

# Connective Tissue Grafts with Nonincised Papillae Surgical Approach for Periodontal Reconstruction in Noncontained Defects



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*This case report presents the preliminary results of combining a modification of the nonincised papillae surgical approach (NIPSA), attempting to improve outcomes in the treatment of teeth with advanced periodontal support loss. The modification added a connective tissue graft (CTG) in the buccal aspect of these unfavorable cases caused by deep buccal bone dehiscence, soft tissue deficiencies, or tooth malposition (especially when positioned outside the bony contour). Deep, intrabony, noncontained defects affecting the maxillary incisors were treated in four patients. At the 1-year follow-up, all cases showed an improvement in the marginal soft tissue with considerable reductions in periodontal pocket depth and gains in clinical attachment. NIPSA plus CTG seem to improve clinical outcomes in deep, noncontained intrabony defects.*

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Periodontal reconstruction has been well documented, even in teeth with advanced loss of periodontal support, and obtains good long-term results with periodontal pocket reduction and clinical attachment gain.<sup>1</sup> However, soft tissue contraction is commonly found following periodontal reconstructive surgery,<sup>2</sup> and periodontal bony defects are frequently associated with soft tissue deficiencies.<sup>3</sup> Even when clinical parameters indicate the resolution of periodontal disease, minimizing soft tissue contraction or improving the soft tissue architecture and quality should be objectives when a regenerative approach has an esthetic aspect.<sup>4</sup>

Although flap designs have been improved to maximize treatment outcomes and decrease post-surgical contraction,<sup>5–8</sup> the bony defect may still heal with increased supra-alveolar soft tissue recession.<sup>6,9</sup> For this reason, the addition of a connective tissue graft (CTG) has been proposed and may positively improve postsurgical soft tissue outcomes.<sup>4,10,11</sup>

Recently, an apical approach for periodontal reconstruction has been described<sup>8,12</sup> with the objective of improving conventional results. The nonincised papillae surgical approach (NIPSA) facilitates optimal conditions for regeneration<sup>13</sup> and shows significant improvement in

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clinical parameters compared with a marginal approach.<sup>12</sup> Furthermore, NIPSA results in preservation of marginal soft tissues with a tendency to improve papillae in the treatment of intrabony defects.<sup>12</sup>

The aim of this report is to present the preliminary results of incorporating CTG in the NIPSA approach to treatment of teeth with advanced loss of periodontal support associated with deep buccal bone dehiscence and soft tissue deficiencies.

## Materials and Methods

The present study reports four cases of nonsmoking and systemically healthy patients (two males and two females; age range: 40 to 55 years). All patients had a diagnosis of periodontitis and complied with the preventive treatment and the maintenance program. In each patient, an active residual deep intrabony periodontal defect associated with buccal bone dehiscence remained. Defect configurations were confirmed intrasurgically. One maxillary central incisor and three maxillary lateral incisors were treated. Clinical parameters, including bleeding on probing (BoP), probing pocket depth (PPD), clinical attachment level (CAL), recession (REC), and tip of the papillae location (TP), were recorded before surgery and at 12 months using a periodontal probe (PCP UNC 15, Hu-Friedy). The deepest value was recorded to the nearest millimeter. All patients gave written informed consent after receiving a complete description of

the periodontal surgical procedure in full accordance with the guidelines of the World Medical Association Declaration of Helsinki and the Good Clinical Practice Guidelines 2013 revision.

### *Presurgical Procedures*

As described elsewhere,<sup>8</sup> 1 to 2 weeks before surgery, the area to be regenerated received professional presurgical prophylaxis with micro-ultrasonic tips (After Five Piezo Scaling Tip, Hu-Friedy) and micro-curettes (Micro Mini Five Gracey Curette, Hu-Friedy), only instrumenting the first millimeters of the pocket and the entire exposed root surface. The patient was instructed to brush the area with a roll technique. The surgical phase only took place if an excellent tone of the soft tissues overlying the defect was achieved.

Postoperative pain and inflammation were controlled with 600 mg ibuprofen at the beginning of the surgical procedure, and subsequent doses were taken only if necessary to control pain. Patients also received 2 g of amoxicillin 1 hour before surgery. The surgical area was anesthetized using articaine-epinephrine 1:100,000.

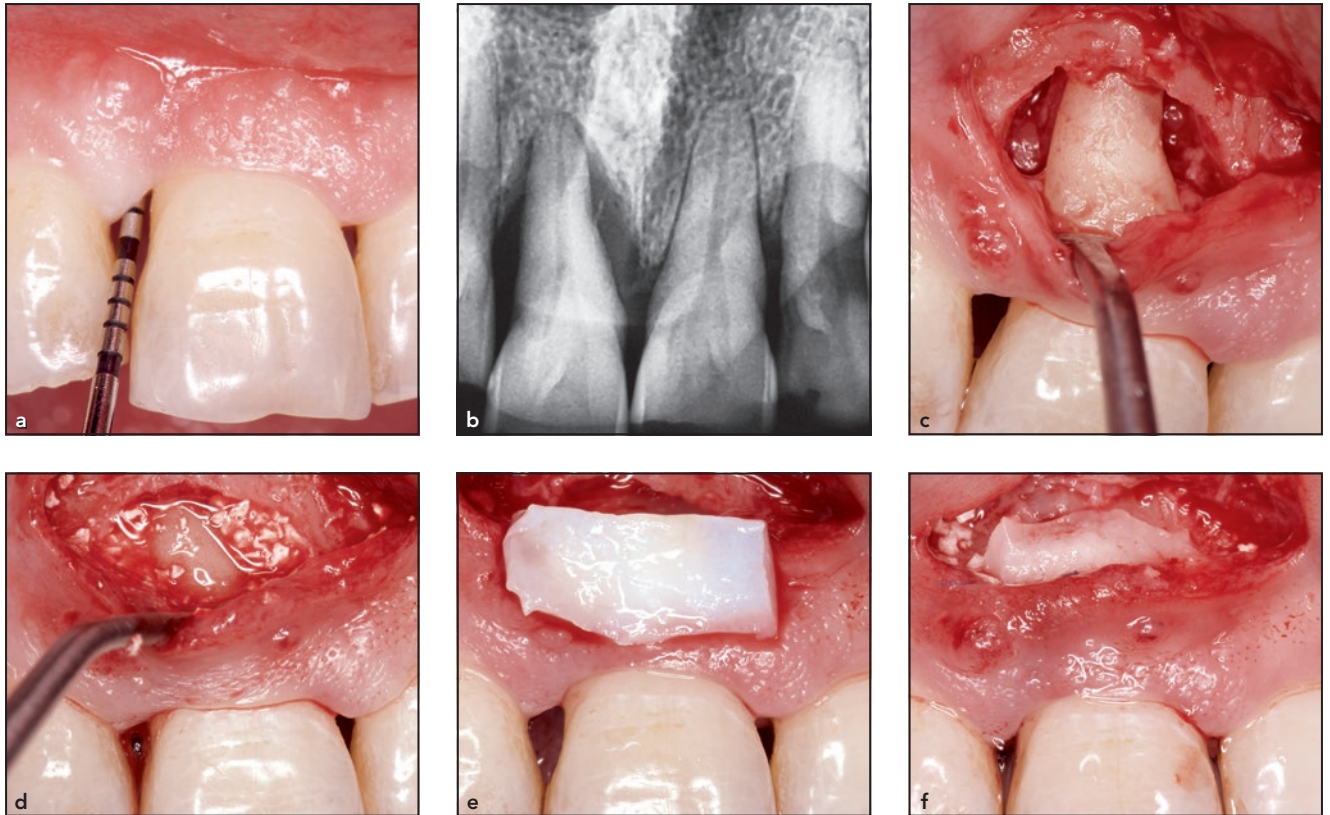
### *Surgical Procedure*

Periodontal reconstructive surgery was performed as described<sup>8,12</sup> (Figs 1 and 2), with the only difference being that, before the application of biomaterials, the supraosseous component of the defect (supra-al-

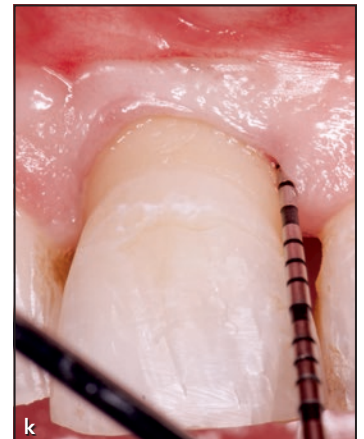
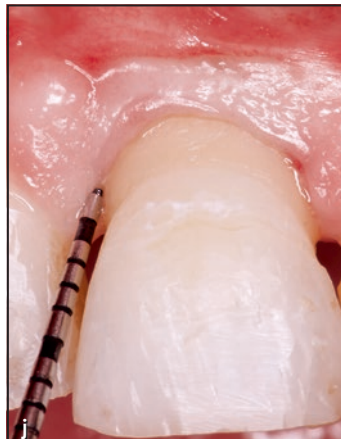
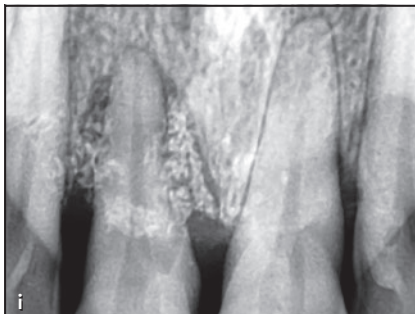
veolar soft tissue) was pushed coronally. After defect debridement and root surface instrumentation, 24% ethylenediaminetetraacetic acid gel (PrefGel, Straumann) was applied on the root for 2 minutes. The area was carefully rinsed with saline. Enamel matrix derivative (EMD; Emdogain, Straumann) was applied on the root followed by a composite graft of deproteinized bovine bone xenograft (Bio-Oss, Geistlich) and EMD. Subsequently, a CTG taken from the lateral palate at the level of the first molar was harvested as a free gingival graft and de-epithelialized extra-orally.<sup>14</sup> The mesiodistal length was equal to the distance between the two papillae on the affected tooth. The apicocoronal dimension was 5 mm and the thickness 1 mm.<sup>15</sup> The CTG was sutured to the inside of the palatal aspect of the papillae by two vertical mattress sutures (Fig 3), or with a suspensory suture to the affected tooth, using a 6-0 polyglycolic acid suture. Finally, the primary incision line was sutured according to the original NIPSA technique.<sup>8,12</sup>

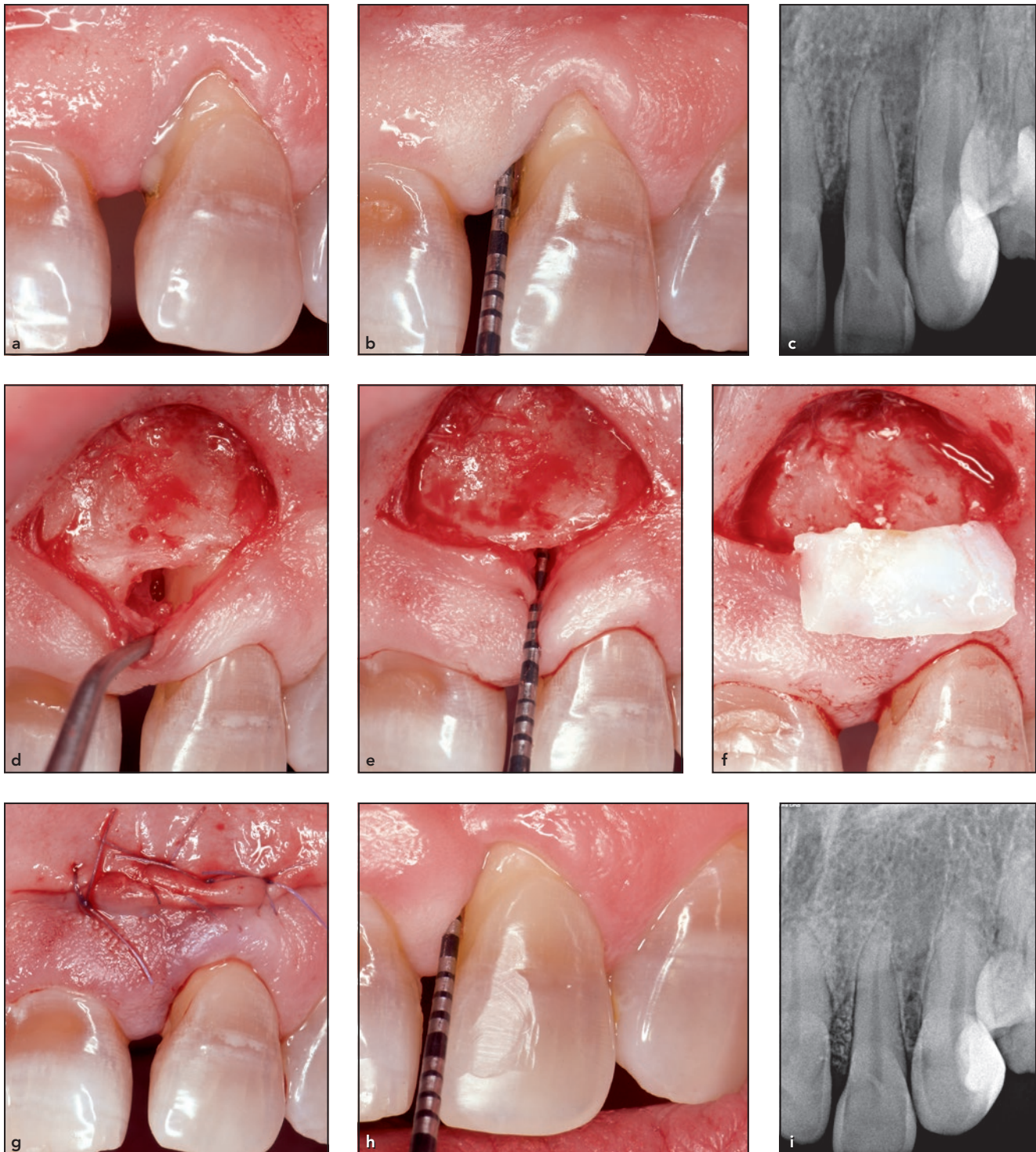
### *Postsurgical Instructions*

Patients were instructed to rinse with a 0.2% solution of chlorhexidine digluconate twice a day for 4 weeks. The sutures were removed after 7 days. After 4 weeks, patients were instructed to start brushing with a soft toothbrush and a roll technique. Patients were recalled for control and prophylaxis at weeks 1, 2, 3, and 4 and at months 3, 6, and 12. Patients were followed for 12 months.



**Fig 1** CTG with NIPSA. (a, b) Clinical and radiographic examinations revealed a hopeless right maxillary central incisor extruded and protruded with distal suprabony bone loss combined with deep mesial and distal intrabony defects reaching the apex of the tooth. The soft tissue showed a nonscalloped architecture as a result of chronic inflammation. (c) Apical incision with coronally reflected soft tissue shows the lack of buccal bone. (d–f) Biomaterials and CTG in position. (g) Double line sutures. (h) Primary wound closure 1 week after surgery. (i–k) 1 year after surgery. Harmonious scalloped gingiva with physiologically healthy interdental papillae height resulting from controlled inflammation and coronal displacement of the papillae. The root remained slightly exposed due to the position of the tooth. The vitality was positive.





**Fig 2** CTG with NIPSA. (a) Suppuration on probing before tissue conditioning. (b, c) Presurgical clinical and radiographic examination. Advanced pathologic migration of the left maxillary incisor. PPD and periapical radiographs revealed an interproximal deep periodontal defect. (d, e) The supra-alveolar tissue is pushed coronally during surgery. A combined 3-1 wall defect was confirmed. (f) CTG "positioned" outside the flap. (g) Soft tissue aspect at the end of the surgery. (h) Clinical view at 12 months. Note the tooth malposition in relation to the lower lip. Healthy soft tissue with residual recession (as a result of advanced tooth malposition) and considerable resistance to probing were found. Being distally rotated and outside the bony contour may have contributed to the soft tissue recession, especially on the mesial aspect. (i) Radiograph suggests complete intrabony defect fill.

## Results

The baseline and 12-month clinical parameters of the four treated teeth are presented in Table 1 with means and standard deviations. All teeth were malpositioned (extruded and/or protruded) and were associated with a noncontained defect and buccal bone dehiscence. There was a mean PPD reduction of  $5.25 \pm 0.5$  mm and a mean CAL gain of  $5.75 \pm 1.25$  mm. The mean REC reduction was  $0.75 \pm 0.5$  mm, and TP demonstrated a mean coronal displacement of  $0.75 \pm 0.5$  mm. All cases had a positive presurgical BoP, which was negative at 12 months.

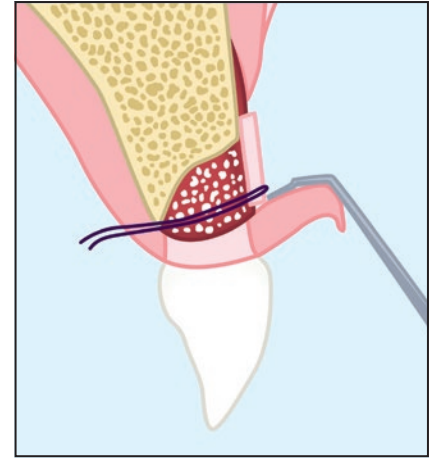
All defects had a 3-plus-1-wall configuration. The overall intrabony depth ranged from 5 to 8 mm (mean:  $6.2 \pm 1.2$  mm), and the three bony wall components varied from 2 to 4 mm (mean:  $3.0 \pm 0.8$  mm).

Primary-intention healing was observed in all cases at 1 week after surgery.<sup>12</sup>

## Discussion

The present report describes four cases with advanced loss of periodontal support in which the malposition of the teeth facilitated noncontained defects associated with the deep buccal bone and soft tissue deficiencies. The addition of CTG to the surgical technique may have played several roles: (1) it may have prevented postsurgical recession, promoting root coverage<sup>16</sup>; (2) it may have acted as a buccal wall for a largely exposed root surface, increasing wound stability

**Fig 3** Schematic drawing. Lateral view of the interproximal aspect. Using vertical mattress sutures, the CTG is sutured to the inside of the palatal aspect of the papillae at both sides of the affected tooth.



**Table 1** Baseline and Postoperative Clinical Parameters

Tooth no. <sup>a</sup>	PPD (mm)		CAL (mm)		REC (mm)		TP (mm)		
	Baseline	1 y	Baseline	1 y	Baseline	1 y	Baseline	1 y	
Case 1	11	8	3	9	5	1	1	1	2
Case 2	22	7	2	9	3	2	1	3	4
Case 3	22	9	3	12	5	3	2	-1	-1
Case 4	12	8	3	9	3	1	0	0	1
Mean ± SD		8 ± 0.8	2.7 ± 0.5	9.7 ± 1.5	4 ± 1.15	1.7 ± 0.9	1 ± 0.8	0.7 ± 1.7	1.5 ± 2

PPD = probing pocket depth; CAL = clinical attachment level; REC = recession; TP = tip of the papillae; SD = standard deviation.  
<sup>a</sup>FDI system.

and reducing the micromovement of the flap to the clot-dentin complex<sup>4,17</sup>; and (3) the CTG seems to act as a “cell-occlusive autologous membrane,” allowing the potential growth of resources from the periodontal ligament<sup>18</sup> and retarding epithelial migration into the periodontal defect.<sup>19,20</sup> At 12 months, significant PPD reduction, CAL gain, and clinical improvement of the soft tissues were achieved in all cases.

It is accepted that, for periodontal regeneration to succeed, surgery and the healing phase must proceed under optimal conditions.<sup>21</sup> To achieve this goal, periodontal surgical procedures have been evolving

towards minimal soft tissue disruption techniques with the objective of maintaining the soft tissue architecture and protecting the periodontal defect.<sup>4,5,7</sup> Consequently, the first step in periodontal regenerative surgery is to create space for clot stabilization, assessing the periodontal defect, and removing the gingival connective tissue and pocket epithelium with minimal soft tissue alteration.<sup>18</sup> The NIPSA technique approaches the defect by an apical incision, leaving the marginal tissue undisturbed and attached to the neighboring areas.<sup>8,12</sup> The results of these four cases showed no alterations in the integrity of the

marginal soft tissues or the papillae immediately after surgery or during the healing period. Biomodification of the surgical area seems to be an important step in improving the outcome of regeneration.<sup>21</sup> EMD has been widely documented as an improvement in periodontal regeneration.<sup>22</sup> However, the composite use of EMD and the grafting material seems to further improve clinical outcomes due to its space-making potential in noncontained defects, preventing the collapse of the overlying soft tissues into the area to be regenerated.<sup>23,24</sup> The last step is to achieve complete wound closure.<sup>21</sup> The apical approach places the incision in the apical mucosa, and connective tissue from both sides of the incision borders are put into intimate contact through suturing, promoting primary-intention healing at 1 week postsurgery in all cases.

During the healing phase, maintaining the space and the stability of the established clot<sup>18,21</sup> and giving preference for cells from the periodontal ligament are primordial conditions for periodontal regeneration.<sup>25</sup> Flap management and, subsequently, wound closure and stability during healing are the main factors influencing the adherence and immobility of the clot.<sup>21</sup> In cases with advanced loss of periodontal support with deep bony dehiscence, healing depends on the stability of the interface between the inner surface of the flap and the root surface and/or the interproximal clot.<sup>26,27</sup> Micromovements may cause degradation of the clot-root adhesion and compromise periodontal regeneration.<sup>17,28</sup> Under nonoptimal condi-

tions, a long junctional epithelium may be the most common healing pattern.<sup>21,29</sup> NIPSA maintains a firmly attached soft tissue over the periodontal defect, improving wound stability and vertical space provision in the interproximal area. However, in deep noncontained defects combined with buccal bone dehiscence, wound stability may be compromised over the root surface. The application of a CTG may improve wound stability and protect the established blood clot-graft complex by controlling the micromovements of the flap during healing.<sup>17</sup> Furthermore, the use of a bone graft may prevent CTG collapsing into a deep noncontained defect with a malpositioned tooth, and improve the horizontal space provision.

Occlusion of cells from gingival tissues by means of guided tissue regeneration is of critical importance in achieving periodontal regeneration.<sup>25</sup> Histologic studies show that adapting a CTG to the root surface seems to improve regeneration by delaying the down-growth of the epithelial cells and acting as a tissue barrier for gingival tissues.<sup>20</sup> Combining regenerative and mucogingival therapy with CTG may also improve soft tissue quality and quantity, as shown by several studies,<sup>4,11,16</sup> and as is widely documented in the treatment of gingival recession.<sup>30</sup>

All treated cases maintained a harmonious gingival architecture.<sup>31</sup> However, complete root coverage may not have been achieved as a result of the pathologic tooth migration frequently encountered and associated with deep periodontal

defects.<sup>32</sup> In cases with tooth malposition, a noncontained periodontal defect, deep buccal bone dehiscence, and/or a protruding root surface, the additional incorporation of a CTG may play an important role in improving soft tissue stability.<sup>17,33</sup>

## Conclusions

When wound healing may be negatively affected by the local characteristics of the periodontal defect, the combined use of an apical approach with biomaterials and CTG appears to be a desirable strategy. NIPSA with CTG improves soft tissue outcomes in cases with deep periodontal defects.

## Acknowledgments

The authors declare no conflicts of interest.

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