Xerostomia: Etiology, Diagnosis, and Management

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LEARNING OBJECTIVES
After participating in this CE activity, the individual will learn:
• The etiology of xerostomia.
• The dentist's role in the diagnosis and clinical management of xerostomia.

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INTRODUCTION
Xerostomia is the subjective perception of oral dryness. It is associated with dysfunction of the salivary glands. Xerostomia and salivary gland dysfunction are most commonly due to: pharmaceuticals, systemic disease (ie, Sjögren's syndrome), radiation therapy, dehydration, and emotional stress. There may be various degrees of salivary hypofunction depending upon the etiology; in some severe cases there may be complete lack of salivary function. This article discusses the etiology of xerostomia and the dentist's role in the diagnosis and clinical management of this condition.

Saliva is produced mainly by 2 major salivary glands: the parotid salivary glands produce the more watery serous saliva, and the submandibular salivary glands produce the more mucinous sticky saliva. Furthermore, there are hundreds of minor salivary glands within the oral mucosa, and these glands are important with regard to lubrication necessary for speaking and increased production of salivary immunoglobulin A (IgA), which has immune functions. The minor salivary glands produce approximately 10% of the saliva but approximately 25% of the salivary IgA.

A large number of medications (> 1,500) have been implicated as causing xerostomia. Dry mouth (salivary hypofunction) is seen as a frequent side effect of prescription and nonprescription drugs such as those used to treat depression, anxiety, allergies, and colds (antihistamines and decongestants), hypertension (diuretics), asthma (certain bronchodilators), and muscle relaxants and sedatives. The use of medications increases with age, with more than 75% of persons aged 65 years and older taking at least one prescription medication; therefore, the prevalence of medication-induced xerostomia is high in elders, although healthy elders do not tend to have any more dry mouth issues than healthy younger adults. Most drugs with xerostomic side effects are not known to cause permanent damage to the salivary glands. Drug-induced xerostomia is a transient symptom (limited to the duration of effect of the medication). The inhibitory effect of the drugs on salivary secretion can be overcome with gustatory stimuli.

Dry mouth is commonly seen in patients receiving radiation therapy for head and neck cancer as radiation therapy destroys the salivary gland tissue; or it is seen in patients having surgical removal of the salivary glands due to salivary gland tumor or stones (sialolith). Dry mouth is also seen in certain autoimmune disorders such as Sjögren's syndrome, rheumatoid arthritis, systemic lupus erythematosus, and scleroderma. In these autoimmune disorders, there is production of autoantibodies that are...
directed toward the exocrine glands, resulting in destruction of the salivary gland tissue. Both radiation therapy and autoimmune disorders affect stimulated and unstimulated whole salivary flow rate as the damage to the salivary gland tissue is permanent.\(^1\)

Other factors that can affect saliva production and aggravate dry mouth include dehydration due to factors such as fever, excessive sweating, vomiting, diarrhea; smoking or chewing tobacco; and mouth breathing habits.\(^1\)

Salivary flow rates (stimulated and unstimulated) can be determined by collection of whole saliva or individual gland output. Both unstimulated (resting) and stimulated whole saliva collection is a simple procedure which can be accomplished in the dental office. In healthy individuals, unstimulated whole saliva rate exceeds 0.5 mL/min. Values of < 0.1 mL/min are considered abnormal. It is generally accepted that when saliva production is decreased by about 50%, a person will have symptoms of dry mouth.\(^4\) However, complaints of dryness do not necessarily demonstrate decreased stimulated or unstimulated salivary flow rates, but may also pertain to saliva composition and a qualitative disorder rather than only a quantitative disorder.\(^6,7\)

**SYMPTOMS**

The common symptoms of dry mouth include a dry, sticky feeling in the mouth and throat, and increased frequency of thirst.\(^1\) Dry mouth causes difficulty in swallowing, speaking, chewing, and wearing dentures. There may be a change in taste sensation, and patients frequently complain of a burning or tingling sensation in the mouth, especially of the tongue.\(^1\) Intraorally there may be sores on the oral mucosa; fissured tongue or dry, red, raw tongue; increased susceptibility to oral candidiasis; and cracked corners of the mouth and lips. Dry mouth also may result in rampant decalcification of enamel, cervical dental caries, and acid erosion, as well as increased accumulation of bacterial plaque and associated gingival inflammation and periodontal disease, and halitosis\(^1\) (Figures 1a and 1b).

**DIAGNOSIS**

To confirm the diagnosis of dry mouth, patients should be questioned in greater detail about their dryness. Questions which focus on oral activities dependent on salivation, such as chewing and swallowing, help in identifying patients with salivary hypofunction. As part of diagnosis, the dentist should check for the type of saliva; for example, thick ropy saliva and absence of salivary pool in the floor of the mouth is indicative of decreased parotid function and a qualitative salivary disorder.\(^4\)

Patients who have the clinical manifestations of dry mouth and (or) etiology of dry mouth should be asked the following questions: \(^4\)

- Do you sip liquids to aid in swallowing dry foods? Does your mouth feel dry when eating a meal?
- Do you have difficulties swallowing any foods? Does the amount of saliva in your mouth seem to be too little?
- Does your nose or throat feel dry and tickly? Do you have a dry cough, hoarseness, nosebleeds, or a decreased sense of taste or smell?

Dry mouth patients who respond positively to
these questions and have a lower salivary flow rate (< 0.1 mL/min) are diagnosed as having salivary hypofunction. Unstimulated and stimulated salivary function tests are used to determine the actual severity of xerostomia. Unstimulated salivary samples require that the patient has ingested nothing by mouth for at least 60 minutes. Unstimulated saliva includes the output of the major and minor salivary glands. When performing the test, patients are instructed to sit upright and allow saliva to accumulate passively in the mouth without swallowing. Patients are instructed to spit the contents of the mouth into a receptacle at one-minute intervals. A collection of at least 5 minutes is recommended. Salivary flow of less than 0.1 mL/min is considered as low salivary flow.

Stimulated saliva is collected by having the patient chew an unflavored gum base or paraffin wax at a rate of 60 chews/min for at least 2 minutes. Salivary output of less than 0.1 mL/min indicates salivary hypofunction.

Another useful means of evaluating salivary function is to apply pressure to the parotid salivary gland in milking the gland. Once the cheek is retracted and the parotid (Stensen’s) duct is visualized and the area dried with cotton, milking pressure to the area will express saliva in functioning parotid glands. Milking of the submandibular salivary glands is somewhat more difficult but also feasible.

**MANAGEMENT**

Dry mouth is managed well by having an early diagnosis of the condition and aggressively treating the symptoms. Early diagnosis and treatment can slow progression of dry mouth and improve comfort and productivity.

Xerostomia increases the vulnerability of tooth enamel to dental caries. Patients diagnosed with dry mouth are at high risk for dental caries; thus an extra effort must be made to protect teeth from decalcification and dental caries. Patients diagnosed with dry mouth as well as patients with high caries index should receive a comprehensive intraoral dental exam, and bite-wing x-rays should be performed annually to detect any new carious lesions. To arrest dental caries, patients need aggressive fluoride therapy in the form of professionally applied concentrated sodium fluoride varnishes every 3 months and daily use of prescription strength fluoride toothpaste (PreviDent 5000 Dry Mouth [Colgate-Palmolive Company]). Another consideration is the use of fluoride gel application with trays. Calcium also has a remineralizing effect on dental enamel. A calcium-containing remineralizing oral rinse such as Capshol (EUSA Pharma) is recommended as well.

Dry mouth patients are also at high risk for periodontal disease. Importance of regular brushing and flossing should be reinforced and use of an electric toothbrush should be recommended to effectively remove plaque and prevent gingivitis. An electric toothbrush helps to effectively remove plaque. It is recommended that patients having a diagnosis of dry mouth receive periodontal prophylaxis every 3 months to arrest periodontal disease. Periodontal prophylaxis is followed by an in-office application of fluoride varnish. The usage of antibacterial rinse 0.12% chlorhexidine gluconate (eg, Actavis MidAtlantic) may be helpful in reducing gingivitis. In severe cases patients should be referred to a periodontist.

Oral candidiasis is frequently seen in patients with dry mouth. Patients diagnosed with oral candidiasis should be prescribed topical antifungal rinses (nystatin) or lozenges (clotrimazole) for treatment of oral candidiasis. Systemic antifungal medication such as fluconazole is recommended for recurrent oral candidiasis or when topical antifungal agents are ineffective.

Nonselective muscarinic receptor agonists (sialagogues) such as pilocarpine or civemline may be prescribed for patients to promote salivary function. These are parasympathomimetic drugs and act therapeutically at the muscarinic acetylcholine receptor and stimulate saliva production. Sialagogues should always be taken with food. For patients who are unable to afford prescription medications or are unable to tolerate them due to their side effects, there are over-the-counter products by Biotene (GlaxoSmithKline) for treatment of dry mouth. The use of xylitol containing salivary stimulants such as Biotene gum or Trident gum (Cadbury Adams USA) can help stimulate salivary flow in patients having remaining functional salivary glands. Xylitol helps to arrest dental caries as it interferes with the growth of cariogenic bacteria. It is safe and approved as a therapeutic sweetener by the US Food and Drug Administration.
Dry mouth causes the oral mucosa to become dry and sore. The use of oral lubricants such as vitamin E or Oral Balance (GlaxoSmithKline) may be helpful to provide comfort to the irritated oral tissues. Patients should be instructed to break the vitamin E capsule and apply its contents topically to the affected oral tissues. The regular use of topically applied oil-based balms or vitamin E-containing balm may provide soothing relief to dry, cracked lips.

Patients should be counseled to avoid any products that can contribute to oral dryness or irritation such as alcohol, caffeine, and tooth whitening products. Alcohol has a drying effect and should be avoided in both beverages and in oral products such as mouthwashes. Caffeine is a mild diuretic which promotes fluid loss and may worsen dry mouth. If possible, patients should avoid or limit items which contain significant amounts of caffeine such as coffee, tea, and certain soft drinks as these are acidic in nature and cause decalcification of enamel. Tooth whitening products should also be avoided as they can be irritating to friable oral tissues. Patients are advised to minimize consumption of carbohydrate containing foods and beverages between meals, especially sticky foods such as cookies, bread, potato chips, gums, candies, and acidic beverages (such as carbonated and sports replenishment drinks), and lemon products as these can cause decalcification of enamel and dental caries. Frequent sips of small amounts of sugar-free fluids, especially water, can be helpful in diminishing the effects of oral dryness. Many patients keep a bottle of water handy to moisturize their tissues.

If patients tend to breathe through their mouth, they should be referred to an otolaryngology specialist to examine for any impediments to normal nasal breathing. The dry ambient air of most modern homes contributes to sensation of dryness. The use of a humidifier, particularly at night, helps address this concern. Patients taking certain medications that result in dry mouth should consult their physician to determine if an alternative medication or dosage is appropriate that may reduce dry mouth and still meet their medical needs.

CONCLUSION
It is important to have an early diagnosis and treatment of dry mouth to manage symptoms and slow the progression of disease. Routine follow-up care between the physician and dentist is essential to arrest the progression and severity of dry mouth. Early intervention and individualized management of dry mouth can help improve the quality of life for patients who suffer from dry mouth.

REFERENCES
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POST EXAMINATION QUESTIONS

1. Xerostomia and salivary gland dysfunction are most commonly due to:
   a. Pharmaceuticals.
   b. Certain systemic diseases.
   c. Radiation therapy.
   d. All of the above.

2. Parotid salivary glands produce the more watery serous saliva. Submandibular salivary glands produce the more mucinous sticky saliva.
   a. The first statement is true, the second is false.
   b. The first statement is false, the second is true.
   c. Both statements are true.
   d. Both statements are false.

3. The minor salivary glands produce approximately ____ of salivary immunoglobulin A.
   a. 10%.
   b. 25%.
   c. 35%.
   d. 50%.

4. What percentage of persons aged 65 years or older take at least one prescription medication?
   a. 50%.
   b. 60%.
   c. 70%.
   d. 75%.

5. Which autoimmune disorders can be associated with xerostomia?
   a. Sjögren's syndrome.
   b. Rheumatoid arthritis.
   c. Systemic lupus erythematosus.
   d. All of the above.

6. In healthy individuals unstimulated whole saliva rate exceeds ____ mL/min.
   a. 0.2.
   b. 0.3.
   c. 0.4.
   d. 0.5.

7. It is generally accepted that when saliva production is decreased by approximately ____ a person will have symptoms of dry mouth.
   a. 30%.
   b. 40%.
   c. 50%.
   d. 60%.
8. Complaints of oral dryness do not necessarily demonstrate decreased stimulated or unstimulated salivary flow rates. Such complaints may also pertain to saliva composition and a qualitative disorder.
   a. The first statement true, the second is false.
   b. The first statement is false, the second is true.
   c. Both statements are true.
   d. Both statements are false.

9. An unstimulated whole saliva flow rate of _____ mL/min is considered to be abnormally low.
   a. 0.4.
   b. 0.3.
   c. 0.2.
   d. < 0.1.

10. When collecting unstimulated salivary samples, the patient should not ingest anything by mouth for at least ______ prior to collection.
    a. 15 minutes.
    b. 30 minutes.
    c. 45 minutes.
    d. 60 minutes.

11. Pilocarpine and Cevimeline are:
    a. Antifungal medications.
    b. Sialagogues.
    c. Antibiotics.
    d. Oral lubricants.

12. The following systemic antifungal medication(s) is/are recommended for dry mouth patients with oral candidiasis when topical agents are ineffective:
    a. Nystatin.
    b. Clotrimazole.
    c. Fluconazole.
    d. All of the above.

13. The following statement regarding sialagogues is TRUE:
    a. They should not be taken with food.
    b. They are parasympathomimetic drugs.
    c. They are available as over-the-counter medications.
    d. Both a and b.

14. Which of the following can contribute to oral dryness or irritation of oral tissues?
    a. Caffeine.
    b. Alcohol.
    c. Tooth whitening products.
    d. All of the above.

15. Most drugs with xerostomic side-effects are not known to cause permanent damage to the salivary glands. The inhibitory effect of drugs on salivary secretion can be overcome with gustatory stimuli.
    a. The first statement is true, the second is false.
    b. The first statement is false, the second is true.
    c. Both statements are true.
    d. Both statements are false.

16. Radiation therapy and autoimmune disorders affect stimulated and unstimulated whole salivary flow rate. The damage they cause to salivary gland tissue is temporary.
    a. The first statement is true, the second is false.
    b. The first statement is false, the second is true.
    c. Both statements are true.
    d. Both statements are false.
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6.  ☐ a  ☐ b  ☐ c  ☐ d

7.  ☐ a  ☐ b  ☐ c  ☐ d

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10.  ☐ a  ☐ b  ☐ c  ☐ d

11.  ☐ a  ☐ b  ☐ c  ☐ d

12.  ☐ a  ☐ b  ☐ c  ☐ d

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