



# The design of the access cavity: New Considerations

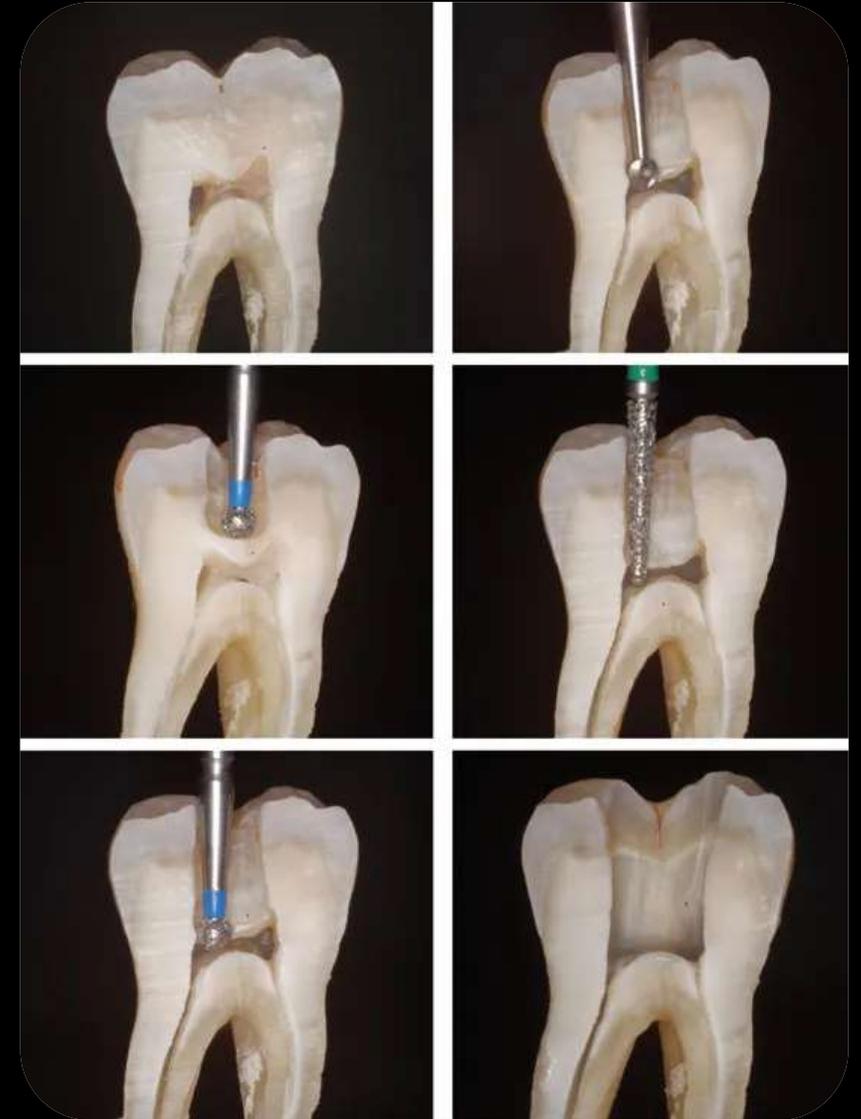
*Dr. Molnár Eszter*

2021.04.22.



# *Principles of preparation of access cavity*

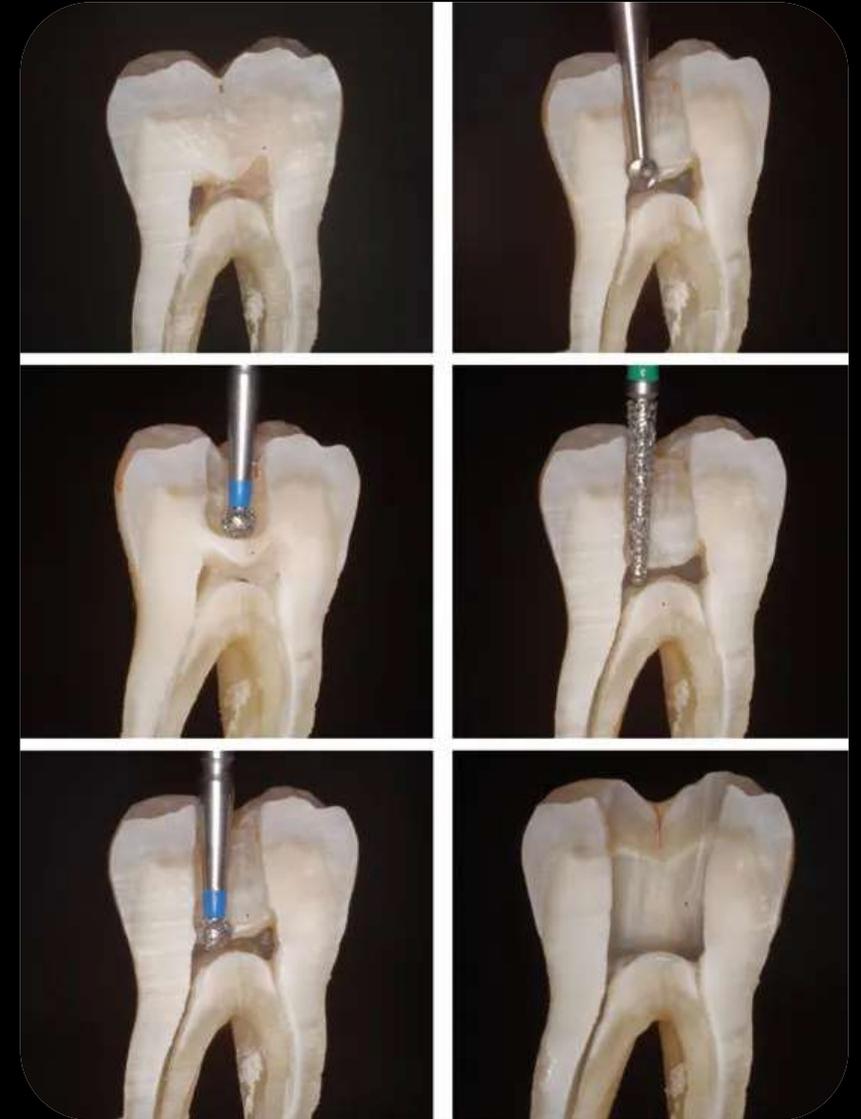
- complete removal of carious tooth material and coronal restorations with insufficient sealing
- preservation of intact dental material
- complete removal of the pulp tissue/  
necrotic pulp tissue
- localization of the orifices



# *Traditional endodontic access cavity (TEC)*

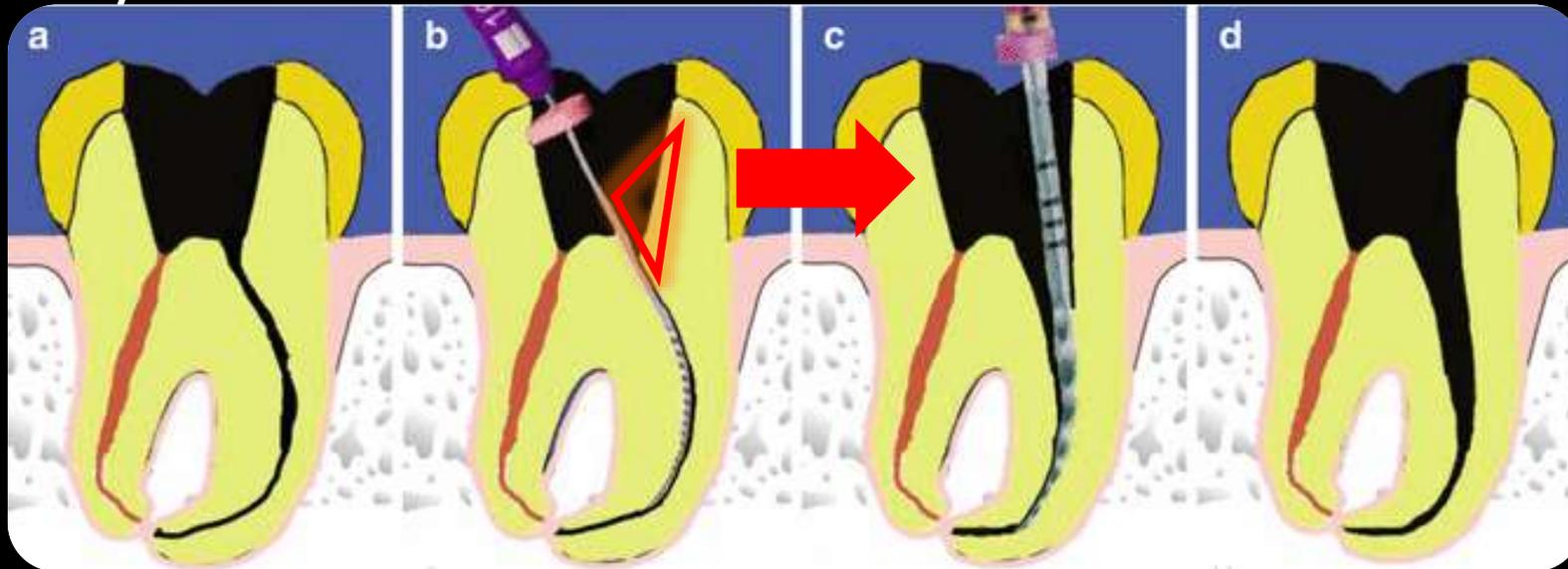
→ complete removal of the top of the pulp chamber

→ providing straight line access (SLA) to the foramen apical or the first curvature of the canal



# *Straight line access (SLA)*

- **TEC**
- complete removal of pulp chamber roof
- may be an obstacle to the dentin shelf (GG) at the orifices
- can reduce the incidence of preparation errors
- undercuts may form on the wall of the pulp chamber with unnecessary removal of intact dental material

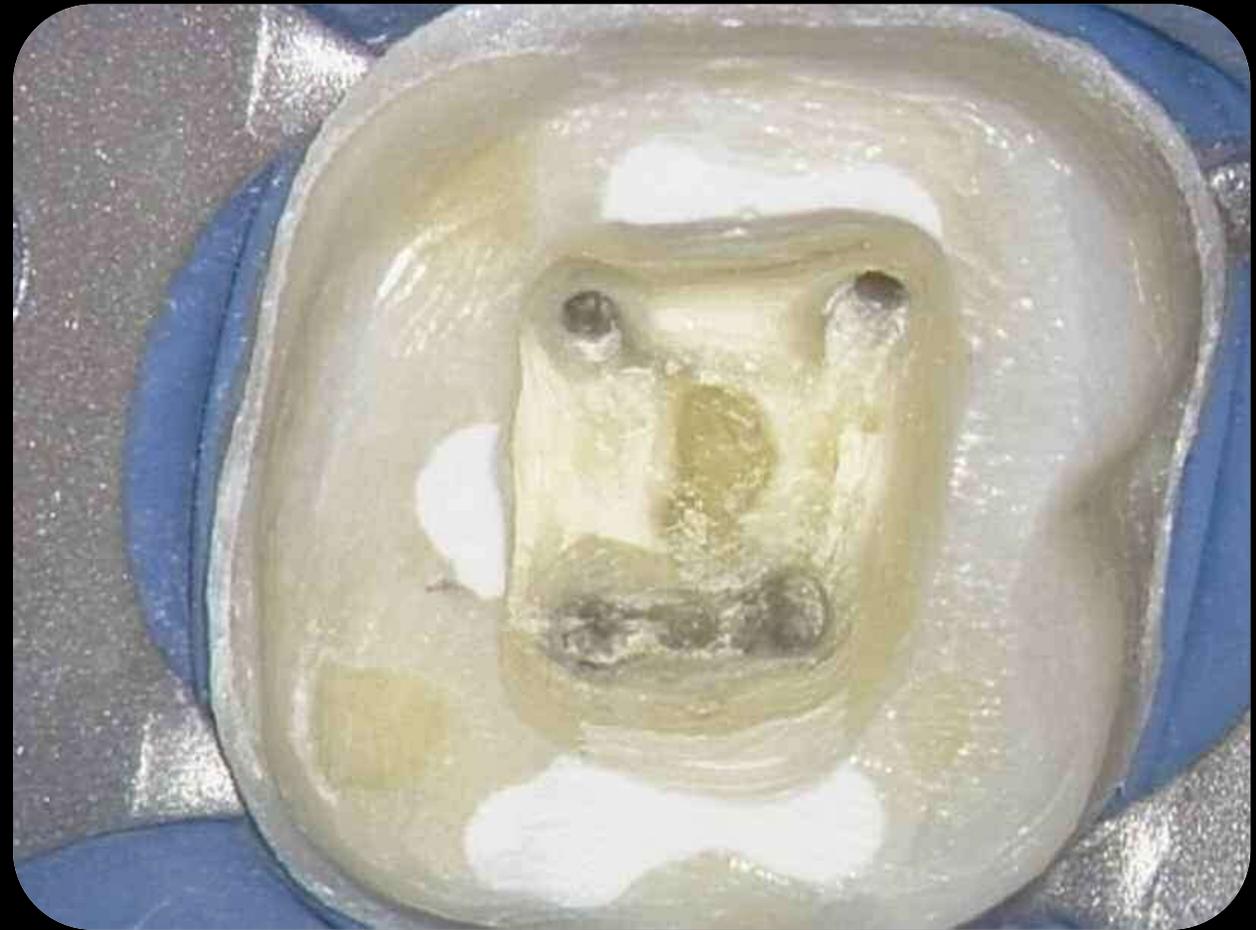


# *TEC*

The standardization of cavities depends primarily on the tooth type

**Endodontic principles for the preparation of trepanation cavity:**

- I. **Removal of remaining caries and defective restorations**
- II. **Design form**: the proposed shape for access, which is designed by mechanically projecting the internal anatomy of the pulp onto the external surface
- III. **Convenience form**: providing straight access to the apical third of the canal for preparation & root filling
- IV. **Cavity cleaning and rinsing**



# *Summarizing TEC*

1. Geometrically pre-designed shapes
2. The outline of the TEC determines the degree of occlusal extension
3. *The form of convenience*: providing direct access to the first curvature of the root canal
4. Applying the concept of extension for prevention

**Needs**

**operator**  **tooth,  
restoration**



The formation of an *SLA* leads to a weakening of the pericervical dentin

# David Clark & John Khademi 2010

## Case Studies in Modern Molar Endodontic Access and Directed Dentin Conservation

David Clark, DDS<sup>a,\*</sup>, John A. Khademi, DDS, MS<sup>b</sup>

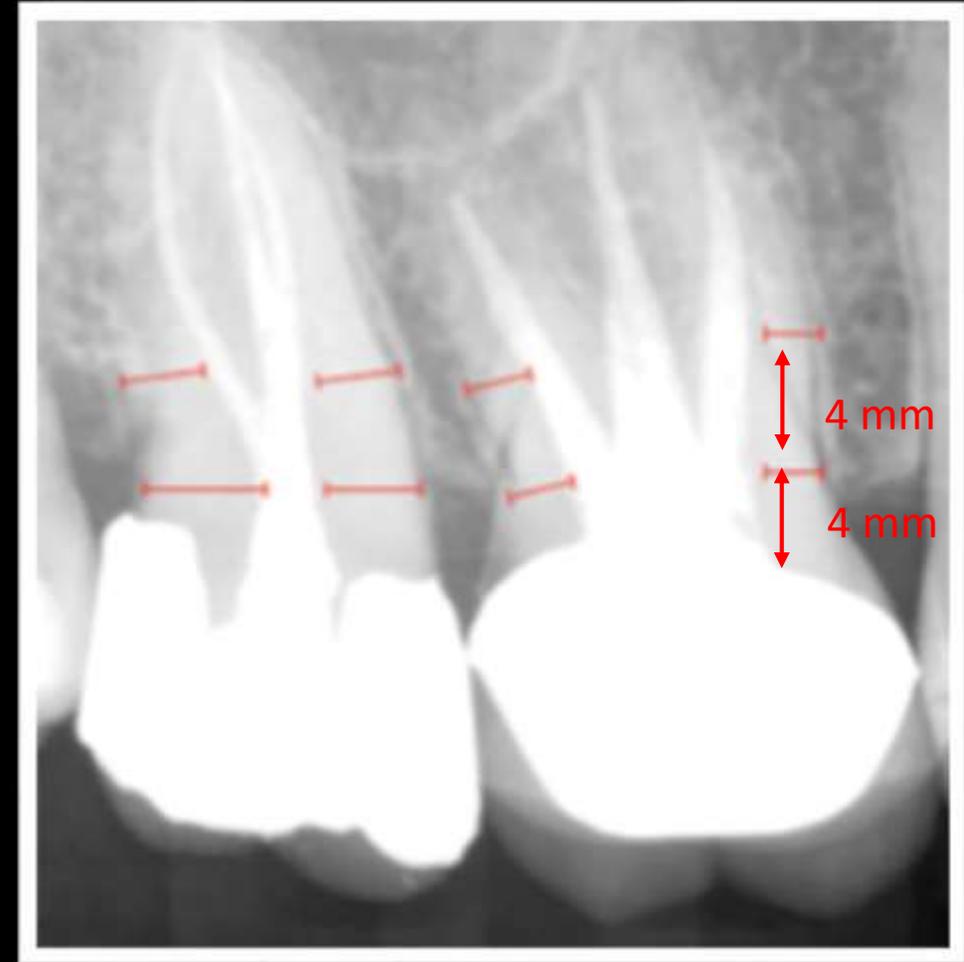
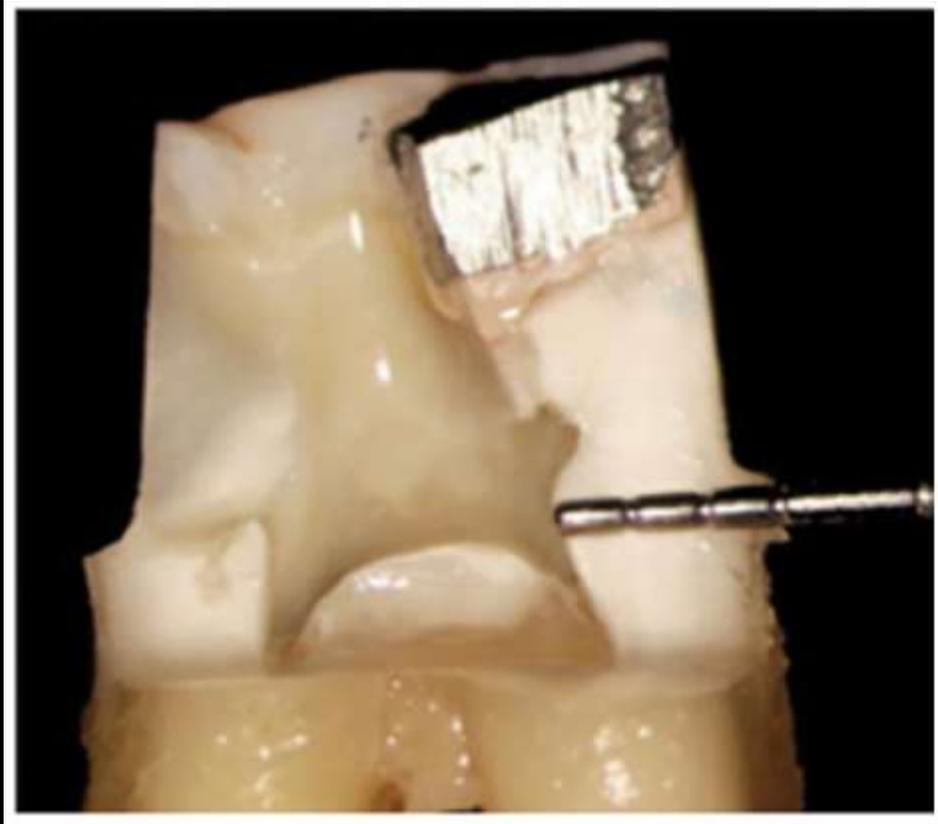
## Modern Molar Endodontic Access and Directed Dentin Conservation

David Clark, DDS<sup>a,\*</sup>, John Khademi, DDS, MS<sup>b</sup>

### *Minimal invasive access cavity*

- *Conservative access cavities*
- *Contracted endodontic cavities (CEC)*

# *Pericervical dentin (PCD)*



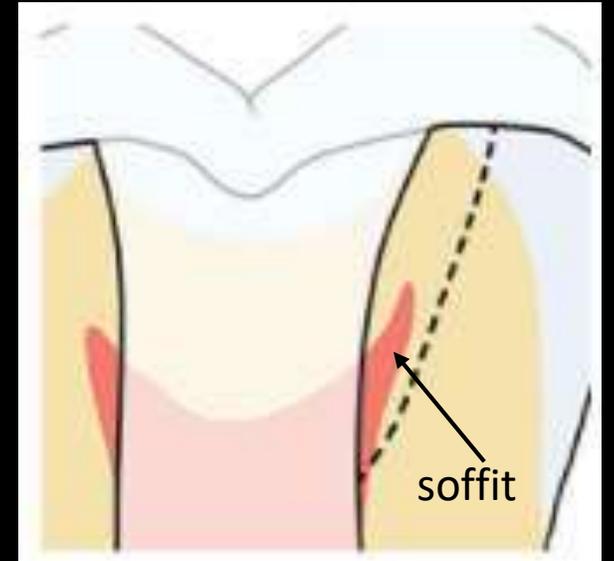
It is important for 3 reasons:

1. Ferrule
2. Fracture
3. Proximity to the origin of dentin tubules (pulp chamber)

# *Conservative access cavity*

David Clark & John Khademi 2010

- Coronal design change:
  1. Implant success rates
  2. OM & micro-endodontics
  3. Biomimetic dentistry
  4. Minimally invasive dentistry
  5. Aesthetic needs of patients



*Purpose: to maintain the mechanical stability of the tooth, reduce vertical fracture*

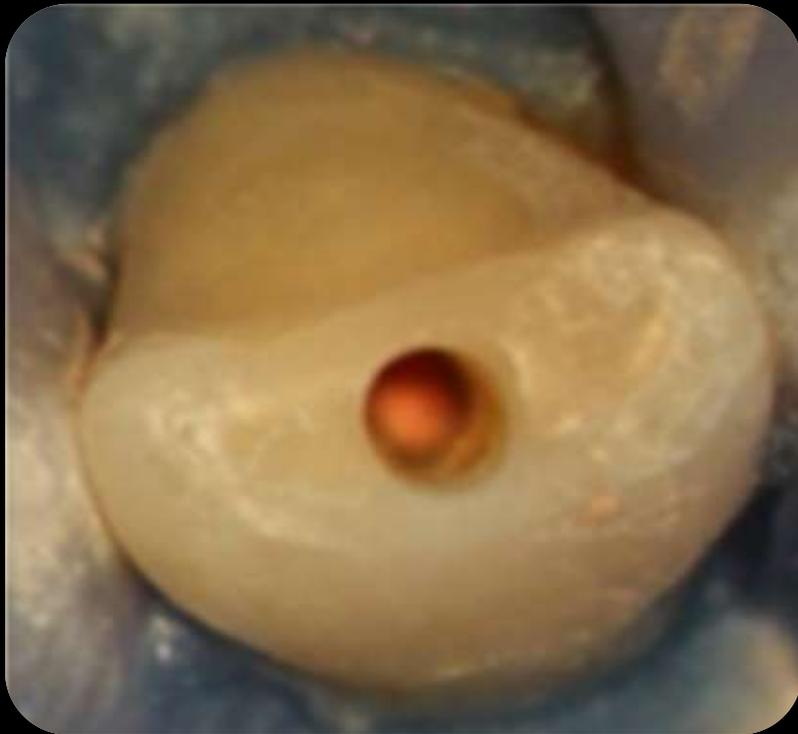
- A dentin rim 0.5 to 3 mm wide, like a tire, can serve as an internal stiffener for the tooth
- “Soffit” is the overhanging part of the top of the pulp chamber that remains after a trepanation cavity formation
- Sacrifice of multiple occlusal dentures to preserve cervical parts (instead of dentin)

# Planning

- the anatomy of the pericervical region should be monitored and the curvature of the roots
- the height of the pulp chamber and the width of the base in the mesio-distal direction and the depth in the vestibulo-oral direction
- the situation of caries or restoration that needs to be replaced must be taken into account
- because *SLA* for maximum curvature can damage the pericervical and furcative dentin, it is worthwhile to design **orifice-oriented access** to the orifices.

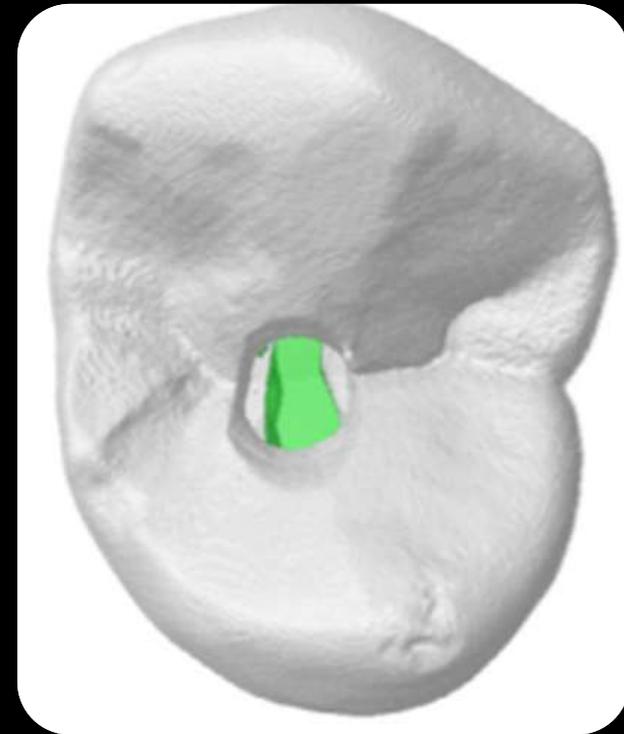
# *Planning*

Front teeth



Bóveda, 2015

Premolars



Silva, 2019

# Molars

*Platform width:* the line connecting the mesial and distal root canal systems

*Platform depth:* connecting line between buccal and oral root canal systems

*Chamber height:* the distance between the furcation base and the top of the pulp chamber



→ The variable platform width and canal convergence profiles allow for a different orifice-oriented approach instead of SLA.

# Morphology of minimally invasive access cavities



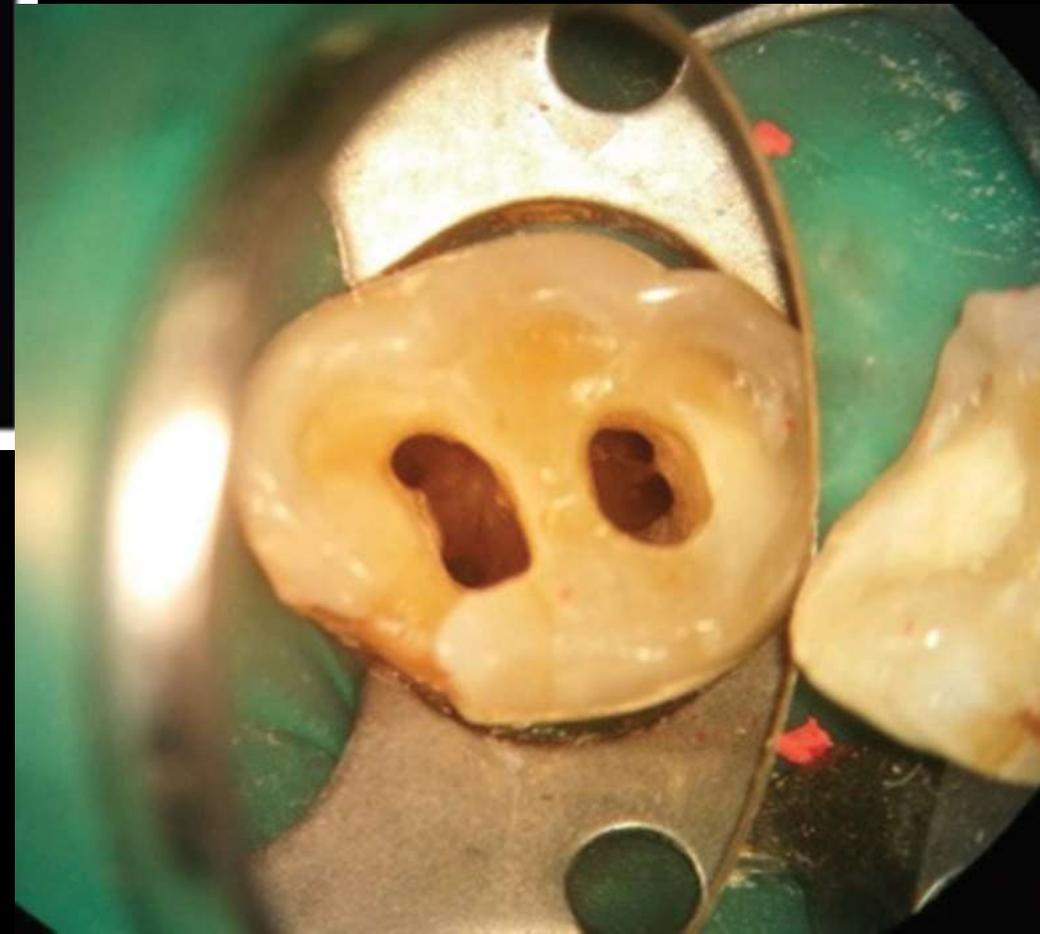
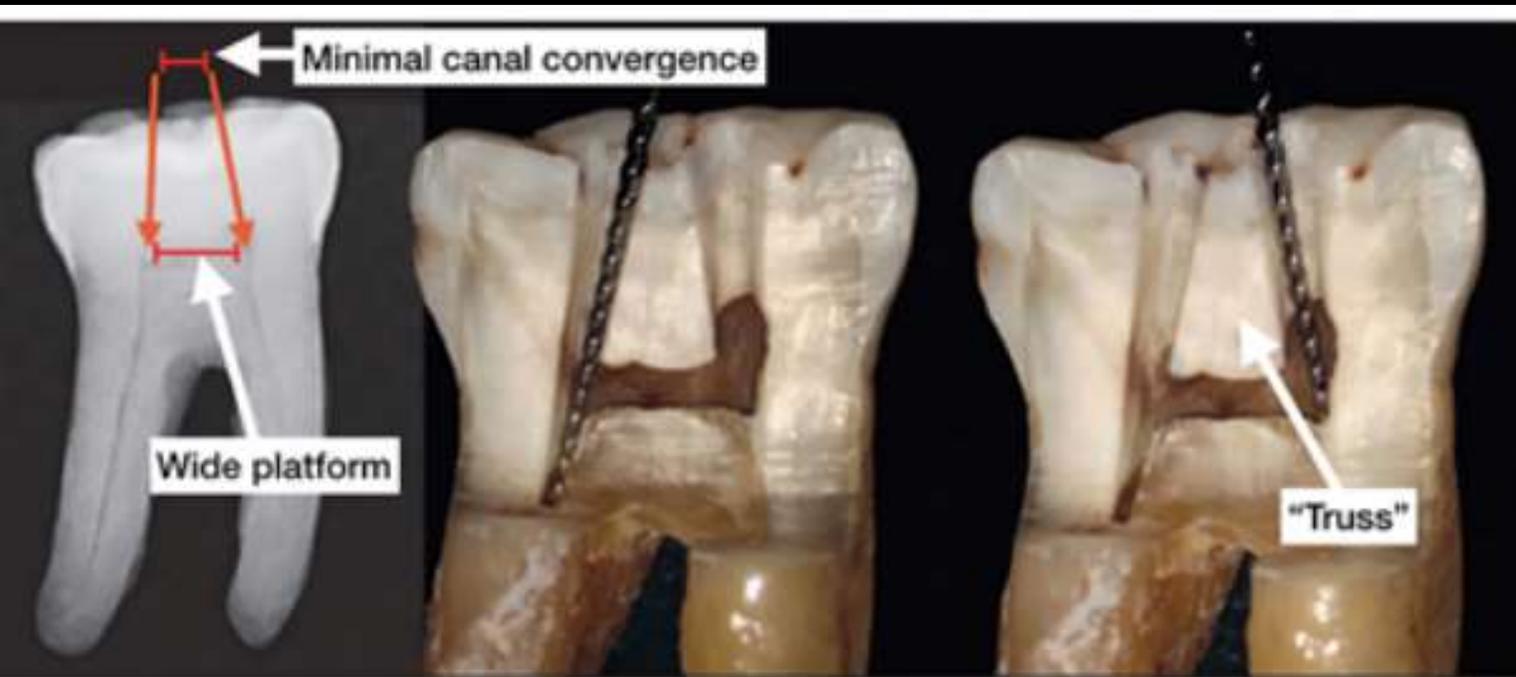
the base of the pulp chamber	the shapes of the roots	the shape of the access cavity
wide	straight	Truss
	converging and / or strongly curved	Frustum
narrow	straight	Frustum, X/ hour glass
	converging and / or strongly curved	X/ hour glass

**X or Hour glass**

**Frustum**

**Truss**

# *Truss access cavity*





*„Cala Lily” form*

- ❖ Enamel 45 ° beveled
- ❖ Better visualization on occlusal surface
- ❖ Adhesion to better enamel
- ❖ More favorable sealing
- ❖ Better ability for direct composite restoration

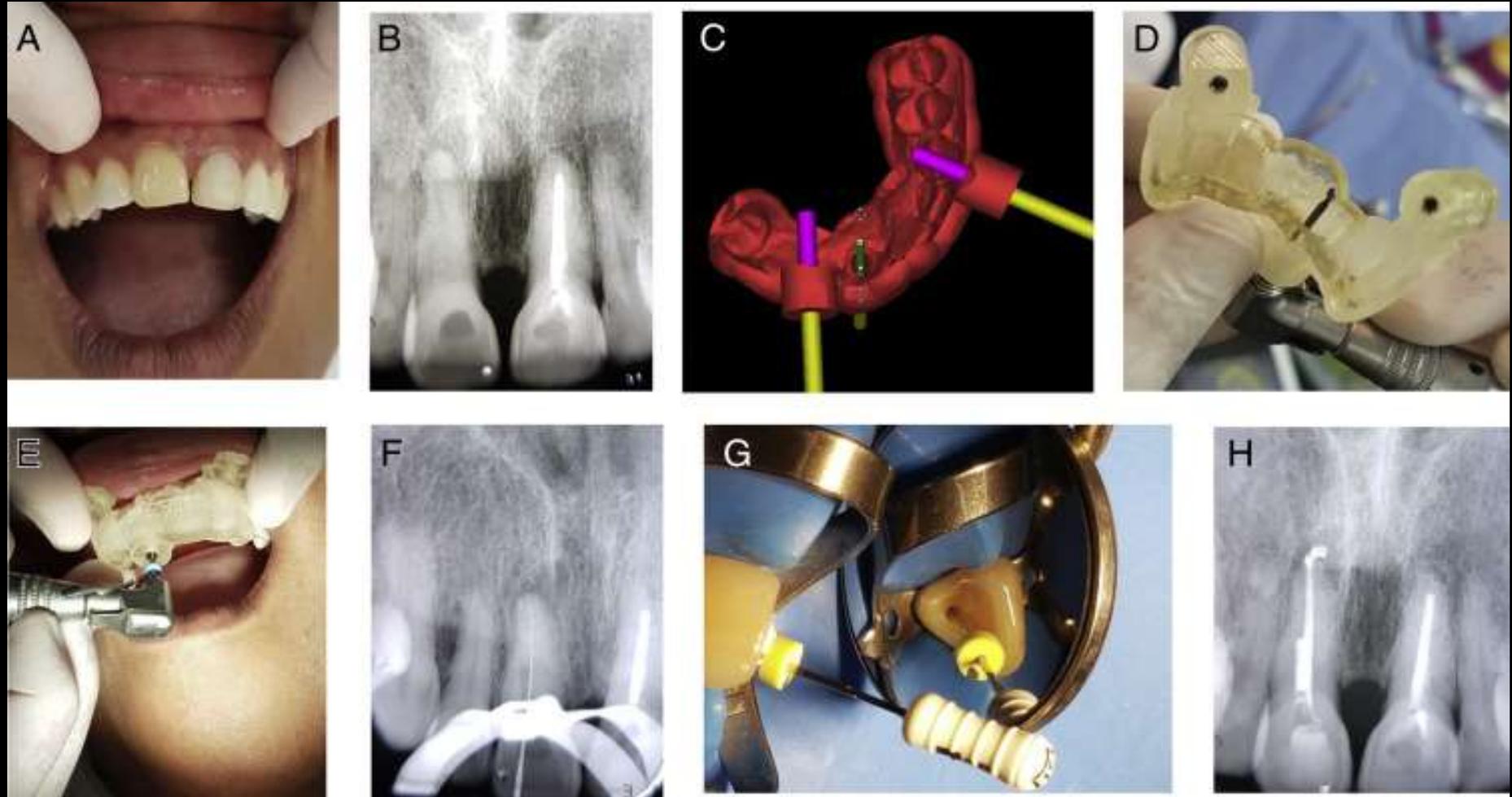
# *Ultra-conservative access cavity- „ninja access”*

➤ *Point endodontic access cavities (PEAC)*

the risk of complications is higher, e.g., breaking files and transporting the canal

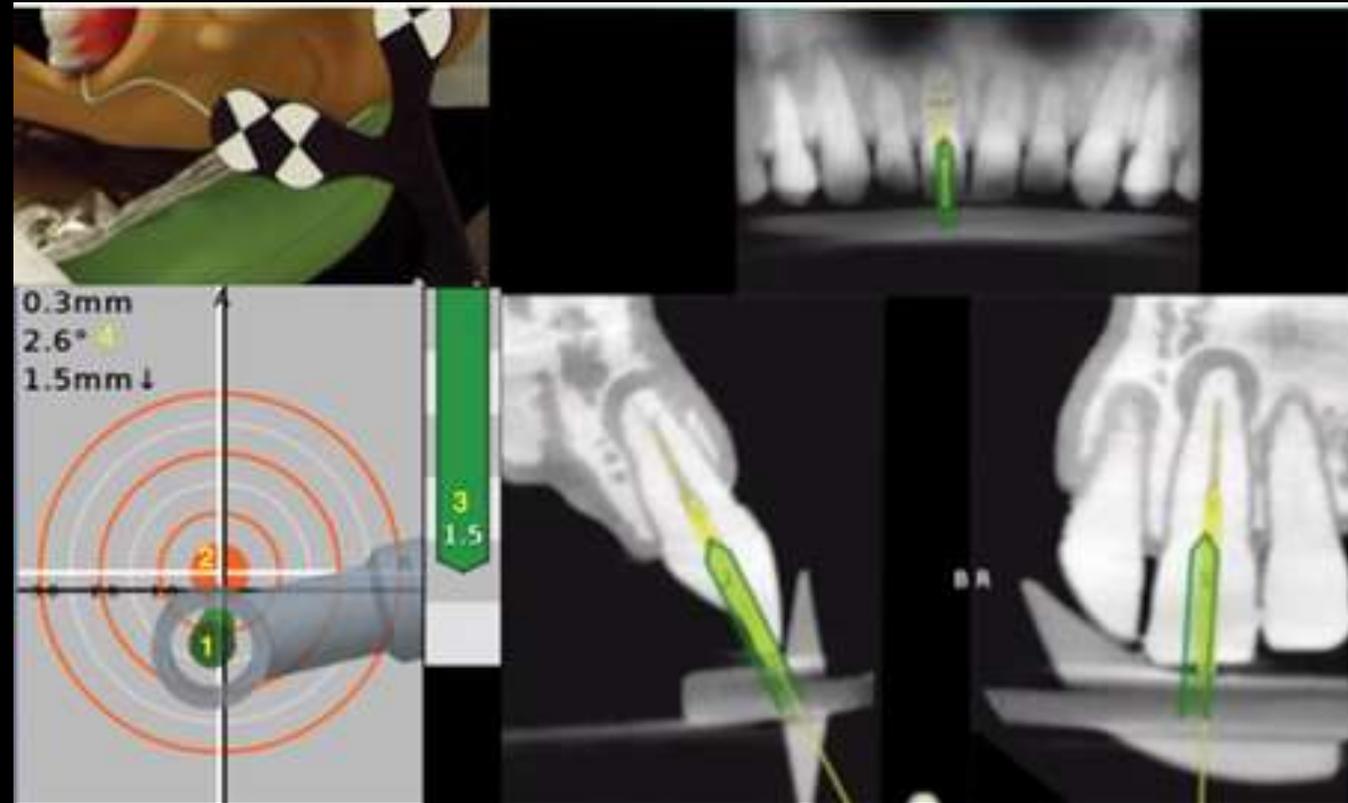
# *Guided endodontic access cavity*

- Controlled access cavity shaping
- CBCT and surface scanning required, lab prepares
- High vertical space requirements, a tooth may need several guides
- Water cooling???



# *Dynamically Guided Access*

- Uses information from the patient's CBCT volume to plan an access cavity.
- Overhead tracking cameras relate the position of the patient's jaw and the clinician's bur in 3-dimensional space.
- The clinician, by looking at the software interface, gets immediate feedback about the position of the bur as it relates to the position of the planned access and the tooth.



# *Undercut enamel vs. Undercut dentin*

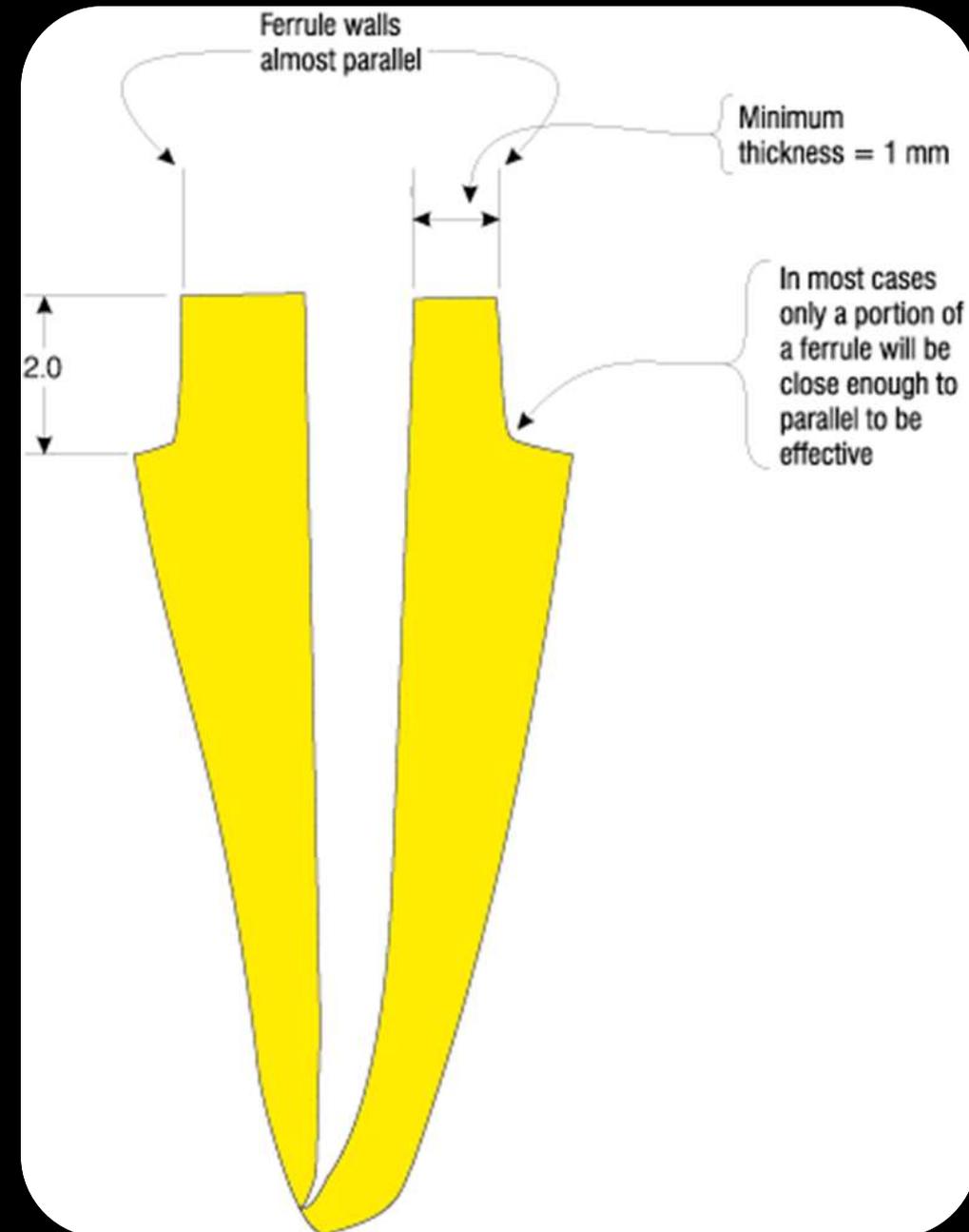
- Resin restorations do not strengthen it
  - Fracture potential
  - Physical and visual barrier for the operator
  - Prism structure, so dentin naturally supports it 100%
- 
- Dentin acts as a multilayer composite, a semiconductor tube

# Three-dimensional Ferrule-effect (3DF)

- **Height:** min. 1.5 mm-2 mm vertical component
- **Width:** min. 1 mm
- Total occlusal convergence (TOC) or conicity:
  - IF → TOC 10°: 3 mm vertical ferrule
  - IF → TOC 20°: 4 mm vertical ferrule
- Closure line design, degree of apical placement

*Enamel-cement junction (CEJ) is invaluable:*

- Transfer of stress from the crown to the root surface
- Enamel-restored restorations are more resistant



# *Modern tools of trepanation cavity preparation*

- a. Lupes
- b. Operating microscope
- c. Ultrasonic heads: pulp stones removal, hidden canals, for calcified canals
- d. Geometric techniques
- e. RTG (CBCT): Improving CEC accuracy, reducing errors: perforation, missing channels, anatomical variations
- f. Dyes, endo hand instruments



microsonic

# *Dental Operating Microscope*

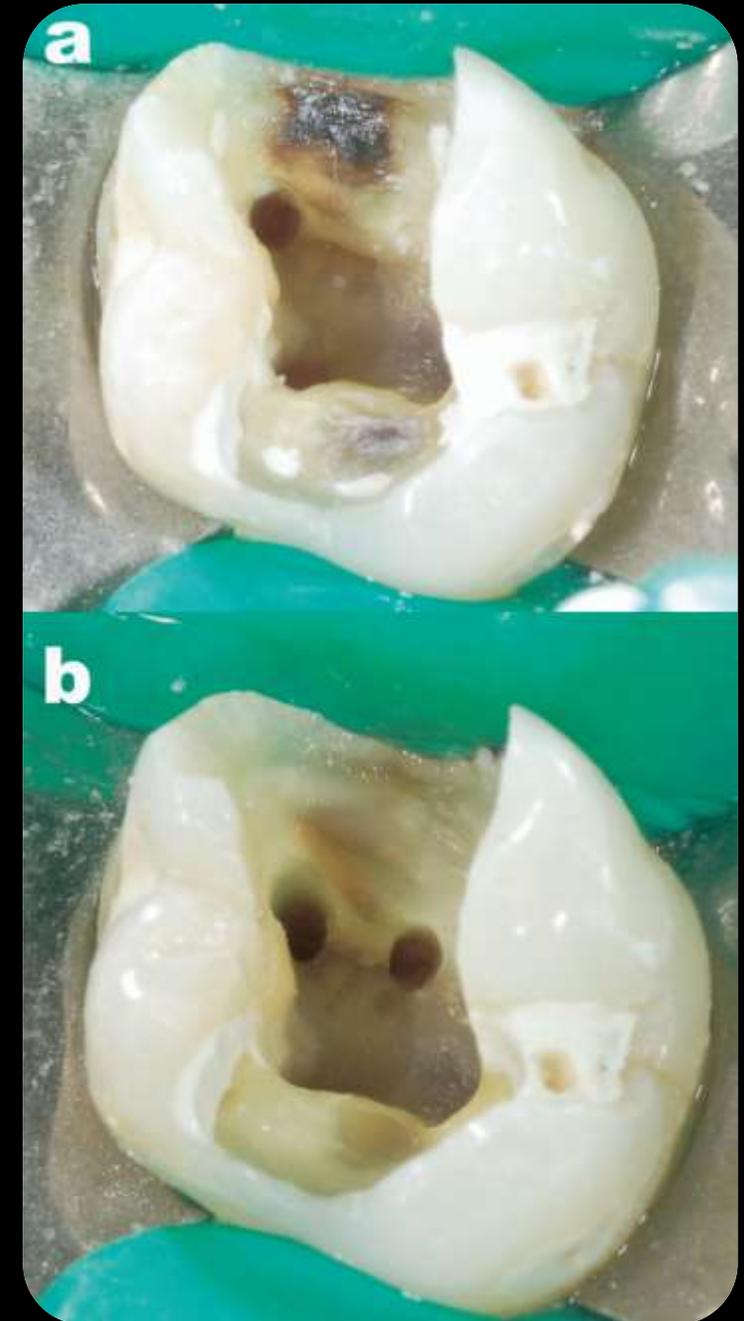
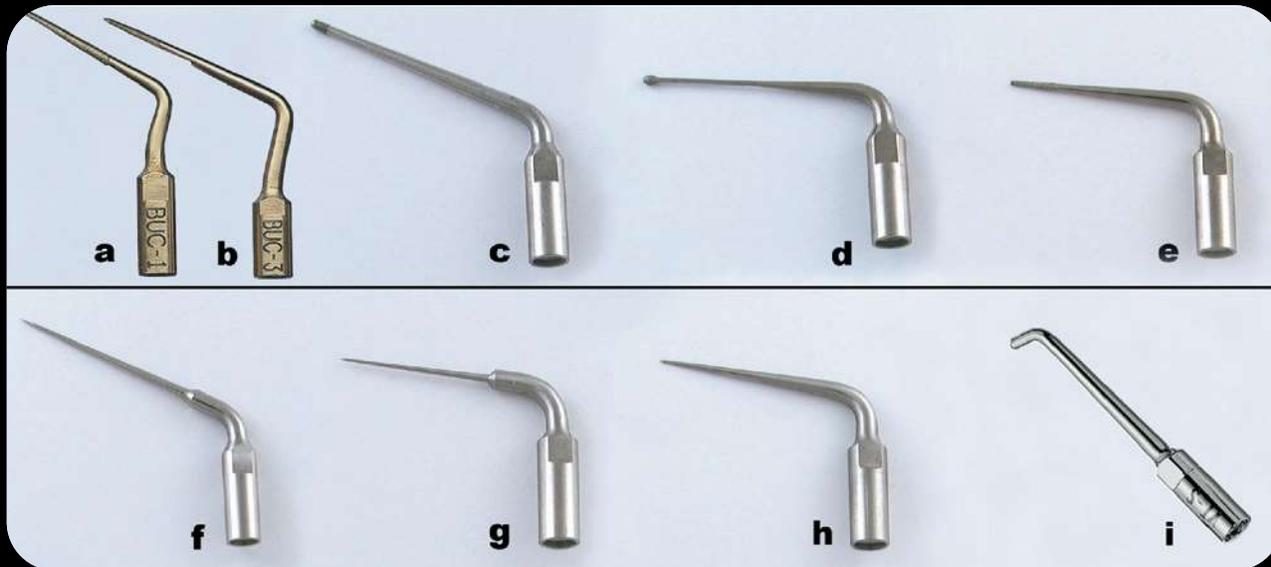


increases the magnification

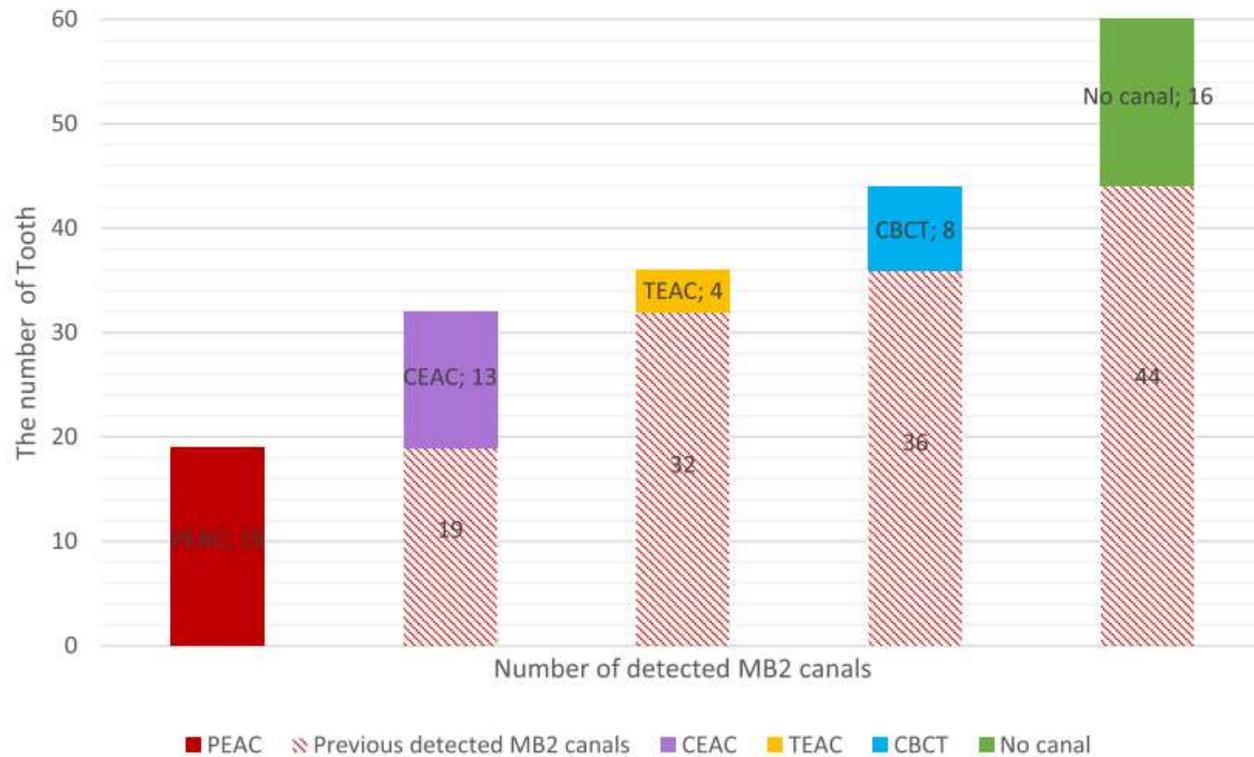
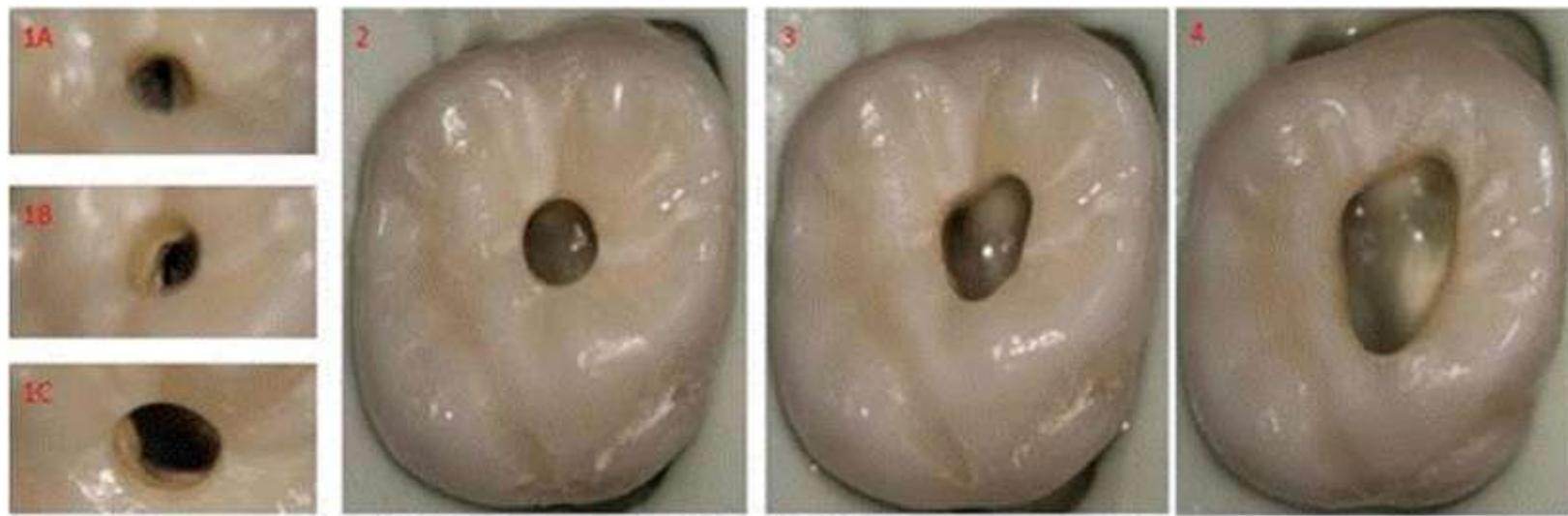
# *Ultrasonics in Endodontics*

*More useful in applications:*

- gaining access to canal openings
- cleaning and shaping
- removal of intracanal materials and obstructions



# MB2



- There was no significant difference between CEAC and TEAC in terms of determining MB2 canals
- MB2 detection rate of CEAC and TEAC was statistically higher than that of PEAC
- With PEAC and 31.6% of the molar teeth were diagnosed with MB2

Saygili et. al. 2018

**Fig. 2** The number of detected MB2 canals with all EAC's and CBCT images

# *Coronal restoration*

- For the final restoration traditional methods can be used, there is no clear recommendations.
- The goal, however minimally invasive direct composite restorations would be, to protect the dental material.
- But based on current research articles, it is not clear yet, that these restorations can achieve biomechanical integrity such as traditional restorations covering all cusps.

# *Clinical applications*

Conservative access cavity may be indicated in cases where endodontic treatment is required but the occlusal surface is not or only minimally affected:

- Class II. and V. caries, non-carious cervical lesions
- Trauma, periodontitis
- Injury of vascular and nerve structures during surgery targeting adjacent teeth

# Summary

- ,microsonic'
- CBCT could help
- the protective effect of a minimally invasive method on *pericervical dentin* has not yet been proved
- however, more tooth material in the coronal part: restorability is improved
- despite strong deformation of expansion instruments, there is no difference in machining efficiency and success
- although transportation of the root canals must be taken into account
- there is currently no conclusive evidence that the minimally invasive method can increase tooth fracture resistance

- ❖ BE LESS INVASIVE
- ❖ These techniques need a lot of experience
- ❖ ONLY with Ultrasonics & Operating Microscope



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*Thank you for your attention!*

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