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RESEARCH ARTICLE

NON-SURGICAL CORRECTION OF SKELETAL CLASS III WITH MANDIBULAR ARCH DISTALIZATION USING BUCCAL SHELF MINI-IMPLANTS: A CASE REPORT

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ABSTRACT

Orthopaedic treatment options for Class III malocclusion include face mask, chin cup therapy, premolar extraction, and orthognathic surgery, depending on the severity of the skeletal and dental manifestations. Accurate treatment planning is essential for treating skeletal Class III malocclusion, which can cause both aesthetic and functional issues depending on the severity of the disparity. Here, we report a case of Angle's Class III malocclusion that was successfully treated by distalizing the lower arch. After extracting the lower third teeth, use 2 buccal shelf screws (2x12mm) with elastic chains. Furthermore, the case's soft tissue profile showed improvement. Following 18 months of therapy, the case achieved both cosmetic and functional occlusion. A 19-year-old female with skeletal and dental Class III malocclusion, concave profile, anterior crossbite, and negative overjet of 3 mm had non-surgical treatment to maintain her profile. At the end of the process, there was a noticeable improvement in both the functional and aesthetic outcomes.

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INTRODUCTION

When all of the lower teeth occlude mesial to normal, with the cusp of the upper second premolar in the sulcus between the mesio-buccal and middle buccal cusps of the lower first molar, this is known as a Class III malocclusion. (1) Class III malocclusion has low prevalence and incidence (2). The incidence of this malocclusion varies across ethnic groups (3). The prevalence of Class III malocclusions varies with race. Whites have a 1% to 4% incidence, while blacks have 5% to 8% and Asians have 4% to 14%. (1-3) The aetiology of this condition varies from person to person, with factors such as heredity (e.g., Hapsburg chin), environmental influences (e.g., anterior functional shifts of the mandible or mouth breathing, which can stimulate mandibular growth), and pathologies (e.g., pituitary tumours causing acromegaly). Orthognathic surgery is recommended for severe malocclusion, although orthodontic camouflage can be used in mild to moderate cases. (4-5) Various procedures have been used for camouflage, including single lower incisor extraction, high pull headgear, molar protraction, and class III elastics. (4-6) There are two techniques to camouflage therapy. The first involves extracting teeth, either the lower premolars or single lower incisor. (7-9) In the second strategy, bone screws can be used to distalize mandibular molars in various sites such as the buccal shelf, ramus, or retromolar portion of the jaw. Buccal shelf implants can effectively distalize the entire mandible, avoiding the need for a Bilateral Sagittal Split Osteotomy in situations of mild to moderate Class III discrepancy. In this case report, buccal

shelf implants were used to treat class III malocclusion and improve the patient's facial profile.

CASE REPORT

Diagnosis: A 19-year-old female patient came to the clinic with a complaint of forwardly placed lower front teeth. The patient's medical history was unremarkable, and there was no family history of similar dental conditions. Pre-treatment extra-oral pictures revealed a concave face profile and Class III skeletal pattern (Figures 1). Frontal photographic study revealed no facial asymmetry. The patient showed minor mandibular prognathism and an anterior divergence of the face. The dental examination indicated a half cusp Class III molar relation bilaterally with anterior crossbite and negative overjet of 3mm. Also patient had grossly decayed upper right first molar (tooth 16) (Figure 2). The midline of the lower teeth was moved to the left. A Skeletal Class III relationship with an increased mandibular plane angle and a slightly retrognathic maxilla was shown by the cephalometric examination. In comparison to the posterior facial height, the anterior facial height was increased. The maxillary incisors are proclined interincisal relationship was reduced. The patient was diagnosed with a skeletal Class III malocclusion with mild maxillary deficiency and a dental Class III relationship (Figure 3)

Problem list

- Prognathic mandible

- Retrognathic maxilla
- Concave profile with skeletal class III pattern
- Prominent chin
- Angle’s class III molar and canine relationship
- Anterior crossbite
- Proclined upper and retroclined lower incisors
- 8.Grossly decayed tooth 16



Figure 1. Pre-treatment Extra-oral photographs



Figure 2. Pre-treatment Intra-oral Photographs

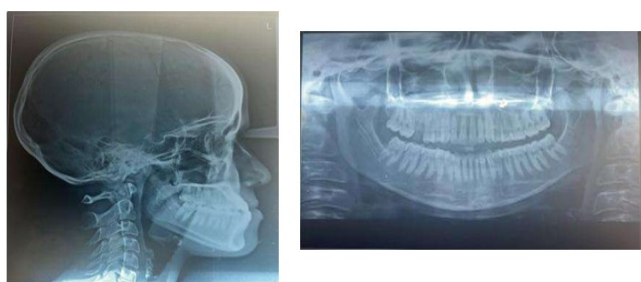


Figure 3. Pre-treatment lateral cephalogram and panoramic radiograph

Treatment Objectives: The goals of the treatment were to distalize all mandibular teeth, enhance the interincisal angle to have a normal overjet and overbite, and achieve Class I canine and molar intercusp relationships based on the patient's preferences and the original records. Initially, a conventional fixed orthodontic mechanotherapy was recommended, followed by buccal shelf implants to distalize the entire mandible.

Treatment plan: Buccal shelf bone screws were used to aid plan the en-masse mandibular distalization, which was intended to provide a straight facial profile, minimal patient trauma, optimal occlusion, and facial aesthetics. Using pre-treatment radiography records, which included orthopantomograms (OPG) and lateral cephalograms, cephalometric analysis was carried out. Radiographs showed a Class III skeletal pattern, including minor maxillary deficit, mandibular prognathism, increased vertical chin height, and upper anterior proclination with lower anterior retroclination. After weighing surgical and non-surgical options, it was decided to perform En-masse mandibular distalization using Buccal shelf bone screws to correct mandibular prognathism

and reverse overjet, resulting in improved facial aesthetics and functional occlusion. The patient had 3rd molars extracted at the commencement of treatment. The upper right first molar with arrested caries was not bonded and its extraction was postponed until after completion of orthodontic treatment, to replace it with prosthetic implant. Fixed mechanotherapy using MBT 0.022 inch slot was planned (Bonding from 7-7). The retention protocol was fixed lingual bonded retainers from 3-3 in the upper and lower arches along with Hawley’s retainer in order to avoid any relapse, allow for teeth settling, maintain the arch.

Treatment Progress

Phase I: The upper and lower teeth were aligned and levelled using 0.014", 0.016" nickel titanium (NiTi) wires, followed by .017" x .025" and .019" x .025" NiTi wires and .019" x .025" stainless steel (SS) wires. The lower third molars were extracted.

Phase II: The lower arch was consolidated. After 3 months, 2x12-mm stainless steel screws (Favanchor, India) were put bilaterally on the buccal shelf. A closed elastomeric chain was used to apply 150-g force bilaterally from the miniscrews to the lower teeth. After 4 months of force application, the mandibular arch was fully distalized. There was no interproximal reduction performed in the lower arch. The fixed appliances were removed after 20 months of treatment.

Phase III: Finishing and detailing were done using .019" x .025" stainless steel (SS) wires with settling elastics. Diagonal elastics was used to correct the midline. (Figure 4 and 5)



Figure 4. Mid-treatment photographs with Buccal shelf mini-implants bilaterally for lower arch distalization

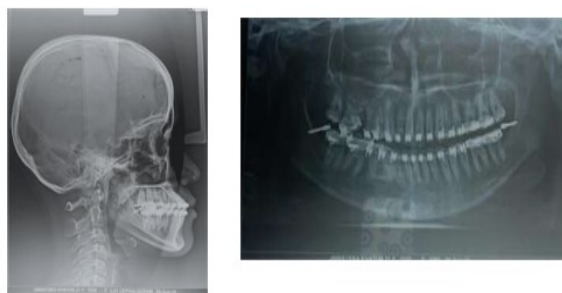


Figure 5. Settling phase of the treatment

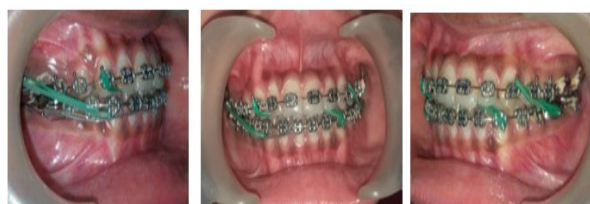


Figure 6. Post-lower arch distalisation lateral cephalogram and panoramic radiograph

TREATMENT RESULTS

The patient's soft tissue profile improved. Incisor relation was rectified and Angle's Class I canine and Class I molar relationships were achieved. Root parallelism was adequate, with no root resorption seen. The patient's anterior crossbite was successfully treated, resulting in normal overjet and overbite, as well as a stable occlusion with acceptable intercuspation.



Figure 7. Post-treatment intra-oral photographs



Figure 8. Post-treatment extra-oral photographs

DISCUSSION

This case study illustrates the distalization of the complete mandibular dentition using intra-arch elastic chain traction and buccal shelf screws. After treatment, Angle's class I occlusion with a 3mm overjet and a 2.5mm overbite replaced half cusp class III molar and the canine relationship. An effective way to treat a borderline class III dentoalveolar malocclusion is with this approach. Rivera et al reported that patients had orthognathic surgery to resolve aesthetic and functional issues. However, the benefits of orthognathic surgery are not always realized (10). Relapse of surgical alterations can lead to unsatisfactory treatment outcomes. The relapse rate after a mandibular setback is among the highest recorded for a surgical operation. (11-13). The literature reveals that a variety of methods, including mini-plates and dental implants, have been employed for segmental mandibular molar distalization.(14) However, installation of both implants and micro plates necessitates intricate surgery. (15) Miniscrews offer the same resistance against orthodontic load with the following benefits: less discomfort, reduced anatomical limits due to smaller possible sizes, reduced prices, easier installation, and no need for osseointegration.

The literature reports on two basic techniques for applying distalizing forces: en masse distalization and tooth-by-tooth distalization. The latter can be accomplished by directly exerting a reactive force to the anterior hooks, canines, or first premolars.(16) In this case, we have performed en-masse (full arch) distalization as part of our treatment. Few investigations have demonstrated that using buccal shelf screws can lead to increased inter-canine width, affecting treatment stability. Depending on how the force vector and the centre of resistance

of the whole arch interact, they may also result in rotation of the occlusal plane, increasing the vertical dimension. (17) Buccal shelf screws did not cause any bad consequences in our case. To avoid first and second-order side effects, rigid wire like .019" x .025" stainless steel should be utilised for distalisation. Buccal shelf implants may be a suitable alternative for lower complete arch distalization due to their ability to tolerate heavy loads. Compared to retromolar implants, there is no waiting period for bone fill in the third molar location, which is favourable.

CONCLUSION

This paper describes a technique for distalizing the lower arch using buccal shelf screws. These stainless-steel screws, measuring 2mm in diameter and 12mm in length, are put in the buccal shelf area. After 6-7 months, we successfully achieved full arch distalization into Class I molar and Class I canine relationships, with normal overjet and overbite.

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