Non-Surgical Clinical Management of Class III Malocclusion in Adult Patient: A Case Report

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Abstract

Prevalence of skeletal class III malocclusion is on average 3% in Caucasians, 5% in adolescents of African American descent, and 14% in Asians. 3.4% of Indians are estimated to have class III malocclusions. A case with class III malocclusion has severe differences in the underlying skeletal jaw bases and craniofacial morphology, as well as symptoms similar to edge-to-edge bite and substantial reverse overjet.

Skeletal class III difference has been a therapeutic issue since, depending on the severity of the discrepancy, the patient’s aesthetic element may also need to be addressed as part of the therapeutic remedy of the condition. The success of treating any type of malocclusion depends critically on treatment planning in orthodontics.

Given the complexity of the skeletal and dental manifestations that class III malocclusions induce, they’re generally challenging to correct. Although the case prefers a more conservative treatment, orthognathic surgery in confluence with fixed orthodontics is common choice for interdisciplinary care of severe skeletal Class III malocclusion. Thus, if function, stability, and aesthetics are each considered, camouflage treatment is the favored option.

This case report details the Class III management using buccal shelf miniscrew, bilaterally using 2x12 mm stainless steel screws fitted into the mandible to distalize the lower teeth. A power chain from miniscrews was applied to the lower teeth, and the crossbite was corrected later. In addition, enhancement was observed in the soft tissue profile of the case. After 16 months of treatment, the case achieved an aesthetic and functional occlusion. A non-surgical approach of a 23 years old male with skeletal and dental class III malocclusion, concave profile, anterior crossbite, and a negative overjet of 3 mm while retaining the patient’s profile was achieved. At the conclusion of the procedure, positive functional and aesthetic issues were attained.

Categories: Dentistry, Medical Education, Quality Improvement

Keywords: adult orthodontics, non-surgical management, malocclusion of teeth, cross bite, class iii malocclusion

Introduction

An effective orthodontist makes use of the variety of treatment approaches like as the myofunctional, orthopedic, orthodontic, or surgical remedy to the fullest rested on the growth capability of the case and the proper judgment of the malocclusion, both dentally and skeletally. Skeletal malocclusions either as a result of atypical maxilla, mandible, or both is important establishment to treat than the dental counterpart.

Skeletal class III malocclusion describes anomaly in size and/or position of the jaws in sagittal plane. The malocclusion occurs due to retrusive or small-sized mandible and prognathic or large-sized mandible or combination of either of the two, influencing in a further aged look of the existent. These cases constantly present concave or straight facial profile depending on the severity of the malocclusion, prominent chin, and dentally with an anterior crossbite.

The anterior crossbite in the earlier phases of development plays an important part in impeding the growth of the maxilla [1]. Skeletal class III malocclusion is one of the most delicate problems for an orthodontist in his practice. When juvenile cases and adolescents are diagnosed beforehand with developing class III tendency, they can be treated easily with growth modification appliances like functional regulator-III, reverse twin block, chin-cup and headgear [2]. Cases whose growth eventuality is completed must be masked by orthodontic tooth movement with fixed appliances or treated surgically. The camouflage system to treat skeletal malocclusion was developed as an extraction treatment and introduced into orthodontics in the 1930s and 1940s [2].

Camouflage treatment is the orthodontic tooth movement relative to their supporting basal bone to compensate for any jaw discrepancy [3]. The camouflage approach to treat class III malocclusion generally
involves proclination of the maxillary incisors and retroclination of the mandibular incisors to correct rear/ negative overjet. It’s always necessary for the orthodontist to deliver the right appliance to the case at the right time. However, also it will affect in a more intricate and multifaceted malocclusion which can only be treated through surgical approach. If the growing phase of the child is not employed to correct the developing malocclusion. The skeletal class III malocclusion with defect in the maxilla can be corrected to a comparatively less degree than the mandibular defect owing to the sagittal aspect of envelope of discrepancy.

Also, it was set up that skeletal class III malocclusion worsens further with age and earlier correction becomes vitally important [4]. In mild and moderate skeletal Class III cases, camouflage treatment provides better esthetics by hiding skeletal problems as well as attaining good occlusion and function with the help of tooth compensation [4].

In addition, camouflage treatment is the only option in borderline cases for those who don’t want surgery. Class III camouflage treatment with lines can ameliorate the ANB angle and drop facial protuberance with little or no change in the vertical dimension of occlusion [5-8]. With careful selection and opinion, of adult Class III malocclusion cases can be effectively treated with orthodontic remedy alone [9].

Mandibular tooth extraction, use of intermaxillary elastic or distalization of the lower teeth with skeletal anchor devices are among the camouflage treatment options [10]. 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, performing in negative results in terms of aesthetics and stability in grown-ups with increased vertical dimensions [11].

Significant distalization can be achieved with miniscrews placed in the retromolar or premolar regions of the mandible [12,13]. 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 [14]. 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 do on these teeth [13].

This case report aims to present orthodontic camouflage treatment using buccal shelf mini screws in a case with Class III malocclusion. This case report documents the clinical operation of an adult skeletal and dental Class III malocclusion complicated with posterior crossbite, rear overjet and swerved midlines. Conservative treatment redounded in a respectable camouflage result.

**Case Presentation**

A 23- yr old manly presented for orthodontic discussion with following principal complaints: Protruded chin, spaces between upper frontal teeth along with poor smile esthetic appearance. There was no contributing medical or dental history.

On clinical examination the case was mesoproscopic with concave profile, negative lip-step, gross symmetric face, well-proportioned face with competent lips. (Figure 1)

Soft tissue examination showed symmetrical soft tissue smile with a flattened smile arc. No gingival tissues were exposed during smiling (low lip line), and no canting of the occlusal plane or buccal corridor was shown upon smiling.

Intra-oral examination revealed all the respects of teeth present, Angle Class III molar relationship bilaterally, mild spacing in maxillary arch, the lower arch showed a very mild degree of crowding, crossbite with respect to anterior teeth, distance with maxillary anterior teeth associated with lower dental midline shift toward left side by 4 mm. (Figure 2)

Cephalometric examination and analysis showed the skeletal class III tendency, with retrognathic maxilla and prognathic mandible, average to horizontal mandibular plane angle with proclined and protruded maxillary incisors and upright mandibular incisors.
### TABLE 1: Cephalometric Analysis

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean</th>
<th>Pre-treatment values</th>
<th>Post-Treatment values</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA (*)</td>
<td>82±2°</td>
<td>73°</td>
<td>77°</td>
</tr>
<tr>
<td>SNB (*)</td>
<td>80±2°</td>
<td>84°</td>
<td>82°</td>
</tr>
<tr>
<td>ANB (*)</td>
<td>2±2°</td>
<td>-11°</td>
<td>5°</td>
</tr>
<tr>
<td>GoGn-SN (*)</td>
<td>32°</td>
<td>30°</td>
<td>27°</td>
</tr>
<tr>
<td>U1 to NA (*, mm)</td>
<td>22°, 4mm</td>
<td>53°,15mm</td>
<td>27°,10mm</td>
</tr>
<tr>
<td>L1 to NB (*,mm)</td>
<td>25°, 4mm</td>
<td>25°,5mm</td>
<td>11°,0mm</td>
</tr>
<tr>
<td>N perp A</td>
<td>1±2&quot;mm</td>
<td>-5mm</td>
<td>-5mm</td>
</tr>
<tr>
<td>N perp Pog</td>
<td>2±2mm</td>
<td>+8.5mm</td>
<td>+3mm</td>
</tr>
<tr>
<td>Nasolabial angle</td>
<td>90°- 110°</td>
<td>121°</td>
<td>122°</td>
</tr>
<tr>
<td>IMPA (*)</td>
<td>90±5°</td>
<td>94°</td>
<td>78°</td>
</tr>
<tr>
<td>Saddle angle</td>
<td>125±5°</td>
<td>125°</td>
<td>128°</td>
</tr>
<tr>
<td>Articular angle</td>
<td>143±3°</td>
<td>140°</td>
<td>144°</td>
</tr>
<tr>
<td>Gonial angle</td>
<td>128±7°</td>
<td>120°</td>
<td>117°</td>
</tr>
<tr>
<td>Sum of posterior angle</td>
<td>396°</td>
<td>385°</td>
<td>389°</td>
</tr>
<tr>
<td>Skeletal convexity at Point A</td>
<td>0±2°</td>
<td>-18mm</td>
<td>-17mm</td>
</tr>
<tr>
<td>Harmony angle</td>
<td>7°-15°</td>
<td>3°</td>
<td>5°</td>
</tr>
<tr>
<td>Soft tissue chin</td>
<td>10-12mm</td>
<td>10mm</td>
<td>10mm</td>
</tr>
</tbody>
</table>

Panoramic radiograph showed all compliments of teeth including all third molars. No abnormal findings were noted.
FIGURE 1
Pre-treatment Extra Oral Photographs
FIGURE 2
Pre-treatment Intra-oral Photographs
FIGURE 3
Pre-treatment Radiographs

TREATMENT OBJECTIVES

- To correct the prognathic mandible.
- To correct the anterior crossbite
- To correct the spacing in relation to the upper anteriors and mild crowding in relation to the lower anteriors
- To achieve ideal overjet, overbite, and obtain class I incisor relation
- To correct the protrusive lower lip
- To maintain the straight facial profile of the patient
- To achieve pleasing esthetics smile.
TREATMENT ALTERNATIVES

Orthognathic surgery was the first treatment recommendation for our patient to mandibular protrusion. The second treatment alternative was the distalization of the mandibular teeth using buccalshelf screws for camouflage treatment. Since the patient did not accept orthognathic surgery, it was decided to distalize mandibular teeth using miniscrews.

TREATMENT PLAN

Fixed mechanotherapy using MBT 0.022 inch slot was planned. (Bonding from 7-7)

The anterior crossbite was planned to be corrected by opening the bite, by means of proclining the upper anteriors and retroclination of lower anteriors by means of placement of continuous elastomeric chain, using the buccal shelf crews. After the desired amount of overjet was achieved by leveling and alignment of the upper teeth, following which the settling of posterior occlusion, leveling, and alignment of the lower teeth would be done. The spacing would later be closed in the upper arches along with possible midline correction.

RETENTION PLAN

The retention protocol was fixed retainers from 3-3 to Lingual bonded retainers in the upper and lower arches in order to avoid any relapse, allow for teeth settling and maintain the arch.

TREATMENT PROGRESS

Phase I: Initial alignment and levelling of upper and lower teeth was achieved using 0.016”, 0.018”, 16x22” nickel titanium (NiTi) wires and later on with 17x25 NiTi wires and subsequent wires, 17x25”SS and 19x25”SS wires. The lower third molars were planned for extraction.

Phase II: The lower arch was consolidated and, 2x12-mm Buccal Shelf screw (Bioray, Orthosystems, India) stainless steel were placed bilaterally on the buccal shelf region.

150-g of force was applied enmass from the miniscrews to the lower teeth using a closed elastomeric chain (Orthosystems, India). 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 16 months after the beginning of treatment. (Figure 4,5)

Phase III: Final finishing and detailing was done using 0.016 Wilcock SS archwire and with M-shaped settling elastics.
FIGURE 4
Extra Oral Mid Treatment Photographs

FIGURE 4: Mid Treatment Extra Oral Photographs
TREATMENT RESULTS

It was observed that the patient’s soft tissue profile improved. Anterior crossbite was corrected, and negative overjet was resolved. A Class I canine and molar relationship was obtained. Adequate root parallelism was achieved and root resorption did not occur. Cephalometric corrections are recorded in Table 1. After finishing and detailing, class I canine relationship was achieved on both the sides. The patient’s chief complaint of prominent chin was successfully relieved and normal overjet and overbite and a stable occlusion with good intercuspation was achieved. The patient’s profile was dramatically improved from concave to straight profile with very pleasing aesthetics. (Figure 6,7,8)

Discussion

Cases with an orthognathic profile in centric relation, nearly Class I buccal segments, and a functional shift are candidates for camouflage treatment [15]. A hardly low to average mandibular plane angle and no open bite are also positivesigns. However, treatment of a Class III malocclusion with orthodontic camouflage may affect in increased axial inclination of the maxillary incisors and decreased axial inclination of the mandibular incisors, if there’s an underlying Class III skeletal discrepancy [6].

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 [16,17].
The miniscrews don’t cause extrusion of upper molars and proclination of the upper incisors, and don’t demand patient compliance(10). In our case, we applied miniscrew- supported distalization to prevent side effects. Miniscrew- supported mandibular arch distalization has come popular [18]. For this purpose, buccal shelf screws can be placed in the retromolar region, ramus region, and interdentally [11,19].

A limiting factor for buccal shelf crews placed in the interradicular region is inadequate distance between the tooth roots [12]. In our study we’ve placed the screws distal to alternate molars. In cases where skeletal anchorage is needed, miniplates and extra alveolar screws (e.g. buccal shelf) can be used. The advantage of extra alveolar screws is that there’s no threat of contact with the roots during the movement of the teeth [20].

When force is applied in the distal direction with screws placed in the buccal shelf region; lower molar intrusion occur (19). 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 [10].

Considering the effects of camouflage treatment on the extraoral profile, the prominence of the chin cannot be corrected with this treatment option. Cases who’ll admit camouflage treatment should be informed in advance that there will be limitations in profile change.

The buccal shelf miniscrew- supported mandibular arch distalization treatment applied in Class III malocclusion cases offers a successful preference because it eliminates the side effects seen in other camouflage treatment options.
FIGURE 6
Post Treatment Extra Oral Records

FIGURE 6: Post Treatment Extra Oral Photographs
FIGURE 7
Post Treatment Intra Oral Records

FIGURE 7: Post Treatment Intra Oral Photographs
Conclusions
The purpose of this report to describe technique for enmass lower arch distalization with buccal shelf screws. These screws are made of stainless steel and diameter is of 2mm and length 12mm placed in buccal shelf area.

We achieved full arch distalization in span of 3 months into class 1 molar and class 1 canine relationship, with normal overjet and overbite.

Additional Information
Disclosures
Human subjects: Consent was obtained or waived by all participants in this study. Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.
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