



Distribution of Microbial Plaque on Intaglio Surfaces of Maxillary Removable Complete Denture: A Cross Sectional Study

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ABSTRACT

Aim: To assess the dispersion of prosthetic microbial plaque on intaglio planes of removable completely edentulous denture.

Study Design: Descriptive Cross Sectional

Place and Duration of Study: Department of Prosthodontics, Liaquat Medical University Hospital from December 2107 to November 2018.

Methodology: The maxillary removable complete dentures were collected from the 62 patients. The inner sides of the maxillary prosthesis remained revealed with 1% neutral red solution. These internal sides stayed at that point captured with an advanced camera. Natural plaque scattering on the inner layer of the denture was inspected by calculating plaque layering the subsequent definite zones of the denture inner layers: The fitting layer of the maxillary prosthesis was divided into 14 zones. Biofilm was enumerated in all of the 14 assessed zones by a visual analogue scale. The data was analyzed by SPSS version-16. Independent t test and Anova test were applied for statistical difference of plaque score.

Results: Males and females were 48% and 52% respectively. The mean age was 56.48 ± 7.176 . The mean plaque score on intaglio surface was 1.912 ± 0.468 . The Vestibular inclination of the

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right labial flange (areas 4) had the highest biofilm growth 19% tailed by palatal inclination, frontal portion of the right buccal flange (area 8) 18%, vestibular inclination of the left labial flange (area 3) 14% and palatal inclination, front portion of the left buccal flange (area 11) 11%. There was no statistical difference between gender and plaque score.

Conclusion: The Vestibular slope area of the right labial flange had the greater growth of plaque shadowed by Palatal slope space, frontal zone of the right buccal extension area, Vestibular slope area of the left labial extension and slope of palate area, front zone of the left buccal extension.

Keywords: Dental plaque; bio-film; prosthesis; dentures.

1. INTRODUCTION

Throughout the world life eagerness increases the figure of old age group, which ultimately progresses the number of completely edentulous patients and greater count of appliances wearers [1,2]. Regardless of altering demographics, in coming century treatment of completely edentulous old patients is suspected to be a main portion of treatments in dental practice [3].

Wearing a maxillary complete denture forms an acidic room in between the palatal portion and inner surface of the prosthesis. As saliva did not reach the fitting surface of the prosthesis sufficiently, denture plaque film starts to accumulate easily on inner surface of denture if patient fails to maintain denture clean sufficiently [4,5]. That denture plaque present on the inner surface of prosthesis consists of gram positive and streptococci microorganisms [6].

Insufficient cleanliness of prosthesis results due to underprivileged leadership, the constructive properties of prosthesis, and poor handiness of old aged patients [3,4]. Plaque grows on prosthesis due to insufficient cleanliness, which in turn results many local and general infections [3-5]. Therefore, maintaining prosthesis hygiene is of top significance as to avoid or cure infections in completely edentulous patients [1,2].

By using suitable methods, it is essential to diminish the biofilm layer on prosthesis as one can live with sound mucosa topographic spreading of plaque on prosthesis for completely edentulous condition is a significant part to be measured in oral cleanliness and structural topographies of the base effect the retaining of debris [7].

Therefore, educating the patients about the sides of maximum plaque accumulation will result in less probabilities of poor denture hygiene from patient side [6,8]. As prosthesis biofilm is translucent, it needs to be stained as one can see it and for this situation, the significance of

unveiling colorants is obvious. These disclosing colorants can be utilized for representing cleanliness, and assessing denture plaque controller for complete denture wearers [6,9,10]. By using suitable methods one can resist growth of bacterial film on dentures and preserve the health of mucosa, for this resolution this study is designed to occur to evaluate the spread of plaque on fitting surface of prosthesis for completely edentulous patients. The purpose is to assess the dispersion of prosthetic microbial plaque on intaglio planes of removable completely edentulous denture. By getting results of this study we can highlight the necessity of teaching programs for completely edentulous prosthesis in dental training, as most of the people will require prosthesis for their missing teeth and it will help patients to remove plaque not only on fitting part of oral cavity, but also on the planes of dentures to maintain their oral hygiene as well as denture hygiene.

2. MATERIALS AND METHODS

This study was conducted in the Dental section of Prosthodontics; Liaquat University of Medical and Health Sciences Jamshoro from December 2107 to November 2018. The Epitool online calculator was used to determine the sample size to estimate a single mean with specified precision. By taking the values of assumed population standard deviation (the average proportion of space sheltered with microbial biofilm of the total area of the denture fitting surface) 8.4 at 95% confidence interval with desired precision of 2, the total sample size calculated was 62. The patients were nominated by a non-probability consecutive sample method. The inclusion criteria were set as, patients wearing maxillary complete dentures constructed by heat-cure acrylic resin, patient must wear denture for at least one year, both genders and a generalized healthy condition. The exclusion criteria were set as; prosthesis made for completely edentulous patients constructed by self-cured acrylic resin, flexible removable

complete dentures, cast complete denture, handicapped, mentally and psychological ill patients, self-cured/ short term re-liner dentures and night wearers.

2.1 Data Collection Procedure

To ensure the quality of research, the participants were informed of the procedure and on paper knowledgeable agreement was taken from the patients. The study members were assured that their identification will not be disclosed at any stage and their information will be used for education and research simply.

Demographic data was recorded and the maxillary removable complete dentures were collected from the patients. The fitting surface of upper prosthesis was unveiled with 1% neutral red solution. After that the denture sides were photographed with an advanced camera with flash (Canon EOS Digital Rebel EF-S18-55, Canon MR-14EX, Canon Inc., Tokyo, Japan) with standard film-object distance and exposure time, and the camera fixed on a stand (CS-4 Copy Stand, Testrite Inst. Co., Inc., Newark, NJ) before and after staining.

Structural plaque scattering on the inner zones of the denture was inspected by assessing microbial biofilm layering the subsequent detailed parts of the prosthesis inner zone: The fitting surface of the maxillary prosthesis was divided into 14 zones. Microbial plaque was calculated in all of the 14 estimated zones by the help of visual analogue scale. Recording method was followed as: 0 – absence of plaque; 1 – quarantined plugs; 2 – site reporting biofilm less than partial; 3 – covering of half to greater zone; 4 – site entirely enclosed with noticeable plaque.

All the collected data was recorded in the proforma. Afterward the utilize of each strategy and evaluation, the microbial plaque was evacuated by scrubbing with a particular brush for prosthesis and fluid cleanser. The figures was analyzed by SPSS version-16. All the quantitative variables like age, time period of denture insertion and plaque score were presented as mean and standard deviation. All the qualitative variables as gender, distribution zones were calculated as frequency and percentage. Independent t test was applied gender and plaque score. Anova test was applied between age groups and plaque score at 95% confidence interval.

3. RESULTS

In this study males and females were 48% and 52% respectively. Majority of patients were Poor 74%, followed by Middle class 24% and high class 2%. Educated and uneducated patients were 42% and 58% respectively. Time period of denture usage was categorized as 2-5 Years 53%, 6-10 years 43% and above 10 years 3.23%. The mean age was 56.48 ± 7.176 . The mean plaque score on intaglio surface was 1.912 ± 0.468 (Table-1).

The Vestibular incline of the right facial extension (areas 4) had the highest microbial film growth 19.35% followed by slopes of palate, frontal segment of the right buccal extension (area 8) 17.8%, Vestibular inclination of the left facial extension (area 3) 14.5% and slopes of palate, frontal segment of the left buccal extension (area 11) 11.3% (Fig.1).

When the plaque score was compared in gender by applying Independent t-test, the males showed less plaque score than females which is statistically in-significant (Table-2).

The plaque score was highest 2.495 ± 0.502 in the patients who were using dentures more than ten years, which is statistically in-significant (Table-3).

4. DISCUSSION

Demineralized plaque layer present on prosthesis is transparent in color, hence difficult to visualize. Labeling and revising its qualitative and quantifiable features in prosthesis for completely edentulous patients need accurately-located inspecting but determination criteria have not however been well characterized. For better management and precautionary approaches for completely edentulous patients, it is essential to discover the numerous denture plaque growth areas on complete denture internal layers.

This study has examined the intaglio layer of upper prosthesis for completely edentulous patients. This study discovered that more microbial film grows on the labial zone (19%) of the denture internal layer than on the outer (18%) and palatal areas (15%). This is not in contract with the study results of Abi Nader S [11]. The difference in results might be due to structural and morphological changes in upper and lower jaw, upper jaw morphology favours the plaque

Table 1. Descriptive statistics of demographic characteristics

Characteristics	Frequency	Percent (%)
Gender		
Male	32	51.6
Female	30	48.4
Socioeconomic status		
Poor = < 20000/=	46	74.2
Middle Class= 20-35000/=	15	24.2
High Class = > 35000/=	1	1.6
Education Level		
Educated	26	41.9
Uneducated	36	58.1
Duration of Denture Usage		
2-5 Years	33	53.2
6-10 Years	27	43.5
> 10 Years	2	3.2
Characteristics	Mean	SD
Age	56.48	7.176
Plaque score	1.91	0.468

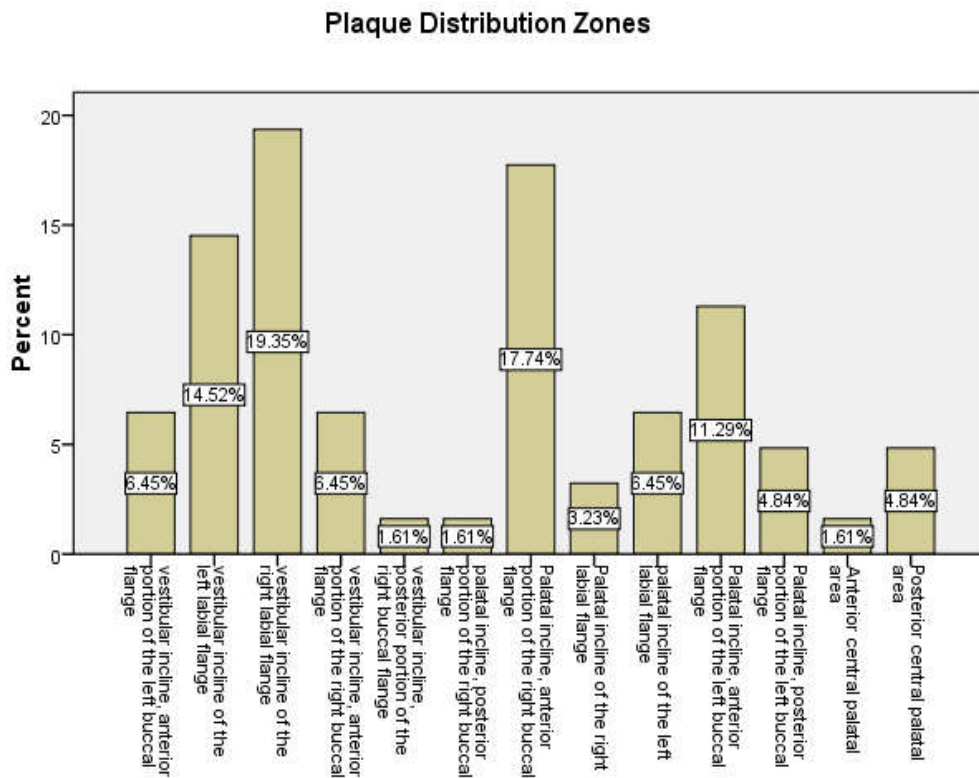


Fig. 1. Descriptive statistics of plaque distribution zones

Table 2. Comparison of plaque score in gender

Gender	N	Mean	Std. Deviation	Std. Error Mean	p= value
Male	32	1.84	0.479	0.084	0.230
Female	30	1.98	0.452	0.082	

Table 3. Analysis of plaque score with duration of denture usage by Anova

Age Groups	N	Mean	Std. Deviation	Minimum	Maximum	p= value
2-5 Years	33	1.90	0.360	0.92	2.57	0.196
6-10 Years	27	1.87	0.563	0.71	3.00	
> 10 Years	2	2.49	0.502	2.14	2.85	
Total	62	1.91	.468	0.71	3.00	

growth [12,13]. Additional reason could be that our local patients might be not conscious in regard of prosthesis hygiene. Therefore, keeping dentures at the optimal cleanliness level is a vital defensive method in demand to diminish the accumulation of plaque.

In this study the most colored zone was the vestibular inclination of the right facial extension and least colored zone was vestibular inclination, posterior segment of the right buccal extension, slopes of palate, posterior segment of the right buccal extension and frontal central palatal zone where as post damming one was the highest and the top of palate one was the least colored zone in the study conducted by Mercedes L et al [14]. This might be due to methodology difference.

The results of this study are not in contract with the Keng SB et al [15] who showed that fitting area, the plaque readings were lesser for certain zones, like as the slopes of palate of frontal segment of the buccal extensions whereas this area in our study scores higher. Further zones with small layered film ranks were the vestibular inclinations of the frontal buccal extension, as well as the vestibular inclination of the left facial extension while in this study these areas have greater marks. A collective highlight of these segments is the concave but indeed setup above the remaining edge, but for the tuberosity. In this way, these regions can be washed with small exertion, since of their comparative softness and comfort of brushing. However, the most noteworthy sums of microbial film were established on the vestibular inclination of the posterior buccal extension and palate slopes of labial flange.

In this study mean age was 56.48 ± 7.176 years which is in approximate (59.6 ± 11.3) with the study of Sachdeo A et al [16]. The insertion of a complete maxillary prosthesis makes a different, potentially acidic, atmosphere among the palatal portion and the internal zone of the prosthesis. Saliva reaches palatal area in very minute amount, hence if patient fails to maintain healthy oral environment, dental plaque starts to accumulate on the internal surface of prosthesis.

In this study plaque score was increasing with increasing age/usage of dentures which is in agreement with the study results of Mizugai, H et al [17] and Sumi, Y et al [18] who also stated that prosthesis plaque is a biofilm that illustrate growing level with advancing age of the prosthesis plaque biofilm. This might be due to lack of interest in cleansing dentures due to compromising of health status.

This study results revealed that the utmost volumes of microbial film were appear on the vestibular inclination of the facial extension on the other side the fitting area, biofilm scores were lesser for certain segments with a comparatively even pattern, i.e., palate slopes of the posterior buccal extension and frontal middle palatal area. This is in agreement with the research conducted by Paranhos HF et al [19] and Paranhos et al [20] who described the same biofilm results. In this way, it can be expressed that cleaning viability is profoundly related with the comfort of get to, while evenness plays an auxiliary part.

The investigation used in this study was constructed on the fitting zone of the upper prosthesis which resembles with other studies [21-25]. This area is rich for growing denture plaque. Outer zone of denture were not evaluated, due to less tendency of plaque accumulation [21,26-28]. Moreover, underestimation of plaque on the fitting zone is imaginable. The justification for using neutral red solution has quality of attraction for plaque and can be removed easily [29].

In our study DP distribution was unequal way on the maxillary fitting surfaces which is related to the study results of Mercedes L et al [14]. We noted in significant difference in the staining frequencies of the targeted zones on the contrary the Mercedes L et al [14] found highly significant difference. The assessment of maxillary and mandibular prosthesis with respect to the quantities of denture plaque was studied in some epidemiological studies deprived of comprehensive assessment [30]. Consequently, in this study maxillary prosthesis was chosen for assessment, giving adequate information of particular areas which are responsible for greater

food accumulation and are clinically significant. More studies must focus on the improvement of an appropriate system for denture plaque quantification of mandibular prosthesis. This study has some limitations like no cleansing agent and cleansing method was evaluated and single operator evaluation could be biased.

5. CONCLUSION

Within the light of limitations it is concluded that the Vestibular inclination area of the right facial extension had the higher accumulation of plaque followed by Palate slope area, frontal segment of the right buccal extension area, Vestibular inclination area of the left facial extension and Palate slope area, anterior portion of the left buccal extension.

CONSENT

The written informed consent was taken from each patient prior to study. The confidentiality was maintained.

ETHICAL APPROVAL

The ethical permission was sought from the Ethical Review Committee (ERC) of the CPSP, Karachi, Pakistan. Thesis approval Reference No: CPSP/REU/DSG-2015-166-1523 Dated: June 27, 2019

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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