Simplified Rolled Technique at Implant-Uncovering Surgery for Correcting Horizontal Ridge Defect

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Introduction: Ridge deficiencies are major esthetic challenges for the rehabilitation of edentulous ridges with fixed prostheses. Depending on the severity of the defect, it may be corrected through either hard- and soft-tissue augmentation or soft-tissue augmentation alone. The second-stage surgery for implant uncovering offers an opportunity to surgically correct remaining ridge defects. This case presents an alternative approach to correct a facial soft-tissue deficiency at the implant-uncovering surgery.

Case Presentation: A 34-year-old white female with high esthetic expectations was seen for extraction of tooth #9. Five months after extraction, an implant was placed with simultaneous bone augmentation. Six months later, a mild horizontal ridge deficiency was observed. It was subsequently corrected at the time of implant uncovering using a simplified roll technique, featuring minimal surgical trauma and patient discomfort. The implant restoration, peri-implant bone, and soft tissue were stable after 6 months of functional loading.

Conclusion: Mild ridge deficiencies in the esthetic zone can be corrected through the use of a simplified roll technique during implant uncovering. *Clin Adv Periodontics* 2014;4:140-146.

Key Words: Connective tissue; dental implants; esthetics, dental; gingiva; surgical flaps.

Background

Correcting ridge deficiencies to achieve esthetic outcomes for fixed prostheses presents a major challenge. Ridge deficiencies have been defined as vertical (or apico-coronal), horizontal (or bucco-lingual), or combination defects.[1-3] Although varying degrees of deficiencies require both hard- and soft-tissue augmentation, small-to-moderate deficiencies may be treated with soft-tissue augmentation alone. Three commonly performed procedures for improving soft-tissue contours under fixed prostheses are the free gingival graft,[1] subepithelial connective tissue graft (CTG),[4] and roll technique.[5-7]

Scharf and Tarnow,[6] drawing from the work of Abrams,[5] harvested a pedicle CTG from the palatal side of a deficient edentulous ridge. It was subsequently rolled anteriorly and tucked into a buccal envelope. It was deemed a "modified roll technique," differing from the original "roll technique" of Abrams[5] in that the epithelial layer was preserved and allowed to cover the donor site. The roll technique and its modifications are effective because it maintains vascularity to the graft, which is integral to its survival. Gasparini[8] further modified the technique by Scharf and Tarnow[6] by double folding the palatal graft to maximize the amount of augmentation. Table 1 summarizes the above-mentioned three roll techniques used for pontic site preparation for fixed prostheses.

Minor ridge deficiencies around the implant can also be corrected during second-stage implant uncovering by

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TABLE 1 Summary of the Original Roll Technique and Its Derivatives Initially Proposed for Pontic Site Preparation for Fixed Prostheses

Rolled Technique	Reference	Donor-Site (Palate) Preparation				Advantages	Disadvantages
		Epithelial Layer	Vertical Incisions	Sutures	Mode of Healing		
Original	Abrams, 1980[5]	Removed	Yes	Not required	Secondary	Easy to perform Vascularity preserved through pedicle graft	Requires adequately thick palatal tissue Potential for exposed/denuded bone during healing More patient discomfort Heals with depressed and concave area on palatal side
Modified	Scharf and Tarnow, 1992[6]	Retained as part of the palatal flap	Yes	Required for closure of the vertical incisions	Primary	Epithelium is preserved to allow for primary intention healing Less patient discomfort Can be used in long edentulous spans Vascularity preserved through pedicle graft	Thick palatal tissue required Difficult to suture at vertical incisions Healing might be delayed with vertical incisions
Double-fold	Gasparini, 2004[8]	Retained as part of the palatal flap	Yes	Required for closure of the vertical incisions	Primary	More tissue bulk can be achieved by double folding the connective tissue Vascularity preserved, decreasing risk of necrosis	Thick palatal tissue required Limited to one to two teeth because the length of the donor site has to be twice that of the recipient site

using the original roll technique and its derivatives.[7,9,10] This case report presents a unique variation to the modified roll technique, using a minimally invasive method, to correct a minor horizontal facial soft-tissue deficiency around an implant in the esthetic zone during second-stage implant surgery.

Clinical Presentation

On December 18, 2010, a 34-year-old white female was seen in the Graduate Periodontics Clinic at the School of Dentistry, University of Michigan, Ann Arbor, Michigan, for extraction of her maxillary left central incisor (tooth #9) and a single implant restoration. The patient provided written consent for all treatment. She was considered an esthetically high-risk patient because of high esthetic demands and significant hard- and soft-tissue defects, which presented as a gingival margin discrepancy of 2 mm between the maxillary central incisors and a 10-mm probing depth (PD) on the disto-facial site of tooth #9 (Fig. 1a), corresponding to a vertical bony defect on the periapical film (Fig. 1b). Five months after extraction, slight vertical ridge deficiency combined with significant horizontal ridge resorption, especially on the disto-facial site, was observed (Fig. 2). An implant[§] was placed (Fig. 3) with simultaneous bone augmentation using particulated cancellous allogenic bone graft[‖] (Fig. 4a) and a collagen membrane[¶11] (Fig. 4b).

Case Management

The patient was seen 6 months after implant placement for the implant-uncovering procedure. Because there was a mild horizontal ridge deficiency (Fig. 5), it was decided to correct the defect with a variation of the modified roll technique, which the authors termed as the simplified roll technique. A horizontal incision ≈1 mm deep was made 1 mm palatal to the center of the implant, with 2-mm clearance from the adjacent teeth. A partial-thickness pouch was prepared on the palate, starting from the horizontal incision with a mini-surgical blade.[#] The size of the pouch was determined by the amount of the pedicle CTG required for the augmentation. Two vertical incisions were made on the mesial and distal side of the proposed pedicle CTG to the palatal bone under the pouch with the same blade. Finally, a pedicle CTG 6 × 6 mm was elevated from the underlying bone after a horizontal incision was made at its apical end by a back-action chisel (Figs. 6 and 7). Two 2- to 3-mm short vertical releasing incisions extending into the facial soft tissue were made to allow for free movement of the facial flap (Fig. 8). The pedicle CTG was folded onto itself and sutured to the facial flap with a loop suture,[**] as described

§ OsseoSpeed TX, Astra Tech, Mölndal, Sweden.
‖ Puros, Zimmer Dental, Carlsbad, CA.
¶ BioMend, Zimmer Dental.
# Inmedic, Bredaryd, Sweden.
** 5-0 Surgical Gut Suture-Chromic, Ethicon, Johnson & Johnson, West Somerville, NJ.

FIGURE 1a Preoperative image of tooth #9. The gingival margin on tooth #9 was 2 mm higher than that of tooth #8 (black line). A PD of 10 mm was noted on the disto-facial site of tooth #9. **1b** Preoperative periapical radiograph of tooth #9. Note a vertical bony defect on the distal site (arrow), corresponding to the 10-mm PD.

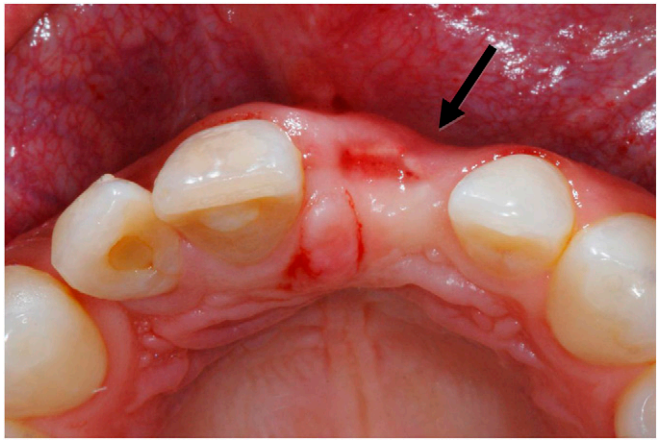


FIGURE 2 Occlusal view 5 months after extraction. Note the horizontal ridge depression (arrow).

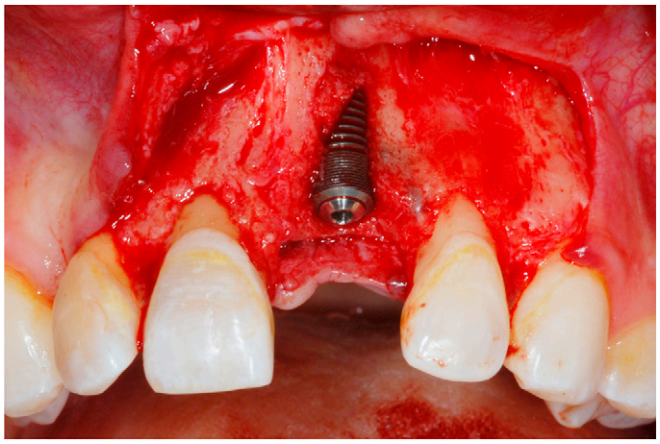
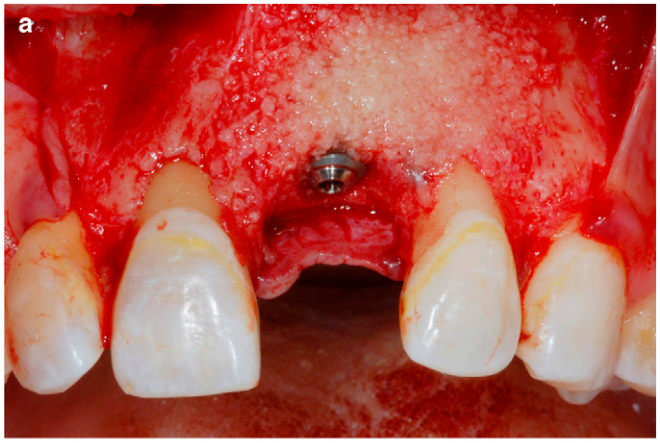


FIGURE 3 Implant placement. Note the large buccal dehiscence and ridge deficiency.



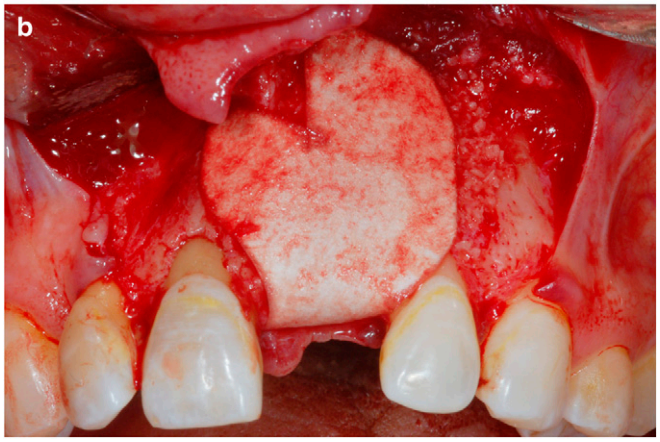


FIGURE 4a Allograft placed over the dehiscence defect. **4b** Guided bone regeneration was accomplished using a resorbable collagen membrane.

by Scharf and Tarnow[6] (Fig. 8). An interrupted suture and sling suture were placed in the mesial and distal vertical releasing incisions, respectively (Fig. 9). After six months of healing, a zirconia abutment fabricated by the computer-aided design/computer-aided manufacturing (CAD/CAM) technique was connected to the implant. Lithium-disilicate-reinforced monochromatic ceramic block with low-translucency color for CAD/CAM technology††

†† IPS e.max CAD LT, Shade BL, Ivoclar Vivadent, Amherst, NY.

FIGURE 5 Mild horizontal ridge deficiency (arrow) was still present at implant exposure.

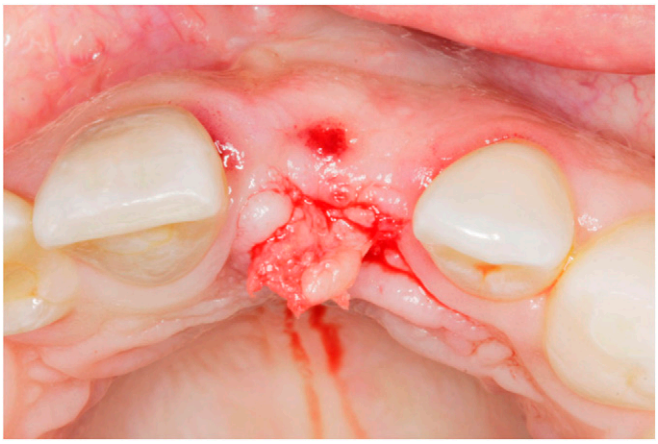


FIGURE 6 Two vertical incisions were made down to the bone under the pouch on the mesial and distal sides of the pedicle CTG, which was subsequently elevated from the underlying bone after a horizontal incision was made at its apical end.

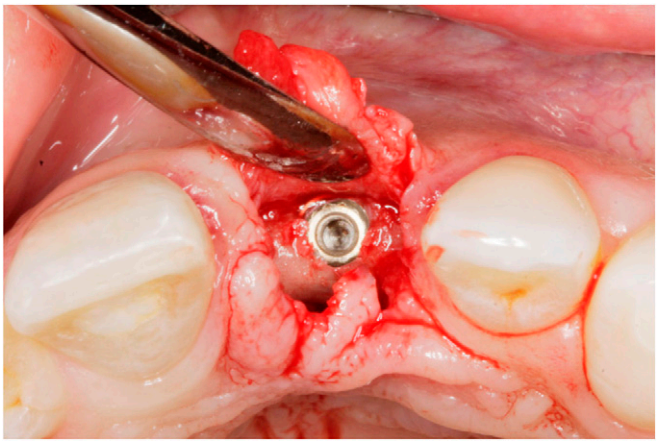


FIGURE 7 Pedicle CTG elevated from palatal donor site. The implant was visualized and the healing abutment was placed.

was used to fabricate definitive restorations for the implant and teeth #7 and #8. The definitive restorations were cemented with radiopaque reinforced glass ionomer luting cement‡‡ (Fig. 10).

FIGURE 8 Sutures were placed to stabilize the pedicle CTG beneath the flap and to secure the small vertical releasing incisions.

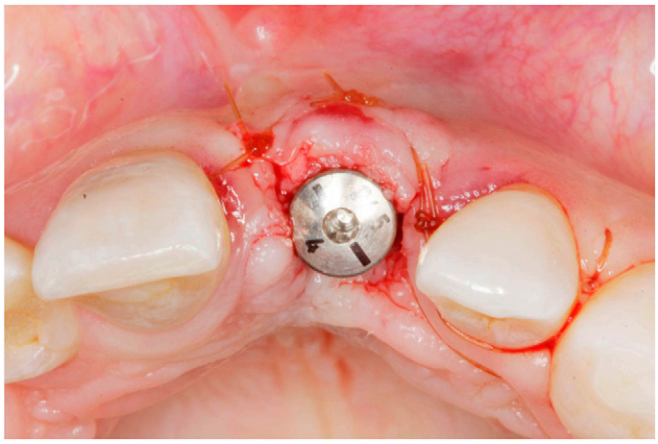


FIGURE 9 Occlusal view after suturing.

FIGURE 10 Implant restoration. Note the soft-tissue thickness apical to tooth #9 (arrow). At 3 months after final crown placement, slight inflammation remained mesial to tooth #9, which was expected to resolve after continued soft-tissue remodeling.

Clinical Outcomes

One year after the second-stage surgery, the implant was clinically stable (Figs. 10 and 11). Although there was a

‡‡ GC FujiCEM Automix, GC America, Alsip, IL.

FIGURE 11 Occlusal view 3 months after crown placement. The mild ridge deficiency was corrected, and the horizontal peri-implant soft-tissue thickness blends harmoniously with that of the adjacent teeth.

slight facial mucosal recession on implant #9, the patient was satisfied with the esthetic outcome.

Discussion

This case report documents the use of an alternative method, modified from the roll technique during implant exposure, for concurrent augmentation of the facial soft tissue. Other modifications of the roll technique[7,9] for implant uncovering have been proposed and the differences in flap designs and the advantages and disadvantages of each procedure are summarized in Table 2. Similar to the pouch rolled technique,[7] this proposed technique is minimally invasive because no vertical incisions were made on the palatal surface, thereby achieving primary wound closure, preserving blood supply, and reducing postoperative discomfort. Comparatively, a wider pedicle CTG can be harvested; thus, it is more suited for correcting larger facial soft-tissue ridge defect. In addition, by thinning the palatal soft tissue, shallower PDs on the palatal site of the implant can be obtained, which eases peri-implant maintenance protocols.

The initial horizontal incision has several features. First, the depth of this incision is kept ≈ 1 mm to prevent the palatal flap from sloughing. Second, it is 2 mm away from the adjacent teeth to avoid disruption of vasculature to the interproximal papillary tissues. Third, it is placed ≈ 1 mm palatal to the center of the implant to facilitate not only implant exposure but also displacement of the soft tissue on top of the implant to the facial side, where the ridge defect is. To minimize damage to surrounding soft tissue, a mini-surgical blade is recommended for this technique. Although the proposed procedure may be technique sensitive, it has proven to be a viable alternative for implant uncovering in the esthetic zone when a slight ridge defect is present. ■

Summary

Why is this case new information?	■ This case documents an alternative method for soft-tissue augmentation that allows a larger soft-tissue graft to be harvested with the use of minimal incisions.
What are the keys to successful management of this case?	■ Correct diagnosis and delicate tissue management, such as the use of mini-surgical blades, ensure an atraumatic surgical technique and minimal patient discomfort.
What are the primary limitations to success in this case?	■ This method of soft-tissue augmentation may be technique sensitive.

Acknowledgment

The authors report no conflicts of interest related to this case report.

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TABLE 2 Modifications of the Roll Technique Used for Implant-Uncovering Surgery

Technique	Reference	Donor-Site (Palate) Preparation				Advantages	Disadvantages
		Epithelial Layer	Vertical Incisions	Sutures	Mode of Healing		
Modified roll	Barone et al., 1999[9]	Removed from the pedicle flap tissue	No	Not required	Primary	No vertical incisions	Only possible for minimal soft-tissue augmentation
Pouch roll	Park and Wang, 2012[7]	Removed from the pedicle flap tissue	No	No	Primary	No need for suturing Interdental areas preserved Primary wound healing	Requires thick overlying tissue Size of graft limited by dimension of tissue overlying cover screw
Trapdoor	Tinti and Parma-Benfenati, 2012[10]	Removed from the pedicle flap tissue	Yes	Yes	Primary	Primary wound healing (Multiple implants) Maintains interimplant tissue to achieve papilla without the use of bone grafting	Requires thick overlying tissue Size of pedicle graft limited to dimension of tissue overlying cover screw (Single implant) May compromise papilla of adjacent teeth
Simplified roll	Current case report	Retained as part of the palatal pouch	No	Required	Primary	Allows larger graft dimensions Preserves vasculature Minimal postoperative discomfort Preserves interdental papillae Primary wound healing	Requires thick palatal tissue Requires the use of mini-surgical blades Technique sensitive

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○ indicates key references.