Case Report

Skeletal Anchorage for Orthodontic Correction of Maxillary Protrusion with Adult Periodontitis

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Abstract: Because the number of adult patients seeking orthodontic treatment is increasing, orthodontists are becoming more likely to encounter patients with adult periodontitis. However, it is sometimes difficult to establish anchorage because of poor periodontal tissues in patients with adult periodontitis. This article reports the successful use of skeletal anchorage to treat a maxillary protrusion case complicated by severe adult periodontitis. A female patient aged 50 years seven months showed a skeletal Class II jaw base relationship. A spacing of five mm in the upper anterior teeth with an overjet of 7.5 mm and overbite of four mm was observed. She had generalized horizontal bone loss in both arches, with vertical bone loss in the posterior segment. After periodontal treatment, miniplates were placed in the zygomatic process, and retraction and intrusion of the maxillary incisors were performed. After active treatment for 21 months, the upper incisors had been inclined 9.5° lingually, intruded two mm at the apex, and good anterior occlusion was achieved. Acceptable occlusion and periodontal tissue were maintained after a retention period of two years. Our results suggest that skeletal anchorage is useful for retraction and intrusion of upper incisors in cases of maxillary protrusion with severe adult periodontitis. (*Angle Orthod* 2006;76:148–155.)

Key Words: Skeletal anchorage; Adult periodontitis; Maxillary protrusion

INTRODUCTION

Patients with periodontal disease may demonstrate migration, elongation, and spacing of the incisors.[1,2] With periodontal disease, the loss of alveolar bone results in a center of resistance of the involved teeth moving apically, and the forces acting on the teeth commonly result in tooth tipping.[3] In the treatment of these patients, intrusion of migrated and elongated incisors is necessary to close the spaces.[4,5] Adequate orthodontic and periodontal treatments have been shown to improve the periodontal condition and to reestablish a healthy and well-functioning dentition, if oral hygiene is maintained.[6–10] In a report that followed patients for 12 years after the end of orthodontic treatment, Re et al[2] also suggested that orthodontic treatment is no longer contraindicated in the presence of severe adult periodontitis. However, it is difficult to establish proper anchorage in patients with periodontitis when performing orthodontic treatment because of the poor condition of teeth with reduced periodontal support.

Recently, to obtain a stationary anchorage, dental implants,[11–14] screws,[15–19] and miniplates[20–23] have been used. These materials can provide stationary anchorage for various tooth movements and reduce treatment time without requiring patient cooperation. However, there have been few case reports on the correction of elongated and spaced incisors using skeletal anchorage in patients with severe adult periodontitis. This article demonstrates the usefulness of miniplates for orthodontic anchorage to retract and in-

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FIGURE 1. Pretreatment intraoral photographs and panoramic radiograph.

trude the upper incisors in a patient with severe adult periodontitis.

CASE SUMMARY

A female patient aged 50 years seven months came to the outpatient clinic of our university dental hospital, with a chief complaint of spacing between the maxillary incisors and dental protrusion. Clinical examination demonstrated an acute nasolabial angle, straining of the circumoral musculature on lip closure, Class II malocclusion, and increased overjet (7.5 mm) and overbite (four mm) (Figure 1). The upper incisors showed migration and rotation, resulting in five mm of spacing, whereas the lower anterior segment demonstrated mild crowding (0.5 mm) (Figure 1). The upper left first molar was missing, and a temporary bridge had been set (Figure 1). The lower right second premolar and first molar were under prosthetic treatment (Figure 1). The third molars were absent (Figure 1).

Periodontal charting demonstrated that probing depths ranging from three to 10 mm and bleeding on probing was present in almost all teeth except for the upper and lower left lateral incisors, upper first premolar, and lower second premolars. Radiographic examination demonstrated generalized horizontal bone loss in both arches, with vertical bone loss in the upper right first premolar and molars, lower right first premolar, and second molars. In particular, severe bone loss around three-fourths of the root was noted in the upper left posterior region (Figure 1).

Cephalometric analysis showed a skeletal Class II jaw base relationship (ANB 9°) with mandibular retrusion (SNB 73°) and deficiency (Go-Me 65 mm) relative to the Japanese norm[24] (Figure 2; Table 1). The mandibular plane angle was steep (MP/FH 34°), and the Gonial angle was large (Go.A 131°) (Figure 2; Table 1). The mandibular ramus height was within the normal range (Table 1). The lower incisors were labially inclined (L1-MP 111.5°) and significantly extruded (L1/MP 48.5 mm) (Table 1).

Diagnosis and treatment objectives

The patient was diagnosed as having an Angle Class II maxillary protrusion, skeletal Class II jaw base relationship, and high mandibular plane angle, with adult periodontitis.

The treatment objectives were (1) to acquire good plaque control and clinically healthy gingiva by periodontal treatment, (2) to correct the maxillary anterior diastemata and establish ideal overjet and overbite,

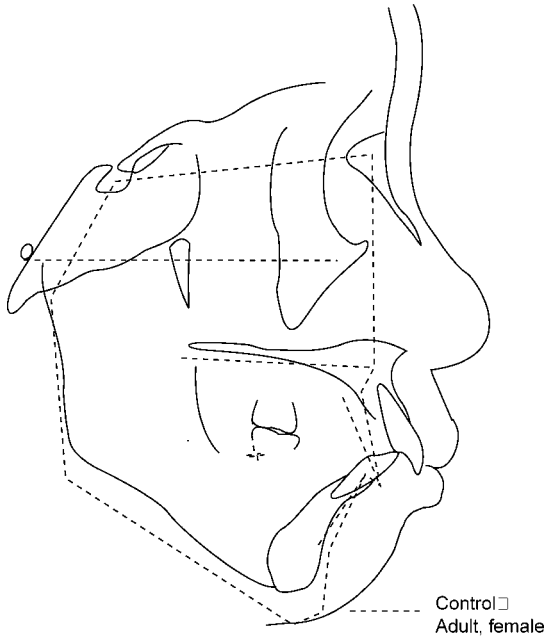

FIGURE 2. Pretreatment cephalometric tracing. Tracing was superimposed on the mean profilogram.

and (3) not to worsen the retrognathic appearance of the facial profile.

Because the facial height would be unaltered and molars in both arches would not be elongated, we planned to implant titanium miniplates for skeletal anchorage to intrude and retract maxillary incisors.

Treatment progress

Before starting orthodontic treatment, the patient received periodontal treatment from a periodontist for 14 months. Periodontal treatment involved oral hygiene instructions, curettage, scaling, root planing, and flap operations. The upper left second molar was extracted because of poor response to periodontal treatment (Figure 3). After periodontal treatment, the patient acquired good plaque control and clinically healthy gingiva (Figure 3). Probing depths were less than three mm, except at the mesial palatal aspects of upper left premolars and right first molar, mesial lingual aspect of the lower left second molar, and distal buccal aspect of the lower right second molar, where the probing depths were four mm. The upper right molars and lower left molars were fixed with an A-splint, and temporary continuous crowns were set in the lower right second premolar and molars (Figure 3).

Six months after finishing the initial periodontal treatment, a 0.018-inch slot, preadjusted edgewise appliance was placed on the lower anterior teeth and first molars, and leveling and alignment with a round archwire was initiated. Stripping of the lower incisors was performed for the retraction and intrusion of lower incisors. The anchorage consisted of two bilateral segments connecting the posterior teeth.

Y-shaped miniplates (Dentsply-Sankin, Tokyo, Japan) were implanted into the zygomatic process of the maxilla through the buccal mucosa after local anesthesia had been administered (Figure 4). Analgesics and antibiotics were prescribed to the patient for three days after the implantation. After eight weeks for healing, integration, and adaptation, a 0.018-inch slot, preadjusted edgewise appliance was placed on the upper anterior teeth. Then, leveling and alignment were initiated with light sectional wires (Figure 5).

TABLE 1. Cephalometric Summary[a]

Measurements	(Japanese Female Adult) Mean	SD	Pretreatment (50 y 7 mo)	Posttreatment (53 y 11 mo)	Postretention (55 y 11 mo)
Angular (°)					
SNA	81	3.5	82	82	81.5
SNB	78	4.5	73	73	73
ANB	3	2.5	9	9	8.5
Mp-FH	30.5	3.5	34	34	34
Gonial angle	122	5.5	131	132	132
U1-FH	112.5	8.5	115.5	106	107
L1-Mp	93.5	7	111.5	104.5	113
IIA	123.5	10.5	99	115	106
Linear (mm)					
S-N	68	3.5	72.5	72.5	72.5
Ans-Ptm	52	3	58	58	58
Go-Me	71.5	4	65	65	65
Ar-Me	106.5	5.5	99	99	99.5
Overjet	3	1	7.5	4.5	4
Overbite	3.5	2	4	4	3
U1/NF	31	2.5	31.5	31	31
L1/Mp	44	2.5	48.5	46.5	46

[a] Means and SDs from Wada et al[24].

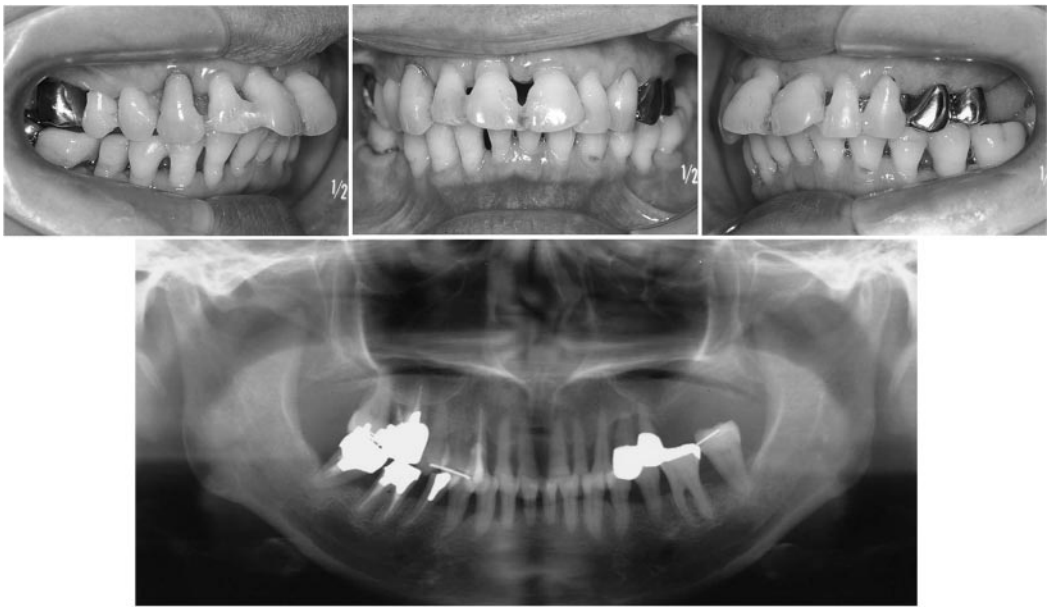

FIGURE 3. Postperiodontal treatment intraoral photographs and panoramic radiograph.

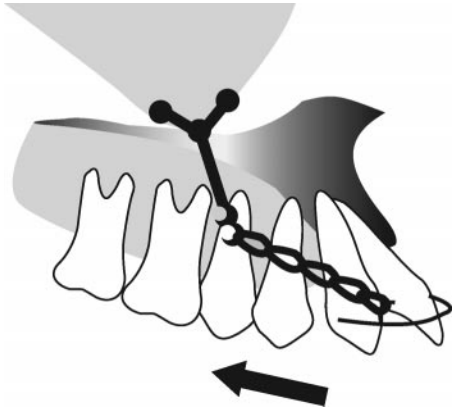

FIGURE 4. Schematic representation of retraction of upper incisors.

At the beginning of leveling, a 0.010 inch ligature wire was tied from the miniplates to the anterior segment to prevent the flaring the upper incisors (Figure 5). After a 0.016 × 0.022–inch sectional stainless steel archwire was placed, retraction and intrusion of the anterior teeth was started with elastic chains between the miniplate and the hook (Figure 5). Eight months after the start of loading, the space in the upper anterior segment was closed. After 21 months of edgewise treatment, ideal overjet and overbite were achieved. Three months before removal of the edgewise appliances, the miniplates were removed. After the removal of the edgewise appliances, the maxillary teeth were stabilized by a six-unit bonded lingual retainer with a Begg-type retainer, and the mandibular teeth were stabilized by a nine-unit bonded lingual retainer (Figure 6).

During orthodontic treatment, the periodontist carried out periodontal maintenance at one-month intervals and home care was emphasized.

RESULTS

The space in the upper dentition was closed, and maxillary dental midline coincided with the mandibular midline (Figure 6). The upper incisors were inclined 9.5° lingually (Figure 8; Table 1), and the vertical perpendicular distance from the upper central incisal edge to the nasal floor was maintained (Figure 8). The upper incisors were intruded two mm at the apex (Figure 8). The lower incisors were intruded and lingually inclined 7° (Figure 8; Table 1). There was no remarkable apical root resorption observed in the upper and lower incisors, and ideal overbite and overjet with a Class I canine relationship was established (Figure 6).

After two years of retention, acceptable occlusion and facial profile were also maintained (Figure 7). During retention, the lower incisors were labially inclined 8.5°, and the lower right second molar was extracted because of severe vertical bone loss around the apex of the root (Figures 7 and 8; Table 1). During active orthodontic treatment and retention, probing depth and bone loss in the anterior segment on radiograph were maintained at the levels achieved after periodontal treatment.

DISCUSSION

In this case, orthodontic treatment was performed in a patient with severe adult periodontitis. Adult patients with periodontitis usually present with varying degrees of proclination, irregular spacing, rotation, and overe-

FIGURE 5. Photographs taken during the treatment progress. (A) Starting of the retraction of the upper incisors. (B) Four months after the start of the retraction of the upper incisors. (C) Eight months later.

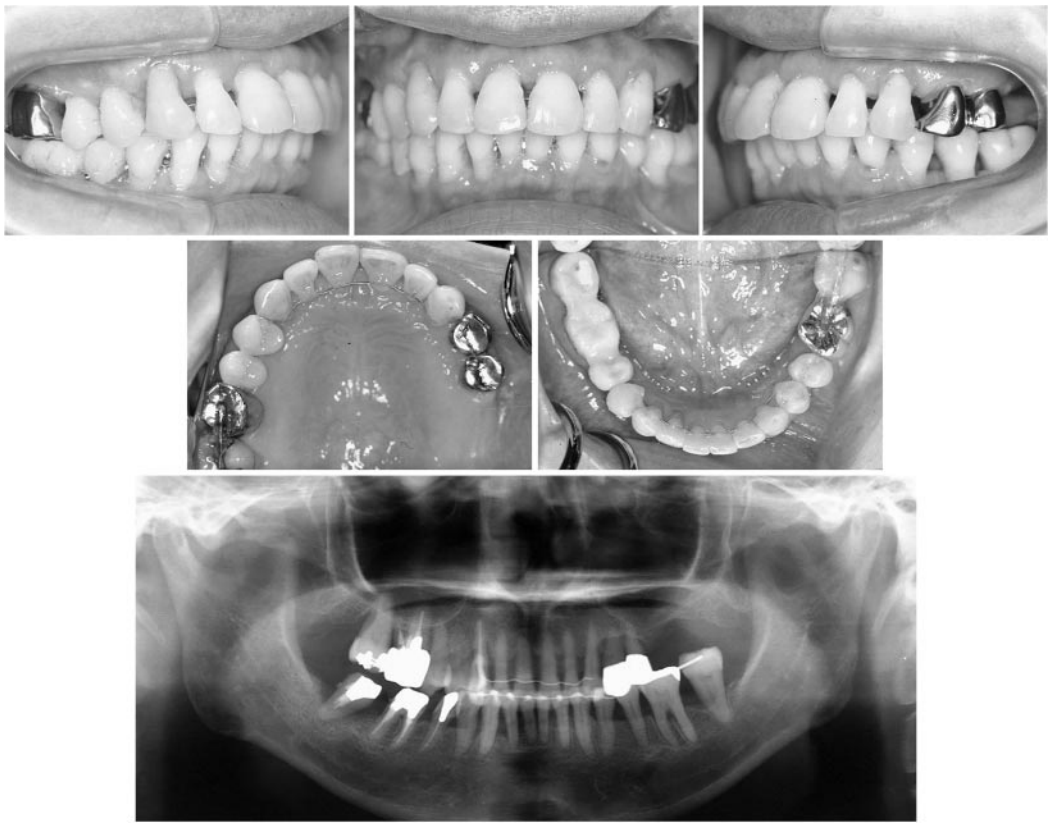

FIGURE 6. Postactive treatment intraoral photographs and panoramic radiograph.

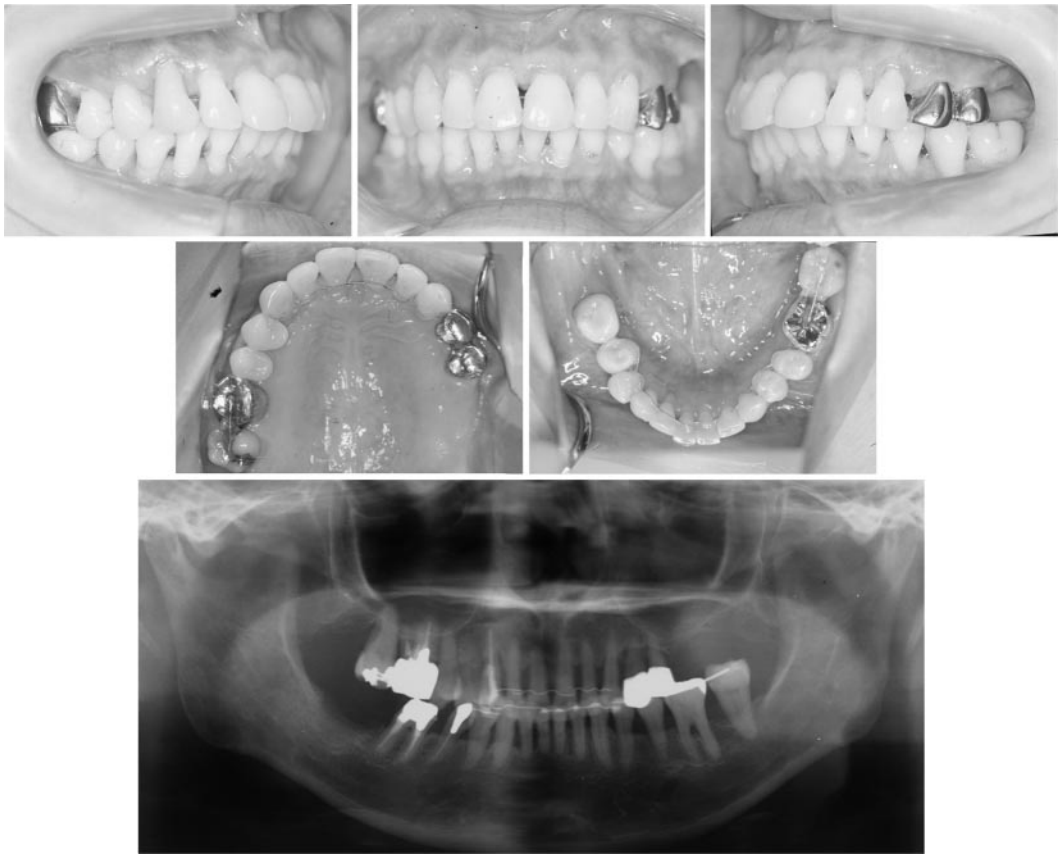

FIGURE 7. Two-year postretention intraoral photographs and panoramic radiograph.

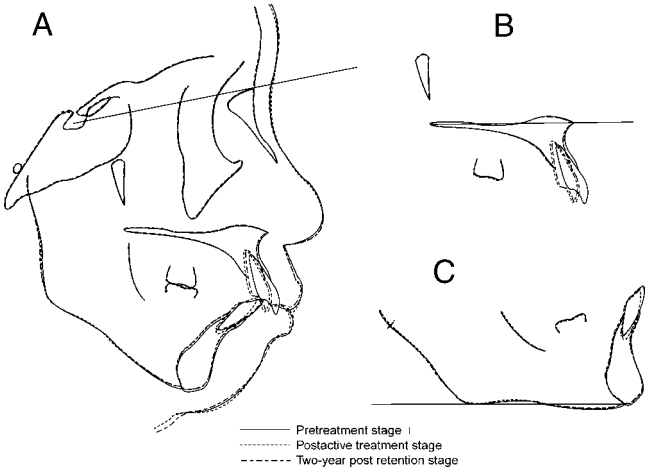

FIGURE 8. Superimposition of cephalometric tracings made before and after treatment and two-year postretention stage. (A) Superimposing on the Sella-Nasion plane at Sella. (B) Superimposing on the palatal plane at ANS. (C) Superimposing on the mandibular plane at Menton.

ruption of the upper anterior segment, resulting in functional and esthetic problems.[1,2] The patient in this study had severe periodontal disease that led to spacing and extrusion in the upper anterior teeth. Moreover, the lower incisal edges were contacting the linguogingival ridge of the upper incisors. Therefore, it was important to combine space closure of upper incisors with bite raising during active orthodontic treatment. Bite raising involves the intrusion of incisors[5,25] or the use of a removable appliance with an anterior biteplate.[26,27] The patient in this study showed skeletal Class II jaw base relationship, high mandibular plane angle, and the loss of alveolar bone. Therefore, an eruption of the posterior segments would lead to an increase in facial height, crown-root ratio, and overjet. Thus, we considered that intrusion of the upper incisors was desirable in this case.

It has been reported that in adult patients, the best results are obtained when intrusion is performed with a light force (five to 15 g per tooth) with the line of action of the force passing close to the center of resistance.[25] The use of segmented arch mechanics has been recommended to provide incisor intrusion with light force in nongrowing patients, instead of molar extrusion.[4] However, a genuine intrusive movement of the anterior incisors by segmented arch mechanics needs a posterior anchorage unit.[4] In this case, we could not obtain proper anchorage for upper incisor intrusion because of missing teeth in the left posterior segment after periodontal treatment. Thus, skeletal

anchorage was needed for the retraction and intrusion of upper incisors. However, the lower left molars were fixed with an A-splint, and the lower right second premolar and molars were connected with temporary continuous crowns, and these were used as anchorage units.

Several methods of acquiring bone anchorage have been reported, ie, dental implants,[11–14] titanium screws,[15–19] and miniplates.[20–23] The patient in this study had lost the upper left molars. Therefore, it was considered that a dental implant into the upper left posterior segment was appropriate for orthodontic anchorage. However, the patient refused to allow the dental implant because of its higher medical costs and larger surgical access requiring maxillary sinus floor elevation (sinus lift) in the patients with deficient alveolar bone.[28] The use of miniplates for orthodontic anchorage has been reported in anterior open-bite cases, and these reports showed that miniplates were useful for the intrusion.[20–23] Therefore, miniplates were placed in the zygomatic process in the maxilla. Moreover, the three hooks of miniplates facilitated adjustment of the direction of force to retract and intrude the upper incisors. However, titanium screws have more recently been used for stationary anchorage. Compared with miniplates, titanium screws used for the patient in this study would have had the advantages of lower medical costs, simpler placement surgery, and less discomfort after implantation.[29] Thus, titanium screws might have been appropriate for stationary anchorage in this case.

As a result of retraction and intrusion of upper incisors, the spaces between the upper incisors were closed and the increased overjet was improved. It is reported that orthodontic intrusion may shift supragingival plaque to a subgingival location and result in the formation of infrabony pockets.[6] However, the combination of proper orthodontic intrusion and periodontal treatment has been shown to improve reduced periodontal conditions, if good oral hygiene is maintained.[2,8] In this case, good oral hygiene prevented further periodontal breakdown during and after active orthodontic treatment. In addition, a healthy periodontal condition was maintained because we could perform intrusion of upper incisors with a light force in the appropriate directions using skeletal anchorage in the maxilla.

The planning of retention and the stability of orthodontic treatment requires greater consideration in patients with adult periodontitis. It is reported that optimal long-term retainer for adults with advanced periodontal disease is the lingual-bonded retainer using multistranded flexible wire.[27,30] In the upper arch, the lingual-bonded retainer was used in combination with a removable retainer, and a lingual-bonded retainer was used alone in the lower arch. Although acceptable occlusion was maintained, the mandibular incisors inclined 8.5° labially after two years of retention. The patient in this study had severe adult periodontitis with alveolar bone loss. Therefore, forces acting on the teeth would generate the tooth tipping because the center of resistance of the teeth moved apically.[3] In the lower arch, only a lingual-bonded retainer using multistranded flexible wire was used for retention. Thus, a removal retainer that wrapped the lower dentition would be required for further long-term retention in the lower anterior teeth.

This case suggests that skeletal anchorage for orthodontic treatment enables forces to be very carefully controlled in both magnitude and direction in patients with severe adult periodontitis, ie, patients with lack of proper anchorage. Moreover, we suggest that skeletal anchorage is useful for retraction and intrusion of upper incisors in cases of maxillary protrusion with severe adult periodontitis.

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