

## Combined Periodontal-Orthodontic Treatment of Pathologic Tooth Migration: A Case Study with 10-Year Follow-Up

### Abstract

Pathologic tooth migration is a change in tooth position resulting from disruption of the forces that maintain teeth in a normal position in relation to their arch. The disruption of the equilibrium in tooth position may be caused by various etiologic factors. Loss of attachment apparatus along with a non periodontal related condition such as excess occlusal force, a progressive migration of tooth may take place. Mostly this migration can be associated with aesthetic damage of the smile line. To solve these issues, a combination of periodontal and orthodontic treatment is often needed. In this presentation a 23-year-old, systemically healthy, non-smoking female presented with the complaint of bleeding gums, mobility and increased space between upper and lower front teeth causing un-aesthetic appearance and low self esteem. She was treated with interdisciplinary approach of orthodontic and periodontal intervention. Improvement of facial esthetics contributed to the self-confidence of an adult periodontal patient with pathologic tooth migration. Follow up at 10 years post treatment confirmed the good choice of treatment planning and the tendency to improve the results over time. Periodontally compromised orthodontic patients can be satisfactorily treated, achieving correction of the malocclusion and a marked improvement in esthetics when an interdisciplinary approach is used.

**Keywords:** *Clinical attachment loss, gingival inflammation index, pathological tooth migration, plaque index*

### Introduction

Pathologic tooth migration (PTM) is defined as a change in tooth position resulting from disruption of the forces that maintain teeth in a normal position in relation to their arch. The disruption of the equilibrium in tooth position may be caused by various etiologic factors.<sup>[1,2]</sup>

Periodontal bone loss appears to be a major agent in the etiology of PTM, along with occlusal changes caused by several factors. The pressure produced by inflammatory tissues within periodontal pocket is also considered important.<sup>[3]</sup> When loss of attachment apparatus is combined with a nonperiodontal related condition such as excess occlusal force, a progressive migration of tooth may take place.<sup>[4]</sup> Unfortunately, PTM can be associated with esthetic damage of the smile line, reducing a patient's self-esteem.<sup>[3]</sup> To solve both issues, therefore, a combination of periodontic and orthodontic treatment is often needed.

The aim of this work is to evaluate the effect of a combined orthodontic-periodontal

nonsurgical and surgical therapy in the maintenance of a healthy periodontal status before and after the orthodontic treatment. It also emphasizes the importance of strict maintenance follow-up phase in such complex cases. Re-evaluation of the results of the treatment approach demonstrated stability in the short and long term.

### Case report

A 23-year-old, systemically healthy, nonsmoking female presented with the complaint of bleeding gums, mobility, and increased space between upper and lower front teeth causing unesthetic appearance and low self-esteem. She had undergone scaling of the teeth 3 years back. On intraoral examination, there were composite restorations on mesial surfaces of maxillary central incisors [Figure 1]. A periodontal examination and charting were performed including assessment of probing depths (PDs), clinical attachment levels (CALs), full mouth plaque (Silness and Loe index 1964), and gingival inflammation scores (Loe and Silness index 1963).<sup>[5]</sup> The measurements

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for PDs and CALs were performed at six sites per tooth (mesiobuccal, mid-buccal, distobuccal, distolingual, mid-lingual, and mesiolingual). PD was measured from the gingival margin by UNC-15 (Hu-Friedy Instruments, Chicago, IL, USA) and CAL was considered as primary outcome and defined as the distance from the cemento-enamel junction to the base of the pocket. The occlusal examination revealed Class I molar relationship bilaterally for the first molars and canines. Overbite and overjet were 5 and 4 mm, respectively, and the fremitus and tension tests were positive. The maxillary and mandibular incisors showed pathologic migration and rotations. Radiographic examination showed generalized, moderate, horizontal bone loss in both arches [Figure 2]. A diagnosis of moderate-to-severe generalized chronic periodontitis was made. Treatment objectives were as follows:

- Oral hygiene instructions, supragingival scaling, subgingival debridement, and periodontal flap surgery to eliminate existing pockets and thus achieve a favorable periodontal environment for good oral hygiene with a regular follow-up
- Alignment and leveling of both arches
- To achieve optimal facial aesthetics, and to obtain an optimal overjet-overbite relationship
- Finishing and detailing
- Reduce or keep the defects at the same level and fixed retention between teeth with bone loss.

After several sessions of nonsurgical periodontal therapy comprising general scaling and complete root planning accompanied by recommendations concerning oral hygiene, re-evaluation of the periodontium showed

statistically significant improvement in the periodontal parameters [Table 1]. Before periodontal surgical therapy, endodontic treatment was done in maxillary left central incisor as it was found to be nonvital with pulp testing.

The modified papilla preservation surgical flap technique was selected when the interdental space was wider than 2 mm; the simplified papilla preservation surgical flap technique was performed where the space was >2 mm [Figure 3]. A full-thickness flap was elevated to allow adequate visualization at the treatment site [Figure 4]. To reduce postoperative complications, including pain and swelling, the patient received antibiotic therapy (amoxicillin 1.5 g/day for 6 days) and rinsed twice a day for 15 days with chlorhexidine 0.2% as antiplaque, antigingivitis, and antiplaque agent. The sutures were removed after 7 days. The patient was enrolled in a recall system that included professional tooth cleaning and reinforcement of oral hygiene maintenance after periodontal treatment for 1 year [Figure 5]. Orthodontic treatment started 1 year after surgery. On stabilization of periodontal disease the patient underwent different types of movement according to the clinical need to realign the dental arch: intrusion and bodily movement that included movement away from the defect (tension side) and movement into the defect (pressure side). Orthodontic treatment was performed with the goal to obtain movement that would not impair the newly regenerated attachment. Straight-wire preadjusted brackets with thermoactive nickel archwire (3M MBT 0.22-inch victory system) manufactured by Victory 3M UNITEK were used to achieve well-controlled



Figure 1: Preoperative clinical view showing pathological migration

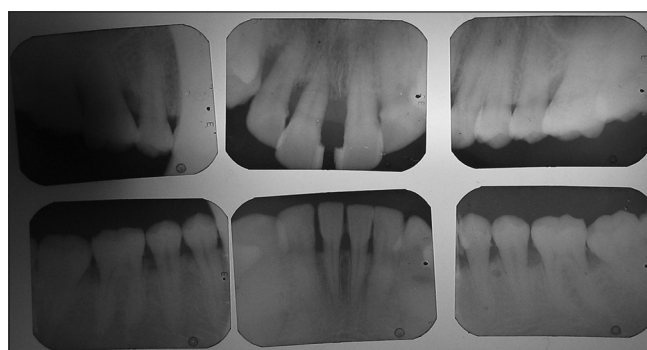


Figure 2: Preoperative radiographs showing moderate-to-severe bone loss with respect to pathological migration

**Table 1: The difference in parameters related to clinical attachment level, probing depth, gingival inflammation index, plaque index after different durations as compared to baseline**

Parameters	Baseline	After periodontal therapy	After orthodontic therapy	1 year	10 years
CAL	5.06±0.67	4.19±0.79	3.83±0.54	3.63±0.4*	3.90±0.59**
PD	6.03±0.63	2.40±0.40	2.38±0.23	2.76±0.56*	3.01±0.34*
GI	1.87±0.56	0.91±0.56	1.12±0.59	0.81±0.05**	1.02±0.61*
PI	1.82±0.01	0.90±0.32	0.91±0.34	1.12±0.53*	1.22±0.91*

\*Significant difference in parameter as compared to baseline.  $P < 0.05$ . \*\*Highly significant difference in parameter as compared to baseline.  $P < 0.001$ . CAL: Clinical attachment level; GI: Gingival inflammation index; PI: Plaque index; PD: Probing depth

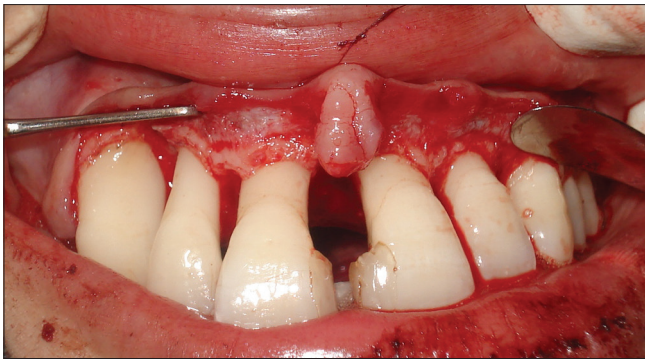


Figure 3: Papilla preservation periodontal flap surgery

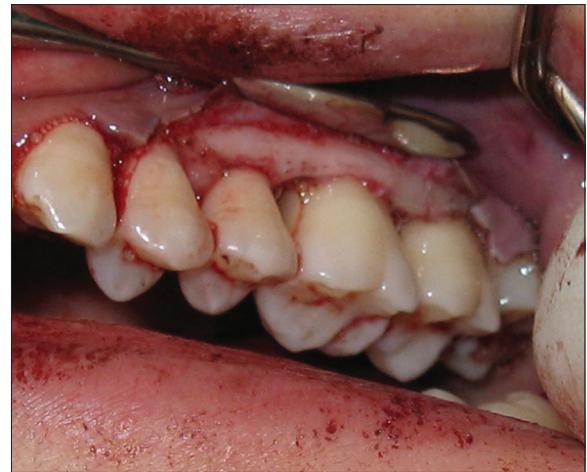


Figure 4: Open debridement during flap surgery



Figure 5: Postperiodontal treatment

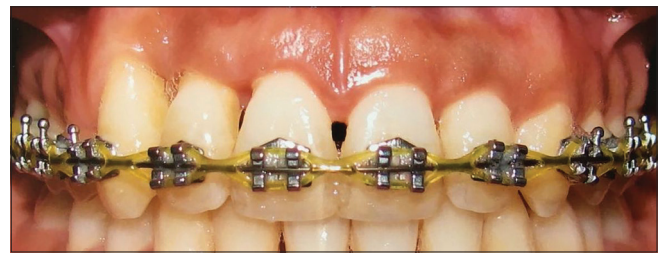


Figure 6: Orthodontic treatment for pathologic migration



Figure 7: Facial profile postorthodontic treatment

repositioning [Figure 6]. After debonding, the patient had a notably improved smile with no interference between the lower lip and the upper incisors, and she expressed genuine satisfaction. Posttreatment photographs confirm this esthetic improvement, with a more balanced profile and a harmonious face. The clinician selected an appropriate fixed retention device after active therapy. This long-term retention was used to prevent relapse, to decrease tooth mobility, and to improve chewing comfort. Following orthodontic treatment, functionally stable occlusion and improved periodontal parameters and esthetics were achieved [Figure 7].



Figure 8: A 10-year follow-up view after combined orthodontic and periodontal treatment

The patient was put on meticulous oral hygiene program, and professional follow-up regimen was strictly practiced by orthodontist and periodontists at regular interval for 10 years till the present time. This approach ensured that shallower pocket depth upon periodontal probing, no adverse effect to the repaired periodontium, and stable bone levels were detected during the maintenance phase [Table 1 and Figures 8-11]. A general improvement in esthetic parameters as achieved with combined periodontal and orthodontic treatment was evident.

## Discussion

Pathologic tooth migration (PTM) is a common complication of moderate-to-severe periodontitis and



Figure 9: A 10-year follow-up lateral view after combined orthodontic and periodontal treatment



Figure 10: 10-year follow-up lateral view after combined orthodontic and periodontal treatment

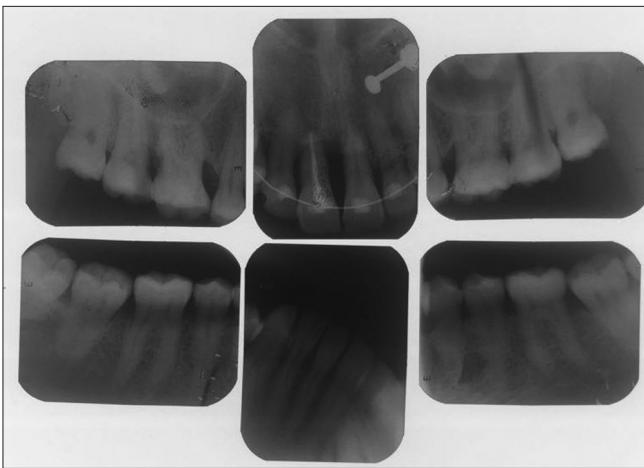


Figure 11: Radiograph at 10-year follow-up showing stable bone architecture

is often the motivation for patients to seek orthodontic therapy.<sup>[6]</sup> As a result of PTM, occlusal trauma and periodontitis are mutually aggravated, resulting in greater loss of attachment, extrusion, and mobility of the displaced teeth.<sup>[7,8]</sup> In many patients with a periodontally involved dentition, the migration of the anterior teeth leads to spacing and extrusion, resulting in serious functional and esthetic problems.<sup>[6,9,10]</sup> Orthodontic correction of pathologic malpositioned teeth can relieve occlusal trauma, stabilize the dentition, and improve the periodontal status.<sup>[11-13]</sup>

Many other issues might complicate the orthodontic treatment of a periodontal patient with PTM, for example, periodic periodontal maintenance, strength and direction of orthodontic force, and surveillance of periodontal status.<sup>[9,11,14]</sup> Treatment for such a patient with PTM is systemic, comprehensive, and multidisciplinary. Controlling plaque and eliminating inflammation are extremely important during the orthodontic treatment of patients with periodontal disease. Once orthodontic treatment is finished, the maintenance phase begins. The patient is required to be reviewed every 3–6 months to prevent reinfection and recurrence.<sup>[15,16]</sup>

The epidemiological studies of Sadowsky and BeGole<sup>[17]</sup> (comparison of the periodontal status of 96 treated cases and 103 controls, 12–35 years after orthodontic treatment) and Polson and Reed<sup>[18]</sup> in 1984 and then in 1988 (comparison of the periodontium of 112 treated cases and 111 controls, 10 years after orthodontic treatment) showed that the periodontal status of the treated cases and the controls was similar. There were no significant effects visible at periodontal level following orthodontic treatment in patients with good oral hygiene and free from periodontitis. Similarly, this type of treatment can be carried out on patients with periodontal disease that is stabilized before the start of treatment if good hygiene is maintained throughout treatment.<sup>[19,20]</sup> Therapeutic stability is guaranteed by good occlusofunctional balance, periodontal maintenance treatment, and reliable retention generally fixed and with the least possible traumatic effect on the periodontium.<sup>[21,22]</sup>

Melsen *et al.* showed that orthodontic tooth movements on reduced periodontal tissue did not aggravate the loss of periodontal support but, on the contrary, encouraged bone apposition, the key to a good periodontal response.<sup>[23-25]</sup> The periodontal study by Boyer *et al.* in 2011<sup>[26]</sup> showed an overall increase of bone level in the two patient groups: orthodontic and periodontal treatment or periodontal treatment alone. This tends to suggest that combination with orthodontic treatment in no way compromises the benefits of periodontal treatment. Similar findings were observed in the present case, where periodontal parameters were improved with periodontal nonsurgical and surgical therapy and later with orthodontic treatment. Meticulous oral hygiene practiced by patient and rigorous professional periodontal maintenance phase ensured stability of treatment result over long period of time.

### Conclusion

Periodontally compromised orthodontic patients can be satisfactorily treated, achieving correction of the malocclusion and a marked improvement in esthetics,

when an interdisciplinary approach is used. There are two delicate fundamental questions to be addressed in the orthodontic phase: the correct and careful application of forces and the monitoring of oral hygiene. In the postorthodontic phase, permanent retention was established. The combination of periodontal-orthodontic therapy can allow the achievement of satisfactory outcomes from esthetic, occlusal, and functional standpoints if physiologic forces are used, periodontal inflammation is controlled, and meticulous oral hygiene is maintained throughout active therapy. Improvement of facial esthetics contributed to the self-confidence of an adult periodontal patient with PTM follow-up at 10-year posttreatment confirmed the good choice of treatment planning and the tendency to improve the results over time.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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#### Conflicts of interest

There are no conflicts of interest.

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