

Salvaging the Impaired Soft Tissue - A Case Series

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Abstract

Background: A sufficient amount of keratinized tissue around the implants is an essential factor in maintaining functional stability. The keratinized gingiva is important to protect the connection between the implant and the abutment. Another important function of the keratinized tissue is aesthetics. For successful outcome of implantation and subsequent implant prosthesis, and for long-term stable results, it is necessary to recreate the attached keratinized gingiva. **Aim:** To evaluate the clinical effect of free gingival graft, Connective tissue graft and Platelet Rich Fibrin for peri-implant soft tissue augmentation. **Methods:** Three cases are presented in which soft tissue augmentation of the implant using free gingival graft, Connective tissue graft and Platelet Rich fibrin was done. **Results:** Clinically, soft tissue healing was uneventful without any postoperative complications and keratinised tissue around the implant collar was well established. **Conclusion:** To prepare ideal conditions for prosthetics and for the long-term success of implants it is necessary to create sufficient amount of keratinized tissue around the implants

Keywords: *Implant, Aesthetics, Soft Tissue Augmentation, Connective Tissue Graft, Gingival Graft*

1. INTRODUCTION

Implant dentistry has been a successful treatment modality for replacing missing or non-restorable teeth. Recently, the focus of implant research has shifted from the functional stability of the implant to its aesthetic integration in the smile line of patient. The aesthetics of implant restorations is based on two fundamental components: the reproduction of the natural tooth characteristics on the implant crown and the establishment of a soft tissue housing (Adequate width of keratinized tissue) that will intimately embrace the crown¹.

Lang and Loe assessed the amount of keratinized gingiva required to maintain gingival health and concluded that regardless of the patients health inflammation still persists in areas with less than 2.0 mm of keratinized gingiva².

Clinical significance of Attached gingiva around implants as stated by Krygier et al is as follows³:

- Attached gingiva helps to maintain patient comfort and resistance to mechanical trauma during oral hygiene procedures, especially in patients with severe atrophy where the

retraction of the lip and tongue hinder hygiene efforts

- A non-keratinised epithelium may not be able to form a functional junctional epithelium
- The alveolar mucosa, due to its elastic and moveable nature, would under functional movement constantly challenges the epithelial seal around implants
- Tissue prolapse can occur while attaching or removing prosthetic components

Therefore, the success of implant rehabilitation relies heavily on the preservation or the augmentation of peri-implant soft tissue by means of periodontal surgical procedures.

Factors that should be considered when evaluating the need for soft tissue grafting include the level of clinical attachment on adjacent teeth to support papillary height, the thickness of the coronal soft tissue margin to ensure a proper emergence profile, the thickness of labial soft tissue to simulate root eminence and prevent trans illumination of underlying metallic structure, the position of the mucogingival junction and amount of keratinized tissue so as to

blend harmoniously with that of the adjacent teeth^{4,5}

Depending on the patient's requirement and the techniques used, various methods have been known for obtaining adequate amounts of keratinized tissue. These include apically positioned flaps, laterally positioned flaps, free gingival grafts, connective tissue grafts, pedicle graft, and platelet rich fibrin. Soft tissue augmentation can be done while the implant is being placed or prior to surgery and even during the second stage implant surgery.

Autogenous free gingival grafts is an effective option in places where there is less than 0.5 mm of keratinized tissue available. One of the methods widely used is free gingival grafts, which are proven successful. However, these also represent with various disadvantages like; increased discomfort, requirement of two surgical sites, potential for postoperative bleeding from donor site owing to the wound that heals by secondary intention. In addition, discrepancies in colour and texture with the surrounding mucosa oftentimes result in a compromised aesthetic outcome⁶. When using this technique, a few percentile of shrinkage is expected. A shrinkage of 38 to 45% after one year has been reported in the case of a free gingival graft in relation to the graft thickness⁷.

Significant gains of soft tissue by augmenting the gingiva with a connective soft tissue graft harvested from the palate have been investigated. Soft tissues at augmented sites were thicker than on control sites and had a better pink aesthetic score. However, this technically sensitive procedure did not lead to less peri-implant bone loss and requires secondary surgical site to be obtained⁸.

Another trial to influence the peri-implant soft tissue is the use of platelet-rich fibrin (PRF). This second-generation platelet concentrate described by Choukroun. et al. is a fibrin matrix enriched with cytokines, circulating progenitor cells, and growth factors which can be used as a resorbable membrane in surgery. Several studies show a constant release of growth factors such as PDGF (platelet-derived growth factor) or TGF- β (transforming growth factor) for at least 1 week

up to 28 days and proved its accelerating effect on the healing process⁹.

Few years ago, the use of PRF has developed extremely and has continued to demonstrate its efficiency and its potential applications in bone grafting and mucogingival procedures, including the prevention and correction of peri-implant gingival recession. It has been clinically proven that PRF enables the simple, effective, and predictable management of the gap between alveolar bone and implant. This, in turn, allows the prevention of secondary gingival recession by maintaining the future level of the biologic space¹⁰.

Hence, the aim of this case series was to evaluate the clinical effect of using free gingival graft, Connective tissue graft and Platelet Rich Fibrin for peri-implant soft tissue augmentation.

2. CASE REPORT - 1

A 46-year-old male patient reported to the Department of periodontology, FDS, Bangalore with the chief complaint of feeling roughness with respect to implant placed 46 since 1 month. The patient was systemically healthy with good overall periodontal status. The patient had undergone implant placement 6 months back. Clinical examination revealed black colour peri-implant gingiva, lingually placed implant with respect to 46 and evident bone loss around implant. Inadequate width of attached gingiva (2mm) was noted in the respective region. Hence, it was decided to perform peri-implant plastic surgery by connective tissue grafting for the better prognostic outcome of the implant.

Surgical Procedure

The procedure was done under local anaesthesia with 2% xylocaine with 1:200,000 epinephrine

Donor Site

A single, full thickness horizontal incision is made at a right angle to the alveolar bone of the palatal keratinized tissue approximately 3mm from the free gingival margin of the maxillary teeth. This first incision extends from the mesial aspect of the palatal root of the maxillary first molar as far anteriorly as needed for the appropriate amount of donor tissue required. A

second incision is made parallel to the underlying bone so that a thin split-thickness flap is created to separate the underlying connective tissue from the superficial flap. When the desired volume of SCTG has been identified, the blade is directed towards the bone at the edges of the graft so that the SCTG is free except for its periosteal attachment. A periosteal elevator is slid under the partial-thickness flap to separate the graft from the underlying bone. The procured graft is kept in saline-soaked gauzes until used. The palatal flap is then closed with single interrupted sutures.

Recipient Site

A crestal incision is given on the buccal and palatal aspect with respect to 46 and is extended onto the adjacent teeth. A full-thickness flap is raised to allow access to the recipient site. The procured graft is adapted to the area. Adequate dimension of the graft is taken to provide soft tissue bulk at the level of the neck of the implant to ensure an aesthetic emergence profile for the restoration. The tissue grafts is trimmed to resemble a semi-circular cone so that the apical aspect does not span to the proximal surfaces of adjacent teeth. The apex of the graft is stabilized in the connective tissue at the base of the flap so that the graft is stretched and well adapted onto the recipient bed. The flap is closed with single interrupted sutures using a 4-0 or 5-0 suturing material and area is covered with periodontal dressing.

Post-operative instructions were given and Amoxicillin 500mg, thrice daily for 5 days and Aceclofenac (100mg) Paracetamol(500mg) combination twice daily for five days.

Recall visit one year after grafting procedure reported good acceptance of the graft at the recipient site. The bulk of the graft was reduced and increase vestibular depth keratinized tissue was observed.

3. CASE REPORT - 2

A 66 year old female patient reported to the department of periodontology, FDS, Bangalore with history of implant placement done with respect to 46,47 region 8 years back in a private practice which had not been prosthetically replaced since then. The patient was systemically healthy with good overall periodontal status. Clinical examination revealed loss of keratinized tissue and thread exposure on the buccal aspect of the implant placed with respect to 46. Intraoral periapical radiograph revealed bone loss around the implant. Hence it was decided to perform soft tissue augmentation using free gingival graft.

Surgical Procedure

The procedure was done under local anaesthesia with 2% xylocaine with 1:200,000 epinephrine.

Donor Site

The graft was harvested from the edentulous area seen adjacent to the implant placed 46, 47. Horizontal anterior/posterior incision is given using a 15c blade 3mm away from the implant placed. A second anterior/posterior horizontal partial-thickness incision is traced parallel to the first incision at a position closer to the midline. The distance between these two incisions is based upon the estimated amount of tissue graft required for grafting. The two horizontal incisions are connected via anterior and posterior vertical partial-thickness incisions on the mesial and distal aspect of the graft. The graft is separated from the underlying tissue for an ideal thickness of 1.5mm to 2mm. The procured graft is placed in saline until used.

Post-operative instructions were given and Amoxicillin 500mg, thrice daily for 5 days and Aceclofenac (100mg) Paracetamol(500mg) combination twice daily for five days.



Fig. 1 (a) Pre-operative view



Fig. 1 (b) Reflection of flap



Fig. 1 (c) Incisions given on the palate



Fig. 1 (d) Split-thickness flap is created to separate the underlying connective tissue from the superficial flap



Fig. 1 (e) Connective tissue graft harvested



Fig. 1 (f) Palatal flap closed with single interrupted sutures



Fig. 1 (g) The procured graft is adapted to the area.



Fig. 1 (h) Flap is closed with single interrupted sutures



Fig. 1 (i) 1-Week postoperative view



Fig. 1 (j) 1 Year postoperative view

Results

The soft tissue healing was uneventful without any postoperative complications. Dense connective tissue was observed around implants

and there was significant increase in the vestibular depth two months after the surgical procedure. The epithelial tissue around the implant collar was well established.



Fig. 2 (a) Pre-operative view



Fig. 2 (b) Pre-operative radiograph



Fig. 2 (c) Edentulous area – donor site



Fig. 2 (d) Incisions given on the donor site



Fig. 2 (e) Graft harvested



Fig. 2 (f) Full-thickness flap is reflected



Fig. 2 (g) Procured graft is adapted to the



Fig. 2 (h) Sutures placed



Fig. 2 (i) 2 months Post-operative

4. CASE REPORT - 3

A 60 year old male patient reported to the Department of periodontology, FDS, Bangalore with the chief complaint of irritation of gums with respect to implant placed 43 since 1 month. Patient reported of implant placement 2 years back. The patient was systemically healthy with good overall periodontal status. Clinical examination revealed inflamed gums, implant thread exposure and loss of keratinized tissue on the buccal aspect of the implant placed with respect to 43. CBCT images revealed loss of buccal cortical plate and anteriorly placed implant with respect to 43. . Hence, it was decided to perform peri-implant plastic surgery by Platelet rich fibrin membrane for the better prognostic outcome of the implant.

Surgical Procedure

The procedure was done under local anaesthesia with 2% xylocaine with 1:200,000 epinephrine. A full thickness mucoperiosteal flap is reflected by giving crevicular incisions on the buccal and palatal aspect of the implant placed and is extended to adjacent teeth. Implantoplasty was done to smoothen the rough edges around implant. Decortication procedure was done to

stabilise the blood clot and improve the blood circulation in that area. On the day of the surgery, venous blood was extracted from the patient's right hand into 10 mL tube (total of two tubes). Choukroun's method (a light spin method) was used to prepare PRF. Blood was softly centrifuged immediately after collection without anticoagulant and then separated into three components with the formation of a fibrin clot at the middle of the tube. The clot PRF was taken and placed in the press system to unify it. The PRF membrane obtained is placed on the desired site. The flap is closed with single interrupted sutures using a 4-0 or 5-0 suturing material and area is covered with periodontal dressing.

Postoperative instructions were given to the patient. Chlorhexidine gluconate mouth rinse 0.12% and amoxicillin 500 mg TID was prescribed for a week.

Results

Recall visit one year after grafting procedure reported a good acceptance of the graft and gain in keratinized tissue around implants. The soft tissue healing was uneventful without any postoperative complications



Fig. 3 (a) Pre-operative view



Fig. 3 (b) Full thickness mucoperiosteal flap reflected. Implantoplasty done



Fig. 3 (c) Decortication done



Fig. 3 (d) PRF membrane is placed



Fig. 3 (e) Flap closed with single interrupted sutures



Fig. 3 (f) Periodontal dressing placed



Fig. 3 (g) 1 year post-operative

5. DISCUSSION

Adequate width of attached tissue at the tooth and implant soft tissue surface is pre-requisite for healthy prosthesis and correlates with maintenance of teeth and implant supported prosthesis. It has been established that the presence of keratinized tissue was significantly associated with good mucosal health and inadequate keratinized tissue lead to 2mm or greater bone loss¹¹.

In a retrospective study of 339 implants in 69 patients over 3 years, it was reported that regardless of the implant surface configuration and absence of adequate keratinized tissue in dental implants it was associated with higher plaque accumulation and gingival inflammation¹².

Another study that randomly collected data on 200 implants which covered various indices including the mean gingival index score, plaque index and radiographic alveolar bone loss. In these cases, it was found that all these indices showed a significantly higher value for those implants which were placed in a narrow zone of keratinized tissue compared with those implants placed within a keratinized tissue which was not more than 2 mm¹³. Various approaches are used for soft tissue augmentation around the dental

implant include, laterally positioned flaps, free gingival grafts, connective tissue grafts, pedicle graft, and platelet rich fibrin. In this case series, free gingival grafts, connective tissue grafts and platelet rich fibrin was used.

The major drawbacks of free gingival graft and connective tissue graft is the requirement of additional wound site that may cause certain degree of discomfort and increase the risk of postoperative complications such as pain and haemorrhage, limited amount of soft tissue procured by this procedure especially when the keratinized tissue defect is large. As various growth factors are expressed during different phases of tissue healing, hence could serve as therapeutic agents to enhance both peri-implant soft and hard tissue regeneration. Platelet concentrates is one of these various growth factors and PRF is one of the recent innovation of various platelet concentrates. PRF is a concentrated suspension of growth factors found in platelets. These concentrates contains high levels of growth factors including PDGF, TGF β 1, β 2, vascular endothelial growth factors (VEGF), platelet derived endothelial growth factors, Interleukin 1 and 2, basic fibroblast growth factor (β -FGF), platelet activating factor 4 (PAF-4) . The cascade of reaction involves

immediate binding of secreted growth factors to the transmembrane receptors present on the external surface of cell membranes in graft, flap or wound. This result in activation of an endogenous internal signal protein, which further initiate the expression of a normal gene sequence of cell such as matrix formation, cellular proliferation, osteoid production, and collagen synthesis¹⁴.

Although PRF has been tested successfully in surgical procedures with reference to hard tissue augmentation (sinus lift, socket preservation) and in the field of periodontal regeneration, publication of PRF usage in combination with soft tissue augmentation are rare.

According to a study done by Ahmed et al in 2016, used Platelet Rich Fibrin (PRF) for Peri-Implant Soft Tissue augmentation in aesthetic Zone. They concluded that PRF can be used for soft tissue augmentation to modify thin gingival biotype. In this case series, we find that both Sub epithelial connective tissue graft (SCTG) and Free gingival graft (FGG) helped in the reconstructing the buccal dimensions of the site improving the tissue thickness.

In addition, they create the illusion of root prominence and increase the width of the crestal peri-implant mucosa in order to provide an emergence profile for the restoration and enable the constructed site to closely resemble a natural tooth. When a thin biotype is diagnosed, a SCTG, FGG or PRF can be used to prevent potential long-term recession of the facial mucosal margin or permeation of a gray color from the implant.

6. CONCLUSION

To prepare ideal conditions for prosthetics and for the long- term success of implants it is necessary to create sufficient amount of keratinized tissue around the implants. Knowledge of the variety of techniques available for soft tissue augmentation around implants and proper planning enable clinicians to meet patients' increasing aesthetic demands. The present case series put forward various soft tissue augmentation procedures around implants which help to improve the prognosis, aesthetics and function of implant. Further, long-term clinical

studies are needed for better assessment of these surgical procedures.

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