Xerostomia: An overview
Nishat Sultana, M. Ehtaih Sham

Abstract
Xerostomia is a subjective sensation of a dry mouth which is a common complaint among older patients during periods of anxiety, radiation therapy, immunological disorder which lead to increased frequency of caries, candida infection, dysarthria and dysphagia. This article presents an overview of the Xerostomia and its management.

Key Words: Xerostomia; Sjogren’s syndrome; Radiation therapy

Xerostomia refers to a subjective sensation of dry mouth; it is frequently, but not always, associated with salivary gland hypo function.(1) Xerostomia is a common complaint found often among older adults, affecting approximately 20% of the elderly.(2-4) The dry mouth is common during periods of anxiety, mouth breathing and with advancing age. Very rarely, children are born with missing salivary glands so-called salivary gland aplasia or agenesis. The table 1 shows the common causes of dry mouth.

![Table 1: Common causes of Xerostomia](image)

Xerostomia is the most common adverse drug-related effect in the oral cavity. To date, xerostomia has been associated with more than 500 medications. Medications cause xerostomia by interfering with the transmission of signals at the parasympathetic neuro effector junctions, interfering with actions at the adrenergic neuro effector junctions, or causing the depression of the connections of the autonamic nervous system. Therapeutic doses of medications do not damage salivary gland anatomy and any damage is therefore reversible with discontinued use of xerogenic drugs.(6) The drugs causing Xerostomia was tabulated in table 2.

![Table 2: Drugs associated with dry mouth](image)

Xerostomia is a common side effect of radiation therapy, when employed as primary, concomitant or adjuvant treatment for primary or recurrent tumors of head and neck.(5) The most radiosensitive salivary gland is parotid gland followed by submandibular, sublingual and minor salivary gland. A radiation dose as low as 20 Gy can cause permanent cessation of salivary flow if given as a single dose. At doses above 52 Gy, salivary dysfunction is severe. Treatment of oral carcinoma conventionally involves the administration of a dose of 60 Gy to 70 Gy, and this can lead to a rapid decrease in flow during the first week of radiation, with an eventual reduction of 95% in the region. By 5 weeks of radiation, the flow virtually ceases and rarely recovers completely.(5) The degree of xerostomia depends on the degree of exposure of the salivary tissue to the radiation. To spare salivary function and improve quality of life, salivary gland exposure to radiation can be minimized by utilizing intensity modulated radiation therapy and three dimensional treatment planning and dose delivery techniques. A reduction in radiation induce hypo salivation was...
noted with the use of the radio-protective agent amifostine which provides cyto-protection to salivary glands.(7, 8)

Xerostomia is a well-known complication of chronic graft-versus-host disease (cGVHD). A prolonged significant reduction in parotid salivary flow rate correlates with the histopathology findings (i.e, fibrosis of glands) and alterations in the chemical composition of saliva (i.e., a reduced sodium Na\(^+\) and raised K\(^-\) ion concentration). The squamous epithelium of the oral mucosa and the epithelium of salivary glands are affected early in the course of cGVHD but the major salivary functional injury in cGVHD occurs later, with the target of destruction possibly being the muscarinic receptor, water transporter or calcium ions.(9)

Levels of diabetes associated xerostomia are reported in upwards of 40 to 80 percent of patients. Stimulated parotid flow rates are observed to be the lowest in patients with poorly controlled diabetes mellitus as compared to well controlled diabetes mellitus. Approximately 24 to 48 percent of diabetes mellitus patients have experienced parotid gland enlargement. Diabetic patients are also predisposed to develop oral candidiasis, median rhomboid glossitis, denture stomatitis and angular cheilitis associated with denture use and poor glycemic control. It is believed that patient xerostomia is one possible cause for this predisposition.(10)

Sjogren’s syndrome (SS) is a chronic multisystem immune-mediated disorder characterized by inflammation of exocrine glands leading to clinical symptoms of dryness, particularly of the eyes and mouth, which can be severe and disabling.(5, 11) Primary Sjogren’s syndrome presents in patients that do not suffer from another autoimmune disease, arthritic symptoms or degenerative connective tissue disease. Secondary Sjogren’s syndrome present alongside a second autoimmune disorder such as systemic lupus erythematosus (SLE), Rheumatoid Arthritis (RA), Scleroderma, mixed connective disease, relapsing polychondritis and polymyositis. Both primary and secondary forms are responsible for mouth dryness and eye dryness.

Chronic Sarcoidosis can give rise to xerostomia and salivary gland enlargement in up to 9% of affected patients, often occurring as part of Heerfordt’s syndrome.(12) In a study, the degree of xerostomia and xerophthalmia were similar among a group of patients with Sjogren’s syndrome and a group with Sarcoidosis, whereas parotid gland enlargement was more frequently found in those with Sarcoidosis.(13)

Salivary gland disease can arise in 4% to 8% of adults and children with HIV infection. The principal clinical features of salivary gland disease in HIV infection are as follow: a) associated xerostomia and salivary gland enlargement, b) Kaposi’s sarcoma causing salivary gland enlargement, c) non-Hodgkin’s lymphoma and intra glandular lymphadenopathy; and d) acute supportive saladenitis.(14)

A number of additional disease entities may contribute to the presence of xerostomia, either through pathophysiology of the disease process or due to the medications used in treating the disease and its symptoms.(15) Patients with the following disorders should be considered at risk for xerostomia Table 3.

<table>
<thead>
<tr>
<th>Risk factors for Xerostomia(5)</th>
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<tbody>
<tr>
<td>1. AIDS</td>
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<tr>
<td>2. Systemic Lupus Erythematosus</td>
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<tr>
<td>3. Thyroid Dysfunction</td>
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<td>4. Parkinson’s Disease</td>
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<td>5. Cerebral Palsy</td>
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<td>6. Depression</td>
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<td>7. Anxiety</td>
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<td>8. Post-Traumatic Stress Disorder</td>
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<td>9. Dehydration</td>
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<td>10. Eaten-Lambert Syndrome</td>
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<tr>
<td>11. Trauma to Salivary Glands</td>
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<tr>
<td>12. Anorexia and Bulimia</td>
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The dental management of patients suffering from dry mouth should begin with thorough patient education and the identification of the underlying cause. Treatment should include local and systemic stimulation of salivary glands, palliative treatment for symptomatic relief, as well as preventing and treating oral complications.(7) Patients with dry mouth may stop chewing and reactively modify their diet to a liquid or semi liquid diet rich in fermentable carbohydrates in order to compensate for oral dryness. Decreased mastication exacerbates the condition due to the fact that periodontal mechanoreceptors and mechanical stimulation of the oral mucosa and tongue are required to stimulate salivation. Consequently, patients should be referred for nutritional counseling to educate them to minimize any negative effects from reactionary diet alterations.(16)

A non-specific mechanical and gustatory stimulant increases salivation; therefore, the use of sugar free gums, hard candies, and mints are highly recommended for the relief of symptoms in patients with residual salivary capacity.(17) In studies it has been found that xylitol sweetened gums prevent caries development due to limited ability of streptococcus mutants to ferment xylitol.(18) The use of citric acid or candies is
discouraged due to accelerating caries development. (16) Lifestyle changes available to patients suffering from dry mouth to control and prevent dental caries include adhering to a rigorous oral hygiene regimen and non-cariogenic diet. The need for meticulous plaque control via assiduous oral hygiene is necessary for xerostomic patients. Brushing twice a day with a soft bristle toothbrush and the use of a low abrasive, highly fluorinated toothpaste is recommended, accompanied by a sodium fluoride rinse. (19) Current interest involves the use of fluoride varnishes to prolong the exposure to fluoride an approach that may be beneficial to prevent xerostomia associated caries. (7)

Medications are available to stimulate the salivation. Prescribing parasympathetic drugs like pilocarpine has been approved for xerostomia patients. Pilocarpine is a potent and naturally occurring nonspecific cholinergic agonist which stimulates muscarinic receptor leading to the secretion of water and electrolytes, if the patients has sufficient amount of functional salivary gland tissue. Pilocarpine has also shown to be effective in patients who have undergone radiation therapy or bone marrow transplantation. Initial dose of pilocarpine should be administered 30 minutes before meals, in 5 mg tablets 3 to 4 times a day, with the usual dose range being approximately 3 to 6 tablets a day, not to exceed two tablets per dose. Side effects seen in radiation induced xerostomia patients include sweating, chills, nausea, dizziness, rhinitis and asthenia. New modes of delivery are also being researched including loading nanoparticles with pilocarpine. (20)

Cevimeline is another cholinergic agonist used to induce salivary function. Recommended dosage for Cevimeline is 30 mg, 3 times a day. It is capable of inducing salivation with minimal adverse cardiac and pulmonary effects due to the fact that Cevimeline has a high affinity for the M3 muscarinic receptor subtypes found on salivary and sweat gland. However its use in asthma patients or those suffering from narrow angle glaucoma is questionable. Animal studies have shown that Cevimeline has adverse effects on the fetus but its use during pregnancy is considered acceptable if the benefits are considered acceptable. (7, 21)

Bethanecol found to increase the stimulated and unstimulated salivary flow rates of patients with xerostomia secondary to radiation, but objective changes in salivary flow rates did not always correlate with symptomatic improvement. It is given in a dose of 25 mg; 3 times daily orally. (20) Anethole trithione is specifically used to treat Sjogren’s associated xerostomia. It increases the number of receptor sites on the salivary acinar cells. Patient’s benefits have been reported when Sjogren’s patients were administered 25 mg doses 3 times a day. A synergistic effect on salivation has been observed when a combination of pilocarpine and anethole trithione has been administered. (22)

When a patient complaints of xerostomia and is believed or diagnosed to be a side effect of a medication, an alternative medication that does not employ the same mode of action may be prescribed. The dentist should consult the patient’s physician and pharmacist if an elimination or change of medication is being contemplated. Patients are urged to coordinate the timing of the dose of necessary medications with meal times to allow sufficient salivary flow during the eating process, counteracting the drying effect of these medications, due to the fact that salivary flow is lowest during sleep the patient should avoid taking medications before bedtime. (16)

Patients affected with xerostomia should also increase their fluid intake due to the fact that most people do not drink enough water, contributing to the condition. (16) The patients should be encouraged to place ice chips in their mouth and sip water throughout the day to provide moisture and possibly provide relief to dry mouth symptoms. (7)

For patients with extremely low salivary flow rates, the use of saliva substitute based on polyacrylic acid and Xanthan gum has been developed and are recommended. (17) Ideal characterization of saliva substitute is that, it should be long lasting, provides lubrication to protect oral tissues as well as impedes the colonization and action of cariogenic bacteria, has not been developed. (16) Salivary substitute tend to be short acting, providing relief for a limited period of time. They are most effective when applied before sleeping or speaking. (7)

Acupuncture has been reported to increase parasympathetic activity, causing a release in neuropeptide, stimulating salivary flow and secretions. Three points are treated in each ear, and one in the radial aspect of each index finger. (23) A regimen of three to four weekly treatments followed by monthly sessions is now recommended, although some patients achieve lasting response without further therapy. Preliminary data revealed that many patients achieve relief, even for symptoms refractory to pilocarpine therapy. (23)

A wide range of systemic therapies have been advocated for the management of long-standing xerostomia. At present, the anticholinergic agents

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would seem to hold promise and are appropriate for the treatment of xerostomia associated with radiation and Sjögren’s syndrome. Future treatment for some of the salivary gland disorders may require the use of gene therapy and tissue engineering, but at present there is a need to have a greater understanding of the causes and pathogenesis of salivary gland disease before specific therapies can be developed.

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