

Management Of Class II Malocclusion In A Post-pubertal Patient with A Modified Fixed Twin Block and Fixed Orthodontic Therapy: A Case Report

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Cite this paper as: Dr. Dharini M, Dr. Hemanth M, Dr. Sanjana Shaji , Dr. Shivaprasad Gaonkar , Kavya BR , Dr. Shyama Pramod (2025) Effect of Autologous Platelet Rich Fibrin (PRF) Management Of Class II Malocclusion In A Post-pubertal Patient with A Modified Fixed Twin Block and Fixed Orthodontic Therapy: A Case Report. *Journal of Neonatal Surgery*, 14 (32s), 8204-8213.

ABSTRACT

Functional appliances have long been employed in the management of skeletal Class II malocclusions, with their primary objective being to stimulate mandibular growth by enhancing growth activity at the condylar cartilage. Among the myofunctional appliances, the Twin Block appliance is one of the most widely used due to its effectiveness and patient compliance. The aim of this paper is to present a case report of mandibular deficiency treatment with modified Fixed Twin Block appliance in a female patient whose sexual maturation (one year after menarche) and cervical vertebral maturation stage assessment indicated the end of peak pubertal growth .

Diagnosis revealed an Angle's Class II malocclusion with an orthognathic maxilla, retrognathic mandible, horizontal growth pattern, recessive chin, and a convex facial profile. Phase I treatment was carried out using a modified fixed twin block appliance, which improved mandibular growth, facial balance. This was followed by a support phase with a Rick-A-nator and subsequently Phase II fixed mechanotherapy using 0.022 in MBT prescription. Post- treatment, the patient exhibited improved skeletal relationship and a harmonious soft tissue profile and Class I relationship with normal overjet and overbite was achieved.

1. INTRODUCTION

Patients with class II malocclusion generally seek orthodontic treatment for esthetic concern. Various myofunctional appliances can be used for the treatment of skeletal as well as the dental malocclusion in a growing patient. These appliances have been used in clinical orthodontics for a long time have been used for over a century in the treatment of Class II patients¹. Functional appliances can be removable or fixed². The Twin Block appliance is one of the most commonly used functional appliances, partly due to its acceptability and compliance among patients. It redirects the mandibular growth to correct the maxillomandibular relationship, enhancing facial esthetics³.

The main objective of therapy with functional appliances such as Twin Block is to induce supplementary lengthening of the mandible by stimulating increased growth at the condylar cartilage². It has been demonstrated that the effectiveness of the functional treatment of mandibular growth deficiencies strongly depends on the biological responsiveness of the condylar cartilage, which in turn is associated with the growth rate of the mandible⁴.

The rate of mandibular growth, however, is not constant throughout the juvenile and adolescent periods, with the existence

of a pubertal peak in mandibular growth described in classical cephalometric studies⁵⁻¹⁰. The onset, duration, and intensity of this pubertal spurt in mandibular growth vary on an individual basis. Most of the literatures mentioned that one of the main indications of skeletal maturity marking the end of growth in females is menarche⁴. Another more indication of growth is cervical vertebral maturation index (CVMI).

According to this method, the peak in mandibular growth typically occurs between CVMI stage III and CVMI stage IV. CVMI stage V is usually observed at least one year after the growth peak, although individual variations from the norm may influence this pattern¹¹.

This case report presents the management of mandibular deficiency in a female patient who was one year post-menarche and at CVMI stage V, both of which indicated completion of active mandibular growth

2. CASE REPORT

A 12-year-old female patient, presented with the chief concern of forwardly placed upper front teeth, recessive lower jaw with no significant medical or dental history, and was motivated for orthodontic treatment due to esthetic concerns.

On Clinical Examination, Extra-orally she had a convex profile, recessive chin, acute nasolabial angle, deep mento-labial sulcus, and potentially incompetent lips. Facial proportions indicated decreased lower anterior facial height with a horizontal growth pattern.

Intraoral findings the oral hygiene was good, with Angle classification Class II division 1 malocclusion, and the buccal segment relationship included Angle's Class II molar and canine relation bilaterally, increased overjet, deep bite, proclined upper and lower anteriors, and mild lower anterior crowding. The upper arch was tapered, while the lower arch was ovoid with a deep curve of Spee. (Figure 1)

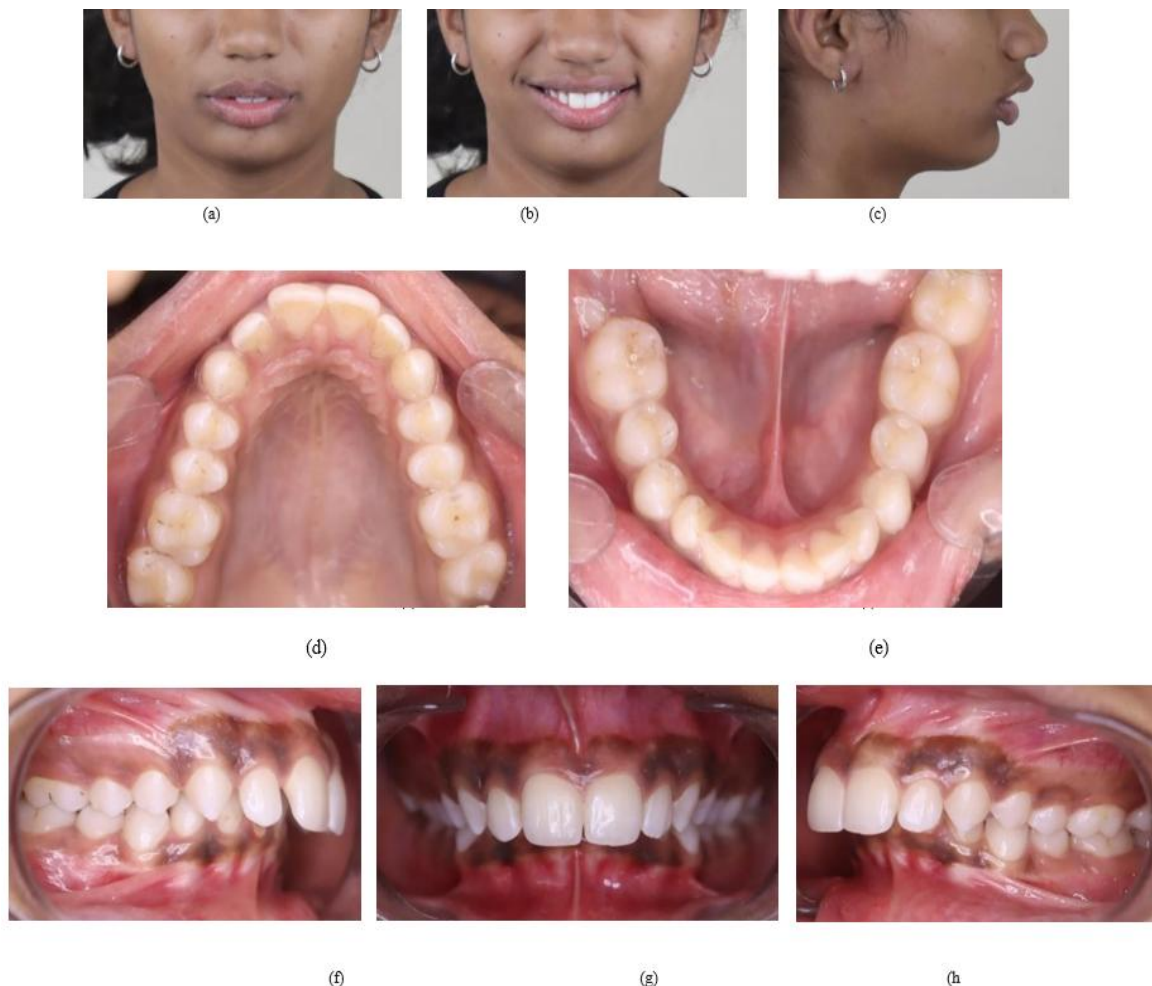


FIGURE 1: Pretreatment photos: Extraoral: frontal (a); smile frontal (b); profile (c); intraoral views: upper occlusal (d), lower occlusal (e), right (f), frontal (g), and left (h).

The Orthopantomogram confirmed the presence of all permanent teeth including the developing third molars (Figure 2).



FIGURE 2: Pretreatment panoramic radiograph: the presence of all permanent teeth including the developing third molars.

In the cephalometric assessment (Figure 3),



(a)



(b)

FIGURE 3: Pretreatment lateral cephalometric image and hand wrist radiograph

the suggested Class II base due to orthognathic maxilla and retrognathic mandible, proclined upper and lower incisors, and a horizontal growth pattern, decreased lower third facial proportion. (Table 1).

TABLE 1: Normal and pretreatment cephalometric values

Parameter	Normal Value	Pretreatment	Inference
SNA (°)	82 ± 3	81	Orthognathic maxilla
SNB (°)	79 ± 3	73	Retrognathic mandible
ANB (°)	3 ± 1	8	Class II skeletal pattern
Wits appraisal (mm)	0–1	8	Class II sk pattern
FMA (°)	25 ± 3	24	Horizontal growth pattern
UI–SN (°)	102 ± 5	110	Proclined upper incisors
LI–MP (°)	92 ± 5	105	Proclined lower incisors
Interincisal angle (°)	133 ± 10	120	Proclined incisors

Cervical vertebral maturation (CVMI stage V) and hand-wrist radiographs indicated residual or no growth potential SMI stage 11 according to Bjork, Grave and brown and MP3- I STAGE indicating end of pubertal growth spurt. (Figure4)

Possible treatments are as follows.

The upper right and left posterior segments could be distalized using cervical headgear appliance to correct the molar relationship and create space to reduce the overjet and the overbite. Even though the headgear treatment has a restraining effect on the maxilla, it has little effect on mandible, and en- masse distalisation of maxilla to correct the Class II malocclusion can be done, but it does not address the underlying skeletal malocclusion.

It could be argued that this case might be treated only with fixed functional appliances using Class II intermaxillary traction; nevertheless, the main disadvantages with this approach are that it will lead to proclination of the lower incisors and molar correction to Class I may be difficult to achieve and has more dental changes as compared to skeletal effect as achieved by functional appliances and less vertical control and redirecting the growth pattern.

Besides, premolar extraction would be a possible treatment but has minimum effect on retruded.

mandible and may lead to increased overbite.

After thorough clinical examination, and informed consent was obtained after checking out the documents, and considering patient's motivation and expectations, the following phases of treatment was decided.

3. TREATMENT OBJECTIVES:

Correction of skeletal Class II jaw base, improvement of convex facial profile, correction of proclined anteriors, leveling, aligning, and coordinating the arches.

Establishment of Class I molar, canine, and incisor relationships, to achieve an ideal overjet and overbite, and harmonious soft tissue balance.

In the first phase of the treatment, after bite registration was taken with sagittal advancement by 7 mm and vertical opening of 5 mm.

The modified fixed Twin Block appliance (Figure 5)



FIGURE 5: Modified Fixed Twin Block appliance intraoral views: upper occlusal (a), lower occlusal (b), right (c), frontal (d), and left (e).

was given fabricated using upper acrylic blocks with hyrax screw and lower acrylic block with lingual cross over wire for stabilisation.

The active phase of treatment was for 8 months, with gradual trimming of the upper blocks for the vertical control, it took 8 months to achieve the molar relationship overcorrection, that is, zero overjet without any apparent anterior occlusal shift ,following the first phase post functional records was taken and was evaluated for the treatment outcomes . At this stage lateral cephalometric image clearly showed mandibular growth .

The skeletal effects and increasing of mandibular length were evident, despite the fact that some of the corrections, mainly proclination of lower incisors, were due to dental effects of Twin Block (Figure 6).



FIGURE 6: Cephalometric image after phase II (discontinuing Twin Block): mandibular growth is evident.

Next the second phase of treatment with Fixed mechanotherapy using MBT 0.022 slot prescription was started with Rick-A-nator support post the functional correction, Alignment was achieved with sequential wire changes with the use of NiTi wires, followed by stainless steel (SS) wires.(Figure 7)

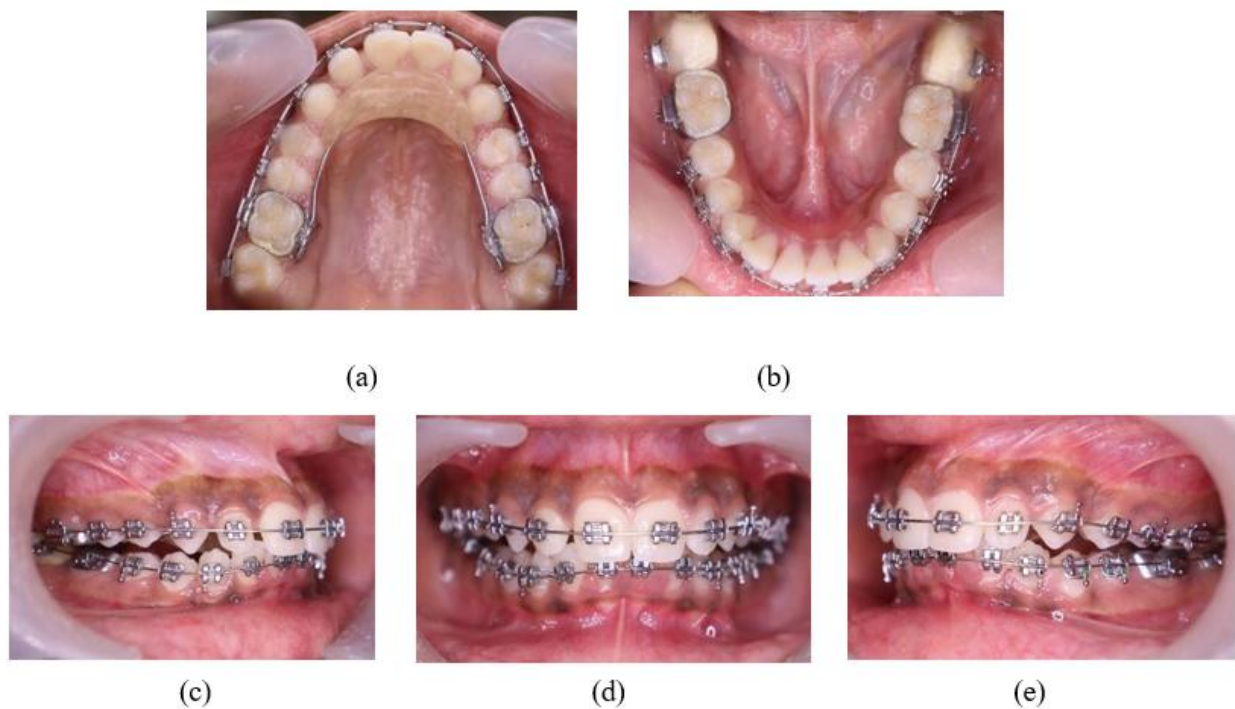


FIGURE 7:Fixed Appliance upper occlusal (a), lower occlusal (b), right (c),frontal(d), left (e).

Retention with Hawley retainer in maxilla and fixed retainer in mandible. (Figure 8)

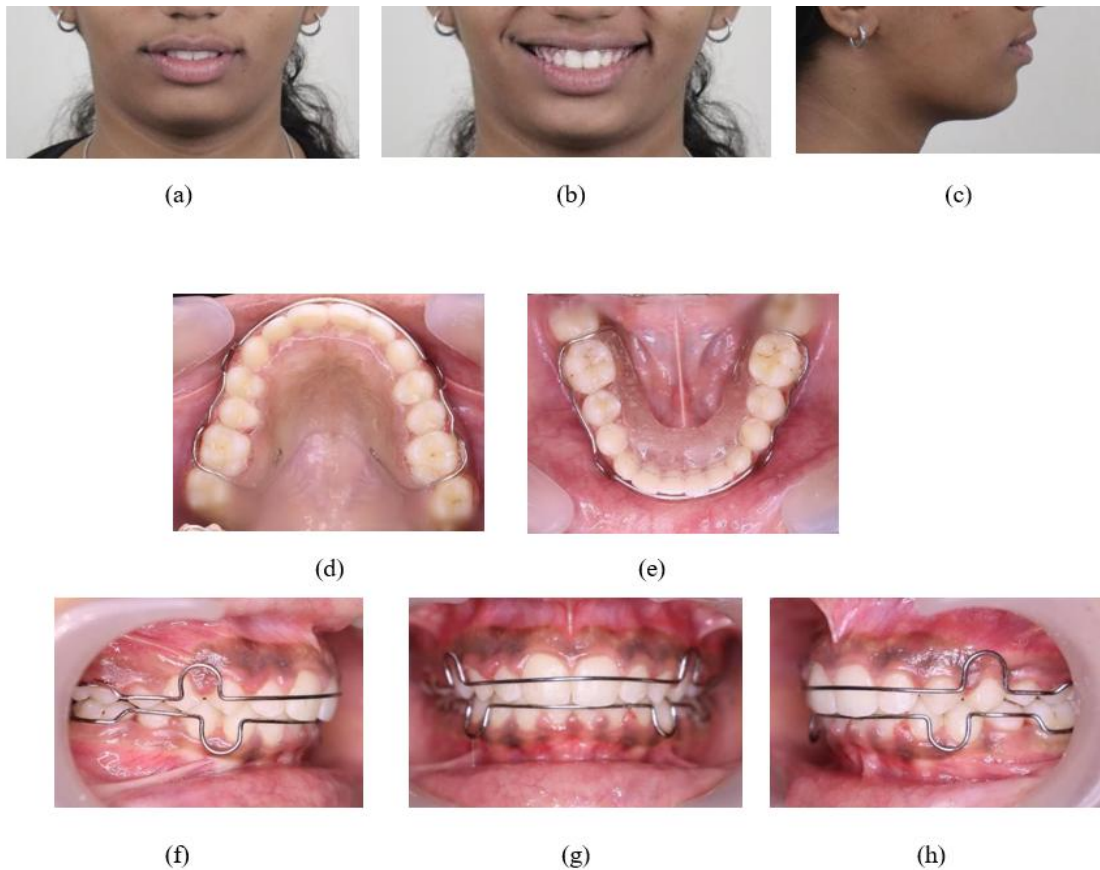


FIGURE 8: Posttreatment photos: frontal (a); smile frontal (b); profile (c); intraoral views: upper occlusal (d), lower occlusal (e), right (f), frontal (g), and left (h).

Having finished phase I treatment objectives were met: profile of the patient improved. Class I relationship with desirable overjet and overbite was achieved Overall super- imposition of the lateral cephalometric radiographs is also illustrated in (Figure 9).

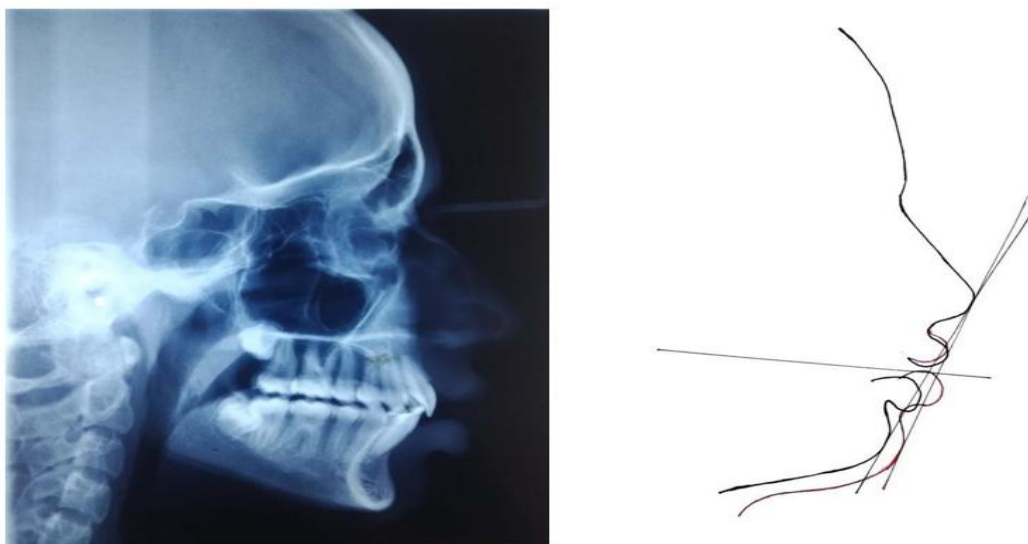


FIGURE 8: Posttreatment cephalographic image (a); overall superimposition of pretreatment (black color) and posttreatment (red color) cephalometric radiographs (b).

Cephalometric measures are shown in Table 2 and 3

TABLE 2: Post functional cephalometric values

Parameter	Pretreatment	Post functional	Inference
SNA (°)	81	80	Orthognathic maxilla
SNB (°)	73	77	Orthognathic mandible
ANB (°)	8	3	Improved skeletal relation
Wits appraisal (mm)	8	3	Class I skeletal pattern
FMA (°)	24	26	Average growth pattern
UI-SN (°)	110	103	Retroclination of upper incisors
LI-MP (°)	105	110	Proclination of lower incisors
Interincisal Angle (°)	120	116	Improved incisor relation

TABLE 3: Post treatment cephalometric values

Parameter	Pretreatment	Post treatment	Inference
SNA (°)	81	80	Orthognathic maxilla
SNB (°)	73	78	Orthognathic mandible
ANB (°)	8	2	Class I skeletal relation
FMA (°)	24	26	Average growth Pattern
UI-SN (°)	110	103	average upper incisor inclination
Mandibular length (mm)	120	123	Increase in mandibular length
Interincisal Angle (°)	120	116	Improved incisor relation

4. DISCUSSION

Treatment with functional appliances has several well- established advantages. In this case functional appliance treatment caused reducing overjet, patient's profile improvement, and taking care of skeletal jaw discrepancies. What is more, the patient's confidence improved and the risk of trauma to the upper incisors was minimized¹.

The selection of functional appliances is dependent upon several factors which can be categorized into the patient factors, for example, age and compliance, and clinical factors, for example, preference/familiarity and laboratory facilities¹⁴. Twin Block functional appliance has several advantages including the fact that it is well tolerated by patients¹⁵, being robust, easy to repair, suitable to use in permanent and mixed dentition, and compatible with fixed orthodontic appliances, and in comparison with Herbst appliance it has less dental effect; nevertheless, there are potential disadvantages as well as the

proclination of lower incisors and development of posterior open bites¹¹ which in this case did not pose an issue as the use of fixed orthodontic appliances that can finally eliminate the posterior open bite .

It seems that age was the only factor which was unfavorable for the functional treatment. Both chronologic age and developmental stages indicated that growth spurt had come to an end. In most literatures ⁴⁻¹¹ menarche is assumed to be the last stage of growth spurt. The cervical vertebral maturation stage also pointed to the same founding (CVMS V). Even though we consulted the patient about the disadvantages and limitations, she was still highly motivated to try the treatment with hope of improving her profile.

In a functional treatment, a symmetrical overjet and possibility of advancing mandible without any interference is a critical issue¹¹ , which could be achieved here .

The treatment included modified fixed Twin Block appliance (Figure 5) with hyrax screw in the maxillary arch to correct the narrow tapered maxillary arch form to facilitate the transverse correction. Phase II fixed orthodontics started with Rick-A-nator support

and fixed orthodontic appliances for maxillary and mandibular arch in order to align . This treatment has several advantages such as relieving crowding more efficiently, creating a symmetric overjet, and improving the patient's self-esteem. Nevertheless, this treatment takes more time to start fixed therapy and causes lower incisor proclination and LIMP angle to increase, which were partly taken care by fixed treatment later primarily addressing the underlying skeletal Class II due to retrognathic mandible .At the end of the treatment, patient's

profile was noticeably improved with favorable treatment effects in cephalo-metric analysis. SNB was increased by 5 ° while SNA and ANB had reduced by 1° and 6°, respectively. Mandibular length also undergone an increase of 3 mm. Dental relations for canines and molars

were Angle Class I after treatment and overjet and overbite was optimal. Patient was satisfied with the results with her self-esteem being significantly improved.

Retention was maintained with Hawley appliances for maxillary arch and mandibular arch. The patient was instructed to wear the retainers for as long as required to ensure treatment stability ¹⁶. Furthermore, she was recalled for regular check follow-ups to evaluate treatment stability during the retention phase of treatment.

5. CONCLUSIONS

Functional appliance therapy offers an effective approach for managing dentoskeletal Class II malocclusions. The Twin Block appliance, in particular has several advantages, including high patient acceptance and favorable clinical outcomes. Although age can be a limiting factor and the skeletal age of the patient is assessed for functional therapy, in a cooperative and motivated patient, the appliance can still deliver highly desirable skeletal and soft tissue changes using the residual growth potential which is advantageous in certain patients to obtain optimal results

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