ISSN: 0975-833X

Availableonlineathttp://www.journalcra.com

International Journal of Current Research
Vol. 11, Issue, 05, pp. 4093-4097, May, 2019

DOI: https://doi.org/10.24941/ijcr.35509.05.2019

INTERNATIONAL JOURNAL OFCURRENTRESEARCH

RESEARCH ARTICLE

PARTES SALIVA IN ORTHODONTICS

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ARTICLEINFO

Article History:
Received 03rd February, 2019
Received in revised form
22nd March, 2019
Accepted 26th April, 2019
Published online 30th May, 2019

Key Words:

Saliva,
Salivary gland.

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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 orthodontic implications.

***Citation: Dr. Gaurav Arya, Dr. Ashish Gupta, Dr. Gaurav Sharma, Dr. Suresh Sharma and Dr. Garvita Dubey,* 2019.** "Partes saliva in orthodontics", *International Journal of Current Research*, 11, (05), 4088-4092.

INTRODUCTION

Saliva is clear viscous fluid secreted by the salivary and mucous glands in the mouth. Saliva contains water, mucin, organic salts and the digestive enzyme ptyalin. It serves to moisten the oral cavity, to aid in the chewing and swallowing of food and to initiate the digestion of starch. Anatomy of Salivary Glands Salivary glands are defined as compound, tubuloacinar, merocrine, exocrine glands whose ducts open into oral cavity.

Classification of salivary glands

Salivary glands is classified as follows:

Salivary Secretion

Spontaneous: Occurs all the time, without any known stimulus. This keeps mouth moist all the time.

Stimulated: Occurs because of known stimulus; may be

- Psychological
- Visual
- Taste
- Others (during vomiting)

Salivary Flow

Under resting condition

- Anything above 0.1ml/min
- Slow flow of saliva - Keeps mouth moist and lubricates mucosa

Under stimulated condition

- Above 0.2ml/min with max 7ml/ min
- During sleep—Nearly zero

Applied aspects of saliva in orthodontics

Saliva and Bonding

- Saliva is detrimental to adhesive bonding.
- Salivary contamination during acid etching or actual bonding procedure jeopardizes the chance of a successful bond through precipitation of salivary proteins, which

may physically clog and/or chemically react with the etched enamel surface
- Ever changing influence of saliva in bonding procedure with advent of new generation of bonding agents, primers.
- Bond strengths of brackets bonded to contaminated and uncontaminated enamel following pretreatment of contaminated enamel with Scotch bond MP (multi-purpose) bonding system.
- Bond strengths were found to be equal in brackets bonded to saliva contaminated etched enamel treated with Scotch Bond MP primer and bonding agent applied to uncontaminated enamel[5].
- The primer composed of Hydroxy Ethyl Methacrylate and polyalkeonic copolymer behaves similar to the liquid of glass ionomer in that it forms stronger bonds to a moistened enamel or dentin surface.

Fluid absorbents

- Isolation achieved by absorption of salivary secretions.
- Can be used for short periods when absolute dryness is not required (Öztoprak, 2007)
- Cotton rolls with holders
- Gauze or throat shields
- Absorbent wafers
- Dri-Angle

Saliva ejectors (Kumar, 1976)

Prevent pooling of saliva in the floor of the mouth.

- Types
- High volume
- Low volume
- Based on the material from which they are
- manufactured[8]
- Metallic
- Plastic

Rubber Dam (Liebenberg, 1993)

- Provides a clean, visible field
- Prevents aspiration of foreign bodies
- Reduces risk of cross contamination.
- Improves properties of adhesive materials.

Indications

- Molar Banding
- Bonding procedures
- Debonding procedures
- Bonding lingual retainers

Contraindications

- Patient with upper respiratory tract infection
- Asthmatics
- Allergy to latex
- Partially erupted tooth.

Anti-sialogogues (Brandt, 1981)

- Decrease salivary release from glands & ducts
- Atropine sulphate- In JCO-1981 Sidney Brant showed this is a safe drug with least complications & can be used as an sublingual injection
- Dose-0.4 mg
- Banthine tablets –In JCO 1981 Carter RN reported that 50 mg per 100 lb in a sugar free drink 15 min before bonding is adequate. Saliva and Friction (Baker, 1987; Stannard, 1986; Ireland, 1991; Riley, 1979; Pratten, 1990; Kusy, 1991)
- The influence of saliva on the observed friction in an orthodontic system seems quite elusive.
- Baker *et al*. observed decreased friction in presence of artificial saliva
- Stannard JG *et al*. have shown increased friction in presence of artificial saliva
- Ireland AJ *et al*. and Riley JL *et al*. have shown no significant differences between wet and dry conditions
- At low loads saliva may act as a lubricant, but at high loads saliva may increase friction if it is forced out from the contacts between the brackets and the arch wire. In the latter situation, saliva may produce shear resistance to sliding forces.
- Kusy has shown that, when saliva is present, frictional forces and coefficients may increase,
- decrease, or not change depending on the arch wire alloy tested.
- In the wet state, the kinetic coefficients of the all stainless steel combinations increased up to 0.05 over the dry state.
- In contrast, all beta-titanium wire combinations in the wet state decreased to 50% of the values in the dry state.
- The composition of the saliva appears important with regard to ceramic brackets; in artificial saliva the friction increased whereas in human saliva it decreased.
- Salivary clearence and fixed appliance[17]
- Since fixed appliances have numerous recesses, pits, which entraps the food particles, oral clearance rate is slowed

Salivary pellicle on orthodontic appliance (Ahn, 2002)

- Knowledge of salivary pellicles on orthodontic brackets provides a better understanding of microbial adherence.
- In a study by Ahn SJ *et al* the authors showed that low-molecular-weight mucin, alpha-amylase, secretory IgA, acidic proline-rich proteins, and cystatins adhered to all kinds of brackets, though the amino acid composition of pellicles differed between bracket types.
- Collectively, salivary pellicles were found to play a significant role in the initial adhesion of oral streptococci to orthodontic brackets.
- Least amount of salivary pellicle which was cariogenic was found on stainless resin, followed by adhesive resin, highest amount of cariogenic pellicle was found on elastomers. Saliva and orthodontic elastics (Andreasen, 1970; Tong Wanga, 2007; Ferriter, 1990)
- Tong Wanga *et al* evaluated the characteristics of force degradation of latex elastics in clinical applications and in vitro studies.
- At 24- and 48-hour time intervals, the force decreased during in vivo testing and in artificial saliva, whereas there were no significant differences in dry room conditions.

According to size of the glands	According to histo-chemical nature of secretion	According to position
Major	Serous	Extraoral
Minor	Mucous	Intral oral
	Mixed	

Major Salivary Glands	Minor Salivary Glands
Parotid Gland	Labial and buccal glands
Submandibular Gland	Glossopalatine glands
Sublingual Gland	Palatine glands
	Lingual glands

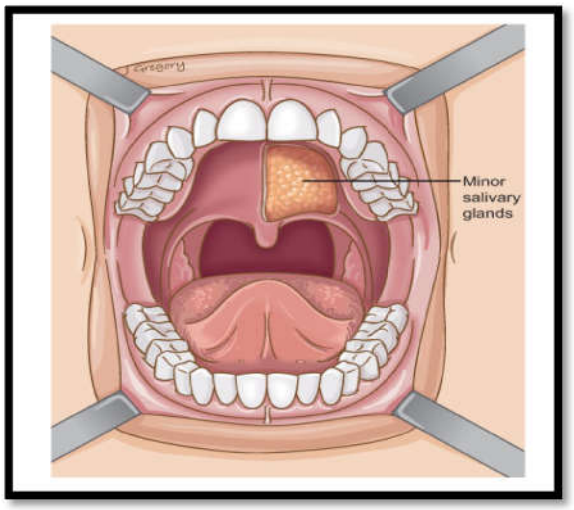


Figure 1. Minor salivary gland

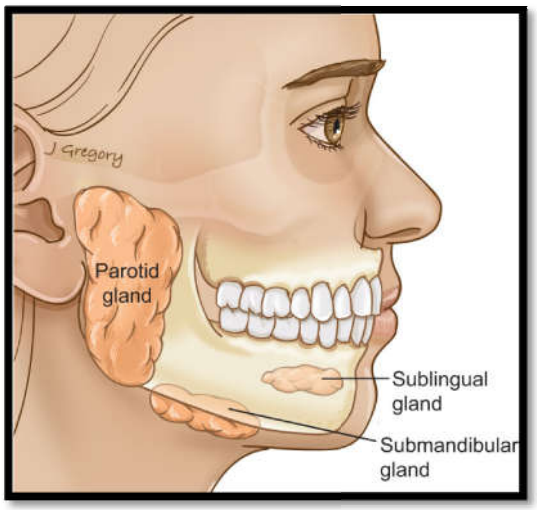


Figure 2. Major salivary gland

Nerve to gland stimulated

⇩

Release of neurotransmitters

⇩

Binding of NT on external surface of membrane

⇩

Receptors on External membrane

⇩

Guanine nucleotide dependant membrane protein (G-protein)

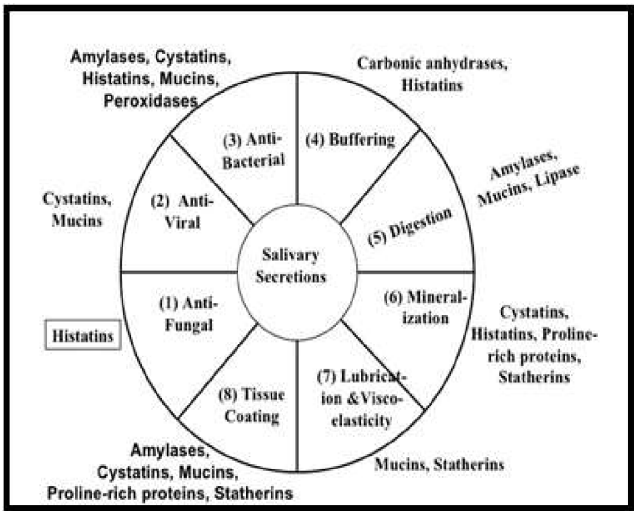
Phospolipase C ← Regulatory Enzyme → **Adenyl cyclase**

Properties of Saliva

1.Colourless
2.Volume :- 1000 – 1500 ml per day
3.Reaction:- In healthy individuals varies between 6.0-7.5
4.Specific gravity:- 1.002-1.012
5.Tonicity-: Hypotonic as compared to plasma

Organic substances	Inorganic substances	Gases present in saliva
Salivary protein – mucin and albumin	Sodium	Oxygen – 1 ml
Salivary enzymes – amylase (ptyalin) maltase, lipids, lysozyme, phosphatase, lactoferrin, sialoperoxidase and carbonic anhydrase	Potassium	Carbondioxide – 50 ml/10ml
Blood component and blood derivatives –antigens, serum cells, gingival cervicular fluid (GCF)	Chloride	Nitrogen – 2.5 ml
Kallikrein	Calcium	
Immunoglobulins – IgA, IgG, IgM	Bicarbonate	
Non protein nitrogenous substances – urea, uric acid, creatine, xanthine, hypoxanthin etc.	Fluoride	
Free amino acids	Bromide	
Glycoproteins and proteoglycans	Thyocynate and Phosphate	

Function of Saliva



- In a study by Ferriter JP *et al*. the authors concluded that force decay rate of polyurethane
- orthodontic chain elastics is inversely proportional to the pH of oral environment
- The pH levels of 4.85 to 7.26 are more hostile to the polyurethane chain elastics thus increasing their force decay rates.

Saliva and Corrosion (Matos de Souza, 2008)

- Saliva acts as an electrolyte and hence aids in causing corrosion of metal components of fixed orthodontic appliances
- Orthodontic alloys emit electro-galvanic currents with saliva as the medium, leading to a release of metal ions.
- The discharge of nickel ions, a strong immunologic sensitizer may result in hypersensitivity, contact dermatitis, asthma, and cytotoxicity.
- Matos de Souza R *et al* assessed the in vivo release of nickel, chromium, and iron ions into saliva by different metallic brackets.
- Nickel and chromium ion concentrations increased immediately after placement of the appliance in the mouth for all study groups.

Morphological parameters of the saliva in patients undergoing orthodontic treatment

- Orthodontic patients develop changes in the composition and morphology of salivary cells, the intensity of which depends on the time of exposure to the appliance.
- The longer the treatment continues, the slighter the metal-induced histo-pathological changes; this inturn suggests that mechanisms of oral tolerance might develop.

Saliva and Caries (Axelsson, 1990)

- The pH of saliva acts as a deciding factor, be it demineralization and induction of carries or remineralization.

Barrier control for saliva (Moawad, 1988): The objective of barrier control is to eliminate cross-contamination. Barriers are the most effective way to control cross-contamination and reduce the number of microbes in the orthodontic office.

Include

- Gloves
- Masks
- Protective clothing,
- Protective eyewear
- Surface coverings,
- Disposable materials.

Conclusion

Saliva is probably the most important environmental factor affecting the performance of the orthodontic appliances, affecting their success or failure. Understanding the role of saliva in various pathological processes as well as orthodontic procedures can go a long way in improving the quality of treatment.

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