

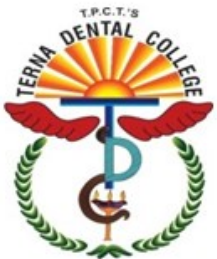
Access cavity preparation

PART 1



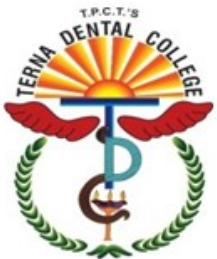
Introduction.

- It is widely accepted that disinfection and subsequent obturation of the root canal space require enlargement of the canal.
- The two distinct steps for doing so are –
 - Coronal access cavity.
 - Radicular canal shaping.



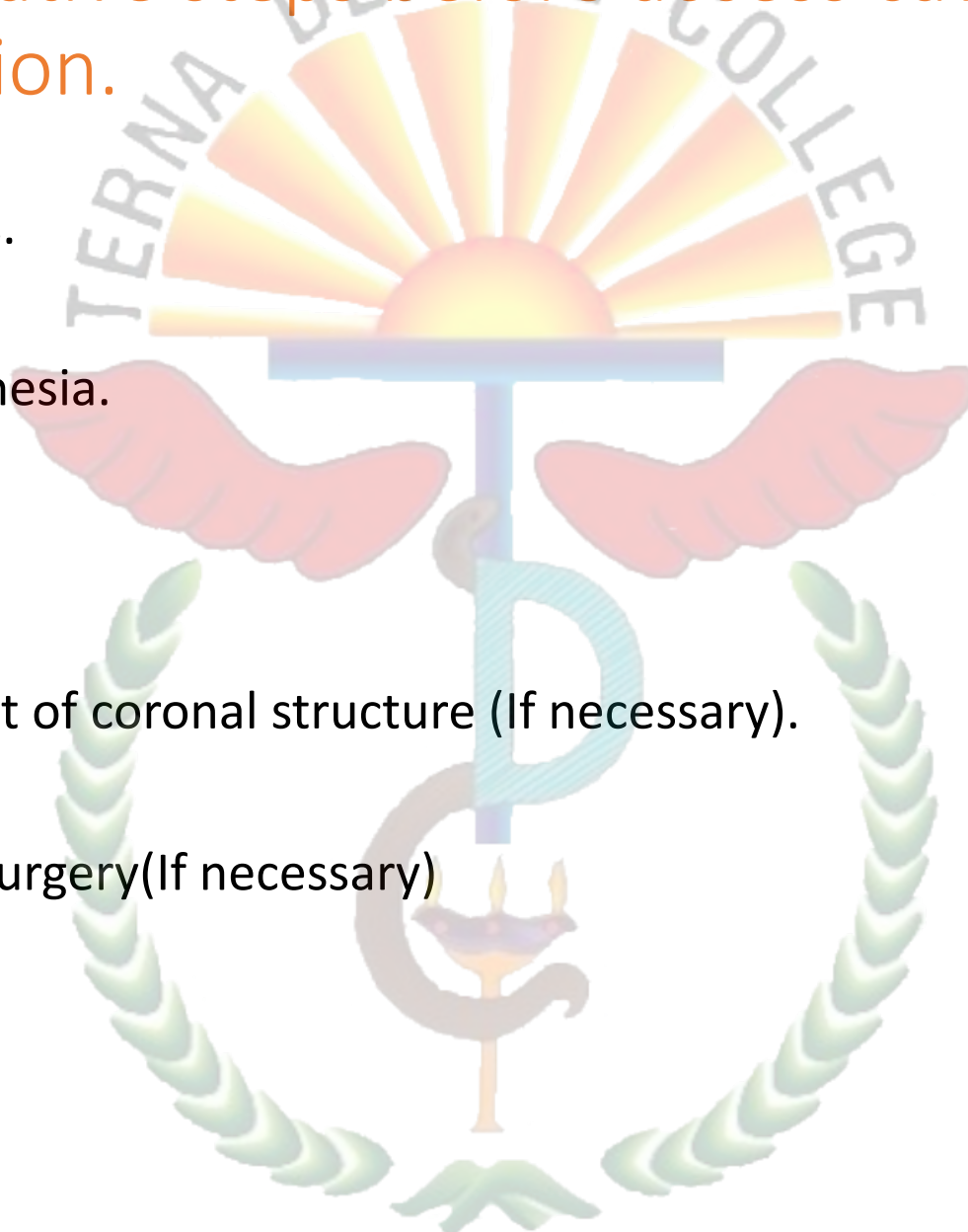
Definition.

- Endodontic access can be defined as the preliminary step in endodontic treatment, the opening in the dental crown that permits localization, cleaning, shaping, disinfection and three-dimensional obturation of the root canal system.



Pre-operative steps before access cavity preparation.

- Radiographs.
- Local Anesthesia.
- Isolation.
- Replacement of coronal structure (If necessary).
- Corrective Surgery(If necessary)

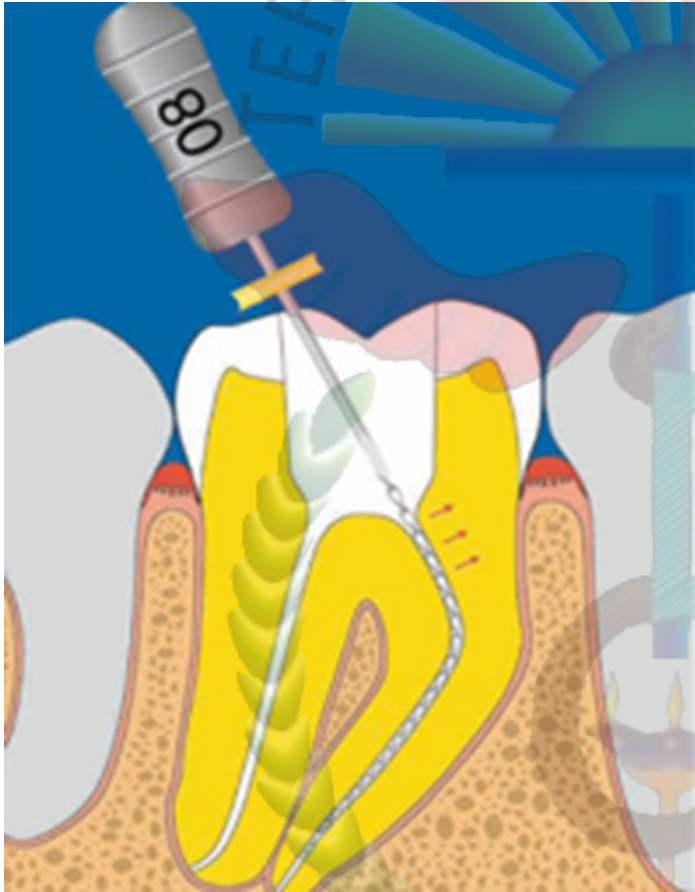


Objectives of Access cavity preparation

OBJECTIVES

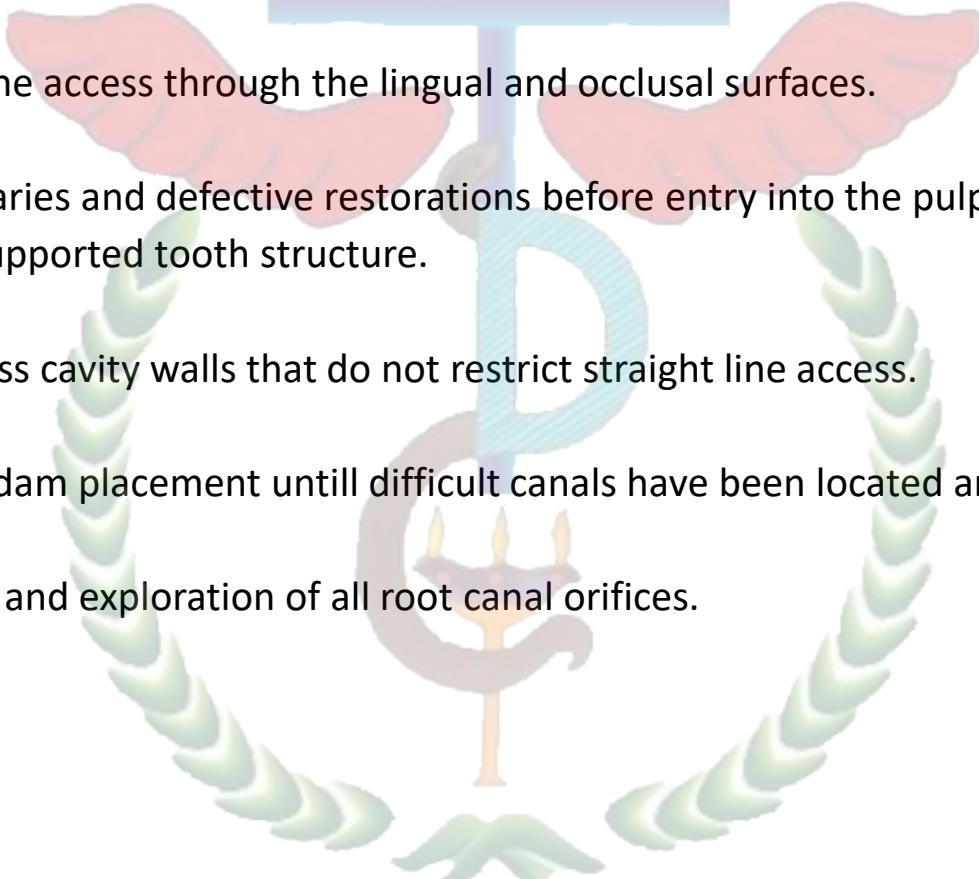
- To achieve a straight or direct line access to the apical foramen or the initial curvature of the canal.
- To locate all root canal orifices.
- To conserve sound tooth structure.
- To completely unroof the pulp chamber.
- To remove all coronal pulp (Vital or necrotic).
- To establish restorative margins to minimize microleakage of restored tooth.

The need for straight-line access.



Guidelines for Access cavity preparation

- Visualization of the likely internal anatomy.
- Evaluation of the CEJ and occlusal anatomies.
- Preparation of the access through the lingual and occlusal surfaces.
- Removal of all caries and defective restorations before entry into the pulp chamber.
- Removal of unsupported tooth structure.
- Creation of access cavity walls that do not restrict straight line access.
- Delay of Dental dam placement until difficult canals have been located and confirmed.
- Location, flaring and exploration of all root canal orifices.



Guidelines for Access cavity preparation





- Inspection of the pulp chamber using magnification and adequate illumination.
- Tapering of cavity walls and evaluation of space adequacy for coronal seal

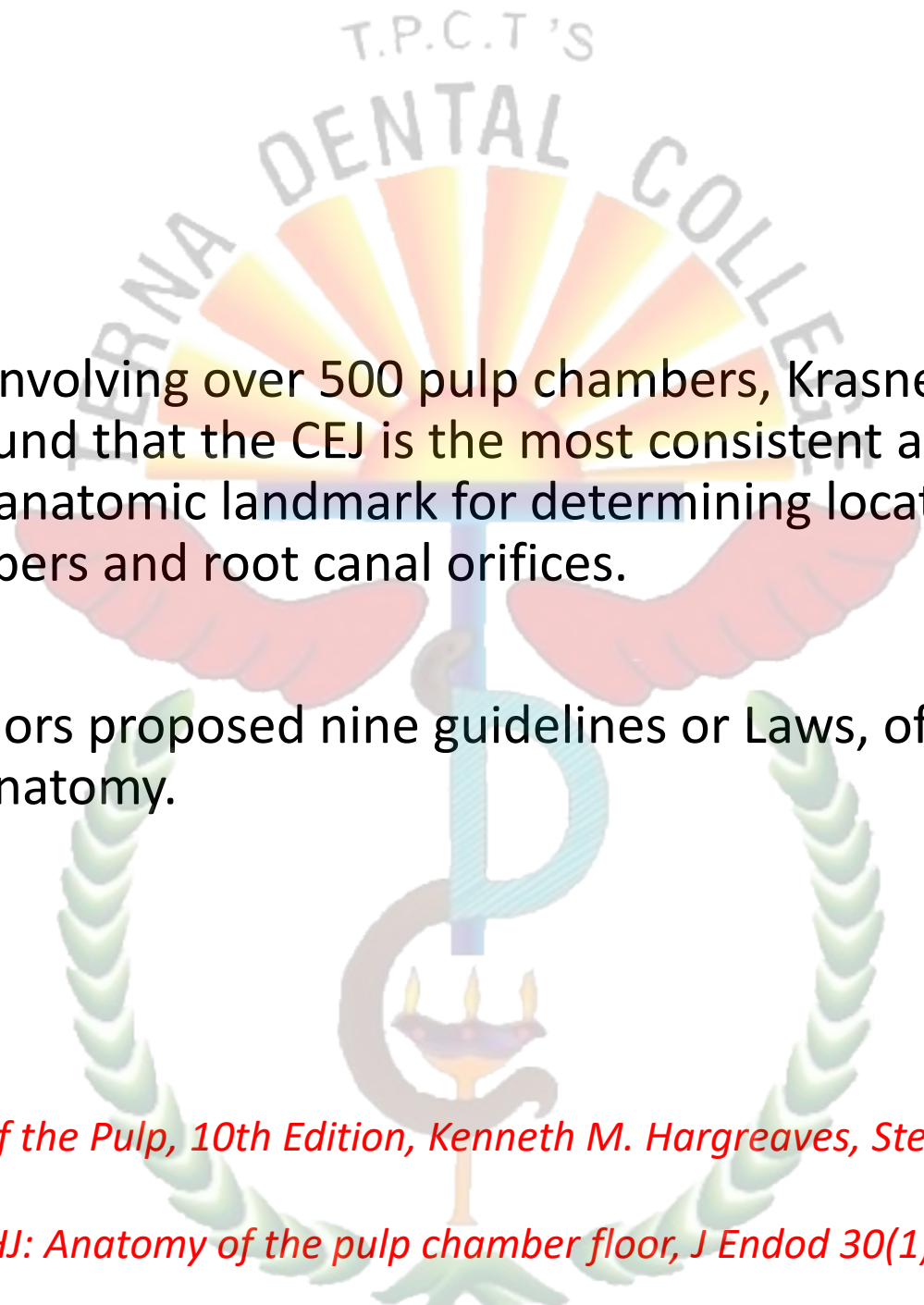
Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Visualization of the likely internal anatomy.

- Internal anatomy dictates access shape.
- First step is therefore, to visualize the anatomy.
- Studying angled periapical radiographs,
- Examination of tooth anatomy at coronal, cervical and root levels.
- Radiographs help in approximately locating pulp chamber, detecting pulp calcifications, and knowing the number of root canals and their lengths.
- Palpation along the attached gingiva helps in determining root direction and location.

Evaluation of CEJ and occlusal anatomies.

- Traditionally, access openings have been made keeping in mind the occlusal anatomy.
- However, this is misleading since the occlusal anatomy can change as the crown is destroyed by caries and subsequently reconstructed.
- Complete dependence on occlusal anatomy is wrong and not recommended.

- 
- In a study involving over 500 pulp chambers, Krasner and Rankow found that the CEJ is the most consistent and important anatomic landmark for determining location of the pulp chambers and root canal orifices.
 - These authors proposed nine guidelines or Laws, of pulp chamber anatomy.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Krasner P, Rankow HJ: Anatomy of the pulp chamber floor, J Endod 30(1):5, 2004.

Law of centrality.

- It states that The floor of the pulp chamber is always located in the center of the tooth at the level of the CEJ.



Krasner P, Rankow HJ: Anatomy of the pulp chamber floor, J Endod 30(1):5, 2004.

Cut specimen showing the centrality of the pulp chamber.

Law of centrality.

The Law of Centrality can be used as a guide for the beginning of access. However, it is critical that the operator understand that the law is consistently true only at the level of the CEJ and unrelated to the occlusal anatomy.

Krasner P, Rankow HJ: Anatomy of the pulp chamber floor, J Endod 30(1):5, 2004.

"Access opening and canal location", American Association of Endodontists – Colleagues for excellence – Spring 2010 Volume.



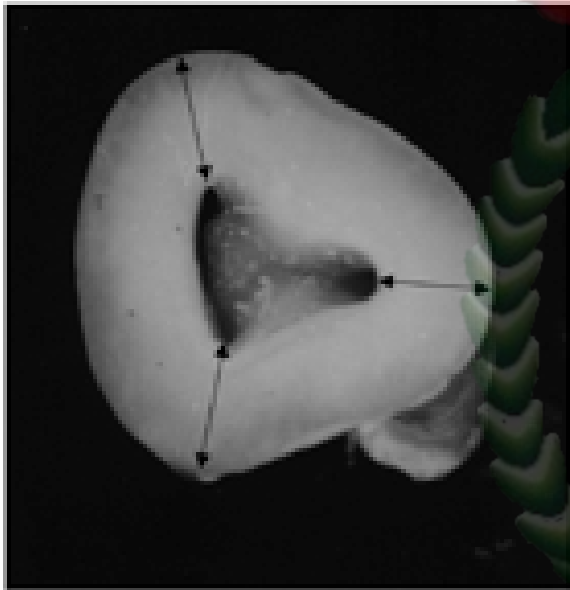
Location of CEJ unrelated to oversized crown.

Law of centrality.

- Since we know that the pulp chamber is always in the center of the tooth at the level of the CEJ, the initial penetrating bur should be directed towards the center of the CEJ.
- Therefore, in a counterintuitive method, access should be initiated by mentally ignoring the clinical or restored crown of the tooth and looking beyond the crown to the mentally imaged CEJ

Law of concentricity.

- It states that the walls of the pulp chamber are always concentric to the external surface of the tooth at the level of the CEJ, that is the external root surface anatomy reflects the internal pulp chamber anatomy.



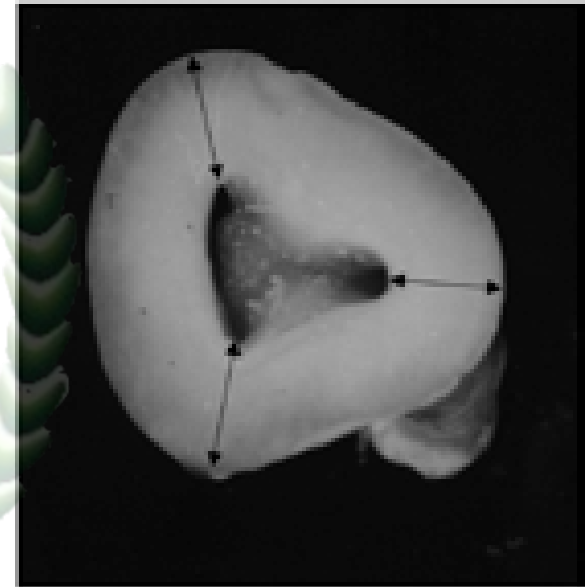
*“Access opening and canal location”, American Association of Endodontists –
Colleagues for excellence – Spring 2010 Volume.*

Law of the C.E.J.

- It states that the distance from the external surface of the clinical crown to the wall of the pulp chamber is the same throughout the circumference of the tooth at the level of the CEJ, making the CEJ the most consistent repeatable landmark for locating the position of the pulp chamber.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Krasner P, Rankow HJ: Anatomy of the pulp chamber floor, J Endod 30(1):5, 2004.



First law of symmetry.

- Except for the maxillary molars, canal orifices are equidistant from a line drawn in a mesiodistal direction through the center of the pulp chamber floor.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Krasner P, Rankow HJ: Anatomy of the pulp chamber floor, J Endod 30(1):5, 2004.

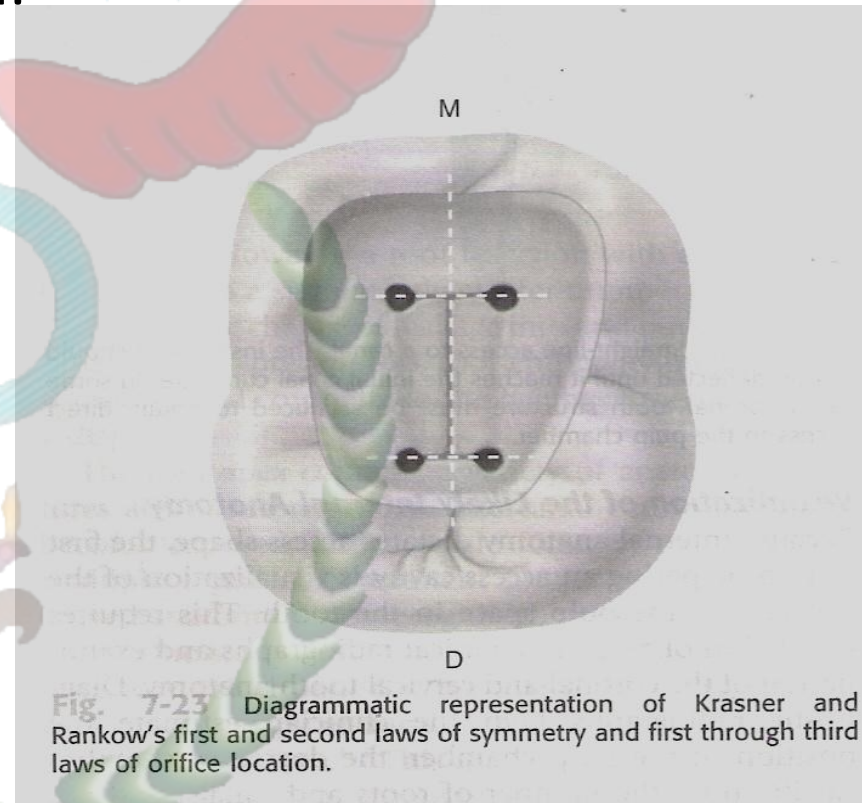


Fig. 7-23 Diagrammatic representation of Krasner and Rankow's first and second laws of symmetry and first through third laws of orifice location.

Second Law of symmetry.

- Except for the maxillary molars, canal orifices lie on a line perpendicular to a line drawn in a mesiodistal direction across the center of the pulp chamber floor.

*Cohen's Pathways of the Pulp,
10th Edition, Kenneth M.
Hargreaves, Stephen Cohen,
2011.*

*Krasner P, Rankow HJ: Anatomy
of the pulp chamber floor, J
Endod 30(1):5, 2004.*

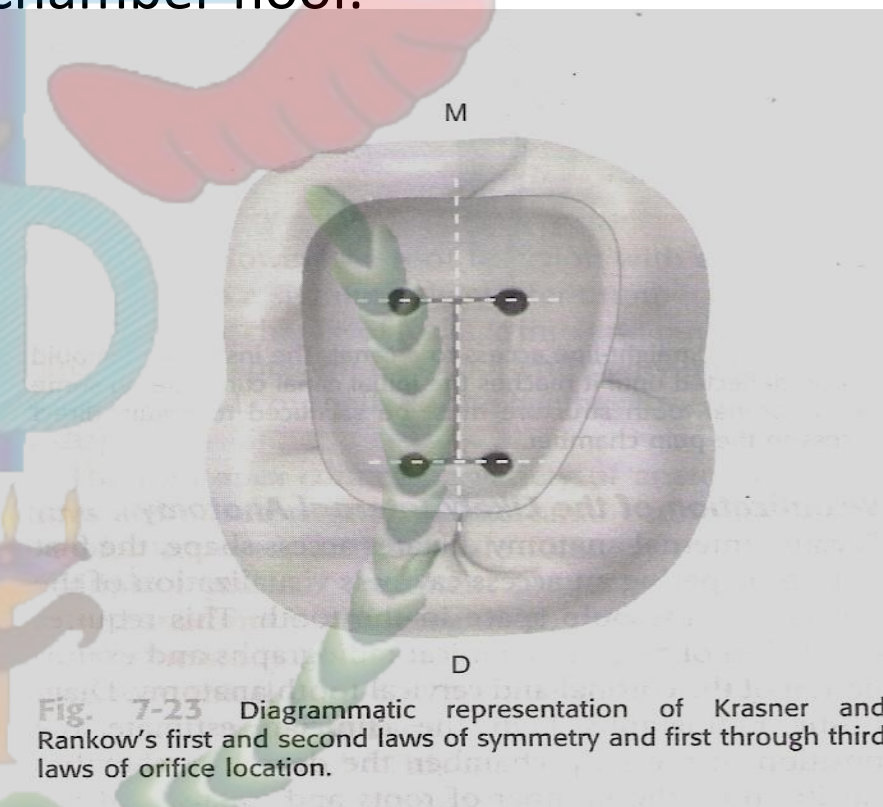


Fig. 7-23 Diagrammatic representation of Krasner and Rankow's first and second laws of symmetry and first through third laws of orifice location.

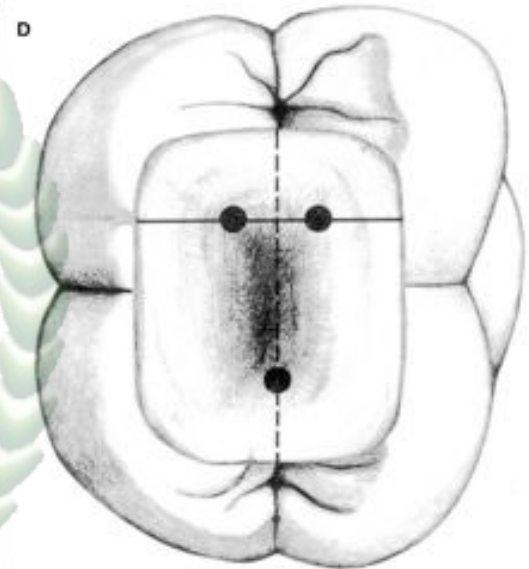
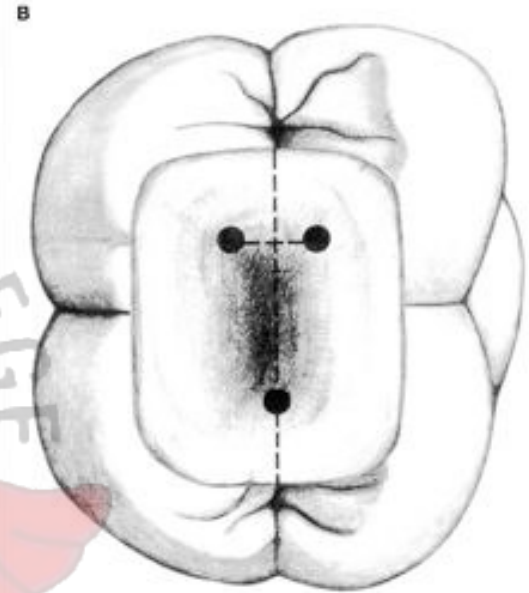
(A) Cut specimen of mandibular molar showing equidistance of orifices from mesiodistal line.

(B) Mandibular molar showing equidistance of orifices from mesiodistal line.

(C) Cut specimen of mandibular molar showing orifices perpendicular to mesiodistal line.

(D) Mandibular molar showing orifices perpendicular to mesiodistal line.

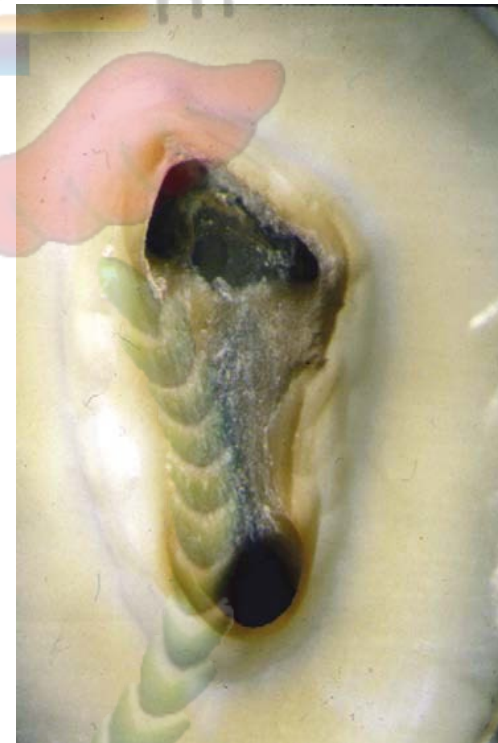
Krasner P, Rankow HJ: Anatomy of the pulp chamber floor, J Endod 30(1):5, 2004.



Law of color change.

- The pulp chamber floor is always darker in color than the walls.

(A) Cut specimen showing the dark chamber floor (FI). (B) Cut specimen showing the junction of the light walls and the dark floor (FWJ).



First law of orifice location.

- The orifices of the root canals are always located at the junction of the walls and the floor.

Cut specimen showing the orifices located at the junction of the floor and walls .



Second law of orifice location.

- The orifices of the root canals are always located at the angles in the floor-wall junction.

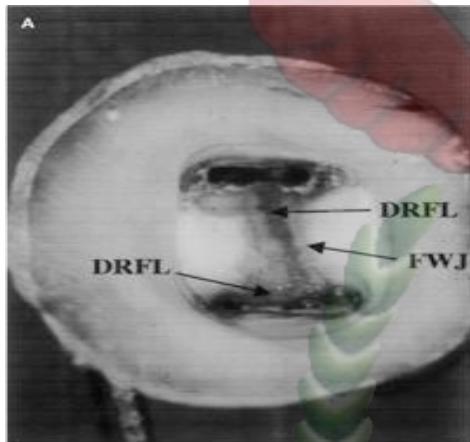


*Krasner P,
Rankow HJ:
Anatomy of the
pulp chamber
floor, J Endod*

Cut specimen showing the orifices located (OL) at the angles in the chamber floor and floor-wall junction (FWJ). (B) Diagram of maxillary molar showing orifice location at the angles of the chamber floor and floor-wall junction.

Third law of orifice location.

- The orifices of the root canals are always located at the terminus of the roots' developmental fusion lines.



Cut specimen showing the developmental root fusion lines (DRFL) and the floor-wall junction (FWJ).



Developmental root fusion lines of a maxillary molar.

Preparation of the access cavity through the lingual and occlusal surfaces.

- Access in anterior teeth is usually gained through the lingual surface.
- In the posterior teeth, it is gained through the occlusal surface.
- These approaches are the best means of gaining straight-line access and achieving optimal aesthetics after the endodontic treatment.
- For mandibular incisors, access may be gained through incisal surface. This allows better access to the lingual canal(if present) and improves canal debridement.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Mauger MJ, Waite RM, Alexander JB, Schindler WG: Ideal endodontic access in mandibular incisors. J Endod 25(3):206, 1999.

T.P.C.T'S
TERNA DENTAL COLLEGE

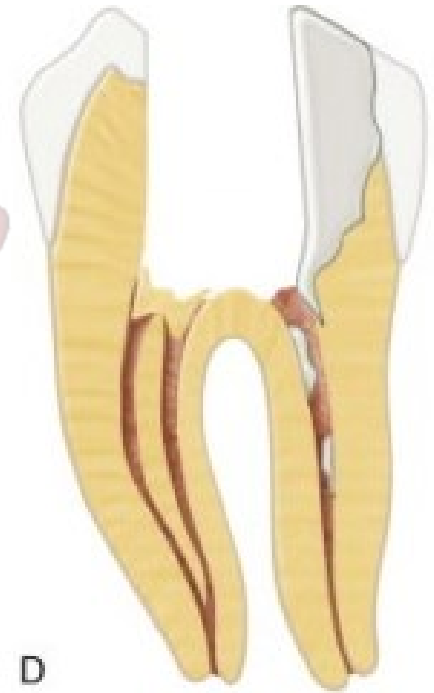
An incisal access cavity on mandibular anterior teeth may allow for improved straight-line access and canal debridement.



Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Removal of all defective restorations and caries before entry into the pulp chamber.

- With an open preparation, canals are easier to locate, clean, shape and obturate.
- Working through restorations also allows debris to become lodged easily in the canal.
- All caries must be removed to prevent carious dentin and bacteria from entering the root canals.

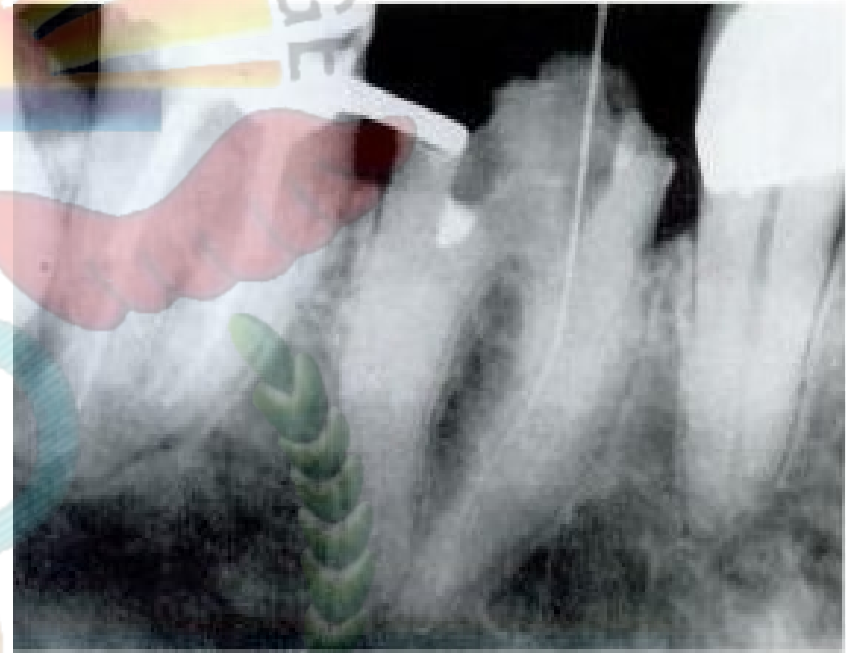


Debris falling into the root canal-
an iatrogenic mishap.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Removal of all defective restorations and caries before entry into the pulp chamber.

- If the chamber wall is perforated during caries removal, that particular wall must be repaired immediately using a temporary restorative material.
- Sometimes, caries removal may severely reduce the tooth size to such an extent that a rubber dam clamp no longer fits adequately, a CLP must be done in such a situation.



Badly broken down first molar, with rubber dam clamp on second molar allowing unobstructed view.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Image – courtesy of Jeffrey M. Coil, Ingle's Endodontics, John Ide Ingle, Leif K Bakland, 2002.

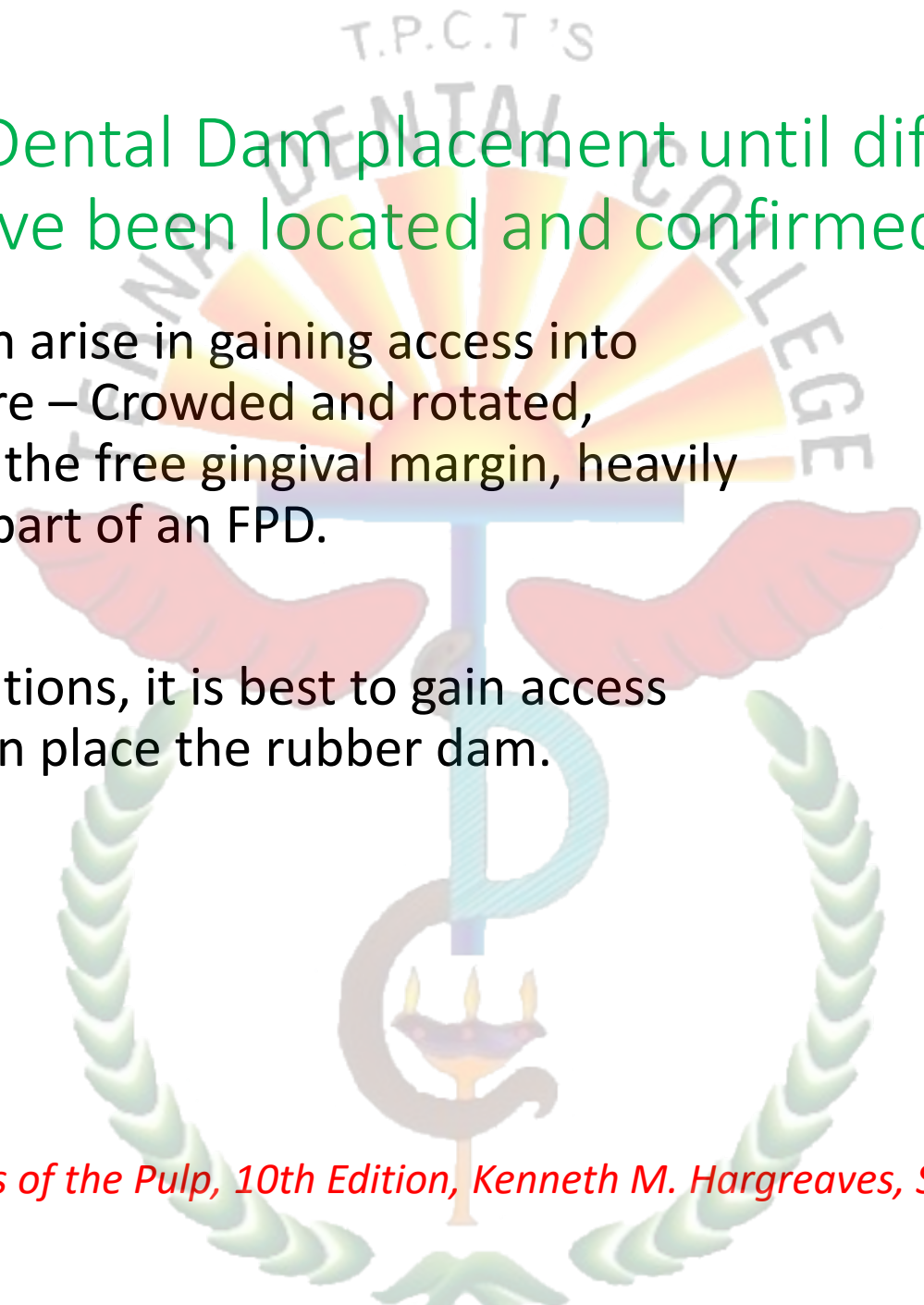
Creation of access cavity walls that do not restrict straight-line or direct-line passage of instruments.

- Sufficient tooth structure must be removed from the canal to allow instruments to be placed easily into each canal orifice without interference from canal walls.
- The walls of the canal rather than the walls of the access opening should guide placement of instruments into the canal.
- Failure to do so may lead to ledge formation or transportation of the apical foramen or instrument separation.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Delay in Dental Dam placement until difficult canals have been located and confirmed.

- Difficulty can arise in gaining access into teeth that are – Crowded and rotated, fractured to the free gingival margin, heavily restored or part of an FPD.
- In such situations, it is best to gain access first and then place the rubber dam.



Location, Flaring, and Exploration of All Root Canal Orifices.

- A sharp endodontic explorer is used to locate all root canal orifices.
- Next, all the canal orifices and the coronal portions of the canals are flared to make instrument placement easier.
- Small, pre-curved K-files are then introduced into the canal taking care not to exceed the working length until it has been determined accurately.
- A water-based lubricating agent like RC Prep [Premier Dental Products, Plymouth Meeting, PA) may be used as water based lubricants will not congeal pulp tissue.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Inspection of the Pulp Chamber, Using Magnification and Adequate Illumination

- Adequate illumination and magnification are essential for successful endodontic therapy.
- This is true, especially for determining the location of canals; negotiating constricted, curved, and calcified canals; and debriding and removing tissue and calcifications from the pulp chamber.
- Internal dentin color changes and subtle landmarks may not be visible to the unaided eye.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Vizualization Aids in locating canals.

- Anatomic familiarity.
- Vision = Magnification + illumination.
- Surgical length burs.
- Dyes - Methylene Blue is water soluble that can be applied to dried acces cavities. It will be absorbed into orifices, fins and isthmus areas and help to “Map” the location of the orifices.

Vizualization Aids in locating canals.

- Bubble test – When NaOCl is flooded into the access cavity, it dissociates into Na^+ and Cl^- Liberating free Oxygen.

This Oxygen forms bubbles when it comes in contact with pulpal tissue. This indicates a positive Bubble or “Champagne” test.



NaOCl forms bubbles on coming in contact with pulp tissue

Vizualization Aids in locating canals.

- Transillumination. – A fibreoptic wand is held at the cervical level perpendicular to the tooth, any overhead light is turned off.
- Red Line test – In vital teeth, blood frequently emanates from a fin, isthmus or orifice area. It serves a similar purpose as dyes.
- White Line test – In necrotic teeth, dentinal dust accumulates into an open space such as a fin, isthmus or orifice and forms a white dot or line, forming a “roadmap” which will lead to the canal orifice – for eg the MB2 orifice. The access cavity must be dry while performing this test.



Canal orifices seen under Transillumination.

*“Radar,” Vol 4, No 6.
Clifford J. Ruddle, Nov
2011.-*

www.endoruddle.com

Tapering of cavity walls and evaluation of space adequacy for a coronal seal.

- A proper access cavity generally has tapering walls with its widest dimension at the occlusal surface.
- Such a design does not allow occlusal forces to push the restoration into the cavity, thus disrupting the coronal seal in the process.
- At least 3.5 mm of temporary restoration material (e.g., Cavit [3M, St. Paul, MN]) is required to provide good coronal seal for a short time.



Tapering walls of access cavity



Armamentaria for access cavity preparation.

- Magnification and illumination.
- Hand-pieces and Burs.
- Endodontic explorer.(DG-16, DE-17, JW-17).
- Endodontic spoon.
- #17 Operative explorer.
- Ultrasonic unit and tips.

Magnification.

- Loupes.

All loupes use convergent lenses to form a magnified image.

The simplest form of magnification is single-lens loupes (used by jewellers). These have a set focal length and working distance .

To overcome this, multi-lens optics are used. This provides a higher depth of magnification and an improved working distance.

Endodontics, 6th edition, John I. Ingle, Leif K. Bakland, J. Craig Baumgartner, 2008



Single lens loupe



Surgical loupes with compound lenses (2 lenses)

Magnification.

- Loupes.

Ideal magnification recommended for loupes is 2.5x. This offers the best compromise between weight, optical performance as well as cost.

Loupes with magnification of 4.5x are also available. But this limits the field of view and the depth of field.

Also such loupes would be significantly heavier.

Magnification.

- Dental Operating Microscope.

Microscopes can provide magnification upto 30x.

DOM can provide good Depth of view at high magnifications.

Fiber optic light of a DOM is 2-3 times more powerful than that emitted by surgical loupes with clip-on lamps.



Operating Microscope

Magnification.



**Magnified tooth as seen through Loupes
Magnification 3x**

**Image courtesy of Dr. Scott K. Bentkover, DDS,
Univ of Illinois, Chicago - <http://dentistry.uic.edu>**

Magnification.



**3.4x magnification
with DOM**



**5.1x magnification
with DOM**



**8.4x magnification
with DOM and cervical
transillumination.**

Handpieces.

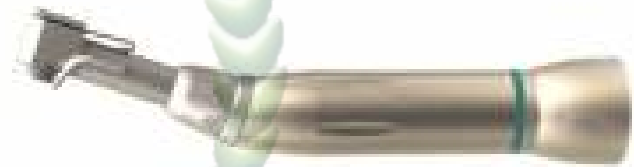
High speed and low speed handpieces may be used to make access.

High speed handpieces have high speed and cutting efficiency, but at the cost of decreased tactile sensation.

Initial penetration into dentin may be made with a high speed handpiece and then a slow speed handpiece may be used, especially in teeth involving calcified and receded pulp chambers.



High speed handpiece



Slow speed handpiece

Burs.

- Round carbide burs (sizes #2, #4, and #6) are used extensively in the preparation of access cavities.
- Used to remove caries and to create the initial external outline shape, penetrating through the roof of the pulp chamber and for removing the roof.

Burs.

- Some clinicians prefer to use a fissure carbide bur or a diamond bur with a rounded cutting end to perform these procedures.



Access bur: #57 fissure carbide bur.

Burs.

- The advantage is that these same burs can be used for axial wall extensions of the access opening.

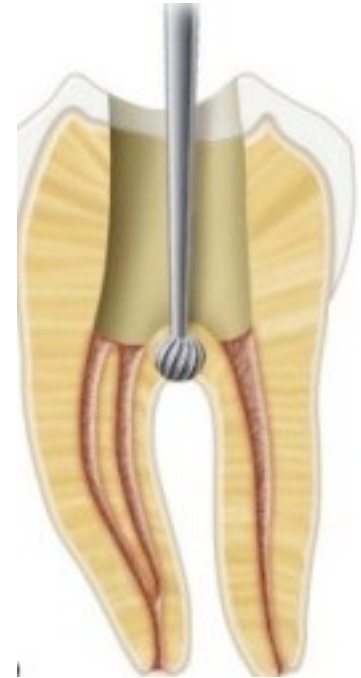


Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Access bur: round-end cutting tapered diamond bur

Burs.

- Use by an inexperienced operator may cause these burs to cause gouging of the floor of the pulp chamber and the axial walls.



Burs.

- To solve this problem, we have safe-ended burs for access preparation.
- The burs can be allowed to extend to the pulp floor, and the entire axial wall can be moved and oriented all in one plane from the enamel surface to the pulp floor.

*Cohen's Pathways of the Pulp, 10th Edition,
Kenneth M. Hargreaves, Stephen Cohen, 2011.*

Safety-tip tapered diamond bur (*left*); safety-tip tapered carbide bur (*right*).

Burs.

- Round diamond burs (#2 and #4) must be used when access needs to be gained through a ceramic or ceramo-metal restoration.
- Diamond burs are less traumatic to porcelain than carbide burs and are more likely to penetrate it without cracking or fracturing it.

#2 and #4 round diamond burs.

Burs.

- Zirconia is a brittle material and, when cut, can develop cracks that propagate through the framework and lead to eventual failure of the crown or onlay.
- Medium and fine-grit diamond burs effectively cut zirconia, but these burs dull rapidly; should be discarded after one use.



Zirconia crowns 36 and 37

Burs.

- Sometimes, access has to be made through metal.
- Can be amalgam, all-metal cast restorations, or metal copings of porcelain fused to metal crowns.
- A Trans-metal bur is used for this purpose.



Transmetal bur.

Burs.

- If a tooth has a receded pulp chamber and calcified orifices, the clinician often must cut into the root to locate and identify the canal orifices.
- Extended-shank round burs, such as the Mueller bur (Brasseler USA, Savannah, GA) and the LN bur (DENTSPLY Maillefer, Tulsa, OK), are useful for this purpose.

*Cohen's Pathways of the Pulp, 10th Edition,
Kenneth M. Hargreaves, Stephen Cohen, 2011.*

A, Mueller bur. **B**, LN bur.

Burs.

- Munce Discovery Burs (Santa Barbara, CA) are also available for the same purpose



Munce Discovery Burs- #1/4,
#1/2, #1, #2, #3, #4

Mueller bur kit – from left to
right – tip sizes
0.9 , 1, 1.2, 1.4, 1.6, 1.8 mm

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011. images – Brasseler and CJM engineering catalogues.

Burs.

All 4 sizes of the MD Burs have the same shaft diameter—1mm.

This contrasts with Mueller Burs which have variable shaft diameters, the smallest of which is a very flexible 0.5mm

Additionally, the smallest Mueller Bur tip size is ~0.85mm in diameter, compared to the #1 and #1/2 MD Bur tip sizes of ~0.77mm and ~0.58mm in diameter, respectively

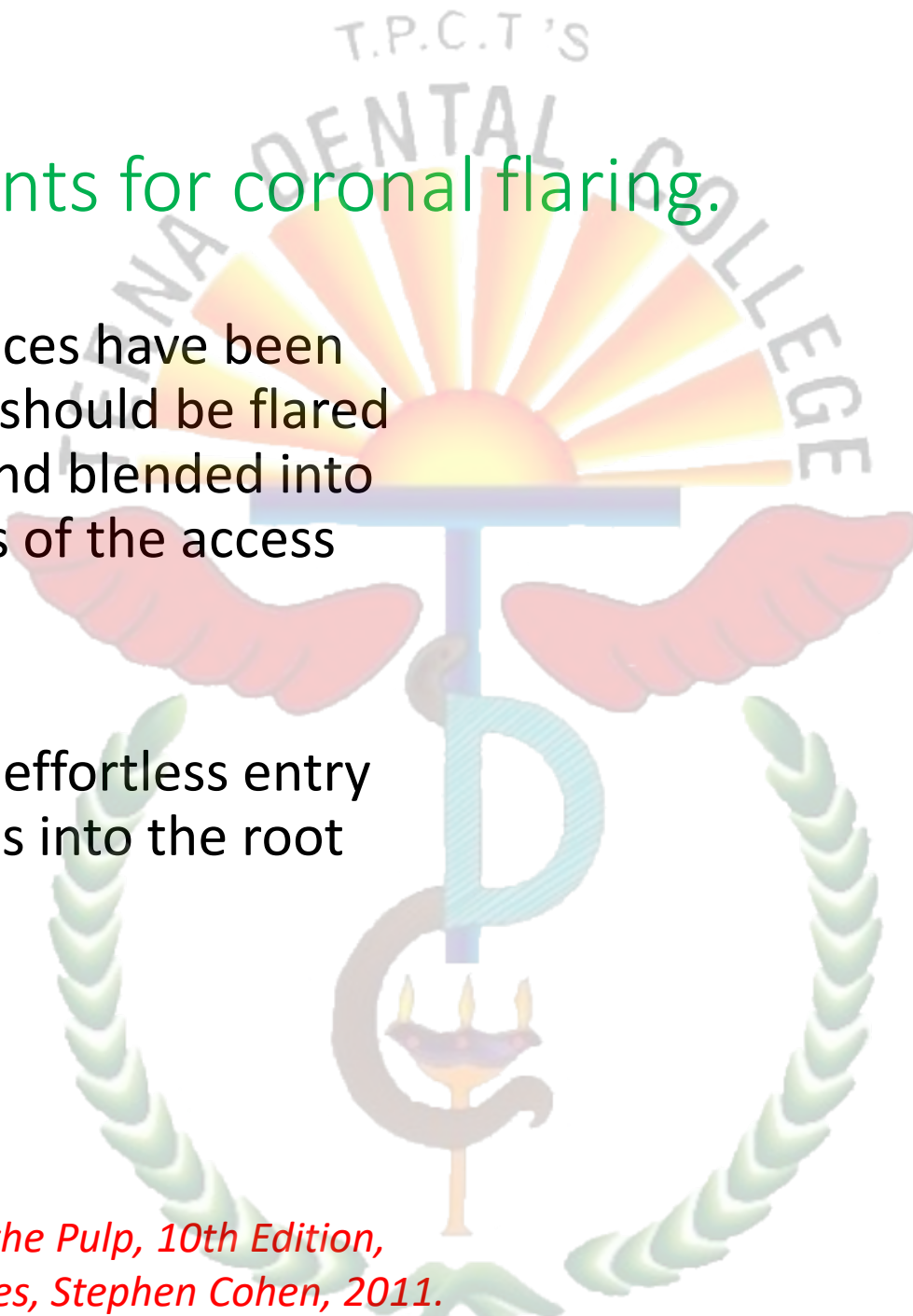


Stiff shaft of the Muncie Discovery Bur compared to the flexible shaft of the Mueller Bur.

John Munce- "A new troughing method is developed" – CJM Engineering – www.cjmengineering.com

Instruments for coronal flaring.

- Once the orifices have been located, they should be flared or enlarged and blended into the axial walls of the access cavity.
- This provides effortless entry of instruments into the root canal.



Instruments for coronal flaring.

- Gates-Glidden drills are used for this purpose, starting with the smaller instruments and progressing to the larger sizes.



Gates-Glidden burs, 1 through 6

Instruments for coronal flaring.

- A #.12 tapered rotary endodontic file can also be used for the flaring procedure.



#.12 taper nickel–titanium orifice opener

Instruments for coronal flaring.

- A #.12 tapered rotary endodontic file can also be used for the flaring procedure.



#.12 taper nickel–titanium orifice opener

Instruments for coronal flaring.


- Micro-openers (Dentsply-Maillefer, Tulsa, OK) are excellent instruments for locating canal orifices when a rubber dam hasn't been placed.
- These instruments have #.04 and #.06 tapered tips with offset handles for better visualization.



Instruments for coronal flaring.

Micro-Openers (Dentsply Maillerfer, Tulsa, OK) are modified K-files with a shank that is bent at 200° and a long plastic handle.

This avoids interference from the fingers and is ideal for working under the microscope.



The Micro-Opener series comprises three instruments with a tip diameter respectively of 0.10, 0.15 and 0.10 mm and a taper respectively of .04, .04 and .06

Instruments for coronal flaring.

The Micro-Debridors (Dentsply Maillefer, Tulsa, OK) are Hedstroem Files with a taper of .02 characterized by a short shaft bent at an angle of 200° and a long grip in plastic.

The Micro-Debridors are to be used only with a circumferential filing movement and are available in ISO diameters 20 and 30.



Micro-debridors

Instruments for coronal flaring.

- Other instruments that can be used for coronal flaring are –
- Gates glidden drills.
- SX file from the ProTaper system.
- Orifice Shapers- from the ProFile series.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Orifice Shapers.- ProFile series.

SX file – ProTaper series

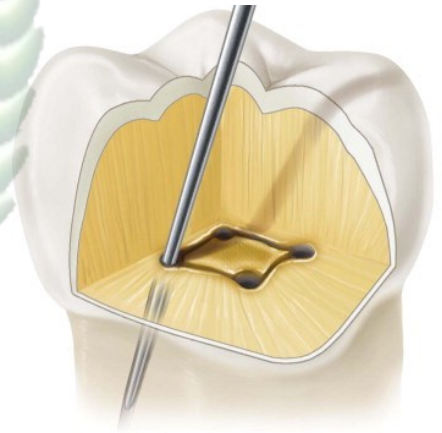
Endodontic explorer and spoon.

- The DG-16(Hu-Friedy, Chicago, IL) endodontic explorer is used to identify canal orifices and to determine canal angulation.
- The JW-17 endodontic explorer (CK Dental Industries, Orange, CA) serves the same purpose, but it is thinner, stiffer and can be used to identify calcified canals as well.



Dg 16 explorer, top

JW 17 explorer, bottom



Ultrasonics.

- An ultrasonic unit and tips specifically designed for endodontic procedures can be used in access cavity preparations.
- They can be used to trough and deepen developmental grooves to remove tissue and explore for canals.
- Ultrasonic systems provide excellent visibility compared to conventional handpiece heads.
- Ultrasonic tips are smaller than round burs, and their abrasive coatings allow clinicians to sand away dentin and calcifications.



Endodontic Ultrasonic Unit
(SybronEndo, Orange, CA)

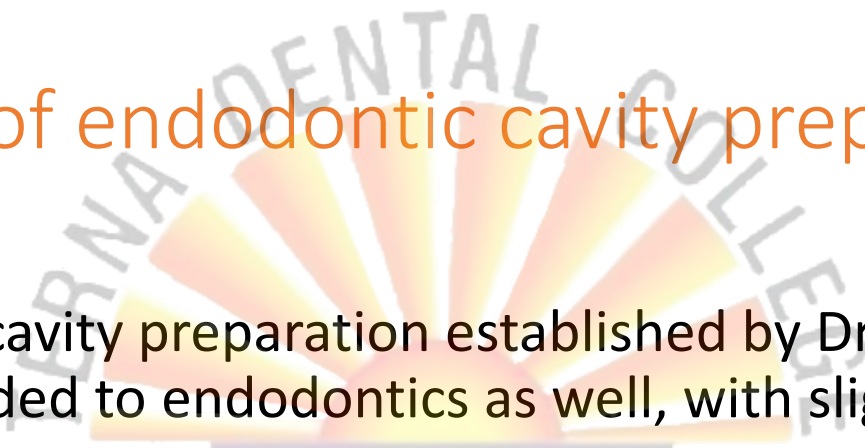


Ultrasonic tips with abrasive coating.

Ultrasonics.



Video – Courtesy of Dr. Shishir Singh, Dr. Roheet Khatavkar, Terna Dental College.

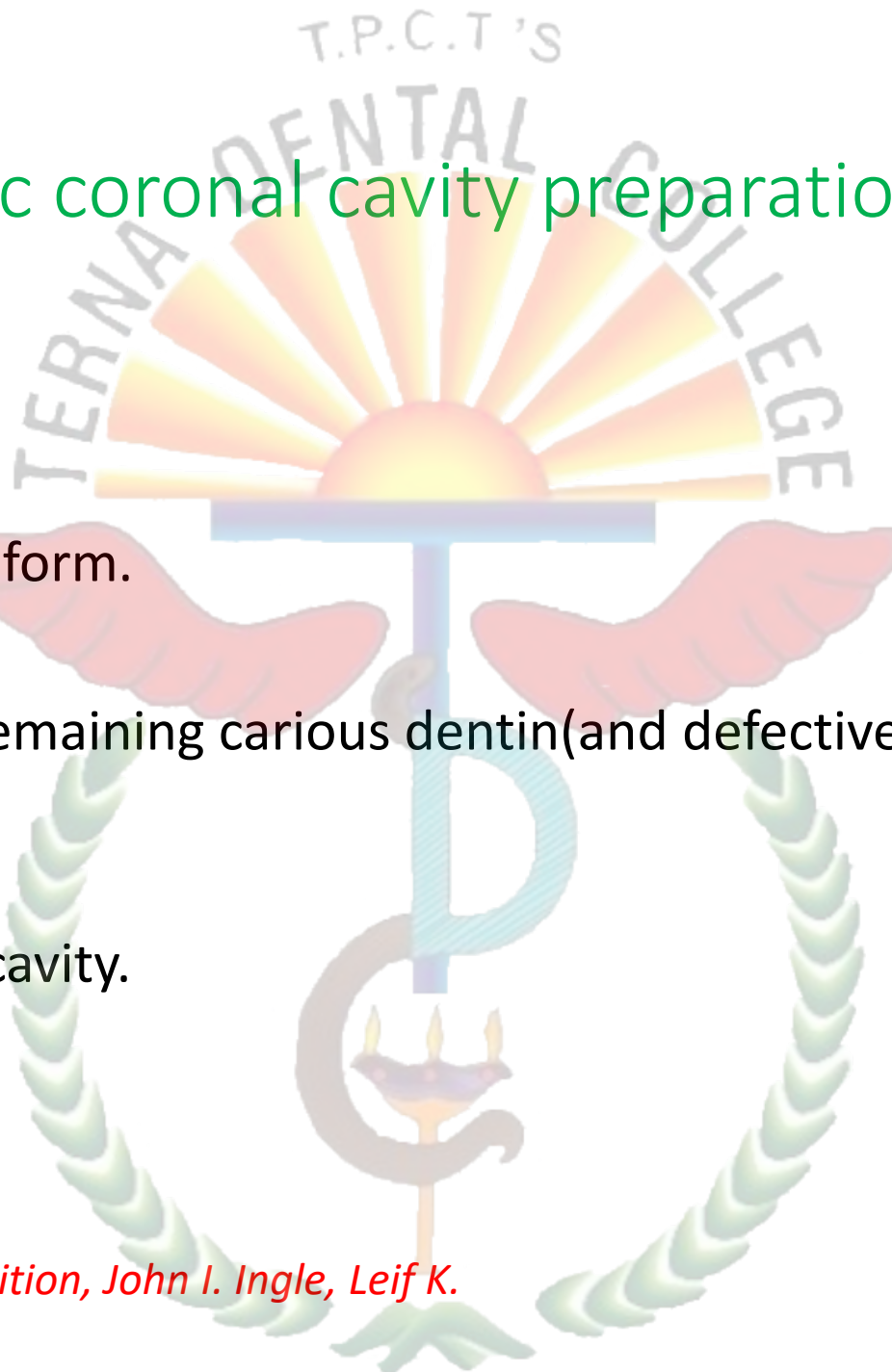


Principles of endodontic cavity preparation.

- Principles of cavity preparation established by Dr. G.V. Black. – Can be extended to endodontics as well, with slight modification.
- Can be divided into
 - Endodontic Coronal cavity preparation.
 - Endodontic Radicular cavity preparation.

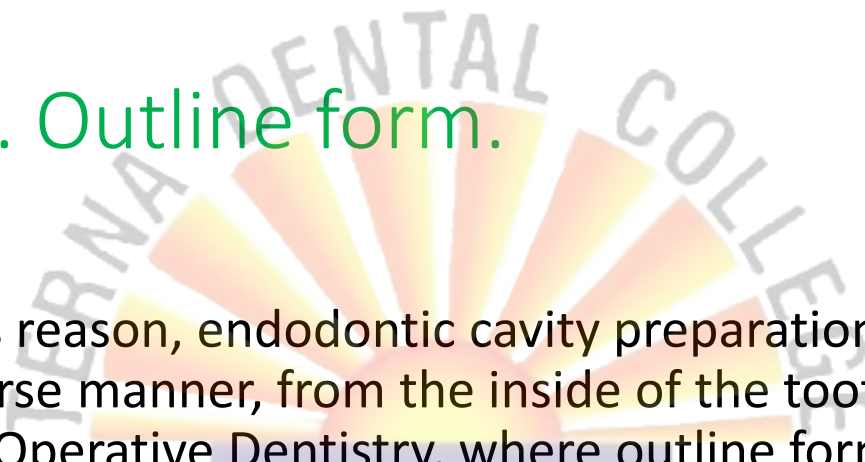
Endodontic coronal cavity preparation.

- Outline form.
- Convenience form.
- Removal of remaining carious dentin (and defective restorations).
- Toilet of the cavity.



Principle 1. Outline form.

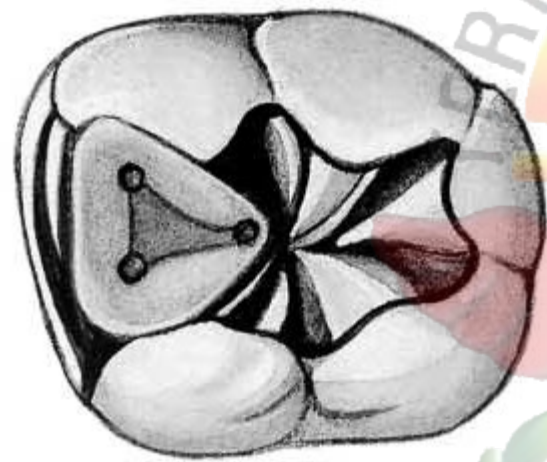
- The outline form of the access cavity must be correctly shaped and positioned to establish complete access for instrumentation, from cavity margin to the apical foramen.
- In endodontics, the outline form does not depend on the external anatomy of the tooth, but more on the internal anatomy.



Principle 1. Outline form.

- Because of this reason, endodontic cavity preparations need to be made in a reverse manner, from the inside of the tooth to the outside. (c.f. – Operative Dentistry, where outline form is dependent on external anatomy)
- Outline form depends on
 - Size of pulp chamber
 - Shape of pulp chamber
 - Number, position and curvature of the root canals.

Principle 1. Outline form.



c

Endodontic access with superimposed Inlay cavity preparation- Inlay cavity outline determined by external outline, and endodontic cavity is determined by internal anatomy.

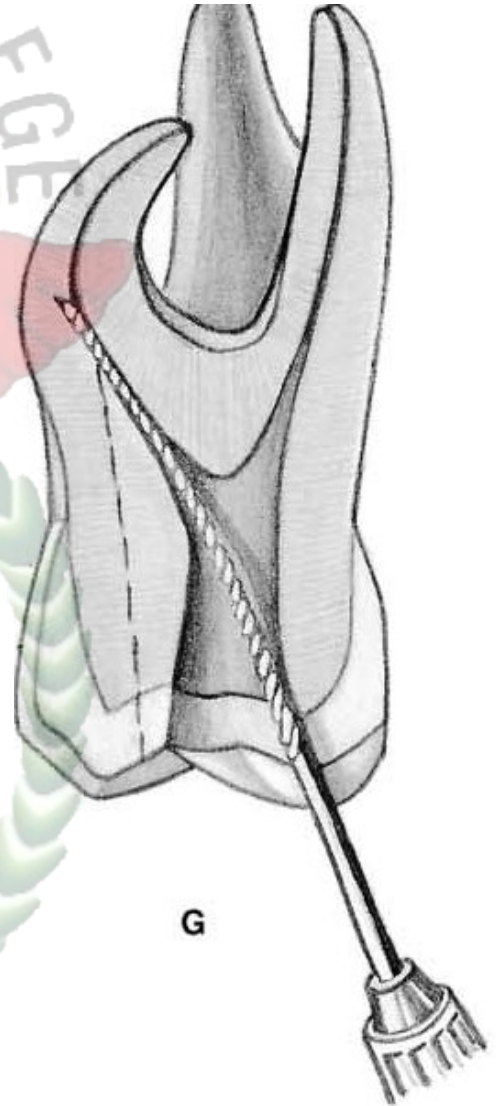


Left – access for young patient,
Right – access for older patient.

Principle 1. Outline form.

Inadequate coronal preparation in a maxillary molar, with a severe curvature in the MB root.

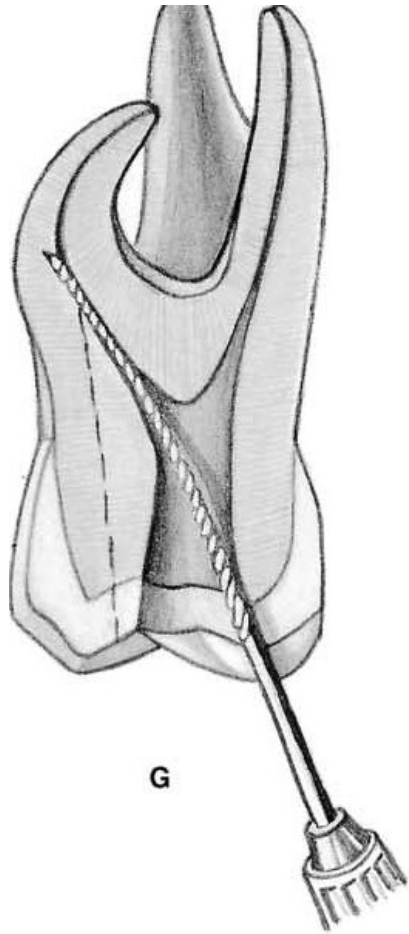
A ledge has been created. The internal cavity should have been extended to the dotted line to accommodate and maintain control if the instrument.



“Shamrock” preparation – Luebke, 1983.

- Luebke has made an important point, that an entire canal wall need not be extended in the event that instrument impingement occurs due to a severely curved root, or an extra canal.
- Only that portion of the wall, needed to free the instrument may be extended.
- A Clover-leaf appearance may evolve as the outline form as a result of this – This is called as a “Shamrock Preparation.”

“Shamrock” preparation – Luebke, 1983.



Modified outline – shamrock preparation on the right, to accommodate the instrument severely restrained in the mesial canal in the image on the left.

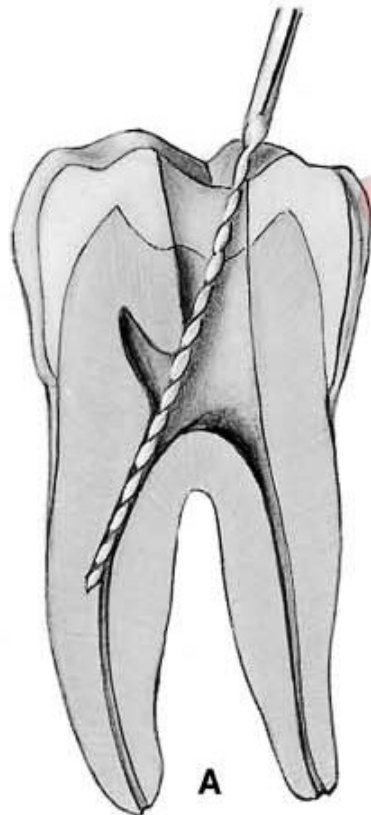


3-leaf Clover – The “Shamrock”

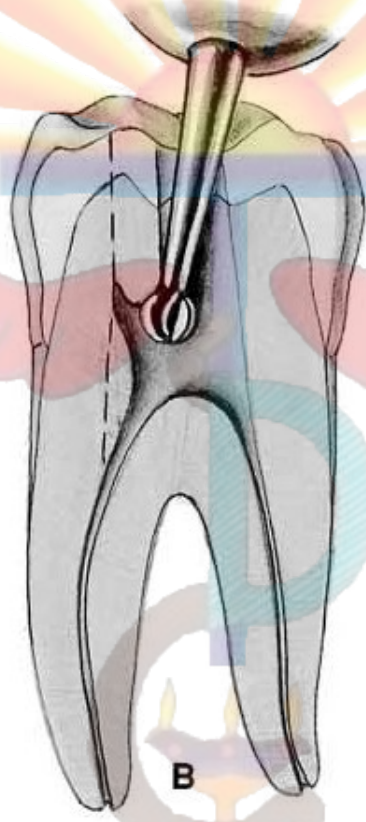
Principle 2. Convenience form.

- For convenient placement of instruments, preparation and filling of the canal.
- Three benefits are gained by proper convenience form:
 - 1) Unobstructed access to canal orifice.
 - 2) Direct or straight line access to apical foramen.
 - 4) Complete authority over the enlarging instrument.

Principle 2. Convenience form.



Obstructed access to the mesial canals in Mandibular first molar.



Using round bur to bring canal orifices into view.

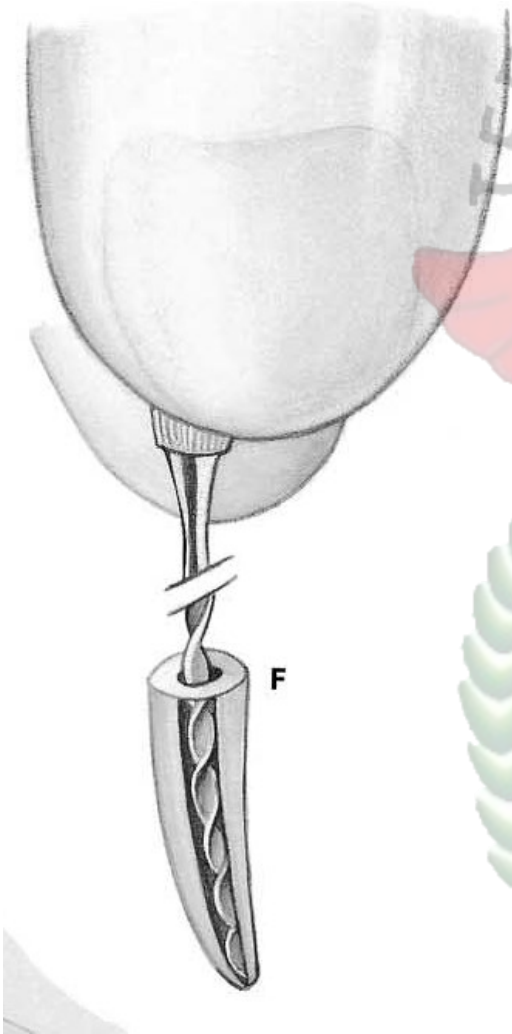


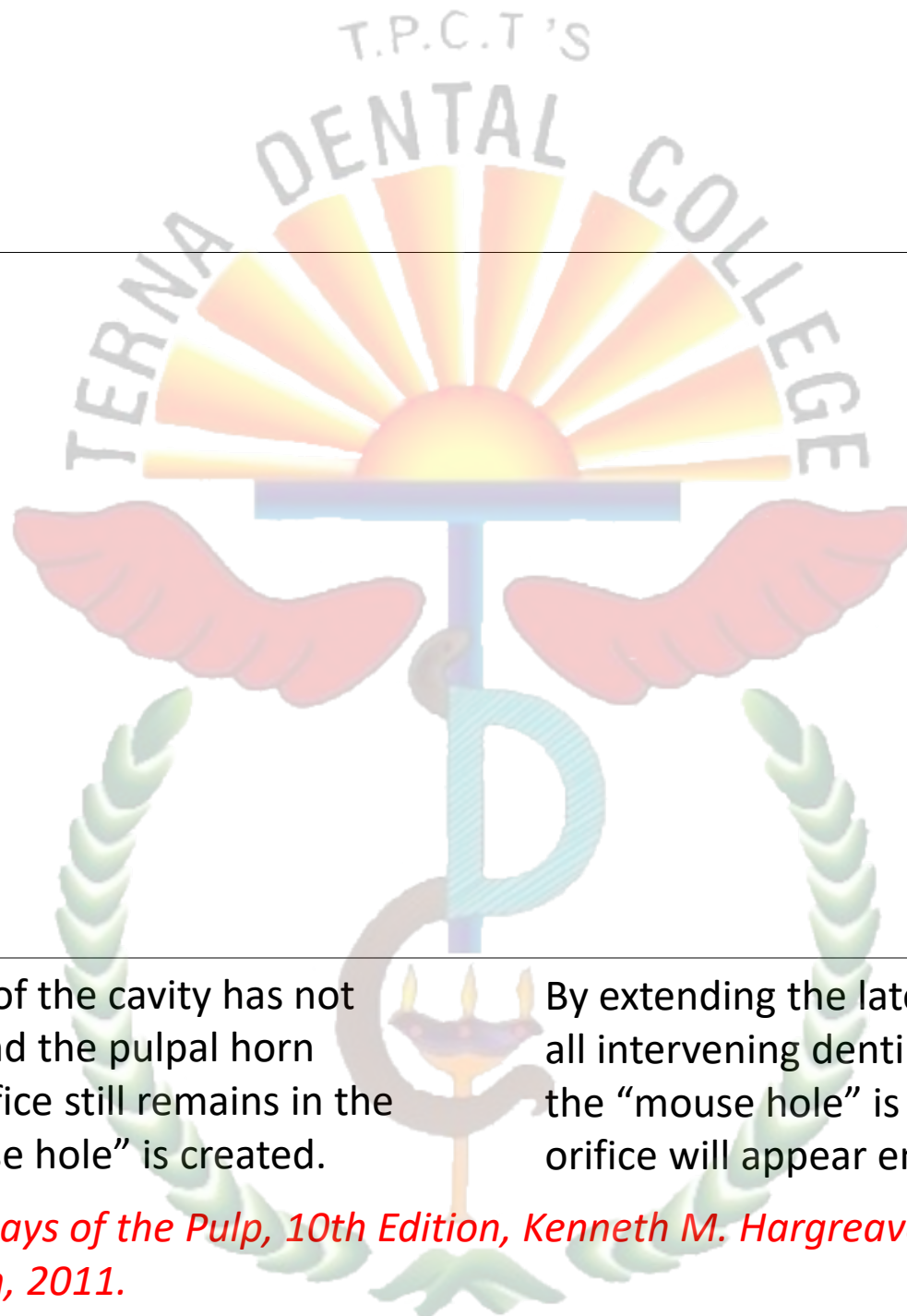
Final finish is done with a fissure bur, diamond point or non-end-cutting bur.

Principle 2. Convenience form.

Complete authority of the enlarging instrument is maintained when all intervening tooth structure is removed.

The instrument is controlled by the clinician's fingers on the handle of the instrument and the tip is free in the lumen of the canal





If the lateral wall of the cavity has not been extended and the pulpal horn portion of the orifice still remains in the wall, a tiny “Mouse hole” is created.

By extending the lateral wall, removing all intervening dentin from the orifice, the “mouse hole” is eliminated and the orifice will appear entirely in the floor.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargreaves, Stephen Cohen, 2011.

Principle 3. Removal of the remaining carious dentin and defective restoration.

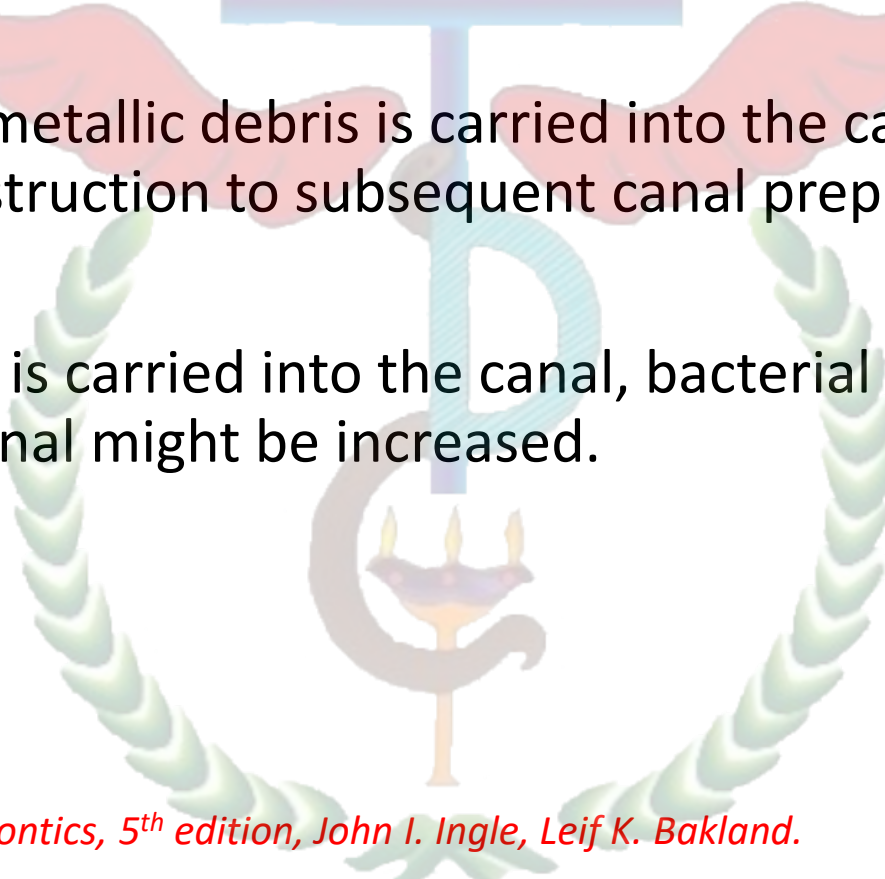
3 reasons for doing this :

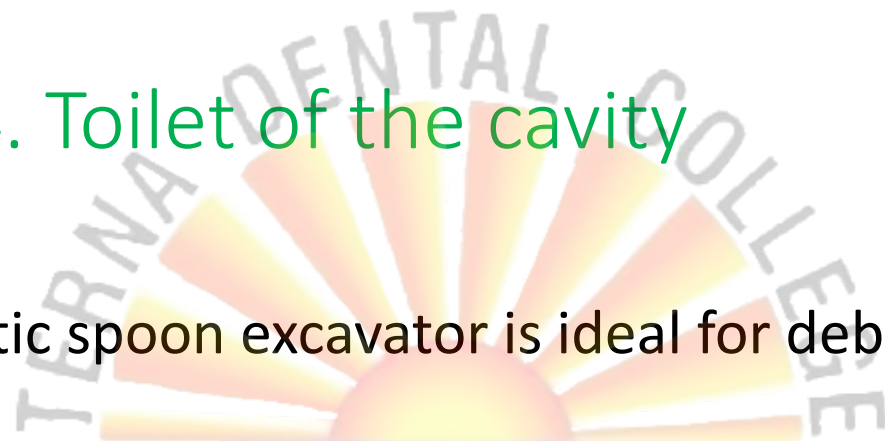
- To eliminate mechanically as many bacteria as possible from the interior of the tooth.
- To remove the discolored tooth structure that may ultimately lead to staining of the crown.
- To eliminate the possibility of bacteria-laden saliva leaking into the prepared cavity.



Principle 4. Toilet of the cavity.

- All caries, debris and necrotic material should be removed from the chamber before radicular preparation is begun.
- If calcific or metallic debris is carried into the canal, it may act as an obstruction to subsequent canal preparation.
- If soft debris is carried into the canal, bacterial population inside the canal might be increased.





Principle 4. Toilet of the cavity

- An endodontic spoon excavator is ideal for debris removal.
- Irrigation with Sodium Hypochlorite is also an excellent measure for cleansing the chamber of debris.
- The chamber should finally be wiped with cotton and a **careful** flush of air will eliminate all debris.

Principle 4. Toilet of the cavity

- Air must never be aimed down directly into the canal.
- Surgical emphysema has been produced because of air escaping out of the apex.
- Also, there is added risk as the air from the air syringe is not sterile.

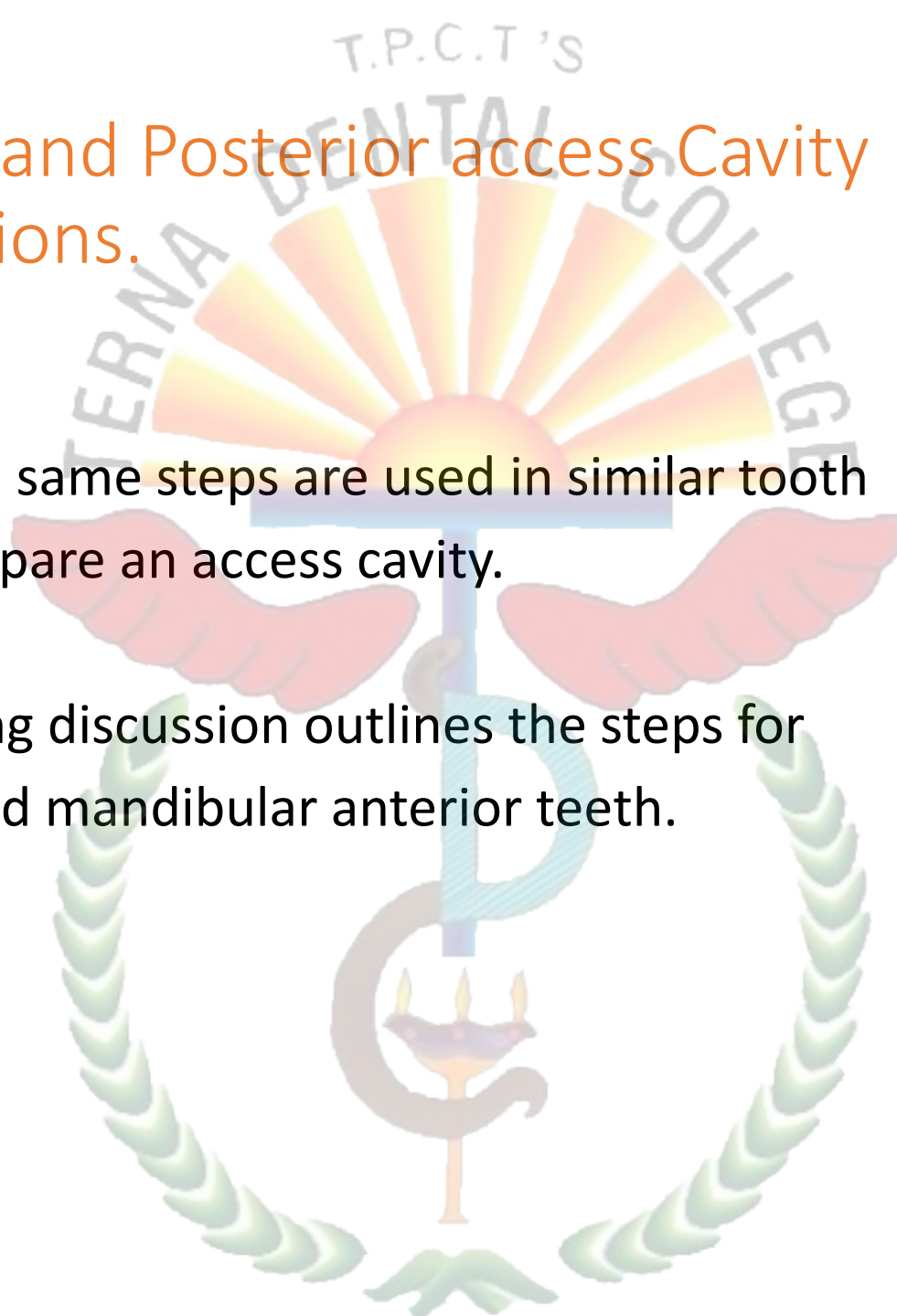
Endodontics, 5th edition, John I. Ingle, Leif K. Bakland.

Eleazer PD, Eleazer KR. Air pressures developed beyond the apex from drying root canals with pressurized air. JOE 1998; 24:833

Anterior and Posterior access Cavity preparations.

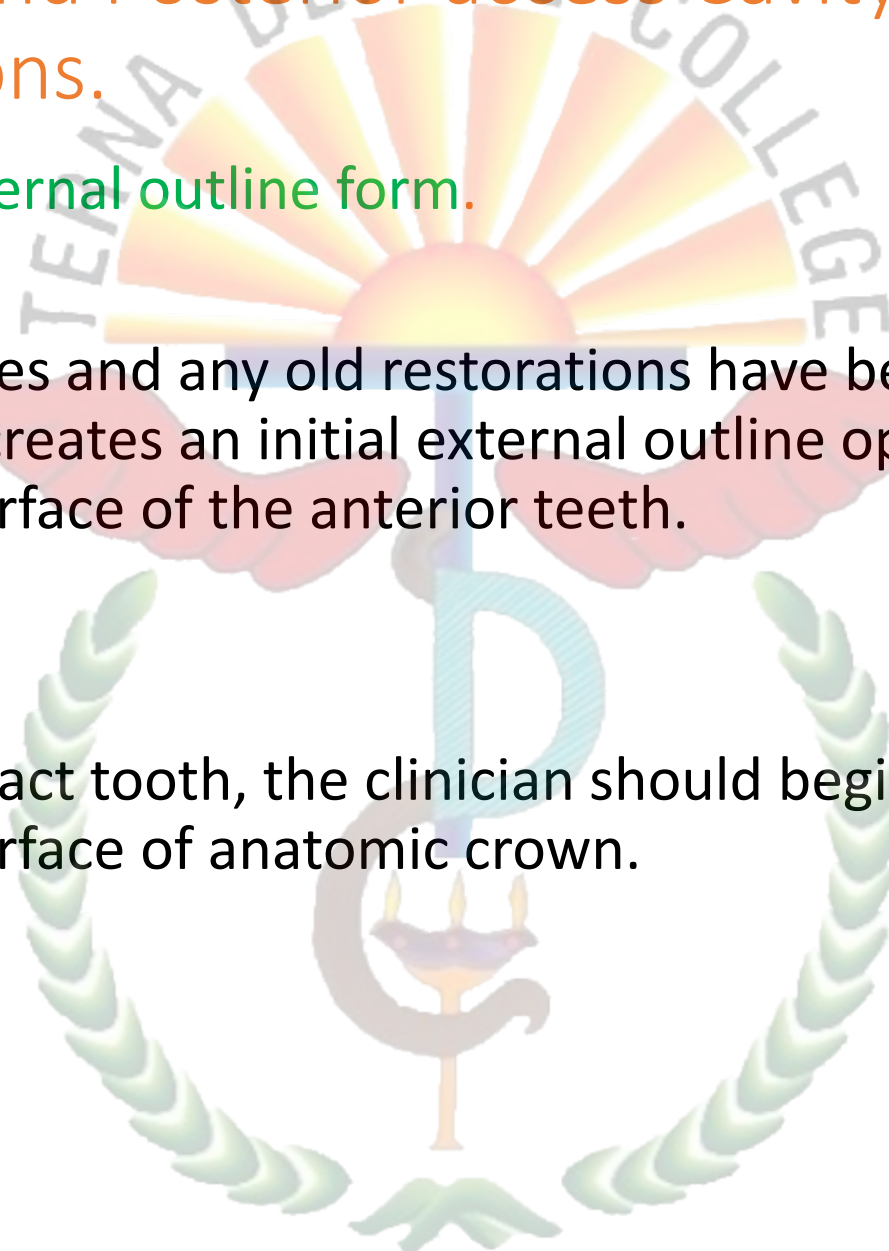
Many of the same steps are used in similar tooth types to prepare an access cavity.

The following discussion outlines the steps for maxillary and mandibular anterior teeth.

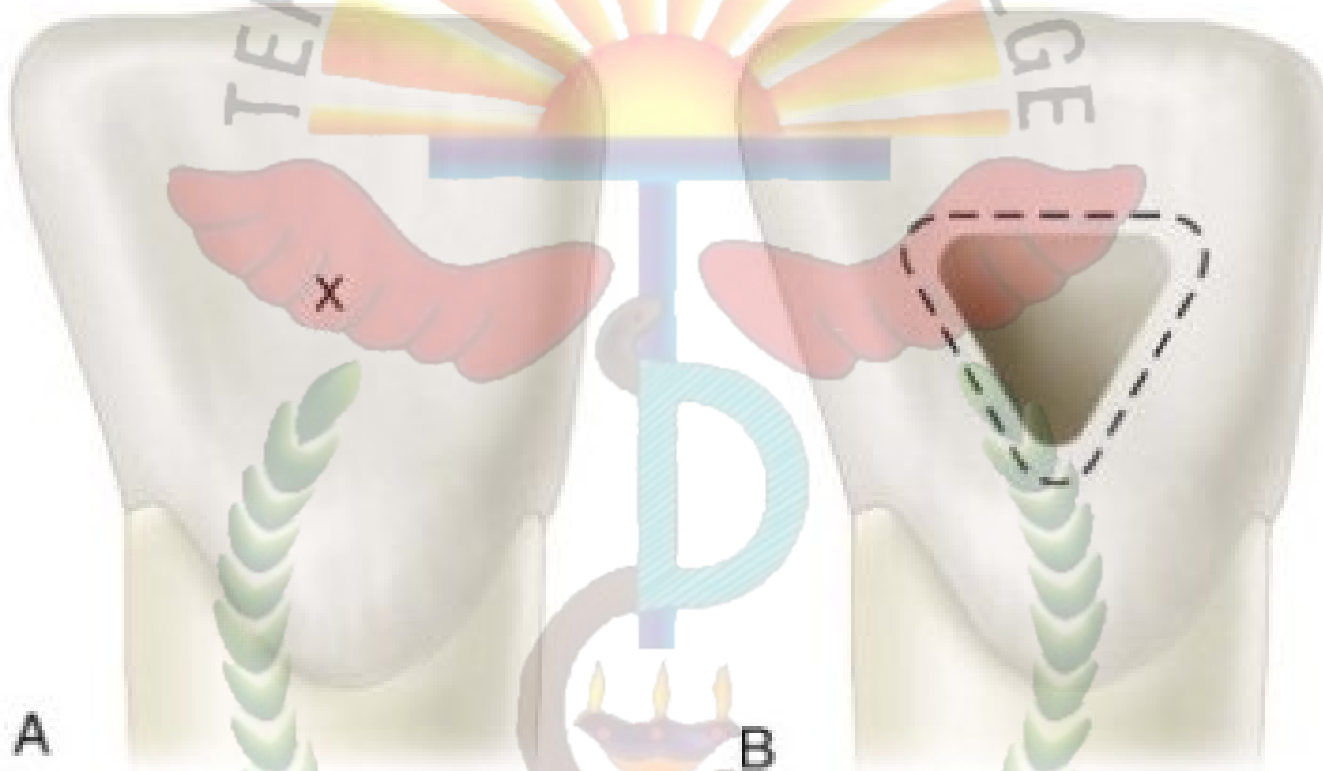


Anterior and Posterior access Cavity preparations.

- Initial external outline form.
- Once caries and any old restorations have been addressed, the clinician creates an initial external outline opening on the lingual surface of the anterior teeth.
- For an intact tooth, the clinician should begin in the center of lingual surface of anatomic crown.



Initial external outline form



A, Starting location for access. **B**, Initial outline form, dotted line- final cavity..

Initial external outline form

- ❖ No 2 or 4 round bur or tapered fissure bur is used to penetrate the enamel and slightly into the dentine (approximately 1 mm) using a high speed handpiece.
- ❖ The bur is directed perpendicular to the lingual surface as the external outline opening is created.



Penetration of the pulp chamber roof.

- ❖ Experienced clinicians may use a high-speed handpiece, but it is better to use a slow-speed handpiece.
- ❖ Continuing with the penetration of the pulp chamber roof with the same round or tapered fissure bur, change the angle of the bur from perpendicular to the lingual surface; to parallel to the long axis of the tooth.
- ❖ Penetration is usually confirmed with a “drop-in” effect.

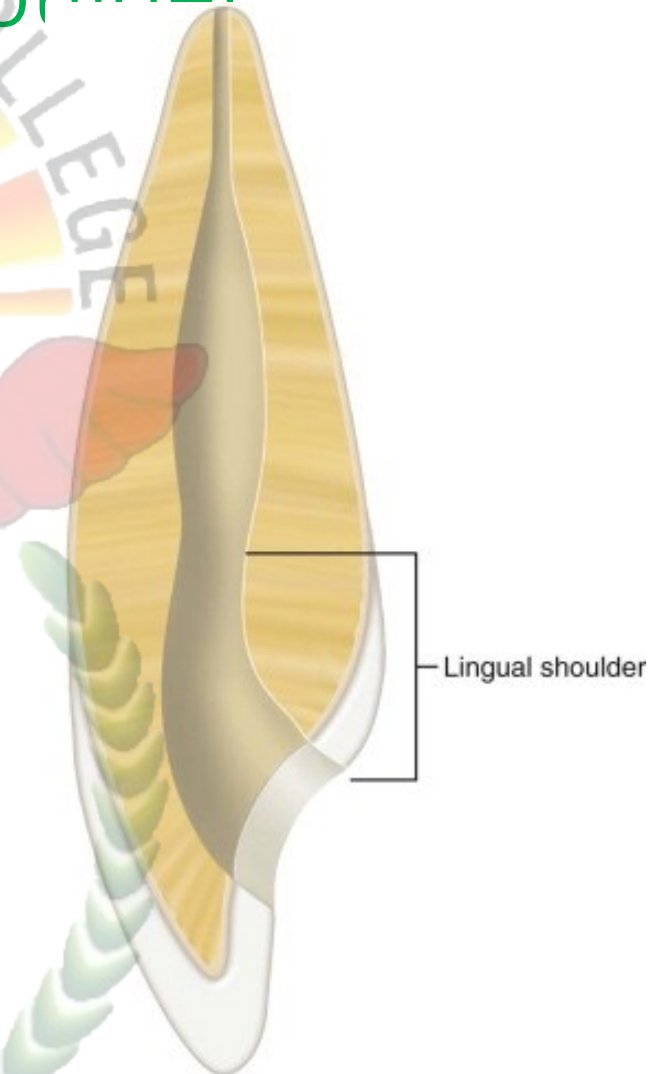
Complete roof removal.

- ❖ Once the pulp chamber has been penetrated, the remaining roof is removed by catching the end of a round bur under the lip of the dentin roof and cutting on the bur's removal stroke.
- ❖ Each tooth has a unique pulp chamber anatomy, working in this manner allows the internal pulp anatomy to dictate the external outline form of the access opening.



Removal of the lingual shoulder

- ❖ Once the orifice has been identified, the lingual shoulder is removed.
- ❖ Lingual Shoulder-: this is the lingual shelf of dentin that extends from the cingulum to a point approximately 2mm apical to the orifice.
- ❖ Its removal aids straight-line access and allows for more intimate contact of files with the canal walls for effective shaping and cleaning.



Endodontics, 5th edition, John I. Ingle, Leif K. Bakland.

Cohen's Pathways of the Pulp, 10th Edition, Kenneth M. Hargrett-

Stephen Cohen, 2011.

Refinement and smoothing of restoring margins.

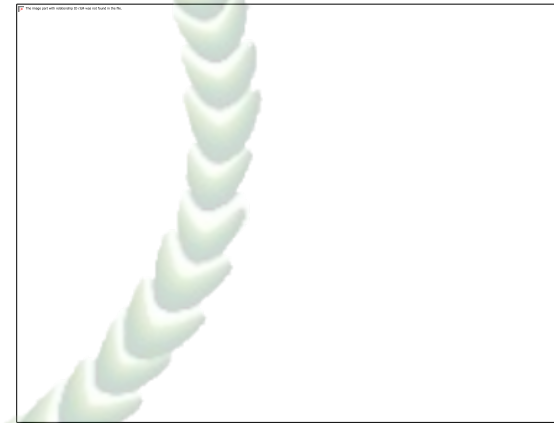
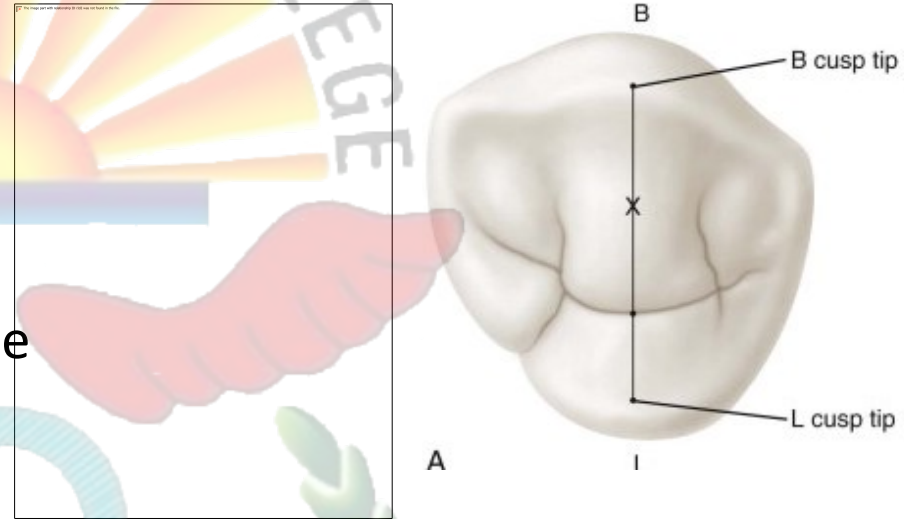
- ❖ The final step in the preparation of an access cavity is to refine and smooth cavosurface margin.
- ❖ Rough margins can cause coronal leakage.
- ❖ Proper restorative margins are important because anterior teeth may not require a crown as a final restoration

Posterior Access Cavity Preparation

- The pulp chamber of posterior teeth is positioned in the center of the tooth at the level of CEJ.
- The removal of caries and existing restorations often accomplishes the creation of an initial external outline form.
- An access starting location must be determined for an intact crown.

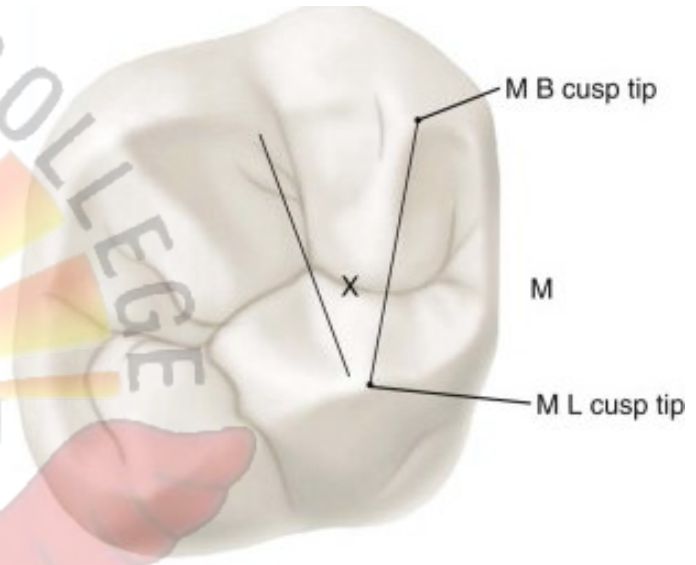
Initial outline form.

- In maxillary premolars this point is on the central groove between the cusp tips.
- In mandibular 1st premolar the starting location is half way up the lingual incline of the buccal cusp on the line connecting the cusp tips.
- In mandibular 2nd premolar the starting location is one third the way up the lingual incline of the buccal cusp on a line connecting the buccal cusp tip and lingual groove between the lingual cusps.



Initial outline form.

- To determine the starting location for molar access cavity preparations, the clinician must establish the mesial and distal boundary limitations.
- The mesial boundary for both the maxillary and mandibular molars is a line connecting the mesial cusp tips.
- The distal boundary for maxillary molars is the oblique ridge.
- For mandibular molars the distal boundary is a line connecting the buccal and lingual grooves.
- For molars the correct starting location is on the central groove halfway between the mesial and distal boundaries



Anterior and Posterior access Cavity preparations.

- Penetration through the enamel into the dentin is performed using a No 2 round bur for premolar and No 4 round bur for molar.
- The bur is directed perpendicular to the occlusal table and initial outline shape is created.
- The premolar and maxillary molar outline shape is oval and widest in bucco-lingual dimension and is widest in mesiodistal direction in mandibular molars.
- The final outline shape of molar is triangular or rhomboidal.

Penetration of pulp chamber roof:

- Continuing with a same round or tapered fissure bur and angle of bur is changed as in the anterior teeth.
- The angle of penetration is changed from perpendicular to the occlusal table to an angle appropriate for penetration through the roof of the pulp chamber.

Penetration of pulp chamber roof:

- In premolars the angle is parallel to the long axis of the root(s).
- Failure to analyze this penetration angle carefully can result in gouging or perforation because premolar roots often are tilted relative to the occlusal plane.
- In molars the penetration angle should be toward the largest canal, because the pulp chamber space usually is largest just occlusal to the orifice of this canal. Therefore, in maxillary molars the penetration angle is toward the palatal orifice, and in mandibular molars it is toward the distal orifice.



Angle of penetration toward the largest canal (palatal) in a maxillary molar

Complete Roof Removal

- A round bur, a tapered fissure bur, or a safety-tip diamond or carbide bur is used to remove the roof of the pulp chamber completely, including all pulp horns.
- The safety-tip diamond or carbide bur is passed between the orifices along the axial walls to remove the roof, taper the internal walls, and create the desired external outline shape simultaneously.

Conclusion

- Endodontic cavity preparation begins the instant the involved tooth is approached with a cutting instrument.
- This cavity preparation should be done keeping in mind all the principles and guidelines of access preparation.
- The final restoration can only be as good as the initial cavity preparation
- The success of the final obturation, and therefore the success of endodontic treatment is dependent on this first step of access cavity preparation.



T.P.C.T.'S
TERNA DENTAL COLLEGE

Thank You!

