RESEARCH

# The effect of free gingival graft on peri-implant health*

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## ABSTRACT

**The effect of free gingival graft on peri-implant health**

**Background:** Keratinized tissue is important for the maintenance of healty peri-implant mucosa. The aim of the clinical study was to evaluate the width of keratinized tissue and periodontal parameters after free gingival graft procedure in implant supported prosthesis area and comparing with the contralateral implant supported prosthesis area without keratinized tissue.

**Methods:** 15 patients with missing keratinized tissue in peri implant area participated in this randomized split mouth controlled study. Group I (test group) consisted of 15 patients receiving 15 free gingival grafts after implant supported prostheses. Group II (control group) consisted of the contralateral implant supported dentures of the same patients. Plaque scores (PI), gingival index (GI), bleeding on probing (BOP) gingival recession depth (RD), keratinized tissue width (KTW), probing depth (PD), clinical attachment level (CAL) and gingival thickness (GT) were evaluated at baseline and after 12 months.

**Results:** Both groups showed absence of signs and symptoms of peri implant disease. The amount of keratinized tissue significantly increased 6 months after surgery in test groups. KTW and GT were increased in test groups from baseline to 6 months ($p<0.001$). PI and GI scores were found higher in control groups. In postoperative sixth month RD, PD and CAL were similar in the both group. In postoperative sixth month, KTW and GT was better in test group ($p<0.001$). RD, PD and CAL were similar in the both group.

**Conclusion:** The free gingival graft is an effective approach to increase the width of keratinized tissue of implant supported prosthesis. Lack of the peri implant keratinized tissue plays a critical role in the accumulation of bacterial plaque around the dental implants, this situation may increased risk of peri implant diseases.

## KEYWORDS

**Dental implant, free gingival graft, gingival recessions**

## ÖZ

**Serbest dişeti greftinin peri-implant sağlık üzerine etkisi**

**Amaç:** Keratinize doku, sağlıklı peri-implant mukozanın idamesi için önemlidir. Bu klinik çalışmanın amacı, yapışık dişeti olmayan implant destekli protez bölgesine serbest dişeti grefti prosedürünün ardından keratinize doku genişliğinin, periodontal parametrelerin değerlendirilmesi ve keratinize doku olmayan kontrlaterel implant destekli protez alanındaki klinik parametreler ile karşılaştırılmasıdır.

**Gereç ve Yöntemler:** Bu randomize kontrollü çalışmaya simetrik bölgelerinde peri-implant alanında keratinize doku eksikliği bulunan 15 hasta katıldı. Grup I (test grubu), implant destekli protezlerin tamamlanmasından sonra implant bölgelerinden birine serbest dişeti grefti yapılan 15 hastadan oluşmaktaydı. Grup II (kontrol grubu), aynı hastaların yumuşak doKusuna cerrahi müdahale yapılmamış kontralateral implant etrafı yumuşak doku bölgelerinden oluşuyordu. Her iki grupta plak indeksi (PI), gingival indeksi (GI), Sondalamada kanama (BOP) dişeti çekilmesi miktarı (GÇ), keratinize doku genişliği (KDG), sondalama cep derinliği (CD), klinik ataçman düzeyi (KAD) ve gingival kalınlık (GK) başlangıçta ve 12 ay sonra değerlendirildi ve karşılaştırıldı.

**Bulgular:** Her iki grupta da peri-implant hastalığının belirtileri yoktu. Test gruplarında ameliyattan 6 ay sonra keratinize doku miktarı belirgin olarak arttı. KTW ve GT test gruplarında başlangıçtan 6 aya yükseldi ($p <0.001$). PI ve GI skorları kontrol gruplarında daha yüksek bulundu. Ameliyat sonrası altıncı ayda RD, PD ve CAL her iki grupta da benzerdi. Postoperatif altıncı ayda, KTW ve GT test grubunda daha iyi idi ($p <0.001$). RD, PD ve CAL her iki grupta benzerdi.

**Sonuç:** Serbest dişeti grefti prosedürü peri-implant bölgede keratinize doku oluşturmak için en güvenilir yöntemdir. Keratinize doku eksikliği peri-implant bölgede plak birikimine neden olmaktadır, bu durum peri-implant hastalıkların oluşması için risk teşkil etmektedir.

## ANAHTAR KELİMELER

**Dental implant, serbest dişeti grefti, dişeti çekilmesi**

Keratinized tissue is important for healthy peri-implant mucosa. Absence of the peri implant keratinized tissue plays a critical role in the accumulation of bacterial plaque around the dental implants, increased risk of peri implant inflammation and contributes to implant failure.[1-3] Several clinical and experimental studies have shown that the lack of the keratinized tissue on peri-implant area, that effects the maintenance of periodontal health.[4]

If an adequate zone of keratinized tissue around the implant long term implant health, plaque control and aesthetics can be improved.[5,6] Peri implant plastic surgery approaches are methods that can contribute to

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the development of healthy peri implant structures able to withstand occlusal forces and mucogingival stress, while providing satisfactory esthetic results in both soft and hard tissues. Peri implant plastic surgery techniques are important in terms of increasing keratinized tissue width (KTW), helping to improve peri implant health and maintaining it over the long term.[7] Most of surgical procedures have been used to create the attached gingiva, including apically positioned flap or a vestibuloplasty procedure, free gingival graft, the coronally advanced flap with subepithelial connective tissue graft, pedicle graft, guided tissue regeneration with membranes, acellular dermal matrix and platelet rich fibrin.[8-10]

Soft tissue augmentation can be performed before the implant placement, at the same time with second stage surgery or after the final reconstruction. In the presence of both shallow vestibules and inadequate KTW, free gingival graft (FGG) can be performed successfully.[11,12] Some authors suggest that soft tissue augmentation finished before implantation in order to avoid peri implantitis and facilitate oral hygiene.[11] In contrast, some authors recommended that periodontal plastic surgery procedures and soft tissue augmentation finished after the implant placement and during the healing phase of the implants.[12,13]

Several studies have stated that increased gingival and plaque index scores, gingival recession, and marginal bone resorption in around implants with less than 2 mm of keratinized tissue.[14,15] In contrast some studies have demonstrated that, peri implant tissues can be provided in a healthy condition with a minimum amount of keratinized tissue.[16] Nowadays, there are a limited number of studies have been investigated peri implant tissue health and the presence of keratinized tissue around implants.[17] When searching the literature we founded that there are a limited number of studies about peri implant tissue health.In the literature, there are a limited number of studies about peri implant tissue health

The aim of the clinical study was to evaluate the width of keratinized tissue and periodontal parameters after free gingival graft procedure in implant supported prosthesis area and comparing with the contralateral clinical parameters in implant supported prosthesis area without keratinized tissue.

## MATERIALS AND METHODS

All patients were recruited from Necmettin Erbakan University, School of Dentistry, Department of Periodontology, Konya, Turkey. All selected patients gave full written informed consent in accordance with Helsinki Declaration and the study protocol was approved by the Necmettin Erbakan University, School of Dentistry human study ethic committee.

30 sites of 15 patients (7 males and 5 females, aged 35 to 65 years; median: 50 years) participated in this split mouth study based on the following inclusion criteria: age≥18 years good systemic and periodontal health, similar bilateral lack of keratinized tissue in implants area in mandibular region. Exclusion criteria were as follows: insufficient bone volume; parafunctional habits; smoking more than 10 cigarettes per day; excessive consumption of alcohol; localized radiotherapy of the oral cavity; antitumor chemotherapy; liver, blood, and kidney diseases; immunosuppression; current corticosteroid or bisphosphonate use; pregnancy; mucocutaneous diseases involving oral cavity; and poor oral hygiene.

The study was designed as a split mouth, randomized, controlled clinical trial. Bilateral posterior premolar and molar site of the mandible which have lack of keratinized tissue on the ridge crest and inadequate vestibular depth (Figure 1, Figure 2). A metal coin was flipped for randomization. Randomization was done in the operation day, just before the surgery. Simultaneous interpositional free gingival grafting was planned in the implant supported prosthesis area to increase the amount of keratinized tissue after implant placement. 15 patients with missing keratinized tissue in peri implant area participated in this randomized split mouth controlled study. Group I (test group) consisted of 15 patients receiving free gingival grafts after implant supported prostheses. Group II (control group) consisted of the contralateral implant supported dentures of the same patients (Figure 2).

**Figure 1.**

Preoperative view of test group

**Figure 2.**

The clinical view of test group

The augmentation procedure was performed on Group I with the implants already restored with the final prosthesis. Clinical measurements were taken at starting point and 6 months postoperatively. The measurements comprised an assessment of probing depth (PD), plaque scores (PI), gingival index (GI), clinical attachment level (CAL) and gingival recession parameters including recession depth (RD)(from the edge of the implant supported prothesis-gingival margin distance was measured) keratinized tissue width (KTW) and gingival thickness (GT). PD, CAL, RD and KTW values were recorded by using a Williams probe (Hue Friedy, Chicago, IL, USA) and rounded up to the nearest millimeter. To standardize the clinical measurements acrylic stents were prepared on patients' casts. KTW recorded as the distance from the mucogingival junction to the gingival margin. Duplicate measurements were made for KTW with an interval of 24 hours and the average value of two measurements was used for the assessment.

## Surgery procedure

All surgical procedures were performed under local anesthesia. The patient was instructed to rinse with 0.12% chlorhexidine mouthwash before the surgery. The horizontal incision line extend of the implant site was on the mucogingival junction and supra periosteal dissection was performed to the desired vestibular depth. The recipient sites were prepared in the palate. Graft was harvested from the palate and bleeding was controlled using sterile gauze dampened with saline. A prefabricated acrylic stent was placed to protect the donor site. The graft was cut to the correct shape, sutured with 5 0 vicryl in place on the periosteum, and stabilized using a periodontal surgery dressing (Figure 3). The patient was prescribed an analgesic (flurbiprofen 2*1), and mouthwash (0.12% chlorhexidine digluconate, twice a day for two weeks). The stent and sutures were removed 10 days after the operation.

**Figure 3.**

Intraoperative views after free gingival graft was placed and sutured

Postoperatively, the patient was instructed to rinse her mouth twice a day with 0.12% chlorhexidine solution for the first 2 weeks after the surgery and the sutures were removed after 10 days. All patients were followed up postoperatively at 1, 3 and 6 months and oral hygiene instructions reinforced. Postoperative measurements were done by a different surgeon.

## Statistical analysis

Statistical computations were carried out using IBM PASW/SPSS software (v.18.0.0 2009, IBM Corporation, Somers, NY, USA). Implants were included in the statistical analysis as independent values. Mean values and standard deviations were calculated for each variable and group. The difference between groups was analyzed with paired T testand Wilcoxon test.

## RESULTS

Postoperative measurements were done 6 months after surgery (Figure 4). Evaluations were performed for 15 patients. No adverse events or side effects were observed after treatment. Comparison of clinical parameters among and within the groups is shown in Table 1. Clinical measurements showed a significantly increase for KTW in test groups. GT and

KTW significantly increased 6 months after surgery in test groups (Table 2). PI and GI scores were found higher in control groups. In postoperative sixth month RD, PD and CAL were similar in the both group (Table 1).

In all patients, the development of the attached gingiva allowed a better restoration of the implant site. Patients reported little discomfort during the healing and maintenance phases. No signs of inflammation and peri implantitis were observed through periodical examinations.

**Table 1.**

**Postoperative 6th months comparisons between control and test groups**

| Parameter (mm) | Test group mean ± SD | Control group mean ± SD | Statistical test | P value |
|---|---|---|---|---|
| Probing depth | 2.27 ± 0.69 | 2.84 ± 0.81 | Wilcoxon | < 0.001 |
| Recession width | 0.47 ± 0.33 | 0.93 ± 0.41 | Wilcoxon | < 0.001 |
| Clinical attachment level | 2.73 ± 0.77 | 3.07 ± 1.07 | Paired t- test | < 0.001 |
| Keratinized gingival width | 7 ± 1.47 | 1.40 ± 0.50 | Paired t-test | 0,023 |
| Gingival thickness | 3,89 ± 1.23 | 0.39± 0.21 | Paired t-test | < 0.001 |
| Gingival index | 0.39± 0.11 | 1.99 ± 0.20 | Wilcoxon | < 0.001 |
| Plaque index | 0,87± 0,46 | 2,04±0,67 | Wilcoxon | < 0.001 |

**Table 2.**

**Postoperative 6th months comparisons in test group**

| Parameter (mm) | Baseline mean ± SD | Postoperative mean ± SD | Statistical test | P value |
|---|---|---|---|---|
| Probing depth | 2.33 ± 0.66 | 2.27 ± 0.69 | Wilcoxon | < 0.001 |
| Recession width | 0.87 ± 0.83 | 0.47 ± 0.33 | Wilcoxon | < 0.001 |
| Clinical attachment level | 3.13 ± 1.07 | 2.73 ± 0.77 | Wilcoxon | < 0.001 |
| Keratinized gingival width | 1.37 ± 0.77 | 7 ± 1.47 | Wilcoxon | < 0.001 |
| Gingival thickness | 0.46 ± 0.23 | 3,89 ± 1.23 | Wilcoxon | < 0.001 |
| Gingival index | 1.49± 0.31 | 0.39 ± 0.11 | Wilcoxon | < 0.001 |
| Plaque index | 1,77± 0,56 | 0,87±0,46 | Wilcoxon | < 0.001 |

**Figure 4.**

View of test group postoperative sixth month after surgery

## DISCUSSION

It has been shown in many studies that increased gingival and plaque index scores, mucosal recession, and marginal bone resorption in peri implants areas when less than 2 mm of keratinized tissue.[17-19] Studies showed that a lack of keratinized tissue after the insertion of the final prosthesis, causing discomfort and restricting oral hygiene performance. On the contrary some authors stated that with adequate plaque control, peri implant tissues can be achieved with a minimum amount of keratinized tissue.[16,20-23] In this study we observed that greater amount of plaques in the control group than test groups. Due to the increased amount of keratinized tissue in the test group may have decreased plaque accumulation. These results were similar with recent studies.[15-19]

Free gingival grafts are commonly used to increase the keratinized tissue band. In cases where less than 0.5 mm of keratinized tissue is present preoperatively, autogenous free gingival grafts have been proven to be successful and predictable before implant surgery.[24] For this reason in this study we preferred free gingival grafts to increase the level of attached gingiva.

The amount of keratinized tissue should be evaluated when planning for implant supported restoration. If it noticed the lack of attached gingiva surgical soft tissue augmentation procedures should be performed. Soft tissue grafting can be performed at a variety of timelines during implant therapy. Some study showed that successful outcomes decreases when performed after crown connection but some authors advised that timing for soft tissue augmentation associated with implants or after the fixed partial dentures.[22,26] But

the time of free gingival graft application should be done is still uncertain. We preferred the applications in graft after the prosthesis. After the prosthesis it is risky to do soft tissue surgery but in clinical practice usually that may need create attached gingival in the maintenance phase. Because of these we wanted to results of the surgery after the prosthesis.

Free gingival grafts had proven for increase in the width of keratinized gingival.[25] But they stated that FGG has limitations, both regarding the quantitative (volume augmentation) and qualitative outcomes (aesthetic integration, surface, colour, scarring), in aesthetic zone. In this study soft tissue augmentation was done in posterior region because of this aesthetic did not important.

Studer et al. compared in a controlled clinical study SCTGs and FGGs for soft tissue augmentation in peri-implant area by quantitative volume assessment. After 3.5 months revealed significantly greater volume gain with SCTGs in comparison to FGGs.[25,26] In this study we preferred to use FGG because of lack of attached gingiva. Free gingival grafts are classified as fullthickness or split-thickness grafts. A full-thickness graft's mean, that include the epithelium and the entire zone of lamina propria. Split-thickness grafts are consist of epithelium and minimal of lamina propria.. The use of a thicker gingival graft is ideal for cases where the main purpose is to increase the zone of attached or keratinized tissue tissue.[22] These grafts are less prone secondary graft contraction when compared with split-thickness grafts. Because of these reasons in this study we preferred full-thickness free gingival graft's. In previous reports, maximum tissue shrinkage (approximately 20%–40%) occurs during the first 3 months post operation and will proceed until first years postsurgicaly with a persistent, significantly lower rate.[27-29] Consistent with the literature in this study the tissue width reduced until the third month to the sixth month. But contrary to the literature the results of the study meaning about 88% of the tissue width were maintained for test groups after a 6 months follow up, these values were found higher than literature but this time may shorter for evaluate the tissue shrinkage.[30]

In conclusion; we evaluated and to compared the width of keratinized tissue after free gingival graft procedure in implant supported prostheses. Several studies have demonstrated that increased gingival and plaque index scores, gingival recession, and marginal bone resorption in around implants with less than 2 mm of keratinized tissue.[14,15] Similarly in this study we observed that greater amount of plaques in the control group than test groups.

## CONCLUSION

The free gingival graft is an effective approach to increase the width of keratinized tissue of implant supported prosthesis. Lack of the peri implant keratinized tissue plays a critical role in the accumulation of bacterial plaque around the dental implants, this situation may increased risk of peri implant diseases.

### Conflict of interest

"No potential conflict of interest relevant to this article was reported".

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All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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