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Management of skeletal class II malocclusion with twinblock and headgear followed by fixed orthodontic appliance: Case report

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Abstract

A 12 year old boy presented with class II skeletal and dental relationship due to prognathic maxilla and retrognathic mandible with excessive overjet and 100% deepbite. He was treated with 2 phase treatment by phase I growth modification therapy using twinblock appliance with combination pull headgear to improve his profile followed by phase II fixed mechanotherapy to settle his occlusion. Pretreatment, postfunctional and posttreatment records are shown and treatment stability after 2 years are also shown.

Keywords: Twinblock, headgear, 2phase treatment

Introduction

Class II malocclusion is one of the most common orthodontic problems and it affects one third of patients seeking orthodontic treatment ^[1]. It can be due to prognathic maxilla, retrognathic mandible or both. Various treatment modalities includes growth modification, dental camouflage and surgical correction are available ^[2]. For growing patients, functional appliances are widely used to correct skeletal discrepancy by stimulating growth of mandible. Varieties of functional appliance have been used to correct class II malocclusion. The twinblock, given by Clark ^[3], is a widely used appliance for many reasons. The fact that it is well tolerated by patients because it has reduced bulk and patient adjusts to speech and other functions very quickly, robust, easy to repair etc. In case of severe skeletal discrepancy with problem in both maxilla and mandible, orthopedic traction can be used in conjugation with twinblock. Usually it is a 2 phase treatment, where in skeletal discrepancy is corrected first followed by fixed mechanotherapy to correct the remaining dental discrepancy. This case report demonstrates the use of twinblock with combination pull headgear in skeletal class II division I patient with prognathic maxilla and retrognathic mandible in 1st phase followed by preadjusted edgewise appliance therapy in 2nd phase.

Diagnosis and Etiology

A 12-year-old boy was reported with the chief complaint of forwardly placed upper front teeth. He had no significant medical and dental history. His father had similar profile. Extra-oral examination indicated no apparent facial asymmetry, convex facial profile. The nasolabial angle was acute and the chin recessive with potentially incompetent lips, deep mentolabial sulcus, inter-labial gap of 6-7 mm and moderate exposure of maxillary incisors. He had a normal range of mandibular motion and no joint noise or pain. The clinical FMA was average, and he had positive visual treatment objective on the advancement of the mandible [figure1].

Intraoral findings included good oral hygiene, Class II Division 1 malocclusion (bilateral full Class II molars and canines) with a 10-mm overjet and an impinging overbite. The maxillary incisors were proclined. The mandibular dental midline shifted to right by 2mm with mild mandibular crowding.

The cephalometric analysis confirmed a skeletal Class II jaw relationship (wits- +7mm, ANB-8°) with a slightly prognathic maxilla (SNA-85°, effective length-77mm) and retrognathic

mandible (SNB- 77°, effective length- 93mm) with average mandibular plane angle(FMA-26°, SN-MP= 33). Additionally, the maxillary incisors were labially inclined and CVMI (stage-3) indicated he was at the stage of a growth spurt [figure 2].

The panoramic radiograph showed 4 third molars tooth buds and symmetric bilateral joints. A hand-wrist radiograph confirmed that he was at the stage of growth spurt stage-3(Hassel & farmen)

Treatment objectives

1. To correct the skeletal Class II malocclusion (prognathic maxilla & retrognathic mandible) improve his facial appearance
2. improve lip competency
3. improve his overjet and overbite,
4. solve the dental crowding
5. achieve class I incisor and buccal segment relationship

Treatment plan

Considering clinical and radiographic findings a two phase treatment was planned.

Phase 1- Growth modification- to reduce skeletal discrepancy anteroposteriorly using twinblock and headgear to promote growth of mandible and inhibit maxillary growth.

Phase 2- fixed mechanotherapy dentition using pre adjusted edgewise brackets to align and level the dentition.

Treatment progress

Phase 1: Growth Modification

An acrylic twin block was fabricated with headgear tube of size 0.045" placed in upper bite block over 1st molar region bilaterally. The appliance with bite opening of 5mm in premolar region with sagittal advancement of 7mm was delivered and patient was asked to wear it full time a day especially during eating. From 2nd month, the combination pull headgear was instructed to worn for atleast 14 hours per day with force of 350g per side. Patient was reviewed monthly so that headgear and blocks were adjusted for retention and stability [Figure 3].

The twinblock and headgear was removed after 12months of treatment. Normal overjet and overbite, overcorrected molar relationship were achieved [Figure 4 and 5].

Post functional records suggested that skeletal class I relation was achieved.

Phase 2: Fixed Orthodontic Treatment

Anterior reverse inclined plane was given for 3 months to retain skeletal corrections. The 0.022" MBT preadjusted edgewise was bonded on both upper and lower arches. Levelling and alignment was done with sequence of archwires (0.014 NiTi till 19×25 S.S). Intermaxillary elastics was used to achieve proper occlusion after that fixed appliance was debonded [Figure 6 and 7]. Upper and lower Hawley's retainer with inclined biteplane in maxillary plate was given immediately.

Treatment results

After phase 1 treatment, facial profile of the patient was showed noticeable improvement and balanced competent lips. SNA value was reduced by 3° and SNB increased by 3° due to this, ANB reduced by 6° towards class I skeletal pattern. The effective maxillary length reduced by 1.5mm and mandibular length increased by 3mm. Intraorally, maxillary molars moved distally. The vertical mandibular height was increased, improvement in overjet and overbite and inclination of maxillary anterior teeth, proclined lower incisors with overcorrected molar relationship [Table-1].

After phase 2 treatment, acceptable facial profile and balanced lips, levelling and alignment with class I canine and molar relationship with good buccal interdigitation were achieved. The posttreatment lateral cephalogram showed class I skeletal pattern, average mandibular plane angle. The maxillary molars moved slightly mesially with eruption.

The prognosis for stability was good as patient's growth pattern was favourable. Even after 2years of follow up, good interdigitation and incisal contact along with retainer helped to stabilize the correction [Figure 8 and 9].

The cephalometric superimposition was compared between pretreatment, postfunctional, posttreatment and 2 years after retention. Superimposition depicted downward and forward position of mandible, maxillary molars were vertically controlled and moved distally, mandibular molars were extruded and moved mesially thus overcorrected molar relationship after phase 1 was helped [Figure 10 and 11].

Table 1: Cephalometric analysis

Analysis	Standard	Pre-Treatment	After Phase 1	After Phase 2	After 2 Years Retention
SNA	82°	85 ⁰	82 ⁰	83°	83°
SNB	80°	77 ⁰	80°	80°	81°
ANB	02°	8 ⁰	2°	3°	2°
1-NA	22°	30 ⁰	24°	23°	23°
1-NA	4 mm	7mm	4mm	3mm	3mm
1-NB	25°	24 ⁰	26°	27°	27°
1-NB	4 mm	5mm	6mm	6mm	6mm
1-1	131°	119 ⁰	123°	128°	128°
1-SN	103°	117 ⁰	110°	104°	104°
GoGn-SN	32°	32 ⁰	34°	34°	34°
Y-axis	59.4°	53 ⁰	58°	58°	58°
FMA	25°	23 ⁰	25°	25°	25°
IMPA	90°	93 ⁰	95°	95°	95°
FMA	65°	64 ⁰	60°	60°	60°
Wits		5mm	3mm	3mm	3mm
Saddle Angle	123±5°	117°	121°	121°	121°
Articular angle	143±6°	151°	140°	140°	140°
Gonial angle	128±7°	122°	124°	126°	126°
Lower gonial angle	70-75°	64°	69°	70°	70°
Maxillary length		77mm	75.5mm	76mm	77mm
Mandibular length		93mm	96mm	96mm	98mm
Ramus height		43mm	44mm	45mm	46mm

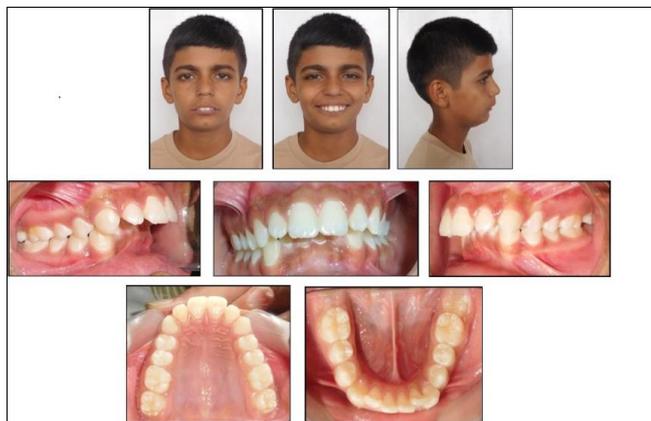


Fig 1: Pre- treatment clinical photographs



Fig 4: Post-functional appliance photographs

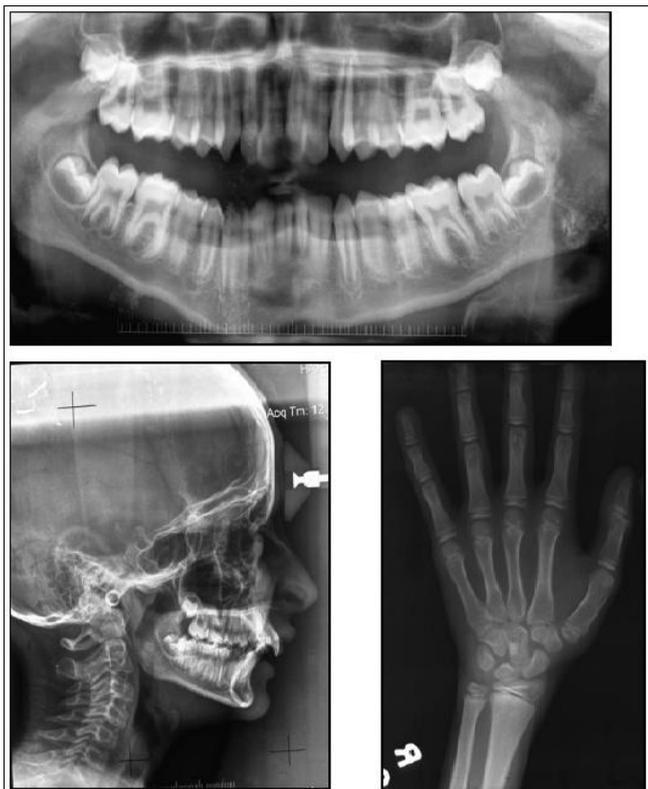


Fig 2: Pre- treatment panoramic radiograph, lateral cephalogram and handwrist radiograph

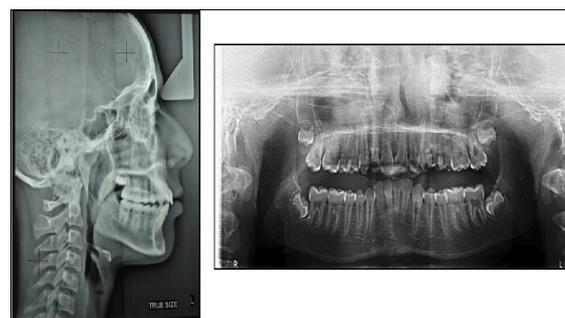


Fig 5: Post- functional appliance panoramic radiograph and lateral cephalogram



Fig 6: Post- treatment clinical photographs



Fig 3: Twin block with headgear



Fig 7: Post- treatment panoramic radiograph and lateral cephalogram



Fig 8: Clinical photographs after 2 years of retention

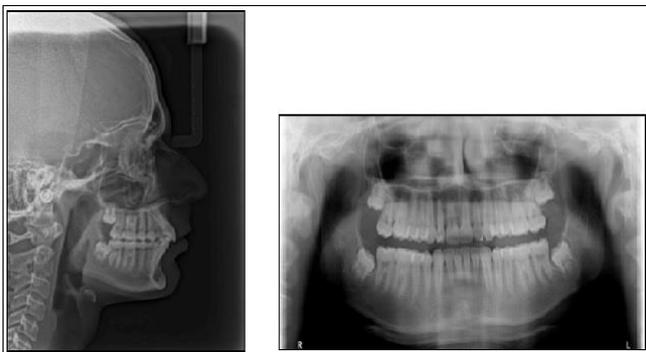


Fig 9: Panoramic radiograph and lateral cephalogram after 2 years of retention

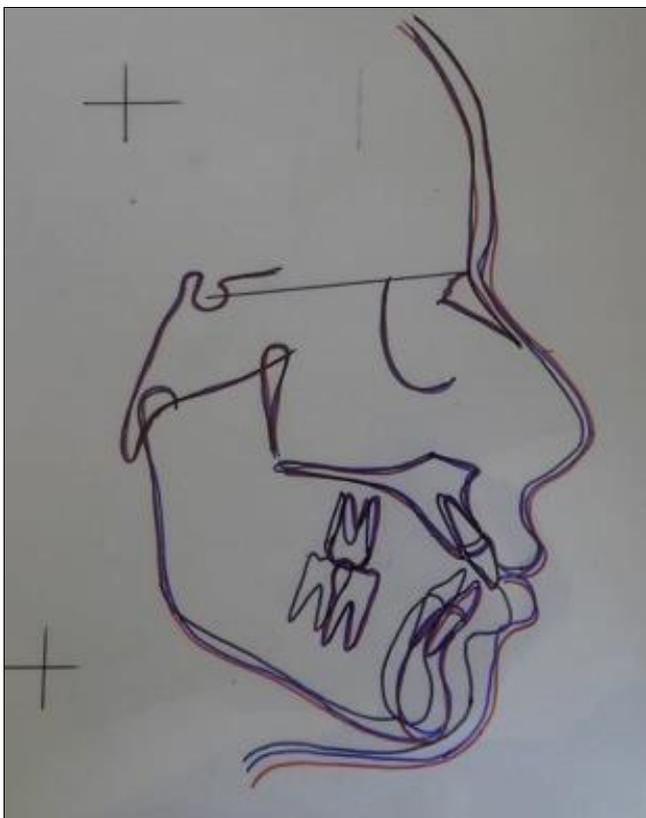
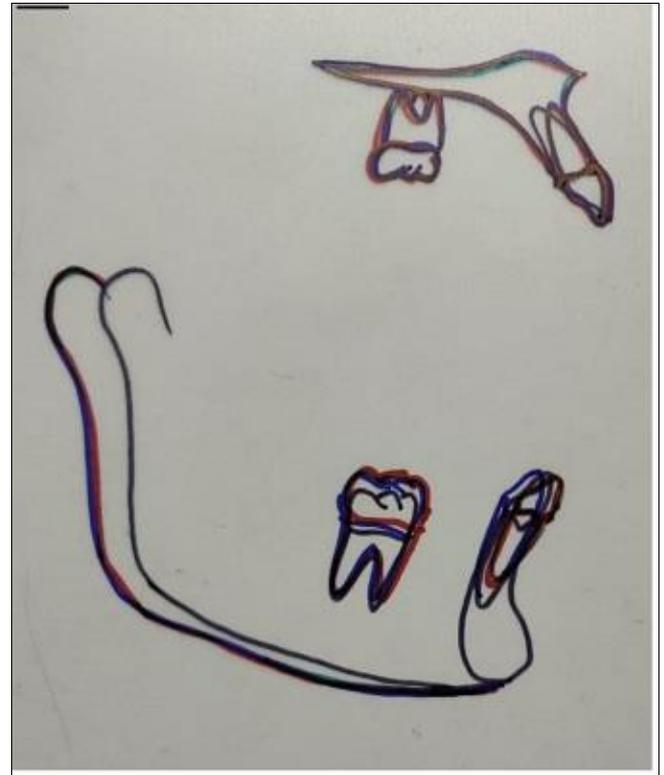


Fig 10: Superimposition of pretreatment, post- functional appliance treatment, post- treatment and after 2 years of retention cephalometric tracings



- a) Black line: Before treatment
- b) Blue line: Post-functional appliance treatment with twin block
- c) Red line: Post-treatment.
- d) Green line: 2 years after retention

Fig 11: The maxillary superimposition was registered on the palatal plane at ANS. The mandibular superimposition was registered on the lingual aspect of the symphysis

Discussion

Various treatment modalities for class II division I malocclusion have been reported. Tulloch *et al.* found that favourable growth changes in around 75-80% of class II patients receiving early treatment with either headgear or functional appliance [4]. Since the patient had a skeletal class II pattern with problem in both maxilla and mandible at acceleration stage of growth as indicated by hand-wrist radiograph [5], the functional appliance with extra-oral forces were used to correct skeletal anteroposterior discrepancy.

Another treatment option was camouflage treatment by extraction of upper premolars that would able to retract upper protrusive lips and improve facial convexity to certain extent but that would not improve mandibular retrognathism.

The advantage of twinblock when compared to other functional appliance is greater mandibular growth because of duration and timing of wear that it can be worn while eating and well tolerated by patients [6]. Even though twinblock has little headgear effect, several studies used twinblock with either combination pull headgear [7] or high pull head gear [8]. The headgear helped to restrain maxillary growth. Therefore correction of class II was achieved both by maxillary restraint and mandibular advancement.

In this patient, early intervention by functional appliance using his growth potential, compliance resulted in improved facial profile. Studies have shown that anteroposterior correction was more through dentoalveolar changes than by skeletal changes [9, 10]. But in this patient skeletal changes were confirmed by restrained maxilla and advanced mandible, though dentoalveolar changes were also there with inclination of molars and incisors [11].

The overjet reduction in this case was achieved by favourable growth of mandible with proclination of lower incisors and retroclination of upper incisors.

Conclusion

The use of twin block with combination pull headgear produce desirable effects in our patient. This treatment modality cannot be routinely used in all patients. Proper case selection and treatment planning is the key to successful outcome.

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