Orthodontic Correction of Severe Class III Malocclusion with Deep Anterior Crossbite: A Case Report

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Abstract

Skeletal class III malocclusion has the lowest prevalence in the world, but increases in Asian countries and needs more care for orthodontists to treat. Mandible prognathism, maxillary deficiency and combination of both can be the etiology. So the treatment is very challenging as it varies from dentoalveolar compensation to surgical.

To present the case of a 30-year-old woman with skeletal Angle class III malocclusion with deep anterior crossbite, anterior crowding, maxillary midline shifting and a consequent concave facial profile that was corrected with camouflage conventional orthodontic treatment.

The camouflage conventional orthodontic treatment is chosen by extracting mandibular premolars. The goal of this treatment is to achieve proper class I occlusion with ideal overjet and overbite, and also to correct every problem existed.

After retracting the mandibular anterior segment, good class I occlusion is achieved. The anterior crossbite and soft tissue of lips are corrected in 9 months. And the total treatment was finished within 48 months due to theCorona Virus Disease 19 pandemic periods.

Conventional orthodontic treatment as a camouflage treatment is still desired by most patients with skeletal class III malocclusion and it is proven that this treatment is reliable as an alternative conventional treatment.

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Introduction

According to Angle's classification, class III malocclusion occurred when the lower molar is mesially positioned relative to the upper molar[1,2]. In normal individuals, a class III Angles's malocclusion is usually accompanied by a concave facial profile[3]. The average prevalence of Angle class III Malocclusion is 26.7% globally, with the lowest prevalence of whole malocclusion types. The population is most often found in Asian countries. In Southeast Asia, such as Malaysia and Singapore have a prevalence of 15.8%. And in East Asian countries, such as China, Japan and Korea vary from 8-40%[4,5]. In patients with a class III malocclusion, correction is aimed at achieving a class I key relation and normal overbite and overjet, regardless of the position of the maxilla and mandible[6].

Class III malocclusions are classified into three types, namely, pseudo, dentoalveolar and skeletal, so the treatment option for these cases is different according to the type[5]. It does not only depend on the type, the treatment case of class III malocclusion also depends on many things, one of which is the age of the patient. In the case of growing class III malocclusions can be treated using functional appliances or orthopaedic treatment, whereas in adulthood combined camouflage orthodontic treatment can be performed or orthognathic surgery[5,7]. In patients without cosmetic problems, orthodontic treatment without surgery is often preferable[8].

Some severe cases of class III malocclusion can not be treated with camouflage orthodontic treatment only. They are usually potential candidates for orthognathic surgery to correct the skeletal anomaly. Nevertheless, an alternative for patients reluctant to undergo surgery or who are satisfied with their facial

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appearance is to treat with dentoalveolar compensation without correcting the underlying skeletal deformity[9-12]. Orthodontic camouflage itself is one of the treatment options that need cautious specifically for class III cases, with the right and proper measurement of some analysis, this can be done[7].

Therefore, the objectives of this report were to evaluate the effects of dentoalveolar compensation in the treatment of adults with skeletal Class III malocclusion and to evaluate the occlusal results and changes obtained with compensatory dentoalveolar mechanics during the camouflage treatment.

Case Report

A Javanese 30-year-old woman came to our orthodontic specialist clinic with a chief complaint of lower anterior teeth being more forward than the upper ones. This made her smile awkward because she found it hard to hide her lower anterior teeth when she was smiling. Thus, make her chin also forward than her upper face, like her mother. She explained that she was treated before using a removable appliance when she was a child and her left maxillary first premolar has been extracted. As she was growing, that treatment didn't make her pleased and she lost her cooperation doing the interceptive treatment, so she abandoned that appliance.

Initially, the clinical relation of molar and canine was in class III relation or mesiocclusion. Intraorally she had anterior crossbite, deep bite, medium to severe crowding, and missing 24 and 48. There were also midline shifts; the maxillary midline shifted 0.8 mm to the left because of missing 24 and the mandibular midline shifted 1 mm to the right. The maxillary arch form was parabole, but the mandibular arch form was square. The arch forms were very challenging because of the unbalanced arch forms as the result of 43 that were located too buccal. Although the upper arch had been normal it seemed the missing 24 made the left arch collapse resulting in an asymmetric upper arch form. The missing 24 also made space between 23 and 25. The overjet and overbite were measured respectively -4 cm and 5 cm. In addition, the curve of spee was measured at 2,2 mm so it was slightly positive. There was no sign of TMD (temporomandibular disorder) or complaint of the joint. The path of closure was normal and there was no displacement of the mandible.The initial intraoral examination also showed good oral hygiene with no calculus and periodontal disease. But in initial OPG showed a bony defect in 23 distally, but in clinical probing, there was no pocket or bony defect, so it could be evaluated throughout the orthodontic treatment. There were amalgam fillings in 16 and 46. In centric occlusion, she had no problem closing her lips, but there was tension in lower lips. Freeway space was normal, 2 mm. She also projected a concave profile (soft tissue concavity: -2°), with protruded lower lip (Figure 1). The nasolabial angle was as acute as 89°; but according to Choi *et al*, her nasolabial angle is considered normal for Asian women.

Figure 1. Pre-treatment extraoral and intraoral photo.

Pretreatment lateral cephalogram shows skeletal class III with ANB -3°. It also shows mandible prognatism (SNB: 90°, NAPog: -4°) and tendency prognatism maxilla (SNA: 89°). The mandibular plane still was in the normal range though it was in the lower number (26°). Thus, this case was a low-angle case. From Wendell-Wylie analysis, there is vertical dysplasia showing that lower anterior facial height is shorter than middle anterior facial height and its ideal ratio (47%:53%). So, it was beneficial to rotate the mandible inferiorly and backwards (clockwise rotation) if needed.

Case Management

The orthodontic treatment used pre-adjusted Roth slot 0.022, molar band was used

on first molar and buccal tube on second molar. The wire sequence used in this treatment was NiTi 0.012, NiTi 0.014, NiTi 0.016, NiTi 0.016×.016, NiTi 0.016×0.022, NiTi 0.017×0,025, SS 0.017×0.025 and SS 0.018×0.025 on upper and lower arch. The last was the retention phase by wraparound retainers in the maxilla and mandible.

The NiTi wires used for aligning and levelling stage. After 6 month, the lower first premolars were extracted to retract anterior lower segment. After that, two steps anterior retraction was taken place using 0.017×0.025 stainless steel wire. And last, the four incisors were retracted using T-loop mechanics with also 0.017×0.025 stainless steel wire. GIC bite riser added during incisors retraction to decrease deep overbite combined with 4.5 oz class III elastics. And the total treatment was finished within 48 months due to the pandemic periods.

Measurement	Norms	Pretreatment	During Treatment
Skeletal parameters			
SNA (°)	84 ± 4	89	87
SNB (°)	62 ± 4	92	90
ANB (°)	2 ± 2	-3	-3
NAPog (°)	5 ± 5	-4	-2
Mandibular Plane(°)	32 ± 5	26	28
Y-Axis (°)	66 ± 4	67	69
Wits appraisal (mm)	+ 1	-5	-4
Dental parameters			
NA-UI (°)	26 ± 4	29	30
NA-UI (mm)	6 ± 4	8	9
NB-LI (°)	29 ± 4	32	30
NB-LI: (mm)	8 ± 4	13	6
Soft Tissue parameters			
Facial Contour Angle (°)	11 ± 3	-2°	0°
E-Line: Ls (mm)	-1	-1	0
Li (mm)	-2 ± 2	1	0

Table 1. Lateral cephalometric measurements initially and during the treatment (30 months).

Discussion

The camouflage treatment resulted in a satisfying improvement of the patient's facial profile although it needs more improvement (Figure 2, 3). In this case, we decided to treat with camouflage treatment because of some limitations such as the patient was afraid of surgery treatment and due to Covid-19 pandemic era. In this case, the increase in the maxillomandibular plane angle might be attributed to the uprighting of the mandibular molars and the slight extrusion of the maxillary molars. Overall, the increases in ANB angle and vertical dimension were favourable for improving the patient's facial profile in this camouflage treatment of a skeletal class III malocclusion. In addition, there was a significant increase in the Wits appraisal (10 mm) that might have been influenced by the change of the occlusal plane.

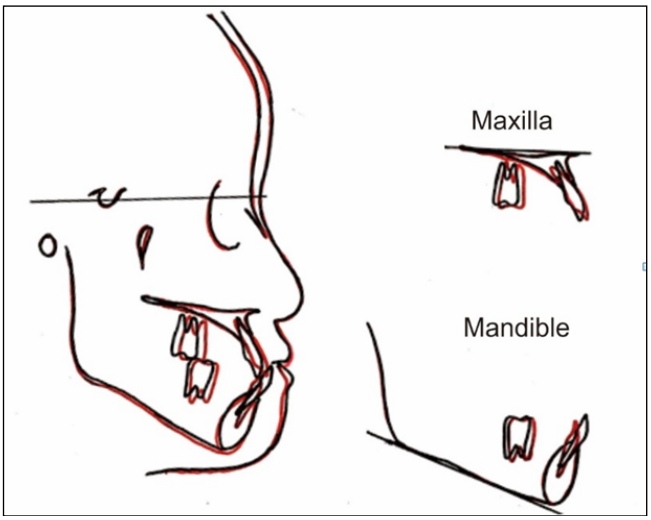

Figure 2. Superimposition of pretreatment (black) and lateral cephalograms during treatment (red).

Figure 3. Post-treatment extraoral and intraoral photo.

This change could be attributed to the extrusion of the mandibular premolars in conjunction with the correction of the curve of Spee. Significant dental changes included the 13° increase in the U1- angle and the 3° reduction in the L1 angle (Table 1), meaning that the maxillary incisor proclination and mandibular incisor retroclination were the strategies to camouflage the skeletal class III malocclusion to improve smile esthetics and the dental occlusion. Mandibular incisor retroclination in this patient

might be attributed to the use of class III elastics. Moreover, a previous study stated that treatment with the passive self-ligating system resulted in 1.5° less mandibular incisor proclination compared with the conventional ligation system. Another study found no difference in incisor inclination between class III surgical and camouflage groups after treatment; both showed maxillary incisor proclination and mandibular incisor retroclination[13-15]. Therefore, camouflage treatment would be successful in various tooth movements without undesirable effects on the periodontal tissues.

Conclusions

Compensatory mandibular premolars extraction treatment of class III malocclusion can establish normal overjet and overbite through significant changes in the maxillomandibular relationship, associated with labial tipping of the maxillary incisors and lingual tipping of the mandibular incisors. These changes also increased facial convexity and facial height.

Declaration of Interest

The authors report no conflict of interest.

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