



The design of the access cavity: New Considerations

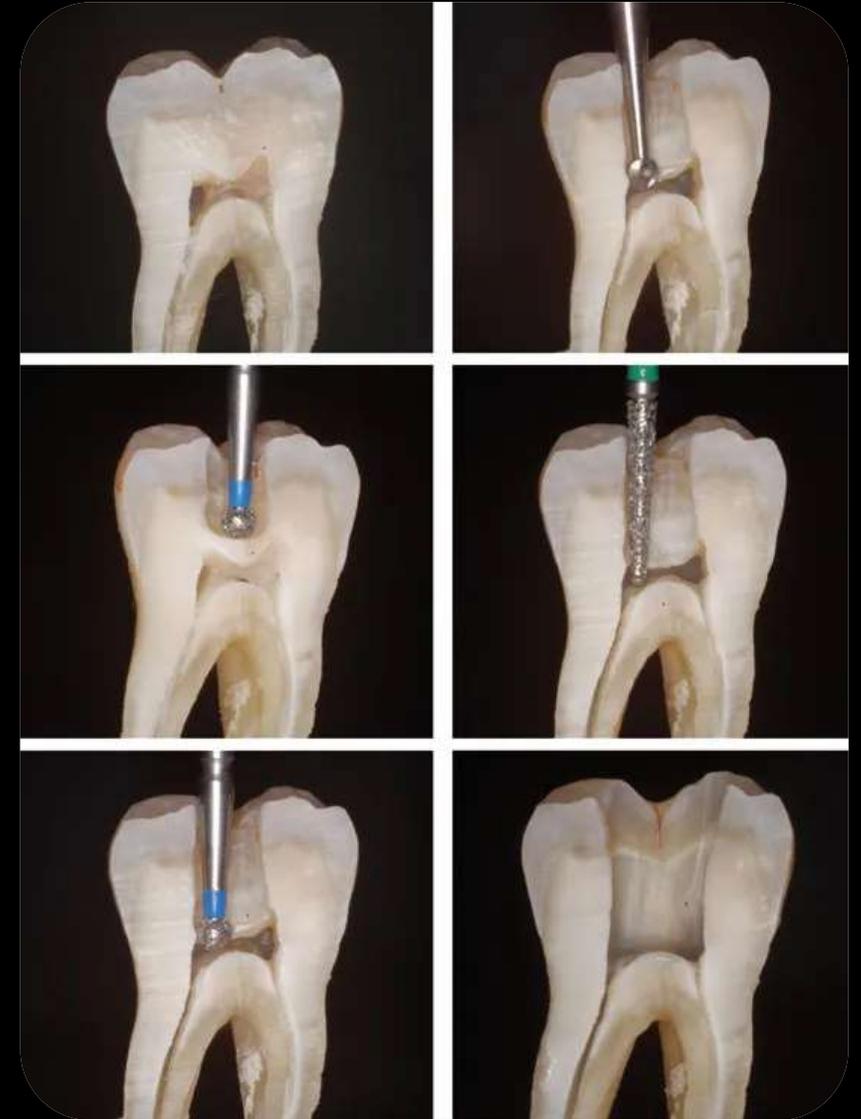
Dr. Molnár Eszter

2021.04.22.



Principles of preparation of access cavity

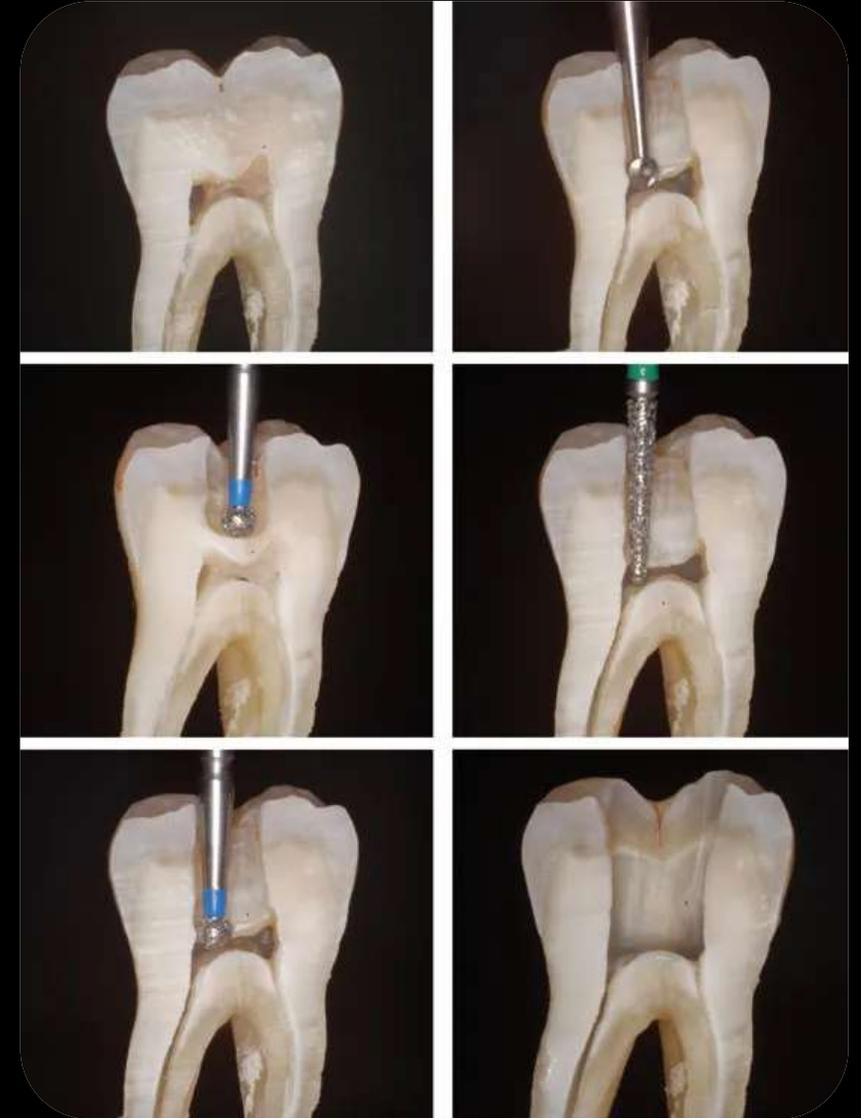
- complete removal of carious tooth material and coronal restorations with insufficient sealing
- preservation of intact dental material
- complete removal of the pulp tissue/
necrotic pulp tissue
- localization of the orifices



Traditional endodontic access cavity (TEC)

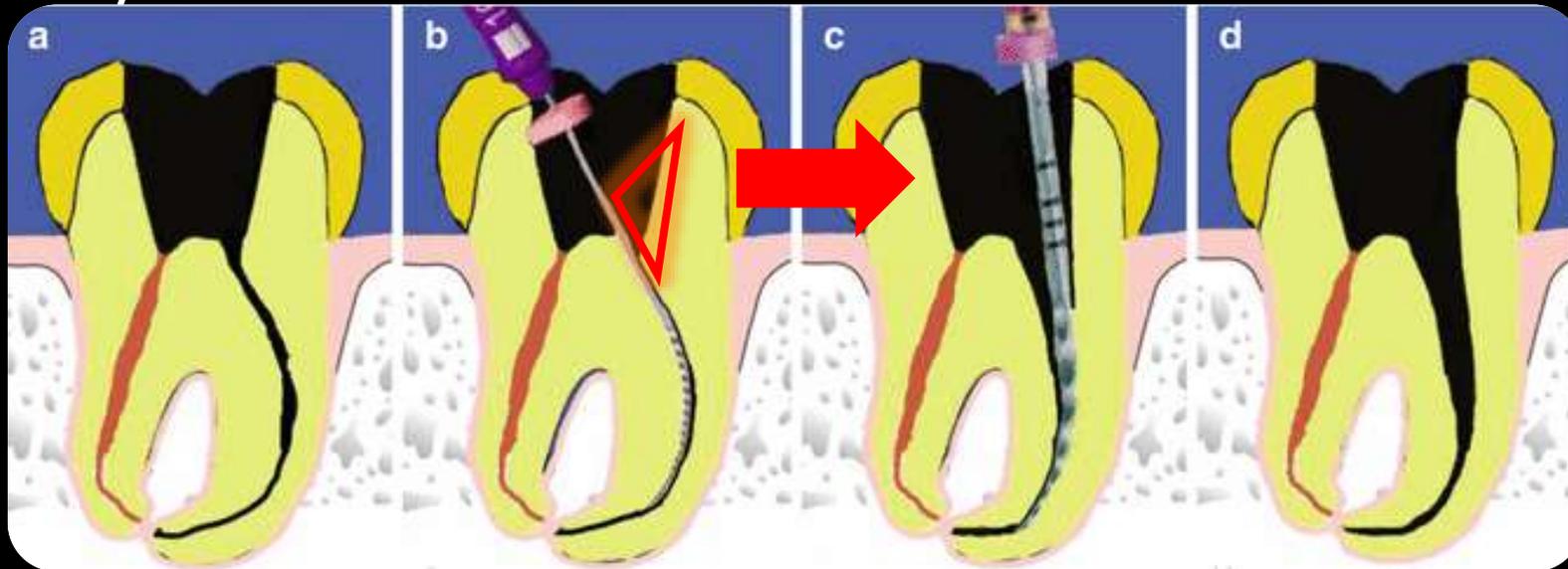
→ complete removal of the top of the pulp chamber

→ 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

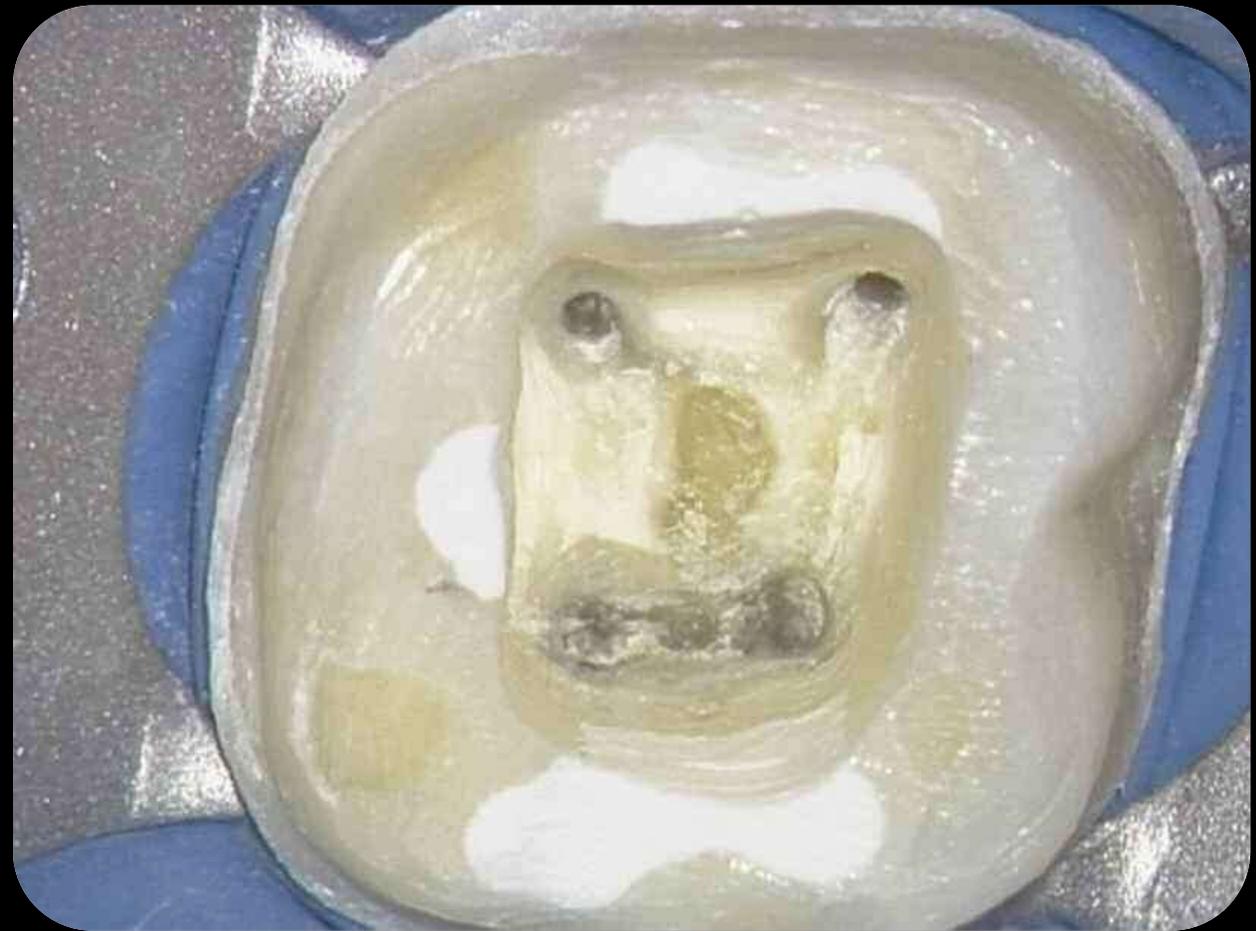


TEC

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^{a,*}, John A. Khademi, DDS, MS^b

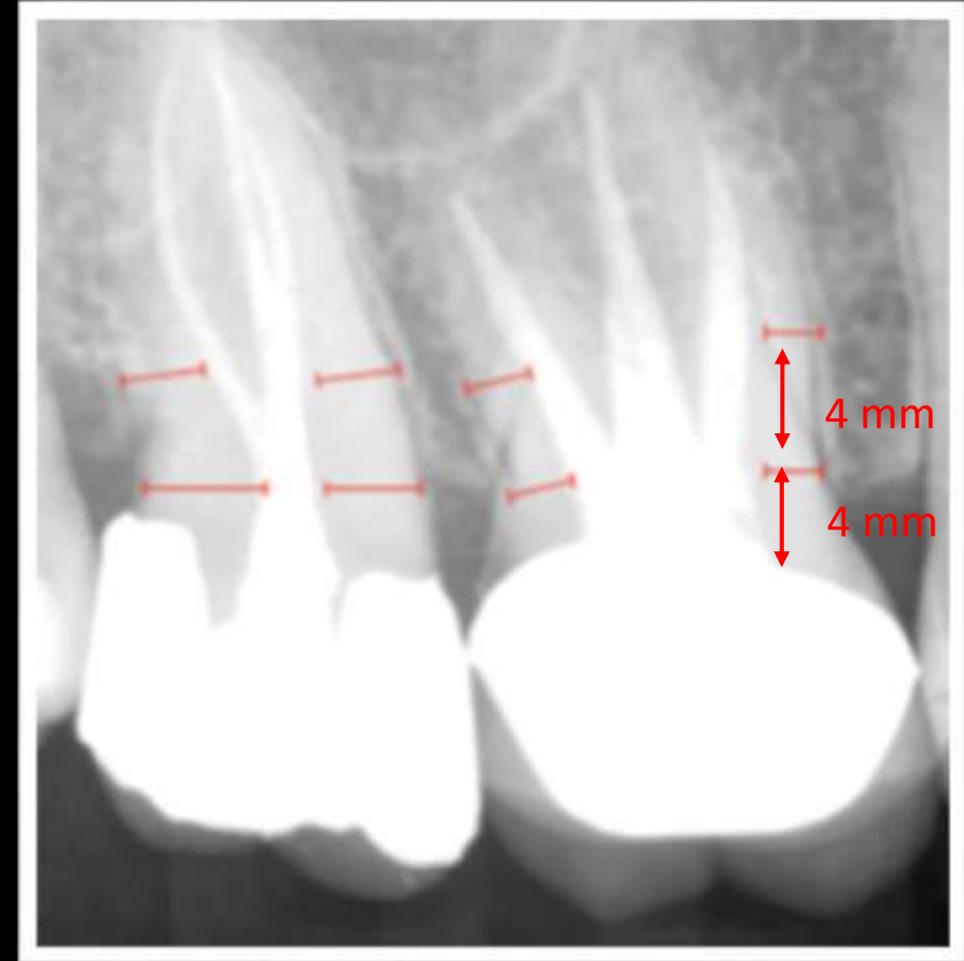
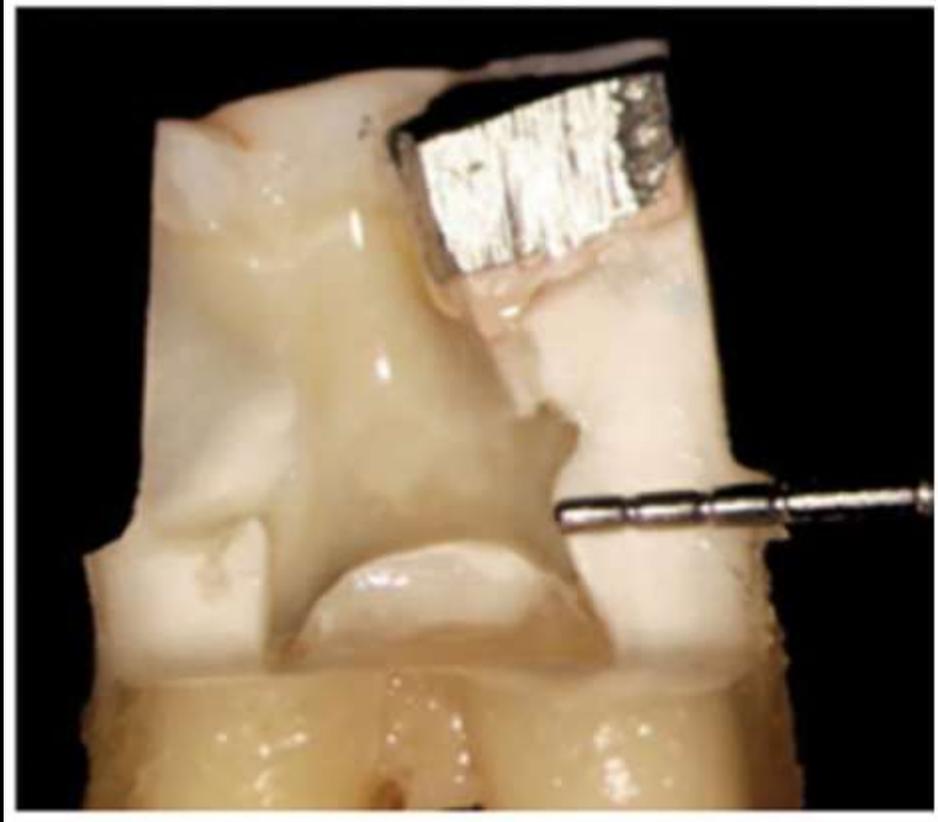
Modern Molar Endodontic Access and Directed Dentin Conservation

David Clark, DDS^{a,*}, John Khademi, DDS, MS^b

Minimal invasive access cavity

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

Pericervical dentin (PCD)



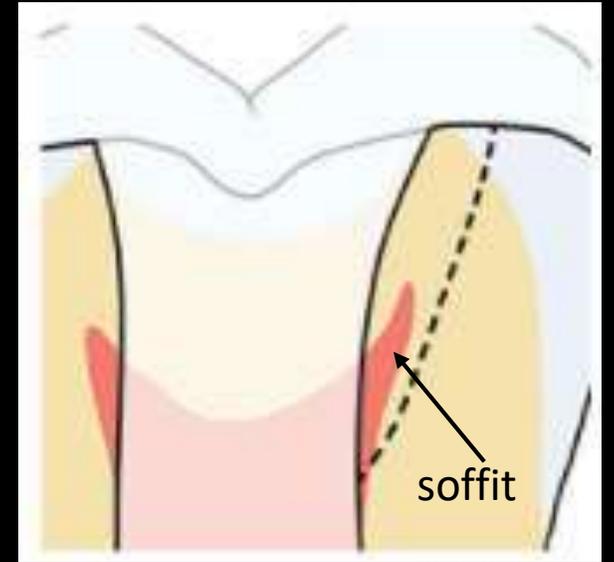
It is important for 3 reasons:

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.

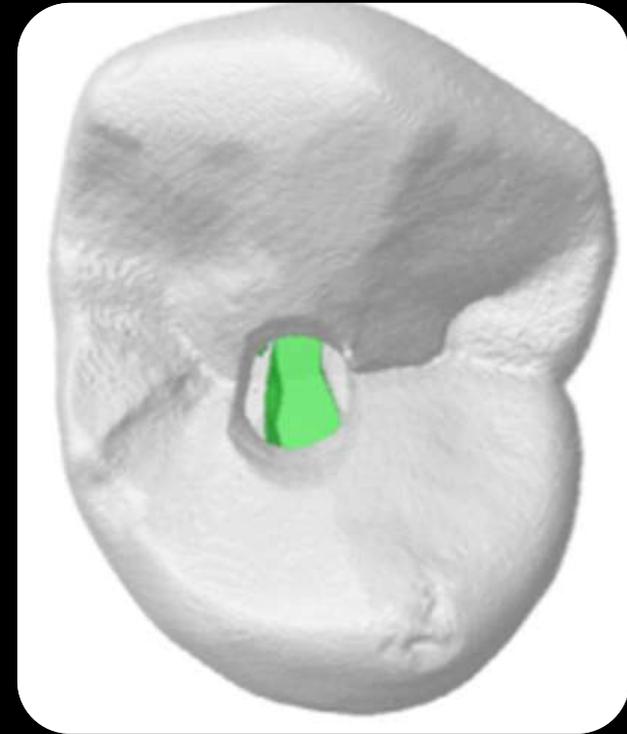
Planning

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



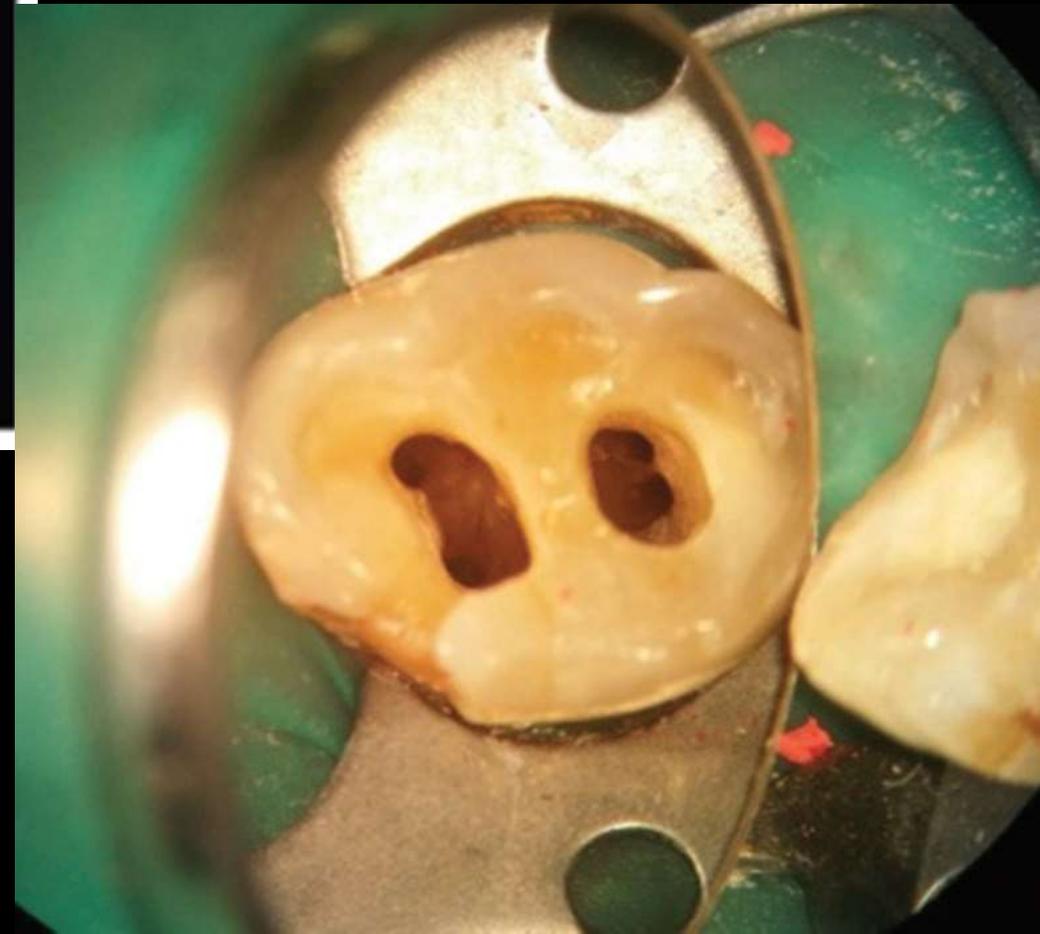
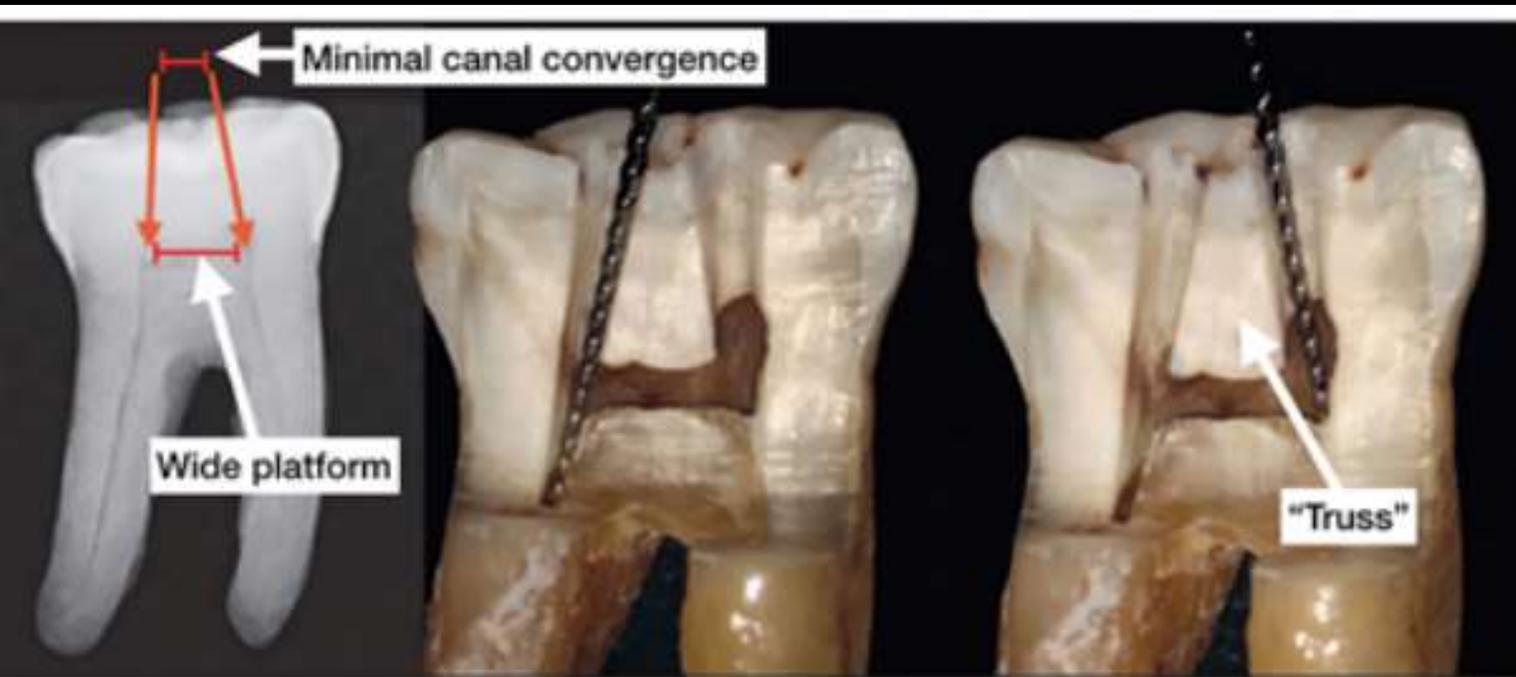
the base of the pulp chamber	the shapes of the roots	the shape of the access cavity
wide	straight	Truss
	converging and / or strongly curved	Frustum
narrow	straight	Frustum, X/ hour glass
	converging and / or strongly curved	X/ hour glass

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

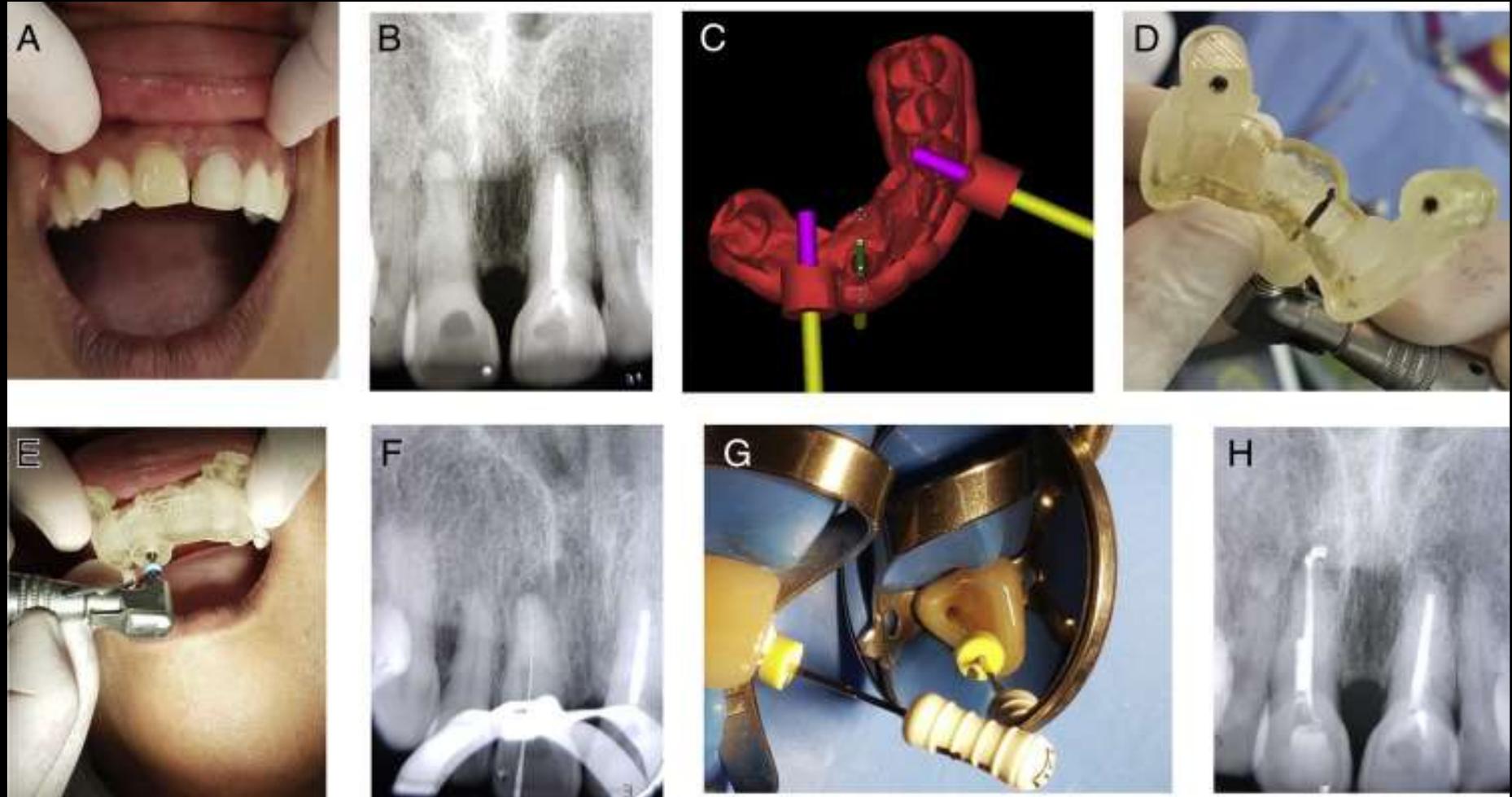
Ultra-conservative access cavity- „ninja access”

➤ *Point endodontic access cavities (PEAC)*

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

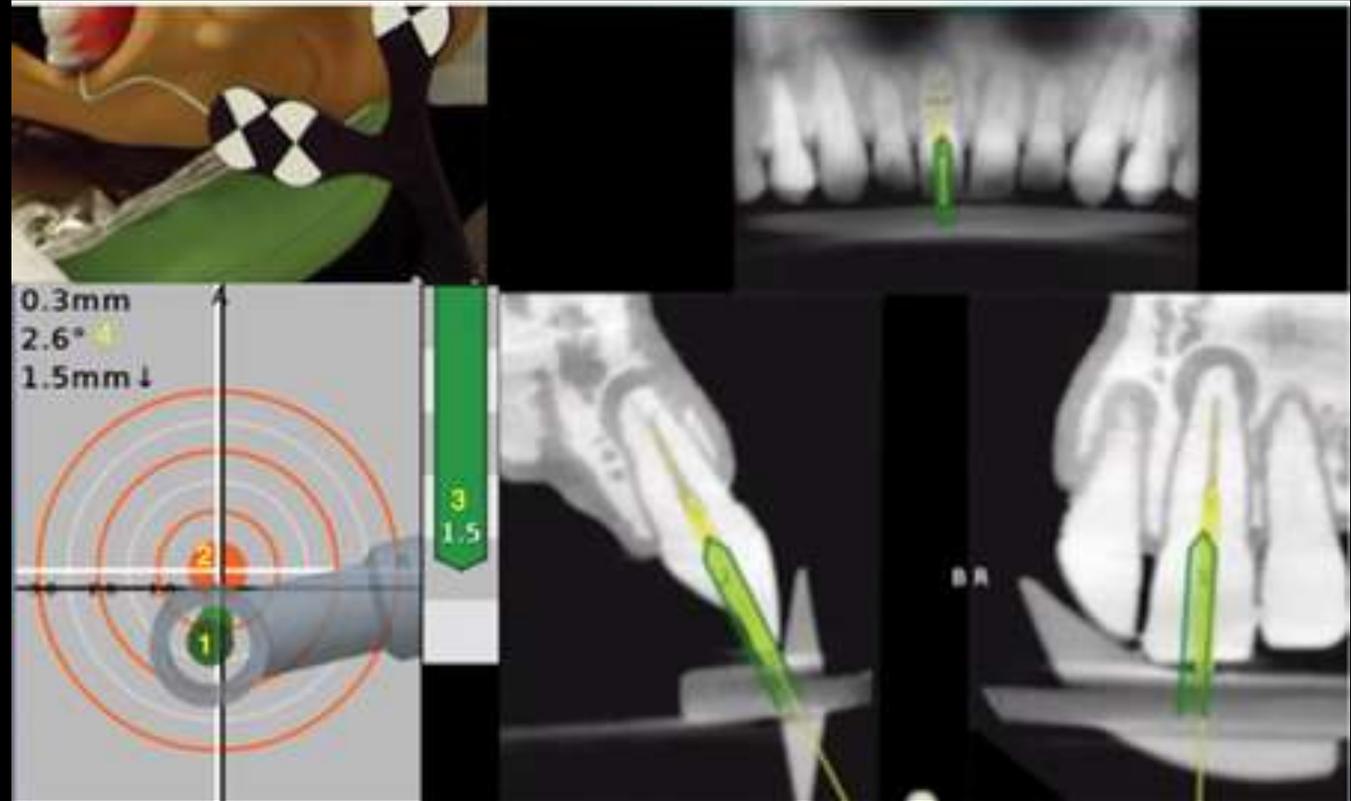
Guided endodontic access cavity

- 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

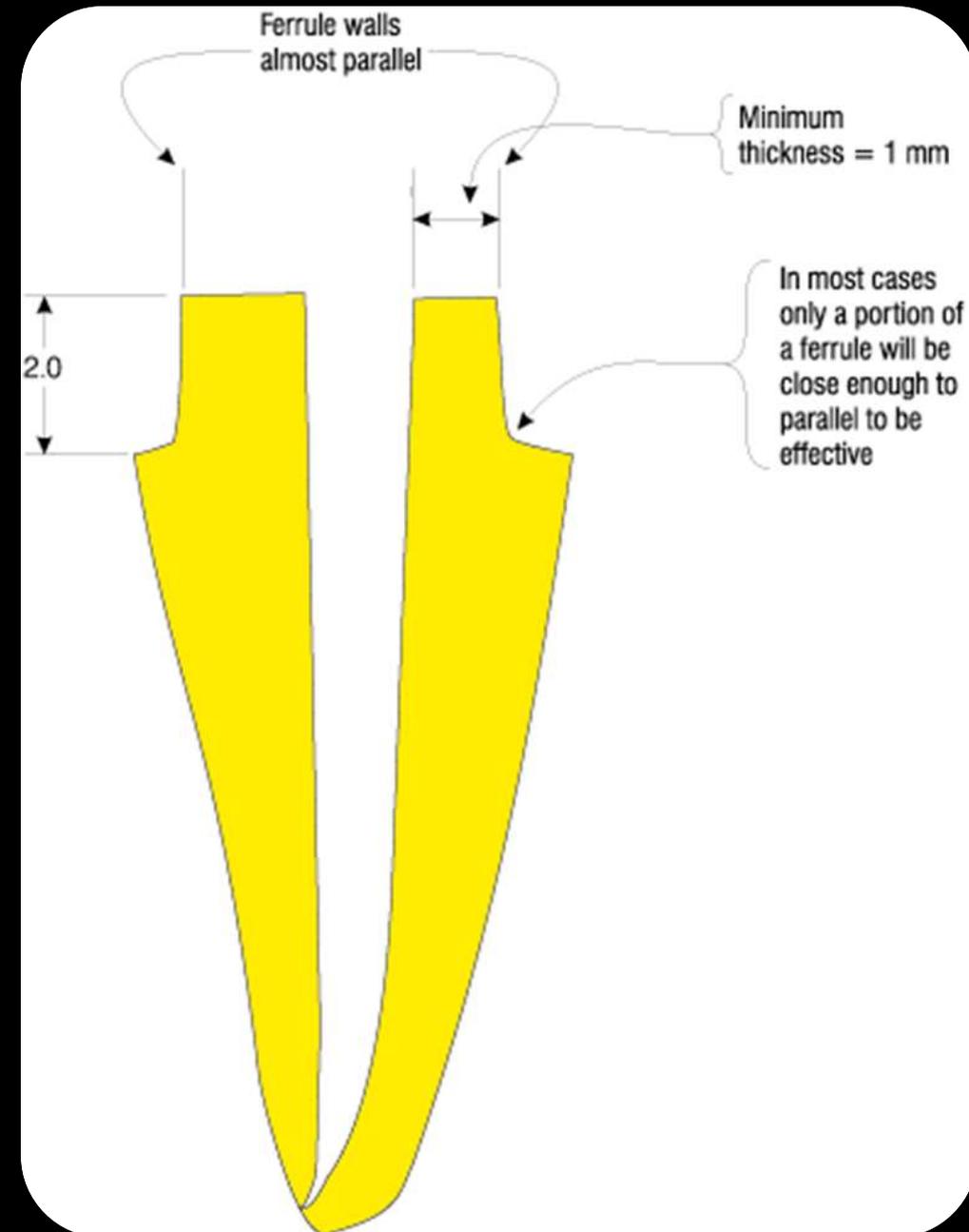
- Resin restorations do not strengthen it
 - Fracture potential
 - Physical and visual barrier for the operator
 - Prism structure, so dentin naturally supports it 100%
- 
- Dentin acts as a multilayer composite, a semiconductor tube

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

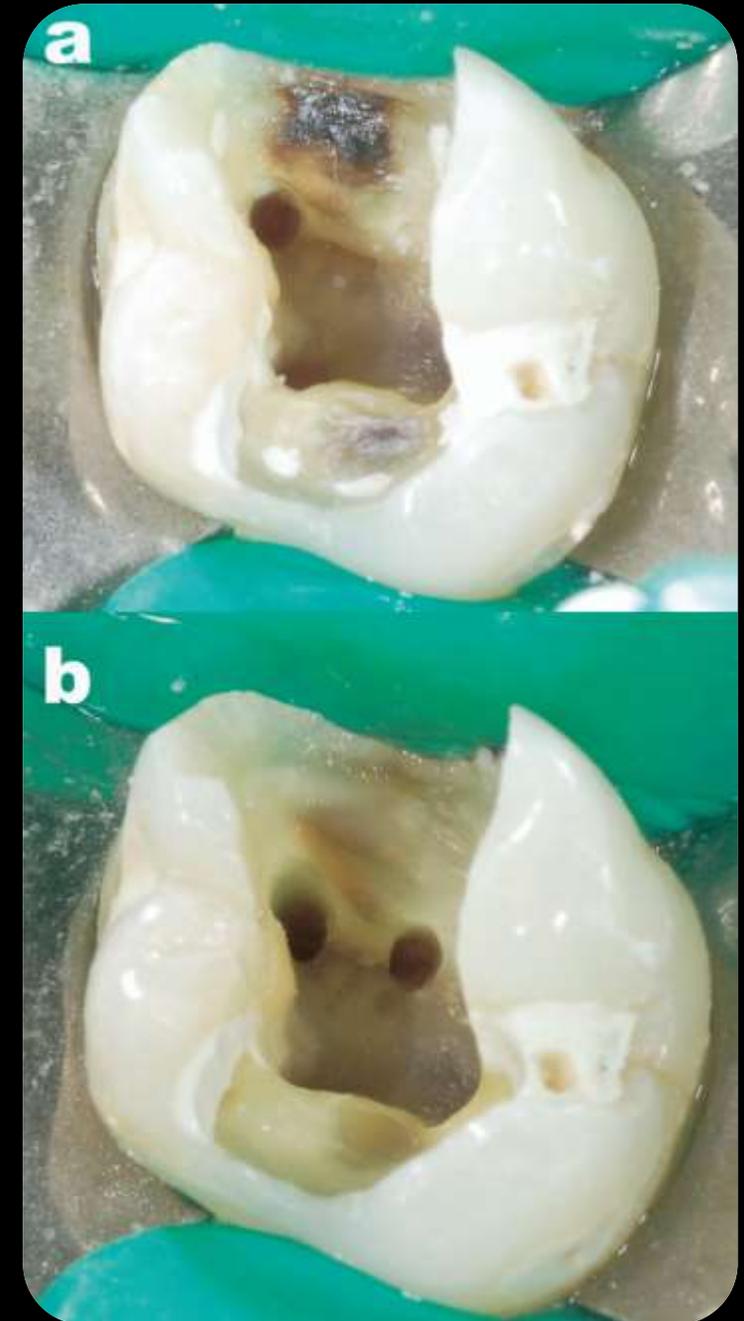
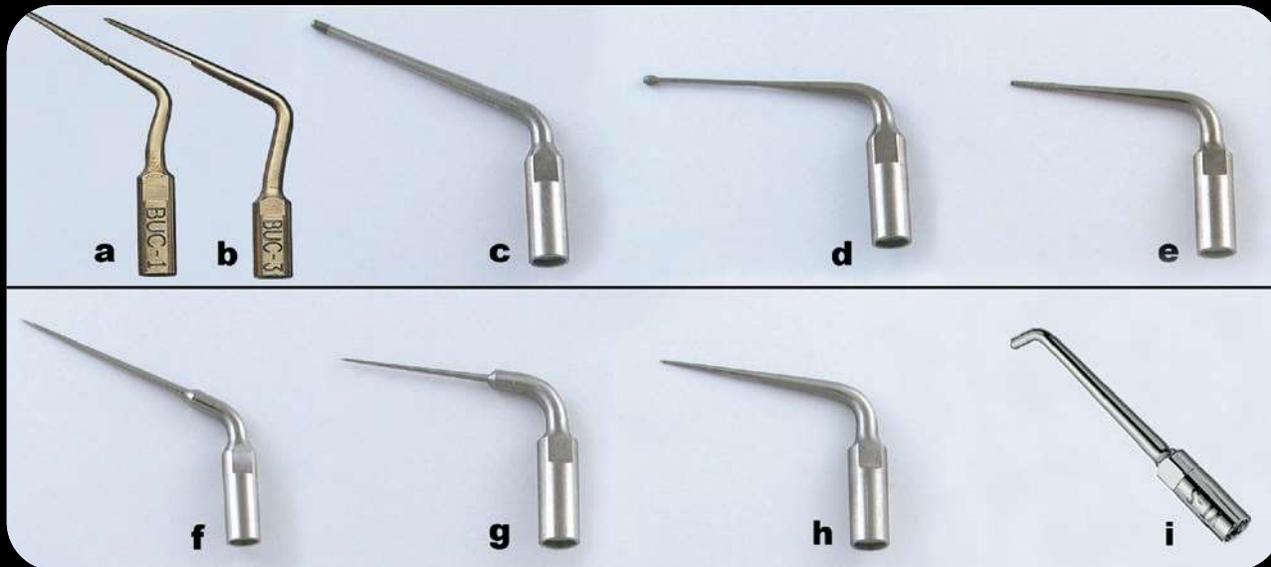


increases the magnification

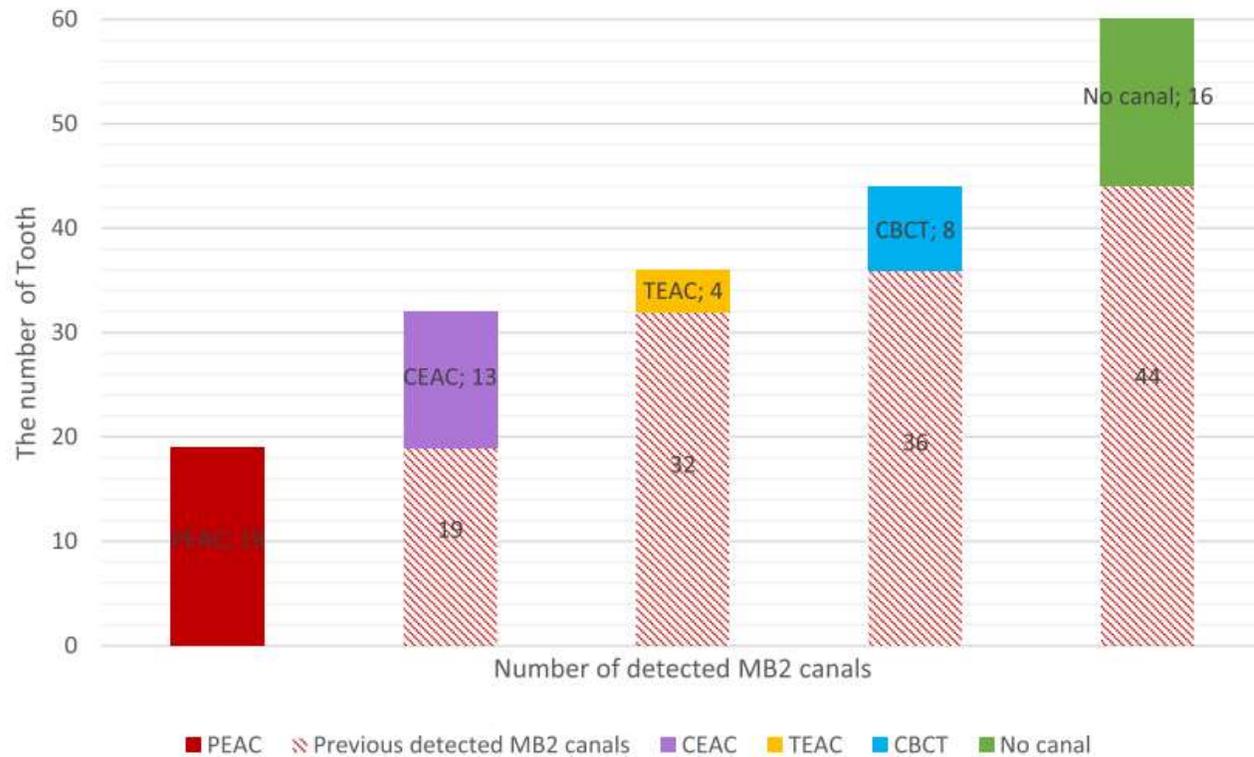
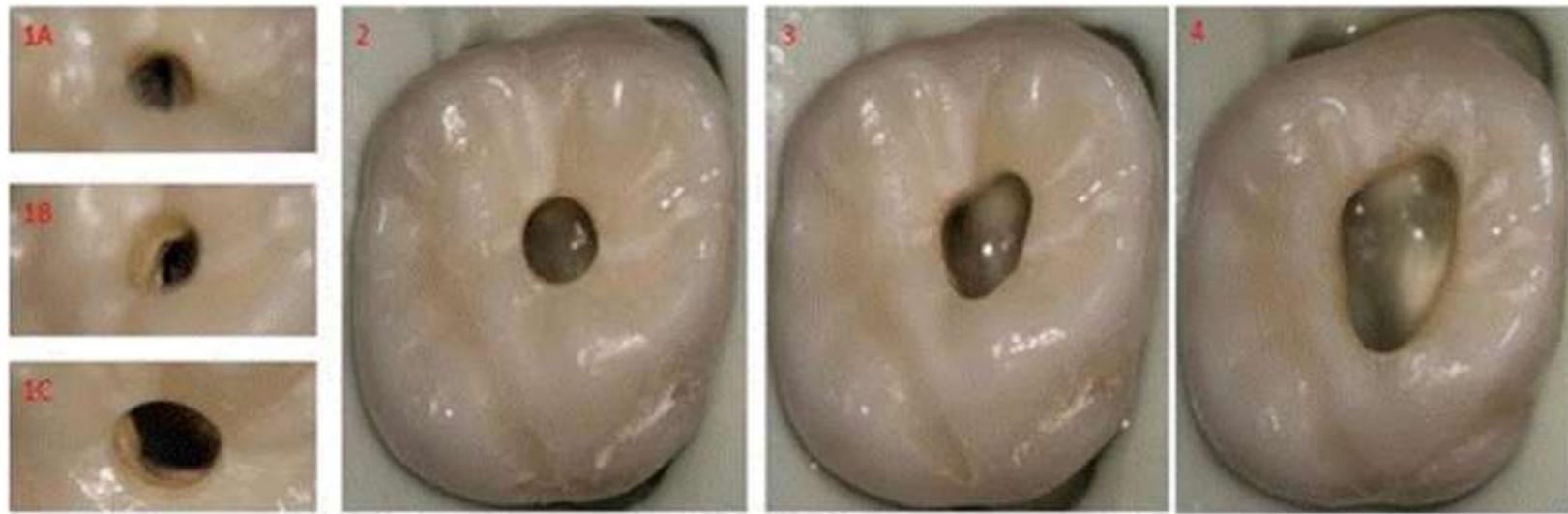
Ultrasonics in Endodontics

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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