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XEROSTOMIA- A COMMON CONDITION IN GERIATRICS- MAINTENANCE AND PROSTHODONTIC MANAGEMENT-A REVIEW

VENUGOPAL S[1], SRINIVAS RP[2*] AND NAVEEN M[3]

1: Dean & HOD, Dept. of Prosthodontics, Guardian College of Dental Sciences & Research Center, Thane, Mumbai.

2: Asst. Prof. Dept. of Prosthodontics, Guardian College of Dental Sciences & Research Center Thane, Mumbai.

3: Reader, Dept. of Oral Pathology, SB Patil Dental College, Bidar

***Corresponding Author: E Mail: drsrinivas82@gmail.com**

ABSTRACT

Xerostomia is the subjective sensation of oral dryness, usually, but not invariably, associated with hyposalivation mainly caused due to drugs. The major dental problems reported by xerostomic patients include a high caries rate, repeated failure of dental restorations, and early tooth loss that necessitate various degrees of prosthodontic treatment. This article outlines the maintainance and prosthodontic management of this special group of patients with xerostomia.

Keywords: Xerostomia, Prosthodontic, Oral Dryness, Geriatrics

INTRODUCTION

Despite a decline in edentulism, the number of people in the India requiring prosthodontic services will increase significantly over the next two decades **[1]**. Though natural tooth retention rates are increasing [**2, 3]**, the India adult population in need of complete denture treatment will increase from 35.4 million in 2000 to nearly 37.9 million in 2020 **[4]**. Taking into account the expected relative decrease in edentulism in the total population, the relative growth of people aged 55 years and older, and the fact that many of these patients will need both maxillary and mandibular complete dentures, it is estimated that the 56.5 million dentures needed in 2000 will increase to a need for over 61 million dentures in 2020 **[4]**.

Likewise, the need for removable partial prosthodontic services will also increase as the population increases and ages. An estimate of future professional chairside hours available to treat partially edentulous individuals in the India falls well short of the predicted future demand for such services. It is estimated that 49.2 million professional chairside hours will be available to treat 609.4 million hours of prosthodontic treatment need for partially edentulous patients in 2020. Considering only removable partial denture services, 190.4 million chairside hours will go unmet [**5]**. As with complete denture therapy, the need for removable partial denture treatment over the next 20 years will increase substantially.

Concomitant with a growing population of older individuals and increasing demand for removable prosthodontic services is a rise in the consumption of prescription medications by older patients. In any given week, most India adults consume at least one medication and may take multiple drugs. Based on survey information, 50% of the adult population (ie, 106 million people) take at least one prescription medication on a weekly basis, and 7% (ie, 14.8 million individuals) take at least five. The most prevalent users of prescription drugs are women 65 years or older. In this age group, 81% (ie, 17 million) take at least one prescription medication every week, and 23% (ie, 4.7 million) take five or more prescription drugs [**6]**.

A common side effect of many popular prescription medications is impaired saliva production, or xerostomia. [**7-10]** There are hundreds of medications that list xerostomia as a possible side effect [**11]** including: anorexiants, antiasthmatics, anticholinergics, antidepressants, antihistamines, antihypertensives, anti-inflammatories, anxiolytics, antiparkinsonians, antipsychotics, decongestants, antinauseants, bronchodilators, muscle relaxants, diuretics, and sedatives [**12, 13]**. Consultation with the patient's physician regarding possible drug substitutions or elimination is indicated in the presence of substantial oral sequelae resulting from drug-induced xerostomia.

Numerous other etiologic factors are associated with persistent reduced salivary flow. At the top of the list are patients who have been subjected to radiation therapy involving the head and neck. Radiation therapy affects salivary gland parenchyma, causing inflammation, atrophy, fibrosis, and subsequent hyposecretion [**14]**. Unfortunately, salivary gland damage and resulting reduced saliva secretion is long lasting and presumably permanent [1**5]**. Other conditions associated with xerostomia include

dehydration **[16]**; cancer chemotherapy; autoimmune diseases such as Sjogren's syndrome [**17]**; congenital factors such as ectodermal dysplasia; HIV infection [**18-20]**; diabetes [**21]**; nephritis; anemia; immunosuppressive therapy; nutritional deficiencies; alcoholism [**22]**; salivary gland/duct infections, neoplasms or obstructions; emotional stress or mental depression; and various neuropathologic conditions. Although frequently associated with aging, no clear consensus regarding a direct correlation between advancing age and xerostomia can be found in the literature [**23-25]**.

DISCUSSION

Xerostomia

Xerostomia is the sensation of oral dryness. Although commonly associated with salivary gland dysfunction or hypofunction, xerostomia may occur in the presence of normal salivary gland physiologic activity. The lack of adequate saliva may negatively impact complete denture and removable partial denture wearers in many ways, including [**13, 14, 26-32]**:

- Reduced denture retention and generalized denture intolerance
- Demineralization of tooth tissues, rapidly progressive dental caries, and dental attrition
- Increased susceptibility to periodontal disease
- Increased degree of oral sensitivity, soft tissue erythema, generalized burning mouth pain, and intolerance to foods with high acid concentration
- Decreased buffering capacity in the oral cavity with increased risk for opportunistic infections, eg, oral candidiasis
- Increased susceptibility to mechanical, chemical, allergic, and biologic injury
- Delayed healing of traumatized oral mucosa
- Difficulty in mastication and swallowing
- Compromised oral hygiene, excessive accumulation of food debris, and presence of oral malodor
- Altered taste perception
- Dry throat, nose and lips (including angular cheilitis)
- Limitation of tongue motion and impaired phonetic ability
- Compromised emotional well-being and reduced quality of life.

Saliva of appropriate consistency and content is necessary for oral health, comfort, and function. Functionally, healthy saliva serves to: (1) form a coating, ie, the acquired pellicle, on tooth, mucosal, and prosthetic surfaces; (2) regulate the adherence and clearance of microorganisms in the oral environment; (3) control the growth of oral flora; (4) modulate remineralization of enamel; (5) prepare the food bolus for digestion; and (6) concentrate protective molecules at oral surfaces [**29]**. In patients wearing removable prostheses, saliva functions to protect denture-supporting soft tissues from direct mechanical trauma. In partially edentulous patients, minerals contained in normal saliva are essential for remineralization of the dental hard tissues. Additionally, saliva contributes significantly to the regulation of pH, oral flora, electrolyte balance, and immunologic factors within the oral cavity [**14]**.

Xerostomic Denture Wearers

Denture retention, or the resistance to movement of the denture away from the supporting tissues, is critical to patient acceptance of the prosthesis and successful function. The physical, physiological, and mechanical phenomena associated with denture retention are not fully understood. The physical forces involved in denture retention likely include complex interactions between adhesion, cohesion, capillary attraction, surface tension, fluid viscosity, and atmospheric pressure. It has long been recognized that the surface tension developed as a result of the layer of saliva interposed between the denture base and the supporting tissues is important for effective prosthesis retention. This is particularly true for maxillary complete dentures. To achieve optimal surface tension the intervening saliva layer must be thin and effectively wet the opposing surfaces. The low surface tension of oral mucosa permits optimal wetting by saliva. Once coated by a salivary pellicle, conventional denture base materials also display reasonable wetting characteristics. Therefore, a thin film of saliva between the supporting soft tissues and a well-adapted denture base yields retention as the saliva maximizes contact with both the approximating surfaces.

The quality and quantity of saliva have been shown to play a significant role in retention of otherwise adequately constructed dentures. In addition to surface tension, the physical forces of adhesion, cohesion and atmospheric pressure operate in association with the saliva film layer between the denture base and supporting mucosa. It is readily apparent that

saliva of suboptimal quality or quantity may adversely influence denture retention [**26-29]**.

Patient Management

Examination

Clinical examination of patients suspected of suffering from reduced salivary flow must include thorough review of the patient's medical and dental histories. A comprehensive review and understanding of current and past medical conditions and current medications should be noted. Consultation with the patient's physician is in order for patients with extensive medical histories, numerous medications, or if clarification is needed.

A standard, and thorough, intraoral and extraoral examination must be accomplished. Particular attention should be given to visual examination and palpation of the major and minor salivary glands and associated salivary duct orifices. The use of firm external pressure to express fluid from the parotid glands may reveal saliva production from Stenson's duct in the maxillary first molar region. Fluids may also be expressed from sublingual and submandibular glands by the application of firm pressure beneath and medial to the mandible. Salivary secretions present on the floor of the mouth may be identified when the tongue is elevated. Swellings and tenderness evident on palpation of the glands are associated with acute and chronic inflammation.

Evidence of dry oral tissues and associated complications must be documented. During the initial interview, patients may have difficulty speaking because of the dry oral environment. Examination of mucosal tissues may reveal desiccation to the point that a dental mirror sticks, rather than slides, along the tissue surface. The vermilion borders of the lips are often dry and fissured with signs of ulceration and angular cheilitis. The tongue is often coated with food and plaque debris that should be wiped away to evaluate the underlying soft tissues. Four clinical measures, when concurrently identified on examination, have been shown to be reliable predictors of salivary gland hypofunction: dryness of the lips, dryness of the buccal mucosa, absence of saliva production during gland palpation, and decayed/missing/filled teeth (ie, DMFT) score.

All removable prostheses should be removed so that both the dentures and the underlying tissues can be examined. Frequently, excessive accumulation of food debris and plaque on the denture surface is indicative of the absence of normal salivary flow within the oral cavity. Evidence of trauma to the denture-supporting tissues may include redness, swelling, and ulceration. Replacing

the dentures permits evaluation of denture fit and form. Observation of denture occlusion must be carefully accomplished and, when necessary, clinical remount procedures performed to assess occlusal balance.

Special attention should be devoted to residual teeth and periodontal tissues in partially edentulous patients. Thorough intraoral evaluations of the teeth should be supplemented by radiographic examination because xerostomic patients have increased susceptibility to generalized tooth demineralization and root surface caries.

Prosthetics

When considering removable prosthodontic treatment of xerostomic patients, close attention must be given to clinical and laboratory procedures aimed at optimizing denture retention and stability. Accomplishing accurate and appropriately extended impressions of the denture-bearing surfaces will facilitate physical forces working to retain and stabilize the prosthesis. Adhesive force developed between saliva and the denture base functions to retain the denture. Since adhesion is directly proportional to the surface area involved, maximal extension of the denture base within the physiologic limits of the supporting tissues is essential. Dentures incorporating metal bases may exhibit both improved accuracy of fit and more effective wetting, thus contributing to better retention [**32]**. Metal-based prostheses are also easier to clean and less likely to harbor large plaque accumulations.

Careful attention should be given to the external denture contours, ie, the cameo or polished denture surface, in xerostomic patients. Successful denture wearers learn patterns of muscular action, perhaps at a reflex level, that work to retain rather than displace the prosthesis. When appropriately contoured, the dentures will take physiologic advantage of oral and perioral muscular function and will derive stability and retention during mastication, deglutition, and speech.

An often overlooked but critical component of complete denture retention is occlusion. All other factors influencing the retention of complete dentures can be effective only in the presence of efficient and accurate occlusion. Developing smooth, bilaterally balanced occlusion will minimize functional forces acting to mechanically disrupt stability and dislodge the dentures from their foundations. Random occlusal contacts occur throughout the day with varying frequency in different patients. In the absence of balanced occlusion, these empty-mouth occlusal contacts will dislodge the dentures and disrupt normal and comfortable patient function. Effective balanced occlusion depends on careful

clinical and laboratory procedures. Accurate interocclusal records, appropriate articulation instrumentation, careful denture tooth positioning, and meticulous denture base processing techniques must be used. Both laboratory and clinical remount procedures are essential to achieving optimal occlusal balance prior to definitive placement of the dentures. Periodic recall of all denture patients permits re-evaluation of occlusal stability and clinical remount for correction when necessary.

It is appropriate to prescribe a denture adhesive to augment retention for xerostomic patients. When properly applied, adhesives function to enhance the surface tension developed between the denture base and supporting tissues by: (1) improving the adhesive, cohesive, and viscosity characteristics of the otherwise saliva-deficient film layer; and (2) eliminating voids occurring at the interface of the denture and mucosa. In addition to improved retention and stability, denture adhesives have been shown to reduce mucosal irritation, reduce food impaction under the denture base, improve chewing efficiency, increase bite force, improve functional load distribution over the denture-bearing area, and facilitate the psychological well-being of the patient. For patients with xerostomia, the use of a well-hydrated denture adhesive will provide a cushioning or lubricating effect that reduces frictional irritation of the supporting soft tissues and prevents further tissue dehydration. Two currently available denture adhesives that function well in this regard are Fixodent (Procter & Gamble) and Denture Grip (Laclede Research Laboratories). Following initial application for best results these materials should be carefully spread across the entire tissue surface of the denture and firmly seated against the denture-supporting tissues.

The use of dental implants to support both fixed and removable prostheses is now routinely included in treatment options for the restoration of edentulous and partially edentulous patients. Though few reports have appeared in the literature describing the application of implant therapy in xerostomic patients, the authors have experienced great success in this regard. Patients wearing implant-supported dentures typically report improved oral comfort and function when compared with conventional, mucosa-supported prostheses.

Supplemental Treatment

Educating xerostomic patients regarding the importance of their condition is essential. This is particularly true for partially edentulous patients because they are susceptible to

demineralization of tooth structure, dental caries, dental attrition and periodontal disease. A soft, low sugar, carbohydrate-rich diet is recommended. Patients must frequently consume liquids to hydrate dry oral soft tissues, but must avoid sugar-containing juices, punches, and soft drinks. Most patients find the frequent intake of plain water or sucking on sugar-free lozenges to be the most convenient and effective methods of managing oral dryness. For partially edentulous patients, topical fluoride applications are recommended. Excellent at-home fluoride tray systems are available and include FluoriSHIELD 1.1% NaF gel (Medical Products Laboratories) and PreviDent 1.1% NaF gel (Colgate Oral Pharmaceuticals). Fluoride-containing oral rinses may also be prescribed, including Reach Act Mouthrinse 0.05% NaF solution (Johnson & Johnson) and PreviDent Dental Rinse 0.2% NaF solution (Colgate Oral Pharmaceuticals).

A variety of saliva substitutes are available and most are effective in alleviating oral dryness. Proprietary examples include Xero-Lube (Colgate Oral Pharmaceuticals) and Saliva Substitute (Roxane Laboratories). Both of these products have a neutral pH value and are therefore appropriate for both edentulous and partially edentulous patients. Care must be taken to avoid the use of solutions with a pH of 5.5 or less because of the potential for demineralization of tooth structure in partially edentulous patients.

The use of topical agents for increasing oral moisture may be considered. Of note is the topical gel Oralbalance (Laclede Research Laboratories). This moisturizing gel adheres to the oral mucosa providing symptomatic relief from oral dryness for several hours. For patients who wear dentures, Oralbalance or Denture Grip may be used to coat the intaglio surface of the denture prior to placement. In doing so, the patient will realize both the topical moisturizing and denture adhesive effects of the material. Re-application may be accomplished as needed. Caution should be exercised when prescribing Oralbalance to partially edentulous patients having glass ionomer dental restorations. It has been suggested that the relative acidity of the gel may damage both conventional glass ionomer and resin-reinforced glass ionomer restorative materials [**13]**.

Of great significance to denture patients is the increased propensity for oral colonization by *Candida albicans* in the acidic oral environment resulting from xerostomia. Frequent recall appointments and examination of the oral tissues in xerostomic denture wearers is necessary to screen for all forms of

candidiasis. If infection is present, the systemic antifungal treatment of choice for candidiasis is fluconazole (Diflucan, Pfizer, Inc). Local treatment of the denture-supporting tissues is effectively accomplished by placing an antifungal cream (eg, Lotrimin 1% cream, Schering Corp) on the intaglio surface of the denture prior to placement. Oral rinsing with 0.12% chlorhexidine gluconate (Peridex, Zila Pharmaceuticals, Inc; PerioGard, Colgate Oral Pharmaceuticals, Inc) or direct swabbing of the denture may inhibit growth of *C albicans*. Extended use of these oral rinses will likely stain oral surfaces, restorations, and prostheses.

In the presence of functioning salivary gland tissue, use of a cholinergic agonist, such as pilocarpine (Salagen tablets, MGI Pharma, Inc), has been shown to be effective in stimulating endogenous saliva production. This medication has been shown to be effective in the treatment of xerostomia secondary to radiation therapy and Sjogren's syndrome [**13]**. Extreme caution must be exercised in the prescription of this medication because of its widespread parasympathomimetic effects on multiple organ systems and significant drug interactions with beta blockers and anticholinergics. Consultation with the patient's physician prior to consideration of this drug is indicated.

SUMMARY

Successful management of complete and removable partial dentures is complicated by a reduction in saliva. Dental practitioners should be aware of the signs and symptoms of xerostomia, available diagnostic procedures, likely etiologies, expected sequelae, and appropriate therapeutic regimens. Effective evaluation and appropriate treatment will promote acceptable levels of comfort and function. Over-the-counter and prescription medications may be needed to improve the clinical situation.

REFERENCES

[1] Douglass CW, Gammon MD, Atwood DA, Need and effective demand for prosthodontic treatment, J Prosthet. Dent., 59, 1988, 94-104.

[2] Weintraub JA and Burt BA, Oral health status in the United States: tooth loss and edentulism, J. Dent. Educ., 49, 1985, 368-378.

[3] Marcus SE, Drury TF and Brown LJ, Tooth retention and tooth loss in the permanent dentition of adults: United States, 1988-1991, J. Dent. Res., 1996, 75 (Spec Issue), 684-695.

[4] Douglass CW, Shih A and Ostry L, Will there be a need for complete

dentures in the United States in 2020?, J. Prosthet. Dent., 87, 2002, 5-8.

[5] Douglass CW and Watson AJ, Future needs for fixed and removable partial dentures in the United States, J. Prosthet. Dent., 87, 2002, 9-14.

[6] Kaufman DW, Kelly JP and Rosenberg L, A Recent patterns of medication use in the ambulatory adult population of the United States: the Slone survey, J Am Med. Assoc., 287, 2002, 337-344.

[7] Gilbert GH, Heft MW and Duncan RP, Mouth dryness as reported by older Floridians, Community Dent Oral Epidemiol., 21, 1993, 390-397.

[8] Locker D, Subjective reports of oral dryness in an older adult population, Community Dent. Oral Epidemiol., 21, 1993, 165-168.

[9] Locker D, Xerostomia in older adults: a longitudinal study, *Gerodontology.*, 12, 1995, 18-25.

[10] Navazesh M, Brightman VJ and Pogoda JM, Relationship of medical status, medications, and salivary flow rates in adults of different ages, Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 81, 1996, 172-176.

[11] Smith RG and Burtner AP, Oral side-effects of the most frequently prescribed drugs, Spec. Care Dentist, 14, 1994, 96-102.

[12] Felder RS, Millar SB and Henry RH, Oral manifestations of drug therapy, Spec. Care Dentist, 8, 1988, 119-124.

[13] Haveman CW and Redding SW, Dental management and treatment of xerostomic patients, Tex. Dent. J., 115, 1998, 43-56.

[14] Astor FC, Hanft KL and Ciocon JO, Xerostomia: A prevalent condition in the elderly, Ear Nose Throat J., 78, 1999, 476-479.

[15] Dreizen S, Brown LR and Daly TE, Prevention of xerostomia-related dental caries in irradiated cancer patients, J Dent Res., 56, 1977, 99-104.

[16] Massler M, Geriatric nutrition II: dehydration in the elderly, J. Prosthet. Dent., 42, 1979, 489-491.

[17] Atkinson JC and Fox PC, Sjogren's syndrome: Oral and dental considerations, J. Am. Dent. Assoc., 124, 1993, 74-86.

[18] Schiodt M, Dodd CL and Greenspan D, Natural history of HIV-associated salivary gland disease, Oral Surg. Oral Med. Oral Pathol., 74, 1992, 326-331.

[19] Schiodt M, Atkinson JC and Greenspan D, Sialochemistry in human immunodeficiency virus associated salivary gland disease., J Rheumatol., 19, 1992, 26-29.

[20] Schiodt M, HIV-associated salivary gland disease: a review, Oral Surg Oral Med. Oral Pathol., 1992, 73, 164-167.

[21] Sreebny LM, Yu A and Green A, Xerostomia in diabetes mellitus, *Diabetes Care.* 15, 1992, 900-904.

[22] Leonard RH Jr., Alcohol, alcoholism, and dental treatment, Compendium, 1991, 12, 274-283.

[23] Scott J, Structure and function in aging human salivary glands, Gerodontology, 5, 1986, 149-158.

[24] Percival RS, Challacombe SJ and Marsh PD, Flow rates of resting whole and stimulated parotid saliva in relation to age and gender, J Dent Res., 73, 1994, 1416-1420.

[25] Vissink A, Spijkervet FK, Van Nieuw Amerongen A, Aging and saliva: A review of the literature, Spec. Care Dentist., 16, 1996, 95-103.

[26] Chen MS and Daly TE, Xerostomia and complete denture retention, Tex Dent. J., 97, 1979, 6-9.

[27] Navazesh M and Ship II, Xerostomia: Diagnosis and treatment, Am. J. Otolaryngol., 1983, 4, 283-292.

[28] Fox PC, Van Der Ven PF, Sonies BC, Xerostomia: Evaluation of a symptom with increasing significance, J Am Dent Assoc., 110, 1985, 519-525.

[29] Edgerton M, Tabak LA and Levine MJ, Saliva: a significant factor in removable prosthodontic treatment, J. Prosthet Dent., 57, 1987, 57-66.

[30] Navazesh M. Xerostomia in the aged, Dent. Clin. North Am., 33, 1989, 75-80.

[31] Bodner L, Dayan D and Pinto Y, Characteristics of palatal wound healing in desalivated rats, Arch Oral Biol., 38, 1993, 17-21.

[32] Lloyd PM, Complete-denture therapy for the geriatric patient, Dent. Clin. North Am., 4, 1996.