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Case Report

Orthodontic camouflage treatment using a passive self-ligating system in skeletal Class III malocclusion

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ABSTRACT

Background: *The treatment options for adults with skeletal Class III malocclusion can be dentoalveolar compensation, also known as orthodontic camouflage, or orthognathic surgery. Camouflage treatment can be carried out with teeth extractions, distalisation of the mandibular dentition, and use of Class III intermaxillary elastics. However, intermaxillary elastics as anchorage has its own risk–benefit.* ***Purpose:*** *To explain that camouflage treatment with teeth extractions can be performed in a mild to moderate skeletal Class III malocclusion using intermaxillary anchorage with elastics, while minimising the deleterious effects and achieving a satisfactory treatment outcome.* ***Case:*** *Our patient was a 25-year-old female who had a skeletal Class III pattern, with normal maxilla and a protruded mandible. She had a straight facial profile with a Class III canine and molar relationship on her right and left sides. Anterior crossbite was also present with crowding on both the maxilla and the mandible.* ***Case Management:*** *The treatment plan was carried out with dentoalveolar compensation by extracting teeth. Extraction of the lower first premolars was conducted to eliminate the crowding and correct the anterior crossbite. The mandibular incisors were retroclined and the maxillary incisors were proclined with dentoalveolar compensation. Passive self-ligating system was used with standard torque prescription, intermaxillary anchorage, and no additional appliances for anchorage control. Class I canine and incisor relationship were both achieved at the end of the treatment, while maintaining the Class III molar relationship.* ***Conclusion:*** *Orthodontic camouflage treatment in an adult patient using a passive self-ligating system and intermaxillary anchorage can improve facial profile and improve dental occlusion.*

Keywords: *Class III malocclusion; orthodontic camouflage treatment; passive self-ligating system*

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INTRODUCTION

Edward Angle described Class III malocclusion as a lower molar which is mesially positioned relative to an upper molar, with no specification of the line of occlusion. Nonetheless, Class III malocclusion can be constituted from skeletal and dental irregularities. Skeletal Class III malocclusion can be a result of maxilla deficiency, mandible excessiveness , or a combination of both. Dental features include retroclined mandibular incisors, proclined maxillary incisors, edge-to-edge incisor relationship and negative overjet.[1,2] Studies have showed that the prevalence of Class III malocclusion affects a great variety of different populations. It has been documented that there is a greater prevalence of it in Asian races compared to other races.[2–4]

The treatment of choice for skeletal Class III malocclusion in adult patients often requires a combination of orthodontic and surgical procedures. However, with camouflage treatment it is also possible to correct skeletal Class III malocclusion, depending on the level of severity. Adult patients who have a mild to moderate skeletal Class III malocclusion and a fairly good facial profile can be treated with camouflage treatment. Camouflage treatment can be conducted by extracting teeth, distalising the mandibular dentition, and using Class III intermaxillary elastics. Strategies in skeletal Class III malocclusion camouflage treatment are to procline the upper incisors and retrocline the lower incisors. Acceptable occlusion, function, and facial aesthetics with dentoalveolar compensation are the objectives from camouflage treatment.[5–8]

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Intermaxillary elastics have been used as intermaxillary anchorage and are available in many sizes and strengths.[9] However, Class III intermaxillary elastics can promote extrusion of upper molars, proclination of upper incisors, distal tipping of lower molars, and extrusion of lower incisors.[9,10] In some studies, a combination of skeletal anchorage and intermaxillary elastics were used to minimise the unwanted effects of intermaxillary elastics alone.[11,12] This case report demonstrates a camouflage treatment in an adult patient with skeletal Class III malocclusion by the extraction of lower first premolars with the use of intermaxillary elastics and no additional appliances.

CASE

The patient was a 25-year-old woman, who came to the orthodontic clinic at the Faculty of Dentistry in the Universitas Indonesia Dental and Oral Hospital. She was concerned about her crowded and crossbite of the anterior teeth; hence, she did not feel confident when smiling. The photographs taken before treatment showed a symmetric face and a dolichofacial appearance. Her facial profile was straight and her lips were competent (Figure 1). The intraoral examination showed anterior crossbite with –3 mm overjet, +4 mm overbite, single posterior crossbite of the upper right second premolar, and Class III canine and molar relationships. The degree of crowding on her maxilla was mild, while on the mandible it was moderate. There was no deviation on her maxillary dental midline with her facial axis, but there was a deviation in the mandibular dental midline by as much as 1mm to the right. There was premature contact on the upper right first incisor with lower right first incisor causing functional displacement to the anterior when closing the jaw. Her oral hygiene and periodontal tissues were good, and all teeth were present (Figure 2).

The lateral cephalometric analysis revealed a pattern of skeletal Class III malocclusion with normal maxilla and prognathic mandible, concave skeletal profile, proclined maxillary incisors, and a normal interincisal angle. A panoramic radiograph showed impacted maxillary third-molars and partially erupted mandibular third-molars (Figure 3).

Figure 1. Pre-treatment extraoral photographs. Facial photos of (a) frontal view at rest, (b) during smiling, and (c) lateral view.

Figure 2. Pre-treatment intraoral photographs. Intraoral view of (a) upper occlusal, (b) lower occlusal, (c) right lateral, (d) frontal, and (e) left lateral.

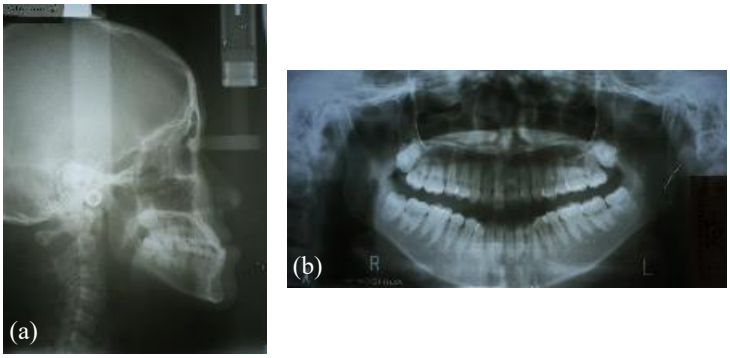

Figure 3. Initial (a) lateral cephalometric and (b) panoramic radiographs.

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According to the patient, she knew of no relatives in her family that had skeletal Class III malocclusion features. Meanwhile, the etiologic possibility for the single posterior crossbite of the upper right second premolar could be the retention of the upper right second deciduous molar.

The treatment objectives were to improve the occlusion, including correction of the anterior and posterior crossbites and to achieve ideal overjet and overbite. The ideal treatment for skeletal malocclusion was a combination of orthodontic and surgical procedures to improve the facial profile. However, as the patient refused to have surgery, she chose to have the camouflage treatment, involving the extraction of the lower first premolars with fixed orthodontic appliances.

CASE MANAGEMENT

Clinicians should be able to make a proper diagnosis and establish realistic treatment objectives with the patient, in order to prevent undesirable outcomes when performing a camouflage treatment in a mild to moderate skeletal Class III malocclusion. It has been suggested that changes in the three aspects, such as skeletal, dental, and soft tissue, can be successfully camouflaged without damaging the periodontal tissue.[7]

In this case, the camouflage treatment was conducted by extracting lower first premolars. The patient had a well-formed maxillary arch with mild crowding, while the mandibular arch was prognathic with moderate anterior crowding. By extracting the lower first premolars, the extraction space was used to relieve crowding and retract the lower incisors. The lower first premolars were extracted before bracket bonding. A Damon Q passive self-ligating system (0.022x0.028-inch slot; Ormco, Glendora, California) with standard torque prescription was bonded on the upper and lower teeth. Bite raisers were used on the mandibular posterior teeth and the patient was given an instruction to use the early Class III elastics (2 oz, 5/16-inch Ormco). Open coil springs were used between upper lateral incisors and canines to protract the upper incisors. Power chain and Class III elastics were simultaneously used for retracting the mandibular anterior teeth. After six months of treatment, the overjet became positive and crowding was resolved. As we progressed to 0.018x0.025-inch copper-nickel-titanium archwire, we inverted the brackets of the four upper incisors, so that the upper incisors with labial root torque were inclined labio lingually. Aligning and levelling with sequential copper-nickel-titanium archwires was achieved in 12 months. Then, 0.019x0.025-inch stainless steel archwires were put into the upper and lower arches and elastics were also constructed to be used for improving interdigitation and detailing occlusion. After 22 months of treatment, the brackets and molar tubes were debonded and vacuum-formed Essix retainers were used for stability on both upper and lower arches.

A straighter soft tissue profile and a pleasant smile were obtained at the end of the treatment (Figure 4). An ideal overjet and overbite were also attained with a Class I canine relationship, while the molars are maintained in Class III relationship. Crowding on both arches were relieved and the crossbite on the second upper premolar was also corrected (Figure 5).

After 20 months of treatment, a lateral cephalometric radiograph showed changes in skeletal, dental, and soft tissue parameters (Figure 6). Analysis from lateral cephalometric radiograph were shown in Table 1. The ANB angle showed improvement from –2° to 0° and the angle of convexity was also improved from –5° to 0°, while the lower facial height was maintained. Dental parameters

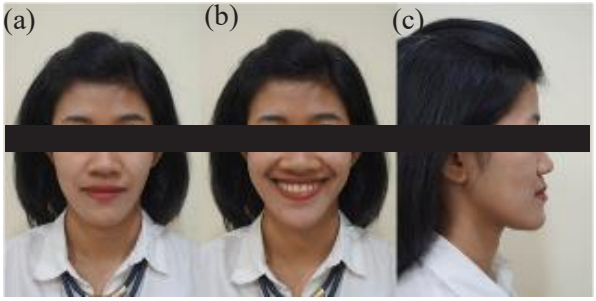

Figure 4. Post-treatment extraoral photographs. Facial photos of (a) frontal view at rest, (b) during smiling, and (c) lateral view.

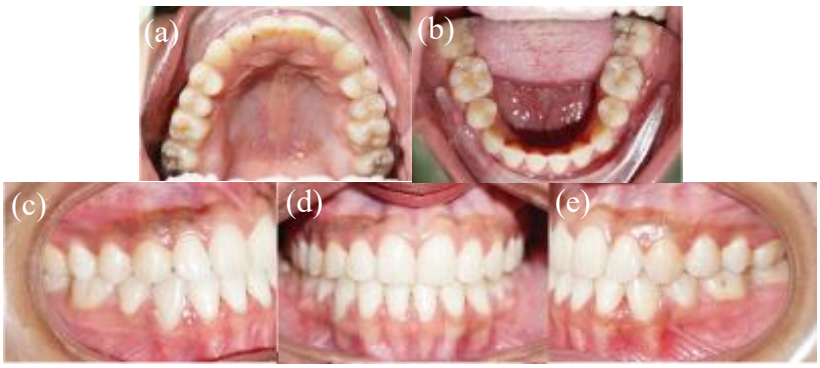

Figure 5. Post-treatment intraoral photographs. Intraoral view of (a) upper occlusal, (b) lower occlusal, (c) right lateral, (d) frontal, and (e) left lateral.

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showed that the upper incisor to maxillary plane angle and lower incisor to mandibular plane angle decreased from 120° to 115° and 86° to 81°, respectively. Soft tissue parameters showed that the positions of the upper and lower lip positions were also improved and confirmed in the lateral cephalometrics superimposition (Figure 7).

DISCUSSION

In this case, Class III molar relationship was maintained with a Class I canine relationship and an ideal overjet and overbite. This type of occlusion is also known as therapeutic Class III occlusion.[13] Previous study found that good occlusal stability and periodontal health were observed in patients with Class III molar relationship after 13–14 years of treatment.[14] The alternative treatment by extraction of maxillary second premolars and mesialisation of the first molars to achieve a Class I molar relationship could risk to depress the face, as the patient already had a fairly straight profile.[15]

The patient's facial profile was improved as there were several skeletal and dental changes that affected the position of the upper and lower lip. Increase in ANB angle and the angle of convexity might be attributed to the protraction of the upper incisors and also the retraction of the lower incisors (Table 1). The inclination of upper incisors were initially proclined as a common feature of dental compensation in skeletal Class III malocclusion, while the lower incisors have normal inclination. It has been suggested that using Class III elastics can cause some unwanted tooth movements. Therefore, we used and prescribed the patient with light-force elastics and a bigger wire in the maxillary arch, so that the whole maxillary arch became an anchorage for mandibular anterior teeth retraction and also to minimise any unwanted effects. Light force in Class III elastics was also used to prevent the maxillary posterior teeth from extruding, as this can cause

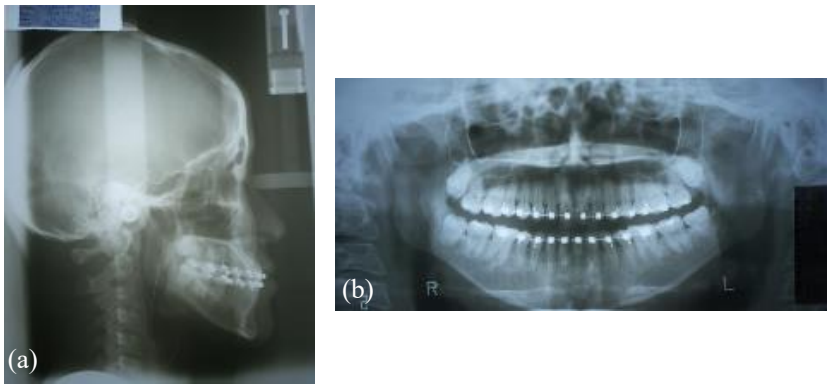

Figure 6. Pre-debonding (a) lateral cephalometric and (b) panoramic radiographs.

Table 1. Comparison of skeletal, dental, and soft tissue values of pre- and post-treatment lateral cephalometric radiographs

Measurement	Mean	SD	Pre-treatment	Post-treatment
Horizontal Skeletal				
SNA (°)	82	2	84	84
SNB (°)	80	2	86	84
ANB (°)	3	2	–2	0
The Wits (mm)	1	2	–12	–5
Angle of convexity (°)	0	10	–5	0
Vertical Skeletal				
Y-axis (°)	60	6	59	58
Go-angle (°)	123	7	134	134
SN-mandibular plane (°)	32	3	32	32
MMPA (°)	27	4	26	26
LAFH (%)	55	2	55	55
Anterior Dental				
Interincisal angle (°)	135	10	130	135
U1-palatal plane (°)	109	6	120	115
L1-mandibular plane (°)	90	4	86	84
Soft Tissue				
Upper lip –E Line (mm)	1	2	–6	–5
Lower lip – E Line (mm)	0	2	1	0

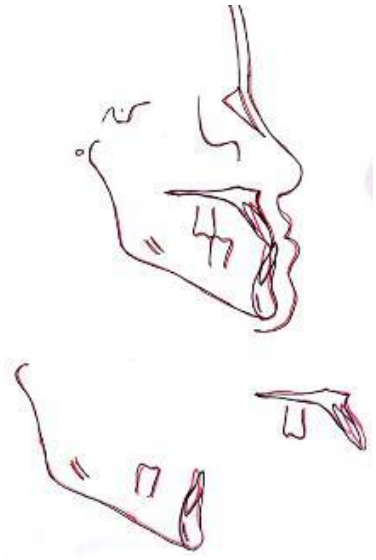

Figure 7. Superimposition of lateral cephalometrics on before (black) and after treatment (red). Note there was changes in maxillary and mandibular incisor angulation, and also in the lip position.

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the mandible to rotate backwards, therefore increasing the lower facial height.[16]

We also inverted the maxillary incisor bracket position to prevent more proclination on maxillary incisor teeth. The torque value for Damon Q brackets with standard prescription are +15° on the upper central incisors and +6° on the upper lateral incisors. When the brackets were inverted, the torque values were changed to –15° and –6° for the upper central and lateral incisors, respectively. Therefore, the upper incisors had a higher labial root torque placed on them. The same effects were also obtained in previous study with Damon 3 brackets by inverting the bracket position.[17]

The inclination of lower incisors was retroclined by the end of the treatment. A meta-analysis study found that self-ligating brackets could promote inclination of incisors become 1.5° less than the conventional brackets.[18] Another study also reported acceptable facial aesthetics and good dental occlusion when camouflaging skeletal Class III malocclusion with a passive self-ligating system without the use of auxiliary appliances.[19]

Retention is needed after an active phase of orthodontic treatment because there is tendency to relapse. A vacuum-formed retainer was used for this patient to maintain the tooth alignment and arch width stability. A previous study suggested that vacuum-formed retainers were more effective than the Hawley retainer at holding the incisors in alignment.[20] However, a recent systematic review also suggested that there are no differences between the Hawley retainer and the vacuum-formed retainer in terms of cost, time, maintaining the arch width, occlusal contacts, and patient satisfaction.[21] There is also limited evidence that suggests fixed retainers are better than vacuum-formed retainers. Further studies are needed to make some recommendations about retention after orthodontic treatment.[22] In conclusion, orthodontic camouflage treatment with passive self-ligating and intermaxillary anchorage can improve facial profile and dental occlusion.

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