

2011 ABGD Study Guide - Endo

1. What is the splinting protocol for treatment of root fracture?

- A. rigid splinting, 2-4 weeks
- B. rigid splinting, 2-4 months
- C. non-rigid splinting, 2-4 weeks
- D. non-rigid splinting, 2-4 months

ANSWER: C. non-rigid splinting, 2-4 weeks

“Emergency treatment involves repositioning of the segments in as close proximity as possible and splinting to adjacent teeth for 2 to 4 weeks. This splinting protocol has recently changed from the 2 to 4 months that has been traditionally recommended.”

Cohen, Stephen C. Pathways of the Pulp, 9th Edition. C.V. Mosby, 2006. 16.6.5

“Rinse exposed root surface with saline before repositioning.

If displaced, reposition the coronal segment of the tooth as soon as possible.

Check that correct position has been reached radiographically.

Stabilize the tooth with a flexible splint for 4 weeks. Cervical fractures stabilization is indicated for a longer period of time (up to 4 months).

Monitor healing for at least 1 year to determine pulpal status. If pulp necrosis develops, then root canal treatment of the coronal tooth segment to the fracture line is indicated.”

Andreason, JO, et al. The Dental Trauma Guide 2010. 15 Aug 2010.

http://www.dentaltraumaguide.org/Permanent_Root_fracture_Treatment.aspx

2. Radiographically, root fractures are best visualized if the x-ray beam passes _____ through the fracture line and are often transverse-to-oblique.

- a. Parallel
- b. From the Mesial at 45°
- c. From the Distal at 45°
- d. It doesn't matter what the angulation is

Answer: A. Parallel

Because the central beam of the x-ray needs to be parallel to diagnose a root fracture, a steep vertical angle (foreshortened view or occlusal view that is approx. 45 degrees) should also be taken whenever a root fracture is suspected. Root fractures will clinically present as mobile or displaced teeth with pain on biting with symptoms generally being mild. The more cervical the fracture, the more mobility and displacement encountered, generally, with a greater likelihood of pulp necrosis occurring if the segment is not repositioned quickly. Splinting is indicated in cervical & middle third fractures. Fractures in the apical third generally require no treatment but should be observed over time.

Endodontics Principles and Practice. Torabinejad and Walton. 4th edition, 2009.

Contemporary Oral and Maxillofacial Surgery. Peterson, Ellis, Hupp and Tucker. 4th edition, 2003.

3. Which statement is false for NSRCT?

- a. Solid fill should be obtained within 1mm of the major foramen
- b. Extrusion of gutta percha beyond the apex can create an inflammatory response
- c. Complete debridement of the canal is possible if done with the right technique
- d. Filling the gutta percha to the radiographic apex will most likely create overextension

ANSWER: C. Complete debridement of the canal is possible if done with the right technique

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Traditionally the apical point of termination has been 1mm from the radiographic apex (1). It was noted that the canal narrowed around 1mm from the opening of the canal.

Extrusion of gutta percha beyond the apical foramen has the potential to create an inflammatory response. This has been noted in past studies (2)

Although it is critical to attempt to debride the canal completely, studies show that it is not possible to completely debride the canal space (3)

Resorption is more common with necrosis and apical bone resorption, and this can result in loss of the constriction. Based on these findings it appears that canals filled to the radiographic apex are actually overextended (3)

1. *Kutler Y: Microscopic investigation of root apices, J Am Dent Assoc 50: 544, 1955*
2. *Rickert UG, Dixon CM. the controlling of root surgery. In: Trans Eighth Internet Dent Congress Section IIIa 1931: 15-22*
3. *Cohen S, Hargreaves KM: Pathways of the Pulp 9th Ed. 2006; Page 363*

4. To date, the most accurate pulp test that are used to determine if a tooth's pulp is healthy is/are
- a. Cold
 - b. Heat
 - c. EPT
 - d. Both a and c
 - e. Both a and b

Answer: d. Both a and c

In comparing all three (hot, cold and electric), a recent study was able to determine sensitivity and specificity. **Peterson K, Soderstrom C, Liani-Anaraki M, Levy G: Evaluation of the ability of thermal and electric tests to register pulp vitality, Endodon Dent Traumatol 15:127, 1999.** Sensitivity = able to identify teeth with disease; Specificity = ability to determine teeth without disease.

1. Sensitivity
 - a. Cold test correctly identified 83% of teeth with necrotic pulps; heat tests were able to determine this 86% of the time and EPT 72% of the time.
2. Specificity
 - a. **93% of teeth with healthy pulps were correctly identified using cold and EPT together; 41% by heat.**
3. Overall accuracy at determining true status of the pulpal tissue (healthy, reversible, irreversible or necrotic)
 - a. Cold test were 86% accurate, 81% for the EPT and 71% for using heat.

Cohen, Stephen. Pathways of the Pulp, 9th edition, 16-21, 2006

5. A 32 y/o white female presents with pain 7/10. Tooth has been sensitive for the past few months. She points to mandibular right 1st molar. She reports, "Anything hot is the worst and the only way to get it to calm down is to put something cold on it". Tooth has a large intact DOBL composite restoration that was placed a year ago. Radiographically, there is an apical radiolucency associated with the distal root. There is no sensitivity to percussion or palpation. The most likely diagnosis is:

- a. Irreversible pulpitis with Symptomatic apical periodontitis
- b. Irreversible pulpitis with Asymptomatic apical periodontitis
- c. Reversible pulpitis with Symptomatic apical periodontitis
- d. Pulpal necrosis with Asymptomatic apical periodontitis

Answer: b. Irreversible pulpitis with Asymptomatic apical periodontitis

PULPAL DIAGNOSIS

Normal pulp – A clinical diagnostic category in which the pulp is symptom free and normally responsive to vitality testing.

Reversible pulpitis – A clinical diagnosis based upon subjective and objective findings indicating that the inflammation should resolve and the pulp return to normal.

Irreversible pulpitis – A clinical diagnosis based on subjective and objective findings indicating that the vital inflamed pulp is incapable of healing.

Additional descriptions:

Symptomatic – Lingering thermal pain, spontaneous pain, referred pain

Asymptomatic – No clinical symptoms but inflammation produced by caries, caries excavation, trauma, etc.

Pulp necrosis – A clinical diagnostic category indicating death of the dental pulp. The pulp is non-responsive to vitality testing.

Previously Treated – A clinical diagnostic category indicating that the tooth has been endodontically treated and the canals are obturated with various filling materials, other than intracanal medicaments.

Previously Initiated Therapy – A clinical diagnostic category indicating that the tooth has been previously treated by partial endodontic therapy (e.g. pulpotomy, pulpectomy).

APICAL DIAGNOSIS

Normal apical tissues – Teeth with normal periradicular tissues that will not be abnormally sensitive to percussion or palpation testing. The lamina dura surrounding the root is intact and the periodontal ligament space is uniform.

Symptomatic apical periodontitis – Inflammation, usually of the apical periodontium, producing clinical symptoms including painful response to biting and percussion. It may or may not be associated with an apical radiolucent area. (This category includes what many of us call Acute Apical Periodontitis & Phoenix Abscess)

Asymptomatic apical periodontitis – Inflammation and destruction of apical periodontium that is of pulpal origin, appears as an apical radiolucent area and does not produce clinical symptoms. (This is what many of us have previously called a Chronic Apical Periodontitis)

Acute apical abscess – An inflammatory reaction to pulpal infection and necrosis characterized by rapid onset, spontaneous pain, tenderness of the tooth to pressure, pus formation and swelling of associated tissues.

Chronic apical abscess – An inflammatory reaction to pulpal infection and necrosis characterized by gradual onset, little or no discomfort and the intermittent discharge of pus through an associated sinus tract.

Reference: Stephen Cohen, MA, DDS, FICD, FACD, Kenneth Hargreaves, DDS, PhD, FACD, "Pathways of the pulp", ninth edition, 2006.

Reference: <http://aae.org/Board/Content.aspx?id=227&terms=new+terminology#pulpal>

6. What is the major difference between the morphology of the 2nd premolar root and canal configuration of the maxillary versus that of the mandibular teeth?

- a. The maxillary 2nd premolars are longer than the mandibular 2nd premolars
- b. The mandibular 2nd premolars have one canal 98%-100% of the time
- c. The mandibular 2nd premolars have 2 canals 50%-75% of the time
- d. There is no difference in the number of canals between the maxillary and mandibular 2nd premolars

Answer: b. The mandibular 2nd premolars have one canal 98%-100% of the time

According to Vertucci the maxillary 2nd premolar will have one canal 75% of the time, two canals 24% of the time and three canals 1% of the time. Kartal et al found the maxillary 2nd premolar to have one canal 55% of the time and two canals 44% of the time.

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Vertucci also found the mandibular 2nd premolar to have one canal 97.5% of the time.

Pathways of the pulp, 9th edition. Stephen Cohen and Kenneth M. Hargreaves

7. Which of the following mandibular local anesthetic techniques requires the needle to pass just under the zygomatic buttress adjacent to the first and second maxillary molars?

- A. Vazirani-Akinosi Technique
- B. Gow-Gates Mandibular Nerve Block
- C. Clark and Holmes Two Step Injection Technique
- D. Standard Inferior Alveolar Nerve Block

ANSWER: A. Vazirani-Akinosi Technique

“The patient's teeth should be gently in occlusion, or, if the patient is edentulous, the jaw should be in a comfortable, closed resting position. ... the needle and syringe are then advanced into the maxillary vestibule with the syringe axis parallel to the occlusal plane at the height of the mucogingival junction. The needle passes just under the zygomatic buttress adjacent to the first and second maxillary molars (it should not touch this structure) and penetrates the retromolar mucosa above the injection site for a standard inferior alveolar nerve block (Fig. 10-37). The needle is advanced until the tip is estimated to be halfway between the anterior and posterior borders of the ramus, or approximately 2.5 cm. Because it is difficult to see the needle insertion, the depth can be estimated by the hub of the needle being adjacent (and above) the maxillary second molar.”

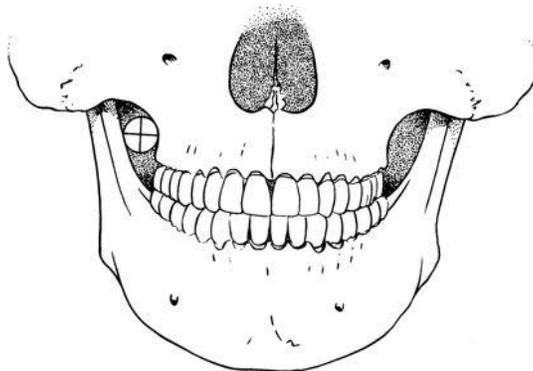


Figure 10-36. (259)

Anterior view of the target zone for needle insertion during a closed-mouth mandibular nerve block injection.

Jastak, J. Theodore. Local Anesthesia of the Oral Cavity. W.B. Saunders Company, 1995. 10.4.2

8. All of the following are examples of external tooth resorption except for:

- A. Surface
- B. Replacement
- C. Pink Tooth of Mummery
- D. Pressure

Answer: C. Pink Tooth of Mummery

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Pink Tooth of Mummery is an example of internal resorption.

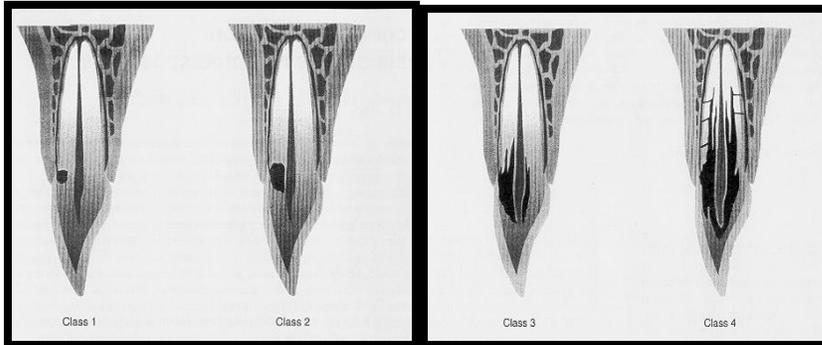
Internal Resorption:

Initiated within pulp space w/ loss of dentin & possible invasion into cementum
sharp, smooth, defined borders, can't follow canal through lesion, lesion remains centered w/ changes in horizontal angulation

External Resorption:

may be Surface (physiologic – needs no treatment), replacement (ankylosis), inflammatory (pathologic) or pressure

less defined, less regular borders, usually asymmetrical w/ no uniform density, canal can be followed through the lesion, lesion shifts w/ change in horizontal angulation



Trope M, Chivian N, Sigurdsson A. Traumatic Injuries. In Cohen S, Burns R (eds.) Pathways of the Pulp. 7th ed. St. Louis: Mosby, Inc. 1998; 576-82.

Heithersay GS. Clinical, radiologic, and Histopathologic features of invasive cervical resorption. Quintessence Int 1999; 30: 27-37.

9. The protocol for dental trauma involves all of the following except:

- Ideally, the tooth should be repositioned to its original position
- The tooth should be splinted for 2 to 4 months if it sustains a root fracture
- EPT and thermal testing are unreliable following trauma since physical trauma can sever or damage nerve supply without altering pulpal blood supply/vitality.
- If the root is completely formed on a tooth that has been intruded, a pulpectomy should be performed within 1-3 weeks after the injury

ANSWER: B. The tooth should be splinted for 2 to 4 months if it sustains a root fracture

Traditionally, the tooth was supposed to be splinted for 2 to 4 months. Current splinting time is 2 to 4 weeks (1). Splinting for various other dental traumas can vary according to the type of injury sustained (2).

- Cohen S, Hargreaves KM: Pathways of the Pulp 9th Ed. 2006; Page 626*
- American Association of Endodontics: Recommended guidelines of the American Association of Endodontics for the Treatment of Traumatic Dental Injuries; 2004*

10. The worst 5 year prognosis can be assigned to:

- Intrusion of a immature apex
- Intrusion of a mature apex
- Coronal 1/3 root fracture of a immature apex
- Coronal 1/3 root fracture of a mature apex
- Extrusion of a mature apex
- Lateral luxation of a mature apex

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Answer: D. Coronal 1/3 root fracture of a mature apex

1st eliminate all immature apex choices. These heal much better. Intrusion is much worse than extrusion so extrusion is eliminated. Now consider just coronal 1/3 root fracture of a mature apex vs intrusion of a mature apex. Remember that beyond complete avulsion that coronal 1/3 root fractures are the worst.

Answer. Coronal 1/3 root fracture of mature apex.

Luxation injuries are the most common of all dental injuries, with an incidence of 30-40%.

	Immature Apex@5 yrs	Mature Apex@5yrs
Infarction	No negative sequela	
Enamel (fx)	No negative sequela	
Enamel-Dentin f(x)	No negative sequela	-5% pulpal necrosis
Enamel-dentin-pulp f(x)	-7 % pulpal necrosis with pulp capping -5% pulpal necrosis with partial pulpotomy	-5% pulpal necrosis with partial pulpotomy
Root (fx)	-100% hard tissue healing - 8% connective tissue healing	Apical 1/3 -23% pulpal necrosis - 9% tooth loss Middle 1/3 -35% pulpal necrosis -2% ankylosis - 8% marginal bone loss -10% tooth loss Coronal 1/3 - 30% pulpal necrosis -28% marginal bone loss -44% tooth loss
Immature Apex crown fracture with or without pulp @5 yrs		Mature Apex crown fracture with or without pulp@5yrs
Concussion	-2% pulpal necrosis	-10% pulpal necrosis - 4% repair related resorption -1% marginal bone loss
Subluxation	-20% pulpal necrosis -5% infection related resorption	-40% pulpal necrosis -5% repair related resorption -2% infection related resorption -3% ankylosis
Extrusion	-17% pulpal necrosis	-88% pulpal necrosis -16% infection related resorption -22% marginal bone loss
Lateral Luxation	-52% pulpal necrosis -29% infection related resorption	-100% pulpal necrosis - 8% repair related resorption -15% marginal bone loss
Intrusion	-72% pulpal pathosis - 4% repair related resorption -34% infection related resorption -13% ankylosis -4% marginal bone loss -8% tooth loss	-100% pulpal necrosis -1% repair related resorption -28% infection related resorption -40% Ankylosis -43% marginal bone loss -29% tooth loss

All information taken from International Association of Dental Traumatology. The latest version of these guidelines has appeared in *Dental Traumatology 2007 (Dent Traumatol 2007; 23:66-71; 23: 130-136; 23: 196-202.*

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11. A ten years old boy presents to your office with his mother. She has her son's maxillary right central incisor in a cup of milk. After a thorough examination and site preparation you notice that the buccal bone has collapsed and will likely prevent replantation. You may:

- a. Gently replant the tooth with slight apical pressure to reposition the buccal bone as you replant. Splint with semi-rigid fixture for 7-10 days
- b. Carefully insert a blunt instrument into the socket and attempt to reposition the wall and then replant tooth. Splint with semi-rigid fixture for 7-10 days
- c. Gently replant the tooth with slight apical pressure to reposition the buccal bone as you replant. Splint with Rigid fixture for 4-8 months
- d. Carefully insert a blunt instrument into the socket and attempt to reposition the wall and then replant tooth. Splint with Rigid fixture for 4-8 months

Answer: d.

The socket should be left undisturbed before replantation. Emphasis is placed on removal of obstacles within the socket to facilitate replacement of the tooth. Socket should be lightly aspirated if a blood clot is present. If the alveolar bone has collapsed and may prevent replantation or cause it to be traumatic, a blunt instrument should be inserted carefully into the socket in an attempt to reposition the wall.

Reference: Stephen Cohen, Kenneth Hargreaves. "Pathways of the pulp", ninth edition, 2006.

12. Which of the following is true regarding EDTA use in endodontics

- a. It is the irrigant of choice to flush out toxins and remove bacteria in the apical 1/3 of the root system.
- b. EDTA may help prevent apical blockage and aid disinfection by improving access of solutions through removal of the smear layer
- c. Concurrent use with MTAD (doxycycline, citric acid, and a surface active agent "Tween 80") as an irrigant to remove the smear layer
- d. In solutions of .05% to 5.25% EDTA is effective against endodontic microorganisms and has the ability to dissolve necrotic and vital tissue

ANSWER : B

The tissue dissolving and disinfecting properties of NaOCl make it the irrigant of choice but NaOCl only minimally removes dentin or the smear layer; therefore, some recommend concurrent use of demineralizing agents to enhance cleaning of difficult-to-reach areas, such as dentinal tubules and lateral canals. Page 321 *Pathways of the Pulp*

In vitro experiments indicate the MTAD has potential for removing the smear layer, but clinical benefits have yet to be demonstrated. P 322 *Pathways of the pulp*

EDTA creates a stable calcium complex with dentin mud, smear laers, or calcific deposits along the canal walls. This may help prevent apical blockage and aid disinfection by improving access of solutions through removal of the smear layer...It exerts it's strongest effect when used synergistically with NaOCL.

Reference: Stephen Cohen, Kenneth Hargreaves. "Pathways of the pulp", ninth edition, 2006.

13. Which of the following is not a complication of Internal (non-vital) bleaching?

- A. External Resorption
- B. Paresthesia
- C. Coronal Fracture
- D. Chemical Burns of the gingiva

ANSWER: B. Paresthesia

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Clinical reports and histologic studies have shown that internal bleaching may induce external root resorption. The oxidizing agent, particularly 30% hydrogen peroxide, may be the culprit. However, the exact mechanism by which periodontium or cementum is damaged has not been elucidated. Presumably, the irritating chemical diffuses through the dentinal tubules and reaches the periodontium through defects in the cemento-enamel junction.

Increased brittleness of the coronal tooth structure, particularly when heat is applied, is also thought to result from bleaching. This may be due to desiccation of the dentin and enamel. Clinical experience suggests that bleached teeth are no more susceptible to fracture, although this has not been proven conclusively.

As mentioned earlier, sodium perborate is safe, but 30% hydrogen peroxide is caustic and will cause chemical burns and sloughing of gingiva. When this strong chemical is used, the soft tissues should be coated with an isolating cream.

Walton, Richard E.. Principles and Practice of Endodontics, 3rd Edition. Saunders Book Company, 2002. 23.6.3.

14. Your 7 year old patient was playing basketball and suffered blunt force trauma to his face. Tooth #8 suffered a crown fracture with a 3 mm pulpal exposure. The patient presents to your office 30 minutes later. Apart from sensitivity to the exposed pulp, the patient is asymptomatic with normal radiographic findings. What would be the appropriate treatment for this patient?

- A. NSRCT
- B. Cvek Pulpotomy using $\text{Ca}(\text{OH})_2$
- C. Sodium Hypochlorite pulpotomy
- D. Direct pulp cap and restoration

Answer: B. Cvek Pulpotomy using $\text{Ca}(\text{OH})_2$

The partial pulpotomy, or Cvek Pulpotomy, is indicated in teeth with immature apices with crown fractures that have exposed pulp. A Cvek pulpotomy involves the removal of damaged and inflamed tissue to the level of a clinically healthy pulp and then a dressing of MTA or Calcium Hydroxide is placed. When the pulp is vital and hyperplastic tissue is seen on the exposure site, only superficial layers of the coronal pulp (1-2mm) and surrounding dentin should be removed. This treatment is suitable for both mature and immature teeth. Some studies show a 95% success rate with Cvek Pulpotomies.

Calcium Hydroxide has been the treatment of choice for the pulp capping dressing with Cvek pulpotomies, but better results have been shown using MTA in histological studies.

Pathways of the Pulp. Cohen and Hargreaves. 4th edition.

A Clinical Guide to Dental Traumatology. Berman, Blanco and Cohen. 1st edition.

15. When would apexification be advised over apexogenesis in a tooth with an incompletely formed root?

- a. When only the apical portion of the pulp remains vital
- b. When periapical disease of the tooth is noted
- c. When the pulp has a vital pulp but it has experienced a carious exposure
- d. Apexification would never be the favored choice in a tooth with an open apex

Answer: B

Apexogenesis: Vital pulp therapy performed to encourage continued physiological formation and development of the tooth.

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Apexification: the process of cleaning and filling the canal with a temporary paste to encourage the formation of a calcified barrier in a tooth with immature root formation or an open apex.

When working with incompletely formed permanent teeth, apexification should be the treatment of last resort in a tooth that has incompletely formed roots. Even if the tooth has experienced a carious exposure, vital pulp tissue should be left behind to give the tooth a chance for the development of the remaining apical portion (apexogenesis). With that in mind, the preferred treatment for a tooth with an incomplete apex with periapical disease would be apexification.

Cohen S, Hargreaves KM: Pathways of the Pulp 9th Ed. 2006; pages 864-972

16. _____ have been linked to endodontic failure and have been shown to adversely affect the healing of post treatment Periapical tissues except:

- a. E. faecalis
- b. C. albicans
- c. A periapical cyst
- d. Vegetable food particles
- e. HSV-1 virus

Answer: e. HSV-1

Although there are some theories about viruses affecting healing of Periapical tissue after endodontic treatment, there has been no direct link.

Things that have been linked

1. Poor instrumentation technique and access
2. Poor aseptic control
3. Missed canals
4. Leaking coronal restorations
5. Host systemic factors such as diabetes
6. Propionibacterium
7. E. faecalis
8. C. albicans
9. A. israeli
10. A Periapical cyst
11. Cholesterol Crystals
12. Periradicular Gutta Percha
13. Vegetable food particles
14. paper points(cellulose)
15. Amalgam
16. Ca(OH)
17. Mistaken healing lesion (scar tissue)

Can be broken down into

1. Instrumentation, missed canals
2. Coronal restoration
3. Host factors
4. **Intraradicular infection (gram + cocci, rods and filaments) (most common)**
5. Extraradicular infection (Actinomycosis)
6. Cystic Apical periodontitis (a true cyst is present)
7. Cholesterol Crystals
8. Foreign bodies (GO, amalgam, sealer, small pieces of dentin, etc)
9. Plant materials
10. Scar tissue healing

Inadequate aseptic control, poor access cavity design, missed canals, insufficient instrumentation, and leaking temporary or permanent fillings are common problems that lead to endodontic failure. (131) Beyond the root canal system, factors within the inflamed periapical tissue can interfere with posttreatment healing including compromising **host factors associate with systemic disease such as diabetes** (31)

Only a small number of bacterial species have been found in root canals that have undergone proper endodontic treatment that on follow-up, revealed persisting periapical radiolucencies. These are **predominantly Gm+ cocci, rods and filaments.** Included are **Actinomyces (mainly A. israelii), E. faecalis and Propionibacterium** (131). **C. Albicans is the most frequently isolated fungus from root filled teeth with apical periodontitis** (132).

A true periapical cyst. Endodontic success rate of 85-90% has been recorded by investigators. **If true cysts are present, particularly large ones, those teeth are less likely to be resolved by nonsurgical root canal treatment.** (90) Clinicians must recognize the fact that the cysts can sustain posttreatment apical periodontitis and consider the option of apical surgery, particularly when previous attempts at orthograde retreatment have not resulted in healing (82)

The incidence of cholesterol clefts in apical periodontitis varies from 18-44% in nonhealing lesions that have received NSRCT (14). These clefts are thought to be formed by disintegrating RBC, lymphocytes and plasma lipids. The macrophages that surround these crystals are not only unable to degrade them but are a major source of inflammatory and bone resorptive mediators (120)

Extruded gutta percha is associated with delayed healing at the periapex (127). Fine particles of gutta percha induce an intense, localized tissue response characterized by macrophages and giant cells. (121)

Vegetable food particles, particularly leguminous seeds, and endodontic clinical materials of plant origin can become lodged in the periapical tissue before or during endodontic treatment. **Seed particles can be found and enter the tooth through caries or a defective restoration and lead to a vegetable granuloma** (41). **Fibers from cotton rolls or paper dry points can cause a cellulose granuloma** (56)

Other foreign materials include amalgam, endodontic sealants and Ca (OH) 2. **In a histologic and X-Ray microanalytic investigation of 29 apical biopsies, 31% of the specimens were found to contain material compatible with amalgam and endodontic sealer components** (58)

Cohen, Stephen. Pathways of the Pulp, 9th edition, 2006.

17. Which one of the following is the most important benefit of using a combination technique (Hybrid Technique) in root canal instrumentation and shaping?

- a. Less tapered instruments allow additional apical enlargement
- b. Hand instruments secure a patent glide path
- c. Instruments can be used in a manner that promotes their individual strengths and avoids their weaknesses
- d. Tapered rotary instruments efficiently enlarge coronal canal areas

Answer: c

Although many combinations are possible, the most popular and useful ones involve coronal pre-enlargement followed by different additional apical preparation sequences. Address anatomic variations in each canal individually. Oval canals extend deep into the apical area and the apical foramina may be oval in shape. Rotary files can produce a round canal at best. A combination approach eliminates the weaknesses and promotes the strengths of different instruments.

Reference: Cohen S, Hargreaves K, Pathways of the pulp, ninth edition, 2006.

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18. What of the following is true regarding the difference between fusion and concrescence.

- a. Concrescence involves the joining of two adjacent tooth germs to form a single large tooth and always presents as one less tooth in the arch
- b. Concrescence involves the fusion of cementum only in adjacent teeth
- c. Fusion is a less complete process than concrescence therefore the two teeth share the same root canal
- d. Fusion is more complete than gemination and results in the formation of two separate teeth from one tooth bud.

Answer: B

Fusion is a more complete process than concrescence and may involve either (1) merging of the entire length of two teeth (enamel, dentin, and cementum) to form one large tooth, with one less tooth in the arch, or (2) fusion of the root only (dentin and cementum) with the maintenance of two clinical crowns.

Concrescence involves union of cementum only.

Twinning is more complete than gemination and results in the formation of two separate teeth from one tooth bud (one extra tooth in the arch). In germination, separation is attempted, but the two teeth share the same root canal.

Shafer WG, Hine MK, Levy BM: A textbook of Oral Pathology 4th ed. Philadelphia, W.B Saunders, 1983
Charles Dunlap DDS "abnormalities of teeth" September 2004

19. According to Krasner and Rankow, which anatomic feature is the most important anatomic landmark for determining the location of pulp chambers and root canal orifices?

- A. Cusp Tips
- B. Level of central groove
- C. CEJ
- D. Occlusal Anatomy

ANSWER: C. CEJ

Traditionally, access cavities have been prepared in relation to the occlusal anatomy. However, complete reliance on the occlusal anatomy is dangerous, because this morphology can change as the crown is destroyed by caries and reconstructed with various restorative materials... In a study involving 500 pulp chambers, Krasner and Rankow found that the cementsoenamel junction (CEJ) was the most important anatomic landmark for determining the location of pulp chambers and root canal orifices. The study demonstrated the existence of a specific and consistent anatomy of the pulp chamber floor. These authors proposed five guidelines, or laws, of pulp chamber anatomy to help clinicians determine the number and location of orifices on the chamber floor.

First law of symmetry: Except for the maxillary molars, canal orifices are equidistant from a line drawn in a mesiodistal direction through the pulp chamber floor.

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.

Law of color change: The pulp chamber floor is always darker in color than the walls.

First law of orifice location: The orifices of the root canals are always located at the junction of the walls and the floor.

Second law of orifice location: The orifices of the root canals are always located at the angles in the 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.

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Cohen, Stephen C. Cohen. Pathways of the Pulp, 9th Edition. C.V. Mosby, 2006.

20. Which one of these is not a goal of obturation following instrumentation of the root canal space?

- A. Sealing of the canal system
- B. Create a 3-D fill that is free of voids
- C. Obturation material should extend to the radiographic apex
- D. Use a material that is radiopaque and nonirritating to apical tissues

Answer: C

The goals of modern endodontic therapy are cleaning, shaping, disinfection and three-dimensional obturation of the root canal system that does not allow leakage and promotes periapical healing. Characteristics of an ideal obturation material are that it should be easily manipulated, be dimensionally stable, seals the canal laterally and apically while conforming to the internal anatomy, be nonirritating to the apical tissues, be unaffected by tissue fluids, inhibits bacterial growth, be radiopaque, doesn't discolor the tooth and can be easily removed if needed. Studies over the years have shown that a fill to within 1mm of the radiographic apex has the greatest success and conforms with the anatomy of the location of the major foramen.

Pathways of the Pulp. Cohen and Hargreaves. 4th edition.

Oddoni PG, Mello I, Coil JM, Antoniazzi H. Coronal and apical leakage analysis of two different root canal obturation systems. Braz. oral res. vol.22 no.3 São Paulo July/Sept. 2008

21. What is the most predominate material in gutta percha

- a. Gutta percha
- b. Zinc oxide
- c. Wax or resin
- d. Heavy metal salts

Answer: B

Composition of Gutta-Percha for endodontic use

Gutta-percha (19-22%) Matrix

Zinc oxide (59-79%) Filler

Heavy metal salts (1-17%) Radiopacifier

Wax or resin (1-4%) plasticizer

Cohen S, Hargreaves KM: Pathways of the Pulp 9th Ed. 2006; page 263

22. Which solvent, when used, is the most effective in dissolving Gutta Percha?

- a. methylchloroform
- b. xlyenes
- c. sodium hypochlorite
- d. chloroform

ANSWER: d. chloroform

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Solvents used. Chloroform, Eucalyptol, Halothane, Rectified turpentine, Xlyenes
Chloroform is considered as a safe and effective endodontic solvent. All the others generally have been reported to be less effective or have some other drawback that limits their use. Xlyenes and eucalyptol dissolve GP slowly and approach chloroform when heated. Rectified turpentine has a higher level of toxicity than chloroform and produces a pungent odor but dissolves GP faster. In a recent study Halothane, required more time in removing GP than chloroform. Although methylchloroform is less toxic than chloroform, it is less effective. Both Halothane and Chloroform have been shown to affect the chemical composition of dentin and may affect bond strengths of adhesive cements.

Cohen, Stephen. Pathways of the Pulp, 9th edition, pg 968.

23. All of the following statements regarding Zinc-Oxide Eugenol are correct except:

- a. When it comes in contacts with water, ZOE undergo surface hydrolysis producing Zinc Hydroxide and Eugenol.
- b. It is well tolerated by the radicular tissue but it has no hard tissue regeneration capacity.
- c. As root-end filler, IRM seals better than amalgam and is not affected by root-end conditioning agents.
- d. Super EBA and IRM are two commercially available ZOE materials.

Answer: c

Zinc-Oxide powder and liquid can be mixed to a paste. Eugenol is released from ZOE mixture, although it declines exponentially with time is directly proportional to the liquid-powder ratio. When ZOE comes in contact with water, it undergoes surface hydrolysis, producing Zinc Hydroxide and eugenol. It appears to be tolerated in the periradicular tissue, but it has no dental hard-tissue (cementum) regeneration capacity. IRM seals better than amalgam and is not affected by the liquid-powder ratio or root-end conditioning agents. IRM and Super EBA are two commercially available ZOE materials. Super EBA contains aluminum oxide.

Reference: Stephen Cohen, MA, DDS, FICD, FACD, Kenneth Hargreaves, DDS, PhD, FACD, "Pathways of the pulp", ninth edition, 2006.

Reference: Crooks, Anderson, Powell, Kimbrough: "Longitudinal evaluation of the seal of IRM root end fillings", J Endodon, 20-250, 1994.

24. All of the following are indications for the use of MTA except

1. Immediate apical barrier
 2. Pulp capping
 3. Apexogenesis
 4. Internal and external root resorption
 5. Lateral and strip perforations
 6. Furcation perforations
 7. Apexification
- a. none of the above
 - b. Choice 2, 3, and 7 only
 - c. choice 3 only
 - d. all of the above are indications for MTA use

Answer: C

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Apexification is a method of inducing a calcified barrier at the apex of a nonvital tooth with incomplete root formation. Apexogenesis refers to a vital pulp therapy procedure performed to encourage physiological development and formation of the root end

In a short-term animal assessment study, MTA consistently induced the formation of dentin at a greater rate with greater structural integrity and more complete dentin bridging than did calcium hydroxide.⁶¹ Histologically, in other animal studies, MTA was considerably better at stimulating reparative dentin formation and maintaining the integrity of the pulp.^{57,59} In a short-term human study using adult third molars, MTA consistently demonstrated less inflammation, hyperemia and necrosis, as well as a thicker dentinal bridge with more frequent odontoblastic layer formation, than that seen with calcium hydroxide.⁵⁸ MTA may be useful as a substitute for calcium hydroxide in pulpotomy procedures. Further research, however, is needed to clarify this conclusion.

Mineral trioxide aggregate pulpotomies. A case series outcomes assessment. David E. Witherspoon, BDS, MS; Joel C Small, DDS; Gary Z. Harris, DDS. JADA 2006; 137:610-618

MTA materials appear not only to demonstrate acceptable biocompatible behavior but also exhibits acceptable *in vivo* biologic performance when used for root-end fillings, perforation repairs, pulp-capping and pulpotomy, and apexification treatment. However, it should be noted that the supporting data have been overwhelmingly from either *in vitro* or animal studies.

Mineral trioxide aggregate material use in endodontic treatment: A review of the literature_ Howard W. Roberts, Jeffrey M. Toth, David W. Berzinsc, David G. Charltond*

Apexogenesis is done in immature teeth when part of the pulp tissue remains vital and uninfamed, or in some trauma cases in which pulp exposure occurred and treatment was delayed and it becomes necessary to extend further into the canal to reach healthier tissue. Although the authors recommend the use of MTA for pulp capping and pulpotomy, Ca(OH)₂ is still widely used.

Pathways of the Pulp, Cohen 9th edition