Adjunctive orthodontic treatment of periodontally involved teeth: Case reports

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Elongated and spaced incisors are common in patients suffering from severe periodontal disease. Intrusion and uprighting of incisors might be the logical solution for this problem. This article describes a team approach to treatment planning for adult patients with severe localized periodontitis accompanied by marginal bone loss and spacing and elongation of incisors. The treatment involves the combination of periodontal treatment, orthodontic intrusion, and prosthetic therapy. Controlled intrusion in two patients led to a decrease in the clinical crown length, better access for oral hygiene procedures, better gingival form, and a more suitable distribution of occlusal forces. (Quintessence Int 1998:27:13–19)

Key words: elongated incisors, marginal bone loss, orthodontic intrusion, periodontally involved teeth, periodontitis, spaced incisors, team approach

Orthodontic tooth movement in periodontally involved patients constitutes a problem distinct from routine orthodontics. Patients with advanced periodontal disease may experience tooth migration involving single or multiple teeth. The most common symptoms may include tipping and extrusion of one or several incisors and development of single or multiple diastemas of the anterior teeth. Correction of these problems demands advanced techniques and an understanding of the biologic situation present in those patients. Judicious interdisciplinary treatment planning should involve a periodontist, an orthodontist, and a general dentist to achieve a satisfactory result. The combination of periodontal treatment and orthodontic intrusion of elongated and migrated incisors seems to be a necessary and beneficial part of the total treatment plan, provided that both the biomechanical force system and oral hygiene are kept under control.

In a recent report, it was suggested that in situations where tooth movement is indicated as an adjunct to periodontal therapy, vigorous preparation of root surfaces and gingival tissues should precede placement of the orthodontic appliance. Deep pockets must be eliminated before orthodontic treatment is initiated, so as to prevent apical displacement of plaque that could establish progressive periodontal lesions. Results of a longitudinal study of adults with reduced gingival height and a healthy periodontium showed that orthodontic treatment did not result in significant further loss of attachment. This finding depended on the prerequisite that periodontal treatment was provided to arrest active disease before orthodontic treatment was begun. Furthermore, these patients received monthly reinforcement of plaque removal and also received subgingival debridement at 3-month intervals during orthodontic treatment to maintain healthy gingival tissues.

When periodontal treatment alone cannot correct or control the damage produced by a pathologic occlusion, then orthodontic tooth movement becomes an important step in the overall treatment plan. In these patients, orthodontic goals and mechanics must be modified to keep orthodontic forces to an absolute minimum. This is necessary when bone has been lost because the periodontal ligament area decreases, and the same force against the crown produces greater pressure in the periodontal ligament of a periodontally compromised tooth than a normally supported one.
The aims of the present article are to illustrate and discuss, by means of case reports, the interrelationship of orthodontics, periodontics, and prosthetic dentistry to fulfill the needs of periodontally involved patients and to highlight the benefits of the team approach.

Case reports

Case 1

A 36-year-old Chinese man presented with the chief complaint of drifting and spacing of the maxillary incisors (Fig 1a). Clinical examination revealed incompetent lips, Class II malocclusion, increased overjet (9 mm), and overbite (4 mm). Periodontal charting demonstrated that probing depths ranged from 4 to 9 mm. The mesial aspect of the maxillary right premolar exhibited a probing depth of 9 mm. Radiographic examination revealed generalized horizontal bone loss in both arches.

Treatment planning involved a team that consisted of a periodontist, an orthodontist, and a general dentist.

Treatment plan

1. Periodontal treatment: Thorough oral hygiene instructions, scaling, and root planing in deep pocket sites before orthodontic treatment
2. Periodontal maintenance: Carried out during and after orthodontic treatment
3. Orthodontic treatment: Intrusion and retroclination of proclined and spaced maxillary incisors and intrusion of mandibular incisors
4. Retention: Fixed lingual retainers and regular review of the periodontal condition
5. Restorative treatment: Prosthetic replacement of maxillary left first molar

Periodontal treatment. This patient had been under a periodontist’s care for nearly 2 years. Intensive periodontal treatment involved oral hygiene instructions, scaling, and root planing. The maxillary left second molar was extracted because of poor response to treatment. Before the commencement of the orthodontic treatment, plaque control was good, periodontal disease was arrested, and the gingiva was clinically healthy. No deep pockets were identified, and only a 4-mm probing depth was measured at the maxillary right first premolar. Radiographic examination revealed generalized horizontal bone loss around one third to one half of the root (Fig 1b).

Periodontal maintenance. Periodontal maintenance was carried out at regular intervals during orthodontic treatment and home care was emphasized.

Orthodontic treatment. Treatment included a fixed appliance with bonded brackets on the first molars and incisors. The initial leveling wire was a 0.014-inch stainless steel arch wire with intrusion loops mesial to the first molars. These intrusion loops were bent in such a way that, when the wire was not engaged in the bracket, the anterior segment of the wire rested at the vestibule (Fig 1c). This wire is called an intrusion arch because, when it is engaged into the incisor brackets, it applies force on the teeth in an apical direction, thus intruding the incisors (Fig 1d). The force used in this case was light and ranged from 10 to 15 g per tooth, to avoid damaging the periodontium.
Residual spaces remaining after retroclination and intrusion of incisors were eliminated by resin composite buildup of the maxillary lateral incisors (Fig 1e).

Retention. Retention was achieved with a fixed lingual splint from canine to canine. Total active treatment time was 7 months.

Restorative treatment. The patient was referred for prosthetic replacement of missing posterior teeth.

Results. Evaluation after the orthodontic treatment revealed satisfactory oral hygiene except for plaque accumulation at the distogingival margin of the maxillary left first molar. No probing depth was in excess of 3 mm, and no further recession was noted. The clinical crown length decreased by 0.5 to 1.0 mm. Posttreatment radiographic evaluation revealed positive bone remodeling around the alveolar crest (Fig 1f).

The aims of the orthodontic treatment were achieved. The maxillary incisors were intruded and retracted and displayed proper overjet and acceptable overbite. Examination of the patient 13 months later revealed a stable occlusion and acceptable functional and esthetic results.
Fig 2a  Appearance of a 30-year-old Chinese woman after initial periodontal therapy. Gingival recession of the mandibular left incisors is associated with anterior crossbite, and the mandibular left incisors are mobile.

Fig 2b  Complete-mouth radiographic series before orthodontic therapy. Note the spacing of the teeth, horizontal bone loss around one third to one half of the root length, and vertical bone loss at the mandibular incisors and first molars.

Case 2

A 27-year-old Chinese woman presented with mild marginal gingival inflammation, limited largely to the mandibular anterior teeth. Gingival recession was observed at the labial surfaces of the mandibular incisors, particularly the right lateral incisor (Fig 2a). Deep probing depths were detected on the maxillary right first molar, mandibular first molars, and maxillary central and lateral incisors, consistent with a diagnosis of localized juvenile periodontitis. This was confirmed in radiographic examination where marked bone loss was evident on anterior teeth and first molars (Fig 2b). Also, a mesiodens was observed between the maxillary incisors.

On clinical examination, a slight anterior displacement of the mandible was detected. The displacement was caused by an anterior crossbite of the maxillary left central and lateral incisors. Molars and canines exhibited Class I relationships, and space analysis revealed excess space in both arches.

Treatment planning involved a team that consisted of a periodontist, an orthodontist, and a general dentist.

Treatment plan
1. Periodontal treatment: Oral hygiene instruction, scaling, and subgingival instrumentation
2. Periodontal maintenance: Carried out during and after orthodontic treatment
3. Orthodontic treatment: Correction of anterior crossbite, alignment of anterior teeth, and elimination of anterior mandibular displacement
4. Retention: Fixed lingual retainers and regular review of the periodontal condition
5. Prosthetic treatment: Porcelain veneers to improve the esthetics of the maxillary incisors

Periodontal treatment. The patient was under the periodontist’s care for 2 years for management of her localized juvenile periodontitis. Before the start of orthodontic treatment, the oral hygiene status was well maintained and the gingival condition was registered as sound with no bleeding on probing. Gingival recession was evident at the mandibular incisors. Probing depths measured 4 to 5 mm at the posterior teeth. Generalized horizontal bone loss around one third to one half the root length was evident. Mild tooth mobility was detected at the maxillary incisor region, and severe tooth mobility was noted at the mandibular incisor region.

Periodontal maintenance. Throughout the orthodontic treatment period, the patient was under regular periodontal care and underwent subgingival curettage when it was considered necessary.

Orthodontic treatment. Treatment included the use of fixed appliances with bonded brackets on the second molars and incisors. The initial wires were 0.014-inch stainless steel arch wire, used for leveling and aligning the incisors. The mandibular incisors were retracted on a rectangular wire with a closing loop distal to the right lateral incisor (Fig 2c). The use of rectangular wire with added lingual root torque prevented the retroclination of the mandibular incisors during space closure. Closure of the spaces in the mandibular anterior region resulted in positive overjet (Fig 2c), which led to the elimination of the traumatic occlusion.

Retention. Retention was achieved with a fixed lingual splint from canine to canine. Total active fixed appliance therapy was 12 months.

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Restorative treatment. Porcelain veneers were used to build up the size of the maxillary lateral incisors and improve the esthetics of the central incisors (Fig 2d).

Results. Evaluation after orthodontic treatment revealed no increase in probing depth and no increase in gingival recession. The bone remained at pretreatment levels (Fig 2e). The orthodontic goals and objectives were achieved, because the crossbite was eliminated and the overjet and overbite were corrected. Porcelain veneers on the maxillary incisors improved esthetics and masked the residual spaces produced as a result of small maxillary lateral incisors.

Discussion

This paper describes a team approach toward treatment planning for adult patients with severe localized periodontitis accompanied by marginal bone loss and spacing and elongation of the incisors. The relationship between periodontal disease and malocclusion has been a controversial subject. Tooth malpositioning has been recognized as both an etiologic factor contributing to periodontal destruction as well as a result of chronic destructive periodontal disease. Malposed or rotated teeth may be predisposed to more rapid breakdown of the periodontium when the roots are too close to one another, resulting in a thin interproximal septum. Klassman and Zacher reported that correction of these malposed teeth may be therapeutic and/or prophylactic.

At the present time, there have been no significant studies that confirm a definite relationship between malocclusion and periodontal disease. On the contrary, the consensus of the majority of studies is that there is no relation between various types of malocclusion and periodontal diseases. In a study of 188 persons with periodontal disease, no relationship was found between periodontal disease and Angle’s classification, overbite, overjet, open bite, rotation, or inclination of the man-
dibular incisors. Grewe and associates\textsuperscript{19} reported that plaque retention based on oral hygiene habits may be the major factor in periodontal disease, while irregularities of tooth position may play another minor complicating role.

The only exceptions to this appear to be extremely severe overbite, in which there is direct impingement of the teeth on the soft tissues, and localized crossbite with traumatic occlusion.\textsuperscript{18} The patient in case 2 exhibited the destructive effects of traumatic occlusion, caused by localized crossbite, on the periodontal supporting structure (see Figs 2a and 2b). Gingival recession and mobility affecting isolated mandibular incisors are not uncommon in association with lingually positioned incisors.\textsuperscript{26} In such cases, the risk of accelerated loss of attachment appears likely.\textsuperscript{29} Because traumatic occlusion may have been a predisposing factor for the gingival recession and mobility of the mandibular incisors of the patient in case 2, elimination of the anterior crossbite became a major objective of the treatment planning.

This type of orthodontic treatment is considered adjunctive orthodontic treatment.\textsuperscript{1} By definition, it is tooth movement carried out to facilitate other dental procedures necessary to control disease and restore function.\textsuperscript{1} During the treatment planning for this adjunctive orthodontic treatment, special biomechanical considerations were emphasized. The design of the appliance used depended on the number of teeth to be moved, the availability of anchorage, and the desired direction and amount of crown or tooth movement.\textsuperscript{1} Thus in case 2, fixed appliances were used only on the maxillary and mandibular incisors and second molars. Second molars were used as anchorage units instead of first molars because of the poor periodontal condition of the latter. Mandibular incisors were retracted bodily on rectangular wires to prevent lingual tipping of the crowns while the roots were being moved lingually.

It has been proposed that orthodontic treatment may be used to attain more favorable bone levels and contours around periodontally involved teeth.\textsuperscript{5,14} Kessler\textsuperscript{4} proposed that changes in osseous topography could be accomplished by moving teeth into an area of the arch that has a greater volume of bone and by repositioning periodontally involved anterior teeth.

On the one hand, traumatic occlusion may contribute to destructive periodontal disease, but, on the other hand, advanced periodontal disease with the loss of periodontal supporting structure can cause migration, extrusion, flaring, and loss of teeth.\textsuperscript{2,21} This is because a secondary occlusal trauma may further complicate an already difficult problem. This pattern of occlusion was manifested by the patient in case 1. The patient presented with the chief complaint of migration of his teeth with resultant spaces. The same biomechanical considerations discussed earlier were implemented for this patient. Fixed appliance therapy was limited to the incisors and the first molars. Buccal segments were not involved in the fixed appliance therapy because of their poor periodontal condition. Orthodontic treatment resulted in successful intrusion and space closure. Melson et al.\textsuperscript{28} concluded that intrusion of incisors in adult patients with marginal bone loss offers a beneficial effect on the periodontal condition at the clinical and radiographic levels. Such a result was seen in Case 1, where Fig 1f demonstrates positive bone remodeling when compared to pretreatment radiographs (Fig 1b).

### Summary

The efficacy of intrusion and uprighting of pathologically migrated anterior teeth with deep overbite and an anterior crossbite has been discussed. Intrusion is a reliable therapeutic method for orthodontic treatment of periodontally involved patients. A multidisciplinary approach can better serve the needs of periodontally involved patients with malposed teeth.

### References