Biological rational and determination of working length

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Rational of Endodontic Treatment

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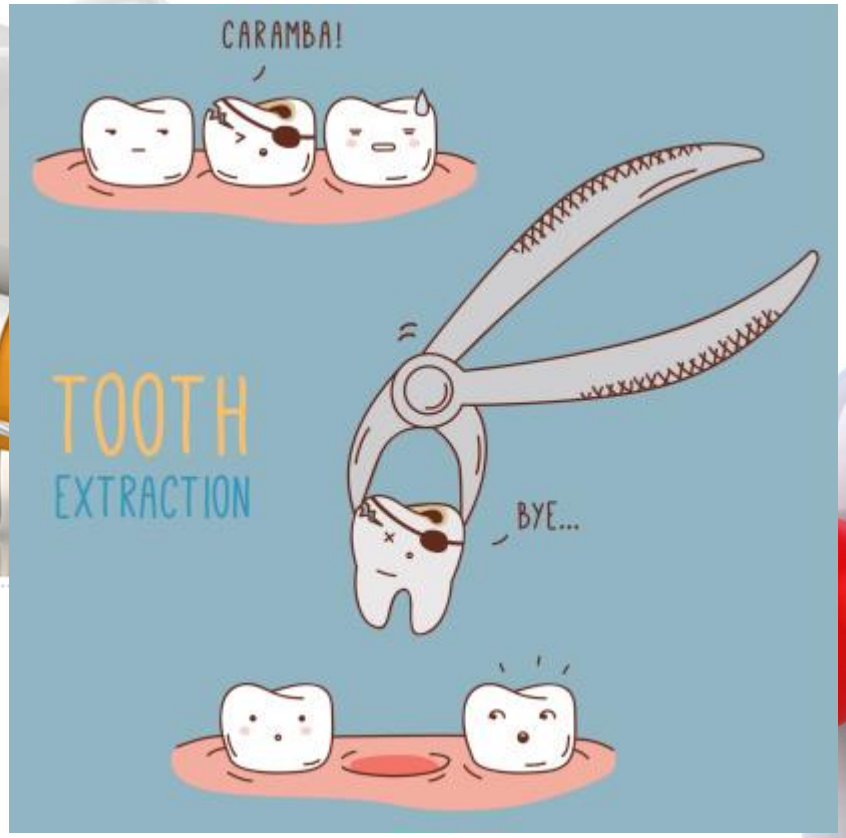
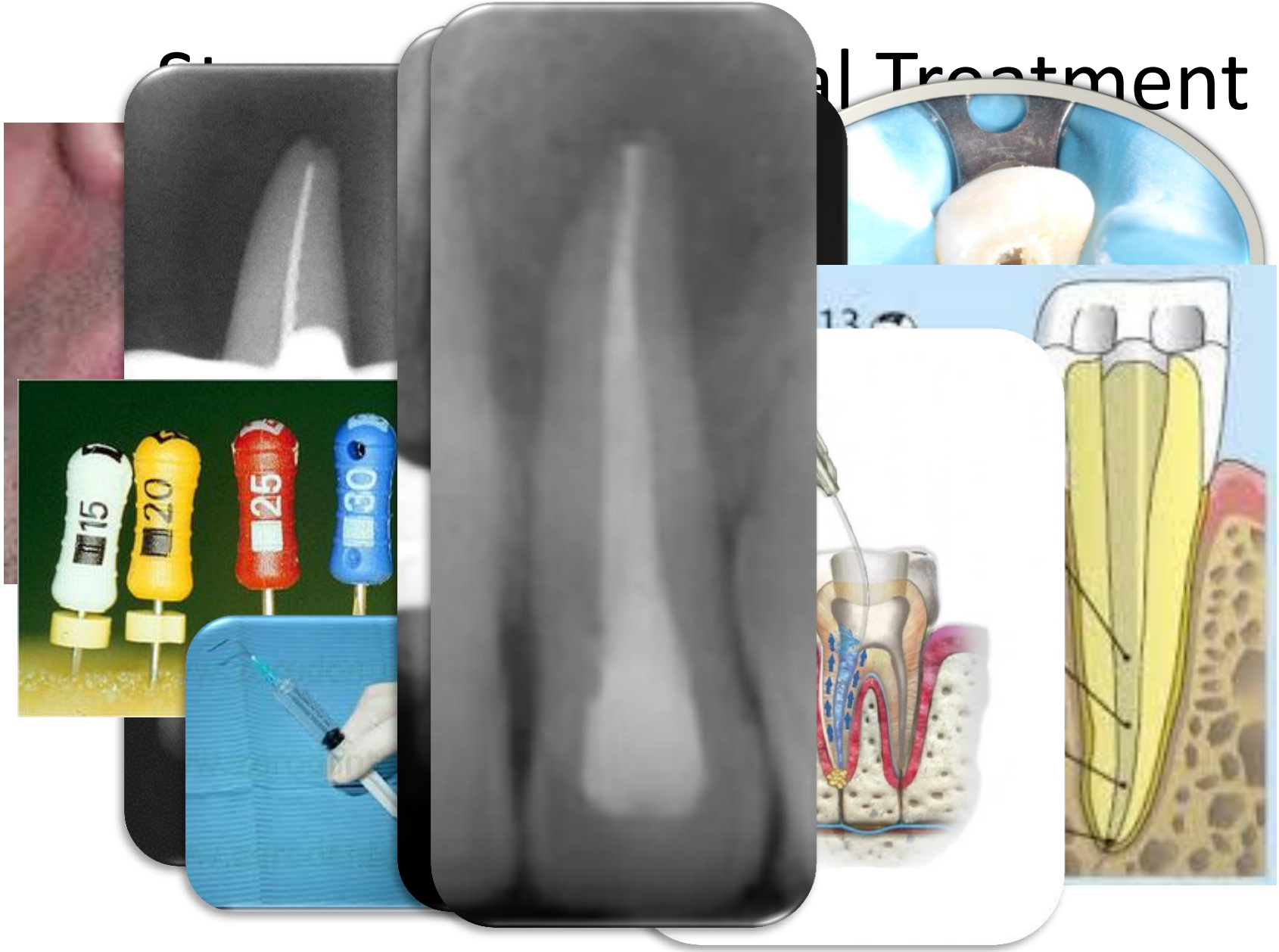
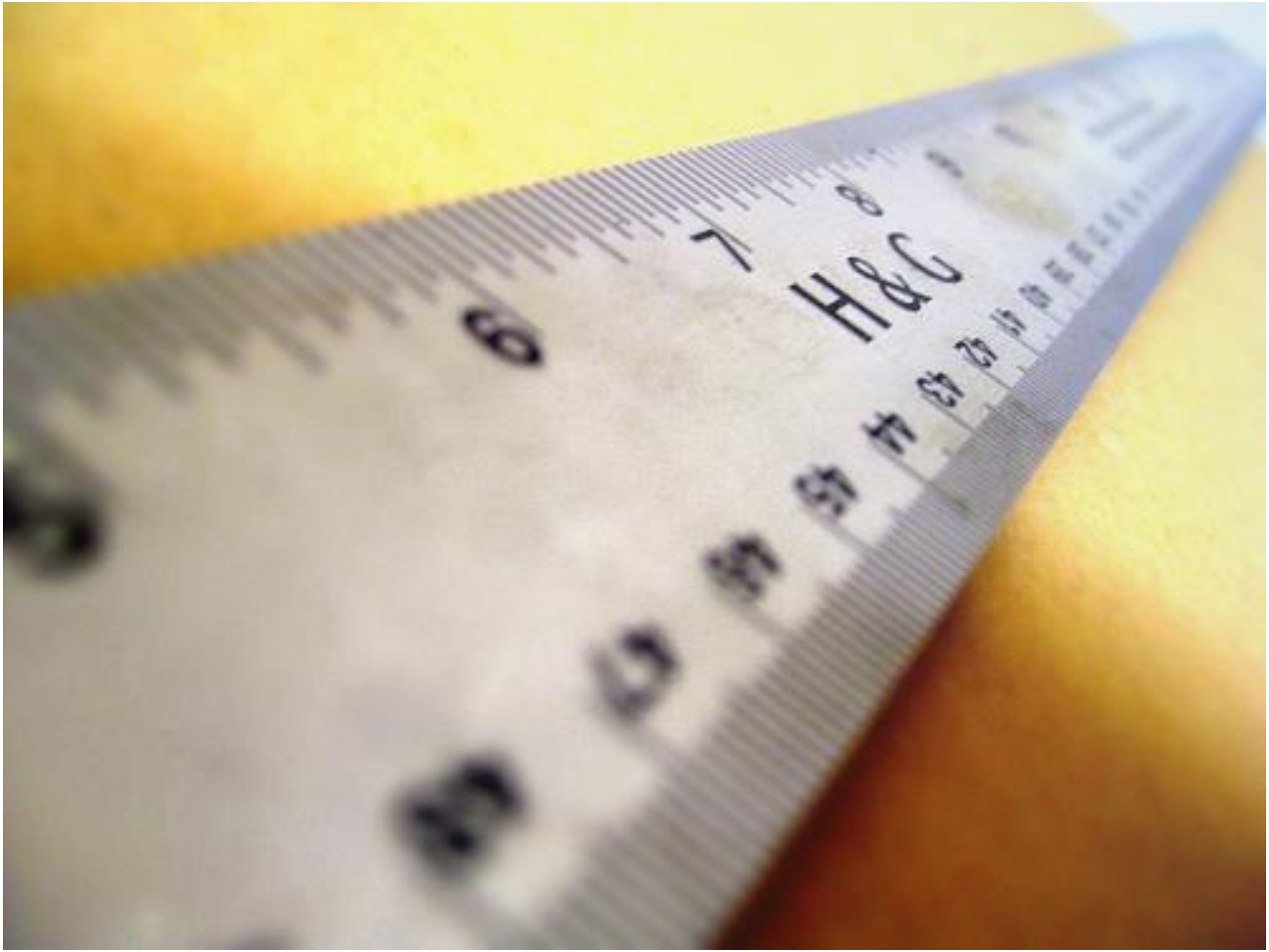
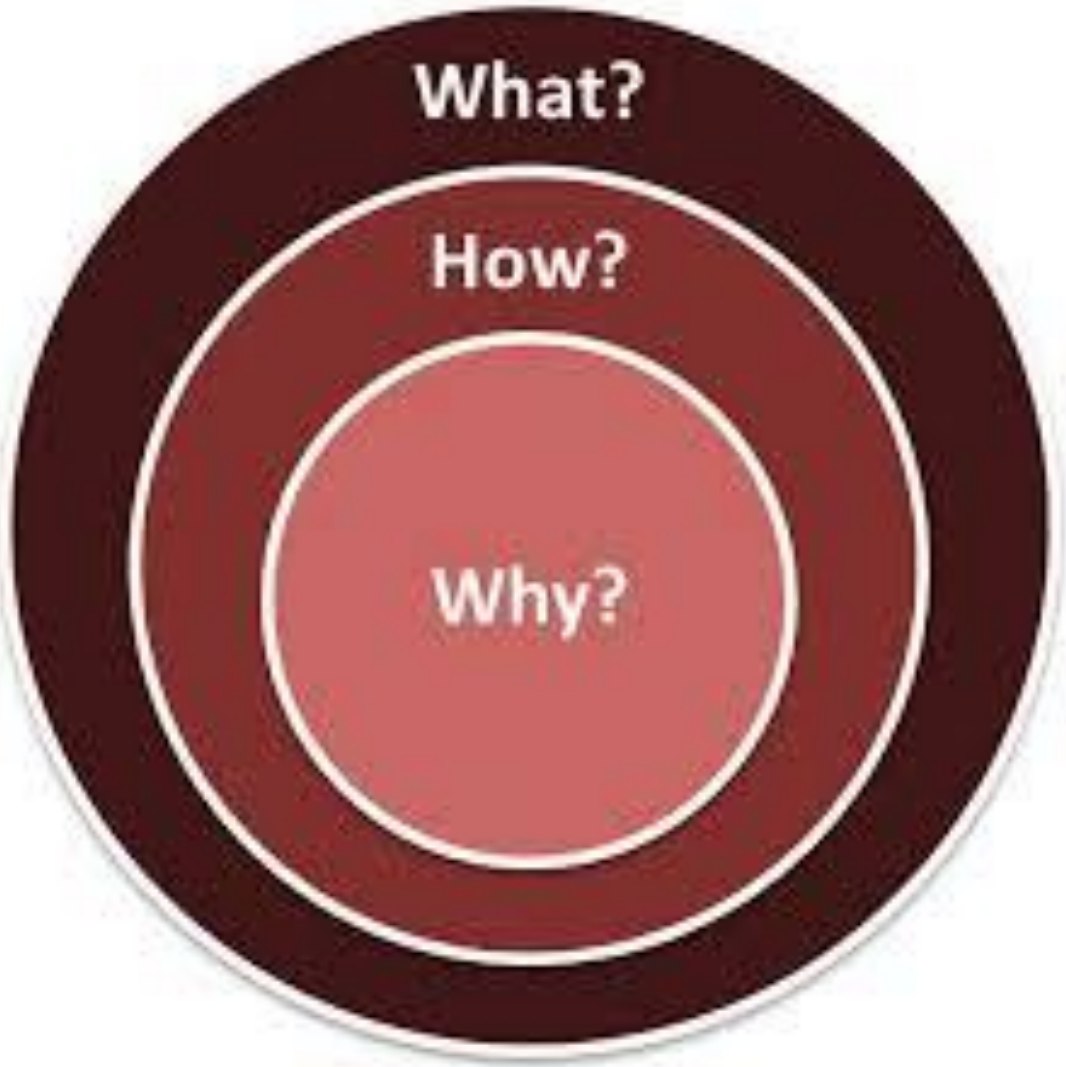


St al Treatment




H&C

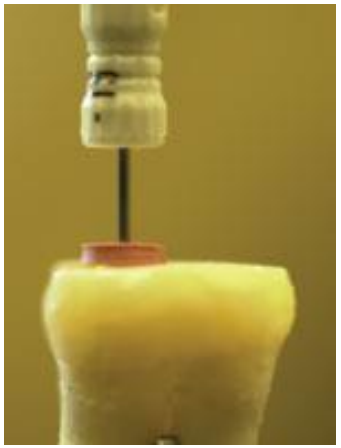

What?
How?
Why?

Working Length Determination

- Working length

Is defined as the distance from a predetermined coronal reference point to the point at which the canal preparation and obturation (filling) should terminate.

Coronal reference point

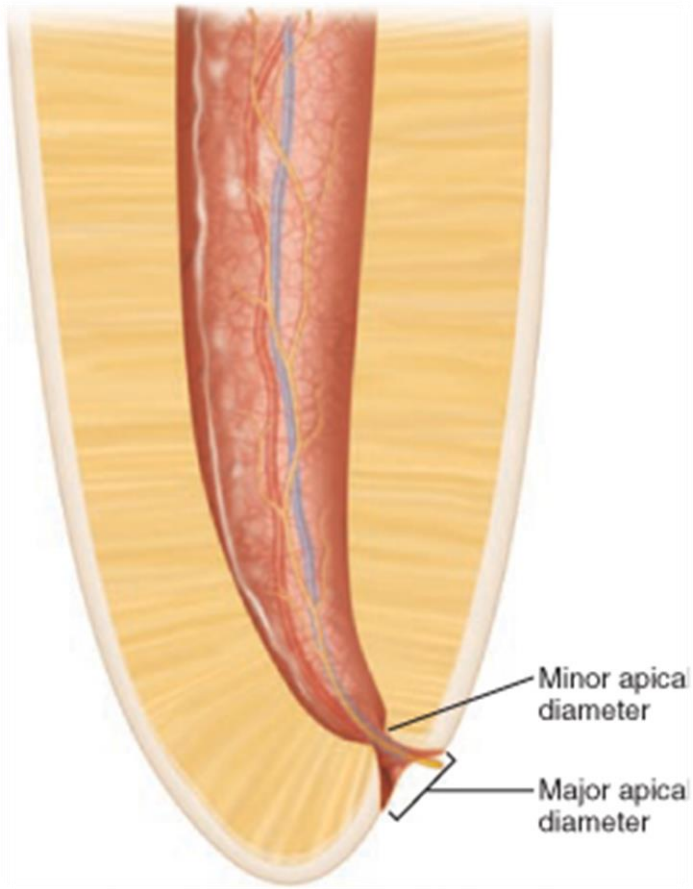


- Should be “predetermined”
- Should be a **stable flat surface**
- Should not be on a filling/undermined and weak tooth structure
- Should be the closest possible to the canal side
- Should be RECORDED

The Termination Point

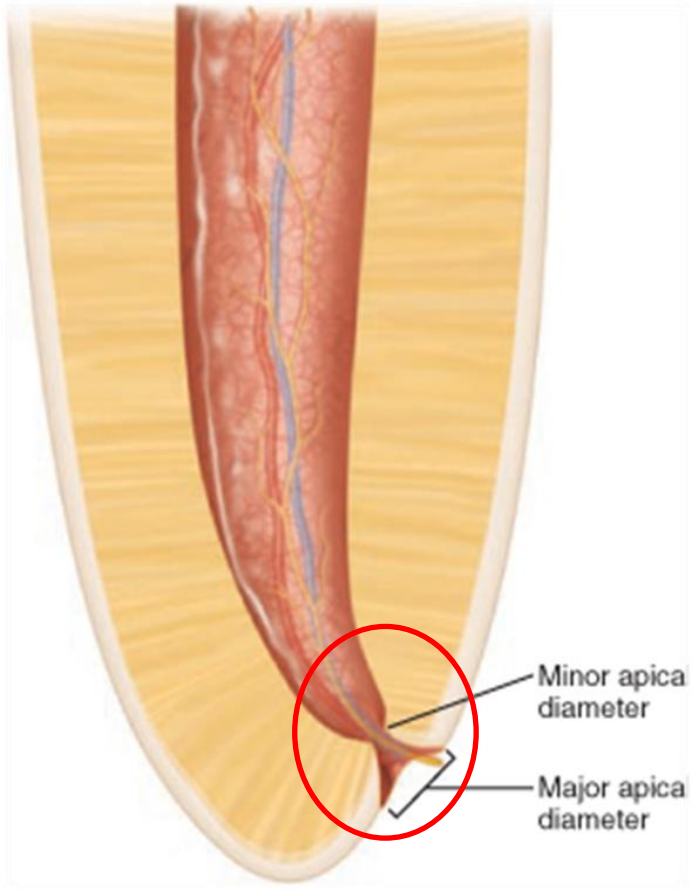
- Where does the “Root Canal” End?

The Termination Point



- Apical Foramen
- CementoDentinal Junction
- Minor Apical Diameter (Apical Constriction)
- Major Apical diameter
- Root Apex

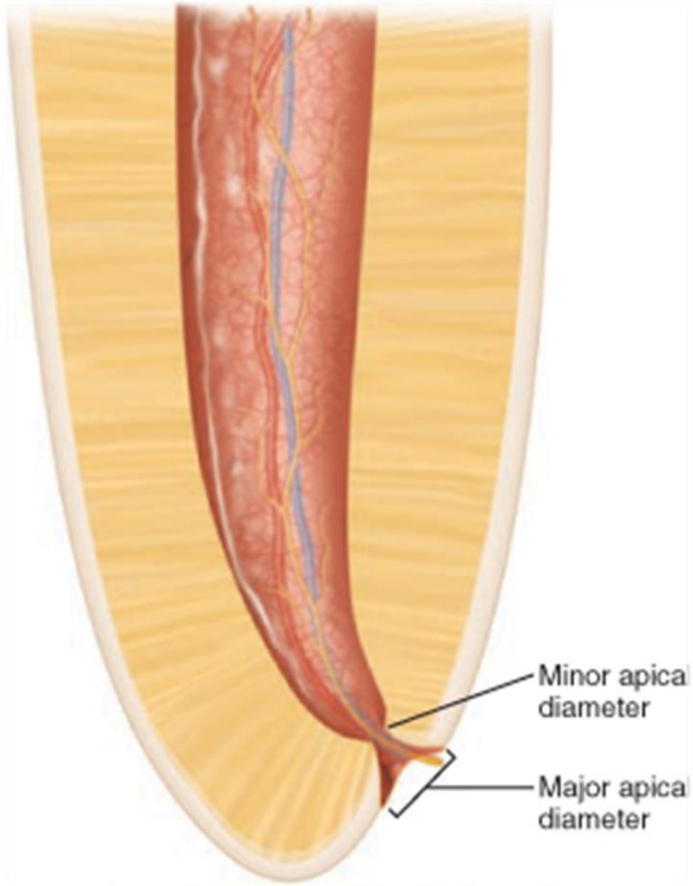
The Termination Point



Apical Foramen

- A rounded edge, like a funnel or crater, that differentiate the termination of the "cemental" canal from the external surface of the root.
- More of a 3 Dimensional "area" than a point
- Does Not normally exist at the Anatomical Apex but Offsets 0.5-3mm.

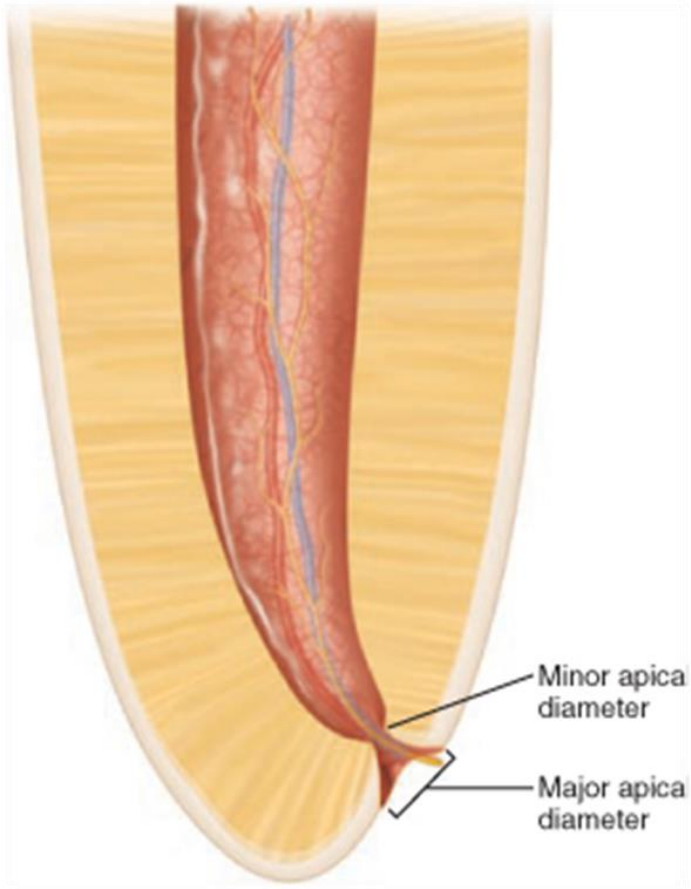
The Termination Point



Cemento-Dentinal Junction

- The point in the canal where the Dentin meets the Cementum (where the pulp ends and periodontal ligament starts.
- Position is unpredictable and varies 0.5-3mm from anatomical apex
- Position varies with age (cementum deposition)
- Is not the same as the apical constriction
- Is a histological landmark

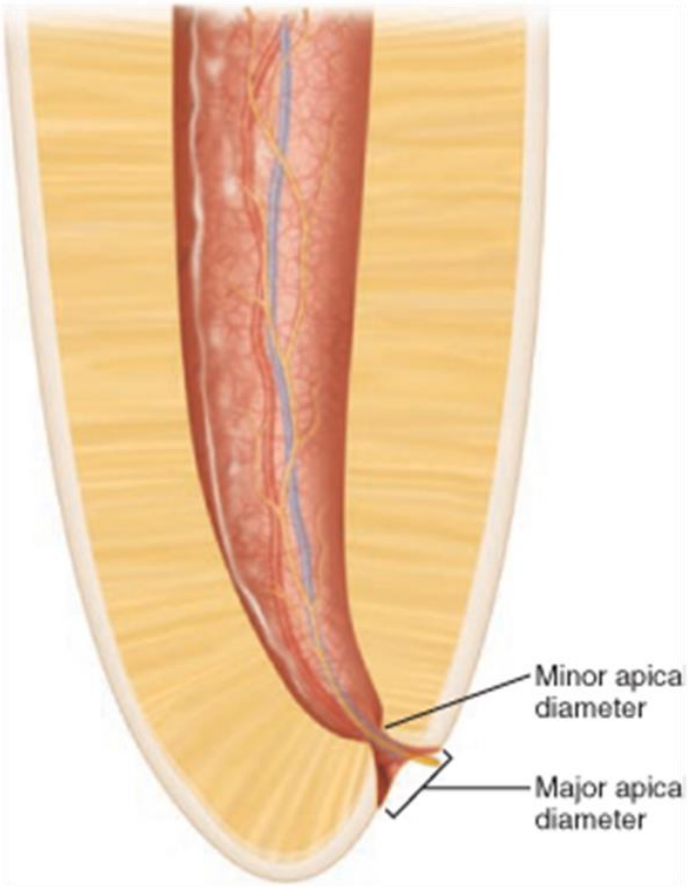
The Termination Point



Apical Constriction

- The most apical portion of the root canal having the narrowest diameter.
- Position may vary, but on average it is 0.5mm from the apical foramen.
- Sometimes not present at all!!!

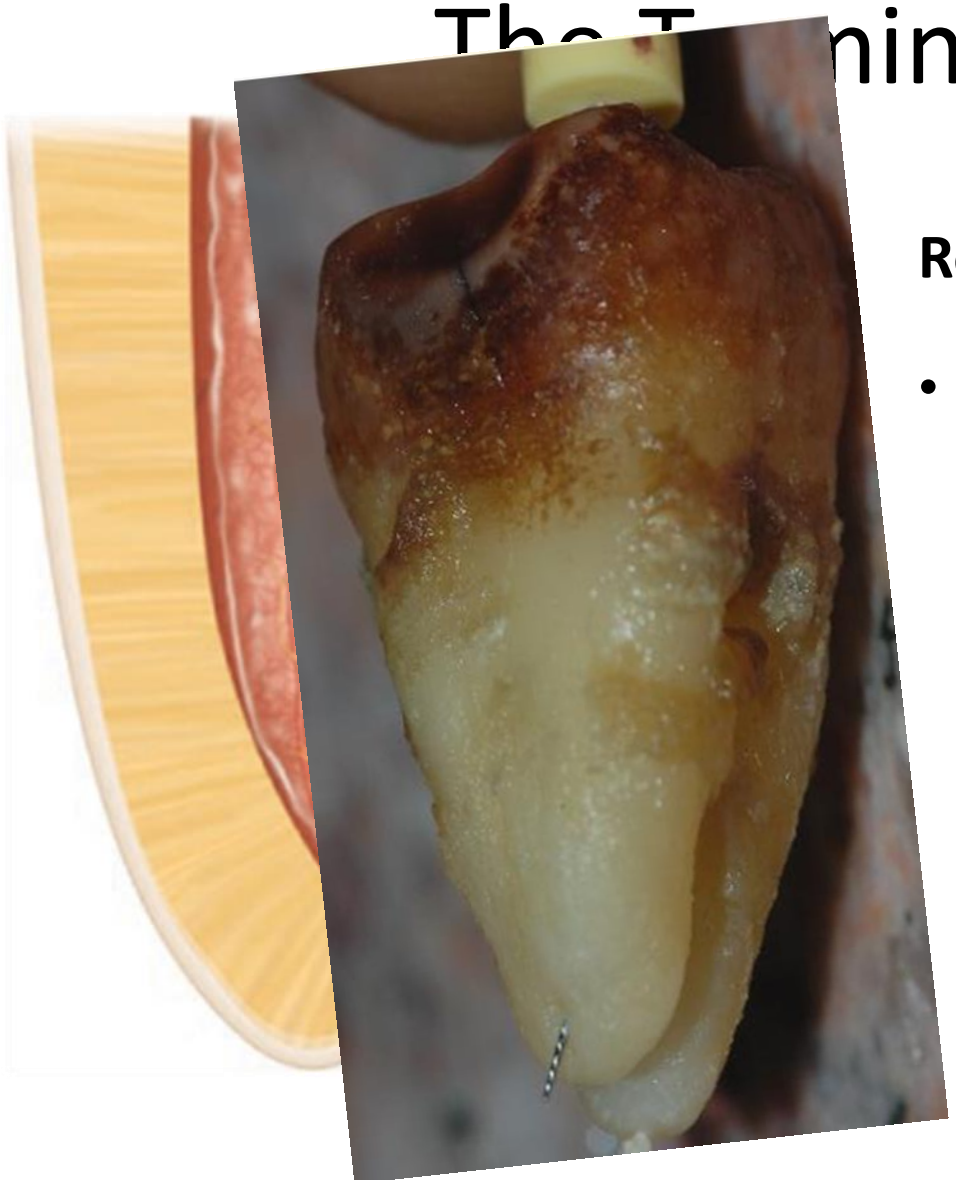
The Termination Point



Major Diameter

- The diameter of the apical foramen at the surface of the root

The Termination Point



Root Apex

- The tip or end of the root as determined Morphologically or Radiographically

The Termination Point

- Clinically,
  - The M[illegible]meter
  - The Ap[illegible]
  - Cem[illegible] Dentina[illegible]tion
  - Apical constriction

The Termination Point

- Apical constriction

Was chosen by clinicians as the termination point of canal preparation and obturation

The Termination Point

- Apical constriction
  - The narrowest part of the canal= smallest wound area= faster healing and less discomfort
  - Allows for incorporation of the “whole” root canal in the preparation and obturation= better outcome
  - Easier to contain irrigating solutions, medicaments, and obturation materials and

The Termination Point

- How to ***<u>Locate</u>*** this termination point?

- Estimation based on average anatomical length
- Tactile sensation
- Paper point technique
- Patient Sensation ("Ouch" Technique
- Radiographically
- Electronically (Apex Locators)

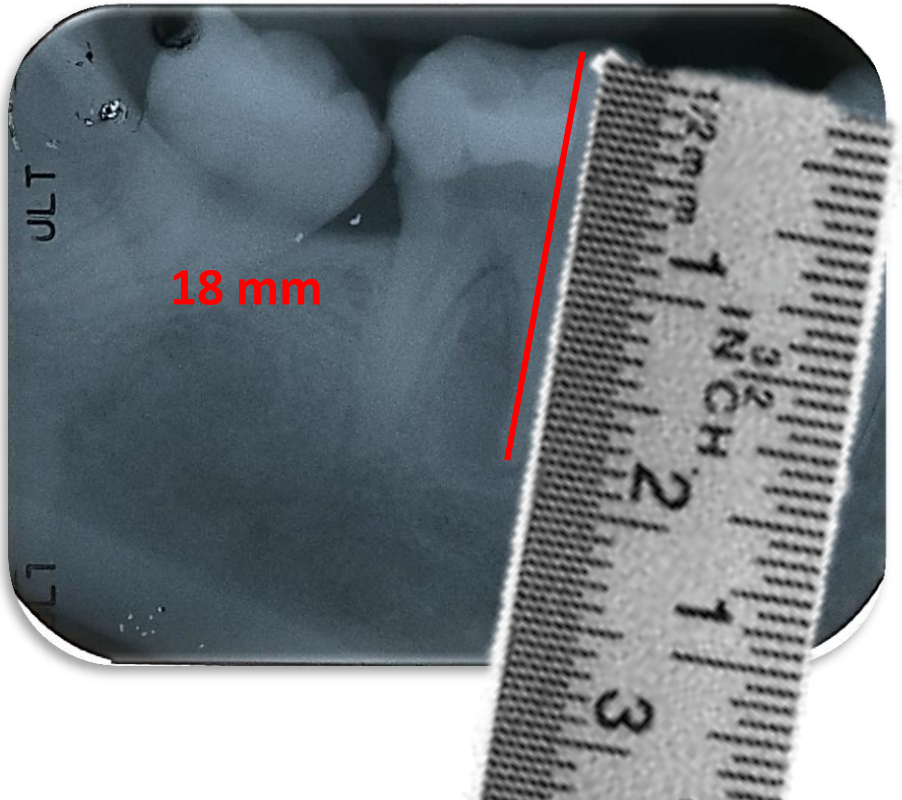
Working Length Determination

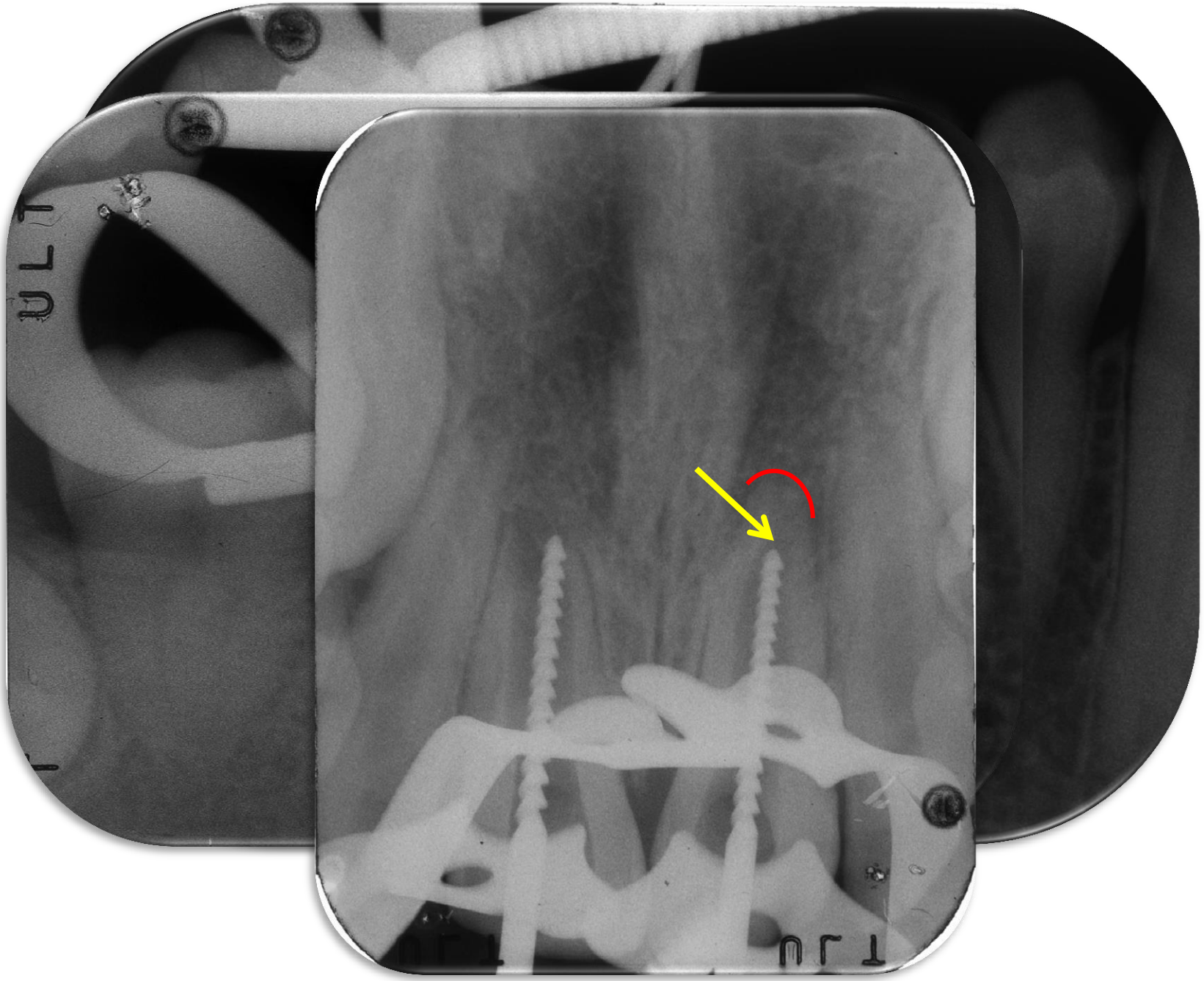
Radiographically=

- Apical constriction can NOT be detected
- Based on average distance between the apex and the apical constriction (0.5mm)

Working Length Determination

- Use File # 15 or larger with conventional radiography, placed to the “estimated” working length *





Working Length Determination

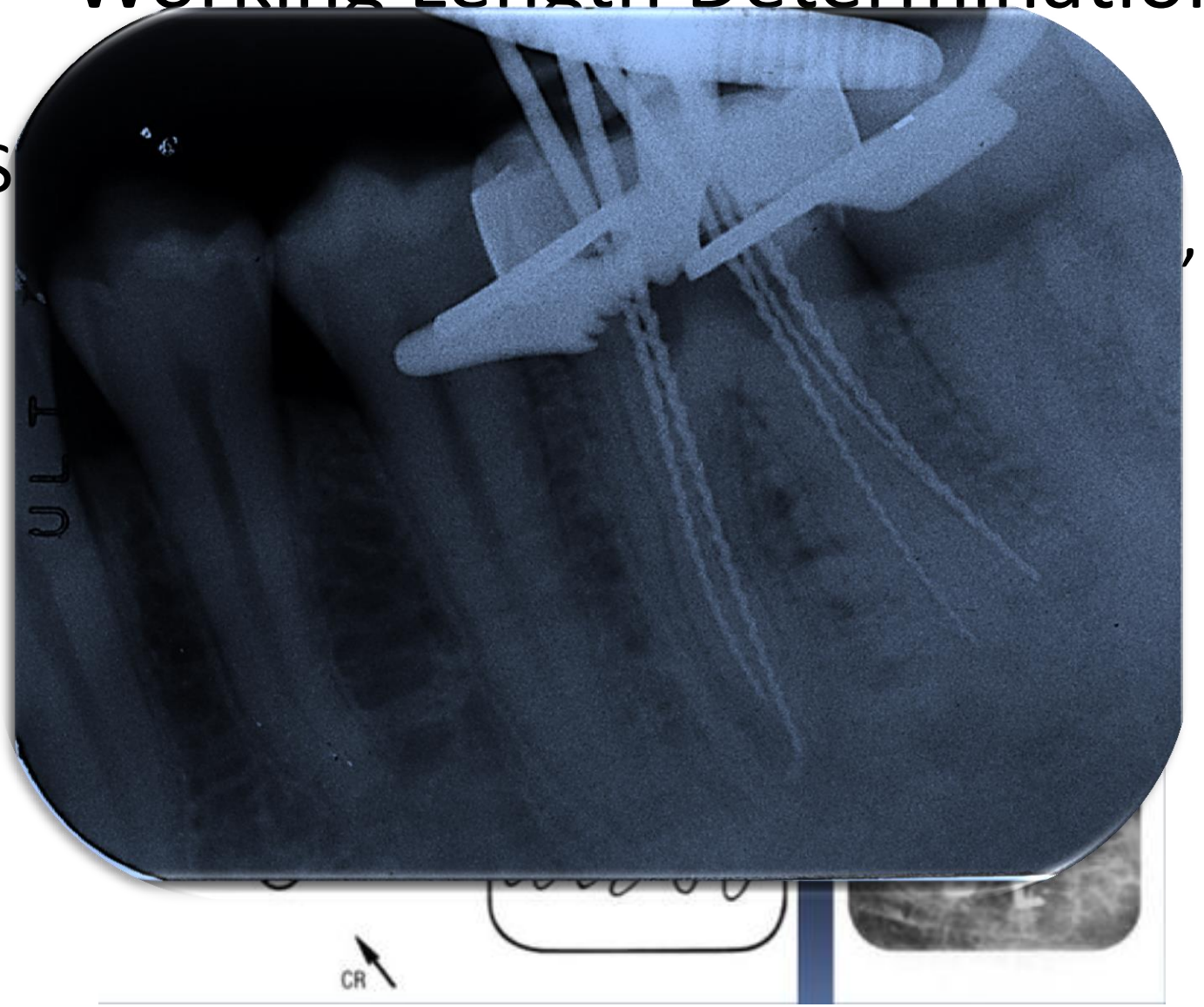
- A 10-20° Angulation/shift radiographs are necessary to separate superimposed files and structures

Recommendations *(Endodontics, Principles and Practice TextBook)*

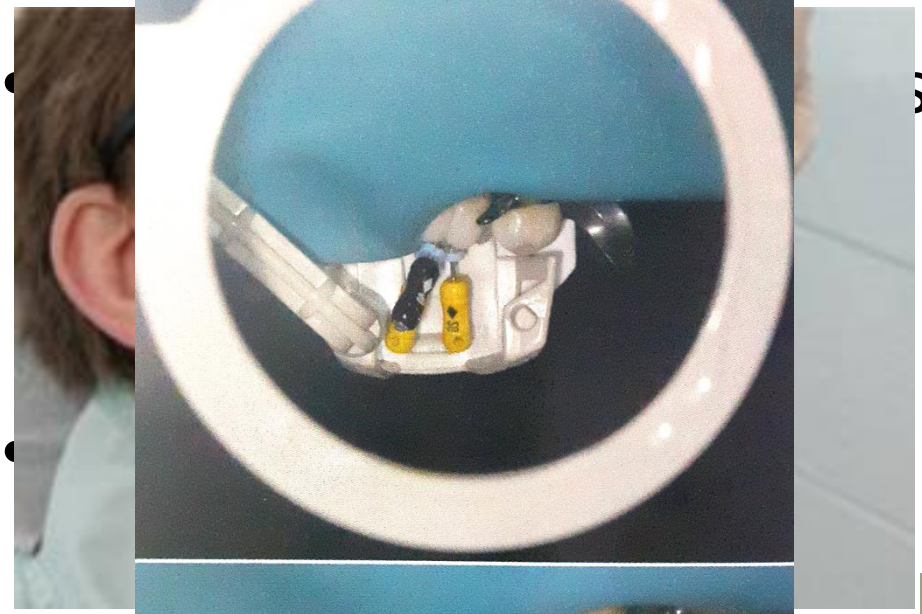
- Upper anterior teeth= no angulation
- Upper posterior teeth = M angulation
- Lower Anterior teeth and Molars= D angulation
- Lower Premolar= M angulation

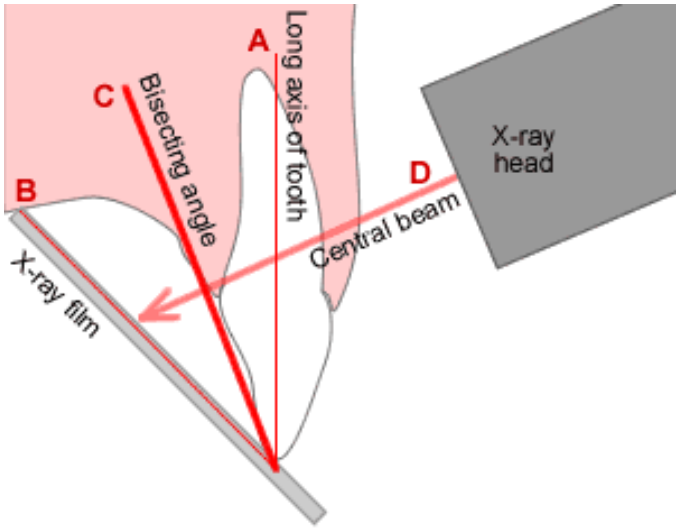
Working Length Determination

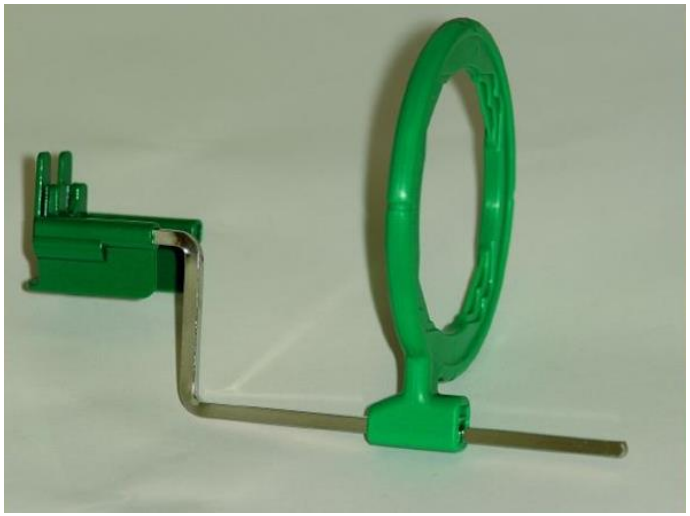
- S



Working Length Determination







Working Length Determination

Benefits of working length radiograph

- Working length determination
- Determining degree of curvature/canal anatomy
- Can help in locating second canals
- Documentation

Working Length Determination

Electronic Apex Locators (EAL)

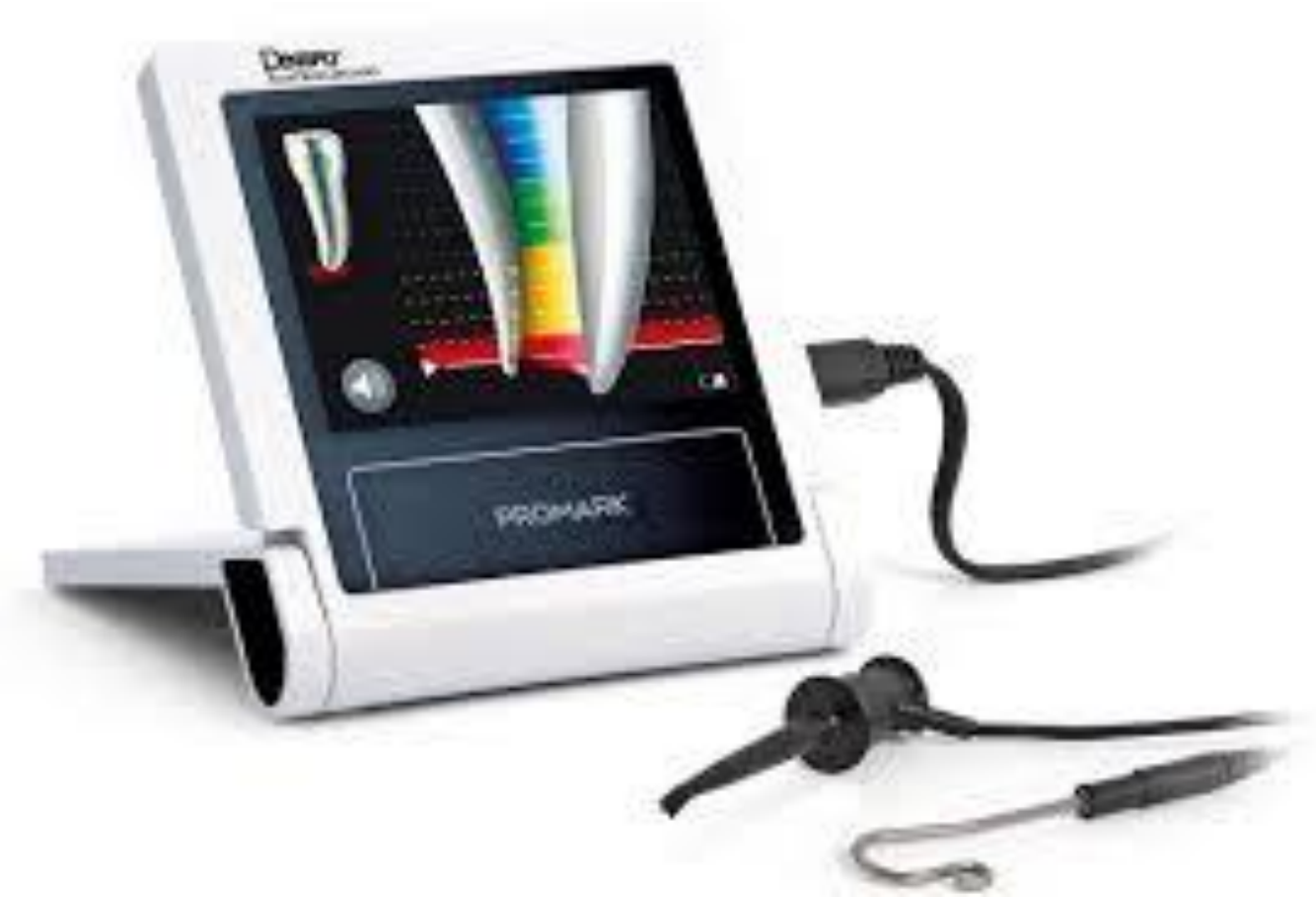
- A tool for measuring the working length
- Currently we are using 4th and 5th generation EALs
- Works on conductance and impedance principles
- At the apex the impedance difference is at its highest

Working Length Determination

- Electronic Apex Locators

Working Length Determination

- Components



Working Length Determination

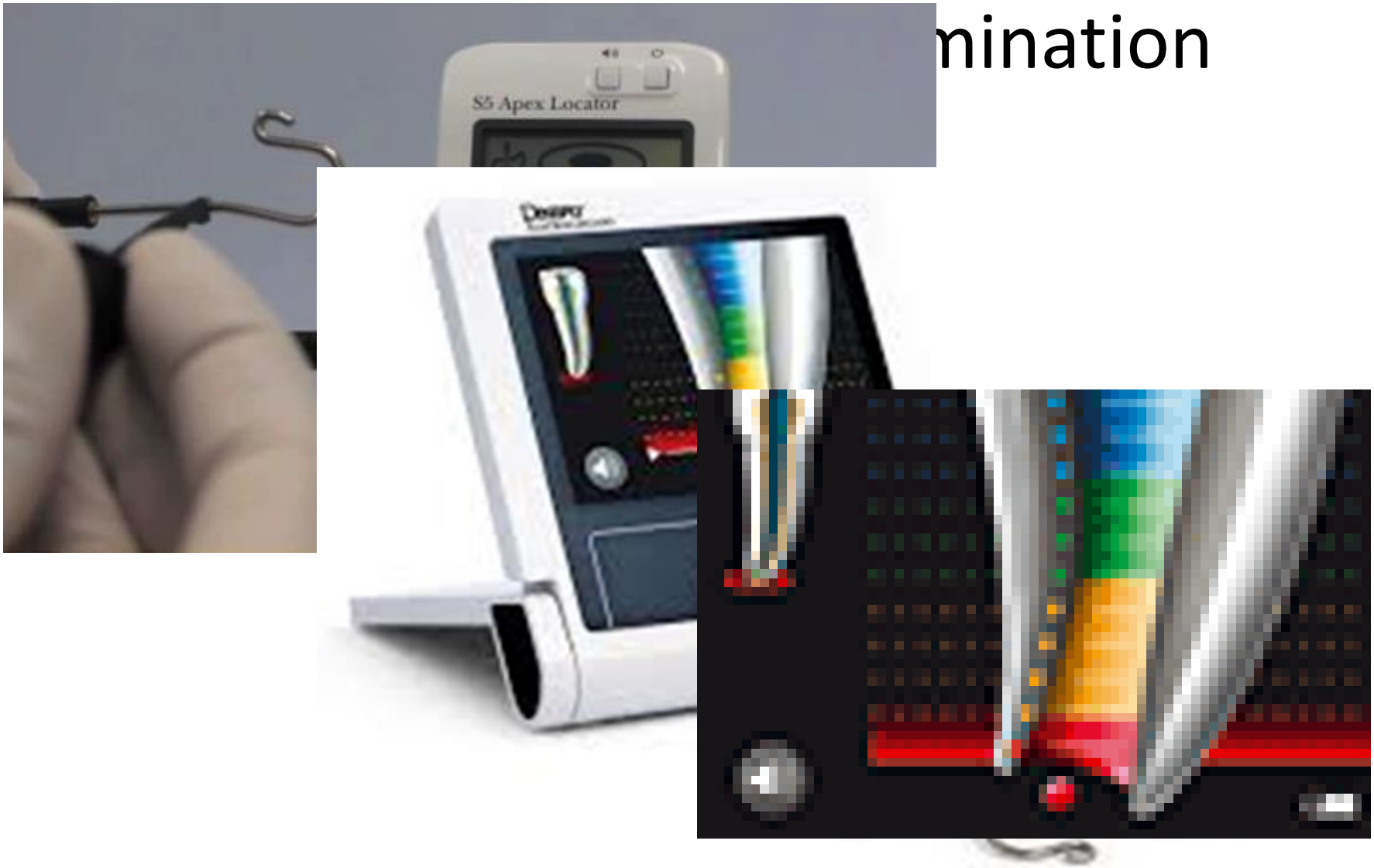
- Make sure connections are working prior to use intra-orally
- The canal should be relatively wet with irrigant (NaOCl, EDTA etc)
- Access cavity should be DRY

Working Length Determination

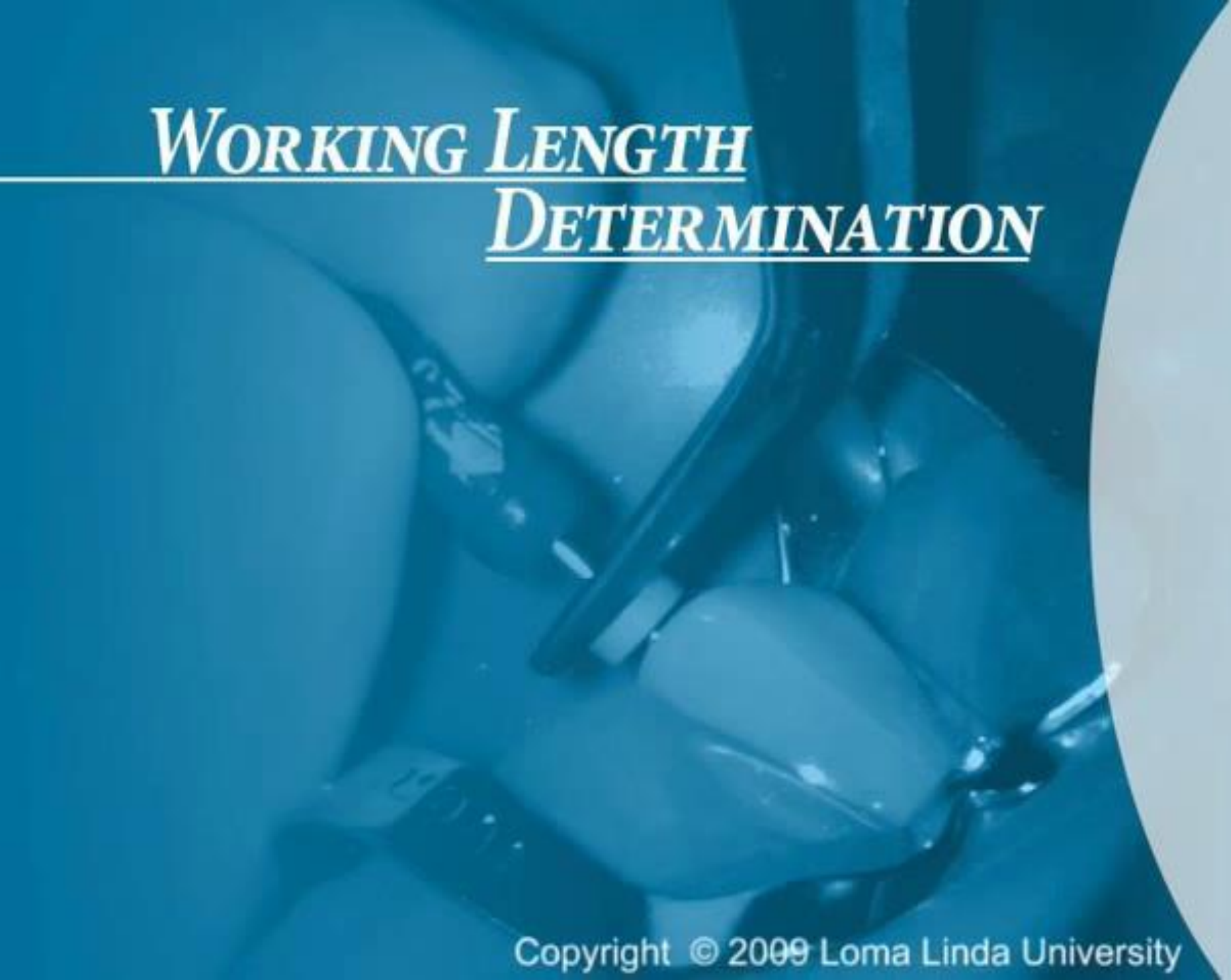
- Lip Hook placed in contact with tissues and file attached to file clip placed in canal without touching coronal structures or fillings if present

- File should be advanced until “APEX” sign and sound are seen and heard, and then retracted 0.5-1mm until a stable beep! is heard. Along with the indicator showing length of 0.5mm

mination



Working Length Determination



Working Length Determination

Accuracy of EAL:

- Accuracy range between 90%-95% for the new generation EAL.

- Still, the use of one radiograph along with EAL is recommended, to detect and confirm canal length and root morphology.

Working Length Determination

- Problems when using EALs (no reading/inaccurate/short readings/inconsistent reading)
  - Canal Blockage
  - Metal Restorations
  - Caries
  - Gingival tissues
  - Perforations/fractures
  - Large accessory canals
  - Bleeding/ draining canals
  - Wide open apices in immature teeth

Working Length Determination

- Significance of determining an exact working length
  - All root canal chemo-mechanical preparation should be confined to the root canal space

- Avoids unnecessary damage to the periapical tissues➔ less inflammation and less postoperative pain
- Avoids extrusion of obturation (filling) material

Working Length Determination

- Avoid working short of the ideal working length

➔invites more procedural errors (ledges, apical transportations, perforations, blockage etc)

➔leaves behind infected debris or inflamed tissue that can cause treatment failure

➔*For each 1mm short from the "ideal" WL =14% decrease in success rate* *(Chugal et al 2001, 2003)*

Working Length Determination

SO,

- All of our instrumentation and chemicals should be confined to the root canal system.
- A stable coronal reference point is of paramount importance
- Ideal Working Length is to the apical constriction, 0-0.5mm from the Radiographic apex.
- Radiographs should be of best possible quality and as “parallel” as possible
- When two canals exist in the same root, angulated radiographs should be used
- If EAL is used, it should be supplemented with a WL Radiograph

Questions