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Nonsurgical Treatment Approach of Class III Malocclusion: Case Report

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Abstracts

A 32 -year-old man presented for an orthodontic consultation reporting dissatisfaction with the appearance of his maxillary anterior dentition. On examination, the maxillary incisors and canines were found to be situated palatally, behind the mandibular incisors. The diagnosis of a skeletal and dental Class III malocclusion was made, with a unilateral cross bite on the right side extending from the upper lateral incisor to the permanent first molar, and a midline deviation to the right. No mandibular shift was detected along with the absence of the crowding in upper arch. Spacing was present in the lower arch distal to the left permanent canine. The treatment outcome validates the effectiveness of treating an adult patient with a Class III malocclusion by non-surgical means utilizing an appliance. This is a simple, clinically effective and convenient approach that resulted in enhanced esthetics and function, with the added advantage of boosting the patient's self-esteem.

Keywords: Class III malocclusion; Anterior cross bite; Non-surgical intervention

Introduction

According to Angle's classification, Class III malocclusion is defined as the lower first molar is mesially positioned relative to the upper first molar [1,2]. The etiology of Class III malocclusion includes heredity (Hapsburg Royal Family) and environmental factors including anterior functional shifts of the mandible or mouth breathing in addition to pathologies (pituitary tumors responsible for acromegaly) [3,4]. Ellis and McNamara conducted study to identify the skeletal and dental relationships of adults who have class III malocclusion. Lateral cephalograms of 302 adult patients who had a class III molar and cuspid relationship were traced. The following five sets of measures were analyzed: The Position of the maxilla. Position of the mandible; Maxillary alveolus; Mandibular alveolus and the vertical development of the face. They concluded "Although there was considerable variation among patients, the most common combination of variables was a retrusive maxilla, protrusive maxillary incisors, retrusive mandibular incisors, a protrusive mandible, and a long lower facial height". Further, Guyer et al. [5] reported that 57% of patients in their study sample presenting with a normal or prognathic mandible also had deficient maxilla [6]. Furthermore, Class III malocclusion comprises several skeletal and dental components that may differ from the concept of normality. It can be characterized by a mandibular skeletal protrusion, a maxillary skeletal retrusion, a combination of both, or the absence of an anteroposterior skeletal discrepancy [7]. Daniel et al. conducted a systematic review and meta-analysis; investigating the prevalence of Angle Class III malocclusion. They reported that these results suggest that the prevalence of Angle class III malocclusion varies greatly within different races and geographic regions indicating that the Chinese and Malaysian populations have a higher prevalence of Angle class III malocclusion compared to other racial groups, while Indian populations have a lower prevalence than all other racial groups examined [8].

Other studies reported that the prevalence among White people was 1% to 4%; among Black people was 5% to 8% and in Asians it is ranged from 4% to 14%.The developing skeletal Class III malocclusion is one of the most challenging problems confronting the orthodontist [9-11]. The choice of treatment options of Class III malocclusion depends on, the age of the patient, the pattern of malocclusion and the severity of malocclusion. The following means are the possible treatment choices. Growth modification in young patients with remaining growth potential using of appliances as chin cup, protraction headgear (Facemask), functional appliances, Dental camouflage and Orthognathic surgery – once growth has stopped. Class III malocclusion when associated with skeletal features, it becomes more difficult to treat. Further, severe skeletal discrepancies in adults required orthodontic treatment as well as orthognathic surgery.

Furthermore, mild-to-moderate discrepancies can sometimes be compensated with orthodontic treatment alone without surgical intervention [12-14]. Nikia et al. stated that the strategy to camouflage a Class III malocclusion usually involves proclination of the maxillary incisors and ret-reclination of the mandibular incisors to improve the dental occlusion. However, this might not correct the underlying skeletal problem or facial profile. They concluded "Significant dental and soft-tissue changes can be expected in young Class III patients treated with camouflage orthodontic tooth movement. A wide range of skeletal dysplasia can be camouflaged with tooth movement without and proper diagnosis and realistic treatment objectives are necessary to prevent undesirable sequelae" [15]. However, non-surgical correction is challenging and difficult to achieve in adult patients after the completion of growth and development. However, most of the patient did not like surgical intervention. The present case report aimed to introduce a nonsurgical treatment approach for an adult patient presenting with Class III malocclusion combined with unilateral anterior and posterior crossbite in the upper right segment from lateral incisor to the first permanent molar.

Case Report

A 32 -year-old man presented for an orthodontic opinion stating that he was dissatisfied with the appearance of his maxillary anterior teeth which were aligned palatal to the mandibular incisors. Written consent terms were obtained from the patient before commencing treatment and publishing the article. An extra oral examination revealed the absence of readily detectable facial asymmetry. The mandible was protruded and the profile concave. When smiling, more than half of the height of the clinical crowns of the maxillary incisor teeth were displayed; the gingiva was not apparent (Figure 1). Intraorally, the dentition was complete, including third molars. There existed a Class III dental relationship on the left side, and Class I on the right side. The maxillary teeth from the right lateral incisor as far back as the right first permanent molar were in crossbite. Dental and facial midlines were coincident, but the mandible deviated to the right by 3mm. Both overjet and overbite were negative on the right side. There existed mild mandibular spacing distal to the left canine (Figure 2). Pretreatment radiographs verified the presence of all permanent teeth. There was no indication of bone or dental pathology, or defective restorations. A skeletal Class III relationship was evident; the maxillary incisors were proclined and the mandibular incisors retroclined, with minimal overjet and overbite. The mandible was horizontal with an ante-gonial notch. (Figure 3a & 3b) a- pretreatment cephalograph. b - OPG pretreatment radiograph). The objectives to treatment were to correct the cross bite and achieve a Class I canine relationship bilaterally as well as correcting the overjet and overbite. In addition, the aim was to correct the mandibular deviation and shift and align both arches.

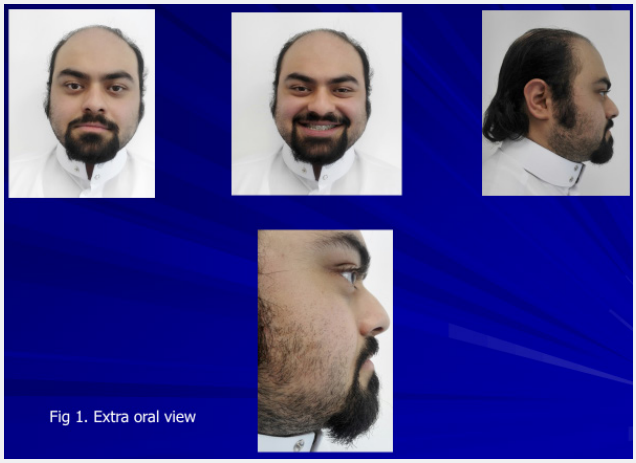

Figure 1: Extra oral view.

Figure 2: Intra oral view.

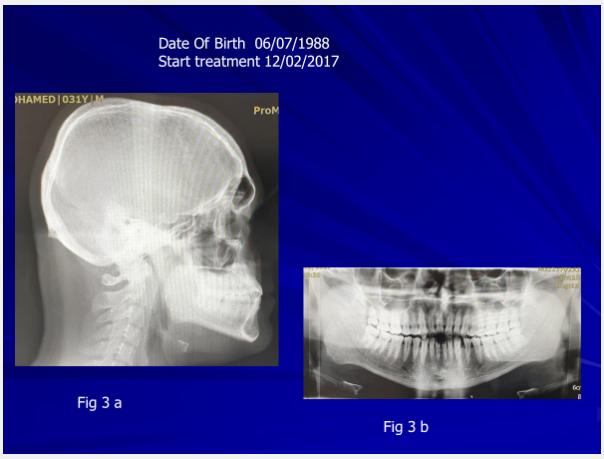

Figure 3: Start Treatment.

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Treatment Progress

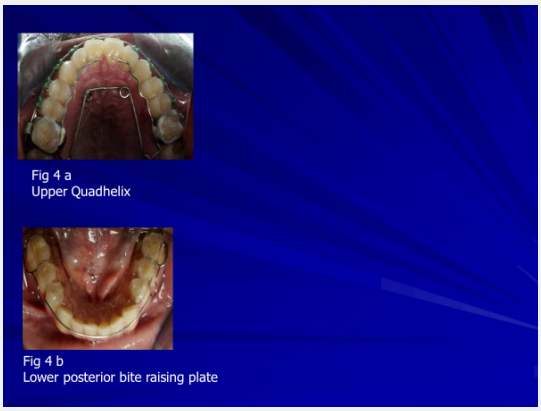

Figure 4: (a) Upper Quadhelix (b) Lower poster bite raising plate.

Figure 5: Austeralian 0.018 arch wire with step out distal to 12 to 15, criss/cross elastic 16 to 46-45.

Treatment commenced with the cementation of a quad helix appliance to correct the cross bite in the maxillary right lateral incisor, canine, premolar and first molar teeth. The patient was also instructed to wear a lower posterior bite plate (Figure 4a & 4b). Upper arch with Quad helix to correct cross bite & b- lower posterior bite raising plate to disengage the bite). Subsequently, edgewise brackets (MBT Slot 0.022) were placed on all maxillary teeth and straight 0.018 Australian arch wire step out from the distal of 12 to the mesial of 16. In addition to criss /cross elastics to correct the cross bite (Figure 5). Once cross bite correction was achieved, 0.017x0.025 nitinol contraction arch wire followed by 0.018x0.025 stainless steel wire with contraction arch was used to close the remaining spaces. A0.019x0.025 nitinol arch wire was used to finish the case (Figure 6). The lower arch was bonded. The arch sequence started with 0.016 nitinol arch wire, and continued with 0.016 stainless steel, 0.017x 0.025 nitinol and 0.018x0.025 stainless steel contraction arches to close the remaining spaces and correct the midline deviation. The finishing arch was 0.019x0.025 nitinol (Figures 7-9). When all treatment objectives had been achieved both arches were de-bonded. Upper and lower vacuum retainers were given; the patient was instructed to wear these continuously during the first year (except when eating or drinking hot drinks), and at night only throughout the second year (Figure 10).

Figure 6: Uper arch: Contraction arch to close remaining spaces.
Lower arch: 0.018ss+ open coil and power chain to correct mid-line from right to left.

Figure 7: Contraction arch in upper and lower jaw to close remainig spaces.

Figure 8: Stages of treatment steps.

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Figure 9: 0.019x 0.025 nitinol for final leveling and alignment in upper and lower arch.

Figure 10: Post treatment extra oral and intra oral view + vacuum form retainers in upper and lower arch.

Treatment Results

Table 1: Pre-treatment and post-treatment cephalometric values.

Variable	Pre-treatment	Post-treatment
SNA	87	87
SNB	86.5	86
ANB	0.5	1
SNPog	87	86
N-S-Ba	138	137
SN-NL	5	6
SN-ML	25	25
NL-ML	20	19
Ar-tgo-Me	124	123
Facial index	73%	73%
Interincisal Angle	126 *	138 *
UI-NA degree	30 *	23 *
UI-NA mm	5 mm	3 mm
LI-NB degree	20 *	18 *
LI-NB mm	3 mm	2 mm
Nasolabial Angle	127	129
UL-EL	5 mm	6 mm
LL-EL	3 mm	4 mm

Table 1 showed pre and post treatment cephalometric recordings which verify that a significant degree of correction to the inclination of the maxillary incisors occurred which resulted in normal inclination. Meanwhile, mandibular incisors underwent up-righting to yield a normal over jet and overbite. The final ANB angle was measured at 1 degree. Treatment spanned a period of approximately two years. At the end of this, the crossbite had been corrected, and an acceptable overjet and overbite had been established. A sound Class I bilateral canine relationship was achieved. Viewed occlusally, both arches demonstrated good arch form. The midline deviation was corrected, and both arches were aligned (Figures 8-10). (Figure 11) demonstrated improvement of patient's smile compared before treatment.

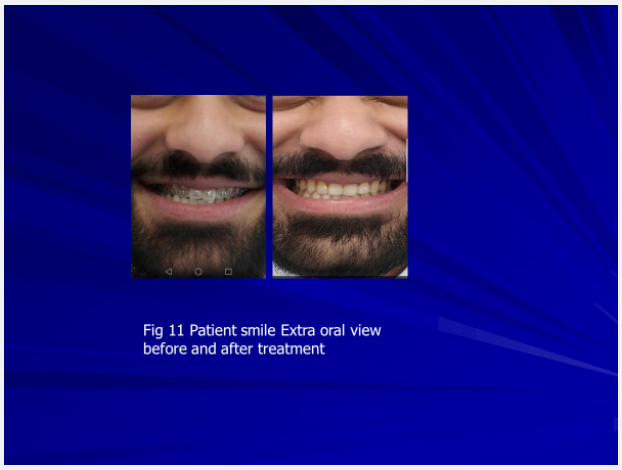

Figure 11: Patient smile extra oral view before and after treatment.

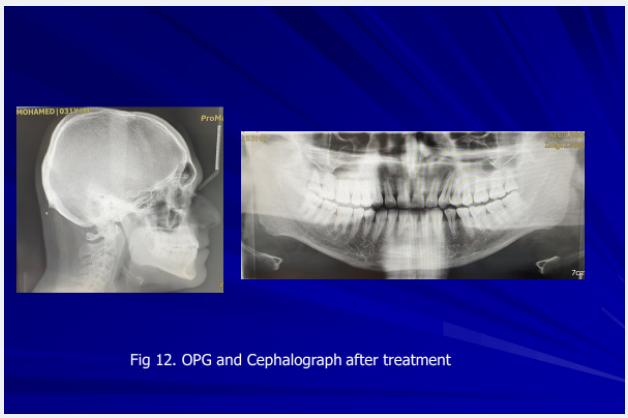

Figure 12: OPG and Cephalograph after treatment.

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Posttreatment Radiographs

The post treatment Cephalograph and ortho pantomograph confirmed that the level of interradicular bone remained relatively stable. The roots of the mandibular anterior teeth remained parallel with no evidence of significant root resorption (Figure 12). (Figures 13a,b,c) show super imposition before and after treatment indicating over all changes (a) indicating no skeletal changes, On the other hand the superimposition of maxilla (b) and mandible (c) before and after treatment exhibited dental changes in upper and lower jaw respectively.

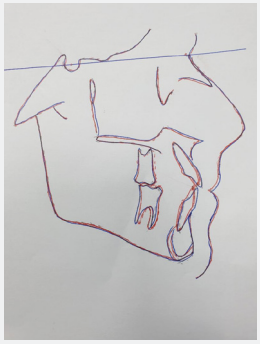

Figure 13a: Cranial base Superimposition before and after treatment indicating over all changes.
Red: Before treatment
Blue: After treatment

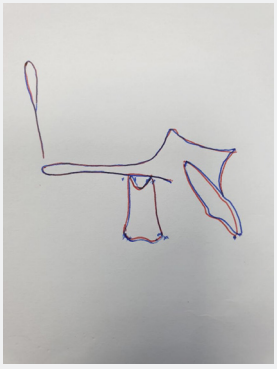

Figure 13b: Maxillary Superimposition before and after treatment indicating dental changes in upper jaw.
Red: Before treatment
Blue: After treatment

Discussion

An anterior crossbite significantly detracts from facial aesthetics and function. Furthermore, when early intervention does not take place, the cross bite increases with age and may give rise to gingival recession affecting the mandibular incisors. Multiple treatment approaches have been reported for the management of a Class III malocclusion. These include treatment with and without extractions. Where extractions are incorporated into the treatment, this may involve premolars or mandibular incisors, or both. More severe cases of skeletal discrepancy have been managed using surgical intervention. In cases where the Class III malocclusion is associated with a skeletal discrepancy treatment is more challenging. Not only is the management of such a case complex in nature, but the tendency for relapse is also significant [16]. In the current case the patient did not report dissatisfaction with his facial appearance. Understandably, he declined orthognathic surgery. Yet, the outcome of this case validates the possibility of achieving highly satisfactory results through a non-surgical approach. The teeth in crossbite were moved buccally out of this alignment through the use of 0.018" special Australian arch wire with a step out- bend from the mesial of the upper right lateral incisor to the mesial of upper right first molar. A fixed quad helix appliance was used in addition to criss /cross elastics in combination with a lower posterior bite plate.

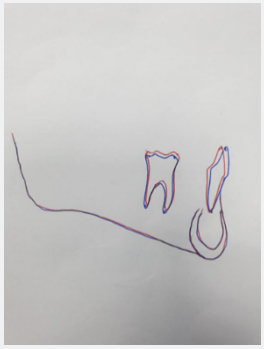

Figure 13c: Mandibular Superimposition before and after treatment indicating dental changes in lower jaw.
Red: Before treatment
Blue: After treatment

The approach followed in the treatment of this case differed from that used by Wissam et al. who made use of rapid maxillary expansion combined with a face mask appliance instead of a Quadhelix for correction of the cross bite in the buccal and incisor segments. In that report the authors made use of an open coil spring and extracted a mandibular incisor to correct the anterior cross bite in a forty-three-year-old patient with skeletal and dental Class III Malocclusions [3]. Marcel et al. made use of mini implants combined with an open coil in the treatment of an adult patient who declined orthognathic surgery for the correction of a Class III malocclusion. The authors concluded that the use of a single mini implant bilaterally in the mandible proved effective in moving the teeth distally in the treatment of a moderate skeletal Class III malocclusion [17]. The treatment of the case reported on in this article was carried out without the use of mini implants, achieving Class I molar relationship on both sides s, and a bilateral Class I canine relationship with normal overjet and overbite was achieved. Liu et al. stated that "Clinical studies have demonstrated that most patients can achieve an edge-to-edge occlusion of the

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anterior teeth soon after the commencement of treatment, which may be mainly due to changes in the masticatory muscles" [18].

The posterior bite plate disengages the bite and allows unhindered movement of the teeth in cross bite. It also protects against first molar extrusion and abnormal pressure on the condyle and temporomandibular joint arising from an altered condylar position. Several investigators have reported that most patients with an anterior cross bite manifest an altered condylar position [19,20]. The bite plate helps to minimize, or even eliminate an altered disc to condyle relationship in a relatively short period of time following the start of treatment [21]. Early correction of an anterior cross bite is vital to avoid the development of a mandibular shift which may lead to facial asymmetry. The patient in the current case manifested neither facial asymmetry nor gingival recession in the mandibular incisor region. The treatment applied in this case corrected the incisal inclination and established solid canine and molar occlusal relationships. The lower midline shift was corrected by utilizing space available distal to the lower left canine. Hence, the anterior crossbite and molar positions were corrected by utilizing an approach that avoided extractions, while concurrently correcting the alignment and levelling of both upper and lower arches. This resulted in a marked improvement in function and esthetics and avoided the risk of tooth loss arising from traumatic occlusion or advanced gingival recession and bone loss that can be the consequence of a severe anterior cross bite.

The establishment of good intercuspation and a normal overjet and overbite are essential for the stability of the occlusion; this is particularly so in the case of a Class III malocclusion [17]. The patient in this report experienced a mild degree of relapse despite an over correction of the cross bite in the right first molar region and consistent wearing of upper and lower vacuum retainers. The failure rate for maxillary vacuum form retainers was reported in one study to be 10% over two years [22]. while a further study reported a higher rate of 17% over 6 months [23]. This is explained by the fact that the vacuum form material shields the teeth from interocclusal forces that deter relapse. In order to avoid this, and to enhance the stability of the outcome, it is preferable to place a sectional fixed bonded retainer between the upper right first and second molars in addition to the use of upper and lower Hawley retainers with an Adams clasp on the left side and C- clasp on the right. However, Dalya et al. reported that fixed retention does not guarantee prolonged stability and concluded '' there is a lack of high-quality evidence to endorse the use of one type of orthodontic retainer based on their effect on periodontal health, risk of failure and cost-effectiveness" [24]. The same finding was observed in observational studies [25]. In some cases, a slight degree of cross bite is acceptable in the absence of a mandibular shift. However, it has been suggested that enhanced stability can be achieved through an overcorrection by maxillary expansion, as a relapse rate of one third can realistically be anticipated [26,27]. In order to minimize this rate, at least three months of retention using removable or fixed retainers is advised. Baccetti et al. [28] reported more favorable prognoses when intervention to correct a cross bite was implemented at an early age. When early intervention is not carried out in the case of a posterior crossbite, this may result in skeletal changes that necessitate a more complex treatment approach [29]. The approach applied in this case resulted in a functional occlusion and a pleasing smile. Consequently, the patient experienced a significant improvement in his quality of life, self-image and confidence, while having avoided surgical intervention.

Conclusion

The approach followed in this report demonstrates the effectiveness of treating an adult patient presenting with a Class III malocclusion without the need for surgical intervention. By using an appliance which was simple and easy to adjust, the patient benefitted from a sound functional occlusion and pleasant facial appearance which enhanced his self-esteem and confidence.

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Conflicts of interest

There are no conflicts of interest.

Aknowledgment:

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