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Peri-Implant Soft Tissue Augmentation: Roll Technique

Dr. Maya S. Indurkar,
Dean And Professor, Department Of Periodontology, Govt. Dental College And Hospital, Chh. Sambhajinagar

Dr. Chandulal D. Dhalkari,
Professor And Head, Department Of Periodontology, Govt. Dental College And Hospital, Chh. Sambhajinagar

Dr. Pawan M. Hargunani,
Post Graduate Student, Department Of Periodontology, Govt. Dental College And Hospital, Chh. Sambhajinagar

Abstract
Peri-implant soft tissue plays a crucial role in the long-term success of dental implants by improving esthetics, enhancing soft tissue volume, and preventing peri-implantitis. This case report presents clinical approaches for peri-implant soft tissue augmentation: the roll technique. This technique is discussed along with surgical procedures, postoperative care, and long-term follow-up.

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I. Introduction –

Following tooth extraction, both hard and soft tissue undergo significant collapse, with horizontal and vertical tissue loss reaching up to **60% within two years**. [1-4] The most substantial post-extraction ridge resorption occurs within the **first year of tooth loss**. Insufficient buccal bone thickness further exacerbates ridge resorption. These **localized ridge defects** manifest as deficiencies in bone and/or gingival tissue and can arise from **tooth extraction, trauma, periodontal disease, or congenital anomalies**.

Such defects pose challenges for **implant placement, soft tissue adaptation, and prosthetic rehabilitation**. The ultimate goal of **implant-supported rehabilitation** is to achieve optimal **soft and hard tissue integrity with esthetic success**. Proper soft tissue management plays a crucial role in maintaining **peri-implant tissue stability over time**.[5]

Localized ridge defects may result from **bone loss, soft tissue deficiency, or a combination of both**. Studies have demonstrated a **predictable success rate** in augmenting Type 1 and Type 2 ridge defects (soft tissue) post-procedure.[6] A **thick keratinized peri-implant mucosa** is essential for preventing **mucosal recession** and ensuring **long-term peri-implant health**. Various surgical techniques have been described in the literature for **augmenting keratinized tissue** at implant sites, including the **Roll Flap, Connective Tissue Graft, Epithelial-Connective Tissue Graft, and Coronally Advanced Flap**.[7]

This case report highlights a **surgical modification of the Roll Technique** for managing **soft tissue deficiencies around implants**. At **six-months follow-up**, the prosthesis exhibited **stable peri-implant tissues**, demonstrating the effectiveness of the approach.

II. Case Report -

This case report describes a **62-year-old patient** who presented with an **edentulous space in relation to the maxillary second molar (17)**. Following the **successful placement of a dental implant**, clinical evaluation after **six months** revealed:

1. **Deficient buccolingual width**
2. **Thin keratinized mucosa**
3. **H-S Class defect** (horizontal defect ≤3 mm) [8]

To assess the extent of the defect, a **bone gauge** was used to measure **crestal bone thickness** around the implant, ensuring the absence of significant **hard tissue deficiency**. Additionally, **transgingival probing** was performed to evaluate **soft tissue thickness** using an **acrylic stent and a graded periodontal probe** with a rubber stop for precise measurement in millimeters.

Considering the findings, **soft tissue augmentation** was planned to enhance **buccal tissue thickness** and improve the long-term stability of the **future implant-supported prosthesis**.

Surgical technique -

After achieving **adequate anesthesia**, a **pedicle flap** was outlined, beginning with a **partial-thickness horizontal incision** made **3 mm away** from the diameter of the underlying **cover screw on the palatal side**. Two **vertical partial-thickness incisions** were then extended from the horizontal incision **toward the crest** and descended **buccally**, ensuring their length corresponded to the required pedicle flap dimensions. The **palatal tissue** was then **marked and de-epithelialized**. [Figure 1]

A **partial-thickness pedicle flap** was carefully reflected **palatally**. Upon reaching the crest over the cover screw, the flap was further reflected as a **full-thickness flap**, extending **buccally** to create a **pouch dissection**, while keeping the **buccal periosteum intact**. [Figure 2] Once the buccal dissection was completed, the **palatal tissue of the pedicle graft was rolled and tucked into the buccal pouch**. The **rolled pedicle flap** was then meticulously **sutured around the emerging implant** using **4-0 vicryl sutures**. [Figure 3] To provide structural support for the **rolled pedicle graft**, **2 mm high healing abutments** were screwed in.

Post-Surgical Care & Follow-Up

- The patient was advised to use an **oral antiseptic rinse (0.2% chlorhexidine) twice daily for 2 weeks**.
- **Ibuprofen 400 mg** was prescribed every **8 hours for 5 days** for pain management.
- **Sutures were removed on the 15th day** post-surgery [Figure 4].
- **At 5 weeks, Impressions were taken**, and after an **intermediate healing period of 2 months**, the **final prosthesis** was placed [Figure 5].
- At **6 months follow-up**, the **achieved mucosal thickness** was **3.5 mm**, reflecting a **2 mm increase in thickness** [Figure 6].

III. Discussion –

Bone resorption is irreversible, chronic, and cumulative. Approximately two-thirds of bone width resorption occurs within the first three months following tooth extraction [1]. Any alteration in gingival morphology post-extraction plays a vital role in determining the final esthetic outcome. Previously, localized ridge deformities were corrected using prosthetic materials to reestablish the natural arch contour. While these prostheses were functionally acceptable, they often resulted in poor esthetics. With the advent of periodontal plastic surgical procedures and their successful integration into implantology, ridge deformities can now be managed before, during, and after implant placement.

Mucosal biotype is an important factor for a successful esthetic outcome. A thin biotype is associated with less interdental papilla fill and an increased risk of peri-implant recession [9]. In a study by Chung et al., mucosal inflammation and plaque accumulation were significantly higher around implants with keratinized mucosa (KM) less than 2 mm [10]. Thick mucosa (≥1 mm) is associated with less mucosal recession compared to thin mucosa (<1 mm) [11]. Cardaripolli, in a prospective study, measured the dimensional alterations of the soft and hard tissues around 11 single-implant restorations over a one-year postloading period. The study reported 1.3 mm of buccal and lingual bone loss, with a corresponding mean soft tissue loss of 0.6 mm. These observed changes occurred within four weeks of implant uncovery and before prosthetic placement [12]. The degree of mucosal collapse depends on the biotype of the peri-implant mucosa, emphasizing the need to transform a thin mucosal biotype into a thick keratinized tissue to ensure stable peri-implant dimensions.

Free mucosal grafts and free connective tissue grafts have been widely used to augment soft tissues around implants. These grafts are harvested from the palate of the same patient and transferred to the recipient site. In the esthetic zone, it is usually necessary to provide a band of keratinized gingiva to harmonize with the adjacent natural teeth. A connective tissue graft with a collar of epithelium attached can help achieve the desired result. The pediculated connective tissue graft, due to its rich vascular supply, enhances and thickens marginal tissue more effectively than a free connective tissue graft. Achieving and maintaining adequate marginal gingival thickness and sufficient width of keratinized tissue at an early stage of implant uncovery surgery is essential for peri-implant health and esthetics.

Speroni, in a three-year retrospective study on augmented soft tissue, observed a mean mucosal thickness of 2.89 mm and a mean increase in mucosal thickness of 1.75 mm at 12 months, compared to baseline [13]. This case report presents a modified roll technique for soft tissue augmentation around a dental implant during the second stage of implant surgery. The primary goal was to correct a mild to moderate buccal ridge deficiency. The mean mucosal thickness achieved after six months was 2.6 mm, with a mean increase in thickness of 1.75 mm from baseline. This technique preserved interproximal tissue, minimized patient discomfort, facilitated faster healing of the palatal donor site, and improved the marginal gingiva associated with the dental implant.

A systematic review on surgical procedures for soft tissue augmentation found that all autogenous tissue graft procedures were effective in increasing tissue volume, with no single technique proving superior to others [14]. This suggests that treatment success does not solely depend on the choice of surgical technique but rather on adherence to sound biological principles to achieve optimal clinical outcomes.

IV. Conclusion –

The procedure described in this case report is indicated for the correction of **mild to moderate buccal ridge deficiency** or for increasing the **bulk of the marginal gingiva** during **stage two implant surgery**. After six months, an **increase in mucosal thickness of 2 mm** was observed. This technique facilitated **optimal healing** and ensured **long-term stability** of the **peri-implant tissues** following the maturation phase of **soft tissue augmentation**.

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Figure 1 – Baseline Deficient Buccal Gingival Thickness
Figure 2 – De-Epithelization, Horizontal Incision 3 Mm Palatal To The Cover Screw And Reflection Of Flap

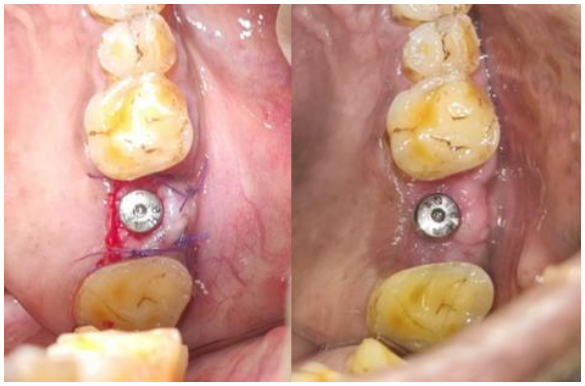

Figure 3 – Suturing Of The Rolled Palatal Flap Into Buccal Pouch
Figure 4 – Suture Removal At 15th Day Post-Surgery

Figure 5 - At 5 Weeks Post-Surgery
Figure 6 - 6 Months Follow-Up