Managing xerostomia and salivary gland hypofunction

Executive summary of a report from the American Dental Association Council on Scientific Affairs

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Xerostomia, the subjective sensation of dry mouth, is a frequent complaint and the most common symptom of salivary gland hypofunction (SGH). Factors that contribute to dry mouth include systemic disease and medical therapies such as medication or radiation treatment.

Although xerostomia often is a manifestation of impaired salivary gland function, it can occur with or without a noticeable decrease in saliva production. In most circumstances, xerostomia is accompanied by SGH, which reflects an objective, measurable decrease in salivary flow (hyposalivation). Symptoms of dry mouth may range from mild oral discomfort to significant oral disease that can compromise patients’ health, dietary intake and quality of life.

Identifying and treating the underlying causes of dry mouth are essential to providing optimal oral health care. Effective prevention and early detection and treatment of oral problems associated with dry mouth require aggressive management by both dentist and patient. This article presents a practical, evidence-guided approach to managing xerostomia and SGH for use in the treatment of patients with salivary dysfunction.

FUNCTIONS OF SALIVA

In addition to its role in digestion, saliva serves several protective functions, including cleansing the oral cavity, facilitating oral processing and swallowing of food, protecting oral tissues against physical and microbial insults, maintaining a neutral pH and preventing demineralization.

ABSTRACT

Background and Overview. Xerostomia, also known as “dry mouth,” is a common but frequently overlooked condition that is typically associated with salivary gland hypofunction, which is the objective measurement of reduced salivary flow. Patients with dry mouth exhibit symptoms of variable severity that are commonly attributed to medication use, chronic disease and medical treatment, such as radiotherapy to the head and neck region. Chronic xerostomia significantly increases the risk of experiencing dental caries, demineralization, tooth sensitivity, candidiasis and other oral diseases that may affect quality of life negatively. This article presents a multidisciplinary approach to the clinical management of xerostomia, consistent with the findings of published systematic reviews on this key clinical issue.

Conclusions and Practice Implications. Initial evaluation of patients with dry mouth should include a detailed health history to facilitate early detection and identify underlying causes. Comprehensive evaluation, diagnostic testing and periodic assessment of salivary flow, followed by corrective actions, may help prevent significant oral disease. A systematic approach to xerostomia management can facilitate interdisciplinary patient care, including collaboration with physicians regarding systemic conditions and medication use. Comprehensive management of xerostomia and hyposalivation should emphasize patient education and lifestyle modifications. It also should focus on various palliative and preventive measures, including pharmacological treatment with salivary stimulants, topical fluoride interventions and the use of sugar-free chewing gum to relieve dry-mouth symptoms and improve the patient’s quality of life.

Key Words. Xerostomia; saliva; salivary flow.

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**ETIOLOGY**

**Systemic diseases.** Box 1 presents medical conditions that may cause dry mouth. An estimated 4 million people in the United States have Sjögren syndrome (SS), an autoimmune disease commonly associated with hyposalivation. SS is a chronic inflammatory disease characterized by lymphocytic infiltration of the salivary and lacrimal glands, resulting in xerostomia and dry eyes. Approximately 90 percent of those with SS are women, and patients often experience associated symptoms such as fatigue and joint pain.

**Side effects of medical treatment.** Salivary gland damage is the most common adverse effect associated with radiation therapy to the head and neck region. Salivary flow decreases rapidly during the first week of treatment, followed by fibrosis of the salivary glands and permanent loss of secretory capacity, thus dramatically diminishing quality of life. Patients undergoing chemotherapy also may experience transient xerostomia.

**Medication.** The use of systemic medications is one of the most frequently reported causes of xerostomia. More than 500 drugs are known to cause oral dryness, including many of the most commonly prescribed classes of medications (Box 2).

The vast majority of medications do not damage the salivary glands, but the likelihood of decreased salivary flow rates increases in the presence of numerous diseases and medications. Although patients receiving multiple xerostomic medications tend to have more severe dry-mouth symptoms, the effects of xerostomic medications on patients can be highly variable. Some medications, such as those prescribed for overactive bladder disease, irritable bowel syndrome and Parkinson disease, are used specifically for their anticholinergic properties. These medications directly inhibit salivary flow and often are associated with dry-mouth symptoms.

**Physiological or psychogenic causes.** Dehydration, mouth breathing and neurological or psychological disorders (such as depression or anxiety) may add to the perception of oral dryness. Affective (mood) disorders may affect the autonomic nervous system, and patients with such conditions may experience xerostomia.

The degree of hydration affects salivary flow substantially. In one study, investigators found that dehydration as a result of abstaining from food and liquids for 24 hours reduced unstimulated parotid salivary flow by approximately 90 percent. Given the increased prevalence of dehydration in older adults, it is important to assess fluid status in these patients.

**SIGNS AND SYMPTOMS**

Box 3 presents clinical signs and symptoms of hyposalivation. Patients with dry mouth often have atrophic and erythematous oral mucosa, loss of papillae on the tongue and lips that peel and crack. Traumatic lesions may be visible on the buccal mucosa and the lateral borders of the tongue. Dentures may become loose, causing painful ulcerations.

**Cervical or root surface caries and candidiasis often are observed in patients with xerostomia.** These patients may demonstrate enlargement of the major salivary glands, as well as salivary gland infection.

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**ABBREVIATION KEY.** SGH: Salivary gland hypofunction. SS: Sjögren syndrome.
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DIAGNOSIS

History and examination. Appropriate evaluation and patient assessment, including a comprehensive medical and dental history, are essential for diagnosing SGH. A positive response to any of the following questions has been associated with reduced saliva, even in patients who have not expressed complaints of xerostomia:

- Does the amount of saliva in your mouth seem to be too little?
- Does your mouth feel dry when eating a meal?
- Do you sip liquids to aid in swallowing dry food?
- Do you have difficulty swallowing?

A comprehensive head and neck examination—both extraoral and intraoral—is important in identifying the presence or absence of pooled saliva, as well as in providing an initial assessment of the quantity and quality of saliva. The clinician should inspect and palpate major salivary glands to identify masses, swelling or tenderness.

Diagnostic tests. Salivary flow measurement. Whole saliva is relatively easy to collect in a clinical setting.

Although there is only limited evidence regarding the effectiveness of clinical assessment of oral dryness, periodic evaluation of the salivary flow rate provides a tool for monitoring dry-mouth symptoms.

Unstimulated whole saliva often is collected by means of the draining or drooling method, in which a patient’s head is tilted forward and pooled saliva is dropped into a sterile container. An unstimulated whole saliva flow rate of less than 0.1 milliliter per minute is suggestive of significant SGH.

Stimulated whole saliva is collected by challenging the glands through mastication, such as chewing paraffin wax, or through gustatory stimulation by means of citric acid, followed by expectoration into a collection tube. Stimulated whole saliva flow rates below 0.7 mL/minute are within the lower range of output and suggest salivary hypofunction.

Blood tests. Laboratory studies (for example, complete blood cell count) may be useful when xerostomia is suspected to be related to systemic disease. Autoantibody screening may be helpful when xerostomia is associated with xerophthalmia, a characteristic of SS, including serologic results positive for serum antinuclear antibody.
rheumatoid factor or the antibodies anti–SS-A (anti-Ro) or anti–SS-B (anti-La). 40,41

**Biopsy.** Minor salivary gland biopsy is a useful diagnostic tool for identifying underlying pathological changes associated with salivary gland dysfunction, especially when the clinician is attempting to identify the underlying etiology of salivary dysfunction as it relates to systemic diseases. Histologic changes are one of the criteria used in the diagnosis of SS; tissue samples are graded according to the level of inflammation within the salivary gland. 42 The biopsy also is important in determining whether salivary gland dysfunction is caused by diseases such as amyloidosis, 43,44 sarcoidosis 45 or other conditions (Box 110-12).

## MANAGEMENT

Treatment planning to alleviate dry-mouth symptoms should be tailored to the individual patient. A multidisciplinary model of care for xerostomia and SGH should include the following components:

- Patient education—a patient-centered process emphasizing daily oral hygiene, regular dental visits, use of topical fluoride, tobacco-use cessation counseling and other interventions;
- Management of systemic conditions and medication use in consultation with the patient’s physician, oncologist or other health care provider;
- Preventive measures to reduce oral disease and associated complications;
- Pharmacological treatment with salivary stimulants (sialagogues);
- For patients who cannot tolerate sialagogues, palliative measures to improve salivary output, such as use of sugar-free salivary stimulants (for example, chewing gum).

**Patient education.** Patients should receive detailed information about the potential causes of dry mouth and the potential sequelae of impaired salivary secretion, including dental caries, candidiasis and mucosal complications. Preventive oral health care should be emphasized strongly, along with oral hygiene instruction stressing the importance of effective plaque removal and of regular dental visits to promote oral health. A meticulous oral hygiene regimen is recommended, including twice-daily toothbrushing, regular use of floss or another interdental cleaner and use of an alcohol-free mouthrinse.

**Managing systemic conditions and medication use.** Consultation with the patient’s primary care provider or specialist may be considered in cases in which hyposalivation is suspected to be due to underlying systemic disease or medical treatment (Boxes 110-12 and 210.17,18). Patients with dry mouth, dry eyes and salivary gland enlargement should be evaluated for SS, because they have a 16-fold increased risk of experiencing lymphoma compared with that of the general population. 46,47 Prompt diagnosis allows for recognition of comorbid diseases and encourages aggressive management of ocular and intraoral complications. Dentists must be aware of prescription and over-the-counter medications associated with dry mouth to discuss dose modification or possible drug alternatives with physicians.

Clinicians also should recognize that most patients with head and neck cancer receive intensity-modulated radiation therapy, which involves using computer-generated information to establish the distribution of radiation that conforms to the patient’s tumor yet minimizes the dose delivered to surrounding tissues. Intensity-modulated radiation therapy significantly reduces radiation to major salivary glands, thereby helping to maintain adequate salivary flow and enhancing quality of life. 6,48

**Preventive measures to reduce oral disease.** Preventive oral health care is essential for optimal care of patients with hyposalivation, who commonly require more frequent dental visits (typically every three to six months). 49,50 Management of secondary infections (for example, candidiasis) often is required concurrently with attempts to address xerostomia and SGH.

Tobacco use is associated with dry mouth 7 and ideally should be minimized or discontinued altogether. Assessment of tobacco use is important for comprehensive treatment planning, early recognition of oral mucosal changes, and integration of tobacco-use cessation counseling, including pharmacotherapies. 51

Maintaining adequate hydration also is important for patients with dry mouth, who often find temporary relief by frequently sipping water, sucking on ice or using a humidifier during sleep. 10,31

**Caries prevention and control.** Patients with SGH are at high risk of experiencing dental erosion, 52 demineralization and dental caries, 53 which often affect coronal tooth structure around existing restorations and exposed root surfaces. Diminished salivary gland function should be considered part of a comprehensive caries risk assessment for all patients, particularly those at high risk who likely will benefit from a more aggressive approach to caries management and prevention. 49

Patients with SGH may benefit from pH neutralization strategies when buffering capacity is in question. These strategies may include traditional methods such as stimulating saliva by using sugar-free gum or candies, as well as pharmacotherapies. 49

Although regular use of over-the-counter fluoride dentifrices can effectively reduce caries, products containing higher concentrations of fluoride often are recommended for patients with SGH who are at high risk of experiencing dry mouth. 49,54 Prescription-strength fluoride dentifrices and gels recommended for daily use in patients at high risk of experiencing dry mouth commonly contain 1.1 percent neutral sodium fluoride and generally are well tolerated by patients with increased dentinal sensitivity. 55
In-office fluoride therapy generally is applied in the form of a gel or varnish. The daily use of a prescription-strength (0.5 percent fluoride or 1.1 percent sodium fluoride) toothpaste or gel, or at least weekly use of 0.09 percent fluoride mouthrinse, combined with the application of 2.26 percent fluoride varnish at least every six months, is recommended for at-risk patients of all ages.56,57 Professional office treatments, home-use fluoride products, dental sealants and dietary counseling are considered the first line of defense in caries prevention.

**Candidiasis prevention and control.** Candidiasis is a common mucosal infection in patients with salivary hypofunction.58 Topical therapy with nystatin or clotrimazole (available in suspensions, powders, creams, ointments, lozenges or pastilles) may provide effective treatment for many patients who have uncomplicated oral candidiasis without esophageal involvement.59,60 Commercially available nystatin suspensions have a high sucrose content61 and should be used with care or avoided in dentate patients with dry mouth. Patients with dry mouth may find lozenges and pastilles difficult to dissolve and irritating to the oral mucosa.

Systemic antifungal agents for the treatment of candidiasis include fluconazole and itraconazole. The clinician must take care to treat not only the oral cavity but also any removable dental appliance, including nightguards, to avoid reinfection. Antifungal therapy, topical or systemic, generally is prescribed for seven to 14 days.

**Pharmacotherapy with salivary stimulants.** Stimulation of salivary output can be achieved using pharmacological agents known as “sialagogues.” Currently, pilocarpine and cevimeline are approved by the U.S. Food and Drug Administration for treating dry mouth that is due primarily to SS or radiation therapy. Pilocarpine and cevimeline hydrochloride are cholinergic, parasympathomimetic agonists, and both are well-tolerated medications.62 The recommended dosage for pilocarpine is 5 milligrams four times per day, and the dosage for cevimeline is 30 mg three times per day.59 Response to these medications may vary on the basis of the amount of healthy acinar cells within the salivary glands. Patients with extensive salivary gland damage, such as those with radiation-induced SGH, may not respond as well as do patients with less severe damage. The use of cevimeline and pilocarpine is contraindicated in patients with hypersensitivity, narrow-angle glaucoma and uncontrolled asthma, and these agents should be used with caution in patients using β-blockers.

The adverse effects associated with cevimeline and pilocarpine are similar, primarily sweating, nausea and rhinitis.59,63 Other, less common adverse effects of both medications include headache, sinusitis and diarrhea, but the incidence of these adverse effects is not appreciably different from that seen in patients treated with placebo.

**Palliative care.** The high prevalence of xerostomia among the general population has generated a market for numerous over-the-counter products for dry mouth, including oral patches, rinses, lozenges, toothpastes, sprays, gels and chewing gums.

Despite the wide array of topical dry-mouth formulations, there is no clear consensus as to the most efficacious ingredients or products for alleviating oral dryness. Authors of a 2011 Cochrane review of topical therapies for managing dry mouth concluded that “there is no strong evidence that any topical therapy is effective for relieving the symptom of dry mouth.”64 Patients should be aware that because of the dynamic nature of the oral cavity, salivary substitutes are removed from the mouth during swallowing, which shortens their duration of effect. Also, salivary substitutes do not provide the protective functions of saliva.

**Use of sugar-free gum.** Mastication stimulates the production of saliva. Authors of a 2010 systematic review reported that the use of salivary stimulants, including sugar-free chewing gum, in patients with residual salivary function appeared to be more helpful than using salivary substitutes.65 However, there is insufficient evidence to prove that chewing gum is superior to other interventions in alleviating dry-mouth symptoms.64

**CONCLUSIONS**

Dentists are often challenged when diagnosing and treating patients with xerostomia and SGH, which can have potentially devastating effects on the oral cavity. Early detection, comprehensive evaluation and diagnostic testing may prevent significant oral disease and lead to multidisciplinary care that includes collaboration with physicians.

Patient education, management of systemic conditions associated with salivary dysfunction and implementation of preventive measures to reduce oral disease are critical components of patient care. An evidence-guided approach to xerostomia management should focus on providing suitable interventions to relieve dry mouth symptoms, reduce oral complications and improve quality of life. ■

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