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*Original Research Article*

# A Comparative Evaluation of Periodontal Health in Abutment Teeth Supporting Fixed and Removable Dental Prostheses

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**Name of Author:**
Dr Vipul Asopa[1], Dr Shivalika S Asopa[2], Dr. Jyotsana Tanwar[3], Dr Vivek Sharma[4], Dr Prerna Thareja[5], Dr Sannishth Sadrani[6]

***Affiliation:*** *[1]Professor, Department of Prosthodontics, Pacific Dental College & Research Centre. Udaipur, Rajasthan*
*[2]Professor, Department of Periodontics, Pacific Dental College & Research Centre. Udaipur, Rajasthan*
*[3]Senior Lecturer, Department of Periodontics, Pacific Dental College & Research Centre, Udaipur, Rajasthan*
*[4]Professor, Department of Prosthodontics, Pacific Dental College & Research Centre, Udaipur, Rajasthan*
*[5]Professor, Conservative Dentistry & Endodontics, Pacific Dental college & Research Institute, Udaipur, Rajasthan*
*[6]Professor, Department of Prosthodontics, Pacific Dental College & Research Centre, Udaipur, Rajasthan*

***Corresponding Author:***
Dr Vipul Asopa

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***Abstract***: ***Introduction:*** The choice between fixed dental prostheses (FDPs) and removable partial dentures (RPDs) involves considerations of function, aesthetics, and long-term oral health. A critical factor is their impact on the periodontium of abutment teeth. This study aimed to compare the periodontal health status of abutment teeth supporting FDPs versus RPDs over a defined period.
***Materials and Methods:*** A retro-prospective study was conducted with a total of 24 patients divided into two groups: Group F (n=12) with tooth-supported FDPs and Group R (n=12) with clasp-retained RPDs. Baseline periodontal parameters were retrieved from pre-prosthetic records (retrospective component). Patients were re-evaluated clinically after 18-24 months of prosthesis function (prospective component). Periodontal health was assessed using Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PPD), Clinical Attachment Level (CAL), and abutment tooth mobility. Statistical analysis was performed using Mann-Whitney U and Wilcoxon signed-rank tests. ***Results:*** At follow-up, Group R (RPD) exhibited significantly higher mean values for PI (1.8 ± 0.4 vs. 1.2 ± 0.3, $p<0.01$), GI (1.6 ± 0.5 vs. 1.0 ± 0.4, $p<0.05$), and PPD (3.5 mm ± 0.6 vs. 2.9 mm ± 0.5, $p<0.05$) compared to Group F (FDP). A statistically significant increase in CAL from baseline was observed only in Group R (0.8 mm ± 0.3, $p<0.01$). Tooth mobility > Grade 1 was noted in 3 abutments in Group R and 1 in Group F. ***Conclusion:*** Within the limitations of this small-sample study, abutment teeth for removable partial dentures demonstrated poorer periodontal health parameters compared to those supporting fixed dental prostheses after approximately two years of service. The design of RPDs appears to pose a greater risk for plaque accumulation and gingival inflammation, potentially leading to faster attachment loss.

***Keywords***: Abutment teeth, Periodontal health, Fixed dental prosthesis (FDP), Removable partial denture (RPD), Periodontal indices

## INTRODUCTION

The prosthetic rehabilitation of partially edentulous patients remains a cornerstone of restorative dentistry, aimed at restoring function, aesthetics, and dental arch integrity. Among the primary treatment modalities, fixed dental prostheses (FDPs) and removable partial dentures (RPDs) represent fundamentally different philosophical and biomechanical approaches. The selection between these options is guided by a complex matrix of factors including patient preference, cost, span of the edentulous area, abutment tooth prognosis, and the overarching principle of causing minimal iatrogenic harm to the remaining oral structures. A critical, long-term determinant of treatment success is the impact of the prosthesis on the periodontal health of the

abutment teeth—the vital pillars of support upon which the functional load is transferred.

Abutment teeth, by virtue of their role, are subjected to a unique constellation of biological and mechanical challenges. In the case of FDPs, these teeth undergo irreversible preparation, which must achieve a balance between retention form and the conservation of tooth structure. The long-term health of the periodontium is intimately tied to the marginal fit of the retainers, the contour of the pontics, and the establishment of accessible embrasure spaces. Even minor discrepancies can become foci for plaque biofilm accumulation, leading to gingival inflammation and potential recession or secondary caries.

Conversely, RPDs, particularly those with clasp-based retention, present a distinct set of challenges. The direct contact of clasps and rests with abutment tooth surfaces creates new ecological niches that are inherently difficult for the patient to clean.[1] These components can alter the natural cleansability of the tooth, promote biofilm maturation, and potentially induce traumatic or pressure-induced changes to the gingival tissues. Furthermore, the functional movement of a tissue-borne prosthesis transmits non-axial, potentially deleterious forces to the abutments, which may contribute to increased tooth mobility and pathological migration over time.[2]

The existing body of literature acknowledges these risks, yet direct, controlled comparisons of the periodontal outcomes between FDP and RPD abutments remain relatively sparse and often yield conflicting results.[3] Much of the evidence is derived from cross-sectional studies or studies with heterogeneous designs, making it difficult to isolate the specific effect of the prosthesis type from confounding variables like pre-existing periodontal status, oral hygiene compliance, and prosthesis design quality. Furthermore, many studies lack a standardized baseline (pre-prosthetic) periodontal assessment, relying instead on single-point evaluations that cannot account for individual patient trajectories.[4]

This study aims to address these gaps by employing a retro-prospective comparative design. By utilizing precise pre-prosthetic clinical records as a true baseline, and coupling them with a standardized follow-up examination after a consistent period of function, this study design allows for a more controlled analysis of change over time attributable to the prosthesis itself.

## MATERIAL AND METHODS

### Research Design

A retro-prospective comparative study design was employed. The study was conducted in the Prosthodontics and Periodontics outpatient departments of a tertiary care dental hospital. All clinical examinations and data collection were performed in a standardized clinical environment under consistent lighting and infection control protocols. Partially edentulous adult patients who had undergone prosthetic rehabilitation with either: Tooth-supported fixed dental prostheses (FDPs), or Clasp-retained removable partial dentures (RPDs)

**Inclusion Criteria:**

- Patients aged 18–65 years
- Patients with a partially edentulous span requiring either FDP or RPD
- Availability of comprehensive pre-prosthetic periodontal records
- Prosthesis in function for 18–24 months
- Willingness to participate and provide informed consent

**Exclusion Criteria:**

- Patients with systemic diseases affecting periodontal health (e.g., uncontrolled diabetes)
- Smokers or tobacco users
- Pregnant or lactating women
- Patients undergoing orthodontic treatment or periodontal therapy during the study period
- Abutment teeth with pre-existing severe mobility (Grade ≥2) or advanced periodontal disease

### Sample Size Calculation

A total of 24 patients were included, divided equally into two groups:

- Group F (FDP): n = 12
- Group R (RPD): n = 12

The sample size was determined based on feasibility and comparable previous studies, considering the exploratory nature of this investigation.

### Procedure for Data Collection

1. Baseline Data Retrieval: Pre-prosthetic records were reviewed to extract baseline periodontal parameters (PI, GI, PPD, CAL, mobility).
2. Follow-up Examination: After 18–24 months of prosthesis use, patients were recalled for clinical examination.
3. Clinical Assessment: A single calibrated examiner performed all measurements using standardized periodontal probes and indices under uniform conditions.
4. Data Recording: All findings were documented in a structured proforma.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using SPSS Version 25. Non-parametric tests (Mann–Whitney U test and Wilcoxon signed-rank test) were applied due to the ordinal nature of indices. A p-value of $<0.05$ was considered statistically significant.

## RESULTS

**Table 1: Comparison of Periodontal Parameters Between FDP and RPD Groups at Follow-up**

| Parameter | Group F (FDP) Mean ± SD | Group R (RPD) Mean ± SD | *p*-value |
|---|---|---|---|
| Plaque Index (PI) | 1.2 ± 0.3 | 1.8 ± 0.4 | <0.01 |
| Gingival Index (GI) | 1.0 ± 0.4 | 1.6 ± 0.5 | <0.05 |
| Probing Pocket Depth (PPD, mm) | 2.9 ± 0.5 | 3.5 ± 0.6 | <0.05 |
| Clinical Attachment Level (CAL, mm) | 2.1 ± 0.4* | 2.9 ± 0.5* | <0.05 |
| Tooth Mobility > Grade 1 (n) | 1 | 3 | 0.28† |

**Statistical test:** Mann–Whitney U test

At the follow-up examination, significant differences were observed between the two groups across several periodontal health indicators. Patients in Group R (RPD) exhibited significantly higher mean Plaque Index scores (1.8 ± 0.4) compared to Group F (FDP) (1.2 ± 0.3) ($p < 0.01$). Similarly, the mean Gingival Index was significantly greater in the RPD group (1.6 ± 0.5) than in the FDP group (1.0 ± 0.4) ($p < 0.05$). Probing Pocket Depth was also significantly deeper in Group R (3.5 ± 0.6 mm) versus Group F (2.9 ± 0.5 mm) ($p < 0.05$). Clinical Attachment Level at follow-up was significantly greater in the RPD group (2.9 ± 0.5 mm) compared to the FDP group (2.1 ± 0.4 mm) ($p < 0.05$). Although a higher number of abutment teeth with mobility greater than Grade 1 was noted in Group R (n=3) compared to Group F (n=1), this difference was not statistically significant ($p = 0.28$).

**Table 2: Change in Clinical Attachment Level (CAL) from Baseline to Follow-up**

| Group | Baseline CAL (mm) Mean ± SD | Follow-up CAL (mm) Mean ± SD | Mean Change (mm) ± SD | *p*-value* |
|---|---|---|---|---|
| Group F (FDP) | 2.0 ± 0.3 | 2.1 ± 0.4 | 0.1 ± 0.2 | 0.32 |
| Group R (RPD) | 2.1 ± 0.4 | 2.9 ± 0.5 | 0.8 ± 0.3 | <0.01 |

**Statistical test:** Wilcoxon signed-rank test

The within-group analysis of Clinical Attachment Level change revealed a statistically significant deterioration only in the RPD group. In Group R, the mean CAL increased from 2.1 ± 0.4 mm at baseline to 2.9 ± 0.5 mm at follow-up, representing a mean loss of 0.8 ± 0.3 mm ($p < 0.01$). In contrast, Group F showed no statistically significant change in CAL, with a mean increase of only 0.1 ± 0.2 mm from a baseline of 2.0 ± 0.3 mm to a follow-up value of 2.1 ± 0.4 mm ($p = 0.32$)

**Table 3: Distribution of Abutment Tooth Mobility at Follow-up**

| Mobility Grade | Group F (FDP) n (%) | Group R (RPD) n (%) |
|---|---|---|
| Grade 0 | 8 (66.7%) | 5 (41.7%) |
| Grade 1 | 3 (25.0%) | 4 (33.3%) |
| Grade 2 | 1 (8.3%) | 2 (16.7%) |
| Grade 3 | 0 (0%) | 1 (8.3%) |

| Mobility Grade | Group F (FDP) n (%) | Group R (RPD) n (%) |
|---|---|---|
| **Total** | **12 (100%)** | **12 (100%)** |

The distribution of abutment tooth mobility grades at follow-up is presented in Table 3. In the FDP group, the majority of abutments (66.7%, n=8) displayed no clinical mobility (Grade 0), while 25.0% (n=3) had Grade 1 mobility and 8.3% (n=1) had Grade 2 mobility. No teeth exhibited Grade 3 mobility. In the RPD group, a lower proportion of teeth were immobile (41.7%, n=5), with 33.3% (n=4) showing Grade 1 mobility, 16.7% (n=2) showing Grade 2 mobility, and one abutment (8.3%) exhibiting Grade 3 vertical mobility.

## DISCUSSION

This retro-prospective comparative study aimed to evaluate and compare the periodontal health status of abutment teeth supporting fixed dental prostheses (FDPs) versus clasp-retained removable partial dentures (RPDs) over a period of 18–24 months. The findings indicate that abutment teeth supporting RPDs exhibited significantly poorer periodontal health parameters compared to those supporting FDPs, as evidenced by higher plaque accumulation, increased gingival inflammation, deeper probing depths, and greater clinical attachment loss. These results support the study hypothesis and underscore the differential impact of prosthesis design on the periodontium.

The significantly higher Plaque Index (PI) and Gingival Index (GI) observed in the RPD group align with the inherent challenges associated with removable prostheses. The clasps, rests, and major connectors of RPDs create retentive niches that impede effective oral hygiene, thereby promoting biofilm accumulation and subsequent gingival inflammation.[1] This finding is consistent with the work of Addison et al. (2020)[5], who reported that RPD abutments demonstrated a 40% higher plaque retention propensity compared to FDP abutments in a two-year longitudinal study. Similarly, Kumar and Smith (2018)[6] noted that the complexity of RPD design often compromises the patient's ability to maintain adequate plaque control, leading to a sustained inflammatory gingival response.

The progressive loss of clinical attachment observed exclusively in the RPD group is a clinically significant outcome. The mean CAL increase of 0.8 mm in this group suggests that RPDs may exert not only a biological burden through plaque retention but also a mechanical one through non-axial forces transmitted during function.[2] This aligns with the biomechanical perspective presented by Verma et al. (2019)[7], who highlighted that tissue-borne removable prostheses induce tipping and rotational forces on abutments, potentially contributing to accelerated periodontal breakdown over time. In contrast, the stable CAL observed in the FDP group may be attributed to the more favorable axial loading and the possibility of achieving better marginal integrity and hygiene access with fixed prosthodontic design.

The greater prevalence of increased tooth mobility in the RPD group, although not statistically significant in this small sample, further hints at the potential for long-term compromise of abutment stability. This trend corroborates findings from Chandrasekaran et al. (2021)[8], who reported that RPD abutments were three times more likely to develop pathological mobility over a five-year period compared to FDP abutments in a retrospective cohort analysis.

Several limitations of this study must be acknowledged. The small sample size, though suitable for an exploratory comparison, limits the generalizability of the findings. Additionally, variables such as individual oral hygiene compliance, exact prosthesis design variations, and occlusal factors were not controlled, which may have influenced the outcomes.

Future research with larger samples, longer follow-up periods, and more detailed biomechanical and microbiological assessments is recommended to further elucidate the causal pathways linking prosthesis type to periodontal health.

## CONCLUSION

Within the constraints of this study, it can be concluded that abutment teeth supporting removable partial dentures are at a higher risk of periodontal deterioration compared to those supporting fixed dental prostheses over a medium-term period. The design of RPDs appears to pose significant challenges for plaque control and may introduce detrimental mechanical forces to the periodontium. These findings reinforce the importance of individualized treatment planning, meticulous prosthesis design, and reinforced periodontal maintenance protocols for patients undergoing removable prosthetic rehabilitation.

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