

ORIGINAL ARTICLE

Clinical Evaluation of Impact of Acrylic Partial Dentures on the periodontal conditions of abutments

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ABSTRACT

Aim: To evaluate the impact of wearing removable partial dentures on the periodontal health of abutments and find out the age and gender association.

Study design: Descriptive case series.

Place and duration: Prosthodontic department of Lahore Medical and Dental College Lahore, from 15th January till 15th July 2023.

Methodology: A total of 70 patients of both genders participated in the study. Removable dentures were delivered to the patients and they were recalled after one month of denture insertion to evaluate the abutment health, gingival recession was checked in terms of its presence or absence, plaque and gingival health index assessment were done using Loe and Silness index. Tooth mobility was checked by using Millar's classification. Mean and SD was computed for quantitative data. Age and gender correlation was assessed using Pearson Chi-square test. Significant level was set to $p < 0.05$.

Results: A total 41.4% males and 58.6% females were selected. A total of 68.6% maxillary partial dentures whereas 31.4% mandibular partial dentures were inserted. Gingival health index showed maximum patients with good health 57.1%. Dental plaque index of maximum patients 77.1% fell under zero score. Tooth mobility score of zero was frequently found in abutments 78.6%. Gingival recession around the abutments after one month of denture insertion was found in 15.7% whereas 84.3% abutments remained healthy. Association of Gingival index, plaque index, tooth mobility and gingival recession with gender did not show statistical significance however with respect to age significant results were obtained. Tooth mobility had no association with age.

Conclusion: Removable partial dentures use does not disturb the periodontal health of abutments if well fabricated dentures are provided and good oral hygiene maintenance protocols are followed. Patients' education regarding denture use along with regular recall visits are of utmost importance.

Keywords: Abutment, Acrylic dentures, dental plaque, Removable partial dentures, Periodontal health, periodontal diseases.

INTRODUCTION

Partial loss of teeth is successfully restored and treated by providing removable partial dentures¹. There can be multiple treatment options for restoring partially edentulous arches but the most cost-effective treatment modality is removable partial denture². Removable partial dentures are given to restore esthetics, phonetics, function and psychological wellbeing of the patients³. So prosthodontic intervention not only restores lost teeth and tissues but also take in account the health of remaining natural teeth. Many materials can be used efficiently for fabrication of removable partial dentures like acrylic resins or acrylic resin in combination with cast metals e.g., cobalt chromium as these are the most popular ones because they are economical and easily fabricated⁴.

Besides removable partial denture advantages there are certain problems like high caries and periodontal disease risk. Common adverse effect on teeth and gums includes caries, gingivitis and periodontitis and abutment mobility⁵. The resultant bleeding gums with high pocket depth around teeth also results into gingival recession due to attachment loss. The causative factors for these adverse changes include increase plaque and calculus resulting from poor hygiene⁶. Epidemiological studies claimed plaque to be an essential factor responsible for periodontitis in animals as well as in humans⁷. Certain components of removable partial denture for example denture base, clasps and rests are found to accumulate plaque underneath them⁷.

In dental literature contrasting results have been found among various studies. Few researchers stated that marginal bone

loss, inflammation and tooth mobility along with accentuated probing depth are some of the periodontal tissue reactions are few serious consequences of wearing RPD⁸. The support mechanism of removable partial denture is through underlying mucosa and abutment teeth. Abutment teeth receive extra damaging forces due to additional loads transferred through clasps⁹. Besides these extra forces on abutments underneath plaque accumulation affects the healthy periodontium and hence the reason why abutments are more prone to mobility, caries and periodontal diseases¹. Change in the biofilm, alter quantitative and qualitative changes in plaque cause harm to the abutments thus the reason for failure of RPDs is the loss of abutments. In contrast some researchers reported that no pathologies could result only by removable dentures alone as long as good hygiene protocols are being followed¹⁰. These adverse effects of removable partial denture can be prevented by careful instructions to the patients regarding importance of oral hygiene, periodic recalls, professional scaling and polishing procedures and optimum fabrication of removable partial denture design with less complicated design¹¹.

These results are inconclusive and contradictory. Due to the controversy and taking in account the fact that many denture patients treated in various parts of the world show up with altered periodontal health, there is a need to evaluate the detrimental effects of removable partial dentures in patients attending to prosthodontic clinics in our region as data is scarce. The study will be helpful in developing better patient management protocol and designing tissue friendly partial dentures.

The aim of the study was to evaluate the impact of wearing removable partial dentures on the periodontal health of abutments and find out the age and gender association.

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METHODOLOGY

This cross-sectional observational study was carried out in department of Prosthodontics at Lahore Medical and Dental College, Lahore. Study duration was six months i.e., from 15th January 2023 till 15th July 2023. A total of 70 patients participated in the study. The age ranged of selected patients was 30 to 70 years. Non probability purposive sampling was used for sample selection. Inclusion criteria was set where all the patients treated with heat cured acrylic removable partial dentures having no gingival and periodontal problems were selected. All selected patients were having zero score for plaque index. On the contrary patients with gingivitis/ periodontitis and those with poor oral hygiene were excluded. Informed verbal consent was taken. Ethical clearance was obtained from the dental college Ethical Review board. Those with compromised physical and mental status were also excluded.

All removable partial dentures were fabricated in dental laboratory of Prosthodontic department of LM&DC. Standard fabrication was ensured and two trained technicians fabricated the dentures. Removable dentures were delivered to the patients and patients were advised to regularly clean their teeth and dentures and oral hygiene instructions were given. They were recalled after one month of denture insertion to evaluate the abutment health. Initially the assessment was done at the insertion time by taking following parameters in account. Tooth mobility, gingival recession, gingival index and plaque index.

Tooth mobility was assessed clinically using Millar's¹² classification 0-3 score. 0= no mobility, 1= smaller than 1mm in horizontal direction, 2=mobility more than 1mm in horizontal direction, 3= mobility in appico-coronal direction. Loe and Silness¹³ index was used for gingival health index (0= normal gingiva, 1= mild inflammation, no bleeding on probing slight colour change, 2= moderate inflammation, redness, bleeding on probing, edema, 3= severe inflammation, marked redness, edema, ulceration, spontaneous bleeding).

SPSS version 20 used for data analysis. Mean and standard deviation was obtained for age where as for qualitative variables (gender, Gingival index, tooth mobility, plaque index,

gingival recession) frequency and percentages were obtained. Pearson Chi square was used for correlating all the parameters with age and gender. P < 0.05 was considered as significant.

RESULTS

A total of 70 patients participated in the study where male 29(41.4%) and female 41(58.6%) were selected. Mean age of the patients was 48.37 ±SD11.530 years with age ranged from 30 to 70 years. Younger age group i.e.; 30 to 50 years old 42(60%) was frequently found to get partial denture treatment as compare to the old group >50 years 28(40%). A total of 48(68.6%) maxillary partial dentures whereas 22(31.4%) mandibular partial dentures were inserted.

Gingival health index showed maximum patients with good health 40(57.1%). Association of gingival health of abutments with gender was statistically insignificant, p>0.05 whereas association of GI with respect to age 24(60.0%) patients of young age group had grade zero gingival index whereas 16(40%) of old age group had zero gingival index. This association was significant i.e., <0.05 (Table I).

Dental plaque index of maximum patients 54(77.1%) fell under zero score according to Loe and Silness. Least number of patients were with grade 3 score (Table II).

Association of plaque index with respect to gender and age was found to be insignificant, p>0.05 Table II. Tooth mobility was not frequently seen in abutments. Maximum patients had zero grade mobility. Tooth mobility score of zero was frequently found in abutments 55(78.6%), score 1 was seen in 6(8.6%) of abutments. Association of tooth mobility with gender and gender was insignificant; p>0.05 (Table III).

Gingival recession around the abutments after one month of denture insertion was found in 11(15.7%) whereas 59(84.3%) abutments remained healthy. Association with gender did not show statistical significance whereas with respect to age significant results were seen p<0.05 where majority patients 40(18.2%) in younger age group had no gingival recession (Table IV).

Table I: Mean gingival index after one month of denture insertion with respect to gender and age, N=70.

Variables	Mean Gingival index				Total	P value
	0	1	2	3		
Gender	Male	19(47.5%)	4(21.1%)	2(33.3%)	4(80%)	0.07
	Female	21(52.5%)	15(78.9%)	4(66.7%)	1(20%)	
Age	30-50 years	24(60%)	15(78.9%)	1(16.7%)	2(40%)	0.04
	>50 years	16(40%)	4(21.1%)	5(83.3%)	3(6%)	

Table II: Mean plaque index after one month of denture insertion with respect to gender and age, N=70

Variables	Mean plaque index				Total	P value
	0	1	2	3		
Gender	Male	22(75.9%)	3(10.3%)	2(6.9%)	2(6.9%)	0.38
	Female	32(59.3%)	5(62.5%)	4(66.7%)	0(0.0%)	
Age	30-50 years	37(68.5%)	1(12.5%)	3(50%)	1(50%)	0.23
	>50 years	17(31.5%)	7(67.5%)	3(50%)	1(50%)	

Table III: Mean tooth mobility index after one month of denture insertion with respect to gender and age (n=70).

Variables	Mean tooth mobility index				Total	P value
	0	1	2	3		
0.79	Male	22(40%)	2(33.3%)	3(60%)	2(50%)	0.79
	Female	33(60%)	4(66.7%)	2(40%)	2(50%)	
0.79	30-50 years	32(58.2%)	5(83.3%)	2(40%)	3(75%)	0.45
	>50 years	23(41.8%)	1(16.7%)	3(60%)	1(25%)	

Table IV: Gingival recession after one month of denture insertion with respect to age and gender (n=70).

Variables	Gingival recession		Total	P value
	Yes	No		
Gender	Male	3(27.3%)	26(44.1%)	0.29
	Female	33(55.9)	8(72.7)	
Age	30-50 years	2(67.8%)	40(18.2%)	0.02
	>50 years	19(32.2%)	9(81.8%)	

DISCUSSION

In the current study the gingival health status of health abutment teeth after one month of removable partial denture installation was assessed according to the standard scales. It was observed that maximum abutments were in good health with zero gingival health index in young (60%) and old age(40%) groups. Furthermore, it was seen that significant association between gingival health and age groups existed however association of gingival health index with gender was statistically insignificant.

Samia¹⁴ and coworker reported in their respective study the fact that gingival health does not compromise with the removable partial denture use nor age and gender had any influence on gingival health index. In concordance with the results of current study Mansuri¹⁵ and coworker study conducted on 200 patients in Eastern Nepal region and analyzed the association of periodontal disease with removable partial denture use. In companionship with the result of current study they concluded no association of wearing denture prosthesis with periodontal disease and suggested need for patients' guidance for oral hygiene maintenance. They further stated that there was found no difference of periodontal health among denture wearers and non-wearers.

Similarly, Ashish¹⁶ and coworkers reported good gingival health index in removable partial denture wearers and found no difference of health status with the non-wearers. In contrast a study conducted by Murad¹⁷ and coworkers stated that the use of removable partial denture results in increase prevalence of periodontitis irrespective of gender and age. They further concluded that lack of awareness and poor socioeconomic status could be the contributing factor.

Dental plaque is a strongest causative factor responsible for compromised gingival health of teeth due to accumulation of gram-negative bacteria and their released toxins destroy soft and hard tissues around teeth.¹⁸ In the current study the plaque index was assessed according to Loe and Silness¹³ scale around the abutments after removable denture use and found that maximum patients had zero score 77.1% and very few had grade 3 score. Association of plaque index with age and gender was not found. In contrast to the results of current study Adnan¹⁹ and coworkers claimed that removable partial denture uses significantly affect the abutment health. They proposed that it increases plaque accumulation and calculus index around the abutments. In contrary, Linda²⁰ and coworkers in their respective study stated that 41% abutment had moderate gingival inflammation. Plaque index of score 1 distribution was 66.7% and was the highest.

In the current study tooth mobility was infrequently seen around the abutments 78.6% had zero score. Only 8.1% patients were with score 1. No association of age and gender was found with respect to tooth mobility. In contrast Murad¹⁷ and coworkers studied 100 subjects and reported 40 % of the patients with grade 1 mobility, 32% have grade 2 and 28% had grade 3 mobility. Gabriela²¹ and coworkers stressed on regular recall visits after acquiring removable partial denture. He recommended scaling twice a year. Pronounced negative effect could occur on the periodontal health of the abutments. Some other longitudinal studies in different parts of the world indicated that there exist a strong association between removable partial denture use and gingivitis, periodontitis, and tooth mobility²².

Linda²⁰ and coworkers reported that all periodontal health assessment parameters showed higher values in removable partial denture wearers especially those with extra oral direct retainers. They claimed that plaque accumulation under the clasps arms and resultant gingival inflammation along with the excessive load on the abutments result in tooth mobility. In contrast to the results of current study Samia¹⁴ and coworker found no association of tooth mobility with age and reported that age had no effect on tooth mobility and gender did influence tooth mobility, however, in agreement to the results of current study they found no change in mean tooth mobility after 60 days post insertion, stating that recall

visits, good hygiene protocols and patient education had impact. Similarly gingival recession was least found around the abutments after the use of removable partial dentures. Only 15.7% of abutments were found to have gum recession. Gender had no impact on the gum recession however gingival recession was significantly increased with increasing age.

Periodontitis is the result of poor oral hygiene. The attachment loss around teeth results in pocket formation where aerobic bacteria colonize and damage the gum and bone structure. Plaque accumulation is due to the neglect of the patients and not brought about by the dentures. Despite the fact that removable partial denture had negative impact on the abutment still the quality of patient's life gets improved with the use of removable partial denture.

CONCLUSION

Removable partial dentures do not disturb the periodontal health of abutments if well fabricated dentures are provided and good oral hygiene maintenance protocols are followed. Patients' education regarding denture use along with regular recall visits are of utmost importance.

Authorship and contribution declaration: Each author of this article fulfilled following Criteria of Authorship:

TK & NS: Data collection, HSMG: Conceived idea, SN: Statistical analysis/designed research, RAA: Manuscript writing, TH: Literature review, KQ: Manuscript final reading

All authors agree to be responsible for all aspects of their research work.

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