

Orthodontic Camouflage of Borderline Skeletal Class III Malocclusion- A Report of Two Cases

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ABSTRACT

Camouflage treatment in borderline Class III patients, especially those who refuse a surgical line of treatment, remains a challenge to the orthodontists. Such patients were usually treated using Class III elastics and lower premolar extractions. Mandibular arch distalisation is an alternative option for non extraction Class III camouflage. Temporary Anchorage Devices (TADs) help in achieving effective mandibular molar distalisation and are more accepted by adult patients. This case report discusses the diagnosis and management of two different presentations of borderline skeletal Class III malocclusion treated with miniscrew assisted mandibular arch distalisation. Two adult female patients between 18-20 years of age presented with a skeletal Class III malocclusion, average growth pattern, super Class I molar relationship and straight facial profile. The patients did not agree for a surgical line of treatment. Camouflage treatment by distalisation of mandibular arch using buccal miniscrew implants was done. Inter-radicular miniscrews were placed between mandibular second premolar and first molar to apply distalisation force of 250 gm/side. Lower arch distalisation of 2-3 mm was achieved in an average of 4.6 months. The outcomes were well retained three years post-treatment.

Keywords: Angle's class III malocclusion, Mandibular arch distalisation, Miniscrews, Orthodontics

CASE REPORT

Case 1

A 20-year-old female patient presented with a chief complaint of irregularly arranged teeth. Extraoral examination revealed a straight profile and potentially competent lips. The patient had a forward mandibular path of closure. On Intraoral examination, patient had super Class I molar relationship on the right-side and a Class III molar on the left-side with anterior crossbite. Mild crowding was present in the upper arch [Table/Fig-1]. Cephalometric analysis



[Table/Fig-1]: Pretreatment intraoral, extraoral images and lateral cephalogram of Case 1.

revealed a skeletal Class III pattern, average growth pattern and retroclined mandibular anteriors [Table/Fig-2].

The skeletal Class III relation was due to prognathic mandible and an orthognathic maxilla. She had a forward path of closure and was able to bring the mandible back to an edge-to-edge bite.

The patient did not agree for a surgical line of treatment. Non surgical camouflage treatment by lower arch distalisation with inter-radicular miniscrews was planned. The treatment was started with alignment and levelling of the upper and lower arches starting from 0.014" Nickle Titanium (NiTi) to 0.019×0.025 stainless steel wires. Following alignment and levelling, lower third molars were extracted. Miniscrews (1.6×8 mm screws) were placed between lower second premolar and first molars and a NiTi coil spring generating force of about 250 grams per side was used [Table/Fig-3]. The distalisation was done on 0.019×0.025" stainless steel wires. Crimpable hooks were attached to the archwire and the force was given from the miniscrews to the hooks. Miniscrews were also placed in the inter-radicular region of the upper second premolar and first molar to control the maxillary anterior proclination. The implants became loose on the right-side after two months of placement. The implants were repositioned between first and second molars and the force was continued.

Class I molar relationship was achieved in 4.5 months of distalisation. A total of 3 mm distalisation of the lower arch was achieved. Mild Class III elastics were continued until appliance removal. At the end

Parameters	Case 1			Case 2		
	Pretreatment	Post-treatment	Retention	Pretreatment	Post-treatment	Retention
SNA	84°	84°	84°	89°	90°	89°
SNB	86°	86°	86°	88°	89°	88°
ANB	-2°	-2°	-2°	1°	1°	1°
Wits	-5 mm	-5 mm	-5 mm	-7 mm	-6 mm	-6 mm
FMA	28°	28°	29°	23°	25°	24°
U1-PP	117°	124°	124°	124°	124°	124°
IMPA	84°	83°	84°	84°	84°	86°
TVL-Chin	-1 mm	-2 mm	-1 mm	-2 mm	-3 mm	-2 mm

Overjet	-1 mm	3 mm	3 mm	0 mm	2 mm	1 mm
Overbite	3 mm	2 mm	2 mm	0.5 mm	2 mm	2 mm

[Table/Fig-2]: Skeletal, dental and soft tissue parameters of cases 1 and 2 during pretreatment, post-treatment and retention periods. SNA: Sella-Nasion plane to Point A angle; SNB: Sella-Nasion Plane to point B angle; ANB: Point A-Nasion- Point B angle; FMA: Frankfurt mandibular plane angle; U1-PP: Upper incisor to palatal plane angle; IMPA: Lower incisor mandibular plane angle.



[Table/Fig-3]: Lower arch distalisation with interradicular miniscrews in Case 1.

of treatment, the patient had well aligned dental arches with Class I molar, canine and incisor relationships, ideal overjet, overbite and pleasing soft tissue profile with competent lips and consonant smile arc [Table/Fig-4]. The total duration of treatment was 19 months. The results were stable after three years postretention [Table/Fig-5].



[Table/Fig-4]: Post-treatment intraoral, extraoral images and lateral cephalogram of Case 1.



[Table/Fig-5]: Three year retention intraoral, extraoral images and lateral cephalogram of Case 1.

Case 2

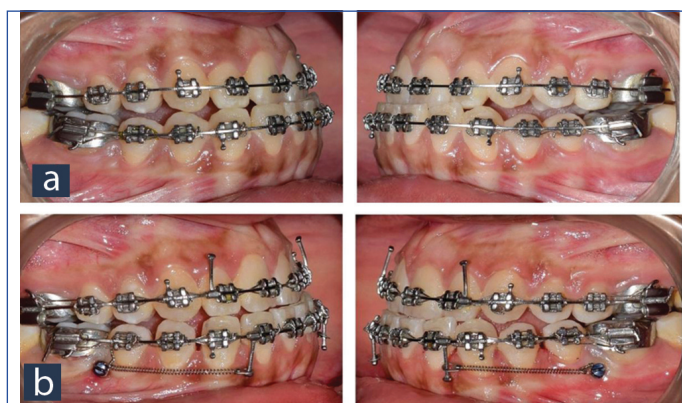
A 19-year-old female patient presented with a chief complaint of irregularly placed upper front teeth. Extraoral examination revealed a straight facial profile with potentially competent lips. Intraorally, a posterior crossbite was present with a super Class I molar relation, mild crowding in maxillary arch and an edge-to-edge incisor relation and a midline mismatch [Table/Fig-6]. The cephalometric analysis showed that patient had a Class III skeletal pattern, with cephalometric analysis showing prognathic maxilla and mandible, average growth pattern, proclined maxillary anterior and retroclined mandibular anterior teeth [Table/Fig-2]. Model analysis revealed 3 mm mandibular overall tooth material excess.

Non surgical treatment plan was finalised as the patient did not want a surgical line of treatment. Treatment was started with initial alignment and levelling with 0.014” NiTi in upper and lower arches



[Table/Fig-6]: Pretreatment intraoral, extraoral images and lateral cephalogram of Case 2.

and finally 0.019x0.025” Stainless Steel arch wire was placed in both the arches. Expanded upper arch wires were used to correct the crossbite. The mandibular third molars were extracted prior to distalisation. The incisors proclined and 1 mm anterior crossbite was present post alignment and levelling. Interproximal reduction was done to correct the mandibular tooth material excess of 3 mm in the posteriors to aid good interdigitation. Buccal miniscrews (1.6x8 mm) were placed in mandibular arch between second premolar and first molar and NiTi closed coil springs were used for mandibular arch distalisation with a force of 250 gm/side [Table/Fig-7]. A total of 2 mm distalisation was achieved in 4.7 months. Postdistalisation mild Class III elastics were used to maintain the correction.



[Table/Fig-7]: a) Mid treatment photographs after completion of alignment and levelling. The lower incisors had proclined and were in anterior crossbite; b) Lower arch distalisation with interradicular miniscrews in Case 2.

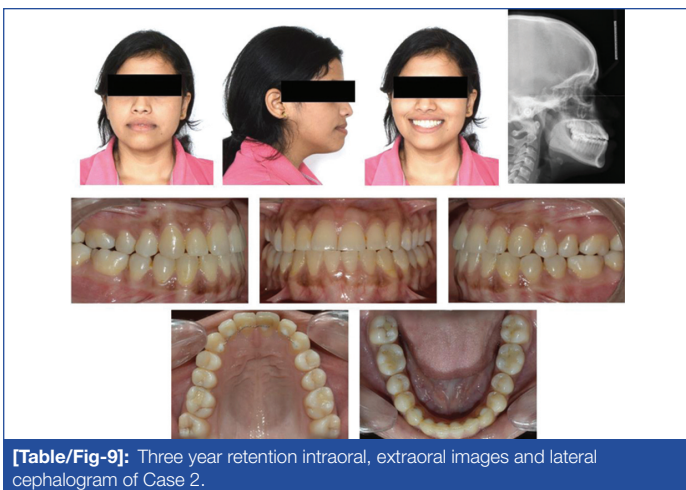
At the end of treatment, well aligned dental arches with super Class I molar, canine and incisor relationships, ideal overjet, overbite and pleasing soft tissue profile with competent lips and consonant smile arc was achieved [Table/Fig-8]. The total duration of treatment was 18 months. The treatment remained relatively stable three years postretention [Table/Fig-9].

DISCUSSION

Skeletal Class III treatment in late adolescents and adults commonly involves either surgical intervention or orthodontic camouflage treatment [1]. The severity of Class III malocclusion, especially in adult patients determines whether the patient is suitable for surgery or orthodontic treatment [2]. In Class III borderline patients, camouflage treatment options like interarch elastics and mandibular premolar extractions were done and they have their own limitations. After the advent of Temporary Anchorage Devices (TADs), the envelopes of discrepancy that can be treated non surgically have



[Table/Fig-8]: Post-treatment intraoral, extraoral images and lateral cephalogram of Case 2.



[Table/Fig-9]: Three year retention intraoral, extraoral images and lateral cephalogram of Case 2.

greatly increased. The dental arches can be distalised efficiently without loss of anchorage [3,4]. Unlike extraoral anchorage or intermaxillary elastics, the use of TADs does not require patient compliance and the treatment mechanics is simple [5].

Many TADs are available to aid mandibular distalisation like miniscrews, miniplates and buccal shelf screws. Among these, buccal miniscrew implants and buccal shelf screws are least invasive as they can be placed without need of any pilot drill or minor surgical procedures like flap exposure. It is also easy to insert, economical and has lesser discomfort [6,7].

Case selection for mandibular distalisation is crucial to obtain optimal results [8]. The cases presented in the report are skeletal Class III borderline cases. Borderline cases pertain to patients having mild to moderate skeletal discrepancies that can be treated either by orthodontic or surgical means [9]. Various literatures have given guidelines for correct case selection. Eslami S et al., showed that wits appraisal greater than- 5.8 mm can be successfully corrected by camouflage and Wits less than- 5.8 mm must be treated by surgery only [10]. Kerr WJ et al., suggested that surgery should be performed when ANB and incisor mandibular plane angles are lower than- 4° and 83°, respectively [11]. Also, Lin's three ring diagnostic tests can be used to predict the prognosis of Class III correction [12]. Ideal characteristics favouring camouflage treatment are acceptable facial profile in centric relation, buccal segments approximately in Class I molar relationship, a forward path of closure, decreased to average mandibular plane angle and an acceptable overbite [13]. Hence, taking into consideration of the cephalometric criteria, type of presentation of the malocclusion, aesthetics and the patient's preference, camouflage treatment was selected for both the discussed cases. Both the patients presented with a good facial profile, buccal segments had mild Class III relation, average mandibular plane angle and had no openbite. Cephalometrically, wits appraisal of the first patient was within the camouflage area

mentioned. The second patient however had slightly increased wits value and both the patients refused a surgical line of treatment.

First case had a negative overjet due to retroclined maxillary incisors and the second case had edge to edge incisor relation. However, after alignment and levelling, the first case was in edge to edge relationship due to upper incisal proclination and the second case was in slight anterior crossbite due to lower incisal proclination.

Retromolar area is considered an optimal site for miniscrew position in mandibular distalisation cases. However, problems with soft tissues can occur around the miniscrews because the soft tissue is thicker and are movable in the retromolar area compared to other areas [6]. Orthodontic miniscrews are commonly placed either between the first and second molars or else between the second premolar and the first molar in the mandibular arch. The thickness of the cortical bone between the first and second molars is adequate to provide primary stability [14,15] but, due to tissue irritation during mastication, this site is generally not advised [16]. Thus, the alveolar bone between the mandibular second premolar and the first molar might be a good choice for minimum discomfort and maximum stability [6]. Buccal inter-radicular miniscrews was chosen over buccal shelf screws in the patients due to economical constrain. It is also easy to place and it can be done with minimal armamentarium [17].

The inter-radicular miniscrews for both the cases were placed between the mandibular permanent first molars and second premolars in both the cases. Force of 250g per side was applied to achieve total arch distalisation. However, in case 1, the implants failed after two months of placement and were shifted into the inter-radicular space between mandibular first and second molars and the same magnitude of force was maintained. Disadvantage of buccal miniscrews is the need to reposition during treatment as the arch is distalised to avoid root contact [18]. The miniscrews were not repositioned in the reported cases as minimal molar tooth movement was required and the implants were placed closer the roots of the first molars to accommodate the distalisation. Miniplates and buccal shelf screws can be used to achieve more amount of distalisation without the need for repositioning. The duration of distalisation in both the cases was within 4-5 months. In the literature, the amount of molar distalisation that can be achieved with the assistance of mini-implants ranges between 2-6 mm [4,19]. The amount of distalisation achieved in both cases were between 2-3mm, which was in agreement with the previous studies [4,19,20].

In a study done by Yeon BM et al., mandibular total arch distalisation with miniscrews and ramal plates were compared [21]. They found that, the buccal miniscrew group had more molar intrusion and counter-clockwise rotation of the occlusal plane than in the ramal plate group and the ramal plate group showed more distalisation of the mandibular dentition with clockwise rotation of the mandible. The study concluded that miniscrews can be selected in patients with more vertical pattern of growth. The two reported cases did not show much change in the occlusal plane and the vertical dimension was relatively well controlled.

To compensate for the skeletal discrepancy, non extraction orthodontic camouflage therapy for treatment of skeletal Class III malocclusion can result in a decreased axial inclination of the mandibular incisors and an increased axial inclination of the maxillary incisors [22]. Mandibular incisor axial inclination of atleast 88 degrees is desirable in Class III patients to maintain good bone support [23]. In both the cases the lower incisor was maintained within 84 degrees. Both cases did not show any relapse and had a stable occlusion after three years of retention.

CONCLUSION(S)

The case report demonstrates two different presentations of borderline skeletal Class III malocclusion. Both the cases were young adult patients who wanted a least invasive and an

economical treatment option. Both the cases were treated with miniscrew assisted mandibular distalisation. A 3 mm distalisation was achieved in case one and 2 mm of distalisation was achieved in case 2. Bilateral Class I molar relationship with ideal over jet, overbite, lip competency and acceptable facial aesthetics were obtained. The treatment is stable 3 years post-treatment. Even after the advent of bone screws, interradicular miniscrews can be used as an economical alternative in selected cases to obtain predictable and stable results.

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