

Long Term Stability of Skeletal Class II Treatment with Modified Bionator Followed by Fixed Appliance - A Case Report

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INTRODUCTION

The most prevalent malocclusion seen in day-to-day practice is Class II division 1 malocclusion. Most patients with malocclusions in class II division 1 have an underlying skeletal difference between the maxilla and the mandible. The treatment of skeletal class II division 1 depends on the patient's age, the ability of growth potential, the seriousness of malocclusion, and the patient's adherence to treatment. Myofunctional equipment can be successfully used to treat rising patients with deficient mandible class II division 1 malocclusion. This case report shows a focus on Class II Division 1 care due to mandibular deficiency using modified bionator appliances accompanied by fixed mechanotherapy with growth modification approach.

Class II Division 1 is one of the most widely encountered form of malocclusion in human populations. The common characteristic of Class II Div 1 malocclusion in growing children is mandibular retrusion, according to Dr. James McNamara.¹ The prevalence of Skeletal Class II malocclusion is 15 % of the world's total population. Underlying difference between Maxillary & Mandibular jaw makes the Class II Div 1 malocclusion more complex than it appears. It's due to a contribution of only maxilla, or only mandible, or a combination of both. The treatment of Class II division 1 relies on the patient's age, growth ability, degree of malocclusion, and patient compliance with therapy.^{1,2} The cases with retrognathic mandible must be addressed by altering the direction & amount of mandibular growth by using functional appliances.³ The Bionator is a tooth-borne appliance that significantly changes dental and skeletal component of the face through a repositioning of mandible in a more protrusive & balanced way, selective eruption of teeth and profile enhancement.⁴⁻⁷

The Balters Bionator was first introduced in 1960 by Wilhelm Balters as a functional appliance & still one of the most widely used removable appliances for correction of mandibular retrognathism.⁸ In functional orthopaedics, all aspects of genetically determined individual growth patterns are important, most particularly time, potential, and growth direction. Although during the prepubertal phase there is limited skeletal development, substantial growth occurs during puberty, but with great individual variation. To prevent damage to erupting teeth and to normalize jaw growth, early functional orthopaedic intervention in the prepubertal phase is used.^{9,10,11}

The purpose of this case report is to illustrate how satisfactory results were obtained in the treatment of Class II division 1 malocclusion with modified Bionator in young patients. The positive facial, dental and cephalometric improvements are also illustrated, with the aid of proper diagnosis, amplified by excellent patient cooperation in case selection.

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PRESENTATION OF CASE

A 12-year and 8 months old female patient with chief complaint of forwardly placed upper front teeth reported to the Department of Orthodontics & Dentofacial Orthopaedics, K.M. Shah Dental College & Hospital, Vadodara. There was no significant dental and medical history with only mild respiratory problems or the presence of snoring or sleep apnoea. Facial analysis revealed symmetrical face, maxillary dental midline shifted towards left side with facial midline. Extra oral examination reveals convex facial profile having posterior divergence of the face due to retrognathic mandible. On Intraoral Examination Angle's class 2 molar and canine relationship were present on right & Left side (Fig. 1). Maxillary arch was "V" shaped with proclined maxillary anteriors & spacing.

The nasolabial angle was obtuse & lower lip was in everted position. There was no significant temporomandibular joint dysfunction, and laterognathia. In dental occlusion, Full cusp angle's class II molar relationship with increased overjet of 7 mm and overbite of 4 mm. The patient had acceptable oral hygiene with no restorations or caries (Fig. 1).

The panoramic radiograph shows presence of all permanent teeth. The lateral radiograph showed that there were no obstructions in the airway space. On analysing Cephalometric radiograph, a Class II skeletal pattern with 5° of ANB & 5° NA - Pog was measured which shows mild mandibular deficiency and a horizontal growth pattern (SN to GoGn = 25°). Maxillary and mandibular incisors were in a normal position in relation to the basal bone.

CLINICAL DIAGNOSIS

Skeletal class II jaw relationship with Angle's class II division malocclusion with average growth pattern.

DISCUSSION OF MANAGEMENT

Treatment Plan and Biomechanics

- Phase 1 - myofunctional appliance therapy with Modified Bionator appliance.
- Phase 2 - Fixed Mechanotherapy with pre-adjusted edgewise 0.022 x 0.028 - in MBT prescription

The aim of the growth modification (myofunctional appliance) was to decrease the skeletal discrepancy of class II pattern & to achieve harmonious skeletal and dental relationship to class I.

In the first Phase modified Balters Bionator,^{12,13} was indicated to stimulate mandibular growth (Fig. 2). Incorporation of lip pads to bionator appliance was done with the thought of additional periosteal pull in labial vestibular area for better chin growth. It should be used all the time, except in the first month, when it should be removed for school activities, for speech adaptation. After that time, for as long as possible, the appliance should be used. This stage of treatment lasted 10 months and improved the facial growth pattern due to good patient cooperation, which led to the reduction of convexity of the bone profile, Class II malocclusion and overjet (Fig. 3)



Figure 1.
Pre-Treatment Extraoral & Intraoral
Photographs



Figure 2.
Modified Bionator Appliance Design and Intraoral Placement



Figure 3.
After Mandibular Advancement with Modified Bionator



Figure 4.
Phase 2 Pre-Adjusted Edgewise Appliance Photographs

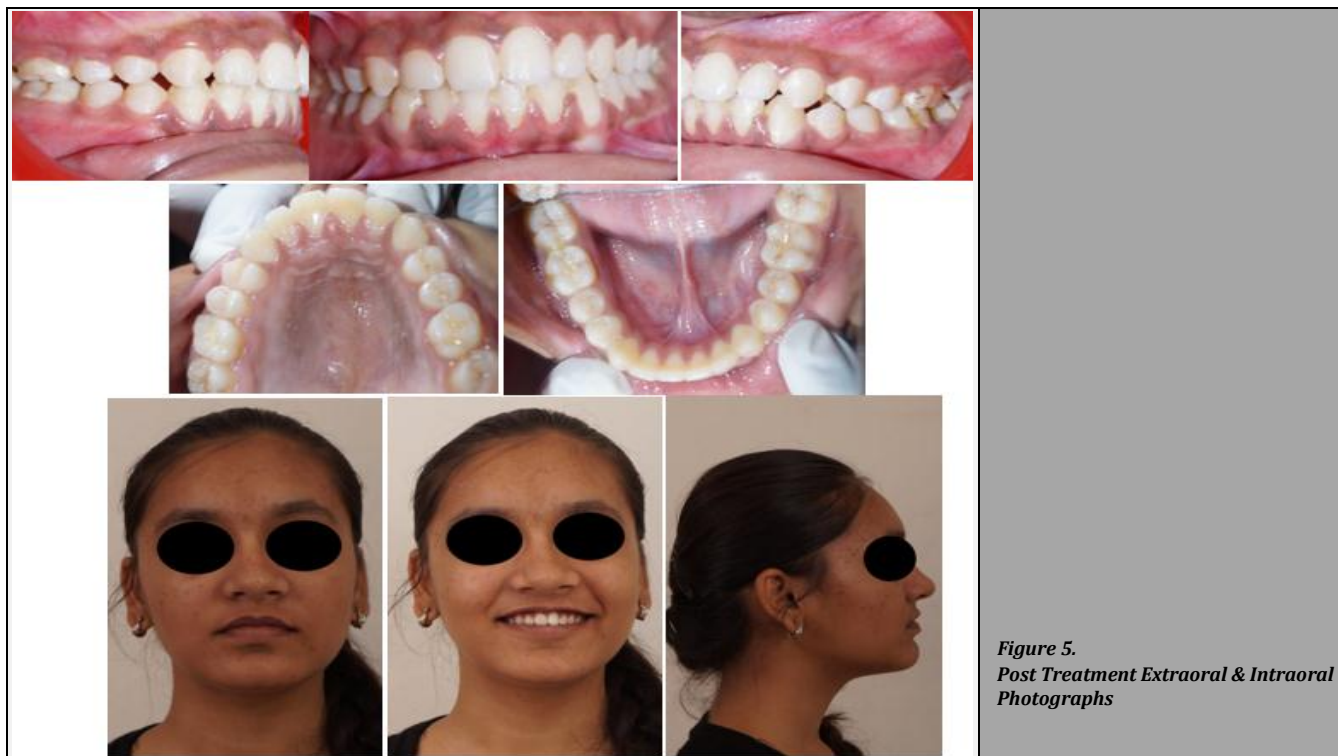


Figure 5.
Post Treatment Extraoral & Intraoral
Photographs



Figure 6.
Retainer

In Phase 2, a fixed mechanotherapy with 0.022 x 0.028 - in MBT prescription was started. Maxillary & Mandibular arches were levelled & aligned using round 0.014" & 0.016 nickel - titanium arch wires followed by 0.020 stainless steel wires. After that, intermaxillary Class II elastics and 0.019 x 0.025 - in stainless steel arch wires were used to achieve adequate intercuspation and to finish the correction of Class II malocclusion (Fig. 4). The patient was given a modified activator with maxillary & Mandibular labial bow & without interdental acrylic as a retainer after debonding for full time wear in the first six months and only at night for six more months' treatment lasted 10 months in the first stage, followed by a 7 - month interval, and 18 months in the second stage (Fig. 5 & 6).

Results

The end result of the treatment was Angle's Class I molar & canine relationship, having good intercuspation with adequate over jet & overbite. A pleasant straight profile with good perioral lip seal resulted from the stimulation of mandibular growth during pubertal growth spurt was achieved. The modified bionator with lip pad helped to reduced ANB angle from 5° to 1°, and the angle of convexity, from 7° to 1° by mandibular growth. The case was finished with Good periodontal health and dental integrity. Post treatment OPG &

Lat. Cephalogram showed no evidence of root resorption. There was no maxillary molar distalization, and mandibular incisors were minimally proclined (Fig. 8).

As the patient was kept on follow up, two years after treatment completion, Dental & Skeletal changes were stable with no evident relapse. (Fig. 7).



Figure 7. Post-Operative Follow Up after 2 Years

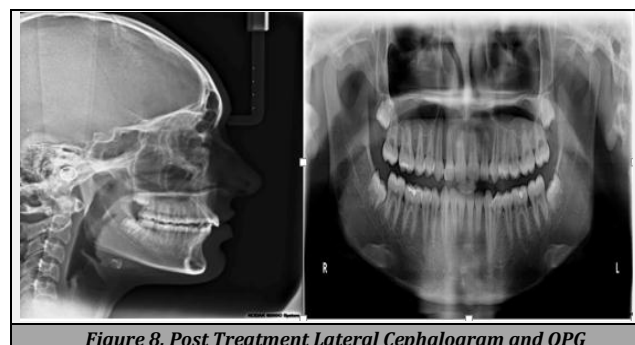


Figure 8. Post Treatment Lateral Cephalogram and OPG

DISCUSSION

The treatment of Angle's class II Div 1 is multifactorial. It requires thorough diagnosis & treatment planning addressing all the important issues. There are various methods to correct mandibular retrognathism during growth period. This case shows the use of bionator appliance with incorporation of lip pads which helps for chin correction by reducing the mentolabial sulcus depth. The correction of chin is very important as it plays an important role in facial aesthetics. This case includes myofunctional therapy with fixed mechanotherapy which helps to correct both skeletal & dental malocclusion.^{14,15,16}

Most of patients with skeletal Class II division 1 malocclusion use to have a normally positioned maxilla with smaller or retropositioned mandibular jaw. Class II malocclusion characterized by mandibular deficiency can be successfully treated with the use of myofunctional devices to advance the mandible during the active growth process. Reducing facial convexity and straightening profiles resulting in better aesthetics is a treatment goal in these cases. Functional appliances can be removable and fixed devices that modify the location of the mandible, both sagittally and vertically, by causing additional lengthening of the mandible by stimulating enhanced development of the condylar cartilage. There are a variety of myofunctional appliances that can be used to correct mandibular retrusion.

More or less, each proponent of the various functional appliances has formulated his own design and working hypothesis: Andresen, Haupl, and Petrik, Herren, and Harvold for the activator; Balters for the bionator; Frankel for the functional regulator; Stockfish for the kinetor; and Bimler for the Gebissformer.

To advance the mandible, removable myofunctional appliances such as activator, bionator, twin block, Frankel, etc. may be used.^{17,18,19,20,21,22,23,24,25}

In two ways, functional appliances work.

1. Application of force: Functional appliances exert force, strain on the involved structures and cause changes in shape and size. This alteration ultimately leads to secondary adaptation in function.
2. Elimination of force: elimination of an unnatural and oppressive force to allow the area to grow and develop.

The functional therapy theory of action is based on the hypothesis that malocclusions arise from imbalances in neuromuscular forces.

The new pattern of function leading to the creation of new morphological patterns is determined by functional appliances such as, acceptable jaw relationships, improvements in the amount and direction of growth of the jaws, better occlusion and proper teeth arrangement.

Muscular imbalance, soft tissue tone and function in the oro-naso-pharyngeal complex are fixed by functional appliances. Active devices are primarily orthopaedic in nature and impact the facial skeleton in condylar and sutural areas of developing children. The theory of functional appliance therapy is to reposition, with the aid of myofunctional appliance, a retrognathic lower jaw to a forward position after a protrusive bite registration. Myofunctional appliances for

mandibular advancement in class II therapy work by facilitating the downward and forward functional displacement of mandibular condyles.

Adaptive remodelling occurs in the temporomandibular joint (TMJ) articular surface to enhance the location of the mandible with respect to the maxilla. The eruption of posterior and anterior teeth is also affected by functional appliances.

The subsequent rotation of the occlusal plane and forward movement of the dentition leads to the correction of the class II relationship when upper anterior teeth are prevented from erupting, while the lower posterior teeth erupt up and forward.

The effect on the maxilla is almost always observed, albeit slight, along with any mandibular effects. The elasticity of the soft tissues creates a reactive force against the maxilla when the mandible is held forward, and restriction of maxillary development occurs, helping to correct the pattern of class II.^{26,27,28}

CONCLUSIONS

Results in the treatment of skeletal class II malocclusion during growth with Modified Bionator appliance are predictable, with improvements in facial growth pattern, functional occlusion, long term stability and adequate facial stability.

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Disclosure forms provided by the authors are available with the full text of this article at jemds.com.

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