

## THE IMPACT OF REMOVABLE PARTIAL DENTURES ON ABUTMENT TEETH

<sup>1</sup>ADNAN HAFEEZ, <sup>2</sup>RAI TARIQ MASOOD, <sup>3</sup>MUHAMMAD FAROOQ KAMRAN,  
<sup>4</sup>MUHAMMAD AAMIR GHAFOR CHAUDHARY

### ABSTRACT

*The aim of this study was to investigate periodontal health status of teeth in contact with removable prosthesis.*

*In this study a total of 500 patients were examined from June 2016 to June 2017. Out of those 500 patients 200 patients were identified who were treated with removable partial denture and were having 0 score for gingival, plaque and calculus index. Patients meeting the inclusion criteria were recalled after 6 months to measure periodontal and gingival status of abutment teeth.*

*Results show that removable partial dentures significantly affect health of abutment teeth. An increase in plaque gingival and calculus index is seen in abutment teeth along with the teeth being more prone to inflammation.*

*Patients undergoing removable partial denture treatment must follow strict oral hygiene protocols, regular recall and follow up schedule for optimal treatment outcome.*

**Key Words:** *Removable partial denture, impact on abutment teeth, community periodontal index, oral health*

### INTRODUCTION

Removable partial denture facilitates the accumulation of plaque and debris on teeth by increasing the number of microorganism in oral cavity thus disturbing the balance of oral flora.<sup>1</sup> Abutment teeth that support the prosthesis have higher chances of Caries and Gingival diseases because irregular surface of prosthesis and poor oral hygiene facilitates the accumulation of plaque.<sup>1</sup> Dental caries and periodontal diseases are the two most leading dental diseases World wide and they contribute to largest burden of oral diseases.<sup>2</sup> The Community Periodontal index has been widely used internationally to compare periodontal disease status of populations. The periodontal index is used to measure calculus, gingivitis and periodontal disease and pocket formation in teeth.<sup>2</sup> According to the American College of Prosthodontics it is estimated that over the next 15 years, approximately 200 million people will be using dentures of some kind.<sup>3</sup> There are conflicting reports as to how the periodontal health of adjacent teeth is affected after the use of dentures.

Keeping in view the health of periodontium and teeth, all forms of fixed prosthesis whether crown, bridge and implants are more suitable than removable prosthesis but in some clinical situations fixed prosthesis is not possible especially in Kennedy class 1 and 2. As we know implants is most recommended form of treatment to replace the lost teeth due to its biological approach but most of patients are unable to bear the cost of procedure. In that case only removable partial denture is the treatment option due to its low cost and non surgical approach.<sup>4</sup>

Lundgren et al proposed that one should try to maintain his natural teeth for as long as possible by maintaining good oral hygiene measures and to replace the lost teeth in later years of life if patient is unable to eat, speak and socialize. Removable partial denture (RPD), has more detrimental effects than benefits as it supports the accumulation of plaque and debris especially in the contact area of abutment teeth, so the chances of Caries and gingival disease in approximal areas of abutment teeth are increased.<sup>5</sup>

Yousof et al<sup>6</sup> conducted their study on 427 patients. They concluded that wearing of partially removable dentures was damaging to periodontal health in patients whose oral hygiene was less than adequate. Qudah et al<sup>7</sup> and Dula et al<sup>8</sup> demonstrated in their researches, that the use of dentures had a negative impact on the health of neighboring teeth and regular periodontal

<sup>1,3</sup>Department of Prosthodontics, Rawal Institute of Health Sciences, Islamabad **For Correspondence:** Dr Adnan Hafeez, Houses 166, Lane-6, Askari-13, Adayala Road, Rawalpindi

<sup>2</sup> Department of Community Dentistry, Rawal Institute of Health Sciences, Islamabad

<sup>4</sup> Department of Prosthodontics, Islamic International Dental College Islamabad

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visits were needed to maintain health. In past, Preshaw et al<sup>9</sup> said that wearing removable partial dentures although do increase the chance of periodontitis, they do overall improve the nutritional status of the individual and also play a role in improving the overall quality of life in the patients. To oppose this, a review of extensive literature done by Petridis and Hampton<sup>10</sup>, showed that wearing removable partial denture does not cause any detrimental periodontal reactions, provided that pre-prosthetic periodontal health has been established and also oral health should be maintained via meticulous oral hygiene. The only visible reason of acquiring partial denture is to improve the masticatory function of patient.<sup>11</sup> Besides the uncertainty about its effect on oral function, partial denture treatment also holds risks for the remaining dentition. The recent study of Jepson N.J et al. investigated that impact of partial denture on oral health and found that negative effect of removable partial denture on oral tissues is significant.<sup>12</sup> Even some researchers have showed that partial dentures have poor effects on general health of individual as well.<sup>13</sup> Even after all the negative impacts of partial denture, still it can significantly improve the quality of life of patients.<sup>14</sup>

One of the important causes of failure of partial denture is that the teeth supporting the denture are lost in later years. As discussed earlier there is increased incidence of caries and gingival disease in natural teeth around the prosthesis. The main reason of this increase is plaque accumulation and additional stress on abutment teeth due to poor oral hygiene measures. Even if regular tooth brushing is ensured the approximal areas of teeth does not respond to regular tooth brushing. Therefore regular dental visits, tooth brushing along with chemical plaque control methods especially use of mouth wash and interproximal dental aids can ensure long term survival of abutment teeth and prosthesis.<sup>15</sup>

The current study was done to assess the periodontal status of natural teeth in contact with the removable partial denture to find out how the use of removable partial dentures affect health of adjacent teeth. Gingival, Plaque and Calculus index was measured in abutment teeth to assess their health.

## METHODOLOGY

This study was conducted in Outpatient Prosthodontic Department of Rawal College of Dental Surgery, Rawal Institute of Health Sciences Islamabad, Pakistan from June 2016 to June 2017. Non-probability convenience sampling technique was used to select the sample. In this follow-up study a total of 500 patients were examined from June 2016 to December 2016. Out of those 500 patients 200 patients were identified who were treated with removable partial denture and were

having 0 score for gingival, plaque and calculus index. Those 200 patients meeting the inclusion criteria were recalled after 6 months to measure periodontal and gingival status of abutment teeth. All the removable partial dentures were fabricated at the laboratory of Rawal Institute of Health Sciences. Efforts were made to ensure the standardized fabrication of dentures. Patients with compromised physical and mental health, children and who didn't consent to participate in study were not included in the study.

Oral hygiene procedures like scaling and polishing were performed. Patients having carious teeth were advised to have their restorative procedures before prosthodontic treatment. Patients were advised to brush and floss twice daily and were requested to report to the department after six months. Out of more than 200 only 120 patients reported to Prosthodontic department.

A Community Periodontal Treatment Need (CPTN) probe 1, which has a ball end of diameter 0.5 mm and a first colored band at 3.5 to 5.5 mm another colored band at 8.5 to 11.5 mm may be present, was used to check the different indexes on the abutment teeth.

A standardized questionnaire regarding natural teeth in contact with removable partial denture based on the following parameters; gingival index (GI) (Loe and Silness, 1963)<sup>8,19</sup>, plaque index (PI) (Loe and Silness, 1964) and calculus index (CI) (Greene and Vermilion, 1960).

### FOR GI Index the score was from 0 to 3

0: No inflammation

1: Mild inflammation, slight change in color, no bleeding on probing

2: Moderate inflammation, moderate redness, bleeding on probing

3: Severe inflammation, marked redness, spontaneous bleeding.

### For Calculus Index the score was from 0 to 3

0: No calculus present

1: Supragingival calculus covering not more than third of the exposed tooth surface.

2: Supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.

3: Supragingival calculus covering more than two third of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical

portion of the tooth or both

**For Plaque Index the score was from 0 to 3**

0: No plaque

1: A thin film of plaque adhering to free gingival margin and adjacent area of the tooth, which cannot be seen by naked eyes

2: Moderate deposits of plaque adhering to free gingival margin and adjacent area of the tooth, which can be seen with the naked eyes.

3: Abundance of soft matter within the gingival pocket and or on the tooth.

**RESULTS**

The descriptive analysis of 120 patients revealed a total of 58 male and 62 females participation in study (Table 1). A total of 302 abutment teeth were evaluated.

Table 2 presents score of gingival index of abutment teeth. Almost 41% of abutment teeth had moderate inflammation of gingiva. The plaque index of score 1 had the highest distribution for abutment teeth i.e 66.7%(Table.3). Table.4 shows score of calculus index for abutment teeth. A calculus score of 0 was frequently seen in abutment teeth 55.6%. Score 1 was observed in 40% of abutment teeth.

**DISCUSSION**

Various studies have been done in the past to examine the relationship between removable partial denture and periodontal health but no particular article has been proclaimed regarding Pakistani population. A study by Sharma et al<sup>16</sup> concluded that the one of the important cause of gingival and periodontal disease was use of partial denture in study population, and implementation of plaque control intervention can reduce a significant number of cases.

Many studies have shown that patients using dentures are predisposed to increased plaque, calculus, gingival inflammation, tooth mobility and pocket loss.<sup>11,17,18</sup> According to Dulah et al<sup>8</sup>, Pellizzer EP et al<sup>12</sup> and Nayana Prabhu et al<sup>13</sup> studies most patients were wearing Kennedy class I and class II dentures. Results of their study showed that abutment teeth are at higher risk of plaque and debris accumulation as compared to other teeth. In present study, out of 191 abutment teeth 67 percent had mild Plaque.

Anand amoorthy et al<sup>19</sup> conducted a study that the removable acrylic partial dentures have negative impact on gingival health of teeth in contact with prosthesis. There is dose response relationship of gum health and partial denture wearing. Therefore, it is prescribed that if possible there should be maximum space between gingiva and partial denture to keep the area self

TABLE 1: GENDER DISTRIBUTION

Gender	Frequency (Percentage)
Male	58(49%)
Female	62(51%)

TABLE 2: FREQUENCY DISTRIBUTION OF GINGIVAL INDEX OF ABUTMENT TEETH

Gingival Index	Abutment	
	N	%
1	174	57.6
2	122	40.4
3	6	2.0
Total	302	100

TABLE 3: FREQUENCY DISTRIBUTION OF PLAQUE INDEX OF ABUTMENT TEETH

Plaque Index	Abutment	
	N	%
0	--	--
1	194	64.2
2	102	33.7
3	6	1.9
Total	302	100

TABLE 4: FREQUENCY DISTRIBUTION OF CALCULUS INDEX OF ABUTMENT TEETH

Calculus Index	Abutment	
	N	%
0	168	55.6
1	120	39.7
2	14	4.6
3	--	--
Total	302	100

cleansing. Results of our study were quiet similar their findings. Natural abutments in contact with removable partial denture showed increased plaque accumulation, inflammation and deterioration of periodontal health.

Studies conducted in the past by Amaral BA et al<sup>23</sup> concluded that severity of plaque accumulation as per plaque index was significantly increased in the teeth contact with partial denture after one year of prosthesis. Similar results were reported by many past studies.<sup>20,21,22</sup> Gingival index score showed increased gingival inflammation in removable partial denture wearers which is in agreement with previously reported study by Samir A Qudah.<sup>7</sup> Same results were concluded by Yousuf et

al<sup>6</sup> study which reported significant increase in gingival and plaque index that is mild Inflammation was found in teeth contact with denture.

Bergam et al<sup>21</sup> study showed increased periodontal disease which supports the result of this study. Dulah et al<sup>8</sup> in their clinical evaluation of periodontal health of abutment teeth in a five year period showed that calculus formation was minimal to nil in most patients. These results are comparable to the result carried out by the present study according to which majority patients showed no signs of calculus in abutment and control teeth. 55% of abutments teeth were calculus free. Study done by Saliba et al<sup>24</sup> showed increased calculus formation and concluded that use of removable partial denture was associated with periodontal and gingival disease.

Gabriela et al<sup>5</sup> in a follow-up study showed that the one should regularly visit periodontist in order to maintain adequate gingival health after acquiring acrylic dentures. This is highly recommended for the teeth in contact of prosthesis. Proper ultrasonic scaling is recommended twice a year. These results showed companionship with results of our study indicating that the natural teeth in contact with removable prosthesis has pronounced negative effect on their periodontal health.

Shala et al<sup>15</sup> in a retrospective study indicated that patient motivation and counseling is very important for success of treatment in terms of maintaining proper oral hygiene. Similarly it is also advised to visit the dentist regularly for periodontal health assessment. Few clinical trials have shown that minimal damage was caused by partial denture when all the above stated precautions were followed by patient after acquiring prosthesis. Similarly proper design of RPD to reduce load on supporting teeth and alveolar bone will also help in maintaining the periodontal health of abutment teeth. The literature also proposes that provision of clasp also helps in reducing stress on supporting teeth. Addy M, Bates JF concluded that simplicity should be considered while designing the partial denture; that it should only cover the required hard and soft tissue structure.

Patients were recalled for clinical examination after 06 months that is why majority of patients were having lowest score of each index (mild disease). Out of 200 patients only 120 reported for follow-up examination. Loss of follow-up is the major limitation of the present study. Patients might not have fully complied with the oral hygiene instructions that can affect the gingival health of abutment teeth.

Follow up studies should be conducted over a long period of time to clearly identify long term complications

of removable partial dentures in abutment and control teeth so that preventive strategies' can be implemented from an early stage.

## CONCLUSION

Results of this study show that removable partial dentures significantly affect health of abutment teeth. An increase in plaque gingival and calculus index is seen in abutment teeth along with the teeth being more prone to inflammation. Patients undergoing removable partial denture treatment must follow strict oral hygiene protocols. If possible patients should be encouraged towards latest techniques of rehabilitation like dental implants in which there is less harm to the abutment teeth. Follow up studies should be conducted over a long period of time to clearly identify long term complications of removable partial dentures in abutment teeth so that preventive strategies can be implemented from an early stage.

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#### CONTRIBUTIONS BY AUTHORS

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|----------------------------------|---|
| <b>1 Adnan Hafeez:</b>           | Topic selection, study conception and design, Data collection and discussion. |
| <b>2 Rai Tariq Masood:</b>       | Analysis, Interpretation of data.   |
| <b>3 Muhammad Farooq Kamran:</b> | Cross References and revision.  |
| <b>4 M Aamir Ghafoor Ch:</b>     | Abstract and Supervision.   |