

# Management of severe Class II malocclusion with sequential modified twin block and fixed orthodontic appliances

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## Abstract

Functional appliance is an effective way of treating skeletal Class II malocclusion in children and adolescents. A 12 months stepwise mandibular advancement protocol with Herbst appliance has been proved to enhance condylar growth and improve mandibular prognathism. The present case report documents a 12-year-old boy presenting with Angle's Class II, division 1 malocclusion associated with excessive overjet (11 mm), 100% deep bite, and retrognathic mandible. He was treated by a phase I growth modification therapy using twin block appliance with lip pads in a stepwise mandibular advancement protocol followed by a phase II preadjusted Edgewise appliance therapy.

**Key words:** Angle Class II malocclusion, functional appliances, myofunctional therapy

## INTRODUCTION

Based on the incisor relationship, Class II malocclusion is defined as the lower incisor edges lying posterior to the cingulum plateau of the upper incisors resulting in an increase in overjet.<sup>[1]</sup> The prevalence of having an overjet >10 mm has been reported to be around 0.2% of the population.<sup>[2]</sup> Large overjet, especially in children and adolescents is associated with an increased risk of traumatic injury to the upper anterior teeth and psychological distress which results in loss of self-esteem and problems with social interaction.

Correction of Class II malocclusion may be approached by growth modification, dental camouflage, and surgical

orthodontics.<sup>[2]</sup> For treating growing Class II patients, functional appliance is often applied in the stage of late mixed dentition or early permanent dentition to reduce excessive overjet by stimulating the growth of the mandible.<sup>[3]</sup>

The following case report documents a 12-year-old boy with 11 mm overjet treated by a phase I growth modification therapy using twin block appliance with lip pads in a stepwise mandibular advancement protocol<sup>[4-6]</sup> followed by a phase II preadjusted Edgewise appliance therapy to settle the occlusion and correct the remaining dental discrepancy.

## CLINICAL EXAMINATION AND DIAGNOSIS

A 12-year-old boy reported to the clinic complaining of forwardly placed upper front teeth. Extraorally, the patient had no apparent facial asymmetry. He had mesoprosopic

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facial form and convex facial profile. The nasolabial angle was acute and the chin recessive with incompetent lips. Lower lip was hypotonic, and lip trap was present. Interlabial distance was 3 mm with a 6 mm exposure of upper incisors at rest. The patient had a deep mentolabial sulcus. He showed obvious mentalis muscle strain on closing his lips. The temporomandibular joints were normal. The clinical FMA was low, and he had positive visual treatment objective on the advancement of the mandible.

Intraorally, the patient presented in late mixed dentition with right mandibular second primary molar being present in the oral cavity. He had a Class II division 1 incisor relationship and increased overjet of 11 mm. The deep bite was increased (7 mm) and complete to the palate. Dental midline was coincident with facial midline. The molar and canine relationships were full unit Class II on both sides. The maxillary incisors were proclined, and 25# palatally displaced. The arch was mildly constricted in the posterior region. There was mild crowding in the mandibular arch. Dental examination revealed a restored dentition without active carious lesions and with good oral hygiene [Figure 1].

Orthopantomogram confirmed the presence of right second primary molar and all permanent teeth including the developing lower third molar tooth buds. At this stage, there was no sign of developing upper third molars [Figure 2].

In the cephalometric assessment, the increased ANB ( $7^\circ$ ) and wits appraisal (+8 mm) confirmed that the patient had a Class II skeletal pattern. The normal SNA and reduced SNB and SNPg indicated a normal maxilla, receding mandible, and chin. Reduced SN-mandibular plane angle ( $24^\circ$ ) and Jarabak's ratio (73%) indicated a horizontal growth pattern. The upper incisors were proclined, whereas the lower incisors were retroclined [Figure 2].



Figure 1: Pretreatment clinical photographs

The lateral cephalometric findings were summarized as “A case of skeletal Class II malocclusion with orthognathic maxilla and retrognathic mandible with Angle’s Class II molar relation and horizontal growth pattern.”

#### Aims of treatment

- Enhance forward growth of the mandible to improve facial profile and mandible/cranial base relationship
- Reduce overjet and overbite
- Achieve Class I incisor and buccal segment relationships
- Eliminate lip trap and improve lip competency
- Relieve crowding and align teeth.

#### Treatment progress

##### Phase I: Growth modification therapy

An acrylic twin block appliance with lip pads was given for full-time wear with an initial mandibular advancement of 6 mm and interocclusal clearance of 5 mm in the 1<sup>st</sup> premolar region. Upper component of the twin block incorporated a labial bow for anterior retention of the appliance. A midline screw was also included. Applying Frankel’s philosophy to twin block appliance, lower lip pads were added to break up abnormal perioral muscle habits (lip trap in this case), shield away the undesirable effects of lip musculature and to exert a stretch effect on underlying periosteal layer enhancing basal bone development. These lip pads made of acrylic rested away from the gingival tissues in the vestibule. The configuration of lip pad was rhomboidal or like parallelogram [Figure 3].

After 6 months, the appliance was activated by advancing the mandible by 5 mm to achieve an edge to edge incisor relationship. The patient was instructed to turn the maxillary expansion screw once a week and was reviewed every 4 weeks. Bite blocks were trimmed to achieve proper vertical eruption of the posterior dentition to reduce the deep bite.

The twin block appliance was removed after 12 months of treatment. Normal overjet, overcorrected molar relationship, and lip competency were achieved by phase

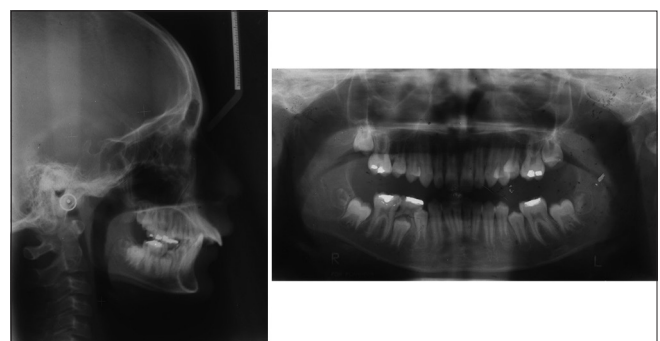


Figure 2: Pretreatment panoramic radiograph and lateral cephalogram

I orthopedic stage. The lateral cephalometric analysis suggested that skeletal class I occlusion was achieved [Figures 4 and 5].

**Phase II: Fixed appliance**

A simple upper appliance with an anterior inclined plane was given to be worn full time for 3 months to maintain and retain the skeletal corrections. The 0.018” slot preadjusted Edgewise appliance with Roth prescription was bonded on both upper and lower arches, and alignment was initiated. Utility intrusion arch fabricated using 0.016” × 0.022” SS wire was placed in the maxillary arch for 3 months for incisor intrusion [Figure 6]. The archwires were subsequently changed to 0.017” × 0.025” stainless steel wire for torque control. Class II elastics were worn full time to maintain the buccal relationships and overjet. Root paralleling was carefully adjusted, and cusp seating was carried out by vertical elastics at the end of treatment. The total treatment was completed in 25 months. Upper and lower Hawley’s retainers were given immediately after the fixed orthodontic appliance was removed [Figures 7, 8 and Table 1].

**Treatment results**

The treatment objectives were achieved. The posttreatment facial profile of the patient demonstrated noticeable improvement with good facial esthetics, straight facial

profile, and balanced competent lips. The intraoral occlusion revealed satisfactory result with characteristics of well-aligned dentition. Overjet and overbite were reduced to 3 mm and 2.5 mm, respectively. Class I canine and molar relationship with good buccal interdigitation were also achieved.

During treatment, SNA value was reduced by 1°, whereas the SNB value increased by 3°. As a consequence, the ANB value decreased by 4° toward Class I skeletal pattern. The upper incisor proclination was reduced, and lower incisor proclination was increased. The effective mandibular length increased by 6 mm by forward growth of the mandible. The vertical mandibular proportions also increased during treatment [Table 2].

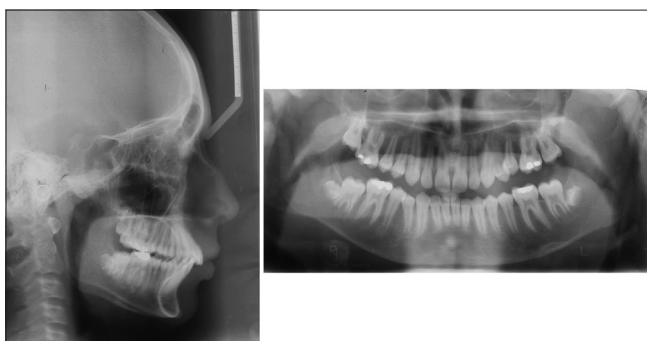
The lateral cephalometric superimposition was compared between pretreatment, posttwin block, and postfixed appliance treatment [Figures 9 and 10]. Superimposition demonstrated that both maxillary and mandibular molars were extruded and moved mesially. Nevertheless, the favorable mandibular growth significantly compensated the



**Figure 3:** Twin block with lip pads in place



**Figure 4:** Postfunctional appliance photographs



**Figure 5:** Postfunctional appliance panoramic radiograph and lateral cephalogram



**Figure 6:** Intrusion arch in place



Figure 7: Posttreatment clinical photographs

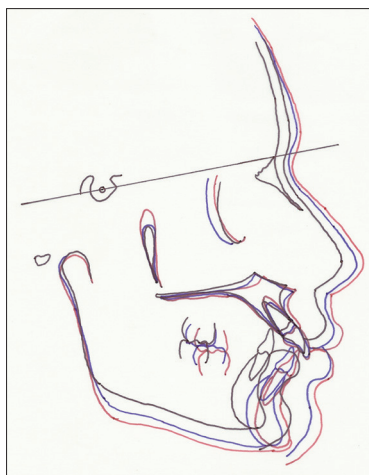


Figure 9: Superimposition of pretreatment, postfunctional appliance treatment, and posttreatment cephalometric tracings (black line: Before treatment, blue line: Postfunctional appliance treatment with twin block, red line: posttreatment)

Table 1: Treatment sequence		
Treatment	Archwires	Duration (months)
Correction of skeletal dysplasia	Twin block with lip pads applied and adjusted	12
	Anterior bite plane	3
Alignment of upper and lower arches	0.014" NiTi, 0.016" NiTi	2
	0.016"×0.022" NiTi	1
Incisor intrusion	Utility intrusion arch (0.016"×0.022" SS)	3
Finishing and detailing	0.017"×0.025" NiTi	1
	0.017"×0.025" TMA	1
	0.017"×0.025" SS	2
Retention	U/L Hawley's retainers	

TMA – Titanium molybdenum alloy; SS – Stainless steel; NiTi – Nickel titanium

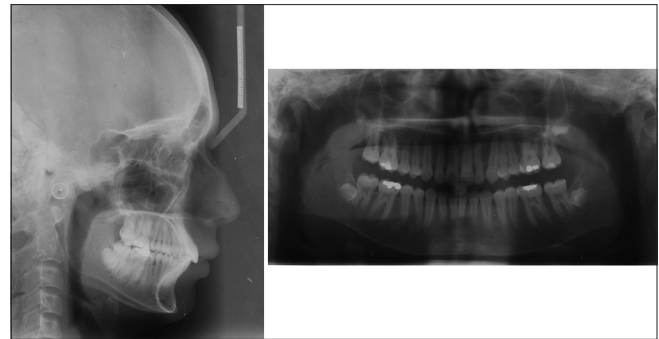


Figure 8: Posttreatment panoramic radiograph and lateral cephalogram

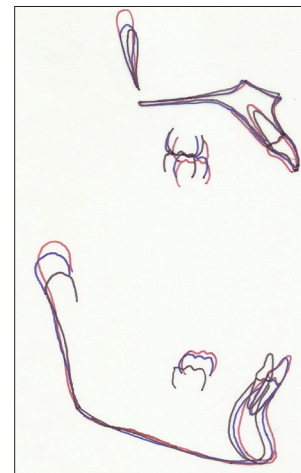


Figure 10: Superimposition of pretreatment, postfunctional appliance treatment, and posttreatment cephalometric tracings (black line: Before treatment, blue line: Postfunctional appliance treatment with twin block, red line: posttreatment)

dental extrusion and fully expressed its forward-downward growing pattern.

## DISCUSSION

Numerous methods treating Class II, division I malocclusion have been reported. Tulloch *et al.* found favorable growth changes in around 75–80% of Class II patients receiving early treatment with either a headgear or a functional appliance.<sup>[7]</sup> The case reported in this article is a young male patient in the acceleration stage of growth.<sup>[8]</sup> The patient was an ideal choice for functional appliance treatment.

Twin block has several well-established advantages including the fact that it is well-tolerated by patients,<sup>[9]</sup> robust, easy to repair and is suitable to use in the permanent and mixed dentition. As a result of the skeletal and dentoalveolar changes produced by twin block appliance with lip pads, a more favorable soft tissue environment was created with

**Table 2: Cephalometric analysis**

Variable	Premyofunctional	Postmyofunctional	Predebond
SNA (°)	82	81	81
SNB (°)	75	78	78
ANB (°)	7	3	3
SN-Pg (°)	78	81	81
1-NA (°)	36	34	33
1-NA (mm)	10	9	7
1-NB (°)	18	30	31
1-NB (mm)	5	8	7
1-1 (°)	120	114	114
1-SN (°)	117	115	114
GoGn-SN (°)	24	26	26
FMA (°)	20	22	21
IMPA (°)	95	103	106
FMIA (°)	65	55	53
Wits appraisal (mm)	8	3	3
Saddle angle (N-S-Ar) (°)	123	120	121
Articular angle (S-Ar-Go) (°)	140	140	141
Gonial angle (Ar-Go-Me) (°)	122	124	121
Lower gonial angle (°)	64	69	67
Maxillary length (mm)	49	50	51
Mandibular length (Go-Pog) (mm)	69	74	75
Ramus height (Go-Cd) (mm)	55	62	66
Anterior facial height (N-Me) (mm)	111	118	120
Posterior facial height (S-Go) (mm)	81	88	90
Jarabak's ratio (%)	73	74	75

elimination of the lip trap and the lower lip acting labially on the upper incisors.

Orthodontic camouflage by extraction of upper premolars could have been another treatment option but was not considered for a number of reasons. The patient was in the growth spurt according to the cervical maturation index.<sup>[8]</sup> The treatment effect by the functional appliance could be maximized during this period. The patient and his parents were keen to avoid extractions due to concerns about removing healthy teeth. Extraction of upper premolar teeth might be able to retract the upper protrusive lip and improve facial convexity to a certain extent, but would not improve mandibular retrognathism.

In this case, the treatment objectives were achieved largely due to the good compliance by the patient. Mandibular advancement every 6 months in a stepwise manner has been proved more effective in stimulating condylar growth<sup>[10]</sup> and improving mandibular prognathism.<sup>[11]</sup> Bass also suggested that gradual bite advancement would improve patient comfort at rest and during speech, and that it would be more likely to maintain the correct position of the appliance during sleep.<sup>[12]</sup>

The overjet reduction in this case was achieved by favorable growth of mandible to bring the lower incisors forward and dentoalveolar effect to retrocline the upper incisors.

Anteroposterior relationship of the maxilla and mandible improved, as angle ANB decreased from 7° to 3°. Maxillary forward movement was restrained, and the mandibular apical base moved forward in relation to cranial base, which proved that twin block produced head gear effect, like all the other functional appliances.

#### Long-term prognosis

The prognosis for stability is good as the patient's growth pattern is favorable. Good buccal interdigitation and incisal contact also helped to stabilize the occlusal stability, as well as retainers.

## CONCLUSION

The twin block appliance due to its acceptability, adaptability, versatility, efficiency, and ease of incremental advancement without changing the appliance has become one of the most widely used functional appliances in the correction of Class II malocclusion. It can eliminate etiologic factors such as sucking habits and lip trap, restore normal growth, and reduce the severity of skeletal abnormalities.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have

given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

#### Conflicts of interest

There are no conflicts of interest.

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