1

CLINICAL ENDODONTICS II

Pathways of the Pulp, *Cohen* 10th edition
Tooth Morphology and Access Cavity Preparation, *Chapter 7*.
Principles & Practice of Endodontics
4th ed. by: Walton & Torabinejad.
Isolation, Endodontic Access, and Length Determination, Chapter 14

THIS IS A READING GUIDE FOR THE ASSIGNED REFERENCE

Dr. Kholod Almanei

Lecture outline

2

- □ **Access cavity preparation.**
- ✓ Objective and guidelines for access cavity preparation.
- ✓ Mechanical phases of access cavity preparation.
- ✓ Morphology and access cavity preparation for individual teeth.
- ✓ Error in access cavity preparation.
- □ **Length determination.**
- ✓ Radiographic
- ✓ Electronic apex locator

Objectives of access

3

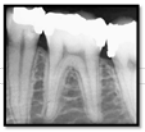
(1) To remove all caries,
(2) To conserve sound tooth structure,
(3) To completely unroof the pulp chamber,
(4) To remove all coronal pulp tissue (vital or necrotic),
(5) To locate all root canal orifices,
(6) To achieve straight- or direct-line access to the apical foramen or to the initial curvature of the canal, and
(7) To establish restorative margins to minimize marginal leakage of the restored tooth.

4

Guidelines

5

- Visualization of the Likely Internal Anatomy
- Evaluation of the CEJand Occlusal Anatomies (Krasner and Rankow's low)
- *Preparation of the Access Cavity Through the Lingual and Occlusal Surfaces*
- *Removal of All Defective Restorations and Caries Before Entry Into the Pulp Chamber*
- *Removal of Unsupported Tooth Structure*



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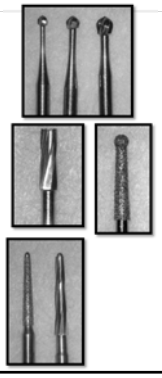
- *Creation of Access Cavity Walls That Do Not Restrict Straight- or Direct-line Passage of Instruments to the Apical Foramen or Initial Canal Curvature*
- *Delay of Dental Dam Placement Until Difficult Canals Have Been Located and Confirmed*
- *Location, Flaring, and Exploration of All Root Canal Orifices*
- *Inspection of the Pulp Chamber, Using Magnification and Adequate Illumination*
- *Tapering of Cavity Walls and Evaluation of Space Adequacy for a Coronal Seal*

Mechanical Phases of Access Cavity Preparation

7

Armamentaria

- Magnification and illumination
- Handpieces
- Burs
- Endodontic explorer (DG-16, DE-17)
- Endodontic spoon
- #17 operative explorer
- Ultrasonic unit and tips



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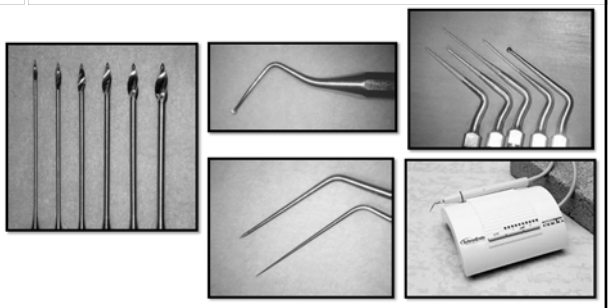

Anterior Access Cavity Preparations

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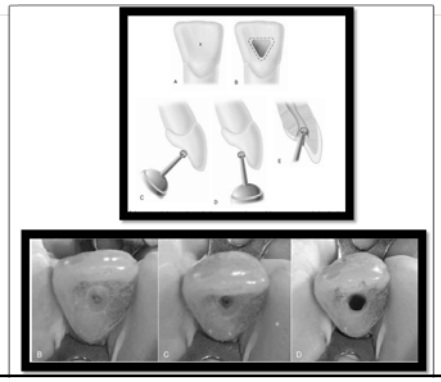
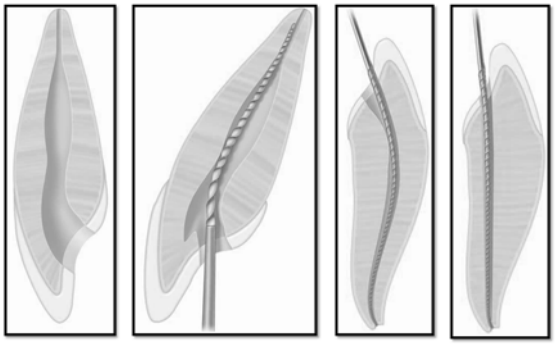


Removal of the Lingual Shoulder

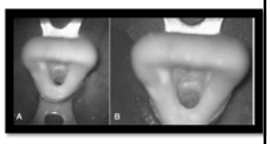
10



Maxillary central incisors

11

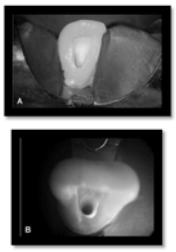
- Single root
- Usually straight root
- Probability of 1 canal – 100%
- Typical length 23-25 mm
- When the curvature of root occurs, usually toward distal and occasionally the palatal
- Usually erupt around age 7-8
- Chamber is triangular in design with high pulp horns on mesial and distal aspect of chamber
- Lingual ledge or lingual bulge often present
- Access opening is triangular in shape with rounded corners



Maxillary lateral incisors

12

- Single root
- Often the apical 1/3 to ¼ of the root curves or dilacerates
- Probability of 1 canal >99%
- Typical length 22-23 mm
- Curvature usually occur toward distal and the palatal
- Usually erupt around age 7-9
- Chamber is similar to central incisors bur proportionately smaller
- Lingual ledge or lingual bulge often present
- Access opening is triangular in shape with rounded corners
- Presence of a lingual radicular or developmental groove & Dens invaginatus



Maxillary canine

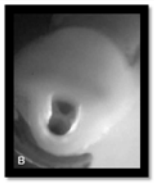
13

- Single root
- Straight root; however, often the apical 1/3 to ¼ of the root curves or dilacerates
- Probability of 1 canal -100%
- Typical length 24-27 mm
- Curvature usually occur toward distal and the palatal
- Usually erupt around age 11
- Chamber is usually elliptical or oval in shape
- Lingual ledge or lingual bulge usually present
- Access opening oval in shape, on the lingual surface and should be in the middle third of the tooth.

Mandibular central & lateral incisors

14

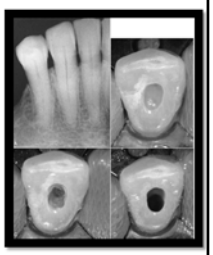
- Usually straight root, although they may have slight curves
- High probability of 2 canal – Labial and lingual
- Typical length 21-22 mm
- When the curvature of root occurs, usually toward the lingual
- Usually erupt around age 6-8
- Chamber is triangular or oval in design with high pulp horns on mesial and distal aspect of chamber
- Lingual ledge or lingual bulge often present
- Access opening is triangular in shape with rounded corners



Mandibular canine

15

- Usually single root
- Straight root; however, often the apical 1/3 often curves toward the distal
- High probability of 1 canal, however 2 canals are not rare
- Typical length 25-26 mm
- Usually erupt around age 9-10
- Chamber is usually elliptical or oval in shape
- Lingual ledge or lingual bulge may be present
- Access opening oval in shape, on the lingual surface and should be in the middle third of the tooth.



Posterior Access Cavity Preparations

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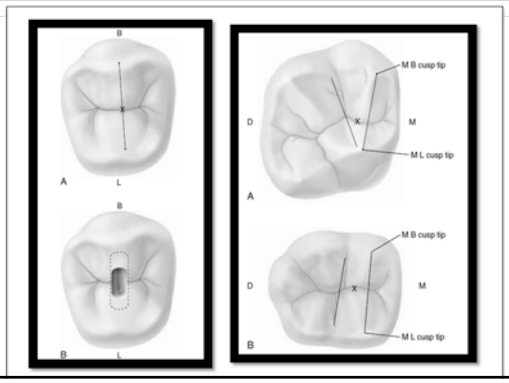
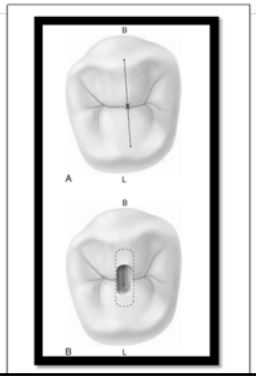


Maxillary premolars

17



Maxillary 1st premolar

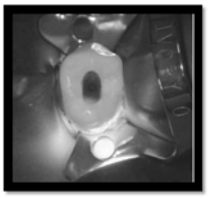
18

- Single or 2-rooted
- Usually 2 canals (buccal and palatal) >85%
- Buccal root usually curved more than palatal root
- Palatal root usually longer and larger
- Typical length 21-22 mm
- Usually erupt around age 10-11
- Chamber is usually oval in shape
- Access opening oval in shape, on the occlusal surface and should be in the middle third of the tooth.

Maxillary 2nd premolar

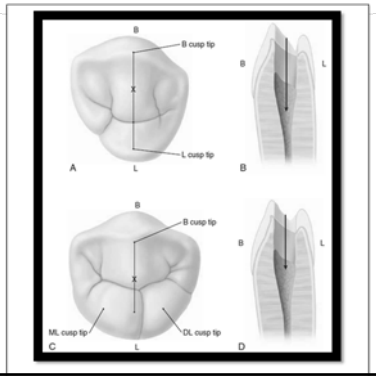
19

- Single or 2-rooted but usually single
- Highest probability -1 root and 1 canal
- Occasionally will have 2 or very rarely 3 canals
- Buccal root usually curved more than palatal root
- Typical length 21-22 mm
- Usually erupt around age 10-11
- Chamber is usually oval in shape
- Access opening oval in shape, on the occlusal surface and should be in the middle third of the tooth.



Mandibular premolars

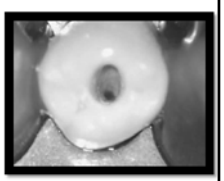
20



Mandibular1st premolar

21

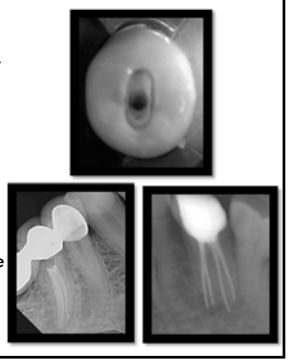
- Usually single root
- Usually 1 canals, 2 canals are not uncommon, although 3 canals are rare
- Typical length 21-22 mm
- Usually erupt around age 10-12
- Chamber is usually oval to round in shape
- Access opening oval in shape, on the occlusal surface and should be in the middle third of the tooth.



Mandibular 2nd premolar

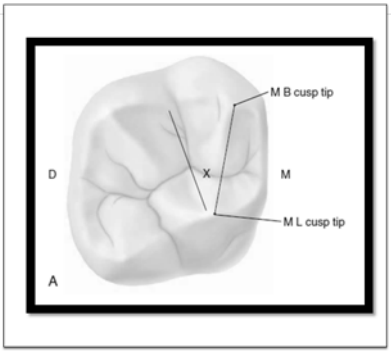
22

- Usually single root
- Usually 1 canals, 2 canals are not uncommon, (<15)
- Typical length 21-22 mm
- Usually erupt around age 11-12
- Chamber is usually oval to round in shape
- Access opening oval in shape, on the occlusal surface and should be in the middle third of the tooth.



Maxillary molars

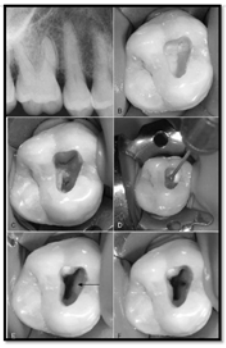
23



Maxillary 1st molar

24

- Usually a 3 rooted, rarely has 4 distinct roots but frequently has 4 canals
- MB root often curves toward distal
- DB root usually straight but can have distal or buccal curvature
- P root is the largest and often has a buccal curvature- 85% of cases
- Typical length of palatal root 19-22 mm
- Typical length of palatal root 22-25 mm
- Usually erupt around age 6-7
- Chamber is usually triangle to square
- Access opening is triangle in shape, on the occlusal surface



Maxillary 2nd molar

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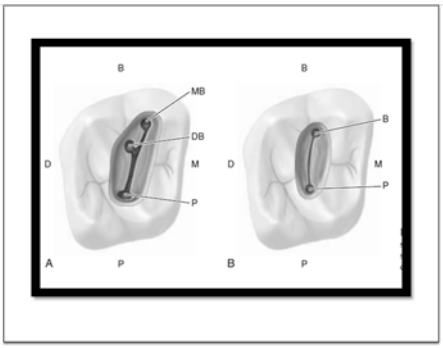

Mandibular molars

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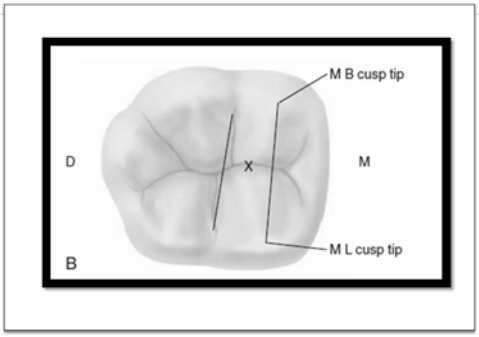
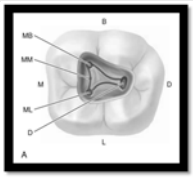
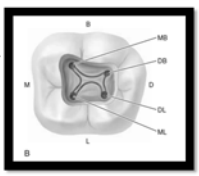


Mandibular1st molar

27

- Usually a 2 rooted, rarely has 3 distinct roots but frequently has 4 canals (2 M &2 D)
- Typical length of mesial root 21 mm
- Typical length of distal root 22-23 mm
- Usually erupt around age 6-7
- Chamber is usually triangle to square
- Access opening is triangle in shape, on the occlusal surface distal to the mesial marginal ridge





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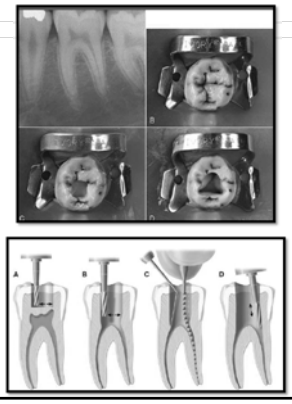
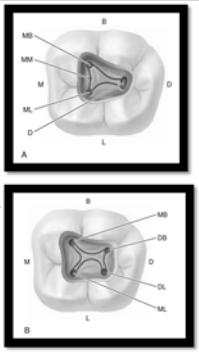


Mandibular 2nd molar

29

- Usually a 2 rooted, has 3 canals (2 M &1 D)
- Typical length of mesial root 21 mm
- Typical length of distal root 22-23 mm
- Usually erupt around age 11-13
- Chamber is usually triangle to square
- Access opening is triangle in shape, on the occlusal surface distal to the mesial marginal ridge



Teeth With C-Shaped Root Canal Systems

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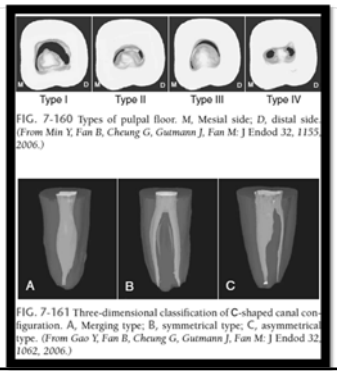

FIG. 7-160 Types of pulpal floor. M, Mesial side; D, distal side. (*From Min Y, Fan B, Cheung G, Gutmann J, Fan M:* J Endod *32, 1155, 2006.*)

FIG. 7-161 Three-dimensional classification of C-shaped canal configuration. A, Merging type; B, symmetrical type; C, asymmetrical type. (*From Gao Y, Fan B, Cheung G, Gutmann J, Fan M:* J Endod *32, 1062, 2006.*)

Challenging Access Preparations

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Teeth With Minimal or No Clinical Crown

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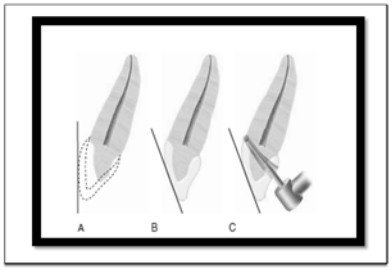
Heavily Restored Teeth (Including Those With Full Veneer Crowns)



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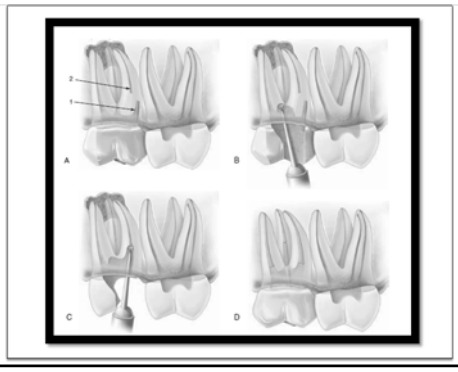

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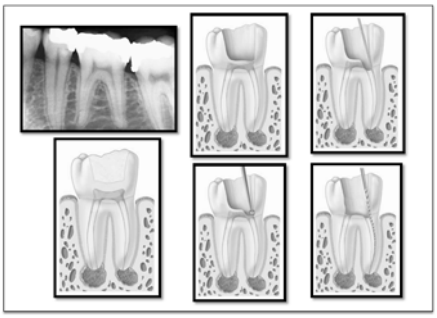
Teeth With Calcified Canals



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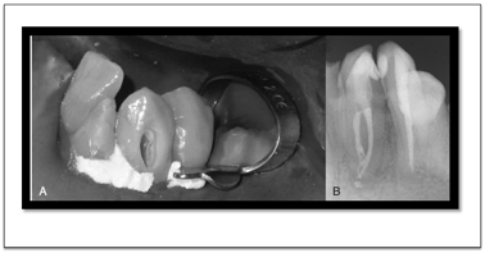
Crowded Teeth



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Rotated Teeth

- Failure to locate a canal or extra canals
- Excessive gouging of coronal or radicular tooth structure
- Instrument separation during attempts to locate an orifice
- Failure to debride all pulp tissue from the chamber

Errors in Access Cavity Preparation

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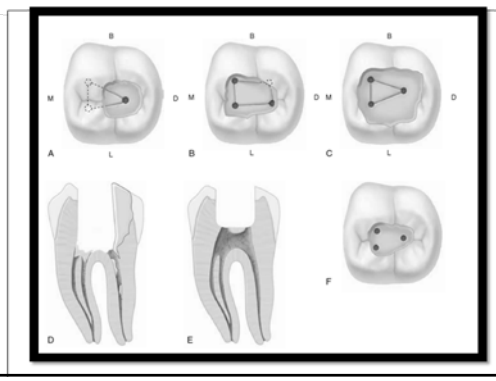

Errors in Access Cavity Preparation

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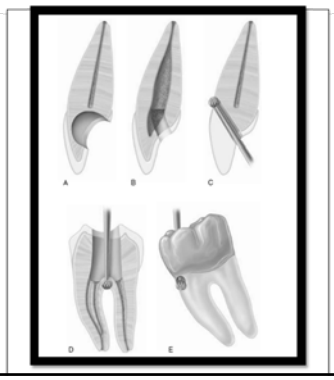
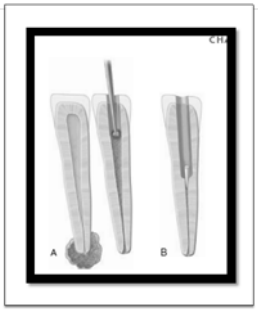


Errors in Access Cavity Preparation

39



Length determination

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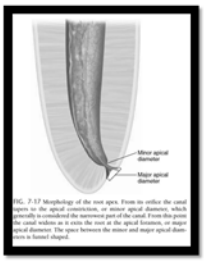
- The working length is defined as the distance from a predetermined coronal reference point to the point that the cleaning and shaping, and obturation should terminate.
- It should be 1.0 mm from the radiographic apex. This accounts for the deviation of the foramen from the apex, and the distance from the major diameter of the foramen to the area where a dentinal matrix can be established apically.



Radiographic

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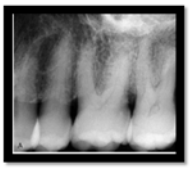
- Before access an estimated working length is calculated by measuring the total length of the tooth on the diagnostic parallel radiograph or digital image
- After access preparation, a small file is used to explore the canal and establish patency to the estimated working length. The largest file to bind is then inserted to this estimated length
- Other clinical factors should be considered include tactile sensation, the patient's response, and hemorrhage.



Electronic Apex Locators

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- Passing two differing frequencies through the canal results in the higher frequency impeding the lower frequency. The impedance values that change relative to each other are measured and converted to length information. At the apex, the impedance values are at their maximum differences.
- Apex locators are helpful in length determination but must be confirmed with radiographs.

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- An apex locator is very helpful in patients with structures or objects that obstruct visualization of the apex, patients that have a gag reflex and cannot tolerate films, and patients with medical problems that prohibit the holding of a film or sensor.
- The use of apex locators and electric pulp testers in patients with cardiac pacemakers has been

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