

Case Report

Dental Class III Camouflage Treatment Using Miniscrew Anchorage

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ABSTRACT

In this case report, the treatment of a moderate Class III malocclusion by miniscrews is presented. A 17-year-old female patient with a chief complaint of crowding had Class III dental relationship. Cephalometric analysis demonstrated a Class II skeletal relationship with a high angle vertical pattern. The aim was to correct the skeletal and dental relationships with orthognathic surgery; however, the patient refused the operation. So it was decided to perform camouflage treatment, which consisted of lower posterior stripping and uprighting of the same teeth by the help of miniscrews placed into the interdental spaces between the mandibular first and second molars. At the end of the treatment, Class I molar and canine relationships were achieved, and the crowding was eliminated. The patient's profile was not negatively affected. The outcome was stable after 1 year of retention. This case report shows that miniscrew anchorage successfully aided in the correction of a dental Class III malocclusion without extraction of any lower teeth and without any side effects on the opposite arch and the profile.

KEY WORDS: Camouflage treatment, Class III malocclusion, Miniscrew anchorage

INTRODUCTION

For every orthodontic tooth movement, there is an equal and opposite reaction. Especially when distalization movement of the mandibular posterior teeth is desired for Class III camouflage, treatment-accompanying reaction can make it difficult to correct the malocclusion using only intraoral appliances. Generally, fixed appliances and intermaxillary elastics have been used to move mandibular molars distally, but this often results in proclination of the maxillary incisors and extrusion of the maxillary molars as reciprocal side effects,¹ which could cause an aesthetic problem and instability, especially in patients with a dolichocephalic appearance. Furthermore, the results are unpredictable because they depend on patient compliance. Therefore, several researchers have tried to treat this type of malocclusion by distal tooth movement alone. Some clinicians have used miniplates for intrusion or distalization of the mandibular posterior teeth.^{2,3}

Recently, the mechanics of group distal movement of teeth with usage of microscrew implant anchorage have been introduced in the treatment of adult

patients with Class III malocclusion without undesirable dental side effects.⁴⁻⁸ Park *et al.*⁴ applied distalizing force to the canines through a nickel-titanium (NiTi) coil spring connecting miniscrews to hooks on the archwire. Chung *et al.*⁹ applied distalizing force to the canines through elastic power chains connecting the mini-implants to the sliding jigs on both sides. Poletti *et al.*¹⁰ applied a sliding jig to distalize the lower molars while the anterior teeth were bonded and retracted secondarily to avoid round tripping.

The primary effect of miniscrew-aided mechanics in the mandible is distal tipping movement of the posterior teeth along with uprighting and distal movement of the anterior teeth.⁴ There is no unwanted tooth movement on the maxillary dentition because intermaxillary elastics are not used. Therefore, distal movement assisted by a miniscrew

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Figure 1. Pretreatment facial and intraoral photographs.

anchorage can be a good treatment alternative when intermaxillary elastics are contraindicated or the patient is not cooperative.

This case report describes the treatment of a dental Class III malocclusion in which the distalization of the mandibular dentition was obtained using miniscrews.

DIAGNOSIS

A 17-year-old young woman's chief complaint was crowding. Her medical history revealed no contraindication to orthodontic treatment, and there were no signs of temporomandibular joint symptoms. The patient had an asymmetrical face, incompetent lips, a high smile line with a flat smile arc, a convex profile, and a retrusive upper lip and chin (Fig. 1).

The upper midline was coincident with the facial midline, and there was a 1-mm deviation of the lower midline toward the right side. The molars were in Class III relationship on both sides. The lower right canine and lower left second bicuspid were in a crossbite relationship. The lower left second bicuspid had gingival recession. Arch-length discrepancies in the upper and lower arches were -1.54 mm and -7.54 mm, respectively. Bolton¹¹ tooth size analysis showed 0.34-mm lower anterior and 3.2-mm lower posterior excess.

The panoramic radiograph revealed unerupted third molars (Fig. 2). The initial cephalometric tracing (Fig. 3) showed that the patient had a Class II skeletal relationship with high mandibular plane angle; in addition, the upper incisors were proclined,



Figure 2. Pretreatment panoramic radiograph.

and the lower incisors were retroclined (Table 1). The main features of the malocclusion were dental Class III malocclusion with severe lower arch crowding.

TREATMENT OBJECTIVES

The primary treatment objectives for this patient were to achieve a Class I canine/molar relationship bilaterally, relieve crowding, correct the upper and lower arch shapes and interincisal relationship, establish good functional occlusion, correct tooth positioning and the gingival defect, and plan an appropriate retention protocol.

TREATMENT ALTERNATIVES

The treatment plan involved a nonextraction treatment protocol. Other options would have been to extract the right and left lower second premolars or perform double jaw surgery. Maxillary impaction plus mandibular setback surgery was a viable treatment option because the skeletal vertical excess was significant; however, the patient refused the surgical option. Sequential stripping from lower premolars and uprighting and slight distalization of the mandibular posterior dentition using miniscrew anchorage became the treatment of choice. The lower third molars were extracted as part of treatment planning.

TREATMENT PROGRESS

The lower third molars were extracted initially to achieve the uprighting of the lower posterior teeth. After aligning the upper arch, sequential stripping was performed from the mesial and distal surfaces of the lower premolars. Initially, elastic separators were placed between the lower first molars and second premolars. Three days later stripping was done from the distal surfaces of the lower second



Figure 3. Pretreatment lateral cephalometric radiograph.

premolars. Brackets were then bonded to the second premolars, and elastic power chains were placed between molars and second premolars on both sides. Later, elastic separators were placed between the lower premolars and then between the lower first premolars and canines at 3-day intervals. Stripping was done from the mesial surfaces of the lower premolars and from the distal surfaces of the lower first premolars, excluding the lower canines (Fig. 4A). The total amount of stripping was 3.6 mm for both sides.

After the stripping procedure, the lower posterior teeth were aligned segmentally to avoid proclination of the crowded lower incisors (Fig. 4B). When 0.016 stainless steel continuous wire was inserted bypassing the lower incisors, 2 miniscrews (7 mm long, 1.8 mm in diameter, O.S.A.S.; Dewimed, Tuttlingen, Germany) were placed into the interdental spaces between the mandibular first and second molars. To upright the mandibular molars, elastic power chains with 150 g of force were applied from the canine brackets to the necks of the miniscrews (Fig. 4C).

Eight months after the miniscrews were inserted, a dental Class I relationship was obtained (Fig. 4D), and the lower incisor braces were placed (Fig. 4E). We gained 3.9 mm of space bilaterally by uprighting the lower molars.

When the braces were debonded, a lower lingual bonded retainer and an upper Essix retainer were placed. After debonding, the patient was transferred to the periodontology department for a gingival graft for the lower left second premolar. A free gingival graft was placed and recession was eliminated (Fig. 5).

Table 1. Summary of the cephalometric analysis

SKELETAL EVALUATION	Standard	Pretreatment	Post –treatment
Vertical			
∑	396±3	406	406
GoMe-SN (°)	32±7	47	47
Maxillary height (°)	60	64	64
FMA (°)	25	38	38
Sagittal			
SNA (°)	82±2	82	82
SNB (°)	80±2	77	77
ANB (°)	2	5	5
NperA (mm)	- 1	1.6	1.6
Maxillary Depth (°)	90	91.4	91.2
ACB/Corpus	X/X+7	67/80	67/80
DENTAL EVALUATION	Standard	Pretreatment	Post- treatment
I-SN (°)	103	109.9	104.8
IMPA (°)	90	83.2	83.8
Holdaway	1/1	8.9/-1.3	9.2/-0.3
SOFT TISSUE PROFILE	Standard	Pretreatment	Post-treatment
Nasolabial angle (°)	90-110	120.2	118.3
Upper lip-E line (mm)	-4	-7.8	-8.1
Lower lip-E line (mm)	-2	-1.3	-2.1



Figure 4. (A) Application of elastic power chain after stripping. (B) Segmental aligning of the lower posterior teeth. (C) Application of the force from miniscrews to the canines through elastic power chains. (D) Class I canine and molar relationship before alignment of incisors. (E) Lower incisors with braces.

RESULTS

The active treatment period was 22 months. The patient's facial profile was mostly unchanged (Fig. 6). Class I canine and molar relationships, normal tooth alignment with a better midline coincidence, and normal overjet and overbite were achieved (Fig. 6). The maxillary incisors moved backward slightly. The IMPA did not change significantly. The upper and lower lips moved very little. The ANB angle remained stable as seen in the superimposition (Table 1; Fig. 7).

The patient was satisfied with the treatment results achieved. All radiographic and clinical mea-



Figure 5. Free gingival graft.



Figure 6. Posttreatment facial and intraoral photographs.

surements were within acceptable limits (Figs. 8 and 9). After a 1-year retention period, the occlusal relationship was stable, and there was no relapse (Fig. 10).

DISCUSSION

The mandibular posterior dentition was uprighted successfully using intra-arch elastics and supporting miniscrews, which were inserted between the first and second molars bilaterally. No recorded extrusion or forward movement of the maxillary dentition was recorded. Mandibular posterior aligning began with sequential stripping then continued with an elastic power chain applied for anterior decrowding. After uprighting and resolution of crowding, the anterior teeth were aligned with a NiTi wire.

The miniscrew insertion site depends on cortical bone thickness, anatomic structures, and soft-tissue functional movements. Most reports suggest that the optimal site for miniscrew placement for arch distalization is the retromolar area because of the

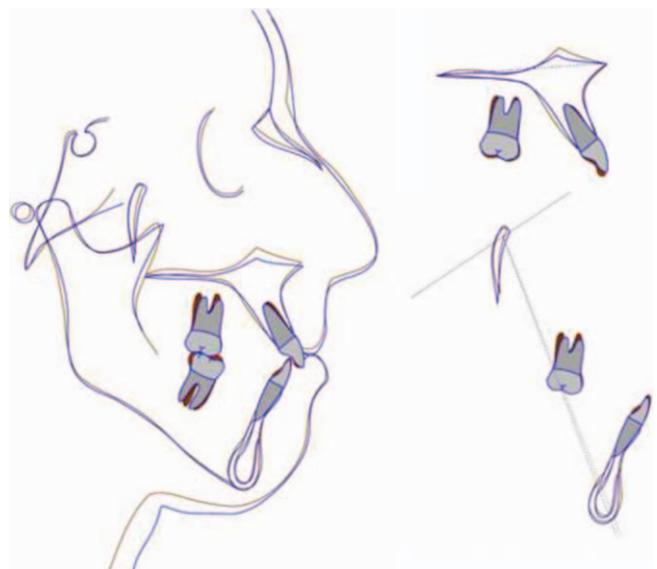


Figure 7. Cephalometric superimposition. Blue indicates pretreatment; brown, posttreatment.



Figure 8. Posttreatment panoramic radiograph.

thick cortical bone layer;^{12,13} however, the soft tissue in the retromolar area is thick and movable, which can cause inflammation, patient discomfort, and difficulty in applying orthodontic appliances.⁴ Alternative sites for placement are the edentulous areas of the alveolar process and posterior alveolar bone.^{13,14} Cortical bone between the roots of the posterior teeth is thick enough to place miniscrews without any tooth damage.¹⁴ Several reports suggest placing miniscrews between the second premolar and the first molar in the mandibular arch instead of between the lower first and second molars because cortical bone thickness between the lower molars is thick enough to provide primary stability;^{13,14} however, tissue irritation can be encountered during mastication.¹⁵ We preferred placing the miniscrews between the lower molars symmetrically, away from the gingival recession area; thus, the elastic chain passed over the lower left premolar brace and oral hygiene was better preserved. We did not encounter any tissue irritation around miniscrew areas, and the miniscrews were stable throughout the active treatment period.

We preferred the segmental technique for the lower arch in order to prevent proclination of the lower incisors. The anterior teeth were bonded secondarily to avoid round tripping, that is, the incisors tipping facially followed by retraction created by distalization of the buccal teeth.

The lower left second premolar was in a crossbite position, and the lower left first molar was in a lingual position after alignment began; because of the reciprocal forces, the lower left first molar moved buccally, the lower left second premolar moved lingually, and the crossbite problem was solved (Figs. 4A through 4C).

Distalizing forces of 150 g were applied from the mandibular miniscrews to the canines by means of



Figure 9. Posttreatment cephalometric radiograph.

elastic power chains in the mandibular arch. The directions of the applied forces were backward and downward. The reason for using 150 g of force was to increase the stability of the miniscrews. The 150 g of force on each side can be roughly calculated at about 30 g per tooth, which is very light compared with ordinary orthodontic forces. Slow movement with light force may be more physiological compared with fast tooth movement.⁴

Control of the vertical position of the posterior teeth is an important factor in achieving a harmonious facial profile in patients with a hyperdivergent appearance. In their recent study, Ye *et al.*¹⁶ placed miniscrews in the retromolar area and found intrusion of molars after distal movement of lower arch; it was suggested that the miniscrews were placed in the retromolar area, which was lower than the clinical crown of the mandibular molars, and the force of vertical direction successfully applied a downward direction on the mandibular molars. For our patient, downward and backward direction of applied force helped control the vertical position of the lower molars.

Numerous factors play roles in the development of gingival recession, and the etiology is often multifactorial.¹⁷ A recent article evaluated patients with gingival recession and found that teeth that are out of their bony housing are more likely to have gingival recession.¹⁸ Our patient had insufficient labiolingual positioning of the mandibular left second premolar crown in the alveolar bone. Our treatment consisted of tipping the crown lingually within the alveolar bone



Figure 10. Retention intraoral photographs at 12 months.

and subsequent referral to a periodontist for a gingival graft.

The timing of the gingival graft surgery to correct a gingival recession is important when both orthodontic treatment and gingival surgery are planned. Recently, Machado *et al.*¹⁹ recommended that a gingival graft should be performed only after ideal tooth positioning in the alveolar bone housing, thus increasing the chances of achieving more favorable results. We preferred graft surgery for our patient after ideal tooth positioning in the alveolar bone housing was achieved.

Double jaw surgery would have been a viable treatment option for correcting the dentofacial deformity. An optimal soft tissue profile would also have been obtained with surgery. Extraction of the lower second bicuspid would have eliminated the gingival recession and periodontal surgery; however, the patient refused the surgery and premolar extraction.

Maxillary Essix and mandibular fixed lingual retainers were used in this patient, and after 12 months of retention the patient did not show any significant relapse (Fig. 10).

CONCLUSION

The miniscrew anchorage successfully aided in the correction of the Class III dental relationship without any lower teeth extraction and side effects on the opposite arch. It can be concluded that this treatment method is a viable alternative to the routine camouflage treatment option with lower teeth extraction.

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