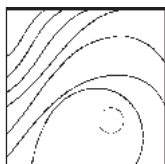


Reconstruction of the Interdental Papilla with an Underlying Subepithelial Connective Tissue Graft: Technical Considerations and Case Reports



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This article introduces a surgical technique developed to achieve soft tissue augmentation of the interproximal space. The technique was designed to minimize surgical trauma and blockage of blood supply to the existing papilla by accessing the papillary area through vertical incisions and by elevating a single full-thickness flap without disrupting the papillary bridge. A free connective tissue graft was placed beneath the undermined papilla and secured with sutures. Advantages and variations of the technique are discussed. (Int J Periodontics Restorative Dent 2011;31:e45–e50.)

Esthetic awareness has increased over the past several years, and dentistry has developed numerous ways of providing patients with esthetic solutions. Several reconstructive periodontal plastic surgical procedures have been developed to attain better esthetics. Coverage of exposed roots resulting from gingival recession, augmentation of atrophic edentulous ridges, and elimination of gingival pigmentation, among others, were made possible because of the advent of connective tissue grafting. However, the reconstruction of the lost interdental papilla has been elusive. Previous attempts were made to augment the interdental papilla using displaced flaps,¹ connective tissue grafts,^{2–5} and repeated inflammatory stimulation⁶ with diverse results. This article is a preliminary report describing a new surgical technique that was developed to achieve soft tissue augmentation of the interproximal space.

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Method and materials

Four healthy, nonsmoking, adult patients that consulted a dental clinic with the request of solving their "black triangle" problem were selected to undergo the surgical papilla augmentation technique. During the initial phase, cases judged as more favorable from a technical point of view, ie, wide interproximal spaces measuring 3 mm or more mesiodistally, were selected for inclusion in this study (Figs 1 and 2). These sites were easier to handle surgically, with better access and less risk of tearing the interproximal tissue.

Surgical technique

Local anesthesia was applied at the recipient and donor sites with particular care not to distort the tissue volume or damage the papilla. Initially, intrasulcular incisions were made at both teeth on either side of the papilla, starting at the vestibular line angle and continuing to the lingual aspect until it reached the opposite lingual line angle (Fig 1b). Then, two vertical releasing incisions were made on the facial aspect of the papilla at the mesiobuccal and distobuccal line angles of both teeth (Figs 1c and 2b). These incisions can be made slightly divergent apically. A third horizontal incision was made on the palatal aspect at the base of the papilla and at least 5 mm apical to the gingival margin (Fig 2c). This incision gives additional mobility to

the papilla and provides another access point.

A full-thickness flap connecting both facial incisions with the palatal and intracrevicular incisions was reflected carefully. In this way, the entire papilla was "lifted." The facial aspect of this flap slides on its vertical incisions, while the palatal aspect opens the horizontal incision like an eyelet. At this point, the flap should be able to be lifted freely without tension (Fig 2d). Then, a free connective tissue graft was harvested from the palate using the technique described by Hürzeler and Weng.⁷ The graft should be at least as wide as the mesiodistal width of the papilla and thick enough to assure sufficient papillary space fill. It also should be long enough to be placed over the crestal bone from the facial to the palatal cortical plates (Fig 1d).

A sling suture was placed in the graft, entering through the palatal incision and exiting through one of the vertical releasing incisions, to aid in graft placement. If no palatal incision is made, the sling suture can traverse the palatal tissue and run freely between the crestal bone and the detached papilla to exit through the vertical vestibular incision. The graft was introduced to the papillary area through one of the vertical incisions by gently pushing from the facial aspect and simultaneously pulling from the sling suture toward the palatal side, until it was seated over the crestal bone (Fig 2f). Once the graft is in place, the suture can be removed or left in place as anchorage for

the graft. A simple suture or horizontal mattress suture was brought through the facial papilla to hold the graft in place (Figs 1e to 1g). A sling suture was taken through the graft and the papilla and tied over the contact point splint to gently "hang the papilla." Care should be taken not to exert excessive tension, since this may compromise vascular supply to the graft. Simple closing sutures were made on the vertical incisions. A cross suture was made on the palatal incision to contain the graft but not to close the wound, since this would apply apical tension to the papilla (Figs 2h and 2i).

Postoperative instructions included antibiotics, chlorhexidine rinses, and nonsteroidal anti-inflammatory medication. Sutures were removed 10 days after the surgical procedure, and regular hygiene was resumed 30 days postoperative.



Fig 1 Patient 1.

Fig 1a (left) Preoperative aspect of a gingival papillary recession.



Fig 1b (right) Intrasulcular incisions were made on either side of the papilla.



Fig 1c (left) Vertical releasing incisions were made on the facial aspect of the papilla at the mesiobuccal and distobuccal line angles of both teeth adjacent to the papilla.



Fig 1d (right) The gingival connective tissue graft harvested from the palate should be of sufficient thickness to assure space fill.



Figs 1e (left) Graft placed gently under the papilla without inducing excessive tension of the recipient bed.

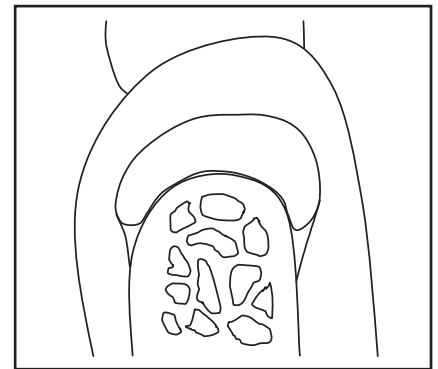


Fig 1f (right) Schematic representation of the connective tissue graft as placed over the interproximal bone crest and under the existing gingival papilla. Volume is generated in an apicocoronary and facial-lingual direction.



Fig 1g (left) Graft secured in place with simple sutures.



Fig 1h (right) Clinical aspect of treated area 15 days after the surgical procedure.



Figs 1i (left) and **1j** (right) Clinical aspect of treated area 24 months after the surgical procedure.





Fig 2 Patient 2.

Fig 2a (left) Preoperative view.



Fig 2b (right) Vestibular aspect of incisions.



Fig 2c (left) Palatal view showing horizontal eyelet releasing incision.



Fig 2d (right) Flap lifted freely without tension.



Fig 2e (left) Gingival connective tissue graft.



Fig 2f (right) Graft placed gently under the papilla through the vertical incision.



Fig 2g (left) Graft in place under the papilla.



Fig 2h (right) Vestibular closing sutures.



Fig 2i (left) Palatal cross suturing of the incision.



Fig 2j (right) Postoperative clinical aspect 3 months after the procedure.

Results

The technique resulted in a significant gain of papillary volume in both a coronal and facial direction. Esthetic improvement was notable, with no visible scars or color mismatch. Minimal coronal displacement of the mucogingival junction was observed, although it was of no perceivable clinical significance.

Discussion

Several techniques have been proposed to reconstruct the lost interdental papilla. In 1985, Shapiro⁶ proposed a noninvasive approach to recreate papillae destroyed after acute necrotizing ulcerative gingivitis. He induced proliferation of gingival tissue by inflammatory hyperplasia produced after repeated scaling, root planing, and curettage. Beagle¹ suggested a combination flap using the basic principles of the Abrams roll technique for ridge augmentation⁸ and the papilla preservation technique of Evian et al.⁹

Use of free soft tissue grafts for papillary augmentation was first proposed by Han and Takei in 1996.² They described a semilunar incision with coronal displacement of the gingivopapillary unit and placement of a subgingival connective tissue graft. Azzi et al³ presented three case reports with a surgical technique that elevated the papilla from its base while leaving it attached to the palatal flap. A wedge-shaped connective tissue

graft with partial preservation of the epithelium was sutured beneath the papilla.³ In a later report, Azzi et al⁴ showed a technique that provided papillary augmentation and root coverage. This procedure consisted of a continuous semilunar buccal incision followed by split-thickness elevation of the buccal flap and full-thickness elevation of the papilla attached to a palatal flap. A connective tissue graft was placed under the papilla, and the semilunar flap was displaced coronally. Nemcovsky⁵ introduced a variation of these techniques by placing a gingival graft with a wedge shape and preserved epithelium through an access incision in the palatal aspect of the papilla. This incision was semilunar in shape and ran horizontally at the level of the base of the papilla or slightly apical to it.

Each technique seems to have its own advantages and disadvantages. However, no long-term results are available that make it possible to recommend any particular technique over another. In the current study, an alternative surgical approach to achieve soft tissue augmentation of the interproximal space was presented.

Most surgical methods involving grafting show limited success, possibly because of limited blood supply. The interdental papilla is a small area of tissue with blood supply arising from various sources, although from only one direction: its base. This seems to be the major factor limiting all surgical reconstructive and augmentation techniques. The gingival blood supply to the

interdental papilla is derived from three sources, which originate in: (1) the interdental septa, where arterioles emerge from the bone crest; (2) the periodontal ligament; and (3) the gingival tissue. Blood vessels within the gingival connective tissue consist of a network of suprapariosteal arterioles that stretch along the surface of the alveolar bone, from which capillaries extend along the sulcular epithelium and between the rete pegs of the external gingival surface.^{10,11} Blood supply reaches the papilla in an apicocoronal direction from these three sources, where they anastomose with each other forming a plexus at the level of the papilla.

Most proposed horizontal incisions interrupt the blood flow that comes from the gingival connective tissue to the papilla. As shown in previous studies, blood flow to the superficial aspect of split-thickness gingival flaps is impaired, especially in thin tissues.¹¹ This is probably because most of the blood supply runs along the suprapariosteal plexus, from which branches emerge toward the surface.

The present technique was designed to minimize surgical trauma and blockage of blood supply to the existing papilla by accessing the papillary area through vertical incisions and elevation of full-thickness flaps. If a horizontal incision was needed, it was proposed to be done in the palatal aspect, where tissue thickness is greater. Also, this technique avoids incisions that interrupt the vascular plexus at the midline papillary level, providing



additional ample stability to the graft. Finally, the vertical incisions on the vestibular aspect allow the entire gingivopapillary complex to be displaced in an apicocoronal direction with minor tension, which could impair circulation by suture compression in the long-term.

This article is the first report intended to describe a new surgical technique developed to achieve soft tissue augmentation of the interproximal space. Variations of the technique were discussed. Long-term results of a series of patients treated with this technique will be presented in a future report.

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