# Endodontics survival guide!

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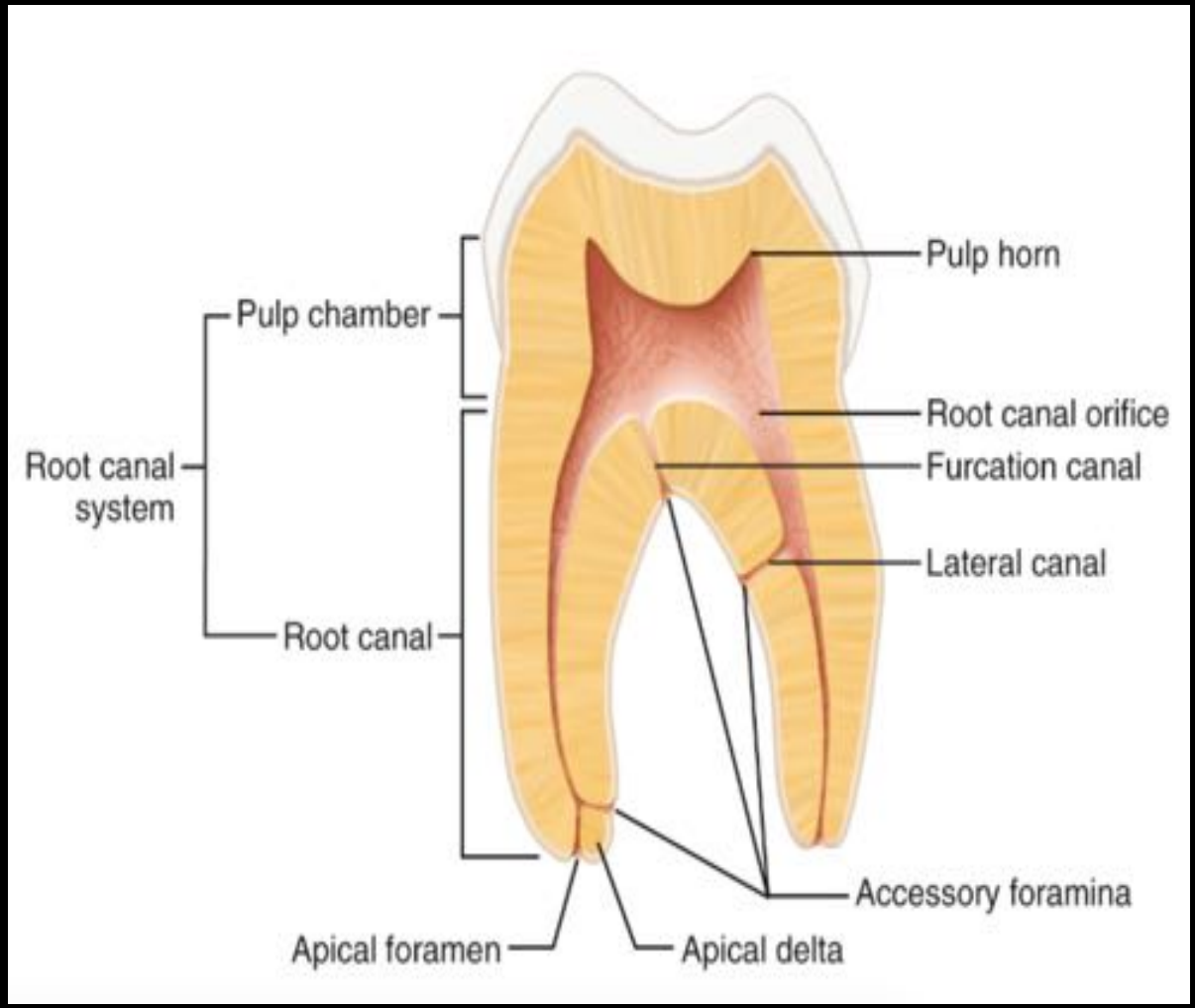
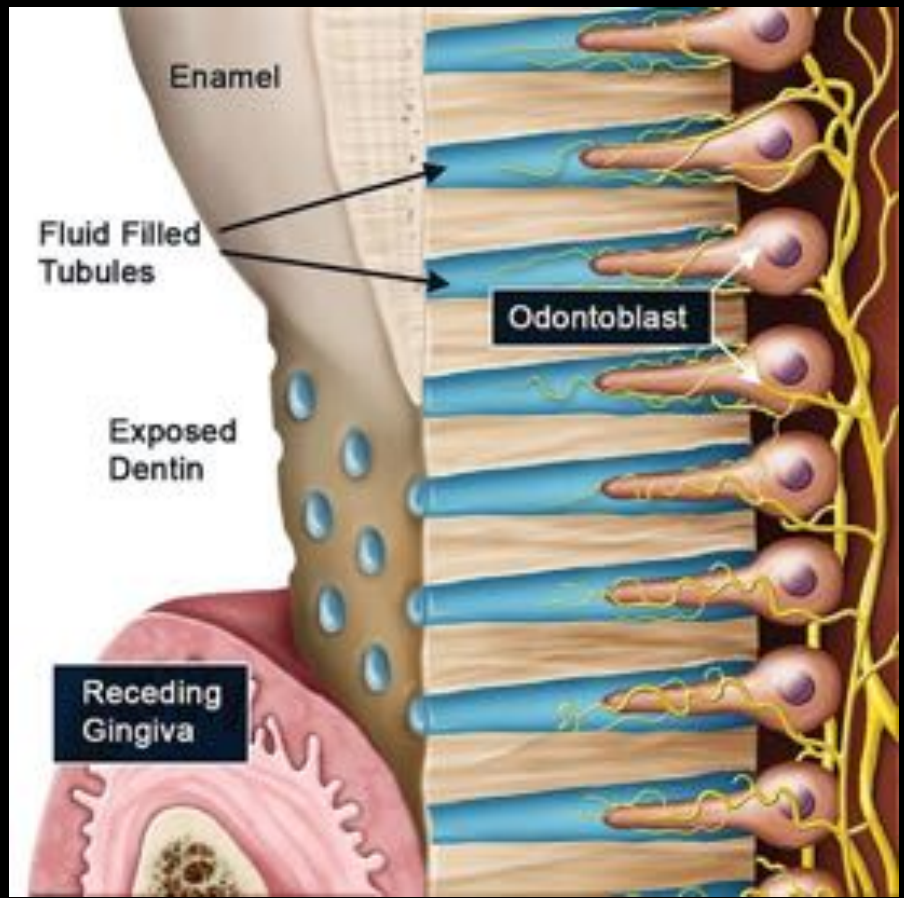
# Components of the Root Canal System



# The functions of the dental pulp

- **Formative** (primary, secondary and tertiary dentine)
- **Defensive** (through the pulp–dentine complex, inflammatory and immune responses)

  The initial inflammatory response in the pulp; blockage of the involved dentinal tubules by large molecular substances in the transudate; the sclerosis of the dentinal tubules by mineral deposition and formation of peritubular dentine; and, finally, the laying down of tertiary dentine
- The pulp–dentine complex has been thought of as a **sensory organ** (Aδ fibers) that warns against developing disease (e.g. caries or other forms of surface tooth tissue loss) by eliciting pain.
- The presence of Aβ fibres, which serve a **proprioceptive function**



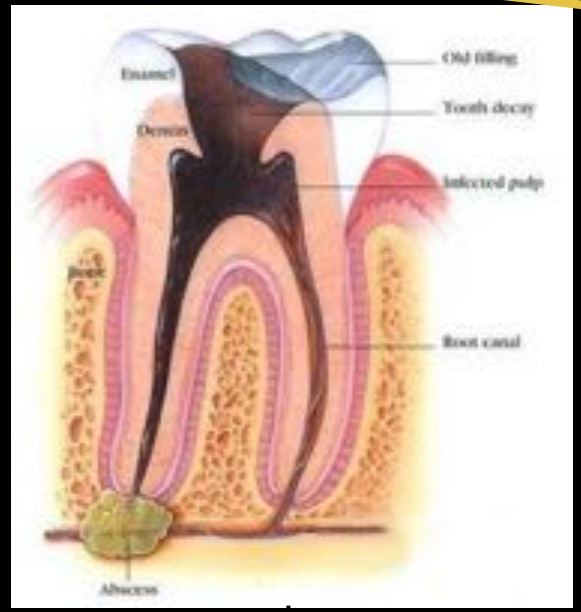
# Irritants

NonLiving

Thermal

Mechanical

Chemical




LIVING

MICROORGANISMS (MO):
Bacteria (mostly)
Viruses
Fungi

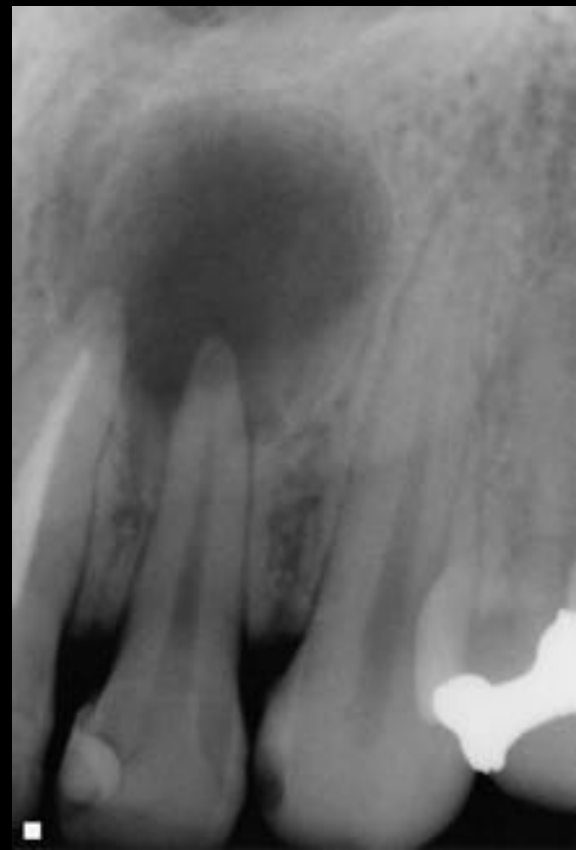
INFLAMMATION

# The biological goals of RCT

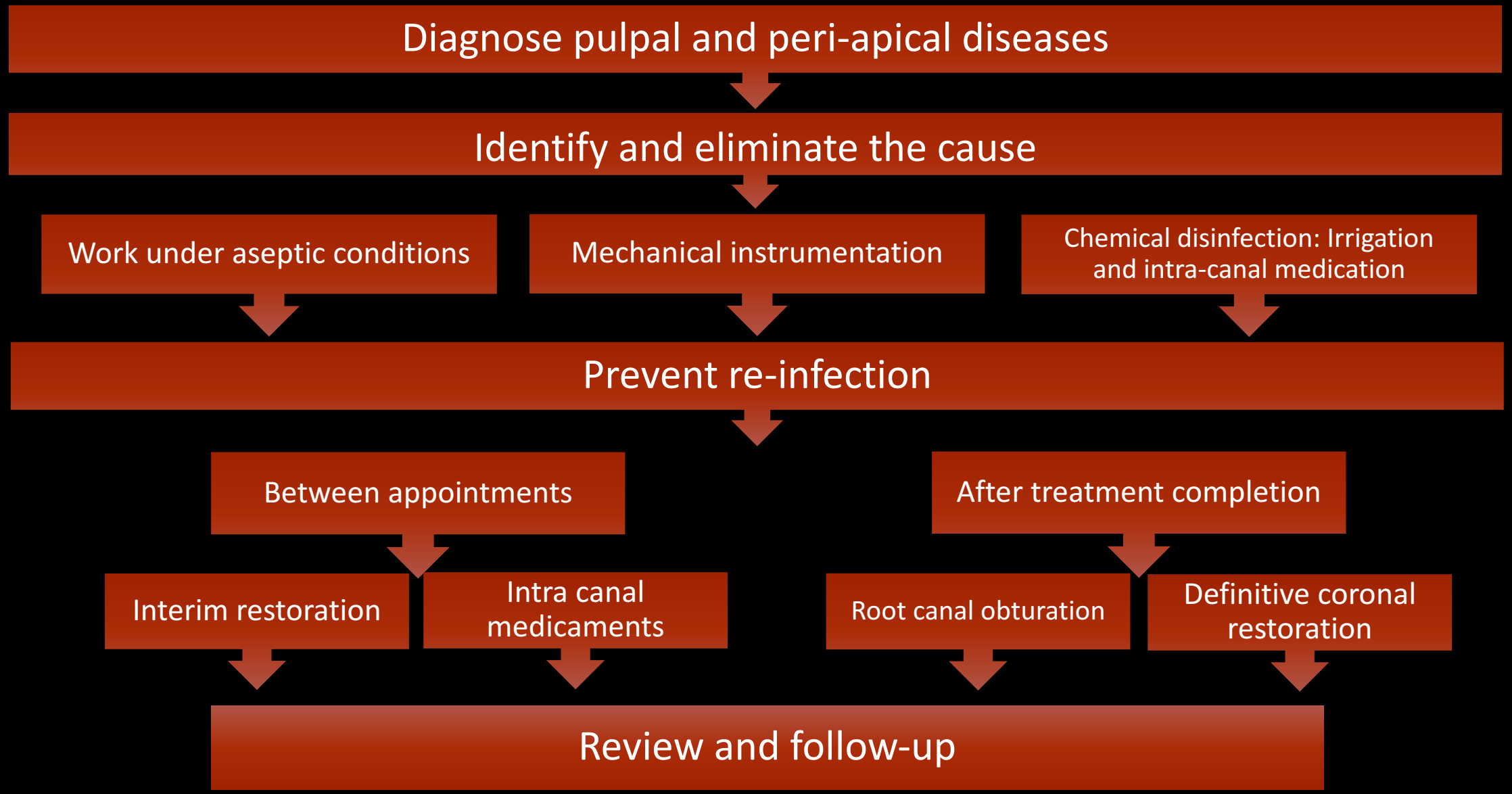
- The aim of root canal treatment is to eliminate or prevent apical periodontitis (*Ørstavik and Pitt Ford, 1998)*

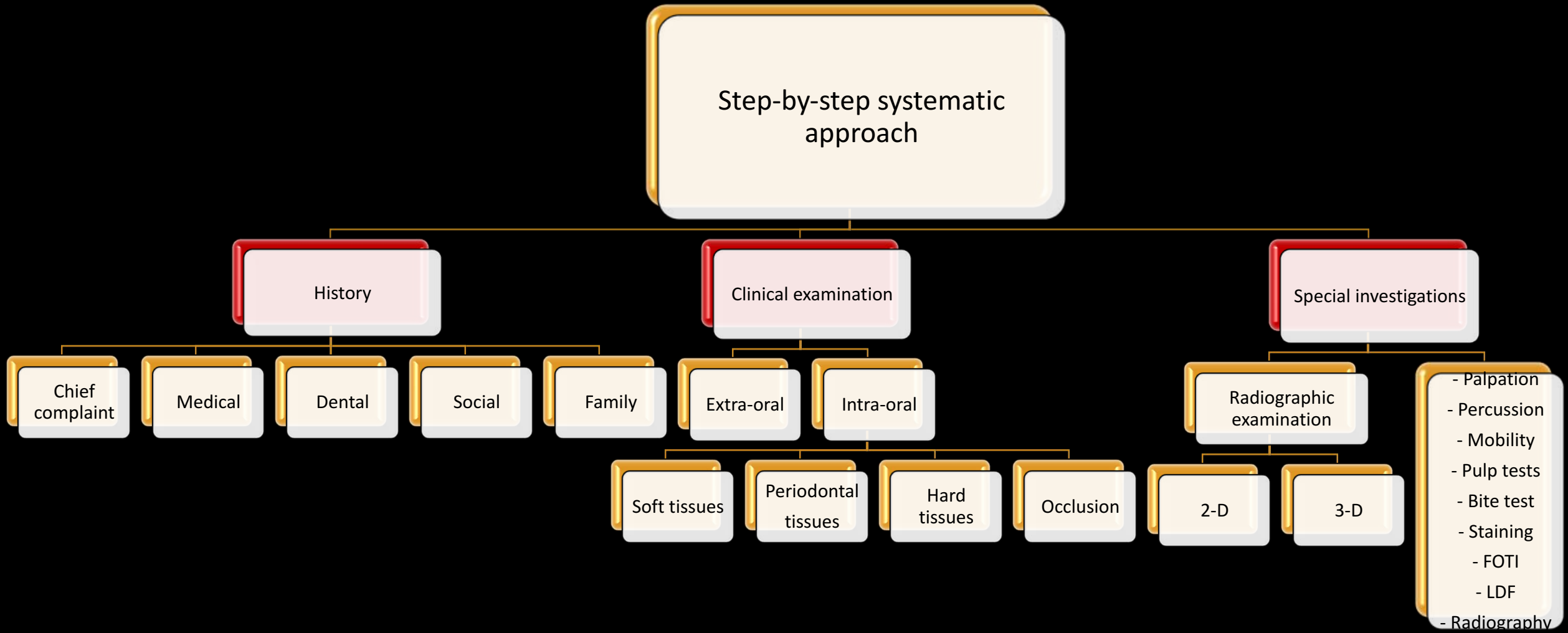
# **THE EFFECTS OF SURGICAL EXPOSURES OF DENTAL PULPS IN GERM-FREE AND CONVENTIONAL LABORATORY RATS** (Kakehashi, et al., 1965):

- Pulp necrosis and periapical inflammation developed in conventional rats when the pulps of teeth were exposed to oral microorganisms. However, in germ-free laboratory rats, no pulp necrosis and periapical inflammation occurred even when the pulps of teeth were exposed to the oral environment and packed with sterile food debris.
- ***Bacteria constitute a major etiologic factor in the development of apical periodontitis***



# Step by step endodontic treatment



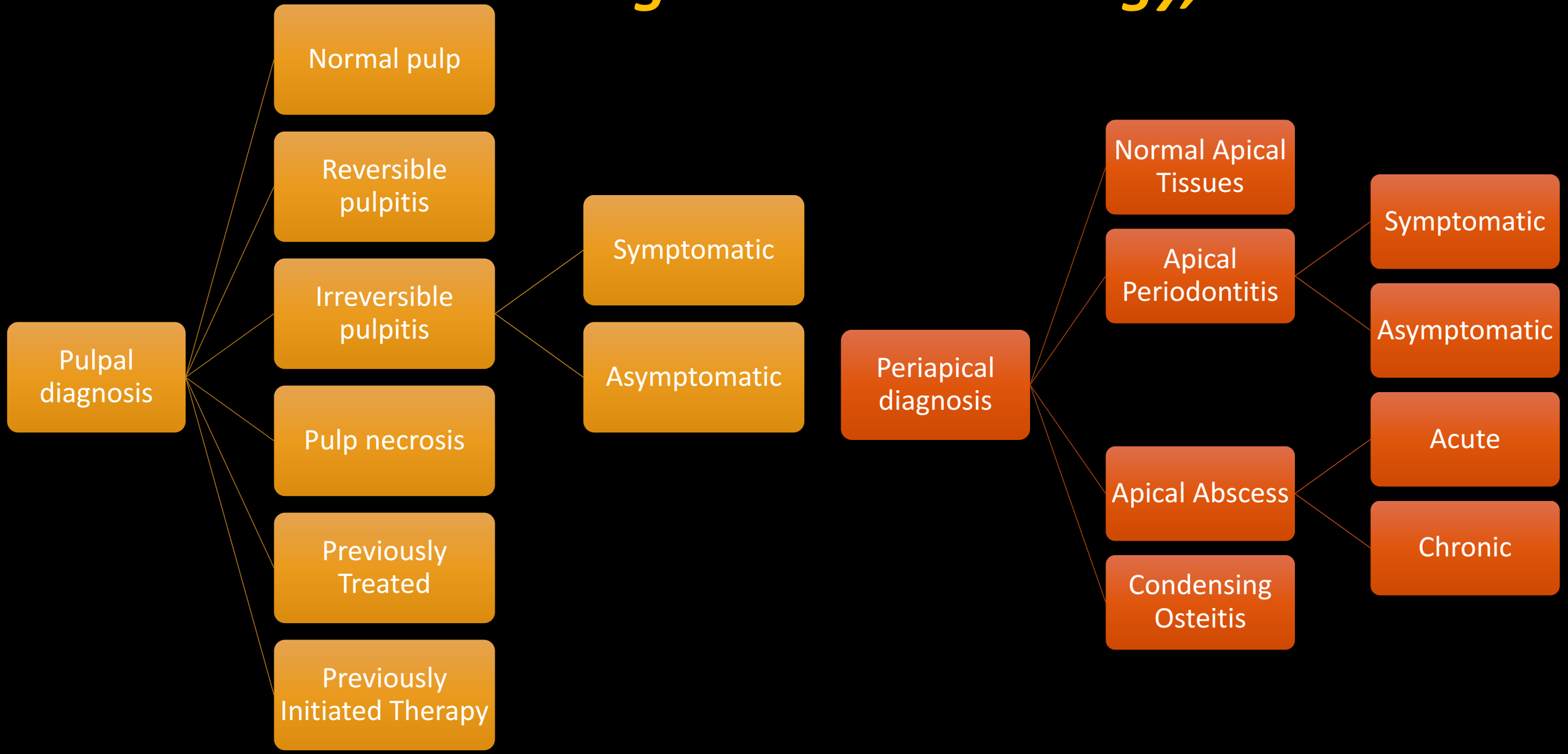

Step-by-step systematic approach
History
Clinical examination
Special investigations
Chief complaint
Medical
Dental
Social
Family
Extra-oral
Intra-oral
Soft tissues
Periodontal tissues
Hard tissues
Occlusion
Radiographic examination
2-D
3-D
- Palpation
- Percussion
- Mobility
- Pulp tests
- Bite test
- Staining
- FOTI
- LDF
- Radiography

# Special investigations:

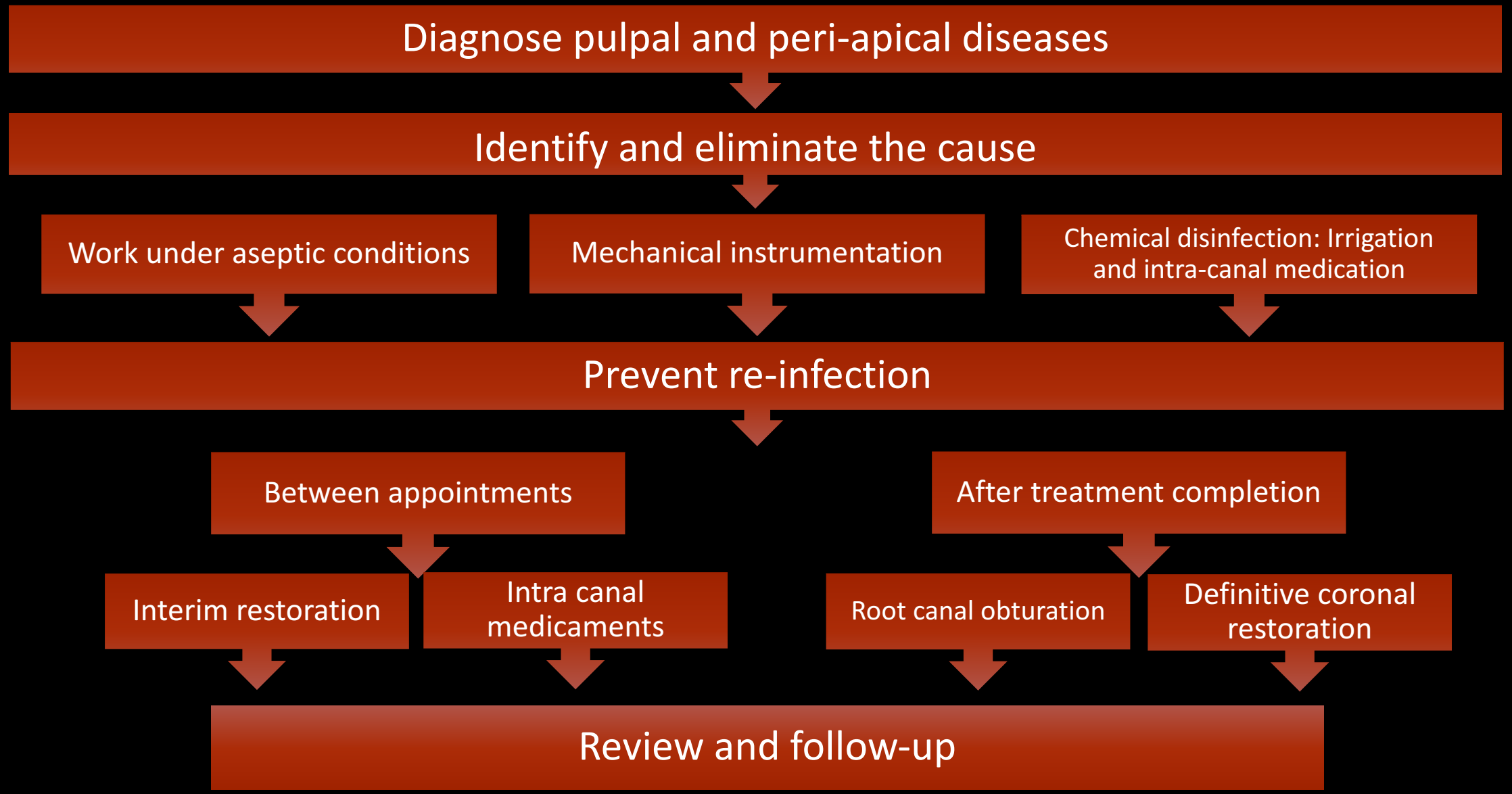
- Percussion
- Palpation
- Periodontal probing and mobility
- Periapical radiograph (Radiographic examination)
- Pulp tests (Thermal: heat and cold, Electric, selective anaesthesia, test cavity, LDF)
- FOTI: Fibro-optic transillumination
- Staining
- Bite test

Suspected crack/fracture

# The American Association of Endodontists (AAE) Recommended Diagnostic terminology, 2009



# Step by step endodontic treatment



# The objectives of access cavity preparation

(1) Remove all defective restorations and caries when present,

(2) Conserve sound tooth structure,

(3) Permit the removal of the pulp chamber roof and contents

If the chamber roof is not completely removed, it will not be possible to perform proper cleaning of the pulp horns. There are two consequences:
– contamination or infection of the endodontic space that the dentist is trying to clean.
– discoloration of the endodontically-treated tooth (especially the anterior teeth).

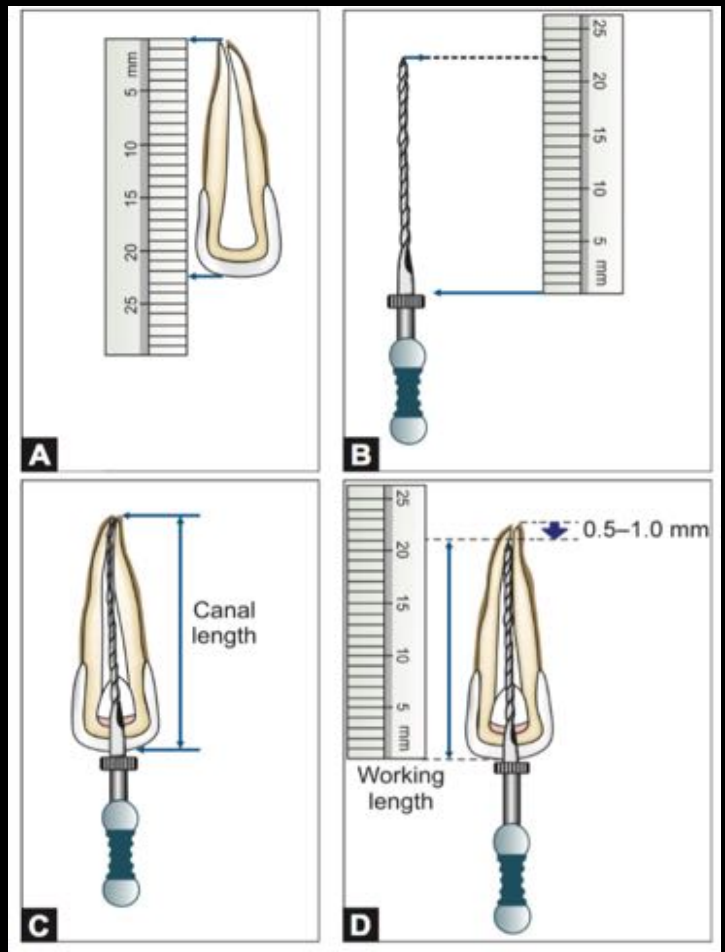
(4) Achieve straight- or direct-line access to the apical foramen or to the initial curvature of the canal.

(5) Permit complete, direct vision of the floor of the pulp chamber and all root canal orifices,

(6) Avoid damage to pulpal floor or perforation

# Methods for working length determination

1. Knowledge of dental anatomy and average roots' lengths
2. Tactile feedback from endodontic instruments
3. The paper point technique
4. Radiographic estimation of the working length
5. Electronic canal length measuring device
6. A combination of techniques



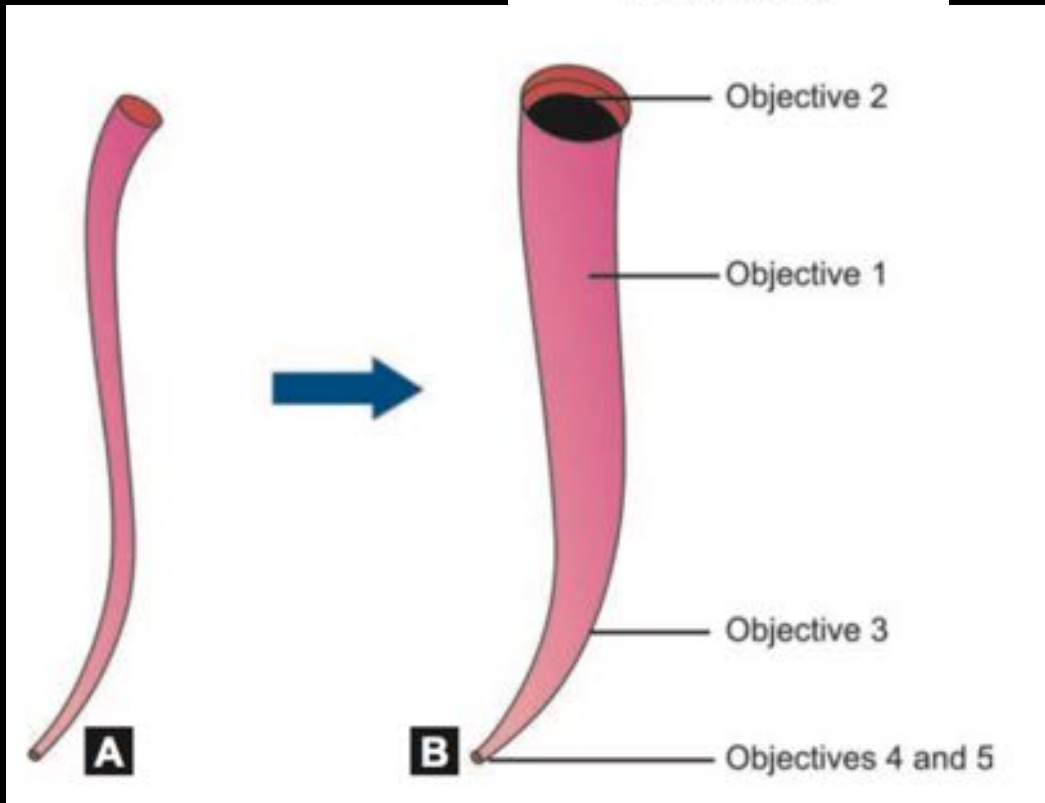
*"Unshaped canals cannot be cleaned and unshaped canals cannot be filled"*

Dr. Herbert Schilder

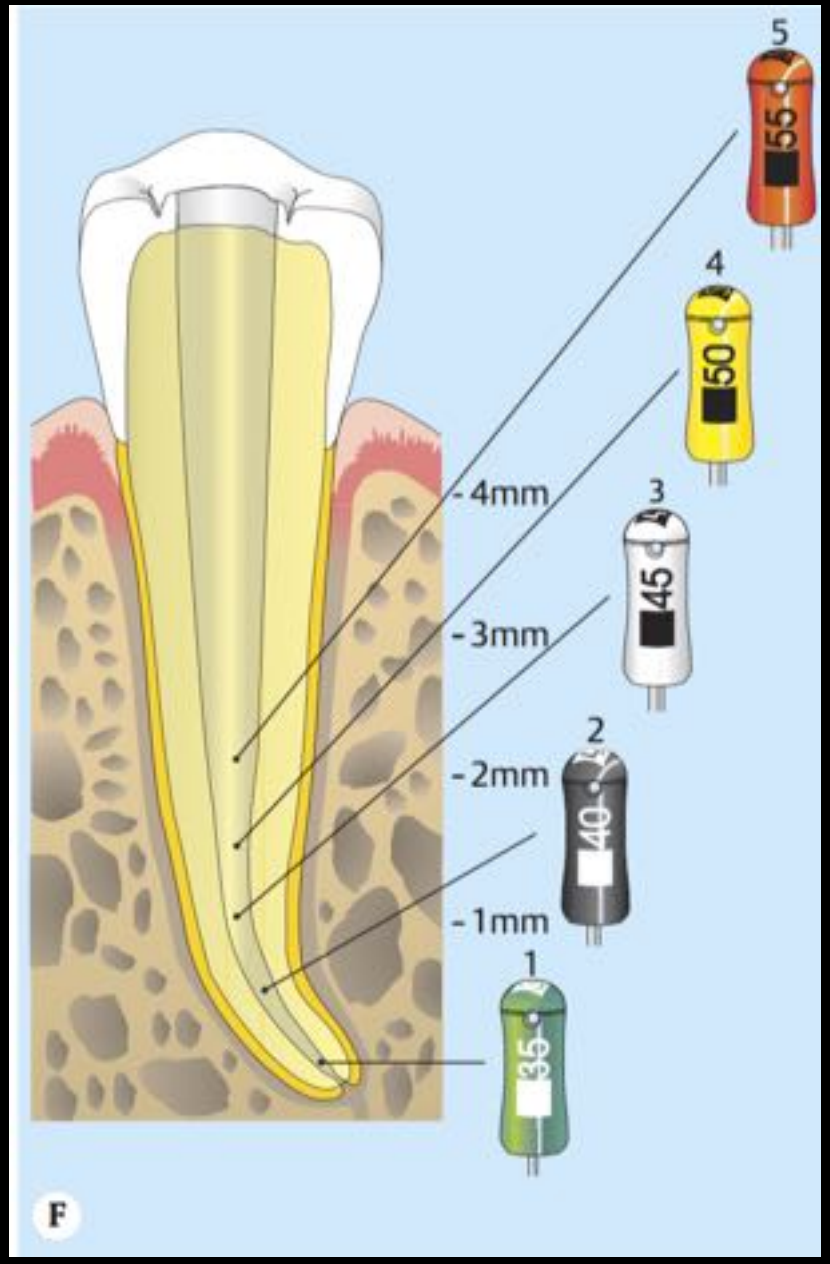
# SCHILDER'S MECHANICAL SHAPING OBJECTIVES


Dr. Herbert Schilder

- Continuous tapering canal preparation
- Cross sectional diameter narrower at every point apically
- Preparation should FLOW with the shape of the original canal
- Foramen position maintained
- Foramen as small as practical



The purpose of canal shaping is to facilitate cleaning and provide space for placing the obturation materials.




# Step-back Technique

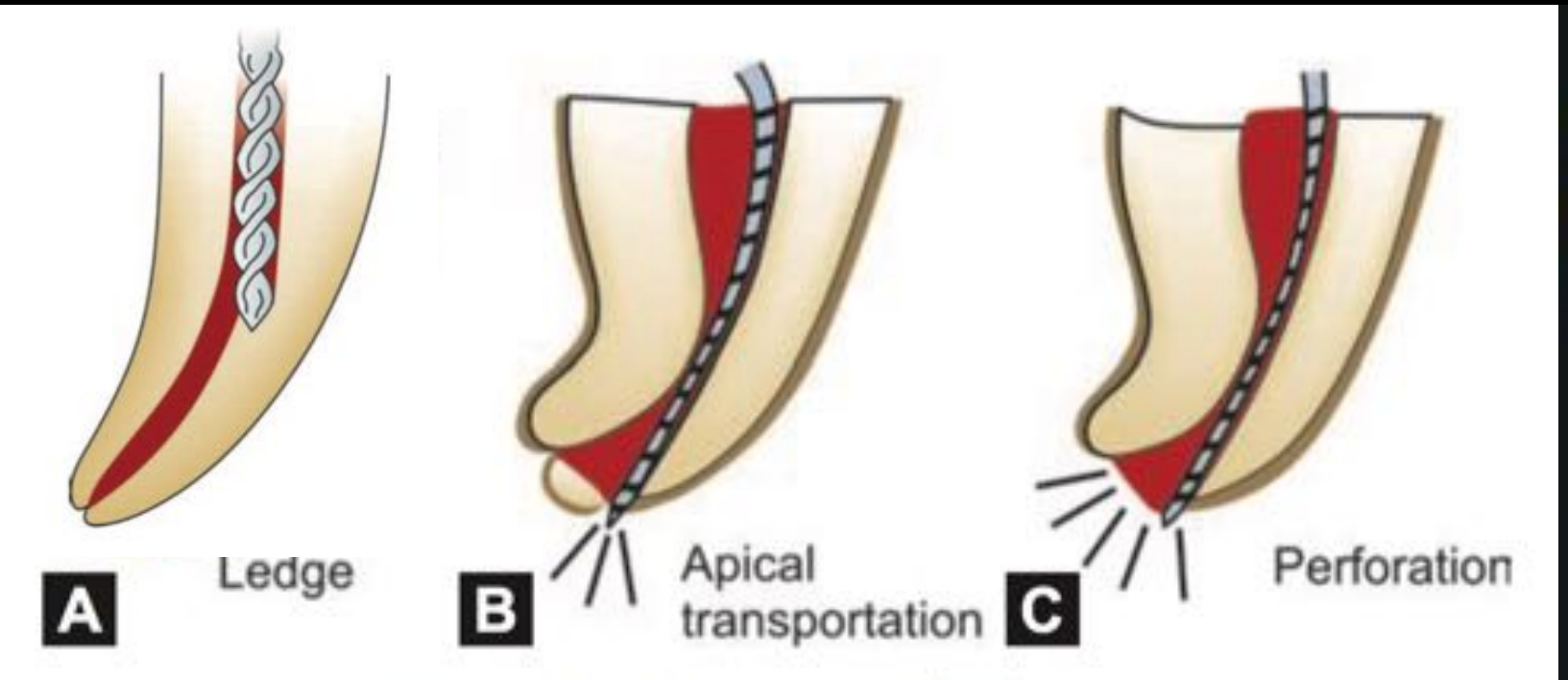
- Determine the WL
- Apical preparation and determination of the MAF
- Succeeding larger files are shortened by 0.5 or 1.0 m increments from the previous file length.
- Circumferential filling, balanced force, anti-curvature filing

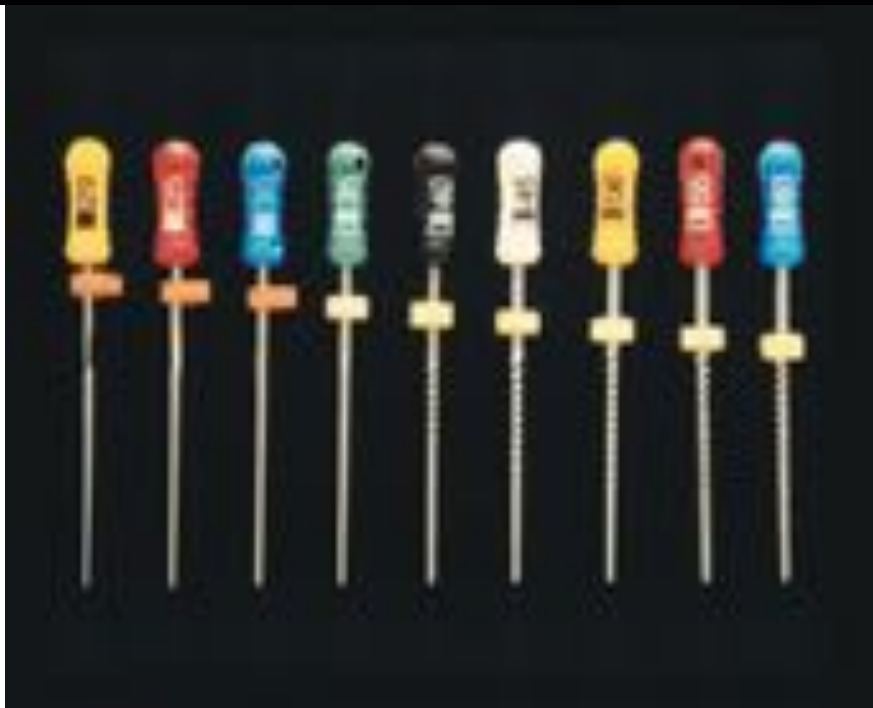
# Drawbacks of the step-back technique

- High risk of apical extrusion of debris, apical blockage and alteration of WL

# Drawbacks of the step-back technique

- Risk of procedural errors such as transportations, ledging and perforation



TIME FOR
SOMETHING
NEW!


Rawan Abu Zaghlan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# Stainless steel VS Nickel-titanium

- Different materials (metallurgy)
- Different shapes (taper)

# Ni-Ti
# (55 wt% Ni and 45 wt% Ti )

- Austenite – Rhombohedral (R-phase)– Martensite
- Superelasticity and shape memory
- Superelasticity of NiTi alloys, it should be in the austenitic state, which is the high-temperature parent phase of NiTi alloy

# IRRIGATING SOLUTIONS

- Sodium hypochlorite (NaOCl)
- Ethylenediamine tetra acetic acid

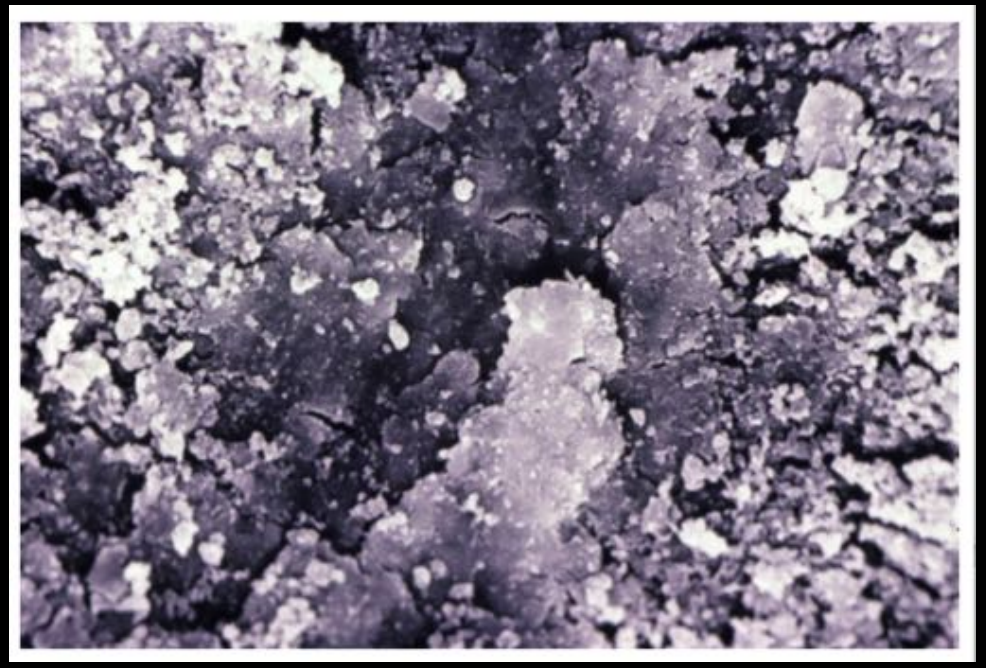
# Sodium Hypochlorite (NaOCl)

- Sodium hypochlorite (NaOCl) is the most popular irrigating solution
- NaOCl is commonly used in concentrations between 0.5% and 6%
- It is an excellent **antibacterial** agent
- Hypochlorite is **the only root-canal irrigant of those in general use that dissolves necrotic and vital organic tissue**
- It dissolves the organic part of the smear layer,
- It should be **used throughout the instrumentation phase**

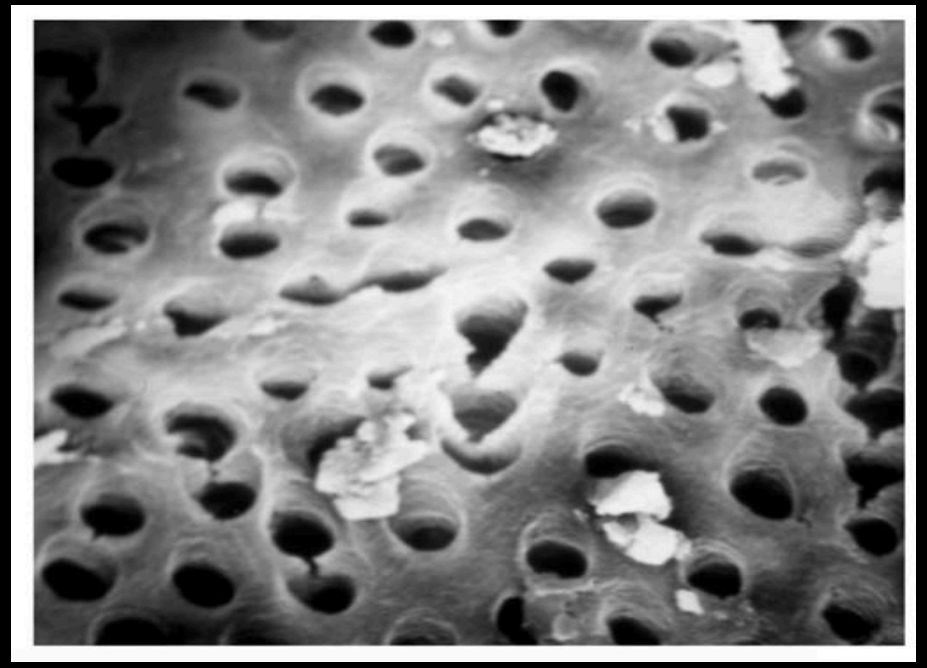
# EDTA
# Ethylenediamine tetra acetic acid


- A chelating agent
- EDTA effectively dissolves inorganic material, including hydroxyapatite,
- It should be used as an adjunct to sodium hypochlorite,
- EDTA should be used as a penultimate wash followed by final rinse with NaOCl solution  before obturation

# Removal of the smear layer



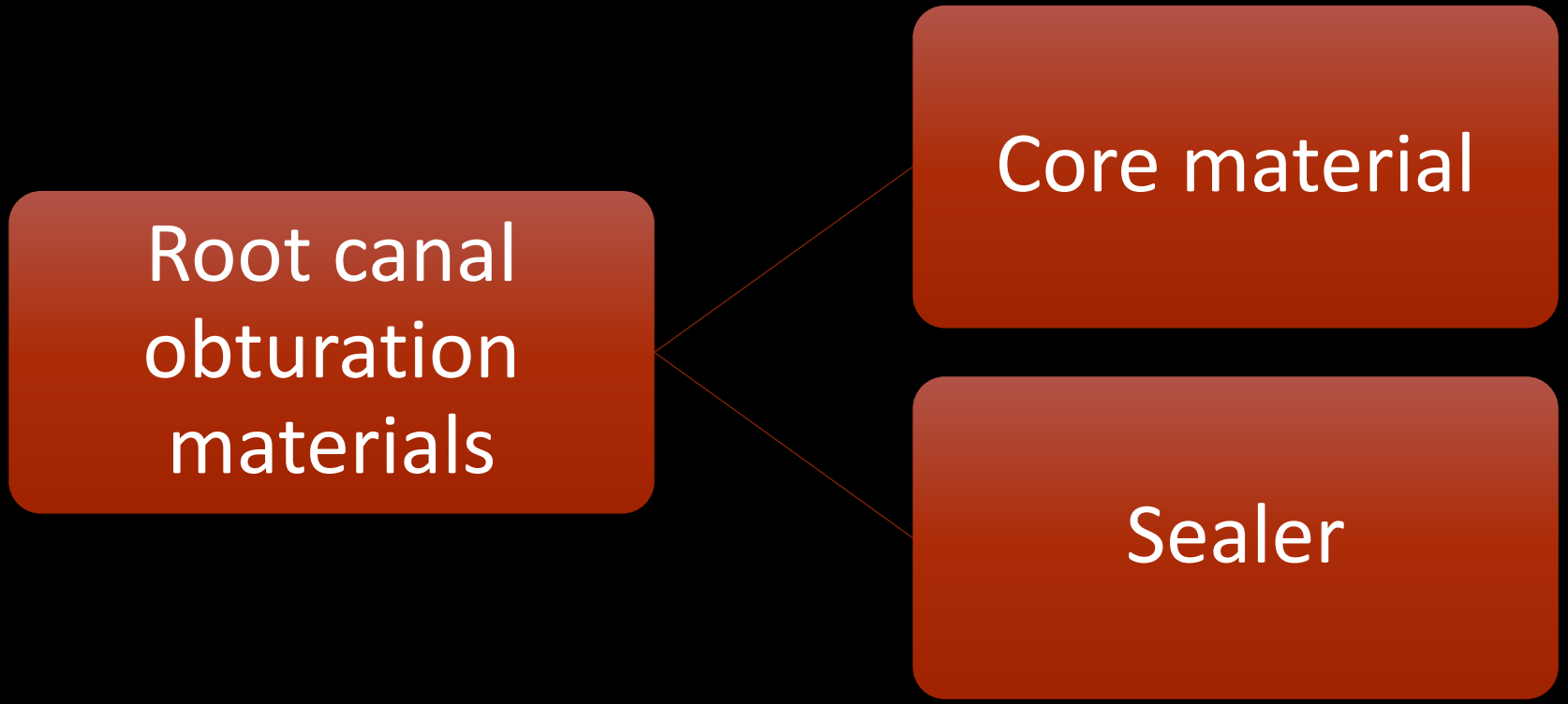
**Scanning electron microscopy of a prepared canal wall after root canal preparation. The tubules are covered with a smear layer of organic and inorganic material.**



**Scanning electron microscopy of the canal wall after removal of the smear layer with 17% EDTA and 5.25% sodium hypochlorite.**

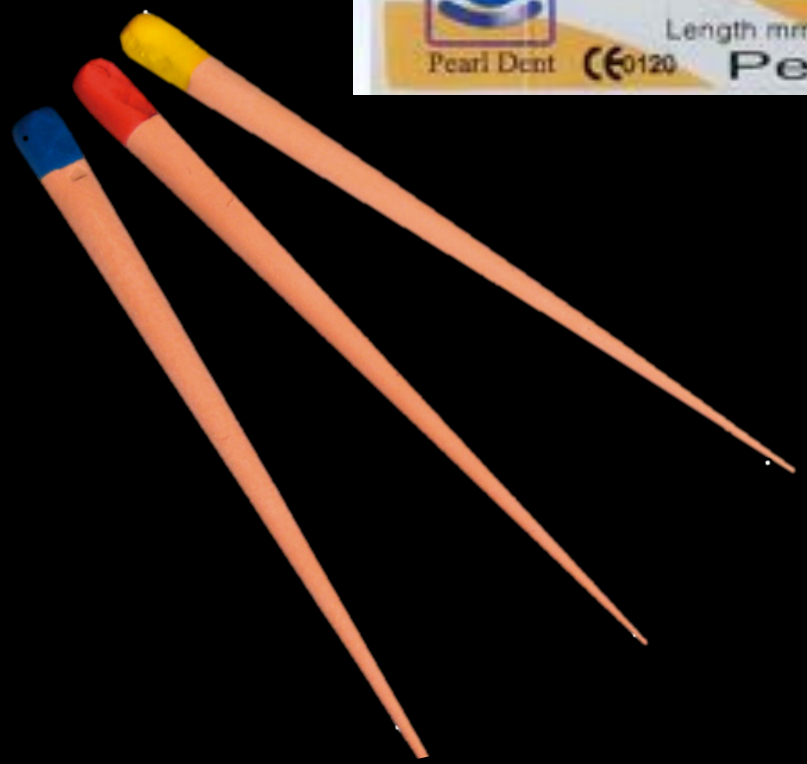
# Obturation of the Cleaned and Shaped Root Canal System

The purpose of obturation is two-fold; to prevent microorganisms from re-entering the root canal system, and to entomb any microorganisms that may remain within the tooth and prevent their survival by obstructing the nutrient supply.


Root canal obturation materials
Core material
Sealer

# Gutta-percha

- Gutta-percha is the most popular core material used for obturation


Mix the sealer properly untill it
becomes homogenous and creamy

# Cold lateral compaction

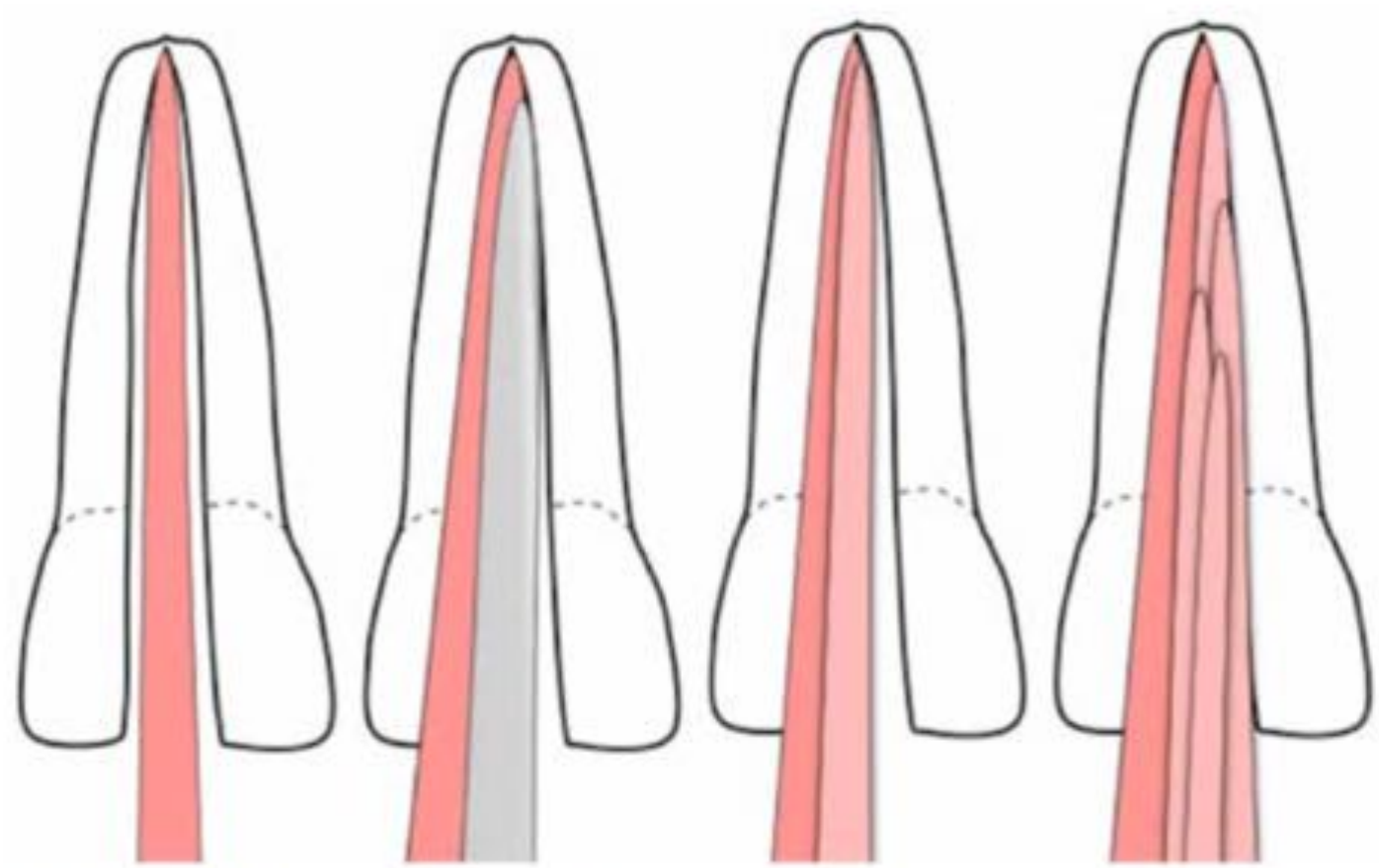


**Figure 5.** Cold lateral compaction following the placement of the master GP point. It is compacted against the canal wall with a spreader. An additional GP point is then placed into the void left by the spreader. The process is repeated until the canal is filled.

# Endodontic treatment phase

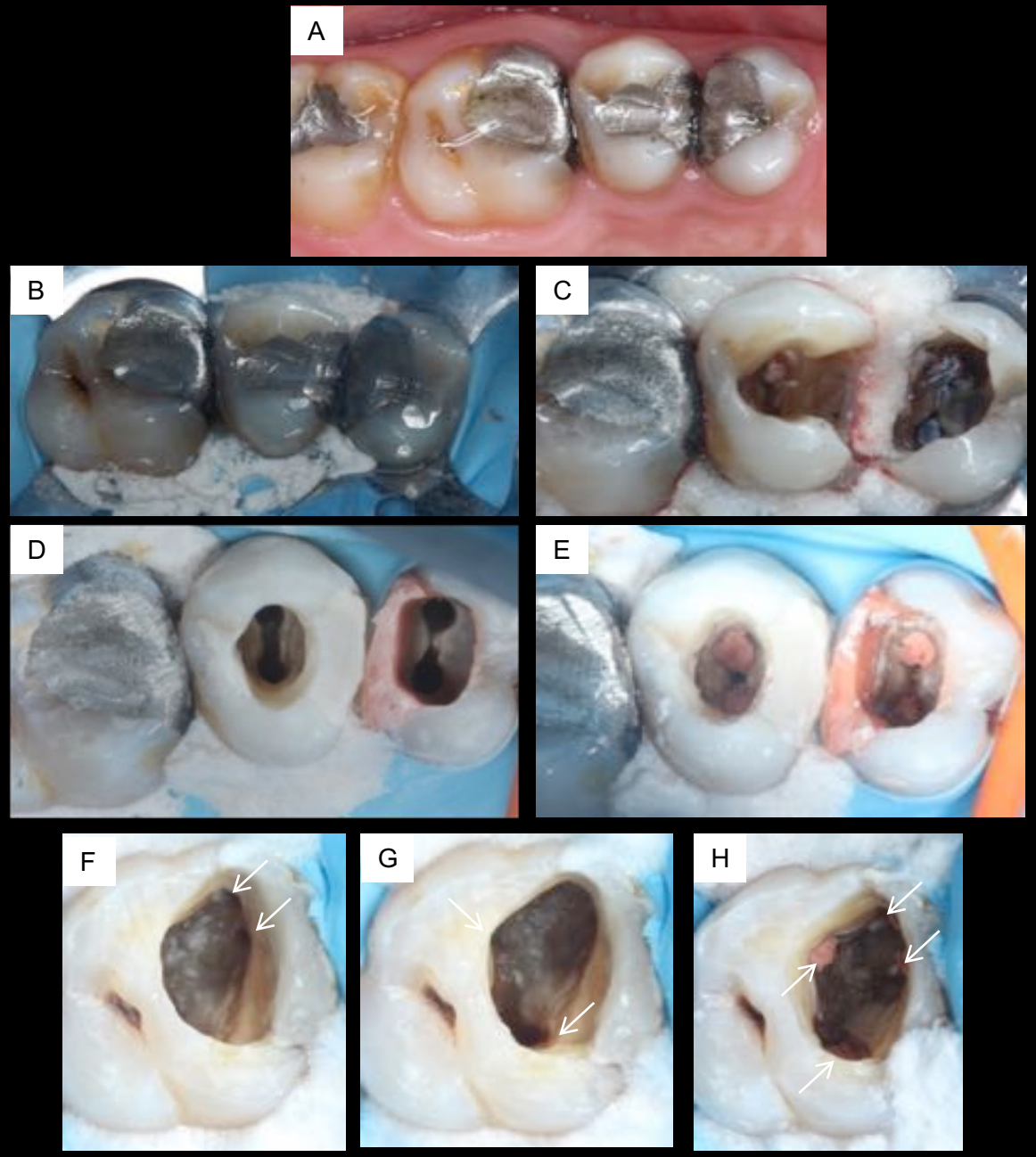



Figure 3 (A) Pre-operative occlusal view of 14-16, (B) Multiple-tooth rubber dam isolation. (C) Coronal restorations on 14 and 15 were dismantled, (D) Pre-endodontic build up and access cavity preparation on 14 and 15, (E) Root filling terminated at the orifice levels. Four canals were located in tooth 16: (F) MB 1and 2, (G) DB and P, (H) Root filling terminated at the orifices' levels

# Restorative treatment phase


Figure 7 Stages of fabrication of the ceramic onlays on 14-16. (A) Occlusal view of the teeth after preparation, (B) The final impression, (C) The provisional restorations *in-situ,* (D) The final restorations pre-fitting, (E) Enamel etching using phosphoric acid, (F) The fitted ceramic onlays

# Post-treatment radiographs

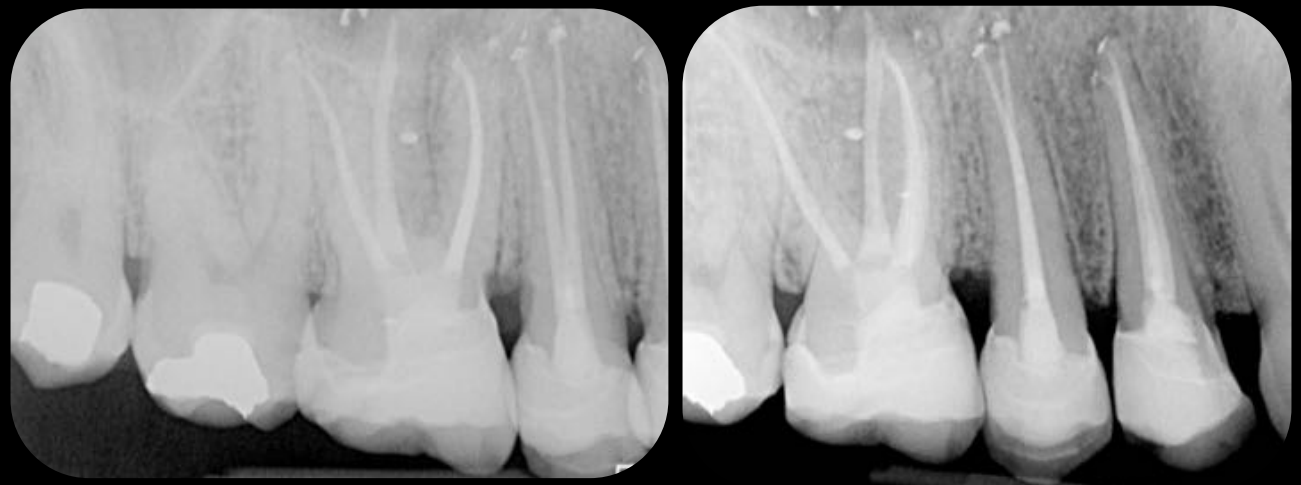


Figure 8 Post-treatment periapical radiographs

- That root canal-treated (RCTed) teeth are more susceptible to fracture is a widely held clinical impression and they may, therefore, require different considerations when restoring them compared to vital teeth.

- The high fracture rate of endodontically-treated teeth, especially immature anterior teeth and posterior teeth (particularly mandibular molars) restored with MOD plastic restorations (composite or amalgam) has been documented.

- The options for restoration of RCTed need careful consideration because more endodontically treated teeth are lost as a result of restorative factors than as a result of failure of the root canal treatment itself

Thank you for your attention

Time for some questions….