

ROLE OF SALIVA IN COMPLETE DENTURES: AN OVERVIEW

Shabina Sachdeva,¹ Rana Noor,² Rizwana Mallick,³ Eram Perwez,⁴

1. Assistant Professor, Department of Prosthodontics, Faculty of Dentistry, Jamia Millia Islamia, New Delhi.

2. Assistant Professor, Department of Biochemistry, Faculty of Dentistry, Jamia Millia Islamia, New Delhi

3. Assistant Professor, Department of Prosthodontics, Faculty of Dentistry, Jamia Millia Islamia, New Delhi

4. Associate Professor, Department of Prosthodontics, Faculty of Dentistry, Jamia Millia Islamia, New Delhi

Abstract

Saliva is a complex biofluid comprising of electrolytes, glycoproteins and enzymes that lubricates and cleanses the mucosa, protects it from trauma, aids in digestion and also contributes to the sensation of taste. The role of saliva as a lubricant and a buffer is central to the comfort and health of the oral cavity. In the completely edentulous, the presence of optimal quality and quantity of saliva becomes even more significant. Any alteration in salivary flow or characteristics may have a detrimental effect on denture stability and retention.

Key Words: - Complete Denture, Hypo-salivation, Retention, Saliva

Introduction

Saliva is a complex biological fluid that plays a very important role in maintaining the overall health of the oral cavity.¹⁻³ It keeps the mouth moist at all times, aids in chewing, swallowing and tasting of food and also helps regulate the oral flora. Any alteration in the quantity or quality of saliva can adversely affect the oral health balance and can lead to various problems such as difficulty in speech, difficulty in deglutition and mastication, altered taste perception, halitosis, xerostomia etc.

The presence of optimal salivary flow, consistency and composition is even more critical in the completely edentulous patients. It is imperative for the prosthodontist to give due attention to these salivary characteristics before, during and after denture fabrication. This article highlights the importance of saliva in oral health and gives an insight into the significant role played by saliva in the successful rehabilitation of completely edentulous patients with complete dentures.

Salivary Glands & Secretion

The average daily secretion of saliva normally ranges from 500-1500 ml.¹ Saliva is produced in, and secreted from, primarily a set of three paired exocrine glands namely the Parotid, Submandibular and Sublingual glands. In addition to these, there are numerous minor salivary glands scattered throughout the oral cavity, such as the labial, lingual, palatal, buccal, glossopalantine, retromolar glands etc. These minor glands are typically located in the submucosa and have short ducts opening directly onto the mucosal surface. The secretions of each of the major and minor salivary glands differ in their composition and volume.

Salivary secretion is primarily of three types, namely serous, mucous or mixed.¹⁻² Serous secretion, which is chiefly secreted by the Parotid gland is thin and watery and contains the enzyme ptyalin for the digestion of starchy foods. Mucous saliva, which is secreted primarily by the minor salivary glands contains glycoproteins called mucins and is viscous and adherent in nature and provides lubrication and protection to the oral tissues. Mixed serous and mucous secretion is produced in the submandibular and sublingual glands.

At rest, a small, continuous salivary flow, termed as basal unstimulated secretion, covers, moisturizes, and lubricates the oral tissues.³ Resting saliva plays a very important role in maintenance of oral health and contributes to the bulk of salivary secretion in the diurnal cycle. Different glands contribute differently to unstimulated salivary flow, with the submandibular gland contributing approximately 65–70% of the total volume, and the parotid and sublingual glands contributing 20% and 8% respectively. The numerous minor salivary glands contribute to less than 10% of unstimulated salivary secretion.^{1,3}

Stimulated saliva, which is secreted upon smell, taste, mechanical or pharmacological stimulus is produced primarily by the parotid glands and contributes to most of the daily salivary production. Such reflex salivation is controlled by the autonomous nervous system and aids in chewing, formation and swallowing of the food bolus and digestion of starch and lipids.²

A number of physiologic factors are known to influence salivary secretion. Agreeable taste stimuli result in profuse salivation whereas distasteful food can result in a temporary cessation of the salivary flow. Dehydration tends to cause a reduction in salivation as an attempt to preserve body water, whereas hyperhydration increases salivary flow.³ Depression and psychological stress have been demonstrated to have a negative effect on salivary flow.⁴ The effect of aging on saliva flow has been a matter of great controversy. It is now known that aging as such does not directly reduce salivary flow per se. The concomitant use of some medications, or the presence of systemic diseases in the elderly, however, tends to reduce salivary secretion.⁵ With age, the salivary consistency is affected, with the saliva becoming ropier in consistency.

Composition of Saliva

Saliva is comprised primarily of water along with electrolytes such as sodium, potassium, calcium, bicarbonate, magnesium and fluoride, Secretary proteins such as amylase, lipase, albumin, PRPs, histatin, lysozyme and mucins, Immunoglobulins, primarily IgA, IgG & IgM and small molecular weight metabolites such as glucose, urea, uric acid, lipids, epidermal growth factor, insulin, serum albumin etc.⁶

Functions of Saliva⁷⁻⁹

Saliva is a very important biofluid which performs the following functions in the oral cavity:

1. *Protection*: The fluid nature of the saliva provides a washing action that flushes away non adherent bacteria and other debris. Salivary mucins and other glycoproteins provide lubrication, preventing the oral tissues from adhering to each other and also minimize friction. Mucins form a barrier against noxious stimuli, microbial toxins and minor trauma. Salivary proteins protect the tooth surface by binding to calcium and forming a thin protective film called salivary pellicle.
2. *Buffering*: The resting pH of Saliva is 6 to 7. The bicarbonate contained in saliva provides a buffering action by diffusing into plaque and neutralizing the acidic products of sugars metabolized by cariogenic bacteria. This protects the teeth from demineralization and subsequent dental caries. Also, the metabolism of salivary proteins and peptides by oral micro flora produces ammonia which is basic in nature and further increase the pH.
3. *Antimicrobial Action*: Saliva has a major ecological influence on the microorganisms that colonize the oral cavity. It contains a spectrum of proteins which possess antimicrobial properties such as lysozyme, lactoferrin, peroxidase, immunoglobulins and secretory leukocyte protease inhibitor. Some salivary proteins and peptides are also known to exhibit antiviral activity.
4. *Digestion*: The moistening and lubricating action of saliva allows the formation and swallowing of the food bolus. Salivary amylase and lipase are primary enzymes contained in saliva that begin the digestive process in the oral cavity itself.
5. *Taste*: Saliva solubilizes food substances so that they can be sensed by taste receptors located in the taste buds. The saliva produced by the minor salivary glands present in the vicinity of circumvallate papillae contains proteins that are believed to bind to the taste substances and present them to the taste receptor. Saliva also aids in preserving the health of the taste receptor sites protecting them from mechanical and chemical stress or bacterial infection.
6. *Maintenance of Tooth Integrity*: In addition to its role of a buffer in preventing tooth decay, saliva is also supersaturated with calcium and phosphate ions, which have an important role to play in maintaining the demineralization – remineralization balance. Salivary proteins such as statherin, proline rich proteins and histatins help stabilize the calcium and phosphate salt solutions and bind to hydroxyapatite on the tooth structure increasing its resistance to acid attack. The presence of fluoride ions in saliva also helps in the remineralization of the initial carious lesion.

7. *Tissue Repair*: A variety of growth factors and biologically active peptides are present in the saliva which aid in tissue repair and regeneration.

Saliva & Complete Denture Prosthodontics

The role of saliva in maintaining the overall wellbeing of the oral cavity in dentate individuals is well documented. In edentulous subjects, who have lost all their teeth and are dependent upon artificial prosthesis to carry out the basic oral functions of mastication, the presence of appropriate quantity and quality of saliva becomes even more critical.

Optimal salivary flow and consistency plays an important role not only in the denture fabrication process but also in the maintenance of integrity of the prosthesis. In patients who present with an excessive secretion of saliva, proper impression making becomes difficult. Also, the minor palatal glands are known to secrete saliva rich in mucins. The presence of such highly mucous saliva may distort the impression material and prevent the ideal reproduction of posterior portion of the palate in the impression.⁹

Saliva also plays a very important role in preserving denture integrity by keeping the denture surfaces clean and in maintaining proper oral hygiene by physically washing away food and other debris from the soft tissues and from the polished surface of the prosthesis. The lubrication provided by saliva in dentate subjects is equally important in the edentulous as this makes the surface of the dentures more compatible with the movements of the lips, cheek and tongue. Salivary glycoproteins facilitate the movement of soft tissues during speech, mastication and swallowing of food.

Denture retention is also to a large extent dependent upon saliva. Retention in complete denture prosthodontics is defined as the quality inherent in the prosthesis which resists the forces of dislodgement along the path of insertion.¹⁰ Successful rehabilitation of edentulous patients with complete dentures is largely contributed to by satisfactory denture retention. Two important factors that contribute to retention of complete dentures include the establishment of an accurate and intimate fit of the denture base to the mucosa and the achievement of a proper peripheral seal.¹¹ The physical factors that contribute to denture retention include Adhesion, Cohesion, Interfacial surface tension, Atmospheric pressure, Capillary attraction and Gravity. An optimal flow, consistency and volume of saliva is considered to be a major factor in enabling these physical factors to act in unison and aid in denture retention.¹¹⁻¹³

The adhesive action of the thin film of saliva between the denture base and the underlying soft tissues is considered to be one of the principal factors that aids in denture retention. Such adhesive action of saliva is achieved through ionic forces between charged salivary glycoproteins and surface epithelium on one side and denture base acrylic resin on the other.¹³ This thin film of saliva also acts as a lubricant and cushion between the denture base and oral tissues and tends to reduce friction. Also, the cohesive forces within the

layers of saliva present between the denture base and mucosa aid in maintaining the integrity of interposed fluids and aids in retention. The presence of a thin film of saliva also provides interfacial surface tension and resists the separation between the denture surface and the mucosa.

Not just the quantity, but also the flow rate, quality & consistency of saliva influence denture stability and tolerance. The presence of thick ropery saliva may compromise maxillary denture retention by creating a negative hydrostatic pressure in the area anterior to the posterior palatal seal leading to downward dislodgement of the denture. The normal salivary flow rate is about 1ml/min. Optimum quantity of saliva of medium viscosity at this rate lubricates the mucosa and assists in denture retention.

An inadequate salivary flow may have a profound effect on denture retention and stability and also tends to make mastication and deglutition difficult. Loss of the mechanical protective influence of saliva on the denture supporting tissues would predispose them to irritation. Also, the antibacterial action provided by saliva would be proportionally reduced making the denture bearing oral tissues more susceptible to infection.¹⁴

Considering the highly significant role played by saliva in successful complete denture rehabilitation, it is imperative for the prosthodontist to give due attention to the quantity and quality of saliva during the fabrication of complete dentures. Hypo-salivation and associated xerostomia is a common finding in the elderly. The effect of age on salivary secretion and flow has been a matter of great debate. However, it is now believed that aging does not directly reduce salivary flow per se; a number of factors associated with aging may however do so.^{5, 15} The geriatric prosthodontic patient may be under some sort of medications that tend to affect salivary function. These include drugs such as sedatives, anti-hypertensives, anti-depressants and anti-histaminics. Any systemic factors such as alcoholism, depression and the presence of diseases such as uncontrolled diabetes, pernicious anaemia, rheumatoid arthritis, Vitamin A & Vitamin-B deficiency and Sjogren's syndrome are also known to have a profoundly negative influence on salivary secretion. Patients who have undergone radiotherapy in the head and neck region also present with xerostomia due to the associated destruction of salivary glands.¹⁵⁻¹⁶ Any such systemic diseases must be identified prior to denture fabrication and due consultation should be sought from the physician. If the patient is under any medication that tends to cause hypo-salivation, consultation should also be sought to substitute these drugs with others that have lesser adverse effects.¹⁷

In patients with xerostomia in whom some residual salivary capacity remains, stimulation of salivary glands may be induced by the frequent snacking and by the use of lemonades, lozenges and sugar free gums like xylitol.¹⁷ Sialogogues such as pilocarpine may also be prescribed in an attempt to stimulate salivary secretion.¹⁸ In severe cases where the salivary glands cannot be stimulated to produce

sufficient saliva, salivary substitutes^{12,13,17} may be used. These substitutes range from readily available compounds such as milk to the commercially available substitutes such as artificial saliva (which may be mucin or carboxymethyl cellulose based), Salinum (containing Linseed oil), Luborant (based on lactose peroxidase) and others. Glandosane is a salivary substitute with an acid pH indicated specifically in denture wearers.

Another approach to providing optimal lubrication in complete denture patients is the use of saliva delivery systems in the form of oral lubricating devices or reservoir dentures. The clinician may either fabricate new reservoir dentures for the patient or may add reservoirs to the existing dentures. An important concern is the size, shape and location of the reservoir. The commonly preferred sites for adding reservoir is the palate in the maxillary denture and interior of the mandibular complete denture.^{13,19-20}

The prosthodontist's role does not end just at denture fabrication and delivery. An important concern for prosthodontic patients who have recently received new dentures is the discomfort associated with a significant increase in salivary secretion. The prosthodontist should explain to the patient that the new dentures are perceived as foreign objects, stimulating the salivary glands to produce excessive saliva, which necessitates frequent deglutition. Such an increase in salivary flow is however a transient natural response of the oral tissues and tends to diminish over time. During this period, the patient should also be advised to avoid compulsive rinsing & spitting as it is unsettles the denture. Also, following the delivery of complete dentures in patients with xerostomia, it is important to advise the patient to use the dentures for shorter periods of time and to consume soft and moist foods which would be tolerated better by the oral mucosa.⁸ Such patients should also be advised to have frequent sips of water¹⁷ and should be followed up regularly to assess and suitably treat any form of mucosal ulceration or denture stomatitis.

Conclusion

Saliva is a very important oral fluid that plays a multitude of functions in preserving the integrity of oral tissues and in maintaining the overall health of the oral cavity. In edentulous patients, the role of saliva becomes even more critical. Optimal salivary flow, quantity and consistency is absolutely essential for not only denture fabrication but also for denture retention and stability. When rehabilitating edentulous patients with complete dentures, the prosthodontist must give due attention to the nature of saliva the patient possesses as this can have a lasting effect on denture success.

References:

1. Humphrey SP, Williamson RT. A review of saliva: Normal composition, flow, and function. *J Prosthet Dent* 2001;85(2):162-9.

2. Mese H, Matsuo R. Salivary Secretion, taste and hyposalivation. *J Oral Rehabil* 2007;34(10): 711-23.
3. de Almeida PDV, Grégio AMT, Machado MÂN, de Lima AAS, Azevedo LR. Saliva Composition and Functions: A Comprehensive Review. *J Contemp Dent Pract* 2008;9(3):72-80.
4. Bergdahl M, Bergdahl J. Low unstimulated salivary flow and subjective oral dryness: association with medication, anxiety, depression, and stress. *J Dent Res*. 2000;79(9):1652-8.
5. Ettinger R L. Review: Xerostomia: A Symptom which acts like a Disease. *Age Ageing* 1996;25(5):409-12
6. Diaz-Arnold AM, Marek CA: The impact of saliva on patient care: A literature review. *J Prosthet Dent* 2002; 88(3):337-43.
7. Nanci A. In Ten Cate's Oral histology: Development, Structure and Function. 2009. 7th ed. Elsevier pp: 290-318.
8. Mandel ID. The functions of saliva. *J Dent Res* 1987; 66:623-7.
9. Lakhyani R, Wagdargi SS. Saliva and its Importance in Complete Denture Prosthodontics. *Nat J Integ Res Med* 2012;3(1):139-146.
10. Zarb GA, Bolender CL, Carlsson GE. Boucher's Prosthodontic Treatment for Edentulous Patients. 2001, 11th ed. Harcourt India Pvt Ltd.
11. Darvell BW, Clark RKF. The physical mechanisms of complete denture retention. *Br Dent J* 2000;189(5):248-52.
12. Turner M, Jahangiri L, Ship JA. Hyposalivation, xerostomia and the complete denture -A systematic review. *J Am Dent Assoc* 2008;139(2):146-50.
13. Chandu GS, Hombesh MN: Management of xerostomia and hyposalivation in complete denture patients. *Ind J Stomatol* 2011;2(4):263-6.
14. Basker RM, Davenport J C, Thomason J M. Prosthetic Treatment of the Edentulous Patient. 5th Ed. UK: Wiley Blackwell. 2001. Pg 232-34
15. Baker KA, Ettinger RL. Intra-oral effects of drugs in elderly persons. *Gerodontology* 1985;1:111-16
16. Turner MD, Ship JA. Dry mouth and its effects on the oral health of elderly people. *J Am Dent Assoc*. 2007; 138:Suppl 15S-20S
17. Gupta A, Epstein JB, Sroussi H. Hyposalivation in Elderly Patients *J Can Dent Assoc* 2006;72(9):841-6
18. Fox PC, van der Ven PF, Baum BJ, Mandel ID. Pilocarpine for the treatment of xerostomia associated with salivary gland dysfunction. *Oral Surg Oral Med Oral Pathol* 1986;61(3):243-8.
19. Toljanic JA, Zucuskie TG. Use of a palatal reservoir in denture patients with xerostomia. *J Prosthet Dent* 1984; 52(4):540-44.
20. Sinclair GF, Frost PM, Walter JD. New design for an artificial saliva reservoir for the mandibular complete denture. *J Prosthet Dent* 1996;75(3):276-80.

Corresponding Author:

Dr. Shabina Sachdeva,
 Assistant Professor,
 Department of Prosthodontics,
 Faculty of Dentistry,
 Jamia Millia Islamia,
 New Delhi -110025
 Email: drshabinasachdeva@yahoo.co.in