

**Xerostomia and the denture patients- current perspectives**

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**Abstract**

One of the common complaint among older adults who are denture patients is Xerostomia. Dry mouth has a multifactorial etiology which has multiple oral health consequences and also affects the quality of life of the patient. It can produce serious negative effects on the patient’s quality of life by affecting dietary habits, nutritional status, speech, taste and tolerance to dental prosthesis. It also potentiates the risk of oral infection such as candidiasis and makes the patient susceptible to dental caries, periodontal disease and tooth loss. Saliva plays a vital role in oral cavity of protecting the oral mucosa and teeth against foreign substances, lubricates the mouth to facilitate chewing, aids in swallowing and speech. Presence of adequate amounts of saliva within denture and

tissue interface is essential. Without enough saliva, a denture will inadequately adhere to tissues, partly through loss of surface tension. Sometimes the cause may easily be eliminated, but in many instances, it is not possible and the condition is persistent and often progressive. There are several approaches to manage dry mouth. In this article, different methods to resolve the above mentioned problems have been discussed.

**Keywords:** xerostomia, denture, reservoir, candidiasis

**Introduction**

Saliva is a clear, viscous liquid secreted from the salivary glands by acini cells. It aids in mastication, swallowing, speech and preservation and maintenance of oral health. It plays a role which is critical for function and retention of

prosthesis as the prosthesis does not barely rest on mucous membranes but on an interposed salivary film as well [1].

Xerostomia is defined as the dryness of the mouth from the lack of normal secretions. This is a result of salivary gland hypofunction. Xerostomia is a symptom which is more commonly seen in ageing populations, but it is not caused by ageing. It may be a local symptom, or part of a systemic disease such as Sjogren's syndrome, alcoholism and diabetes, or as a side effect of medications and other conditions such as menopause, following therapeutic radiation to the head and neck regions and vitamin deficiencies [2].

Without the lubricating effect of saliva the tissues contacting a denture will become chafed and irritated. Edentulous patients suffering from xerostomia may complain of difficulty in normal functions and extreme discomfort in wearing dentures. The physical factors like adhesion, cohesion and interfacial surface tension which play an important role in retention of denture will not be effective in absence of a thin film of saliva between denture and the soft tissues they rest upon.

### **Saliva: Anatomy and physiology**

Saliva is secreted mainly by three major salivary glands which include the parotid, submandibular and sublingual glands. Minor glands contribute very little in saliva production and are found in the lower lip, cheeks, palate, tongue, and pharynx [3].

Salivary secretion can be divided into three types- serous, mucous and mixed. Serous type of saliva is mainly secreted by the parotid gland, mucous type is secreted by minor glands and mixed serous and mucous type is secreted from the sublingual and submandibular glands [3].

The average flow of saliva varies in between 1 to 1.5 litres. The unstimulated salivary flow rate is about 0.3ml/min, whereas the flow rate during sleep is 0.1

ml/min. Stimulated flow of saliva is mainly from parotid contributing more than 50% of total salivary secretions 65% of total amount of unstimulated saliva is mainly produced from submandibular gland, 20% is by parotid, 7% to 8% from sublingual and remaining by minor salivary glands [4,5].

Saliva is composed of a variety of electrolytes [4] including sodium (0-80mg/100ml), potassium (60-100mg/100ml), chloride (50-100mg/ml), bicarbonate (0-40mg/100ml), fluorides (.01-.04mg/100ml), calcium (2-11mg/100ml) and phosphorous (6-71mg/100ml). Organic components of saliva include proteins (200mg/100ml) comprising of enzymes, immunoglobulins, mucins, traces of albumin polypeptides and glycopeptides,  $\alpha$ -amylase (60-120mg/100ml in parotid), antibacterial substances like lysozyme, lactoferrin, histatins and nitrogenous products, such as urea and ammonia. The functions of saliva include-

- (1) buffering action- many bacteria require a specific pH for colonizing in mouth which is denied by the buffering capacity of saliva due to presence of bicarbonates, phosphates, and urea
- (2) proteins and mucins serve to cleanse and act as a lubricant and protect the lining mucosa by forming a barrier against noxious stimuli, toxins and minor trauma and/or attach oral microorganisms
- (3) calcium, phosphate, and proteins help in remineralization of teeth and thus maintain the tooth integrity and
- (4) immunoglobulins, proteins and lysozyme provide antibacterial action. Histatins a family of salivary proteins, have potent antifungal properties that inhibit and kill candidal organisms.

### **Types of xerostomia**

Primary xerostomia – In this case a pathologic lesion is always present in the salivary glands as a manifestation of

either localized or systemic disease.

Secondary xerostomia – When no salivary lesion is present and reduced production of saliva is because of some other factors like medications, radiation exposure and systemic illnesses.

### **Signs and symptoms of xerostomia**

Individuals with xerostomia often complain of problems of chewing, swallowing difficulties, decreased or alterations in taste (dysgeusia), speaking and wearing dentures. Dry, crumbly foods such as cereals, may be particularly difficult to chew and swallow. Decreases in taste perceptions and difficulties in swallowing can force elders to alter food choices. Denture wearers may have problems with denture retention, frictional irritation to the supporting tissues, denture sores and the tongue sticking to the palate. The adherence and growth of microorganisms on the acquired dental pellicle on denture result in a granular or inflammatory response in the underlying mucosa, causing denture stomatitis. Most common site is maxillary palatal surface. Acquired pellicle also causes extrinsic staining and calculus deposition. Patient may discontinue the use of denture. Patients with xerostomia often complain of an increased need to drink water, especially at night. It can lead to marked increase in carious activity (dentulous patients), inflammation or ulcers of the tongue and buccal mucosa, oral candidiasis, fissuring of the lips (cheilitis), salivary gland infection (sialadenitis), halitosis and cracking and fissuring of the oral mucosa [6,7].

### **Some Common Causes of Xerostomia**

**Medications:** Medication use is believed to be the most common reason for reduction of salivary flow in older individuals. This effect is primarily mediated through medications' anticholinergic actions or their effect on fluid balance. Main agents reducing salivary secretion are sedatives, antihypertensives, anticholinergic drugs and

antiparkinsons drugs [8] (Table1). More than 400 medications have side effects that include xerostomia or salivary gland hypofunction. Side effects appear to be more pronounced in the elderly because of slower metabolism, delayed clearance of the drug, or decreased acinar volume [9].

**Aging:** Total production of saliva decreases as a person grows old because with age acini decrease in number and are replaced with adipose and fibrotic tissues [9] but its total impact on the salivary output is argued in the literature. Although more than 40% of elderly subjects report occasional oral dryness, research on healthy subjects has shown minimal or no changes in salivary flow directly related to the aging process [10].

**Systemic disorders:** Xerostomia is sometimes associated with certain illnesses or conditions such as chronic diarrhoea, liver dysfunction and Sjogren's syndrome. Hyposalivation may be caused by localized factors, including salivary gland disease (sialadenitis, sialolithiasis). Other systemic conditions which affect salivary flow include autoimmune diseases (Sjogren's, AIDS, systemic lupus erythematosus, rheumatoid arthritis and scleroderma); hormonal disorders (uncontrolled diabetes, thyroid dysfunction); neurological disorders (Parkinson's, Bell's palsy, cerebral palsy) and psychogenic illness such as depression.

**Radiation therapy:** Radiation causes changes to the secretory cells, in particular the serous cells, causing decrease in salivary output and a change in the viscosity of the saliva. Patient commonly complaint of Thick or sticky saliva. The radiosensitive in increasing order from minor gland, sublingual, submandibular and with highest sensitive being parotid, the effects of radiation are dose, time and field dependent. Even low doses of radiation can cause changes in the quantity and quality of saliva. When the total radiation dose exceeds 5,200 cGy salivary flow

diminishes, the mouth feels extremely dry, and little or no saliva is expressible from the salivary ducts. These changes are essentially permanent, with little or no recovery of salivary gland function [11].

Other major factors associated with xerostomia include chronic mouth breathing and inadequate fluid consumption, dehydration through haemorrhage, sweating, diarrhoea, vomiting, polyurea or diabetes mellitus or insipidus, various vitamin and hormonal deficiencies and anemia.

### **Diagnosis**

Patient's history and clinical examination are the gold standards for correctly diagnosing Xerostomia. Diagnosis may be facilitated by asking simple questions like (1) Do you have difficulties swallowing any foods? (2) Do you sip liquids to aid in swallowing dry foods? (3) Does the amount of saliva in your mouth seem to be too little? Elicitation of drug and family history is critical for its diagnosis. Cracking of corners of mouth and dry lips are common symptoms which may be infected with candida, and occasionally enlarged salivary glands. The oral mucosa may appear dry and shiny. The tongue can become furrowed, dry and sticky or it can undergo partial or complete depapillation of the dorsum. Cleansing of food from tooth surfaces and oral mucosal lining is hampered as normal pooling of saliva in the floor of mouth is absent. Recurrent carious lesions are seen on the cervical margins or neck of the teeth (Class V), incisal margins and cusp tips (Class VI).

### **Management of Xerostomia**

Before managing a persistent dry mouth, it is essential to first become aware of the problem and then attempt to determine causes of xerostomia. In some clinical situations the etiology may be easily determined and eliminated, but in many instances, it is not so and the condition is persistent and often progressive. There are

several approaches to manage dry mouth.

Management of these patients begins with thorough patient education. To overcome the problem of dryness, altered taste and difficulties in swallowing, patients may stop chewing and prefer a liquid or semi liquid diet rich in fermentable carbohydrates which results in nutritional deficiencies. Patients should undergo nutritional counselling to limit the harmful effects of reactionary diet modifications and should be encouraged to chew because mechanical stimulation of periodontal receptors and stimulation of the tongue and oral mucosa are vital stimuli for salivation. Studies have shown increased parotid gland secretion and salivary pH in response to daily gum chewing [12,13].

Consultation with physicians is recommended if change or elimination of an offending medication is considered. The timing of the dose may be changed to correspond with meals, thus enabling salivary stimulation through the process of eating to counteract the drying effect of the drug. The use of medication before bed time should be discouraged because this time of day coincides with the lowest salivary flow rate.

A change in fluid intake also must be recommended. Most people do not drink enough fluids, which contributes to the problem. Patients should sip cool water throughout the day and drink milk with their meals. Water will cleanse and hydrate the oral tissues but it is not a substitute for saliva. Water is a poor mucosal wetting agent that lacks buffering capacity, lubricating mucins and protective proteins. Milk may serve as a better substitute because it has moisturizing properties that can help patient swallow a food bolus [13]. Citrus fruits can irritate the oral mucosa and patient should be cautioned against frequent use of commercial mouth rinses or mouth wash swabs because they contain alcohol which tends to extract moisture from the oral tissues and must be avoided [14].

For denture to be successful in elderly patient of xerostomia, health of the oral tissues has to be restored before a comfortable and functional prosthesis can be expected. The best made denture cannot be tolerated by dehydrated fragile oral tissues in an excessively dry mouth.

It is very difficult to treat long term chronic dehydration of aging. But it can be decreased by hydrophetic (water bound) foods. Soups are the most efficient foods for providing water and nutrients to the dehydrated tissues and cells of elderly. Free water (eg. drinking tap water or coffee) passes too rapidly through gastrointestinal tract and is quickly eliminated by the kidneys to be effectively utilized. Bound water (water bound to an organic or inorganic molecule) can be much more effectively absorbed from intestine and carried into the tissues and cells by the vascular system.

For fungal infection mycostatin or nystatin in form of oral suspension can be used. Depending on the severity of the mouth dryness and soreness a lubricant, oragel mouth aid or vaseline may be used. The oral flora may rise in the presence of xerostomia leading to caries. Meticulous personal oral hygiene is essential to decrease the incidence of caries development. A home fluoride programme must be recommended.

Use of sugar free mints and chewing gum as sialagogues help to increase the level of salivary output. Gustatory sialagogues such as sugar-free hard candies frequently will cause some increase in salivation and citrus flavours such as lemon are sometimes more effective than others. While sugar-free, low-sticking gum has been suggested, the process of chewing gum could more easily irritate already poorly lubricated tissues by increasing denture movement. Patients should be advised not to use tobacco and alcohol because both will complicate the xerostomia and mucosal lesions.

The use of pharmacological agents to increase salivary flow depends on the residual functional capacity of the major and minor salivary glands. Time released pilocarpine may be effective in acinar cell production and may increase salivary synthesis and secretion. The efficacy of pilocarpine 5 to 10 mg administered 3 or 4 times daily, 30 minutes before meals in patients who have undergone radiation and patients with Sjogren's syndrome has been documented [15].

Different types of synthetic saliva are available that alleviate the feeling of dryness for longer period of time than mouth rinses (Table 2). Artificial saliva acts by humidifying and lubricating the dehydrated oral mucosa. Sipping of water during meals can aid in swallowing and improving taste perception. Commercially available artificial saliva is divided into 2 groups: Carboxymethylcellulose (CMC) based and Mucin based. CMC is used to impart lubrication and viscosity. Salts are added to mimic the electrolyte content of saliva. Calcium, Phosphate, Fluoride ions are added to provide remineralization potential. Mucin is derived from porcine gastric tissues or bovine submaxillary glands. Mucin based salivary substitutes are known to have the lowest contact angle and the best wetting properties on the denture base and the oral mucosa. Their rheological properties are more comparable to that of natural saliva [16].

In the partially or fully edentulous patient, susceptibility to mucosal ulcerations and fungal infections may increase because of decreased salivary flow. Patients should be made aware of the importance of a well-fitting prosthesis and minimize denture use at times when decreased salivary flow is noted. Dentures must be soaked in water overnight. The oral mucosa and intaglio surface of prosthesis can be sprayed throughout the day with artificial saliva.

Two hours on an average the reservoir provides continuous wetting but the period varies with the degree of xerostomia and volume of reservoir. Intraoral saliva reservoir in the maxillary complete denture can be fabricated in the palatal area and in the hollowed lingual flange of mandibular denture. [17-19]

#### **Alternative therapy for patients suffering from xerostomia**

Acupuncture reportedly is capable of increasing parasympathetic activity, which results in neuropeptide release that stimulates salivary gland blood flow and secretions [20]. Those patients who are not able to comfortably wear conventional dentures due to severe xerostomia implant supported dentures might be considered as an alternative treatment for such patients. If this course of treatment is pursued, intense oral hygiene practice is necessary to maintain healthy implants in the presence of reduced salivary production.

#### **Conclusion**

Xerostomia is a commonly observed clinical condition in denture patients which should be correctly diagnosed and treated to enhance the quality of life of the patient. Retention is an essential feature of a denture which is influenced by physical properties of surface tension, adhesion and cohesion which are only effective if a thin film of saliva is present. Denture wearing becomes a painful experience if there is a compromised salivary flow in oral cavity. Proper evaluation, diagnosis and treatment planning along with patient education play a critical role in the management of xerostomia which will effect the overall health and quality of life of completely edentulous or partially edentulous denture patients.

#### **References**

1. S. Winkler, Essentials of Complete Denture Prosthodontics, Saunders Elsevier, Philadelphia, Pa, USA, 2nd edition, 2012.

2. Michael D. Turner and Jonathan A. Ship. Dry mouth and its Effects on the oral health of elderly people. JADA 2007, Vol. 138:15-20.
3. Roth G, Calmes R, editors. Salivary glands and saliva. In: Oral biology. St Louis: CV Mosby; 1981. p.196-236.
4. Williamson RT. A review of saliva: normal composition flow, and function. J Prosthet Dent 2001;85:162-9.
5. Edgar WM. Saliva and dental health. Clinical implications of saliva: report of a consensus meeting. Br Dent J 1990;169:96-8.
6. Edgerton M, Tabak LA, Levine MJ. Saliva: a significant factor in removable prosthodontic treatment. J Prosthet Dent 1987;57:57-66.
7. Narhi TO, Meurman JH, Ainamo A. Xerostomia and hyposalivation: Causes, consequences and treatment in the elderly. Drugs Aging 1999;15:103-16.
8. Ship JA, Wu AJ. Characterization of major salivary gland flow rates in the presence of medications and systemic diseases. Oral Surg Oral Med Oral Pathol 1993;76:301-6.
9. Sreebny LM, Schwartz SS. A reference guide to drugs and dry mouth—2nd edition. Gerodontology 1997;14:33-47.
10. Nari TO. Prevalence of subjective feelings of dry mouth in the elderly. J Dent Res 1994;73:20-5.
11. Franzen L, Funegard U, Ericson T, et al: Parotid gland function during and following radiotherapy of malignancies in the head and neck: A consecutive study of salivary flow and patient discomfort. Eur J Cancer 28:457-462, 1992.
12. Imfeid T. Chewing gum—facts and fiction: a review of gum-chewing and oral health. Crit Rev Oral Biol Med 1999;10:405-19.

13. Dodds MW, Hsieh SC, Johnson DA. The effect of increased mastication by daily gum-chewing on salivary gland output and dental plaque acidogenicity. *J Dent Res* 1991;70:1474-8.
14. Atkinson JC, Fox PC. Salivary gland dysfunction. *Clin Geriatr Med* 1992;8:499-511.
15. Fox PC, Ven PF, Mandel ID, Baum BJ. Pilocarpine for the treatment of xerostomia associated with salivary gland dysfunction. *Oral Med Oral Path* 1986;61:243-8.
16. Ferguson MM, Barker MJ. Saliva substitutes in the management of salivary gland dysfunction. *Advanced Drug Delivery Reviews*. 1994;13:151-159.
17. Vissink.A, Huisman MC, and Gravenmade.EJ. Construction of an artificial saliva reservoir in an existing maxillary denture; *J Prosthet Dent* 1986;56(1);70-74.
18. Sinclair FG, Frost.M, Peter. New design for an artificial saliva reservoir for the mandibular complete denture. *J Prosthet Dent* 1996;75(3);276-80.
19. Vissink.A, Gravenmade.EJ, Pander.AK. Artificial reservoirs. *J Prosthet Dent* 1984;52(5);710-5.
20. Blom M, Dawidson I, Angmar Mansson B. The effect of acupuncture on salivary flow rates in patients with xerostomia. *Oral Surg Oral Med Oral Pathol* 1992;73:293-8.

### Legends Tables

Table 1: Drugs Associated With Dry Mouth

|                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drugs that directly damage salivary glands                                                                                                                                                       |
| Cytotoxic drugs                                                                                                                                                                                  |
| Drugs with anticholinergic activity                                                                                                                                                              |
| Anticholinergic agents: atropine, atropinics and hyoscine                                                                                                                                        |
| Antireflux agents: proton-pump inhibitors(e.g., omeprazole)                                                                                                                                      |
| Central-acting psychoactive agents                                                                                                                                                               |
| Antidepressants, including tricyclic compounds                                                                                                                                                   |
| Phenothiazines                                                                                                                                                                                   |
| Benzodiazepines                                                                                                                                                                                  |
| Antihistamines                                                                                                                                                                                   |
| Bupropion                                                                                                                                                                                        |
| Opioids                                                                                                                                                                                          |
| Drugs acting on sympathetic system                                                                                                                                                               |
| Drugs with sympathomimetic activity (e.g., ephedrine)                                                                                                                                            |
| Antihypertensives: alpha-1 antagonists (e.g., terazosin and prazosin); alpha-2 agonists (e.g., clonidine); beta blockers (e.g., atenolol, propranolol), which also alter salivary protein levels |
| Drugs that deplete fluid                                                                                                                                                                         |
| Diuretics                                                                                                                                                                                        |

Table 2: Commercially available saliva substitutes

|                                                                                       |
|---------------------------------------------------------------------------------------|
| Carboxymethyl or hydroxyethyl solutions                                               |
| Moi-Stir spray; Moi-Stir Oral Swabsticks (Kingswood Laboratories, Indianapolis, Ind.) |
| Optimoist spray (Colgate-Palmolive, Canton, Mass.) - sodium-free                      |
| Saliva Substitute (Roxane Labs, Columbus, Ohio) - liquid                              |
| Salivart (Gebauer, Cleveland, Ohio) — preservative-free aerosol                       |
| Salix (Salix Pharmaceuticals Inc, Morrisville, N.C.) -                                |

|                                                             |
|-------------------------------------------------------------|
| tablets                                                     |
| VA OraLube (compounding pharmacies) - sodium-free liquid    |
| Entertainer's Secret (KLI Corp, Carmel, Ind.) - spray       |
| Biotene products                                            |
| Oral Balance Gel (Laclede Pharmaceuticals, Gardena, Calif.) |
| Animal mucin product                                        |
| Glandosane (Bradley Pharmaceuticals, Fairfield, N.J.)       |
| Mucopolysaccharide solutions                                |
| MouthKote (Parnell, San Francisco, Calif.) - spray          |