

Gingival Health Status of Abutment Teeth in Acrylic Removable Partial Denture

Sajjad Hussain, Amna Amjad, Mubashir Sharif, Robina Tasleem

ABSTRACT:

Objective: To determine the change in gingival health status of removable partial dentures abutment tooth/teeth after 1month post-insertion

Study design and setting : Quasi-Experimental Study, Department of Prosthodontics, Armed Forces Institute of Dentistry Rawalpindi, from October 2021 to April 2022

Methodology: The patients underwent a thorough history and clinical examination after formal consent. Prior to recording the impression for provision of acrylic removable partial denture, the baseline scores for gingival index, plaque index and abutment teeth's periodontal pocket depth were noted. After 30-days of placement of the acrylic removable partial denture, the patient was recalled for follow up and reassessment of score.

Results: Out of 90, there were 64 (71.1%) males and 26 (28.8%) females with average age of 31.1 ± 5.8 years. The average value of plaque index at baseline was observed to be 0.39 ± 0.03 , while mean value of gingival index at baseline was found to be 0.19 ± 0.01 . At 30 days follow up, the mean value of plaque index significantly increased to 1.21 ± 0.07 ($p=0.001$). Similarly, the mean value of gingival index after 30 days insertion of the acrylic removable partial denture significantly increased to 1.50 ± 0.09 ($p=0.001$). No significant difference was observed between 30 days post-insertion indices between smokers and non-smokers, males and females, and <30 and >30 years age groups.

Conclusion: It is concluded that the gingival health of abutment teeth significantly gets affected due to removable partial denture. The plaque and gingival index significantly worsen due to use of removable partial denture within a month's time.

Keywords: Abutments, Removable partial denture, gingival health status

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INTRODUCTION:

Tooth loss is a major dilemma that cannot be prevented despite rapid advancement in the field of preventive dentistry and changes in the attitudes of patients in favor of preserving natural teeth rather than their extraction.¹ There are several reasons for loss of teeth, most commonly, tooth extraction occurs as a result of caries and periodontal disease. Other

causes cited for loss of teeth include trauma, infection, malignancies or failed endodontic treatments. Tooth loss may present with different possible adverse consequences on remaining dentition, surrounding soft tissue structures and general wellbeing of individuals.² These may include tilting and drifting of adjacent teeth, decreased masticatory efficiency, altered esthetics and appearance, over eruption of opposing dentition, periodontal problems and altered speech.³

There is a growing trend for people to try to retain more teeth later in life. For this reason, it is quite commonly seen that patients seek treatment to replace the loss of a significant number of teeth. There are different options available for replacement of these missing teeth including implant retained over-dentures, fixed dental prostheses and removable partial dentures i.e., the acrylic removable partial dentures and cast partial dentures.⁴ Removable partial dentures (RPDs) are one of the most widely accepted method of replacing missing natural teeth owing to financial problems, compliance and height of residual ridges. Several studies have been done to review the consequences of placement of removable partial dentures in mouth.³⁻⁵ It has been noted that removable partial dentures significantly alter the oral environment in terms of increased plaque accumulation on tooth surfaces which are

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in contact with it leading to periodontal problems, undue stresses on clasped abutments causing them to become mobile and recurrence of caries owing to food entrapment.⁶⁻⁷ There are many reported methods to determine the periodontal status of abutment and non-abutment teeth. One of them is to collect data via different indices including Plaque Index (PI), Gingival Index (GI), and Probing Pocket Depth (PPD).⁷ Literature supports that patient counselling regarding taking care of removable partial denture can be of significant importance in improving the oral hygiene and gingival health status. Timely follow up is another factor associated with better oral health and hygiene in denture users. The design and material used in formation of acrylic removable partial denture is also reported to be a prominent feature in preserving optimal periodontal health status.⁸⁻⁹

This study was conducted to assess the periodontal health status of abutment teeth at 6 months post-insertion of removable partial dentures. Mean average values of plaque and gingival scores were used to assess the gingival health status before and after use of acrylic removable partial dentures in our local population visiting a tertiary care hospital where a specific design of acrylic removable partial denture is used.

METHODOLOGY:

This quasi-experimental study was conducted at prosthodontics department of AFID (Armed Forces Institute of Dentistry) Rawalpindi for about a period of seven months, spanning October 2021 to April 2022. Minimum required sample size of 90 was calculated by Open-Epi sample size calculator with 95% level of confidence, 80% study power, mean difference in periodontal score of 1.4,¹¹ standard deviation of 1.2¹¹ and 10% precision. The study was approved from ethical committee at AFID prior to data collection. All of the patients showing up at Armed Forces Institute of Dentistry, Rawalpindi were screened in general OPD and those patients who fulfilled the criteria were sent to the prosthodontics department.

Non-probability consecutive sampling technique was used to enroll ninety patients of either gender, belonging to 20-40 years of age to whom removable partial denture was advised. Other inclusion criteria included patients in whom no more than 3 teeth were missing in maxillary or mandibular arch unilaterally, patients with no ongoing periodontal disease e.g., periodontitis, gingivitis etc, patients with good oral hygiene (absence of generalized calculus deposits assessed clinically) and with no recent history of periodontal therapy and patients with no supernumerary or retained deciduous teeth. Patients with poor oral hygiene (presence of generalized calculus deposits assessed clinically), history of bruxism or cervical caries or lesions, fixed restoration of abutment teeth (Crowns, Fixed Dental Prostheses), unfavorable residual ridge form (knife edge, flabby ridge or highly resorbed residual ridge), patients with oral lesions like oral cancer,

ulcers, history of diabetes mellitus, epilepsy or any other medical condition and teeth with poor prognosis (mobile teeth) were excluded from the study.

All the patients were undergone history and complete oral examination after taking informed consent. Sociodemographic and clinical data was recorded in data collection tool. Prior to recording the impression for provision of acrylic removable partial denture, the baseline scores for gingival index, plaque index and periodontal pocket depth of the abutment teeth were calculated and recorded. The gingival index and plaque index scores were calculated by Loe and Silness method using a blunt probe. After 30 days of placement of the acrylic removable partial denture, the patient was recalled for follow up and the scores of the abutment teeth for gingival and plaque index of the abutment teeth were again calculated and recorded.

Data analysis was done using IBM-SPSS software (version 20.0). Mean and standard-deviation were calculated for continuous variables like age, gingival index and plaque index. Frequency and percentages were calculated for categorical variables like gender. Confounding factors and effect modifiers like age, gender and smoking were controlled through stratification. Independent samples T-test was used post stratification to compare mean score between the groups. Paired samples t-test was used to compare quantitative variables including score of plaque index and gingival index at baseline and 30 days after the provision removable partial denture. P values of =0.05 was considered to be significant.

RESULTS:

The sociodemographic characteristics are given in table 1. The minimum value of plaque index at baseline was observed to be 0.35 and maximum of 0.45 was observed with mean score of 0.39 ± 0.03 . Similarly, the minimum value of gingival index at baseline was recorded to be 0.18 and maximum of 0.22 was observed with mean score of 0.19 ± 0.01 .

At follow up, the minimum value of plaque index after 30 days insertion of the acrylic removable partial denture was calculated to be 1.09 and maximum of 1.30 was recorded, with mean score of 1.21 ± 0.07 . Similarly, the minimum value of gingival index after 30 days insertion of the acrylic removable partial denture was found to be 1.34 and maximum of 1.66 was noted with mean score of 1.50 ± 0.09 as given in table 2.

By using Paired sample t-test, difference in mean values of plaque index before and after 30 days insertion of the acrylic removable partial denture was found to be significant ($p=0.001$). There was a significant increase in plaque index score 30 days post insertion. Similarly, mean difference in mean values of gingival index before and after 30 days insertion of the acrylic removable partial denture was also found to be statistically significant ($p=0.001$). There was a significant increase in gingival index score 30 days post insertion as given in table 2.

By the stratification of age, two groups were formed, age group less than 30 years and age group of 30 years and more. It was found that in both groups of age, the mean values of plaque and gingival indices increased after 30 days insertion of the acrylic removable partial denture, but there was no significant difference between plaque and gingival indices scores 30 days post-insertion between two age groups as shown in table 3.

By the stratification of gender, it was found that in both males and females, the mean values of plaque and gingival

Table 1: Sociodemographic characteristics of study participants (n=90)

| Characteristics | | n(%) |
|------------------------|-----------------|------------|
| Age in years (mean±SD) | | 31.1±5.8 |
| Rage range | | 20 - 40 |
| Age groups | <30 | 39 (43.3%) |
| | =30 | 51 (56.6%) |
| Gender | Males | 64 (71.1%) |
| | Females | 26 (28.8%) |
| Smoking status | Yes | 53 (58.8%) |
| | No | 37 (41.1%) |
| Socioeconomic status | Low | 22 (24.4%) |
| | Middle | 40 (44.4%) |
| | High | 28 (31.1%) |
| Education status | Illiterate | 7 (7.7%) |
| | Primary | 10 (11.1%) |
| | Graduation | 53 (58.8%) |
| | Post-graduation | 20 (22.2%) |

Table 2: Mean plaque and gingival indices score at baseline and 30 days post-insertion of acrylic removable partial denture

| Parameters | Mean scores | | p |
|---------------------|-------------|------------|-------|
| | At baseline | At 30-days | |
| Plaque index (PI) | 0.39±0.03 | 1.21±0.07 | 0.001 |
| Gingival index (GI) | 0.19±0.01 | 1.50±0.09 | 0.001 |

Table 3: Post-stratification comparison of Mean plaque and gingival indices score at baseline and 30 days post-insertion

| Strata | | Parameters | Mean Scores At 30-days | P | |
|----------------|-------------|-------------------|------------------------|-------------|-------|
| Age | <30 years | Plaque index (PI) | 1.21 ± 0.069 | 0.526 | |
| | =30 years | | 1.20 ± 0.07 | | |
| Gender | Male | | 1.21 ± 0.070 | 0.98 | |
| | Female | | 1.20 ± 0.071 | | |
| Smoking Status | Smokers | | 1.19 ± 0.074 | 0.209 | |
| | Non-smokers | | 1.22 ± 0.064 | | |
| Age | <30 years | | Gingival index (GI) | 1.49 ± 0.09 | 0.144 |
| | =30 years | | | 1.50 ± 0.10 | |
| Gender | Male | 1.51 ± 0.098 | | 0.478 | |
| | Female | 1.48 ± 0.093 | | | |
| Smoking Status | Smokers | 1.50 ± 0.098 | | 0.920 | |
| | Non-smokers | 1.50 ± 0.097 | | | |

indices after 30 days insertion of the acrylic removable partial denture, were significantly increased as compared to baseline but the difference in mean values 30 days post-insertion between males and females was not significant as shown in table 3. By the stratification of smoking status, there was no significant difference in mean values of plaque and gingival indices after 30 days insertion of the acrylic removable partial denture between smokers and non-smokers as shown in table 3.

DISCUSSION:

Tooth loss is a significant morbidity among older age group people. The desire of restoration of function of lost tooth and aesthetics plays a significant role in adoption of temporary and permanent denture use. Removable partial dentures are more common when there are only a few compromised teeth. According to American College of Prosthodontics, it is estimated that there will be 200 million people using some kind of denture till 2030.¹² With increase utility of temporary and permanent dentures, a primary public health challenge of appropriate oral health is evident. The use of acrylic removable partial denture for a longer period of time predisposes a person's oral health to be compromised which can result in damage to normal teeth upon which the removable temporary denture is anchored to. Plaque and gingival indices are reported to provide valuable indication of the changes associated in the periodontium after the use of an acrylic removable partial denture.¹³ In this study, significant difference has been found between the periodontal status prior and after the intervention of acrylic removable partial denture in patients at 6-months follow up.

Many studies from old literature, conducted at various countries but Pakistan, determining the effect of acrylic removable partial denture, reported significant relationship between compromised oral health and partial dentures. A study conducted by Hafeez A et al in Pakistan in 2018 also reported that removable partial dentures significantly affect the oral health and hygiene in denture users and an increase in plaque and gingival score was reported in results of this study.¹⁴

Similarly, another study conducted by Akaltan F et al on 36 patients reported that at 30-month follow up a significant increase in plaque index was observed in patients undergoing partial removable denture, with more frequent increase in lingual plate treatment group.¹⁵ It was also concluded that timely follow up and regular checkups reduces the poor outcomes in patients using acrylic removable partial denture. In a study conducted by Al Rawi SA et al, the results are quite similar with current study, where baseline Plaque Index for abutment teeth was found to be 0.4±0.05, which increased to 1.2±0.11 after 6 months, similarly baseline Gingival Index was 0.2±0.02 which increased to 1.5±0.16 at 6 months follow up.¹¹ A study conducted by Kazem NA et al on 26 patients, half of whom were removable denture users and

other half were not, and the results revealed that denture wearers had poor oral hygiene with greater frequency of gingival inflammation, periodontium destruction and plaque accumulation on normal teeth.¹³

In a study conducted by Augustin MM et al, the author studied 4117 persistent teeth in denture and non-denture groups for 5 years and assessed dental status, periodontal status, gingival status and dental plaque. It was reported that dental caries was 6 times more frequently reported in patients with removable partial dentures compared with those not wearing dentures.¹⁶

In a Pakistani study conducted by Ali M et al, there were 100 subjects enrolled in the study and followed up for 1 year to assess periodontal health status after using removable partial denture. An increased prevalence of periodontitis regardless of age and gender was reported among the removable partial denture users and the most common factor contributing to poor oral health was said to be lack of awareness, followed by low socioeconomic status.¹⁷ Therefore adequate counseling specially of denture users belonging to low socioeconomic class is required to improve their oral health.¹⁸

In another study conducted by Cankaya ZT included 65 wearers of acrylic removable partial denture to assess the oral health outcomes at three different time intervals. The parameters were compared at day-30 and day-60 with baseline values and confounding factors were stratified for result adjustments. It was reported that periodontal parameters including gingival index, tooth mobility, and clinical attachment loss were significantly affected at day-60 compared with baseline.^{19,20}

CONCLUSION:

It is concluded that the gingival health of abutment teeth is significantly affected due to removable partial denture. The plaque and gingival index significantly worsens due to use of removable partial denture within a month's time.

Authors Contributions:

Sajjad Hussain: Idea conception, data collection
Amna Amjad: Manuscript writing
Mubashir Sharif: Critical Review
Robina Tasleem: Data collection

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