International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Twin Block - The Paired Perfection One Phase Treatment of Adolescent Class II Malocclusion using Standard Twin - Block Appliance Followed by Fixed Orthodontic Treatment - A Case Report

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Abstract: ***Class II malocclusion is one of the most common orthodontic problems and it affects one - third of patients seeking orthodontic treatment. It can be due to prognathic maxilla, retrognathic mandible or both. Twin Block is a well - accepted patient friendly functional appliance for the treatment of growing patients with Class II malocclusion due to mandibular retrognathism. It works by guiding the mandible forward through the inclined plane on the bite block. It alters the neuromuscular environment and promotes favourable growth of the mandible by condylar adaptation. This case report describes the comprehensive management of a 11 - year - old female patient diagnosed with a severe Class II skeletal discrepancy and Class II div I malocclusion with retrognathic mandible. Treatment was carried out in 2 stages. Stage I included twin block for mandibular advancement, reducing the overjet, achieve Class I molar relationships and gain anchorage at the start of treatment to simplify the fixed appliance stage. Stage II treatment included preadjusted edgewise appliance therapy for the aligning and levelling of the dentition. The post - treatment results were highly satisfactory, showing improvement in dental, skeletal and soft tissue profile.***

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

1. Introduction

Class II malocclusion comprises a wide spectrum of specific skeletal, dental, and soft tissue features. Growth modification, dental camouflage and surgical correction are the various treatment modalities. For growing patients, functional appliances are widely used to correct skeletal discrepancy by stimulating growth of mandible. They improve the functional relationship by eliminating unfavourable developmental factors and improving the muscle environment that envelops the developing occlusion.

A case - based analysis and the clinician's preference determine which of the several functional appliances should be used. Many studies indicate that Twin - block appliance is the most preferred removable functional appliance. In 1988, Clark[1] described the twin block appliance and is now popularly used in growing patients with retruded mandible. The amount of mandibular advancement in twin block construction varies from patient to patient. In case of limited overjet, bite can be registered by placing incisors in an edge - to - edge relation while in patients with larger overjet, a step - wise advancement is done by advancing the mandible gradually.[2]

The following case report exemplifies one - phase treatment using a standard twin - block appliance for skeletal correction of a Class II division 1 malocclusion in a 11 - year - old female patient followed by comprehensive fixed orthodontic treatment.

2. Case Report

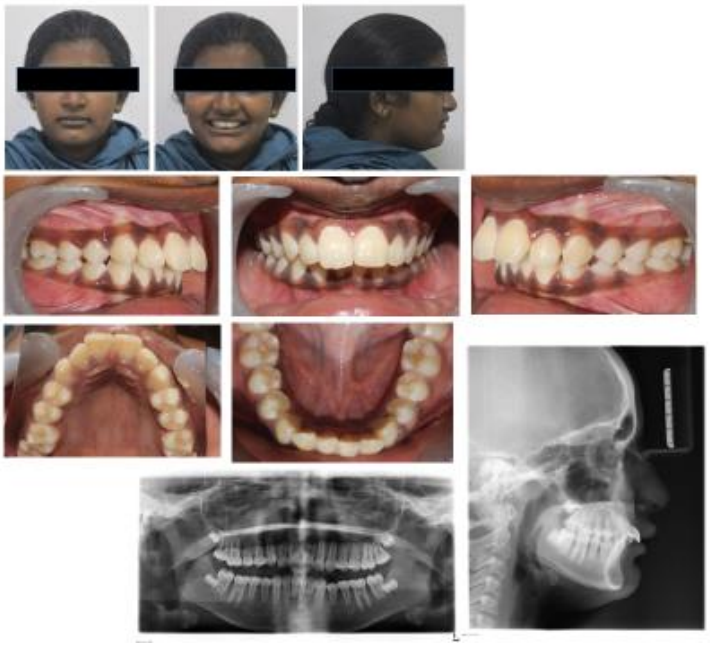

Figure 1: Pre - treatment extra oral and intraoral photographs and radiographs

A 11 - year - old female patient reported to the department with the chief complaint of forwardly placed upper front teeth. Extra oral examination revealed that the patient had an apparently symmetrical face with a convex profile, incompetent lips, acute nasolabial angle, deep mento - labial sulcus, prominent chin and posterior divergence (Figure 1). Intraoral examination revealed an end - on molar relation on left side and Angle's Class II molar relation on right side with end - on canine relation bilaterally and Class II incisor relationship. The overjet was 9 mm, and overbite of 5mm with mandibular midline shifted to right by 3 mm and maxillary midline corresponding with the facial midline (Figure 1). Orthopantomogram of the patient revealed all teeth erupted upto the second molars and 3rd molar buds seen in all the quadrants (Figure 1).

The values of the Cephalometric analysis (Figure 1) conformed with the clinical examination as Class II division 1 malocclusion on a skeletal Class II base with normal maxilla, retrognathic mandible with ANB - 6° and Wits analysis - 4mm. Skeletal parameters revealed a normal maxilla and retruded mandible in relation to cranium, normodivergent growth pattern with increased saddle angle and normal gonial angle. Dento - alveolar findings showed proclined and protruded maxillary anteriors and normally positioned mandibular incisors with an incisor visibility of 2 mm at rest. The pre - treatment Cephalogram (Figure 1) indicated that she was at the peak of her pubertal growth spurt (CVMI - 4) with a considerable amount of growth remaining. The patient had a positive visual treatment objective (VTO) (Figure 2) which favoured the use of mandibular advancement using the twin block appliance.

Figure 2: Positive visual treatment objective

Diagnostic Summary

A 11 - year - old girl was diagnosed as Angle's Class II division 1 malocclusion on a Class II skeletal base with normal maxilla, retrognathic mandible and normal growth pattern. Other associated problems include proclined upper and lower anteriors, mild upper and lower anterior crowding with overjet of 9mm and overbite of 5mm and lower midline shifted to right by 3mm. Overall dental health was satisfactory. Soft tissue parameter reveals convex profile, acute nasolabial angle, incompetent lips.

Treatment Objectives

a) Interception of Class II skeletal malocclusion (mandibular growth modification).
b) To achieve optimum soft tissue balance and an aesthetic profile.
c) Achievement of ideal overjet and overbite.
d) To achieve Class I incisor relationship.
e) To achieve Class I molar and canine relationship bilaterally.
f) Long term retention.

Treatment Plan

A one - phase comprehensive treatment was planned with myofunctional appliance therapy using Twin - block appliance, immediately followed by upper and lower preadjusted edgewise fixed appliance 0.022" MBT prescription.

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 Progress

After discussion with the parents and patient, Stage 1 treatment was started. The twin block appliance was delivered to the patient and she was instructed full - time wear of the twin block. A midline jack screw was incorporated in the maxillary component of the twin - block appliance. According to William J. Clark, it was advised to activate the expansion screw by one quarter turn per week, continuing until the upper arch width was adequate to accommodate the lower counterpart. Selective trimming was done on the posterior bite blocks to permit differential eruption of lower premolars and molars. The upper bite block was trimmed, leaving a clearance of 1–2 mm. Trimming of the upper block continued until all the occlusal coverage was removed from the upper molars. Due to strong patient compliance the functional therapy goals were met and over the course of 9 months this phase of therapy completed. With twin - block treatment, mandibular length was increased by 5 mm, Overjet correction of 6mm achieved and lower molar moved mesially by 6 mm.

After the twin - block treatment, the second stage of the treatment began. For settling in the premolar region and final detailing of occlusion, fixed orthodontic treatment with an upper anterior inclined bite plane was started. Pre - adjusted edgewise appliance 0.022" slot MBT prescription (Ormco Mini 2000 brackets, Glendora, CA) was bonded on the maxillary and mandibular teeth and maxillary and mandibular 0.014" Nitinol wires 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 levelling, both arches were coordinated on 0.019 × 0.025" stainless steel arch wires. The appliance was debonded after 9 months, and the patient was given Hawley's retainer for upper and lower arches.

The skeletal and dentoalveolar changes obtained with the twin - block appliance can be attributed to the positive aesthetic outcome obtained at the end of comprehensive orthodontic treatment in this patient. An increase in the lower anterior facial height was seen cephalometrically in both the post - functional and post - treatment lateral cephalograms (Table 1). There was also good improvement in the macro and micro smile characteristics of the patient. An ideal overjet and overbite were established with a Class I incisal, canine and molar relationship with good buccal intercuspation (Figure 3a and 3b). The upper and lower dental midlines coordinated with each other and the facial midline. Evaluation of post - treatment panoramic radiograph showed acceptable root parallelism along with normal alveolar bone levels (Figure 3b).

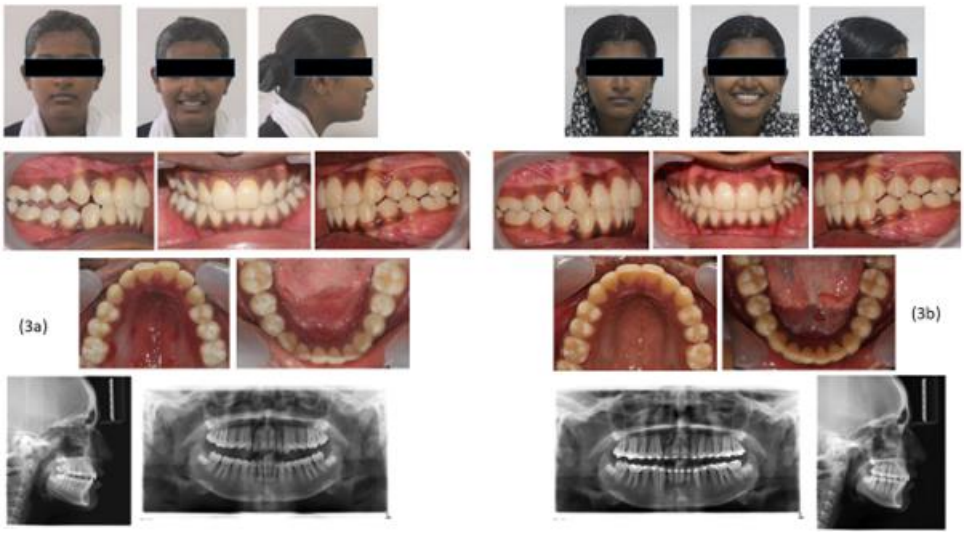

Figure 3: (a) Post- functional extraoral and intraoral photographs and radiographs. (b) Post - treatment extraoral and intraoral photographs and radiographs.

Figure 4: Pre - treatment, Post - functional, Post - treatment comparison of profile.

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

Variable	Pre - treatment values	Post - functional values	Post - treatment values
Skeletal Parameters			
SNA	82°	81°	81°
SNB	76°	80°	80°
ANB	6°	1°	1°
Wits appraisal	4mm	2mm	2mm
SN - GO GN	30°	28°	27°
FMA	24°	28°	28°
Dental Parameters			

Upper incisor to NA (mm)	11 mm	9mm	4 mm
Lower incisor to NB (mm)	4 mm	5 mm	5 mm
Upper incisor to SN plane (°)	117°	102°	100°
Upper incisor to palatal plane (°)	71°	65°	65°
Lower incisor to mandibular plane (°)	92°	97°	97°
Analysis Of Facial Skeleton			
Saddle angle (°)	131°	130°	130°
Articular angle (°)	141°	138°	138°
Gonial angle (°)	124°	122°	122°
Sum of angles (°)	396°	390°	390°
Y - axis (°)	64°	68°	68°

3. Discussion

Class II malocclusion can be caused by a variety of skeletal and dental factors. As a result, determining the cause and manifestation of Class II malocclusion, as well as identifying differential diagnoses, will aid in its correction and treatment planning, whether functional, orthodontic or surgical.[3, 4] Treatment of Class II division 1 malocclusions should be aimed at solving the dentoskeletal disharmony to obtain favorable facial esthetics.[5]

Clark's twin block is a functional appliance that allows mandibular displacement and efficiently modifies the occlusal inclined plane to induce a favourably directed occlusal force. To aid the fundamental processes of mastication and swallowing, rapid soft - tissue adaptation occurs in response to a better occlusal alignment.[1] The twin - block appliance is a popular choice for correcting Class II malocclusion because of its adaptability, acceptability, efficiency and versatility, as well as the convenience of incrementally advancing the mandible without having to change the appliance. It has several advantages and the most significant is that it is well - tolerated and the patient can wear the appliance full time with little discomfort. Aesthetics and repairability are two further additional benefits.[6] For class II malocclusion, a two - phase approach was traditionally recommended. The first phase, typically initiated between the age of 7 to 9 years, focuses on correcting the jaw relationship using the functional appliances, followed by a retention period lasting 1 to 1.5 years. The second phase occurring in early adolescence, entails comprehensive fixed orthodontic treatment.[7, 8] A one - phase treatment approach addresses both the jaw relationship and the dental malocclusion simultaneously or consecutively, commencing during early adolescence period.[7]

Growing patients can be successfully treated with a one - phase treatment strategy, which also significantly improves function and aesthetics, leading to increased self - confidence. Functional appliances disocclude the maxilla from the mandible, restrict maxillary growth, and allow mandibular advancement. Dentoalveolar 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.[9] 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.[10] The underlying skeletal discrepancy of some severe cases can be camouflaged by orthodontic treatment in conjunction with extractions.[11]

This patient initially presented with a skeletal Class II malocclusion, characterized by ANB angle of 6°. Following consistent wear of the twin block appliance for 9 months, the ANB angle reduced to 1°, while the SNB angle increased from 76° to 80°. Additionally, mandibular advancement of 5 mm was observed. These interventions led to the attainment of Skeletal Class I relationship, reduced facial convexity, improved lip competence, coinciding midlines and an overall enhancement in smile and facial aesthetics. Commencing treatment at the appropriate developmental stage facilitated the functional correction, with subsequent refinement of dental occlusion achieved through fixed orthodontic therapy (Figure 4). The patient's exceptional compliance and high motivation were pivotal factors contributing to the treatment's success.

4. Conclusion

Functional appliances are frequently used to stimulate mandibular growth and rectify skeletal discrepancies. They improve the functional relationship by eliminating detrimental developmental factors and improving the muscle environment that envelops the developing occlusion. Twin block is one of the most popular and versatile functional appliances used and its use during growing phase with good patient cooperation can produce significant skeletal effects along with some dental effects. 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.

Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has given her consent for her images and other clinical information to be reported in the journal. The patient understands 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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