

# XEROSTOMIA: AN OVERVIEW

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**Abstract:** Xerostomia is defined as the sensation of oral dryness. Patients usually report mouth dryness, oral burning, swallowing difficulty, and decreased or altered taste. There are numerous causes of xerostomia; the most common cause is medication side effects, followed by Sjogren syndrome (SS) and radiotherapy and other autoimmune diseases in no particular order. Numerous etiologies have been described, but xerostomia mainly presents as a medication side effect, secondary to head and neck radiation therapy, and associated with Sjögren syndrome. This activity outlines the etiology, pathophysiology, evaluation, and treatment of xerostomia and highlights the role of the interprofessional team to aid in managing patients with xerostomia.

## Introduction

Xerostomia is defined as the subjective complaint of dry mouth.[1] Interestingly, patients complaining of xerostomia frequently do not show any objective sign of hyposalivation and their symptoms may be secondary to qualitative and/or quantitative changes in the composition of saliva.[2] The normal stimulated salivary flow rate averages 1.5–2.0 mL/min while the unstimulated salivary flow rate is approximately 0.3–0.4 mL/min. A diagnosis of hyposalivation is made when the stimulated salivary flow rate is  $\leq 0.5$ –0.7 mL/min and the unstimulated salivary flow rate is  $\leq 0.1$  mL/min. Xerostomia in patients with objective hyposalivation is diagnosed when the rate of saliva flow is less than the rate of fluid absorption across the oral mucosa plus the rate of fluid evaporation from the mouth.

Chronic xerostomia remains a significant burden for many individuals. In particular, it may affect speech, chewing, swallowing, denture-wearing, and general well-being. Xerostomia secondary to hyposalivation may also result in rampant dental caries, oral fungal infections (eg, candidiasis), taste changes, halitosis, or burning mouth.[3] The most frequent cause of hyposalivation is the use of certain medications (such as anticoagulants, antidepressants, antihypertensives, antiretrovirals, hypoglycemics, levothyroxine, multivitamins and supplements, non-steroidal anti-inflammatory drugs, and steroid inhalers) (Villa et al, unpublished data, 2014), followed by radiotherapy to the head and neck, and Sjögren's syndrome.[4] Other factors include depression, anxiety and stress, or malnutrition.

The prevalence of xerostomia in the population ranges from 5.5% to 46%. Studies have shown differences in the prevalence between the sexes and xerostomia appears to increase with increasing age. A possible explanation is that older individuals take several xerogenic drugs for their chronic conditions and this may lead to an overall reduction of the unstimulated salivary flow rate.[3] Xerostomia remains an unresolved common complaint especially among the geriatric population, despite seeking medical or dental consultation. The aim of this review is to explore the current state of knowledge on management and treatment of patients affected by xerostomia and hyposalivation.

## Etiology

Xerostomia has multiple etiologies. The commonest cause of xerostomia is the adverse effect of prescription and over-the-counter medications. Many medications have been implicated including but not limited to diuretics such as furosemide, anticholinergic, antihistamine, antihypertensive, antidiarrheal, and antidepressants and treatment of head and neck cancers with radiation and/or chemotherapy. Autoimmune systemic disorders such as Sjogren syndrome (although very well known but a rare cause), systemic lupus erythematosus (SLE), rheumatoid arthritis (RA), thyroid disease, and primary biliary cirrhosis (PBC) all have implications as potential causes.[3] Patients with a history of mouth breathing, dehydration, poorly controlled diabetes, nerve damage from head or neck injury, end-stage renal disease (ESRD), graft versus host disease (GVHD), HIV/AIDS also complain of dry mouth. Xerostomia is a common complaint in older patients, which is likely due to the higher use of medications in these patients and a higher incidence of comorbid conditions.

## Pathophysiology

All major and minor salivary glands have nerve supplies, and upon stimulation, salivatory nuclei in the medulla generate an efferent response. The efferent nerve impulses release acetylcholine (ACh), which works on muscarinic receptors (specifically M3 receptors), which then stimulates salivary glands to produce saliva. The stimulation that causes salivary production ranges from smelling to chewing. Histologically, major salivary glands are made up of salivary acini and ducts, which produce two types of fluids, serous and mucinous. Pathology arises when there is a dysfunction of gland innervation, or the gland itself.[2]

Because so many drugs carry associations with xerostomia, it is imperative to check the medication list before conducting an extensive workup. Some of the medications that have strong correlations to xerostomia include atropine, scopolamine, phentermine, methyl dopa, clonidine, furosemide, timolol, and numerous more. The majority of these medications act on the central nervous system (CNS) or at the neuroglandular junction. Since the secretory cells receive nerve supply from muscarinic M1 and M3 receptors, alpha1 and beta1-adrenergic receptors, and specific peptidergic receptors that are involved in the initiation of salivary secretion, xerostomia is caused by either suppressing the CNS from producing ACh or by occupying the muscarinic/adrenergic receptors.

The reason radiation causes xerostomia is that the oral cavity, lymph nodes, and salivary glands happen are in the radiation field when head and neck cancer patients are receiving treatment. Although the tissues of salivary glands have a low mitotic index which should make them quite stable and typically radiation-resistant, studies have shown a decline in salivary gland function proportional to the radiation dose. Acinar atrophy and chronic inflammation are considered hallmarks of radiation-induced xerostomia. This dose-dependent radiation causes a secretory dysfunction of the gland. Fibrosis mostly presents as periductal and intralobular, but the structure of the ducts remains intact.

### **CLINICAL MANIFESTATIONS**

Signs and symptoms of dry mouth may include:

- bad breath
- cheilitis, or inflammation and fissuring (splitting or cracking) of the lips
- cracking and fissuring of the oral mucosa, or inner lining of the cheeks and lips, in which skin at the corners of the mouth may split or become sore
- dryness in the mouth
- dysgeusia, or taste disorders
- fungal infections in the mouth, such as thrush
- glossodynia, or a painful tongue
- increased need to drink water, especially at night
- inflammation of the tongue, tongue ulcers
- lipstick sticking to teeth
- more frequent gum disease[6]
- more tooth decay and plaque
- problems speaking
- problems swallowing and chewing – especially dry and crumbly foods, such as crackers or cereals
- problems wearing dentures – problems with denture retention, denture sores, and the tongue sticking to the palate
- sialadenitis, a salivary gland infection
- a sore throat[7]
- sticky saliva
- stringy saliva

### **When to see a doctor**

If you've noticed persistent dry mouth signs and symptoms, make an appointment with your doctor.[3]

### **MANAGEMENT**

The management of dry mouth should begin with identification and management of the underlying cause, although this is not always possible. There is no definitive treatment for patients with dry mouth due to radiation therapy or SS. Treatment is directed toward local and systemic salivary gland stimulation, symptomatic relief and preventing and treating complications due to hyposalivation. Patients with xerostomia should undergo frequent dental evaluations for early diagnosis of oral complications. Patients should be encouraged to carry out daily oral self-examinations for any mucosal ulcers, lesions or tooth decay and to report any unusual findings. The mainstay of prevention of dental caries is meticulous plaque control through excellent oral hygiene. Patients should be instructed to brush their teeth at least twice a day using a soft-bristled toothbrush and a low abrasive highly fluorinated toothpaste or gel12 such as Prevident [6](In addition, use of sodium fluoride rinses or fluoride gel may reduce tooth decay.

### **Diagnosis**

- Sialometry
- Salivary gland biopsy

For patients in whom the presence of xerostomia is unclear, sialometry can be conducted by placing collection devices over the major duct orifices and then stimulating salivary production with citric acid or by chewing paraffin. Normal parotid flow is 0.4 to 1.5 mL/min/gland. Flow monitoring can also help determine response to therapy.

The cause of xerostomia is often apparent, but if the etiology is unclear and systemic disease is considered possible, further assessment should be pursued with biopsy of a minor salivary gland (for detection of Sjögren syndrome [8] is a relatively common chronic, autoimmune, systemic, inflammatory disorder of unknown cause. It is characterized by dryness of the mouth, eyes, and other mucous membranes.

Examination of the entire oral cavity is an important part of the assessment. In an individual with xerostomia, the mucosa may be dry and sticky, with the saliva appearing stringy or foamy. There may be little or no pooled saliva in the floor of the mouth, and it may be difficult to express saliva from the ducts of the major salivary glands.

The oral mucosa may appear erythematous, with areas of the dorsal tongue sometimes becoming atrophic. The redness may represent erythematous candidiasis due to an overgrowth of *Candida albicans*. The erythematous patches commonly affect the hard or soft palate and dorsal surface of the tongue. Occasionally, pseudomembranous candidiasis occurs, which presents as removable white plaque that can be found on any mucosal surface. Angular cheilitis presents as cracking or fissuring at the commissures and

can occur either alone or with intra-oral candidiasis. Angular cheilitis is commonly associated with *C. albicans*, but may be caused by *Staphylococcus aureus*. Individuals with oral candidiasis may complain of a burning sensation and changes in taste. Some individuals are susceptible to oral ulceration because of trauma to the dry mucosa. Patients with systemic disease, such as Sjogren's syndrome and human immunodeficiency virus (HIV) infection, may have enlarged parotid glands and even submandibular glands.[9]

### **Differential Diagnosis**

Patients presenting with a primary complaint of dry mouth should be evaluated for a variety of conditions known for causing sicca symptoms. These conditions include primary Sjogren syndrome, idiopathic sicca syndrome, other autoimmune diseases, and drug-induced sicca syndrome.[1] Other disorders might need to be ruled out and require separate specific management. These include sarcoidosis, granulomatosis with polyangiitis, IgG4-related disease, chronic hepatitis C (HCV) or HIV, GVHD, ESRD, and head and neck radiation therapy. [1]

### **Treatment of Xerostomia**

- Cause treated and causative drugs stopped when possible
- Cholinergic drugs
- Saliva substitutes
- Regular oral hygiene and dental care to prevent tooth decay

When possible, the cause of xerostomia should be addressed and treated.

For patients with drug-related xerostomia whose therapy cannot be changed to another drug, drug schedules should be modified to achieve maximum drug effect during the day because nighttime xerostomia is more likely to cause caries. Custom-fitted acrylic night guards carrying fluoride gel may also help limit caries in these patients. For all drugs, easy-to-take formulations, such as liquids, should be considered, and sublingual dosage forms should be avoided. The mouth and throat should be lubricated with water before swallowing capsules and tablets or before using sublingual nitroglycerin. Patients should avoid decongestants and antihistamines.

Patients using continuous positive airway pressure for obstructive sleep apnea Continuous positive airway pressure (CPAP) Obstructive sleep apnea (OSA) consists of episodes of partial or complete closure of the upper airway that occur during sleep and lead to breathing cessation (defined as a period of apnea) may benefit from using the humidifier function of the device. Patients using oral appliance therapy may benefit from a room humidifier.

### **Symptom control**

Symptomatic treatment consists of measures that do the following:

- Increase existing saliva
- Replace lost secretions
- Control caries

Drugs that augment saliva production include cevimeline and pilocarpine, both cholinergic agonists. Cevimeline (30 mg orally 3 times a day) has less M<sub>2</sub> (cardiac) receptor activity than pilocarpine and a longer half-life. The main adverse effect is nausea. Pilocarpine (5 mg orally 3 times a day) may be given after ophthalmologic and cardiorespiratory contraindications are excluded; adverse effects include sweating, flushing, and polyuria.

Sipping sugarless fluids frequently, chewing xylitol-containing gum, and using an over-the-counter saliva substitute containing carboxymethylcellulose, hydroxyethylcellulose, or glycerin may help[13]. Petroleum jelly can be applied to the lips and under dentures to relieve drying, cracking, soreness, and mucosal trauma. A cold-air humidifier may aid mouth breathers, who typically have their worst symptoms at night.

Meticulous oral hygiene is essential. Patients should brush and floss regularly (including just before bedtime) and use fluoride rinses or gels daily; using newer toothpastes with added calcium and phosphates also may help avoid rampant caries. An increased frequency of preventive dental visits with plaque removal is advised. The most effective way to prevent caries is to sleep with individually fitted carriers containing 1.1% sodium fluoride or 0.4% stannous fluoride. In addition, a dentist can apply a 5% sodium fluoride varnish 2 to 4 times a year.

Patients should avoid sugary or acidic foods and beverages and any irritating foods that are dry, spicy, astringent, or excessively hot or cold. It is particularly important to avoid ingesting sugar near bedtime.[10]

### **Avoid the following:**

- a. Caffeine
  - Daily high doses of caffeine can contribute to dry mouth. Make sure all of your beverages (coffee, tea, etc.) are caffeine free.
- b. Alcohol and alcohol containing mouthwashes (read labels carefully)
  - Many commercial mouthwashes contain alcohol which has a drying effect and can irritate the tissue.

- Biotène® and Oasis® make mouth rinses specifically for dry mouth. ACT® Total Care Dry Mouth rinse contains fluoride.[11]

b. Acidic beverages and foods

- Carbonated beverages, vitamin waters, energy and sports drinks are very acidic. Without the neutralizing ability of saliva, these drinks erode the teeth and can make your mouth sore. Constant sipping of acidic beverages is especially problematic.
- Foods and candies high in acid content (citrus fruits, tomatoes, lemon drops, etc.) cause dental decay and may irritate the soft tissue of your mouth.

d. Gum, candy, cough drops and beverages that contain sugar

- Sugar, especially in retentive (sticky) form is very damaging to the teeth. Sucrose feeds bacteria that cause cavities.
- Look for products that contain xylitol (a sweetener that does not cause cavities). Xylitol gums (Spry®, Xyloburst®) when chewed frequently, may inhibit cavity causing bacteria.
- Avoid gums, candies and oral care products that contain cinnamon as it is a common irritant.

e. Toothpastes with harsh chemicals or strong flavoring agents

- Many toothpastes advertised for tartar control, whitening etc. contain pyrophosphates and other chemicals that can damage dry oral tissues.
- Sodium lauryl sulfate (SLS) is a foaming agent/detergent that is found in most toothpastes. This detergent is well-recognized as a cause of intraoral tenderness and ulceration. We recommend toothpastes that are SLS-free and contain no pyrophosphates (Squiggle Enamel Saver Toothpaste – may be purchased from Dental Pharmacy or online).

### **Prognosis**

The underlying cause of dry mouth determines prognosis. Almost all patients will benefit from symptomatic treatment. Providers can address a temporary etiology such as dehydration, medication-induced salivary hypofunction, use of substances such as caffeine, smoking, and alcohol with good results. For chronic and irreversible causes such as Sjogren syndrome and head and neck cancer post-irradiation, the symptom tends to be persistent.

### **Complications**

The role of saliva is to provide lubrication and keep the oral cavity moist and clean, which helps protect the oral mucosa from mechanical injury. Salivary amylase helps to initiate the digestive process. Mucin and immunoglobulin in saliva protect the oral mucosa from microbial infection. Xerostomia can adversely affect oral intake leading to poor nutrition. Lack of saliva contributes to periodontal disease, gingival inflammation, bleeding, dental caries, and halitosis and can also lead to fungal infections and accelerated enamel erosion. Chronic discomfort from dry mouth can contribute to symptoms of anxiety and depression.[12]

### **CONCLUSION**

Maintaining open and clear communication with patients is essential to their well-being. Patients with xerostomia require dental hygienists to detect this common disorder early and provide coordinated management for positive health outcomes.[14]

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