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CASE STUDY

Enhancing esthetics from growth modification

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ABSTRACT

Alteration of maxillary growth, improvement in mandibular growth and position, and change in dental and muscular relationships, especially changing in esthetic profile are the expected results of myofunctional appliances. The use of Bionator appliance is a widely used myofunctional appliance for the management of Class II malocclusion. A normal and healthy Indonesian boy aged 12 years and 2 months old was motivated for treatment for protruded maxillary anterior teeth and retrognathic mandibular. He was introverted and had poor self-esteem despite his normal medical history. He had a Class II Division 1 malocclusion with a 10 mm overjet, normal overbite, with an SNA of 92.89°, SNB of 85.32°, ANB of 7.52°, and a facial angle of 88.11°. He was in mixed dentition stage with all his permanent teeth available and ready to erupt. The patient was treated in two phases: phase I to correct the skeletal discrepancy using Bionator appliance and phase II to correct the tooth discrepancy using fixed appliance. At the end of phase I treatment, or 10 months of wearing Bionator appliance, the patient's mandible was positioned forward with the ANB angle reduced from 7.56° to 2.30°, and the profile was greatly improved. His molar and canine relationship was Class I. His profile became straight and more favorable. Early treatment using functional appliance therapy can reduce the severity of Class II skeletal pattern and instant change in facial and dental appearance in growing patients.

Keywords: bionator appliance; esthetic; growth modification

INTRODUCTION

Functional appliances have been used for many years in the treatment of Class II malocclusion.[1] Alteration of maxillary growth, improvement in mandibular growth position, and change in dental and muscular relationships, especially changing in esthetic profile, are the expected results of these appliances. The appropriate time to start orthodontic treatment for patients with skeletal discrepancy has been a topic of discussion among orthodontists and journals. The timing and duration of using these appliances is another subject of debate. Early orthodontic treatment is the key in interceptive orthodontics, which aims at correcting skeletal and dental relation.[2] Detecting skeletal malocclusion in early stage is advantageous. One of the most common and serious dental issues during mixed dentition stage is Class II skeletal malocclusion.[3] This issue can negatively affect an individual's self-esteem, and thus requires early treatment to alleviate the severity of the skeletal malocclusion. Children with mixed dentition have greater growth potential than older children. Utilizing the growth potential and growth spurt could effectively result in a more effective, efficient and stable result.[4] Functional appliances are common orthodontic therapy for growing children to correct skeletal discrepancies.[5] Bionator appliance is a widely used functional appliance for the management of Class II malocclusion in today's practice.[2] The appliance can be worn most of the time, with the advantage of allowing nearly a full range of mandibular movement, easy acclimation, reasonable speech, and instance change in

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esthetic profile. Myofunctional appliance therapy is a rapidly expanding area of orthodontic treatment, which focuses on correcting facial muscular imbalances as well as teaching proper tongue posture. Its popularity comes also from its high patient acceptability due to easy wearing of the appliance and its ability to produce rapid results especially changing in esthetics. Functional appliance therapy is followed by comprehensive fixed-appliance therapy with or without extractions. This study aims to describe a mixed dentition skeletal malocclusion that was effectively treated using Bionator appliance. Esthetic profile changes benefit from the alteration of growth.

METHODS

An Indonesian boy aged 12 years and 2 months old, in good health, sought treatment for protruded maxillary anterior teeth and a receding mandibula. He exhibited introverted behavior and poor self-esteem despite his normal medical history. He inherited this skeletal discrepancy from his father's side, as his father also had a similar facial profile of protruded maxillary anterior teeth and a recessed chin. He had no significant medical or dental history, and the temporomandibular joints were within normal limits. The patient had normal range of mandibular motion.

The facial photographs indicated a convex facial appearance, protruded lips, mixed dentition, and moderate exposure of the maxillary incisors (Figure 1). The midline of the mandible was shifted 2 mm to the right. Other intraoral findings included gingivitis of the incisors and a short lingual frenum. He had a Class II Division 1 malocclusion (bilateral full Class II molars and canines) with a 10-mm overjet. The cephalometric analysis confirmed a skeletal Class II jaw relationship with a retrognathic mandible and a steep mandibular plane angle. Additionally, the maxillary and mandibular

Figure 1. Pretreatment facial and intraoral photograph

incisors were labially inclined (Figures 1 and 3). The lateral cephalometric (Figure 3 and Table 1) analysis indicated a skeletal Class II jaw with an ANB of 7.56° and a Wits of 2.32 mm. He was in a mixed dentition stages with all compliments of his teeth (Figures 1 and 2).

Figure 2. Pre-treatment panoramic radiograph

Figure 3. Pretreatment cephalograms (Cervical Stage 3)

Figure 4. Photograph of a Bionator appliance

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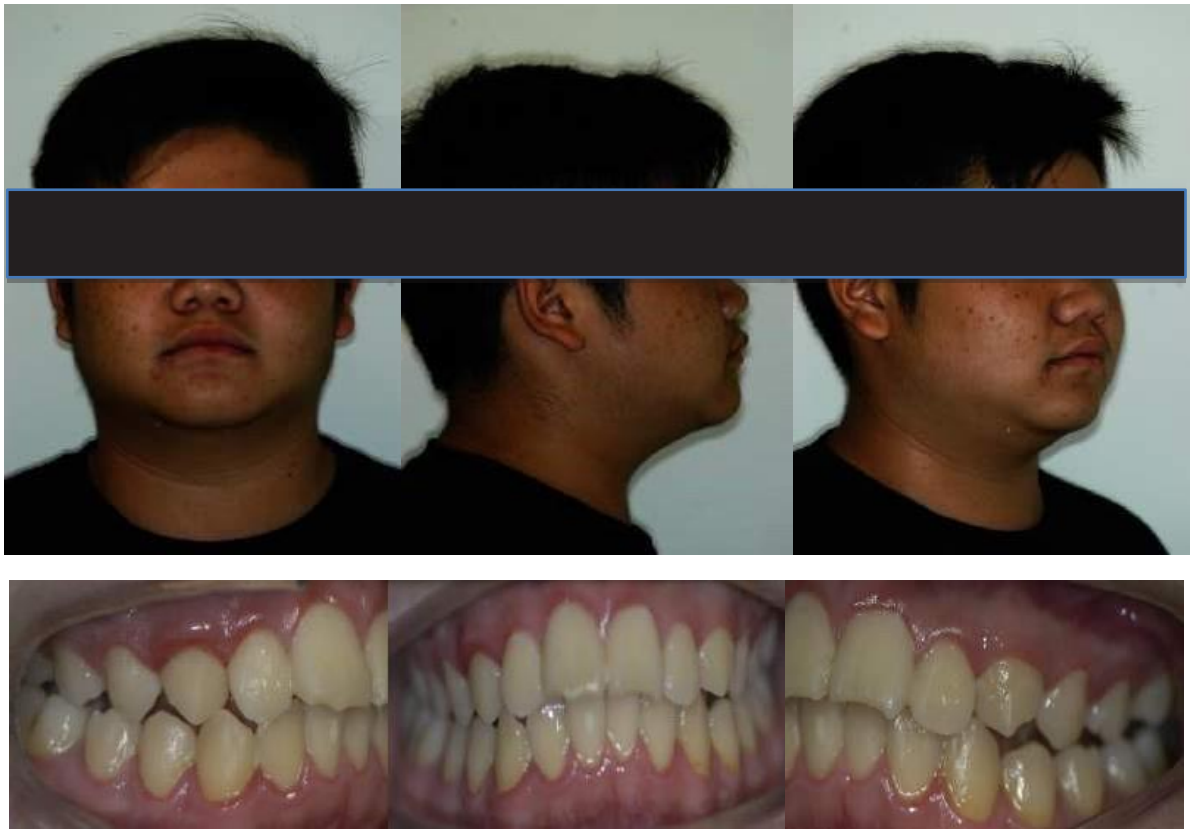

Figure 5. Progress facial and intraoral photograph (Post Phase I / Pre Phase II treatment)

Figure 6. Progress panoramic radiograph (Post Phase I / Pre Phase II treatment)

Figure 7. Progress cephalograms (Post Phase I / Pre Phase II treatment)

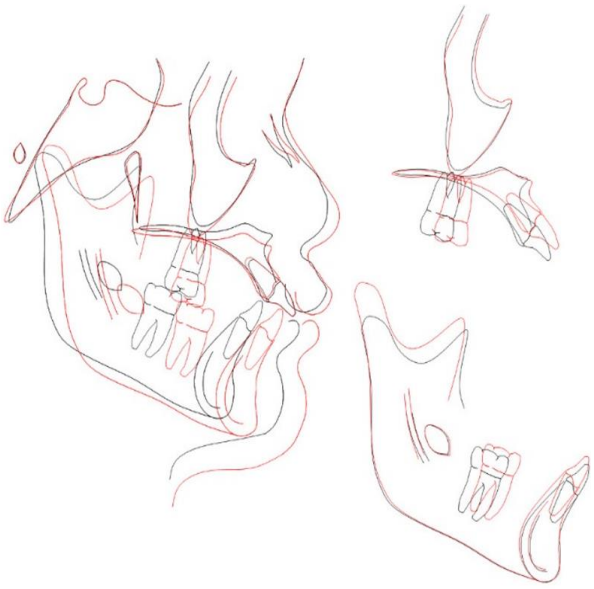

Figure 8. Progress superimposition (black – pretreatment; red – post phase I/pre phase II treatment)

Figure 9. Post treatment intra and extraoral photographs

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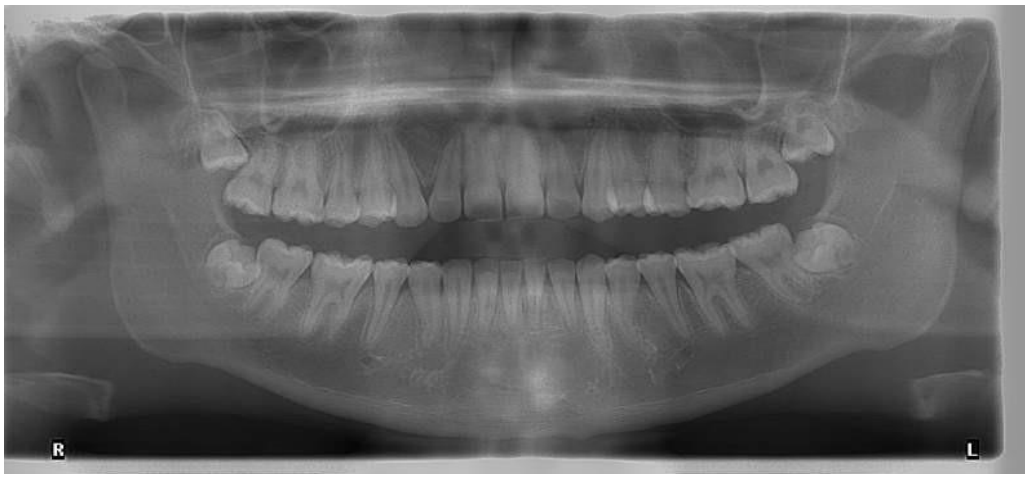

Figure 10. Post treatment panoramic radiograph

Figure 11. Post treatment cephalometric radiograph

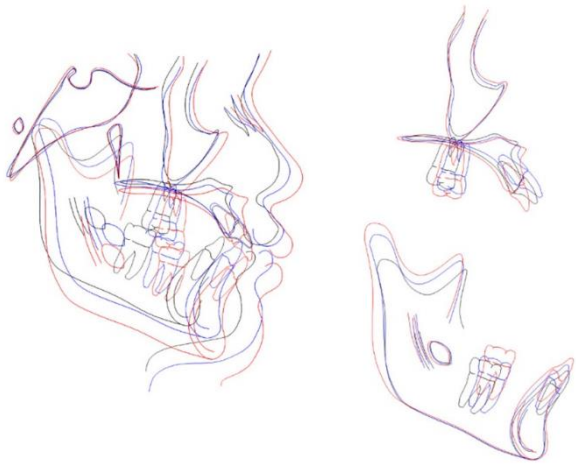

Figure 12. Final superimposition (black – pretreatment/initial; blue – post phase I/pre phase II treatment; red – posttreatment/ final)

Table 1. Analysis cephalometry

No	Measurements	Pretreatment	Post Phase I / Pre Phase II	Posttreatment
1.	SNA	92.89	92.56	92.51
2.	SNB	85.32	90.26	90.01
3.	ANB	7.56	2.30	2.50
4.	Facial Angle	88.11	91.55	91.80
5.	Wits	2.32	-1.94	-1.24
6.	Mandibular Arc	23.43	33.79	34.10
7.	Mand Body Length	70.58	81.52	82.22
8.	E line to Upper	8.34	5.51	4.79
9.	E line to Lower	0.81	2.41	2.10
10.	Z Angle	72.28	79.64	78.01

The treatment objectives of this patient involved a two-phase approach. In phase I, the focus was to correct the skeletal Class II malocclusion (retrognathic mandible), improve his overjet and overbite, solve the dental crowding, and improve his facial appearance instantly. Phase II was treatment using fixed appliances to correct his dental malocclusion.[3] Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

The skeletal imbalance of the Class II patient was corrected in the mixed dentition stage with early phase I treatment. The Bionator appliance (Figure 4) was used with the mandibular expander activated once every 4 weeks after an adaptation period of 10 days. The patient was instructed to wear the Bionator appliance for 24 hours a day, except during eating and brushing teeth. During the phase I treatment, the Bionator appliance was adjusted every month to guide the mandible forward. The patient was first observed 10 days after the initial visit, with subsequent monthly visits scheduled to make necessary adjustments to the Bionator appliance for retention and stability as needed. After wearing the Bionator appliance for 10 months plus retention for 2 months (Figures 5-7), phase II treatment was started using fixed appliances metal brackets of 0.022-in slot preadjusted edgewise appliances with Roth prescription to improve the relationship between the teeth. The phase II treatment took about 10 months (Figures 8-10).

The patient was treated in a two-phase treatment. The first phase was to correct the skeletal discrepancy, and the second phase was to correct tooth discrepancy. At the end of phase I, after 10 months of treatment using a Bionator appliance, the patient's mandible was positioned forward, and the profile was greatly improved (Figure 5). His molar and canine relationships were Class I. His profile became straight and more favorable. A skeletal anteroposterior reduction was significant with 5.26° change in the ANB angle because the SNB angle increased from 85.32° to 90.26°. Facial angle changed from 88.11° to 91.55°. There was an increase in the length of the mandibular body from 70.58 to 81.52, the mandibular arch from 23.43 to 33.79, and Z angle from 72.28 to 79.64 (Table 1). The soft tissue profile improved as indicated by a decrease in the E line value of the upper lip and an increase in the value for the lower lip. The intraoral examination showed an improvement in the deep overbite and large overjet, lingually inclined maxillary anterior teeth and a mesial relationship of the first permanent molars and canines, enhancing instant profile esthetics from growth modification (Figure 4). Progress superimposition (Figure 8) shows the improvement in the maxillary and mandibular jaw relationship. The superimposition also showed that patient had some growth during the phase I treatment.

After active treatment using fixed appliance at the end of the second phase, a normal occlusion with overbite and overjet was achieved. The patient profile changed from convex to straight. Lip protrusion also improved. The molar and canine relationship was neutroclusion. In addition, good alignment and correction of the dental midline were achieved (Figures 9-11). In phase two, the values of analysis measurements did not change (Table1). Figure 12 shows the superimposition of the full treatment from initial to final. Patient had significant growth during the treatment. Class II elastic was also used during fixed appliance, and retroclination of upper anterior teeth was accomplished.

DISCUSSION

Oral habits such as mouth breathing, tongue thrusting, thumb sucking, and lip biting are common problems during childhood.[4-5] If these habits persist, they may become an etiologic factor for abnormal dentofacial growth. Mouth breathing has been reported to have serious effects on the development of occlusions and skeleton by way of altering muscular balance.[6-8] Previous studies have confirmed that mouth breathing causes a narrower maxillary width, big overjet, and high palatal vault.[9-12]

Early treatment is usually carried out in Class II malocclusion cases with the aim of improving skeletal jaw relations by altering the growth pattern. Growth modification in cases of Class II malocclusion can be done either by using headgear to prevent forward movement of maxilla or by using a functional appliance to increase mandibular length.[13-21] In the United States, the frequent approach to growth modification has been extraoral force (headgear) to restrict or redirect the growth of the upper jaw. At the same time, the European approach generally involves myofunctional appliances to redirect forward positioning of the mandibular. Class II malocclusion becomes apparent in the mixed dentition period. Reducing large overjet by modifying the jaw growth will directly improve the facial and dental appearance.

In 1981, McNamara[18] showed that up to 85% of patients with Class II malocclusion had some component of mandibular deficiency underlying the skeletal Class II discrepancy.[18] In growing patients, growth modification is a feasible and more conservative approach, which is more appealing than camouflage, because ideally, the skeletal discrepancy should be addressed for optimal treatment results. In this case, we observed a significant change in the ANB angle from 7.56° to 2.30°. Functional appliances are used to treat skeletal Class II problems due to mandibular deficiency in growing patients.[22] When the growth of the patient is over, the treatment of patients with skeletal Class II malocclusion ranges only from dental compensation, including camouflage by extractions, to surgical management. Removable functional appliance therapy depends totally on the patient's cooperation. Poor compliances are usually caused by the bulkiness of the appliance. In contrast, fixed functional appliances have their drawbacks, including difficult fabrication, easy breakage, and tissue irritation.[22-24]

Bionator appliances are less bulky and cause less discomfort than other functional appliances such as Frankel. The amount of mandibular advancement used small increments to avoid straining of lateral pterygoids muscles.[25] Uzumez et al[26] evaluated the long-term effects of a Bionator in growing patients with mandibular retrusion and concluded that a Bionator could induce skeletal and dentoalveolar shape changes. Significant changes were seen in mandibular length, mandibular arch, and E line in addition to changes in the ANB angle (Table 1).

CONCLUSION

Early treatment using myofunctional appliance therapy can reduce the severity of a Class II skeletal pattern and instant change in facial and dental appearance, preventing incisal trauma and rebuilding confidence. A Class II skeletal pattern can be corrected if the treatment started at the right time, and other factors such as patient cooperation and management must also be taken into account.

CONFLICT OF INTEREST

The authors declare no conflict of interest with the data contained in the manuscript.

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