



# Non-Surgical Treatment of a Class III Malocclusion Using Buccal Shelf Miniscrews

## Bukkal Shelf Vida Yardımıyla Sınıf III Maloklüzyonun Cerrahi Olmayan Tedavisi

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**ABSTRACT** Class III malocclusions can be treated with orthopedic, camouflage, or orthognathic surgical methods, depending on the severity of the problem. This case report describes the non-surgical correction of a Class III problem using a buccal shelf miniscrew. In a 15-year-old female patient, bilateral 2x12 mm stainless steel screws were inserted into the mandible to distalize the lower teeth. A power chain from miniscrews was applied to the lower teeth, and the anterior crossbite was corrected 3 months later. In addition, improvement was observed in the soft tissue profile of the patient. After 13 months of treatment, the patient achieved an aesthetic and functional occlusion. The buccal shelf miniscrew-supported mandibular arch distalization treatment applied in “borderline” Class III malocclusion cases offers a successful alternative because it eliminates the side effects seen in other camouflage treatment options.

**Keywords:** Class III malocclusion; orthodontic anchorage procedures; orthodontics; bone screw

**ÖZET** Sınıf III maloklüzyonlar, problemin şiddetine göre ortopedik, kamuflaj veya ortognatik cerrahi yöntemlerle tedavi edilebilir. Bu vaka raporu, bukkal shelf minivida uygulaması ile Sınıf III problemin düzeltimini anlatmaktadır. On beş yaşındaki kadın hastada, alt dişlerin distalizasyonunu sağlamak için alt çenede iki taraflı 2x12 mm paslanmaz çelik vidalar yerleştirildi. Minividalardan alt dişlere powerchain uygulandı ve 3 ay sonra anterior çapraz kapanış düzeltildi. Ayrıca hastanın yumuşak doku profilinde iyileşme izlendi. On üç aylık tedavi sonunda hasta estetik ve fonksiyonel bir oklüzyona kavuştu. “Borderline” Sınıf III maloklüzyon olgularında uygulanan bukkal shelf minivida destekli mandibular ark distalizasyon tedavisi, diğer kamuflaj tedavi seçeneklerinde görülen yan etkileri ortadan kaldırdığı için başarılı bir alternatif sunmaktadır.

**Anahtar Kelimeler:** Sınıf III maloklüzyon; ortodontik ankraj prosedürleri; ortodonti; kemik vidaları

Class III malocclusion is the least common malocclusion, averaging 7.2% among malocclusions.<sup>1</sup> Skeletal Class III malocclusion may occur due to mandibular prognathism, maxillary retrognathia or a combination of both.<sup>2</sup> Skeletal Class III cases, depending on criteria such as patient age, skeletal pattern, the severity of the skeletal problem, can be treated with orthopedic, orthodontic camouflage or orthognathic surgery methods. Orthopedic treatment is limited to pediatric cases.<sup>3</sup> Treatment options in late adolescent and adult patients are orthodontic camouflage or surgery. The treatment op-

tion for patients with severe Class III malocclusion is orthognathic surgery.<sup>3</sup> Mild to moderate skeletal Class III malocclusions where both orthodontic camouflage and orthognathic surgery options can be applied are defined as “borderline cases.” In mild and moderate skeletal Class III cases, camouflage treatment provides better esthetics by hiding skeletal problems as well as obtaining good occlusion and function with the help of tooth compensation.<sup>4</sup> In addition, camouflage treatment is the only option in borderline cases for those who do not want surgery.

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Mandibular tooth extraction, use of intermaxillary elastic or distalization of the lower teeth with skeletal anchor devices are among the camouflage treatment options.<sup>5</sup> In cases where mandibular tooth extraction is preferred, the prominence of the chin may increase due to the retraction of the lower incisors and may worsen the profile. The use of Class III elastics, which requires patient cooperation, may cause excessive proclination of the maxillary teeth and extrusion of the maxillary molars, resulting in negative results in terms of aesthetics and stability in adults with increased vertical dimensions.<sup>6</sup>

Significant distalization can be achieved with miniscrews placed in the retromolar or premolar regions of the mandible.<sup>7,8</sup> In cases where the bone in the buccal shelf area is sufficient, buccal shelf screws may also be preferred because of their distance from the tooth roots.<sup>9</sup> Distalization with the miniscrew causes distal tilting of the posterior teeth and simultaneous distal movement and uprighting of the anterior teeth. Since no force is applied to the maxillary incisors to cause proclination, no side effects occur on these teeth.<sup>8</sup> This case report aims to present orthodontic camouflage treatment using buccal shelf mini screws in a case with Class III malocclusion.

## CASE REPORT

### DIAGNOSIS

A 15-year-old female patient was admitted to our clinic with a protruding lower jaw complaint. Intraoral clinical examination revealed that the patient had a -1 mm overjet and a 3.5 mm Class III molar relationship. A concave profile was present when the extraoral profile was examined (Figure 1). Her medical history was not relevant, and she had no family history.

Radiologic examination revealed that SNA: 82.5°, SNB: 82.7°, and ANB: -0.2° values were found in the pre-treatment cephalometric x-ray. Upper incisor inclination (U1-NA) was 26.2° and 4.5 mm, and mandibular plane-lower incisor inclination (IMPA) was 88.6° and L1-NB was 5.3 mm (Table 1).

### TREATMENT OBJECTIVES

The treatment objectives were to 1) obtain an ideal overjet/overbite, 2) obtain a Class I molar and canine relationship, and 3) improve the facial profile.

### TREATMENT ALTERNATIVES

Orthognathic surgery was the first treatment recommendation for our patient to reduce mandibular pro-



FIGURE 1: Pretreatment intraoral photographs, extraoral photographs, panoramic and cephalometric record.

**TABLE 1:** Pretreatment and posttreatment cephalometric changes.

Cephalometric measurements	T0	T1
SNA (°)	82.5	82.5
SNB (°)	82.7	82.3
ANB (°)	-0.2	0.2
U1-NA (mm)	4.5	6.8
U1-NA (°)	26.2	26.7
L1-NB (mm)	5.3	4.7
L1-NB (°)	26.3	18.6
IMPA (°)	88.6	80.9
SNGoMe (°)	35	35.1
FMA (°)	26.1	26
SN-OP (°)	15.5	12.8
Overjet (mm)	-1.0	2.4
Overbite (mm)	-0.2	1.1
U-Lip/E line (mm)	-5.9	-3.7
L-Lip/E line (mm)	-4.0	-0.7

T0: Pretreatment; T1: Posttreatment.

trusion. The second treatment alternative is the distalization of the mandibular teeth using miniscrews for camouflage treatment.

Since the patient did not accept orthognathic surgery, it was decided to distalize mandibular teeth using miniscrews.

### TREATMENT PROGRESS

After informed consent was obtained, 0.022" MBT (American Orthodontics, Sheboygan, WI) brackets were bonded to maxillary teeth. Leveling and align-

ment were initiated using a 0.014" Ni-Ti archwire. Six weeks later brackets were bonded to the lower jaw, and 2x12-mm OBS-OrthoBoneScrew (Newton A, HsinChu City, Taiwan) stainless steel miniscrews were placed bilaterally on the buccal shelf region. 0.014" Ni-Ti archwire was placed to lower teeth and 100-g of force was applied bilaterally from the miniscrews to the lower 1<sup>st</sup> premolar teeth using a closed elastomeric chain (Energy Chain, RMO) (Figure 2). One month later, 0.016" Ni-Ti archwire was placed on the lower arch, and 150 g of force was applied to the mandibular canine teeth from the miniscrews. Following 3 months of force application, distalization of the mandibular arch was completed. No interproximal reduction was performed in the lower arch. The fixed appliances were removed 13 months after the beginning of treatment, and the patient received a fixed lingual retainer in both arches.

### TREATMENT RESULTS

It was observed that the patient's soft tissue profile improved. Anterior crossbite was corrected, and crowding was resolved. A Class I canine and molar relationship was obtained. Adequate root parallelism was achieved and root resorption did not occur (Figure 3). The skeletal Class I relationship was obtained and SNB value decreased. Mild upper incisor proclination and lower incisor retroclination were observed (Figure 4, Table 1).

**FIGURE 2:** Progress intraoral photographs and panoramic record.



FIGURE 3: Posttreatment intraoral photographs, extraoral photographs, panoramic and cephalometric records.



FIGURE 4: Superimposition of the pretreatment and posttreatment cephalometric records.

## DISCUSSION

Patients with an orthognathic profile in centric relation, nearly Class I buccal segments, and a functional shift are candidates for camouflage treatment.<sup>10</sup> A marginally low to average mandibular plane angle and no open bite were also positive signs. If there is an underlying Class III skeletal discrepancy, treatment of a Class III malocclusion with orthodontic camouflage may result in increased axial inclination

of the maxillary incisors and decreased axial inclination of the mandibular incisors.<sup>11</sup>

The use of Class III elastics leads to proclination of the maxillary incisors, retroclination of the lower incisors, extrusion of the upper molars, posterior rotation of the mandible, and an increase in vertical dimension.<sup>2,3</sup> The miniscrews do not cause extrusion of upper molars and proclination of the upper incisors, and do not require patient compliance.<sup>5</sup> In our case, we applied miniscrew-assisted distalization to prevent side effects. Miniscrew-assisted mandibular arch distalization has become popular.<sup>12</sup> For this purpose, miniscrews can be placed in the retromolar region, ramus region, and interdentally.<sup>6,13</sup> A limiting factor for miniscrews placed in the interradicular region is insufficient distance between the tooth roots.<sup>7</sup> In cases where skeletal anchorage is required, miniplates and extra alveolar screws (eg. buccal shelf) can be used. The advantage of extra alveolar screws is that there is no risk of contact with the roots during the movement of the teeth.<sup>14</sup>

When force is applied in the distal direction with miniscrews placed in the buccal shelf region; lower molar intrusion occur.<sup>13</sup> The distalization force applied from the buccal shelf miniscrews produces counterclockwise rotation of the mandibular arch because the force passes over the center of resistance of

the mandibular dental arch.<sup>5</sup> The results in our case are similar to Yeon et al.; appropriate overbite was achieved by slight extrusion of the lower incisors and counterclockwise rotation of the occlusal plane.<sup>15</sup>

Considering the effects of camouflage treatment on the extraoral profile, the prominence of the chin cannot be corrected with this treatment option. Patients who will receive camouflage treatment should be informed in advance that there will be limitations in profile change. Although the prominence of the chin could not be reduced with camouflage treatment in our study, the improvement in the profile appearance coincides with the patient's expectations.

The buccal shelf miniscrew-supported mandibular arch distalization treatment applied in "borderline" Class III malocclusion cases offers a successful

alternative because it eliminates the side effects seen in other camouflage treatment options.

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### Conflict of Interest

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### Authorship Contributions

*All authors contributed equally while this study preparing.*

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