

CASE REPORT

Improving Peri-implant Soft Tissue Using a Modified Rolled Connective Tissue Technique: Case Series

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ABSTRACT

Achieving natural esthetics around implants in the maxilla is generally a challenge for clinicians. This is primarily due to soft and hard tissues loss that occurs post tooth extraction. In an attempt to compensate for this loss, ridge augmentation is often required before or at the time of the implant placement. In the current paper, a modification of the roll technique is described to correct soft tissue defects around implants to improve esthetics. The main modifications involve the use of a papilla preservation technique and avoidance of using sutures for the pedicle part of the connective tissue graft (CTG). The results of these clinical cases were objectively evaluated using the white esthetic score (WES) and pink esthetic score (PES). The combined score for PES and WES ranged from 16 to 20 at final follow-up (24 months) compared to 14-18 at the time of initial restoration delivery with mean scores of 9.33 ± 0.58 for PES and 8.33 ± 1.53 for WES. The esthetic scores of the current case series were satisfactory and remained stable at 12 and 24 months follow-up, indicating a beneficial use of the modified rolled CTG technique for improving peri-implant soft tissues.

Keywords: Connective tissue, esthetics, dental implant, tissue graft

INTRODUCTION

Tooth loss leads to hard and soft tissue dimensional changes resulting in esthetic and functional challenges.^[1,2] Therefore, partial edentulism in the esthetic zone can be a difficult task to correct and is dependent on the amount of alveolar ridge deficiency present. In an attempt to compensate for ridge deficiency, restorative management may include long crowns, broad contacts, or masking the defect using pink porcelains.^[3] To obtain natural esthetic results, a multidisciplinary approach including ridge augmentation is often required before or at the time of restorative treatment.^[4,5]

Multiple classification systems describe alveolar ridge defects.^[4-6] Siebert classified the defects into

horizontal, vertical, and a combination of hard and soft tissue deficiencies.^[4] This classification provides an excellent description of the defects but it lacks specific treatment recommendations. To assist in treatment decision making, Wang and Al-Shammari introduced an alternative classification system named the HVC system for horizontal, vertical, and combination defects. The defects are further subclassified based on their size into small (s) ≤ 3 mm, medium (m) 4-6 mm, and large (l) ≥ 7 mm. With regard to small defects, the roll technique, pouch procedure, and inlay graft are proposed to correct small horizontal deficiency.^[6]

The roll technique was first described by Abrams in 1980.^[7] Many modifications of this technique were cited in the literature to improve the treatment outcomes.^[8-10] The majority of these studies described ridge augmentation techniques to improve soft or hard tissue deficiencies for fixed partial denture (FPD) but not for dental implant treatment.^[4] In the current paper, a modification of the roll technique is described to correct both horizontal and vertical small defects around implants to improve esthetics. The main modifications

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involve the use of a papilla preservation technique and avoidance of using sutures for the pedicle part of the connective tissue graft (CTG). These two modifications maintain better papillary and soft tissue esthetics around the dental implant restorations.^[11]

METHODS

Modified roll technique

Papillae-sparing vertical incisions are made within the keratinized tissues in the edentulous implant space to maintain papillary height [Figure 1]. A partial thickness paracrestal incision is then made extending palatally, reflecting the epithelial layer and maintaining the connective tissue attached to the periosteum [Figure 2]. This connective tissue is then reflected, rolled facially, and folded internally as part of the facial flap [Figure 3]. Thereafter, an external mattress suture is used to secure the external part of the facial and palatal flaps without engaging the internal rolled CTG [Figure 4].

CASE REPORT

Case 1

A 32-year-old female with an unremarkable medical history presented with a history of trauma to tooth No. 7. The tooth was extracted and grafted using particulate freeze-dried cancellous bone allograft and a resorbable collagen membrane (Puros and Biomend Extend, Zimmer Dental, Carlsbad, CA). After 6 months of healing, a small horizontal ridge deficiency was present [Figure 5]. A similar modified roll technique was performed and a 3.7 mm × 13 mm implant (Tapered Screw-Vent®, Zimmer Dental Inc., Carlsbad, CA) was placed [Figure 6]. A screw-retained provisional was fabricated using autopolymerizing acrylic resin material. The final crown was delivered after 6 months [Figure 7], and follow-up at 12 months [Figure 8] and 24 months [Figure 9] demonstrated adequate soft tissue volume with a good esthetic outcome.

Cases 2 and 3

A 62-year-old female with a history of controlled hypertension presented with missing No. 6 [Figure 10] and No. 12 [Figure 11]. The teeth were extracted approximately 11 years prior due to caries. Both teeth exhibited small horizontal soft tissue deficiencies and were scheduled for implant placement with simultaneous rolled CTG. Papillae-sparing incisions were made to

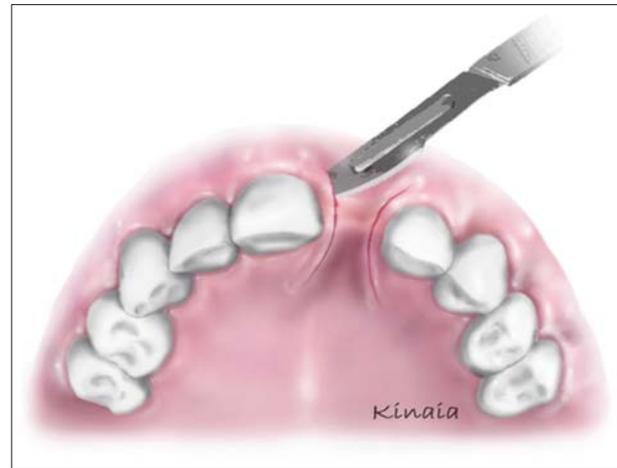


Figure 1: Occlusal illustration of the papilla sparing incisions



Figure 2: Occlusal and lateral illustrations of the thinning partial thickness palatal incision to obtain the pedicle connective tissue graft



Figure 3: Occlusal and lateral illustrations of the palatal connective tissue folded under the facial flap

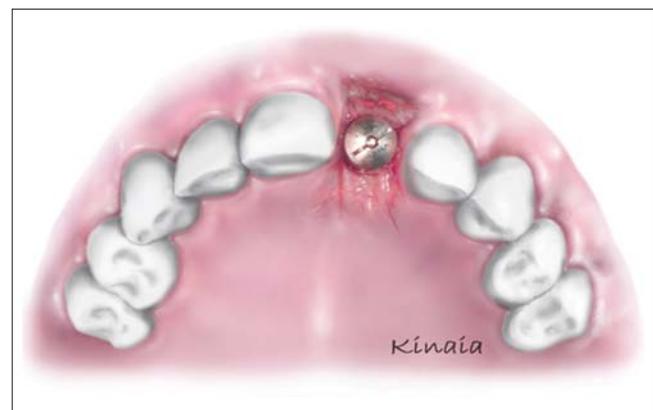


Figure 4: Occlusal illustration of the external mattress suture securing the palatal and facial flaps



Figure 5: Clinical pre-operative facial and occlusal views of the edentulous space No. 7



Figure 6: Clinical view of the harvested connective tissue pedicle and the implant in place



Figure 7: Occlusal and facial clinical presentation at delivery of the final restoration of No. 7



Figure 8: Occlusal and facial views of the final restoration of No. 7 at 12 months follow-up

augment the buccal tissue using the modified roll technique. Site No. 6 received a tapered implant (4 mm × 11.5 mm) (NT, Biomet 3I Inc., Palm Beach Gardens, FL). Site No. 12 received a (4 mm × 10 mm) tapered implant (NT, Biomet 3I Inc., Palm Beach Gardens, FL) with simultaneous internal sinus lift using deproteinized bovine bone (Bio-Oss, Geistlich Pharma AG, Wolhusen, Switzerland). Both implants received screw-retained provisionals using auto-polymerizing acrylic resin material. After 4 months, the final crowns were delivered [Figures 12 and 13]. Follow-up at 12



Figure 9: Occlusal and facial views of the final restoration of No. 7 at 24 months follow-up



Figure 10: Clinical pre-operative facial and occlusal views of the edentulous space of No. 6



Figure 11: Clinical pre-operative facial and occlusal views of the edentulous space of No. 12

[Figures 14 and 15] and 24 months [Figures 16 and 17] demonstrate good esthetics with adequate soft tissue volume for cases Nos. 2 and 3, respectively.

RESULTS

The current modification of the rolled technique showed esthetically pleasing implant crowns with good soft tissue contours. The white esthetic score (WES) and pink esthetic score (PES) is an objective assessment of the esthetic dimensions of the peri-implant soft tissues and restorations evaluating mesial/distal papilla, soft tissue texture and color, etc.^[12] The WES and PES calculated at the 24 months follow-up showed improved values compared to the pre-operative scores. The combined score for PES and WES ranged from 16 to 20 at 24 months compared to 14 to 18 at the time of restoration delivery [Table 1]. The mean scores at 24 months follow-up were 9.33 ± 0.58 for PES and 8.33 ± 1.53 for WES [Table 2]. Clinically, the soft tissues appeared to be stable around the definitive

crowns at 12 [Figures 8, 14, and 15] and 24 months follow-up [Figures 9, 16, and 17] for cases Nos. 1, 2, and 3, respectively.

DISCUSSION

Management of small gingival defects in the esthetic zone presents a challenge for clinicians. The literature cites many techniques to increase the volume of the soft tissue that was lost post extraction. These techniques focus on rebuilding the gingival width of the edentulous space for future restorations including conventional FPDs.^[7,8] However, little consideration has been given to build the facial tissue before or at the time of implant restorations.

This case series described a modification of the rolled connective tissue technique^[7] to augment small deficiencies around dental implant restorations. This technique is performed to preserve the remaining gingival tissue while augmenting the facial tissues

at the time of implant placement using provisional restorations or healing abutments. It employs papillae sparing incisions to maintain papillary height and retains the graft rolled under the facial flap without suturing it.^[13] Retaining the graft attached to the facial tissue provides a better blood supply, which leads to less tissue shrinkage and decreases the chance of tissue morbidity.^[14] The PES and WES system evaluates the esthetic results of peri-implant tissues and restorations objectively. Clinical acceptability is defined as a score of ≥ 12 .^[12] The combined PES and WES for the current case series ranged from 15 to 19 and from 16 to 20 at 12 and 24 months, respectively, indicating an esthetic success.

With regard to the soft tissue response, the PES scores were high ranging from 8 to 9 and from 9 to 10 at 12 and 24 months, respectively, showing horizontal increase in the width of the gingival tissues facially. In addition to the horizontal increase, the authors observed a noteworthy increase in the vertical dimensions. The gingival margin was located slightly more coronal on the implant crown compared to the adjacent natural



Figure 12: Facial and occlusal clinical presentation at delivery of the final restoration of No. 6



Figure 13: Facial and occlusal clinical presentation at delivery of the final restoration No. 12



Figure 14: Facial and occlusal clinical presentation of No. 6 at 12 months follow-up



Figure 15: Facial and occlusal clinical presentation of No. 12 at 12 months follow-up



Figure 16: Facial and occlusal clinical presentation of No. 6 at 24 months follow-up



Figure 17: Facial and occlusal clinical presentation of No. 12 at 24 months follow-up

Table 1: Summary results for the PES and WES at final crown delivery, 12 months follow-up, and 24 months follow-up

Case	Mesial papilla	Distal papilla	Curvature of facial mucosa	Level of facial mucosa	Root convexity, soft tissue color and texture	Total PES	Tooth form	Tooth volume/ outline	Color (hue/ value)	Surface texture	Translucency and characterization	Total WES	Total PES+WES
Final crown delivery													
1	1	1	2	2	1	7	1	1	1	2	2	7	14
2	2	1	2	2	1	8	2	1	1	2	2	8	16
3	2	1	2	2	1	8	2	2	2	2	2	10	18
12 months follow-up													
1	2	1	2	2	1	8	1	1	1	2	2	7	15
2	2	1	2	2	2	9	2	1	1	2	2	8	17
3	2	2	2	2	1	9	2	2	2	2	2	10	19
24 months follow-up													
1	2	2	2	2	1	9	1	1	1	2	2	7	16
2	2	1	2	2	2	9	2	1	1	2	2	8	17
3	2	2	2	2	2	10	2	2	2	2	2	10	20

The follow-up results demonstrate improvement in PES and WES scores compared to the final crown scores for the maxillary anterior teeth. Case 2 corresponds to crown #6, while Case 3 corresponds to crown #12. PES: Pink esthetic scores, WES: White esthetic scores

Table 2: Summary results of the mean PES and WES at 24 months follow-up

Esthetic Index	Mesial papilla	Distal papilla	Curvature of facial mucosa	Level of facial mucosa	Root convexity, soft tissue color and texture	Total score
PES						
Maximum	2	2	2	2	2	10
Minimum	2	1	2	2	1	9
Mean	2	1.667	2	2	1.667	9.333
SD	0	0.577	0	0	0.577	0.577
	Tooth form	Tooth volume outline	Color (hue/value)	Surface texture	Translucency and characterization	Total score
WES						
Maximum	2	2	2	2	2	10
Minimum	1	1	1	2	2	7
Mean	1.667	1.333	1.333	2	2	8.333
SD	0.577	0.577	0.577	0	0	1.528

PES: Pink esthetic scores, WES: White esthetic scores, SD: Standard deviation

teeth as depicted in cases Nos. 1, 2, and 3 at the 12 and 24 months follow ups. This is a notable finding given that previous studies have shown a gingival margin located at the same level of adjacent teeth.^[15] The latter findings may present an additional benefit to the current modified rolled technique; however, one should interpret them with caution as they are merely observational, and a clinical trial is required to validate such findings.

In comparison with the original method, the current modified rolled technique did not require internal sutures to secure the pedicle graft under the facial tissue.^[8,14] Rather, it utilizes the implant crown or the healing abutment to hold and support the grafted tissue facially after it was rolled in. Further, the papillae-sparing incision may play a role in maintaining better papillary height around the implant crown. The esthetic results of the current case series were satisfactory and remained stable at the 12 and 24 months follow-up as evaluated by PES and WES.

CONCLUSION

It is the author's opinion that the current modified rolled technique can be a beneficial adjunctive and conservative procedure to help the practitioner in managing peri-implant soft tissue with mild ridge deficiencies. The modified roll technique may initially be technique-sensitive; however, a clinician can overcome this issue with adequate training and experience.

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