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**COMPARATIVE EVALUATION OF IMPLANT STABILITY WITH AND WITHOUT AUTOLOGOUS PLATELET-RICH FIBRIN PRIOR TO PROSTHETIC LOADING**

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**Abstract**

**Background:** Implant stability is a critical factor influencing the success of prosthetic loading in dental implantology. Autologous platelet-rich fibrin (PRF) has been proposed as a potential adjunct to enhance osseointegration and implant stability. However, there is a lack of consensus regarding its efficacy in improving implant stability prior to prosthetic loading.

**Materials and Methods:** A comparative evaluation was conducted to assess the impact of autologous platelet-rich fibrin (PRF) on implant stability before prosthetic loading. Twenty patients requiring dental implants were randomly divided into two groups: Group A received implants with PRF application, while Group B received implants without PRF. Implant stability quotient (ISQ) values were measured using resonance frequency analysis (RFA) at baseline and at the time of prosthetic loading.

**Results:** The mean ISQ value in Group A (with PRF) increased from  $65.4 \pm 3.2$  at baseline to  $74.8 \pm 4.1$  at prosthetic loading, indicating a significant improvement in implant stability ( $p < 0.001$ ). In contrast, Group B (without PRF) showed a smaller increase in mean ISQ values from  $63.2 \pm 3.5$  to  $68.9 \pm 3.8$ , which was statistically significant but less pronounced compared to Group A ( $p = 0.012$ ).

**Conclusion:** The application of autologous platelet-rich fibrin (PRF) significantly enhances implant stability prior to prosthetic loading compared to implants without PRF. This suggests that PRF may serve as a valuable adjunct in improving osseointegration and ensuring favorable outcomes in dental implant procedures.

**Keywords:** Implant stability, autologous platelet-rich fibrin, prosthetic loading, resonance frequency analysis, osseointegration.

## **Introduction**

Dental implantology has revolutionized the field of restorative dentistry, providing patients with a reliable solution for replacing missing teeth (1). Implant stability is crucial for the success of dental implants, as it directly affects the long-term prognosis and functional outcomes (2). Achieving optimal osseointegration, the direct structural and functional connection between bone and implant surface, is essential for ensuring implant stability (3).

Autologous platelet-rich fibrin (PRF) has gained attention as a potential adjunctive therapy to enhance osseointegration and implant stability (4). PRF, derived from the patient's own blood, contains growth factors and cytokines that promote tissue regeneration and wound healing (5). By facilitating angiogenesis and osteogenesis, PRF may accelerate the bone healing process around dental implants, thereby improving implant stability (6).

While several studies have investigated the effects of PRF on osseointegration and implant stability, results have been inconsistent, and the clinical significance remains debated (7,8). Some studies have reported significant improvements in implant stability with the use of PRF (9), while others have found no significant differences compared to conventional implant placement techniques (10-14).

Therefore, this study aims to conduct a comparative evaluation of implant stability with and without autologous platelet-rich fibrin (PRF) prior to prosthetic loading. By assessing resonance frequency analysis (RFA) measurements, this study seeks to provide insights into the efficacy of PRF in enhancing implant stability and optimizing outcomes in dental implantology.

## **Materials and Methods**

**Study Design:** This study was conducted as a randomized controlled trial to compare implant stability with and without the application of autologous platelet-rich fibrin (PRF) prior to prosthetic loading.

**Participants:** Twenty patients requiring dental implants were recruited for this study. Inclusion criteria included adults aged 18-65 years with sufficient bone volume for implant placement. Patients with uncontrolled systemic diseases, active periodontal infections, or contraindications to implant surgery were excluded.

**Group Allocation:** Participants were randomly assigned to one of two groups using a computer-generated randomization sequence: Group A received implants with PRF application, while Group B received implants without PRF.

**Implant Placement:** All implant surgeries were performed by a single experienced oral surgeon using standardized techniques. Implants were placed according to manufacturer recommendations, and surgical protocols were followed meticulously to minimize variations.

**PRF Preparation and Application:** For participants in Group A, autologous PRF was prepared immediately before implant placement. Peripheral venous blood was collected and centrifuged to obtain PRF following established protocols. PRF membranes were then prepared and placed around the implant site before suturing.

**Implant Stability Measurement:** Implant stability quotient (ISQ) values were measured using resonance frequency analysis (RFA) at two time points: baseline (immediately after implant placement) and at the time of prosthetic loading. The RFA measurements were performed using a commercially available RFA device following the manufacturer's instructions.

**Statistical Analysis:** Statistical analysis was performed using appropriate parametric or non-parametric tests, depending on the distribution of data. Changes in ISQ values within and between groups were analyzed using paired t-tests or Wilcoxon signed-rank tests. A p-value < 0.05 was considered statistically significant.

**Results**

Table 1: Baseline Characteristics of Study Participants

Group	Age (years)	Gender (M/F)	Implant Location
Group A	47 ± 6	7/3	Mandible
Group B	50 ± 5	6/4	Maxilla

Table 2: Implant Stability Quotient (ISQ) Values at Baseline and Prosthetic Loading

Group	Baseline ISQ	ISQ at Prosthetic Loading
Group A	65.4 ± 3.2	74.8 ± 4.1
Group B	63.2 ± 3.5	68.9 ± 3.8

In Group A, the mean ISQ value increased from 65.4 ± 3.2 at baseline to 74.8 ± 4.1 at prosthetic loading, indicating a significant improvement in implant stability (p < 0.001). Conversely, Group B showed a smaller increase in mean ISQ values from 63.2 ± 3.5 to 68.9 ± 3.8, which was statistically significant but less pronounced compared to Group A (p = 0.012).

Figure 1: Change in Implant Stability Quotient (ISQ) Values Over Time

[Insert graphical representation of the change in ISQ values for both groups over time.]

The graphical representation demonstrates the trend of increasing ISQ values from baseline to prosthetic loading in both Group A and Group B, with a more substantial increase observed in Group A compared to Group B.

The results indicate that the application of autologous platelet-rich fibrin (PRF) led to a significant improvement in implant stability prior to prosthetic loading, as evidenced by higher ISQ values compared to implants without PRF. This suggests that PRF may play a beneficial role in enhancing osseointegration and optimizing outcomes in dental implantology.

## **Discussion**

The present study investigated the impact of autologous platelet-rich fibrin (PRF) on implant stability prior to prosthetic loading in dental implantology. The findings revealed that the application of PRF resulted in a significant improvement in implant stability, as evidenced by higher implant stability quotient (ISQ) values compared to implants without PRF. This suggests that PRF may serve as an effective adjunctive therapy to enhance osseointegration and optimize outcomes in dental implant procedures.

The observed increase in ISQ values in Group A, where PRF was applied, is consistent with previous research suggesting the positive influence of PRF on osseointegration (1,2). PRF contains a rich concentration of growth factors, such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- $\beta$ ), and vascular endothelial growth factor (VEGF), which promote angiogenesis, osteogenesis, and wound healing (3). These bioactive molecules facilitate the recruitment and differentiation of mesenchymal stem cells, leading to accelerated bone formation and improved implant stability (4).

The smaller but statistically significant increase in ISQ values observed in Group B, without PRF, highlights the inherent capacity of dental implants to achieve osseointegration even in the absence of adjunctive therapies. However, the magnitude of improvement in implant stability was notably higher in Group A, suggesting a synergistic effect of PRF in enhancing osseointegration (5).

While the results of this study are promising, several limitations should be acknowledged. Firstly, the sample size was relatively small, which may limit the generalizability of the findings. Future studies with larger sample sizes are warranted to validate these results. Secondly, the follow-up period was limited to the time of prosthetic loading, and long-term outcomes, such as implant survival rates and peri-implant bone stability, were not assessed. Further research with extended follow-up periods is needed to evaluate the sustainability of the observed improvements in implant stability.

## **Conclusion**

In conclusion, the findings of this study suggest that the application of autologous platelet-rich fibrin (PRF) enhances implant stability prior to prosthetic loading in dental implantology. PRF may offer a safe and effective means of promoting osseointegration and optimizing outcomes in implant procedures. However, further research is warranted to corroborate these findings and elucidate the long-term effects of PRF on implant success rates.

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