

# Surgical reconstruction of lost papilla around implant with a modified technique: A case report

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## Abstract

This case report describes the clinical application of the coronally advanced flap procedure associated with the subepithelial connective tissue pedicle graft with palatal tunneling for the reconstruction of interproximal papillae. In this modified technique the distal end of the pedicle graft was divided into two parts, creating a bifid, which were then placed around the abutment and sutured on the facial aspect. This technique resulted in the filling up of the entire black triangle, coverage of gingival recessions on adjacent teeth, a significant improvement in the emergence profile of the implant-supported restoration, and obvious esthetic improvement.

**Key words:** Dental implants, connective tissue grafts, pedicle flap, dental papilla, gingival recession.

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## Introduction

In the last decade, the most important factor with regard to the success of implant-supported restoration has been gingival esthetics. The presence of the dental papilla is critical to achieving an esthetic outcome with single-tooth dental implant restoration. Reconstruction of missing peri-implant papilla is still an unpredictable and challenging problem.

The loss of papillae in the anterior region of the maxilla may cause functional, phonetic, and esthetic concerns.<sup>1</sup> Tarnow et al<sup>2</sup> demonstrated that whether or not the interdental papilla is present is mainly dependent on the distance from the contact point to the alveolar interdental bone. According to these authors, in 98% of cases in which the distance was 5 mm or less the papilla was present; this reduces to 56% of cases at 6 mm, and just 27% of cases at 7 mm. Jemt<sup>3</sup> developed an index system which as-

sesses single implant restorations for the degree of regeneration and recession of the papillary contour. In this system, a score of 0 means a papilla is not present; score 1 means the presence of less than half the papilla; score 2 indicates the presence of at least half the papilla height, but it does not reach the contact point; score 3 means the entire proximal space is filled by the papilla; and score 4 means the papilla is hyperplastic, overfilling the restoration.

There is a significant difference between the tissues surrounding a natural tooth and those surrounding an implant. In implants, the absence of the blood vessel branching associated with the periodontal ligament results in a restricted blood supply.<sup>4</sup> With all the surgical techniques for augmentation and reconstruction, a issue with restricted blood supply presents a major limiting factor. In such cases, the combination of surgical and restorative procedures may be required.<sup>1,5</sup> Moreover, a variety of surgical

treatment approaches have been proposed to reconstruct the interdental papilla.<sup>5-10</sup> However, the results achieved by these procedures seem to be unpredictable, and more than one surgical procedure may be required to obtain the expected esthetic result.<sup>5</sup>

With respect to the treatment, the subepithelial connective tissue pedicle graft (SCTPG) can yield better results because of the amplified blood supply provided by the base of the pedicle, and the use of grafts of connective tissue may promote better support for displaced gingival flaps.<sup>11-15</sup> A modification of this method consists of a pedicle connective tissue graft with palatal tunneling where the distal end of the pedicle graft was divided into two parts, creating a bifid. The bifid part of the graft was then placed around the abutment and sutured on the facial aspect. This prevents a second surgical stage from being necessary, and establishes a better healing pattern without interfering with the blood supply from the base of the pedicle graft.

### Case report

A healthy 47-year-old non-smoking woman was referred for the reconstruction of the lost interproximal papilla between the maxillary single-tooth implant and the left central and canine (Figure 1). The patient had previously undergone two surgical procedures, involving guided bone regeneration (GBR), with the implant placement in the second phase. Two years afterwards, her chief complaint was about the esthetic outcome, with the loss of papilla around the implant. Clinical examination revealed a Jemt index score of 0 for the mesial and distal papilla of the implant. The distance between the contact point and the alveolar bone crest was measured and found to be 10 mm. In addition, both teeth adjacent to the implant showed some degree of gingival recession on the buccal and proximal aspects (7 mm on the central incisor, and 4 mm on the canine). The temporary restoration did not display an acceptable appearance.



**Figure 1.** Preoperative view. Lost interproximal papilla around the implant restoration.

However, the soft tissue around the implant restoration had a healthy clinical appearance with a minimal probing depth. After clinical and radiological examination, the patient had been informed about the next procedure.

Preoperatively, light mechanical root instrumentation was performed, with no chemical root conditioning, since extensive root planing had been performed as part of the previous regenerative procedure. The temporary restoration and abutment were removed (Figure 2). As it is shown in the periapical radiograph (Figure 3), the tooth-to-implant distance was less on the mesial side than on the distal side, which might have further compromised the blood



**Figure 2.** Removal of temporary restoration and abutment.



**Figure 3.** Periapical radiograph shows a 10-mm distance from the contact point to the bone crest.

supply to the mesial region.

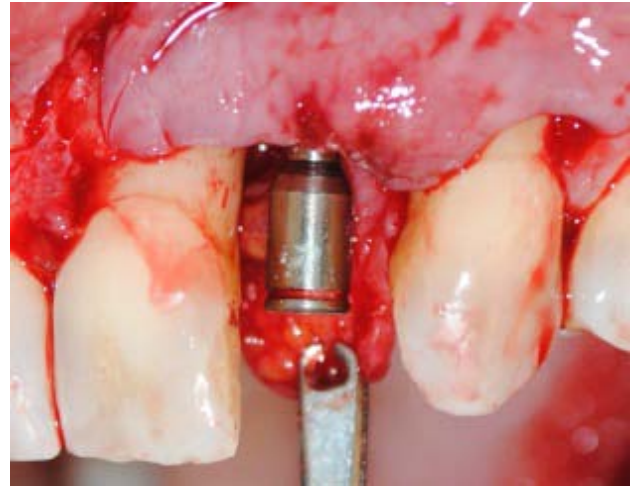
Local anesthesia was applied at the recipient and donor sites, with particular care not to distort the tissue volume. Subsequently, a single palatal incision design was placed from the left canine to the first molar. Care was taken to stop the incision a few millimeters distal to the implant site. The width of the graft was calculated to match the mesio-distal size of the lateral implant space. The pedicle graft was dissected at the coronal, distal and apical aspects, leaving the mesial side attached. Using an Orban periodontal knife, a tunnel was created under the palatal mucosa, connecting the donor site to the implant area (Figure 4). A suture was used at the distal end of the pedicle graft to aid in sliding it under the created tunnel and into the facial aspect. Thereafter, buccal horizontal intra-sulcular incisions were made around both recessions of the adjacent teeth and connected on the base of the adjacent papilla. A vertical releasing incision was made at the end of the horizontal incision mesial to the central incisor and distal to the canine, and extended to the alveolar mucosa to allow the coronal advancement of the flap. Furthermore, the healing abutment was connected to the implant (Figure 5), and the distal end of the pedicle graft was divided into two parts by a surgical knife. This resulted in each connective tissue part being placed interproximally between the healing abutment and the adjacent teeth. Once the connective tissue was



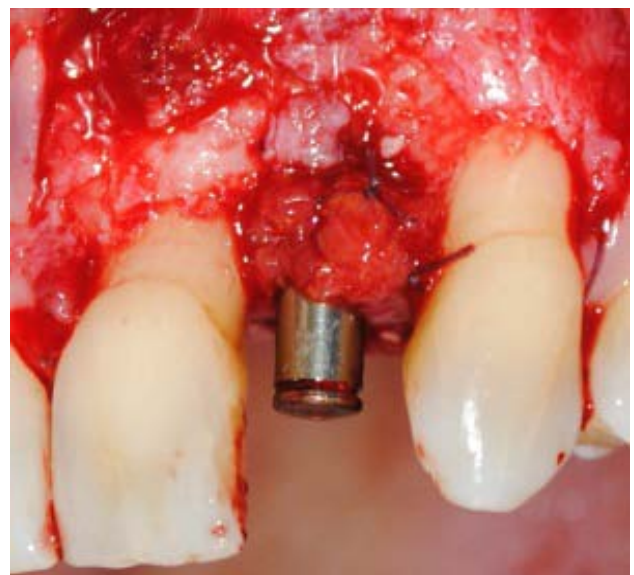
**Figure 4.** Pedicle graft dissected from the palate through a single-incision design from the first molar to canine. Care was taken to stop the incision a few millimeters distal to the implant site.

adapted, the bifid part of the graft was then placed around the abutment and sutured on the facial aspect (Figure 6).

The buccal flap was coronally advanced at the level of the CEJ, covering as much of the connective pedicle graft and the exposed root surfaces as possible, and was sutured (Figure 7). The surgical site was not covered with a periodontal dressing, and the temporary restoration was placed on the healing abutment without any pressure on the surrounding soft tissue. Postoperative instructions included chlorhex-



**Figure 5.** A vertical releasing incision was made at the end of the horizontal incision mesial to the central incisor and distal to the canine and extended to the alveolar mucosa to allow the coronal advancement of the flap. The healing abutment was connected to the implant.



**Figure 6.** The distal end of the pedicle graft was divided into two parts and each connective tissue part was sutured interproximally.





**Figure 7. Coronally advanced flap and primary soft tissue closure.**

idine rinses and nonsteroidal anti-inflammatory medication. Sutures were removed 10 days after the surgical procedure, and thorough hygienic care continued.

Healing was uneventful in the immediate post-operative period. Adequate height and volume of the reconstructed papilla has been maintained over a six-month follow-up (Figure 8).

This technique resulted in a significant gain of papillary volume in both coronal and facial directions. Gingival recession on the canine was also completely covered. However, only 50% of the mesial papilla was regained after the healing period. This can be explained by the insufficient distance between the implant and the central incisor, compromising the blood supply. The emergence profile of the implant-supported restoration improved significantly. The



**Figure 8. Six-month follow-up shows complete papilla reconstruction and significant improvement in the emergence profile of the implant-supported restoration.**

index score of the papilla increased from 0 to 3 at follow-up. The patient was satisfied with the esthetic outcome.

## Discussion

Several surgical and nonsurgical approaches have been proposed in the literature to reconstruct the lost interdental papilla.<sup>3,5-10</sup> Several factors can determine the selection of a specific procedure. These include the crestal alveolar bone height, the dimension of the inter-proximal space, size and shape of the contact area, width of keratinized tissue, professional experience, the amount of connective tissue available from the donor site and mucogingival phenotypes.<sup>16,17</sup>

Various authors claim that more than one procedure can achieve the goal of successful papilla reconstruction. Han and Takei<sup>5</sup> suggested the use of free soft tissue grafts for papillary reconstruction. Later, Azzi et al<sup>8</sup> demonstrated a technique in which a connective tissue graft was placed under the papilla, and the semilunar incision and flap were displaced coronally. A variation to the technique was introduced by Nemcovsky,<sup>9</sup> by placing a gingival graft and preserving the epithelium through an access incision in the palatal aspect of the papilla. The major limiting factor in all these surgical papilla reconstructive and augmentation techniques is insufficient blood supply.

Tarnow et al<sup>2</sup> evaluated interdental bone levels as they relate to papilla height. The authors reported that the distance from the contact point to the alveolar interdental bone is the main determining factor for the presence or absence of the interdental papilla. However, there is controversy over the extent to which the results are affected by the distance from the contact point to the alveolar interdental bone. Other authors have reported that even a distance of 9 mm from the contact point to the alveolar interdental bone can produce excellent papilla results in a single-tooth implant-supported restoration.<sup>3,18</sup> Unpredictable and controversial results exist in the literature relating to papilla augmentation. However, some studies show that the papilla can be reconstructed using adequate techniques and case selection.

In the present case report, the papilla reconstruction was possible even at a distance of 10 mm from the contact point to the alveolar interdental bone. The keystone is providing sufficient connective tissue with adequate blood supply – in other words, a pedicle connective tissue graft. Compared with free grafts, the blood supply of the pedicle graft is re-

tained at the donor site, which is a major advantage. The tunneling procedure increased the stability at the recipient site. This method has demonstrated minimal postoperative morbidity, as well as offering soft tissue closure at both the donor and recipient sites, providing a greater amount of tissue.

In this modified technique a pedicle connective tissue graft was used and the distal end of the pedicle graft was divided into two parts, creating a bifid. The bifid part of the graft was then placed around the abutment and sutured on the facial aspect. The advantage of this procedure resulted in an increased amount of soft tissue around the abutment, maintaining stability. This technique might prevent a second surgical stage, and also could establish a better healing pattern without interfering with the blood supply from the base of the pedicle graft. This technique results in the reestablishment of the papilla in the interdental space and coverage of the gingival recession on the adjacent teeth. There was a significant improvement in the emergence profile of the implant-supported restoration and an obvious esthetic improvement.

In the present case there was a significant gain of both soft tissue height and volume of the treated site. This technique offers greater vascular supply to the pedicle by creating a tunnel to the defect area under the palatal mucosa. Additionally, the graft was stabilized in the desired position over the defect site by the overlying palatal mucosa. When a CAF is associated with a SCTPG, greater vascularization is provided for the graft. This increase in vascularization may be one of the reasons why clinical improvements and esthetic results were achieved. The formation of a soft tissue protuberance at the site of the pedicle rotation was also minimized significantly by this modification. A second stage of healing abutment connection was eliminated; therefore, treatment time was shortened. Despite this, the authors believe that existing pedicle graft modalities are less time-consuming and technique sensitive.

These findings need to be interpreted with caution because this technique has not been the subject of controlled clinical trials.

## Conclusion

Rebuilding the pink esthetic appearance is an important issue in modern esthetic implant dentistry, and any compromised esthetic results following implant-supported restorations are considered failures. Moreover, reconstructing the interproximal papilla in the esthetic zone is one of the most difficult, challenging and unpredictable procedures in implant therapy.

The subepithelial connective pedicle graft associated with a coronally advanced flap seems to be a viable approach for the treatment of missing papilla associated with implant-supported restorations.

This case showed that the surgical technique of using a rotated pedicle palatal connective tissue graft can regenerate a lost interdental papilla and provide significant functional and esthetic advantages at the inter-proximal site. The reconstructed papilla remained stable and without any signs of clinical inflammation six months after surgery. However, clinical studies using large sample sizes are necessary to determine the success rate and predictability of this surgical technique. In esthetically compromised cases, a supplementary restorative approach can mask the loss of tissues, but rarely can this achieve ideal aesthetic outcomes.

## Case summary

a. Why is this case new information?

This modified technique prevents a second intervention, improves the emergence profile of the implant-supported restoration, and results in notable esthetic enhancement.

b. What are the keys to successful management of this case?

Blood supply from the pedicled graft is the main point to get better result. It is essential to prevent any turbulences and inadequate manipulation of the CT graft.

c. What are the primary limitations to success in this case?

Inadequate CT from donor site and technique sensibility, necessitating experience of the surgeon.

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