

Endodontic Instrumentation:

Cleaning & Shaping

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Endodontic Instrumentation

- ✦ **Tooth Morphogenesis**
- ✦ **Endodontic Disease**

- **Coronal Cavity Preparation**

- **Chamber Location**

- **Access to Root Canal System**

- ✦ **Radicular Preparation**

- ✦ **Root Canal Shape**

- ✦ **Instrumentation**

- ✦ **Cleaning**

In the beginning....



Embryology and Morphogenesis

- ***Soft Tissue* → *Hard Tissue***
- Oral Ectoderm → Enamel
- Mesoderm → Pulp, Dentin, Cementum



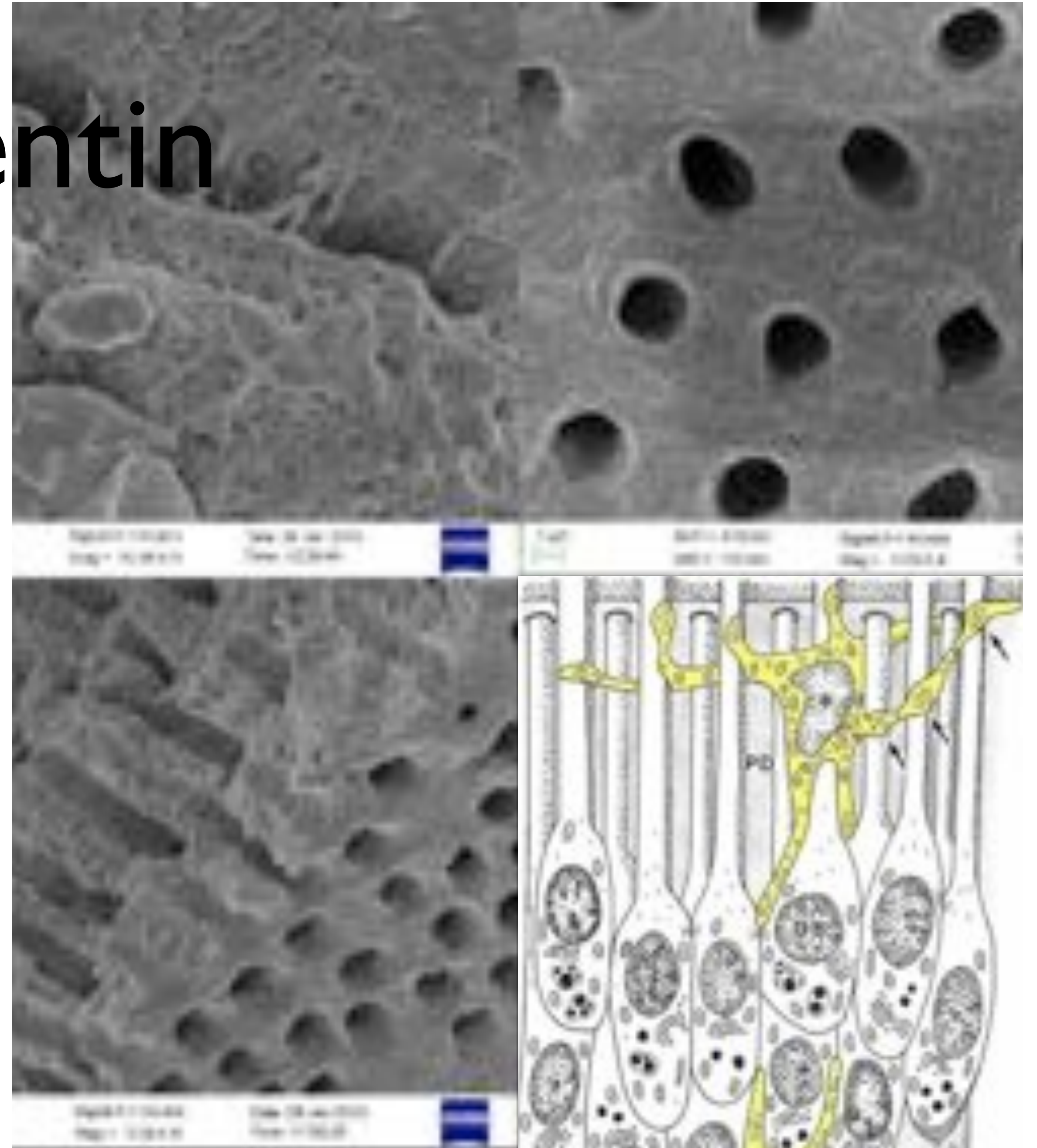
Pulp

- Soft tissue of mesenchymal origin
- Low-compliance environment
- Lacks collateral circulation
- Decreases progressively with age



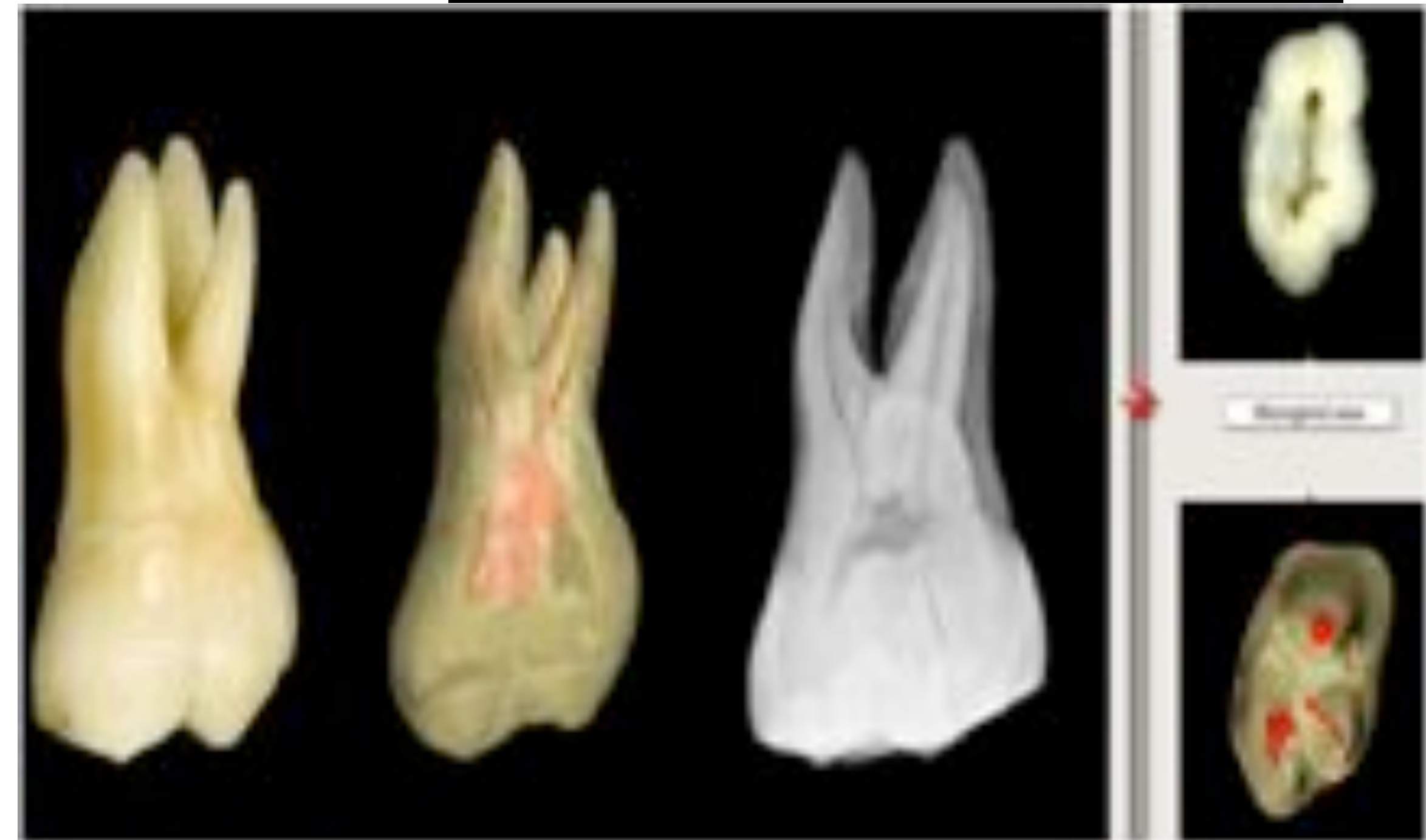
Dentin

- Odontoblasts
- Odontoblastic Processes
- Dentinal Tubules:
 - Peritubular Dentin or Intratubular Dentin
 - Intertubular Dentin



Root Canal Morphology

- Hess 1925
- Pineda & Kuttler 1972
- Kulild and Peters 1990
- Stropko 1999
- Krasner and Rankow 2004
- Tooth Atlas: Brown and Herbranson (eHuman.com)



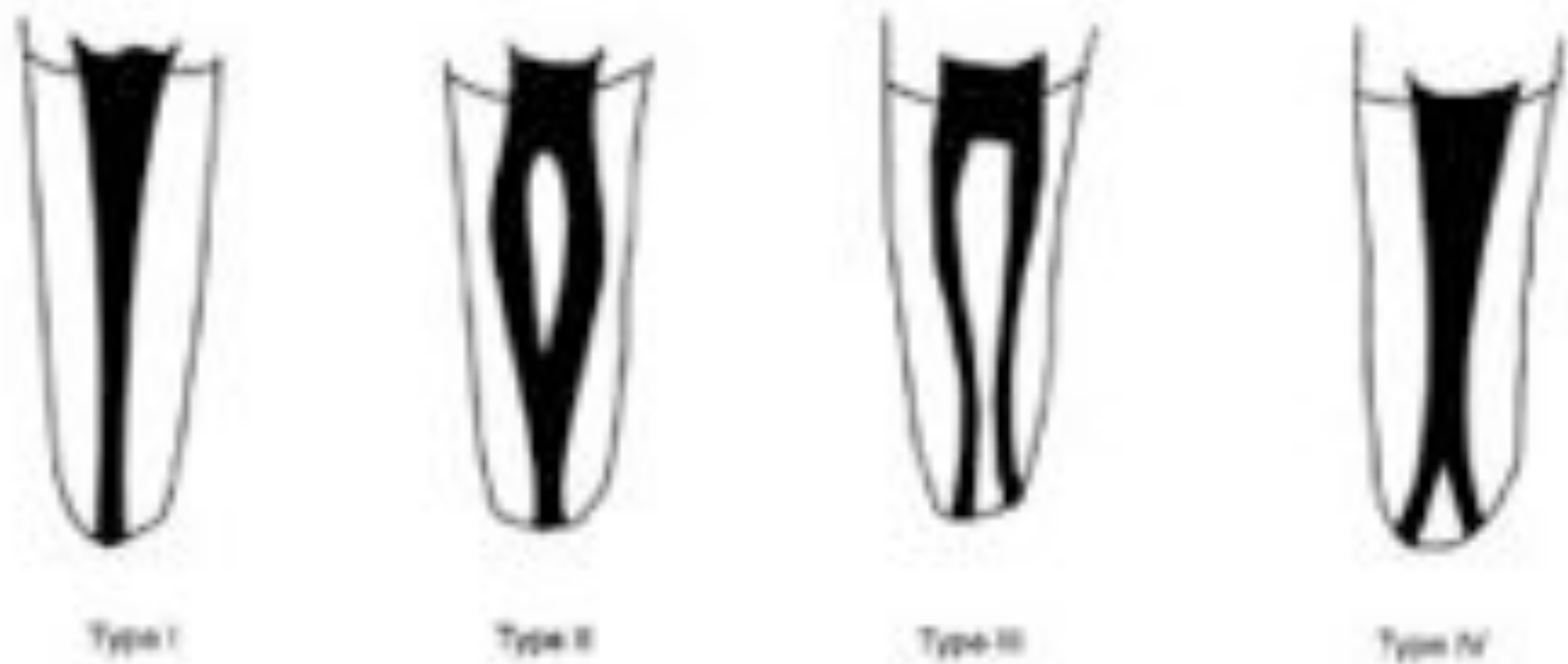
Root canal: an enigma?

- Pulp Chamber
- Points of Negotiation (PON's)
- Portals of Exit (POE's)

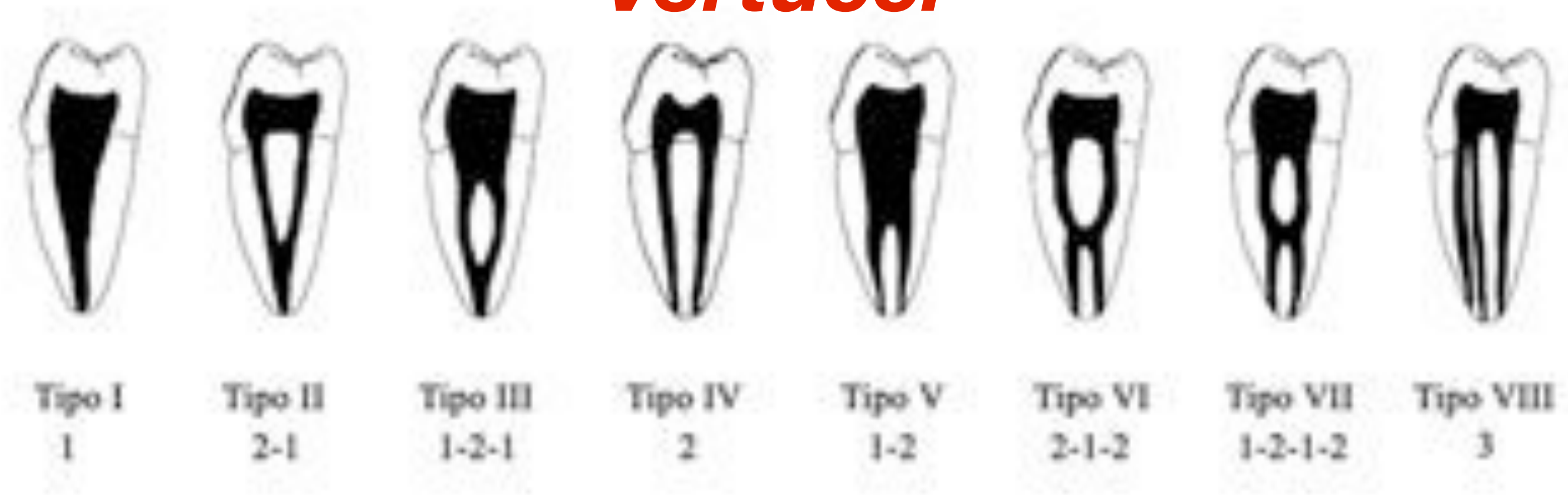


Canal Classifications

Weine



Vertucci



See any problems?

Only 60% of root canals could be classified using the classification of Weine *et al.* (1969) and 70% using the classification of Vertucci (1984).

Introduction

Maxillary first molars are a common tooth type in the permanent dentition. They are often used as abutments for fixed and removable partial dentures. The root canal morphology of these teeth is important for the success of root canal treatment. The aim of this study was to investigate the mesiodistal root canal morphology of maxillary first molars using micro-CT.

The root canal morphology of maxillary first molars is complex and varies among individuals. The Weine classification (1969) and the Vertucci classification (1984) are commonly used to describe root canal morphology. However, these classifications are based on two-dimensional radiographs and may not accurately represent the three-dimensional root canal morphology. Micro-CT is a non-invasive imaging technique that provides high-resolution, three-dimensional images of root canal morphology. This study used micro-CT to investigate the mesiodistal root canal morphology of maxillary first molars.

Access to the root canal system must be based on visual information, not averages.



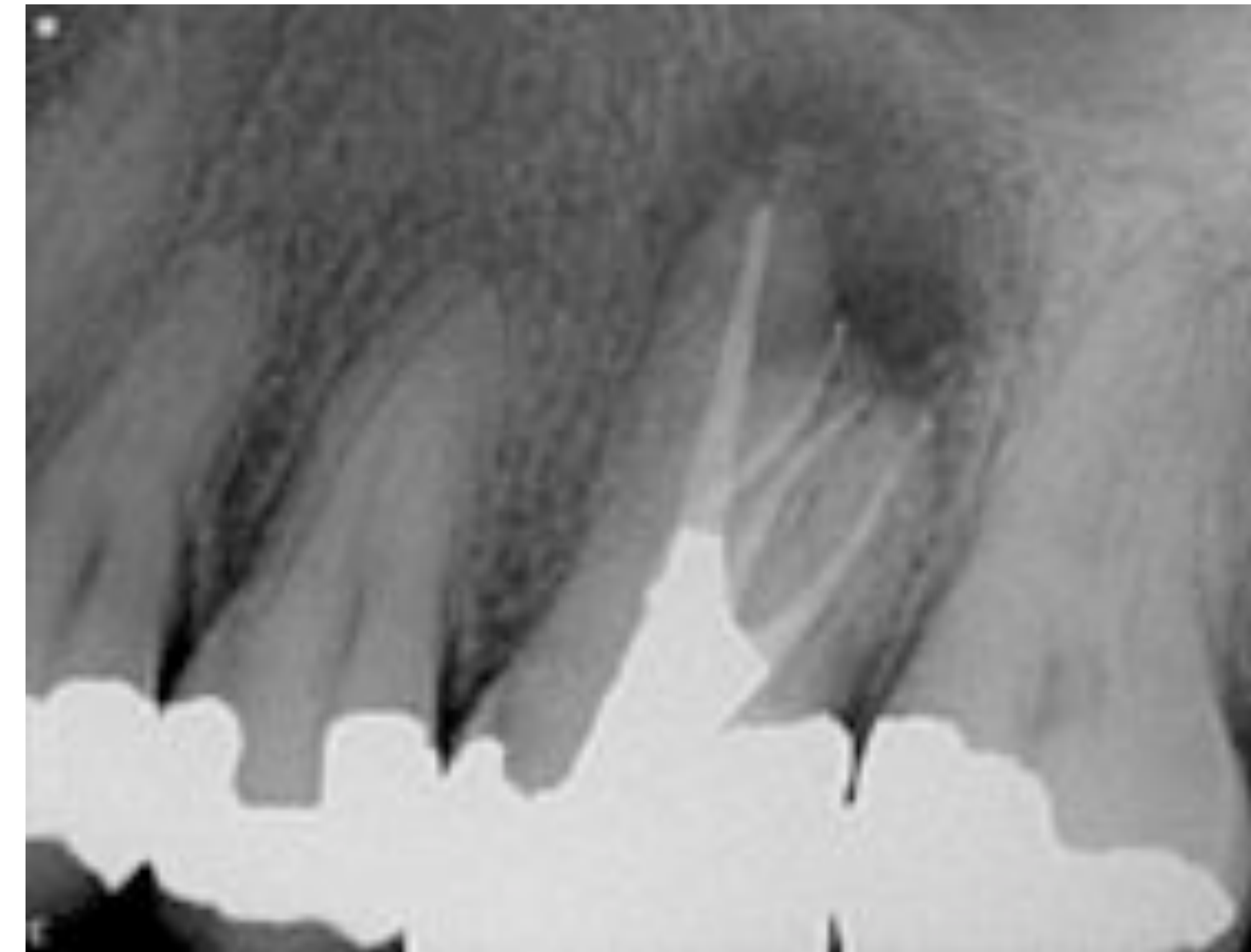
Root Canal Therapy

“The prevention and treatment of apical
periodontitis”

-Martin Trope

Root Canal Therapy

- Eliminate irritants
- Eliminate potential irritants
- Obliterate any space irritants could occupy
- *Entomb** anything not eliminated

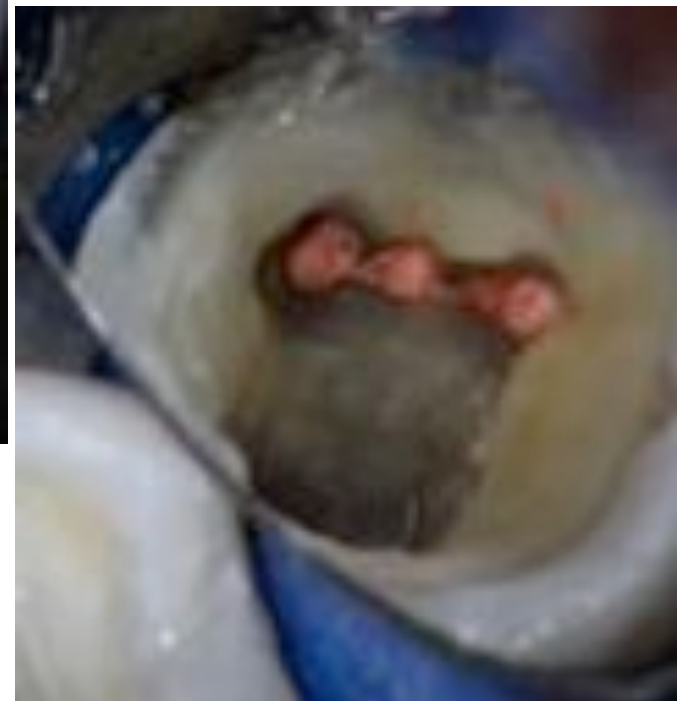
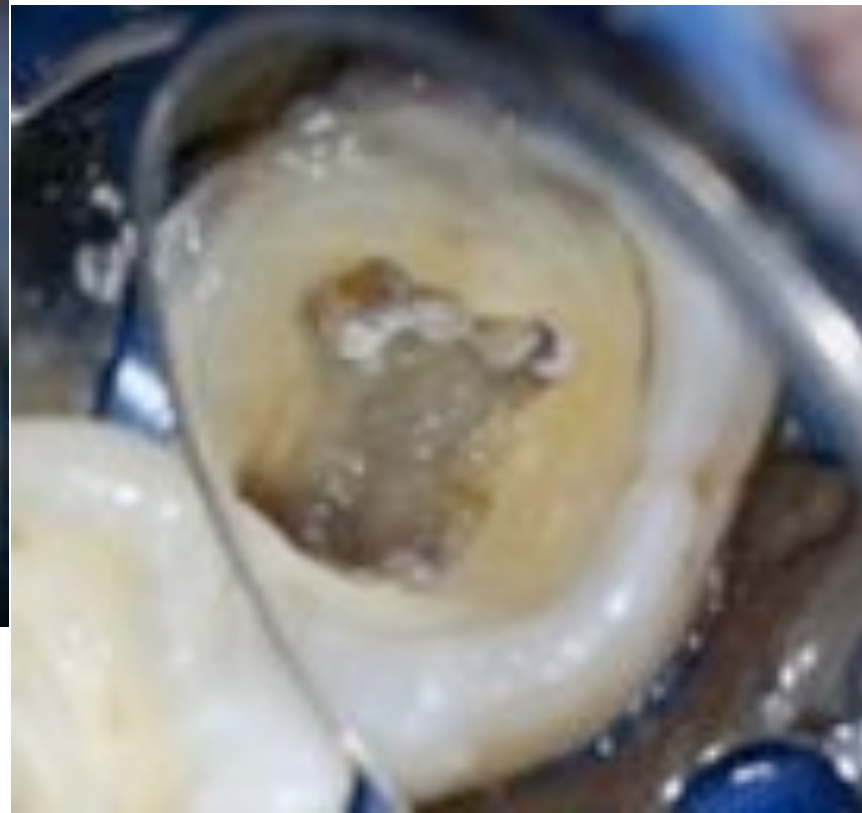
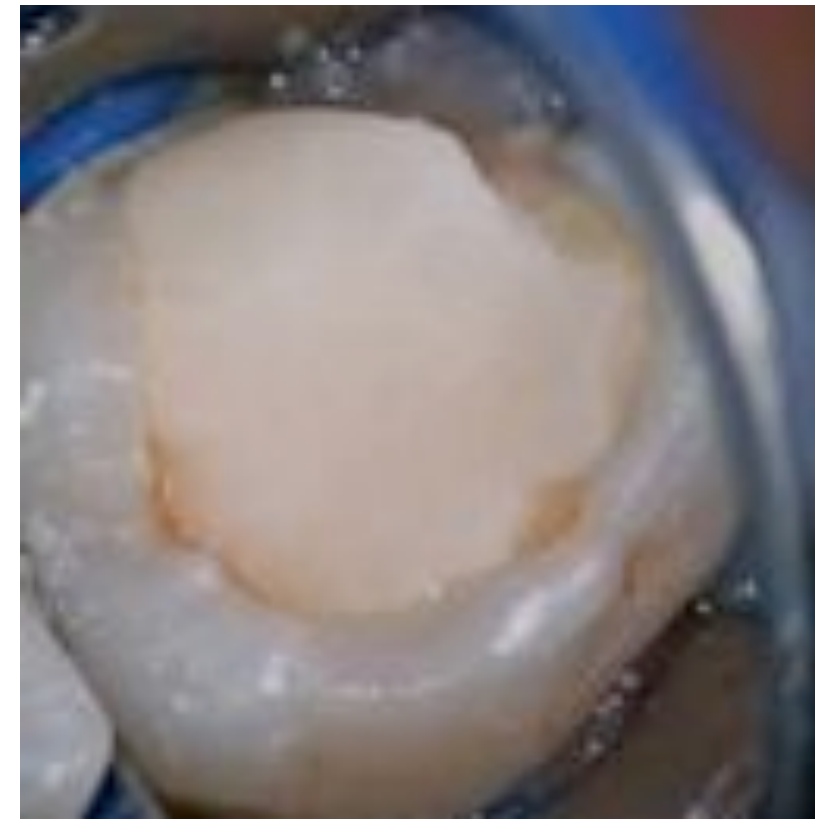


***biofilms can survive 150+ years!**

Keep the tooth in healthy
function in the mouth

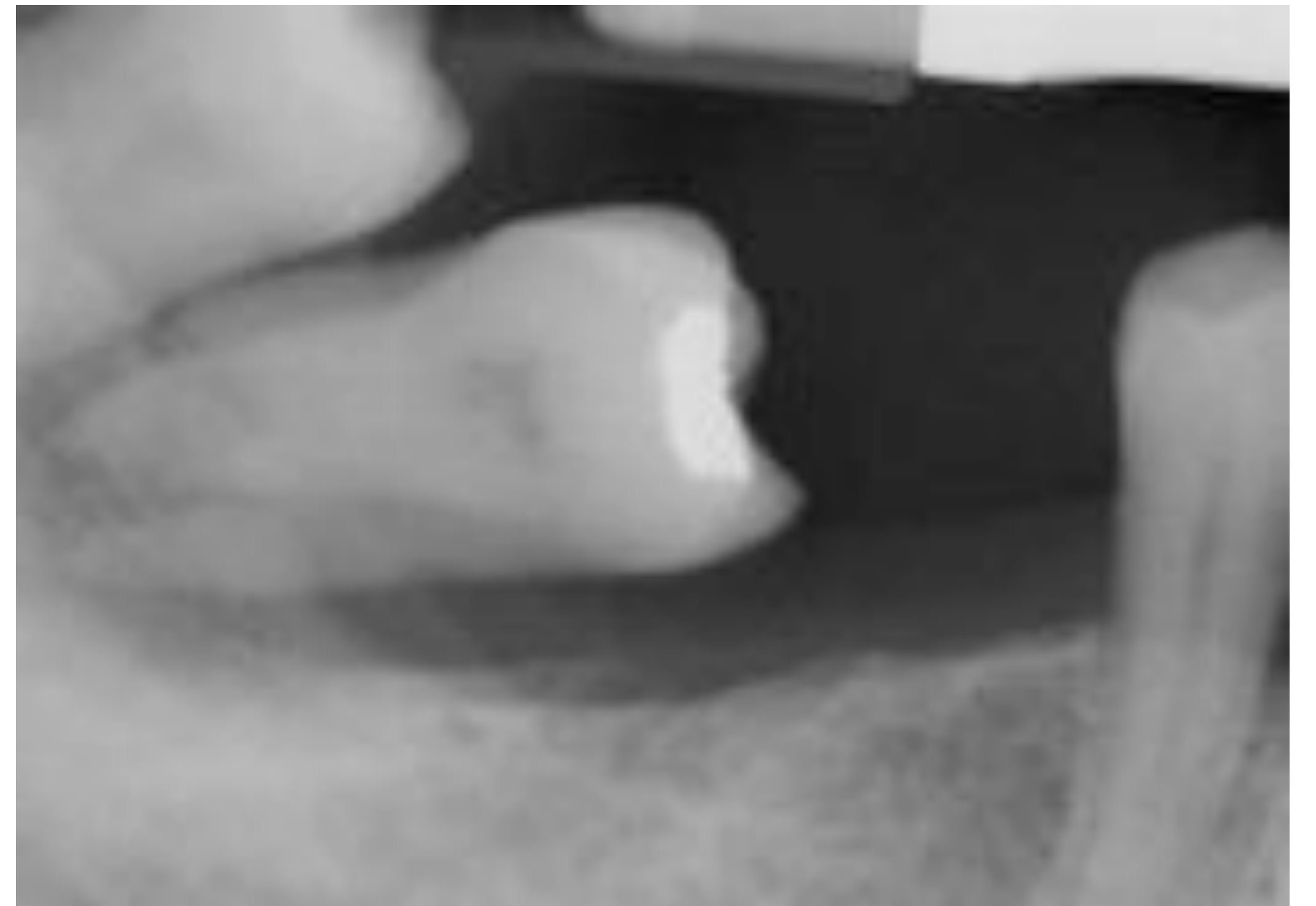
5 Phases of Root Canal Therapy

- Access
- Shaping
- Cleaning
- Obturation
- Restoration (coronal





Winning the Battle but Losing the War



Heirarchy of Needs

Tooth Needs

1. Restorative
2. Periodontal
3. Endodontic

Procedure Needs

- ✦ Tooth
 - ✦ Materials
 - ✦ Operator
- } BALANCE

Instrumentation

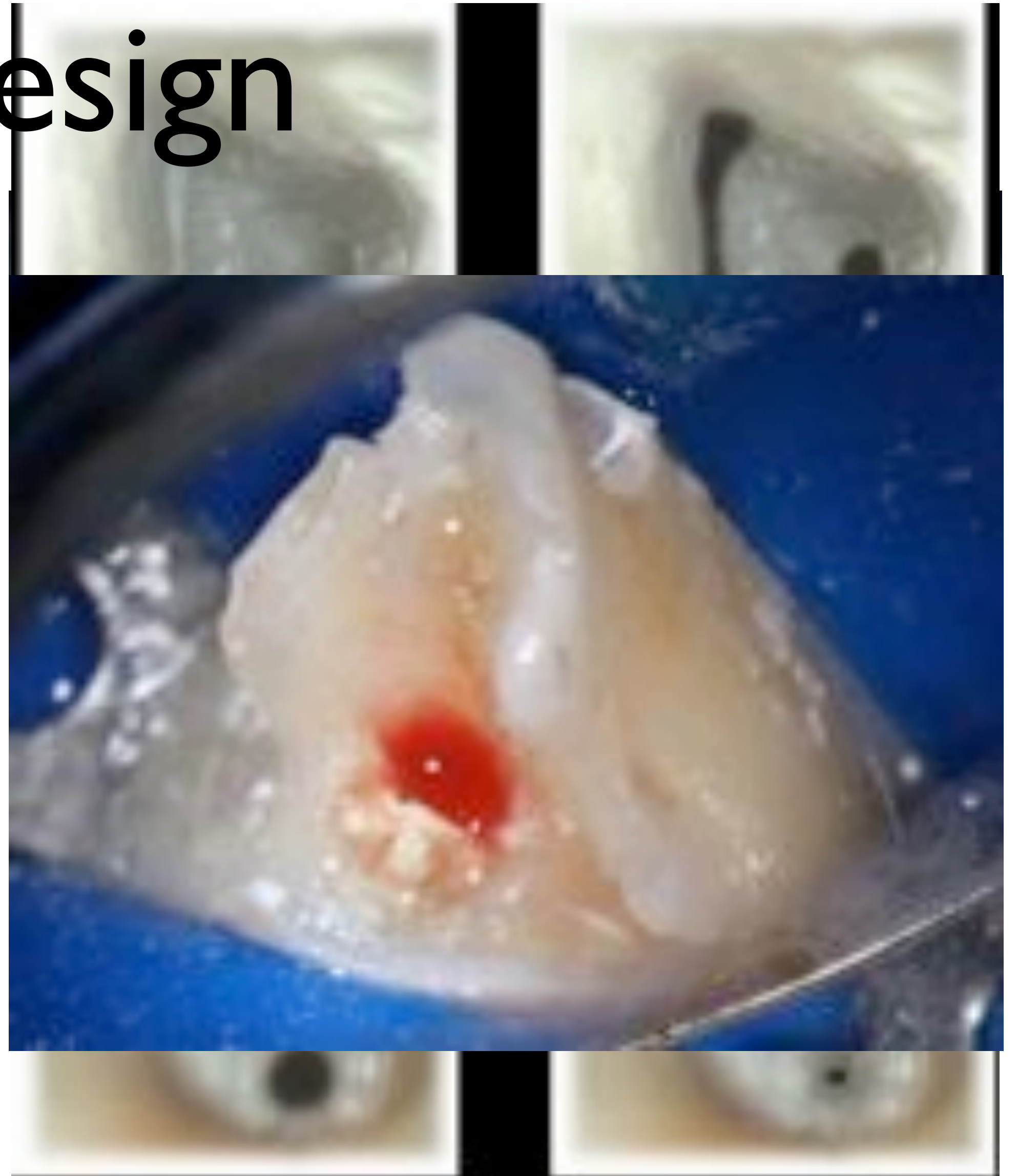
Coronal Access Principles

- Goal 1: create access to the pulp system
- Goal 2: strategically extend the access to accomplish proper shaping/cleaning
- Goal 3: maintain structural integrity of the tooth, especially the cervical area



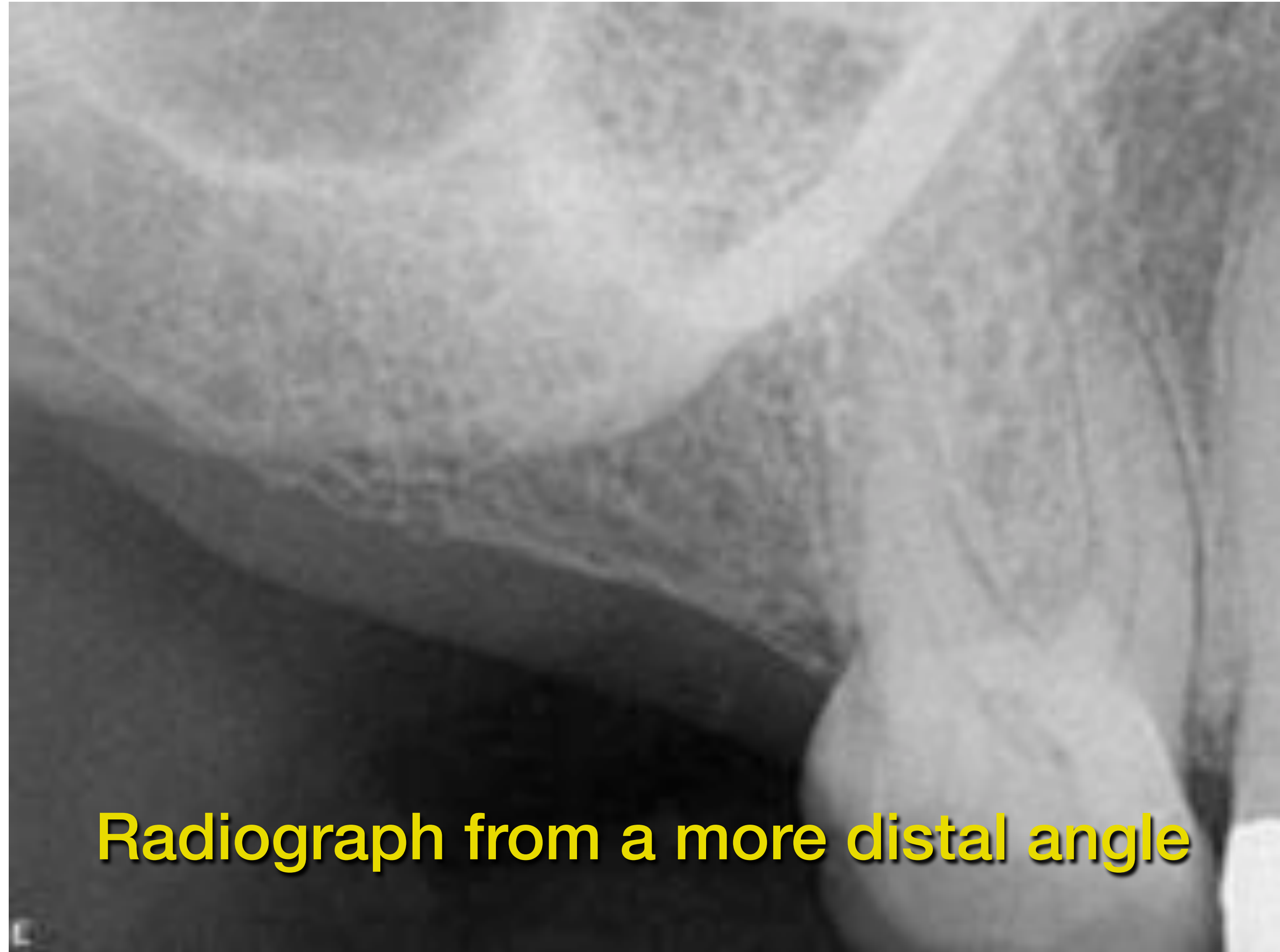
Access Design

- Tooth dependent
- Pt age
- Current damage of coronal structure



Pre-operative considerations

- Periapical and Bitewing radiographs
- Pulp chamber location/size
- Crown shape
- CEJ shape



Coronal Access Armamentarium

- Any end-cutting high speed bur
- Special considerations for porcelain and metal
- Round burs more difficult to maintain orientation
- Square-end burs are rarely beneficial in dentistry
- Tapered fissure-like burs give better angulation feedback



Stepped Access

- Remove materials according to a hierarchy of importance
- Can always remove:
 - Caries
 - Restorative material
 - Coronal 1.5-2mm of tooth (posterior)

-David Clark & John



“SEE” Access:

Strategically Extended Endodontic Access

- **Deliberate excellence**
- Locate the chamber in the most predictable way
- Extend the access to facilitate the treatment
- Straight line access



Deliberate Excellence

- **"There are countless ways of attaining greatness. But any road to reaching one's maximum potential must be built on a bedrock of respect for the individual, a **commitment to excellence**, and a **rejection of mediocrity**."**

-- Buck Rodgers, IBM



“SEE” Access: Chamber Location

- Preoperative: “RPC” and “FPC”
- Law of Centrality
- Law of Centricity



...at the Level of the CEJ

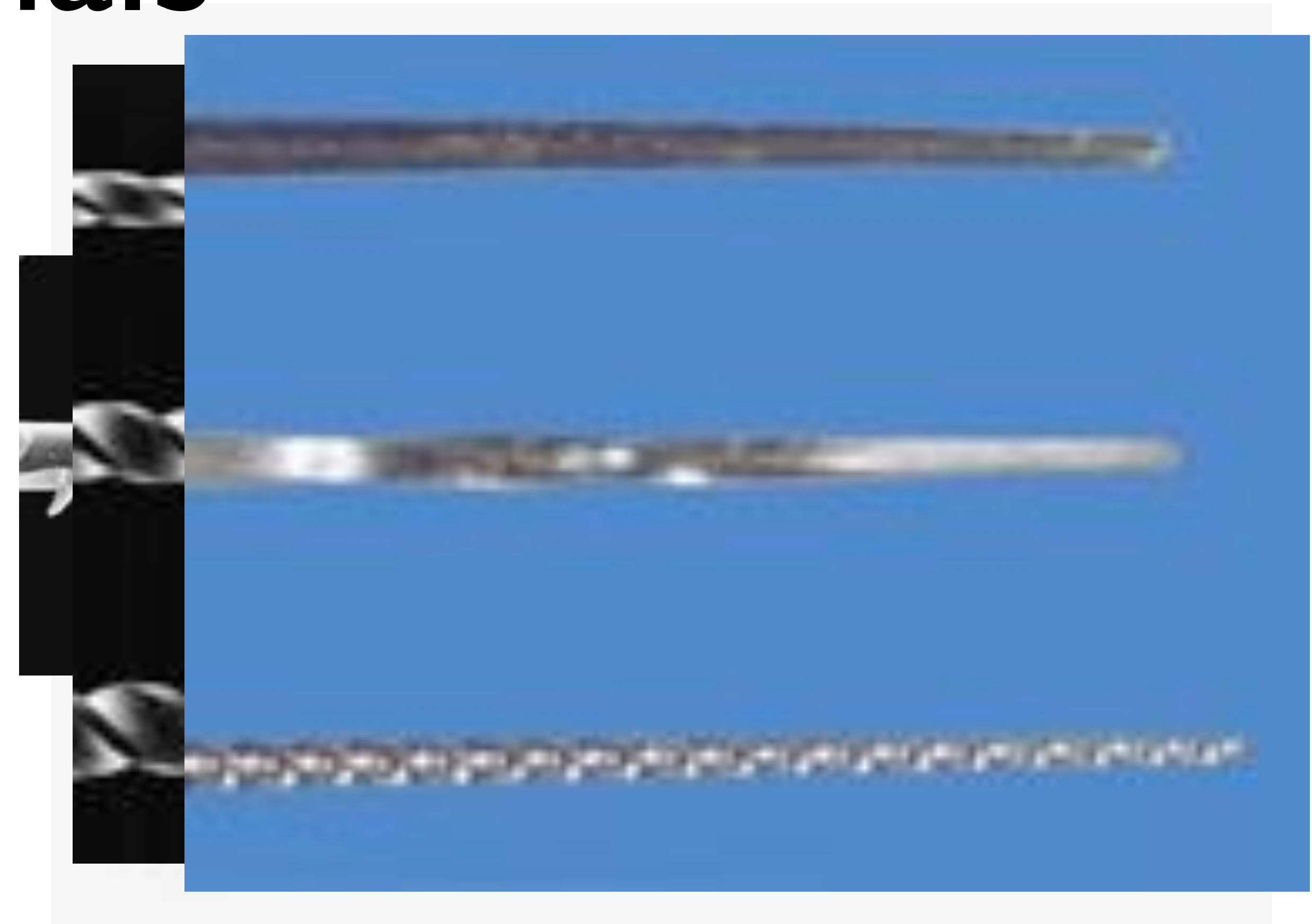
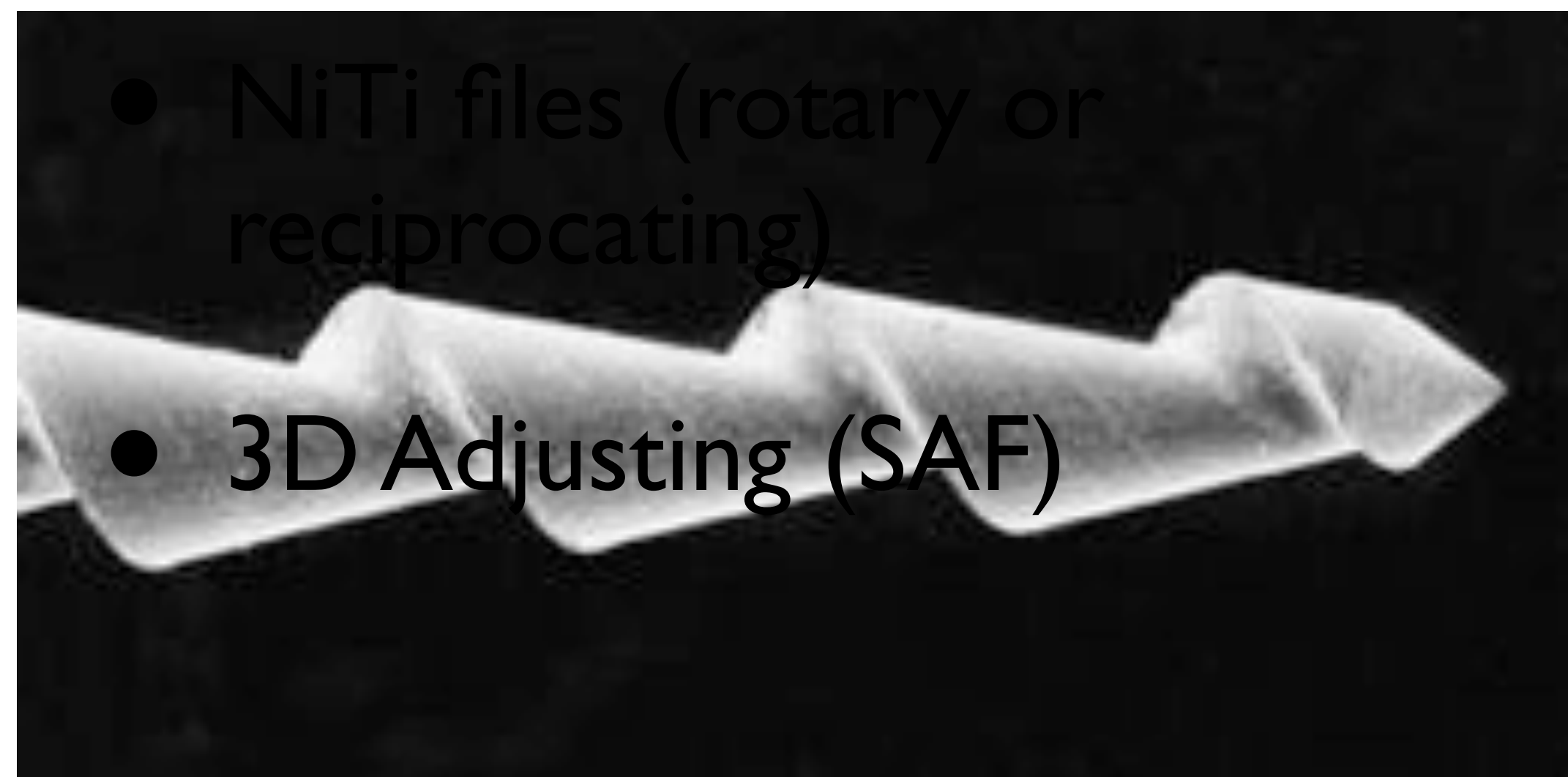
Radicular Access

- Gates Glidden Drills
- Peeso Reamers (dangerous)
Higher Magnification
- Mueller and LN burs
- Munce Discovery Burs



Instrumentation of the Root Canals

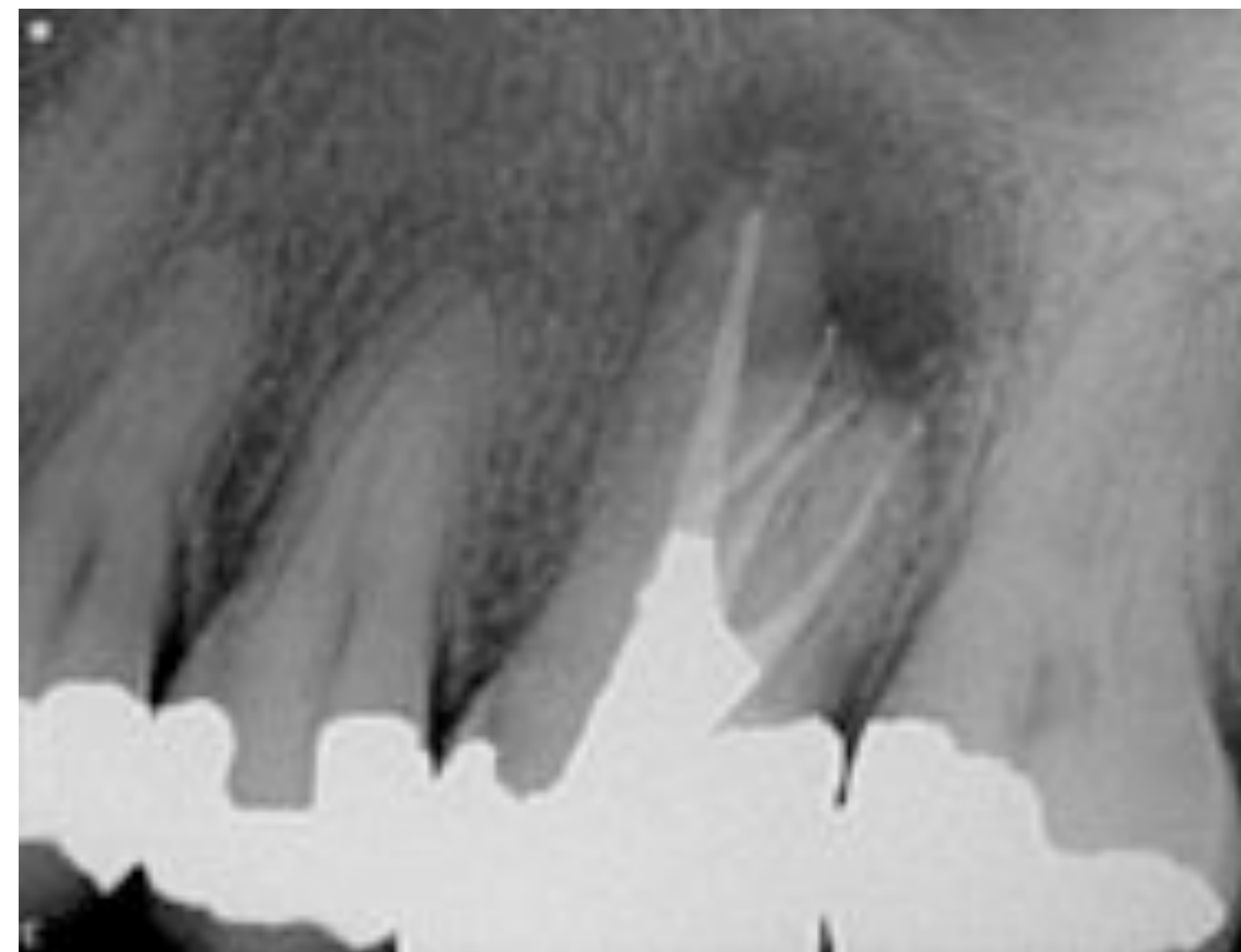
- Hand Files (K and H-type)
- Barbed Broaches
- Engine Driven



REVIEW

Root Canal Therapy

- Eliminate irritants
- Eliminate potential irritants
- Obliterate any space irritants could occupy
- *Entomb** anything not eliminated



*biofilms can survive 150+ years!

Goal of Canal Instrumentation

- Physically Remove Tissue and *Irritants*
- Create Space for *Irrigants*
- Facilitate Obturation

Remember this?

Procedure Needs

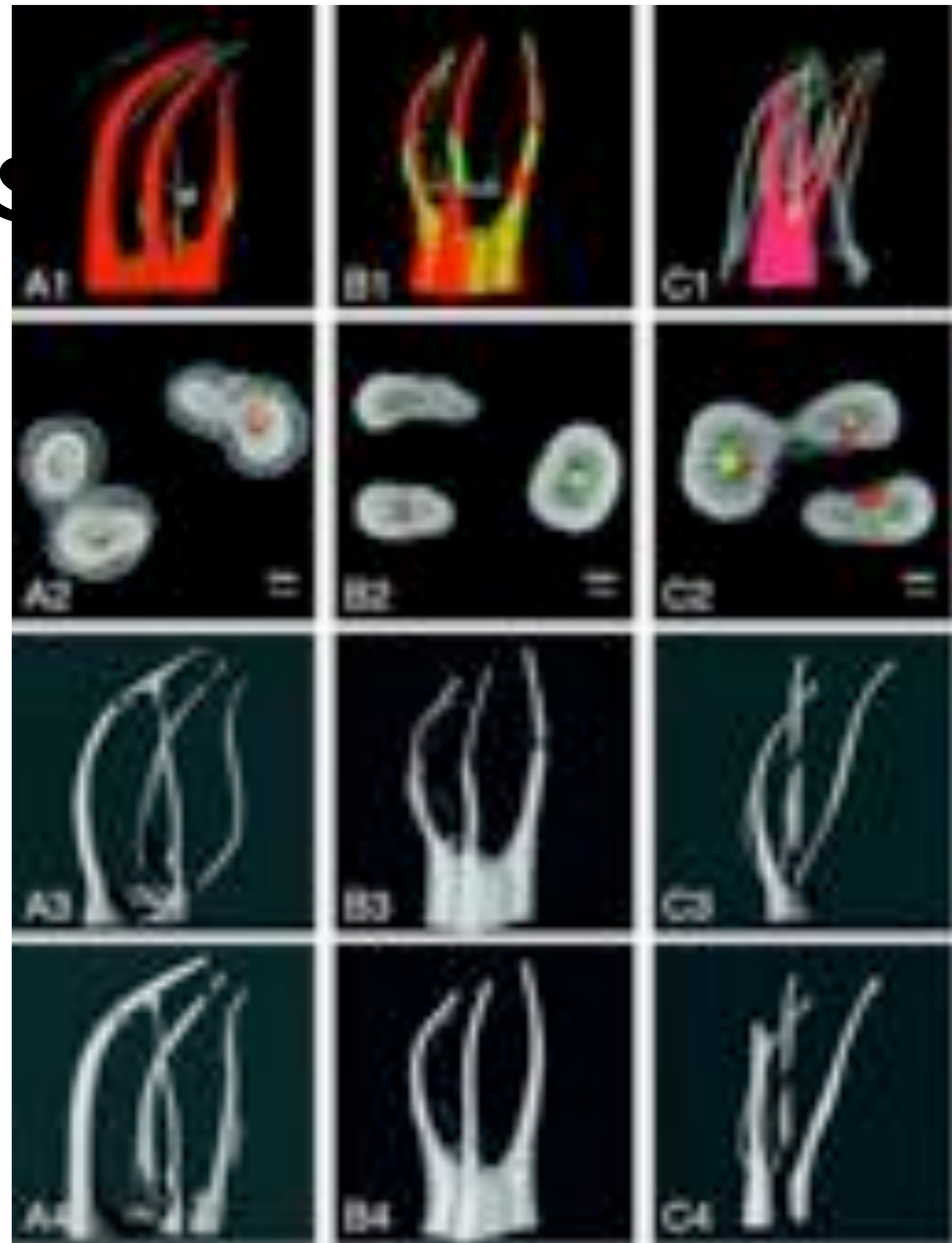
✦ **Tooth**

✦ **Materials**

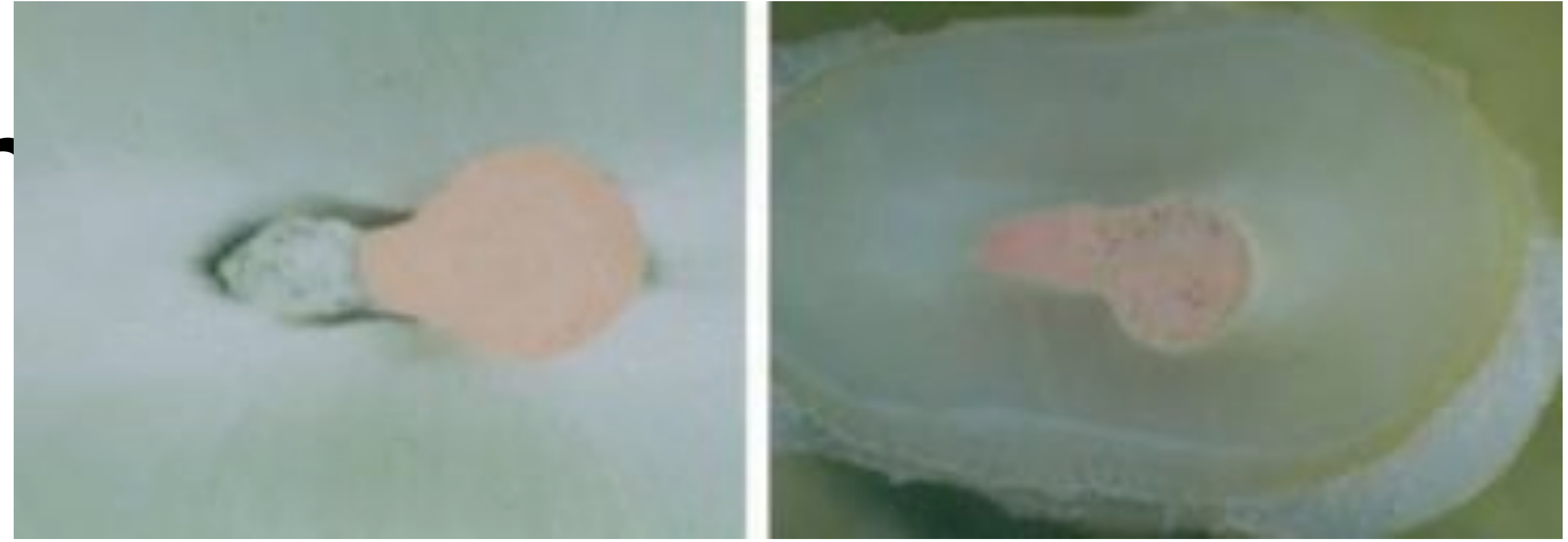
✦ **Operator**

BALANCE

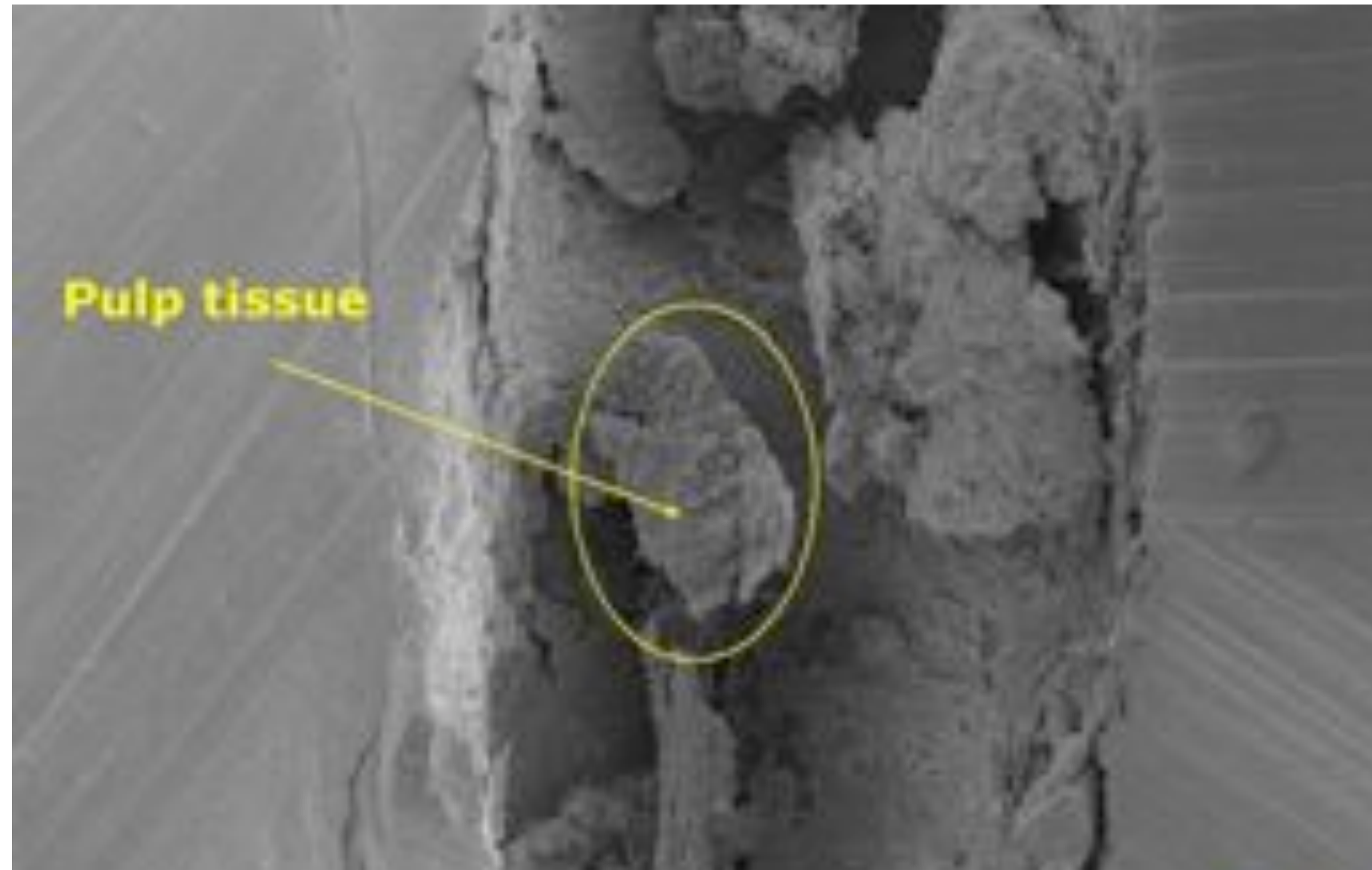
Files &



...irrigation



- NaOCl
- EDTA
- Chlorhexidine
- MTAD

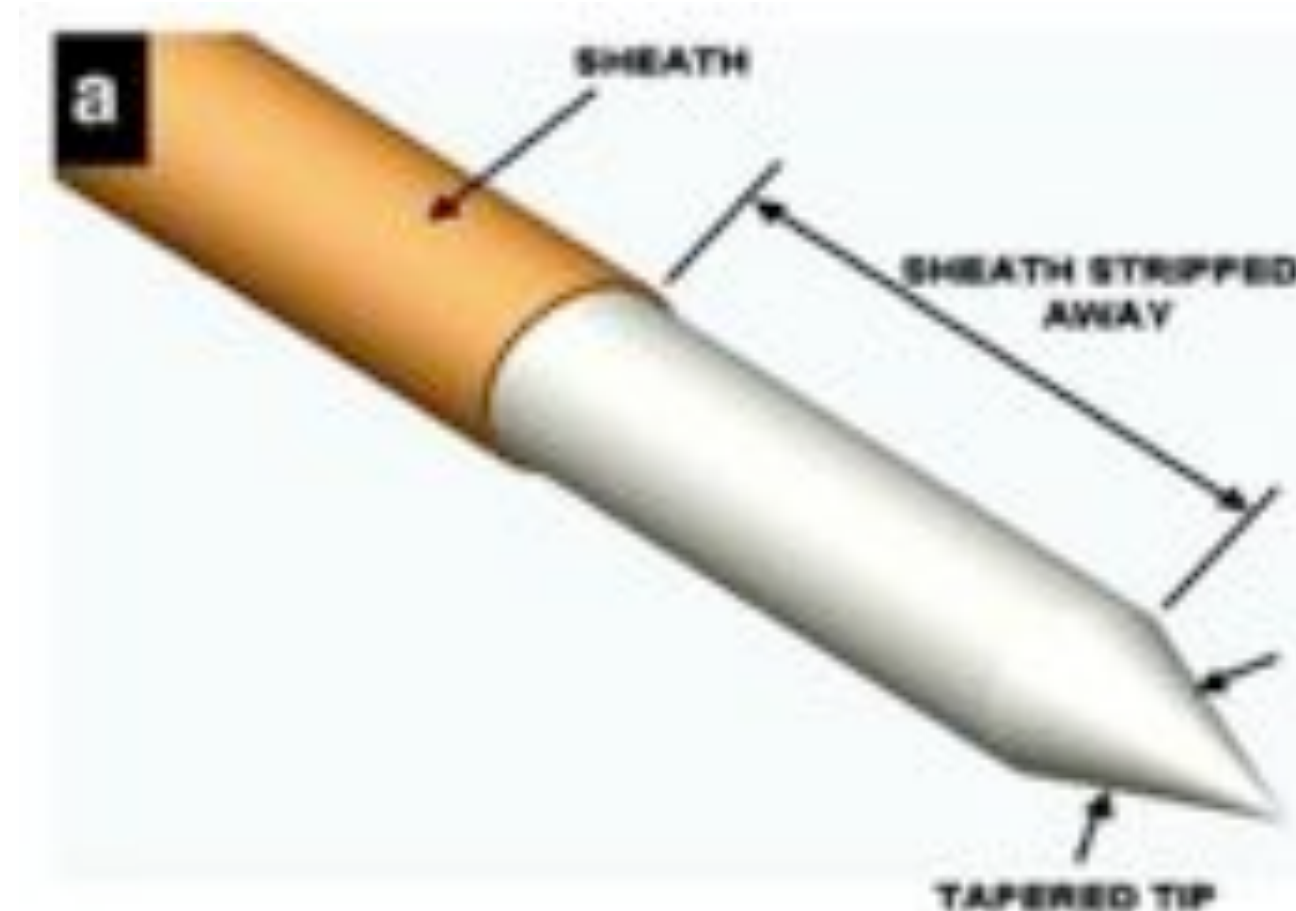


Dr. Herb Schilder

- 1967 & 1974 Papers
 - ✦ Vertically Compacted Warm Gutta Percha
 - ✦ Tapering Funnel
 - ✦ Small Apical Opening
 - ✦ Recapitulation
 - ✦ Envelope of Motion
- Dental Clinics North America
- Laid foundation of modern techniques

Current shaping techniques

- Tooth dependent
 - ❑ Enlargement of canals
 - ❑ Maintain “true” canals
- Root dependent
 - ❑ Mechanical cutting of dentin (except lasers)
 - ❑ Avoid instrumenting past apex
- Canal dependent
 - ❑ Adjunct irrigation
 - ❑ Overenlargement weakens teeth



Current irrigation (cleaning) techniques

Full Strength NaOCl

- Dissolves Tissue
- Kills Microbes
- Inactivates irritants

Needs Time

- ☒ Imparts lubricity to files
- ☒ Clears debris
- ☒ *Time starts when shaping complete

Needs Volume

- ☒ Chemistry gets “used up”
- ☒ Replenish often

Tying it all together

Richard

- 12 y.o. hispanic male
- initial presentation

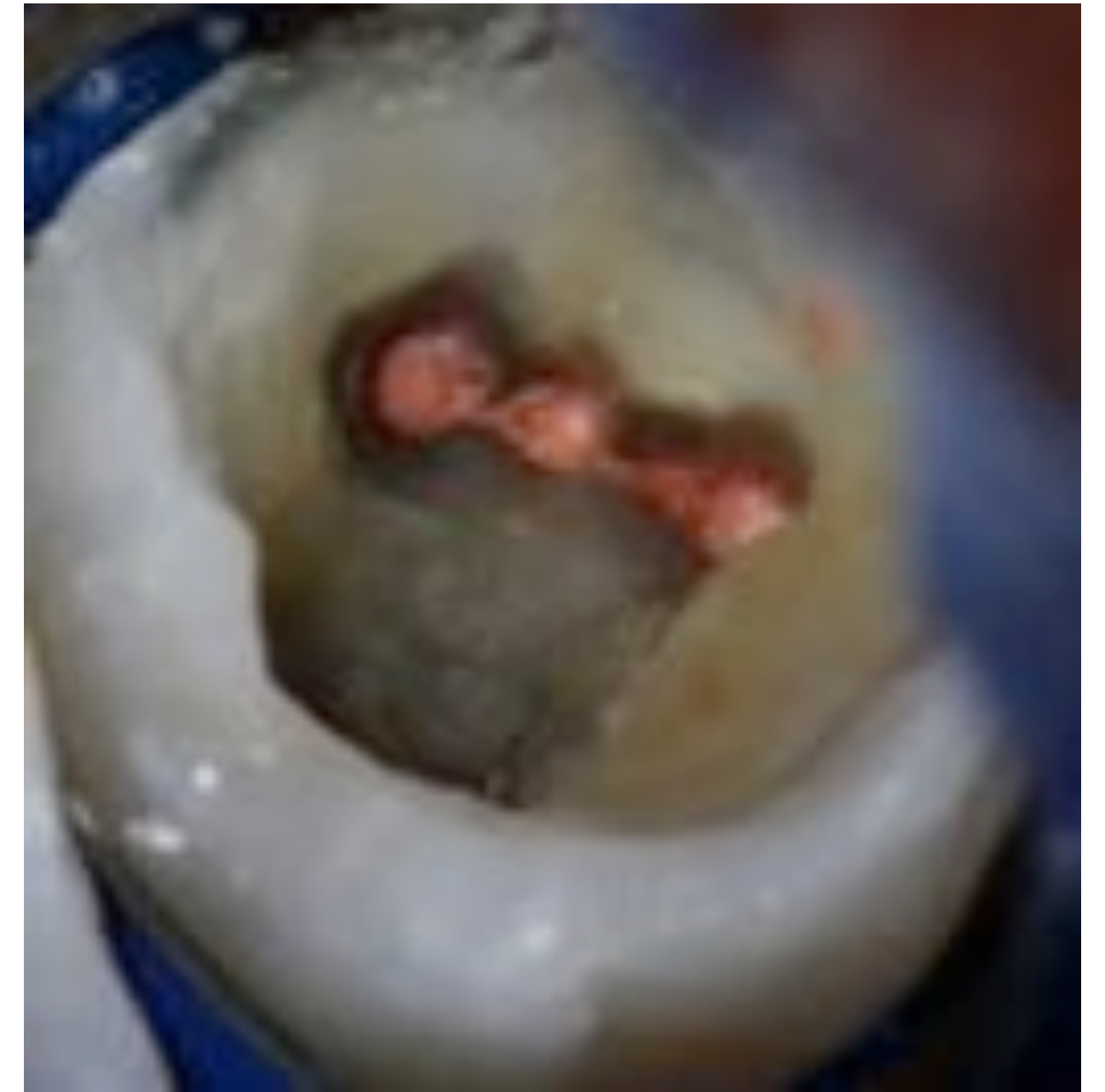
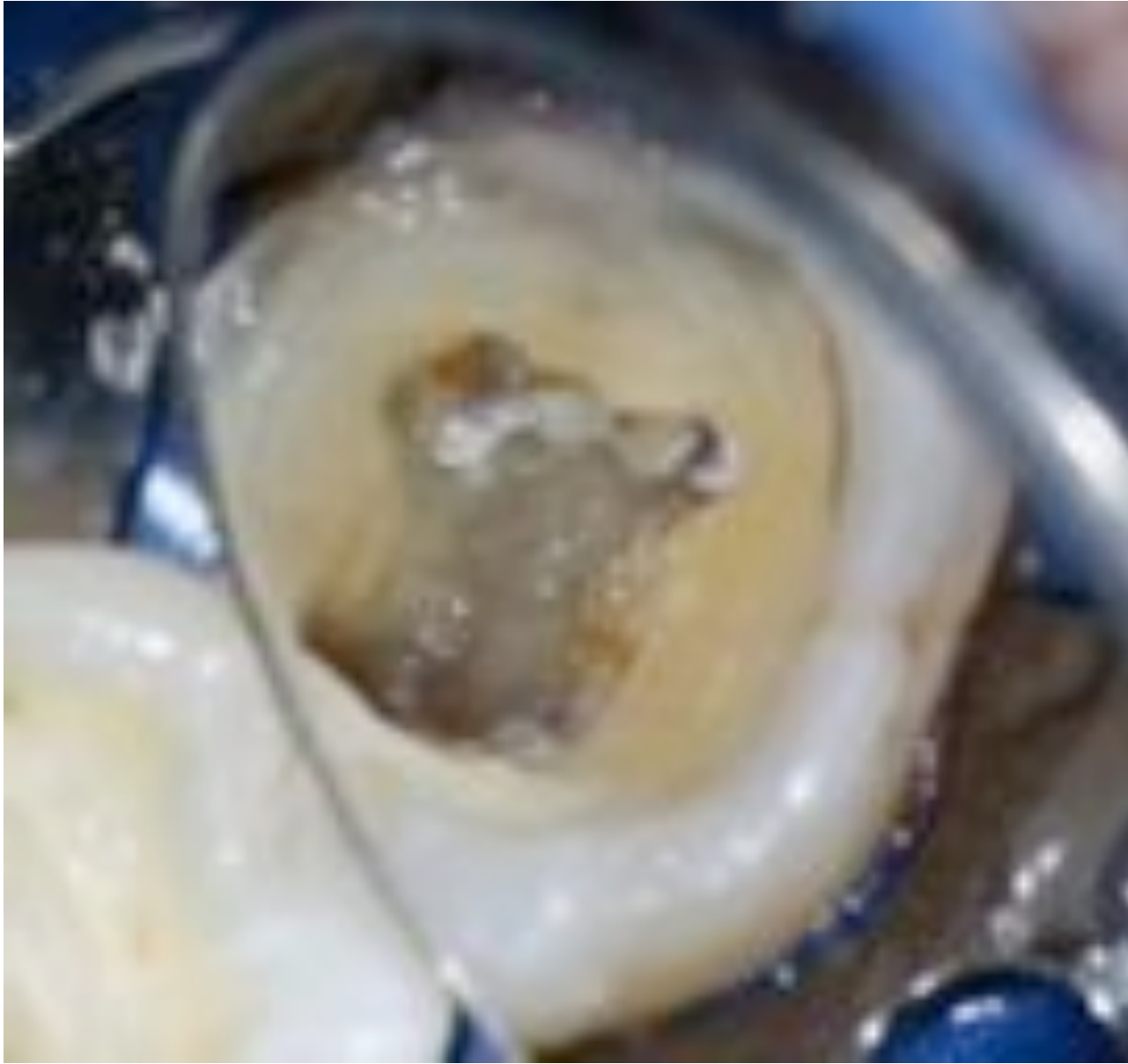


| | #18 | #19 | #20 |
|------------|-----|-----------|-----|
| Probing | WNL | WNL | WNL |
| Percussion | WNL | + | WNL |
| Palpation | WNL | WNL | WNL |
| Bite | WNL | WNL | WNL |
| Cold | WNL | NR | WNL |

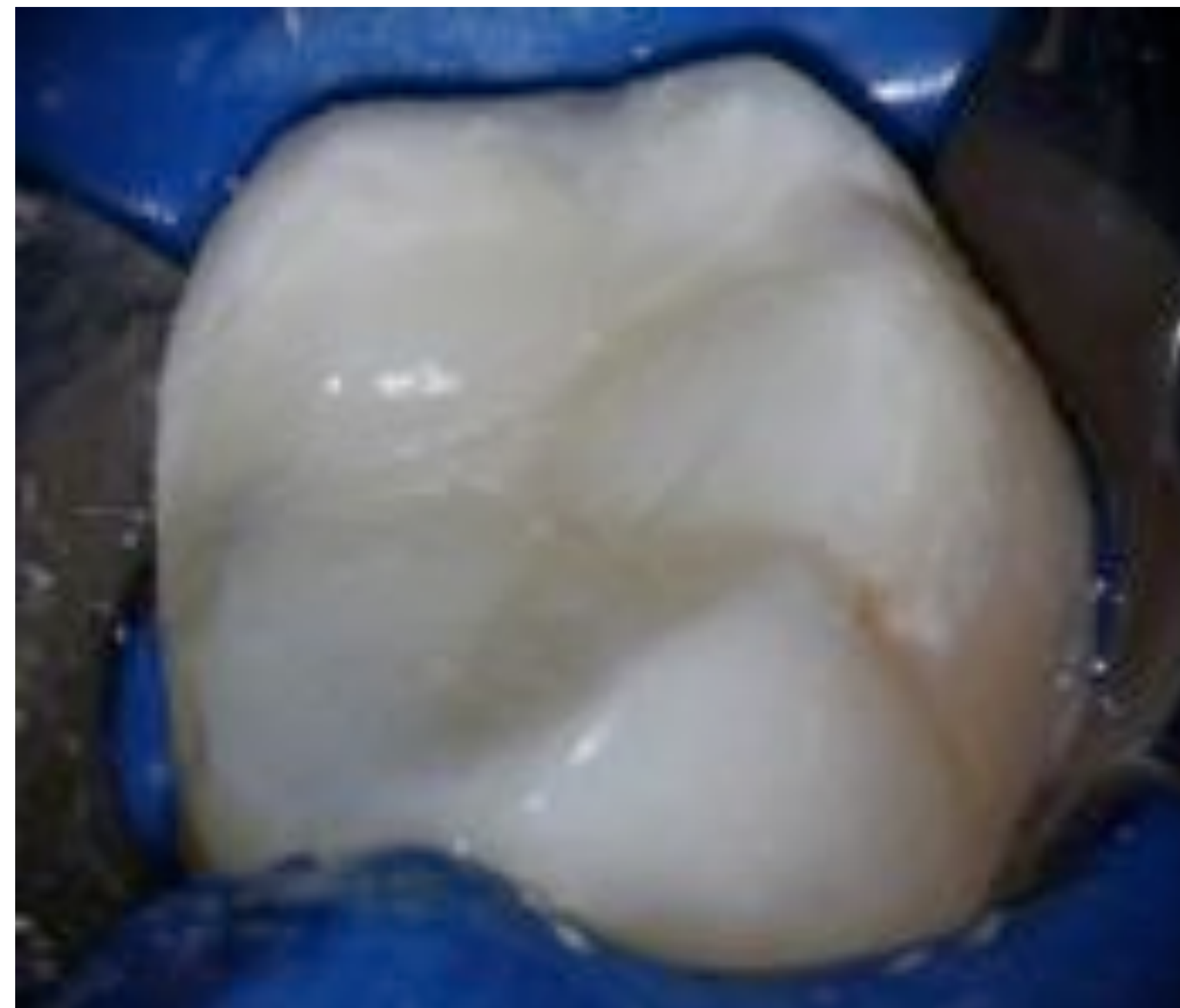
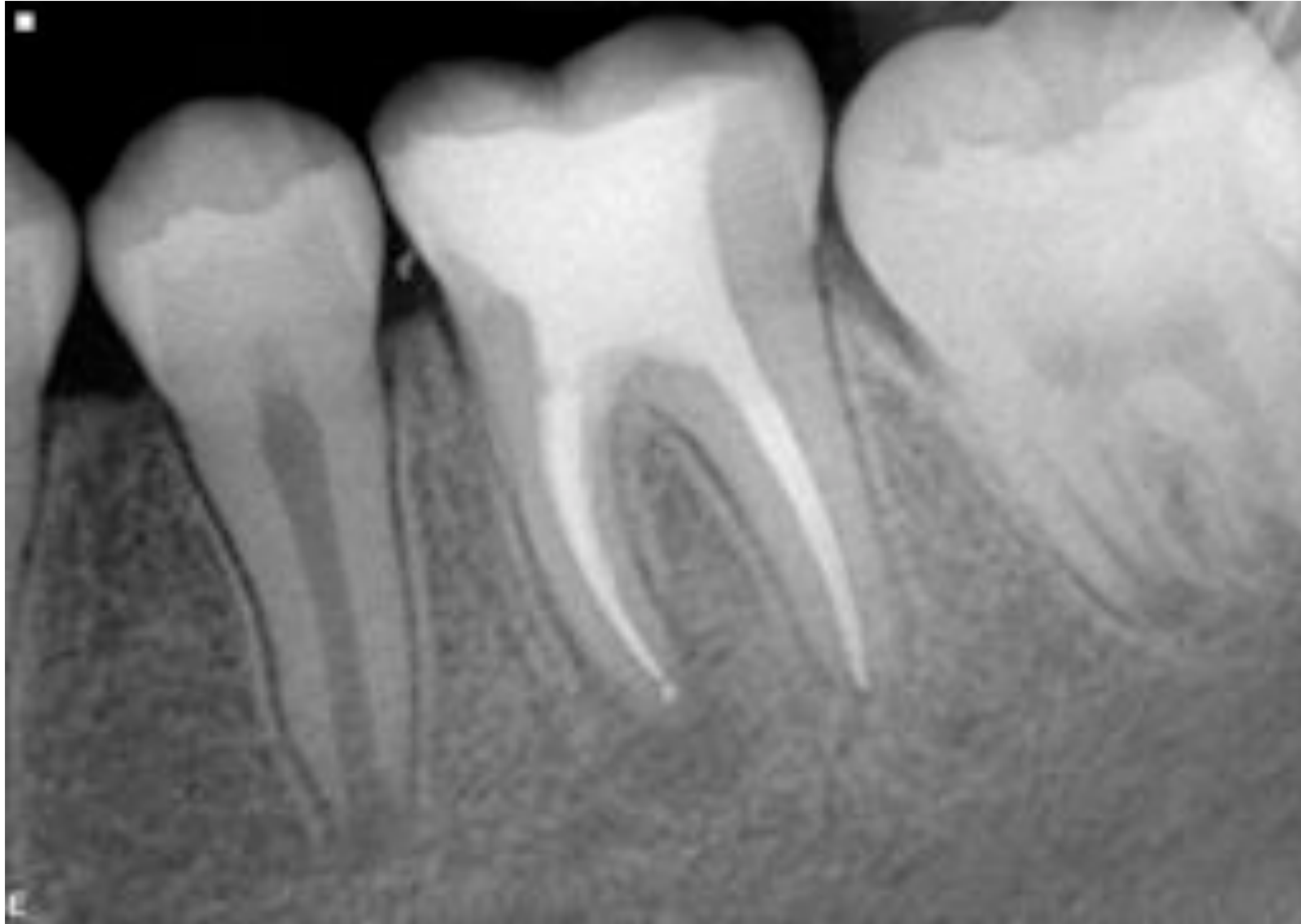
Assessment

- ❑ pulp necrosis
- ❑ symptomatic apical periodontitis
- ❑ etiology: caries
- ❑ prognosis: good

Working...



Final



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