

Review Article

Xerostomia: A Comprehensive Review

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ABSTRACT:

Saliva plays an important role in maintaining good oral and general health. Xerostomia is the subjective feeling of oral dryness, which is often associated with hypofunction of the salivary gland. Xerostomia can also have a major impact on a patient's oral health and quality of life. Patients with xerostomia complaints of problems with mastication, phonetics, deglutition and wearing dentures. So, these patients need special care for maintenance of oral and general health. Present review of literature aims to paper the etiology and management of xerostomia.

Keywords: Xerostomia, Dry Mouth, Saliva

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INTRODUCTION

Saliva is a watery liquid usually frothy seen in the oral cavity of animals and humans, secreted by the glands, which is a hydrous hypotonic solution that protects the whole of the oral cavity. Saliva plays an important role in maintaining good oral and general health.¹ Saliva is a complex fluid, which is composed of 99% of water and only 1% of non organic and organic substances.² These constituents are from within the gland and transported from the blood.³ The major role of these components present in the saliva are to provide prophylactic, therapeutic and diagnostic properties to saliva. The compounds which are present in the saliva are also present in the blood.⁴ A large number of analytes in saliva are discovered and some of them are used as biomarkers different diseases such as periodontal diseases, oral cancer, breast cancer, autoimmune diseases, HIV,

cardiovascular disease, diabetes mellitus, viral and bacterial disease. Because of molecular diagnostics and nanotechnology, saliva is becoming valuable source of diagnostic information.⁵

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.^{4,5} A diagnosis of hypo salivation is made when the stimulated salivary flow rate is #0.5–0.7 mL/min and the unstimulated salivary flow rate is #0.1 mL/min.⁶

Xerostomia is a subjective sensation of dry mouth which is a common complaint among older patients during periods of anxiety, radiation therapy and immunological disorders, which lead to increased frequency of caries, candida infection, dysarthria and dysphagia. It generally arises as a side effect of treatments or medications or it can be connected to a specific disease. Very rarely, children are born with

missing salivary glands, the so-called salivary gland aplasia or agenesis.⁷ Present review of literature aims

to paper the etiology and management of xerostomia.

| Table no. 1: Etiology of Xerostomia | |
|--|--|
| <p>Primary Cause: Primary causes or direct causes are the conditions which directly affect the salivary glands and decrease the salivary flow rate</p> <ul style="list-style-type: none"> • Sjogrens syndrome • Type 1 and 2 diabetes mellitus • Gestational diabetes • Thyroid disease • Adrenal conditions • Renal and hepatic diseases • Hepatitis C viral infection <ul style="list-style-type: none"> • HIV | <p>Secondary Cause: Secondary causes or indirect causes are conditions in which Xerostomia is the side effect.⁵</p> <ul style="list-style-type: none"> • Radiation therapy • Chemotherapy • Rheumatoid disorders • Scleroderma • Mixed connective tissue diseases • Systemic erythematus lupus • Anorexia and bulimia <ul style="list-style-type: none"> • Alcohol • Smoking tobacco <p>Drugs Causing Xerostomia: Cytotoxic drugs, Drugs with anticholinergic activity Anticholinergic agents - Atropine, Atropinics and hyoscine, Antireflux agents - Proton pump inhibitors, Central acting psychoactive agents, Antidepressants, Antihistamines, Opioids, Drugs acting on sympathetic systems Drugs with sympathomimetic activity, Antihypertensive-alpha 1 and alpha @ antagonists and Beta blockers, Diuretics</p> |

IMPACT OF DRY MOUTH ON ORAL HEALTH

In healthy adults, up to 1.5L of saliva is produced daily. Salivary function can be organised into five major categories that serve to maintain oral health and create ecologic balance: (1) lubrication and protection; (2) buffering action and clearance; (3) maintenance of tooth integrity; (4) antibacterial activity; and (5) taste and digestion. Unstimulated saliva keeps the oral mucosa moist and maintains oral health. Stimulated saliva that is produced in response to sensory stimuli (together with mechanical chewing) aids in the digestion process. Saliva also facilitates speech, cleanses food residues in the mouth, enhances taste, and neutralises potentially damaging food acids. The physical impact of dry mouth is drastic and can manifest in a range of signs and symptoms.⁸

SIGNS OF XEROSTOMIA⁹

- Dry, Cracked, and peeling lips; dry and coarse tongue
- Cracks in the corners of the mouth
- Dental decay
- Cervical or atypical (such as in incisal and cusp areas)
- Dental erosion
- Erythematous tongue
- Swelling of the salivary glands
- Oral mucositis, Oral candidiasis, Oral ulcers

SYMPTOMS XEROSTOMIA⁹

- Difficulties while swallowing and chewing dry foods
- Sensitivity to spicy foods
- Altered, salty, bitter, and metallic taste in mouth
- Burning sensation
- Lack of (or diminished) taste perception
- Pain in salivary glands
- Coughing episodes
- Voice disturbances/speech difficulties
- Increased liquid intake
- Nocturnal discomfort

DIAGNOSIS OF XEROSTOMIA^{10,11,12}

CRACKER BISCUIT TEST/ WAFER TEST

The subject is asked to sit in a relaxed and upright position and not to speak. Patient is asked to swallow the residual saliva and a wafer is placed on the tongue at the centre. Patient is asked not to swallow or chew. The time of dissolution is measured from the moment when the wafer is placed on the tongue. With a resting period of about 5 min the test is repeated for three times. This test is inappropriate if the patient is anorexic or nauseated

CARLSON- CRITTENDEN COLLECTOR OR LASHLEY CANNULA

In this method the parotid gland secretion is drained directly into the device. The chamber is held in place at the stensen's duct orifice. The chamber is then weighed to determine the amount of saliva collected. This method is easy, painless, Quick and also non invasive. This method can also be adapted to assess

both sub-mandibular and sublingual salivary gland function.

MANAGEMENT

Management is broadly can be classified in two parts e.g. General management and Therapeutic management.

GENERAL MANAGEMENT

The following primary principles of treatment are relevant in xerostomia:¹³

- **Patient education:** The affected individual has to be entrusted with a qualified clinician to discuss the issues, concerns about the condition for clarity. The etiology, diagnosis, prognosis, and prospective management should be discussed with the patients to follow the recommended treatment with regular appointments.
- **Maintenance of proper oral hygiene:** Patients using dentures need to be encouraged to use fluoride toothpaste, preferably in conjunction with daily fluoride mouth rinse. Denture patients should be educated with denture cleaning techniques, especially to remove the appliance before sleeping.
- **Monitoring:** Regular check-up combined with microbiological analysis is useful to find visible or hidden oral infections such as candida or *Staphylococcus aureus* species.
- Diet and habit modifications
- Frequent and regular sips of water Avoidance of dry, hard, sticky, acidic foods Avoidance of excess caffeine and alcohol

THERAPEUTIC MANAGEMENT SYSTEMIC SIALOGOGUES

Pilocarpine and cevimeline are two systemic US Food and Drug Administration-approved sialogogues for treatment of dry mouth. Their effect depends on the presence of functional glandular tissue. Oral pilocarpine is a para-sympathomimetic medication with muscarinic action. Cevimeline is a salivary gland stimulant with a stronger affinity for M3 muscarinic receptors. Pilocarpine and cevimeline provide a similar benefit in patients with dry mouth. Pilocarpine is typically administered at a dose of 5 mg three times a day for at least 3 months and cevimeline is prescribed at a dose of 30 mg three times a day for at least 3 months. Side effects include: excessive sweating, cutaneous vasodilatation, emesis, nausea, diarrhoea, persistent hiccup, broncho constriction, hypotension, bradycardia, increased urinary frequency, and vision problems.^{14,15,16}

CORTICOSTEROIDS

Systemic corticosteroids may be of benefit in reducing the oral and ocular symptoms of Sjogren's syndrome. Corticosteroid irrigation (with

prednisolone 2 mg/ml in normal saline) is clinically helpful by increasing the salivary flow rates in early stages of disease.

SALIVARY SUBSTITUTES

In prolonged xerostomic patients, artificial salivary substitutes can be used which humidify the oral cavity and replace lost salivary function and components. Such preparations do contain aqueous solutions like mucins, glycoproteins, salivary enzymes, and polymers such as carboxymethylcellulose used to protect soft tissues or ions such as calcium, phosphates, or fluorides for protecting the hard structures of the teeth. Milk helps in moistening and lubricating the oral mucosa, buffering oral acids, reducing enamel solubility, and contributes to enamel remineralization as it contains calcium, phosphate, and phosphoproteins that adsorb to enamel; hence, it is recommended as a salivary substitute.^{17,18}

RECENT ADVANCEMENT SALIVARY PACEMAKER

The Salitron system is a battery-powered electrostimulation system that consists of an electronic control module, a connecting cord, and a handheld stimulus probe with two metal electrodes. The probe is held by the user every day for several minutes between the tongue and palate. It increases the salivation by producing impulses, which stimulates sensory nerves of oral mucous membrane. (Figure 1) This device was approved in US 1988 by the US Food and Drug Administration. It was not used commonly due to its large size and high cost.¹⁹ GenNarino is a new intraoral miniature neuroelectric stimulator to increase salivary secretion. It consists of two units: a mouthpiece and a push button to on and off the device. (Figure 2) Mouthpiece consists of two plastic sheets. GenNarino attaches an electronic module enclosed between two sheets and a power source consisting of two small 3 V batteries. Two electrodes made of biocompatible material are connected to an electronic module, emerging from a plastic sheet and the lower dental arch of the lingual side.²⁰

Figure 1: Salitron system

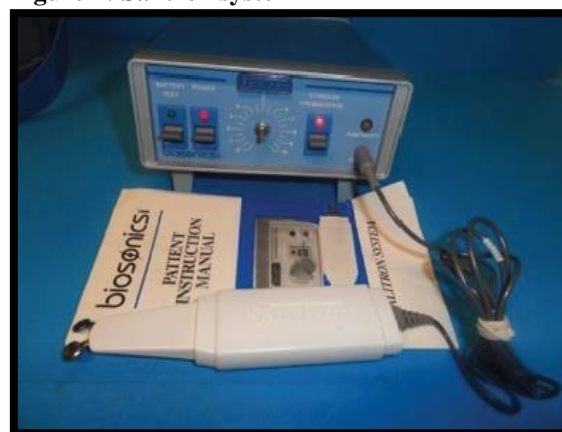


Figure 2: Saliwell GenNarino**LOW-LEVEL LASER THERAPY (LLLT)**

The LLLT has been widely used as a novel, non pharmaceutical intervention and is a beneficial tool for alleviating xerostomia and enhancing the quality of life of patients. LLLT utilises light energy in form of photons to generate cellular responses in cell. Extremely low voltage electrical stimulation is trailed in individuals with salivary gland hyposalivation.²¹

ACUPUNCTURE

Due to the limitations of the conventional therapies, one of most popular Complementary and Alternative Medicine (CAM) therapy used in the treatment of xerostomia is acupuncture. Acupuncture simply means to puncture using a needle. The treatment involves inserting very thin solid needles into areas of interest and later gently manipulating by hands or with light stimulation. The mechanism of action of acupuncture posits that, it intensifies the discharge of neuropeptides and spurs the autonomic nervous system, promoting salivary secretion in xerostomia. These released neuropeptides contain anti-inflammatory and trophic effect in the salivary gland and eventually increase the blood flow in the acini.²²

HYPNOSIS

Although there is some benefit of hypnotic therapy in treatment of salivary flow, there are no evident study trials to conform its role in the treatment of xerostomia.¹²

HYPERBARIC OXYGEN

The most common complain of xerostomia is observed in patients receiving irradiation for tumours involving the oral cavity mainly salivary glands, because they are in the field and are more likely to develop xerostomia as compared to the cancers of the head and neck where no major and minor salivary glands are irradiated. Hyperbaric Oxygen Therapy (HBT) is one such strategy that is recommended for the treatment of xerostomia. The application of hyperbaric oxygen therapy following irradiation enhances neo-angiogenesis and aids in the mobility

of stem cells from bone marrow. Thus, proving to improve and relieve xerostomia. However, robust studies are yet to provide elaborate evidence of its use in the treatment of xerostomia.²³

CONCLUSION

Saliva is an element that is extremely necessary in order to maintain good oral hygiene and health of the oral cavity. The causes of xerostomia are abundant. Patients with xerostomia are at a greater risk of developing caries. Hence it is important for the clinicians to have sound understanding of this condition, prompt diagnosis and monitoring of xerostomia patients in order to ensure proper treatment for these patients.

REFERENCES

1. Boyce HW, Bakheet MR. Sialorrhea: A review of a vexing, often unrecognized sign of oropharyngeal and esophageal disease. *J Clin Gastroenterol* 2005;39:89-97.
2. Mravak-Stipetic M. Xerostomia — Diagnosis and treatment. *Medical Sciences* 2012;38:69-91.
3. Guggenheimer J, Moore PA. Xerostomia: Etiology, recognition and treatment. *J Am Dent Assoc* 2003;134:61-9.
4. Lee YH, Wong DT. Saliva: An emerging biofluid for early detection of diseases. *Am J Dent* 2009;22:241-8.
5. Rao PJ, Chatra L, Shenai P, Veena KM, Prabhu RV, Kushraj T, *et al.* Xerostomia: Few dry facts about dry mouth. *Arch Med Health Sci* 2014;2:190-4.
6. Iorgulescu G. Saliva between normal and pathological. Important factors in determining systemic and oral health. *J Med Life*. 2009 Jul-Sep;2(3):303-7.
7. Sultana N, Sham E M. Xerostomia: An overview. *Int J Dental Clinics* 2011;3(2):58-61.
8. S.P. Humphrey, R.T. Williamson, A review of saliva: normal composition, flow, and function, *J. Prosthet. Dent.* 85 (2) (2001) 162–169.
9. Soto-Rojas AE, Kraus A. The oral side of Sjögren syndrome. Diagnosis and treatment. A review. *Archives of medical research*. 2002 Mar 1;33(2):95-106.
10. Fox P. C, Van Der Ven, PF, Sonies, B. C. Weiffenbach, JM, and Baum, BJ, Xerostomia: cance, *J. Am. Dent. Assoc.* Evaluation of a symptom with increasing signi 1985;110:519.
11. Aagaard A, Godiksen S, Teglers PT, Schiodt M, Glenert U. Comparison between new saliva stimulants in patients with dry mouth: a placebo-controlled double-blind crossover study. *Journal of oral pathology & medicine*. 1992 Sep 1;21(8):376-80.
12. Fox PC, Busch KA, Baum BJ. Subjective reports of xerostomia and objective measures of salivary gland performance. *The Journal of the American Dental Association*. 1987 Oct 1;115(4):581-4.
13. Kubbi JR, Reddy LR, Duggi LS, Aitha H. Xerostomia: An overview. *J Indian Acad Oral Med Radiol* 2015;27:85-9.
14. Weber J, Keating GM. Cevimeline. *Drugs*. 2008;68(12):1691–1698.
15. Chambers MS, Jones CU, Biel MA, *et al.* Open-label, long-term safety study of cevimeline in the treatment

- of postirradiation xerostomia. *Int J Radiat Oncol Biol Phys.* 2007;69(5):1369–1376.
16. Aframian DJ, Helcer M, Livni D, Robinson SD, Markitziu A, Nadler C. Pilocarpine treatment in a mixed cohort of xerostomic patients. *Oral Dis.* 2007;13(1):88–92.
 17. Porter SR, Scully C, Hegarty AM. An update of the etiology and management of xerostomia. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;97:28-46.
 18. Silvestre-donat F J, Miralles-Jordá L, Martínez-Mihi V. Protocol for the clinical management of dry mouth. *Med Oral* 2004;9:273-9.
 19. Hargitai IA, Sherman RG, Strother JM. The effects of electrostimulation on parotid saliva flow: a pilot study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2005;99:316-20.
 20. Gil-Montoya JA, Barrios R, Sánchez-Lara I, Carnero-Pardo C, Fornieles-Rubio F, Montes J, *et al.* Prevalence of drug-induced xerostomia in older adults with cognitive impairment or dementia: An observational study. *Drugs Aging* 2016;33:611-8.
 21. Ara SA, Patil A, Patil BM. Current trends in the Management of Xerostomia: A review. *Archives of Dental and Medical Research.* 2016;2(1):15-21.
 22. Naik PN, Kiran RA, Yalamanchal S, Kumar VA, Goli S, Vashist N. Acupuncture: An alternative therapy in dentistry and its possible applications. *Med Acupunct.* 2014;26(6):308-14.
 23. Nik Nabil WN, Lim RJ, Chan SY, Lai NM, Liew AC. A systematic review on Chinese herbal treatment for radiotherapy-induced xerostomia in head and neck cancer patients. *Complement Ther Clin Pract.* 2018;30:06-13. Doi: 10.1016/j.ctcp.2017.10.004. Epub 2017 Oct 14.