

Comparative evaluation of effect of complete denture wears on the flow rate of saliva in both medicated and apparently healthy patients

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Abstract

Aim and Objectives: In the denture wearing people, saliva is necessary to create adhesion, cohesion, and surface tension that ultimately leads to the increased retention of the denture. Medications have some influence on the flow rate of saliva and denture retention. The present study evaluates the effect of complete denture wear on the flow rate of saliva in both medicated and apparently healthy patients. **Materials and Methods:** The participants were 42 edentulous individuals aged 35–70 years requiring complete denture prostheses. The participants were divided into two groups of medicated and unmedicated. Unstimulated whole saliva was collected at 24 h and 3 months after the insertion of new complete dentures in both the groups. The data obtained were analyzed using Student's paired *t*-test and unpaired *t*-test. Intergroup changes were compared with unpaired *t*-test. Intragroup changes were compared with paired *t*-test using the Statistical Package for Social Sciences, version 22.0. **Results:** In the unmedicated group, the mean salivary flow rate was high at 24 h after denture insertion when compared to before denture insertion ($P = 0.001$ VHS). In the medicated group, the observation was highly significant ($P = 0.007$ HS) 24 h after denture insertion and after 3 months ($P = 0.02$ S) when compared to before denture insertion. **Conclusion:** No significant difference in the salivary flow rate was found 3 months after denture insertion when compared to before denture insertion for both the medicated and unmedicated groups.

Key words: Complete denture flow, medication, unmedicated, saliva

INTRODUCTION

Among some of the common problems of the elderly people that leave a significant impact on their life are edentulism, xerostomia, and salivary gland hypofunction.^[1]

There are various factors, including saliva, that aid in the proper functioning of removable complete denture and increase their longevity, which may be influenced by a number of variables, as classified by Hardy and Kapur.^[2]

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Normally, dentures do not rest on the bare mucosa but on the interposed salivary film. The functions of this film include protection of tissues from forces of the denture base and hydration of these tissues so that the prosthesis can rest on this layer rather than directly on oral tissues. Soreness and ulceration in the denture-bearing tissues, decreased denture retention, burning sensation, alteration in taste perception, and difficulty in mastication and swallowing are among the problems encountered in xerostomia patients.

There are several methods of determining flow rate, such as unstimulated or stimulated saliva, whole saliva, and saliva from individual glands, and there are different views on their clinical values. Saliva flow is termed unstimulated when no exogenous or pharmacological stimulation is present, and is termed stimulated when secretion is promoted by mechanical or gustatory stimuli or pharmacological agents.^[3]

Approximately 70% of resting whole saliva is derived from submandibular/sublingual glands, approximately 15–20% from parotid, and 5–8% from minor glands. In stimulated conditions, 40–50% of whole saliva comes from parotid and from submandibular and sublingual glands and smaller amounts from minor glands. The accepted range for very low, low, and normal unstimulated whole salivary flow rate are less than 0.1, 0.1–0.2, and >0.2 ml/min, respectively.^[4,5]

According to Peltola,^[6] new complete dentures do not change unstimulated whole salivary flow rate significantly, whereas Yurdukoru^[3] found that unstimulated whole salivary flow rates immediately after denture insertion were >1.5–2 times higher compared to preinsertion values in experienced complete denture wearers.

The role of systemic disorders and xerogenic medication on the onset of salivary gland hypofunction has been investigated. Several studies have associated medications with decreased salivary flow.^[2,4,7-11] Other studies have reported salivary flow being independent of associated medications.^[6]

Very few reports are available regarding the effect of dentures on salivary flow and the effect of medications on the rate of salivary flow in denture wearers. Hence, this study was conducted to evaluate and compare the effect of complete denture wear on the flow rate of saliva in both medicated and apparently healthy patients.

MATERIALS AND METHODS

The following armamentarium were used in the study; mouth mirror, explorer, graduated cylindrical beaker, and distilled water [Figure 1]. Forty-two samples were selected out of 200 from the Outpatient Department (OPD) of Prosthodontics at the 95th confidence level with a confidence interval of 13.47. Forty-two participants with equal number of medicated and nonmedicated were selected from OPD who met the selection criteria.

Subject selection

A brief health history about the patient’s systemic health and the present medication was recorded. Patients who were taking analgesics, angiotensin-converting-enzyme inhibitors, antihypertensive, oral hypoglycemic, etc., were shortlisted for the medicated group because these drugs reduce salivary flow [Table 1], whereas the nonmedicated group consisted of those individuals who were not taking any medicine that could alter salivary flow. A reference guide was used to identify medications with antisialogogue effect.^[12] Patients who were tobacco users, had undergone radiotherapy, chemotherapy, surgery of salivary glands, without salivary glands,



Figure 1: Armamentarium used in the study

Table 1: Individual drugs and their effect on salivary flow

Name of the medication	Effect
Oral hypoglycemic drugs	Associated symptoms with reduction of salivary flow
ACE inhibitors	Inhibition of enzyme cause accumulation of bradykinin resulting in dry mouth
Anti cholinergic drugs	Immediate release oxybutanin
Skeletal muscle relaxants	Reduction in salivary flow
Benzodiazapines, hypnotics and opioids	Decreasing fluid secretion and amylase release

and who had previously worn partial dentures were excluded from the study.

The patients were grouped as the unmedicated and medicated group. Unmedicated group consisted of apparently healthy, completely edentulous 6 male and 15 female patients aged between 35 and 70 years. The mean age was 60 years; the participants were not under any medications having antisialogogue effect.

The medicated group consisted of 21 (10 males, 11 females) completely edentulous patients aged between 28 and 77 years. The mean age was 58 years. The participants of this group were taking medications having antisialogogue effect. Institutional ethics committee approval and informed consent was taken from the selected patient groups. The study was conducted by a single trained investigator. The study was conducted in the Department of Prosthodontics, Awadh Dental College and Hospital, Jharkhand, India from March 2012 to August 2012.

Collection of saliva

Saliva samples were collected from each participant on three different occasions:

1. Before denture insertion,
2. 24 h after denture insertion, and
3. 3 months after denture insertion.

Patients were instructed not to eat or drink anything 2 h prior to the saliva collection. The patients did not receive their medication until after the collection of saliva. During the initial visit, unstimulated whole saliva was collected from all the patients and measured.

Method of collection of saliva

Unstimulated whole saliva was collected under standardized conditions between 9–11 AM using the spitting method, which is simple, reproducible, and efficient.^[13] The patients were seated upright comfortably, with eyes wide open and head tilted down to avoid postural changes. They rinsed their mouth for 5 s with 5 ml distilled water. Following the spitting out of the water and the initial swallow, whole saliva was collected by spitting into a beaker every 30 s for 10 min.^[3] Rinsing and initial spitting out was necessary to remove food debris and other nonsalivary elements that could stimulate salivary flow or interfere with the accurate measurements of the flow rate.^[13] Unstimulated whole saliva was collected in a similar manner 24 h and 3 months after the insertion of new complete dentures.

The amount of saliva collected was then determined volumetrically and the flow rate was calculated based on the sample collection time and was expressed in ml/min. The data obtained were analyzed using Student's paired *t*-test and unpaired *t*-test. Intergroup changes were compared with unpaired *t*-test. Intragroup changes were compared with paired *t*-test using the IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.

RESULTS

Mean for the salivary flow rate was the lowest before denture insertion and was highest 24 h after denture insertion. The difference between the means before and 3 months after denture insertion was minimal [Table 2]. The mean for the salivary flow rate was the lowest before denture insertion and was highest 24 h after denture insertion. The difference between the means before and 3 months after denture insertion was minimal [Table 3].

The medicated group had a lower salivary flow rate compared to the unmedicated group at all the 3 time intervals (before, 24 h later, and 3 months later), however, the difference was not statistically significant ($P = 0.614, 0.722, 0.545$, respectively) [Table 4]. In the unmedicated group, the difference between the means before and 24 h after denture insertion was negative, that is, the mean salivary flow rate was high 24 h after denture insertion when compared to before denture insertion, and the difference was statistically very highly significant ($P = 0.001$ very highly significant (VHS)) [Table 5].

In the medicated group, the observation remained the same, however, the difference was not very highly

Table 2: Mean and standard deviation of the salivary flow rate in the unmedicated group

Group	Mean	Standard deviation
Before denture insertion	0.2414	0.16034
24 hrs after denture insertion	0.3568	0.14440
3 months after denture insertion	0.2600	0.13209

Table 3: Mean and standard deviation of the salivary flow rate in the medicated group

Group	Mean	Standard deviation
Before denture insertion	0.2130	0.20155
24 hrs after denture insertion	0.3275	0.35351
3 months after denture insertion	0.2285	0.19861

Table 4: Inter group comparison of the salivary flow rate between the medicated and the unmedicated group

Group	Sub group	Mean	Standard deviation	P
Before denture insertion	Un medicated (n=22)	0.2414	0.16034	0.614 NS
	Medicated (n=20)	0.2130	0.20155	
24 hours after denture insertion	Un medicated (n=22)	0.3568	0.14440	0.722 NS
	Medicated (n=20)	0.3275	0.35351	
3 months after denture insertion	Un medicated (n=22)	0.2600	0.13209	0.545 NS
	Medicated (n=20)	0.2285	0.19861	

Table 5: Intra group comparison of differences between the means of salivary flow rate in the unmedicated and the medicated groups

	Paired differences		P
	Mean	Standard deviation	
Group (unmedicated)			
Before denture insertion	1154	0.13761	0.001 VHS
24 hours after denture insertion	0.0186	0.05889	0.154 NS
3 months after denture insertion	0.0968	0.11470	0.001 VHS
Group (medicated)			
Before denture insertion	0.1145	0.16891	0.007 HS
24 hours after denture insertion	0.0155	0.04763	0.162 NS
3 months after denture insertion	0.0990	0.17511	0.02 S

significant. It was highly significant ($P = 0.007$ highly significant (HS)) 24 h after denture insertion and after 3 months ($P = 0.02$ S) when compared to before denture insertion, and was significant after 3 months of denture insertion when compared to 24 h after denture insertion.

DISCUSSION

The presence of saliva is essential for the maintenance of health and functions of the oral tissues. Xerostomia or dry mouth can be a symptom of certain diseases caused by certain medications, such as oral hypoglycemic, which are commonly taken by elderly people.^[1] Reduction of salivary output results in a rapid deterioration of oral health, difficulty in mastication, and swallowing.^[5] The various causes for reduction in the salivary flow have been attributed to age, medication, temperature changes, stress, salivary gland hypofunction, etc.

Even though literature proves the significance of secretion from individual major salivary glands and palatal glands, it was preferable to measure the produced whole saliva. The disadvantage of measuring from individual glands is that typically only one of the six major salivary glands is measured. In addition, the minor glands are not evaluated. Because salivary glands during most of the 24 h function at a basal rate, unstimulated saliva seemed to be the most logical and relevant flow to assess. Whole saliva is easy to collect and it also represents the status of the oral cavity as well as the entire body; hence, whole unstimulated saliva was used for this study.^[14]

The mean unstimulated salivary flow rate before the denture insertion, 24 h after denture insertion, and 3 months after denture insertion for unmedicated group and medicated group were in the prescribed range of 0.1–0.5 ml/min.^[15]

The results revealed that the mean whole salivary flow rate, when compared between 3 months of complete denture placement to 24 h after complete denture placement, decreased significantly in the unmedicated and medicated group, which was consistent with the study reported by Muddugangadhar *et al.*^[16] An increase in mean whole salivary flow rate was noted 24 h after complete denture placement as compared to before denture placement for both the unmedicated and medicated groups. This statistically significant increase in the mean unstimulated salivary flow rate 24 h after denture insertion is in agreement with similar studies conducted by Yurdukuru^[3] who reported that unstimulated whole salivary flow rate immediately after denture insertion was 1.5 to 2 times higher compared to the preinsertion values.

The probable reason could be the stimulation of the mucous glands in the posterior third of the palate because of denture coverage, causing increase in salivary secretion. Landa suggested that the etiology for hypersalivation, apart from new dentures acting as a foreign body, thereby stimulating the salivary glands, could be psychological with patients being anxious of the possible failure of their dentures or it could be denture-related inaccuracies such as incorrect jaw relation registrations, excessive vertical dimension, pain and pressure upon the nerves, and their terminal ramification.^[17]

This study also indicates that there was a significant decrease in the flow rate when compared between 24 h after denture insertion and 3 months after denture insertion. The probable reason could be the fact that the salivary glands need to accommodate to the presence of new dentures, and the production of saliva

would eventually return to normal following salivary gland adaptation. Eventual atrophy of the gland with contractual fatigue would then reduce the mucous secretion to an acceptable level.^[14]

The results also indicate that there is no statistically significant increase in flow rate before treatment and at follow-up after 3 months these results are in agreement with a similar study conducted by Peltola *et al.*^[6] The probable reason for this fact is the salivary gland adaptation to the new denture and the reported improved patient satisfaction with better fitting as well as the acceptable occlusion of the dentures. Another reason supporting this fact is the apparent vulnerability of salivary glands to impaired mastication, as seen in a complete denture wearer.^[4]

The results of this study also indicate that patients who were taking medication had a lower unstimulated salivary flow rate than those not taking any medication, however, the difference was not statistically significant. These results are in contrast to certain earlier studies done by Navazesh *et al.*^[7] as well as the current opinion regarding medication and salivary production. In part, the reason for the differences with earlier workers may be attributed to the random time of collection of the sample, type of sample, method of collection, drug dosage, and frequency of drug intake. In addition, because the spitting method involves some muscular effort, an accurate measurement of whole saliva is difficult. Further, it is very difficult to draw any conclusion regarding the function of individual gland types from whole saliva.

Limitations of the study

- Time of collection was not specific, and there is a diurnal variation in salivary flow rate
- There is individual variation in salivary flow rates. High saliva producers will respond with larger increase in salivary flow following denture wear in comparison to low saliva producers
- Sample size was small. A larger sample size could give statistically significant result
- It is practically difficult to obtain true unstimulated saliva because flow is always influenced by some kind of stimulation.

CONCLUSION

No significant difference in the salivary flow rate was found 3 months after denture insertion when compared to before denture insertion for both the medicated and unmedicated groups.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Turner M, Jahangiri L, Ship JA. Hyposalivation, xerostomia and the complete denture: A systematic review. *J Am Dent Assoc* 2008;139:146-50.
2. Hardy IR, Kapur KK. Posterior border seal-Its rationale and importance. *J Prosthet Dent* 1958;8:386-97.
3. Yurdukuru B, Terzioğlu H, Yilmaz T. Assessment of whole saliva flow rate in denture wearing patients. *J Oral Rehabil* 2001;28:109-12.
4. Sreebny LM. Saliva in health and disease: An appraisal and update. *Int Dent J* 2000;50:140-61.
5. Anil S, Vellappally S, Hashem M, Preethanath RS, Patil S, Samaranyake LP. Xerostomia in geriatric patients: A burgeoning global concern. *J Investig Clin Dent* 2016;7:5-12.
6. Peltola MK, Raustia AM, Salonen MA. Effect of complete denture renewal on oral health – A survey of 42 patients. *J Oral Rehabil* 1997;24:419-25.
7. Navazesh M, Brightman VJ, Pogoda JM. Relationship of medical status, medications, and salivary flow rates in adults of different agents. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1996;81:172-6.
8. Nagler RM, Hershkovich O. Relationships between age, drugs, oral sensorial complaints and salivary profile. *Arch Oral Biol* 2005;50:7-16.
9. Takeuchi K, Furuta M, Takeshita T, Shibata Y, Shimazaki Y, Akifusa S, *et al.* Risk factors for reduced salivary flow rate in a Japanese population: The Hisayama study. *BioMed Res Int* 2015;2015:381821.
10. Krunić J, Stojanović N, Ivković N, Stojić D. Salivary flow rate and decayed, missing, and filled teeth (DMFT) in female patients with schizophrenia on chlorpromazine therapy. *J Dent Sci* 2013;8:418-24.
11. Al-Dwairi Z, Lynch E. Xerostomia in complete denture wearers: Prevalence, clinical findings and impact on oral functions. *Gerodontology* 2014;31:49-55.
12. Ciancio SG. Medications' impact on oral health. *J Am Dent Assoc* 2004;135:1440-8.
13. Navazesh M, Christensen CM. A comparison of whole mouth resting and stimulated salivary measurement procedures. *J Dent Res* 1982;61:1158-62.
14. Wang SL, Zhao ZT, Li J, Zhu XZ, Dong H, Zhang YG. Investigation of the clinical value of total saliva flow rates. *Arch Oral Biol* 1998;43:39-43.
15. Niedermeier WHW, Krämer R. Salivary secretion and denture retention. *J Prosthet Dent* 1992;67:211-6.
16. Muddugangadhar BC, Sangur R, Rudraprasad IV, Nandeeshwar DB, Kumar BH. A clinical study to compare between resting and stimulated whole salivary flow rate and pH before and after complete denture placement in different age groups. *J Indian Prosthodont Soc* 2015;15:356-66.
17. Landa JS. Trouble shooting in complete denture prosthesis: Part IX. Salivation, stomatopyrosis and glossopyrosis. *J Prosthet Dent* 1961;11:244-6.