Clinical Implications of Xerostomia in Geriatric Population

Surender Kumar¹, Prashant Gupta²

ABSTRACT
Xerostomia is a common undiagnosed disorder of mostly geriatric population caused by decrease in production of saliva. It can be presenting symptoms of many local and systemic factors with varied etiology. Xerostomia leading to salivary dysfunction resulting in oro-pharyngeal disorder, impairing quality of life. Xerostomia patient have difficulty wearing dentures as it compromises retention of prosthesis. Establishing the complex etiology presents a big challenge to oral physicians, so that proper management of xerostomia can be done, thus improving oral health as saliva contributes to oral immunity.

Keywords: Xerostomia, Geriatric, Prosthesis.

INTRODUCTION
Xerostomia is a common undiagnosed disorder of mostly geriatric population (30% of > 65 years)¹, caused by a decrease in the production of saliva by 0.1-0.2 ml/min (1-1.5lit. normal/day)², giving a 'subjective feeling of oral dryness' due to salivary gland dysfunction resulting in impaired mastication, swallowing, speech and host defense mechanism which are facilitated through anti-bacterial peptides and mucins present in saliva required for the protection of soft tissues and teeth.³ The prevalence of xerostomia has been assessed to be 20% of the elderly population⁴,⁵ Ship et al. revealed 30% of the population 65 years and above experience these disorders whereas; study has shown approximately 100% association with Sjogren Syndrome⁶ and head and neck radiation for the treatment of cancer causes permanent xerostomia.⁴,⁷ Chronic xerostomia and salivary dysfunction results in oro-pharyngeal disorders, impairing a person’s lifestyle. It can present itself as a local symptom or in association with systemic disease such as Sjogren's syndrome, diabetics, alcoholism, adverse effects of medications or following therapeutic radiation to the head and neck regions. Xerostomia patient have difficulty wearing removable dentures as saliva deficiency compromises the retention of the prosthesis.

Etiology
Xerostomic conditions can arise as a result of multiple factors. [TABLE 1]

Hormone induced xerostomia
The surge in estrogen and progesterone levels during puberty and menstrual cycle causes gingival inflammation, swelling, bleeding and periodontal disease due to the exaggerated reaction of the gingival tissue to the toxins produced from plaque, as seen in women taking birth control pills. Pregnancy gingivitis appears between second to eight months of pregnancy. Hormonal imbalance due to menopause alters oral conditions including burning sensations, dysguesia and reduced salivary secretion.⁸

Manifestation of xerostomia
This clinical disorder manifests itself with dryness and burning sensation of oral mucosa, atrophic, pale and translucent or inflammed according to severity. Tongue reveals bald, atrophy of papillae, inflammation and cracking. Denture wearing patients having deficiency of saliva in the denture-mucosal interface can cause adherence and mucosal irritation⁹ leading to denture stomatitis and loss of retention of the prostheses associated with soreness, pain and burning sensation of mucous membrane and tongue. Taste sensations may be altered, as saliva is required to stimulate gustatory receptors located on the taste buds. Normal salivary pH (6.8-7.2) is maintained with sufficient saliva and regulates bacterial populations. Xerostomia exhibits acidic environment (pH 5.5) and rapidly colonizes acidophilic microorganisms (streptococci mutans) resulting in rampant dental caries.²,¹⁴ Halitosis, Stomatodynia (burning mouth and tongue) and intolerance to acidic and spicy foods also have been reported. Xerostomia patients are more susceptible for oral candidiasis (tongue, angular cheilitis, and cracked lips) and erythema of the underlying tissues. Complication of persistent xerostomia associated with Sjogren Syndrome, post head and neck radiotherapy are reduced gustatory stimuli (dysguesia), dry mouth, radiation caries, trismus, osteonecrosis and salivary gland (major) enlargement (Sialadenitis) following infection or obstruction of the duct which impairs patient's oral health and function.[Table 2]

Diagnosis
Sialometric Analysis – A diagnostic tool for the estimation of salivary flow or production either as a collective salivary secretions or as a separate glandular secretion. It is a convenient method and most commonly used to estimate the salivary flow of the gland. It is measured as ml/min/gland. This tool can be of utmost importance in diagnosing xerostomia conditions.⁹ Qualitative analysis and composition of saliva cannot be assessed thus limiting the use of sialometry for

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identifying the severity of xerostomia but not the probable causative factor.

Management
Most important step in treating xerostomia is to determine the diagnosis. In drug induced xerostomia, the dosage, timing or even change in the medication may relieve the condition.

Salivary substitute
Commercial artificial saliva (carboxymethylcellulose, orthana, lubranant, xerolue and glandsfane) containing calcium, phosphate ions, 2ppm fluoride and biotene mouthwash assist in lubricating the oral mucosa in patient of salivary gland aplasia or total absence of saliva production.

Caries protection
Fluoridated water (1ppm) can also aid in mouth moisturizer. Fluoridated toothpaste and 1% sodium fluoride gel/mouthrinse with fluoride varnish applications may prevent xerostomia induced caries (radiation caries). Xylitol inhibits caries producing bacteria (streptococci mutans)2

Acupuncture
Acupuncture has revealed to enhance parasympathetic activity, which liberates neuropeptides promoting salivary flow and secretions. Treatment areas are ears and radial aspect of index finger for 3 to 4 weeks. Dawidson L, et al. noticed Calcitonin Gene-Related Peptide (CGRP) may be the inducing factor for salivary secretion in treating xerostomia patients with acupuncture technique.

Salivary Stimulants
Salivary parenchyma cell may be stimulated by Sialogogues; chewing xylitol-containing gum or lozenges and sucking ice chips.

Pharmaceutical therapy
Medications stimulating salivary secretion include parasympathomimetic agent like Pilocarpine, a non specific cholinergic agonist that stimulates muscarinic receptors M3 (exocrine gland) and M2 (heart) causing water and electrolyte secretion. Bethanecol stimulates salivary flow in radiation induced xerostomia patient with 25mg thrice orally dose. Anethole trithione enhances salivation in Sjogren’s syndrome patient by inflating the number of receptor site on the salivary acinar cells with dose of 25mgTDS.

Amifostine (Ethyl) is an aminothiol prodrug used to treat xerostomia in post radiotherapy (RT) of head and neck cancer patients. The recommended dose for amifostine is 200 mg/m² OD daily as a 3 minute intravenous (IV) infusion 15 to 30 minutes prior RT. Amifostine is transformed to its active form which is 100 times better absorbed in normal cells than in tumor cells thus protects normal cells against post RT and CT damage by scavenging free radicals, donating hydrogen ions to free radicals, depleting oxygen and inactivating cytotoxic drugs. Clinical trial are undergoing for this drug to have a potent antitumor efficacy in post RT and CT xerostomia condition.

Cevimeline
Cevimeline has similar action as pilocarpine with little cardiac and respiratory adverse effects, a safe drug in asthma and pregnancy with enhanced duration of action (5 hrs). Dianne Petrone et al. investigated the efficacy of cevimeline hydrochloride (Evoxac) on xerostomia and keratoconjunctivitis sicca syndrome and resulted in remarkable improvement in saliva and tear flow in Sjogren syndrome patients with 30mg dose thrice daily.

Fungal infection
Oral candidiasis (Thrush) are most prevalent in dry mouth conditions and are effectively treated with azole systemic medications (Fluconazole 100mg tab. and Itraconazole 100mg/10ml suspension) as topical Nystatin solution contain 50% sucrose which may enhance caries and require saliva for dissolution resulting in mucosal abrasion. Other topical preparation that can be used is clotrimazole (0.1%) for managing candidiasis. Recent investigations proved the efficacy of Caphosol (calcium and phosphate solution) on oral fungal infection in xerostomia patients, exhibiting enhanced salivaf secretion with an antifungal activity as compared to sodium bicarbonate solution and showed no significant variation along with myconazole. Sialadenitis is a bacterial inflammatory condition associated with swelling of the salivary gland and requires antibiotics for treatment.

Prosthetic management
Retention is that quality inherent in the dental prosthesis acting to resist the forces of dislodgment along the path of...
### Table 2: Xerostomia Related Disorders

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<th>Disorders</th>
<th>Etiology</th>
<th>Management</th>
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| *Dry mouth:*                      | *Radiation induced in head and neck cancer*  | Thyroid collar (lead Apron)  
Tab Amifostine 200mg/m² once daily  
Tab Pilocarpine 5mg thrice daily  
Tab Cevimeline 30mg thrice daily  
Tab Bethanecol 25mg thrice daily  
Tab Anethole trithione 25mg thrice daily |
| Bacterial Infection (Sialadenitis) | Staphylococcus Aureus                         | Glandular massage  
Tab Penicillin VK 500mg  
Tab Amoxicillin 500mg  
Tab Clindamycin 300mg |
| Physical (duct obstruction)        | Calculus, mucus plug                          | Heat application over the swelling,  
Diuresis to flush out the stone,  
Antibiotics and Analgesics |
| *Dental caries*                    | Streptococcus mutans                         | Dentrifice (0.05% NaF)  
Fluoride gel (1%NaF,0.4% SnF)  
Sodium fluoride varnish (0.5%)  
Restoration |
| *Autoimmune disease*              | Auto-antibodies detected:                   | Artificial saliva:  
Carboxymethylcellulose  
Orthana  
Xerolube  
Sugar free chewing gums/ lozenges  
Lubrication: water  
Tab Pilocarpine 5mg thrice daily  
Hypermellose (lachrymal substitute)  
Tab Cevimeline 30mg thrice daily |
| Sjogren’s syndrome                |                                               |                                                                            |
| *Psycho-pathological*             | Stress, anxiety                              | Tab Ketazolam 15-30mg HS |
| *Oral candidiasis (Thrush)*       | Fungal infection (Candida albican)            | Chlorhexidine mouthwash (0.12%) 10ml 1BD  
Clotrimazole troches: 10mg dissolved orally 4-5 times daily.  
Tab. Fluconazole 100mg  
Tab. Itraconazole 100mg/10ml suspension  
Topical nystatin/ lozenges |
| *Angular cheilitis/ lip cracking* | 1. Absence of saliva (protective effect)      | Nystatin/triamcinolone ointment (topical application) QID.  
B complex vitamin tablets 1OD x 7days  
Relining/rebasin/refabrication of denture  
Saliva substitute (carboxymethylcellulose/ milk etc.) |
|                                   | 2. Decreased vertical relation of denture     |                                                                            |
| *Ill fitting denture*             | Loss of retention due to absence of saliva.   | Denture adjustment  
Hard and Soft Reline  
Implant supported prosthesis  
Lubricating prosthesis (saliva reservoir) |
| *Dysguesia*                       | Absence of normal salivary flow and concentration are necessary for taste | Saliva substitute: (carboxymethylcellulose/xerolube/milk/ saline/ salivix)  
Sialogogues: chewing sugar-free gum  
**Drugs:**  
Tab Pilocarpine 5mg thrice daily |
| Arthritis                         | Auto-antibodies                              | Tab. Methotrexate 0.2-0.3mg/kg body wt weekly.  
Tab. Prednisolone 10mg daily orally/  
Tab. Hydroxychloroquine 200-400mg daily |
| Raynaud’s phenomenon              | Unknown cause (rare disease of blood vessels) | Cold protection by gloves  
Tab. Nifidipine 10mg thrice daily |
| Lymphoma                          | human T-cell leukemia virus type 1 and adult T-cell lymphoma | CHOP regimen + Anti CD20 |
| Renal tubular acidosis            | Renal impairment (metabolic acidosis)         | Bicarbonate replacement |
| Vaginal dryness                   | Hormonal alteration (menopause, pregnancy)    | Propanionic acid gel |

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*Table-2: Xerostomia Related Disorders*
placement. Saliva plays an important role to aid in denture retention along various factors such as adhesion, cohesion and interfacial surface tension. Denture wearing patients are more prone to dry mouth resulting in oral infection as stated by John Wiley and Sons. The acrylic dentures contain minute pores which may harbor fungal infection (candida albicans) leading to halitosis and discomfort. Denture immersion in benzoic acid, 0.12% chlorhexidine and 1% sodium hypochlorite once or twice daily is required. Soft denture liners and specialized dentures with innovative techniques are constructed incorporating artificial saliva reservoir like split denture technique in mandibular denture and palatal closed lid techniques in maxillary dentures providing good lubrication of the oral tissues has shown remarkable reduction in patient discomfort and denture stomatitis. Xerostomia patient should be advised to wet the denture before wearing along with increased fluid intake to replace electrolytes and reduce discomfort. Flexible denture fabrication in radiation induced xerostomic patient with minimal tissue damage have shown promising results. Salivary substitutes are available as solutions, sprays and gel forms.

Radio-protectors

Study has revealed that Lidocaine has a radioprotective effect on the capacity of mucosal carcinogen-induced water secretion in irradiated salivary glands. Research has proved evidence that Sodium selenite, Vitamin A, C and E (Antioxidants), Mesna (2-mercaptoethanesulfonic acid), Dexrazoxane and Amifostine has radio protective and chemo preventive activity in cancer treatment of submandibular glands. Herbal medication, Hippophae Rhamnoide leaves and sea buckthorn berries has shown to have radio protective action against radiation induced xerostomia. Gerardo Gómez-Moreno revealed that 1% malic acid shows a positive response in treating antihypertensive-induced xerostomia. Recent advancements in radiation protective techniques: A recently developed multileaf collimators and Intensity-Modulated Radiation Therapy (IMRT) reduces the radiation of salivary glands and the surrounding normal tissues as investigated by Eisbruch et al. that IMRT prevents parotid gland mutilation resulting in xerostomia. Conformal 3D radiotherapy (3DCRT) has been proved to deliver greater dose of radiation on the target site without much complications (e.g. xerostomia) compared to conventional RT. Seikaly et al and Al-Qahtani et al suggested that the surgical transplantation of submandibular glands prior to radiotherapy can prevent radiation-induced xerostomia.

Gene therapy

Animal experiments are under trial for preventing post radiation xerostomia by transferring genetic coding for water channels in the acinar cells and genes coding for enzymes that engulf the free radicals generated during radiation.

CONCLUSION

Radiation-induced xerostomia is one of the major etiologies of xerostomia, which augments the risk of oral and dental disease in patients with head and neck cancer. Palliative agents, such as topical fluoride gel, oral lubricants, saliva substitutes and pharmacological stimulation of salivary flow may manage the symptoms in some patients. Xerostomia may be reduced with recently developed radio-protective drugs or by certain radiologic techniques that minimize radiation doses to normal tissues during RT. The definitive aim of management of head and neck cancer should be curative treatment while preserving the overall quality of life for patients.

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