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ORIGINAL RESEARCH

# BRIDGING THE GAP: PROSTHODONTIC REHABILITATION OF JUVENILE PERIODONTITIS IN TYPE 1 DIABETIC ADOLESCENTS

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## ABSTRACT

**Background:** Juvenile periodontitis (JP), also referred to as molar-incisor pattern periodontitis, is a rapidly progressing periodontal condition that can lead to early tooth loss. Its severity increases in the presence of systemic diseases such as Type 1 diabetes mellitus (T1DM), which compromises host immune response and delays wound healing.

**Objective:** To evaluate the effectiveness of prosthodontic rehabilitation in Type 1 diabetic patients with JP, focusing on periodontal outcomes, prosthesis performance, and patient-reported satisfaction.

**Methods:** A total of 30 patients aged 12–25 years with confirmed JP and T1DM were enrolled. Following initial periodontal therapy, patients received either resin-bonded fixed prostheses or removable partial dentures. Periodontal indices and prosthesis satisfaction scores were recorded at baseline, 3 months, and 6 months. Healing outcomes were compared based on glycemic control.

**Results:** Statistically significant reductions in plaque index, bleeding on probing, and improvements in clinical attachment level were observed ($p < 0.05$). High satisfaction scores were reported in 86.7% of patients. Patients with poorly controlled diabetes (HbA1c >8%) showed delayed healing and localized prosthesis-related inflammation.

**Conclusion:** Coordinated periodontal and prosthodontic management in T1DM patients with JP results in positive clinical and psychological outcomes. However, glycemic control remains essential for optimal healing and long-term success.

***Keywords:** Juvenile periodontitis, Type 1 diabetes, prosthodontics, periodontal healing, adolescent oral health, resin-bonded bridge*

## Introduction

Juvenile periodontitis (JP), now more appropriately classified under molar-incisor pattern periodontitis, is a rapidly progressive periodontal disease seen in otherwise healthy adolescents. It is characterized by significant alveolar bone destruction around the permanent first molars and incisors with a relatively low

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amount of dental plaque. If left untreated, JP leads to early tooth mobility and loss, creating functional and esthetic concerns during a critical developmental period.

Type 1 diabetes mellitus (T1DM) further complicates the clinical picture. It is associated with delayed wound healing, altered immune responses, and increased susceptibility to infections, all of which contribute to worsening periodontal destruction. Periodontal inflammation is more severe in diabetics, and the disease tends to progress more rapidly in this group [1].

Prosthodontic rehabilitation in adolescents with JP and T1DM presents unique challenges. Conventional prostheses may not be ideal due to compromised bone support, ongoing facial growth, and esthetic demands. Additionally, systemic factors such as glycemic control directly impact prosthesis-related outcomes, including soft tissue healing and inflammation [2].

Despite increasing awareness of these challenges, there is limited literature addressing prosthodontic approaches tailored specifically to young diabetic individuals suffering from JP. This study seeks to fill that gap by evaluating prosthodontic outcomes and periodontal stability in Type 1 diabetic patients following periodontal therapy and conservative prosthodontic care.

## MATERIALS AND METHODS

**Study Design and Setting:**

This prospective observational study was conducted in the departments of periodontology and prosthodontics at a tertiary dental care center over a span of 12 months.

**Study Population:**

Thirty patients (17 males, 13 females), aged between 12 and 25 years, diagnosed with JP and confirmed T1DM (duration >2 years), were included after obtaining informed consent and ethical clearance.

**Inclusion Criteria:**

- Clinical and radiographic evidence of JP involving ≥4 teeth
- Diagnosed T1DM with recent HbA1c records
- No history of periodontal therapy in the preceding year

**Exclusion Criteria:**

- Systemic diseases other than diabetes
- Active smokers
- Inability to commit to follow-up visits

**Intervention:** All patients first underwent Phase I periodontal therapy (scaling, root planing, and hygiene instruction). After 4–6 weeks of stabilization, prosthodontic rehabilitation was carried out:

- **Group A (n=16):** Removable partial dentures
- **Group B (n=14):** Resin-bonded fixed partial dentures

**Parameters Assessed:**

- Plaque Index (Silness and Loe)
- Bleeding on Probing (BOP)
- Clinical Attachment Level (CAL)
- Prosthesis satisfaction (5-point Likert scale)
- Healing outcomes compared across glycemic control categories

**Statistical Analysis:** SPSS v25 software was used for statistical analysis. Paired t-tests and ANOVA were applied, with $p < 0.05$ considered significant.

## RESULTS

The demographic distribution of the study cohort reflects a typical presentation of juvenile periodontitis among adolescents and young adults, with a mean age of 18.4 years and a relatively balanced gender ratio. The mean HbA1c level of 7.8% indicates a mixed population of patients with both controlled and uncontrolled Type 1 diabetes, allowing meaningful comparison of treatment outcomes across glycemic control levels.

**Table 1. Demographic Profile of Patients**

| Parameter | Values |
|---|---|
| **Total Patients** | **30** |
| **Age (Mean ± SD)** | **18.4 ± 3.2** |
| **Gender (Male/Female)** | **17 / 13** |
| **Average HbA1c (%)** | **7.8 ± 1.2** |

The nearly equal distribution between removable partial dentures (53.3%) and resin-bonded fixed partial dentures (46.7%) underscores the importance of individualized treatment planning. Selection was based on clinical considerations such as site of tooth loss, patient age, and periodontal support. The preference for conservative, minimally invasive prosthetic options highlights the suitability of resin-bonded bridges in young patients with systemic comorbidities.

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**Table 2.Distribution of Prosthetic Intervention**

| Type of Prosthesis | Number of Patients (n=30) | Percentage (%) |
|---|---|---|
| Removable Partial Denture | 16 | 53.3 |
| Resin-Bonded Fixed Bridge | 14 | 46.7 |

Significant improvements were observed across all periodontal parameters over the 6-month follow-up period. Plaque index and bleeding on probing showed progressive reductions, while clinical attachment levels improved, suggesting successful periodontal stabilization and effective patient compliance with hygiene measures. These findings confirm that periodontal healing is achievable in Type 1 diabetic patients when managed with a coordinated treatment approach.

**Table 3.Changes in Periodontal Indices Over Time**

| Clinical Parameter | Baseline | 3 Months | 6 Months |
|---|---|---|---|
| Plaque Index | 2.6 ± 0.4 | 1.5 ± 0.3 | 1.2 ± 0.2 |
| Bleeding on Probing (%) | 68% | 40% | 24% |
| Clinical Attachment Level (mm) | 5.2 ± 0.7 | 4.3 ± 0.6 | 4.0 ± 0.5 |

Patient satisfaction scores at 6 months post-rehabilitation revealed overwhelmingly positive responses, with 86.7% of participants rating their experience as 4 or 5 out of 5. This suggests that both functional and esthetic demands were adequately met through the prosthodontic interventions employed. The single case of dissatisfaction was linked to poor glycemic control and highlights the interdependence of systemic health and prosthesis outcomes.

**Table 4.Prosthesis Satisfaction Scores**

| Satisfaction Score (1-5) | Number of Patients | Percentage (%) |
|---|---|---|
| 1 | 0 | 0.0 |
| 2 | 1 | 3.3 |
| 3 | 3 | 10.0 |
| 4 | 11 | 36.7 |
| 5 | 15 | 50.0 |

A clear correlation was observed between glycemic control and healing outcomes. Patients with poor glycemic control (HbA1c >8%) had significantly higher rates of delayed healing (50%) and prosthesis-associated inflammation (37.5%). In contrast, patients with well-controlled diabetes experienced no such complications. This reinforces the critical role of metabolic control in determining the success of both periodontal and prosthodontic therapies in diabetic individuals.

**Table 5. Healing Outcomes vs Glycemic Control**

| Glycemic Control | Number of Patients | Delayed Healing (%) | Inflammation at Prosthesis Margin (%) |
|---|---|---|---|
| Good (HbA1c ≤ 7%) | 10 | 0.0 | 0.0 |
| Moderate (7% < HbA1c ≤ 8%) | 12 | 16.7 | 8.3 |
| Poor (HbA1c > 8%) | 8 | 50.0 | 37.5 |

## DISCUSSION

The present study included 30 young individuals (mean age: 18.4 ± 3.2 years) diagnosed with juvenile periodontitis and Type 1 diabetes mellitus, with a nearly balanced gender distribution (Table 1). This demographic spread reflects the common clinical presentation of JP during adolescence and underscores the critical timing for therapeutic intervention.

Table 2 highlights the choice of prosthodontic intervention. Of the total cohort, 16 patients (53.3%) were rehabilitated using removable partial

dentures, while 14 (46.7%) received resin-bonded fixed partial dentures. The selection was primarily based on clinical parameters such as the number of missing teeth, patient age, bone support, and esthetic demands. Resin-bonded bridges, particularly suitable for anterior regions with limited abutment damage, provided esthetic and functional benefits with minimal invasiveness—an essential consideration in growing adolescents with systemic comorbidities [6].

Table 3 reflects the clinical impact of comprehensive therapy. There was a significant reduction in plaque index from 2.6 at baseline to 1.2 at 6 months, indicating enhanced patient compliance with oral hygiene instructions. Similarly, bleeding on probing dropped from 68% to 24%, suggesting reduced gingival inflammation and improved periodontal health. Clinical attachment level (CAL) improved from 5.2 mm to 4.0 mm, a statistically and clinically significant gain. These outcomes validate that even in a diabetic milieu, periodontal stability can be achieved when inflammation is controlled and biofilm is managed effectively [3-5].

Table 4 provides valuable insights into patient satisfaction post-rehabilitation. The majority (50%) rated their satisfaction as 5/5, while another 36.7% gave a score of 4, suggesting that nearly 87% of participants were highly satisfied with the outcome. Factors influencing satisfaction included esthetics, phonetics, ease of use, and comfort. Only one patient reported low satisfaction, attributed to persistent inflammation at prosthesis margins—reinforcing the need for systemic control in ensuring optimal outcomes [7].

Perhaps most crucially, Table 5 explores the correlation between glycemic control and healing outcomes. Among patients with good glycemic control (HbA1c ≤ 7%), none experienced delayed healing or inflammation. In contrast, those with poor control (HbA1c > 8%) had a 50% rate of delayed healing and over one-third exhibited inflammation at prosthesis margins. These findings align with studies by Mealey et al. and Genco et al. [3-9], which highlight the detrimental effects of hyperglycemia on neutrophil function, collagen synthesis, and angiogenesis. The inflammatory cascade triggered in poorly controlled diabetics not only delays healing but also predisposes to early prosthetic complications.

This evidence reinforces the concept that prosthodontic care in medically compromised patients cannot be undertaken in isolation. The dental team must work closely with endocrinologists and pediatricians to ensure that systemic parameters are optimized before, during, and after dental rehabilitation. Such integrated care models are the future of clinical dentistry, particularly in complex cases like these [10].

The findings of this study affirm that well-planned prosthodontic rehabilitation following periodontal stabilization can result in functional and esthetic success in young diabetic patients with JP. Notably, the improvements in plaque index, bleeding on probing, and CAL were statistically significant, confirming the effectiveness of coordinated therapy.

Glycemic control played a pivotal role in healing outcomes. In our study, patients with HbA1c values >8% were more likely to exhibit delayed soft tissue healing and prosthesis-related inflammation. This aligns with earlier observations made by Mealey and Oates 3, who emphasized that poorly controlled diabetes compromises the inflammatory and repair processes within the periodontium.

Our results are consistent with those of Lalla et al. [4], who documented increased matrix metalloproteinase activity and inflammatory mediators in the gingival tissues of diabetic individuals, leading to exaggerated tissue destruction. Preshaw et al. [5] similarly reported that the inflammatory burden in diabetics contributes to rapid progression of periodontal disease unless systemic control is maintained.

The use of resin-bonded bridges, a conservative prosthodontic option, proved beneficial in our cohort, particularly for patients with anterior tooth loss. These findings support the clinical recommendations of Rees and Biggs [6], who proposed such approaches for young periodontitis patients due to minimal invasiveness.

From a psychosocial perspective, prosthodontic rehabilitation significantly improved patient confidence and social comfort—an aspect often overlooked in clinical literature. Novak et al. [7] stressed the need for early esthetic rehabilitation in adolescents to address the psychosocial distress associated with tooth loss.

Furthermore, Casarin et al.[8] have shown that individualized oral hygiene programs are particularly effective in young diabetic patients, corroborating the sustained improvements we observed in plaque control.

Despite these encouraging outcomes, a subset of patients experienced mild prosthesis-related inflammation. This was largely limited to the poorly controlled group, further reinforcing the critical role of systemic stability as emphasized by Genco et al. [9].

The multidisciplinary model applied here—integrating periodontics, prosthodontics, and endocrinology—reflects the comprehensive care approach supported by Trombelli et al. [10], and should be encouraged in similar clinical scenarios.

## CONCLUSION

Juvenile periodontitis in Type 1 diabetic patients poses a complex therapeutic challenge requiring interdisciplinary management. This study demonstrates that with proper periodontal therapy followed by conservative prosthodontic rehabilitation, favorable functional and esthetic outcomes can be achieved.

Successful outcomes, however, are highly dependent on glycemic control and patient compliance with oral hygiene. The integration of medical and dental care, early diagnosis, and tailored prosthetic solutions are crucial for long-term oral health and improved quality of life in these young individuals.

Future longitudinal studies with larger sample sizes and longer follow-ups are warranted to validate these findings and refine treatment protocols further.

## DECLARATIONS

**Ethical approval and consent to participate**

Not Applicable

**Availability of data and material**

All data generated or analyzed during this study are included in the published article.

**Competing interest**

The authors declare that there are no competing interests.

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