

CLINICAL CASE REPORT

Management of peri-implant keratinized tissue deficiency following roll flap complication: A case report

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ABSTRACT

Adequate peri-implant keratinized tissue is crucial for the maintenance of implant health and long-term success. This case report presents the management of a soft tissue complication arising from an initial attempt to augment peri-implant keratinized tissue. A 43-year old female patient presented with a lack of keratinized tissue around an implant. A roll flap technique was first employed to increase tissue volume; however, it led to an undesirable coronal shift of the mucogingival junction and further reduction of the peri-implant keratinized tissue. To address this complication, a free gingival graft was subsequently performed. The procedure resulted in a significant increase in peri-implant keratinized tissue, promoting healthy peri-implant conditions and supporting long-term implant stability. This case highlights the importance of selecting appropriate techniques for soft tissue management around implants.

Keywords: Peri-implant soft tissue complication, gingival recession, roll flap technique, vestibuloplasty, free gingival graft

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1. Case presentation

A 43-year-old female patient presented with a fractured root at tooth #14 due to failed endodontic treatment, and a periapical cyst at tooth #15 caused by long-standing pulp necrosis (**Fig 1**). Dental implants were placed at those site simultaneously with guided bone regeneration (GBR) (**Fig 2**).



Fig 1. Initial situation of patient

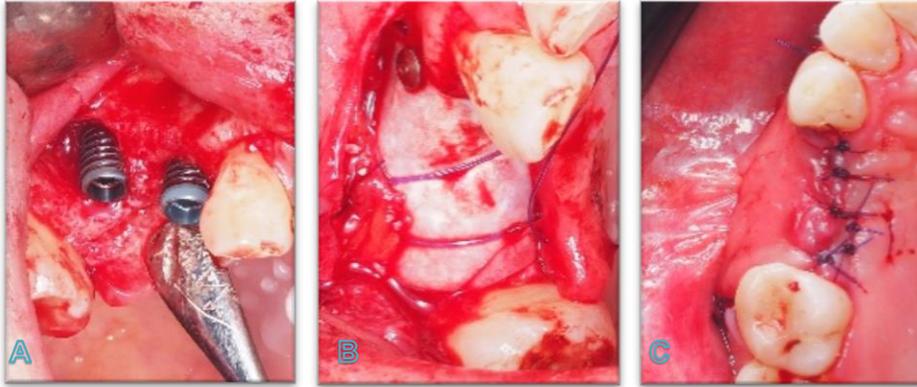


Fig 2. *Implant placement + GBR*

After 5 months, a roll flap technique was performed to augment the buccal soft tissue volume at implant sites, followed by the placement of implant-supported prostheses (**Fig 4**). However, after one month of functional loading, the patient reported food impaction around the implant area, mild gingival discomfort, and halitosis.



Fig 3. *Healing after 5 months*



Fig 4. *Roll flap technique and final restoration*

Intraoral examination revealed significant food impaction around the cervical areas of the restorations. Gingival recession was noted on both the buccal and palatal aspects, exposing the abutments (**Fig 5-A**). The peri-implant gingiva was mildly tender and bled slightly upon probing. Periapical radiographs showed good osseointegration of both implants with no signs of crestal bone loss. The restorations exhibited proper marginal adaptation with no residual cement detected (**Fig 5-B**).

After removing the prostheses, it was observed that the mucogingival junction had migrated coronally, particularly at implant site #14 (**Fig 6-A**). The vestibule was shallow, and there was an almost complete absence of keratinized gingiva (< 1mm width) on the buccal side of both implants (**Fig 6-B**).



Fig 5. A: Gingival recession exposing the abutment.
B: Periapical radiography of 2 implants



Fig 6. Lack of keratinized gingival and shallow vestibule

Based on all signs and symptoms examined from the patient, we provided treatment plan including 3 steps:

- Removal of restorations at sites #14 and #15
- Vestibuloplasty combined with free gingival graft on the buccal aspect of implants #14 and #15
- Digital workflow–based restoration of implants #14 and #15 redone 2 months after free gingival graft surgery

In surgical phase, firstly, we employed partial-thickness flap elevation and vestibuloplasty. The patient underwent a partial-thickness flap procedure, with the incision made at the mucogingival junction. A partial-thickness dissection of the mucosa over the buccal aspect of the implants was carried out using a 15c blade and the rounded end of a periosteal elevator to eliminate cheek muscle insertions, leaving the periosteum and part of the connective tissue as the recipient bed (**Fig 6-A**). The flap margin was sutured to the periosteum at the base of the future vestibular depth (**Fig 6-B**).

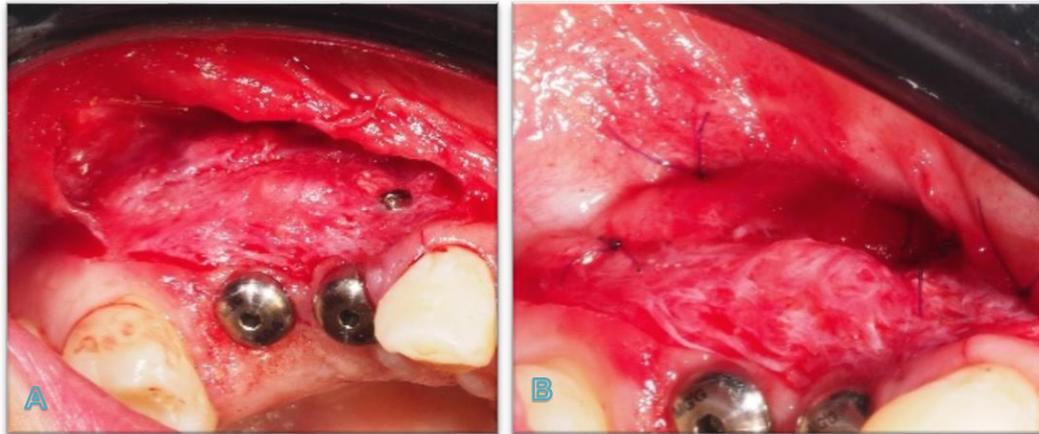


Fig 6. Flap design and vestibular depth recontouring

After created the recipient bed, we employed free gingival graft, firstly, we used the suture wrapper paper to shape a template that matches the recipient site (**Fig 7-A**). Secondly, we harvested the connective tissue graft from the posterior palatal area using the four-incision technique and trimmed excess fatty tissue from the underside of the graft (**Fig 7-C**). Thirdly, we contoured the graft to match the shape of the template (**Fig 7-D**) then secured the graft to the recipient site using simple interrupted and cross-mattress sutures (**Fig 7-F**). The most important thing to note is always ensure that there is no overlapping of flap margins, as this may impair wound healing.

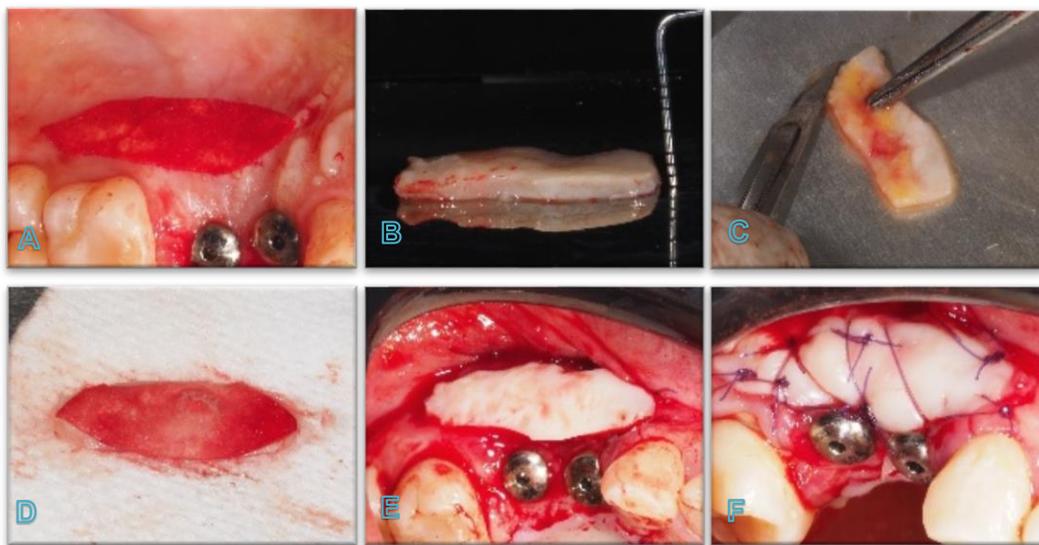


Fig 7. Free gingival graft step by step.

After 1.5 months, the graft demonstrated excellent integration with the recipient site, the vestibular sulcus was deepened, and the volume of keratinized gingiva on the buccal aspect of the implant area was significantly increased (**Fig 8**). A digital impression was taken using a Scan Body and the Trios 3 intraoral scanner. The prosthesis was then fully computer-aided designed (**Fig 9**).



Fig 8. Healing after one and a haft months



Fig 9. Digitally designed prosthesis

The final restoration was tried in the mouth, occlusion was adjusted, and the crown was cemented extraorally onto the abutment to ensure optimal control of excess cement. The restoration showed precise adaptation and harmony with the surrounding soft tissues.



Fig 10. Final restoration

2. Discussion

In this case, several factors contributed to an increased risk of failure for the roll flap technique. Firstly, it is important to note the deficiency in the width of buccal keratinized gingiva (<1 mm). Chowdhury et al. reported that the roll flap technique primarily focus is on enhancing the gingival thickness, it might contribute to the increase in soft tissue width and does not change the gingival biotype¹. Additionally, periosteal releasing incisions and the detachment of buccinator muscle insertions from the flap were not performed. As a result, even after suturing the flap to the periosteum, flap mobility still remained, which impeded the

formation of stable attached gingiva. Last but not least, this technique is not recommended for multiple implants¹. Consequently, a complication occurred involving the deficiency of buccal keratinized tissue around the implants and vestibular shallowing.

In contrast, the vestibuloplasty combined with free gingival graft has shown significant effectiveness in deepening the vestibular sulcus and increasing keratinized gingiva². This technique requires specific considerations. Firstly, the incision should be made at the mucogingival junction, and the flap should be partially elevated to create a connective tissue bed for graft nourishment. Secondly, the future vestibular sulcus should be determined based on the depth of the one of adjacent teeth, allowing for the fixation of the flap edge to shape the future vestibule. Finally, the graft should be shaped precisely according to the recipient site to avoid overlapping the flap edges, which could impede primary healing³.

In this case, we employed a digital impression technique, with the crown being entirely designed on a computer and milled as a single piece. Moreover, a customized abutment was used to create a gingival profile similar to that of natural teeth. We chose a multilayered Zirconia material with high strength and durability, which is highly compatible with the digital workflow to reduce clinical working time. As a result, it did not take much time to adjust the occlusion of the final restoration.

The final restoration fits snugly against the gingival margin and appears relatively harmonious. The keratinized gingiva increased significantly, and the vestibule was successfully re-established with 10 mm depth. The patient now eats comfortably and no longer complains about food impaction around the abutments.



Fig 11. Pre-operative situation

Fig 12. Post-operative result

3. Conclusion

The coronal shifting of the mucogingival junction after an implant surgery simultaneously with guided bone regeneration is a common occurrence. The roll flap technique carries a high risk of failure in cases with deficient keratinized gingiva. Therefore, if applied in this case, it would result in complications such as gingival recession and exposure of the abutments. Instead, the vestibuloplasty combined with free gingival graft can reposition the mucogingival junction, deepen the vestibular sulcus, and significantly increase the volume of keratinized gingiva around the implant, thereby contributing to the long-term stability of the implant.

Acknowledgments

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