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PHYSIOLOGY AND COMPOSITION OF SALIVA AND ITS INFLUENCE IN PROSTHODONTICS- A REVIEW

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Abstract:

Saliva is a biologic fluid secreted from the salivary glands in the oral cavity performs various functions such as protection, digestion and lubrication. It is a necessary factor for adequate speech articulation. The environment of the oral cavity is to a large degree created and regulated by saliva. Any disorder and symptoms of any disease can be easily diagnosed from the abnormal secretion of saliva and function. Hence the knowledge of salivary glands, secretion and function is important. The aim of this article is to review the composition, functions and its influence in diagnosis and the prosthodontics implications.

Key words: *saliva, complete denture, xerostomia, reservoir.*

Introduction:

Saliva is a complex biological fluid that plays a very important role in maintaining the overall health of the oral cavity. Saliva is mainly derived from the major and minor salivary glands. The major salivary glands consist of three pairs of salivary glands such as parotid gland, submandibular gland and sublingual gland. The histologic structure and the secretion of each gland vary and the composition of the saliva varies from time to time, depending on such as secretion rate and the type of stimulus to the gland. The minor salivary glands are located throughout the mouth, in the lips, cheek, tongue and palate. Saliva keeps the mouth moist at all times aids in chewing, swallowing, phonetics and in tasting of food and also helps regulate the oral flora. Any alteration in quantity and quality of saliva can adversely affect the oral health balance lead to various problems. From dentist point of view, the salivary glands are of great importance both anatomically and physiologically. This article highlights the role of saliva in dentistry.

Salivary glands and its secretion:

Saliva is secreted mainly from the major exocrine glands such as parotid, submandibular and sublingual glands. In addition to these major glands, numerous minor salivary glands are distributed throughout the oral cavity in the lips, cheeks and tongue and palate. The secretion from the gland is carried into the oral cavity through their excretory ducts. The parotid gland excrete the saliva through stenson's duct which opens into the buccal mucosa opposite to the maxillary second molar. The submandibular gland through Wharton's duct at the sublingual caruncle attached to the lingual frenum. While the sublingual gland through bartholin duct at the sublingual fold in the floor of the mouth. The accessory glands empty through individual ducts in the various locations. Saliva is a mixture of two types of primary secretions, seroussecretion (thin and watery), and mucous

secretion (viscous, sticky). The parotid glands are considered to be serous type while the submandibular and sublingual gland are mixed glands that contain both serous and mucous secretory cells.[8]

There are two types of saliva is present. At rest without any stimulation, there is a small, continuous salivary flow named as unstimulated salivary secretion present in the form of a thin film that covers, moisturizes and lubricates the oral tissues and contributes to the bulk of secretion in the diurnal cycle. Unstimulated stimulated produced primarily by submandibular gland (60%). While the stimulated salivary flow is produced in case of any mechanical, gustatory and pharmacological stimulation. This stimulated saliva is produced by the parotid gland and contributes to the most of the daily salivary production.[6,11]

A healthy person mean daily production of salivary flow ranges from 1-1.5L. The salivary flow (SF) index is a parameter to classify the salivary flow as normal, low. In adults, total stimulated SF ranges from 1-3ml/min, while the unstimulated saliva ranges from 0.25 to 0.35 ml/min. Salivary flow less than 1ml for stimulated saliva and 0.1ml for unstimulated saliva termed as hyposalivation. The salivary flow initially formed inside the gland is isotonic with respect to plasma as it runs through the ducts it becomes hypotonic. Normally saliva has a pH ranges from 6.0-7.0.[3,11]

Composition and functions:

Saliva consists of approximately 99% water and containing a variety of electrolytes (sodium, potassium, calcium, chloride, magnesium, bicarbonate, and phosphate), digestive enzymes, immunoglobulins, antimicrobial factors, mucosal glycoproteins. It also contains nitrogenous products and glucose.

1. *Taste sensation*: the hypotonicity of saliva and its capacity to provide the dissolution of the substances allows the gustatory buds to perceive different flavours. Gustin a salivary protein appears to be necessary for the growth and maturation of gustatory buds.
2. *Digestion:* saliva is initially responsible for the initial digestion of food bolus. This action mainly due to the presence of the digestive enzyme ptyalin. Its function is to divide the starch into maltose, maltotriose and dextrins.[11]
3. *Protection and lubrication*: saliva forms a seromucosal covering that protects and lubricates the tissue. This occurs due to the presence of mucins responsible for protection, lubrication as well as it maintains the salivary viscosity. They selectively modulate the adhesion of microorganisms which control the bacterial and fungal colonization. In addition they protect tissues against microorganisms. Mastication, speech and deglutition are aided by the lubricant effects of these proteins.
4. *Dilution and cleaning*: the fluid consistency of saliva provides mechanical cleansing of the residues in the mouth such as non-adherent bacteria and food debris. Salivary flow tends to eliminate the excess carbohydrates thus limiting the availability of

glucose to the biofilm microorganisms. The greater the salivary flow, the greater the cleaning and diluting capacity.

5. *Buffer capacity*: saliva behaves as a buffer system to protect the mouth, by preventing colonization by potentially pathogenic microorganisms and also buffers and cleans the acids produced by acidogenic bacteria thereby preventing enamel demineralization. Sialin, a salivary peptide plays an important role in increasing the biofilm pH after exposure to fermentable carbohydrates. Urea is another buffer present in the saliva causes a rapid increase in biofilm by releasing ammonia and carbon dioxide when hydrolyzed by bacterial ureases. The carbonic acid bicarbonate system is the most important buffer in stimulated saliva and for unstimulated saliva serves as the phosphate buffer system.
6. *Integrity of tooth enamel*: saliva plays a fundamental role in maintaining the physical and chemical integrity of the tooth enamel by modulating remineralisation and demineralization.
7. *Antibacterial properties*: saliva contains a spectrum of immunologic and non-immunologic proteins with antibacterial properties. Secretory immunoglobulin (IgA) is the main immunologic component of saliva. It can neutralize viruses, bacterial and enzyme toxins. It serves as an antibody for bacterial antigens and is able to aggregate bacteria, inhibiting their adherence to oral tissues.

Non immunologic enzymes such as lysozyme, lactoferrin and peroxidase, mucin glycoproteins, agglutins, histatins, prolin rich proteins, statherins and cystatins.

Lysozymes responsible for hydrolyzing the cellular wall of bacteria, it activate the bacterial autolisines able to destroy the bacterial cell wall components.

Lactoferrin cause bactericidal effects on various microorganisms and also provides fungicidal, antiviral, anti-inflammatory functions.

Peroxidase offers antimicrobial activity.

Proline rich proteins inhibit the spontaneous precipitation of calcium phosphate salts and the growth of hydroxy apatite crystals on the tooth surface preventing the formation of salivary and dental calculus. It also prevents bacterial adhesion to the tooth surface.

Factors affect salivation:

Several factors influence the flow of saliva. They are:

Hydration:

The degree of hydration is the most important factor in salivary flow and also it varies with the individual.

Diurnal cycle:

Salivary flow attains its peak value at the end of the afternoon but goes down to zero during sleep. Salivary protein attains its peak value in the afternoon while sodium and

chloride occur at the beginning of the morning. In the summer lower volumes of salivary secretion while in the winter season there are peak volumes of secretion.[9,11]

Medications:

Drugs such as antidepressants, anticholinergic, anxiolytics, antihistamines, long term steroid therapy, radiation therapy, systemic disease such as sjogren syndrome, vitamin A&D deficiency, rheumatoid arthritis, uncontrolled diabetes, pernicious anemia causes decrease in salivary flow.

Emotions (thinking of food and stimulation): agreeable taste stimuli result in profuse stimulation, whereby thinking of distasteful stimuli can result in cessation of flow of saliva. Excitement, fright almost stopsgastrointestinal mobility and exocrine gland secretion.[1]

Prosthodontics implications:

Saliva play vital role in maintaining the overall health of the oral cavity in dentate individuals. In edentulous individuals, ie those who completely lost the teeth, depend upon artificial prosthesis to carry out their basic functions. For those individuals the quantity and quality of saliva is more important. Optimal salivary flow and quantity and quality of saliva is important not only in the fabrication of complete denture also in the retention, stability and support of denture.

Saliva plays an important role as a physical agent in the retention of complete dentures. The physical factors consist of: Adhesion, Cohesion, Surface tension, Capillary attraction and Atmospheric pressure.

Adhesion: It is the physical molecular attraction of unlike surfaces in close contact. It acts when saliva wets and sticks to the basal surfaces of dentures and at the same time to the mucous membrane of the basal seat. Effectiveness of adhesion depends upon close adaptation of denture base to the supporting tissues and fluidity of saliva.

Cohesion: It is the molecular attraction between two similar surfaces in close contact. It occurs in the layer of saliva between the denture base and mucosa.

Interfacial surface tension: It is the resistance to separation possessed by the film of liquid between two well adapted surfaces. It is found in the thin film of saliva between the denture base and the mucosa of basal seat.

***Capillary attraction*:** It is the force that causes the surface of liquid to become elevated or depressed when it is in contact with a solid. When the adaptation of denture base to mucosa on which its rests is sufficiently close, the space filled with a thin film of saliva acts like a capillary tube and helps retain the denture. Saliva as a physiological factor of retention affects the effectiveness of physical forces. The higher the viscosity occurring to the mucoid content, the lower the flow and greater is the fixation. Hence the mucous saliva provides better cohesion that serous saliva. But the presence of thick ropy mucous

saliva may compromise denture retention by creating negative pressure in the area anterior to the posterior palatal seal area causes dislodgement of denture.[5]

Patients affected with systemic diseases having inadequate salivary flow and xerostomia has a severe effect on wearing the dentures. For these patients, mastication, deglutition, phonation and wearing denture itself is difficult. Due to loss of salivary flow, there is no lubrication, cleansing action of saliva which causes frictional effect on the mucosa and denture will cause high irritation to the mucosa.

For above mentioned patients, salivary stimulation is induced by the artificial substitutes such as lemonades, lozenges, pilocarpine drugs, and salivary substitutes, sugar free gums like xylitol, artificial saliva gel, and salivary substitute mouth wash. Another approach is by providing salivary reservoirs in maxillary and mandibular dentures thereby injecting the artificial saliva in the reservoirs, it acts as a lubricating device.

After wearing a new denture, there is an increase in salivary secretion. Usually patients feel very discomfort because of the excess salivation. Dentist job is to explain the patient that dentures are interpreted as foreign objects, it stimulates the salivary gland to secrete more saliva. If the flow is excessive, the patient may complains of floating of dentures. The patient should be assured that this overactive flow of saliva is a normal reaction it will slowly decreases. Deglutition will be necessary to evacuate the excess saliva and patient advised to compulsive rinsing and spitting will be avoided, as it is unsettling of the dentures.[2]

For xerostomia patients, patient should wear the denture with medicated gel having increased salivary substitutes; this will reduce the ulceration and laceration of the mucosa. They should be asked frequent consuming of soft and moist foods.[7]

Practical application while making the impression:

- Excessive salivation due to sub mandibular and sublingual gland causes difficulty in impression making of complete dentures. Administration of drugs should be done before making impression.
- Excessive secretion from the mucous glands in the palate region causes distortion of the impression material. To counteract this problem, the palate may be massaged to encourage the glands to empty, the mouth may be irrigated with astringent and the palate may wiped with gauze.[1]

Conclusion:

Saliva is an oral fluid that plays a vital role in preserving and maintaining the overall health of the oral cavity. In dentulous and edentulous patients, the role of saliva is even more critical. Many oral and systemic conditions manifest themselves in the changes in the flow, quantity and quality of saliva. The dentist must pay attention to the nature of

saliva as the patient possess and it will be useful in predicting and diagnose the disease and also plan the treatment accordingly to provide a good prognosis.

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