

One-phase Management with a Standard Twin-Block Appliance Followed by Fixed Orthodontic Treatment – A Case Report

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Abstract

A wide range of skeletal and dental configurations can result in Class II malocclusion. For the correction of skeletal Class II malocclusions, a variety of treatment approaches are available, including functional appliances, extraoral appliances, and orthopedic realignment of the jaws surgically depending on the patient's age and severity of the malocclusion. In this case report, a 13-year-old male patient presented with a Class II division 1 malocclusion on a Class II skeletal base with convex profile and posterior divergence and increased incisor visibility. Intraorally, he presented with Angle's Class II molar relation bilaterally and incisor relation with an overjet of 9 mm and overbite of 4 mm. There were two stages to the treatment. Stage 1 was growth modification with twin-block appliance, and Stage 2 was post-functional orthodontics with pre-adjusted edgewise appliance 0.022" × 0.028" MBT prescription for dental correction and finishing and detailing of occlusion. The post-treatment results were highly satisfactory, showing improvement in facial esthetics with an acceptable occlusion.

Keywords: Angle's Class II malocclusion, One-phase treatment, Twin-block appliance.

INTRODUCTION

Many treatment modalities are currently available to the orthodontist for the alteration of occlusal relationships of Class II malocclusions. These include a variety of extraoral traction appliances, arch expansion mechanisms, extraction procedures, and functional jaw orthopedic appliances.^[1] Jaw growth affects orthodontic treatment, usually favorably, but sometimes unfavorably. When and how much growth will occur is completely unpredictable till the growth is completed. During the growing stage, functional appliance therapy has become an increasingly common approach of addressing Class II malocclusions with mandibular deficiency. By altering the pressures produced by the neuromuscular complex, these appliances direct the pattern and direction of jaw growth. With functional appliance treatment, there is a restraining effect on the growth of the maxilla and maxillary dentoalveolar complex, as well as stimulation of mandibular growth and mandibular alveolar adaptation. Management of skeletal Class II cases depends on various factors including age, growth, compliance, and the severity of the malocclusion.^[2]

Many clinicians choose "the Standard Twin-Block appliance" above the other removable functional appliances available because of the patient's ease of use and ease of management of the appliance. It was first introduced by Clark^[3] in 1988 and

consists of two separate upper and lower removable plates with acrylic blocks trimmed to an angle of 70°. Compared to other appliances, the twin block seems to be more useful in causing sagittal and vertical changes.^[4] The popularity of twin block is due to its great patient adaptability and potential to make rapid treatment modifications.

The following case report illustrates one-phase treatment using a standard twin-block appliance for skeletal correction of a Class II division 1 malocclusion in a 13-year-old male patient followed by comprehensive fixed orthodontic treatment.

CASE REPORT

A 13-year-old male patient reported to the postgraduate clinic complaining of forwardly placed upper front teeth. There was no considerable medical or dental history for the patient. On extraoral examination, (Figure 1) patient presented with convex

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Figure 1: Pre-treatment extraoral and intraoral photographs and radiographs

profile, posterior divergence, potentially incompetent lips with lip trap, chin was normal, and positive visual treatment objective (VTO) (Figure 2). Intraoral examination (Figure 1) revealed an Angle's Class II division 1 malocclusion and Class II canine on both sides with upper anterior proclination. The overjet and overbite were 9 mm and 4 mm, respectively, and midline diastema of 3 mm. Panoramic radiographs revealed the presence of all the teeth including the third molars whose root formation was yet to be completed. There were supernumerary tooth germs between 14 and 15, 33 and 34, and 44 and 45 (Figure 1).

Cephalometric analysis revealed normal maxilla and retrognathic mandible with normal growth pattern (Figure 1). The patient had convex profile, increased overjet and overbite, and acute nasolabial angle. The maxillary incisors were proclined with respect to the maxillary base. Skeletal maturity was assessed using the cervical vertebral maturation index staging, which showed Stage 3 of skeletal maturation which is an ideal stage for growth modification by mandibular advancement (Figure 1).

Bolton's analysis showed overall maxillary tooth material excess by 1.2 mm and mandibular anterior tooth material excess by 0.68 mm.

Diagnostic summary

A 13-year-old boy presented with Angle's Class II division 1 malocclusion on a Class II skeletal base. He presented with a convex profile, potentially incompetent lips, clinically retrusive mandible, and a positive VTO. Intraorally, he presented with bilateral Angle's Class II molar and canine relation, overjet and overbite of 9 mm and 4 mm, respectively, and midline diastema of 3 mm. Cephalometrically, he presented with a



Figure 2: Positive visual treatment objective

Class II skeletal pattern with retrusive mandible and proclined upper anteriors.

Aims and objectives of treatment

- Interception of Class II skeletal relationship (mandibular growth modification)
- To achieve an esthetic profile
- To achieve Class I incisor relationship
- To achieve Class I molar and canine relationship
- To achieve ideal overjet and overbite.

Treatment plan

There were two stages to the treatment:

1. Stage 1 – Growth modification with a standard twin-block appliance
2. Stage 2 – Comprehensive fixed orthodontic treatment.

Treatment

After discussion with the parents and patient, Stage 1 treatment was started. The twin-block appliance was delivered to the patient. A midline jack screw was incorporated in the maxillary component of the twin-block appliance. The jack screw was activated at a rate of 0.5 mm every 3 weeks to achieve maxillary expansion of 4 mm. The patient was given instruction to wear the appliance full time. The bite plane in the maxillary appliance was trimmed during recall visits to guide the mandibular dentition. The appliance was continued for 11 months. With twin-block treatment, 7 mm advancement of the mandible was achieved (Figure 3a).

After the twin-block treatment, supernumerary teeth that were present were extracted, and the second stage of the treatment began. For settling in the premolar region and final detailing of occlusion, fixed orthodontic treatment was started after the support phase of twin block without giving an upper anterior inclined bite plane appliance. Pre-adjusted edgewise appliance 0.022" slot MBT prescription (Ormco Mini 2000 brackets) was bonded on the maxillary and mandibular teeth and a 0.014" NiTi was placed. After the initial alignment was complete, the arch wires were sequentially changed to 0.017"×0.025" and 0.019"×0.025" Nickel Titanium wires on the maxillary and mandibular teeth. After aligning and leveling, both arches were coordinated on 0.019 × 0.025" stainless steel archwires and the midline diastema was closed

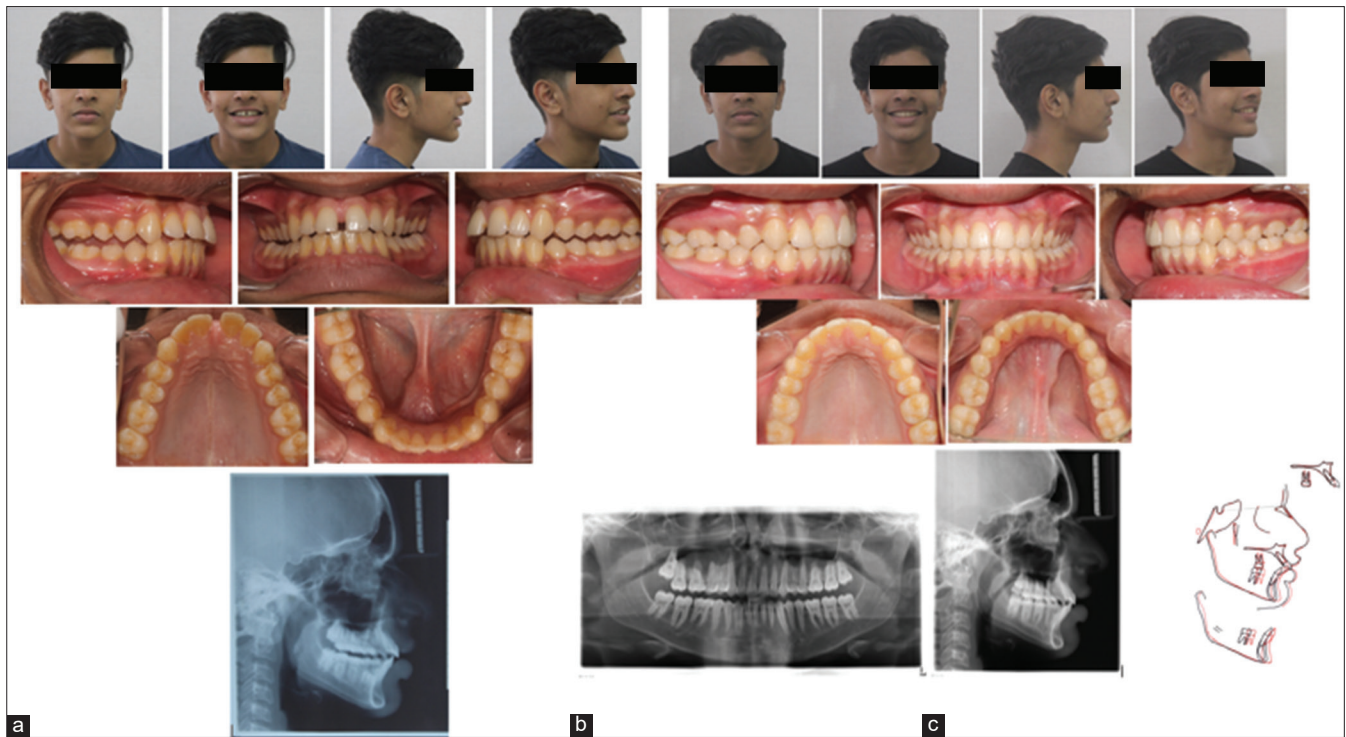


Figure 3: (a) Post-functional extraoral and intraoral photographs and lateral cephalogram. (b) Post-treatment extraoral and intraoral photographs and radiographs. (c) Cephalometric superimposition

(Figure 3b). The appliance was debonded after 10 months, and the patient was given fixed retainers that were palatally and lingually bonded.

The skeletal and dentoalveolar changes obtained with the twin-block appliance can be attributed to the positive esthetic outcome obtained at the end of comprehensive orthodontic treatment in this patient. Post-treatment, there was an increase in SNB angle of 3° , from 75° to 78° (Table 1). This was most likely the result of post-functional mandibular advancement by 7 mm. Post-treatment values showed increase in facial height when compared to pre-treatment. Maxillary incisor proclination was reduced from 115° to 108° whereas there was 2° increase in mandibular incisor proclination. Overjet was reduced from 9 mm to 1.5 mm which was attributed to the skeletal and dental changes obtained.

The previous literature has revealed the results of many randomized clinical trials to favor one-phase treatment in Class II patients.^[5] Two-phase treatment was observed to have longer total duration and they did not produce a better result when compared to one-phase treatment. When a twin-block appliance was used in the first stage of treatment, the expected time of fixed appliance therapy in the second stage of treatment is reduced. Furthermore, without having to wait until the permanent teeth erupt, patients' facial esthetics will be considerably improved in a relatively short amount of time.

Treatment results

The retrognathic mandible was successfully corrected with mandibular advancement of 7 mm. With a Class I incisal, canine,

and molar relationship and adequate buccal intercuspatation, an optimal overjet and overbite were established. Lip competency and facial convexity were improved. Dental midline was corrected in relation to facial midline, with mutually protected occlusion and canine guidance. The panoramic radiograph showed adequate root parallelism in both the maxillary and mandibular arches and all the third molars were in normal development (Figure 3b). The changes in superimposition are shown in Figure 3c. Overall, the patient's soft-tissue profile was improved and satisfactory dental, functional, and facial esthetics were achieved.

DISCUSSION

Despite certain concerns and controversy, treatment with functional appliances has showed substantial improvements in the dental and skeletal relationships of a growing patient in a short period of time and has several well-established advantages. The basic goal of functional appliance therapy is to stimulate greater growth at the condylar cartilage to promote lengthening of the mandible. The peak growth velocity would be expected around age 12 years in girls and age 14 years in boys.^[6] Treatment of Class II division 1 malocclusions should be aimed at solving the dentoskeletal disharmony to obtain favorable facial esthetics.^[7] The use of a one-phase treatment approach can successfully treat growing patients and can drastically improve both function and esthetics, ultimately resulting in improved self-confidence. Functional appliances disocclude the maxilla from the mandible, restrict maxillary growth, and allow mandibular advancement. Dentoalveolar

Table 1: Comparison between pre-treatment, post-functional, and post-treatment cephalometric values

Variable	Pre-treatment values	Post-functional values	Post-treatment values
Sagittal skeletal relationships			
SNA (°)	81	81	81
SNB (°)	75	78	78
ANB (°)	6	3	3
Wits appraisal (mm)	-5	-2	-2
Vertical skeletal relationship			
Maxillary-mandibular plane angle (°)	27	31	31
Upper anterior facial height (mm)	46	46	46
Lower anterior facial height (mm)	62	64	64
Jarabak ratio	73	73	73
Maxillary length (mm)	85	85	85
Mandibular length (mm)	112	116	116
Dental base relationship			
Upper incisor to NA (mm)	12	7	4
Lower incisor to NB (mm)	6	6	5
Upper incisor to SN plane (°)	129	115	108
Upper incisor to maxillary plane (°)	55	60	68
Lower incisor to mandibular plane (°)	97	98	98
Analysis of facial skeleton			
Saddle angle (°)	119	119	119
Articular angle (°)	138	133.5	133.5
Gonial angle (°)	129	132	132
Sum of angles (°)	386	384.5	384.5
Upper gonial angle (°)	52	52	52
Lower gonial angle (°)	77	80	80
Y-axis (°)	58	60	60

retroclination of the maxillary teeth and proclination of the mandibular teeth are also observed. All these changes together contribute to the establishment of a new occlusion while the patient is growing.^[8]

Twin-block therapy is widely accepted as a better alternative to the earlier bulky monobloc appliances when treating Class II division 1 patients. The twin-block appliance is a popular choice for correcting Class II malocclusions because of its adaptability, acceptability, efficiency, and versatility, as well as the convenience of incrementally advancing the mandible without having to change the appliance.^[5] It has several advantages and the most significant is that it is well-tolerated and can be worn constantly by the patient.^[3]

Successful treatment of Class II division 1 cases can prevent (1) possible trauma to maxillary incisors, (2) temporomandibular joint dysfunction, and (3) poor psychosocial adaptation.^[9] It is important to consider that in mild-to-moderate skeletal Class II division 1 cases, where active growth is complete, it is not possible to undertake growth modification treatment. The underlying skeletal discrepancy of some severe cases can be camouflaged by orthodontic treatment in conjunction with extractions.^[10] The most significant component in the success of utilizing a functional appliance is the patient's compliance, and this patient was very motivated and had exceptional compliance.

CONCLUSION

The one-phase treatment with twin block followed by comprehensive fixed orthodontic treatment enabled us to obtain satisfactory outcomes in this patient. The mandible was advanced by 7 mm. Skeletal Class I relation was achieved, facial convexity was reduced, lip competence was achieved, and the midlines were coinciding. The success of this case would not have been possible without the compliance of the patient in the first stage of treatment. Given the severity of the situation at the outset, the anticipated outcome was achieved. It was possible to attain harmonious skeletal, dental, and soft-tissue equilibrium.

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