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Original Research

Effectiveness of free gingival graft in the augmentation of keratinized tissue around implants: A randomized controlled trial

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ABSTRACT:
Objective: The aim of this study was to evaluate the effectiveness of free gingival grafts (FGG) in augmenting keratinized tissue (KT) around dental implants. **Materials and Methods:** This randomized controlled trial was conducted at the Department of Periodontology, Awadh Dental College and Hospital. The study was conducted between 2021-2022. The institutional ethical clearance was obtained [Ref. code: ADCH/2021-22/EC25]. This study included 60 patients with dental implants and insufficient KT. Participants were divided into two groups: the FGG group (n=30) and the control group (n=30). Clinical parameters, including KT width, probing depth (PD), and clinical attachment level (CAL), were recorded at baseline, 3 months, and 6 months post-surgery. Statistical analysis was performed using paired t-tests and chi-square tests. **Results:** The FGG group showed a significant increase in KT width at both 3 months (3.1±0.4 mm) and 6 months (3.0±0.5 mm) compared to baseline (1.1±0.2 mm) ($p<0.001$). The control group showed no significant changes in KT width. Improvements in PD and CAL were also observed in the FGG group, with mean PD reduced from 2.8±0.5 mm to 2.2±0.4 mm and mean CAL improved from 3.2±0.6 mm to 2.6±0.5 mm ($p<0.05$). Patient satisfaction and esthetic outcomes were significantly better in the FGG group ($p<0.05$). **Conclusion:** The results indicate that FGG is an effective method for increasing KT around implants, improving both clinical parameters and patient satisfaction. This study supports the use of FGG in clinical practice for the management of peri-implant soft tissues.
Keywords: free gingival graft, keratinized tissue, dental implants, peri-implant health, soft tissue augmentation.

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INTRODUCTION

Dental implants have revolutionized restorative dentistry by providing a stable and functional replacement for missing teeth. The success of dental implants is not only dependent on osseointegration but also on the health of the peri-implant soft tissues. Adequate keratinized tissue (KT) around implants is essential for maintaining peri-implant health and function [1]. The lack of sufficient KT has been associated with increased plaque accumulation, inflammation, and peri-implantitis [2]. Therefore, augmenting KT around implants is a critical aspect of implant therapy.

Free gingival graft (FGG) is a widely used technique for increasing the width of KT around natural teeth and implants [3]. The procedure involves harvesting a donor tissue from the palate and transplanting it to the recipient site. FGG has been shown to effectively increase KT width, enhance esthetics, and improve patient comfort [4]. However, the effectiveness of

FGG specifically around dental implants requires further investigation.

Several studies have explored various techniques for augmenting KT around implants, including autogenous grafts, allografts, and xenografts [5, 6]. Among these, FGG remains a popular choice due to its predictable outcomes and long-term stability. Nonetheless, the literature presents mixed results regarding the necessity and benefits of KT augmentation around implants. Some studies suggest that adequate KT is not critical for implant success if proper oral hygiene is maintained, while others emphasize the importance of KT for preventing peri-implant diseases [7, 8].

This study aims to evaluate the effectiveness of FGG in augmenting KT around implants by comparing clinical outcomes, patient satisfaction, and esthetic results between the FGG group and a control group without grafting. The hypothesis is that FGG will result in a significant increase in KT width and improve peri-implant health compared to the control group.

The primary outcome measure in this study is the change in KT width from baseline to 6 months post-surgery. Secondary outcomes include probing depth (PD), clinical attachment level (CAL), patient satisfaction, and esthetic evaluation. By providing a comprehensive analysis of these parameters, this study seeks to contribute valuable data to the ongoing debate regarding the necessity of KT around implants.

To ensure the reliability and validity of the results, this study was designed as a randomized controlled trial. Patients were randomly assigned to either the FGG group or the control group. Standardized surgical protocols and follow-up procedures were implemented to minimize variability and bias. Clinical assessments were performed by blinded examiners to further enhance the objectivity of the findings.

MATERIALS AND METHODS

Study Design and Patient Selection

This randomized controlled trial was conducted at the Department of Periodontology, Awadh Dental College and Hospital. The study was conducted between 2021-2022. The institutional ethical clearance was obtained [Ref. code: ADCH/2021-22/EC25]. Informed consent was obtained from the subjects. Sixty patients with dental implants and insufficient KT (<2mm) were selected based on specific inclusion and exclusion criteria. Inclusion criteria included patients aged 18-65 years, non-smokers, and those with good oral hygiene. Exclusion criteria included systemic diseases affecting healing, uncontrolled diabetes, and use of medications affecting gingival tissue.

Randomization and Group Allocation

Patients were randomly assigned to the FGG group (n=30) or the control group (n=30) using a computer-generated randomization list. Allocation concealment was ensured using sealed opaque envelopes.

Surgical Procedure

In the FGG group, a free gingival graft was harvested from the palatal donor site. The recipient site was prepared by removing any existing soft tissue and creating a recipient bed. The graft was then secured to the recipient site using sutures. Post-operative care included antibiotics, analgesics, and chlorhexidine mouthwash.

In the control group, no grafting procedure was performed. Standard oral hygiene instructions and follow-up care were provided.

Outcome Measures

The primary outcome measure was the change in KT width, measured at baseline, 3 months, and 6 months post-surgery. Secondary outcome measures included probing depth (PD), clinical attachment level (CAL), patient satisfaction, and esthetic evaluation.

Statistical Analysis

Data were analyzed using SPSS software. Paired t-tests were used to compare changes within groups, while independent t-tests and chi-square tests were used to compare differences between groups. A p-value of <0.05 was considered statistically significant.

RESULTS

KT Width

The FGG group showed a significant increase in KT width at both 3 months (3.1±0.4 mm) and 6 months (3.0±0.5 mm) compared to baseline (1.1±0.2 mm) ($p<0.001$). In the control group, KT width remained unchanged at both time points (1.2±0.3 mm at baseline, 1.3±0.4 mm at 6 months). Table 1.

Probing Depth and Clinical Attachment Level

The FGG group demonstrated significant improvements in PD and CAL at 6 months compared to baseline. Mean PD reduced from 2.8±0.5 mm to 2.2±0.4 mm ($p<0.05$), and mean CAL improved from 3.2±0.6 mm to 2.6±0.5 mm ($p<0.05$). The control group showed no significant changes in PD and CAL. Table 2

Patient Satisfaction and Esthetic Outcomes

Patient satisfaction scores were significantly higher in the FGG group compared to the control group ($p<0.05$). Esthetic outcomes, evaluated using a visual analog scale, also favored the FGG group ($p<0.05$). Table 3

Table 1. Changes in KT Width (mm)

Time Point	FGG Group	Control Group
Baseline	1.1±0.2	1.2±0.3
3 months	3.1±0.4	1.2±0.3
6 months	3.0±0.5	1.3±0.4

Table 2. Changes in Probing Depth (PD) and Clinical Attachment Level (CAL) (mm)

Parameter	Time Point	FGG Group	Control Group
PD	Baseline	2.8±0.5	2.7±0.6
PD	6 months	2.2±0.4	2.6±0.5
CAL	Baseline	3.2±0.6	3.1±0.7
CAL	6 months	2.6±0.5	3.0±0.6

Table 3. Patient Satisfaction and Esthetic Outcomes

Parameter	FGG Group	Control Group
Patient Satisfaction	8.5±1.2	6.3±1.5
Esthetic Outcome	8.3±1.1	6.1±1.4

DISCUSSION

The findings of this study demonstrate that FGG is an effective technique for augmenting KT around dental implants. The significant increase in KT width observed in the FGG group aligns with previous studies that have reported similar outcomes [9, 10]. The improvement in KT width is critical for enhancing peri-implant health, as sufficient KT acts as a barrier against plaque accumulation and inflammation [11].

The reduction in probing depth (PD) and improvement in clinical attachment level (CAL) in the FGG group further supports the benefits of KT augmentation. These clinical parameters are essential indicators of peri-implant health and stability [12]. The lack of significant changes in PD and CAL in the control group highlights the potential risks of insufficient KT around implants.

Patient satisfaction and esthetic outcomes were significantly better in the FGG group, suggesting that the procedure not only improves clinical parameters but also enhances patient-perceived outcomes. The higher satisfaction scores in the FGG group can be attributed to the improved appearance and comfort provided by the augmented KT [13]. Esthetic considerations are increasingly important in modern implant dentistry, and the ability of FGG to deliver favorable esthetic results is a significant advantage.

Comparing our findings with existing literature, it is evident that FGG remains a reliable method for KT augmentation around implants. A study by Kim et al. (2016) reported similar increases in KT width and improvements in PD and CAL following FGG around implants [14]. Likewise, Thoma et al. (2014) found that FGG effectively increased KT and improved peri-implant soft tissue conditions [15]. These studies, along with our findings, reinforce the clinical utility of FGG in managing peri-implant soft tissues.

However, the necessity of KT augmentation has been debated. Some researchers argue that with proper oral hygiene, implants can be successful without adequate KT [16]. For instance, a study by Linkevicius et al. (2013) suggested that implants with minimal KT can maintain health if patients adhere to strict oral hygiene protocols [17]. Despite these findings, the consensus in the literature leans towards the benefits of sufficient KT in preventing peri-implant diseases and ensuring long-term implant success [18-20].

The limitations of this study include the short follow-up period and the focus on a single type of grafting procedure. Future research should aim to include longer follow-up periods to assess the long-term stability of the augmented KT. Additionally, comparing different grafting techniques could provide a broader understanding of the most effective methods for KT augmentation around implant.

CONCLUSION

This study demonstrates that free gingival graft (FGG) is an effective method for augmenting keratinized tissue (KT) around dental implants. The significant increase in KT width, reduction in probing depth (PD), and improvement in clinical attachment level (CAL) observed in the FGG group highlight the clinical benefits of this procedure. Additionally, higher patient satisfaction and favorable esthetic outcomes further support the use of FGG in enhancing peri-implant health and appearance. Despite some debate regarding the necessity of KT augmentation, our findings align with the consensus that sufficient KT is crucial for maintaining peri-implant health and preventing peri-implant diseases. Future research should focus on long-term outcomes and comparisons with other grafting techniques to provide a comprehensive understanding of the best practices for KT augmentation around implants.

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