Patients with Xerostomia:
CAUSES AND TREATMENT OPTIONS
by Richard H. Nagelberg, DDS
Xerostomia is the subjective sensation of oral dryness, while dry mouth is objective and refers to hyposalivation, defined as reduced or nonexistent salivary flow. The terms xerostomia and dry mouth are often used interchangeably, as is the case in this course. The severity of xerostomia has wide variability, from mild and relatively easily managed cases to severe cases that have a significant impact on the quality of life and are more difficult to manage. While not associated with aging, xerostomia occurs most commonly in older individuals. The most common etiology, however, is medication induced xerostomia. More than 400 commonly prescribed medications, as well as over-the-counter medications, can cause dry mouth. A diagnosis of xerostomia can be ascertained by a variety of methods, but commonly is achieved by patient dialogue and history. A variety of approaches are available to alleviate its symptoms, with selection depending on the patient and the severity of dry mouth.

Introduction

Xerostomia affects approximately 30% of individuals 65 years-of-age and older.\(^1\)

While not the result of the aging process, it is most prevalent in seniors due to the medications, and the number of medications, older patients commonly need to take.\(^2,3\)

Dry mouth/xerostomia is defined as a reduced or absent salivary flow. Xerostomia is not a life threatening condition, however severe dry mouth can impact patients’ quality of life.

### OBJECTIVES

1. Discuss the prevalence and causes of xerostomia;
2. List and describe the signs and symptoms of xerostomia; and,
3. Review management and treatment options for xerostomia.
4. Describe when and how salivary stimulation can be achieved in patients with severe xerostomia.

### ABSTRACT

Xerostomia is the subjective sensation of oral dryness, while dry mouth is objective and refers to hyposalivation, defined as reduced or nonexistent salivary flow. The terms xerostomia and dry mouth are often used interchangeably, as is the case in this course. The severity of xerostomia has wide variability, from mild and relatively easily managed cases to severe cases that have a significant impact on the quality of life and are more difficult to manage. While not associated with aging, xerostomia occurs most commonly in older individuals. The most common etiology, however, is medication induced xerostomia. More than 400 commonly prescribed medications, as well as over-the-counter medications, can cause dry mouth. A diagnosis of xerostomia can be ascertained by a variety of methods, but commonly is achieved by patient dialogue and history. A variety of approaches are available to alleviate its symptoms, with selection depending on the patient and the severity of dry mouth.
Causes of Xerostomia

More than 1500 commonly prescribed medications, as well as over-the-counter medications, can cause dry mouth. Commonly prescribed medications with a xerostomic effects include antihistamines, antihypertensives, muscle relaxants, antidepressants, and antiparkinson medications. Cancer treatment including head and neck radiation and/or chemotherapy also causes dry mouth. Head and neck radiation can damage the salivary glands, affecting salivary flow. Oral tumors commonly occur in close proximity to salivary glands, which are therefore often exposed to radiation during therapy for oral malignancies at other sites. Salivary glands are highly sensitive to radiation, and the acute effects of radiation occur within a few days or weeks of exposure. Chronic effects occur months or years after irradiation and xerostomia is the most common and severe side effect of radiation therapy for head and neck cancer. Chemotherapy can also cause a thick ropy property to saliva and a reduction in the volume of saliva being produced. Chemotherapy can also cause alterations to salivary immunoglobulins, proteins, electrolytes, and nonspecific host defenses in saliva. (Table 1)

Xerostomia may also be the result of systemic diseases and conditions, including poorly controlled diabetes mellitus, rheumatoid arthritis, HIV/AIDS, depression, Parkinson’s disease and anxiety disorders. Sjögren’s syndrome is associated with chronic inflammation and salivary gland damage, resulting in salivary gland dysfunction and xerostomia. The primary symptoms of Sjögren’s syndrome are dry eyes and dry mouth, and approximately 1 in 70 individuals suffer from this syndrome. Alzheimer’s disease and stroke may cause dry mouth. Other causes of xerostomia include surgery or injury to the head and neck, including nerve damage. Tobacco usage of all types including smoking, chewing and snuff-dipping also cause dry mouth, while insufficient fluid intake and long periods of physical activity result in temporary dehydration. Mouth breathing and snoring also temporarily dry out the oral cavity.

Salivary Glands and Salivary Secretions

Salivary secretions are produced by the three major salivary glands – the parotids, submaxillary and sublingual glands – and by many minor glands in the oral cavity. In health, salivary function is mediated by muscarinic M3 receptors that are stimulated by acetylcholine released by the parasympathetic nervous system. Salivary secretion is a reflex response controlled by both parasympathetic and sympathetic secretomotor nerves. The muscarinic M3 receptors are present in the oral mucosal surfaces. When the receptors are stimulated, afferent nerve signals travel to the salivatory nuclei in the medulla. This signal may also be influenced by stimuli including taste, smell, anxiety or depression. Efferent nerve signals stimulate the salivary glands, increasing salivary secretions. Most salivary glands also receive innervation from sympathetic nerves which release noradrenaline from which tends to evoke greater release of stored proteins, mostly from acinar cells but also ductal cells. All salivary glands are supplied by cholinergic parasympathetic nerves which release acetylcholine that binds to M3 and (to a lesser extent) M1 muscarinic receptors, evoking the secretion of saliva by acinar cells in the

<table>
<thead>
<tr>
<th>Table 1. Causes of Xerostomia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antihistamines, antihypertensives, antidepressants, antiparkinson medications, muscle relaxants</td>
</tr>
<tr>
<td>Head and neck radiation</td>
</tr>
<tr>
<td>Chemotherapy</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>Sjögren’s syndrome</td>
</tr>
<tr>
<td>Injury/surgery to the head and neck</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
</tr>
<tr>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>Alzheimer’s disease</td>
</tr>
<tr>
<td>Parkinson’s disease</td>
</tr>
<tr>
<td>Stroke</td>
</tr>
</tbody>
</table>
endpieces of the salivary gland ductal tree. Most salivary glands also receive a variable innervation from sympathetic nerves which released noradrenaline from which tends to evoke greater release of stored proteins, mostly from acinar cells but also ductal cells.

Saliva is a complex fluid that is essential for oral health. Saliva is 99% water; the other 1% contains the components that confer a wide variety of beneficial effects on the oral cavity. These include antimicrobial activity, removal of food debris, lubrication of the oral cavity, and remineralization of teeth. Saliva facilitates swallowing, speaking and taste perception. It is also involved in defending the oral mucosa from infection from oral microbiota due to the presence of naturally occurring antimicrobial compounds including thiocyanate, lysozyme, immunoglobulins, lactoferrin and transferrin. There are also antimicrobial peptides called defensins. (Table 2)

Content and Functions of Saliva

Saliva contains organic and inorganic components. The organic components primarily consist of proteins and glyco-proteins, including the enzyme amylase; thus, the digestive process starts in the mouth. There are also mucous secretions containing mucin, which lubricates the oral cavity. It is the inorganic components, however, that provide the majority of the beneficial effects of saliva. Among the most important properties of saliva is its buffering capacity. The primary buffer systems are the bicarbonate and phosphate systems and protein based buffering systems. The protein buffering system contributes to salivary buffering only in the very low pH ranges. The majority of salivary buffering occurs during food intake and mastication by means of the bicarbonate buffering system. The salivary concentration of bicarbonate increases significantly when salivary flow rates increase. Phosphate makes a minor contribution to the total salivary buffer capacity relative to bicarbonate. Saliva is also supersaturated with respect to tooth mineral content, providing calcium, phosphate and fluoride. These ions aid in tooth remineralization and promote soft tissue healing by permeating the epithelium of the injured tissue and participate in tissue repair.

<table>
<thead>
<tr>
<th>Table 2. Antimicrobial compounds in saliva</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiocyanate</td>
</tr>
<tr>
<td>Lysozyme</td>
</tr>
<tr>
<td>Immunoglobulins</td>
</tr>
<tr>
<td>Lactoferrin</td>
</tr>
<tr>
<td>Transferrin</td>
</tr>
<tr>
<td>Defensins</td>
</tr>
</tbody>
</table>

Signs and Symptoms of Xerostomia

The signs and symptoms of xerostomia are variable both in terms of severity and effects. They include increased caries, periodontal disease, difficulty wearing partial and full dentures, stringy saliva, halitosis, difficulty speaking and swallowing, angular cheilitis, dysgeusia (taste disorders), glossodynia (painful tongue), and fungal infections which most commonly manifest as oral candidiasis. The oral mucosa becomes thin and friable in xerostomic conditions and is then more susceptible to abrasions. The combination of fragile tissue and microbial population increases the likelihood of oral infection in xerostomic individuals.

Screening and Diagnosing Xerostomia

A diagnosis of xerostomia can be made upon examination of the oral cavity or from the patient’s history together with salivary testing. The flow rate of saliva can also be obtained through sialometry, a simple procedure done in the office. Patient complaints of dry mouth especially at night and difficulty eating crackers or other dry foods
Patients with Xerostomia: Causes and Treatment Options

should trigger a potential diagnosis of xerostomia. Lipstick adhering to the anterior teeth may be a tell-tale sign of xerostomia. When trying to ascertain whether or not an individual has xerostomia a number of questions may provide insight. (Figure 2)

Advising Patients with Xerostomia

Patients with xerostomia should be advised to decrease or avoid the consumption of caffeinated and alcoholic beverages, and to avoid alcohol-containing mouthwashes, as caffeine is a diuretic and alcohol has a drying effect. Salty and spicy foods should also be avoided because they can cause oral irritation and increase thirst. The oral pH is decreased, becoming more acidic in patients with xerostomia due to the diminished salivary flow and resultant decrease in buffering capacity. This creates favorable conditions for caries development. Patients should be counseled to avoid sugary and acidic foods and drinks when xerostomia is present and to practice meticulous home care. Recommendations for biofilm removal devices should also be considered if appropriate. (Figure 3)

Managing Xerostomia

The objectives of xerostomia treatment include identifying the possible cause(s), relieving discomfort, and preventing complications such as periodontal infection and caries. A variety of over-the-counter (OTC) and prescription medications are available. There are also prescription rinses that simulate the buffering and protective effects of saliva.

Management of patients with xerostomia should include encouraging the individual to actively participate in their care. Dental professionals should assist patients in identifying products that are useful as well as those that should be

Figure 2. Questions providing insight into the presence of xerostomia:

- Do you need to moisten your mouth frequently or sip liquids often?
- Does your mouth feel dry at mealtime?
- Do you have less saliva than you used to?
- Do you have trouble swallowing?
- Is it difficult to eat dry foods such as crackers or toast?
- Do you suffer from any chronic illness, such as diabetes or hypertension?
- What prescription and OTC medications are you currently taking?
- What dietary supplements are you currently taking?
- How often do you brush your teeth?
- How much water do you drink daily?

For denture-wearers, the following questions may be helpful:

- Do you wear dentures? If so, how often do you clean your dentures?
- Are you having difficulty wearing your dentures?
- Do your dentures feel as if they are sticking to your lips or gums?
- Have you noticed any sores in your mouth or on your lips?
avoided. Certain protocols such as meticulous home care and the avoidance of salty foods, spicy foods as well as limiting or eliminating alcohol intake should be encouraged. Recommendations should be made for self-examination of the mouth, looking for sores, dry lips, dark, white or red patches, ulcers or caries. If the patient identifies anything unusual in the mouth, they should be advised to see their dentist without delay. Fluoride rinse usage should be encouraged. There are a variety of OTC fluoride rinses as well as high concentration (5000 ppm) fluoride toothpastes and rinses available by prescription for home use. In-office fluoride treatments should also be considered. Products with sodium lauryl sulfate should be avoided as these may cause aphthous ulcers. Patients should be advised against wearing full or partial dentures overnight. More frequent visit to the dental office may be appropriate as well. (Figure 3)

Mild and intermittent cases of xerostomia are commonly addressed by recommending over-the-counter products that stimulate salivary flow, including sugar-free lemon drops or sugar-free gum. The symptoms of xerostomia can be alleviated with the use of OTC lubricants containing carboxymethylcellulose or hydroxyethyl cellulose, which are commercially available in a variety of forms including rinses and sprays. Recommendations to moisturize the lips should be provided as well. Moisture can be added to the air at night with a humidifier, which helps reduce the xerostomic effect of mouth breathing. Snoring cessation appliances may be considered as well.

When xerostomia is moderate to severe, a variety of treatments are available. Currently there are two prescription medications available including cevimeline (Evoxac®), which is used, according to the manufacturer, in cases of xerostomia as a symptom of Sjögren’s syndrome. Cevimeline stimulates nerves to increase salivary production, provided there is still residual salivary gland function. Prescribing information is as follows: cevimeline 30 mg, three times daily in adults. For head and neck cancer patients the recommended dose is 5 mg three times daily. The dosage may be increased for patients who have not responded sufficiently. Pilocarpine (Salagen®) is also used for xerostomia caused by radiation treatment or Sjögren’s syndrome. It has the same mechanism of action as cevimeline. It is available as 5 mg tablets. Prescribing information is as follows: pilocarpine 5 mg four times daily for patients with Sjögren’s syndrome. For head and neck cancer patients the recommended dose is 5 mg three times daily. The dosage may be increased for patients who have not responded sufficiently.

Among the other approaches to xerostomia are antioxidant rinses, gels and toothpastes. The antioxidant gels, rinses and toothpaste contain plant-based antioxidants, and moisturizers, among other ingredients, that promote a moist feeling in oral tissues. Another approach for the treatment of xerostomia involves products that simulate saliva, such as supersaturated calcium phosphate (SSCP) rinses. Commercially available SSCP products such as NeutraSal® and SalivaMax™ contain calcium chloride, sodium phosphate.

<table>
<thead>
<tr>
<th>Encourage:</th>
<th>Avoid/Discourage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Meticulous home care</td>
<td>• Consumption of caffeinated beverages</td>
</tr>
<tr>
<td>• Oral self-examination</td>
<td>• Consumption of alcohol</td>
</tr>
<tr>
<td>• Fluoride rinse usage</td>
<td>• Use of alcohol-containing mouthwashes</td>
</tr>
<tr>
<td>• OTC and RX fluorides</td>
<td>• Salty and spicy foods</td>
</tr>
<tr>
<td>• More frequent dental visits as appropriate</td>
<td>• Sugary drinks/foods</td>
</tr>
<tr>
<td>• Sugar-free lozenges and candies</td>
<td>• Wearing dentures at night</td>
</tr>
<tr>
<td>• OTC oral lubricants</td>
<td>• SLS-containing products</td>
</tr>
</tbody>
</table>
and sodium bicarbonate plus inactive ingredients. These products are in powder forms that are mixed with water, which creates a supersaturated calcium phosphate solution. The sodium bicarbonate provides the buffering property, returning the pH of the oral cavity to normal ranges of approximately 6.5 – 7.5. The supersaturated concentration of calcium and phosphate ions helps to prevent demineralization of the teeth by providing the minerals needed to maintain the integrity of the teeth. Additionally, the calcium and phosphate ions promote healing of inflamed tissue by penetrating the intercellular spaces.

Conclusions

Xerostomia is a common condition that will likely increase in incidence as the baby boomer population advances in age. Clinicians should be encouraged to ask questions to ascertain if patients have dry mouth, especially when there are signs of xerostomia. Offering solutions including over the counter remedies, antioxidants, supersaturated calcium phosphate rinses, or referral to the patient’s physician should be undertaken when appropriate.

References


Acknowledgment

Figure 1 courtesy of Dr. John Comisi.

Webliography


Mayo Clinic. Dry mouth. Available at: www.mayoclinic.org/diseases.../dry-mouth/basics/symptoms/con-200354.
Patients with Xerostomia: Causes and Treatment Options

CE Quiz

1. The most common cause of xerostomia __________.  
   a. diabetes mellitus  
   b. Sjögren’s syndrome  
   c. medication-induced xerostomia  
   d. chemotherapy

2. The acute effects of radiation occur within a __________ of exposure.  
   a. few days  
   b. few days or weeks  
   c. weeks  
   d. few weeks or months

3. Chemotherapy can cause __________.  
   a. A thick ropy property to saliva  
   b. a reduction in the volume of saliva  
   c. cause alterations to salivary immunoglobulins  
   d. all of the above

4. Sjögren’s syndrome is the systemic condition most often associated with xerostomia and salivary gland dysfunction.  
   a. True  
   b. False

5. In health, salivary function is mediated by __________ that are stimulated by acetylcholine released by the parasympathetic nervous system.  
   a. muscarinic M3 inhibitors  
   b. muscarinic M3 receptors  
   c. mucinophilic receptors  
   d. vasoactive receptors

6. Defensins are naturally-occurring __________.  
   a. salivary stimulants  
   b. cytokines  
   c. antimicrobial peptides  
   d. antimicrobial enzymes

7. Phosphate is a __________ to the total salivary buffer capacity relative to bicarbonate.  
   a. detriment to  
   b. minor contributor to  
   c. significant contributor to  
   d. catalyst for

8. Intraoral fungal infections most commonly manifest as oral __________.  
   a. candidiasis  
   b. aspergillosis  
   c. red patches  
   d. a and b

9. Only major salivary glands are supplied by cholinergic parasympathetic nerves.  
   a. True  
   b. False

10. Sialometry is a method to determine the __________.  
    a. volume of saliva present  
    b. constituents of saliva  
    c. antimicrobial capacity of saliva  
    d. flow rate of saliva

To complete this quiz online and immediately download your CE verification document, visit www.dentallearning.net/PWX-ce, then log into your account (or register to create an account). Upon completion and passing of the exam, you can immediately download your CE verification document. We accept Visa, MasterCard, Discover, and American Express.
11. Patient who complain of ____________ may have xerostomia.
   a. having to moisten their lips frequently
   b. difficulty wearing dentures
   c. difficulty eating crackers or swallowing
   d. all of the above

12. The use of alcohol-containing mouthwash ____________.
   a. is recommended for its antimicrobial effect
   b. helps to eliminate antioxidants from the oral cavity
   c. is discouraged because of its drying effect
   d. may be recommended for older patients with xerostomia

13. Recommendations should be made for self-examination of the mouth, looking for ____________.
   a. dark, white or red patches
   b. sores or ulcers
   c. dry lips
   d. all of the above

14. Mild and intermittent cases of xerostomia are commonly addressed by recommending ____________.
   a. antioxidants
   b. over-the-counter products that stimulate salivary flow
   c. pilocarpine
   d. amifostine

15. The symptoms of xerostomia can be alleviated with the use of OTC lubricants containing ____________.
   a. carboxymethylcellulose or hydroxyethylcellulose
   b. glycol
   c. oxidizing agents
   d. pyrophosphates

16. Cevimeline is recommended for the treatment of ____________.
   a. Mild xerostomia
   b. severe xerostomia in patients with diabetes mellitus
   c. mild xerostomia in patients undergoing chemotherapy
   d. severe xerostomia in patients with Sjögren’s syndrome

17. Pilocarpine is prescribed at a dose of ____________ to treat xerostomia in head and neck radiation patients.
   a. 5 mg three times daily
   b. 5 mg five times daily
   c. 10 mg three times daily
   d. 10 mg four times daily

18. Supersaturated calcium phosphate (SSCP) rinses are commercially available that contain ____________.
   a. calcium chloride, calcium phosphate and sodium bicarbonate
   b. calcium chloride, sodium phosphate and sodium chloride
   c. calcium chloride, sodium nitrate and sodium bicarbonate
   d. calcium chloride, sodium phosphate and sodium bicarbonate

19. Calcium and phosphate ions ____________.
   a. help to prevent demineralization
   b. promote healing of inflamed tissue
   c. help to maintain the integrity of the teeth
   d. all of the above

20. Management of patients with xerostomia should include encouraging the individual to ____________.
   a. place a dehumidifier in the bedroom
   b. purchase a larger variety of oral care products
   c. actively participate in their care
   d. chew gum for at least 2 hours each day
Patients with Xerostomia: Causes and Treatment Options

**CE ANSWER FORM**
(E-mail address required for processing)

Name:  
Address:  
City:  State:  Zip:  
NPI No.:  
Phone:  
License Renewal Date:  
Provider number is RP5062. The cost for courses ranges from $19.00 to $90.00. RECORD KEEPING: Dental Learning, LLC maintains records for a minimum of seven years. CANCELLATION/REFUND POLICY: Any participant who is not satisfied with this course can request a full refund by contacting Dental Learning, LLC in writing or by calling 1-888-724-5230. This report, which will list all credits earned to date, will be generated and mailed to you within five business days of request. Dental Learning, LLC maintains verification records for a minimum of seven years. Dental Learning, LLC is also designated as an Approved PACE Program Provider by the American Dental Association. The formal continuing education programs of this program provider are accepted by AGD for Fellowship, Mastership, and CERP recognized provider. Dental Learning, LLC is also designated an Approved PACE Program Provider by the Academy of General Dentistry. The formal continuing education programs of this program provider are accepted by AGD for Fellowship, Mastership, and membership maintenance credit. Please contact Dental Learning, LLC for current terms of acceptance. Participants are urged to contact their state dental boards for continuing education requirements. Dental Learning, LLC is a California Provider. The California Provider number is 3907. The cost for courses ranges from $79.00 to $95.00. RECORD KEEPING: Dental Learning, LLC maintains records of your successful completion of any exam. Please contact our offices for a copy of your continuing education credits report. This report, which will list all credits earned to date, will be generated and mailed to you within five business days of request. Dental Learning, LLC maintains verification records for a minimum of seven years. CANCELLATION/REFUND POLICY: Any participant who is not 100% satisfied with this course can request a full refund by contacting Dental Learning, LLC in writing or by calling 1-888-724-5230.

**EDUCATIONAL OBJECTIVES**
- Discuss the prevalence and causes of xerostomia;
- List and describe the signs and symptoms of xerostomia; and,
- Review management and treatment options for xerostomia.
- Describe when and how salivary stimulation can be achieved in patients with severe xerostomia.

**COURSE EVALUATION**
Please evaluate this course using a scale of 3 to 1, where 3 is excellent and 1 is poor.

1. Clarity of objectives .............................................. 3  2  1
2. Usefulness of content ........................................... 3  2  1
3. Benefit to your clinical practice ................................. 3  2  1
4. Usefulness of the references .................................... 3  2  1
5. Quality of written presentation .................................. 3  2  1
6. Quality of illustrations ............................................ 3  2  1
7. Clarity of quiz questions .......................................... 3  2  1
8. Relevance of quiz questions ..................................... 3  2  1
9. Rate your overall satisfaction with this course ............... 3  2  1
10. Did this lesson achieve its educational objectives?  Yes No
11. Are there any other topics you would like to see presented in the future?

**COURSE SUBMISSION:**
1. Read the entire course.
2. Complete this entire answer sheet in either pen or pencil.
3. Mark only one answer for each question.
4. Mail or fax answer form.

For immediate results:
1. Read the entire course.
2. Go to www.dentallearning.net/PWX-ce.
3. Log in to your account or register to create an account.
4. Complete course and submit for grading to receive your CE verification certificate.

A score of 70% will earn your credits.

**QUIZ ANSWERS**
Fill in the circle of the appropriate answer that corresponds to the question on previous pages.

1. A     B     C     D
2. A     B     C     D
3. A     B     C     D
4. A     B     C     D
5. A     B     C     D
6. A     B     C     D
7. A     B     C     D
8. A     B     C     D
9. A     B     C     D
10. A    B     C     D
11. A    B     C     D
12. A    B     C     D
13. A    B     C     D
14. A    B     C     D
15. A    B     C     D

AGD Codes: 730, 149

Price: $29  CE Credits: 2

If you have any questions, please email Dental Learning at questions@dentallearning.net or call 888-724-5230.

**PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.**

Please direct all questions pertaining to Dental Learning, LLC or the administration of the course to playrix.co. COURSE EVALUATION and PARTICIPANT FEEDBACK: We encourage participant feedback pertaining to all courses. Please be sure to complete the evaluation included with the course. INSTRUCTIONS: All questions have only one answer. Participants will receive confirmation of passing by receipt of a verification certificate. Verification certificates will be processed within two weeks after submitting a completed examination. EDUCATIONAL DISCLAIMER: The content in this course is derived from current information and research based evidence. Any opinions of efficacy or perceived value of any products mentioned in this course and expressed herein are those of the author(s) of the course and do not necessarily reflect those of Dental Learning. Completing a single continuing education course does not provide enough information to make the participant an expert in the field related to the course topic. It is a combination of many educational courses and clinical experience that allows the participant to develop skills and expertise. COURSE CREDITS/COST: All participants scoring at least 70% on the examination will receive a CE verification certificate. Dental Learning, LLC is an ADA-CERP recognized provider. Dental Learning, LLC is also designated as an Approved PACE Program Provider by the Academy of General Dentistry. The formal continuing education programs of this program provider are accepted by AGD for Fellowship, Mastership, and CERP recognized provider. Please contact Dental Learning, LLC for current terms of acceptance. Participants are urged to contact their state dental boards for continuing education requirements. Dental Learning, LLC is a California Provider. The California Provider number is 3907. The cost for courses ranges from $79.00 to $95.00. RECORD KEEPING: Dental Learning, LLC maintains records of your successful completion of any exam. Please contact our offices for a copy of your continuing education credits report. This report, which will list all credits earned to date, will be generated and mailed to you within five business days of request. Dental Learning, LLC maintains verification records for a minimum of seven years.