

2012 ABGD Study Guide

1. The protocol for dental trauma involves all of the following, except
 - a. Ideally, the tooth should be repositioned to its original position.
 - b. EPT and thermal testing are unreliable following trauma since physical trauma can sever or damage nerve supply without altering pulpal blood supply/vitality.
 - c. 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.
 - d. The tooth should be splinted for 2 to 4 months if it sustains a root fracture

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1. Answer – D

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).

1. Cohen S, Hargreaves KM: Pathways of the Pulp 9th Ed. 2006; Pages: 626; 629-30.
2. American Association of Endodontics: Recommended guidelines of the American Association of Endodontics for the Treatment of Traumatic Dental Injuries; 2004

“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

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2. When evaluating horizontal root fractures, one should consider all as being true, except:
 - A. Chances of coronal root fractures healing are similar to mid-root or apical fractures if the fracture is below the height of crestal bone and properly splinted
 - B. If the fracture is at or coronal to the crest of the alveolar bone, the prognosis is still favorable
 - C. Pulpal necrosis occurs in 25% of root fractures
 - D. In the vast majority of cases, necrosis occurs in the coronal segment only with the apical segment remaining vital

2. Answer – B

Historically, fractures in the cervical segment were considered to have a poor prognosis and extraction of the coronal segment was recommended. Research does not support this treatment. Endodontic treatment is indicated in the coronal root segment only unless periapical pathosis is seen in the apical segment. The coronal segment is filled after a hard tissue barrier has formed apically in the coronal segment and periradicular healing has taken place (long term calcium hydroxide treatment is a viable option to assist in hard tissue barrier).

Cohen S, Hargreaves K. Pathways of the Pulp. 2006: 16 (226-29)

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3. How long should horizontal root fractures be splinted if the coronal section was displaced and repositioned?
- A. not indicated
 - B. 7 to 10 days
 - C. 4 to 6 weeks
 - D. 3 months

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3. Answer: C 4 to 6 weeks

Reference: Endodontic Principles and Practice by M. Torabineja

Peterson's Principles of Oral and Maxillofacial Surgery Vol. 1 by M. Miloro

After root fracture a semi-rigid splint should be placed for 4 to 6 weeks to permit optimal formation of a dentin callus to unite the root fracture.

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4. Which of the following techniques is the best way to detect a vertical root fractures?
- A. Periapical Film
 - B. Panograph
 - C. CAT Scan
 - D. Occlusal Film

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4. **Correct-C.** Cat Scans. Cat Scans have been shown to be superior in detecting vertical root fractures than other dental radiographs. Although most dental offices do not have CAT scans.

Cohen, Stephen C. Pathways of the Pulp, 9th Edition. C.V. Mosby, 2006. p28

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5. Patient presents for emergency dental exam after falling off his bike and face planted into sidewalk. Upon examination, you suspect that he may have a root fracture of #8. How many angled PA radiographs would you take, at a minimum?

- A. Two angled films at 45 and 90 degrees to the possible fracture line
- B. Only one film from the distal or mesial at 45 degree to uphold ALARA,
- C. Three angled films at 45, 90 and 110 degrees to ensure at least one passes through the possible fracture line
- D. Two angle films at any angle as long as it is parallel to the long axis of the root and will reveal the fracture line.

5. Correct: C

Since root fractures are usually oblique (facial to palatal) one PA can easily miss its presence. It's imperative to take at least 3 angled radiographs (45, 90 and 110 degrees) so that at least one angulation, the x-ray beam passes directly through the fracture line to make it visible on the radiograph.

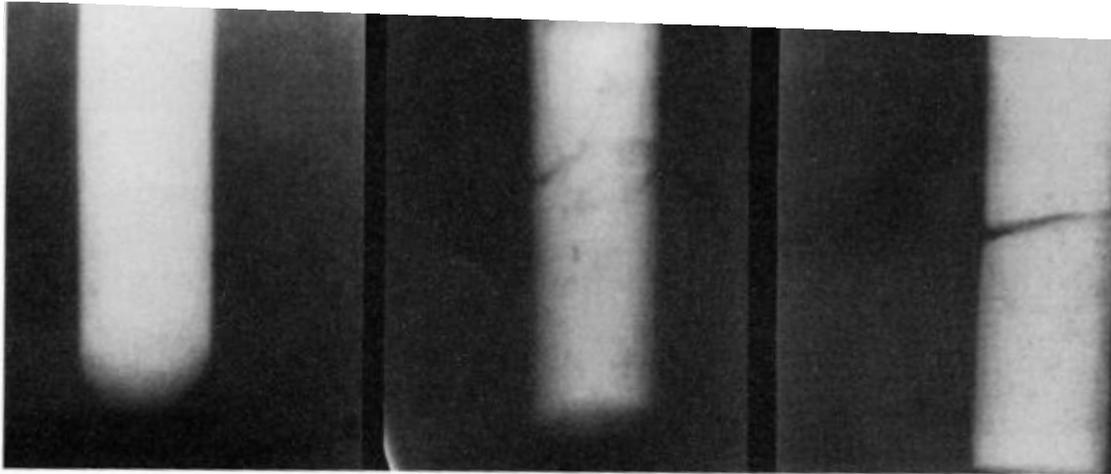


FIG. 16-15 Chalk cut horizontally and radiographed at different angles illustrating the different radiographic pictures that can be obtained. *Left*, At this angle, no “fracture” is seen. *Middle*, The “fracture” appears complicated in nature. *Right*, Only at this angle can the true nature of the fracture can be seen. (Courtesy Dr. I. B. Bender.)

Cohen, Stephen. Pathways of the Pulp, 7th edition, 567-572, 2006

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.

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6. Assessment of a completed NSRCT is based primarily on what?
- A. Radiographic examination
 - B. Pain level of the patient
 - C. Mobility of the tooth
 - D. EPT results
 - E. The alignment of the planets

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6. ANSWER: A. Radiographic examination

“The radiographic criteria for evaluating obturation include the following categories: length, taper, density, gutta-percha and sealer removal to the facial cementenamel junction in anterior teeth and to the canal orifice in posterior teeth, and an adequate provisional restoration or definitive.”

Cohen, Stephen C. Pathways of the Pulp, 10th Edition. C.V. Mosby, 2011. Pg.358

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7. Research has demonstrated that the average distance from the foramen to the minor constriction is:
- a. 0.5 -1.0mm
 - b. 0.2-0.4mm
 - c. 1.0-2.0mm
 - d. 2.0-3.0mm

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7. Answer: A – the average is 0.5mm-1.0mm

In 1955 Kuttler noted that the average distance from the foramen to the constriction was found to be 0.5mm. Chapman in 1969 showed that in 92% of examined teeth the apical constriction was within 0.5mm to 1.0mm of the foramen, and in 1984 Dummer found that 95% were between 0.5mm to 1.0mm.

Resource: Pathways of the pulp, 9th edition. Chapter 10 – pg 363

8. Which of the following diagnostic tests is (are) not an indication of pulp vitality?

1. Percussion
2. Mobility
3. Thermal (hot and cold)

Answer:

- A. 1 only
- B. 3 only
- C. 1 and 2
- D. 2 and 3
- E. all of the above

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8. Answer: C. Percussion and Mobility do not indicate pulp vitality

Pathways of the Pulp; 9th edition; page 15

Percussion: “is an indication of inflammation in the periodontal ligament (i.e., an acute periradicular periodontitis). This inflammation may be secondary to physical trauma, occlusal prematurities, periodontal disease, or the extension of pulpal disease into the periodontal ligament space.”

Mobility: “It is merely an indication of a compromise to the periodontal attachment apparatus. This comprise could be the result of acute or chronic physical trauma, occlusal trauma, parafunctional habits, periodontal disease, root fractures, rapid orthodontic movement, or the extension of pulpal disease, specifically an infection, into the periodontal ligament space.”

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9. Which of following is *false* with respect to the use of electric pulp testing in endodontics?
- A. The technology is not accurate enough at this time to be utilized on a routine basis in a clinical setting.
 - B. The response of the pulp to electric testing reflects the histologic health or disease status of the pulp.
 - C. A response by the pulp to the electric current only denotes that some viable nerve fibers are present in the pulp and are capable of responding.
 - D. Electric pulp test results are most accurate when no response is obtained to any amount of current (i.e. necrotic pulp).

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9. ANSWER: B. The response of the pulp to electric testing reflects the histologic health or disease status of the pulp.

“The response of the pulp to electric testing does *not* reflect the histologic health or disease status of the pulp.”

-The vitality of the pulp is determined by the intactness and health of the vascular supply, not the status of the pulpal nerve fibers. Even though advances are being made with regard to determining the vitality of the pulp on the basis of blood supply, this technology is not accurate enough at this time to be utilized on a routine basis in a clinical setting.

-The electric pulp tester has limitations in providing information about the vitality of the pulp. The response of the pulp to electric testing does *not* reflect the histologic health or disease status of the pulp.

-A response by the pulp to the electric current only denotes that some viable nerve fibers are present in the pulp and are capable of responding.

-Numerical readings on the pulp tester have significance only if the number differs significantly from the readings obtained from a control tooth tested on the same patient with the electrode positioned at a similar area on both teeth. Electric pulp test results are most accurate when no response is obtained to any amount of current (i.e. necrotic pulp).

Cohen, Stephen C. Pathways of the Pulp, 9th Edition. C.V. Mosby, 2006. p17-18.

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- 10.** 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 b
 - e. Both a and c

10. Answer - E.

In comparing all three (hot, cold and electric), a recent study was able to determine sensitivity and specificity. 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, pgs 16-21, 2006

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.

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11. When applying the tube shift technique, buccal object rule, Clark's rule, or the SLOB rule – all being the same concept – one should realize all of the following except:
- A. Can be used to locate additional canals or roots and distinguish between objects that have been superimposed
 - B. Distinguishes between various types of resorption and helps locate foreign bodies
 - C. The object closest to the buccal surface appears to move in the direction opposite the movement of the tube head
 - D. The object farthest from the film moves farthest on the film with respect to a change in horizontal angulation of the radiograph tube head
 - E. All are true

11. Correct– E All are true

- A. Can be used to locate additional canals or roots and distinguish between objects that have been superimposed
- B. Distinguishes between various types of resorption and helps locate foreign bodies
- C. The object closest to the buccal surface appears to move in the direction opposite the movement of the tube head
- D. The object farthest from the film moves farthest on the film with respect to a change in horizontal angulation of the radiograph tube head

Cohen S, Hargreaves K. Pathways of the Pulp. 2006: 5 (116-17)

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12. An advantage of the Gow-Gates mandibular block over the Akinosi technique includes all the following except:

- A. higher success rate 97.25%
- B. presence of bony contact to provide a landmark prior to injection of solution
- C. a high positive aspiration rate
- D. highly successful in patients with limited opening

12. Answer: D

Reference: Pathways of the Pulp by S. Cohen

The Gow-Gates mandibular block provides the clinician with a success rate of greater than 95%. The Akinosi technique has a success rate of 80 to 85% in patient with limited or no opening. Technique for Gow-Gates technique: A 25 gauge long needle is inserted in the mucous membrane on the mesial of the mandibular ramus, on a line from the intertragic notch to the corner of the mouth, just distal to the maxillary second molar. The target area is the lateral side of the condylar neck, just below the insertion of the lateral pterygoid muscle.

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13. Which of the following is not a landmark for the Akinosi block?

- A. Maxillary Tuberosity
- B. Pterygomandibular Raphe
- C. Coronoid Notch
- D. Mucogingival Junction of the maxillary third

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13. **B.** Pterygomandibular Raphe. The landmarks for the Akinosi Block are the maxillary tuberosity, the coronoid notch, and the mucogingival junction of the maxillary third (or second). The Pterygomandibular Raphe is a landmark for the Inferior Alveolar nerve block.

Malamed. *Handbook of Local Anesthesia Fifth Edition* p. 242.

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14. Your first two attempts with conventional IAN block to anesthetize a patient with irreversible pulpitis was ineffective during the pulpectomy procedure, which adjunctive technique will more likely increase your success rate on the second attempt?

- A. Gow Gates technique
- B. Buccal and lingual infiltration
- C. Vazirani-Akinosi technique
- D. None of the above

14-Correct: A

Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010 Feb;109(2):303-8.

Comparative evaluation of anesthetic efficacy of Gow-Gates mandibular conduction anesthesia, Vazirani-Akinosi technique, buccal-plus-lingual infiltrations, and conventional inferior alveolar nerve anesthesia in patients with irreversible pulpitis.

Aggarwal V, Singla M, Kabi D.

OBJECTIVE: Conventional inferior alveolar nerve block (IANB) has a poor success rate in inflamed pulps. Three alternative techniques of providing anesthesia to mandibular molars were evaluated and compared with conventional IANB.

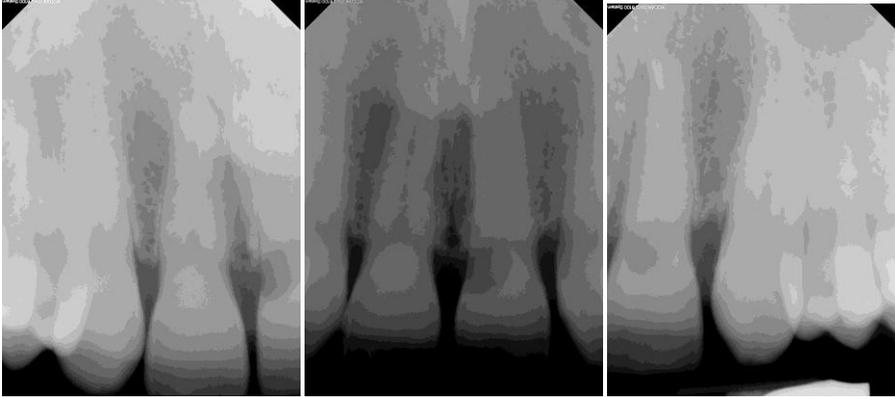
CONCLUSIONS: Gow-Gates mandibular conduction anesthesia may increase the success rates in patients with irreversible pulpitis compared with conventional IANB. None of the techniques provided acceptable success rates.

J Philipp Dent Assoc. 1994 Jun-Aug; 46(1):13-9.

A comparative study: classical, Akinosi, and Gow-Gates techniques of mandibular nerve block.

Abstract This study was conducted to compare the effectiveness and the degree of patient acceptability of the three techniques of mandibular nerve block, namely the classical, the Akinosi and the Gow-Gates. Forty five patients with mandibular posterior tooth/teeth indicated for extraction were chosen and divided equally into three groups to represent the three techniques of mandibular nerve block. Following the administration of the local anesthetic, the patients were evaluated using the evaluation sheet prepared for the study. Tabulation and analysis of the collected data followed. Results show that the Gow-Gates technique was the most effective in inducing anesthesia while the Akinosi technique appeared to be the most acceptable among the patient

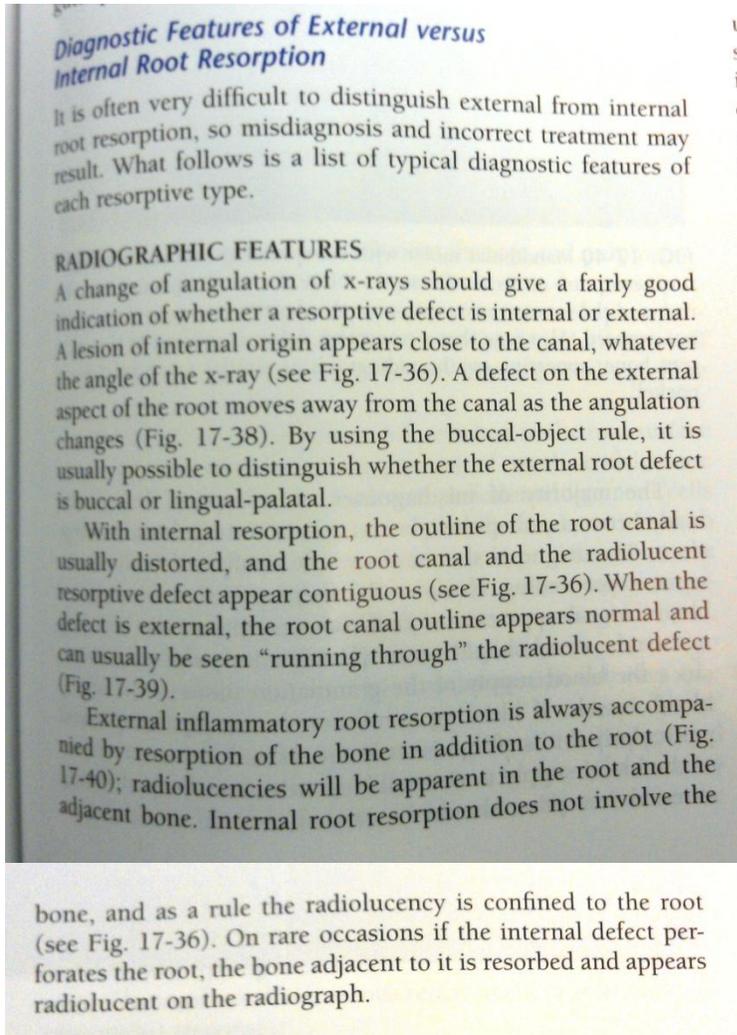
15. The following radiographs are an example of what type of lesion?



- A. Internal resorption
- B. External resorption
- C. Caries
- D. Abrasion
- E. A really bad pulp chamber access

15-ANSWER: B. External resorption

“A change of the angulation of x-rays should give a fairly good indication of whether a resorptive defect is external or internal.



Cohen, Stephen C. Pathways of the Pulp, 10th Edition. C.V. Mosby, 2011. Pg.645

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16. What type of nonavulsive tooth displacement has the worst prognosis?

- a. Extrusion
- b. Intrusion
- c. Subluxation
- d. Lateral luxation

16. Answer: B – Intrusion

Traumatic intrusion of teeth indicates that the alveolar socket has sustained a compression fracture to permit the new tooth position. On percussion the tooth emits a metallic sound similar to an ankylosed tooth, distinguishing it from a partially erupted tooth. Intrusion usually involved maxillary teeth.

Treatment: is controversial – some advocate surgical reposition and splinting; however this has led to serious periodontal and pulpal consequences. Others believe if left alone the teeth will re-erupt, and some advocate the use of orthodontic forces to assist re-eruption.

If orthodontic forces are used, the tooth should be extruded slowly, over a 3-4 week period. It is then splinted for 2-3 months.

Resource: Contemporary oral and maxillofacial surgery, 5th edition – pg. 481

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17. Subluxation refers to _____ and is treated _____.

- a. displacement labially, lineally, distally, or incisally; repositioning the tooth into normal position, take x-ray after repositioning, stabilize with flexible splint for up to 3 weeks
- b. no displacement normal mobility, and sensitivity to percussion; flexible splint is optional, may be used for pt comfort for 7-10 days
- c. sensitivity to percussion, increased mobility, no displacement; flexible splint is optional, may be used for the comfort of the patient for 7-10 days
- d. displacement in a coronal direction; reposition, stabilize the tooth with a flexible splint for up to 3 weeks

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17. Answer: C

- A. displacement labially, lineally, distally, or incisally; repositioning the tooth into normal position, take x-ray after repositioning, stabilize with flexible splint for up to 3 weeks
- B. no displacement, normal mobility, and sensitivity to percussion; flexible splint is optional, may be used for pt comfort for 7-10 days
- C. sensitivity to percussion, increased mobility, no displacement; flexible splint is optional, may be used for the comfort of the patient for 7-10 days
- D. displacement in a coronal direction; reposition, stabilize the tooth with a flexible splint for up to 3 weeks

Cohen; Pathways of the Pulp; 9th edition; page 630

Recommended guidelines of the AAE for the treatment of traumatic dental injuries, 2004

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18. Which of the following scenarios and clinical management would be considered the *incorrect* preparation of a root during avulsion of a permanent tooth?

A. Extraoral dry time *less than 60 minutes* with *closed apex*:

The root should be rinsed of debris with water or saline, replant and apply flexible splint for 1-2 weeks, initiate endodontic treatment with calcium hydroxide at 7-10 days.

B. Extraoral dry time *less than 60 minutes* with *open apex*:

The root should be rinsed of debris with water or saline, soak in doxycycline for 5 minutes, replant, initiate endodontic treatment with calcium hydroxide at 7-10 days (apexification) or allow for revascularization.

C. Extraoral dry time *more than 60 minutes* with *closed apex*:

Remove debris and necrotic periodontal ligament, soak in 2% stannous fluoride, replant, initiate endodontic treatment with calcium hydroxide at 7-10 days (apexification) or allow for revascularization.

D. Extraoral dry time *more than 60 minutes* with *open apex*:

Replantation usually is not indicated

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18-ANSWER: C. Extraoral dry time *more than* 60 minutes with *closed apex*:

Remove debris and necrotic periodontal ligament, soak in 2% stannous fluoride, replant, initiate endodontic treatment with calcium hydroxide at 7-10 days (apexification) or allow for revascularization.

-An avulsed tooth with a closed apex is not a candidate for revascularization.

-A dry time of 60 minutes is considered the point where survival of the root PDL cells is unlikely. If the dry time is more than 60 minutes, the root should be prepared to be as resistant to resorption as possible (attempting to slow the osseous replacement process).

Cohen, Stephen C. Pathways of the Pulp, 9th Edition. C.V. Mosby, 2006. p648-649.

Recommended Guidelines of the American Association of Endodontists for the Treatment of Traumatic Dental Injuries, 2004.

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- 19.** EDTA or ethylenediamine tetra acetic acid is a chelating agent that is used in endodontics to remove inorganic mineral to aide in negotiating calcified canals. What else does it help to do in canal prep?
- a. Removes potassium ions to make tooth less sensitive post op
 - b. Removes the inorganic portion of the smear layer
 - c. Removes the organic portion of the smear layer
 - d. Kills bacteria and digests organic debris

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19. Answer – B Removes the inorganic portion of the smear layer

B. With its ability to chelate inorganic material, it removes mineral from the smear layer while NaOCl digests organic material from the smear layer and kills bacteria and also digests organic debris.

EDTA is available in liquid or paste form and is used in concentrations from 15-17% It is usually combined with a detergent to decrease the surface tension to increase the cleaning ability and wettability of the dentin surface. To remove smear layer the EDTA needs to be left in place for 1-5 minutes and then rinsed out of the tooth with water or NaOCl.

Nygaard-Ostby in 1957 introduced chelating agents to endodontics for the treatment of narrow calcified canal systems. It allows for an easier cutting of the calcified dentin and its removal to aide in treatment.

Johnson WT, Gutmann JL; Ch. 10 *Obturation of the Cleaned and Shaped Root Canal System; Pathways of the Pulp*; Mosby Publishing, St. Louis, MO, 2006; pp. 366-367.

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- 20.** When using EDTA, one must factor in which variables to evaluate its effectiveness:
- A. Time of application
 - B. pH
 - C. Concentration
 - D. Location of EDTA – coronal/middle/apical third of root canal
 - E. All the above

20. Answer – E

The effectiveness of EDTA is related to time of application, the pH, and the concentration. The action of EDTA appears to be more effective in the coronal and middle thirds of the root and is reduced apically. This reduced activity may be a reflection of canal size – which is a clinical concern because of the more irregular structure of dentin in the apical third (accessory canals/irregular secondary dentin.)

Cohen S, Hargreaves K. Pathways of the Pulp. 2006: 10 (366-67)

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21. Which of the following is not a step as part of the technique for a shallow (partial) pulpotomy?
- A. rubber dam isolation
 - B. pulp tissue removed to about 2 mm below the exposure
 - C. use of a large round carbide bur in the slow-speed handpiece to remove tissue
 - D. restoration of the cavity with a hard-setting cement

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21. Answer: C - use of a large round carbide bur in the slow-speed handpiece to remove tissue

Reference: Endodontic Principles and Practice by M. Torabineja

The procedure is accomplished using a water-cooled small round diamond in the high-speed handpiece. The surface layers of pulp tissue are removed 2mm below the exposure site. The wound is then gently washed with sterile saline and hemostasis can be expected within 5 minutes. The clot is dress with calcium hydroxide and the remainder of the cavity is sealed with hard-setting cement.

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22. With a Cvek pulpotomy, a one to two millimeter deep cavity is prepared into the pulp with a slow speed bur. The material in the pulpal cavity and all dentinal tubules are covered by calcium hydroxide.

- A. Both statements are true.
- B. The first statement is true and the second statement is false.
- C. The first statement is false and the second statement is true.
- D. Both statements are false.

22. C. The first statement is false and the second statement is true.

When preparing the cavity for a cervical pulpotomy, a high speed with copious coolant is used. A slow speed or spoon excavator should be avoided unless of cooling of the high speed is not possible. The pulpal cavity and all exposed dentinal tubules should be covered with a hard setting calcium hydroxide.

Cohen, Stephen C. Pathways of the Pulp, 9th Edition. C.V. Mosby, 2006. p618

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23. A 9 yo presents to your office with fractured crowns #8 and 9, due to an elbow to the mouth while wrestling with his brother about an hour ago. He is suffering a pain scale of 7/10 when he smiles, drinks or tries to talk. Radiographic and clinical exam reveal exposed pulps and immature apices on both teeth. What is your treatment of choice for the best prognosis?

- A. Immediate extraction and implants #8 and 9.
- B. Direct pulp cap with calcium hydroxide with composite restorations
- C. Cvek or partial pulpotomy with composite restorations.
- D. Pulpectomy to alleviate pain today and NSCRT #8 and 9 at the next appointment.

23-Correct: C

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. Some studies show a 94-96% success rate with Cvek Pulpotomy

Direct pulp capping is an acceptable treatment option and depends of the calcium hydroxide’s ability to disinfect the superficial pulp and necroses the zone of superficial inflamed pulp. Success range about 80% and depends on a bacteria-tight seal.

Therefore, Cvek pulpotomy is a better treatment choice due to higher success rate and better prognosis. Calcium Hydroxide has been the treatment of choice for the pulp capping dressing with Cvek pulpotomy, but better results have been shown using MTA in histological studies.

-Pathways of the Pulp. Cohen and Hargreaves. 7th edition, pages 556-565.

http://www.aae.org/uploadedFiles/Publications_and_Research/Guidelines_and_Position_Statements/2004TraumaGuidelines.pdf

-AAE Guide and position statements (accessed 16 July 2011)

TABLE 6. Treatment guidelines for tooth fractures and alveolar fractures in the permanent dentition

	Crown fracture		Crown-root fracture	Root fracture	Alveolar fracture
	Uncomplicated	Complicated			
Diagnosis and clinical findings	Enamel fracture or enamel-dentin fracture; no pulp exposure.	Enamel-dentin fracture, with pulp exposure.	The coronal fragment is attached to the gingiva and mobile. The pulp may or may not be exposed.	The coronal fragment is usually mobile and sometimes displaced. The apical segment is usually not displaced.	The bone segment containing the involved tooth/teeth is mobile.
Radiographic and clinical assessment and findings	Take one radiograph (2). Evaluate size of pulp chamber and stage of root development. Sensitivity test.	Take one radiograph (2). Evaluate the size of pulp chamber and stage of root development. Sensitivity test.	Take four radiographs (1-4). Radiographs taken at different angulations are useful. Sensitivity test.		
Treatment	Account for fractured segment. Radiograph soft tissue lacerations for tooth fragments or other foreign bodies. Provide a temporary glass-ionomer cement bandage or a permanent restoration using a bonding agent and composite resin. If very close to pulp, consider Ca(OH) ₂ base. If an intact fragment exists, a bonding procedure may be carried out (SA/D).	<i>In immature tooth:</i> Perform pulp capping or partial pulpotomy and bacteria-tight coronal seal. <i>In mature tooth:</i> As with immature tooth or pulpectomy and root canal filling (SA).	In an emergency, stabilize the coronal fragment with an acid etch/resin splint to adjacent teeth. Expose subgingival fracture site by: a) Gingivectomy b) Orthodontic or surgical extrusion. If root formation is complete, root canal treatment is indicated. Otherwise, pulp capping or pulpotomy, and wait for completion of root formation (SA).	Reposition the coronal fragment as soon as possible. Check position radiographically. Stabilize the tooth with a splint (A/SA).	Reposition the fragment. Stabilize the fragment to adjacent teeth with a splint (A).
Patient instruction	Soft diet. Brush teeth with a soft toothbrush after each meal. Use chlorhexidine mouthrinse (0.12%) twice a day for 7 days. Follow up (see Table 7)				

Radiographs: (1) occlusal (2) periapical central angle (3) periapical mesial eccentric (4) periapical distal eccentric
Treatment urgency: A = Acute (within a few hours) SA = Subacute (within 24 hours) D = Delayed (more than one day)

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24. A differential diagnosis for failure of a NSRCT include all of the following except?

- A. perforation
- B. root canal missed
- C. periodontal disease
- D. split tooth
- E. having a proper apical seal

24-ANSWER: E. having a proper apical seal

Dent Clin North Am. 1979 Oct; 23(4):617-35.

Differential diagnosis in endodontic failure. Crump MC.

Abstract: Research in education has demonstrated the usefulness of verbal mediators as memory aides. The mediator or mnemonic POOR PAST can be of use to the dentist in recalling the list of alternatives in the differential diagnosis of endodontic failures: P--perforation; O--obturation; O--overfill; R--root canal missed; P--periodontal disease; A--another tooth; S--split; T--trauma. With a comprehensive list of diagnoses, recall of the appropriate questions and tests in examining for each possibility is simplified. The diagnostician then proceeds to look for a specific symptom or symptoms that would confirm a particular diagnosis or that would limit the alternatives to two or three possibilities. Questioning about the nature and duration of the symptoms is useful in ruling out some diagnoses. Pulp tests, periodontal probing, radiographs from different angles, percussion, palpation, and sinus tract exploration each have special application to one or more of the possibilities on the list. The wise clinician also evaluates access preparations, occlusion, and those etiologic factors that could cause pulp or periodontal disease. Variations in the root canal, requirements of treatment, the nature of the healing process, expected results, and surgical principles are considered along with the foregoing in problem solving. After a case has been thoroughly investigated and if the POOR PAST alternatives have been ruled out the dentist may then conclude that for some as yet undetermined reason the lesion exceeds the recuperative powers of the host and that further consultation or surgical intervention will be necessary.

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25. What is the most consistently reported organism found in failed endodontic procedures?
- a. *Streptococcus mutans*
 - b. *Enterococcus faecalis*
 - c. *Propionibacterium*
 - d. Actinomycoses

25-Answer: B – Enterococcus faecalis

E. faecalis has multiple mechanisms to avoid destruction. It has an efficient proton pump to protect from pH extremes. Is resistant to the high pH of calcium hydroxide, is sheltered from disinfectants and meds by remaining within tubules, and is able to survive long periods of time without a food source.

Resource: Pathways of the pulp ninth edition. Pg. 921-922

Navy endodontics lecture by Dr. Glen E. Minah 2011

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- 26.** The most common cause of vertical root fractures may be:
- A. occlusal prematurities
 - B. parafunctional activities
 - C. physical trauma
 - D. iatrogenic dentistry

26. Answer: D. iatrogenic dentistry

“Dental procedures such as the placement of posts and pins or the tapping into place of tightly fitting post or intracoroanal restoration may induce a vertical root fracture. The most common dental procedure contributing to the vertical root fractures is endodontic treatment.”

Cohen, Pathways of the Pulp, 9th edition, page 25

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27. Which of the following represents the *most likely* location of a second MB canal when accessing a maxillary first molar?

- A. The canal orifice is generally located slightly buccal to or directly on a line between the primary MB canal and distal orifices.
- B. The canal orifice is generally located directly distal to the MB canal orifice.
- C. The canal orifice is generally located mesial to or directly on a line between the primary MB canal and palatal orifices.
- D. The canal orifice is generally located equidistant between all three canals in the central pulpal floor.

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27. ANSWER: C. The canal orifice is generally located mesial to or directly on a line between the primary MB canal and palatal orifices.

Maxillary 1st Molar anatomy:

-Average length- (B) 19mm, (P) 21mm

-Usually 3 rooted with 3-4 canals. Second MB canal usually located between the primary MB canal and the palatal root. Primary MB canal is the straighter canal.

Weine FS, Healy HJ, Gerstein H, Evanson L. Canal configuration in the mesiobuccal root of the maxillary first molar and its endodontic significance. Oral Surg 1969; 28: 419-25.

-The MB2 canal was found in 73.2% of first molars, 50.7% of second molars, and 20.0% of third molars

-71.2% of MB roots had two canals that were located and treated.

Fogel HM, Peikoff MD, Christie WH. Canal configuration in the mesiobuccal root of the maxillary first molar: a clinical study. J Endod 1994; 20:135-37.

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- 28** All of the following may be indicative of multiple canals in a maxillary second premolar, EXCEPT
- a. Sharp change in canal density - “fast break”
 - b. Canal is well centered in root
 - c. Root outline unclear
 - d. Root has unusual contour
 - e. Root differs from expected appearance

28. ANSWER B. Canal is well centered in root

Detecting extra-canals:

- Sharp change in canal density “fast break”
- Root outline unclear
- Root has unusual contour
- Root differs from expected appearance
- Canal is not centered in root

Second premolar - Access – ovoid

- Average length - 21.0 mm

- Morphology -

One canal / one foramen - 48%

Two canals / one foramina - 27%

Two canals / two foramina - 24%

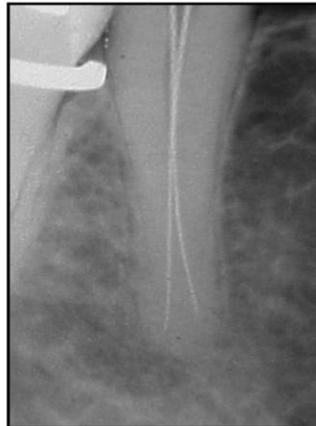
Three canals - 1%

Example of “fast breaking” canal.

Ref.: Slowey RR (1974)_Vertucci FJ, Seelig A, Gillis R. Root canal morphology of the human maxillary second premolar. Oral Surg 1974;38:456-64.

Maxillary second premolar

“Fast Break”



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In 40% of cases, this tooth, which is similar in length to the first premolar, has one root with a single canal. Two canals may be found in about 58% of cases.⁴ The configuration of the two canals may vary with two separate canals and two exits, two canals and one common exit, one canal dividing and having two exits. In one study,⁵ it was found that 59% of maxillary second premolars had accessory canals. As with the first maxillary premolar, the apical third of the root may curve quite considerably, mainly to the distal, sometimes buccally. The access cavity is similar to the first premolar.

British Dental Journal **197**, 379 - 383 (2004)
www.nature.com/bd/journal/v197/n7/full/4811711a.html

Pathways of the Pulp; Mosby Publishing, St. Louis, MO, 2006; pp. 366-367.

The maxillary 1st premolar has 2 canals 85% of the time (Carns EJ, Skidmore AE. Configuration and deviation of root canals of maxillary first premolars. *Oral Surg* 1973; 36: 880-6.

The maxillary 1st premolar has 2 canals 80% of the time according to the textbook, *Principles and Practices of Endodontics*. Walton and Torabinejad. 1989. Pg 467.

The maxillary 2nd premolar has 2 canals 51% of the time (Vertucci FJ, Seelig A, Gillis R. Root canal morphology of the human maxillary second premolar. *Oral Surg* 1974; 38: 456-64.

The maxillary 2nd premolar has 2 canals 35% of the time according to the textbook, *Principles and Practices of Endodontics*. Walton and Torabinejad. 1989. Pg 468.

The mandibular first premolar has 2 canals 24% of the time (Vertucci FJ. Root canal morphology of mandibular premolars. *J Am Dent Assoc* 1978; 97: 47-50.

The mandibular 2nd premolar has 2 canals 2.5% of the time (Vertucci FJ. Root canal morphology of mandibular premolars. *J Am Dent Assoc* 1978; 97: 47-50.

The mandibular 2nd premolar has 2 canals 12% of the time according to the textbook, *Principles and Practices of Endodontics*. Walton and Torabinejad. 1989. Pg 475.

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- 29.** All of the following are true concerning the canal configuration of mandibular incisors, EXCEPT?
- A. One canal/one foramen 58.6%
 - B. Two canals present 41.4%
 - C. With two canals present – Weine Type II 40.1%
 - D. With two canals present – Weine Type III 40.1%
 - E. With two canals present – Weine Type III 1.3%

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29. Answer – D is not true

- A. One canal/one foramen 58.6%
- B. Two canals present 41.4%
- C. With two canals present – Weine Type II 40.1%
- D. With two canals present – Weine Type III 40.1%
- E. With two canals present – Weine Type III 1.3%

Benjamin K, Dowson J. Incidence of two root canals in human mandibular incisor teeth. *Oral Surg* 1974; 34: 122-26

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30. What antibiotics are commonly used as a scaffold for pulpal revascularization of an immature necrotic permanent tooth?
- A. Cipro
 - B. Metronidazole
 - C. Ceflor
 - D. All the above

30. Answer: D

Reference: Endodontic Principles and Practice by M. Torabineja

Triple-antibiotic paste contains both bactericidal (metronidazole, ciprofloxacin) and bacteriostatic (minocycline) components, allowing for successful revascularization and the continued development of the root to its normal length.

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31. What is the major component of gutta percha obturation material?

- A. Gutta-Percha
- B. Zinc Oxide
- C. Heavy Metal Slats
- D. Waxes

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- 31. Correct- B.** Zinc Oxide comprises of 59-79% of the gutta percha. Gutta percha itself comprises of 19-20% and the rest are heavy metal salts (1-17%) and waxes or resins (1-4%).

Cohen, Stephen C. Pathways of the Pulp, 9th Edition. C.V. Mosby, 2006. p263

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32. Which of the following is **NOT** a solvent used in removing gutta percha in endodontic retreatment?
- a. Chloroform and methylchloroform
 - b. Eucalyptol
 - c. Tetrachloroethylene
 - d. Ethylene Chloride
 - e. Rectified turpentine

32. Correct: D

Several solvents have been recommended to dissolve and remove gutta percha for retreatment.

- Chloroform,
- Methylchloroform
- Eucalyptol
- Halothane
- rectified turpentine
- xylene
- Tetrachloroethylene is EndoSolv-E. Endosolv E allows the softening of temporary fillings of the normal zinc oxide-eugenol
- EndoSolv-R (formamide and 2-phenoethanol) =for removal of resilon. Endosolv R aids in the softening of phenolic resin type fillings.

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 967-968.

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33. Which of the following does not regulate/affect the setting of zinc oxide eugenol cements?

- A. Particle size of the zinc oxide
- B. pH
- C. Presence of $\text{Ca}(\text{OH})_2$ remaining in the canal
- D. Presence of water
- E. Remnants of pulpal tissues

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33. ANSWER: E. Remnants of pulpal tissues

“The particle size of zinc oxide, pH, and the presence of water regulate the setting and other additives that might be included in special formulas. The formation of eugenolate constitutes hardening of the cement, and Ca (OH)₂ accelerates this action, so canal systems containing Ca (OH)₂ must be well irrigated before obturation.”

Cohen, Stephen C. Pathways of the Pulp, 10th Edition. C.V. Mosby, 2011. Pg.263-264

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34. Which of the following is **not** a suggested use for the material MTA?
- a. Pulp capping
 - b. Non surgical apical closure
 - c. Perforation repair
 - d. Oburation of accessory canals
 - e. Surgical root-end filling

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34. Answer: D – obturation of accessory canals

Cementum deposition is essential to the regeneration of the periodontal apparatus, and a layer of cementum would enhance the integrity of the apical barrier in endodontic therapy. MTA appears to be able to induce cementoblastic cells to produce hard tissue.

MTA is very biologically compatible and has minimal reaction with the host. It is also virtually insoluble and can set in the presence of moisture.

Resource: Pathways of the pulp, 9th edition. Ch 8 pg. 278 and Ch. 20 Pg. 760

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35. Cvek has shown that with pulp exposures:

- a. it doesn't matter whether the exposure is traumatic or carious, the amount of pulp that is removed is the same
- b. in an traumatic injury, only a few millimeters of pulp tissue needs to be removed, regardless of lapsed time or the size of the exposure
- c. the instrument of choice for tissue removal is a round carbide bur, using a high-speed handpiece and adequate water cooling
- d. the instrument of choice for tissue removal is a round carbide bur, using a slow-speed handpiece and progressing slowly, as to not remove unnecessary healthy pulp tissue

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35. Answer: B- in an traumatic injury, only a few millimeters of pulp tissue needs to be removed, regardless of lapsed time or the size of the exposure

“Cvek has shown that with pulp exposures resulting from traumatic injuries, regardless of the size of the exposure or the amount of lapsed time, pulpal changes are characterized by a proliferative response with inflammation extending only a few millimeters into the pulp. When this hyperplastic, inflamed tissue is removed, healthy pulp tissue is encountered. In teeth with carious exposure of the pulp, it may be necessary to remove pulp tissue to a greater depth to reach uninfamed tissue. The instrument of choice for tissue removal in the pulpotomy procedure is an abrasive diamond bur, using high-speed, adequate water cooling. This technique has been shown to create the least damage to the underlying tissue.”

Cohen, Stephen C. Pathways of the Pulp, 9th Edition. C.V. Mosby, 2006. P 862-62.

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36. Which of the following represents the correct technique when performing a *Cvek pulpotomy*?

- A. Coronal pulp tissue should be removed to the level of the canal orifice(s).
- B. The most superficial 1mm of coronal pulp only should be excavated.
- C. A pulp cap only is performed with either calcium hydroxide or MTA, as no attempt should be made to remove any coronal pulp tissue.
- D. A 1- to 2-mm deep cavity is prepared into the coronal pulp tissue, and extended deeper as necessary to achieve appropriate hemostasis.

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36. Correct: D. A 1- to 2-mm deep cavity is prepared into the coronal pulp tissue, and extended deeper as necessary to achieve appropriate hemostasis.

The *Cvek pulpotomy* technique:

-A 1- to 2-mm deep cavity is prepared into the coronal pulp tissue using a high-speed handpiece with a sterile diamond bur with copious water coolant. If bleeding is excessive, the pulp is amputated deeper until only moderate hemorrhage is seen. Excess blood is carefully removed by rinsing with sterile saline and the area dried with a sterile cotton pellet. Use of 5% NaOCl is recommended to rinse the pulpal wound.

-A thin layer of pure CaOH or MTA is mixed with sterile saline or anesthetic solution to a thick mix and carefully placed onto the pulp stump. A material with the best chance for a bacteria-tight seal (ZOE or GI cement) is placed to a level flush with the fractured surface. The remainder of the tooth can then be restored with a composite restoration.

Cohen, Stephen C. Pathways of the Pulp, 9th Edition. C.V. Mosby, 2006. 627-28.

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37. NiTi wires have the following properties except:

- A. Superelasticity
- B. Can exist in more than one crystal structure
- C. Poor shape memory
- D. Shape memory

37. Correct: C

Stainless steel wires have better strength and springiness with better corrosion resistance than precious metal wires that they replaced. Typical formulation is 18% chromium and 8% nickel and often called 18-8 SS. Properties can be controlled over wide range by changing amount of cold working and annealing during manufacture. Steel is softened by annealing and hardened by cold working. Steel ligatures used to tie ortho arch wires to brackets are made from such “dead soft” wire.

Nickel-Titanium (NiTi) alloys – Developed for the space program and has exceptional springiness. Have shape memory and superelasticity. It exists in more than one form of crystal structure. Martensite form exists at lower temperatures and austenite form at higher temperatures. Both shape memory and superelasticity are related to phase transitions within NiTi alloy between the martensite and austenite forms.

Beta-Titanium (TMA) – A titanium alloy with a good combination of strength and springiness to provide excellent resilience with good formability. Good choice for auxiliary springs and for intermediate and finishing arch wires. Properties are intermediate between SS and M-NiTi.

Key Notes:

- NiTi = exceptional springiness (very difficult to define a yield point)
 1. Shape Memory
 2. SuperElastic
- TMA = intermediate
- Stainless Steel = exceptional stiffness
- Usual Wire Sequence in Ortho
 1. Round or Rectangular NiTi
 2. Round SS
 3. Rectangular TMA and /or SS

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38. In regards to orthodontic wires, which of the following are true?
- A. Doubling the diameter leads to 8 times the strength
 - B. Doubling the diameter leads to 1/16 the springiness
 - C. Doubling the diameter leads to half the range
 - D. Doubling the length leads to 4x the range
 - E. Greater titanium content leads to increased friction due to surface reactivity
 - F. All the above are true

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38. Correct – F. All the above are true.

This question, according to the notes, is referring to the effects of diameter/length on properties of all of the wires that ortho uses.

Springiness = $1/\text{stiffness}$. With the stress-strain curve: more horizontal slope = greater the springiness, and the more vertical slope = stiffer wire. Range is the distance the wire will bend elastically before permanent deformation. Strength = stiffness x range. Resilience is the area under the stress-strain curve to the proportional limit (point at which permanent deformation is 1st observed).

Hsieh T. Mechanical principles in orthodontic force control. Lecture series pgs 8-9.

Dr. Stefanos Lecture notes

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- 39.** Which is true regarding a pulpotomy in permanent teeth and in primary teeth?
- A. The calcium hydroxide pulpotomy technique is recommended in the treatment of permanent teeth with carious pulp exposure
 - B. Formocresol is the medicament of choice for a pulpotomy in permanent teeth
 - C. Pulpotomy technique for primary teeth involves only partial removal of the pulp chamber
 - D. If there is evidence of hyperemia after the removal of the coronal pulp, formocresol should be placed directly on the pulp stump for hemorrhage control

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39. Correct: A

Reference: Dentistry for the child and adolescent by McDonald

Calcium hydroxide pulpotomy technique is recommended in the treatment of permanent teeth with carious pulp exposures. It's indicated for permanent teeth with immature root development but with healthy pulp tissue in the root canals.

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40. Which of the following is true about the actions of a formocresol pulpotomy
- A. Formocresol pulpotomies do not produce dentinal bridging
 - B. Formocresol pulpotomies contain four zones of fixation.
 - C. Formocresol pulpotomies are initiated when the inflammation has spread into the tissues within the root canal.
 - D. All of the above are true

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40. Correct= A. Formocresol Pulpotomies do not produce dentinal bridging

- Formocresol Pulpotomies has a 62-97% success rate.
- The formocresol is bactericidal
- Formocresol Pulpotomies should only be used on vital teeth where the infection is confined to coronal pulp. If it involves the canal space, a pulpectomy should be initiated.
- Since there has been studies showing an immune response to formocresol, a 1/5 dilution of formocresol should be used with 3 parts glycerine, one part formocresol, and one part water
- There is no dentinal bridging
- There are three zones of fixations with progressive fibrosis
 1. Acidphilic zone: fixation
 2. Broad pale staining zone with diminished cellular and fiber definition
 3. Broad zone of inflammatory cells concentrated at the pale staining junction and diffusing apically into normal pulp.

<http://www.identalhub.com/dental-how-pulpotomy-saves-teeth-752.aspx>

Stephen Cohen, Richard C. Burns, Pathways of the pulp, Mosby, 8th E, 811

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41. A 3 year old patient has gross decay & early childhood caries in #K and you have to extract it, which appliance would be best to maintain the space?

- A. distal shoe
- B. lip bumper
- C. nance appliance
- D. lower lingual holding arch

41-Correct: A



The Nance appliance is a space maintainer used for the maxillary arch only. Bands are placed on the first permanent molars or 2nd primary molars. The appliance provides cross palatal bracing preventing rotation and mesial drifting of the 1st permanent molars when the 1st or 2nd primary molars are lost prematurely. The acrylic button provides an additional stop.



The Lingual holding arch . The objective is to retain the mandibular right and left first permanent molars in a normal Class I dental relationship and to prevent the tendency of mandibular incisors to tip lingually. The fixed lingual arch appliance is used where there are multiple losses of primary teeth.



Distal shoe or band and loop space maintainers are placed on either the maxillary or mandibular arch to prevent mesial drifting after premature loss of a first or second primary molar. The distal shoe is typically placed immediately after extraction of the primary 2nd molar to prevent mesial movement of the permanent 1st molar.

The Transpalatal arch space maintainer can be used for cross-anchorage if only one of the primary second molars is lost and both permanent first molars are erupted. It is effective in preventing mesial drifting of the maxillary first permanent molars and is more hygienic than the Nance transpalatal bar.
Mesial drifting of the maxillary first permanent molars and is more hygienic than the Nance transpalatal bar.



Pediatric Dentistry total patient care; Stephen Wei, 1988. Management of space in the primary and mixed dentition. P 454-463
Fundamental of pediatric dentistry 2nd revised edition; Arch length loss. P385-394.
Dentistry for the child and adolescent. 8th edition, Management of the developing occlusion. P 626-646

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42. Which of the following two classes of medications should be avoided for anxiolysis in patients with asthma?

- A. benzodiazepines
- B. barbiturates
- C. anti psychotics
- D. narcotics

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42-ANSWER: B. and D. Barbiturates and narcotics

“Likewise, barbiturates and narcotics (histamine releasing drugs) are best not used because they also may precipitate an asthma attack.”

Little, et al. Dental Management of the Medically Compromised Patient, 7th Edition. Mosby, 2008. Pg.103

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43. What should a practitioner be aware of and treat when uprighting a molar?

- a. Patient sensitivity
- b. Occlusion
- c. Increased probing depths
- d. Damage to adjacent teeth

43. Correct B: Occlusion

When patients lose a first molar it is common for the second molar to tip into the empty space. This can create a pseudopocket and difficult area to keep clean. Uprighting the molar can reduce the pseudopocket. As the tooth is rotated distally it is important to adjust the occlusion as needed to continue to allow orthodontic movement. The authors suggest a 17x25 NiTi wire as the most appropriate for molar uprighting with no need for wire bending

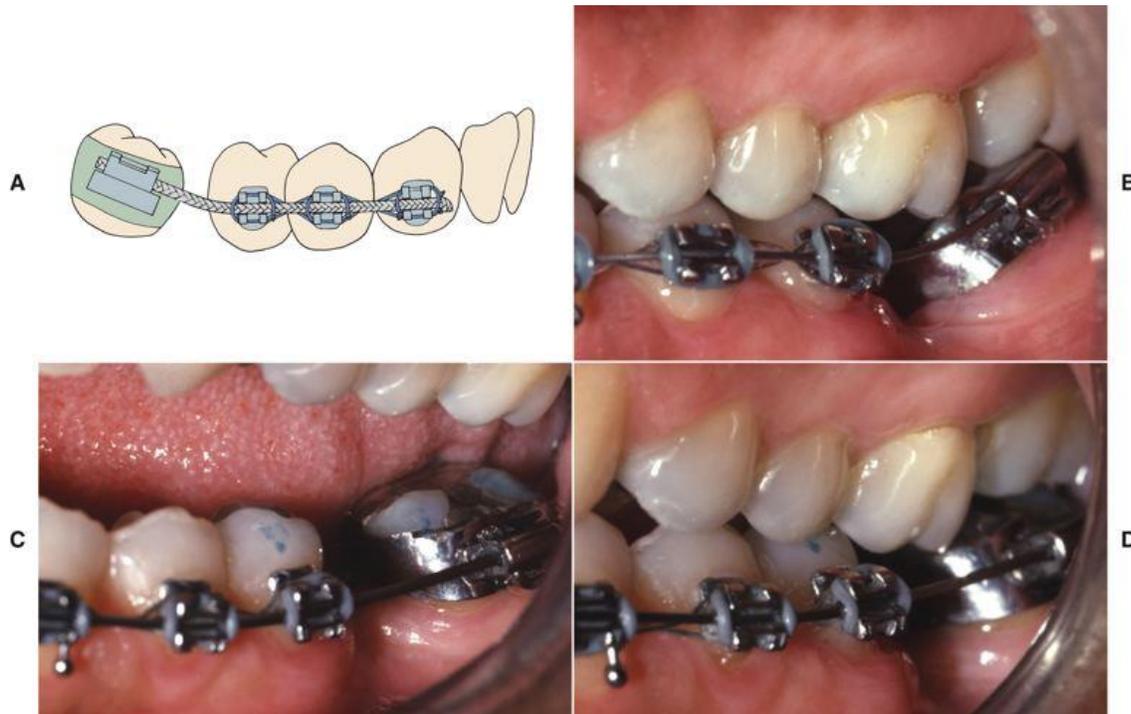


FIGURE 18–8 Fixed appliance technique for uprighting one molar with a continuous flexible wire. A, Initial bracket alignment is achieved by placing a light flexible wire such as 17 × 25 A-NiTi, from molar to canine; B, Molar uprighting with a continuous M-NiTi wire; C, Progress 1 month later; D, Uprighting essentially completed 2 months later.

Reference: Proffit, William R.. *Contemporary Orthodontics, 4th Edition*
CH. 18

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44. What is the primary indication for a supracrestal fibrotomy?

- a. To reduce the tendency for crowded incisors to relapse
- b. To reduce the possibility for a severely rotated tooth (teeth) to relapse
- c. Both a and b
- d. Neither a or b

44. Correct: B

The primary indication for gingival surgery (therefore) is a tooth or teeth that were severely rotated.

Proffit; Contemporary Orthodontics; 4th edition; 2007; page 615

“A major cause of rebound after orthodontic treatment is the network of elastic supracrestal gingival fibers. As teeth are moved to a new position, these fibers tend to stretch, and they remodel very slowly. If the pull of these elastic fibers could be eliminated, a major cause of relapse of previously irregular and rotated teeth should be eliminated. In fact, if the supracrestal fibers are sectioned and allowed to heal while the teeth are held in the proper position, relapse caused by gingival elasticity is greatly reduced.”

“Whatever the mechanism used to correct crossbite, it should be overcorrected by at least 1 to 2 mm before the force system is released. If the crossbite is corrected during the first stage of treatment, as should be the case, the overcorrection will gradually be lost during succeeding phases of treatment, but this should improve stability when transverse relationships are established precisely during the finishing phase.”

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45. Which of the following is *not* an indication for treating a high frenum?
- A. A high frenum attachment that is associated with an area of persistent gingival inflammation that has not responded to root planning and good oral hygiene.
 - B. A frenum that is associated with an area of recession that is progressive.
 - C. A high maxillary frenum with a sufficient band of attached gingiva.
 - D. A high maxillary frenum and an associated midline diastema that persists after complete eruption of the permanent canines.

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45. ANSWER: C. A high maxillary frenum with a sufficient band of attached gingiva.

Indications for treating a high frenum:

- A high frenum attachment that is associated with an area of persistent gingival inflammation that has not responded to root planning and good oral hygiene.

- A frenum that is associated with an area of recession that is progressive.

- A high maxillary frenum and an associated midline diastema that persists after complete eruption of the permanent canines.

- A mandibular lingual frenum that inhibits the tongue from touching the maxillary central incisors, thus inhibiting the child's ability to make t,d, and l sounds.

McDonald RE, Avery DR, Dean JA. Dentistry for the Child and Adolescent. Mosby, 2004. Pp 440-442.

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46. Tanaka and Johnston used the width of the lower incisors to predict the size of what unerupted teeth?
- A. Maxillary Canines and Premolars
 - B. Mandibular Canines and Premolars
 - C. Maxillary and Mandibular Canines and Premolars
 - D. Maxillary and Mandibular Incisors and Canines

46. Correct= C. Maxillary and Mandibular Canines and Premolars

Space analysis requires comparison between amount of space available for the alignment of teeth and the amount of space required to align them properly. Analysis can be done directly on casts or by a computer algorithm. The first step is calculation of space available, and this is done by measuring the perimeter from the mesial of one first molar to the other over the contact points and incisal edges of anterior teeth. The second step is to calculate the amount of space required for alignment of teeth, by measuring the mesiodistal width of each erupted tooth from contact to contact, estimating the size of unerupted permanent teeth and then summing the widths of individual teeth. If the sum of the widths of the permanent teeth is greater than the amount of space available, there is an arch perimeter space deficiency and crowding would occur. If available space is larger than the space required (excess space), spacing can be expected.

There are three ways to estimate the size of unerupted permanent teeth: measuring them on radiographs, estimating them using proportionality tables (Tanaka & Johnston), and a combination of the two.

Contemporary Orthodontics. Proffit, Fields and Sarver. 4th edition, 2007.

Moyers' probability tables (1973, 1988) are not suitable for predicting the summed widths of unerupted canine and premolars in Thai subjects. Moyer's prediction tables at the 50th percentile were found to underestimate tooth size summation.

Tanaka and Johnson probability tables (1974) gave predictions that were close to the accuracy of Thai subjects.

European Journal of Orthodontics. Jaroontham, Godfrey. 22 (2000) 127-134.

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47. In a mixed dentition analysis using either Moyers or Tanaka-Johnson techniques, which of the following statements is false?

A. Using the Moyers analysis, the M-D width of the lower incisors is measured and this number is used to predict the size of both the lower and upper unerupted canines and premolars.

B. With the Tanaka-Johnston analysis, you take $\frac{1}{2}$ the M-D widths of the lower four incisors and add 10.5 to estimate the width of the mandibular canine and premolars for one quadrant

C. With the Tanaka-Johnston analysis, you take $\frac{1}{2}$ the M-D widths of the lower four incisors and add 10 to estimate the width of the mandibular canine and premolars for one quadrant

D. With the Tanaka-Johnston analysis, you take $\frac{1}{2}$ the M-D widths of the lower four incisors and add 11 to estimate the width of the maxillary canine and premolars for one quadrant

47. Correct- C

Hsieh T. Orthodontic diagnosis and treatment planning. Lecture series pgs 29-30.

Moyer's prediction table

TABLE 6-6 Moyer's Prediction Values (75% level)

Total Mandibular-Incisor Width		19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0
Predicted width of canine and premolars	Maxilla	20.6	20.3	21.2	21.3	21.8	22.0	22.3	22.6
	Mandible	20.1	20.4	20.7	21.0	21.3	21.6	21.9	22.2

From Moyer's PE: Handbook of orthodontics, ed 3, Chicago, 1973, Mosby.

23.5	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5	29.0
22.9	23.1	23.4	23.7	24.0	24.2	24.5	24.8	25.0	25.3	25.6	25.9
22.5	22.8	23.1	23.4	23.7	24.0	24.3	24.6	24.8	25.1	25.4	25.7

- The M-D width of the lower incisors is measured and this number is used to predict the size of both the lower and upper unerupted canines and premolars.

29

Tanaka and Johnston prediction values

BOX 6-2

TANAKA AND JOHNSTON PREDICTION VALUES

One half of the mesiodistal width of the four lower incisors + 10.5 mm = **m** = estimated width of mandibular canine and premolars in one quadrant

+ 11.0 mm = estimated width of maxillary canine and premolars in one quadrant

From Tanaka MM, Johnston LE: J Am Dent Assoc 88:798, 1974.

30

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48. Which is true regarding leeway space?

- A. The leeway space in the maxilla is larger than in the mandible
- B. Leeway space is the difference between the mesiodistal widths of the primary canine, first and second primary molars and the permanent canine, first and second premolars
- C. The most favorable dental arch pattern is one in which leeway space is not excessive
- D. The leeway space per side is about 1.5mm in the lower arch and 1.0mm in the upper arch

48. Correct: B

Reference: Contemporary Orthodontics 4th edition by Graber

Leeway space describes the difference in size between primary molars and permanent premolars for both the maxillary and mandibular dentition. The mandibular primary second molar is 2mm larger than the second premolar, and the maxillary primary second molar is 1.5mm larger. The primary first molar is only slightly larger in the maxillary compared to the permanent premolar, but it is 0.5mm larger in the mandible. This constitutes 2.5mm excess for the mandibular arch and 1.5mm excess in the maxillary arch for each quadrant.

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49. The primate space in the maxilla is between the primary canine and primary first molar. The primate space in the mandible is between the primary canine and primary lateral incisor.
- A. Both statements are true.
 - B. The first statement is true. The second statement is false.
 - C. The first statement is false. The second statement is true.
 - D. Both statements are false.

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49. Correct=D. Both answers are false. The primate space in maxilla is between the primary canine and primary lateral. The primate space in the mandible is between the primary canine and primary first molar.

Mcdonald R, Avery D, Dean J. Dentistry for the child and adolescent. Mosby. 2004 p627

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50. Which of the following statements regarding developing primary dentition is **INCORRECT**?

- A. Spaced primary arches generally produced favorable alignment of permanent incisors, whereas 80% of arches without spacing produced crowded anterior segments.
- B. Straight terminal plane with primate space allows proper class one permanent molar occlusion with an early mesial shift.
- C. Mesial step will most likely to allow for class I molar occlusion with a late mesial shift.
- D. Distal step is abnormal and is indicative of a developing class II malocclusion.

50. Correct: A

Spaced primary arches generally produced favorable alignment of permanent incisors, whereas 40% of arches without spacing produced crowded anterior segments. All other statements (b-d) are correct and directly from text reference.

Early vs late mesial shift:

Early Mesial Shift= Mesial migration of the erupting mand permanent molar. It uses the mand primate spaces (63% have this). This occurs around 6yrs of age.

Late Mesial Shift=Mesial migration of erupted mand permanent molar after the loss of the primary second molar. It uses the leeway space. Seen around age 11 and occurs in all cases.

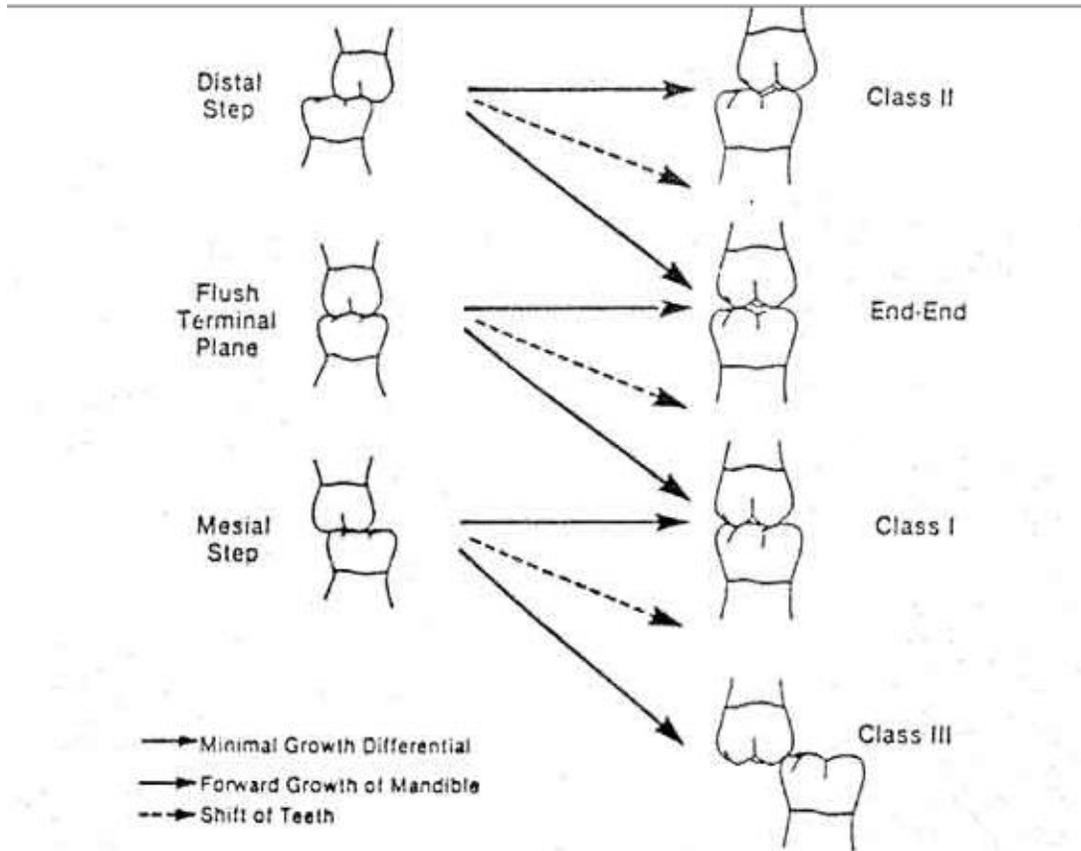


Fig. 3-45 ■ Occlusal relationships of the primary and permanent molars. The flush terminal plane relationship, shown in the middle left, is the normal relationship in the primary dentition. When the first permanent molars first erupt, their relationship is determined by that of the primary molars. The molar relationship tends to shift at the time the second primary molars are lost and the adolescent growth spurt occurs, as shown by the arrows. If leeway space is inadequate and there is no differential forward growth of the mandible, the change will be that shown in the red line. With available leeway space but without good growth, the change will be that shown by the dotted line. With good growth and a shift of the molars, the change shown by the solid black line can be expected. (Adapted from Moyers RE: Handbook of orthodontics, ed 3. Chicago, 1973, Mosby– Year Book.)

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51. Biomechanical overload in the pathologic range may enhance root resorption by the following mechanisms EXCEPT?

- A. Production of catabolic cytokines in the PDL
- B. Release of acid from the compressed bone
- C. Damage to the protective cementum layer, resulting in the exposure of dentin
- D. Inhibition of reparative cementum formation

51. Correct : B. Release of acid from the compressed bone

Root resorption is a perplexing problem in orthodontics. In contrast to bone, the roots of teeth do not normally turn over (model and remodel). Therefore fatigue damage of these heavily loaded structures accumulates over a lifetime. By definition, root resorption of permanent teeth is pathologic. The proximal cause of root resorption is the activation of osteoclast-like cells that attack the roots of teeth. However, the actual mechanism or mechanisms of the process are unclear (see Chapter 5).

All mineralized tissues can be resorbed under special circumstances, such as infection, wound healing,

unreduced fracture, neoplasm, and fatigue failure. In effect, root resorption appears to be a symptom of a localized pathologic condition that probably has a multifactorial cause. Although no definitive data are available on the role of occlusal trauma in the expression of root resorption, clinical observations suggest that biomechanical fatigue of the protective cementum layer is an important consideration. Whether all cases of root resorption are related to occlusal trauma is unclear, but cyclic biomechanical overload in the pathologic range (see Figure 6-51) may enhance root resorption by at least three mechanisms: (1) production of catabolic cytokines in the PDL; (2) damage to the protective cementum layer, resulting in the exposure of underlying dentin; and (3) inhibition of reparative cementum formation. Extensive in vivo and in vitro studies have demonstrated that catabolic cytokines (e.g., prostaglandins) and exposed mineralized collagen are conducive to resorption. The latter may be chemotactic for osteoclasts.

Notes on bends:

First-, Second-, and Third-Order Bends and Their Interaction

Knowledge of the action, interaction, and reaction of teeth to bends in the arch wire is crucial to the use of any orthodontic appliance. Such knowledge is fundamental and drastically affects clinical results.

First-order bends

The action and reaction of first-order bends affect expansion or contraction. These actions are monitored most easily and are used routinely to move individual teeth. The interaction of the bends can affect the third-order position of the teeth if expansion forces are used.

Second-order bends

Second-order bends in the posterior segment of the mandibular arch wire are antagonistic to the teeth in the anterior segment. Without excellent directional control and a careful application of these second-order forces in a sequential manner, vertical control of the anterior teeth will be lost.

Second-order bends in the posterior segment of the mandibular arch wire also negatively affect the third-order position of the mandibular anterior teeth. These teeth generally require lingual crown torque. Posterior tipping bends apply labial crown torque force to the incisors. This fact must be given careful consideration in arch fabrication and force application.

In the maxillary arch, second-order bends (an exaggerated curve of Spee) in the posterior segments are generally desirable or complementary to the teeth in the anterior segment. The reaction to the tipping forces intrudes the maxillary incisors and gives a lingual root torque effect to these teeth. This is generally positive or complementary to treatment objectives.

Third-order bends

Third-order bend reaction in the mandibular arch wire is complementary to all the teeth if properly placed. The objective is to have some degree of lingual crown torque on all the mandibular teeth. The posterior and anterior segments work together in action, reaction, and interaction. The ideal third-order bends in the mandibular

arch wire are as follows: incisors, 7 degrees; canines and first premolars 12 degrees; and second premolars and molars, 20 degrees.

Conversely, third-order bends in the maxillary arch wire are antagonistic. The anterior segment needs no torque (0 degrees) or slight lingual root torque, and the posterior segment needs lingual crown torque: canines and first premolars (7 degrees) and second premolars and molars (12 degrees). Application of active torque force simultaneously in segments with opposite actions is not wise. In the maxillary arch, applying active third-order bends sequentially and in only one direction at any given time is prudent.

52. What is the sequence of decay on primary teeth (early childhood caries)?

A. Maxillary anterior teeth, the maxillary and mandibular first primary molars, and the mandibular canines. The mandibular incisors are usually unaffected.

B. Maxillary anterior teeth, the mandibular incisor teeth, and the maxillary and mandibular first primary molars. The mandibular canines are unaffected.

C. Maxillary incisor teeth, the maxillary and mandibular second primary molars, and the mandibular canines. The mandibular anterior teeth are usually unaffected.

D. Maxillary and mandibular first primary molars, the mandibular anterior teeth, the maxillary incisors, and the maxillary and mandibular second primary molars. The maxillary canines are usually unaffected.

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52. Correct: A maxillary anterior teeth, the maxillary and mandibular first primary molars, and the mandibular canines. The mandibular incisors are usually unaffected.

McDonald; Dentistry for the Children and Adolescent; 8th edition; page 209

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53. Which of the following is an indication for a lower lingual holding arch?

- a. Loss of Maxillary primary molars
- b. Loss of Mandibular second primary molars
- c. Loss of first maxillary primary molar
- d. Loss of first mandibular primary molar

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53. Correct = B – Loss of second primary molars in the mandible

The lower lingual holding arch maintains the tooth space and the leeway space. The disadvantage to this technique is that the first permanent molars may be susceptible to decalcification. Another option for the space maintenance of the early loss of second primary molars is a lip bumper.

Resource: University of Minnesota orthodontics lecture

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54. Which of the following represents the most commonly recommended management approach for treated intruded primary teeth?

- A. Initiate immediate, forced eruption of the primary tooth to ensure minimal subsequent occlusal discrepancy.
- B. Perform immediate extraction of the tooth.
- C. Observation initially; with few exceptions, no attempt should be made to reposition the tooth after the accident.
- D. Initiate pulpal debridement, followed by orthodontic eruption at 7-10 days.

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54. Correct: C. Observation initially; with few exceptions, no attempt should be made to reposition the tooth after the accident.

Recommended management of an intruded primary tooth:

-Despite differing opinions, it is generally agreed that immediate attention should be given to soft-tissue damage. Intruded primary teeth should be observed initially; with few exceptions, no attempt should be made to reposition the tooth after the accident.

-Normally the developing permanent incisor tooth buds lie lingual to the roots of the primary central incisors. Thus, when intrusive displacement occurs, the primary tooth usually remains labial to the developing permanent tooth. If the intruded primary tooth is found to be in a lingual or encroaching relationship to the developing permanent tooth, it should be removed.

-Primary anterior teeth intruded as a result of a blow may often reerupt within 3-4 weeks after the injury. Ravn reported 88 cases of intrusion; four were extracted within 2 weeks, four did not re-erupt and were subsequently extracted, but the remaining 80 teeth fully re-erupted within 6 months.

McDonald RE, Avery DR, Dean JA. Dentistry for the Child and Adolescent. Mosby, 2004. Pp 479-481.

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- 55.** Which statement is true concerning space management in the primary maxillary incisor region?
- A. Space closure rarely occurs in the primary maxillary anterior region when primary incisors are lost
 - B. The indication for replacing lost primary maxillary incisors is for cosmetic purposes only
 - C. Spacing of maxillary primary anterior teeth is an indication for space maintenance
 - D. No previous spacing is an indication for space maintenance in the primary anterior region

55. ANSWER: D. No previous spacing is an indication for space maintenance in the primary anterior region.

“Some dentists believe that space closure rarely occurs in the anterior part of the mouth, but this is not true; each case must be evaluated critically. It is important to consider the occlusion and the degree of spacing, if any, between the anterior teeth. If the anterior primary teeth were in contact before the loss or there is evidence of an arch-length inadequacy in the anterior region, a collapse in the arch after the loss of one of the primary incisors is almost certain. Even when spacing is present, it may be desirable to construct a partial denture or a fixed appliance to reproduce a desirable esthetic appearance, to reestablish function, or to prevent abnormal speech and tongue habits. Removable appliances are contraindicated in high caries risk children.”

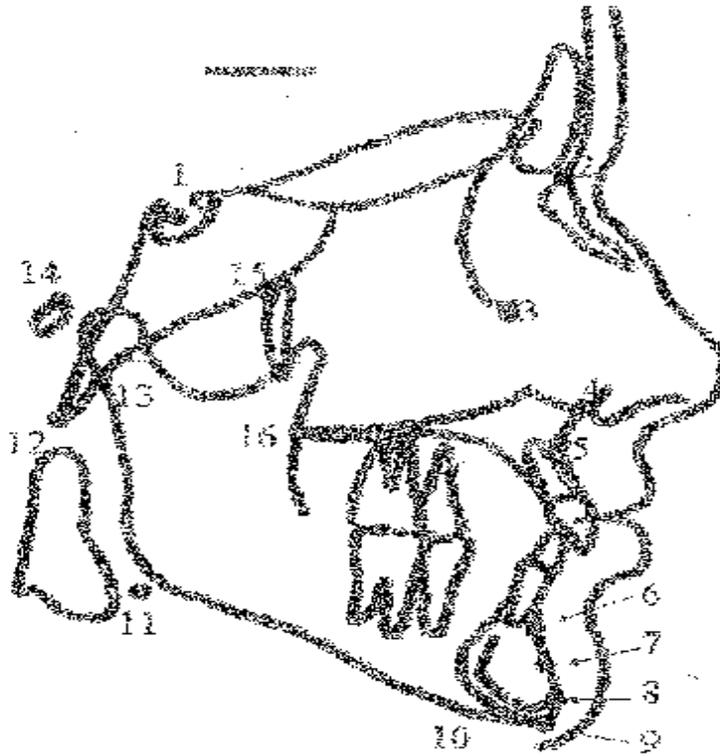
“The loss of anterior permanent teeth requires immediate treatment by the dentist if intra-arch changes are to be prevented. Within a few days after the loss of a tooth as a result of trauma or extraction of a severely traumatized tooth, the teeth adjacent to the space will begin to drift, and often within a few weeks several millimeters of space will be lost.”

If any degree of space closure has occurred, the space should be regained, if possible, before construction of a space maintainer. A partial denture-activating appliance can be used successfully in this procedure if there is no need for bodily movement of teeth”

McDonald; Avery; Dean; Dentistry for the Child and Adolescent 8th edition, 2004 pgs 638-640

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56. Which cephalometric landmark is improperly identified?
- A. Label 1 – Sella tursica
 - B. Label 13 – Articulare
 - C. Label 14 – Porion
 - D. Label 8 – Menton
 - E. Label 9 – Gnathion



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56.

Answer – D. This is the Pog and not the menton

LCDR Stefanos lecture handouts.

- 1 - Sella tursica – geometric center of the pituitary fossa
- 2 - Nasion – most anterior aspect of the frontonasal suture
- 3 - Orbitale – lowest point on the infraorbital rim
- 4 - ANS – Anterior tip of nasal spine
- 5 - A point – most posterior point in the concavity between ANS and the maxillary alveolar process
- 6 - B point – most posterior point in the concavity between the chin and the mandibular alveolar process
- 7 - Pm – point at which shape of symphysis changes from convex to concave
- 8 - Pog – most anterior point of chin
- 9 - Gnathion – midway between Pog and menton
- 10 - Menton – lowest point on the sympheseal shadow of the mandible
- 11 - Gonion – a constructed point by intersecting a tangent to lower border and a tangent to the posterior border of the ramus
- 12 - Basion – lowest point on the anterior rim of foramen magnum
- 13 - Articulare – intersection of posterior border of the ramus and the inferior border of the cranial base
- 14 - Porion – most superiorly positioned point of the external auditory meatus
- 15 - Pterygoid – junction of pterygomaxillary fissure and foramen rotundum
- 16 - PNS – most posterior aspect of palatine bone

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57. Which of the following is not true regarding ectopic eruption of the first permanent molar?
- a. Ectopically erupting molars will erupt into their normal position in 66% of the time
 - b. Ectopic eruption occurs more often in boys
 - c. Ectopic eruption can be corrected by the Humphrey or Halterman's technique
 - d. Ectopic eruption occurs more often in the mandible

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57. Correct: D

Reference: Dentistry for the Child and Adolescent by R. McDonald

Young observed that ectopic eruption for the first permanent molar occurred more frequently in boys (33 times) than in girls (19 times). 66% of the ectopically erupting molars erupted into their normal position with corrective treatment. Ectopic eruption was most often observed in the maxilla.

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- 58.** The bionator is the most commonly used removable function appliance because of its simplicity, patient acceptance, and use in TMD problems. It is often used for the full correction of a class II malocclusion.
- A. Both statements are true.
 - B. The first statement is true. The second statement is false.
 - C. The first statement is false. The second statement is true.
 - D. Both statements are false.

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58. Correct=B, the first statement is true but second statement is false. The bionator is primarily used as an interceptive device and not to achieve full correction.

Graber T, Vanarsdall R, Vig K. Orthodontics: Current Principles and Techniques p507.

Moyers RE: Handbook of orthodontics, ed 4, Chicago, 1998, Mosby

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59. A tooth is fractured 1mm below the height of the alveolar crest. Forced eruption is planned to expose sound tooth structure for future crown. What is the minimum amount of extrusion that should be accomplished?

- a. 1mm
- b. 2mm
- c. 3mm
- d. 4mm

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59. Correct: D 4mm

The distance the tooth should be extruded is determined by 3 things

- 1) location of defect or fracture line or perforation
- 2) Space to place the margins of the restoration so that it is not at the base of the gingival sulcus (typically 1mm is needed)
- 3) biological width allowance (2mm)
 - if fracture is at the height of alveolar crest, the tooth should be extruded about 3mm,
 - if 1mm below height of alveolar crest, you need extrude 4mm extrusion
 - if 2mm below height of alveolar crest, you need 5 mm extrusion

*Proffit, Contemporary orthodontics 3rd edition
p.627-628*

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- 60.** The sella-nasion-subspinale angle (SNA) relates the relative horizontal position of the maxilla to:
- A. The cranial base
 - B. Frankfort horizontal
 - C. The mandibular plane
 - D. The occlusal plane
 - E. The prime meridian

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60. Correct: A. The cranial base

“The SNA angle indicates the relative horizontal position of the maxilla to cranial base. The range at the termination of growth is 80 to 84 degrees for a white population sample.”

*Graber, et al. Orthodontics Current Principles and Techniques, 4th Edition. Mosby, 2005.
Pg.681*

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61. Which of the following films would be most helpful in viewing the orbit:
- a. Lateral Ceph
 - b. Reverse Towne
 - c. Oblique body
 - d. Waters
 - e. Panoramic

61-Answer D: Waters

	Lateral Ceph	SMV	Waters	PA Ceph	Reverse Towne	Oblique Body	Lateral Ramus	Panoramic
Anterior mandible	Medium	Medium		Medium				Low
Mandibular body	Low	Low		Medium		High		High
Ramus				Medium		Low	High	High
Coronoid process			High	Medium	Low		High	Medium
Condylar neck				Medium	High		High	Medium
Condylar head		Medium	Low	Low	High		Medium	Low
Anterior maxilla	Medium		Low	Medium				Medium
Posterior maxilla	Low	Medium	Low	Low		Low		High
Orbit	Medium	Low	High	High				
Zygoma	Low	Low	High	Low				Medium
Zygomatic arch		High	Medium					Low
Nasal bones	High		Medium	Low				
Nasal cavity	Low	Low	Medium	High	Low			Low
Maxillary sinus	Medium	Low	High	Low				Medium
Frontal sinus	High	Low	Medium	High				
Ethmoid sinus	Low	Medium	Medium	Medium				
Sphenoid sinus	High	High	Low					

Low usefulness
 Medium usefulness
 High usefulness
 No symbol: Not recommended

FIG. 12-14 Relative usefulness of extraoral radiographic projections to display various anatomic structures.

White, Stuart C.. *Oral Radiology: Principles and Interpretation, 6th Edition.*

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- 62. What is/are the technique(s) to capture a sialolith on a radiograph?**
- a. Lateral Ceph with cheek blown out
 - b. Occlusal-over-the-shoulder projection
 - c. Anteriorposterior-with cheek blown out
 - d. A and B
 - e. B and C

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62. Correct: E Occlusal-over-the-shoulder projection, Anteriorposterior-with cheek blown out
Also, a stereoscopic panoramic plane film will work, as well.

White; Oral Radiology Principles and Interpretation, 6th edition, page 581

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- 63.** How often should biologic monitoring of an approved sterilizer be performed?
- A. Upon each sterilization cycle
 - B. Once per month
 - C. Periodic observation- at least weekly
 - D. Twice per year

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63. Correct: C. Periodic observation- at least weekly

Rationale:

Correct functioning of sterilization cycles should be verified for each sterilizer by the periodic (at least weekly) use of BI(BIOLOGICAL INDICATOR). Users should follow the manufacturer's directions concerning the appropriate placement of the BI in the sterilizer. A control BI (not processed through the sterilizer) from the same lot as the test indicator should be incubated with the test BI. The control BI should yield positive results for bacterial growth. In addition to conducting routine biological monitoring, equipment users should perform biological monitoring.

- Whenever a new type of packaging material or tray is used.
- After training new sterilization personnel.
- After a sterilizer has been repaired.
- After any change in the sterilizer loading procedures.

http://www.cdc.gov/oralhealth/infectioncontrol/faq/sterilization_monitoring.htm

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64. Sharpness (decrease of penumbra) is maximized when:

- a. The source-object distance is increased
- b. The source object distance is increased and the object film distance is decreased
- c. The object-film distance is increased
- d. The object-film distance is decreased

64. Correct-B. The source object distance is increased and the object film distance is decreased

In all situations, sharpness is improved when the source-object distance is increased and the object-film distance is decreased. It should be remembered that the longer the object-film distance, the greater the unsharpness. In the dental radiograph, the dental structure farthest from the film will have the greatest unsharpness. Example: The lingual cusp and the lingual root of a tooth will have more sharpness on the radiograph than the buccal cusp and the buccal root or roots on a tooth. The lingual structures are sharper because they are closer to the film.

The factors that influence magnification are the same factors that influence radiographic image or geometric in sharpness; however, the distance factors (source-film distance and object-film distance) have more influence than focal-spot size. It is possible to minimize magnification (equal enlargement) of dental structures by increasing the source-film distance (long cone) and reducing the object-film distances as much as practical

Langland; Langlais; **Principles of Dental Imaging**; 1997; pgs 57-59

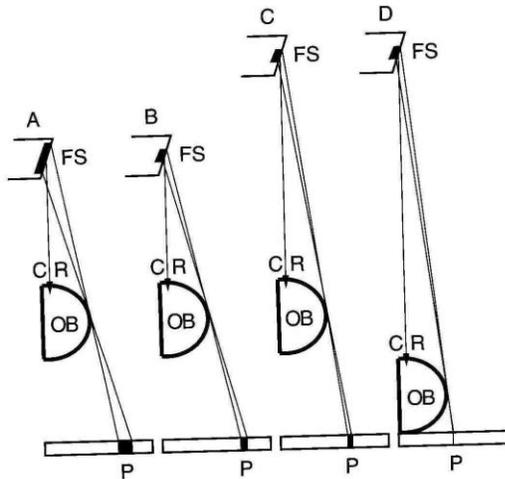
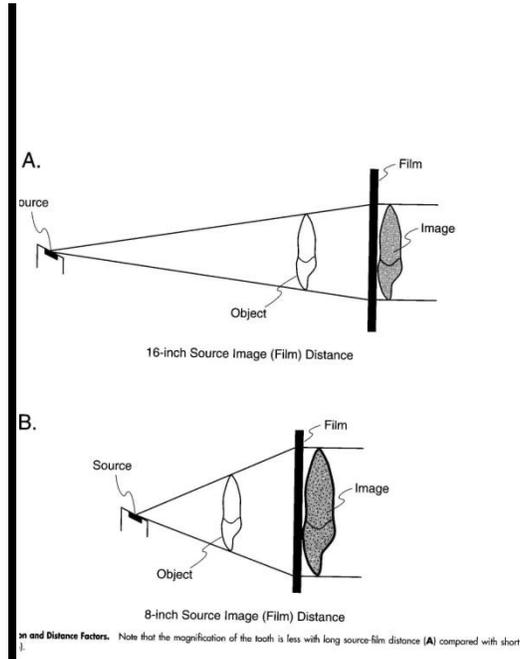


Figure 3.7. Five Rules of Accurate Image Formation. Diagrams illustrating how the accuracy of the radiographic image can be improved by decreasing the size of the penumbra (P). The penumbra affects image unsharpness and magnification. Note the changes in size of the penumbra: from A to B by decreasing the size of a focal spot (FS) of the anode; from B to C by increasing the distance between the focal spot and the film; and from C to D by decreasing the distance between (OB) and the film.



Source and Distance Factors. Note that the magnification of the tooth is less with long source-film distance (A) compared with short distance (B).

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65. CT has all of the following advantages over conventional film radiography EXCEPT:
- A. CT eliminates the superimposition of images of structures outside the area of interest
 - B. Due to the inherent high contrast resolution of CT, differences between tissues that differ in physical density by less than 1% can be distinguished
 - C. Conventional radiography requires a 10% difference in physical density to distinguish between tissues.
 - D. Due to the inherent high contrast resolution of CT, differences between tissues that differ in physical density by less than 5% can be distinguished

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65. Correct– D. Due to the inherent high contrast resolution of CT, differences between tissues that differ in physical density by less than 5% can be distinguished

CT has several advantages over conventional film radiography and tomography. First, it eliminates the superimposition of images of structures outside the area of interest. Second, because of the inherent high contrast resolution of CT, differences between tissues that differ in physical density by less than 1% can be distinguished; conventional radiography requires a 10% difference in physical density to distinguish between tissues. Third, data from a single CT imaging procedure, consisting of either multiple contiguous or one helical scan, can be viewed as images in the axial, coronal, or sagittal planes.

White S, Pharoah M. Oral Radiology 6th Edition. 13 (210)

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66. CBCT technology has been applied in all areas of dentistry except:
- A. Soft tissue analysis
 - B. Localization of the inferior alveolar canal
 - C. Temporomandibular joint analysis
 - D. B and C only

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66. Correct: A Soft tissue analysis

Reference: Oral Radiology Principles and Interpretation

Scattered radiation contributes to increased noise of the image, and is significant factor in reducing the contrast of the cone beam. To date, cone-beam technology gives little in the way of soft tissue detail and, although newer algorithms have been developed to improve this aspect, it in no way compares to those capable of conventional CT. This, obviously, precludes the technique in the assessment of head and neck malignancy where evaluating the soft tissue extent of the lesion is crucial. Cancer staging will continue to be performed with conventional CT and/or MRI supplemented with newer imaging offered by CT/PET scanning in the near future

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67. CT Numbers, also called Hounsfield units are scaled in cortical bone at which of the following numbers?

- A. +2000
- B. +1000
- C. +100
- D. 0

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67. **Correct- B.** +1000.

Cortical bone is +1000 Hounsfield units. Other bone can range from +400 to +1000

White S., Pharoah M. Oral Radiology Principles and Interpretation 6th edition. Mosby 2009 p210.

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68. Cone beam CT can be used in dentistry for all the following application, except
- A. locate the precise position of impacted teeth
 - B. 3-D airway analysis of obstructive sleep apnea and adenoids
 - C. diagnosis of TMJ disorders by precisely mapping muscles and their attachments.
 - D. assess the osseous dimensions, bone density, and alveolar height, especially when multiple implants are planned

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68. Correct=C is not true

-Only MRI can map muscles and attachments

-CBCT is capable of imaging hard-tissue and most soft-tissue structures. However, this technology does not have the ability to precisely map muscles and their attachments. These structures would have to be imaged using conventional magnetic resonance imaging technology, which does not expose the patient to ionizing radiation.

- Anatomic structures such as the inferior alveolar nerve, maxillary sinus, mental foramen, and adjacent roots are easily visible using CBCT. The CBCT image also allows for precise measurement of distance, area, and volume. Using these features, clinicians can feel confident in the treatment planning for sinus lifts, ridge augmentations, extractions, and implant placements.

- Three-dimensional airway analysis will be useful for the understanding of more complex conditions such as obstructive sleep apnea (OSA) and enlarged adenoids.

-The use of CBCT has proven useful in the management of patients with impacted teeth . The CBCT allows for a more precise analysis of the extent of the pathology related to the ectopic tooth. CBCT images can be used to locate the precise position of ectopic cusps and to design treatment strategies that would result in less invasive surgical intervention.

*THREE-DIMENSIONAL CONE BEAM COMPUTERIZED TOMOGRAPHY IN DENTISTRY
J. MARTIN PALOMO, CHUNG HOW KAU, LEENA BAHL, MARK G. HANS INTERNATIONAL
DENTISTRY SA VOL. 9, NO. 6*

2012 ABGD Study Guide

69. "Scatter" on a CBCT image is caused by:
- A. Very dense objects
 - B. Objects with low density
 - C. Both
 - D. Neither

69- **Correct A**-Very dense objects

X-ray beam artifacts

CT image artifacts arise from the inherent polychromatic nature of the projection x-ray beam that results in what is known as beam hardening (ie, its mean energy increases because lower energy photons are absorbed in preference to higher energy photons). This beam hardening results in two types of artifact: (1) distortion of metallic structures due to differential absorption, known as a cupping artifact, and (2) streaks and dark bands that can appear between two dense objects. Because the CBCT x-ray beam is heterochromatic and has lower mean kilovolt (peak) energy compared with conventional CT, this artifact is more pronounced on CBCT images. In clinical practice, it is advisable to reduce the FOV to avoid scanning regions susceptible to beam hardening (eg, metallic restorations, dental implants), which can be achieved by collimation, modification of patient positioning, or separation of the dental arches. More recently, dental CBCT manufacturers have introduced artifact reduction technique algorithms within the reconstruction process (eg, Scanora 3D, SOREDEX, Helsinki, Finland) (Fig. 11). These algorithms reduce image-, noise-, metal-, and motion-related artifacts and require fewer projection images, and therefore may allow for a lower acquisition dose. However, they are computationally demanding and require increased reconstruction times.

Scarfe, W. et al. What is cone-beam CT and how does it work?. Dent Clin N Am. 2008; 52:707-730.

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70. Which of the following is not one of the four components to CBCT image acquisition?
- a. X-ray generation
 - b. Image detection system
 - c. Image reconstruction
 - d. Image display
 - e. Image transduction

70. Correct: E: Image transduction is not one of the four components to CBCT image acquisition

Image Acquisition

The cone-beam technique involves a rotational scan exceeding 180 degrees of an x-ray source and a reciprocating area detector moving synchronously around the patient's head. During the rotation, many exposures are made at fixed intervals, providing single projection images known as *basis images*. These are similar to lateral cephalometric radiographic images, each slightly offset from one another. The complete series of basis images is referred to as the *projection data*. Software programs incorporating sophisticated algorithms including back-filtered projection are applied to these projection data to generate a 3D volumetric data set that can be used to provide primary reconstruction images in three orthogonal planes (axial, sagittal, and coronal).

There are four components to CBCT image acquisition:

- X-ray generation
- Image detection system
- Image reconstruction
- Image display

White, Stuart C. *Oral Radiology: Principles and Interpretation, 6th Edition.*

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71. Which of the following is (are) *false* relative to Cone Beam CT?
1. Field of view is synonymous with scan volume
 2. The speed with which individual images are acquired is called the *frame rate* and is measured in frames, projected images, per second.
 3. The ability of CBCT to display differences in attenuation is related to the ability of the detector to detect subtle contrast difference. This parameter is called the *bit depth* of the system and determines the number of shades of gray available to display the attenuation.
 4. Once the basis projection frames have been acquired, it is necessary to process these data to create the volumetric data set. This process is called *primary reconstruction*.
- a. 1 and 2
 - b. 1 and 3
 - c. 2 and 3
 - d. 4 only
 - e. None of the above

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71. Correct- E None of the above

- Field of view is synonymous with scan volume
- The speed with which individual images are acquired is called the *frame rate* and is measured in frames, projected images, per second.
- The ability of CBCT to display differences in attenuation is related to the ability of the detector to detect subtle contrast difference. This parameter is called the *bit depth* of the system and determines the number of shades of gray available to display the attenuation.
- Once the basis projection frames have been acquired, it is necessary to process these data to create the volumetric data set. This process is called *primary reconstruction*.

Oral Radiology Principles and interpretation; White SC, Pharoah MJ, 6th edition; Page 226-227

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72. Which of the following is *incorrect* when comparing a cone-beam CT (CBCT) to a conventional CT?

- F. Compared with conventional CT, the time for CBCT scanning is substantially reduced.
- G. Relative to conventional CT, the radiation dose for CBCT is significantly less.
- H. Relative to conventional CT, the scanning process is faster for CBCT.
- I. Compared with conventional CT, the financial burden for CBCT is significantly more expensive.

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72. **ANSWER: D.** compared with conventional CT, the financial burden for CBCT is significantly more expensive.

- Due to the speed at which image acquisition can occur, the potential cost savings for a patient is significant relative to a conventional CT.
- Strengths and Limitations of CBCT
 - Strengths: equipment size and cost is reduced, scanning time is reduced, low patient radiation dose, and interactive analysis
 - Limitations: Image noise, poor soft-tissue contrast

White SC, Pharoah MJ. Oral Radiology, Principles and Interpretation. Chapter 14.

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- 73.** Which of the following statement(s) is/are advantages of Computed Tomographic (CT) imaging over conventional film radiography and tomography?
- A. Because of the inherent high-contrast resolution of CT, differences between tissues that differ in physical density by less than 1% can be distinguished
 - B. It eliminates the superimposition of images of structures outside the area of interest.
 - C. As compared with plain-film radiography, CT involves much higher doses of radiation, resulting in a marked increase in radiation exposure in the population.
 - D. Data from a single CT imaging procedure can be viewed as images in 3 dimensions, the axial, coronal, or sagittal planes, depending on the diagnostic task.
 - E. A,B, D

73. Correct- E

“The widespread use of CT represents probably the single most important advance in diagnostic radiology. However, as compared with plain-film radiography, CT involves much higher doses of radiation, resulting in a marked increase in radiation exposure in the population.

“CT has several advantages over conventional film radiograph and tomography. First, it eliminates the superimposition of images of structures outside the area of interest. Second, because of the inherent high-contrast resolution of CT difference between tissues that differ in physical density by less than 1% can be distinguished; conventional radiography requires a 10% difference in physical density to distinguish between tissues. Third, data from a single CT imaging procedure, consisting of either multiple contiguous or one helical scan, can be viewed as images in the axial, coronal, or sagittal planes, or in any arbitrary plane, depending on the diagnostic task. This is referred to as multiplanar reformatted imaging. Having the capability of viewing normal anatomy or pathologic processes simultaneously in three orthogonal planes greatly facilitates radiographic interpretation.” P. 210

The increase in CT use and in the CT-derived radiation dose in the population is occurring just as our understanding of the carcinogenic potential of low doses of x-ray radiation has improved substantially, particularly for children. This improved confidence in our understanding of the lifetime cancer risks from low doses of ionizing radiation has come about largely because of the length of follow-up of the atomic-bomb survivors — now more than 50 years — and because of the consistency of the risk estimates with those from other large-scale epidemiologic studies. These considerations suggest that the estimated risks associated with CT are not hypothetical — that is, they are not based on models or major extrapolations in dose. Rather, they are based directly on measured excess radiation-related cancer rates among adults and children who in the past were exposed to the same range of organ doses as those delivered during CT studies. Communication. Tellingly, a straw poll³⁵ of pediatric radiologists suggested that perhaps on third of CT studies could be replaced by alternative approaches or not performed at all.”

Computed Tomography — An Increasing Source of Radiation Exposure

Brenner DJ, Hall EJ. Computed Tomography — An Increasing Source of Radiation Exposure

NEJM Vol. 357:2277-2284, Nov 29,2007 Number 22

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74. When using surface disinfectants, one must keep in mind all of the following EXCEPT:
- A. Ortho-phthala-dehyde (OPA) is classified as an intermediate level disinfectant and is an alternative to those with glutaraldehyde sensitivities
 - B. Glutaraldehyde is classified as a high level disinfectant and can be used as a liquid sterilant with sufficient immersion time.
 - C. Chorine dioxide is an effective rapid acting environmental surface disinfectant (3 minutes) or chemical sterilant (6 hours)
 - D. Alcohols are not effective in the presence of blood and saliva, evaporate quickly and are damaging to certain materials such as plastics and vinyl

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74. Correct – A. Ortho-phthala-dehyde (OPA) is classified as an intermediate level disinfectant and is an alternative to those with glutaraldehyde sensitivities

Glutaraldehyde is classified as a high level disinfectant and can be useful for plastics or other items that cannot withstand heat sterilization. OPA is classified as a high level disinfectant and is effective in achieving high level disinfection within 12 minutes at room temperature and is a good alternative to glutaraldehyde.

Bird K, Robinson D. Modern Dental Assisting: Principles and Techniques of Disinfection. 20 (140-143)

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75. What is not an appropriate active ingredient to use for intermediate level work surface infection control?

- A. Quaternary ammonium chloride,
- B. Iodophors
- C. Phenols
- D. Halogens such as chlorine or iodine

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75. Correct: A

Reference: Infection Control and Management of Hazardous Materials for the Dental Team by C. Miller

A chemical germicide registered with the EPA as a "hospital disinfectant" and labeled for "tuberculocidal" (i.e., mycobactericidal) activity is recommended for disinfecting surfaces that have been soiled with patient material. These intermediate-level disinfectants include phenolics, iodophors, and chlorine-containing compounds. Because mycobacteria are among the most resistant groups of microorganisms, germicides effective against mycobacteria should be effective against many other bacterial and viral pathogens. A fresh solution of sodium hypochlorite (household bleach) prepared daily is an inexpensive and effective intermediate-level germicide. Concentrations ranging from 500 to 800 ppm of chlorine (a 1:100 dilution of bleach and tap water or 1/4 cup of bleach to 1 gallon of water) are effective on environmental surfaces that have been cleaned of visible contamination. Caution should be exercised, since chlorine solutions are corrosive to metals, especially aluminum.

Low-level disinfectants -- EPA-registered "hospital disinfectants" that are not labeled for "tuberculocidal" activity (e.g., quaternary ammonium compounds) -- are appropriate for general housekeeping purposes such as cleaning floors, walls, and other housekeeping surfaces. Intermediate- and low-level disinfectants are not recommended for reprocessing critical or semicritical dental instruments.

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76. A disinfection procedure that inactivates vegetative bacteria, mycobacteria, fungi, viruses, and not necessarily high numbers of bacterial spores.
- A. High-Level Disinfectant
 - B. Medium-Level Disinfectant
 - C. Low-Level Disinfectant
 - D. Hospital-Level Disinfectant

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76. **Correct=A.** High Level Disinfectant. The FDA defines a high level disinfectant that inactivates vegetative bacteria, mycobacteria, fungi, viruses, and not necessarily high numbers of bacterial spores. Furthermore, the FDA states that it is a sterilant used under the same contact conditions but in a shorter contact time.

http://airforcemedicine.afms.mil/idc/groups/public/documents/afms/ctb_109770.pdf

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77. Generally, semi-critical items require what type of disinfection?

A. High-level disinfection with the use of wet pasteurization or chemical germicides, such as Glutaraldehyde (Cidex), stabilized hydrogen peroxide, chlorine and chlorine compounds for ≥ 20 min exposure time

B. Intermediate-level disinfection, such as ethyl or isopropyl alcohol (70% to 90%), Phenolic or iodophor germicidal detergent for ≤ 10 min exposure time

C. Low-level disinfection, such as sodium hypochlorite, Phenolic, iodophor or quaternary ammonium germicidal detergent for ≥ 10 min exposure time

D. None of the above

77. Correct=A

Instruments and items for patient care are divided into three (3) categories on the basis of the degree of risk of infection involved in the use of the items. The three categories of items are: critical, semi-critical, and non-critical.

- **Critical items** are objects that enter sterile tissue or the vascular system. These items present a high risk of infection if the item is contaminated with any microorganism, including bacterial spores. Critical items must be sterile. This category includes surgical instruments, cardiac and urinary catheters, implants, and needles. Items in this category should be purchased as sterile or be sterilized by steam under pressure if possible. If heat labile, the object may be treated with ethylene oxide, or if other methods are unsuitable, a chemical sterilant. The following table lists several germicides categorized as chemical sterilants. Chemical sterilants can be relied on to produce sterility only if adequate cleaning precedes treatment and if proper guidelines as to organic load, contact time, temperature and pH are met.
- **Semi-critical items** are those objects which come in contact with mucous membranes or with skin that is not intact. These items must be free of all microorganisms, with the exception of high numbers of bacterial spores. Respiratory therapy and anesthesia equipment, endoscopes, diaphragm--fitting rings and vaginal probes are included in this category. Semi-critical items, generally, require high-level disinfection with the use of wet pasteurization or chemical germicides. Glutaraldehyde (Cidex), stabilized hydrogen peroxide, chlorine and chlorine compounds are dependable high-level disinfectants. Refer to the following table for methods. The exposure time required to achieve high-level disinfection is 20 minutes or more. A sterile water rinse after disinfection is required to prevent contamination with tap water organisms.
- **Non-critical items** come in contact with intact skin, but, not with mucous membranes. Intact skin acts as an effective barrier to most microorganisms and sterility is not critical. Examples of non-critical items include bedpans, blood pressure cuffs, crutches, bed rails, linens and patient furniture. Low-level disinfectants listed in the following table may be used for cleaning non-critical items.

APIC Guidelines for Infection Control Practice, American Journal of Infection Control; April 1990, Vol 18, 99-113.

Methods of sterilization and disinfection (Table)

Sterilization			Disinfection		
<i>Critical items (will enter tissue or vascular system or blood will flow through them)</i>			<i>High-level (semi-critical items; will come in contact with mucous membrane or non-intact skin)</i>	<i>Intermediate-level (some semi-critical items^a and non-critical items)</i>	<i>Low-level (non-critical items; will come in contact with intact skin)</i>
Object	Procedure	Exposure Time (hr)	Procedure (exposure time ≥ 20 min) ^{b,c}	Procedure (exposure time ≤ 10 min)	Procedure (exposure time ≤ 10 min)
Smooth, hard surface ^a	A	MR	C	H	H
	B	MR	D	J	I
	C	MR	E	K	J
	D	6	F ^d		K
	E	6	G		L
Rubber tubing and catheters ^c	A	MR	C		
	B	MR	D		
	C	MR	E		
	D	6	F ^d		
	E	6			
Polyethylene tubing and catheters ^{c,e}	A	MR	C		
	B	MR	D		
	C	MR	E		
	D	6	F ^d		
	E	6			
Lensed instruments	B	MR	C		
	C	MR	D		
	D	6	E		
	E	6			
Thermometers (oral and rectal) ^f				H ^f	
Hinged instruments	A	MR	C		
	B	MR	D		
	C	MR	E		
	D	6			
	E	6			

Modified from Rutala WA: In Wenzel RP, ed. *Prevention and control of nosocomial infections*, Baltimore, 1987, Williams & Wilkins, pp 257-282. And from Simmons BP: *Am J Infect Control* 11:96-15, 1983.

- A. Heat sterilization, including steam or hot air (see manufacturer's recommendations).
 - B. Ethylene oxide gas (see manufacturer's recommendations).
 - C. Glutaraldehyde-based formulations (2%). (A glutaraldehyde-phenate formulation at full strength also has been shown to sterilize items that are soaked for 6 ¾ hours. Caution should be exercised with all glutaraldehyde formulations when further in-use is anticipated.)
 - D. Demand-release chlorine dioxide (will corrode aluminum, copper, brass, series 400 stainless steel, and chrome, with prolonged exposure).
 - E. Stabilized hydrogen peroxide 6% (will corrode copper, zinc, and brass).
 - F. Wet pasteurization at 75° C for 30 minutes after detergent cleaning.
 - G. Sodium hypochlorite (1000 ppm available chlorine; will corrode metal instruments).
 - H. Ethyl or isopropyl alcohol (70% to 90%).
 - I. Sodium hypochlorite (100 ppm available chlorine).
 - J. Phenolic germicidal detergent solution (follow product label for use-dilution).
 - K. Iodophor germicidal detergent solution (follow product label for use-dilution).
 - L. Quarternary ammonium germicidal detergent solution (follow product label for use-dilution).
- MR Manufacturer's recommendations.

^a See text for discussion of hydrotherapy.

^b The longer the exposure to a disinfectant, the more likely it is that all microorganisms will be eliminated. Ten minutes' exposure is not adequate to disinfect many objects, especially those which are difficult to clean, because they have narrow channels or other areas that can harbor organic material and bacteria. Twenty minutes exposure may be the minimum time needed to reliably kill *M. tuberculosis* with glutaraldehyde.

^c Tubing must be completely filled for disinfection; care must be taken to avoid entrapment of air bubbles during immersion.

^d Pasteurization (washer disinfectior) of respiratory therapy and anesthesia equipment is a recognized alternative to high-level disinfection. Some data challenge the efficacy of some pasteurization units.

^e Thermostability should be investigate when indicated.

^f Limited data suggest that at least 20 minutes exposure time is necessary. Do not mix rectal and oral thermometers at any stage of handling or processing.

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78a. The maximum amount of CFU's allowed in dental unit water lines by the EPA is:

- A. 500
- B. 5,000
- C. 50,000
- D. 500,000

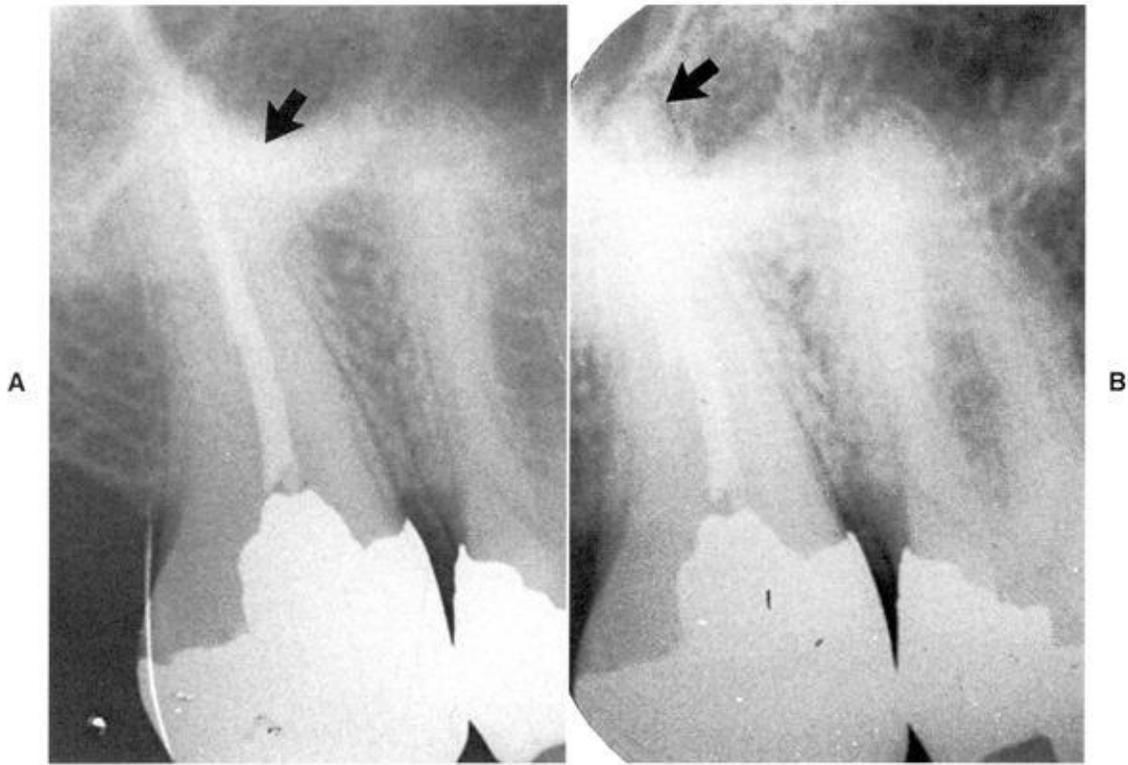
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78a. Correct A= 500

Reference: EPA website

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78b. Using the SLOB rule and the picture provided which direction was the cone moved to allow for visibility of the apex?



- a. Buccal
- b. Lingual
- c. Mesial
- d. Distal

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78 b. Correct: C.

A, Malar process of maxillary zygoma (*arrow*) obscures the apex and blocks the view of the obturation.

B, Slight mesial shift of the cone “pulls” the lingually positioned root apex (*arrow*) to the mesial for visibility.

Reference: Walton, Richard E... *Principles and Practice of Endodontics, 3rd Edition*. Saunders Book Company, 012002. p. 139).

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79. The major causes of facial fractures include falls and sports-related activities. The most common place for a mandible to fracture is in the angle of the mandible (29.1% of the time).

- A. Both statements are true
- B. Both statements are false
- C. The first statement is true, and the second statement is false
- D. The first statement is false, and the second statement is true

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79. Correct: B-Both statements are false

“The major causes of facial fractures in motor vehicle accidents and altercations. Other causes of injuries include falls, sports-related incidents, and work related accidents.”

Anatomic distribution of mandibular fractures:

Condylar	29.1%
Angle	24.5%
Symphysis	22.0%
Body	16.0%
Not Specified	2.2%
Ramus	1.7%
Coronoid	1.3%

Peterson, et.al. Oral and Maxillofacial Surgery; 3rd edition, page 598

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81. You just took a radiograph, but do not like the contrast. For short scale, how can you increase contrast and maintain original density?

- a. Decrease the original kVp by 15 kVp; Use 2 times the original exposure time.
- b. Increase the original kVp by 15 kVp; Use one half the original exposure time.
- c. Increase the original kVp by 15 kVp; Use 2 times the original exposure time.
- d. Decrease the original kVp by 15 kVp; Use one half the original exposure time.

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81. Correct: A. Decrease the original kVp by 15 kVp; Use 2 times the original exposure time.

*The contrast of a radiographic image can be defined as the number of shades of gray between the extremes of black and white. A higher kVp beam (75 to 90 kVp) will produce an image with more shades of gray between black and white than a lower kVp beam (60 to 75 kVp). More shades of gray between black and white result in a gradual transition from the one extreme to the other, and this is referred to as *low contrast*, or *long-scale contrast*. When there are just a few shades of gray between black and white, this is known as *high contrast*, or *short-scale contrast*. A black and white checkered flag is an example of maximum high contrast or short-scale contrast.*

Although kVp exerts its major influence on contrast, density is also affected. A higher energy beam will penetrate the patient more completely and darken the image more than a lower energy beam. When it becomes necessary to alter contrast and maintain the original density of the image, exposure time must be adjusted to compensate for the change in penetrating ability of the beam at the new kVp setting. The following rules can be applied:

To increase contrast and maintain original density:

- (1) Decrease the original kVp by 15 kVp
- (2) Use 2 times the original exposure time.

To decrease contrast and maintain original density:

- (1) Increase the original kVp by 15 kVp
- (2) Use one half the original exposure time.

Razmus, Thomas F. Current Oral and Maxillofacial Imaging. W.B. Saunders Company, 1996.

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82. When interpreting panoramic films, all are true of ghost images EXCEPT:
- A. May obscure normal anatomy or be mistaken for pathologic conditions
 - B. Results when the x-ray beam projects through a dense object (earring/spinal column/ramus) that is in the path of the x-ray beam but out of the portion of the focal trough being imaged
 - C. Results in a projection on the same side of the radiograph with a reversed configuration
 - D. Object typically appears blurred and projects over the midline structures

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82. Correct– C. Results in a projection on the same side of the radiograph with a reversed configuration. The object typically appears blurred and projects either over the midline structures, as with the cervical vertebrae, or onto the opposite side of the radiograph with reversed configuration and more cranially positioned than the real structure. These contralateral images are termed ghost images, and they may obscure normal anatomy or be mistaken for pathologic conditions.

White S, Pharoah M. Oral Radiology – Principles and Interpretation 6th Edition. 11 (pp 188-189)

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83. You are examining a panoramic radiograph. The occlusal plane on the radiograph appears flat or inverted and the image on the mandible is distorted. What would be the cause of this?

- a. The patient's chin is placed too high.
- b. The patient's chin is placed too low.
- c. The patient is positioned too far posterior.
- d. The patient is positioned too far anterior.

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83-Answer: A

Reference: Oral Radiology Principles and Interpretation by S. White

If the chin is tipped too high, the occlusal plane on the radiograph appears flat or inverted, and the image of the mandible is distorted. In addition, a radiopaque shadow of the hard palate is superimposed on the roots of the maxillary teeth.

- If the chin is tipped too low, the teeth become severely overlapped; the symphyseal region of the mandible may be cut off the film.
- Too far posterior results in magnified mesiodistal dimensions through the anterior sextants and resulting “fat” teeth.
- Too far anterior results in reduced mesiodistal dimensions through the anterior sextants and resulting “thin teeth”

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- 84.** A person has a positive Hepatitis B surface and core antibodies but is negative for the surface antigen. The patient has a(n)
- A. Chronic Hepatitis B infection
 - B. Acute Hepatitis B Infection
 - C. Immunity from Natural Infection
 - D. Immunity from Vaccination

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84. Correct- C. Immunity from a natural infection.

Interpretations	Hep B Surface Antigen	Hep B Core Antibody	Hep B Surface Antibody	IGM Hep B Core Antibody	Hep B e-antigen	Hep B Antibody to e-antigen
Immunity from Natural infection	Neg	Pos	Pos			
Immunity from Vaccination	Neg	Neg	Pos			
Acute Infection	Pos	Pos	Neg	Pos		
Chronic Infection: Active carrier states, high infectivity	Pos	Pos	Neg	Neg	Pos	Neg
Chronic Infection: Inactive carrier states, low infectivity	Pos	Pos	Neg	Neg	Neg	Pos
Recovering from an acute infection	Neg	Pos	Neg			

Greenburg M, Glick M, Ship J. Burket's Oral Medicine Eleventh Edition. BC Decker 2008 p 500

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85. Which of the following statement regarding Hep B vaccines is **TRUE**?

- a. Dose 1 and 2 should be given 2 months apart
- b. Dose 3 should be given 3 months after the 2nd dose
- c. Antibody response to hepatitis B surface antigen should be performed 1-2 months after the third vaccine dose
- d. Booster dose should be given every 10 years.

85. Correct: C

Hepatitis B Vaccine Dosage Schedule

The hepatitis B vaccine is delivered in a series of three intramuscular injections according to the schedule below. If administration of the series is delayed or interrupted, it should be resumed as soon as possible—rather than restarted.¹

Pregnant and lactating women can receive the hepatitis B vaccine series.²

Hepatitis B Dosage Schedule	
Doses 1 and 2	Given 4 weeks apart
Dose 3	Given 5 months after Dose 2
Booster Dose	Not recommended
Antibody Testing	<p>Antibody response to hepatitis B surface antigen should be performed 1-2 months after the third vaccine dose.¹</p> <p>People who do not respond at a level of ≥ 10 milliinternational units per milliliter should repeat the vaccination series including antibody testing.¹</p> <p>Non-responders to a second vaccine series should be referred for a medical evaluation of their lack of response.³</p>

¹ [CDC. Hepatitis B Vaccine: Fact Sheet \(http://www.cdc.gov/ncidod/diseases/hepatitis/b/factvax.htm\)](http://www.cdc.gov/ncidod/diseases/hepatitis/b/factvax.htm)

² Advisory Committee on Immunization Practices. [Summary of recommendations for adult immunization \(http://www.immunize.org/catg.d/p2011b.htm\)](http://www.immunize.org/catg.d/p2011b.htm). June 2002.

<http://www.ada.org/sections/professionalResources/pdfs>

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86. All of the following are RNA viruses except?
- a. HAV
 - b. HBV
 - c. HCV
 - d. HDV
 - e. HEV

86. Correct B. HBV

HEPATITIS A VIRUS

Several diseases of the liver, collectively known as hepatitis, are caused by viruses. The viruses involved, five of which have been reasonably well characterized, come from a wide range of virus families. Hepatitis A virus is a picornavirus, a small single strand RNA virus; hepatitis B virus belongs to the hepadnavirus family of double stranded DNA viruses; hepatitis C virus is a flavivirus, a single stand RNA virus; hepatitis E, also an RNA virus, is similar to a calicivirus. Hepatitis D which is also known as Delta agent is a circular RNA that is more similar to a plant a viroid than a complete virus. For a summary of the hepatitis viruses, see Table 1.

HEPATITIS B VIRUS

Human hepatitis B virus (figure 3) is the prototype virus of the hepadnavirus family and causes serum hepatitis. HBV has a diameter of about 40nm. It infects humans and chimpanzees but there are closely related members of this family that infect other mammals and birds. HBV is a DNA virus and is enveloped. The DNA is only partly double stranded and forms a circle of around 3,200 bases. Although surrounded by a host cell-derived envelope, HBV is remarkably stable to organic solvents. It is also heat- and pH-resistant. The genome is associated with the P (polymerase) protein and this complex is, in turn, surrounded by the core antigens (HBcAg and HBeAg). These two proteins have most of their sequence in common and most of the HBeAg is secreted since it is processed differently from the HBcAg and thus not assembled into progeny virus. Embedded in the surface lipid bilayer is the surface antigen (HBsAg). The HBsAg (Australia antigen) is made up of three glycoproteins that are encoded by the same gene. The proteins are translated in the same reading frame but start at a different AUG start codon; thus, all have the same C-terminus. The largest protein is the L protein (42kd) and contained within this is the M glycoprotein. The S glycoprotein (27kD) is contained within the M protein. The HBsAg protein is also secreted into the patient's serum where it can be seen as spherical (mostly self-associated S protein) or filamentous particles (also mostly S protein but with some L and M). The former are smaller than the true virus but the filaments can be quite large (several hundred nanometers). This large amount of free HBsAg accounts for the inability to detect antibodies against the protein early during infection (the so-called "window" between the presence HBsAg (indicative of the presence of virus) and the presence of anti-HBsAg).

HEPATITIS C VIRUS

Hepatitis C is a flavivirus (of which yellow fever is the prototype) that causes non-A, non-B hepatitis. Flaviviruses (figure 5) are icosahedral, positive strand RNA viruses and gain an envelope from their host cell. The virus particle is about 30 to 60nm across. The genome of 9,600 bases codes for ten proteins. In many ways, the flaviviruses are similar to picornaviruses with the prominent exception that they are enveloped. The viral RNA does not have a 5' cap or 3' poly A tract. Translation of the viral RNA is mediated by the internal ribosome entry site (IRES).

HEPATITIS DELTA AGENT

Hepatitis D (figure 7) is a highly defective virus since it cannot produce infective virions without the help of a co-infecting helper virus. This helper virus is hepatitis B virus that supplies the HBsAg surface protein. In budding out of the cell, HDV acquires a membrane containing HBsAg.

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HDV is similar to a plant viroid in that it has a small circular RNA genome (1,700 bases) but unlike the plant viroids, the RNA encodes a protein called the delta antigen. This complexes with the RNA. The RNA is single stranded negative sense and is a covalently closed circle. Because of a large amount of base pairing, the RNA takes on a rod-like structure (figure 8).

HEPATITIS E VIRUS

This virus (figure 10), which causes enteric non-A, non-B hepatitis, seems to be related to the Caliciviruses but its classification is undecided since the genome organization is not the same as that of the Caliciviridae. In sequence, HEV is more similar to rubella which is a Togavirus than to any Calicivirus. HEV is a small (approximately 34nm), round, icosahedral, positive strand RNA virus that does not have an envelope. It has a rather smooth surface but not as smooth a HAV. The genome has a poly A tract and is capped at the 5' end. There are three open reading frames that overlap; each is in a different coding frame. Based on sequence motifs, open reading frame 1 (ORF1) appears to have several enzymic activities. These may be involved in RNA capping, proteolysis and an RNA-dependent RNA polymerase activity. ORF2 is the structural protein and may be glycosylated. It appears to have a signal sequence suggesting that its encoded protein may enter the endoplasmic reticulum. The third ORF codes for a phosphoprotein of unknown function that interacts with the host cell's cytoskeleton. Not much is known about HEV replication but it is likely that the positive strand RNA is copied to a negative strand intermediate by a viral polymerase

<http://pathmicro.med.sc.edu/virol/hepatitis-virus.htm>

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87. Which of the following is the best correlate to the presence of infectious Hepatitis B?

- a. Anti-HBsAg
- b. Anti-HBc
- c. Anti-HBe
- d. HBeAg

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87. Answer: C – HbsAg

HBsAg (infectious) Anti-HBsAg (recovery) Anti-HBc (acute, persistently infected, or previously infected nonprotective) HBeAg (infectious) Anti-HBeAg (clearing/cleared infection)

HBsAg and HBeAg are secreted into the blood during viral replication. The detection of HBeAg is the best correlate to the presence of infectious virus. A chronic infection can be distinguished by the continued finding of HBeAg, HBsAg, or both, and a lack of detectable antibody to these antigens.

During the symptomatic phase of infection, detection of antibodies to HBeAg and HBsAg is obscured because the antibody is complexed with antigen in the serum. The best way to diagnose a recent acute infection, especially during the period when neither HBsAg nor anti-HBs can be detected (the window), is to measure IgM anti-HBc.

(Murray, Patrick R. *Medical Microbiology, 6th Edition*. Mosby, p. 654).

(Little, James W. *Dental Management of the Medically Compromised Patient, 7th Edition*. Mosby. p. 142).

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87. Regarding the ADC (analog-to-digital conversion) process in digital radiography, *sampling* means _____ and *narrow sampling* _____
- A. A small range of voltage values are grouped together as a single value; mimics the original signal but leads to larger memory requirements for the resulting digital image
 - B. A large range of voltage values are grouped together as a signal value; mimics the original signal and does not require a lot of memory for the resulting digital image
 - C. A small range of voltage values in multiple values; replicates a previous captured signal and leads to larger memory requirements for the resulting digital image
 - D. A large range of voltage values in multiple values; replicates a previous captured signal and leads to larger memory requirements for the resulting digital image

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88. Correct- A A small range of voltage values are grouped together as a single value; mimics the original signal but leads to larger memory requirements for the resulting digital image

Digital images are numeric and discrete in two ways: (1) in terms of the spatial distribution of the picture elements (pixels) and (2) in terms of the different shades of gray of each of the pixels. A digital image consists of a large collection of individual pixels organized in a matrix of rows and columns. Each pixel has a row and a column coordinate that uniquely identifies its location in the matrix. The formation of a digital image requires several steps, beginning with analog processes. At each pixel of an electronic detector, the absorption of x rays generates a small voltage. More x rays generated a higher voltage and vice versa. At each pixel, the voltage can fluctuate between a minimum and maximum value and is therefore an analog signal.

Production of a digital image requires a process called analog-to-digital conversion (ADC). ADC consists of two steps: *sampling and quantization*. *Sampling* means that a small range of voltage values are grouped together as a single value. Narrow sampling better mimics the original signal but leads to larger memory requirements for the resulting digital image. Once sampled, the signal is *quantized*, which means that every sampled signal is assigned a value. These values are stored in the computer and represent the image. For the clinician to see the image, the computer organizes the pixels in their proper locations and displaces a shade of gray that corresponds to the number that was assigned during the quantization step.

Oral Radiology Principles and interpretation; White SC, Pharoah MJ; 6th edition; Page 78

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- 89.** Which of the following represents the image of choice for soft-tissue assessment of the TMJ?
- A. Cone-beam CT
 - B. Magnetic Resonance Imaging (MRI)
 - C. Conventional CT
 - D. Arthrography

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89. ANSWER: B. Magnetic Resonance Imaging (MRI)

Rationale:

MRI has replaced arthrography and is now the imaging technique of choice for the soft-tissues of the TMJ. MRI can not only display the articular disk, but also the surrounding soft tissue structures and can reveal the presence of joint effusion.

MRI displays the osseous structures of the TMJ but not in the comparable detail seen in CT imaging. The technique is noninvasive and does not use ionizing radiation.

White SC, Pharoah MJ. Oral Radiology, Principles and Interpretation. p478-480.

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90. In diagnosing condylar neck fractures with suspected medial displacement, panoramic views must be supplemented with a _____.

- a. Water's view
- b. Towne's view
- c. Posterior-Anterior radiograph
- d. Lateral Oblique radiograph

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90. Correct: B

The most common difficulty is in determining whether a fracture is indeed present. Panoramic views taken as an initial examination must be supplemented with a Towne's view, especially if there is suspected *medial displacement* of the condylar head.

Reference: Stuart White, Michael Pharoah, "Oral Radiology: principles and interpretation", Sixth edition, 2009.

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91. Regarding tuberculosis, all of the following statements are considered true except?
- A. With active sputum positive TB, urgent care only; palliate urgent problems with medication if contained facility in hospital environment not available
 - B. INH and rifampin therapy can cause nephrotoxicity and elevations of serum Aminotransferases
 - C. With active sputum positive TB, urgent care requiring use of handpiece performed only in hospital setting with isolation, sterilization (gloves/mask/gown), and special ventilation
 - D. When patient produces consistently negative sputum, treat as normal patient (noninfectious)

91. Correct – B. INH and rifampin therapy can cause nephrotoxicity and elevations of serum aminotranferases

Little J, Falace D. Dental Management of the Medically Compromised Patient. Fifth edition; 10 (251-258)

TABLE 10-7

Dental Management of the Patient with a History of Tuberculosis

1. Active sputum-positive tuberculosis
 - a. Consult with physician before treatment
 - b. Urgent care only; palliate urgent problems with medication if contained facility in hospital environment not available
 - c. Urgent care requiring use of handpiece (>6 years) performed only in hospital setting with isolation, sterilization (gloves, mask, gown), special ventilation
 - d. Under age 6 years, treat as normal patient (noninfectious after consultation with physician to verify status)
 - e. When patient produces consistently negative sputum, treat as normal patient (noninfectious—verify with physician)
 2. Past history of tuberculosis
 - a. Approach with caution; obtain good history of disease and its treatment duration; appropriate review of systems is mandatory
 - b. Patient should give history of periodic chest radiographs and physical examination to rule out reactivation or relapse
 - c. Consult with physician and postpone treatment if there is
 - (1) Questionable history of adequate treatment time
 - (2) Lack of appropriate medical follow-up since recovery
 - (3) Signs or symptoms of relapse
 - d. If present status is free of clinically active disease, treat as normal patient
 3. Recent conversion to positive tuberculin skin test
 - a. Should have been evaluated by physician to rule out active disease
 - b. May be receiving isoniazid (INH) 6 months to 1 year for prophylaxis
 - c. Treat as normal patient
 4. Signs or symptoms suggestive of tuberculosis
 - a. Refer to physician and postpone treatment
 - b. If treatment necessary, treat as in 1 above
-

TABLE 10-8
Dental Considerations of Antituberculosis Drugs

Generic Drug (trade drug)	Adverse effects	Dental considerations
Isoniazid (INH, Laniazid, Nydrazid, Tubizid)	Hepatotoxic, elevation of serum aminotransferase activity in 10% to 20% of patients*	Avoid acetaminophen
Rifampin (Rifadin, Rimactane)	Hepatotoxic, gastrointestinal (GI) disturbances, flu-like symptoms, thrombocytopenia, rash, turns urine red orange	Increased incidence of infection, delayed healing, gingival bleeding; decreases metabolism of diazepam, clarithromycin (Biaxin), ketoconazole (Nizoral), itraconazole (Sporanox), and fluconazole (Diflucan)
Pyrazinamide (generic)	Arthralgias, hyperuricemia, GI disturbance, and hepatitis	—
Ethambutol (Myambutol)	Optic neuritis (rare)	—
Streptomycin (generic)	Ototoxicity, vestibular disturbances, infrequent renal toxicity	Avoid concurrent use of aspirin
Amikacin (Amikin), kanamycin (Kantrex), capreomycin (Capastat)	Nephrotoxicity and ototoxicity	Avoid concurrent use of aspirin
Ofloxacin (Floxin), ciprofloxacin (Cipro)	GI disturbances	—
Aminosalicylic acid (PAS, Teebacin)	GI disturbances	—

*Greater risk of liver damage in persons over 35 years of age.
Vitamin B₆ is recommended to counteract the adverse effect profile of INH.

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92. Xerostomic drugs include:

- A. Antidepressant and sedative/hypnotic
- B. Antidepressant, sedative/hypnotic, antiparkinson agent
- C. Antihistamine, antidepressant, sedative/hypnotic, antiparkinson agent
- D. Proton pump inhibitor, antihistamine, antidepressant, sedative/hypnotic, antiparkinson agent

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92. Answer: D

Reference: Oral Diagnosis Oral Medicine and Treatment Planning by S. Bricker

Anti-depressants (Amitriptyline), sedative/hypnotic (Flurazepan and Diazepam), anti-parkinson agent (Benztriofine and Trihexyphenidyl), antihistamine (Diphenhydramine HCl), and proton pump inhibitor can all cause xerostomia.

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93. Which of the following salivary stimulants is approved by the FDA to be used for the relief of xerostomia?

- A. Bromhexine, Pilocarpine HCL
- B. Pilocarpine HCL, Cevimeline HCL
- C. Cevimeline HCL , Anetholetrithione
- D. Bromhexine, Anetholetrithione

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93. Correct=B. Pilocarpine HCl and Cevimeline HCl are the only FDA approved drugs for Xerostomia. Bromhexine and Anetholetrithione are not available in the United States. Bromhexine is available in Europe and the Middle East. Anetholetrithione is not currently found in the US.

Greenburg M, Glick M, Ship J. Burket's Oral Medicine Eleventh Edition. BC Decker 2008 p214

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94. A squamous cell carcinoma that was discovered on the lateral border of the tongue during routine oral cancer screening was biopsied and found to be in Stage II category after excisional biopsy. Patient is concerned with his survival rate. What do you tell him?

- A. 5 year survival rate is 100% because it was completely removed in the biopsy
- B. 5 year survival rate is about 66% due to its stage
- C. 5 year survival rate is unknown due to the high recurrence rate
- D. 5 year survival rate is about 9% due to its stage

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94. Correct= B

Tumor size and extent of metastasis oral SSC is the best indicator of pt's prognosis.
Table 10-2 TNM Clinical Staging categories for oral SSC

STAGE	TNM CATEGORY	5 YR SURVIVAL RATE%
Stage I	T1N0M0	85
Stage II	T2N0M0	66
Stage III	T3N0M0 or T1, T2, T3, N1M0	41
Stage IV	Any T4 lesion or any N2 or N3 lesion or any M1 lesion	9

Neville and Damm. Oral and Maxillofacial Pathology, 3rd edition. P294-302

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95. The 5-year survival rate of oral SCC is approximately:

- A. 10%
- B. 23%
- C. 57%
- D. 76%

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95. Correct= C 57%

Close to 37,000 Americans will be diagnosed with oral or pharyngeal cancer this year. It will cause over 8,000 deaths, killing roughly 1 person per hour, 24 hours per day. Of those 36,000 newly diagnosed individuals, only slightly more than half will be alive in 5 years. (Approximately 57%) This is a number which has not significantly improved in decades. The death rate for oral cancer is higher than that of cancers which we hear about routinely such as cervical cancer, Hodgkin's lymphoma, laryngeal cancer, cancer of the testes, and endocrine system cancers such as thyroid, or skin cancer (malignant melanoma). If you expand the definition of oral cancers to include cancer of the larynx, for which the risk factors are the same, the numbers of diagnosed cases grow to approximately 50,000 individuals and 13,500 deaths per year in the US alone. Worldwide the problem is much greater, with over 640,000 new cases being found each year. Statistics on worldwide occurrence Oral cancers are part of a group of cancers commonly referred to as head and neck cancers, and of all head and neck cancers they comprise about 85% of that category. Brain cancer is a cancer group unto itself, and ironically is not included in the head and neck cancer group.

<http://oralcancerfoundation.org/facts/index.htm>

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96. What complication can be commonly seen in the infant at birth if codeine is taken during the third trimester?

- a. Cleft palate
- b. Heart murmur
- c. Breathing difficulties
- d. Spina Bifida

96. Correct: C breathing difficulties

The analgesic of choice during pregnancy is acetaminophen (category B). Aspirin and nonsteroidal anti-inflammatory drugs convey risks for constriction of the ductus arteriosus, as well as for postpartum hemorrhage and delayed labor. The risk of these adverse events increases when agents are administered during the third trimester. Risk also is more closely associated with prolonged administration, high dosage, and selectively potent anti-inflammatory drugs, such as indomethacin.

Prolonged or high doses of opioids are associated with congenital abnormalities and respiratory depression. For this reason, opioid-containing drugs should generally be avoided.

Little, James W. *Dental Management of the Medically Compromised Patient, 7th Edition*. Mosby. pp. 274
– 275

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97. Which of the following is the most common clinically significant odontogenic tumor?
- a. Calcifying epithelial odontogenic tumor
 - b. Ameloblastic fibroma
 - c. Ameloblastic fibro-odontoma
 - d. Ameloblastoma

97. Answer: D

a. Calcifying epithelial odontogenic tumor (Pindborg Tumor)-uncommon lesion that accounts for less than 1% of all odontogenic tumors. The tumor is of odontogenic origin, but its histogenesis is uncertain. No sex predilection, encountered in patients between 30 and 50, most cases have been found in the mandible, most often in the posterior areas. Painless, slow-growing swelling is the most common presenting sign

b. Ameloblastic fibroma-is considered to be a true mixed tumor in which the epithelial and mesenchymal tissues are both neoplastic. It is an uncommon tumor, tend to occur in younger patients, most lesions are dx in the first two decades of live, posterior mandible is the most common site (~70% of cases), X-ray appearance either uni or multilocular

c. Ameloblastic fibro-odontoma- is defined as a tumor with the general features of an ameloblastic fibroma but that also contains enamel and dentin. Usually encountered in children (ave age 10yo), occur more frequently in the posterior regions of the jaws, commonly asymptomatic, usually discovered on x-rays when a tooth fails to erupt, associated with painless swelling of the affected bone

d. Ameloblastoma –Its relative frequency equals the combined frequency of all other odontogenic tumors, excluding odontomas. They are epithelial in origin, are slow-growing, locally invasive tumors that run a benign course in most cases.

Oral and Maxillofacial Pathology; Neville, Damm, Allen, Bouquot; 3rd edition, pages 695, 716-720

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98. Which of the following may present as a radiopaque lesion associated with the root of a non-vital tooth?

- A. Cementoblastoma
- B. Focal sclerosing osteomyelitis
- C. Periapical cemento-osseous dysplasia
- D. Idiopathic osteosclerosis

98. Correct: B. Focal sclerosing osteomyelitis

Rationale:

Focal sclerosing osteomyelitis (condensing osteitis) is a chronic osteomyelitis that develops at the root apex of a tooth with chronic pulpitis secondary to deep caries. A distinct periodontal membrane space is usually present. The tooth may be asymptomatic, or there may be a chronic pain of low intensity. The tooth will usually test non-vital or vital.

A **cementoblastoma** is a benign neoplasm of cementoblasts that develops at the root apex of an associated tooth. The lesion appears confluent with the root surface cementum, and a thin radiolucent margin is usually visible around the radiopaque mass. The associated tooth should test vital.

Periapical cemento-osseous dysplasia is a reactive proliferation in response to unknown factors. It typically presents as circumscribed radiopaque lesions with distinct radiolucent margins at the ends of the roots of multiple mandibular anterior teeth. The teeth involved are usually free of caries or restorations.

Idiopathic osteosclerosis manifests as a radiopaque lesion at a root apex and is of unknown etiology. The lesion is often associated with mandibular molar teeth that are free of caries or restorations. The tooth will usually be asymptomatic and vital.

Oral Soft Tissue Diseases, 3rd Ed. Lexi-Comp, 2005.

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99. Choose the correct statement that best describes pemphigoid and/or pemphigus?
- a. Pemphigoid alters the cellular connections at the basement membrane (desmosomes)
 - b. Positive Nikolsky sign is seen in pemphigus and pemphigoid
 - c. Pemphigus rarely affects the oral cavity
 - d. Pemphigus alters the cellular connections above the basement membrane (hemidesmosomes)
 - e. Pemphigoid rarely affects the oral cavity

99. Correct- E. Pemphigoid rarely affects the oral cavity

Both are autoimmune disease. Pemphigoid alters the cellular connections (hemidesmosomes) above the basement membrane, while pemphigus alters the cellular connections (desmosomes) at the basement membrane, causing a burn like blister lesion. Positive Nikolsky sign can be seen in pemphigus vulgaris. Pemphigoid is more common, less dangerous affecting older people (over 60), produces blisters that appear mainly on the trunk, arms and legs, rarely in the mouth. Lesion can be large (3cm), itchy and painful.

Pemphigus can be familial, its precise cause is unknown, possible triggers include penicillamine derived drugs, HSV, solar irradiation and stress. The blisters are fragile and burst easily leaving ulcers that do not heal without treatment. The lesions are itchy, painful, and burning, and treatment resembles that of burn victims. Three main types are vulgaris-usually appears in mouth first, foliaceus-does not occur in mouth, paraneoplastic- occurs in people with cancer.

Treatment of both involves oral steroids in order to suppress the immune system.

Reference.

Neville, Damn, Allen, Bouquot. Oral & Maxillofacial Pathology. 3rd edition. pp. 764-76.

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100. In regards to screening tests for pre-op evaluation of bleeding times, which statement is incorrect?

- A. PT (prothrombin time) is activated by tissue thromboplastin, tests extrinsic and common pathways, with a normal time of 11-15 seconds
- B. PT measures factors II, III, V, VII, and X
- C. APTT (activated partial thromboplastin time) tests intrinsic and common pathways, with a normal reading of 25-35 seconds
- D. INR (International normalized ratio) has normal range of .8-1.2 and is calculated by the ratio of the patients PT/normal PT raised to the power of the ISI (International sensitivity index)

100. Answer –B. PT measures factors II, III, V, VII, and X

PT measures factors I/II/V/VII/and X

Average lifespan of a platelet is 5-9 days

The prothrombin time can be prolonged as a result of deficiencies in vitamin K, which can be caused by warfarin, malabsorption, or lack of intestinal colonization by bacteria

Little J, Falace D. Dental Management of the Medically Compromised Patient. Fifth Edition. 23 (484-488)

Screening laboratory tests

Five clinical laboratory tests can be used by the dentist to screen patients for bleeding disorders. These tests are the platelet count, the BT (Ivy), APTT, PT, and TT^{23,30} (Table 23-17).

From a functional viewpoint, the platelet count does not have to be obtained to screen a patient, because the bleeding time will reflect problems with both the number and the quality of platelets. However, by ordering a platelet count the dentist can gain better insight into the nature of the problem in patients with a prolonged bleeding time. For example, if the BT was prolonged and the platelet count within normal limits, a problem in platelet function would be indicated. The BT (Ivy) is the best test to measure for the presence of adequate platelet function (Fig. 23-9).

In the past, we recommended that the tourniquet test be used to screen for abnormalities in the vas-

cular phase. However, this test has been found too insensitive to be of any real value in the screening procedure, although it may show abnormal results in patients with vascular or platelet-phase disorders. The BT is now used to screen these phases. It too, however, is subject to error due to lack of standardization.

The APTT test is used to measure the status of the intrinsic and common pathways of coagulation. This test reflects the ability of blood still within vessels in the area of injury to coagulate. It will be prolonged in coagulation disorders affecting the intrinsic and common pathways (hemophilia, liver disease) and also in cases of excessive fibrinolysis.

The PT test is used to measure the status of the extrinsic and common pathways of coagulation. This test reflects the ability of blood lost from vessels in the area of injury to coagulate. It will be prolonged in cases of Factor VII deficiency and disorders affecting the common pathway and fibrinolysis. This test usually is normal in patients with intrinsic pathway defects (hemophilia).^{23,30} Many laboratories in the United States now report the findings as the international normalized ratio (INR).

The TT test uses thrombin as the test activating agent; hence, it measures only the ability of fibrinogen to form an initial clot. Since fibrin-degradation products tend to prolong the TT, this test becomes reasonably sensitive for fibrinolysis disorders. When done with the PT and APTT tests, it allows for the identification of coagulation disorders involving the last "stage" of the sequence. For example, if the PT, APTT, and TT are all prolonged, the problem in the coagulation system would be at the point of conversion of fibrinogen to the initial clot.

TABLE 23-17
Screening Laboratory Tests for the Detection of a Potential "Bleeder"

- | |
|--|
| 1. PT—activated by tissue thromboplastin |
| a. Tests extrinsic and common pathways |
| b. Control should be run |
| c. Normal (11 to 15 seconds, depending on laboratory) |
| d. Control must be in normal range |
| 2. APTT—activated by addition of contact activator (kaolin) |
| a. Tests intrinsic and common pathways |
| b. Control should be run |
| c. Normal (25 to 35 seconds, depending on laboratory) |
| d. Control must be in normal range |
| 3. TT—activated by thrombin |
| a. Tests ability to form initial clot from fibrinogen |
| b. Controls should be run |
| c. Normal (9 to 13 seconds) |
| 4. BT |
| a. Tests platelet and vascular phases |
| b. Normal if adequate number of platelets of good quality present with intact vascular walls |
| c. Normal (1 to 6 minutes) |
| 5. Platelet count |
| a. Tests platelet phase |
| b. Normal (140,000 to 400,000/mm ³) |
| c. Clinical bleeding problem can occur if less than 50,000/mm ³ |



FIG. 23-9 Ivy bleeding time. Midway through the test, blood can still be blotted onto filter paper.

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101. What is acute sialadenitis?

- A. Acute infection of the submandibular gland caused by staphylococcus aureus
- B. Acute infection of the parotid gland caused by three viruses: Mumps, Group A Coxsackievirus, Cytomegalovirus
- C. Acute bacterial infection of the major salivary glands that is caused by the presence of salivary stone

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101. Correct: B

Reference: Oral Medicine Secrets by S. Sonis

Bacterial sialadenitis is an acute infection of the parotid gland. Acute infection of the parotid gland caused by three viruses: Mumps, Group A Coxsackievirus, Cytomegalovirus

Sialolithiasis is an acute bacterial infection of the major salivary glands that is caused the presence of salivary stones or sialoliths in the ducts.

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102. Necrotizing sialometaplasia is a self limiting neoplastic inflammatory condition of unknown etiology. Treatment is via anti-virals.

- A. Both statements are true.
- B. The first statement is true. The second statement is false.
- C. The first statement is false. The second statement is true.
- D. Both statements are false.

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102. Correct-B. The first statement is true. The second statement is false since this condition is self limiting.

Greenburg M, Glick M, Ship J. Burket's Oral Medicine Eleventh Edition. BC Decker 2008 p173

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103. Human papilloma virus is associated with all the following lesions Except

- A. Verruca vulgaris
- B. Condyloma Acuminatum
- C. Focal Epithelial Hyperplasia
- D. Verruciform Xanthoma
- E. Squamous papilloma

103. Correct: D Verruciform Xanthoma ,which is a lesion of unknown etiology. It's characterized by an accumulation of lipid-laden histiocytes and histologically similar to dermal xanthoma. It has no association with diabetes, hyperlipidemia or other metabolic disease.



Figure 1.
Verruciform xanthoma of the lateral posterior surface of tongue at the primary clinical presentation. Note the yellowish-orange color with warty surface appearance. These are characteristic features of this lesion.

All the others were associated with HPV:

- Verruca vulgaris (HPV-2, HPV-4, HPV-6)
- Condyloma Acuminatum (HPV-6, 11, 16, 18)
- Focal Epithelial Hyperplasia (HPV-13, 32)
- Squamous papilloma (HPV-6 & 11)

-in addition, these are also associated with HPV

- Sinonasal Papillomas (HPV-11)
- Keratoacanthoma (self-healing carcinoma HPV-26, 37)

http://www.dental.washington.edu/oralpath/caseofthefmonth/mar-06/clinical-rad_findings.htm

Neville and Damm. Oral and Maxillofacial Pathology, 3rd edition. p250-270

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104. Assuming that a patient that is taking corticosteroids meets the requirements for supplementation, the patient should receive which of the following to prevent an adrenal insufficiency?
- a. No additional therapy
 - b. Normal morning dose, supplemental pre and intraoperatively to achieve 100mg equivalent during the 1st hour of surgery and 25mg every 8 hrs for 24-48hrs post operatively.
 - c. Double the morning dose, supplemental pre and intraoperatively to achieve 200mg equivalent during the 1st hour of surgery and 50mg every 8 hrs for 24-48hrs post operatively.
 - d. Skip the morning dose, supplemental pre and intraoperatively to achieve 100mg equivalent during the 1st hour of surgery and 25mg every 4 hrs for 72-96hrs post operatively.

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104. Correct B. Normal morning dose, supplemental pre and intraoperatively to achieve 100mg equivalent during the 1st hour of surgery and 25mg every 8 hrs for 24-48hrs post operatively.

Rule of 2's:

- Pt who has received more than 20mg of cortisol or equivalent daily for more than 2 weeks in the last 2 months

Little, James W. Dental Management of the Medically Compromised Patient. St. Louis: Mosby, 2002. Pgs 277-281

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105. Limiting the epinephrine given to a patient with hyperthyroidism is wise because excessive epinephrine may lead to?

- a. Heart attack
- b. Stroke
- c. Thyrotoxicosis
- d. Aneurysm
- e. Headache

105. Answer: C – Thyrotoxicosis

Mild degrees of thyroid hyperfunction may pass for acute anxiety, with little increase in clinical risk. However, various cardiovascular disorders, primarily angina pectoris, are exaggerated in cases of thyrotoxicosis. If, in the course of the dental treatment, the patient develops one or more of these cardiovascular disorders, the management protocol for that specific situation should be followed (see Part Seven: Chest Pain).

Patients exhibiting severe hyperfunction should receive immediate medical consultation. Dental care should be postponed until the patient's underlying metabolic disturbance is corrected. Worth remembering is that psychological or physiologic stress may precipitate thyroid crisis in the untreated or incompletely treated hyperthyroid individual.

Furthermore, use of atropine, a vagolytic drug (i.e., one that inhibits the vagus nerve, which decelerates the heart) should be avoided. Atropine causes an increase in heart rate and may be a factor in precipitating thyroid storm. In addition, epinephrine and other vasopressors should be used with caution in clinically hyperthyroid patients. Vasopressors stimulate the cardiovascular system and can precipitate cardiac dysrhythmias, tachycardia, and thyroid storm in hyperthyroid patients, whose cardiovascular systems have already been sensitized. However, local anesthetics with vasoconstrictors may be used when the following precautions are taken:

- Use the least-concentrated effective solution of epinephrine (1:200,000 is preferred to 1:100,000, which is preferred to 1:50,000)
- Injecting the smallest effective volume of anesthetic/vasopressor
- Aspiration prior to every injection (see [Chapter 23](#))

(Malamed, Stanley F. *Medical Emergencies in the Dental Office, 6th Edition*. Mosby, 022007. pp. 291 - 292).

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106. The reason why the use of epinephrine (and other sympathomimetics) requires special consideration when treating hyperthyroid patients is:

- A. epinephrine acts on alpha-adrenergic receptors, causing vasodilation
- B. epinephrine acts on beta-2 receptors causing vasoconstriction
- C. epinephrine acts on alpha-adrenergic and beta-2 receptors causing vasodilation
- D. epinephrine acts on beta-2 receptors causing vasodilation and on alpha- adrenergic receptors, causing vasoconstriction,

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106. Answer-D epinephrine acts on beta-2 receptors causing vasodilation and on alpha- adrenergic receptors, causing vasoconstriction,

“The use of epinephrine and other sympathomimetics requires special consideration when treating hyperthyroid patients and those taking nonselective beta-blockers. Epinephrine acts on the alpha-adrenergic receptors, causing vasoconstriction, and on beta 2 receptors, causing vasodilatation. Nonselective beta-blockers eliminate the vasodilatory effect, potentiating an alpha-adrenergic increase in blood pressure. This pathophysiology is applicable to any patient taking nonselective beta blockers and those with hyperthyroidism due to concurrent cardiovascular complications.”

Burket’s Oral Medicine; Greenberg, Glick, Ship; 11th edition; page 530

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107. Which of the following dermatologic conditions is classically associated with generalized widening of the periodontal ligament space?

- A. Systemic sclerosis
- B. Ehlers-Danlos syndrome
- C. Tuberous sclerosis
- D. Epidermolysis bullosa

107. ANSWER: A. Systemic sclerosis

Rationale:

Systemic sclerosis is a relatively rare condition in which dense collagen is deposited in the tissues of the body in extraordinary amounts. One of the first signs of the disease is Raynaud's phenomenon, a vasoconstrictive event triggered by emotional distress or exposure to cold. The patient often presents with microstomia, dysphagia, and xerostomia. Radiographically, diffuse widening of the periodontal ligament space is often present throughout the dentition.

Ehlers-Danlos syndrome is an inherited connective tissue disorder in which abnormal collagen production occurs. Remarkable joint hypermobility without scarring can be seen, including Gorlin's sign (the ability to touch the tip of one's nose with their tongue).

Tuberous sclerosis is an uncommon syndrome that is classically characterized by mental retardation, seizure disorders, and angiofibromas of the skin. Facial angiofibromas can be seen clinically, along with classic skin lesions known as shagreen patches (connective tissue hamartomas) and ashleaf spots (ovoid areas of hypopigmentation).

Epidermolysis bullosa is an inherited blistering mucocutaneous disorder. The dystrophic form may show characteristic hemorrhagic bullae, scarring, and erosion of the skin associated with minimal trauma. If restorative treatment is required, the lips should be lubricated to minimize trauma.

Neville, Damn, Allen, Bouquot. Oral and Maxillofacial Pathology, 2nd Ed. W.B. Saunders Company, 2002. Ch. 16.

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108. Because nonselective B blockers block B2 adrenergic receptor-mediated vasodilation in peripheral blood vessels, there is a risk of a hypertensive episode after administration of local anesthetic agents that contain vasoconstrictors or the use of epinephrine impregnated retraction cords.

- A. Only the first statement is true
- B. Only the second statement is true
- C. Both statements are true
- D. Both statements are false

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108. Correct: C

Non-selective B blocker (i.e. Propranolol) blocks both B1 and B2 adrenergic receptors. In the absence of peripheral vasodilation, the peripheral resistance increases. This in turn predisposes a patient to a hypertensive episode when epinephrine is injected.

Reference: Yagiela JA: Adverse drug interactions in dental practice: interactions associated with vasoconstrictors. Part V of a series, J Am Dent Assoc 130:701-709, 1999.

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109. In regards to organ transplant procedures, the best clinical results are attained with triple drug immunosuppressive therapy, which includes all of the following except?

- A. Cyclosporine
- B. Rapamycin
- C. Prednisone
- D. Azathioprine

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109. Answer – B. Rapamycin

The best clinical results are attained with triple-drug immunosuppressive therapy – cyclosporine, prednisone, and azathioprine or mycophenolate mofetil (MMF).

Prednisone	Corticosteroid	Blocks cytokine gene transcription
Cyclosporine	Calcineurin inhibitor	Inhibits IL-2 gene transcription Reduces activation of T-cells
Tacrolimus	Calcineurin inhibitor	Inhibits IL-2 gene transcription Reduces activation of T-cells
Azathioprine	Nucleoside inhibitor	Impairs DNA synthesis Inhibits B-cell proliferation
Mycophenolate mofetil	Nucleoside inhibitor	Impairs DNA synthesis Inhibits B-cell proliferation
Rapamycin	TOR inhibitor	Inhibits tyrosine kinase
Everolimus (RAD)	TOR inhibitor	Inhibits tyrosine kinase

Little J, Falace D, Miller C, Rhodus N. Dental Management of the Medically Compromised Patient 7th Edition. 2008. 22(342-43)

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110. Necrotizing sialometaplasia is:

- A. a reactive, nonneoplastic inflammatory process that usually affects the minor salivary glands of the Palate.
- B. caused by diminished blood flow to the affected area to include: trauma, local anesthetic injection and smoking.
- C. often mistaken for malignant carcinoma.
- D. all the above

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110. Correct: D

Reference: Oral and Maxillofacial Surgery by Peterson

Necrotizing sialometaplasia is often misdiagnosed with mucoepidermoid carcinoma or squamous cell. Helpful histologic criteria for distinguishing necrotizing sialometaplasia from a malignant process include the maintenance of the overall salivary lobular morphology, the generally nondysplastic appearance of the squamous islands or nests, and evidence of residual ductal lumina within the epithelial nests.

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111. LH, FSH, and progesterone are produced in the pituitary. High levels of LH and FSH during pregnancy, causes capillary permeability which can make the patients susceptible to such conditions like melasma, gingivitis, gingival hyperplasia, and pyogenic granuloma.

- A. Both statements are true.
- B. The first statement is true. The second statement is false.
- C. The first statement is false. The second statement is true.
- D. Both statements are false

111. Correct-C. The first statement is false. The second statement is true.

LH and FSH are gonadotropins are produced in the pituitary while Progesterone is produced by the corpus luteum in the ovaries. During pregnancy, higher levels of pregnancy hormones can lead to capillary permeability and lead to melasma, also known as mask of pregnancy, as well as gingivitis, gingival hyperplasia, and pyogenic granuloma.

Greenburg M, Glick M, Ship J. Burket's Oral Medicine Eleventh Edition. BC Decker 2008 p531.

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112. A patient presents to your clinic coughing with bloody sputum, low-grade fever, enlarged cervical lymph nodes (scrofula) and night sweats. Which drug regimen would be best to treat this patient who has been diagnosed with active tuberculosis?

- A. Isoniazid (INH) for 2 months
- B. Isoniazid (INH) with Rifampin for 3 months
- C. Isoniazid (INH) with rifampin and pyrazinamide for 2 months, followed by INH and rifampin for 4 months
- D. Rifampin for 6 months

112. Correct C

There are several recommended treatment regimens. These include:

- Isoniazid (INH) with Rifampin for 9 months
- Isoniazid (INH) with rifampin and pyrazinamide for 2 months, followed by INH and rifampin for 4 months

M tuberculosis can mutate and develop resistance to a single agent medication. To combat this ability, multiple agent therapy is the treatment of choice.

The optimum treatment for patients with latent tuberculosis infection and abnormal chest radiographs consistent with prior tuberculosis has been examined in several studies. A placebo-controlled trial conducted by the IUATLD (2) compared the efficacy of 3, 6, and 12 months of INH in preventing active tuberculosis for persons with latent tuberculosis infection who had chest radiographs showing fibrotic lesions consistent with inactive tuberculosis. Among those receiving INH for at least 6 months, the incidence of tuberculosis was significantly reduced compared with those given placebo. In patients with fibrotic lesions greater than 2 cm in diameter INH given for 12 months was significantly better than 6 months (89 versus 67% reduction). A reanalysis of data from a community-based study of persons with abnormal radiographs felt to represent inactive tuberculosis showed that the efficacy of INH decreased significantly if less than 9 months of the drug was taken, but that further protection was not conferred if the duration was extended from 9 to 12 months . On the basis of these data, guidelines for treatment of latent tuberculosis infection recommend 9 months of INH for persons with abnormal chest radiographs consistent with prior tuberculosis. Additional treatment regimens are RIF (with or without INH) for 4 months, and RIF and PZA for 2 months (for persons who are unlikely to complete a longer course and who can be monitored carefully).

Neville and Damm. Oral and Maxillofacial Pathology, 3rd edition. p 150-153
<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5211a1.htm#tab1>

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113. The superior head of lateral pterygoid originates on the _____ and inserts on the _____.

- A. infratemporal surface and infratemporal crest of the greater wing of the sphenoid bone, articular disc and fibrous capsule of the TMJ.
- B. lateral surface of the lateral pterygoid plate, neck of condyle of the mandible
- C. coronoid notch, articular disk
- D. patella, styloid process

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113. Correct= A. The superior head of lateral pterygoid originates on the infratemporal surface and infratemporal crest of the greater wing of the sphenoid bone and inserts on the articular disc and fibrous capsule of the TMJ.

Okeson, J, Orofacial Pain, 1996 Pg114

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114. A joint sound categorized as grating that is thought to be a sign of disk perforation, disk disruption, or terminal stage osteoarthritis is known as?

- a. Clicking
- b. Popping
- c. Crepitus
- d. Reciprocal clicking

114. Correct: C Crepitus

TMJ Sounds and Disk Displacement

Clicking is a common joint noise that is found in a significant part of the population without a past or present history of discomfort. Clicking has been studied in epidemiologic, clinical, and in autopsy as well as fresh specimen material; however, the cause of the sound in many respects is an enigma. A review of the literature may be found elsewhere.³⁰⁰ The physics and the sounds produced by the temporomandibular joints have recently received some clarification. The presence or absence of joint sounds does not indicate or exclude joint disorders. Another joint sound, "crepitus," is a grating sound in the joint. It is thought to be a sign of disk perforation, disk disruption, or the terminal stage of osteoarthritis.

(Ash, Major M. *Occlusion, 4th Edition*. W.B. Saunders Company, 11997. p. 135).

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115. In diagnosing disc displacement with reduction, all of the following must be present EXCEPT:
- a. Reproducible joint noise that occurs at variable positions during opening and closing mandibular movements
 - b. Soft tissue imaging revealing displaced disc that improves its position during jaw opening, and hard tissue imaging showing an absence of extensive degenerative bone changes
 - c. Soft tissue imaging revealing displaced disc that does not improve its position during jaw opening
 - d. May be accompanied by pain, and deviation during movement coinciding with a click

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115. Correct - C -Soft tissue imaging revealing displaced disc that **does not** improve its position during jaw opening

Diagnostic Criteria for Disc Displacement with Reduction:

Reproducible joint noise that occurs at variable positions during opening and closing mandibular movements

Soft tissue imaging revealing displaced disc that improves its position during jaw opening, and hard tissue imaging showing an absence of extensive degenerative bone changes

May be accompanied by pain, precipitated by joint movement

Deviation during movement coinciding with a click

No restriction in mandibular movement

Episodic and momentary catching of smooth jaw movement during mouth opening (<35mm) that self-reduces with voluntary mandibular repositioning

Orofacial Pain Guidelines for assessment, diagnosis, and management; Okeson JP; Page 130-131

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116. Which of the following statements is *incorrect* about disc dislocation either with or without reduction?

- A. Normally a long history of clicking in the joint and more recently some catching sensation may be seen.
- B. A sudden loud click will be heard recapturing the disc, in which a normal range of mandibular movement will follow in patients diagnosed with disc dislocation with reduction.
- C. Clinical characteristics of disc dislocation without reduction include a range of mandibular opening of 25 to 30 mm, with the mandible deflecting towards the involved joint at the end of movement.
- D. Patients diagnosed with disc dislocation without reduction present with a consistent joint click and a maximum point of opening revealing a soft-end feel.

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116. ANSWER: D. Patients diagnosed with disc dislocation without reduction present with a consistent joint click and a maximum point of opening revealing a soft-end feel.

Rationale:

Disc dislocation with reduction

Normally a long history of clicking in the joint and more recently some catching sensation is seen. A sudden, loud click will be heard during recapturing of the disc. Unless the disc is reduced, the patient displays a limited range of opening. After the disc is reduced, a normal range of mandibular movement is present.

Disc dislocation without reduction

When the disc is not reduced, the forward translation of the condyle merely forces the disc in front of the condyle. Most patients with a history of disc dislocation without reduction know precisely when the dislocation occurred. They report that the jaw is locked closed so that normal opening cannot be achieved. The range of mandibular opening is 25 to 30 mm, and the mandible deflects to the involved joint at the end of movement. The maximum point of opening reveals a hard-end feel.

Okeson, JP. Management of Temporomandibular Disorders and Occlusion, 5th Ed. Mosby, 2003. pp. 345-47.

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117. A patient with an Anteriorly Displaced Disc without reduction will complain of which of the following?

- A. Severe pain during meals
- B. Occasional popping and clicking without pain
- C. Occasional popping and clicking with pain
- D. Occasional opening and the jaw will “lock” in place

117-Correct=D. Occasional opening and the jaw will “lock” in place

TMJ sounds are detected in 25-35% of the general population. Not all joint sounds are progressive. Only joint sounds associated with pain should be considered for treatment, if the pain is intracapsular in origin (as opposed to extracapsular muscle pain).

In an anteriorly displaced disc, the condyle articulates on the posterior border of the disc. This may progress to anterior displacement of the disc. Disc displacement occurs due to ligament elongation (capsular and discal ligaments), also the disc can be thinned. These changes occur in response to trauma: macro (pt usually knows about) or micro (pt unaware (i.e. bruxism or hypoxia-reperfusion injury). Changes start on cellular level and work up to clinical changes: (e.g. long term clenching leads to overuse and hypoxia-reperfusion injury → eventually collagen fibrils fragment and loss of disc stiffness, loss of disc shape.

ADD with reduction: relatively normal ROM, but may be limited by pain. Discal movement palpable upon opening/closing. Deviation is common.

ADD without reduction: Pts often report the exact onset. Sudden changes of mandibular movement. Gradual increase of “catching” and clicking is reported. Often no joint sounds present after the disc dislocation.

Okeson. (2003). **Management of temporomandibular disorders and occlusion**, 5th Ed. Mosby, p. 438-53.

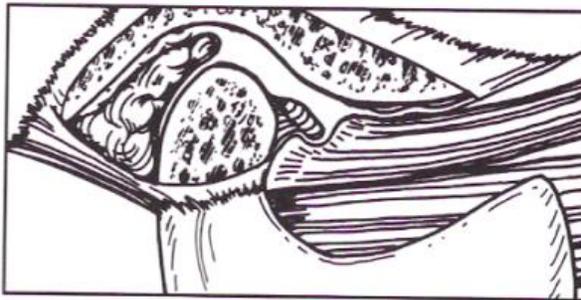


FIG. 13-1 ANTERIORLY DISPLACED DISC. The posterior border of the disc has been thinned, and the inferior retrodiscal lamina, as well as the lateral collateral ligament (not shown), has been elongated. The disc is anteriorly displaced, resulting in the condyle articulating on the posterior border of the disc instead of the intermediate zone.

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118. Hyperparathyroidism can involve all of the radiographic features except one of the following?
- A. Demineralization and thinning of cortical boundaries often occur in the jaws in cortical boundaries such as the inferior border, mandibular canal, and the cortical outlines of the maxillary sinuses
 - B. The density of the jaws is decreased, resulting in a radiolucent appearance that contrasts with the density of the teeth
 - C. A change in the normal trabecular pattern may occur, resulting in a ground glass appearance of numerous, small, randomly oriented trabeculae
 - D. Brown tumors (may resemble a central giant cell granuloma or an aneurysmal bone cyst) occur late in the disease and in about 20% of cases
 - E. Depending on the duration and severity of the disease, loss of the lamina dura may occur around one tooth or all the remaining teeth – with the loss being either complete or partial around a particular tooth

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118. Answer – D. Brown tumors (may resemble a central giant cell granuloma or an aneurysmal bone cyst) occur late in the disease and in about 20% of cases.

Brown tumors can occur late in the disease and in about 10% of cases. These peripheral or central tumors of bone are radiolucent. The gross specimen has a brown or reddish-brown color. Hyperparathyroidism is an endocrine abnormality in which there is an excess of circulating parathyroid hormone (PTH). An excess of serum PTH increases bone remodeling in preference of osteoclastic resorption, which mobilizes calcium from the skeleton. In addition, PTH increases renal tubular reabsorption of calcium and renal production of the active vitamin D metabolite. The net result of these functions is in an increase in serum calcium. Primary hyperparathyroidism usually results from a benign tumor (adenoma) of one of the four parathyroid glands, which produces excess PTH. Secondary hyperparathyroidism results from a compensatory increase in the output of PTH in response to hypocalcemia.

White S, Pharoah M. Oral Radiology – Principles and Interpretation Fourth Edition. 2000; 23(473-76)

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119. The most common location of the Adenomatoid Odontogenic Tumor
- a. Anterior maxillae
 - b. Posterior maxillae
 - c. Posterior mandible
 - d. Midline of the mandible

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119-The answer is A.

Reference: Oral and Maxillofacial Pathology by Neville

The Adenomatoid Odontogenic Tumor AOT tumor is painless, slow growing lesion usually found in the anterior maxilla. 2/3rd of all cases are diagnosed when patients are 10 to 19 years of age. There is a strong female predilection (twice as often as males). Radiographically, adenomatoid odontogenic tumors can be differentiated from dentigerous cyst by its radiolucent lesion extending almost to the apex . The lesion may appear completely radiolucent, however it may contain fine (snowflake) calcifications.

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120. Of all ectopic thyroids, ninety percent are located in/on the _____. Seventy percent of these patients suffer from _____.

- A. Submandibular Gland, Hyperthyroidism
- B. Submandibular Gland, Hypothyroidism
- C. Lingual Dorsum, Hyperthyroidism
- D. Lingual Dorsum, Hypothyroidism

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120. Correct- D. Ninety percent of all ectopic thyroids occur on the lingual dorsums. Two-thirds of these patients had no thyroid tissue in the neck. 70 % of these patients have hypothyroidism and 10 % have cretinism.

<http://www.maxillofacialcenter.com/BondBook/softtissue/lingthyroid.html>

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121. Which statement regarding Stevens-Johnson syndrome is true?
- A. It presents with severe ocular blistering, scarring may occur, similar to that in bullous pemphigoid.
 - B. The etiology is usually a result of an acute infection rather than a drug reaction
 - C. For a diagnosis to be made, either the ocular or genital mucosa should be affected in conjunction with the oral and skin lesions.
 - D. A less severe form of erythema multiforme and has an acute onset
 - E. All of the above are true

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121-Answer C

Erythema multiforme is a blistering, ulcerative mucocutaneous condition of uncertain etiopathogenesis. It is probably an immunologically mediated process, although the cause is poorly understood. In about 50% of the cases, the clinician can identify either a preceding infection, such as herpes simplex or mycoplasma pneumoniae, or exposure of anyone of a variety of drugs and medications, particularly antibiotics or analgesics.

Erythema multiforme usually has an acute onset and may display a wide spectrum of clinical disease. On the mild end of the spectrum, ulcerations develop, affecting the oral mucosa primarily. In its most severe form, diffuse, sloughing and ulceration of the entire skin and mucosal surfaces may be seen (toxic epidermal necrolysis or Lyell's disease)

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122. The primary hereditary abnormalities of the enamel that are unrelated to other disorders are termed _____.

- A. Dentinogenesis Imperfecta
- B. Odontodysplasia
- C. Amelogenesis Imperfecta
- D. Osteogenesis Imperfecta

122-Correct=C. Amelogenesis Imperfecta
Neville, Damm, Oral Pathology, 2nd edition, p 445-447

ENVIRONMENTAL EFFECTS ON TOOTH STRUCTURE DEVELOPMENT

The ameloblasts in the developing tooth germ are extremely sensitive to external stimuli, and many factors can result in abnormalities in the enamel (Box 2-2). The primary hereditary abnormalities of the enamel that are unrelated to other disorders are termed **amelogenesis imperfecta** (see page 99).

Dental enamel is unique in that remodeling does not occur after initial formation. Therefore, abnormalities in enamel formation are etched permanently on the tooth surface. The enamel develops in three major stages: (1) **matrix formation**, (2) **mineralization**, and (3) **maturation**. During matrix formation, the enamel proteins are laid down. In the next phase, minerals are deposited and the majority of the original proteins are removed. During the final maturation period, the enamel undergoes final mineralization and the remnants of the original proteins are removed. In the early stage of mineralization, the enamel is dull, white, and relatively soft. During the late stage of maturation, the final hard translucent enamel replaces this diffuse opaque enamel.

The timing of the ameloblastic damage has a great effect on the location and appearance of the defect in the enamel. The cause of the damage does not appear to be of major importance, because many different local and systemic stimuli can result in defects that have similar clinical appearances. The final enamel represents a record of all significant insults received during tooth development. Deciduous enamel contains a neonatal ring, and the rate of enamel apposition is estimated to be 0.023 mm/day. Using this knowledge, the clinician can estimate the timing of an

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123. Lesions of juvenile fibrous dysplasia should not be treated by radiotherapy due to the risk of what?

- a. Future malignancy
- b. May increase in size
- c. Inhibits healing
- d. Cosmetic scarring

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123-Answer: A future risk of malignancy

TREATMENT

Treatment is pursued only when lesions are cosmetically unacceptable or interferes with sight, breathing, mastication, or speech. Some clinicians believe that constant surgical osteoplasty of a lesion will accelerate it from an indolent to an aggressive course, resulting in greater distortion than might otherwise occur. It is important to biopsy lesions, because other, more serious diseases may have a similar clinical and radiographic appearance. Most lesions of the normal form of juvenile fibrous dysplasia do not require treatment until the patient has reached early adulthood. At this time the degree of cosmetic improvement that can be accomplished by surgery is assessed. Lesions should not be treated by radiotherapy in an attempt to halt growth, because the risk of a malignancy in later life is greatly enhanced.

(Sapp, J. Philip. *Contemporary Oral and Maxillofacial Pathology, 2nd Edition*. C.V. Mosby. p. 101).

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124 Regarding fissured tongue, which of the following is false?

- A. The prevalence of fissured tongue ranges from 12%-15%
- B. The prevalence and severity appear to increase with age
- C. Fissured tongue also may be a component of Melkersson-Rosenthal syndrome
- D. A hereditary basis has been suggested for geographic tongue, and the same gene or genes may possibly be linked to both fissured and geographic tongue

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124- False: A. The prevalence of fissured tongue ranges from 12%-15%

The prevalence of fissured tongue ranges from 2%-5%

Fissured tongue is relatively common. Numerous grooves, or fissures, are present on the dorsal of the tongue. A strong association has been found between fissured tongue and geographic tongue, with many patients having both conditions. It is a benign condition, with no specific treatment indicated. The patient should be encouraged to brush the tongue, because food or debris entrapped in the grooves may act as a source of irritation.

Neville, Damn, Allen, Bouquot. Oral and Maxillofacial Pathology, 2nd Ed. W.B. Saunders Company, 2002. p.12.

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125. Which of the following statements is *incorrect* when comparing geographic tongue and fissured tongue?

- A. Both conditions are typically asymptomatic, although some patients may complain of mild burning or soreness.
- B. A strong association has been found between fissured and geographic tongue, with many patients having both conditions.
- C. Considerable variations of both conditions can be seen upon clinical presentation.
- D. No association is suspected between fissured and geographic tongue, as the clinical presentation represents dissimilar conditions.

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125. ANSWER: D. No association is suspected between fissured and geographic tongue, as the clinical presentation represents dissimilar conditions.

Rationale:

Erythema migrans (geographic tongue) is a common benign condition that primarily affects the tongue. Females are affected more frequently than males by a 2:1 ratio. The characteristic lesions are seen on the anterior two-thirds of the dorsal tongue mucosa. They appear as multiple, well-demarcated zones of erythema, concentrated at the tip and lateral borders of the tongue. This erythema is due to atrophy of the filiform papillae, and are typically surrounded at least partially by a slightly elevated, yellowish-white, serpentine or scalloped border. Often patients with fissured tongue are affected with erythema migrans as well. The lesions are usually asymptomatic, although a burning sensation or sensitivity may be noted when the lesions are active. No treatment is indicated.

Fissured tongue is relatively common. Numerous grooves, or fissures, are present on the dorsal of the tongue. A strong association has been found between fissured tongue and geographic tongue, with many patients having both conditions. It is a benign condition, with no specific treatment indicated. The patient should be encouraged to brush the tongue, because food or debris entrapped in the grooves may act as a source of irritation.

Neville, Damn, Allen, Bouquot. Oral and Maxillofacial Pathology, 2nd Ed. W.B. Saunders Company, 2002. pp. 12-13, 677-78.

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126 Which statement (s) is/are true regarding migratory glossitis (geographic tongue)?

- A. Most cases of migratory glossitis occur due to an allergic reaction to oral medicine.
- B. Patients with psoriasis have a higher incidence of migratory glossitis.
- C. Patients with a fissured tongue often have migratory glossitis as well.
- D. b and c

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126. Answer D. b and c

- b. Patients with psoriasis have a higher incidence of migratory glossitis.
- c. Patients often have a fissured tongue along with migratory glossitis.

Erythema migrans affects 1%-3% of the population. Females are affected more commonly than males 2:1. It is not seen as frequently in cigarette smokers, and there seems to be no significant differences in frequency related to age, oral contraceptive use, presence of allergies, diabetes mellitus, or psychological conditions. Lesions appear as multiple, well-demarcated zones of erythema, concentrated at the tip and lateral borders of the tongue. Lesions are typically asymptomatic; however they may accompany a burning sensation. Patients often have a fissured tongue along with migratory glossitis.

No treatment is indicated for the patients.

Neville, Damn, Allen, Bouquot. Oral and Maxillofacial Pathology, 3rd^d Ed. W.B. Saunders Company, 2009. pp. 679-681.

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127. When considering dental management for a patient with congestive heart failure (CHF), all of the following applies except?

- A. Expect patient to be taking one or a combination of the following medications – loop diuretics (Lasix), thiazide diuretics (HCTZ), ACE inhibitors (the ‘prils’), angiotensin receptor blockers (the ‘sartans’), beta blockers (the ‘lols’ such as Atenolol), or Digoxin
- B. For patients taking digitalis, avoid epinephrine; but if considered essential – use cautiously (.036mg epinephrine)
- C. You may use nonsteroidal anti-inflammatory drugs (long-term)
- D. You may use nitrous oxide/oxygen sedation

127. Answer- C. You may use nonsteroidal anti-inflammatory drugs (long-term)

For patients with symptoms of untreated or uncontrolled HF, defer elective dental care and refer to physician. For patients taking digitalis, avoid epi – if considered essential, then use cautiously (max .036mg.) Nitrous oxide/oxygen sedation may be used with a minimum of 30% oxygen. Avoid the use of NSAIDs (long-term) due to orthostatic hypotension concerns/exacerbation of symptoms associated with HF when combined with ACE inhibitors and Beta blockers. Clinical manifestations of digitalis toxicity include headache, nausea, hypersalivation, altered vision and color perception, fatigue, malaise, arrhythmias (tachycardias or bradycardias). Avoid erythromycin and clarithromycin when patient is taking digitalis since this can lead to an increase in the absorption of digitalis and lead to toxicity. Little J, Falace D, Miller C, Rhodus N. Dental Management of the Medically Compromised Patient – 7th Edition. 2008; 6(85-8)

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128. Sleep apnea patients tend to:

- A. snore loudly
- B. be overweight
- C. have high blood pressure
- D. has some physical abnormality in the nose, throat, or other parts of the upper airway
- E. All the above

128-Answer: E

Resources

- www.sleepapnea.org -- American Sleep Apnea Association
- www.aasmnet.org -- American Academy of Sleep Medicine
- www.sleepfoundation.org -- National Sleep Foundation
- www.nhlbi.nih.gov/sleep -- National Center on Sleep Disorders Research
- www.sleepeducation.com -- Sleep Education from the American Academy of Sleep Medicine

Gender

Sleep apnea is more common in men than in women. Men tend to have larger necks and weigh more than women. However, women tend to gain weight and develop larger necks after menopause, which increases their risk of developing sleep apnea.

Age

Sleep apnea is most common in adults ages 40 - 60 years old. Middle age is also when symptoms are worse. Nevertheless, sleep apnea affects people of all ages.

Race and Ethnicity

African-Americans face a higher risk for sleep apnea than any other ethnic group in the United States. Other groups at increased risk include Pacific Islanders and Mexicans.

Family History

People with a family history of obstructive sleep apnea are at increased risk of developing the condition.

Obesity

Obesity, especially having fat around the abdomen (the so-called apple shape), is a particular risk factor for sleep apnea, even in adolescents and children. However, not all people who are obese have sleep apnea. Specific anatomical and physiological properties in the airways are more likely to be present in obese individuals with apnea.

Physical Characteristics

Large Neck. A large neck (17 inches or greater in men and 16 inches or greater in women) is a risk factor for sleep apnea.

Facial and Skull Characteristics. Structural abnormalities in the face and skull contribute to many cases of sleep apnea.

Smoking and Alcohol Use

Smoking. Smokers are at higher risk for apnea. Those who smoke more than two packs a day have a risk 40 times greater than nonsmokers.

Alcohol. Alcohol use may be associated with apnea. Patients diagnosed with sleep apnea are recommended not to drink alcohol before bedtime.

Medical Conditions Related to Sleep Apnea

Diabetes. Diabetes is associated with sleep apnea and snoring. It is not clear if there is an independent relationship between the two conditions or whether obesity is the only common factor.

Gastroesophageal Reflux Disease (GERD). GERD is a condition caused by acid backing up into the esophagus. It is a common cause of heartburn. GERD and sleep apnea often coincide. Research suggests that the backup of stomach acid in GERD may produce spasms in the vocal cords (larynx), thereby blocking the flow of air to the lungs and causing apnea. Or, apnea itself may cause pressure changes that trigger GERD. Obesity is common in both conditions and more research is needed to clarify the association.

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Polycystic Ovary Syndrome (PCOS). Obstructive sleep apnea and excessive daytime sleepiness appear to be associated with polycystic ovary syndrome (PCOS). About half of patients with PCOS also have diabetes. Obesity and diabetes are associated with both sleep apnea and PCOS and may be the common factors.

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129. There has been a bidirectional link between sleep apnea and obesity. There is another bidirectional link between sleep apnea and diabetes mellitus.

- A. Both statements are true.
- B. The first statement is true. The second statement is false.
- C. The first statement is false. The second statement is true.
- D. Both statements are false

129. A. Both statements are true.

The clinical sequela of untreated and poorly-treated sleep apnea include conditions that are considered components of the metabolic syndrome for which central obesity is one of the major case-defining features. Hence, in this review of obesity and sleep apnea, it is unavoidable to include discussion of sleep apnea and other components of the metabolic syndrome. Proponents of this clinical perspective suggest that there are mutual genetic determinants that give rise to common phenotypic features and allow clustering of sleep apnea with the other components of the metabolic syndrome. Perhaps, the strongest observational evidence to support a link between sleep apnea and obesity is the similarity in age distribution of symptomatic sleep apnea and metabolic syndrome. The putative causal links between sleep apnea and each individual component of the metabolic syndrome have been extensively evaluated and have implicated bidirectional causality in certain metabolic conditions, such as obesity and sleep apnea, sleep apnea and diabetes mellitus, and obesity and diabetes mellitus. These studies collectively suggest that even modest weight loss improves OSA, and positively affects both metabolic and cardiovascular risk profiles.

Yu JC, Berger P 3rd. Sleep Apnea and Obesity. S D Med. 2011; Spec No: 28-34.

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130. Depending on the severity, sleep apnea may be treated by all of the following regimens EXCEPT,

- A. Weight loss to reduce snoring
- B. Sleep aid medication
- C. Nasal decongestion
- D. Positional therapy such as side sleeping and discourage supine sleeping
- E. Positive airway pressure machines, such as CPAP

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130-Correct: B

Weight Loss-About 70 percent of people with obstructive sleep apnea is overweight or obese. Practitioners report striking improvements in both OSA and snoring among patients who lose weight. In some situations a physician may wish to prescribe weight loss medications to an overweight or obese patient with OSA.

Nasal Decongestant is more likely to be effective in cases of snoring or mild sleep apnea. In some cases, surgery is an effective way to improve airflow through the nose.

Positional Therapy-Some people snore or have sleep apnea only when sleeping on their back. Such people can eliminate or reduce airway blockage simply by learning to sleep on their side. The traditional technique to induce side-sleeping is dropping a tennis ball in a sock and then pinning the sock to the back of the pajama top. Positional therapy generally works only in mild cases of OSA. In more severe cases, the airway collapses no matter what position the patient assumes.

Surgery (Adults) Surgery is often effective in treating snoring. It is less effective in treating obstructive sleep apnea. The challenge that confronts the surgeon is determining what part of the upper airway is causing the obstruction to airflow. There are many possible sites, and conventional sleep testing does not identify the area the surgeon should modify. The most common is uvulopalatopharyngoplasty, or UPPP. The success rate of this operation is about 50 percent.

Surgery (Children) Most children with snoring or sleep apnea have enlarged tonsils, or adenoids, or both. In 75 percent of those cases, surgical removal of these tissues cures sleep breathing problems. The American Academy of Pediatrics has endorsed removal of the tonsils and adenoids as the initial treatment of choice for sleep breathing problems in children. There is more information children's sleep apnea and its treatment here.

Oral Appliances Most appliances work by positioning the lower jaw slightly forward of its usual rest position and keep the airway open during sleep. The American Academy of Sleep Medicine has endorsed oral appliance therapy for selected patients with sleep apnea. Many authorities recommend routine assessment for sleep apnea after oral appliance therapy has been applied.

Positive Airway Pressure Devices used for moderate and severe sleep apnea. They have been endorsed by the American Academy of Sleep Medicine. The increased air pressure prevents the sleeper's airway from collapsing. The pressurized air is supplied through a flexible tube from one of several types of machines: CPAP (continuous positive airway pressure), BiPAP (bilevel positive airway pressure), VPAP (variable positive airway pressure), and so on. Studies of the effect of PAP therapy show that OSA patients who consistently use their machines feel better and, as a result of the reduction of apnea and hypopnea episodes during sleep, encounter fewer complications of the disease.

Other Abstinence from alcohol before bedtime is an important part of treating sleep apnea.

American Sleep Apnea Association:

<http://www.sleepapnea.org/diagnosis-and-treatment/treatment-options.html>

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131. In a RDP, which is NOT an indication for using a bar clasps:

- A. when a small degree of undercut (.01in) exists in the cervical 1/3 of the abutment tooth
- B. on abutment teeth for tooth-supported partial dentures or tooth-supported modification areas
- C. in distal extension base situations
- D. in situations in which esthetic considerations must be accommodated and a cast clasp is indicated.
- E. In an area with a large soft tissue undercut

131-Correct=e. In an area with a large soft tissue undercut

“The specific indications for using a bar clasp arm are:

- a. when a small degree of undercut (.01in) exists in the cervical 1/3 of the abutment tooth,
- b. on abutment teeth for tooth-supported partial dentures or tooth-supported modification areas,
- c. in distal extension base situations,
- d. in situations in which esthetic considerations must be accommodated and a cast clasp is indicated.

McCraken's RPD, 11th edition, pg 95-96

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132. What is the most important factor in RDP design?

- a. Type of metal used
- b. Esthetics
- c. Clasp systems that cause least harm
- d. Minor connectors

132. Answer C: Clasp design to cause least amount of harm

Design

Many concepts of partial RDP design have been advocated. Regardless of the concept selected, the operator needs a keen understanding of the requirements placed on fixed retainers. The design should allow the forces developed during placement, removal, and function to be so directed as to cause the least harm to the remaining dentition. The proposed design should be carefully sketched at the initial treatment planning stage. In general, this reveals any existing problems. Each fixed restoration should be designed to be fully compatible with the removable prosthesis while concurrently meeting all criteria to properly fulfill the functional requirements of mastication and facilitating the performance of oral hygiene. Often, decisions made about the path of placement of the partial RDP necessitate removal of additional tooth structure in order to maintain the minimally required material thickness for the fixed prosthesis.

(Rosenstiel, Stephen F. *Contemporary Fixed Prosthodontics, 4th Edition*. C.V. Mosby, 062006, p. 652).

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133. Which of the following is true regarding the Kratochvil infrabulge clasp design?

A. The superior edge of the proximal plate contacts 1 mm of the gingival portion of the guide plane on the tooth. This should approximate the junction of the occlusal and middle thirds of the clinical crown; I-bar tip located .01" undercut on M-D height of contour

B. Proximal plate contacts tooth only at the height of contour for approximately 1 mm occlusal gingival-at occlusal extent of guiding plane. Height of contour should be as occlusally positioned as possible; I-bar tip located at .01" undercut slightly anterior to M-D height of contour

C. Long guide plane; Physiologic relief at framework try-in; I-bar tip located .01" undercut on M-D height of contour

D. The superior edge of the proximal plate contacts 1.5 mm of the gingival portion of the guide plane on the tooth. This should approximate the junction of the occlusal and middle thirds of the clinical crown; I-bar tip located .01" undercut slightly anterior to M-D height of contour

133. C. Long guide plane; Physiologic relief at framework try-in; I-bar tip located .01” undercut on M-D height of contour

A= Krol

B= Demer

Infrabulge clasps:

Kratochvil-Long guide plane; Physiologic relief at framework try-in; I-bar tip located .01” undercut on M-D height of contour

Krol- The superior edge of the proximal plate contacts 1mm of the gingival portion of the guide plane on the tooth. This should approximate the junction of the occlusal and middle thirds of the clinical crown; I-bar tip located .01” undercut on M-D height of contour

Demer- Proximal plate contacts tooth only at the height of contour for approximately 1 mm occlusal gingival-at occlusal extent of guiding plane. Height of contour should be as occlusally positioned as possible; I-bar tip located at .01” undercut slightly anterior to M-D height of contour

Modification of RPI system (RPA clasp) is indicated when bar-type clasp is contraindicated and desirable undercut is located in gingival third of tooth away from extension base area.

Dr. Marks' lecture; "Components of RPD" page 31-3; 08SEP10

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134. Which of the following statements regarding polyvinyl siloxane (PVS) and polyether impression material is *false*?

- A. PVS is considered an addition silicone and results in no by-product formation upon setting.
- B. Of all commonly used impression materials, PVS is least affected by pouring delays, or by second pours, and is still accurate, even when poured 1 week after removal from the mouth.
- C. Polyether exhibits excellent dimensional stability even when pouring is delayed for longer periods of time- it is accurate when poured 1 week after removal from the mouth.
- D. Polyether is hydrophobic, thus impressions should not be stored in a moist environment in order to prevent dimensional alteration.

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134. ANSWER: D. Polyether is hydrophobic, thus impressions should not be stored in a moist environment in order to prevent dimensional alteration.

Rationale:

Polyether is a *hydrophilic* impression material exhibiting excellent accuracy and dimensional stability even upon delayed pouring of 1 week. Due to its hydrophilicity, the material should not be stored in a humid or moist environment. Due to the stiffness of the material, undercuts must be blocked out.

PVS is an addition silicone, and upon setting yields no by-product formation. The material is exceptionally stable, and is accurate, even when poured 1 week after removal from the mouth. Early formations of the material released hydrogen gas from the impression surface, resulting in voids in the surface of the setting stone cast. The addition of palladium to absorb the hydrogen has minimized this problem. In its unaltered form, PVS is hydrophobic. Surfactants can be incorporated into the material to make it less hydrophobic and easier to pour.

Fundamentals of Fixed Prosthodontics, 3rd ed. Shillingburg, pp 299-303.

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135. What gas is produced by the setting reaction of polyvinylsiloxanes?

- a. Carbon
- b. Nitrogen
- c. Hydrogen
- d. Oxygen

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135. Answer: C

Hydrogen gas is a byproduct of the polymerization reaction of PVS. Cross linking occurs between the vinyl terminated polydimethyl siloxane, catalyzed by a platinum salt (chloroplatinic acid). Hydrogen gas is formed because of terminal hydrogen impurities on the polyvinylsiloxane chains. Palladium powder added to the impression material absorbs the gas and eliminates the problem. Pour up should be delayed for an hour to prevent pitting.

Craig R. Review of Dental Impression materials. Adv Dent Res 2(1): 51-64, August 1988

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136. In regards to the characteristics of various impression materials, all of the following statements are true, except

- A. Setting times, from longest to shortest, is polysulfides > silicones > polyethers
- B. Tear strength, from strongest to weakest, is polysulfides > silicones > polyethers
- C. Alginate has a flexibility of 11-15% where as silicone's flexibility is 5%
- D. Dimensional change for silicone (PVS) is 0.5% over 24 hours

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136. Answer – D. Dimensional change for silicone (PVS) is 0.5% over 24 hours

Flexibility for alginate is 11-15%, polysulfide is 7%, silicone is 5%, and polyether is 3%.

Dimensional change for PVS is 0.1% over 24 hours

Tear strength ranking: polysulfides > silicones > polyethers

Setting time ranking: polysulfide > silicones > polyethers

Alginate impression material (Irreversible hydrocolloid) contains the following by wt %:

Sodium alginate – 18% - reacts with calcium, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ – 14%, Diatomaceous earth – 56% - flexibility, potassium sulfate – 10%, trisodium phosphate – 2%

Fixed Long Course Lecture Notes 2011

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137. Which of the following elastomeric impression material is ideal for subgingival preps?

- a. polysulfide
- b. polyether
- c. condensation silicone
- d. addition silicone

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137-Answer: A

Tear strength: Polysulfides > Silicones > Polyethers

Advantages: High tear strength
Easier to pour than other elastomers

Disadvantages: Messy, unpleasant odor
Long setting time

Recommended: Most impressions to be poured within 1 hr; allow 10min to set

Reference: Contemporary Fixed Prosthodontics by Rosenstiel

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138. Which of the following material is the most dimensional stable?

- A. Reversible Hydrocolloid
- B. Irreversible Hydrocolloid
- C. Addition Silicone
- D. Polysulfide

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138. Correct= C. Addition Silicones

Reversible and Irreversible Hydrocolloids have poor dimensional stability. Polysulfides have fair dimensional stability. Addition silicone have excellent dimensionally stability.

Carr A, Brown D, McCracken's Removeable Partial Prosthodontics. 12th edition Mosby 2011 p 221.

Deyton Guy, Impression Material used in Removable and Fix Prosthodontics. Tallgrass Dental Seminars.

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139. All the following are proper procedures to disinfect impression material before sending it to the laboratory, EXCEPT

- A. Rinse off blood, saliva and debris
- B. Disinfect impressions using an intermediate-level, EPA-registered disinfectant for the contact time recommended by the manufacturer (usually about 15 minutes)
- C. Immersing in disinfecting agents such as 1% sodium hypochlorite or 2% potentiated glutaraldehyde or iodophors for up to 1 hour
- D. Sometimes soft, camelhair brushes can help remove debris

139 Correct= C

Table. Impression Materials and Disinfectant Choices.*

Impression Material	Disinfecting Agent
Alginate	iodophors and dilute sodium hypochlorite solutions
Compound	iodophors and dilute sodium hypochlorite solutions
Polyether	iodophors, [#] complex phenolics, [#] and dilute sodium hypochlorite solutions
Polysulfide	iodophors, complex phenolics, ^{\$} and dilute sodium hypochlorite solutions
Reversible Hydrocolloid	iodophors and dilute sodium hypochlorite solutions
Silicone	iodophors, complex phenolics, ^{\$} and dilute sodium hypochlorite solutions
ZOE Impression Paste	iodophors

*Modified from Reference 3.
[#]Use with caution; material is sensitive to immersion. Consult manufacturers' recommendations.
^{\$}Prepared according to the manufacturers' recommendations.

Organization for Safety & Asepsis Procedures. *From Policy to Practice: OSAP's Guide to the Guidelines*. Annapolis, Md: OSAP; 2004.

here are several steps for properly disinfecting dental impressions:¹⁻³

- after removal from the oral cavity, rinse impressions under running tap water and shake gently to remove adherent water; sometimes soft, camel-hair brushes can help remove debris;
- disinfect impressions using an intermediate-level, EPA-registered disinfectant for the contact time recommended by the manufacturer (usually about 15 minutes);
- after the proper exposure time, the impressions are rinsed under running tap water and gently shaken to remove adherent water; and
- Properly disinfected and dried impressions are ready for pouring.

1. Kohn WG, Collins AS, Cleveland JL, et al; Centers for Disease Control and Prevention.

Guidelines for infection control in dental health-care settings – 2003. *MMWR Recomm Rep*. 2003;52(RR-17):1-66. Also available at: <http://www.cdc.gov/mmwr/pdf/rr/rr5217.pdf>. Accessed December 2004.

2. Miller CH, Palenik CJ. *Infection Control and Management of Hazardous Materials for the Dental Team*. 3rd ed. St Louis, Mo: Mosby Year-Book; 2004.

3. Organization for Safety & Asepsis Procedures. *From Policy to Practice: OSAP's Guide to the Guidelines*. Annapolis, Md: OSAP; 2004.

-Disinfection of elastomeric impressions (polysulfide, condensation silicone, addition silicone and polyether) : can be disinfected by immersion in several different types of disinfectants for up to 18 hours without loss of surface quality and accuracy

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-Alginate colloid impressions should be sprayed and immersed in disinfectants as well. The effect of disinfection in 1% sodium hypochlorite or 2% potentiated glutaraldehyde solutions on accuracy and surface quality has been measured after 10-30 min immersion. Statistically significant dimensional changes were observed, however, changes were in the order of 0.1% and the quality of the surface was not impaired. Another study showed immersion in iodophor was best.

Craig's Restorative dental materials 12th Ed, p 174-178

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140. Which could not be the cause of generalized pain on an edentulous ridge of a patient wearing a removable prosthesis?

- A. Malocclusion
- B. Excessive OVD
- C. inaccurate denture base.
- D. resin spicule

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140-Correct=D. Resin spicule

This is directly from the denture manual in the trouble shooting section. A resin spicule would cause localized soreness of the ridges not generalized unless it was really really bad.

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141. Which material for clasp design needs the smallest undercut for retention?

- a. Type IV gold
- b. Base metal
- c. Noble metal

141-Answer: B Base metal

The modulus of elasticity of the base metals is considerably higher than that of a type IV gold alloy. Hence, shallower retentive undercuts, on the order of 0.12 to 0.25 mm (0.005 to 0.010 inch), can be used with the former. Undercuts of 0.25 to 0.50 mm (0.010 to 0.020 inch) can routinely be used with clasps made of either type IV gold or wire.

(Rosenstiel, Stephen F.. *Contemporary Fixed Prosthodontics, 4th Edition*. C.V. Mosby, 062006. p. 655).

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142. In a Kennedy Class III partial denture, which of the following is true?

A. There is a need for indirect retention

B. The abutment teeth will demonstrate approximately 200 μm of intrusion under 4 N of force, as opposed to tissues over edentulous ridges, which will demonstrate up to 500 μm of intrusion under the same amount of force

C. The components necessary in a Kennedy Class III partial denture are: 1) support provided by the rests and 2) connectors (stabilizing components)

D. The support of the removable partial denture by the abutment teeth is dependent on the alveolar support of those teeth, the crown and root morphology, and the rigidity of the partial denture framework and the design of the occlusal rests.

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142- D. The support of the removable partial denture by the abutment teeth is dependent on the alveolar support of those teeth, the crown and root morphology, the rigidity of the partial denture framework and the design of the occlusal rests.

A. There **is no need** for indirect retention

B. The abutment teeth will demonstrate approximately **20 um** of intrusion under 4 N of force, as opposed to tissues over edentulous ridges, which will demonstrate up to 500um of intrusion under the same amount of force

C. The three components necessary in a Kennedy Class III partial denture are support provided by the rests, connectors (stabilizing components), and **retainers**

Removable Partial Prosthodontics; McCracken; 11th Edition; Pages 146-147, 150

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143. Which of the following is *correct* regarding the timing of the retentive and reciprocal arms upon partial denture insertion?

- A. To provide true reciprocation, the reciprocal clasp contacts the tooth simultaneously with the retentive arm.
- B. To provide true reciprocation, the reciprocal clasp should contact the tooth immediately prior to tooth contact by the retentive arm.
- C. To provide true reciprocation, the reciprocal clasp must be in contact during the entire period of retentive arm deformation.
- D. Timing of reciprocal clasp contact with the tooth occurs with consideration for the retentive arm of the clasp assembly on the contralateral side of the arch only.

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143. ANSWER: C. To provide true reciprocation, the reciprocal clasp must be in contact during the entire period of retentive arm deformation.

Rationale:

To provide true reciprocation, the reciprocal clasp must be in contact during the entire period of retentive arm deformation. A stabilizing (reciprocal) clasp arm should be rigid. Therefore it is shaped differently than is the cast retentive clasp arm, which must be flexible. Its average diameter must be greater than the average diameter of the opposing retentive arm, to increase desired rigidity.

McCracken's Removable Partial Prosthodontics, 12th ed. Carr, Brown. pp. 92.

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144. Which statement regarding rest seat design on posterior teeth is INCORRECT?
- A. The occlusal rest seat is triangular, with the base of the triangle located at the marginal ridge and the apex pointing toward the center of the tooth
 - B. The angle formed between the floor of the rest seat and the proximal surface should be less than 90 degrees
 - C. When cutting rest seat preps, undercuts are more likely when using a round bur, vice a tapered cylinder
 - D. Rest seats preps should be completed prior to guide plane preps
 - E. Marginal ridge reduction should be at least 1mm and deeper towards the center of the tooth

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144. Answer: D

Occlusal rest seats should be triangular in shape with the base of the triangle located at the marginal ridge and the apex pointing toward the center of the tooth.

All features of the rest seat should be rounded.

Reduction at the marginal ridge should be at least 1mm, resulting in a rest that is at least 1mm thick at its thinnest point.

The angle formed by the floor of the rest seat and the proximal surface should be less than 90 degrees to avoid an inclined plane situation.

Caution needs to be taken not to create undercuts with a round bur when making rest seat preparations (see pictures).

Guide planes are created prior to rest seat preparation. Cutting a guide plane in the proximal surface would remove part of the rest seat if it is done after rest seat preparation.

Phoenix, Cagna, DeFreest. Stewart's Clinical Removable Partial Prosthodontics. 3rd edition. Pages 293-297.

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145. In determination of OVD and dentures, all of the following are possible techniques except?

- A. Silverman – closest speaking space
- B. Pound – Phonetics and Esthetics
- C. Littleman – Neuromuscular perception
- D. Pleasure – pleasure points
- E. Boos: Bimeter

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145. Correct – C. Littleman – neuromuscular perception

Lytle – not Littleman used neuromuscular perception to determine OVD. With neuromuscular perception – this aids in determining the tentative vertical relation of occlusion for an edentulous patient. A central bearing device is used to permit the patient to experience different vertical relations for comparison. In this way, the tentative vertical relation of occlusion is determined by employing the neuromuscular perception of the patient.

The speaking method of measuring vertical dimension is a physiologic phonetic method which measures vertical dimension by means of the closest speaking space. The same closest speaking space should be reproduced in full dentures as is found in the natural dentition. Boos and the bimeter (which is an oral meter that measures pressure.) With pleasure points – mark two points (one of nose/other on chin), determine RVD (rest vertical dimension), measure existing OVD (occlusal vertical dimension), determine new OVD, repeat until consistent. $OVD = RVD - IRS$ (inter-occlusal rest space)

Comprehensive Complete Denture Manual - Record Bases and Wax Occlusal Rims. NPDS Bethesda MD 2011.

Lytle R. Vertical relation of occlusion by the patient's neuromuscular perception. J Pros Dent 1964; 14(1): 12-21.

Silverman M. The speaking method in measuring vertical dimension. J Pros Dent 1953; 3(2): 193-99.

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146. When making an impression with irreversible hydrocolloid, which of the following statement is true?

- A. Select the largest try that will fit comfortably in the patient's mouth. A greater bulk of material produces a more accurate impression because it has a more favorable surface are/volume ratio and is less susceptible to water loss or gain.
- B. Select a tight fitting tray in which a uniform thin layer of material is used. This produces the most accurate impression.
- C. For optimum results, the teeth should be cleaned and thoroughly dry.
- D. The tray should be removed by teasing or wiggling 2 to 3 minutes after gelation. This will prevent tearing of the impression material.

146. Correct: A

Reference: Contemporary Fixed Prosthodontics by Rosenstiel

All types of trays are capable of producing impressions with clinically acceptable accuracy. . Select the largest try that will fit comfortably in the patient's mouth. A greater bulk of material produces a more accurate impression because it has a more favorable surface are/volume ratio and is less susceptible to water loss or gain.

In contrast, elastomeric impression materials work well with a relatively tightly fitting custom tray in which a uniform thin layer of material is used. This produces the most accurate impression.

Excessively dried tooth surfaces cause the irreversible hydrocolloid impression material to adhere.

Teasing or wiggling the set impression from the mouth causes excessive distortion as a result of viscous flow.

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147. In which of the following situations can an irreversible hydrocolloid NOT be used?
- A. Provisional Crown and Bridge Impression
 - B. Study Models
 - C. Final Impressions when the prep margin is a chamfer.
 - D. All of the above can be impressed.

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147. Correct- D. All of the above.

Irreversible hydrocolloids can be used for preliminary impressions, provisional impressions, study models, opposing dentition, impressions, orthodontic models, sports mouth guards, and even final impressions only when the prep 's margin is a chamfer.

Nandini V, Venkatesh K, Nair K. *Alginate Impressions: A Practice Perspective*. J Conserv Dent.2008 Jan-Mar; 11(1): 37-41.

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148. Alginates, if not poured up immediately, will have a tendency to exhibit syneresis, which is defined as

- A. swelling from absorbing surrounding water
- B. swelling from absorbing surrounding gases
- C. distortion due to exudate or liquid released on the surface
- D. distortion due to hydrogen gas release

148. Correct: C

Gels that are formed with water are hydrophilic (water loving) in character and tend to imbibe large quantities of water if allowed to stand immersed. The imbibition is accompanied by swelling and a change in physical dimensions. When allowed to stand in dry air, the gel loses water to the atmosphere, with an accompanying shrinkage. Such changes may be observed readily in agar or alginate gels.

Syneresis - A characteristic of many gels is to contract on standing in closed containers and to exude or squeeze out some of the liquid phase. This process of accumulating an exudate on the surface is known as syneresis. The degree of attraction forces and the tenacity with which the filaments and fibers of the gel are held together have much to do with syneresis and the extent to which the exudate is formed. In dental impression-taking operations, the formation of exudates by syneresis is troublesome.

Powers and Sakaguchi, Craigs Restorative Dental Materials. 12th edition, p16 and 17.

...Because set irreversible hydrocolloid is largely water, it will readily absorb (by imbibition) as well as give off (by syneresis) liquid to the atmosphere, causing distortion of the impressions. Alginate impressions must therefore be poured immediately.

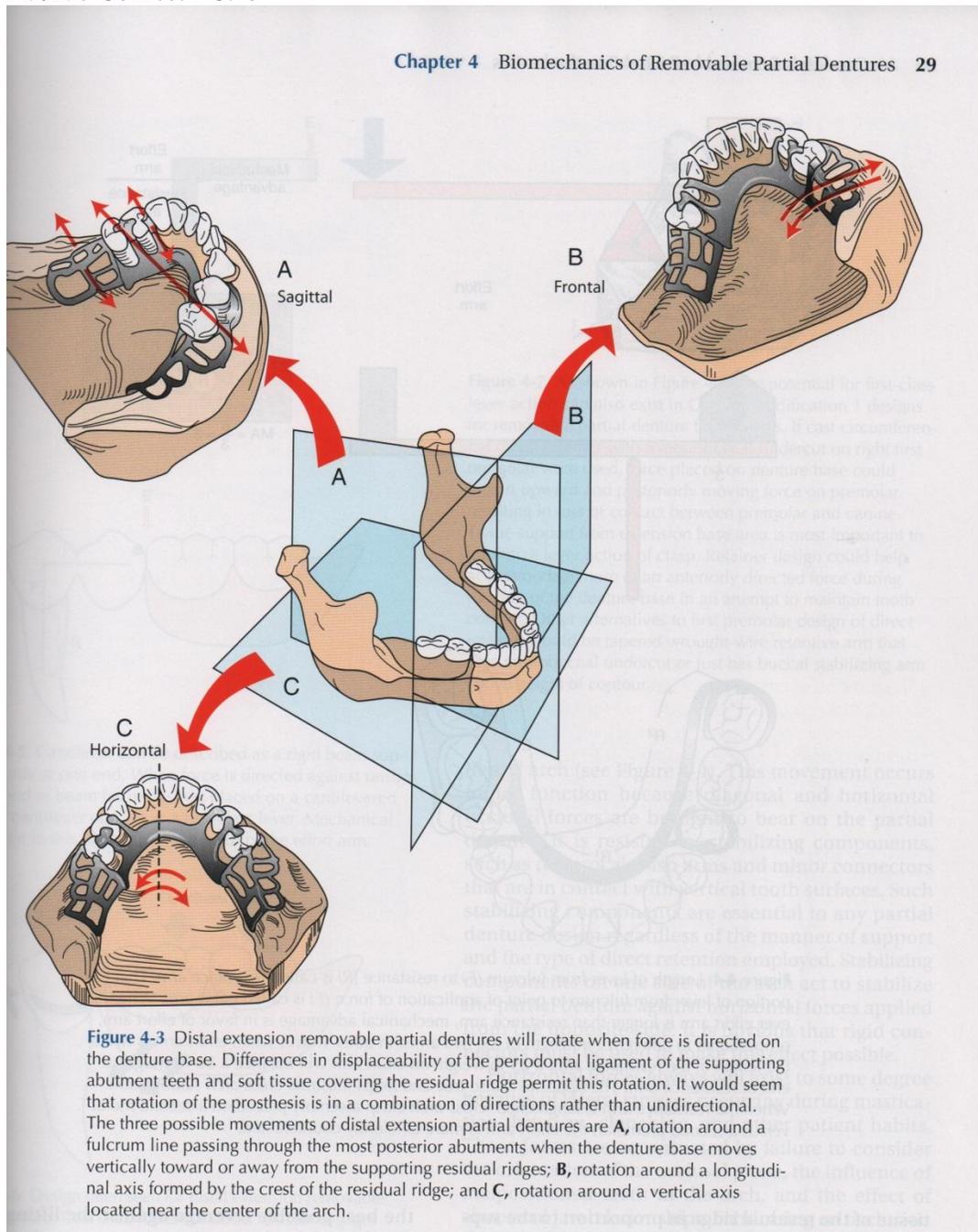
Rosenstiel, Land, Fujimoto. Contemporary Fixed Prosthodontics, 3rd edition, p.26

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149/150. The rotation of a tissue-borne RDP during function is directionally around how many axis?

- a. 1
- b. 2
- c. 3
- d. 4

149/150 Correct= C. 3



McCracken's RPD, 11th edition, pg 29

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151. Bilateral edentulous areas located posterior to the natural teeth is what Kennedy classification?

- a. Class I
- b. Class II
- c. Class III
- d. Class IV

151. Correct =A Class I

KENNEDY CLASSIFICATION

The Kennedy method of classification was originally proposed by Dr. Edward Kennedy in 1925. Like the Bailyn and Skinner classifications, it attempts to classify the partially edentulous arch in a manner that suggests certain principles of design for a given situation (Figure 3-1).

Kennedy divided all partially edentulous arches into four basic classes. Edentulous areas other than those determining the basic classes were designated as modification spaces (Figure 3-2).

The following is the Kennedy classification:

Class I Bilateral edentulous areas located posterior to the natural teeth

Class II A unilateral edentulous area located posterior to the remaining natural teeth

Class III A unilateral edentulous area with natural teeth remaining both anterior and posterior to it

Class IV A single, but bilateral (crossing the midline), edentulous area located anterior to the remaining natural teeth

(Carr, Alan B.. *McCracken's Removable Partial Prosthodontics, 11th Edition*. Mosby, p. 20).

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152. Which of the following is **true** regarding Applegate's Rules for applying the Kennedy Classification?

- A. If a first molar is missing and is not to be replaced, it is not considered in the classification (e.g., if the opposing first molar is likewise missing and is not to be replaced) (Rule 4)
- B. The most posterior edentulous area (or areas) does not determine the classification (Rule 5)
- C. The extent of the modification is not considered, only the number of additional edentulous areas (Rule 7)
- D. There can be modification areas in Class IV arches (Rule 8)

152. Correct-C. The extent of the modification is not considered, only the number of additional edentulous areas (Rule 7)

A. If a **second** molar is missing and is not to be replaced, it is not considered in the classification (e.g., if the opposing **second** molar is likewise missing and is not to be replaced) (Rule 4)

B. The most posterior edentulous area (or areas) **always** determines the classification (Rule 5)

D. There can be **no** modification areas in Class IV arches. **(Other edentulous areas lying posterior to the single bilateral areas crossing the midline would instead determine the classification)** (Rule 8)

Rule 1- Classification should follow rather than precede any extractions of teeth that might alter the original classification

Rule 2- If a third molar is missing and not to be replaced, it is not considered in the classification

Rule 3- If a third molar is present and is to be used as an abutment, it is considered in the classification

Rule 6- Edentulous areas other than those determining the classification are referred to as modifications and are designated by their number

Removable Partial Prosthodontics; McCracken; 11th edition; Page 22

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153. Which of the following combinations represents a tooth-supported removable partial denture?

- A. Kennedy Class I and II
- B. Kennedy Class II and III
- C. Kennedy Class I and IV
- D. Kennedy Class III and IV

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153. Correct: D. Kennedy Class III and IV

Rationale:

Kennedy Class III and IV arches present with edentulous spaces that are bound by teeth- thus are considered tooth-supported, or tooth-borne.

McCracken's Removable Partial Prosthodontics, 12th ed. Carr, Brown. pp. 92.

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- 154. A maxillary arch missing #4, 6, 7, 8,9,10 & 11 would be classified according to Kennedy Classification and Applegate's rules for classifying RPDs?
 - a. Kennedy Class 3, no modification
 - b. Applegate Class 4, modification 1
 - c. Kennedy Class 3, modification 1
 - d. Kennedy Class 4, modification 1
 - e. None of the above

154. Correct- C Kennedy Class 3, modification 1

Kennedy classified partially edentulous arches according to:

- Position
- Number of edentulous area

Purpose of Kennedy classification system.

- Immediate visualization of tooth lost.
- Immediate differentiation between tooth-borne and tissue supported RPDs.
- Communication among dentists and lab.
- Universally understood.

Kennedy (1925)-Applegate

- Class I: Bilateral distal extension
- Class II: A unilateral distal extension
- Class III: A unilateral tooth supported
- Class IV: Anterior edentulous span crossing the midline

Modification Space: additional edentulous areas (tooth bounded)

Applegate's Rules for applying Kennedy's Classification:

Rule 1: Classification should follow rather than precede any extraction of teeth that might alter the original classification

Rule 2: If a third molar is missing and not to be replaced, it is not considered in the classification.

Rule 3: If a third molar is present and is to be used as an abutment, it is considered in the classification.

Rule 4: If a second molar is missing and is not to be replaced, it is not considered in the classification (e.g., if the opposing second molar is likewise missing and is not to be replaced).

Rule 5: The most posterior edentulous area or areas Always determines the class.

Rule 6: Edentulous areas other than those determining the classification are referred to as modifications and are designated by their number.

Rule 7: The extent of the modification is not considered, only the number of additional edentulous areas.

Rule 8: There can be no modification areas in Class IV arches. (Other edentulous areas lying posterior to the single bilateral areas crossing the midline would instead determine the classification).

Ref.:

Lovely, M. **Review of Removable Partial Dentures.** (2005) pp 164.65.

McGivney, G. **McCraken's Removable Partial Prosthodontics.** (2000) pp. 20-21

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155. When discussing Combination Syndrome and complete dentures, all of the following are true, except

- A. Occurs when an edentulous maxilla is opposed by a natural dentition and a mandibular Kennedy Class I RDP
- B. Extrusion/flaring of the mandibular anteriors and papillary hyperplasia are findings
- C. Mandibular bone loss beneath RDP distal extensions
- D. Absorption of maxillary tuberosities with accompanying loss of OVD
- E. Bone loss in maxillary anterior

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155. Correct– D. Absorption of maxillary tuberosities with accompanying loss of OVD

Combination syndrome is a description of a dental condition that is the result of long term use of a few, usually 6 remaining lower anterior teeth, #22-27 and a complete upper denture with no other natural remaining teeth and a mandibular Kennedy class I RDP. The normal biting pressure or forces are directed from the remaining lower teeth and transmitted through the maxillary anterior denture, with resulting resorption of bone and slow auto-rotation and tilting of the denture upward and backward, with the upper anterior teeth becoming less visible and the upper posterior teeth becoming more visible as the denture is rotated from function with bone loss of the pre-maxilla.

There may be seven characteristics associated with this syndrome: 1-Bone loss in the premaxilla 2-Dropping of the posterior maxilla (tuberosities) 3-Extrusion of the lower anterior teeth 4- Posterior bone loss in the mandible under the RDP 5- Papillary hyperplasia of the maxilla 6-Decreased occlusal vertical dimension 7-Facial esthetics often altered dramatically

Comprehensive Complete Denture Manual, Naval Postgraduate Dental School Bethesda MD 2011

<http://www.dr-amet.com/combination%20syndrome.htm>

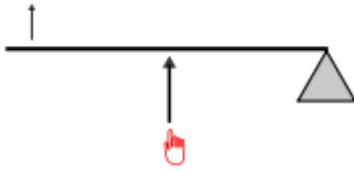
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156. Of the three classes of lever systems, which two are most likely to be encountered in removable partial prosthodontics?

1. A first-class lever is a lever in which the fulcrum is located between the input effort and the output load. The fulcrum may be at the center point of the lever as in a seesaw or at any point between the input and output.
 2. In a second class lever the input effort is located at the end of the bar and the fulcrum is located at the other end of the bar, opposite to the input, with the output load at a point between these two forces.
 3. In third class levers, effort is applied between the output load on one end and the fulcrum on the opposite end.
- a. Answer 1 and 2
 - b. Answer 1 and 3
 - c. Answer 2 and 3
 - d. All of them are encountered in partial denture

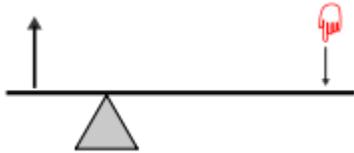
156. Correct: Answer: A Reference: Removable Partial Prosthodontics by Carr

Third-class levers



Class III: (the “fishing pole”) **fulcrum – effort – resistance**
Does not occur in RPD design. TMJ muscles and teeth act as a class III lever

First-class levers

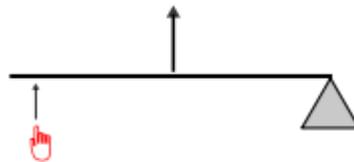


Examples: Seesaw (also known as a teeter-totter)

Class I: (the “see-saw”) **resistance – fulcrum – effort**

KENNEDY CLASS II RPD: resistance is on the contralateral side of the arch from the fulcrum and effort
-resistance is the clasp
-fulcrum is the terminal rest
-effort is downward force on the distal extension
-like KII, where

Second-class levers



Examples: Dental elevator , Nutcracker, Paddle, Wheelbarrow, Bottle opener

Class II: (the “wheelbarrow”) **fulcrum – resistance – effort**

KENNEDY CLASS I RPD: effort is upward force on the distal extension, otherwise the clasp would disengage

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157. Which of the following is true concerning rotational path RDP?

- A. With a category II rdp, seat rest associated with rigid connector 1st and rotate 2nd segment into place
- B. A category I rotational rdp can have lateral paths and is used to replace anterior teeth
- C. A category I rotational path rdp can be AP or PA but will replace posterior teeth
- D. There is only 1 category for a rotational path RDP.

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157. C.

Category I: Characteristics of

- Seat rest associated with rigid connector 1st and rotate 2nd segment into place
- Can be AP or PA but will replace posterior teeth

Category II:

- Lateral paths and AP replacing anterior teeth

Jacobson, T. E. and Krol, A. J. Rotational path removable partial denture design. J Prosthet Dent 48:370-376, 1982.

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158. Advantages of rotational path RPD include all the following except

- a. Minimizes the number of clasps, reducing tooth coverage that may reduce plaque accumulation
- b. It can esthetically restore anterior gingival area with a flange
- c. May prevent further tipping of abutment teeth
- d. Can be used in absence of lingual or facial undercuts

158. Correct: B

Advantages of a Rotational Path RPD

- Minimizes the number of clasps, reducing tooth coverage-may reduce plaque accumulation
- Anterior clasps eliminated for improved esthetics
- May be used in preference to an anterior FPD for better esthetics
- Minimal tooth preparation Vs. FPD or attachments
- Can be used in absence of lingual or facial undercuts
- Distortion of rigid retentive component is unlikely
- May prevent further tipping of abutment teeth

Disadvantages of Rotational Path RPDs

- Adjustment of rigid retentive component is difficult
- Less tolerance of error
- Requires well prepared rest seats
- If anterior flange needed, cannot use with Rotational Path RPD

CAPT Michael Marks, RPD-rotational path

Types of Rotational Path

1. Anterior-Posterior
2. Posterior-Anterior
3. Lateral

Categories of Rotational Path Designs

CAT- I

- Rotational centers located at the termini of the external rests of the rigid retainers
 - Rotational centers on each side of the arch determine the axis of rotation for placement of the RDP
 - Rotation centers are seated first, then the prosthesis is rotated into place
 - *Includes AP and PA rotation replacing posterior teeth*

CAT- II (Dual Path)

- Rotational centers are located at the gingival extensions of the rigid retainers
 - Rotational centers on each side of the arch determine the axis of rotation for final placement of RDP
 - *Includes all AP paths of rotation replacing anterior teeth*
 - *Includes all lateral paths of rotation utilizing proximofacial undercuts*

Carr, McGivney, Brown, "McCracken's removable partial prosthodontics", Eleventh ed, Mosby, 2005.

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160. According to Krol a rotational path RPD is seated in how many segments?

- a. 1
- b. 2
- c. 3
- d. 4

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160. Correct= B: 2

A conventional RPD is seated in a single path of insertion. In a rotational path RPD the segment that contains the centers of rotation is seated first before the RPD is rotated, positioning the second segment to the RPD's final seat. Stated differently, the RPD framework engages desirable proximal undercuts that are essential for retention during the first insertion path. At that point, it rotates, utilizing conventional clasps for additional retention.

Resource: Rotational path removable partial denture: An esthetic alternative
Byron, R. General Dentistry May/June 2007 pg. 245-250

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161. Which of the following is/are false regarding lingualized occlusion and tooth selection?

1. According to Pound and Murrell, use 33° on the maxillary and 20° or 0° teeth on the mandibular
2. When adjusting the mandibular posterior teeth remove the transverse ridges and even out the marginal ridges
3. The compensating curve begins with the first molars, with the distal cusps of the second molars 1.5 mm above the plane of the anteriors and bicuspid
4. All mandibular posteriors are set with 0° mediolateral curve

- A. (1) only
- B. (1) and (2) only
- C. (3) only
- D. (3) and (4)

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161. **Correct=A. (1) only**

1. According to Pound and Murrell, use **33° teeth on the maxillary** and **20° or 0° teeth on the mandibular**
 2. When adjusting the mandibular posterior teeth, remove the transverse ridges and even out the marginal ridges
 3. The compensating curve begins with the first molars, with the distal cusps of the second molars 1.5 mm above the plane of the anteriors and bicuspid
 4. All mandibular posteriors are set with 0° mediolateral curve
- Comprehensive Complete Denture Manual, NPDS Course #252; Page 72-73

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162. When treatment planning for a mandibular RDP lingual bar major connector, the height of the lingual vestibule must measure at least:

- A. 9.0mm
- B. 8.0mm
- C. 6.0mm
- D. 5.0mm

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162. Correct: B. 8.0mm

Rationale:

The superior aspect of the lingual bar must be 4.0mm from the gingival margin of an anterior tooth, and the bar itself should be a minimum of 4.0mm in thickness (inferior-superiorly).

McCracken's Removable Partial Prosthodontics, 12th ed. Carr, Brown.

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163. Which is not a requirement of a properly designed clasp assembly:
- a. Support - against vertical forces
 - b. Encirclement - of more than half its abutment tooth circumference
 - c. Elasticity – flex with equal and opposite forces as the occlusion forces
 - d. Passivity - at rest when seated
 - e. Retention - resist forces in a occlusal direction

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163. Correct=C. Elasticity – flex with equal and opposite forces as the occlusion forces

A **DIRECT RETAINER** (clasp assembly) is a unit of a removable partial denture that engages an abutment tooth in such a manner as to resist displacement of the prosthesis away from basal seat tissues.

It is usually composed of

- a retentive arm,
- a reciprocal (bracing) element or arm,
- a rest and
- a minor connector

Retention is derived by placing a clasp arm into an undercut area so that it is forced to deform upon vertical dislodgment. Resistance of the clasp to deformation generates retention.

Resistance is proportionate to the flexibility of the clasp arm. Non-flexible portions of clasp arms must be placed occlusal to the height of contour (suprabulge area).

REQUIREMENTS OF DIRECT RETAINERS

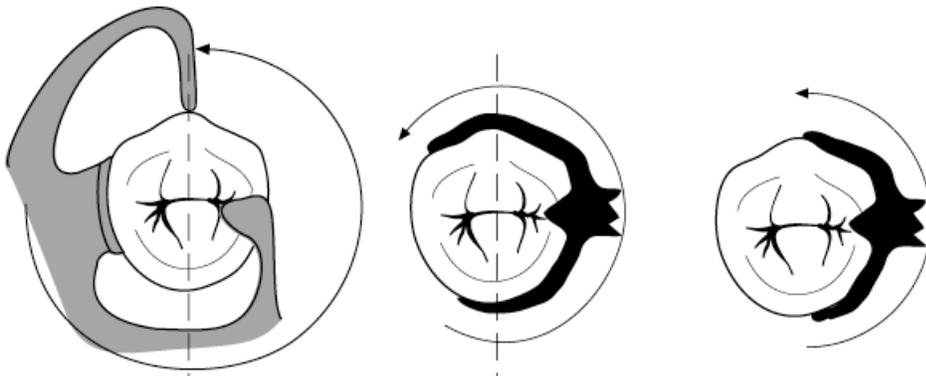
All clasp assemblies should meet the following requirements:

- **Support** - resistance to gingival displacement (occlusal rests)
- **Reciprocity** - resistance to orthodontic movement of teeth using reciprocal arms or elements placed against guiding planes. During placement and removal of the partial denture the retentive arm flexes over the height of contour and generates energy. At this point the rigid reciprocal arm should contact the guiding plane and prevent orthodontic movement from taking place.
- **Stability** - resistance to lateral movement (reciprocal arms, minor connectors)
- **Retention** - retentive arms located in undercuts on the abutments

Encirclement of greater than 180° of the tooth - prevents the prosthesis from moving away from the tooth

- **Passivity** - at rest, a direct retainer should not exert force against a tooth

Wherever possible direct retainers should be selected to fit the existing teeth. This is preferable to preparing teeth to fit a particular clasp design. It may be possible to select a different clasp design to meet the retentive requirements for a partial denture. Nonetheless, judicious tooth preparation should not be avoided at all costs, since it can immeasurably improve prosthesis biomechanics



Ref.:

- Krol A.J.: Clasp Design for Extension Base Removable Partial Dentures. J Prosthet Dent 29:408-415, 1973.*
Demer W.J.: An Analysis of Mesial Rest-I-Bar Clasp Designs. J Prosthet Dent 36:243-253, 1976.
Eliason, C.: RPA Clasp Design for Distal Extension Removable Partial Dentures. J Prosthet Dent 49:25, 1983.
Robert W. Loney: Removable Partial Denture Manual 2008

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164. In designing RDP's and using a surveyor, the following concepts need to be addressed and implemented EXCEPT?

- A. Start with the occlusal plane parallel to the deck (survey table)
- B. Adjust A-P tilt before lateral tilt to improve guide plane undercuts
- C. Height of contours are evaluated and marked with a graphite rod to determine adequate lateral tilt and where blockout might be needed
- D. Proper lateral tilt allows for slightly greater undercuts unilaterally to minimize tooth preparations

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164. Correct-Answer D. Proper lateral tilt allows for slightly greater undercuts unilaterally to minimize tooth preparations

Lateral tilt adjustments allows one to improve on undercuts – ideally want undercuts equal on both sides, same surface on both sides and equal embrasure spaces in the anterior.

Uses of surveyor – determine path(s) of insertion, identify guide planes, locate retentive undercuts and measure depth, and mark the height of contours. A-P tilt is determined first followed by lateral tilt.

How to survey a cast – start with occlusal plane parallel to deck/evaluate existing guide planes – no undercut, too much undercut, find A-P tilt with greatest existing parallelism of the abutments proximal surface. Evaluate existing undercuts – lateral tilt adjustments to improve on undercuts – want equal on both sides. Evaluate interferences – tooth surfaces and boney prominences and consider possible solutions – such as the need to blockout and the need of recontouring.

Marks M. Basic Removable Partial Dentures – Lecture – NPDS Bethesda MD 24AUG2010.

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165. Which of the following statements concerning lingualized occlusion for removable dentures is correct?

1. results in placement of the mandibular teeth lingual to the ridge crests
 2. uses anatomical teeth for the maxillary denture and modified or semi-anatomical teeth for the mandibular denture
 3. cannot be used effectively when a complete denture opposes a Removable Partial Denture (RPD).
 4. used to compensate for prognathism and resorbed maxillary arches resulting in the maxillary teeth being set lingual to the mandibular teeth
 5. concentrates forces of occlusion on lingual cusps of the upper posterior teeth and vertical forces centralized on mandibular teeth
 6. contraindicated for patients with flat ridges that are unable to resist lateral forces
-
- a. 2, 5, 6
 - b. 1, 2, 4, 5
 - c. 2, 3, 5, 6
 - d. 1, 4, 5, 6
 - e. all of the above

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165. Correct- A: 2, 5, 6.

Reference: Textbook of Complete Dentures, Fifth Edition by Lea and Febiger

Lingualized occlusion results when the maxillary lingual cusps are the main functional occlusal elements. The maxillary lingual cusps may oppose mandibular 0° or shallow anatomic or semianatomic teeth in balanced or nonbalanced patterns depending upon the needs of the patient. In the lingualized occlusal scheme, there may be reduced lateral forces directed against the alveolar ridges, but, even though lateral forces have been reduced, they still do exist and therefore lingualized occlusion is not recommended for pts with flat ridges that are unable to resist lateral forces.

The primary goals when selecting occlusion for fabrication of a single complete denture are harmony of the occlusal plane and the modification of the existing occlusal characteristics to seat and stabilize the prosthesis rather than to dislodge it. Attempts are made to direct forces so that they are perpendicular to the bearing position of the ridge; this seats and stabilizes the denture. The types of teeth selected can be 20° versus shallow cusps, 33° versus 20°, 10° or 0° cusps.

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166. Place the following stages of graft healing in order from earliest to latest.
- A. Organic Union, Plasmatic Circulation, Vascularization
 - B. Plasmatic Circulation, Vascularization, Organic Union
 - C. Vascularization, Organic Union, Plasmatic Circulation
 - D. Vascularization, Plasmatic Circulation, Organic Union

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166. Correct= B

1. **Plasmatic circulation:**

1-2 days, graft nourished by diffusion from recipient bed thru fibrin clot

2. **Vascularization:**

2-3 days, capillaries extend into graft and begin anastomosis with graft vasculature. 8 days adequate blood supply to graft is established

3. **Organic union:**

4-10 days – fibrous attachment of graft to recipient bed

Sullivan and Atkins 1967

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167. During the initial stage (24-48HR) of connective tissue graft healing, the graft is nourished by diffusion from recipient bed through the fibrin clot, which is known as

- a. Vascularization
- b. Re-vascularization
- c. Plasma circulation
- d. Plasma diffusion

167. Correct: C

The success of the graft depends on survival of the connective tissue. Sloughing of the epithelium occurs in most cases, but the extent to which the connective tissue withstands the transfer to the new location determines the fate of the graft. Fibrous organization of the interface between the graft and the recipient bed occurs within 2 to several days.

The epithelium undergoes degeneration and sloughing, with complete necrosis occurring in some areas. It is replaced by new epithelium from the borders of the recipient site. A thin layer of new epithelium is present by the fourth day, with rete pegs developing by the seventh day.

The fact that heterotopically placed grafts maintain their structure (keratinized epithelium), even after the grafted epithelium has become necrotic and has been replaced by neighboring areas of nonkeratinized epithelium, suggests that there exists a genetic predetermination of the specific character of the oral mucosa that is dependent on stimuli that originate in the connective tissue. This is the **bases for the technique that uses grafts composed only of connective tissue obtained from areas where it is covered by keratinized epithelium.**

Stages of graft healing

1. Plasmatic circulation 24-48 hours, graft nourished by diffusion from recipient bed through the fibrin clot
2. **Vascularization 2-3 days, capillaries extend into the graft and begin anastomosis with graft vasculature. 8 days adequate blood supply to the graft is established.**
3. Organic union 4-10 days, fibrous attachment of graft to the recipient bed

Sullivan, H., Atkins, J., Free autogenous gingival grafts. I. Principles of successful grafting. Periodontics. 6:5, 1968, 856.

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168. After the connective tissue graft begins to degenerate and necrose, where does the new epithelium proliferate from?

- A. The graft
- B. The recipient site
- C. Both the graft and the recipient site
- D. Neither the graft or the recipient site

168. Correct-B. The recipient site

“The epithelium undergoes degeneration and sloughing, with complete necrosis in some areas. It is replaced with new epithelium from the borders of the recipient site. A thin layer of epithelium is present by the fourth day, with rete pegs developing by the seventh day.”

Carranza's Clinical Periodontology 9th edition, Pg 856

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169. Placement of membranes during GTR favors the repopulation of the area by which type of cells?
- a. Epithelium
 - b. Periodontal ligament
 - c. fibrous tissue
 - c. Blood cells

169. Correct: B. PDL

Guided Tissue Regeneration

The method for the prevention of epithelial migration along the cemental wall of the pocket that has gained wide attention is guided tissue regeneration (GTR). This method derives from the classic studies of Nyman, Lindhe, Karring, and Gottlow and is based on the assumption that only the periodontal ligament cells have the potential for regeneration of the attachment apparatus of the tooth. GTR consists of placing barriers of different types to cover the bone and periodontal ligament, thus temporarily separating them from the gingival epithelium. Excluding the epithelium and the gingival connective tissue from the root surface during the postsurgical healing phase not only prevents epithelial migration into the wound, but also favors repopulation of the area by cells from the periodontal ligament and the bone

(Newman, Michael G. *Carranza's Clinical Periodontology, 10th Edition*. Saunders Book Company, 072006. p. 972).

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170. What is false regarding primary or secondary occlusal trauma?

1. *Primary occlusal trauma* results from excessive occlusal force applied to a tooth or to teeth with unhealthy supporting tissues.

2. *Secondary occlusal trauma* refers to changes that occur when normal or abnormal occlusal forces are applied to the attachment apparatus of a tooth or teeth with adequate supporting tissues.

3. *Primary occlusal trauma* results from excessive occlusal force applied to a tooth or to teeth with normal and healthy supporting tissues.

4. *Secondary occlusal trauma* refers to changes that occur when normal or abnormal occlusal forces are applied to the attachment apparatus of a tooth or teeth with inadequate or reduced supporting tissues.

- A. (1) only
- B. (1) and (2)
- C. (2) only
- D. (3) and (4)

170. Correct-B.

1. *Primary occlusal trauma* results from excessive occlusal force applied to a tooth or to teeth with unhealthy supporting tissues.

2. *Secondary occlusal trauma* refers to changes that occur when normal or abnormal occlusal forces are applied to the attachment apparatus of a tooth or teeth with **adequate** supporting tissues.

3. *Primary occlusal trauma* results from excessive occlusal force applied to a tooth or to teeth with normal and healthy supporting tissues.

4. *Secondary occlusal trauma* refers to changes that occur when normal or abnormal occlusal forces are applied to the attachment apparatus of a tooth or teeth with inadequate or reduced supporting tissues.

Historically trauma from occlusion has been classified as either primary or secondary. *Primary occlusal trauma* results from excessive occlusal force applied to a tooth or to teeth with normal and healthy supporting tissues.

Secondary occlusal trauma refers to changes that occur when normal or abnormal occlusal forces are applied to the attachment apparatus of a tooth or teeth with inadequate or reduced supporting tissues. Recently, the distinction between primary and secondary occlusal trauma has been challenged as meaningless since the changes that occur in the periodontium are similar irrespective of the initial level of periodontal attachment.

S J Davies, R J M Gray, G J Linden & J James Occlusal: Occlusal considerations in periodontics *British Dental Journal* **191**, 597 - 604 (2001) Published online: 8 December 2001

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171. Which of the following bacteria is most commonly associated with pregnancy-associated gingivitis?

- A. *B. forsythus*
- B. *P. gingivalis*
- C. *P. intermedia*
- D. *S. oralis*

171. Correct- *C. P. intermedia*

Rationale:

Pregnancy-associated gingivitis is an acute inflammation of the gingival tissues associated with pregnancy. This condition is accompanied by increases in steroid hormones in crevicular fluid and dramatic increases in the levels of *P. intermedia*, which use the steroids as growth factors.

Newman, Takei, Klokkenvold, Carranza. Carranza's Clinical Periodontology, 10th ed. Saunders Elsevier, 2006.

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172. The following periodontal fibers are most resistant to periodontitis?
- A. Transseptal
 - B. Transgingival
 - C. Intergingival
 - D. Circular

172. Correct -A. Transseptal Fibers

Functions of Collagen fibers

Circular – maintain contour and position of free marginal gingiva

Dentogingival – provide gingival support

Alveologingival – attach gingiva to bone

Periostogingival – attach gingiva to bone

Transseptal – maintain relationships of adjacent teeth and protect interproximal bone

Transgingival – secure alignment of teeth in arch

Interpapillary – provide support for interdental gingiva

Intercircular – stabilize teeth in arch

Intergingival – provide support and contour of attached gingival

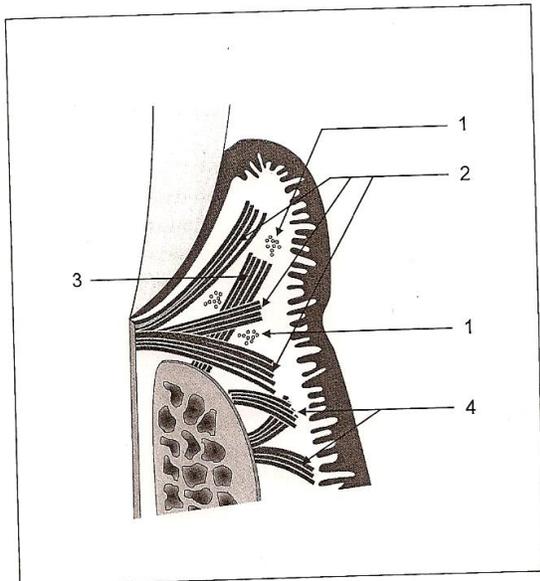


Fig 3-17a Gingival collagen fiber groups in vertical section: (1) circular fibers, (2) dentogingival fibers, (3) alveologingival fibers, and (4) periostogingival fibers.

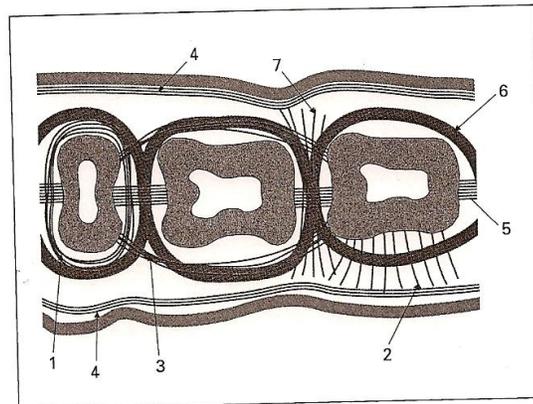


Fig 3-17b Gingival collagen fiber groups in horizontal section: (1) circular fibers, (2) dentogingival fibers, (3) intercircular fibers, (4) intergingival fibers, (5) transseptal fibers, (6) transgingival fibers, and (7) interpapillary fibers.

- 350 human autopsy and surgical specimen
- “Our observations are in agreement with earlier descriptions (Goldman) of the **continual presence of intact transseptal fibers over the crestal alveolar bone**, no matter how severe or advanced the periodontitis lesion or the level of alveolar destruction”
 - Page 538, second paragraph under “Periodontal Ligament”

Moskow B, Polson A. Histologic studies on the extension of the inflammatory infiltrate in human periodontitis. J Clin Periodontol 18:534-542, 1991.=

Carranza’s Clinical Periodontology 10th ed., M. Newman et al . Philadelphia: WB Saunders, 2006

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173. Indications for osseous resective surgery include all of the following, except
- A. Shallow (1-2 mm) 2-walled (crater) intrabony defect
 - B. 3-walled intrabony defect
 - C. 1-walled (hemiseptum) defect normally located interproximally
 - D. Reverse/negative bony architecture

173. Correct-Answer B. 3-walled intrabony defect

3-walled defects have a high success with GTR because more blood supply and more cells are available.

Positive bony architecture is when the crest of the interdental gingival/bone is coronal to its midfacial/midlingual margins

Intrabony defects

1-walled – usually interproximal, not amenable to GTR

2-walled/crater – most common type because bacteria populate interproximal sites more readily

Shallow – 1-2 mm, good for osseous resective surgery

Medium – 3-4 mm, good for GTR

Deep – 5+ mm, good for GTR

3-walled – high success with GTR because more blood supply and more cells available

Circumferential/moat-like – not graftable since blood supply has too far to travel

Inconsistent margins – reverse/negative bony architecture, good for osseous surgery

Interradicular – furcation invasion, Grade I good for osseous surgery and odontoplasty, grad II better served by GTR, Grade III can be maintained, tunneled, or treated by GTR (not ideal)

Contraindications for osseous surgery – esthetic zone/high smile line, 3-walled defects (good for GTR), generalized/advanced bone loss or deep isolated defects (osseous would make these worse), anatomic structures (sinus invasion), history of root sensitivity

During osseous surgery, thickness of bone, sloping of maxilla/mandible, and root trunk lengths will dictate the extent of reduction

Mumford J. The Yin and Yang of Osseous Defect Therapy. Lecture 26OCT2010 NPDS
Bethesda MD

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174. Advantages of laser treatment over the use of a scalpel include:
- A. greater hemostasis
 - B. bactericidal effect
 - C. minimal wound contraction
 - D. all the above

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174. Correct: D

Reference: Clinical Periodontology by Carranza

Advantages of laser treatment are greater hemostasis, bactericidal effect, and minimal wound contraction. The use of lasers has been approved for soft tissue management such as gingivectomy, frenectomy, and removal of melanin pigmentation. When applied to the root surface or alveolar bone, carbonization and major thermal damage have been reported on the target and adjacent tissues.

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175. Which of the following periodontal term is defined as the healing in the area of the root not previously exposed to the pocket after surgical detachment of the tissues or following traumatic tears in the cementum, tooth fractures, or the treatment of periapical lesions?

- A. Regeneration
- B. Reattachment
- C. New Attachment
- D. Repair

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175. Correct- B

Regeneration is the natural renewal of a structure produced by growth and differentiation of new cells and intercellular substances to form new tissues or parts.

New attachment is the embedding of new periodontal ligament into new cementum on the tooth surface previously denuded by disease.

Repair restores the continuity of the diseased gingiva and reestablished the gingival sulcus at the same level on the root as the base of the preexisting periodontal pocket.

Newman M, Takei H, Klokkevold P, Carranza F. Carranza's Clinical Periodontology. Saunders 12th edition. 2012 p 388-390.

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176. Smokers are more susceptible to periodontal disease due to

- A. lower levels of bacterial pathogens such as *B forsythus* or *P gingivalis* in subgingival sites
- B. impaired function of host response in neutralizing infection and overstimulation of host response to destroy surrounding tissue
- C. generally having more periodontal pathogens presents at 70-85% more sites than nonsmokers.
- D. increased amounts of salivary antibodies (immunoglobulin A, or IgA,) and serum IgG antibody response to *Prevotella intermedia* and *Fusobacterium nucleatum*

176. Correct: B

Smoking is known to have a negative influence on connective tissue metabolism and wound healing.

In general, two types of changes in the host response due to smoking could lead to increased periodontal destruction: (1) tobacco smoking could impair the normal function of the host response in neutralizing infection and (2) tobacco smoking could overstimulate the host to destroy the surrounding healthy tissue.

Socransky and Haffajee have now clarified this important relationship by showing that current smokers do not have higher levels of bacterial pathogens such as *B forsythus* or *P gingivalis*, but that the pathogens are found in more subgingival sites than in subjects who never smoked or who stopped smoking. Smokers generally had periodontal pathogens present at 10% to 25% more sites than nonsmokers.

Factors such as smoking and genetic influences on cytokine expression, which are capable of modifying critical aspects of the PMN-antibody protection and/or fibroblast function, alter the protective-destructive balance of the systems.

For example, smokers have decreased amounts of salivary antibodies (immunoglobulin A, or IgA, which is necessary to neutralize bacteria in the mouth) and a decreased serum IgG antibody response to *Prevotella intermedia* and *Fusobacterium nucleatum*.

Smoke exposure may impair the neutrophils' ability to combat periodontal microorganisms.

Wilson, Thomas G.. Fundamentals of Periodontics, 2nd Edition. Quintessence Publishing (IL), 2003.

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177. All of the following are rules that should be followed when placing intracrevicular margins EXCEPT:

- A. If the sulcus probes 1.5mm or less, place the restoration margin 0.5mm below the gingival tissue crest.
- B. If the sulcus probes more than 1.5mm, place the margin one half the depth of the sulcus below the tissue crest.
- C. If a sulcus greater than 2mm is found, evaluate to see if a gingivectomy could be performed to create a 1.5mm sulcus.
- D. All the above are correct.

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177. Correct D. All the above are correct.

1. If the sulcus probes 1.5mm or less, place the restoration margin 0.5mm below the gingival tissue crest. This is especially important on the facial aspect and prevents a biologic width violation in a patient who is at high risk in that regard.
2. If the sulcus probes more than 1.5mm, place the margin one half the depth of the sulcus below the tissue crest. This places the margin far enough below the tissue so that it still is covered if the patient is at higher risk of recession.
3. If a sulcus greater than 2mm is found, evaluate to see if a gingivectomy could be performed to create a 1.5mm sulcus. Then the patient is treated using rule #1.

Carranza's Clinical Periodontology 9th edition, Pg953

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178. Which one of the following does **not** tend to occur when the biologic width is violated by a restoration

- a. Chronic pain
- b. Chronic inflammation
- c. Unpredictable loss of alveolar bone
- d. Enhance crown to root ratio

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178. Correct: D – enhance crown to root ratio

Several clinical studies have demonstrated that the closer a crown margin is to the dentogingival attachment, ie, the deeper into the gingival sulcus the margin is placed, the greater the probability of an inflammatory response, as evidenced by increased gingival plaque, increased bleeding indices, and, with time, the loss of attachment.²⁴²⁻²⁴⁵ A prospective clinical study²⁴⁶ evaluating 480 ceramometal crowns found that the risk of gingival bleeding was related to the baseline oral hygiene index and was twice as high for intrasulcular margins as for supragingival margins. Thus, it is generally accepted that a supragingival crown margin is beneficial for periodontal health. However, an intrasulcular or even subgingival preparation margin is often necessary because of a short clinical crown, cervical or root caries lesions, a coronal fracture, or the need to hide the margin. Maintenance of the 2.0-mm dimension of the dentogingival junction is generally deemed a high-priority condition for biologic health. The assumption is that a violation of the biologic width, especially into the connective tissue attachment, will lead to chronic inflammation and perhaps the loss of attachment, bone resorption, and gingival recession.²⁴⁷

(Summitt, James B. *Fundamentals of Operative Dentistry: A Contemporary Approach, 3rd Edition*. Quintessence Publishing (IL), 012006. p. 27).

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179. Which of the following is **false** relative to biological width, and the dentogingival complex?

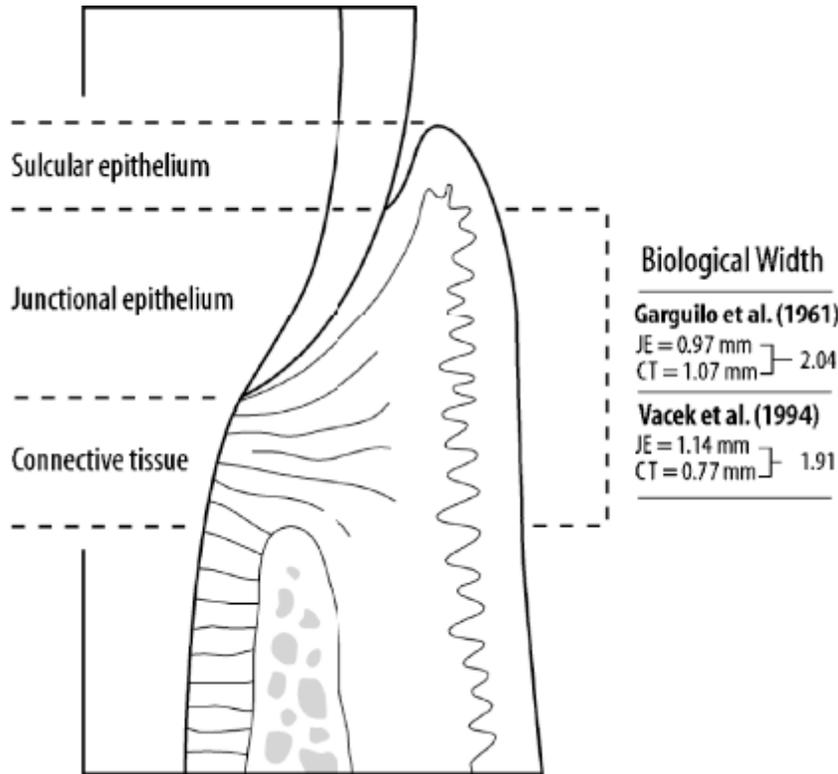
A. The biologic width is defined as the dimension of the soft tissue, which is attached to the portion of the tooth coronal to the crest of the alveolar bone.

B. Regarding overhangs on restorations, the severity of bone loss is directly proportional to the severity of the overhang.

C. Crown lengthening may be accomplished by surgery, by orthodontic forced eruption, or a combination of both.

D. Gargiulo et al. (1961) reported the following mean dimensions: a sulcus depth of 0.97mm, an epithelial attachment of 0.69mm, and a connective tissue attachment of 1.07mm.

179. Correct- D. Gargiulo et al. (1961) reported the following mean dimensions: a sulcus depth of **0.97mm**, an epithelial attachment of **0.69mm**, and a connective tissue attachment of 1.07mm.



“Gargiulo et al. (1961) reported the following mean dimensions: a sulcus depth of 0.69mm, an epithelial attachment of 0.97mm, and a connective tissue attachment of 1.07mm. Based on this work, the biologic width is commonly stated to be 2.04mm, which represents the sum of the epithelial and connective tissue measurements.

One must realize however that significant variations of dimensions were observed, particularly the epithelial attachment, which ranged from 1.0 to 9.0mm. The connective tissue attachment, on the other hand, was relatively constant.

The severity of bone loss was directly proportional to the severity of the overhang.

Oftentimes, failure to perform surgery prior to margin placement in these situations leads to margins placed too near the alveolar crest, thus invading the biologic width space. Therefore, in the early stages of restorative treatment planning, if the clinician believes that the margin of the final restoration will be 3mm from the alveolar bone crest, crown lengthening should be recommended. This can not only be accomplished by surgery but also by orthodontic forced eruption, or a combination of both.”

http://www.endoexperience.com/documents/Biologic_Width.pdf

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180. Which of the following most accurately describes how epithelium that is sloughed and lost during a connective tissue graft is replaced by new epithelial growth?

- A. While undergoing epithelial necrosis, molecular communicative factors from tissue debris stimulate new growth.
- B. Locally accumulated macrophages release growth factors upon phagocytosis that initiate new epithelial regeneration in a process known in histological research communities as squamous poop eating.
- C. Chemotactic initiators from local vasculature induce epithelial growth by diffusion and hydration.
- D. Genetic predetermination of the oral mucosa that is dependent on stimuli that originate in the connective tissue.

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180. Correct: D. Genetic predetermination of the oral mucosa that is dependent on stimuli that originates in the connective tissue.

Rationale:

The fact that heterotopically placed grafts maintain their structure (keratinized epithelium), even after the grafted epithelium has become necrotic and has been replaced by neighboring areas of nonkeratinized epithelium, suggests that there exists a genetic predetermination of the oral mucosa that is dependent on stimuli that originate in the connective tissue. This is the basis for the technique that uses grafts composed only of connective tissue obtained from areas where it is covered by keratinized epithelium.

Newman, Takei, Klokkenvold, Carranza. Carranza's Clinical Periodontology, 10th ed. Saunders Elsevier, 2006.

2012 ABGD Study Guide

181. Which of the following characteristic is false regarding absorbable sutures:
- a. Moderate tissue reaction; poor tensile strength; half-life of 5-6days – chromic gut sutures
 - b. Moderate tissue reaction; poor tensile strength; half-life of 14 days - chromic gut
 - c. Minimal tissue reaction; good tensile strength; half-life of 2-3 weeks; absorbed in 56-70 days – Polyglactin 910 (Coated Vicryl)
 - d. Minimal tissue reaction; fair tensile strength; absorbed in 91-119 days - Poliglecaprone 25 (Monocryl)

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181 Answer: A Moderate tissue reaction; poor tensile strength; half-life of 5-6days – chromic gut sutures is FALSE

Rational:

- a. Moderate tissue reaction; poor tensile strength; half-life of 5-6days – plain gut sutures
- b. Moderate tissue reaction; poor tensile strength; half-life of 14 days - chromic gut
- c. Minimal tissue reaction; good tensile strength; half-life of 2-3 weeks; absorbed in 56-70 days – Polyglactin 910 (Coated Vicryl)
- d. Minimal tissue reaction; fair tensile strength; absorbed in 91-119 days - Poliglecaprone 25 (Monocryl)

Reference:

Louise FR et al., *Periodontics: Medicine, Surgery, and Implants*, pg. 391, Mosby 2004.
Newman et al, Carranza's Clinical Periodontology, 10th ed., Saunders, 2006

2012 ABGD Study Guide

182. When considering endodontic-periodontic lesions, all of the following are true except?
- A. A true combined lesion may mimic (in appearance) a vertical root fracture radiographically
 - B. Pulp and the periodontal ligament communicate via dentinal tubules, lateral/accessory canals and furcal canals
 - C. In addressing a primary endodontic lesion with a secondary periodontal lesion, periodontal treatment is performed first followed by NSRCT
 - D. In a primary periodontal defect with secondary endodontic involvement, expect probing depths wider coronally than apically as well as the perio disease infecting the pulp through lateral and accessory canals

182. Correct C. In addressing a primary endodontic lesion with a secondary periodontal lesion, periodontal treatment is performed first followed by NSRCT

Primary periodontal lesion –

Bacterial plaque in a susceptible host

Probing depth, attachment loss, radiographic bone loss, and bleeding on probing

Sinus tract traces to base of pocket

Vital Pulp

Prognosis depends on periodontal therapy

Primary endodontic lesion –

Non-vital or necrotic pulp

No periodontal etiology

Normal crestal bone level

Lesion traced to apex

Isolated, deep probing in sulcus

Prognosis depends on endodontic therapy

Primary perio with secondary endo involvement –

Probing is wider coronally and tapers apically

Periodontal etiology is present

Perio disease progresses toward apex

Perio disease infects the pulp through apical foramen, lateral or accessory canals

Perio therapy can expose dentinal tubules

Similar to primary endo/secondary perio on radiograph

Mixed pulp tests findings, partial necrosis

Primary endo with secondary perio –

Untreated endodontic problem

Bacterial plaque colonizes root surface

Formation of periodontal pocket

Plaque and calculus present

Requires both endodontic and periodontic therapy

Prognosis depends on periodontic therapy with adequate endodontic therapy

True combined lesion –

Endodontic lesion exists on a tooth that is periodontally involved tooth

Develop independently and meet

Radiographically, similar to vertically fractured tooth

Fracture that has penetrated pulp and causes necrosis is a true combined lesion

Bahrani Y. Periodontic-Endodontic Interrelationships. 31AUG2010 Lecture NPDS Bethesda

MD

2012 ABGD Study Guide

183. Which of the following are true concerning antibiotics used for periodontal disease:
- a. Atridox® is effective because its active ingredient is chlorhexidine
 - b. Arestin is effective because it is a locally delivered, sustained-release form of minocycline microspheres
 - c. Actisite® is effective because its active ingredient is metronidazole
 - d. Periochip® is effective because its active ingredient, tetracycline, is released slowly over a two week period

183. Correct answer: B

Reference: Clinical Periodontology by Carranza

Atridox®: a 10% doxycycline gel syringe system

Actisite® (tetracycline periodontal) periodontal fiber for periodontal pocket placement consists of a 23 cm (9 inch) monofilament of ethylene/vinyl acetate copolymer, 0.5 mm in diameter, containing 12.7 mg of evenly dispersed tetracycline hydrochloride, USP.

Periochip®: a 4X5mm firm gelatin strip impregnated with Chlorhexidine that is inserted into periodontal pockets >5mm. This delivery releases chlorhexidine and maintains drug concentrations in the GCF for at least 7 days. Biodegrades in 7 to 10 days.

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184. Which of the following local delivering devices does not contain any tetracycline or tetracycline derivative?

- A. Arestin
- B. Atridox
- C. Periochip
- D. Periostat

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184. C

Periochip contains Chlorhexidine, the only non-tetracycline derivative.

Arrestin contains minocycline.

Atridox and Periostat contain doxycycline.

Newman M, Takei H, Klokkevold P, Carranza F. Carranza's Clinical Periodontology. Saunders
12th edition. 2012 p 488-489

2012 ABGD Study Guide

185. The FDA approved and ADA accepted antimicrobial agent, Atridox, is
- locally delivered with 10% doxycycline gel using a syringe
 - locally delivered with 10% doxycycline microspheres using a syringe
 - locally delivered with 30% doxycycline gel using a syringe
 - systemically and locally delivered with 10% doxycycline tablet

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185. Correct: A

Atridox is a FDA approved and an ADA accepted antimicrobial agent.

Doxycycline is a broad-spectrum semisynthetic tetracycline.

Doxycycline is bacteriostatic, inhibiting bacterial protein synthesis due to disruption of transfer RNA and messenger RNA at ribosomal sites.

Product	Antimicrobial Agent	Dosage Form	FDA approval (as of 2006)
Actisite	Tetracycline	<i>Nonresorbable</i> fiber	No
Arestin	Minocycline microspheres	Biodegradable powder in syringe	Yes
Atridox	Doxycycline gel	Biodegradable mixture in syringe	Yes
Dentamycin, Perio Cline	Minocycline	Biodegradable mixture in syringe	Yes
Elyzol	Metronidazole gel	Biodegradable mixture in syringe	No
PerioChip	Chlorhexidine gelatin	Biodegradable device	Yes

Newman, Takei, Carranza. Carranza's Clinical Periodontology, 9th edition. p 806-809

2012 ABGD Study Guide

186. Once Actisite tetracycline fiber is packed into a periodontal pocket a sustained dosage of 1300 $\mu\text{g}/\text{ml}$ is sustained, well beyond the 32-64 $\mu\text{g}/\text{ml}$ required to inhibit the growth of pathogens. In contrast, crevicular fluid concentrations of 2000 to 2200 $\mu\text{g}/\text{ml}$ are reported after systemic administration of tetracycline of 250mg qid.

- A. Both statements are true
- B. Both statements are false
- C. The first statement is true and the second is false
- D. The first statement is false and the second is true

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186. Correct-C. The first statement is true and the second is false

Once Actisite tetracycline fiber is packed into a periodontal pocket a sustained dosage of 1300 µg/ml is sustained, well beyond the 32-64µg/ml required to inhibit the growth of pathogens. In contrast, crevicular fluid concentrations of 4 to 8µg/ml are reported after systemic administration of tetracycline of 250mg qid. Carranza's Clinical Periodontology 9th edition, Pg 682

2012 ABGD Study Guide

187. Chlorohexidine has an immediate bacteriocidal effect but has a prolonged bacteriostatic effect and inhibits the formation of plaque by what mechanism?

- a. Positive charge
- b. Adsorption to pellicle
- c. Adsorption to cementum
- d. Sticky consistency

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187. Correct -B: Adsorption to pellicle

Chlorohexidine is often used as an active ingredient in mouthwashes because it is able to reduce dental plaque and oral bacteria. It has been shown to have an immediate bacteriocidal effect and a prolonged bacteriostatic effect due to the adsorption onto the pellicle-coated enamel surface. This ability is partly due to its inherent negative charge.

Reference: Jenkins, S. "The mechanism of action of chlorohexidine. A study of plaque growth on enamel inserts in vivo" J. Clinic Periodontology 415-424 1988

2012 ABGD Study Guide

188. Which of the following is false regarding Triclosan?

- A. It is regarded as an antibacterial agent in the Pharmacologic Category
- B. It is used in the prevention of dental caries and gingivitis
- C. To provide a longer retention time of the triclosan in plaque, a polymer has been added to the toothpaste vehicle
- D. There is no generic form available

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188. Correct=B- It is used in the prevention of **dental caries** and gingivitis-**when combined with fluoride**

A. It is regarded as an antibacterial agent in the Pharmacologic Category

B. It is used in the prevention of dental caries and gingivitis

C. To provide a longer retention time of the triclosan in plaque, a polymer has been added to the toothpaste vehicle- **Polymer= PVM/MA-polyvinylmethyl ether/maleic acid copolymer**

D. There is no generic form available

Wynn RL, et.al.; Drug information handbook for dentistry; 13th edition; Page 1616

2012 ABGD Study Guide

- 189.** The prevalence of cervical enamel projections are highest for which of the following teeth?
- A. Mandibular and maxillary second molars
 - B. Mandibular and maxillary first molars
 - C. Mandibular first molars and maxillary second molars
 - D. Mandibular second and maxillary first molars

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189. Correct: A. Mandibular and maxillary second molars

Rationale:

Cervical enamel projections (CEPs) are reported to occur on 8.6% to 28.6% of molars. The prevalence is highest for mandibular and maxillary second molars. These projections can affect plaque removal, complicate scaling and root planing, and may be a local factor in the development of gingivitis and periodontitis.

Grade I: The enamel projection extends from the CEJ toward the furcation entrance

Grade II: The enamel projection approaches the entrance to the furcation. It does not enter the furcation, therefore there is no horizontal component.

Grade III: The enamel projection actually extends horizontally into the furcation.

Newman, Takei, Klokkenvold, Carranza. Carranza's Clinical Periodontology, 10th ed. Saunders Elsevier, 2006.

2012 ABGD Study Guide

190. The following statements are true regarding Metronidazole:

- A. It is bacteriocidal
- B. Used in treating periodontitis associated with *A. actinomycetemcomitans*
- C. Possible side effects include metallic taste and xerostomia
- D. Pt should avoid alcohol during usage
- E. a,b,c
- F. All of the above

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190. Correct: F. All of the above

Metronidazole is a bacteriocidal antibiotic that can be used for treating periodontitis associated with *A. actinomycetemcomitans*.

Less than 1% of patients report xerostomia and a metallic taste. Patients should avoid alcohol-containing food or drinks during therapy and for 72 hours following discontinuation; metronidazole inhibits ethanol's usual metabolism and may cause a disulfiram-like reaction. (Symptoms include flushing of the skin, accelerated heart rate, shortness of breath, nausea, vomiting, throbbing headache, visual disturbance, mental confusion, postural fainting, and circulatory collapse.)

References:

von Troil-Linden B, Alaluusua S, Wolf J, Jousimies-Somer H, Torppa J, Asikainen S. Periodontitis patient and the spouse: Periodontal bacteria before and after treatment. *J Clin Periodontol* 1997;24:893-899.

Winkel EG, Van Winkelhoff AJ, Timmerman MF, Vangsted T, Van der Velden U. Effects of metronidazole in patients with "refractory" periodontitis associated with *Bacteroides forsythus*. *J Clin Periodontol* 1997;24:573-579.

2012 ABGD Study Guide

191. When discussing the bacteria associated with periodontal diseases, all of the following associations are true, except

- A. Pregnancy gingivitis is associated with high levels of *Prevotella intermedia* (Pi)
- B. As chronic periodontitis progresses, the plaque microflora becomes more anaerobic, Gram -, motile, and inflammatory consequences intensify
- C. Aggressive periodontitis has a strong association with Aa
- D. The red complex (most pathogenic) in relation to chronic periodontitis, includes *Porphyromona gingivalis*, *Treponema denticola* and *Fusobacterium nucleatum*

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191. Correct- D. The red complex (most pathogenic) in relation to chronic periodontitis, includes Porphyromona gingivalis, Treponema denticola and Fusobacterium nucleatum

Minah G. Microbiology Lecture 15Feb2011 – Microbiology of Periodontal Diseases.

The most pathogenic cluster, the red complex, is comprised of Porphyromonas gingivalis, Treponema denticola and Tannerella forsythia.

Aggressive periodonitis are periodontal diseases which occur in individuals younger than 30 years of age and show rapid attachment loss, some familial associations, and disease severity which is inconsistent with microbial deposits and frequent association with Aa.

There is a correlation between elevated proportions of anaerobic bacteria with high levels of Prevotella intermedia in crevicular plaque. Findings suggest that increased hormones in the GCF may be ecological determinants of Pi – nutrients that stimulate growth rate. Sex hormones can directly or indirectly intensify inflammation

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192. List, in order, the steps to perform the Modified Widman flap technique:

1. Incision is an internal bevel incision to the alveolar crest starting 0.5 to 1mm away from the gingival margin.
2. The gingival is reflected, leaving a wedge of tissue of tissue still attached by its base.
3. A crevicular incision is made from the bottom of the pocket to the bone.
4. An incision is made in the interdental spaces coronal to the bone with a curette. Tissue tags and granulation tissue are moved with a curette. Root surfaces are scaled and planed.
5. The flaps may be thinned to allow for close adaptation of the gingival around the entire circumference of the tooth and replaced in its original position.

- A. 3, 1, 2, 4, 5
- B. 1, 2, 3, 4, 5
- C. 3, 4, 1, 2, 5
- D. 1, 2, 5, 3, 4

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192-Answer: B

Reference: Clinical Periodontology by Carranza

Initial incision is an internal bevel incision to the alveolar crest starting 0.5 to 1mm away from the gingival margin. The gingival is reflected, leaving a wedge of tissue still attached by its base. A crevicular incision is made from the bottom of the pocket to the bone. After the flap is reflected, a third incision is made in the interdental spaces coronal to the bone with a curette. Tissue tags and granulation tissue are moved with a curette. Root surfaces are scaled and planed. The flaps may be thinned to allow for close adaptation of the gingival around the entire circumference of the tooth and replaced in its original position. Interrupted direct sutures are placed in each interdental space.

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193. Which of the following statements about papilla preservation flaps is false?
- A. The papilla preservation flap should be used for narrow interdental spaces.
 - B. A crevicular incision around each tooth is made with no incisions across the interdental papilla.
 - C. The Orban knife is used to sever 1/2 to 2/3 of the base of the interdental papilla.
 - D. The flap is reflected without thinning the tissue.

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193. Correct- A.

The papilla preservation flap cannot be used if the interdental space is narrow. There must be adequate space to allow for intact papilla to be reflected with a facial or lingual/palatal flap.

Newman M, Takei H, Klokkevold P, Carranza F. Carranza's Clinical Periodontology. Saunders 12th edition. 2012 p 568

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194. Vertical releasing incisions are indicated in all the following, except

- A. extending beyond the mucogingival line, reaching the alveolar mucosa
- B. at the line angles of the tooth and should include the entire papilla or none at all
- C. designed to avoid short flap (mesial distally) that is long apical-gingival flap
- D. At both ends if the flap is apically displaced.

194. Correct- C-short flaps (M-D) should be avoided because it could jeopardize blood supply to the flap.

Vertical or oblique releasing incisions can be used on one or both ends of the horizontal incision, depending on the design and purpose of the flap. Vertical incisions at **both ends are necessary if the flap is to apically displaced**. Vertical incisions **must extend beyond the Mucogingival line**, reaching the alveolar mucosa, to allow for the release of the flap to be displaced.

In general, vertical incisions in the lingual and palatal areas are avoided. **Facial vertical incisions should not be made in the center of an interdental papilla or over the radicular surface of a tooth.**

Incisions should be made **at the line angles of a tooth** either to include the papilla in the flap or to avoid it completely. The vertical incision should also be designed so as to avoid short flaps (mesiodistal) with long, apically directed horizontal incisions because these could jeopardize the blood supply to the flap.

Several investigators proposed the so-called interdental denudation procedure, which consists of horizontal, internal bevel, nonscalloped incisions to remove the gingival papillae and denude the interdental space. This technique completely eliminates the inflamed interdental areas, which heal by secondary intention, and results in excellent gingival contour. It is contraindicated when bone grafts are used.

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195. The following are indications to extrude a tooth except?
- A. To gain adequate biologic width
 - B. To level the free gingival margin of teeth
 - C. To reduce a vertical bony defect
 - D. To prepare a site for an immediate implant
 - E. All of the above are indications for extrusion

195. **Correct=E.** All of the above are indications for extrusion

BENEFITS OF ORTHODONTICS FOR A PERIODONTAL PATIENT

Orthodontic therapy can provide several benefits to the adult periodontal patient. The following six factors should be considered:

1. Aligning crowded or malposed maxillary or mandibular anterior teeth permits the adult patient better access to adequately clean all surfaces of their teeth. This could be a tremendous advantage for patients who are susceptible to periodontal bone loss or do not have the dexterity to adequately maintain their oral hygiene.
2. Vertical orthodontic tooth repositioning can improve certain types of osseous defects in periodontal patients. Often, the tooth movement eliminates the need for resective osseous surgery.
3. Orthodontic treatment can improve the esthetic relationship of the maxillary gingival margin levels before restorative dentistry. Aligning the gingival margins orthodontically avoids gingival recontouring, which potentially could require bone removal and exposure of the roots of the teeth.
4. The *fourth* benefit of orthodontics is for the patient who has suffered a severe fracture of a maxillary anterior tooth, which requires forced eruption to permit adequate restoration of the root. In this situation, erupting the root allows the crown preparation to have sufficient resistance form and retention for the final restoration.
5. Orthodontic treatment allows open gingival embrasures to be corrected to regain lost papilla. If these open gingival embrasures are located in the maxillary anterior region, they can be unaesthetic. In most patients, these areas can be corrected with a combination of orthodontic root movement, tooth reshaping, and/or restoration.
6. Orthodontic treatment could improve adjacent tooth position before implant placement or tooth replacement. This is especially true for the patient who has been missing teeth for several years and has drifting and tipping of the adjacent dentition.

Carranza's Clinical Periodontology 9th edition, Pg704-705

2012 ABGD Study Guide

196. When used in GBR/GTR BMP's stimulate the differentiation of what type of cells to form chondroblasts and osteoblasts?

- a. Mesenchymal cells
- b. Endocrine cells
- c. Endothelial cells
- d. Endoderm
- e. Ectoderm

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196. Correct A: Mesenchymal cells

Bone morphogenetic proteins (BMP) are a group of regulatory glycoproteins that are members of the TGF- β superfamily. These molecules primarily stimulate differentiation of mesenchymal stem cells into chondroblasts and osteoblasts.

(Rose, Louis F.. *Periodontics: Medicine, Surgery and Implants*. Mosby, 072004. p. 598).

2012 ABGD Study Guide

197. Which of the following has been used to induce root surface biocompatibility and enhance cellular response?

- A. Fibronectin
- B. Laminin
- C. Tetracycline
- D. A and C only
- E. All of the above

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197. Correct-E. Which of the following has been used to induce root surface biocompatibility and enhance cellular response?

- A. Fibronectin
- B. Laminin
- C. Tetracycline
- D. A and C only
- E. All of the above**

<http://faculty.ksu.edu.sa/anil/Publications/061/BISP151992.pdf>

Fibronectin (FN) is a high molecular weight glycoprotein which is widely distributed throughout the body, and is found in the soluble form in plasma and in an insoluble form in connective tissue matrices¹⁸.

Fibronectin mediates cellular adhesion and spreading, and promotes cell motility during embryogenesis and wound healing. Fibronectin act as a non specific opsonin Terranova and Martin¹⁹ first investigated Fibronectin as an aid in treating human periodontitis and showed that attachment of fibroblast to root surface was improved significantly using exogenous fibronectin. The combined used of citric acid and fibronectin resulted in a significantly longer connective tissue reattachment than did either agent applied by itself in the treatment of periodontitis^{20,21}.

Primary results have been shown with the use of fibronectin both in animals and humans. However more data should be available before this procedure could be recommended as a routine approach to therapy.

2. LAMININ

Laminin has been demonstrated to be a potent chemo-attractant for gingival epithelium as were types IV collagen and epidermal growth factor^{22, 23}.

3. TETRACYCLINE

Another approach for enhancing the regenerative response of connective tissue to root surface is to increase the number of binding sites for the polypeptides. It has been noted that root surface conditioning with tetracycline results in an increased number of binding sites for fibronectin²⁴. Another beneficial effect of tetracycline conditioning was that the drug was released in a biologically active concentration for 48 hrs. after application. The results of the study of Caffey et al²⁵ showed that the periodontal ligament response was similar or superior to that obtained with citric acid, but root resorption and ankylosis were commonly noted. They used one percent tetracycline solution for 5 minutes to the defects and block sections were removed for histological evaluation at 3 months post treatment. Further evaluation of tetracycline root surface conditioning in combination with other agents was certainly needed.

2012 ABGD Study Guide

198. Which of the following factors is believed to most significantly influence the development of plaque-induced gingivitis?

- A. Elevated hormone levels
- B. Poor oral hygiene
- C. Cardiovascular disease
- D. Low socioeconomic status

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198. Correct : B. Poor oral hygiene

Rationale:

Because bacterial plaque is the cause of the most common form of gingivitis, factors that influence the oral hygiene status of individuals would likely influence the prevalence of gingivitis. Poorer oral hygiene may also explain the higher prevalence of gingivitis among adolescents and males. Even though the increased levels of circulating sex hormones have been implicated in the higher prevalence, the influence of plaque control on gingivitis may be more important than the rising levels of hormones.

Newman, Takei, Klokkenvold, Carranza. Carranza's Clinical Periodontology, 10th ed. Saunders Elsevier, 2006.

2012 ABGD Study Guide

199. What perio exam criteria identify a tooth as hopeless?

- A. tooth mobility with slight bone loss
- B. tooth mobility with advanced bone loss
- C. grade II furcation involvement
- D. grade III furcation involvement only

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199. Correct = B. tooth mobility with advanced bone loss

Reference: M. Newman, DDS, H. Takei, DDS, MS, F. Carranza, Dr Odont, “Carranza’s Clinical Periodontology”, Ninth edition, 2002

Prognosis	Bone loss	Tooth mobility	Furcation involvement	Patient cooperation	Systemic/environmental
Excellent	none	none	none	good	none
Good	slight	none	none	adequate	controlled
Fair	<adequate	slight	Grade I	acceptable	limited
Poor	Mod-adv	Mod	Grade II	doubtful	impacting
Questionable	Advanced	Advanced	Grade III	Too late	impacting
Hopeless	Advanced	Advanced	Grade III	Too late	uncontrolled

Excellent prognosis:

No bone loss, excellent gingival condition, good patient cooperation, no systemic/environmental factors

Good prognosis: One or more of the following

Adequate remaining bone support, adequate possibilities to control etiologic factors and establishes a maintainable dentition, adequate patient cooperation, no systemic/environmental factors or if systemic factors are present, they are well controlled

Fair prognosis: One or more of the following

Less than adequate remaining bone support, some tooth mobility, **grade I furcation involvement**, adequate maintenance possible, acceptable patient cooperation, presence of limited systemic/environmental factors

Poor prognosis: One or more of the following

Moderate to advanced bone loss, tooth mobility, **grade I and II furcation involvements**, difficult to maintain areas and/or doubtful patient cooperation, presence of systemic/environmental factors

Questionable prognosis: One or more of the following

Advanced bone loss, **grade II and III furcation involvements**, tooth mobility, inaccessible areas, presence of systemic/environmental factors

Hopeless prognosis: One or more of the following

Advanced bone loss, non-maintainable areas, extraction (s) indicated, presence of uncontrolled systemic/environmental factors

2012 ABGD Study Guide

200. All of the following statements are true regarding connective tissue grafts healing in a normal healthy individual, except?

- A. Revascularization of the graft starts by the second or third post-op day
- B. During the first day, the CT becomes edematous/disorganized but as healing progresses – degenerated CT is replaced by new granulation tissue
- C. Functional integration of the graft occurs by the 20th post-op day
- D. By day four (4), a thin layer of epithelium is present at the edges of the recipient site

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200. Correct C. Functional integration of the graft occurs by the 20th post-op day
Functional integration of the graft occurs by the 17th post-op day

Carranza F, Newman M. *Clinical Periodontology* – 8th Edition. 1996; 59(657-59)

The graft is initially maintained by a diffusion of fluid from the host bed, adjacent gingiva, and alveolar mucosa. During the first day, the connective tissue becomes edematous and disorganized and undergoes degeneration and lysis of some of its elements. As healing progresses, the edema is resolved, and degenerated CT is replaced by new granulation tissue. Revascularization of the graft starts by the second or third day. Capillaries from the recipient bed proliferate into the graft to form a network of new capillaries. Necrotic tissue is replaced by new epithelium from the borders of the recipient site. A thin layer of new epithelium is present by the fourth day, with rete pegs developing by the seventh day. At the time of transplantation, the graft vessels are empty, and the graft is pale. The pallor changes to an ischemic grayish white during the first 2 days until vascularization begins, after which a pink color appears. The plasmatic circulation accumulates and causes softening and swelling of the graft, which are reduced when the edema is removed from the recipient site by the new blood vessels. Loss of epithelium leaves the graft smooth and shiny. Functional integration of the graft occurs by the 17th day, but the graft will be morphologically distinguishable from the surrounding tissue for months.

2012 ABGD Study Guide

201. Tarnow related the presence or absence of the papilla between two teeth is determined by the distance from the crest of bone to the contact point. Which of the following statement is incorrect?

- A. When the distance was 5 mm or less, the papilla completely filled this space approximately 100% of the time.
- B. A small difference of 1 mm was clinically significant.
- C. When the distance was 6 mm, the interdental space filled about 55% of the time.
- D. When an implant is placed adjacent to a tooth, a greater than 5 mm distance between the contact point and the crest of the bone is recommended for the papilla to completely fill this space.

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201. Correct: D

Reference: Vertical Distance from the Crest of Bone to the Height of the Interproximal Papilla Between Adjacent Implants by Tarnow

A clinical study related the presence or absence of the papilla between two teeth to the distance from the crest of bone to the contact point between the teeth. When this distance was 5 mm or less, the papilla completely filled this space approximately 100% of the time. When the distance was 6 mm, the interdental space filled about 55% of the time.

When an implant is placed adjacent to a tooth, a <5 mm distance between the contact point and the crest of bone shows similar results regarding presence or absence of papilla to that between two adjacent teeth.

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202. An implant must be placed ____ from a natural tooth or ____ from another implant?

- A. 3 mm, 1.5 mm
- B. 3 mm, 3 mm
- C. 1.5 mm, 1.5mm
- D.1.5 mm, 3 mm

202. Correct-D

An implant fixture must be placed 1.5mm from a natural tooth and 3.0mm.

Newman M, Takei H, Klokkevold P, Carranza F. Carranza's Clinical Periodontology. Saunders
12th edition. 2012 p 627-629.

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203. Cross-cut fissured burs are designed to do all the following except

- A. increase cutting efficiency
- B. plane the tooth surface
- C. cutting dentin and enamel
- D. remove old restorations

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203-Correct=B

It does not plane tooth surfaces due to the horizontal ridges that it leaves

Cross-Cut Fissure are primarily effective for cutting dentin at slow speeds, although in their carbide form at a high speed they effectively reduce enamel and dentin. To prevent fracture the blades are more blunt and the cross grooves less deep than with a steel bur. Steel blades are more fragile and thin than carbide blades, yet their thin cutting edges enable them to shave away dentin better than their carbide counterpart.

Baum, Lloyd. Textbook of Operative Dentistry, 3rd Edition, 1995

Cross-cut or dentate burs are employed for removal of old restorations, but the horizontal ridges they leave on tooth structure make them unacceptable for planning tooth surfaces.

Shillingburg, H. Fundamentals of Fixed Prosthodontics, 3rd Ed. 1997

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204. The metal component of an admixed amalgam is produced by:
- A. Lathe cutting an ingot of alloy
 - B. The alloy is melted and then sprayed under high pressure
 - C. Both A and B
 - D. Neither A or B

204. Correct= C. Both A and B

“High copper alloys contain either spherical particles or a mixture of irregular and spherical particles (admix)”

Powers, et al. Craig’s Restorative Dental Materials. 12th ed, Pg 227

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205. Condensing amalgam with a larger diameter nib as compared to a small diameter nib requires?
- a. More condensation force
 - b. Less condensation force
 - c. Same condensation force

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205. Correct: A More pressure

Each condensing stroke should overlap the previous condensing stroke to ensure that the entire mass is well condensed. The condensation pressure required depends on the amalgam used and the diameter of the condenser nib. Condensers with larger diameter nibs require greater condensation pressure. The preparation should be overpacked 1 mm or more using heavy pressure; this ensures that the cavosurface margins are completely covered with well-condensed amalgam. Final condensation over cavosurface margins should be done perpendicular to the external enamel surface adjacent to the margins.

(Roberson, Theodore. *Sturdevant's Art and Science of Operative Dentistry, 5th Edition*. C.V. Mosby, 042006. p. 724).

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206. Excessive trituration should be avoided because:

1. It generates heat and creates an inadequate matrix in the microstructure of the resulting set material
2. It will set prematurely after trituration
3. It prevents adequate condensation and adaptation to the walls of the preparation,
4. It will result in a weakened restoration.

- A. (1) and (3)
- B. (1) and (4)
- C. (2), (3), and (4)
- D. All of the above

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206. Correct- C. Excessive trituration should be avoided because:

1. It generates heat and creates **an inadequate** matrix in the microstructure of the resulting set material
2. It will set prematurely after trituration
3. It prevents adequate condensation and adaptation to the walls of the preparation,
4. It will result in a weakened restoration.

A. (1) and (3)

B. (1) and (4)

C. (2), (3), and (4)

D. All of the above

“The duration and speed of trituration should be just enough to coat all alloy particles with mercury, produce the amalgam matrix, and provide a plastic mix. Excessive trituration should be avoided because it generates heat and **creates excess matrix** in the microstructure of the resulting set material. In addition, an over triturated mix of amalgam will set prematurely after trituration, and this will prevent adequate condensation and adaptation to the walls of the preparation, resulting in a weakened product. A mix of amalgam that is too plastic due to excess mercury, or, is not plastic enough, must If a mix is too hard, brittle, or hot, reduction of the missing time and/or the mixing speed is indicated”.

Summitt, et. al.; Fundamentals of operative dentistry, a contemporary approach; 3rd edition; Page 375

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207. Which of the following is *not correct* regarding the mercury content of amalgam restorations?

- A. Restorations containing increasing quantities of mercury exhibit decreasing strength values.
- B. Higher concentrations of mercury are located around the margins of the restoration.
- C. The compressive strength decreases 1% for each 1% increase in mercury above 60%.
- D. Uniform concentrations of mercury are typically present throughout well-condensed restorations.

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207. Correct = D. Uniform concentrations of mercury are typically present throughout well-condensed restorations.

Rationale:

When amalgam restorations are subjected to compressive stress, those containing increasing quantities of mercury exhibit decreasing strength values. The compressive strength decreases 1% for each 1% increase in mercury above 60%. The mercury content is not uniform throughout the restoration. Higher concentrations of mercury are located around the margins of the restoration. Because condensation brings mercury to the surface of the amalgam mass, such “plashy” material should be periodically removed when filling the cavity to prevent trapping high mercury concentrations within the restoration. Thus, overfilling of the cavity should be done.

Powers JM, Sakaguchi RL. Craig's Restorative Dental Materials, 12th ed. Mosby Elsevier, 2006. pp 253.

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208. Glass ionomers consist of an ion-leachable aluminosilicate glass powder and a phosphoric acid liquid. Carboxylic acid groups (-COOH) chemically bond to calcium on exposed tooth surface.

- a. Both statements are true.
 - b. Both statements are false.
 - c. The first statement is true and the second statement is false.
 - d. The first statement is false and the second statement is true.
-

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208. Correct: D The first statement is false and the second statement is true. The liquid is a polyacrylic acid.

The setting reaction of glass ionomers is an acid/base reaction. The glass powder is attacked by the polyacid liquid which releases Al, Ca, Na, and F ions. Metallic salt bridges form between the Al and Ca ions leached from the glass and the acid groups on the polymers. A cross-linked gel matrix is formed in the initial set and an aluminum ion exchange strengthens the cross-linking in the final set. A chelating effect takes place with the calcium on the exposed tooth surface, creating an adhesive bond. The surfaces of new restorations should be protected from saliva during the initial set with a heavy varnish or light-cured bonding agent.

Reference: Powers and Sakaguchi. (2006). Craig's Restorative Dental Materials, 12th Ed. p. 173-4.

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209. When considering compomers, all of the following are true EXCEPT?
- A. Compomers are also known as polyacid modified resin composites
 - B. Compomers have more fluoride release than RMGI's
 - C. One of main shortcomings of compomers is their inability to be recharged with topically-applied fluoride
 - D. Compomers have the ability to chemically bond to tooth structure

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209. Correct B. Compomers have more fluoride release than RMGI's

Compomers have less fluoride release than RMGI's.

http://afspp.afms.mil/idc/groups/public/documents/afms/ctb_109841.pdf

Compomers – also known as polyacid-modified resin composites – are fluoride containing resin composites. Compomers have become popular because they handle like resin composites, are generally quite esthetic, and are marketed as having many of the advantages of true glass ionomers, including fluoride release and the ability to chemically bond to tooth structure. Shortcomings include limited release of fluoride and the inability to be recharged with topically applied fluoride. These materials have two main constituents – dimethacrylate monomer (s) with two carboxylic groups present in their structure and filler that is similar to the ion-leachable glass present in GICs. The ratio of carboxylic groups to backbone carbon atoms is approximately 1:8. They set via a free radical polymerization reaction and have significantly lower levels of fluoride release than GICs.

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210. Which one of the following statements is true?
- a. A compomer is a composite to which some glass-ionomer components have been added.
 - b. Compomers have better physical characteristics than composites.
 - c. Compomers are capable of releasing fluoride at a constant rate.
 - d. Compomers have low wear resistance and low strength when compared to conventional glass ionomer.

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210. Correct: A

Art and Science of Operative Dentistry by Roberson

Compomers (Polyacid-Modified Composites)

Overall, their physical properties are superior to traditional glass-ionomers and RMGIs, but inferior to those of composites. Compomers are capable of releasing fluoride, the release is not sustained at a constant rate, and anticariogenicity is questionable.

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211. What is the correct order of the compressive strengths from lowest to highest?
- A. Resin Modified Glass Ionomer, Glass Ionomer, Nanocomposite, Compomer
 - B. Compomer, Nanocomposite, Glass Ionomer, Resin Modified Glass Ionomer
 - C. Glass Ionomer, Resin Modified Glass Ionomer, Compomer, Nanocomposite
 - D. Nanocomposite, Compomer, Resin Modified Glass Ionomer, Glass Ionomer

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211. Correct C. Glass Ionomer, Resin Modified Glass Ionomer, Compomer, Nanocomposite

Powers J, Sakaguchi R. Craig's Restorative Dental Materials 12th edition Mosby 2006. P175-196

Xu X, Burgess JO. Compressive strength, fluoride release and recharge of fluoride-releasing materials. Biomaterials. 2003 Jun;24(14):2451-61.

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212. When considering physical properties, hybrid glass ionomers (RMGI) compared to glass ionomers have

- a. Slightly lower fluoride release/rechargability, higher compressive strength, and better esthetics
- b. Equal fluoride release/rechargability, higher compressive strength, and better esthetics
- c. Slightly higher fluoride release/rechargability, higher compressive strength, better esthetics
- d. Slightly lower fluoride release, lower compressive strength, and better esthetics

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212. Correct= A

Property	Hybrid/RMGI	Glass ionomer
Compressive strength	Med	Low-med
Flexural strength	Med	Low-med
Flexural modulus	Med	Med-high
Wear resistance	Med	Low
Fluoride release	Med-high	High
F- rechargability	Med-high	High
Esthetics	Good	Acceptable

Craig's Restorative dental materials 12th ed, p 174-178

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213. In office bleaching is usually above what percentage of Hydrogen peroxide?
- A. 5%
 - B. 15%
 - C. 25%
 - D. 35%

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213. Correct=D. 35%

“In-office bleaching utilizes a much more potent agent (usually 35% solution of hydrogen peroxide, as opposed to 10% solution of carbamide peroxide for the at-home technique). This powerful agent (10 times as powerful as a 10% carbamide peroxide) is necessary to produce the rapid improvement expected if an in-office procedure.” 10% carbamide peroxide will convert to 3.5% hydrogen peroxide
Fundamentals of Operative Dentistry, Summitt et al, 2nd edition

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214. Whereas normal bleaching time is 2 to 6 weeks some tetracycline stained teeth may require 2-12months of daily treatment. Teeth stained in what section have the poorest prognosis?

- a. Incisal third
- b. Middle third
- c. Gingival third

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214. Correct: C – gingival third

There are several factors to consider when bleaching tetracycline-stained teeth for extended periods of time.¹⁴⁶ First, the location of the stained area has a great impact on the prognosis for success. A tooth generally lightens from the incisal to the gingival area because the tooth gets progressively thicker from incisal to gingival. Teeth heavily stained in the gingival third have the poorest prognosis for complete lightening. The further toward the incisal edge the stain resides, the better the prognosis. In any situation, absolute predictions of success are unrealistic. Patients must understand that each discoloration responds differently and that they may not see results in the first few months.

(Summitt, James B. *Fundamentals of Operative Dentistry: A Contemporary Approach, 3rd Edition*. Quintessence Publishing (IL), p. 454).

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215. Self-etch systems contain mild ($\text{pH} \pm 2$), intermediary strong ($\text{pH} \pm 1.5$), and strong ($\text{pH} < 1$) adhesive classes. The micromorphologic aspect of strong self-etch adhesives is very similar to that of etch-and-rinse adhesives and is characterized by a 3- to 5- μm thick hybrid layer and extensive resin tags.

- A. Both statements are true
- B. Both statements are false
- C. The first statement is true, the second statement is false
- D. The first statement is false, the second statement is true

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215. A. Both statements are true

“Self-etch systems contain mild ($\text{pH} \pm 2$), intermediary strong ($\text{pH} \pm 1.5$), and strong ($\text{pH} < 1$) adhesive classes. The micromorphologic aspect of strong self-etch adhesives is very similar to that of etch-and-rinse adhesives and is characterized by a 3- to 5- μm thick hybrid layer, dentinal tubule funneling, extensive resin tags, and tubule wall and lateral tubule wall hybridization.”

Summitt, et. al.; Fundamentals of operative dentistry, a contemporary approach, 3rd edition; page 221

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216. Which statement is true when comparing bond strengths of self-etching adhesive systems on prepared versus unprepared enamel?

- A. A higher microtensile bond strength is expected when bonding to prepared enamel versus unprepared enamel.
- B. A lower microtensile bond strength is expected when bonding to prepared enamel versus unprepared enamel.
- C. While a difference in microtensile bond strength exists, no statistically significant difference is evident.
- D. No difference in microtensile bond strength exists between prepared and unprepared enamel.

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- 216. Correct - A.** A higher microtensile bond strength is expected when bonding to prepared enamel versus unprepared enamel.

Rationale:

Single Bond, the total-etch adhesive, resulted in statistically higher microtensile bond strength than any of the other adhesives regardless of the enamel preparation (unprepared = 31.5 MPa; prepared = 34.9 MPa). All the self-etching adhesives resulted in higher microtensile bond strength when enamel was roughened than when enamel was left unprepared. Commercial self-etching adhesives performed better on prepared enamel than on unprepared enamel. The field-emission scanning electron microscope revealed a deep interprismatic etching pattern for the total-etch adhesive, whereas the self-etching systems resulted in an etching pattern ranging from absent to moderate.

Esthet Restor Dent. 2003;15(1):32-41; discussion 42.

Bonding characteristics of self-etching adhesives to intact versus prepared enamel.

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217. What is the design for performing a mini-flap when restoring root surface caries?
- A. Incisions at the mesial and distal line angles straight apically
 - B. Incisions at the line angles, initially toward the papilla and then apically
 - C. Vertical incisions that bisect the papilla on each side
 - D. Envelope flap incorporating at least 1 tooth on either side

217. Correct: B. Incisions at the line angles, initially toward the papilla and then apically

“For this technique (sometimes referred to as a miniflap procedure) to be successful, the periodontium must be healthy. The incisions should be confined to the keratinized gingival tissue and kept as short as possible (just long enough to allow adequate exposure for isolation). Incisions can often be limited to the free gingiva, and, although reattachment to previously unexposed cementum can be expected, unnecessary severing of attachment should be avoided. Full thickness vertical incisions should be initiated at the mesial and/or distal aspects of the facial and should be directed perpendicular to the root and surface of bone, first slightly toward the interproximal papilla, then apically.”

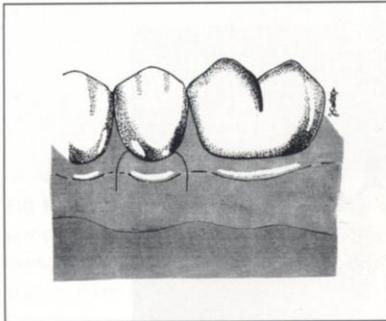
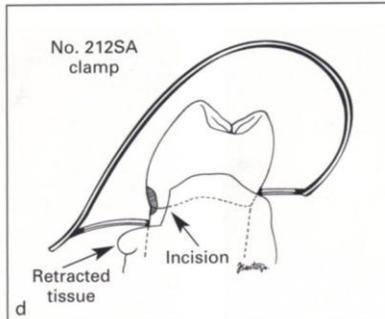
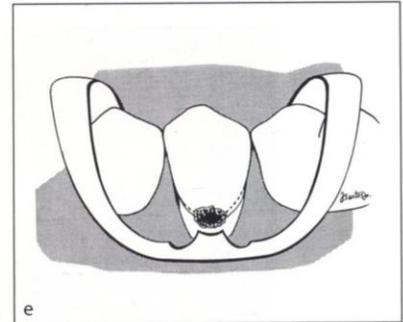


Fig 14-9c Short vertical incisions are made within the keratinized tissue at the line angles of the tooth. This allows additional tissue retraction with minimal trauma to the tissue or attachment apparatus.



Figs 14-9d and 14-9e The No. 212SA retracting clamp and rubber dam are in place. This clamp should always be stabilized with modeling compound or similar material.



Summitt J. Fundamentals of operative dentistry: A contemporary approach, 3rd Edition Quintessence Publishing, 2006. (7),175-6.

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218. All of the following are considerations when preparing tetracycline stained teeth for veneers EXCEPT?

- A. Ensure proximal extensions are into the contact area
- B. Vital bleaching should be an adjunct before veneer preparations are made
- C. Color modifiers (unfilled resins) are useful in covering tetracycline staining
- D. Ensure all discolored enamel is removed down to expose dentin

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218. Correct- D. Ensure all discolored enamel is removed down to expose dentin

Ideally – entire veneer preparation is in enamel. Margins should be in enamel. Enamel reduction – facial .3-.6 mm, proximal ½ way into contact, sulcular extension 0-0.1 mm, incisal 1.5+ mm(from desired tooth length,) and finish lines – light chamfer with internal lines rounded. Optimal bond strength in the incisal and cervical 1/3's are vital to restoration longevity, lack of adhesion in the middle portion of the tooth is less critical – meaning if you have to prepare into dentin – do it in the middle third of tooth. Tetracycline stain tends to get darker as more enamel layer is removed since the tetracycline stain is mainly incorporated into dentin. Tetracycline teeth are more difficult to veneer if the dark banding occurs in the gingival third. Color modifiers (such as Kolor + Plus) are a light cured, viscous liquid resins/opaquers.

Nordin J. Porcelain Veneers - Lecture 27OCT2010 NPDS Bethesda MD

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219. Steps in preparing a veneer for diastema closure include all the following except:

- a. The window preparation typically is made with a facial surface reduction of 0.5 to 0.75 mm midfacially
- b. The gingival margin is reduced to a depth of 0.2 to 0.5mm
- c. The preparation is terminated just facial to the proximal contact area
- d. The incisal edge is preserved to protect the veneer from heavy functional forces

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219. Correct: C

Art and Science of Operative Dentistry by Roberson

The preparation for a direct veneer normally is terminated just facial to the proximal contact except in the area of a diastema. To correct the diastema, the preparations are extended from the facial onto the mesial surfaces, terminating at the mesiolingual line angles.

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220. Which of the following statements concerning the effects of light and heat on the bleaching process is correct?

- A. Light speeds the bleaching reaction. Heat speeds the bleaching reaction.
- B. Light speeds the bleaching reaction. Heat slows the bleaching reaction.
- C. Light slows the bleaching reaction. Heat speeds the bleaching reaction.
- D. Light slows the bleaching reaction. Heat slows the bleaching reaction.

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220. Correct= A Light speeds the bleaching reaction. Heat speeds the bleaching reaction.

The use of high-intensity light, for raising the temperature of the hydrogen peroxide and accelerating the rate of chemical bleaching of teeth was reported in 1918 by Abbot. Other approaches for heating the peroxide have historically been described to accelerate tooth bleaching, such as heated dental instruments.

Joiner A, The bleaching of teeth: A review of the literature. Journal of Dentistry vol 34 (2006) 412-419.

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221. Which statement comparing QTH and LED light curing units is correct?

- a. QTH means Quartz-Tungsten Halogen light and LED means Light Emitting Diode
- b. Both QTH and LED unit have peak wavelengths varying from 450-490 nm.
- c. Both QTH and LED require a filter, reflector and a fan to reduce the heat output
- d. Only QTH can cure material with camphorquinone photo-initiator more efficiently compared to LED

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221 Correct=B Both QTH and LED unit have peak wavelengths varying from 450-490 nm.

-QTH QTH means Quartz-Tungsten Halogen light and LED means Light emitting diode.

-QTH require a light bulb (usually 75 W), several filters, reflector and a fan to reduce the heat output of the bulb, and a light guide.

-LED use junctions of doped semiconductors based on gallium nitride to emit blue light. It does not require a filter, have a long life span and do not produce as much heat as QTH devices. Heat becomes a problem when large arrays are used.

-Composite cure with LED unites have flexural properties similar to those cured with QTH devices.

-Because the output spectrum of blue LEDs matches absorption spectrum of camphorquinone more closely than QTH sources, it is thought that blue LED sources are more efficient

Craig's Restorative Dental material. Powers JM et al, 12th ed 2006: 204-207

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222. Which of the following types of curing lights produces the narrowest spectrum of light without being filtered?

- a. QTH
- b. PAC
- c. LED
- d. LMNOP

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222. Correct=C. LED

QTH – quartz tungsten halogen – 400-800mW/cm² before filtered, 470 -480 after the filter

PAC – Plasma-arc – 380-500

LED – Light emitting diode – 450-490

Fundamentals of Operative Dentistry, Summitt et al, 2nd edition, Pg 204-207

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223. What type of margin is preferred when preparing a veneer?

- a. Shoulder
- b. Chamfer
- c. Feather edge
- d. Chisel edge

223. Correct: B chamfer

Gingival Finishing Lines.

A chamfer is preferred for all gingival finishing lines. Supragingival finishing lines provide the same advantages as proximal finishing lines, which terminate labial to the contact areas. In addition, impressions are easier to make with supragingival preparations as compared with subgingival preparations. Supragingival finishing lines also increase the likelihood that restoration margins will end on enamel. The major disadvantage, however, is that any subsequent staining or color changes at the restoration margin will be visible. Therefore supragingival margins are limited to clinical situations when this area remains concealed by the lip during maximum smiling (high lip line).

When the entire clinical crown is included in the labial display, the gingival margin should be placed 0.1 mm below the free gingival margin. If gingival recession is anticipated, the gingival finishing line can be extended deeper subgingivally as long as the biologic width is not violated.

(Aschheim, Kenneth W. *Esthetic Dentistry: A Clinical Approach to Techniques and Materials*, 2nd Edition. Mosby, p. 158).

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24. Regarding taper of a crown prep:

When prep height and diameter are equal, the prep with the greater taper will have a decrease in resistance. The taper that provides resistance for a prep where the height is equal to the base is 2X that of that prep where height equals $\frac{1}{2}$ the base

- A. Both statements are true
- B. Both statements are false
- C. The first statement is true, the second is false
- D. The first statement is false, the second is true

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224. Correct- A. Both statements are true

When prep height and diameter are equal, the prep with the greater taper will have a decrease in resistance. The taper that provides resistance for a prep where the height is equal to the base is 2X that of that prep where height equals $\frac{1}{2}$ the base

Resistance is quantifiable-preps are either resistant or they are not

Santulli, GA; NPDS 253, Fixed Prosthodontics; Page 69

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225. The flexural and compressive moduli of microfilled and flowable composites are about 50% lower than values for the multipurpose hybrids and packable composite resin restorations. This reflects the lower volume percent of filler present in microfilled and flowable composites.

- A. The first statement is true, the second statement is false.
- B. The first statement is false, the second statement is true.
- C. Both statements are true.
- D. Both statements are false.

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225. **Correct:** C. Both statements are true.

Rationale:

Type of Composite	Size of Filler Particles (um)	Volume of Inorganic Filler (%)	Advantages	Disadvantages
Multipurpose	0.04, 0.2-3.0	60-70	High strength, high modulus	
Nanocomposite	0.002-0.075	78.5	High polish, high strength, high modulus	
Microfilled	0.04	32-50	Best polish, best esthetics	Higher shrinkage
Packable	0.04, 0.2-20	59-80	Packable, less shrinkage, lower wear	
Flowable	0.04, 0.2-3.0	42-62	Syringeable, lower modulus	Higher wear

Powers JM, Sakaguchi RL. *Craig's Restorative Dental Materials, 12th ed.* Mosby Elsevier, 2006; Chapter 9.

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226. The differences between a packable composite and a hybrid one are:

- a) the inorganic filler material of hybrid composites is approximately 80 % by weight
- b) packable composites are less viscous than hybrid composites
- c) the hybrid composites inorganic fillers have an average particle size of 0.4 to 1 μm
- d) the packables have a smoother surface texture in the finished restoration
- e) a and c

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226. Answer: E- the inorganic filler material of hybrid composites is approximately 80 % by weight; and the hybrid composites inorganic fillers have an average particle size of 0.4 to 1 μm

Packable composites. Packable composites are designed to be inherently more viscous to afford a “feel” upon insertion, similar to that of amalgam. Because of increased viscosity and resistance to packing, some lateral displacement of the matrix band is possible. Currently, there are no long-term clinical studies to equate [substantiate] packable composites’ promoted benefits with improved clinical results when compared to hybrid composites. Their development is an attempt to accomplish two goals: 1) easier restoration of a proximal contact, and 2) similarity to the handling properties of amalgam. They do not completely accomplish either.

Hybrid composites. In an effort to combine the favorable physical and mechanical properties characteristic *Pattern of Systemic Disturbance* of conventional composites with the smooth surface typical of the microfill composites, the hybrid composites were developed. These materials generally have an inorganic filler content of approximately 75 % to 85 % by weight. The filler is typically a mixture of a micro filler and small filler particles that results in a considerably smaller average particle size (0.4 to 1 μm) than that of conventional composites. Because of the relatively high content of inorganic fillers, the physical and mechanical characteristics are generally superior to those of conventional composites. Also, the presence of sub-micrometersized microfiller particles interspersed among the larger particles provides a smooth “patina-like” surface texture in the finished restoration. Hybrid composites currently are the predominant direct esthetic restorative materials used. They have almost universal clinical applicability and are the primary materials referred to as composites throughout this book.

Source: Roberson, Theodore M., et al. Sturdevant’s Art and Science of Operative Dentistry. 4th Ed. 2002. Mosby, USA. Pp: 202, 477, 47 479

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227. When considering coefficient of thermal expansion (COTE), which material has the highest COTE on average?

- A. Pit and fissure sealants
- B. Composite resins
- C. Amalgam
- D. Gold
- E. Glass Ionomer

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227. Correct- A. Pit and fissure sealants

Craig R. Restorative Dental Materials Tenth Edition. 1997; 3(44-45)

The change in length ($L_{\text{final}} - L_{\text{original}}$) per unit length of a material for a one degree change in temperature is called the linear coefficient of thermal expansion. Tooth structure and restorative materials in the mouth will expand when warmed by hot foods and beverages but will contract when exposed to cold substances. Such expansions and contractions may break the marginal seal of a restoration – especially if the difference in COTE is great between the tooth and the restorative material.

Material	Coeff x 10^{-6} /degree C
Inlay waxes	350-450
Silicone impression material	210
Polysulfide impression material	140
Pit and fissure sealants	71-94
Acrylic resin	76
Mercury	60.6
Composite resins	
Anterior	17-50
Posterior	14-40
Zinc oxide-eugenol cement	35
Amalgam	22.1-28
Silver	19.2
Copper	16.8
Gold	14.4
Porcelain	12
Tooth (crown portion)	11.4
Glass Ionomer (type 2)	10.2-11.4

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228. Which of the following statements is true regarding adhesive of resins to dentin?
- a. The 3-step total etch system includes: etchant, primer, and bonding agent.
 - b. The all-in-one self-etch technique etches the enamel and removes the smear layer.
 - c. The bonding agent in a total etch system includes monomers that are mostly hydrophilic such as Bis-GMA.
 - d. All in one self etching adhesive are hydrophobic and not likely to undergo water degradation.

228. Answer: A
 Art and Science of Operative Dentistry by Robertson

TABLE 5-1

Current Strategies for Adhesion of Resins to Dentin*

	Etchant (E)	Primer (P)	Bonding Agent (B)
Three-step total-etch (E + P + B)	<p>Removes the smear layer</p> <p>Exposes intertubular and peritubular collagen</p> <p>Opens the tubules in a funnel configuration</p> <p>Decreases surface-free energy</p>	<p>Includes bifunctional molecules (simultaneously hydrophilic and hydrophobic)</p> <p>Envelops the external surface of collagen fibrils</p> <p>Re-establishes surface-free energy to levels compatible with a more hydrophobic restorative material</p>	<p>Includes monomers that are mostly hydrophobic, such as Bis-GMA; however, can contain a small percentage of hydrophilic monomers, such as HEMA</p> <p>Copolymerizes with the primer molecules</p> <p>Penetrates and polymerizes into the interfibrillar spaces to serve as a structural backbone to the hybrid layer</p>
One-bottle total-etch (E + [PB])	<p>Removes the smear layer</p> <p>Exposes intertubular and peritubular collagen</p> <p>Opens tubules in a funnel configuration</p> <p>Decreases surface-free energy</p>		<p>Penetrates into the dentin tubules to form resin tags</p> <p>The first coat applied on etched dentin works as a primer—it increases the surface-free energy of dentin</p> <p>The second coat (and third, fourth, and so on) acts as the bonding agent used in three-step systems—it fills the spaces between the dense network of collagen fibers</p>
Two-bottle self-etch ([EP] + B)	<p>The SEP does not remove the smear layer, but fixes it and exposes about 0.5-1 μm of intertubular collagen because of its acidity (pH = 1.2-2.0)</p> <p>The smear plug is impregnated with acidic monomers, but it is not removed</p> <p>When it impregnates the smear plug, the SEP prepares the pathway for the penetration of the subsequently placed fluid resin into the microchannels that permeate the smear plug</p>		<p>Uses the same type of bonding agent included in the three-step, total-etch systems</p> <p>The resin tags form on resin penetration into the microchannels of the primer-impregnated smear plug</p>
All-in-one self-etch (EPB)	<p>Etches enamel</p> <p>Incorporates the smear layer into interface</p> <p>Being an aqueous solution of a phosphonated monomer, it demineralizes and penetrates dentin simultaneously, leaving a precipitate on the hybrid layer</p> <p>Forms a thin layer of adhesive, leading to low bond strengths; a multi-coat approach is recommended</p> <p>Incompatible with self-cure composite resins</p>		

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229. Arrange the order of these adhesives according to their bond strengths from lowest to highest.

- A. Total-etch two-step; Self-etch one-step; Self-etch two-step
- B. Total-etch two-step; Self-etch two-step; Self-etch one-step
- C. Self-etch two-step; Self-etch one-step; Total-etch two-step
- D. Self-etch one-step; Self-etch two-step; Total-etch two-step

229. Correct- D

Self-etch one-step; Self-etch two-step; Total-etch two-step

*Ceballos L, Camejo D, Fuentes M, et al. Microtensile bond strength of total-etch and self-etching adhesives to caries-affected dentine. *Journal of Dentistry* (2003) 31, 469–477*

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230. Which statement regarding packable resins and hybrid composite is Correct?

- a. Packable resins have superior marginal integrity
- b. Hybrid resins are more resistant to surface texture loss over time
- c. Hybrid resins have noticeably better color match
- d. Both systems have similar color match and marginal discoloration

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230. Correct - D Both systems have similar color match and marginal discoloration

The clinical performance of packable and conventional hybrid resin composites in Class I restorations for a period of three years was compared using a randomized controlled double-blind clinical trial with self-matching design. A total of 50 pairs of Class I restorations were placed in 32 adult patients by one dentist in a self-matching prospective clinical trial. The paired teeth were divided into the TPH Spectrum/XenoIII (TS) restoration group and the Synergy Compact/One Coat (SC) restoration group according to a random number table. Application of the materials followed the manufacturer's instructions. The restorations were evaluated by two independent evaluators using US Public Health Service (USPHS)-Ryge modified criteria. Statistical analysis was performed using the McNemar's test with Yates' continuity correction. After three years, 40 pairs of restorations were available for evaluation. Four TS and two SC restorations failed due to fracture. Only one TS-restored tooth showed postoperative sensitivity at baseline and the symptom disappeared one week later. Alpha ratings of TS vs. SC restorations were as follows: 95% vs .98% for color match, 85% vs 88% for marginal integrity, 88% vs. 90% for anatomical form, 85% vs. 83% for marginal discoloration, 88% vs. 93% for occlusal contact. **For both materials, Alpha ratings were 88% for surface texture.** The three-year clinical performances of the two restorative materials were satisfactory and not significantly different for each of the parameters evaluated.

Shi L, Wang X, Zhao Q, Zhang Y, Zhang L, Ren Y, Chen Z. Evaluation of packable and conventional hybrid resin composites in Class I restorations: three-year results of a randomized, double-blind and controlled clinical trial. Oper Dent. 2010 Jan-Feb; 35(1):11-9.

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231. TEGDMA (triethylene glycol dimethacrylate) serves what function in composite?
- A. photoinitiator
 - B. viscosity reduction
 - C. color stabilizer
 - D. filler

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231- Correct= b. Viscosity reduction

“The viscosity of the oligomers, especially Bis-GMA, is so high that diluents must be added, so a clinical consistency can be reached when they are compounded with filler. Low-molecular-weight compounds with difunctional carbon double bonds, usually TEGDMA, are added by the manufacture to reduce and control with viscosity of the compounded composite.”

Powers, et al. Craig's Restorative Dental Materials. 12th ed, Pg192

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232. Transillumination may be most helpful in detecting caries in what location of the mouth?

- a. Posterior teeth
- b. Anterior proximal caries
- c. Class V lesions
- d. Pits and fissures

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232. Correct: B -anterior smooth surface proximal lesions

For detection of proximal lesions in anterior teeth, the fiber-optic transillumination technique is particularly appropriate and convenient. With this technique, a fine light, coned down to a 0.5-mm diameter, is transmitted through a contact area. A lesion appears as a dark shadow. It is difficult, however, to discriminate between demineralization extending just into enamel and that progressing further into dentin, especially in the posterior areas.

(Summitt, James B. *Fundamentals of Operative Dentistry: A Contemporary Approach, 3rd Edition*. Quintessence Publishing (IL), 2006. p. 88).

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233. Match the following components of composite resin setting reaction with their function:

1. Visible light (460nm)	a. Activator
2. Tertiary amines, diketones (camphoquinone)	b. Initiator
3. Organic peroxide	c. Source of free radical generation
4. Hydroquinone	d. Protect methyl methacrylate monomer from premature polymerization, prolongs shelf life
5. Bis-GMA	e. Oligomer, reactive double bonds at each end, cross links polymer
6. Triethyleneglycol dimethacrylate	f. Low molecular weight difunctional monomer, reduces viscosity of composite

233. Correct- 1-a, 2-b, 3-c, 4-d, 5-e, 6-f

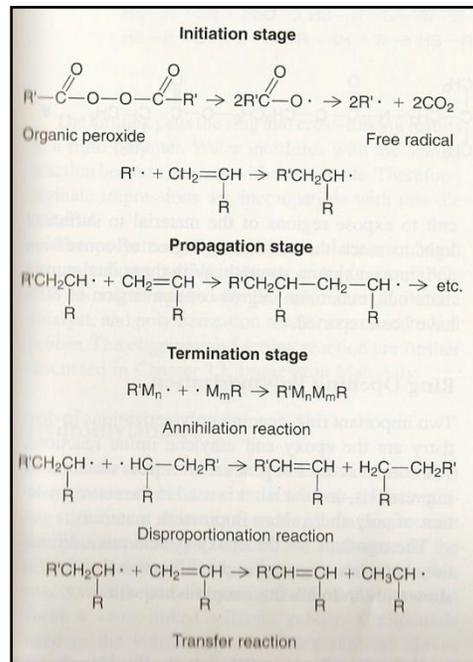
Composite resin setting reaction is an addition polymerization reaction in which no by product is obtained. It is a free-radical polymerization reaction which takes place in 3 stages: initiation, propagation, and termination.

The reaction may be accelerated by heat, light, traces of peroxides, and other chemicals.

Initiation stage: free radicals are produced by either 1) benzoyl peroxide + aromatic tertiary amine or 2) camphoroquinone + aliphatic amine + visible light (460nm)

Propagation stage: rapid addition of monomer molecules to the free radical and the shifting of the free electron to the end of the growing chain

Termination stage: the growing free radical is terminated by any material that will react with a free radical, thus decreasing the rate of initiation or increasing the rate of termination. Hydroquinone, eugenol, or large amounts of oxygen will inhibit or retard polymerization.



Free radical polymerization of monomers or oligomers with unsaturated double bonds does not result in all the double bonds reacting.

Degree of conversion: the percentage of double bonds that react and convert to single bonds, depending on the conditions. The value may vary from 35% at the air-inhibited layer to 80% in the bulk.

Reference: Powers and Sakaguchi. (2006). Craig's Restorative Dental Materials, 12th Ed. p. 152-4.

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234. In amalgam bonding, the mechanism for attachment of the bonding resin to tooth structure is identical to the mechanism that resin bonding systems use to attach resin composite to dentin and enamel. However, the amalgam-to-resin attachment is entirely mechanical.

- A. The first statement is true, the second statement is false.
- B. The first statement is false, the second statement is true.
- C. Both statements are true.
- D. Both statements are false.

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234. Correct: C. Both statements are true.

Rationale:

In amalgam bonding, the mechanism for attachment of the bonding resin to tooth structure is identical to the mechanism that resin bonding systems use to attach resin composite to dentin and enamel. However, the amalgam-to-resin attachment is entirely mechanical.

The unset amalgam is condensed into the bonding resin covering the cavity walls prior to polymerization of the resin. This incorporates “fingers” of resin into the amalgam mass at the interface.

Summit JB, et al. Six-year clinical evaluation of bonded and pin-retained complex amalgam restorations. *Oper Dent*, 2004; 29-3, 261-268.

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235. The use of amalgam bonding has several possible benefits except:

- a. Less need for the removal of tooth structure such as grooves and dovetails
- b. Bonded amalgam may increase the fracture resistance of restored teeth
- c. The adhesive resin liner may seal margins better than the traditional cavity varnishes with decreased risks for postoperative sensitivity
- d. Long-term clinical and laboratory studies are well established for its effectiveness

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235. Correct: D. Long-term clinical and laboratory studies are well established for its effectiveness
Long-term clinical and laboratory studies are lacking that assess the effectiveness of amalgam bonding agents in retaining amalgam, reinforcing tooth structure, reducing leakage, and reducing sensitivity.

Some bonding agents, especially when placed incorrectly, may adversely affect the physical properties of amalgam.

Summit JB, et al. Fundamental of Operative Dentistry, 3rd ed, 2006, pp 242-243.

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236. When considering placing a fiber post following NSRCT, all of the following are true, EXCEPT
- A. The post length should be at least $\frac{1}{2}$ the length of the root contained in the remaining radiographic bone
 - B. One should prepare the canal for the largest fiber post thus maximizing retention of the core
 - C. The purpose of the post is not to reinforce endodontically treated teeth but is to retain the core
 - D. The best retention for a fiber post will most likely be achieved using etch and rinse and self cure resin cement

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236. Correct-B. One should prepare the canal for the largest fiber post thus maximizing retention of the core

You should prepare the canal for the smallest post that will still have good adaptation to the walls of the canal. Preparing the canals for larger posts does not result in added retention of the core.

Posts do not reinforce endodontically treated teeth. The purpose of a post is to retain a core. Posts are not necessary when substantial tooth structure is present after teeth have been prepared. Post failure is usually due to loosening or tooth fracture. Threaded posts are the most retentive and most destructive post designs, parallel sided posts are the next most retentive over tapered posts. Tapered post designs can cause wedging effects and subsequent fractures in the root. 3-10% of post and core failures are due to root fractures.

Acidic monomers in self-etch adhesives and self-etching resin cements are not strong enough to etch the smear layer to form hybrid layers along the canal walls.

Dual-cured and self-cured adhesives and composites are favored for fiber post cementation.

Jacoby: J Pros Dent: 1976; 35: 357-60.

Santulli G. Werking C. NPDS Fixed Prosthodontics - The Santulli Manual. 2011: 48-50.

Monticelli, Ferrari, Toledano. Cement system and surface treatment selection for fiber post luting. Med Oral Pathol. Mar 2008, 20; 5(523-25)

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237. Which of the following statement is incorrect concerning the use of a non-rigid fiber post?
- A. Bonding fiber posts to root canal dentin can improve the distribution of forces applied along the root
 - B. A cemented fiber post is retentive with the least amount of stress generated on the canal walls
 - C. Most failures of fiber posts are due to catastrophic root fractures
 - D. A light transmitting post results in better polymerization of resin composites in the apical area of a root canal

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237. Correct: C Most failures are due to catastrophic root fractures

Reference: Pathways of the Pulp by Cohen

Posts made of nonstiff materials (low modulus of elasticity) are more resilient, absorb more impact force, and transmit less force to the root than stiff posts. However, low modulus posts fail at lower levels of force than high modulus posts. A bent, broken, or structurally weakened post then displaces the core and crown. Excessive flexing of the post and micromovement of the core are particularly a risk in teeth with minimal remaining tooth structure because these teeth lack their own cervical stiffness as a result of the missing dentin. Post flexion can also distort and open crown margins. Open margins can result in potentially devastating caries or endodontic leakage and apical reinfection. Extensive caries extending into the root can be as irreparable as root fracture.

The primary benefit of resilient posts with a lower modulus of elasticity is protection of the root from fracture through reduction of the transfer of forces through the post to the root. This post flexibility is beneficial for teeth with more than 3 to 4 mm of remaining axial dentin, which provides cervical stiffness to the tooth/post/core complex. Numerous in vitro studies of posts report that teeth restored with nonrigid posts have fewer catastrophic, irreparable root fractures when tested to failure. In extracted teeth restored with carbon fiber/composite core or custom cast post/core and a cast crown, the fiber post/core failed at a lower load but failed without root fracture. The cast post/core did not fail until loads were reached that rarely occur clinically, but it failed with fracture of the tooth. A significantly higher rate of root fracture was found in teeth restored with stiffer zirconium posts than in quartz fiber or carbon fiber posts. Clinical studies of fiber post systems also report successful multiyear service with few or no root fractures. A retrospective clinical study of carbon fiber posts and custom cast posts reported root fractures in 9% of teeth restored with cast posts, and no root fractures in teeth restored with fiber posts after 4 years. The primary mode of failure has been reported to be decementation of the post from the root.

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238. Which of the following shows the correct order of luting a porcelain veneer with a resin cement after removal of provisionals.

- A. Try-in paste; Rinse thoroughly, Etch veneer with 35% phosphoric acid, Primer in veneer, Single bond adhesive in veneer, Etch tooth with 35% phosphoric acid, Single bond adhesive, Resin Cement in Veneer.
- B. Try-in paste, Rinse thoroughly, Etch tooth with 35% phosphoric acid, Single bond adhesive, Resin Cement in Veneer
- C. Try-in paste, Rinse thoroughly, Etch veneer with 35% phosphoric acid, Primer in veneer, Single bond adhesive in veneer, Etch tooth with 35% phosphoric acid, Single bond adhesive, Resin Cement in Veneer Rinse thoroughly, Etch tooth with 35% phosphoric acid, Single bond adhesive, Resin Cement placed on tooth.
- D. Try-in paste, Rinse thoroughly, Etch veneer with 35% phosphoric acid, Primer in on tooth, Single bond adhesive in veneer, Etch tooth with 35% phosphoric acid, Single bond adhesive, Resin Cement in Veneer

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238. Correct- A

Try-in paste; Rinse thoroughly, Etch veneer with 35% phosphoric acid, Primer in veneer, Single bond adhesive in veneer, Etch tooth with 35% phosphoric acid, Single bond adhesive, Resin Cement in Veneer.

http://solutions.3m.com/wps/portal/3M/en_US/3M-ESPE-NA/dental-professionals/products/category/cement/relyx-veneer/

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239. Compared to hybrid composite, compomers have all the following characteristics, EXCEPT

- a. Compomers contain poly-acid modified monomers with fluoride releasing silicate glasses
- b. setting occurs primarily by light-cured polymerization, but acid-base reaction also occur as compomers absorb water upon contact with saliva
- c. compomers have higher compressive strength and can have fluoride recharged from daily fluoride exposure
- d. both materials can be used to restore Class 1 and 2 in primary teeth

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239. Correct= C compomers have higher compressive strength and can have fluoride recharged from daily fluoride exposure (is not true)

Compomers have lower compressive strength (180-259MPa) than hybrid composites (240-300MPa) and do not recharge from fluoride treatment as much as glass ionomer or RMGI. Compomers contain poly-acid modified monomers with fluoride releasing silicate glasses. It's setting occurs primarily by light-cured polymerization, but acid-base reaction also occur as compomers absorb water upon contact with saliva.

While hybrid composites are more versatile and can be used to restore Class 1, 2, 3, 4, 5 in low caries patient, compomers are mainly recommended for primary teeth Class 1 and 2 and Class 3 & 5 in medium caries patient.

-Compomer filler size=0.8-5.0 μ m, 42-67% filler by volume vs.

Hybrid resins have filler content size of 0.04 and 0.2-3.0 μ m, with 60-70% inorganic filler by volume. Its advantage is high strength and high modulus.

Craig's Restorative Dental material. Powers JM et al, 12th ed 2006: 175-205

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240. Which of the following is not an advantage to using composite as a core material?
- a. Adequate compressive strength
 - b. Adequate fracture toughness
 - c. Dimensional stability in a wet environment
 - d. Tooth colored material for use under all ceramic restorations

240. C. Dimensional stability in a wet environment

Resin composite is the most popular core material because it is easy to use. It is available in light-cure, dual-cure, and autocure formulations. It is provided as both a tooth-colored material to be used as a core material under anterior all-ceramic restorations and as a color-contrast material to be used under metallic restorations. Adequate compressive strength^{13,86} and fracture toughness⁷¹ have been confirmed by static load testing. However, resin composite has not performed as successfully when tested with dynamic repeated load tests.^{46,64} This type of laboratory test is used to simulate the small, repeated loads of function and parafunction in the oral cavity. It appears that resin composite undergoes plastic deformation under a small repeated load, which may lead to core failure. Another disadvantage of resin composite is that it is not dimensionally stable in a wet environment.⁹⁵ As it absorbs water, the buildup expands. This is clinically relevant if a provisional restoration over a resin composite core is lost after the impression has been made for the crown. At delivery, the crown will not fit accurately because of the dimensional expansion of the core.

Resin composite is an adequate buildup material when some vertical tooth structure remains to help support the core buildup. However, it is not recommended for situations in which the entire coronal portion of the tooth is to be replaced with the core material.

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241. Retention grooves placed on the mesial and distal of a crown prep increase the resistance to dislodgement of forces in which direction?

- a. Buccal lingual
- b. Mesial distal
- c. Occluso vertical

241. Correct: A buccal lingual

Limiting the freedom of displacement from torquing or twisting forces in a horizontal plane increases the resistance of a restoration. A groove whose walls meet the axial wall at an oblique angle does not provide the necessary resistance. V-shaped grooves produce roughly one-half as much resistance to lingual displacement as do grooves with a definite lingual wall.²¹ Forces that produce rotating movement in the restoration can produce shear and eventual slippage along the surfaces oblique to the direction of the force. There must be a definite wall perpendicular to the direction of the force to sufficiently limit the freedom of displacement and provide adequate resistance

(Shillingburg, H. *Fundamentals of Fixed Prosthodontics, 3rd Edition*. Quintessence Publishing (IL p. 121).

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242. The advantage of the ultrathin metal matrices (“ring”) system for the placement of posterior Class II composites are all of the following except:

- A. Tight interproximal contacts are more easily developed
- B. They provide better proximal contours
- C. They simplify matrix placement for single proximal-surface restorations
- D. Used with the plastic, light-reflecting wedge creates a more effective interproximal contact

242. Correct- D. The advantage of the ultrathin metal matrices (“ring”) system for the placement of posterior Class II composites are all of the following **except**:

- A. Tight interproximal contacts are more easily developed
- B. They provide better proximal contours
- C. They simplify matrix placement for single proximal-surface restorations

D. Used with the plastic, light-reflecting wedge creates a more effective interproximal contact

“Tight interproximal contacts are more easily developed with the ultrathin metal matrices than with the clear matrices because they are easier to place, maintain their shape better, and can be burnished against the adjacent tooth. Sectional matrix systems are helpful in developing adequate interproximal contacts. Sectional matrix systems used with metal rings with springlike properties. They are used with wooden wedges. These “ring” systems have a number of advantages: they provide wedging to ensure good interproximal contact; they provide better proximal contours for posterior resin composite restorations than traditional matrices; and they simplify matrix placement for single proximal-surface restorations compared to a circumferential band.”

“The rigidity and smoothness of the plastic, light-reflecting wedge makes it less effective than a wooden wedge in gaining the slight tooth separations needed to ensure adequate interproximal contact.”

Summitt, et. al.; Fundamentals in operative dentistry, a contemporary approach; 3rd edition; Page 312

http://airforcemedicine.afms.mil/idc/groups/public/documents/afms/ctb_109756.pdf

Palodent Sectional Matrix System (Project 98-24) (09/02)

The Palodent Sectional Matrix System is designed to be used for the placement of posterior resin composite restorations. A number of problems have been associated with using resin composite for posterior restorations, including staining, marginal ditching, post-operative sensitivity, increased wear compared to metallic restorations, and difficulties in obtaining adequate interproximal contacts. In an effort to overcome this latter problem, Darway, Inc. has introduced the Palodent Sectional Matrix System. This system consists of one size of contoured sectional matrix bands and a "BiTine" ring. The purpose of the BiTine ring is two-fold: 1) to apply an interproximal wedging force to enhance contact formation and 2) to aid in the proximal contouring of the restoration. The procedure for using the Palodent Sectional Matrix System for a Class II resin composite restoration is the following: apply the BiTine ring interproximally between the tooth to be prepared and the adjacent tooth pre-operatively for initial separation; after completion of the preparation the BiTine ring is removed; the sectional matrix and wedge are applied; the matrix is burnished against the adjacent tooth; compound is added to the BiTine ring tines and replaced; and the resin composite restoration is placed.

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243. Which of the following represents the correct order of *increasing* flexural strength of various dental ceramics?

- A. Feldspar, lithium disilicate, leucite, zirconia, alumina
- B. Feldspar, leucite, lithium disilicate, alumina, zirconia
- C. Leucite, feldspar, alumina, lithium disilicate, zirconia
- D. Feldspar, zirconia, alumina, leucite, lithium disilicate

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243. Correct : B. Feldspar, leucite, lithium disilicate, alumina, zirconia

Rationale:

Ceramic	Flexural Strength (MPa)
Feldspar	105
Leucite	135
Lithium Disilicate	350
Alumina	650
Zirconia	900

Powers JM, Sakaguchi RL. *Craig's Restorative Dental Materials, 12th ed.* Mosby Elsevier, 2006; Chapter 18.

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244. Which type of porcelain is resistant to etching with hydrofluoric acid?
- A. Stackable porcelains
 - B. In-ceram porcelains
 - C. Pressable porcelains
 - D. Stripped porcelains

244 Correct= B. In-ceram porcelains

High content alumina and zirconia core-based ceramics including In-ceram, Procera, and LAVA are resistant to acid etching with HF acid. To increase bonding to these surfaces, the porcelain can be treated with silica coated aluminum oxide particles. Low pressure sandblasting (~20psi) should be used with particle size of 30-50 microns.

Alex, G. Preparing Porcelain Surfaces for Optimal Bonding. *Functional Esthetics and Restorative Dentistry*. 2007 2(1); 38-46.

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245. When considering properties of porcelain, all of the following are true EXCEPT?
- A. 1st generation pressable ceramics are reinforced with leucite crystals and stronger than feldspathic porcelains
 - B. 2nd generation pressable ceramics are reinforced with lithium disilicate crystals
 - C. CEREC (machined leucite) restorations have a higher flexural strength (MPa) than E-max restorations
 - D. Hardness does not correlate to wear opposing dentition

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245. Correct = C. CEREC (machined leucite) restorations have a higher flexural strength (MPa) than E-max restorations

Flexural strength (MPa)

Empress I 120 MPa

CEREC 135 MPa

E-Max 380 MPa

In-Ceram 604 MPa

PFM 740 MPa

Zirconia Oxide >900 MPa

Hardness does not correlate to wear, wear related to:

Ceramic microstructure/roughness of the contacting surfaces/environmental influences – alkali or acidic/internal porosities from inadequate firing

Nordin J. Porcelain Systems Lecture. Operative Dentistry Course NPDS Bethesda MD; 20OCT2010

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246. Dicor ceramic restoration is fabricated by using which of the following methods?
- A. Pressure molded under heat using lost wax technique
 - B. Cast from a melted ceramic ingot
 - C. Milled using CAD/CAM
 - D. Glass infused alumina or zirconia core with stacked body porcelain
 - E. Lithium disilicate core with glass-ceramic veneer

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246. Correct= B

Reference:

Dental Materials and their Selection by O'Brien

Dicor is created from an ingot of castable ceramic, using the lost wax technique.

Empress and Empress II are glass ceramics that are pressure molded under heat into a phosphate bonded investment. Empress gains its shading by addition of surface porcelain layers. Empress II forms an etchable lithium disilicate core with a layered porcelain veneer.

Procera mills restorations from a glass-porcelain block using computer assisted design and computer assisted manufacturing.

In-ceram alumina restorations are made by painting slurry of alumina particles onto a plaster die. Glass is then applied at high temperatures, allowing infiltration of the core. Body porcelains are stacked in a conventional manner.

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247. Arrange these machined dental ceramics according to flexural strengths from lowest to highest.
- A. Zirconia, alumina, feldspathic, leucite
 - B. Feldspathic, leucite, alumina, zirconia
 - C. Leucite, zirconia, feldspathic, alumina,
 - D. Alumina, leucite, zirconia, feldspathic

247. Correct- B

Feldspathic 105 MPa
Leucite 135 MPa
Alumina 650 MPa
Zirconia 900 MPa

Powers J, Sakaguchi R. Craig's Restorative Dental Materials 12th edition Mosby 2006. p458.

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248. The primary function of leucite added to dental ceramics is

- a. To raise the coefficient of thermal expansion, consequently increasing the hardness and fusion temperatures
- b. To increase opacity for better esthetic restorations and custom color match
- c. To decrease the coefficient of thermal expansion, consequently increase the hardness and fusion temperatures.
- d. To decrease phase transformation toughness to prevent the propagation of surface cracks

248. Correct A

Many of the greatly improved properties of low-fusing porcelains can be related to the changes made to the leucite component. Leucite is an artificial crystal feldspathoid (potassium-aluminosilicate). In most dental porcelains, the leucite crystals are created by transforming feldspar crystals into glass and leucite crystals by a special heat treatment. Leucite's primary function in dental porcelain is to raise the coefficient of thermal expansion, consequently increasing the hardness and fusion temperatures. As a rule, dental porcelains consist of a leucite crystal-containing frit and at least one other frit to control various physical and mechanical properties. The leucite component forms a refractory skeleton and the glass fills the spaces in between, adding special properties required for dental porcelains.

The high shrinkage of leucite crystals creates compressive stress in the vitreous phase, which prevents the development of surface cracks. The randomly oriented leucite crystals are tightly packed in the vitreous phase and stop the propagation of micro-cracks. The combination of heat pressing, initial firing, and stain and glaze of the veneers creates an additional 50% increase in strength. This higher cohesive strength and fracture toughness allows for thicker areas of porcelain with a lesser risk of fracture. Unbonded glazed IPS Empress has a flexural strength of 215 MPa compared to 71 MPa of feldspatic porcelain, 114 MPa of Dicor, 167 MPa of Optec HSP, and 419 MPa of In-Ceram.

The Journal of the American Dental Association June 1, 2000 vol. 131 no. suppl 1 47S-51

The probability of survival of the 125 crowns was 95.2% at 11 years (98.9% in the anterior segment and 84.4% in the posterior segment). Six crowns had to be replaced. Most of the 119 successful crowns were rated excellent; Alfa ratings were assigned to 94.2% for color match, 91.6% for porcelain surface, 86.6% for marginal discoloration, and 94.2% for marginal integrity. Conclusion: Leucite-reinforced glass-ceramic crowns showed a low clinical failure rate and excellent esthetics after up to 11 years. (*Quintessence Int 2002;33:503-510*).

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249. Place the following porcelains in order from greatest to the least amount of translucency.
- A. Zirconium, lithium disilicate, feldspathic, leucite.
 - B. Feldspathic, leucite, lithium disilicate, zirconium
 - C. Leucite, feldspathic, lithium disilicate, zirconium
 - D. Feldspathic, lithium disilicate, leucite, zirconium

249. Correct=B. Feldspathic, leucite, lithium disilicate, zirconium

translucency.

Translucency is another critical property of dental ceramics. The translucency of opaque, dentin (body), and enamel (incisal) porcelains differs considerably. Opaque porcelains have very low translucency, allowing them to mask metal substructure surfaces. Dentin porcelain translucency values range between 18% and 38%, as seen in Table 18-4. Enamel porcelains have the highest values of translucency, ranging between 45% and 50%. The translucency of materials for all-ceramic restorations varies with the nature of the reinforcing crystalline phase. Alumina- and zirconia-based systems are opaque, whereas leucite-reinforced systems are more translucent. The translucency of spinel-based systems is comparable with that of lithium disilicate-based systems and intermediate between alumina-based and leucite-reinforced systems.

Powers, et al. Craig's Restorative Dental Materials. 12th ed, Pg 460

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250. What is the most abundant mineral in most high-medium-and low fusing porcelains?

- a. SiO₂ - quartz
- b. Al₂O₃ – Aluminum oxide
- c. Na₂O – Sodium Oxide
- d. K₂O- Potassium oxide

250. Correct A: Quartz

	High-fusing	Medium-fusing	Low-fusing (vacuum fired)	Metal-ceramic
SiO ₂	72.9	63.1	66.5	59.2
Al ₂ O ₃	15.9	19.8	13.5	18.5
Na ₂ O	1.68	2.0	4.2	4.8
K ₂ O	9.8	7.9	7.1	11.8
B ₂ O ₃	—	6.8	6.6	4.6
ZnO	—	0.25	—	0.58
ZrO ₂	—	—	—	0.39

Modified from Yamada HN, Grenoble PB: Dental Porcelain: The State of the Art-1977. Los Angeles, University of Southern California School of Dentistry, 1977.

Table 24-1 Composition of High- Medium- and Low-Fusing Body Porcelains (WeightPercentage)

(Rosenstiel, Stephen F. *Contemporary Fixed Prosthodontics, 4th Edition*. C.V. Mosby, 062006.).

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251. Which type of porcelain is resistant to etching with hydrofluoric acid?

- A. Stackable porcelains
- B. Pressable porcelains
- C. In-ceram porcelains

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251. Correct: C

High content alumina and zirconia core-based ceramics, including In-ceram, Procera, and LAVA, are resistant to acid etching with HF acid. To increase bonding to these surfaces, the porcelain can be treated with silica coated aluminum oxide particles. Low pressure sandblasting (~20psi) should be used with particle size of 30-50 microns.

Alex, G. Preparing Porcelain Surfaces for Optimal Bonding. *Functional Esthetics and Restorative Dentistry*. 2007 2(1); 38-46.

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252. Self-glazing, the traditional final step in the fabrication of MCR crowns, does not significantly improve the flexural strength of feldspathic dental ceramics. Application of a low-expansion glass called glaze to the surface of a ceramic which is then fired to a high temperature is known to reduce depth and width of the surface flaws, thereby improving the overall resistance of the ceramic to crack propagation.

- A. The first statement is true, the second statement is false.
- B. The first statement is false, the second statement is true.
- C. Both statements are true.
- D. Both statements are false.

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252. Correct: C. both statements are true.

Rationale:

Glazing is an extrinsic method to toughen dental ceramics. Self-glazing, the traditional final step in the fabrication of MCR crowns, does not significantly improve the flexural strength of feldspathic dental ceramics. Application of a low-expansion glass called glaze to the surface of a ceramic which is then fired to a high temperature is known to reduce depth and width of the surface flaws, thereby improving the overall resistance of the ceramic to crack propagation.

Powers JM, Sakaguchi RL. *Craig's Restorative Dental Materials, 12th ed.* Mosby Elsevier, 2006; Chapter 18.

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- 253.** Which statement is true when identifying the strongest, pressable wear characteristics of porcelain?
- a. The CTE of porcelain must be less than metal for retention of porcelain to a metal substructure
 - b. Compression of the porcelain on a PFM is a main factor in porcelain retention to the metal substructure.
 - c. Highly esthetic dental ceramics are predominantly glassy, and higher strength substructure ceramics are generally crystalline.
 - d. All are true

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253. Answer d. All are true

There are three main divisions of dental ceramics: (1) predominately glassy materials, (2) particle-filled glasses, and (3) polycrystalline ceramics. Highly esthetic dental ceramics are predominantly glassy, and higher strength substructure ceramics are generally crystalline. Most dental ceramics are a variation of either feldspathic porcelain or of a derivation of silica glass. Feldspathic porcelain is available a high, medium and low fusing types. Only the low fusing type is used in dental restorations. This porcelain is associated with metal-ceramic restorations.

Porcelain fused to metal restorations account for 80% of restorations. PFMs or all-ceramic restorations must be able to withstand normal vertical masticatory forces form 565 MPa in the molar region and 155 MPa in the incisor region.

The porcelain-metal bond consists of: a (1) chemical bonding (2) mechanical interlocking (3) compression and (4) Van der Waal forces.

Compression of the porcelain on a PFM is a main factor in porcelain retention to the metal substructure. The coefficient of thermal expansion (CTE) of the metal and porcelain must be closely matched, such as that **the metal has a slightly larger CTE than the associated porcelain.** Upon cooling this results in a slightly greater amount of contraction than the porcelain. Consequently, the porcelain is compressed. Each layer from opaque to body to enamel has a slightly lower CTE (i.e. opaque has the greatest CTE of any porcelain layer). **Typically porcelain has CTEs in the range of 13.0-14.0 x 10⁻⁶/degree C. and alloys between 13.5 -14.5 x 10⁻⁶/degrees C.**

Kelly, J.R. Dental ceramics: current thinking and trends; Dentl Clin N Am 48 (2004) 513-530

Santulli, G.A CAPT. The Santulli Manual; MPDS 253 Fixed prosthodontics syllabus

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254. When considering low fusing porcelains, all of the following are true, EXCEPT
- A. Low fusing porcelains can have an opaque, dentin, enamel, translucent, and body modifier layers when used with MCR restorations
 - B. Low fusing porcelains have minimal or no leucite content thus decreasing wear on opposing dentition
 - C. Grain size and porosity of low fusing porcelains dictate amount of wear
 - D. Feldspathic veneering porcelain has a high flexural strength (100-150 MPa)

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254. Correct= D. Feldspathic veneering porcelain has a high flexural strength (100-150 MPa)

Feldspathic veneering porcelain have good esthetics and translucency, lower flexural strength (100-150 MPa), and must be etched and resin-bonded to teeth.

Traditional firing temperatures

High: 1315-1370 degrees Celcius

Medium: 1090-1260 degrees Celcius

Low: 870-1065 degrees Celcius

Low fusing porcelains have minimal or no leucite content thus decreasing wear, and grain size and porosity dictate amount of wear

Most all ceramic systems have low fusing, low wear overlay porcelains veneered over substructures

Nordin J. Porcelain Systems Lecture. NPDS Bethesda MD, Operative Dentistry Course; 20OCT2010

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255. Overglazing porcelain will result in which of the following?

- A. Porcelain will fracture
- B. Porcelain will become milky or cloudy in appearance
- C. Porcelain will turn green
- D. Will result in porosity on the surface

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255. Correct: B

After the porcelain is cleaned and any necessary stains are applied, it is returned to the furnace for the final glaze firing. Usually, the glazing step is very short; when the glazing temperature is reached, a thin glassy film (glaze) is formed by viscous flow on the porcelain surface. Overglazing is to be avoided, because it gives the restoration an unnatural shiny appearance and causes loss of contour and shade modification. Glazing temperatures and times vary with the type and brand of porcelain employed.

Powers, John M.. Restorative Dental Materials, 11th Edition. C.V. Mosby, 2001

Since porcelain loses its ability to form a natural glaze after multiple firings, an applied overglaze may be indicated on large restorations that have required numerous corrections. However, caution must be exercised not to overfire the porcelain. It may return to a more crystalline state and become milky or cloudy in appearance, a condition known as *devitrification*. Devitrification causes a loss of natural appearance, and no surface treatment can revive the porcelain.

Shillingburg, H. Fundamentals of Fixed Prosthodontics, 3rd Edition. Quintessence Publishing (IL), 011997.

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256. One can polish dental ceramics with

- A. Overglaze and Natural Glaze
- B. Green Stone, White Stone, Diamond Paste
- C. Overglaze, Natural Glaze, Green Stone, White Stone, Diamond Paste
- D. Sof-Lex discs, Overglaze, Natural Glaze, Green Stone, White Stone, Diamond Paste

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256. D Sof-Lex discs, Overglaze, Natural Glaze, Green Stone, White Stone, Diamond Paste

Yilmaz K, Ozkam P. The Methods for the Generation of Smoothness in Dental Ceramics. Continuing education. Dental Aegis.

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257. The following are steps for bonding of zirconia based ceramics with resin cement is true, except?

- A. tribochemical silica coating (Rocatec Soft/3M)
- B. prime and bond for light-cured resin cements with a silaning agent
- C. a silane coupling agent is applied to achieve chemical bonding to the silica-coated surface
- D. air-particle abrasion with alumina oxide particles

257 Correct= B Light-cured resin cements are strictly contraindicated for zirconia-based ceramic restorations because the zirconia coping does not allow light to penetrate for proper curing.

Product	Company
Lava Crowns and Bridges	3M ESPE
Cercon	DENTSPLY Ceramco
CEREC inLab	Sirona
InCeram Zirconia	Vita
IPS e.max ZirCAD	Ivoclar Vivadent
KATANA	Noritake Dental Supply
KaVo Everest	KaVo
Procera AllZirkon	Nobel Biocare
Versus System	Whip-Mix
ZENO Tec System	Wieland Dental + Technik

Resin cements are composed of diacrylate resins and glass filler. They are usually dual-cured resins that can be light-activated and can self cure.

Esthetic resin and adhesive cements require bonding agent or primer for adhesion to tooth structure and primer for adhesion to ceramic surfaces. These resin cements should be selected when greater bond strength and stronger mechanical properties of the cement are desired. Light-cured resin cements are strictly contraindicated for zirconia-based ceramic restorations because the zirconia coping does not allow light to penetrate for proper curing.

Pretreatment Techniques for Zirconia-based Ceramics

Pretreatment techniques for promoting bonding to zirconia-based ceramics include air-particle abrasion and tribochemical silica coating (Rocatec Soft/3M). These pretreatments are utilized before chemical bonding with a silane coupling agent, ceramic primer, self-adhesive cement or adhesive cement. If ceramic primer, self-adhesive cement or adhesive cement that contains an acidic adhesive monomer is used, air-particle abrasion is the easiest way to form a roughened surface to increase mechanical retention. Tribochemical silica coating with impact energy of blasted silicate particles produces bonding between the silicate and the targeted surface by a mechano- chemical reaction. After the mechanochemical reaction, a silane coupling agent is applied to achieve chemical bonding to the silica-coated surface.

Clinical Use of Resin Cements

Both adhesive resin cements and esthetic resin cements usually include various types of compatible primers or bonding agents that are to be applied to the tooth and ceramic restoration. If the zirconia is sandblasted with aluminum oxide particles, or blasted with tribochemical silica coating (Rocatec Soft/3M ESPE) before placing ceramic primer, the bond of resin cement to the restoration will improve. Dual- and self-cured resin cements are usually not compatible with light-cured bonding agents. All types of bonding agents contain acidic monomers that affect the self-cured chemistry of the resin cement. It is critical to follow the manufacturer's instructions for proper bonding of the restoration to tooth structure.

Guide to Zirconia Bonding Essentials

*John M. Powers, Ph.D. Dental Consultants, Inc. (THE DENTAL ADVISOR), ,
Texas*http://www.kuraraydental.com/products/36/zirconia_bond_guide.pdf

Powers, et al. Craig's Restorative Dental Materials. 12th ed, Pg 460

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258. Which of the following is the least likely cause of ceramic inlay failure?
- A. Debonding of the restoration
 - B. Bulk fracture
 - C. Marginal breakdown
 - D. All the above are equal causes of ceramic inlay failures

258. Correct= A

Debonding of the restoration

Failures

Two types of failure are most common with esthetic inlays and onlays: bulk fracture (see Fig 18-3) and marginal breakdown (Fig 18-9). Bulk fracture sometimes occurs in areas of cuspal coverage, particularly if the restorative material is less than 2.0 mm thick. It also occurs at the isthmus adjacent to marginal ridges, where the porcelain is poorly supported by tooth structure.

Marginal ditching is a common finding in esthetic inlays and onlays.^{59,60,78,105} Because resin cements tend not to be heavily filled, they wear more quickly than the adjacent restorations or tooth structure. This is particularly true if the marginal fit is poor.^{77,113} Kawai and others⁵⁴ demonstrated a linear relationship between wear of resin cement and the horizontal marginal gap. They concluded that reduction of the marginal gap is an important clinical consideration in minimizing the wear of the resin cement. They also found that hybrid resin cements wear faster than microfilled resins. Isenberg and others⁴⁷ reported 3-year results of a clinical study of 121 Cerec inlay and onlay restorations. None of the restorations exhibited any evidence of interfacial staining, discoloration, or caries, but about 50% of the restorations exhibited gap dimensions large enough to be detected with an explorer. The rate of wear of the resin composite luting agent was linear over the first year, but no further vertical wear was noted over the course of the investigation. The depth-width ratio of the gap generally did not exceed 50%.

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259. When a segment of a veneer fractures but remains intact, it is defined as what type of fracture?

- a. Cohesive
- b. Static
- c. Adhesive
- d. Marginal

259. Correct B: Static

The most common cause of failure of porcelain veneers is fracture. Clinical studies report a modest 0% to 5% failure rate due to fracture. Higher fracture rates (7% to 14%) were noted in cases with unfavorable occlusion, significant parafunction, large dentin-bonding surfaces, and bonding to existing restorations. In a 15-year review, Friedman¹⁷ classified the fractures into three categories: static, cohesive, and adhesive. When a segment of a veneer fractures but remains intact, it is defined as a static fracture. These failures are caused by excessive loading or polymerization shrinkage. The key factors are the internal fit of the ceramic restoration and the amount of unsupported porcelain. The crack propensity is inversely proportional to the internal fit of the veneer. An internal fit discrepancy of 100 μm or less will minimize internal stress and prevent static fracture. Cohesive fractures occur within the body of porcelain due to tensile loads from excessive functional or parafunctional loading. Enamel imparts stiffness to the tooth much like a metal coping does for a metal-ceramic crown. Removal of the enamel negatively affects the stress-strain distribution of the subsequent veneer. This leads to an increase in flexure under load and, ultimately, cohesive fracture. The most important areas in which to maintain enamel are the incisal and cervical areas. Lack of adhesion in those areas produces higher fringe-order stress on loading and increased risk of cohesive fracture. Finally, an adhesive fracture is due to a failure of the bonding interface between the porcelain/luting composite and the tooth structure. It is a result of a weak bond or severe occlusal loading. Friedman reports that 86% of the adhesive fractures occurred at a resin-dentin interface.

(Summitt, James B. *Fundamentals of Operative Dentistry: A Contemporary Approach, 3rd Edition*. Quintessence Publishing (IL), p. 482).

260. What are the indications for 1st generation all ceramic crowns (e.g., Empress, Finesse, OPC, Cerpress, Cergo)?

- A. Porcelain veneers, Inlays, Onlays
- B. Anterior crowns, Posterior crowns (though first molars)
- C. Anterior 3-unit FDPs (through 2nd premolar as abutment)
- D. All of the above
- E. A and B only

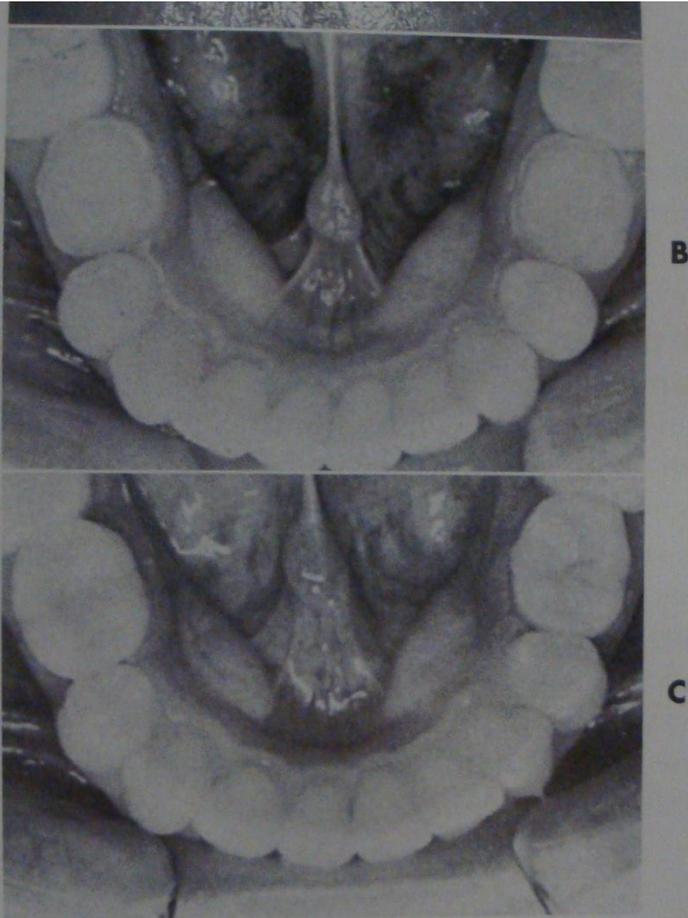


Fig. 25-1. A, All-ceramic crown restoring the maxillary central incisors. B and C, Retained deciduous mandibular second molars restored with ceramic inlays.
(B and C courtesy Dr. R.B. Miller.)

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260. E. A and B only

2nd generation pressed crowns- indications: Anterior 3-unit FDPs; Anterior Crowns; Posterior Crowns; Veneers. Examples are Empress II (Eris) and OPC 3G

Porcelain Systems, NPDS 255 Operative Dentistry, Dr. Nordin

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261. Which of the following techniques should be incorporated in the medical model of caries management?

- A. Eliminate susceptible areas by sealing pits and fissures
- B. Reduce oral flora with chlorhexidine treatment
- C. Recommend diet modification by reducing the source of carbohydrate intake
- D. Induce remineralization with daily, low-dose fluoride application

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261. Correct: E. All of the above

Rationale:

CARIES CONTROL

- eliminate seeding lesions
 - Gross excavation, indirect pulp caps, ZOE
 - Replace questionable restorations
 - use active/therapeutic restorations
 - fluoride releasing materials
 - antibacterial properties
 - eliminate susceptible areas
 - seal remaining pits/fissures
 - diet modification
 - reduce carbohydrate
 - xylitol products
 - reduce oral flora
 - Chlorhexidine treatment
 - increase personal oral hygiene
 - high dose APF (1.23%)- office applied (bacteriocidal)
 - more frequent recall
 - Induce remineralization - low dose daily F- home applied; rinses, dentifrice
-
- saliva analysis
 - buffering capacity (phosphate, bicarbonate)
 - clearance (quantity)
 - viscosity (quality)
 - Peridex after completion of caries control (1/2 oz rinse b.i.d. for 16 days)
 - S. mutans, lactobacillus culture on completion and recall

Class notes courtesy of Dr Nordin

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- 262.** Recommendations in an all ceramic inlay/onlay preparation include all of the following except:
- a. Margins should not fall on centric contact points
 - b. Areas to be onlayed need 1.5mm of clearance in all excursions
 - c. Bevels are contraindicated
 - d. The central groove reduction (2.5mm) follows the anatomy of the unprepared tooth

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262. ANSWER- D The central groove reduction (2.5mm) follows the anatomy of the unprepared tooth

Rubber dam is recommended for visibility and moisture control when preparing for all ceramic inlays and onlays. Step by step procedure.

1. Mark centric contact before isolation. **Margins should not fall on centric contact points.** This will avoid chipping or wear of the luting resin.
2. Prepare outline form, excavate caries as with metal inlays or onlays. Because of the resin bonding, axial wall undercuts can sometimes be blocked out with resin-modified glass ionomer cement, preserving additional enamel for adhesion. However, undermined enamel should always be removed.
3. **The central groove reduction (1.8mm) follows the anatomy of the unprepared tooth.** This will provide additional bulk for the ceramic.
4. **Areas to be onlayed need 1.5mm of clearance in all excursions** to prevent ceramic fracture.
5. Extend the box to allow a minimum of 0.6mm of proximal clearance for impression making.
6. The margin should be kept supragingival which will make cementation and polishing much easier.
7. The width of the gingival floor of the bow should be approximately 1.0.mm.
8. Round all internal line angles. Sharp angles lead to stress concentrations and increase the likelihood of voids during the luting procedure.
9. Use a 90 degree butt joint for ceramic inlay margins. **Bevels are contraindicated** because bulk is needed to prevent fracture. A distinct heavy chamfer is recommended for ceramic onlay margins.
10. Check after the rubber dam is removed that 1.5mm of clearance is achieved in all movements. To be sure, one can measure the thickness of the provisional restoration with a dial caliper.

Contemporary Fixed Prosthodontics pgs 266-267; Rosenstiel, 3rd edition

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263. How do ceramic inlays/onlays most commonly fail?
- A. Fracture and debonding
 - B. Debonding due to method of cementation
 - C. Debonding and marginal breakdown
 - D. Fracture and marginal breakdown

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263. Correct = D. Fracure and marginal breakdown

Two types of failure are most common with esthetic inlays and onlays:

1. Bulk fracture
2. Marginal breakdown

Bulk fracture sometimes occurs in the area of cuspal coverage, particularly if the restorative material is less than 2.0 mm thick

It also occurs at the isthmus adjacent to marginal ridge, where the porcelain is poorly supported by tooth structure

Marginal ditching is a common finding in inlays and onlays because resin cements are heavily filled and wear more quickly than the adjacent restorations or tooth structure, especially if the marginal fit is poor to begin with

Summit, Robbins, Hilton, Schartz, Santos Jr. Fundamentals of Operative Dentistry – A Contemporary Approach. 3rd Ed, 2006.

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264. Which of the following impression material is most accurate in a wet environment?

- A. Condensation silicones
- B. Polysulfides
- C. Polyethers
- D. Addition silicones

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264. Correct : C

Reference: Craig's Restorative Dental Materials by Powers

1. Non-Elastic
 - a. Compound
 - b. Zinc oxide eugenol
 - c. Impression plaster
2. Elastic
 - a. Hydrocolloids
 - i. Agar hydrocolloid
 - ii. Alginate hydrocolloid
 - b. Elastomeric materials
 - i. Polysulfide rubber-excellent tear strength, good surface detail, multiple pours
 - ii. Silicone rubber
 1. Condensation-no longer used
 2. Addition-(PVS) accurate, multiple pours, good for undercuts
 - iii. Polyether rubber-very accurate, rigid, hydrophilic, multiple pours

Property	Polysulfide	Addition silicone	Polyether
Working time	Mod Long	Short to Mod	Short
Setting Time	Mod Long	Short to Mod	Short
Shrinkage on setting	Mod High	Very Low	Low
Permanent deformation in compression	Mod High	Very Low	Mod High
Flexibility During removal	High	Low to Mod	Low
Tear Strength	Mod High	Moderate	Low
Flow after setting under small forces	Mod High	Very Low	Very Low
Wettability by Gypsum	Moderate	Poor to Good	Good
Detail Reproduction	Excellent	Excellent	Excellent

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265. Which of the following statements concerning dentin desensitizers is false?

- A. Arginine and Calcium Carbonate seals the dentin tubules to stop sensitivity.
- B. Using 5% potassium nitrate toothpaste will depolarize the nerves and stop neural transmission.
- C. Potassium nitrates occlude the dentinal tubules to stop sensitivity.
- D. Arginine and Calcium Carbonates will depolarize the nerves and stop neural transmission.

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265. Correct- C.

A desensitizing fluoride toothpaste for home use, Sensodyne® (S) toothpaste (GlaxoSmithKline, London, United Kingdom), using 5% potassium nitrate to depolarize the nerves and stop neural transmission. They do not occlude dentin tubules.

Charig A, Chapin C, Major E et al. Mechanism of Action of a Desensitizing Fluoride Toothpaste Delivering Calcium and Phosphate Ingredients in the Treatment of Dental Hypersensitivity. Compendium of Continuing Education in Dentistry

October 2009, Volume 30, Issue 8

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266. Which desensitizing agents and proposed mechanism of action is incorrect?

- A. Potassium nitrate -reduce nerve excitability in animal models.
- B. Oxalates - reduce dentin permeability and occlude tubules
- C. Calcium phosphates-remineralize the enamel crystalline structure
- D. Fluoride -reduce dentin sensitivity possibly by precipitation of insoluble calcium fluoride within the tubules.

266. Correct= C is incorrect; all other answers were correctly matched to mechanism.

Fluoride. Fluorides such as sodium fluoride and stannous fluoride can reduce dentin sensitivity. Fluorides decrease the permeability of dentin in vitro, possibly by precipitation of insoluble calcium fluoride within the tubules.

Potassium nitrate. Potassium nitrate, which usually is applied via desensitizing toothpaste, also can reduce dentin sensitivity when applied topically in an aqueous solution or an adhesive gel. Potassium nitrate does not reduce dentin permeability in vitro, but potassium ions do reduce nerve excitability in animal models.

Oxalate. Oxalate products reduce dentin permeability and occlude tubules more consistently in laboratory studies than they do in clinical trials.

Calcium phosphates. Calcium phosphates may reduce dentin sensitivity effectively. Calcium phosphates occlude dentinal tubules in vitro and decrease in vitro dentin permeability.

Adhesives and resins. Because many topical desensitizing agents do not adhere to the dentin surface, their effects are temporary. Stronger and more adhesive materials offer improved and longer-lasting desensitization ... claim to occlude tubules in hypersensitive dentin.

Iontophoresis. This procedure uses electricity to enhance diffusion of ions into the tissues. Dental iontophoresis is used most often in conjunction with fluoride pastes or solutions and reportedly reduces DH.

Lasers. The effectiveness of lasers for treating DH varies from 5 to 100 percent, depending on the type of laser and the treatment parameters. Studies have reported that the neodymium: yttrium-aluminum-garnet (YAG) laser, the erbium: YAG laser and galium-aluminium-arsenide low-level laser all reduce DH, but the reductions were not significantly different from those of a placebo or positive controls.

Miscellaneous treatments. A large number of anecdotal reports support alternative approaches for tooth desensitization. Although these reports are not truly evidence-based, they may apply to some clinical situations. For example, periodontal surgery involving coronally positioned flaps reportedly eliminates DH in extensively exposed root dentin. If the DH is associated with an abfraction lesion, occlusal adjustment may be effective.

Orchardson R, Gillam DG. Managing dentin hypersensitivity. JADA 2006; 137, 7, 990-998.

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267. Which of the following are true regarding enamel microabrasion?
- A. Indication is removal of superficial discolorations
 - B. It is accomplished by using an acid and abrasive
 - C. 22 to 27 μm of enamel is removed with each treatment
 - D. All the above are correct.

267. Correct=D. All the above are correct.

Microabrasion and Macroabrasion

One decision in the esthetic treatment planning for a patient is whether to remove a discoloration by bleaching or by removal of tooth structure. Microabrasion is a process in which the tooth surface is subjected to a combination of an acid and an abrasive (Figs 15-27a to 15-27d).^{30,31} The acid removes mineral content, leaving the outer 22 to 27 μm weakened enough that the abrasive, with which the acid is mixed, quickly removes the stained outer surface of the tooth. Although the amount of enamel removed is very limited, this abrasive technique alters the outer surface of the enamel as the undesirable coloration is removed or at least altered. The abrasive, usually suspended in a water-soluble gel containing a low concentration of hydrochloric acid, is applied with a rubber cup or stiff bristle brush for 20 to 30 seconds to acid-conditioned enamel.²⁹ Superficial discolorations can usually be removed from the enamel surface, but it is not possible to know in advance whether the dis-

coloration extends to the dentin or become more visible, a resin composite restoration will need to be placed to seal the defect and restore contour. The choice of resin composite to place poses a dilemma as to whether the material matches the original tooth color or the color the tooth will be. It is best to bleach first unless the tooth enamel is of a chalky texture. Then when abrasive techniques are initiated, the tooth shade is already established should a resin composite restoration be required. Bleaching has been estimated to remove 80% of brown discolorations. White discolorations are not removed, but may be much less noticeable when the surrounding area of the tooth is lightened. If bleaching is unsuccessful, then the more aggressive techniques can be initiated. The patient should be informed of the treatment options (bleaching, abrasion, bonding) before treatment and should understand the different fees for these procedures.

Another form of abrasion is macroabrasion. In this technique, the discoloration is achieved by applying a

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268. What technique can be used to create a matte finish and increase retention on the intaglio surface of a crown before cementation?

- a. Use of a fine diamond
- b. Use of a polishing disc
- c. HF acid
- d. Aluminum oxide air abrasion

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268. Correct D: Air abrasion with aluminum oxide

The internal surface of the casting may be carefully air abraded with aluminum oxide, avoiding the margins; in preparation for the clinical try-in. Air abrasion provides a dull, matte finish. Any area that binds during intraoral seating of the casting creates a bright, burnished mark.

(Summitt, James B.. *Fundamentals of Operative Dentistry: A Contemporary Approach, 3rd Edition*. Quintessence Publishing (IL), p. 559).

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269. The intaglio surface of a casting is best prepared by air-abrading the fitting surface with 50 um alumina. Alternative cleaning methods include steam cleaning, ultrasonics, and organic solvents.

- A. Both statements are true
- B. Both statements are false
- C. First statement is true, second is false
- D. First statement is false, second is true

269. Answer A

Rosenstiel, Land, Fujimoto. Contemporary Fixed Prosthodontics. Third edition. 2001 p. 772

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270. The main advantage of lithium disilicate-containing ceramics relative to leucite-containing ceramics is their higher flexural strength and fracture toughness. The fabrication of fixed partial denture frameworks is possible with lithium disilicate-containing materials.

- A. The first statement is true, the second statement is false.
- B. The first statement is false, the second statement is true.
- C. Both statements are true.
- D. Both statements are false.

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270. ANSWER: C. Both statements are true

Rationale:

The main advantage of lithium disilicate-containing ceramics relative to leucite-containing ceramics is their higher flexural strength and fracture toughness, which extends their range of applications. The fabrication of fixed partial denture frameworks is possible with lithium disilicate-containing materials. The restoration can be later veneered with ceramics of matching thermal expansion.

Powers JM, Sakaguchi RL. *Craig's Restorative Dental Materials, 12th ed.* Mosby Elsevier, 2006; Chapter 18.

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271. Which of the following is not true concerning enamel beveling for composite restorations:

- A. Bevels should be placed at an angle approximately 45 degrees to external tooth surface
- B. *Rarely* used for posterior composite restorations and not placed on areas of potential heavy occlusal forces, however Class I restorations may be beveled resulting in a 0.25-0.5 mm wide bevel.
- C. For moderate and large Class III beveled preparations, all accessible enamel margins are usually beveled, except for the gingival margin. No bevel should be placed on cementum.
- D. May enable the restoration to blend more esthetically with the coloration of the surrounding tooth structure
- E. All are true

271. Correct: E. All are true.

Advantages

- Facilitates better marginal sealing & bonding
- The ends of the enamel rods are exposed to beveling and are more effectively etched
- Increase in etched surface area results in a stronger enamel-to-resin bond, which increases retention and reduces marginal leakage and discoloration.
- Incorporation of a cavosurface bevel may enable the restoration to blend more esthetically with the coloration of the surrounding tooth structure.

Characteristics/Nuggets

- Beveled at angle approximately 45 degrees to external tooth surface
- *Rarely* used for posterior composite restorations and not placed on areas of potential heavy occlusal forces, however Class I restorations may be beveled resulting in a 0.25-0.5 mm wide bevel.
- A bevel placed on an occlusal margin can result in thin composite on the occlusal surface in areas of potentially heavy contacts, potentially resulting in fracture or wear.
- Usually bevels aren't placed on the facial or lingual of the proximal box. Also not placed on proximal margins if beveling results in excessive extension of cavosurface margin.
- However, bevels can be placed on the proximal facial and lingual margins if the proximal box is already wide faciolingually & if it's determined that additional retention form may be necessary. Proximal bevels should not be placed if extensive extension of margins is required.
- A bevel is usually not placed on the gingival margin, although it may be necessary to remove any unsupported enamel rods at the margin because of gingival orientation of the rods.
- For moderate and large Class III beveled preparations, all accessible enamel margins are usually beveled, except for the gingival margin. No bevel should be placed on cementum.
- Bevels may not be recommended on lingual surface margins that are in areas of centric contact or subjected to heavy forces due to less wear resistance of composite.

Roberson, Heymann, Swift. Sturdevant's Art & Science of Operative Dentistry, 4th edition. 2002

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272. When diagnosing anterior interproximal caries, which clinical method will lead to the most accurate and practical diagnosis?

- A. Use of orthodontic separators followed by tactile using an explorer
- B. Caries detection solution of methylene blue
- C. Fiber Optic Transillumination (FOTI)
- D. Use of the gold standard in caries detection – sectioning of teeth

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272. Correct= C. Fiber Optic Transillumination

Use of methylene blue for diagnosis of anterior interproximal lesions still won't allow for adequate visualization due to location of potential lesion – meaning interproximally. For detection of interproximal lesions in anterior teeth, the use of a fiber optic transillumination device – meaning a fine light – which is transmitted through a contact area. A potential lesion will appear as a dark shadow. However, it is difficult to discriminate between demineralization extending just into enamel and that progressing farther into dentin – especially in the posterior areas. The use of an orthodontic separator has been advocated in some cases to allow for the practitioner to see more clearly and feel for any potential cavitation in the enamel surface. Use of the gold standard would be ideal – but can only be used with extracted teeth.

Summitt J. Fundamentals of Operative Dentistry. 3rd Ed; 87-88.

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273. MCR crown is invested in which of the following investment material?

- A. Gypsum-bonded investment
- B. Quartz-bonded investment
- C. Phosphate-bonded investment
- D. Kaolin-bonded investment

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273. Correct : C Phosphate-bonded investment

Reference: *Contemporary Fixed Prosthodontics by Rosenstiel*

Investments classified by binder:

1. Gypsum-bonded - Gypsum is binder, along w/ cristobalite or quartz as refractory material
2. Phosphate-bonded – high concentration of silica refractory material. Binder consists of magnesium oxide & an ammonium phosphate compound. Most mixed w/ colloidal silica
3. Silica-bonded

Gypsum-bonded investments:

Cristobalite and quartz are responsible for thermal expansion of mold during wax elimination. Because gypsum is not chemically stable at temperatures exceeding 1200 F (650 C), these investments are typically restricted to castings of conventional ADA types II, III and IV gold alloys. Not used for MCR's because gypsum unstable at high temps.

Phosphate bonded-investments:

Because most metal ceramic alloys fuse at 1400 C (2550 F) (gold alloys at 925 C, or 1700 F), additional shrinkage occurs when casting cools to room temperature. To compensate, a larger mold is needed.

Added expansion obtained using phosphate-bonded investments.

Material is stable at burnout temps above 650 C (1200 F), allowing for additional thermal expansion.

Some phosphate-bonded investments contain carbon and are gray in color. Carbon-containing materials shouldn't be used for casting base metals because carbon residue affects final alloy composition. May be used for casting high-gold or palladium content alloys. Material of choice for casting metal-ceramic alloys.

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274. Which of the following is true for posterior bucco-lingual embrasure form?

- A. The facial embrasure are usually larger than the lingual embrasure in a mandibular first molar.
- B. The lingual embrasure are usually larger than the facial embrasure in a mandibular first molar.
- C. The facial embrasure is approximately equal to the lingual embrasure in a mandibular first molar.
- D. Embrasure form does not matter for the health of the periodontium.

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274. B The lingual embrasure is usually larger than the facial embrasure in a mandibular first molar.

The tongue can return the food to the occlusal surface easier than the Buccal vestibule.

Sturdevant C, Roberson T, Heymann H, Sturdevan J. The art and science of Operative Dentistry. 3rd edition. Mosby 1995. p31

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275. “Griffith flaws” at the porcelain surface refers to

- A. entrapped microscopic air pockets
- A. minute cracks and scratches
- B. voids incorporated into low-fusing porcelain during firing
- C. gaps created when porcelain is treated with HF for more than 2 minutes

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275 Correct= B

In a paper published in 1920, A A Griffith laid the foundations of fracture mechanics with his criterion for brittle fracture

- There are minute cracks and scratches, submicroscopic in size, on the surface of glass. (*Griffith 1920*)
- These defects, termed “Griffith Flaws”, act as stress concentration centers when the glass is subject to tensile loading
- Fracture occurs when the critical breaking stress, concentrated at the flaw tip, is exceeded, resulting in crack propagation (*Stokey, 1965*)

A A Griffith, The phenomena of rupture and flow in solids, Philosophical Transactions of the Royal Society of London, Series A, **221**, 163-198, 1920.

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276. Which of the following is incorrect regarding the use of resin cements used for cementation of all-ceramic crowns?
- A. The goal is to provide a marginal seal of the crown and adhesively retain it to the tooth
 - B. Resin cementation is extremely technique sensitive
 - C. It has been shown that a strong dependable bond between resin and ceramic can be achieved.
 - D. The bond between dentin and the resin cement is stronger than the bond between the ceramic and the resin cement

276. Correct= D. The bond between dentin and the resin cement is stronger than the bond between the ceramic and the resin cement

Resin Bonding of All-Ceramic Crowns

The goal of adhesive bonding is to provide a marginal seal of the crown and adhesively retain it to the tooth. Resin bonding is extremely technique sensitive and demands proper preparation of ceramic and tooth surfaces. It has been demonstrated that a strong, dependable bond between resin and ceramic can be achieved. The ceramic is etched with hydrofluoric acid to create micromechanical retention sites.¹¹² Silane is added to the etched surface shortly before bonding and allowed to air dry. Silane coupling agents improve the resin bond to porcelain.¹¹⁷

The dentin-resin bond is less dependable than the resin-ceramic bond. Because hemorrhage and crevicular fluid flow may interfere with dentin bonding, teeth should be isolated with retraction cord before cementation. Preparations should be cleaned with pumice or antimicrobial solutions, such as chlorhexidine. Because light polymerization decreases with increasing porcelain thickness¹² and because polymerization of the adhesive before cementation may result in resin pooling and incomplete seating, a chemically activated adhesive system should be applied according to manufacturer's instructions.¹¹ This includes an etchant, primer, and dual-cure adhesive. A dual-cure resin cement is recommended for bonding of the crown for the same reason. Dual-cured resins have a slow, chemically activated autocure component and a light-activated component. The inside of the crown is painted with adhesive before addition of the luting resin. The crown is gently placed and excess cement removed with a brush. Then the crown is seated with additional pressure or lightly tapped to extrude excess luting resin at the margins. The luting resin is light cured through the facial and lingual aspects for 1 minute each. Excess resin is removed with a No. 12 scalpel blade. The occlusion is adjusted with 15- μ m and 8- μ m diamonds under water spray. Finally, the porcelain is polished with a porcelain polishing kit.

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277. In the advancing front of a demineralization zone, the dentinal tubules begin to have a crystalline precipitation occur. When these affected tubules become completely occluded by the mineral precipitate what is the term to describe this zone.

- a. The Occluded zone
- b. The Transparent zone
- c. Dead tracts
- d. Sclerotic dentin

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277. Correct B: Transparent zone

Crystalline precipitates form in the lumen of the dentinal tubules in the advancing front of a demineralization zone (affected dentin). When these affected tubules become completely occluded by the mineral precipitate, they appear clear when a section of the tooth is evaluated. This portion of dentin has been termed the *transparent zone of dentin* (see next section on zones of dentinal caries) and is the result of mineral loss in the intertubular dentin and precipitation of this mineral in the tubule lumen. Consequently, translucent dentin is softer than normal dentin (Fig. 3-33).⁷¹

(Roberson, Theodore. *Sturdevant's Art and Science of Operative Dentistry, 5th Edition*. C.V. Mosby, 042006. p. 100).

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278. The following is considered the radiographic zones in caries: Outer Enamel (E1), Inner Enamel (E2), Outer Dentin (D1), and Inner Dentin (D2). According to Pitts (Car Res 96: 142) when caries reaches the outer dentin, it is cavitated 61% of the time

- A. Both statements are true
- B. Both statements are false
- C. First statement is true, second is false
- D. First statement is false, second is true

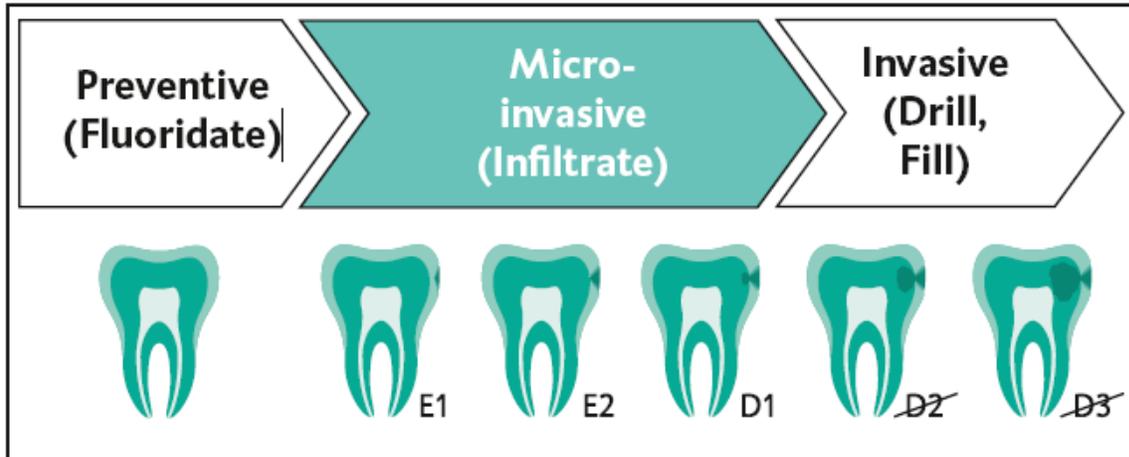
278. Correct - C

According to Pitts (Car Res 96: 142) when caries reaches the outer dentin, it is cavitated 41% of the time

References:

Preventative Treatment Planning Lecture; CAPT Nordin, 19SEP11, slide 116.

ICON System



Icon is applicable for early caries lesions with a radiographic depth up to the outer third of the dentine (D1)

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279. Which of the following most accurately describes the mechanism by which aluminum compounds control bleeding?

- A. Precipitates proteins to physically obstruct hemorrhaging
- B. Coagulates blood by the classic mechanism
- C. Causes severe vasoconstriction of the local vasculature
- D. Induces rapid fibrotication of locally traumatized blood vessels

279. Correct: A. Precipitates proteins to physically obstruct hemorrhaging

Rationale:

Aluminum Compounds (Aluminum chloride)

-Metal salts that cause gingival retraction by precipitating proteins or by desiccation.
Precipitated proteins physically obstruct hemorrhaging.

-Advantages:

- No adverse systemic effects
- Good handling

-Retraction cords saturated with aluminum chloride:

- Control bleeding
- Tissue displacement
- Surface anesthetic
- Minimal tissue damage
- May help to provide up to 23 minutes of displacement

Ferric Sulfate

-Causes actual coagulation of the blood

-Advantages:

- Good tissue response
- Extended working time
- Good displacement
- Compatible with Hemodent

-Disadvantages:

- Not compatible with epinephrine
- Transient tissue discoloration
- Unpleasant taste

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280. The best technique for recording Centric Relation is?

- A. One-handed technique
- B. Record centric relation when the patient is upright
- C. The uppermost terminal axis must be *delicately* located in an open position *without pressure* on the mandible, and *then* it must be firmly held on that axis while the jaw is closed to the first point of contact. align the condyle-disk assemblies in the most superior position
- D. There is no one specific way that must be used to record centric relation correctly

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280. **Correct: D.** There is no one specific way that must be used to record centric relation correctly. There is no one specific way that must be used to record centric relation correctly, but there are important similarities that are common in all the techniques that consistently achieve it.

Centric relation may be defined as the relationship of the mandible to the maxilla when the properly aligned condyle-disk assemblies are in the most superior position against the eminentia, irrespective of tooth position or vertical dimension.

Centric occlusion refers to the relationship of the mandible to the maxilla when the teeth are in maximum occlusal contact, irrespective of the position or alignment of the condyle-disk assemblies. This is also referred to as the **acquired position** of the mandible or the **maximum interocclusal position (MIOP)**.

1. One-handed techniques almost never achieve correct centric relation positioning. Chin-point guidance tends to push condyles down and back.
2. The mandible cannot be *forced* into centric relation. The uppermost terminal axis must be *delicately* located in an open position *without pressure* on the mandible, and *then* it must be firmly held on that axis while the jaw is closed to the first point of contact. Pressure applied before the joints are in centric relation activates muscle contraction.
3. It is difficult to record centric relation when the patient is upright. Manipulation of the mandible is simpler and far more consistent if the patient is supine.
4. If upward pressure toward the condyles causes any sign of discomfort or tension, the position cannot be accepted as centric relation. A differential diagnosis must be made to determine the cause of the discomfort before one proceeds.
5. The most commonly found cause for discomfort from upward pressure is related to tension of hypercontracted muscle. Muscle spasm can affect both the position of the condyle and the alignment of the disk. In most instances, delicate manipulative techniques can be used to release the spasm and ease the condyles into the correct position.
6. Once a correct method of manipulation is learned, patients will not resist the operator. Drugs, injections, or appliances are rarely needed if the mandible is manipulated properly. This is true even in patients with acute trismus in all but the rarest cases unless an intra-articular problem is present.

Dawson, Peter E.. Evaluation, Diagnosis and Treatment of Occlusal Problems, 2nd Edition. C.V. Mosby, 1988.

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281. All of the following are reasons to perform a chair-side remount for major fixed case EXCEPT?
- A. There is a need for significant occlusal adjustment due to tooth movement
 - B. To account for previous mounting discrepancies
 - C. Intraoral occlusal adjustments are proven to be inadequate involving large fixed cases
 - D. To account for dimensional changes inherent with the indirect process

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281. Correct = C. Intraoral occlusal adjustments are proven to be inadequate involving large fixed cases

If there is a need to significant occlusal adjustment, a remount procedure may be recommended. It is typically used when extensive restorative dentistry has been performed, and it serves to convey the relationships of the restorations and teeth to the dental laboratory. Any inaccuracy (slight tooth movement, previous mounting discrepancies, or small dimensional change inherent with the indirect process) can be compensated for relatively easily, thus reducing the amount of chair time needed for precementation adjustment. Intraoral occlusal refinement is limited because of visibility and access difficulties. Laboratory adjustments offer optimum access and visibility and the opportunity to evaluate lingual contact relationships. There are six transfers in the fabrication of a cast restoration – tooth to impression, impression to die, die to wax, wax to investment, investment to metal, and metal to tooth. Errors may occur at any of these transfers. There are many opportunities for error and too many variables from the time of the impression to the time of delivery of the restoration. A remount procedure can compensate for these errors.

Rosenstiel, Land, Fujimoto. Contemporary Fixed Prosthodontics – 3rd Ed. 2001. 30(753-56)

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282. Which of the following are true in regards to the Law of Beams?

1. Double the height will cube the strength
2. Double the width will quadruple the strength
3. Half the height will diminish the strength by $1/4$
4. Half the width will diminish the strength by $1/4$

- a. 1,3
- b. 1,4
- c. 2,3
- d. 2,4

282. Correct- B

Reference: The Santulli Manual by CAPT Santulli

Law of Beams:

Height: 2 X will cube the strength, $\frac{1}{2}$ X will diminish the strength by $\frac{1}{8}$

Width: 2 X will double the strength, $\frac{1}{2}$ X will diminish the strength by $\frac{1}{4}$

When fabricating or adjusting an FPD connector to accommodate the available space, reducing the width of the connector significantly diminishes its strength compared to reducing the height.

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283. What happens to gypsum casts if it is soaked in non slurry water?

- A. Surface detail is lost.
- B. There is more porosity.
- C. The casts get weaker
- D. There is no difference between soaking the casts in slurry or non slurry water.

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283. Correct-A

With some techniques like duplication, it is necessary to soak the set gypsum in water. Although it appears insoluble, the gypsum slowly dissolves, ruining the surface detail in the cast. If soaking is required, it should be done in water saturated in plaster slurry and only enough to achieve the desired wetting.

Rosentiel S, LandM, Fujimoto J. Contemporary Fixed Prosthodontics 3rd edition Mosby 2001 p 432.

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284. During #8-9 MCR try-in, the patient complains that the shade did not match her existing dentition and you decide correct it with custom staining. What is the most difficult to achieve?

- A. decrease the hue
- B. increase the hue
- C. decrease chroma
- D. decrease value

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284. Correct= C. Decreasing Chroma

Increasing the chroma (saturation) is one of the simplest shade alterations to achieve. The addition of yellow stain increases the chroma of a basically yellow shade, whereas orange has the same effect on a yellow-red shade.

When an alteration in hue is required, pink-purple moves yellow toward yellow red, whereas yellow decreases the red content of a yellow-red shade. These are the only two modifications that should be necessary, because the hue of a natural tooth always lies in the yellow-red to yellow orange.

A metal ceramic restoration that has too high a chroma is difficult to modify. Choosing a shade with a lower chroma is always better because a lower chroma can be altered easily. Using the complementary color of a restoration reduces its chroma. Yellow requires purple-blue and orange requires blue or blue-green.

Value can be reduced by adding a complementary color. Violet is used on yellow. Attempting to increase value is less successful because opacity will always be increased.

Rosenstiel et al, Contemporary Fixed Prosthodontics; 4th edition

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285. Raising the value of a ceramic restoration is almost impossible. However, lowering the value is done quite easily by adding the complementary color. Which of the following color combinations below are not complementary colors?

- A. Red, Green
- B. Violet, Yellow
- C. Blue, Orange
- D. Violet, Blue

285 Correct= D. Violet, Blue

Lowering the value can be done very easily by adding the complementary color. If the dominant hue is orange, add blue. If the dominant hue is yellow, add violet. Because most teeth have a yellow hue the violet stain is used more often, esp in the incisal third. Adding violet to the incisal area has the effect of apparent translucency. If the crown being modified has a dominant hue of orange, use a blue stain instead.



Working lecture from Fixed Pros NPDS long course pg 17.

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286. Of the following machined dental ceramics which has the highest flexural strength?

- A. Alumina
- B. Feldspar
- C. Leucite
- D. Zirconia

286. Answer: D Zirconia 900MPa

<u>Processing Technique</u>	<u>Crystalline Phase</u>	<u>Flexural Strength (MPa)</u>
Machined	Zirconia (ZrO ₂)	900
	Alumina (Al ₂ O ₃)	650
	Feldspar (KAlSi ₃ O ₈)	105
	Leucite (KAlSi ₂ O ₆)	135
Slip-cast	Alumina (Al ₂ O ₃)	446
	Spinel (MgAl ₂ O ₄)	378
	Zirconia (ZrO ₂)	604
Heat-pressed	Leucite (KAlSi ₂ O ₆)	121
	Lithium disilicate (Li ₂ Si ₂ O ₅)	350
	Lithium phosphate (Li ₃ PO ₄)	164
Sintered	Leucite (KAlSi ₂ O ₆)	104
	Alumina (Al ₂ O ₃)	139
	Fluorapatite (Ca ₅ (PO ₄) ₃ F)	80
Sintered ceramic-metal	Leucite (KAlSi ₂ O ₆)	70

From Seghi R, Sorensen J: *Int J Prosthodont* 8:239, 1995; Seghi RR, Daher T, Caputo A: *Dent Mater* 6:181, 1990; Höland W, Beall G. *Glass-ceramic technology*, Westerville, OH, 2002, The American Ceramic Society.

TABLE 18-3 Flexural Strength of Selected Dental Ceramics

(Powers, John M. Powers. *Craig's Restorative Dental Materials, 12th Edition*. C.V. Mosby, 022006.).

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287. Before cementing a porcelain veneer after try-in, you must treat the intaglio surface with which of the following?

- A. 37% phosphoric acid
- B. 37% hydrochloric acid
- C. 15% phosphoric acid
- D. Silane coupling agent

287. Correct-D-Silane

“Bonding is achieved by performing the following steps:

1. Etching the fitting surface of the ceramic with **hydrofluoric acid**
2. Applying a **silane** coupling agent to the ceramic
3. Etching the enamel with phosphoric acid
4. Applying a resin bonding agent to etched enamel and silane
5. Seating the restoration with a composite resin eluting agent”

Rosentiel, Contemporary Fixed Prosthodontics; 3rd edition; page 776

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288. Typical film thickness of resin-based cements is less than that of traditional glass ionomer cements; however the 24-hour compressive strength of glass ionomer cements is typically greater than that of resin-based cements.

- A. The first statement is true, the second statement is false.
- B. The first statement is false, the second statement is true.
- C. Both statements are true.
- D. Both statements are false.

288. ANSWER: A. Both statements are false.

Rationale:

Resin Cements

Compressive strengths of dual- and light-cured resin composite cements have been reported from *180 to 265 MPa*. Film thickness ranges from *20 to 60 um*.

Glass Ionomer Cements

Film thickness of glass ionomer cements is slightly less than *25 to 35 um*, with a typically compressive strength from *90 to 230 MPa*.

Powers JM, Sakaguchi RL. *Craig's Restorative Dental Materials, 12th ed.* Mosby Elsevier, 2006; Chapter 20.

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289. Which of the following is true regarding the overglazing of porcelain?

- A. porcelain turns bluish grey
- B. porcelain will fracture
- C. porcelain turns black
- D. unnatural shiny appearance

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289 ANSWER: D. unnatural shiny appearance

After the porcelain is cleaned and any necessary stains are applied, it is returned to the furnace for the final glaze firing. Usually, the glazing step is very short; when the glazing temperature is reached, a thin glassy film (glaze) is formed by viscous flow on the porcelain surface. Overglazing is to be avoided, because it gives the restoration an unnatural shiny appearance and causes loss of contour and shade modification. Glazing temperatures and times vary with the type and brand of porcelain employed.

Powers, John M.. Restorative Dental Materials, 11th Edition. C.V. Mosby, 2001

Since porcelain loses its ability to form a natural glaze after multiple firings, an applied overglaze may be indicated on large restorations that have required numerous corrections. However, caution must be exercised not to overfire the porcelain. It may return to a more crystalline state and become milky or cloudy in appearance, a condition known as *devitrification*. Devitrification causes a loss of natural appearance, and no surface treatment can revive the porcelain.

Shillingburg, H. Fundamentals of Fixed Prosthodontics, 3rd Edition. Quintessence Publishing (IL),

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290. When considering ovate pontics and soft tissue development, all of the following apply EXCEPT?
- A. With a pre-existing healed ridge, there needs to be a minimum of 2.5 mm of gingival tissue over the ridge to allow for modification of soft tissue
 - B. Ideally you want to create a concave pontic receptor site
 - C. In dealing with these cases, one must consider preparation of the teeth (abutments) and the soft tissue
 - D. With a pre-existing healed ridge, plasty tissues .5 – 1.0 mm followed by direct contact with the provisional

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290. Answer A. With a pre-existing healed ridge, there needs to be a minimum of 2.5 mm of gingival tissue over the ridge to allow for modification of soft tissue

Pre-existing healed ridge considerations:

Requires minimum of 2 mm gingival tissue over the ridge

Plasty tissue 0.5-1.0 mm

Provide direct contact with provisional

Healing time is minimum of 2 weeks before final impression

Pre-existing ridge considerations:

Highly keratinized and scalloped tissue should be modified to provide the most convex pontic surface possible

Ridge modification must be considered in every case, ideally to create a concave pontic receptor site.

Werking C. Metal Ceramic Framework and Pontic Design and Assembly NPDS Bethesda MD. Lecture 10Feb2011; 12-13.

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291. Which of the following is true when restoring an endodontically treated tooth?

- A. If more than 2mm of coronal tooth structure remains, the post design has limited role in the fracture resistance of the restored tooth.
- B. Stresses are increased as post length increases
- C. Fiber made posts are advantageous in canals with noncircular cross sections or in canals with extreme taper
- D. Increasing the post diameter increased retention

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291. Answer: A

Reference: Rosenstiel, Land, Fujimoto. *Contemporary Fixed Prosthodontics*. 4th edition, 2006.

6 key features of successful design for a post and core are:

1. Adequate apical seal
2. Minimum canal enlargement (no undercuts)
3. Adequate post length
4. Positive horizontal stop (to minimize wedging)
5. Vertical wall to prevent rotation (similar to a box)
6. Extension of the final restoration margin onto sound tooth structure

Excessive enlargement of the canal can perforate or weaken the root resulting in a split root. The thickness of remaining dentin is the prime variable in fracture resistance of the root. Photoelastic stress analysis also has shown that internal stresses are reduced with thinner posts. The amount of coronal tooth structure remaining is probably the most important predictor of clinical success. If more than 2mm of coronal tooth remains, the post design probably has a limited role in the fracture resistance of the restored tooth. The ferrule is thought to bind the remaining tooth structure together and preventing root fracture during function.

Studies have shown that as post length increases, so does retention. Short posts are more likely to result in root fracture.

Increasing post diameter in an attempt to increase retention is not recommended. The overall prognosis is good when post diameter does not exceed one third of the cross-sectional root diameter. Stresses are reduced as post length increases. A serrated or roughened post is more retentive than a smooth one and controlled grooving of the post and root canal considerably increases retention of a tapered post.

For posterior teeth, 2 or more relatively shorter posts in divergent canals is recommended due to root curvatures and anatomy such as curves and elliptical or ribbon-shaped canals.

Placing a small groove in the path of placement in an extensively damaged tooth increases rotational resistance.

Custom made posts are advantageous in canals with noncircular cross sections or in canals with extreme taper.

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292. Which of the following is true about investments and metals?

- A. Gypsum bonded materials are the investment of choice for metal-ceramic alloys because they are more stable at higher temperatures.
- B. Gypsum bonded materials are the investment of choice for metal-ceramic alloys because they are more stable at lower temperatures.
- C. Phosphate bonded materials are the investment of choice for metal-ceramic alloys because they are more stable at higher temperatures.
- D. Phosphate bonded materials are the investment of choice for metal-ceramic alloys because they are more stable at lower temperatures.

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292. Correct-C.

Phosphate bonded materials are the investment of choice for metal-ceramic alloys because they are more stable at higher temperatures.

Rosentiel S, LandM, Fujimoto J. Contemporary Fixed Prosthodontics 3rd edition Mosby 2001 p 576.

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293. Bis-acryl is often used for veneer provisional but retention may be challenging. What can be done to increase retention?

- A. ensure the prep wraps around the lingual surface
- B. create undercuts in the dentin
- C. ensure the contacts are included in the prep
- D. spot etch the enamel

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293. Correct= D spot etch the enamel to take advantage enamel bonding.

Commonly used provisional materials:

Material	Examples	Advantages	disadvantages
Methyl Methacrylate	Jet, alike, Duralay	-Good marginal adaption -Most color stability -Good polishability -Good strength -Esthetic, durable -repairable -Inexpensive	-Highly exothermic -6% shrinkage -Free monomer toxic to tissue -Strong odor
Vinyl Ethyl Methacrylate	Snap, Trim	-good polishability -low exothermic rxn -low shrinkage -good stain resistance -inexpensive	-low surface hardness and wear resistance -low strength, toughness -low durability -marginal color stability -marginal esthetics
Isobutyl methacrylate	Temp Plus	-good polishability -low exothermic rxn -moderate shrinkage -high fracture toughness -high flexibility -inexpensive	-low color stability -poor esthetics
Bis-acryl	Integrity, Maxitemp	-best marginal fit -low exothermic reaction -good abrasion resistance -Acceptable color stability -repairable	-limited shade selection -brittle -limited polishabiity -expensive
Urethane dimethacrylate	Triad	-high surface hardness -good strength -color stability -controllable working time	-brittle -limited shade selection -less stain resistance -low repair strength -expensive

Craig's Restorative Dental Materials 12th edition

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294. When cementing a post with traditional cements, the choice of luting agents seems to have little effect on post retention. Resin cements have little effect on post performance.

- a. Both statements are true
- b. Both statements are false
- c. The first is true and the second is false
- d. The first is false and the second is true

294. Correct= C. The first is true and the second is false

Luting Agent. When considering traditional cements, the choice of luting agent seems to have little effect on post retention^{32,33} or the fracture resistance of dentin.³⁴ However, adhesive resin luting agents (see Chapter 31) have the potential to improve the performance of post-and-core restorations; laboratory studies have shown improved retention.^{35,36} Resin cements may be indicated if a post becomes dislodged. Resin cements are affected by eugenol-containing root canal sealers, which should

be removed by irrigation with ethanol or etching with 37% phosphoric acid if the adhesive is to be effective.³⁷ Zinc phosphate and glass ionomer have similar retentive properties—polycarboxylate and composite resin have slightly less.³⁸ Some resin and glass ionomer cements have demonstrated significantly higher retention in comparison to hybrid cements.³⁹ Although the choice of luting agent may become more important if the post has a poor fit within the canal,⁴⁰ a post-and-core should be re-made if any rotation or wobble is present.

Contemporary Fixed Prosthodontics, 3rd edition, Rosenstiel, PG 280

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295. When applying die spacer, how far away should the die spacer stay away from the finish line?

- a. 0.5mm to 1.0mm
- b. 0.1mm to 0.3mm
- c. 1.0mm to 1.5mm
- d. 1.0mm to 2.0mm

295-Correct: A: 0.5mm to 1.0mm

Apply cement spacer to the dies, staying 0.5 to 1.0 mm from the finish line (Fig 24-4)

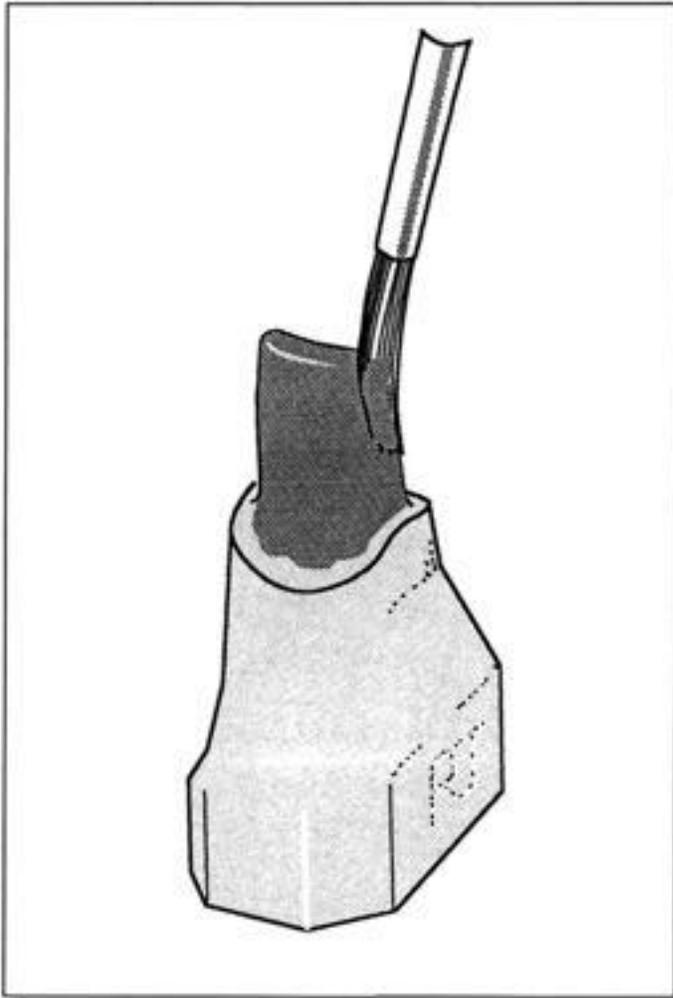


Fig 24-4 Die spacer is applied to the preparation, staying away from the finish line.

(Shillingburg, H.. *Fundamentals of Fixed Prosthodontics, 3rd Edition*. Quintessence Publishing (IL).

2012 ABGD Study Guide

296. When preparing a MCR posterior crown a rationale for placing boxes on the facial and lingual is to counteract the lateral forces that result from the elliptical chewing motion. Grooves should be placed as parallel to the path of withdrawal as possible to maximize their effect.

- A. Both statements are true
- B. Both statements are false
- C. The first statement is true, the second is false
- D. The first statement is false, the second is true

296. Correct-D. The first statement is false, the second is true

“On the prepared tooth the mesial and distal surfaces have more convergence than the facial and lingual surfaces. It is suggested that boxes be placed on the mesial and distal surfaces to enhance their effectiveness (*Mack: J Oral Rehabilitation 1987: 225-265*). Grooves and boxes should be placed as parallel to the path of withdrawal as possible to maximize their effect. Another rationale for placing boxes on the **mesial and distal of posterior teeth is to counteract the lateral forces that result from the elliptical chewing motion**. These forces tend to dislodge a crown in the buccal-lingual direction. Mesial and distal boxes will counteract these forces more effectively than boxes placed on the facial and lingual aspects of the preparation (*Woolsey 1976: JADA 978-980*). In fixed partial dentures, mesial and distal boxes will offset buccal-lingual forces, especially if the pontics are facial to the rotation axis. If the span length is long, facial and lingual grooves will offset mesial-distal movement.”

Santulli GA; NPDS 253 Fixed Prosthodontics Syllabus 2011, Page 71

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297. Of the four proposed theories of porcelain-to-metal attachment, which is believed to be the most significant mechanism?

- A. Chemical bonding
- B. Mechanical interlocking
- C. Van Der Waal's forces
- D. Compression bonding

297. ANSWER: A. Chemical bonding

Rationale:

Mechanisms of Porcelain Metal Attachment (Four Theories)

Chemical bonding

-Occurs between the metal oxides in porcelain and oxide layer of metal; believed to be the most significant.

Mechanical Interlocking

-Interfacial bonding also may occur as the result of physical interlocking between the ceramic and metallic components

Van Der Waal's Forces

-“Wetting bonds” result from the physical attraction between the atoms rather than an actual sharing or exchange of electrons; believed to play a very minor role

Compression Bonding

-Slight mismatches between the COTE of the porcelain and metal. Metal contracts more rapidly than ceramic during cooling, creating tensile forces on the metal and compressive forces on the porcelain.

Fixed Prosthodontics Lecture; Fixed Dental Materials. Curtis Werking, CAPT, USN, DC.

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298. Which statement is not true for the Captek system for fabricating MCRs?

- a. The coping is produced from two metal-impregnated wax sheets that are adapted to a die and fired.
- b. First sheet forms a porous gold-platinum-palladium layer that is impregnated with 97% gold when the second sheet is fired.
- c. The limitation of Captek is the lack of ease of polishability and texture.
- d. Captek provides excellent esthetics and excellent marginal adaptation

298. ANSWERC. The limitation of Captek is the lack of ease of polishability and texture.

In the Captek system the coping is produced from two metal-impregnated wax sheets that are adapted to a die and fired. The first sheet forms a porous gold-platinum-palladium layer that is impregnated with 97% gold when the second sheet is fired. **Advantages of the system include excellent esthetics and marginal adaptation.**

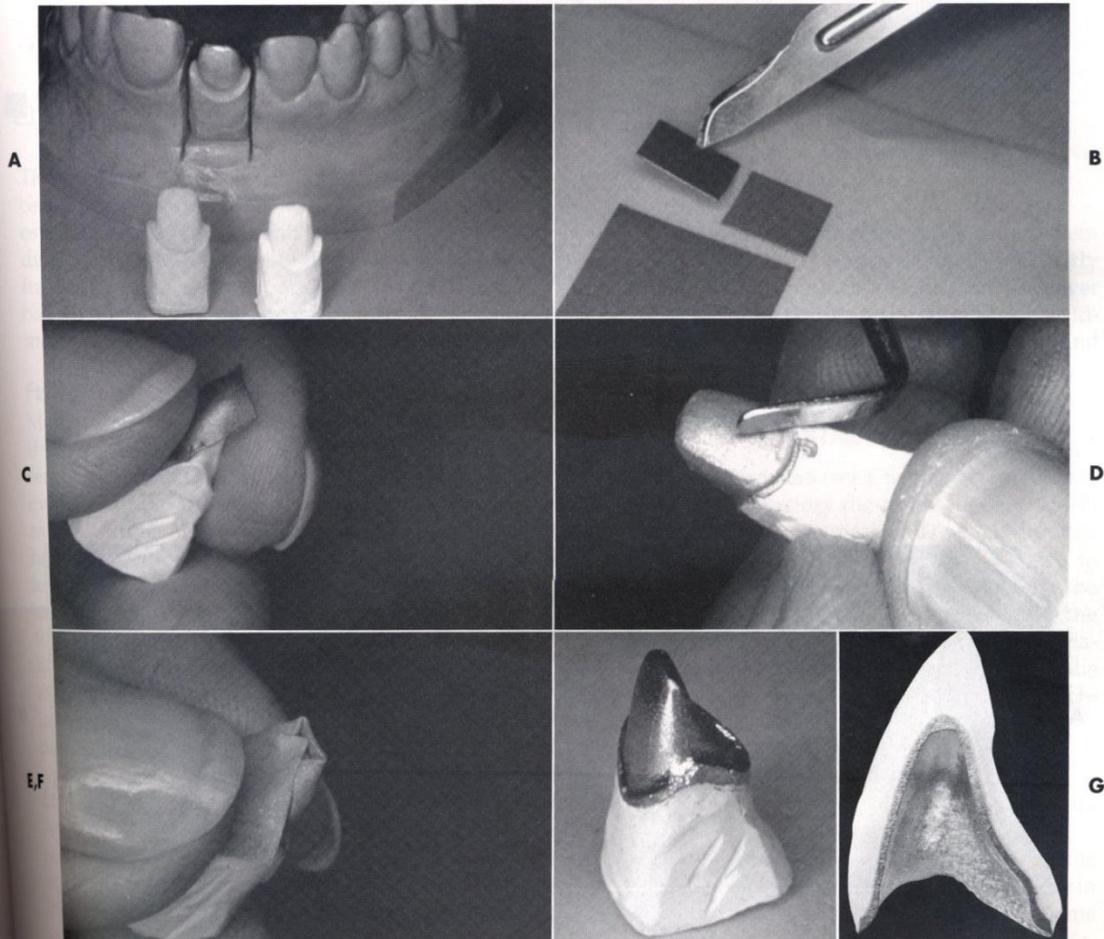


Fig. 25-15. The Captek system. A, Duplicated refractory die. B, Trimming the metal-impregnated wax sheet. C, Adapting first sheet to the die. D, First layer is fired to form a porous coping. E, Adapting second metal-impregnated wax sheet. F, Fired framework. G, Sectioned Captek crown showing coping design.

Continued

Note: Capillary action draws the 2nd sheet of gold into the porous substructure during the 2nd firing.

Rosenstiel et al; Contemporary Fixed Prosthodontics; 3rd edition, 2001

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299. When considering FDP's and stress breakers, which of the following is NOT true?
- A. When considering a tilted molar as an abutment, axial tilt should not be > 25 degree
 - B. With non-rigid connectors, mortise = matrix = female component
 - C. The tenon = patrix = male component, is usually placed on the distal aspect of the anterior retainer (such as with a pier abutment)
 - D. The mortise must parallel the path of withdrawal of the distal retainer.

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299. Correct C. The tenon = patrix = male component, is usually placed on the distal aspect of the anterior retainer (such as with a pier abutment)

To correct this – the tenon is normally on the mesial of the distal retainer which engages the distal of the anterior retainer (mortise)

Werking –NPDS Fixed Pros Course – Lecture Fixed Pros Tx Planning – 26Jan2011
Rosenstiel, Land, Fujimoto. Contemporary Fixed Prosthodontics. 2001; 26 (710-12)

Special abutment considerations

Tilted molar

Intermediary – pier abutment

Canine replacement

Cantilever

Tilted Molar – possible solutions

Orthodontic up-righting

Proximal half crown prep

Non-rigid connector

Axial tilt should not be > 25 degrees, photoelastic studies have shown that a molar which has tipped mesially will actually have less stress in the alveolar bone along the mesial surface of its root with a FDP than without.

Severely misaligned abutments

Issues – prosthesis insertion becomes more difficult, segmented prosthesis designs, altered path of insertion

Possible solutions – non-rigid connector, mesial half-crown, full coping and telescopic crown

Non-rigid connectors

Semi-precision connectors – resin

Precision connectors – metal

Tenon = patrix = male

Mortise = matrix = female

The mortise is usually placed on the distal aspect of the anterior retainer. Accurate alignment of the dovetail or cylindrically shaped mortise is critical, it must parallel the path of withdrawal of the distal retainer.

Cantilever FDPs

Long term prognosis is poor – better results in anterior compared to posterior areas

Careful abutment selection needed – not for endo treated teeth

Forces need to be directed along the long axis of the tooth by way of prep design and control of lateral forces

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300. What is the maximum amount of anterior teeth that can be replaced between a pier abutment and a terminal abutment when restoring with fixed prosthesis?

- A. 1
- B. 2
- C. 3
- D. 4

300. Answer: D

Missing: All maxillary incisors and one first premolar

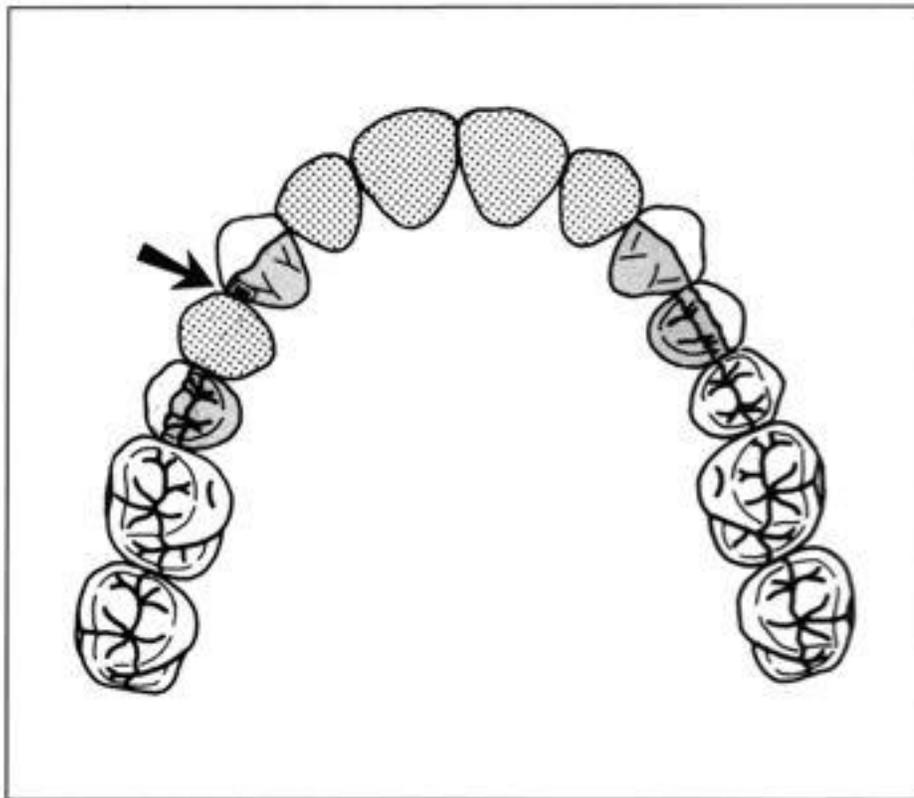
Abutments: Both canines, the first premolar on one side, and the second premolar on the other

Retainers: Metal-ceramic

Pontics: Metal-ceramic

Abutment-pontic root ratio: 1.0

Considerations: Nonrigid connector in the distal of the retainer on the canine "pier" abutment. A long second premolar or a lack of concern for esthetics by patient would permit the substitution of a three-quarter crown on the second premolar. The mandibular situation is handled similarly.



(Shillingburg, H.. *Fundamentals of Fixed Prosthodontics, 3rd Edition.* Quintessence Publishing (IL), p. 117).

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301. What is the difference between an Arcon and Nonarcon articulator.
- A. In an arcon, the condylar spheres are attached to the upper member
 - B. In a nonarcon, the condylar spheres are attached to the lower member
 - C. In a nonarcon, the condylar spheres are attached to the upper member and lower member
 - D. In an arcon, the condylar spheres are attached to the lower member

301. Correct-D.

Arcon is most anatomically correct “Our Con” where the condylar spheres are attached to the lower members. The condylar inclination in an arcon is in a fixed angle. Nonarcons are easier to use to set denture teeth since the upper and lower members are rigidly attached but due the inaccuracies with cast restorations led to the development of the arcon tyoe,

Rosentiel S, LandM, Fujimoto J. Contemporary Fixed Prosthodontics 3rd edition Mosby 2001 p29-30.

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302. What is the purpose of the arbitrary facebow and how accurate can it be?

- a. Record and transfer the maxillary relationship to an arbitrary axis on the articulator with a minimum of 5 mm of error, usually in an anteroposterior direction
- b. Record and transfer both the maxillary and mandibular relationship to an arbitrary axis on the articulator with a minimum of 5 mm of error, usually in anteroposterior direction
- c. Record and transfer the mandibular relationship to an arbitrary axis on the articulator with a minimum of 11mm of error, usually in superior-inferior direction
- d. Record and transfer the maxillary relationship to an arbitrary axis on the articulator with a minimum of 13 mm of error, usually in inferior-posterior direction

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302. Correct= A: Facebow-Record and transfer the maxillary relationship to an arbitrary axis on the articulator with a minimum of 5 mm of error, usually in an anteroposterior direction

Facebows are used to record the anteroposterior and mediolateral position of the maxillary occlusal surfaces relative to the transverse opening and closing axis of the patient's mandible. Then the facebow is used to transfer the recorded relationship of the maxilla by ensuring the corresponding maxillary cast is attached in the correct position relative to the hinge axis of the articulator.

It transfers the relationship of the maxillary teeth, the transverse horizontal axis and the third reference point from the patient's skull to the articulating device

Arbitrary hinge axis facebows approximate the horizontal transverse axis and rely on anatomic averages. They give sufficiently accurate relationship for most diagnostic and restorative procedures. However, regardless of which arbitrary position is chosen, a minimum error of 5mm from the axis can be expected.

Rosenstiel et al; Contemporary Fixed Prosthodontics; 3rd edition, 2001 pg 33

04-013. Palik, J. F. Accuracy of an earpiece face-bow. J Prosthet Dent 53:800-804, 1985. Previous studies are conflicting:

Walker - 20% of true axis were within 5 mm of the arbitrary location situated 13 mm anterior to the tragus. 60 % were 6 mm or more.

Schallhorn - 95 % of true hinge axis were within 5 mm radius of an arbitrary axis.

Hanau No. 159-4 earpiece facebow.

Earbow record repeated 4 times.

Results:

1. Arbitrary axis were, anterior and inferior to true hinge axis 56% and anterior and superior 36%. anterior 92 % of the time.
2. Only 50% were within a 5 mm radius of the true hinge axis.
3. 89% were within a 6 mm radius.
4. The arbitrary axis located with the ear face-bow was significantly different from the true axis in an anteroposterior direction but not in a superior-inferior direction.

The earpiece face-bow was not repeatable.

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303. There are 2 types of facebows, _____ and _____. The _____ is more accurate.
- a. Kinematic, Arbitrary, Kinematic
 - b. Kinematic, Arbitrary, Arbitrary
 - c. Arcon, Non-arcon, Arcon
 - d. Arcon, Non-arcon, Non-Arcon

303. Correct= A. Kinematic, Arbitrary, Kinematic

Most facebows are rigid, caliper-like devices that permit some adjustments. Two types of facebows are recognized: arbitrary and kinematic. **Arbitrary facebows** are less accurate than the kinematic type, but they suffice for most routine dental procedures. **Kinematic facebows** are indicated when it is critical to precisely reproduce the exact opening and closing movement of the patient on the articulator. For instance, when a decision to alter the vertical dimension of occlusion is to be made in the dental laboratory during the fabrication of fixed prostheses, the use of a kinematic facebow transfer in conjunction with an accurate CR interocclusal record is indicated.

Contemporary Fixed Prosthodontics, 3rd edition, Rosenstiel, PG 280

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304. Which of the following does not affect cusp height?

- a. Intercondylar width
- b. Condylar path inclination
- c. Mandibular lateral translation
- d. Angle of anterior guidance

304. Correct- A: Intercondylar width/ distance

Chief among those aspects of condylar guidance that will have an impact on the occlusal surface of posterior teeth are the protrusive condylar path inclination and mandibular lateral translation.

The inclination of the condylar path during protrusive movement can vary from steep to shallow in different patients. It forms an average angle of 30.4 degrees with the horizontal reference plane (43 mm above the maxillary central incisor edge).^{16,17} If the protrusive inclination is steep, the cusp height *may* be longer. However, if the inclination is shallow, the cusp height *must* be shorter

Immediate mandibular lateral translation is the lateral shift during initial lateral movement. If immediate lateral translation is great, then the cusp height *must* be shorter. With minimal immediate translation, the cusp height *may* be made longer.

(Shillingburg, H.. *Fundamentals of Fixed Prosthodontics, 3rd Edition*. Quintessence Publishing (IL), 011997. p. 20).

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305. What is the maximum number of posterior teeth you can replace with a fixed partial denture to achieve a favorable prognosis, based on Ante's Law?

A. 2

B. 3

C. Must consider Ante's Law, but it does not necessarily need to be followed in every case

D. Must consider Ante's Law, and treatment plan accordingly to abide by it

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305. D. Must consider Ante's Law, along with tooth abutment mobility, keratinized gingiva and biological width

Ante's Law (It's only a suggestion): The combined pericemental area of all abutment teeth supporting an FDP should be \geq the combined pericemental area of the tooth or teeth being replaced.

<u>Root surface areas (mm²):</u>	<u>Max</u>	<u>Man</u>
Central	204	154
Lateral	179	168
Canine	273	268
First Premolar	234	180
Second Premolar	220	207
First molar	433	431
Second molar	431	426

Location and extent of edentulous areas must consider:

- span length considerations
- Ante's Law
- Abutment tooth conditions-perio/endo/crown to root ratio/margin locations

Working; Fixed Prosthodontics treatment planning, NPDS 253, 26JAN11

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306. What should be the expected increase in implant surface area available for osseointegration for every 1-mm increase in diameter (provided that body design remains identical)?

- A. 5-10%
- B. 15-25%
- C. 35-45%
- D. 55-65%

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306. ANSWER: B. 15-25%

Rationale:

“The implant increases in surface area by 15-25% for every 1-mm increase in diameter.”

The overall functional surface area of an implant body is therefore related to the thread pitch, thread shape, and thread depth.

Misch, CE. Contemporary Implant Dentistry, 3rd Ed. pp 214

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307. Which type of bone could be described as a thick layer of cortical bone that surrounds a core of dense trabecular bone?

- A. Type I
- B. Type II
- C. Type III
- D. Type IV

307. ANSWER: B. Type II

Quality of bone

Type I: Almost the entire jaw comprises homogenous cortical bone.

Type II: A thick layer of cortical bone surrounds a core of dense trabecular bone.

Type III: A thin layer of cortical bone surrounds a core of dense trabecular bone of favorable strength.

Type IV: A thin layer of cortical bone surrounds a core of low density trabecular bone.

Quantity of bone

A: Most of the alveolar ridge is present.

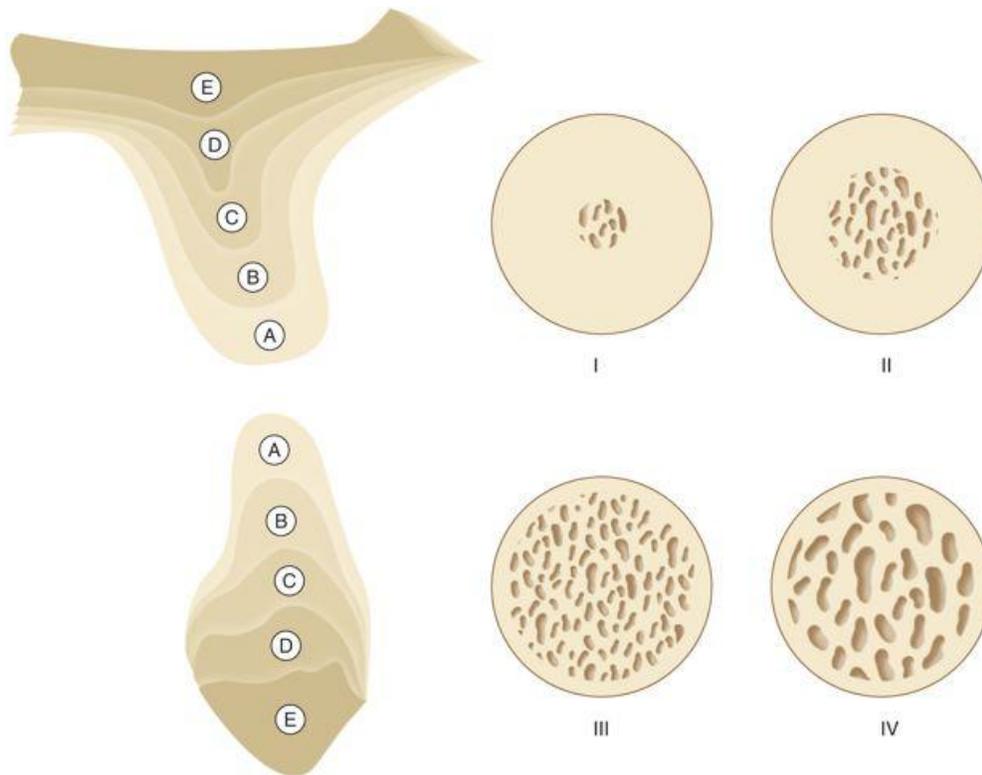
B: Moderate residual ridge resorption has occurred.

C: Advanced residual ridge resorption has occurred and only basal bone remains.

D: Minimal to moderate resorption of the basal bone has occurred.

E: Extreme resorption of the basal bone has occurred.

Adapted from Brånemark P-I, Zarb GA, Albrektsson T: Tissue-integrated prostheses: osseointegration in clinical dentistry, Chicago, 1985, Quintessence Publishing.



Rose, Louis F. Periodontics: Medicine, Surgery and Implants. 2004.

2012 ABGD Study Guide

308. When considering implants, which of the following statements is incorrect?
- A. With immediate implant placement, fixture should engage at least 5 mm of bone apically for primary stability
 - B. Progressive loading is placement of a final prosthesis under immediate loading
 - C. With immediate placement, the critical space between the platform and extraction socket should be < 2 mm and grafting is considered if > 1 mm
 - D. Flatter incline planes and narrower occlusal tables create more vertical forces and a shorter moment arm

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308. Answer-B. Progressive loading is placement of a final prosthesis under immediate loading

Progressive loading is similar to immediate loading, but refers to placement of a provisional restoration and not a final prosthesis as in immediate loading

Immediate loading involves placement of a final prosthesis placed in full occlusion shortly after implant placement – same visit or up to 72 hrs. With immediate placement of fixture – must engage at least 5 mm of bone apically for primary stability, the critical space between the fixture platform and extraction socket should be < 2 mm and consider grafting the space if > 1 mm.

Because dental implants most effectively resist forces directed primarily in their long axis, lateral forces on implants should be minimized. Lateral forces in the posterior part of the mouth are greater and more destructive than lateral forces in the anterior part of the mouth. When they cannot be completely eliminated from the implant prosthesis, efforts should be made to distribute them equally over as many teeth as possible. Flatter inclines can be developed on implant cusps, creating more vertical resultant forces and a shorter moment arm. Sharper cusp inclines and wider occlusal tables increase the resultant force on implant components.

Possibilities of why you have loose implant screws:

- Excessive occlusal contacts not in the long axis of the implant
- Excessive cantilever contacts
- Excessive lateral contacts
- Excessive interproximal contacts
- Inadequately tightened screws

Rosenstiel, Land, Fujimoto. Contemporary Fixed Prosthodontics – 3rd Edition. 2001; 347-48.

Rudmann M. Dental Implants – Treatment Planning and Restorative Procedures. Lecture 27 Nov 2010; NPDS Bethesda MD

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309. Meffert proposed conditions for implants, namely AILING, FAILING and FAILED. Ailing implants are those showing radiographical bone loss without inflammatory signs or mobility. Failing implants are those with progressive bone loss, signs of inflammation and mobility.

- A. The first part is true, the second part is false
- B. The first part is false, the second part is true
- C. Both statements are true
- D. Both statements are false

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309. Answer: A

Reference:

El Askary AS, Meffert RM, Griffin T. Why Do Dental Implants Fail part. *Implant Dent* 1999; 173-185.

Meffert, proposed conditions for implants, namely AILING, FAILING and FAILED. Ailing implants are those showing radiographical bone loss without inflammatory signs or mobility. Failing implants are those with progressive bone loss, signs of inflammation but no mobility. Failed implants are those with progressive bone loss, with clinical mobility and loss of function, in the intended sense.

Failure could be defined as the total failure of the implant to fulfill its purpose (either functional, esthetic, phonetic, etc.) due to mechanical or biological reasons¹. Based on this definition of failure, the etiological factors of implant failure could be classified into the following categories (El Askary-Meffert)

1. According to the etiology
2. According to the timing of the failure
3. According to the condition of the failure
4. According to the responsible personnel
5. According to the failure mode
6. According to the tissues involved
7. According to the origin

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310. For a standard 3.75 implant, the minimum Buccal-lingual dimension is

- A. 2 mm
- B. 4 mm
- C. 6 mm
- D. 8 mm

310. Correct= C

The minimum buccal-lingual dimension for a 3.75mm diameter implant requires 6mm of bone.

*Schincaglia G, Nowzari . Surgical treatment planning for the single-unit implant in aesthetic areas
Periodontology 2000, Vol. 27, 2001, 162–182*

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311. Implant retained overdentures that utilize attachment mechanisms such as bar-clip (such as Hader bar) will need a minimum interocclusal distance of

- A. 5-7mm
- B. 7-9mm
- C. 10-12mm
- D. 13-14mm

311. Correct= D 13-14mm

Steven J. Sadowsky, DDS Treatment considerations for maxillary implant overdentures: A systematic review. Journal of Prosth Dentistry. (6) 2007: 340-348

In the vertical axis, a minimum distance of 13-14 mm from the implant platform to the incisal edges is necessary with a bar design, allowing 4.0 mm for the bar and 1.0 mm below the bar for hygiene, as well as space for the clip and acrylic/tooth housing.⁶⁴ The span length should be no more than 18 mm with a 2-mm vertical stiffener height below the round portion.

However, the use of attaching mechanisms such as a bar-clip (Hader; Attachments Intl, San Mateo, Calif) requires a minimum distance of 10-12 mm between implants, other- wise a milled bar with a frictional fit superstructure is needed.

Solitary anchors require only 10 to 11 mm of vertical space above the implant plat- form to incisal edges and also allow for more flexibility in positioning, given anatomic limitations.

“Whenever we discuss restorative space we need to think through everything that will need to be "Stacked" into that space.

Think of it like this:

$X + y + z =$ minimum restorative space needed.

X=height of abutment/ portion of attachment screwed to the implant.

Y= height of the attachment and housing Z= minimum thickness of denture base resin and any prosthetic teeth that may need to be in the area. (I would think at least 2mm)

You may also have to consider any metal substructure of framework if that is in the plans. “-JR Wilson, DD

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312. Implant retained overdentures that use individual attachments require a minimum occlusal distance of

- A. 5-7mm
- B. 7-9mm
- C. 10-12mm
- D. 12-14m

312. C. 10-12mm

A reported minimum space requirement for implant-supported overdentures with Locator attachments (Zest Anchors, Escondido, Calif) is 8.5 mm of vertical space and 9 mm of horizontal space. A separate report on maxillary implant overdentures suggested that a minimum of 13-14 mm of vertical space is required for bar-supported overdentures, and 10-12mm for overdentures supported by individual attachments.

Defining available restorative space for implant overdentures
Swati Ahuja, BDS, MDS,^a and David R. Cagna, DMD, MS^b
University of Tennessee Health Science Center, College of
Dentistry, Memphis, Tenn (J Prosthet Dent 2010; 104:133-136)

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313. Which of the following provides the most deleterious form of occlusal trauma in implants?

- a. Bruxism
- b. Severe clenching
- c. Shallow condylar inclination
- d. Shallow FMA angle

313. Correct: A – bruxism

Some patient force factors are more important than others. For example, severe bruxism is the most significant factor and, on a risk scale from 1 to 10. Forces from bruxism are often the most difficult forces to contend with on a long-term basis. As a result of this condition, marginal implant bone loss, unretained abutments, and fatigue fractures of implants or prostheses are more likely. The increase in force magnitude and duration is a significant problem. A bruxing patient is at higher risk in two ways. The magnitude of the force increases because the muscles become stronger and the number of cycles on the prosthetic components is greater as a result of the parafunction. Eventually “something” will break if the occlusal disease cannot be reduced in intensity or duration. No long-term prosthetic result without complications can be expected in patients with severe bruxism.

The second highest risk factor is severe clenching, which is a 9 on the risk scale

(Misch, Carl E. *Contemporary Implant Dentistry, 3rd Edition*. Mosby, p. 85).

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314. A potential problem of connecting natural teeth to implants is

- A. failure of the natural tooth prosthesis
- B. cement failure on the implant abutment
- C. screw or abutment loosening
- D. intrusion of the natural tooth

314. Correct=D. intrusion of the natural tooth

Connecting Implants to Natural Teeth

Connecting a single osseous integrated implant to one natural tooth with a fixed dental prosthesis can create excessive forces because of the relative immobility of the osseous integrated implant in comparison with the functional mobility of a natural tooth. During function, the tooth moves within the limits of its periodontal ligament, which can create stress at the neck of the implant up to two times the implied load on the prosthesis? Potential problems with this type of restoration include (1) breakdown of the osseous integration, (2) cement failure on the natural abutment (3) screw or abutment loosening, and (4) failure of the implant prosthetic component. This situation is encountered clinically when the most posterior abutment is lost in the dental arch and a fixed prosthesis is needed to connect a single implant to the natural tooth. If possible, a totally implant supported fixed prosthesis with two or more implants should be provided.

When connecting an implant to a natural tooth is necessary, multiple implant or natural tooth abutments should be used. A semi-precision attachment may compensate for vertical displacement forces in the tooth and an implant-supported fixed prosthesis. It does not compensate for forces in the bucco-lingual direction. When circumstances dictate use of a natural tooth abutment, a telescopic coping should be considered. This is permanently cemented to the natural tooth and can prevent decay if loosening occurs. Interim cement is used to attach the prosthesis to the coping. If it leaches out of the implant crown, that natural tooth is still protected.

Implant-Supported Fixed Prostheses. Rosensteel, Contemporary Fixed Prosthodontics 4th edition

2012 ABGD Study Guide

315. What is the suggested cantilever length that can be extended either mesially or distally from an implant-supported FDP?

- A. 0.5 to 0.75 times the anterior-posterior spread
- B. 1.25 to 1.75 times the anterior-posterior spread
- C. 2.0 to 2.5 times the anterior-posterior spread
- D. 3.0 to 3.5 times the anterior-posterior spread

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315. Correct: B. 1.25 to 1.75 times the anterior-posterior spread

Rationale:

Cantilever length= 1.25 to 1.75 times the anterior-posterior spread

This formula is just a guide and many other factors must be considered in the restoration design.
This prevents the restoring dentist from promising too much.

Wilson, William O. *Diagnosis and Treatment Planning lecture- Dental Implant Long Course*, 2010-2011

2012 ABGD Study Guide

316. In determining the esthetic success of an implant, the gingival biotype of the implant site decisively influences:

- A. contour, texture, transparency
- B. size and color
- C. gingival inflammation and plaque build up
- D. b and c

316. Answer A.

The tooth crown shape generally exhibits a triangular form, and the contact points are smaller and located in a further incisal location. The gingival biotype of the implant site decisively influences contour texture and transparency (colour) of the soft tissue for risk analysis, these parameters have been reported in the literature as relevant for differentiation between esthetic success and failure.

Thin biotype is a weak biotype. The thin fragile soft tissue favors the formation of approximal papillae, but is more prone to recession which significantly increases the esthetic risk.

Gerke, Stohecker, Dhom, "*Influence of interdental papilla length and interproximal contact point on the perception of esthetics in symmetric and asymmetric situations.*", Journal of Dental implantology, 3/2010.

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317. With local anesthetic toxicity, all of the following are true, EXCEPT
- A. Most serious manifestations of local anesthesia toxicity are the appearance of generalized tonic-clonic seizure activity and cardiac depression
 - B. Moderate toxicity can manifest with headache, dizziness, and blurred vision
 - C. Diazepam (valium) 5-10 mg should be administered slowly with extreme toxicity
 - D. 11 carpules of 2% Lido w/ 1:100,000 epi can safely be administered to a 50kg individual

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317. Answer D. 11 carpules of 2% Lido w/ 1:100,000 epi can safely be administered to a 50kg individual

Rationale

Max dose is 6.6 mg/kg for 2% Lido with 1:100,000 epi

$50\text{kg} \times 6.6 \text{ mg/kg} = 330 \text{ mg max}$

34 mg lido per 1.7 ml carpule

$330/34 = 9.7$ carpules

Local anesthetic toxicity

Manifestations

Mild toxicity: talkativeness, anxiety, slurred speech, confusion

Moderate toxicity: stuttering speech, nystagmus tremors, headache, dizziness, blurred vision, drowsiness

Severe toxicity: seizure, cardiac dysrhythmia or Arrest

Management

Stop administration of all L/A
Monitor vital signs
Observe in office for 1 hour

Stop administration of all L/A
Place in supine position
Monitor vital signs
Administer oxygen
Observe in office for 1 hour

Place in supine position
If seizing, protect from nearby objects and suction oral cavity if vomiting occurs
Summon medical assistance
Monitor vital signs
Administer oxygen
Start IV
Administer diazepam (valium) 5-10mg slowly or midazolam (versed) 2-6mg slowly
Start BLS if necessary
Transport to emergency care facility

Peterson, Ellis, Hupp, Tucker. Contemporary Oral and Maxillofacial Surgery – 3rd Ed. 1998; 39-40.

Malamed S. Handbook of Local Anesthesia – 4th Ed. 1997; 57-58.

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318. Clinical presentation of a zygoma fracture includes which of the following?

- A) Clinical flattening or the cheekbone prominence
- B) Mobile maxilla
- C) Paraesthesia in distribution area of inferior alveolar nerve
- D) Floor of mouth hematoma
- E) All the above

318. Answer: A Clinical flattening or the cheekbone prominence

Reference:

Oral and maxillofacial surgery, radiology, pathology and oral medicine by Paul Coulthard

Zygomatic fractures are commonly encountered in facial trauma because of their prominent position on the facial skeleton. Physical signs and symptoms associated with orbital ZMC fractures include:

Periorbital ecchymosis and edema

Subconjunctival hemorrhage that remains bright red for a prolonged period due to continued oxygen saturation of the blood through the oxygen-permeable conjunctiva

Flattening of the malar prominence or zygomatic arch

Diplopia most common type of midfacial fracture is the zygomatic complex fracture. This type of fracture results when an object (baseball, fist) impacts over the lateral aspect of the cheek. Similar trauma can also result in isolated fractures of the nasal bones, the orbital rim, or the orbital floor area.

Periorbital ecchymosis, especially with subconjunctival hemorrhage, is often indicative of orbital rim or zygomatic complex fractures. Bruises behind the ear, or *Battle's sign*, suggest a basilar skull fracture.

Ecchymosis in the floor of the mouth usually indicates an anterior mandibular fracture.

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319. The most diagnostic radiograph for a maxillary fracture is

- A. Cone Beam CT
- B. Panograph
- C. PA Ceph
- D. Lateral Ceph

319. Correct=A.

The most detailed radiograph for a maxillary fracture is a cone beam CT.

Dolekoglu S, Fisekciolgu E, Ilguy D, et al Diagnosis of jaw and dentoalveolar fractures in a traumatized patient with cone beam computed tomography, 2010 Apr;26(2):200-3. Epub 2010 Jan 19.

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320. After a mandibular 3rd molar extraction, you examined the tooth and noticed the distal root is fractured and not present in the socket, what is the most likely area the root tip is displaced?

- A. oropharynx
- B. submandibular fascial space
- C. sublingual fascial space
- D. submental space

320-Correct= B

Fractured mandibular molar roots that are being removed with apical pressures may be displaced **through the linguocortical plate and into the submandibular fascial space**. The linguocortical bone over the roots of the molars becomes thinner as it progresses posteriorly. Mandibular third molars, for example, frequently have dehiscence in the overlying lingual bone and may be actually sitting in the Submandibular space preoperatively. Even small amounts of apical pressure result in displacement of the root into that space. Prevention of displacement into the Submandibular space is primarily achieved by avoiding all apical pressures when removing the mandibular roots.

Occasionally, the crown of a tooth or an entire tooth might be lost down the oropharynx. If this occurs, the patient should be turned toward the dentist, into a mouth-down position, as much as possible. The suction device can then be used to help remove the tooth. The patient should be encouraged to cough and spit the tooth out onto the floor.

If aspiration is suspected, the patient should be transported to an emergency room and a chest radiograph taken to determine the specific location of the tooth. The urgent management of aspiration is to maintain the patient's airway and breathing. Supplemental oxygen may be appropriate if respiratory distress appears to be occurring.

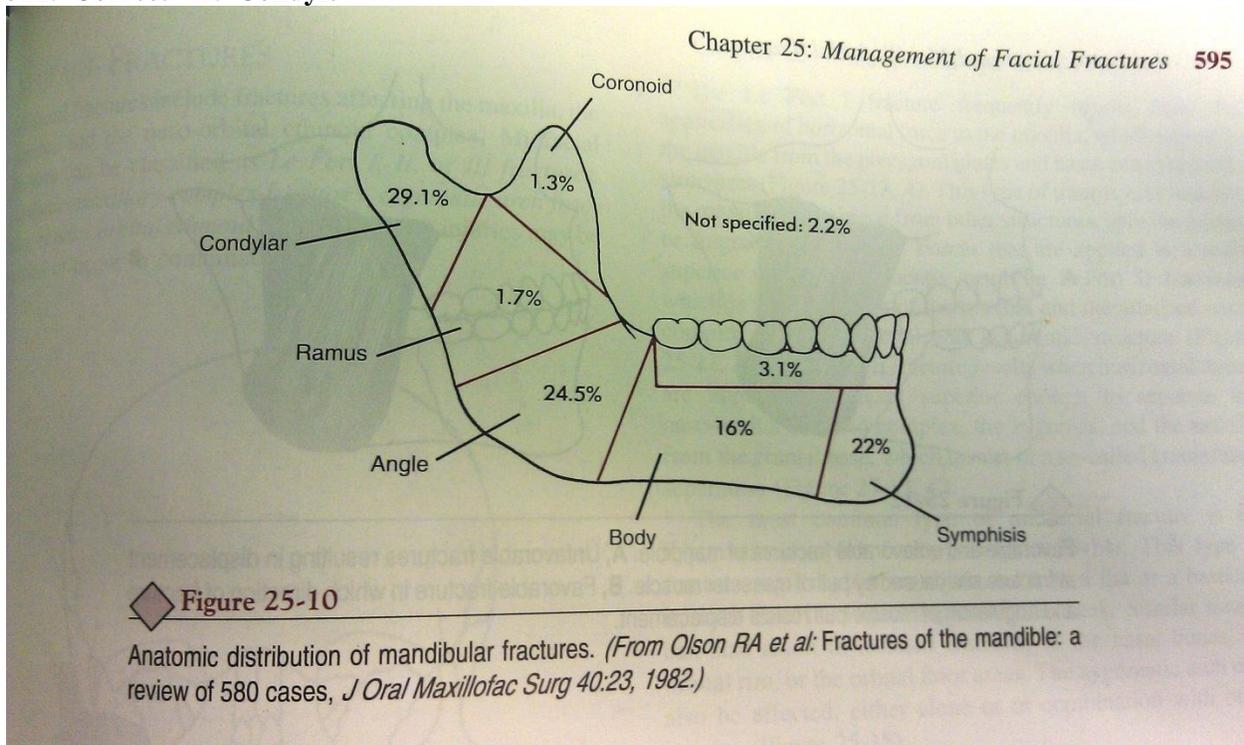
If the tooth has been swallowed, there is high probability that it will pass through the GI tract within 2 to 4 days.

Peterson, Ellis, Hupp, Tucker, "Contemporary Maxillofacial Surgery", third edition, Mosby, 1998

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321. Which part of the mandible has the highest incidence of fracture?
- A. angle
 - B. body
 - C. ramus
 - D. condyle

321. Correct= D. Condyle



Peterson, Ellis, Hupp, Tucker Contemporary and Maxillofacial Surgery Pg595

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322. Where is the film located when taking a Waters view radiograph?

- A. Directly in front
- B. Directly behind
- C. In front with a 37 degree angle
- D. In front with a -30 degree angle

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322. Correct: C in front with 37 degree angle

	Lateral Ceph	SMV	Waters	PA Ceph	Reverse Towne	Oblique Lateral Body	Ramus
Patient placement	Film parallel to midsagittal plane	Canthomeatal line parallel to film	Canthomeatal line at 37° with film	Canthomeatal line at 10° with film	Canthomeatal line at -30° with film	Film in contact with cheek at molar area	Film in contact with cheek at ramus area
Central beam	Beam perpendicular to film	Beam aims at the molar-premolar area	Beam aims at the ramus area				
Diagram of patient placement							
Illustration of patient placement							
Skull view							
Resultant image							

(White, Stuart C. *Oral Radiology: Principles and Interpretation, 6th Edition*. Mosby.)

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323. The most common space that is involved when erosion of the lingual plate adjacent to tooth #20 occurs is the:

- A. Sublingual space or submandibular space
- B. mental space
- C. Buccal space
- D. Pterygomandibular space

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323. Correct-A. Sublingual space

The spaces that are involved directly are known as the fascial spaces of primary involvement. The principal maxillary spaces are the canine, buccal and infraorbital spaces. The principle mandibular primary spaces are the submental, buccal, submandibular and the sublingual spaces. Infections can extend beyond these primary spaces into additional fascial spaces, or secondary spaces.

<u>Spread From:</u>	<u>Spread To:</u>
<u>Maxillary</u>	<u>Primary spaces</u>
Canine	Canine space
Max molars and premolars (most commonly Max molars)	Buccal space
Max 3 rd molar	Infratemporal space
<u>Maxillary</u>	<u>Secondary Spaces</u>
Maxillary odontogenic infections	Secondary periorbital or orbital cellulitis Or cavernous sinus thrombosis
<u>Mandibular</u>	<u>Primary spaces</u>
All mandibular teeth	Vestibular space (most common)
Mandibular incisors	Submental space
Mandibular molar and premolars	Buccal space (most commonly Max molars)
Man premolars and molars (premolars and 1 st molar most common)	Sublingual spaces (perforation above mylohyoid muscle)
Man premolars and molars (3 rd molar most common)	Submandibular spaces (perforation below mylohyoid muscle)
Man 2 nd molars	Can involve both sublingual and submandibular primarily
	Bilateral submandibular, sublingual, and Submental space infection = Ludwig's angina
<u>Mandibular</u>	<u>Secondary Spaces</u>
Buccal space or pericoronitis of a 3 rd molar	Masseteric space
Sublingual or submandibular	Pterygomandibular space
Masseteric space or Pterygomandibular space	Temporal Space
	<u>Tertiary Spaces</u>
Pterygomandibular space	Lateral Pharyngeal space
Lateral Pharyngeal space	Retropharyngeal Space
Retropharyngeal Space	Posterosuperior Mediastinum Space
Retropharyngeal Space	Prevertebral Space

Peterson et al, Contemporary Oral and Maxillofacial Surgery, 3rd edition.

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324. When a submandibular or sublingual space infection is present, it occurs primarily by lingual perforation of an infection from the mandibular molars, although they may be involved by premolar teeth as well. The factor that determines whether the infection is submandibular or sublingual is the attachment of the mylohyoid muscle on the mylohyoid ridge of the medial aspect of the mandible.

- E. The first statement is true, the second statement is false.
- F. The first statement is false, the second statement is true.
- G. Both statements are true.
- H. Both statements are false.

324. ANSWER: C. Both statements are true.

Rationale:

Mandibular Spaces

There are four primary mandibular spaces: *submental*, *buccal*, *submandibular*, and *sublingual*.

The *submental space* is primary infected by mandibular incisors, with an infection that erodes through the labial bone apical to the attachment of the mentalis muscle. Isolated submental space infection is rare.

The *buccal space* is most commonly infected from maxillary teeth, but can also be involved from the mandibular teeth. There is a typical swelling of the cheek, which does not extend beyond the inferior border of the mandible.

When a *submandibular or sublingual space* infection is present, it occurs primarily by lingual perforation of an infection from the mandibular molars, although they may be involved by premolar teeth as well. The factor that determines whether the infection is submandibular or sublingual is the attachment of the mylohyoid muscle on the mylohyoid ridge of the medial aspect of the mandible.

Peterson LJ, Ellis E, Hupp JR, Tucker MR. Contemporary Oral and Maxillofacial Surgery, 3rd Ed. Mosby, 1998.

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325. When you have an impacted Maxillary 3rd molar what is the most common facial space that is involved?

- a. Temporal space
- b. Buccal space
- c. Infratemporal space
- d. Lateral Pterygomandibular space

325. ANSWER = C. Infratemporal space

Primary space involved in an infection from the MAX 3rd molar area is the Infratemporal space. The boundaries of the infratemporal space are: lateral – medial surface of the mandible and temporalis muscle; medial – medial and lateral pterygoid muscle; inferior – inferior head of the lateral pterygoid muscle. Potential spread of the infection is deep temporal space; pterygomandibular space; possibly intracranially which may produce cavernous sinus thrombosis and a possible brain abscess.

*Lecture by CAPT Webb; Fascial Space Infections of Odontogenic Origin; November, 2010
Peterson et al, Contemporary Oral and Maxillofacial Surgery, 3rd edition.*

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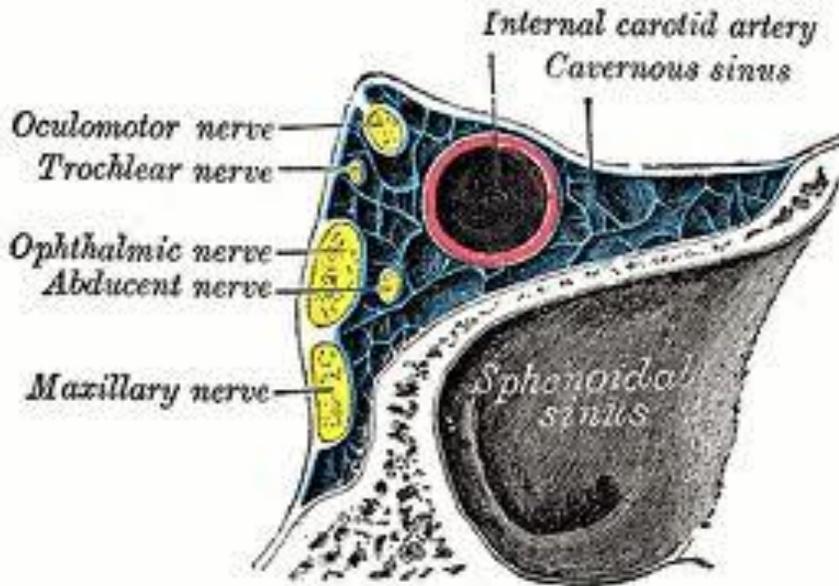
326. All of the following statements concerning cavernous sinus thrombosis (CST) are true EXCEPT
- A. Bacteria may travel from the maxilla posteriorly via the pterygoid plexus and emissary veins to the cavernous sinus
 - B. Staphylococcus aureus and streptococcus are often the associated bacteria with CST
 - C. Bacteria may travel from the maxilla anteriorly via the angular vein and inferior/superior ophthalmic veins to the cavernous sinus
 - D. CST may occur as the result of inferior spread of odontogenic infection via a hematogenous route

326. Answer =D. CST may occur as the result of inferior spread of odontogenic infection via a hematogenous route

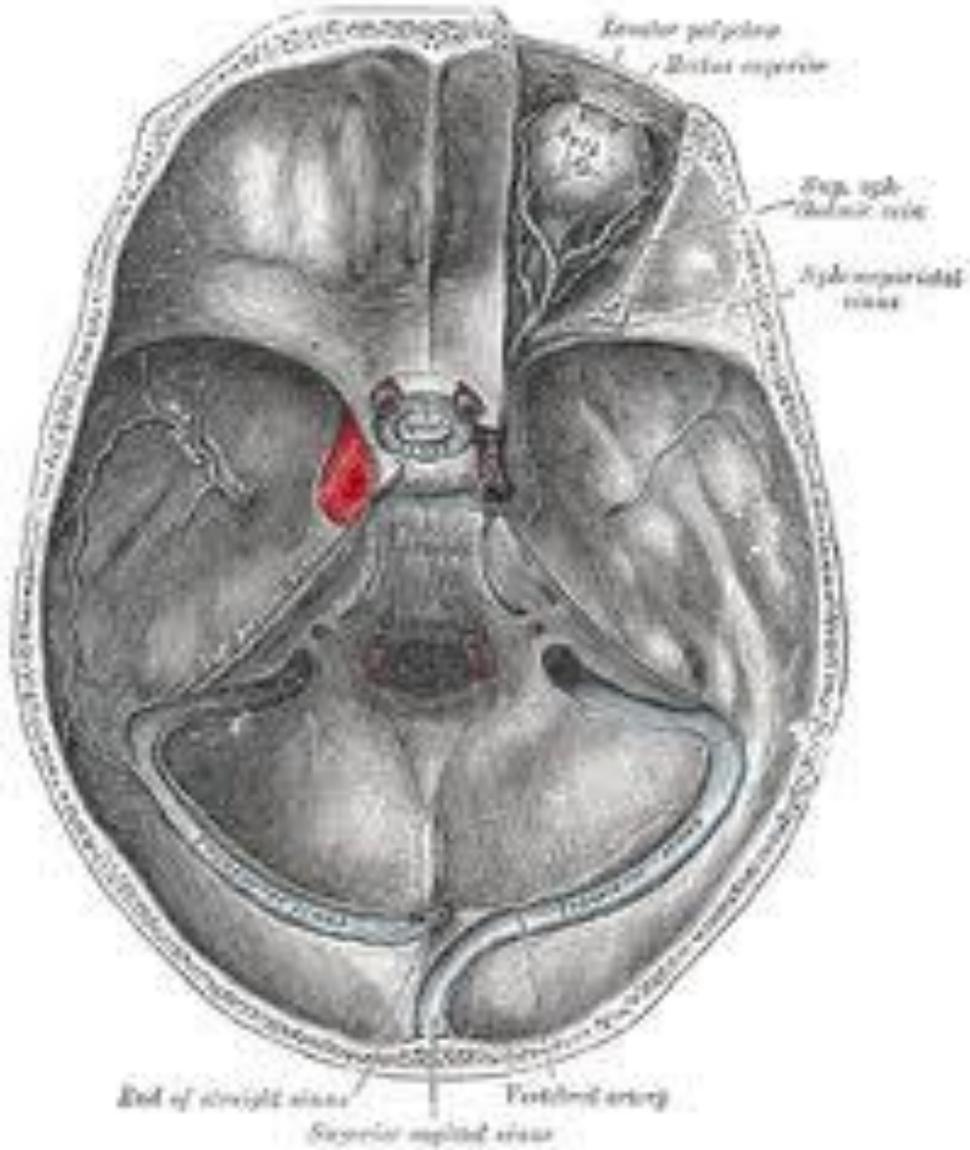
Correct – CST may occur as a result of SUPERIOR spread of odontogenic infection via a hematogenous route

Bacteria may travel from the maxilla posteriorly via the pterygoid plexus and emissary veins or anteriorly via the angular vein and inferior or superior ophthalmic veins to the cavernous sinus. The veins of the face and orbit lack valves, which permits blood to flow in either direction. Thus bacteria can travel via the venous drainage system and contaminate the cavernous sinus, which results in thrombosis. Cavernous sinus thrombosis is an unusual occurrence that is rarely the result of an infected tooth. Like orbital cellulitis, cavernous sinus thrombosis is a serious, life-threatening infection that requires aggressive medical and surgical care. Cavernous sinus thrombosis has a high mortality even today. CST symptoms include decrease or loss of vision, exophthalmos (bulging eyes), headaches, and paralysis of the cranial nerves (CN 3/4/5/6) which course through the cavernous sinus. CST most commonly results from contiguous spread of infection from the nasal furuncle (50%), sphenoidal or ethmoidal sinuses (30%) and dental infections (10%). Broad spectrum antibiotics are used until a definite pathogen is found: nafcillin 1.5 g IV q4hrs, cefotaxime 1.5 to 2.0 g IV q4hrs, metronidazole 15 mg/kg load followed by 7.5 mg/kg IV q6hrs.

Peterson, Ellis, Hupp, Tucker. Contemporary Oral and Maxillofacial Surgery – 3rd Edition. 1998; 419-21.



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327. The use of Dexamethasone is recommended to do all the following except?
- A. Reduce postoperative nausea and vomiting
 - B. Reduce pain
 - C. Enhance wound healing
 - D. Reduce inflammation

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327. Answer =C

Reference: P Gupta, J Khanna, AK Mitramustafi, VK Bharti: Role of pre-operative dexamethasone as prophylaxis for postoperative nausea and vomiting in laparoscopic surgery J Min Access Surg 2006;2:12-5.

Despite the introduction of new anti-emetic drugs, short-acting anaesthetic agents and minimal invasive surgical techniques, the incidence of postoperative nausea and vomiting (PONV) has remained largely unchanged. Use of anti-emetic prophylaxis has become the standard approach to minimize the nausea and vomiting postoperatively.

Glucocorticosteroids are well known for their analgesic, anti-inflammatory, immune- modulatory and anti-emetic effects. Dexamethasone was reported as an effective anti-emetic in patients receiving cancer chemotherapy in 1981. The incidence of postoperative nausea and vomiting has been significantly decreased by preoperative single dose steroid administration in several studies. Glucocorticoids have been recognized as an important modifier of the postoperative physiology, inflammatory, humoral and immunologic response, by regulation of trauma- induced humoral mediators.

As an immune modulation strategy, Dexamethasone appears to shift the balance of inflammation, in favor of anti-inflammatory mediators. The incidence and severity of PONV have been significantly decreased as shown in several studies. This prophylaxis also seemed to reduce postoperative pain and early convalescence. Bisgaard *et al* concluded that, preoperative Dexamethasone reduced pain, fatigue, nausea, vomiting and duration of convalescence in patients undergoing LC, as compared to placebo and they recommend the routine use of Dexamethasone.

The exact mechanism by which glucocorticoids decrease the incidence of nausea / vomiting is not fully understood, but probably can be explained by centrally mediated anti-emetic action via inhibition of prostaglandin synthesis, or inhibition of release of endogenous opioids.

The timing of steroid administration seems to be the key (1-2 hr preoperatively), if excess inflammatory and related postoperative morbidity is to be attenuated.

The major concern regarding the use of Dexamethasone is infection, delayed wound healing and other side effects. But various studies in the literature have shown that single-dose Dexamethasone does not increase complications. A recent metaanalysis concluded that, perioperative administration of high dose of Methylprednisolone (30-35 mg/kg), a dose approximately 50 times that of the dose used in the study, was not associated with significant side effects. We did not have any postoperative complication which could be attributed to Dexamethasone prophylaxis.

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328. Hematomas are most associated with which of the following blocks?

- A. Greater Palatine
- B. Posterior Superior Alveolar
- C. Middle Superior Alveolar
- D. Mental

328. Correct=B.

Hematomas most often occur during a posterior superior alveolar or inferior alveolar nerve blocks

Blanton P, Jeske A, Avoiding complications in local anesthesia induction. J Am Dent Assoc, Vol 134, No 7, 888-893.

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329. A patient presents to your clinic with a deep through and through lip laceration, after evaluation of the injuries, how would you suture the laceration

- a. One suture at the mucocutaneous junction → dermal layer → muscle → mucosa
- b. Mucosa → muscle → dermal layer
- c. The dermis is the only layer that needs suturing
- d. One suture at the mucocutaneous junction → mucosa → muscle → dermal layer

329 Correct: D. One suture at the mucocutaneous junction → mucosa → muscle → dermal layer

Once wound has been cleansed, debrided and hemostasis achieved, the laceration is ready to be closed. Not every laceration needs closure with sutures, such as small lacerations of palatal mucosa, or on the inner lip or tongue. These usually heal by secondary intention.

Goal during closure is proper positioning of all tissue layers. When lacerations of gingiva and alveolar mucosa (or floor of mouth) are noted, they are closed in one layer. If tongue or lip laceration involves muscle, resorbable sutures should be placed to close the muscle layer or layers, after which mucosa is sutured.

In lacerations extending through entire thickness of lip, a triple-layer closure is necessary. If laceration involves vermillion border, **the first suture placed should be at the mucocutaneous junction, while lining up the junction of skin and mucosa perfectly. Once suture is placed, wound is closed in layers from inside out: mucosa (silk or resorbable) → muscle (interrupted resorbable) → dermal layer (5-0 or 6-0 nylon).** Dermal layer should be covered with antibiotic ointment.

Generally, facial skin sutures should be removed 4-6 days later. Suture should be cut and then pulled in a direction that doesn't cause wound to gape. Adhesive strips can be placed at time of suture removal to give external support to the healing wound.

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

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330. Upon histologic examination this condition presents with hyperparakeratosis, spongiosis, acanthosis, and elongation of the epithelial rete ridges.

- a. Fissured tongue
- b. Benign migratory glossitis
- c. Lichen planus
- d. White sponge nevus

330. Correct= b. Benign migratory glossitis

ERYTHEMA MIGRANS (GEOGRAPHIC TONGUE; BENIGN MIGRATORY GLOSSITIS; WANDERING RASH OF THE TONGUE; ERYTHEMA AREATA MIGRANS; STOMATITIS AREATA MIGRANS)

Erythema migrans is a common benign condition that primarily affects the tongue. It is often detected on routine examination of the oral mucosa. The lesion occurs in 1% to 3% of the population. Females are affected more frequently than males by a 2:1 ratio. Patients may occasionally consult a health care professional if they happen to notice the unusual appearance of their tongue or if the lingual mucosa becomes sensitive to hot or spicy foods as a result of the process.

Even though erythema migrans has been documented for many years, the etiopathogenesis is still unknown. Some investigators have suggested that erythema migrans occurs with increased frequency in atopic individuals; however, one recent large epidemiologic study in the United States found no statistically significant association between erythema migrans and a variety of conditions that had previously been postulated either to cause or influence this process. Erythema migrans was not seen as frequently in cigarette smokers, while there seemed to be no significant differences in frequency related to age, sex, oral contraceptive use, presence of allergies, diabetes mellitus, or psychological or dermatologic conditions.

different patient than the one in Fig. 16-85. The lateral distribution of the lesions is shown.

CLINICAL FEATURES

The characteristic lesions of erythema migrans are seen on the anterior two thirds of the dorsal tongue mucosa. They appear as multiple, well-demarcated zones of erythema (Figs. 16-83 and 16-84), concentrated at the tip and lateral borders of the tongue. This erythema is due to atrophy of the filiform papillae, and these atrophic areas are typically surrounded at least partially by a slightly elevated, yellow-white, serpentine or scalloped border (Fig. 16-85). The patient who is aware of the process is often able to describe the lesions as appearing quickly in one area, healing within a few days or weeks, then developing in a very different area. Frequently, the lesion begins as a small white patch, which then develops a central erythematous

atrophic zone and enlarges centrifugally. Often patients with fissured tongue (see page 13) are affected with erythema migrans as well. Some patients may have only a solitary lesion, but this is uncommon. The lesions are usually asymptomatic, although a burning sensation or sensitivity to hot or spicy foods may be noted when the lesions are active. Only rarely is the burning sensation more constant and severe.

Very infrequently, erythema migrans may occur on oral mucosal sites other than the tongue. In these instances, the tongue is almost always affected; however, other lesions develop on the buccal mucosa, on the labial mucosa, and (less frequently) on the soft palate (Figs. 16-86 and 16-87). These lesions typically produce no symptoms and can be identified by a yellow-white serpentine or scalloped border that surrounds an erythematous zone. These features should prevent confusion with such conditions as candidiasis or erythroplakia.

HISTOPATHOLOGIC FEATURES

If a biopsy specimen of the peripheral region of erythema migrans is examined, a characteristic histopathologic pattern is observed. Hyperparakeratosis, spongiosis, acanthosis, and elongation of the epithelial rete ridges are seen (Fig. 16-88). In addition, collections of neutrophils (**Munro abscesses**) are observed within the epithelium (Fig. 16-89); lymphocytes and neutrophils involve the lamina propria. The intense neutrophilic infiltrate may be responsible for the destruction of the superficial portion of the epithelium, thus producing an atrophic, reddened mucosa as the lesion progresses. Because these histopathologic features are reminiscent of **psoriasis**, this is called a **psoriasiform mucositis**. Despite the apparent lack of

association between dermatologic conditions and erythema migrans in one recent report, another case-control study of psoriatic patients showed that erythema migrans occurred at a rate of about 10%; only 2.5% of an age-matched and sex-matched population were affected. A Brazilian study determined that both patients with psoriasis and those with benign migratory glossitis were more likely to have the same human leukocyte antigen (HLA) group, namely HLA-Cw6. Whether these findings mean that erythema migrans represents oral psoriasis or that patients with psoriasis are just more susceptible to erythema migrans is open to debate.

TREATMENT AND PROGNOSIS

Generally no treatment is indicated for patients with erythema migrans. Reassuring the patient that the condition is completely benign is often all that is necessary. Infrequently, patients may complain of tenderness or a burning sensation that is so severe that it disrupts their lifestyle. In such cases, topical corticosteroids, such as fluocinonide or betamethasone gel, may provide relief when applied as a thin film several times a day to the lesional areas.

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331. When looking at root formation when is the best time to remove third molars?

- a. Completely formed
- b. 1/3 to 2/3 formed
- c. 3/4 to 5/6th formed
- d. 6/7 to 7/8 formed

331. Correct - B: 1/3 to 2/3 formed

Early removal reduces the postoperative morbidity and allows for the best healing.³⁻⁶ Younger patients tolerate the procedure better, recovering more quickly and with less interference to their daily lives. Periodontal healing is better in the younger patient because of better and more complete regeneration of the periodontal tissues on the distal of the second molar. Also, nerve recovery is better if injured in younger patients. Moreover, the procedure is easier to perform in younger patients because the bone is less dense and root formation is incomplete. The ideal time for removal of impacted third molars is when the roots of the teeth are one third formed and before they are two thirds formed, usually during the late teenage years, between ages 17 and 20.

(Hupp, James R.. *Contemporary Oral and Maxillofacial Surgery, 5th Edition*. Mosby. p. 154).

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332. A patient presents as an emergency, with noticeable swelling below tooth #28. His blood pressure readings are as follows: Initial: 182/120; 2nd reading (5 minutes after 1st): 185/110; 3rd reading (5 minutes after 2nd): 180/105. What would be your treatment?

- A. Extract #28 or begin NSRCT/I&D, refer patient to primary care physician
- B. Extract #28 or begin NSRCT/I&D, refer patient to nearest emergency room
- C. Refer patient to nearest emergency room

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332. Correct= A. Extract #28 or begin NSRCT/I&D, refer patient to primary care physician $\geq 180/110$ -Defer Elective Treatment-Refer to physician as soon as possible

Little JW, et. al.; Dental Management of the Medically Compromised Patient; 7th Edition; Dental Management and Follow-up Recommendations Based on Blood Pressure; Table 3-5; Page 44

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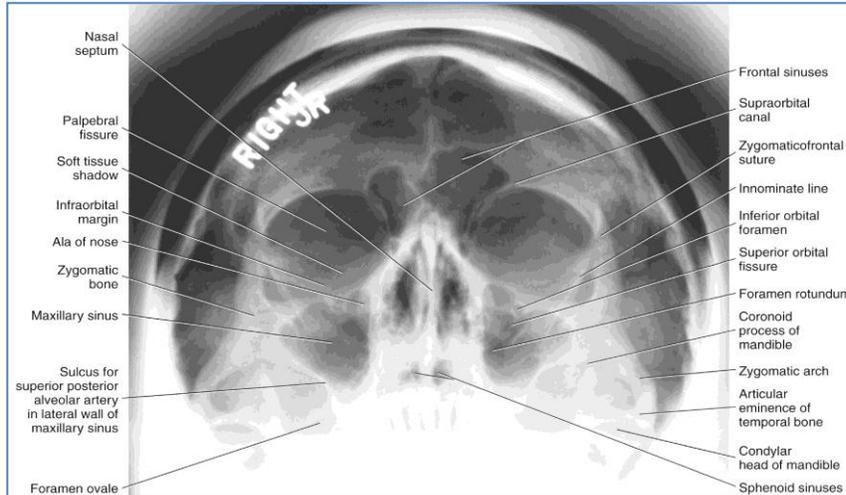
333. Which of the following extraoral radiographs best indicated when assessing suspected fractures of the orbit and zygoma?

- A. Reverse Towne
- B. Lateral Ramus
- C. Panoramic
- D. Waters

333. ANSWER: D. Waters

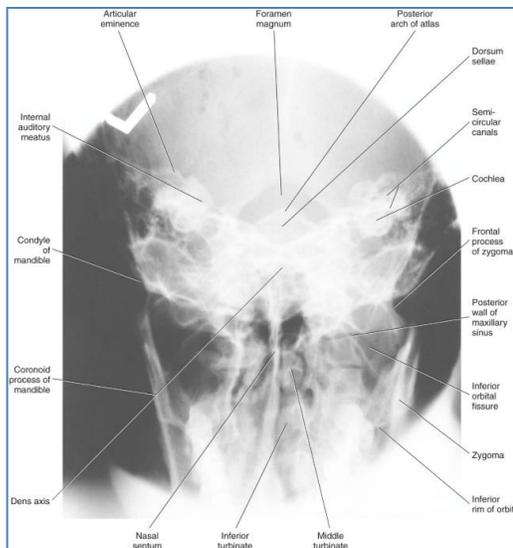
Rationale:

Waters



- Relative usefulness:
 - High: Coronoid process, orbit, zygoma, maxillary sinus
 - Medium: Zygomatic arch, nasal bones, nasal cavity, frontal sinus, ethmoid sinus

Reverse Towne



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- Relative usefulness:
 - High: Condylar neck, condylar head

Additional Images

	Lateral Ceph	SMV	Waters	PA Ceph	Reverse Towne	Oblique Lateral Body	Lateral Ramus
Patient placement	Film parallel to midsagittal plane	Canthomeatal line parallel to film	Canthomeatal line at 37° with film	Canthomeatal line at 10° with film	Canthomeatal line at -30° with film	Film in contact with cheek at molar area	Film in contact with cheek at ramus area
Central beam	Beam perpendicular to film	Beam aims at the molar-premolar area	Beam aims at the ramus area				
Diagram of patient placement							
Illustration of patient placement							
Skull view							
Resultant image							

Peterson LJ, Ellis E, Hupp JR, Tucker MR. Contemporary Oral and Maxillofacial Surgery, 3rd Ed. Mosby, 1998.

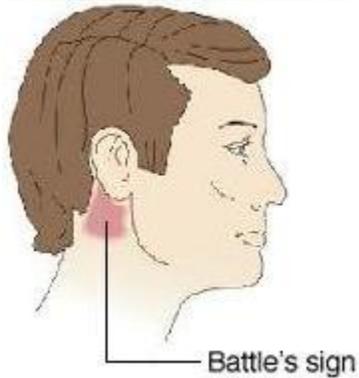
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334. Which of the following are true concerning Battle's sign?

- A. Occurs with-in the first 30 minutes of trauma
- B. Consists of bruising around the mastoid process and may indicate a middle fossa skull fracture or leakage of blood from a condylar fracture or trauma to the auditory canal
- C. Consists of bilateral circumorbital ecchymoses, nasal epistaxis and CSF rhinorrhea and indicates a skull fracture in the anterior fossa.
- D. Occurs from blast damage that causes rapid expansion of gas in internal hollow organs

334. Answer: B

Battle's sign is bruising over the post-auricular and mastoid area. It usually indicates a base of skull fracture, and may take some hours before becoming evident. It can also occur from seepage of blood from a condylar fracture or damage to the auditory canal, and these should be considered if other causes are ruled out. A trauma patient may also demonstrate a more anterior fracture and can have Battle's sign and "raccoon eyes" and other signs and symptoms of an anterior fracture to the base of the skull.



Battles's Sign, Periauricular ecchymosis

Periauricular - around the external ear
Ecchymosis - bleeding under the skin

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Note: Battle's sign is named after Dr. William Henry Battle, an English surgeon (1855-1936), who studied head injury cases involving concussions and optic neuritis, which is an inflammation to the eye. His studies led him to discover that the physical sign of bruising behind the ear to be indicative of a basilar skull fracture. Although Battle's sign is an indicator of head trauma, other physical signs and neurologic symptoms are taken into consideration to evaluate and properly diagnose a skull fracture.

Booth, Eppley and Schmelzeisen, Maxillofacial Trauma and Esthetic Facial Reconstruction, Copyright 2003, Churchill Livingstone, Philadelphia, PA., pp. 39,40,56,82 and 201.

Photo from www.immediateactionservices.com

Source of images www.mindef.gov.sg/joint/smti/wap/battle.htm

Source of Image: Timby/Smith's Essentials of Nursing: Care of Adults and Children (2005). Lippincott.

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335. When discussing odontogenic infections, which statement is false?
- A. The majority of causative organisms of odontogenic infections are mixed aerobic/anaerobic (65%)
 - B. Gram + cocci, such as streptococcus pyogenes, represent the major aerobic organism causing odontogenic infections
 - C. Cellulitis is highly associated with aerobic bacteria
 - D. Duration of cellulitis is classified as chronic

335. Answer =D. Duration of cellulitis is classified as chronic

To correct – duration of cellulitis is classified as acute while an abscess is classified as chronic

Causative organisms of odontogenic infections

Aerobic only – 5%

Anaerobic only – 35%

Mixed aerobic/anaerobic – 60%

Characteristic	Cellulitis	Abscess
Duration	Acute	Chronic
Pain	Severe and generalized	Localized
Size	Large	Small
Localization	Diffuse borders	Well circumscribed
Palpation	Doughy to indurated	Fluctuant
Presence of pus	No	Yes
Degree of seriousness	Greater	Less
Bacteria	Aerobic	Anaerobic

Peterson, Ellis, Hupp, Tucker. Contemporary Oral and Maxillofacial Surgery – 3rd Edition. 1998; 398-99.

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336. Which of the following antibiotics is most commonly associated with pseudomembranous colitis?

- A. Metronidazole
- B. Sulfonamides
- C. Quinolones
- D. Tetracyclines

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336. Answer= C Quinolones

Reference: Pseudomembranous colitis. In: Ferri FF. Ferri's Clinical Advisor 2011. Philadelphia, Pa.: Mosby; 2010.

Virtually any antibiotic can cause pseudomembranous colitis. Antibiotics most commonly associated with pseudomembranous colitis include:

Quinolones, such as ciprofloxacin (Cipro) and levofloxacin (Levaquin)

Penicillins, such as amoxicillin and ampicillin

Clindamycin (Cleocin)

Cephalosporins, such as cefixime (Suprax) and cefpodoxime (Vantin)

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337. A patient presents with complaint of a boney spicule one week after the extraction of #18. What would you do to treat the patient?

- A. With no pain and swelling, place patient on antibiotics and analgesics and wait for the boney spicule to exfoliate.
- B. With pain and swelling, leave it alone, the boney spicule may erupt on its own.
- C. With no pain and swelling, reopen extraction site and allow to exfoliate
- D. With pain and extraoral swelling, place the patient on antibiotics and analgesics, then after the swelling has resolved, remove the boney spicule with rongeurs

337. Correct=D

Pieces of tooth or jawbone occasionally break off during the extraction of a tooth that is stuck in the jawbone (an impacted tooth). These pieces may remain in the tooth socket, the hole where the tooth was located.

Over time, the bone fragment or tooth root can make its way to the surface of the gums. This can cause irritation to the gums or inside the mouth. If this happens, the fragment can be removed or smoothed by a dentist or an oral surgeon.

If a spicule or root tip does not cause any discomfort, the dentist or oral surgeon may recommend a "watch and wait" approach. Sometimes a fragment will completely break through the surface of the gums and fall out on its own.

It is important that you go to see a dentist as soon as possible to confirm that it is a bone or tooth fragment in the extraction site. Then, you can receive treatment. If you ignore the irritation, the gums could get further inflamed and an infection could develop.

Definition

A **bone spicule** could derive different meanings in different medical fields. This term is being used in dentistry, osteology and ophthalmology.

In dentistry, it is characterized by bony fragments or protrusions either loose or still attaching to jaw bone after a tooth extraction. This happens because loose fractured bony fragments may retain in the socket of an extraction and in time it would emerge from the gum covering the socket. These bone fragments are derived from the bone covering the roots of a tooth. When they are being left behind, your body treats them as foreign matters, so there would be an inflammatory response towards the bony fragments. Hence it would cause **swelling** and pain that depict an **infection**.

In some cases it may not trigger any problem at all when it is too small and it emerges from the gum level where you will probably feel something sticking out. Sometimes bony spicule could be the retained septal bone of a tooth. Septal bone lies between two teeth and between roots of one tooth. It may not come out with the extracted tooth. It may not resorb concurrently with gum recession after extraction. Thus, it may protrude through the gums when the gums shrink faster. In other instances, some people may have fractured and retained root inside a socket which the dentist may feel it is safer not to retrieve it. In time, as your bone resorbs due to missing tooth, the retained root may emerge and stick out from the gums.

Bony spicule may occur quite swiftly once after extraction although there are cases that occur months after the extraction.

How to treat it? **Usually if there is swelling and pain, dentist would prescribe a course of antibiotics and pain killers. When you feel much better the dentist would extract the bony spicule under local anaesthesia. Your symptoms should go away quite swiftly after that and the gums would heal normally. But it is advisable for you to return for follow ups to determine complete healing of the wound.**

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338. The most common site for exposed bone/alveolar osteitis post extraction is
- a. Maxillary impacted canine region
 - b. Maxillary tuberosity area
 - c. Mandibular impacted premolars
 - d. Mandibular impacted 3rd molars
 - e. Probability is highest if patient is a smoker and if the extraction was traumatic, so all sites have similar probability.

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338. Correct =D

The etiology of alveolar Osteitis (dry socket) is not absolutely clear, but it appears to be a result of high levels of fibrinolytic activity in and around the socket. This results in lysis of the blood clot and subsequent exposure of the bone. It is not associated with an infection, but the fibrinolytic activity may result from subclinical infections, inflammation of the marrow space. The occurrence of dry after routine tooth extraction is relatively rare (2% of extractions), but is quite frequent after removal of impacted third molars (20%).

Prevention: minimize trauma and bacterial contamination at time of surgery, debride the wound thoroughly with irrigation, small amounts of antibiotic (ie tetracycline) placed in socket alone or on a gelatin sponge may decrease incidence.

Goal of Treatment is to reduce pain during healing: gentle saline irrigation and medicated gauze (iodoform gauze with medication consists of eugenol and benzocaine and a carrying agent like basam of Peru) is gently inserted into the socket. Dressing may be changed daily or every 3-6 days depending on pain.

Petterson, et al. Contemporary Oral and Maxillofacial surgery. 3rd ed. p 274-275

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339. During the extraction of which erupted tooth are most of the luxation forces directed to the lingual?
- a. Maxillary incisors
 - b. Mandibular canines
 - c. Mandibular third molars
 - d. Maxillary third molars

339. Correct= C. Mandibular third molars

Erupted mandibular third molars usually have fused conic roots. Because a bifurcation is not likely, the No. 222 forceps—a short-beaked, right-angled forceps—are used to extract this tooth. The lingual plate of bone is definitely thinner than the buccocortical plate, so most of the extraction forces should be delivered to the lingual aspect. The third molar is delivered in the linguoocclusal direction. The erupted mandibular third molar that is in function can be a deceptively difficult tooth to extract. The dentist should give serious consideration to using the straight elevator to achieve a moderate degree of luxation before applying the forceps

(Hupp, James R. Contemporary Oral and Maxillofacial surgery. 3rd ed. p 274-275)