

# Management of Pathological Tooth Migration in Patients with Advanced Periodontal Disease

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**C**hronic periodontitis is characterized by a loss of clinical attachment due to destruction of the periodontal ligament and loss of the adjacent supporting bone.<sup>1</sup> The condition may be localized, involving one area of a single tooth's attachment, or more generalized, involving several teeth or the entire dentition, with a combination of slight, moderate, and advanced destruction.<sup>1</sup> Advanced periodontitis is marked by periodontal probing depths greater than 6mm, attachment loss of more than 4mm, and a buccal furcation condition exceeding Class I (incipient). Bone loss of more than one-third of the supporting periodontal tissues will be evident radiographically, sometimes accompanied by clinical signs of increased tooth mobility.

In adults, the loss of teeth or periodontal support can result in pathological tooth migration involving either a single tooth or a group of teeth.<sup>2-5</sup> The maxillary anterior teeth have a particular tendency to flare and elongate, since there are no antero-posterior contacts resisting their displacement.<sup>4</sup> These teeth can be more traumatized in protrusive movements when an asymmetrical deep bite is combined with posterior vertical overclosure.<sup>5</sup>

Because underlying periodontal problems can worsen during adult orthodontic treatment, it is important for the clinician to identify affected patients and refer them to a periodontist before initiating orthodontic therapy.<sup>3</sup> Successful treatment of periodontitis may curb inflammation and attachment loss during orthodontic tooth movement, thus preventing unesthetic complications.<sup>6</sup>

Interproximal bone defects should be analyzed both clinically and radiographically, using bite-wing and periapical radiographs to examine the crestal bone. Common sites of periodontal

disease in adults are the upper interproximal regions, the buccal furcations, and the lower lateral-incisor and canine regions, especially in cases with lower-anterior crowding.<sup>5</sup>

Pre-orthodontic periodontal therapy is directed toward risk factors including plaque, subgingival calculus, and occlusal trauma. A personalized home-care program is essential, but may be supplemented with root planing and subgingival debridement three months before the start of orthodontic treatment to help avoid inflammation. A patient who is still periodontally unstable may require periodontal surgery prior to proceeding with orthodontics.<sup>5</sup> The extent of the osseous surgery will depend on the type of defects (crater, hemiseptal, three-walled, or furcation) and whether the situation can be improved with orthodontic treatment.<sup>7</sup>

The following case illustrates complex interdisciplinary treatment of an adult patient with periodontal bone destruction and severe pathologic tooth migration resulting from chronic periodontal disease.

## Case Report

A 55-year-old female presented with complaints about the unesthetic appearance of her upper teeth and difficulties in biting and chewing (Fig. 1). Severe maxillary incisor retroclination and extrusion were noted on the left side. She had Class I canine and molar relationships on the right side and a Class II canine relationship on the left. The upper left molars and lower left second premolar were missing. The patient's upper midline was centered, and the lower midline was deviated

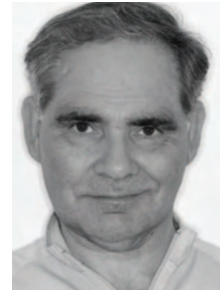
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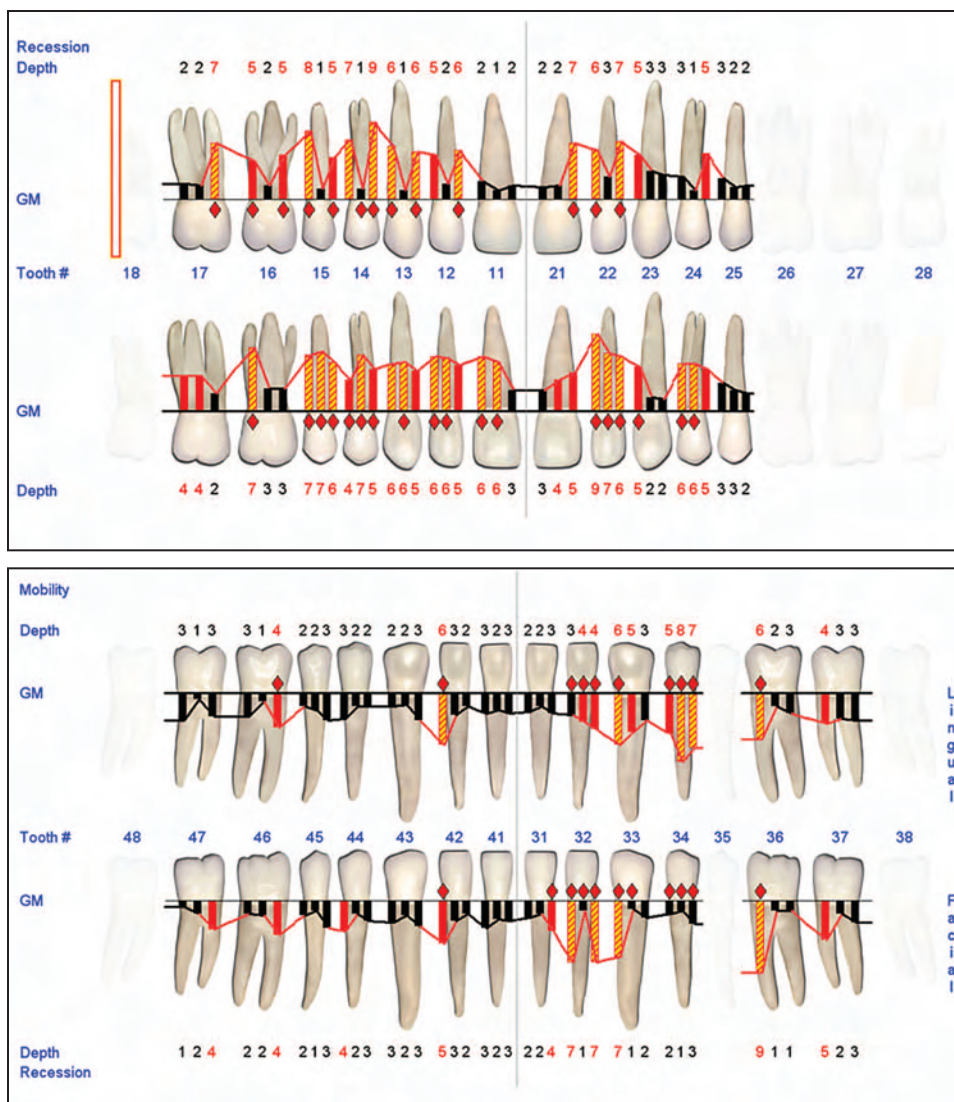


Dr. Neves



Fig. 1 55-year-old female patient with severe alveolar bone destruction due to advanced chronic periodontitis, along with retroclined upper incisors, several missing teeth, and upper and lower anterior crowding.

# Pathological Tooth Migration in Patients with Advanced Periodontal Disease



**Fig. 2** Initial periodontogram showing severely compromised dentition with deep pockets, confirmed by bleeding on probing.

to the left; her descending smile line was normal for her age. There was considerable crowding in both the upper and lower anterior regions.

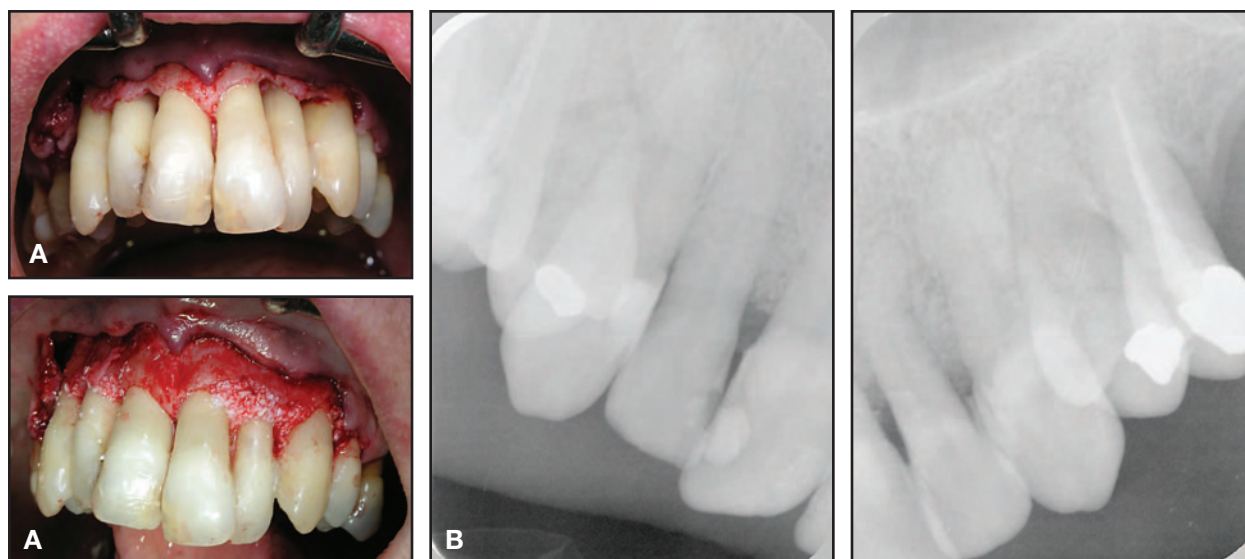
The periodontogram showed deep pockets, confirmed by bleeding on probing (Fig. 2). The diagnosis was generalized advanced chronic periodontitis with considerable alveolar bone destruction, especially in the upper and lower anterior regions and in the lower left canine-premolar re-

gion. The patient had no personal or family history of aggressive periodontitis, and there had been no sign of the disease before age 30.

Treatment goals included:

1. Halting the progression of the periodontitis and preventing its recurrence while attempting regeneration of the periodontal attachment apparatus.
2. Orthodontic leveling of the dentition and intrusion of the upper left incisors to improve the smile





**Fig. 3 A.** Enamel protein derivative and hydroxyapatite placed in upper anterior region. **B.** Three months later, periapical x-rays show periodontal regeneration.

as well as the periodontal situation.

3. Placement of a dental implant in the maxillary left first-molar site, with a temporary crown to be replaced by a fixed prosthesis at the end of orthodontic treatment.

#### *Periodontal Treatment*

The periodontal disease was treated through nonsurgical and surgical means. Plaque-control oral hygiene was supplemented with full-mouth scaling and root planing, performed in two separate appointments. After a three-month evaluation period, pocket depths had been reduced in almost every site, with only the distal aspects of the lower left canine and first premolar exhibiting pockets deeper than 5mm and bleeding on probing.

Periodontal surgery was then carried out on the upper and lower anterior segments and the lower left first premolar. Periodontal regeneration of the two-walled bone defects was attempted by applying enamel protein-derivative gel (Emdogain\*) and hydroxyapatite (Bio-Oss\*\*) in the upper anterior region (Fig. 3A) and on the mesial surfaces of the lower left canine and first premolar. These sites healed uneventfully for three months before ortho-

odontic treatment was initiated (Fig. 3B). Periodontal control visits were scheduled every three months during the orthodontic phase.

#### *Orthodontic Treatment*

Due to the patient's periodontal condition, anterior crowding, lingual tipping, and asymmetrical maxillary incisors, orthodontic leveling and alignment were carried out with .014" and .016" nickel titanium archwires for three and two months, respectively (Fig. 4A). Intrusion of the upper left anterior teeth was initiated with a series of .016", .016" × .022", and .018" × .025" stainless steel archwires to flatten the left side of the occlusal plane. Anchorage for this intrusive movement was provided by an osseointegrated titanium implant with a temporary crown inserted in the upper left first-molar site (Fig. 4B).

After upper-incisor proclination had provided enough space to bond lower labial brackets, mandibular-arch leveling and alignment were

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achieved using the same procedure. Care was taken to avoid excessive tooth movement in the lower left premolar region due to the lack of periodontal bone support.

Orthodontic treatment took about 18 months (Fig. 5).

### Restorative Treatment

After debonding, the upper left first-molar implant was used for a final ceramic crown restoration. Although much improved, the significant pretreatment deficiencies in the patient's gingival margin remained unsatisfactory. Pink-composite cervical restorations were therefore placed above the upper incisors to encourage papillary formation and to fill the black triangles for better esthetics and function.

### Treatment Results

A stable Class I occlusion was established on the right side. The missing lower left second premolar and significant alveolar bone destruction in the lower left canine-premolar region prevented the application of adequate orthodontic force to achieve a Class I relationship on the left, but a satisfactory lateral canine disclusion was estab-

lished. The upper left central-incisor deep bite and the upper-incisor retroclination were improved.

Follow-up periodontal evaluation showed stable pocket depths, with 5mm pockets only around the mandibular left first premolar and mesial to the lower first molar, and no bleeding on probing (Fig. 6). This status has been maintained with supportive periodontal treatment every three months since the end of active treatment.

The patient refused extraction of the lower left second premolar despite its lack of supporting bone. After perio-orthodontic treatment, it caused no discomfort, its mobility had lessened, and the balancing interferences had been eliminated.

Post-treatment cephalometric tracings indicated that the upper-incisor vertical and torque positions had improved. Upper and lower crowding were relieved by dentoalveolar compensations of the upper and lower incisors due to improved angulation: the upper arch reached normal inclination and the lower incisors were slightly proclined, but within a normal range.

Two years after orthodontic treatment, the patient reported no symptoms of TMD, and the occlusion remained stable (Fig. 7). The patient was instructed to maintain her lower fixed retainer and to continue wearing her removable upper retainer at night indefinitely.

**Fig. 4 A.** Orthodontic leveling initiated with nickel titanium archwires. **B.** Anchorage for intrusion of upper left anterior teeth provided by osseointegrated titanium implant with temporary crown in upper left first-molar site.



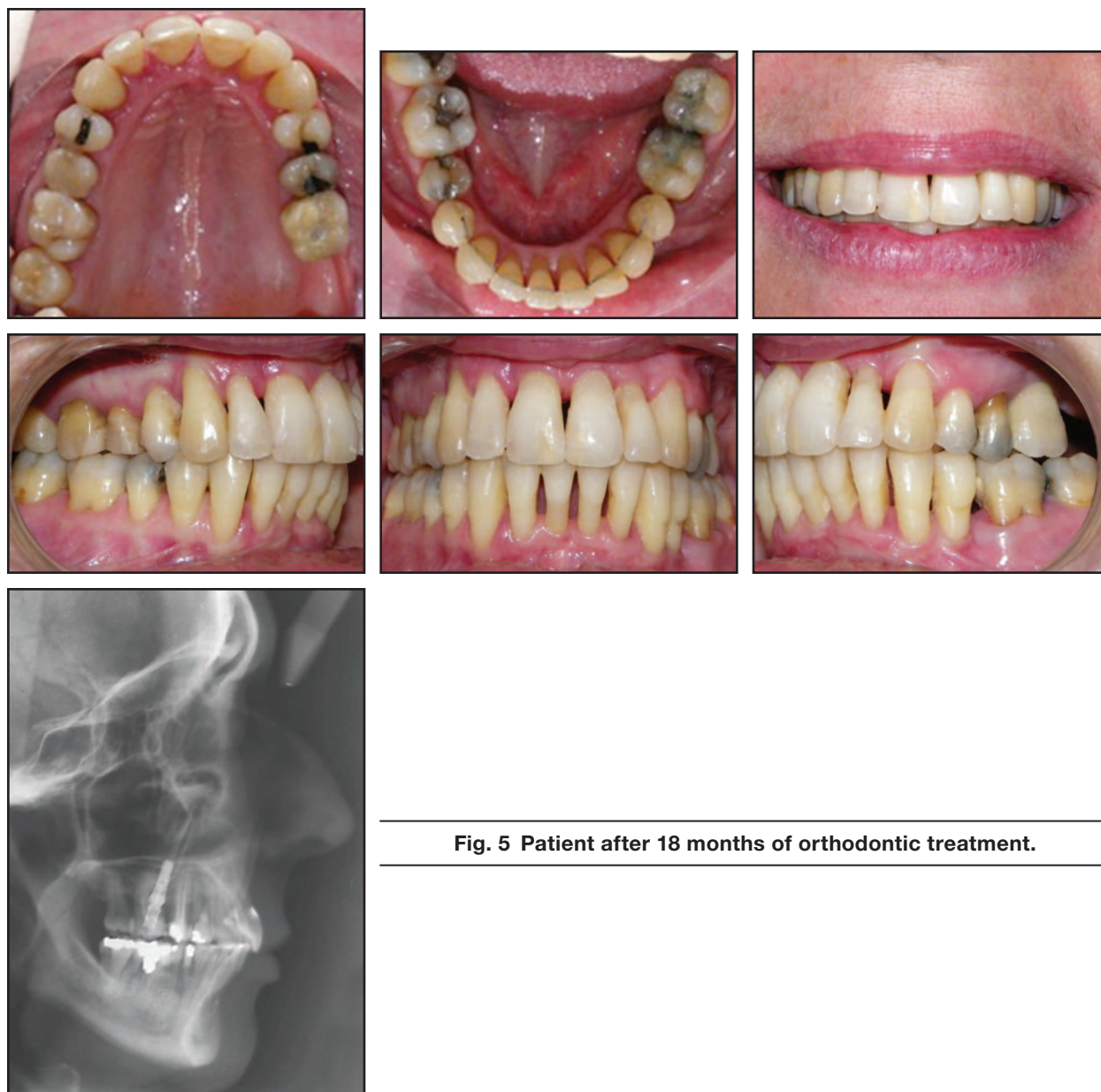


Fig. 5 Patient after 18 months of orthodontic treatment.

## Discussion

The goals of periodontal therapy are to alter or eliminate the microbial etiology and contributing risk factors for periodontitis, thereby slowing the progression of the disease and preserving a healthy, comfortable, and functional dentition with appropriate esthetics. Wherever regeneration of the

periodontal attachment apparatus is possible, it should be attempted.<sup>1</sup> In the patient shown here, periodontal disease was controlled both by an initial hygienic phase and through localized surgical-periodontal regeneration. Periodontal stability, with no pocket depth more than 5mm or bleeding on probing, was achieved before orthodontic treatment.

While orthodontic treatment can provide



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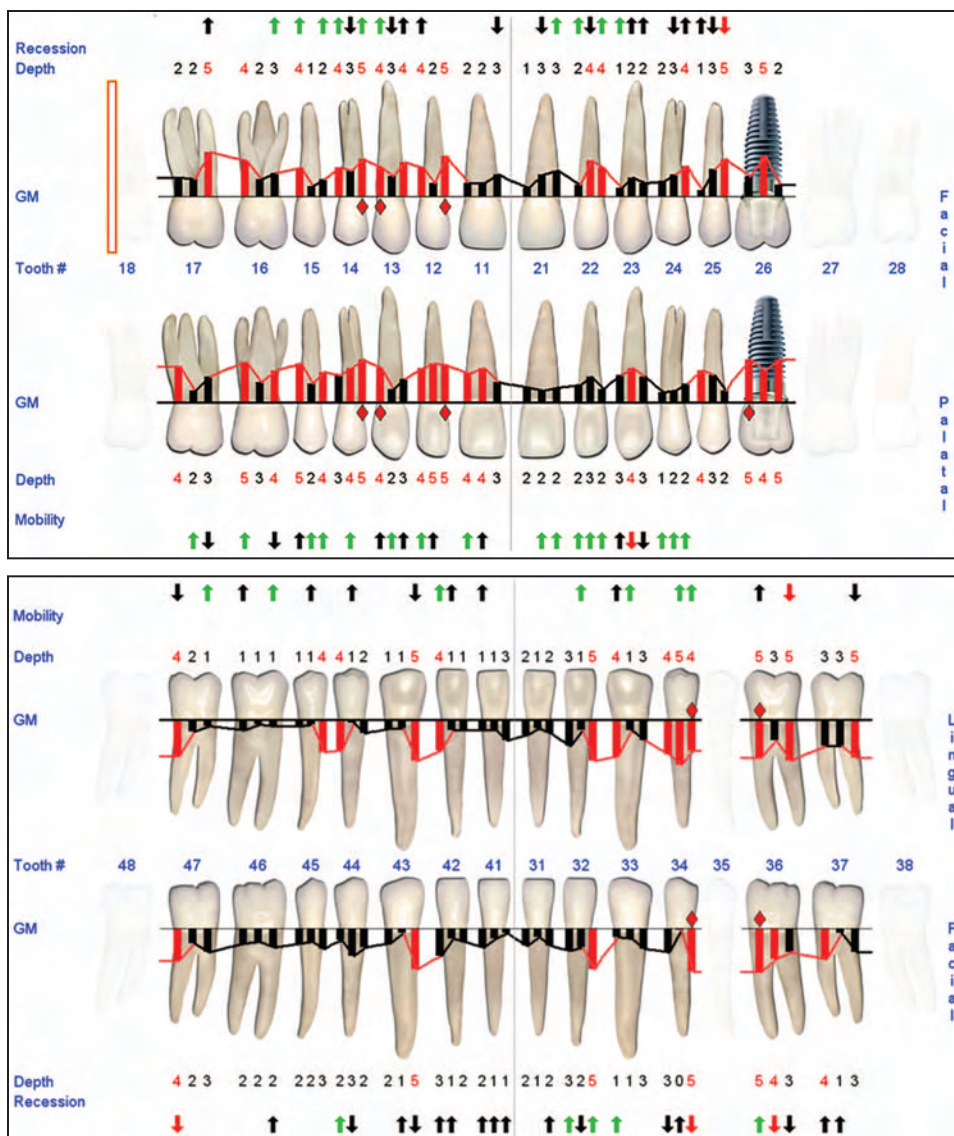


Fig. 6 Final periodontogram showing control of periodontal disease after perio-orthodontic treatment.

good function and satisfactory esthetics for periodontal patients with pathologic tooth migration, prior periodontal therapy can avoid the irreversible breakdown of the periodontium that may result from attempting orthodontic tooth movement in the presence of inflammation.<sup>5,8</sup> Although extrusion has been recommended to improve periodontal conditions,<sup>9</sup> patients with pathological tooth migration often exhibit extruded teeth with long

clinical crowns. Melsen and colleagues demonstrated that a combination of periodontal treatment and orthodontic intrusion can improve the periodontal condition, provided that both the biomechanical force system and oral hygiene are carefully controlled.<sup>10</sup>

In our patient, orthodontic intrusion resulted in significant improvement of the gingival margins, and radiographs confirmed that there was no



**Fig. 7** Follow-up records taken two years after orthodontic treatment, showing pink-composite cervical restorations.

bony destruction. Two factors may have contributed: elimination of dental trauma that had been caused by the maxillary-incisor retroclination and extrusion, and flattening of the occlusal plane by intrusion of the upper left anterior teeth. This conclusion is supported by radiographic studies showing that orthodontic intrusion toward an infrabony defect will modify the defect's morphology, thus reducing pocket depth.<sup>5,11-13</sup> Correction of a traumatic deep bite by intrusion may also improve the

contour of the gingival margin.<sup>14</sup>

Intrusion with light forces (5-15g per tooth) can be a reliable mode of treatment in patients with healthy periodontal status because it does not lead to a reduction in the marginal bone level, as long as periodontal inflammation is controlled.<sup>10,15</sup> Light orthodontic forces should also be applied to periodontally compromised teeth in order to minimize further attachment loss, tipping movements, and root resorption.<sup>5,16</sup> Our patient's osseointegrated



dental implant, placed for eventual prosthetic rehabilitation of the upper left first molar, provided reliable anchorage for intrusion of the upper left anterior teeth.<sup>5,17-20</sup>

Despite significant improvement of the gingival margins after orthodontic therapy, the collapse of the interproximal papillary dimension and the resulting dark triangles created an unattractive gingival architecture, with both esthetic and functional implications. These interproximal spaces and gingival margins were camouflaged by pink restorative composite to encourage papillary reshaping. The patient's descending smile line helped improve the esthetic result, even in her compromised periodontal condition.

## Conclusion

This case clearly demonstrates the importance of interdisciplinary cooperation in treatment of adult cases with advanced periodontal disease.

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