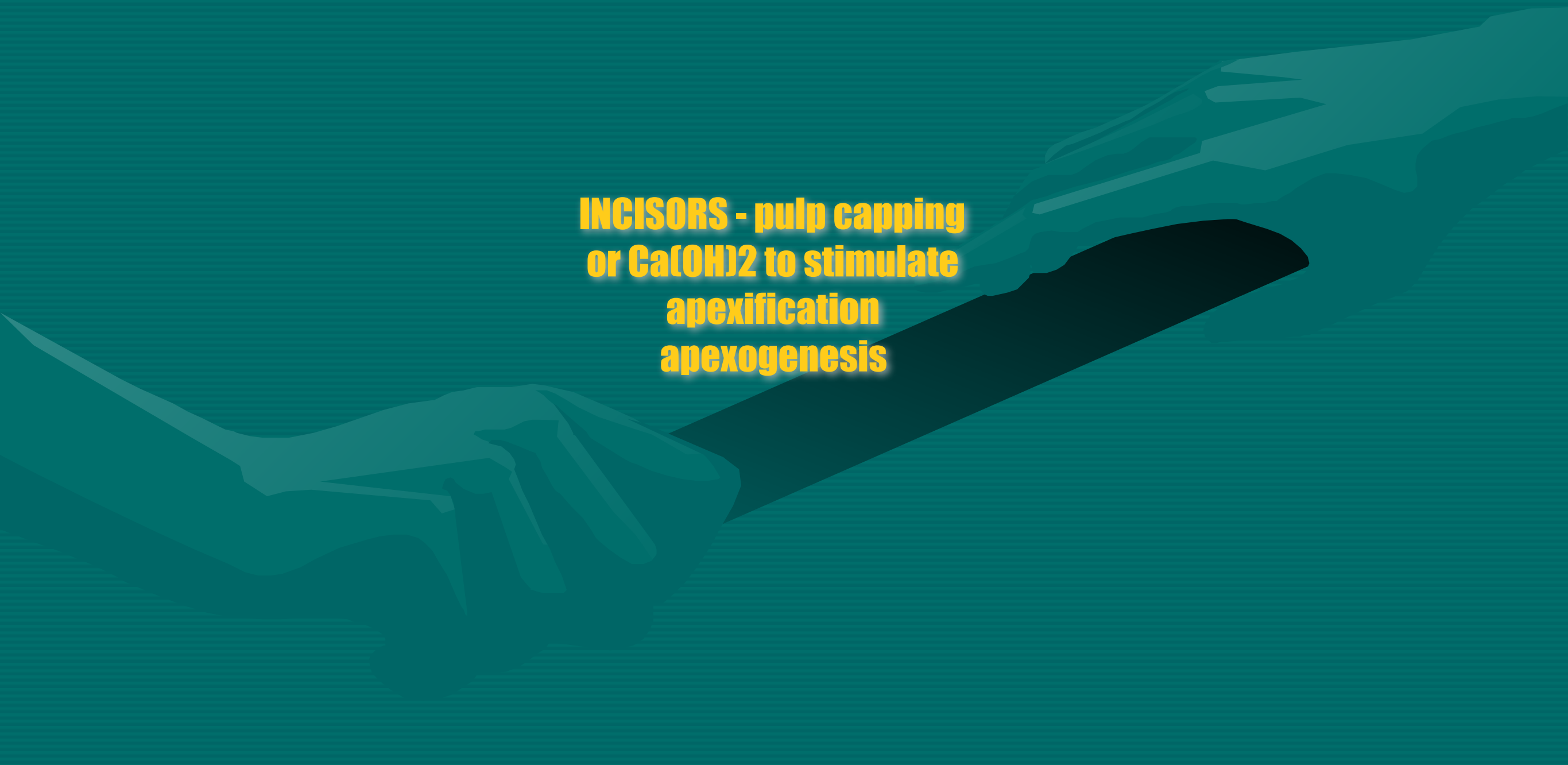


Access and Working length



ENDODONTICS OF YOUNG PERMANENT TEETH

**INCISORS - pulp capping
or Ca(OH)_2 to stimulate
apexification
apexogenesis**

A stylized illustration of a hand holding a dental instrument, possibly a file or reamer, against a dark background. The hand is rendered in a light, semi-transparent blue color, and the instrument is a dark, elongated shape. The background is a gradient of dark blue and black.

YOUNG PERMANENT MOLARS WITH WIDE OPEN APICES

CONSIDER PULP CAPPING

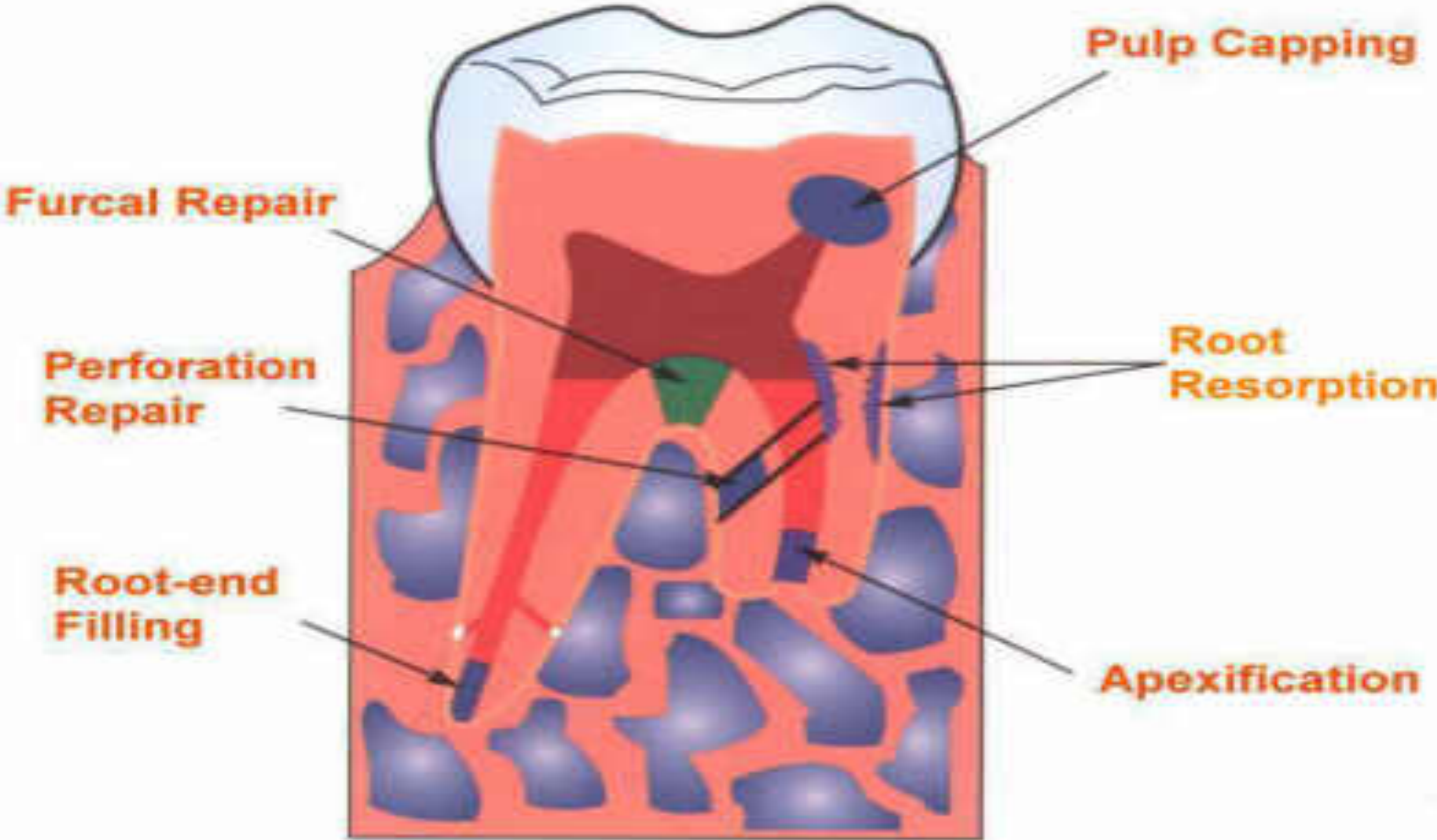
Ca(OH)₂ for root apexification

**HOW LONG WILL
THIS TOOTH LAST ??**

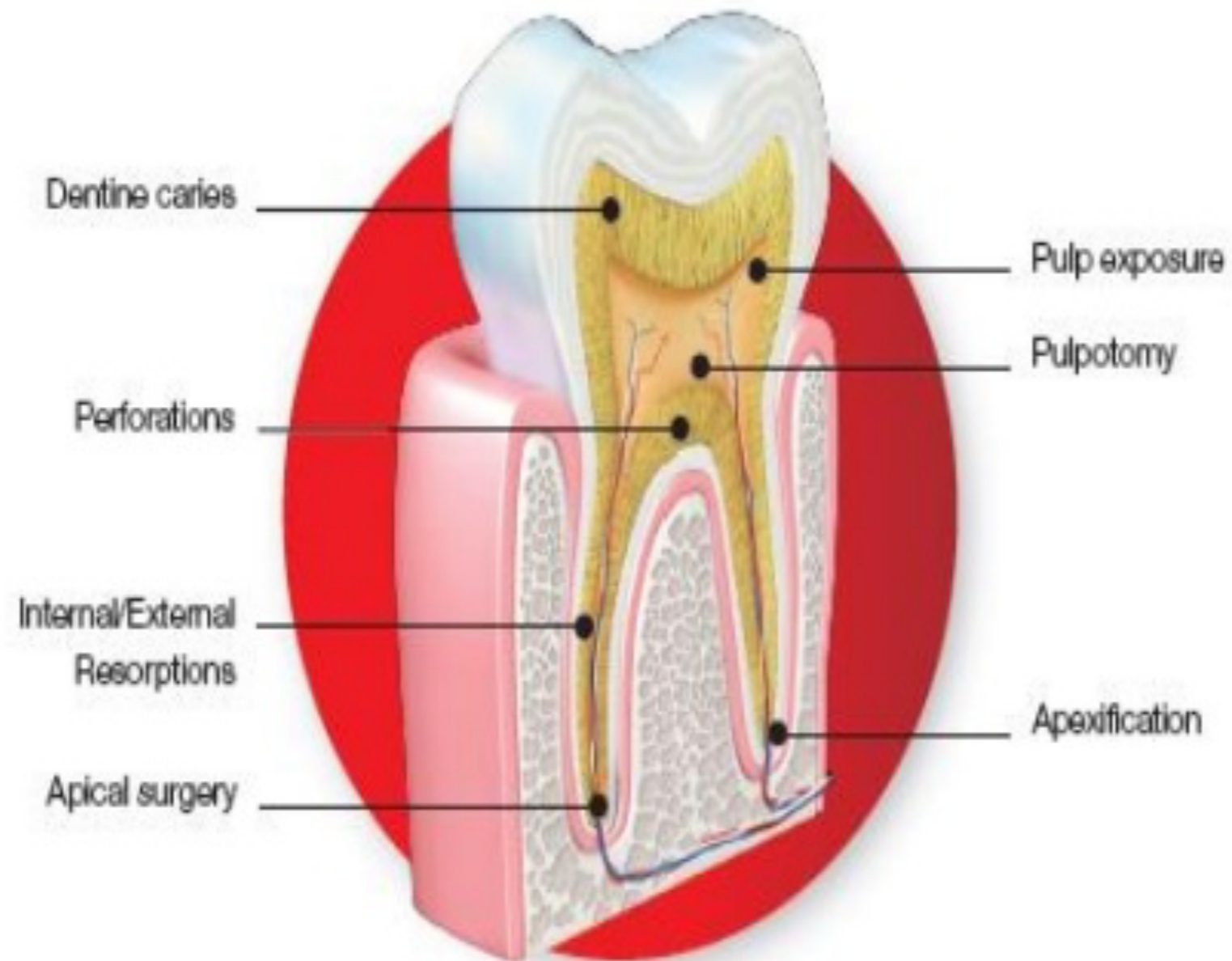
Goal of Treatment

- The main goal in the treatment of an immature tooth is to maintain a vital root forming organ, as long as possible, to allow physiological apical root formation.
- If this happens, the rest of the treatment is routine endodontic treatment
- The second important consideration in treating immature teeth is to keep the surgical procedure as superficial as possible, with minimal instrumentation to not disturb the not yet fully formed roots.

Clinical Applications of MTA



Clinical Applications of Biodentine





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CHEMA-REKTYFICENT

WYKONAWCA PRAC
W OBLASTY PRAC
W OBLASTY PRAC
W OBLASTY PRAC
W OBLASTY PRAC

OXYDENTIN

Wypełnianie czasów

CE 0287 Zawartość netto: **250g**

Wykłada do formowania wypełniacza
stwierdzone w złączach w składowaniu
Przeznaczony do polierzenia powierzchni
stwierdzeń w izolacji betonowej
i żelaznej.

Skład: 90% masy, 10% wody, 10% oleju
10% wosku, 10% żywic, 10% pigmentów

WYKONAWCA PRAC
W OBLASTY PRAC

Przed zastosowaniem należy sprawdzić
czy nie ma żadnych zanieczyszczeń

Wypełnianie
czasów

Przeznaczony
do polierzenia

Przeznaczony
do polierzenia

Przeznaczony
do polierzenia

Przeznaczony
do polierzenia

TEEZON

