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International Journal of Orthodontic Rehabilitation

Original Article

MANAGEMENT OF CLASS II MALOCCLUSION WITH TWIN FORCE BITE CORRECTOR: A CASE SERIES

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How to Cite this Article :Suvetha Siva et al – Management of Class II Malocclusion with Twin Force Bite Corrector – A Case Series.Int J Orthod Rehabil 2022, 13(3), 34-47.

Received:23/09/22 *Accepted:10/10/22* *Web Published:12/10/22*

Doi:10.56501/intjorthodrehabil.v13i3.514

ABSTRACT

Class II malocclusion is the most common sagittal malocclusion after class I and involves mandibular retrognathism. The treatment modalities include both removable functional and fixed functional appliances but fixed functional can be preferred as they have certain advantages. The present case series discusses a hybrid type of fixed functional appliance, i.e., Twin Force Bite Corrector appliance in three cases: A 15-year-old female patient with Class II skeletal due to mandibular retrognathism, a14-year-old male patient with Sagittal Class II malocclusion due to mandibular retrognathism, and a 14-year-old female patient with Sagittal Class II malocclusion due to mandibular retrognathism. The effects produced by this appliance are like the conventional fixed functional appliances, but it has a distinct advantage of quick chair-side fabrication and simple design.

Key words: Class II malocclusion, retrognathism, Twin Force bite corrector appliance

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INTRODUCTION

Prevalence of Skeletal class II malocclusion ranges from 19.56% to 23% in both mixed and permanent dentition.[1]The patient reports to the clinic usually with a chief complaint of unaesthetic profile or forwardly placed upper anterior teeth.[2,3]The treatment of class II division 1 depends upon the age of the patient, growth potential, severity of malocclusion, and compliance of patient for treatment.[4]

In growing patients with mixed or early permanent dentition to correct skeletal class II malocclusion, growth modification procedures can be carried out before the cessation of active growth. In patients who are at the end of prepubertal growth spurt or who are uncooperative, fixed functional appliances can be used.[5] It can also be used in skeletal class III patients with retrusive maxilla. In adult patients, FFAs can be used for the purpose of distalization of upper molars, anchorage, TMJ disorders, pre-surgical muscle conditioning in class II malocclusion and post-surgical stabilization of class II and class III malocclusion.[6]

Fixed devices used for sagittal advancement of the mandible have been introduced to overcome two major limitations of removable appliances: The need for patient compliance and shortening treatment duration.[7]These appliances aid in class II correction by encouraging mandibular growth and by eliciting dentoalveolar effects. Fixed Functional Appliances are broadly classified as rigid, flexible, and hybrid appliances. Rigid Fixed Functional appliances produce more amount of skeletal changes when compared to hybrid and flexible type. The flexible and hybrid type of Fixed functional appliances have effects like class II elastics and also aid in distalization of upper molars.[8] Small and hygienic design, stability, less breakage, and more range of lateral excursion of mandible make the hybrid type more popular.[9]

The present paper reports on three cases treated with Twin Force Bite Corrector (Hybrid fixed functional appliance). The TFBC is a push-type intermaxillary functional appliance with ball-and-socket joint fasteners which allows larger range of lateral jaw movements. The two plunger/ tube telescopic assemblies on each side consist of NiTi coil springs delivering a force of 210g. The appliance consists of hex nuts through which it is attached to maxillary and mandibular arch wires.[10]

CASE REPORTS

CASE A

A 15-year-old female patient reported to the dental hospital with the chief complaint of malaligned upper front teeth. On extraoral examination, the patient had a symmetric face with mesocephalic head and mesoprosopic face form with competent lips. On profile examination, the patient had a convex facial profile. A symmetric and non-consonant smile with 100% maxillary incisor display was noted [Figure 1a]. On functional examination, no abnormalities were detected in speech and TMJ with upward and backward path of closure. Intraoral examination revealed that the patient has Angle's class II malocclusion with crowding in upper and lower arch, increased overjet and overbite and class II canine relationship [Figure 1b].

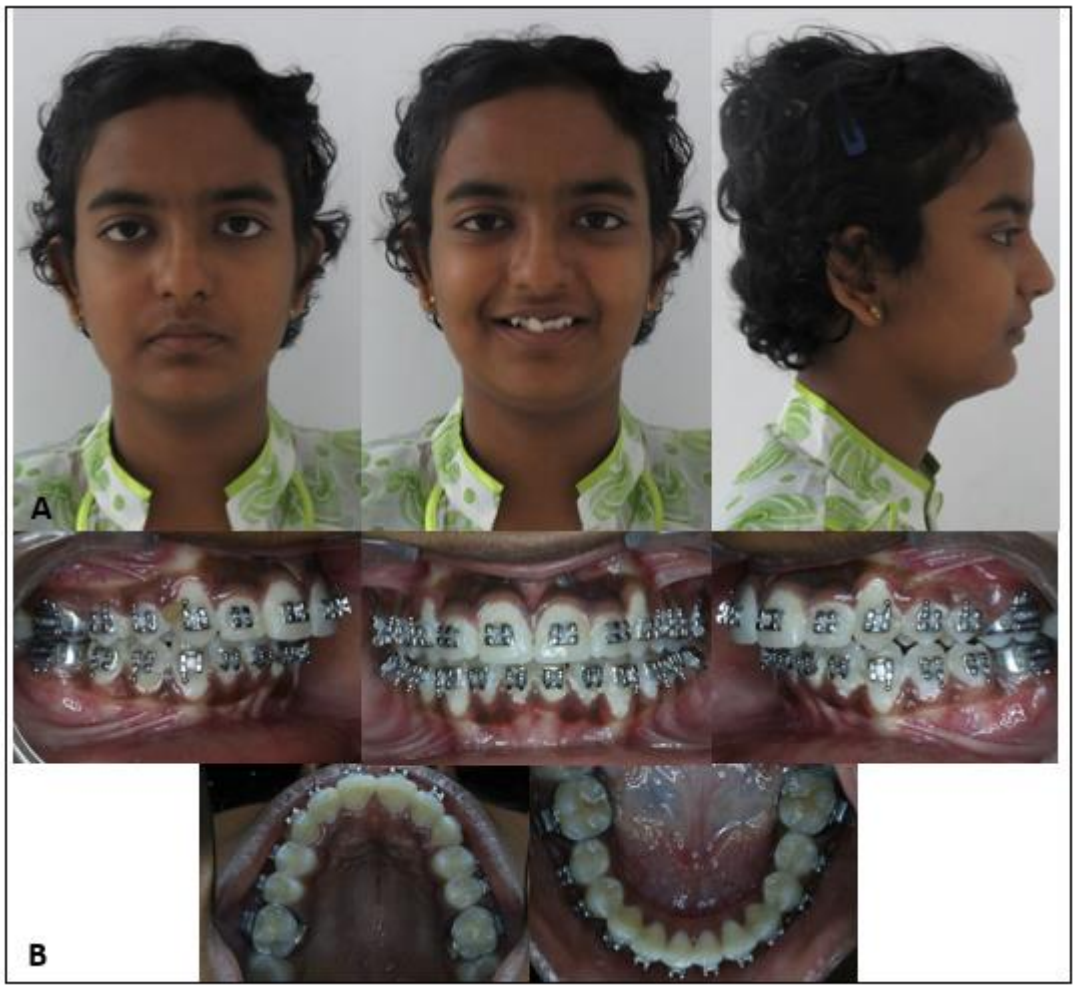

Figure 1*: (A and B) Case A: Pre-functional intraoral*

Examination of study casts showed symmetrical arches with class II molar and canine relationship. There was 7mm of overjet and 3mm of overbite. On skeletal maturity assessment, the patient was in CVMI stage VI (completion). Cephalometric analysis revealed that the patient had class II skeletal base with average angle case and mild proclination of upper and lower incisors. The soft-tissue analysis revealed an average upper lip and lower lip with average nasolabial angle.

Diagnosis

Angles' class II div 2 malocclusion on a skeletal class II base with retrognathic mandible, average growth pattern, with retroclined upper and lower anteriors, crowding in upper and lower anterior, increased overjet and class II canine relationship with competent lips.

Treatment plan

Fixed mechanotherapy was started with MBT 0.022 prescription brackets bonded on both upper and lower arches. Initial levelling and alignment were done in 7 months with wire sequence 0.014″, 0.016″, 0.016″ × 0.022″ NiTi, 0.017″ × 0.025″ NiTi, 0.019″ × 0.025″ NiTi , 0.019" × 0.025″ SS wire.

At the end of levelling and aligning, the pre-functional records were taken. Measurement was done from the mesial of upper first molar buccal tube to distal of lower canine hook using vernier caliper when the patient is in centric occlusion to determine the size of appliance to be placed. Once the size selection was done, the TFBC appliance was inserted, and the hex nut was tightened over the wire using driver. Upper and lower arches were consolidated, cinch back of the wire was done to prevent proclination of anteriors before the appliance was installed into the mouth [Figure 2].

Figure 2: *Case A - intraoral appliance*

The appliance was left in place until a class 1 molar relation was achieved and post removal of appliance settling of occlusion was carried out for 3 months. The total treatment duration

for the correction of class II molar relation to class 1 molar relationship with proper inter-digitation and settling of the posteriors was 10 months.

On comparison of pre functional and post functional lateral cephalograms [Figure 3] class II correction achieved by dentoalveolar effects such as proclination of lower anteriors by 6^{o} and retroclination of upper anteriors by 6^{o}. The amount of skeletal changes achieved were very minimal since the growth of patient was completed. A Class I molar and canine relationship was established bilaterally. The overjet and overbite were reduced, and the profile of the patient improved [Figure 3a and b]. At the end of the treatment, good interdigitation was achieved[Table 1].

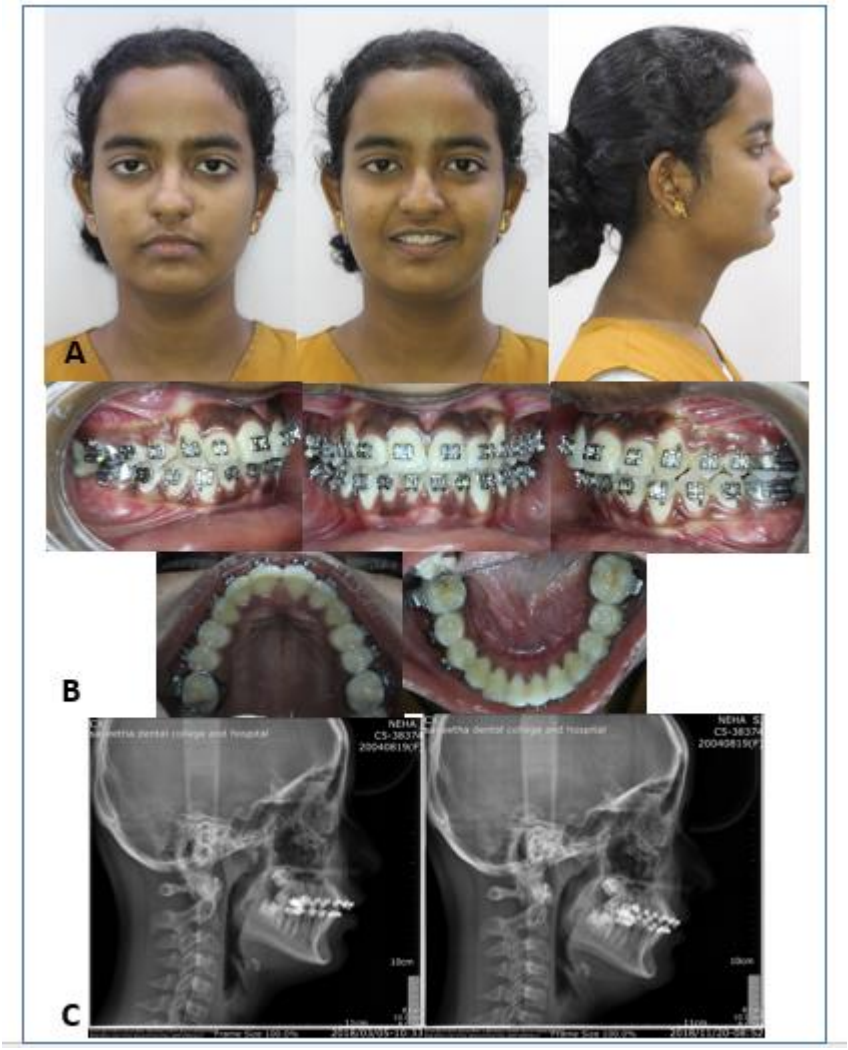

Figure 3: *(A) Case A- Post functional extra oral, (B) post functional intraoral, (C) Pre and post functional lateral cephalograms*

CASE B:

A 14-year-old male patient reported to the dental hospital with the chief complaint of forwardly placed upper front teeth. On extraoral examination, the patient had an apparently symmetric face with mesocephalic head and mesoprosopic face form with potentially competent lips. On profile examination, the patient had a convex facial profile. The smile of the patient was symmetric and non-consonant with 100% maxillary incisor display on smiling [Figure 4-7]. On functional examination, no abnormalities were detected in speech and TMJ with upward and backward path of closure. Intraoral examination revealed that the patient has Angles' class II malocclusion with mild crowding in upper and lower arch, proclination of upper and lower anteriors, increased overjet and overbite and class II canine relationship [Figure 4b].

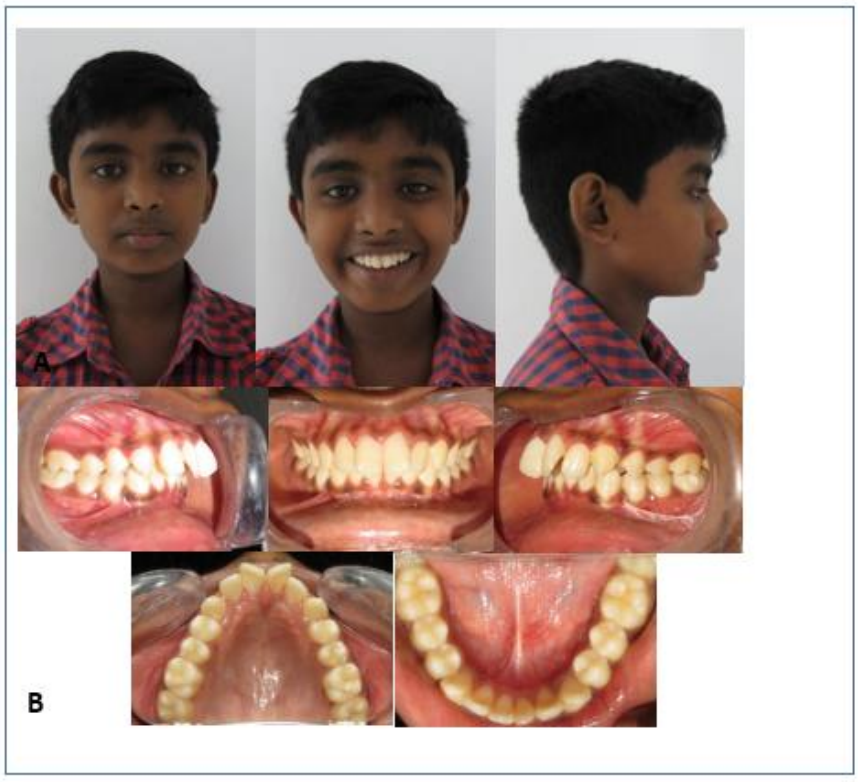

Figure 4: *(A) Case B - pretreatment extraoral, (B) pretreatment intraoral*

Examination of study casts showed symmetrical arches with class II molar and canine relationship. There was 8mm of overjet and 6.2mm of overbite. On skeletal maturity assessment, the patient was in CVMI stage IV (deceleration). Cephalometric analysis revealed that the patient had class II skeletal base with average growth pattern and mild proclination of upper and lower incisors. The soft-tissue analysis revealed an average upper lip and lower lip with average nasolabial angle. [Table 2].

Figure 5: *Case B - intraoral appliance*

Diagnosis

Angle's class II malocclusion due to retrognathic mandible, average growth pattern, crowding and proclination of the upper and lower anteriors, increased overjet and overbite, and class II canine relationship with competent lips.

Treatment plan

Fixed mechanotherapy was started with MBT 0.022 prescription brackets bonded on both upper and lower arches. Initial levelling and alignment were done in 6 months with wire sequence 0.014″, 0.016″, 0.016″ × 0.022″ NiTi, 0.017″ × 0.025″ NiTi, 0.019″ × 0.025″ NiTi, 0.019" × 0.025″ SS wire. The TFBC appliance was inserted as described for the case A. [Figure 6]

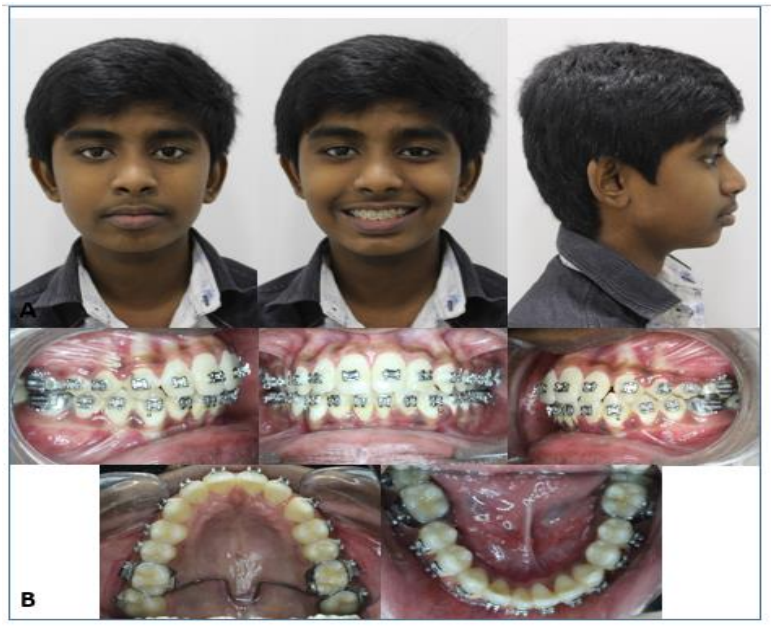

Figure 6: *(A) Case B – post functional extraoral, (B) post functional intraoral*

The appliance was left in place until a class 1 molar relation was achieved and post removal of appliance settling of occlusion was carried out for 3 months. The total treatment duration for

the correction of class 2 molar relation to class 1 molar relationship with proper inter-digitation and settling of the posteriors was 10 months.

On comparison of prefunctional and postfunctional lateral cephalogram, [Figure 7] class II correction was achieved by dentoalveolar effects such as proclination of lower anteriors by 5^{o} and retraction of upper anteriors by 8^{0}. The amount of skeletal changes achieved were very minimal of 1^{o}increase in SNB. A Class I molar and canine relationship was established bilaterally. The overjet and overbite were reduced. The profile of the patient improved with lip competency achieved [Figure 7a and b]. At the end of the treatment, good interdigitation was achieved. [Table 2].

Figure 7: *(A) pre functional cephalogram, (B) post functional cephalogram*

CASE C:

A 14-year-old female patient reported to the dental hospital with the chief complaint of forwardly placed upper front teeth. On extraoral examination, the patient had a symmetric face with mesocephalic head and mesoprosopic face form with competent lips. On profile examination, the patient had a convex facial profile. The smile of the patient was symmetric and non-consonant with 3/4th maxillary incisor display on smiling [Figure 8a]. On functional examination, no abnormalities were detected in speech and TMJ with upward and backward path of closure. Intraoral examination revealed that the patient has Angles' class II malocclusion with mild crowding in upper and lower arch, proclination of upper and lower anteriors, increased overjet and overbite and class II canine relationship [Figure 8b & 8c]. Examination of study casts showed symmetrical arches with class II molar and canine

relationship. There was 5mm of overjet and 5mm of overbite. On skeletal maturity assessment, the patient was in CVMI stage VI (completion). Cephalometric analysis revealed that the patient had class II skeletal base with average growth pattern and mild proclination of upper and lower incisors. The soft-tissue analysis revealed an average lip length with average nasolabial angle. [Figure 8 and Table 3].

Diagnosis

Angles' class II malocclusion on a skeletal class II base with retrognathic mandible, average growth pattern, with crowding in upper and lower anterior, proclination in upper and lower anteriors, increased overjet and overbite, and class II canine relationship with competent lips.

Treatment plan

Fixed mechanotherapy was started with MBT 0.022 prescription brackets bonded on both upper and lower arches. Initial levelling and alignment was done in 6 months with wire sequence 0.014″, 0.016″, 0.016″ × 0.022″ NiTi, 0.017″ × 0.025″ NiTi, 0.019″ × 0.025″ NiTi , 0.019" × 0.025″ SS wire.

The TFBC appliance was inserted. Upper and lower arches were consolidated before the appliance was installed into the mouth.

The appliance was left in place until a class 1 molar relation was achieved and post removal of appliance settling of occlusion was carried out for 3 months. The total treatment duration for the correction of class 2 molar relation to class 1 molar relationship with proper inter-digitation and settling of the posteriors was 10 months.

On comparison of prefunctional and postfunctional lateral cephalogram, the class II correction was done by dentoalveolar effects such as proclination of lower anteriors by 9^{o} and retrusion of upper anteriors by 6mm. The amount of skeletal changes achieved were very minimal of 1^{o}. A Class I molar and canine relationship was established bilaterally. The overjet and overbite were reduced. The profile of the patient improved with lip competency achieved [Figure 8a and b]. At the end of the treatment, good interdigitation was achieved. [Table3].

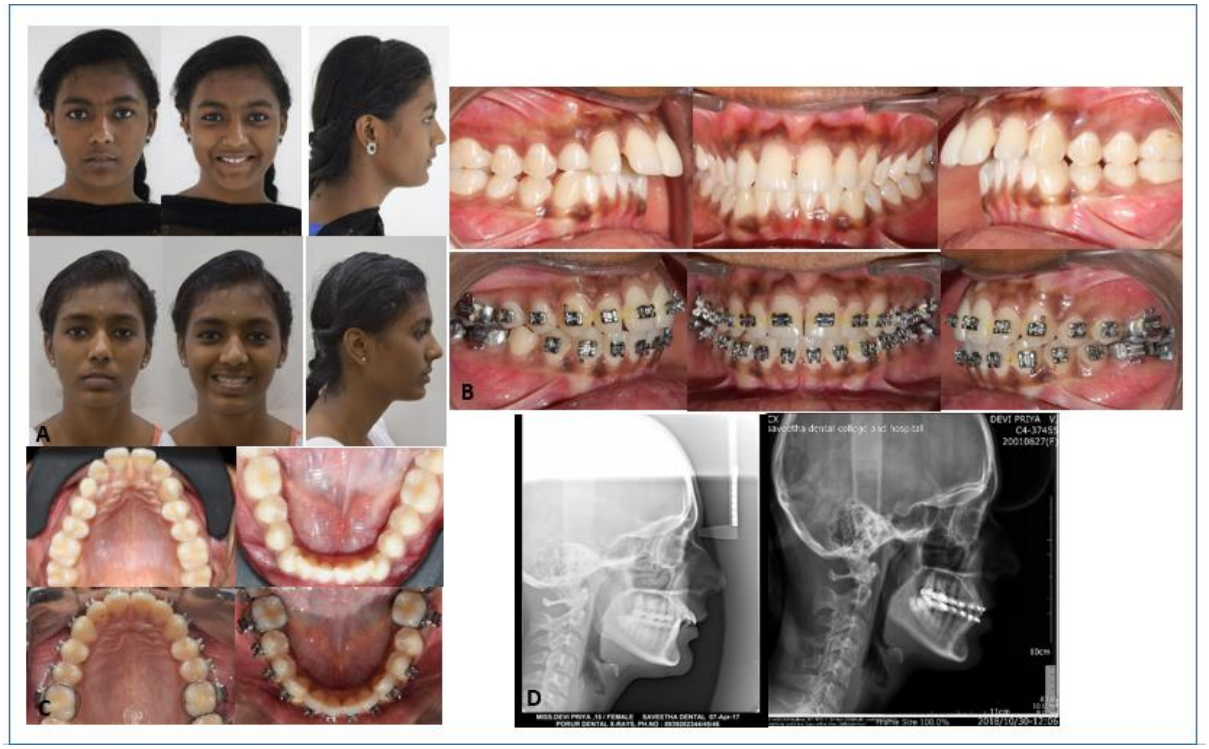

Figure 8: *(A) Case C -extraoral comparative, (B) intraoral comparative, (C) occlusal comparative, (D) cephalometric comparison*

DISCUSSION:

This case study was to assess the dental, skeletal, and soft tissue changes brought about by TFBC in noncompliant Class II Division 1 malocclusion patients. The results in all 3 cases were similar with the dentoalveolar changes seen both in the maxillary and mandibular arches. The upper incisors showed slight amount of retrusion [Tables 1-3].

Table 1: Cephalometric changes: Case A

Measures	Pretreatment	Posttreatment	Difference
SNA(^{0})	80.3	80.6	0.3
SNB(^{0})	75.1	75.2	0.1
ANB(^{0})	5.2	5.4	0.2
Facial Axis (^{0})	84.4	84	-0.4
1 to NA (mm)	5.3	4.3	-1
1 to NA (^{0})	34.9	28.7	-6.2

1 to NB (mm)	5.3	6.1	0.8
1 to NB (^{0})	26.3	29.7	3.4
IMPA (^{0})	98.8	104.1	5.3
Overjet (mm)	7	2	-5
Overbite (mm)	3	2	-1
FMA (^{0})	20.4	23.5	3.1

Table 2: Cephalometric changes: Case B

Measures	**Pretreatment**	**Posttreatment**	**Difference**
SNA(^{0})	80.7	80.4	0.3
SNB(^{0})	74.1	74.9	0.8
ANB(^{0})	6.6	5.5	-1.1
Facial Axis (^{0})	82.6	83.7	1.1
1 to NA (mm)	6.8	6.9	0.1
1 to NA (^{0})	30.4	22.7	-7.7
1 to NB (mm)	7.9	9.5	1.6
1 to NB (^{0})	32.4	37.1	4.7
IMPA (^{0})	99.4	104.2	4.8
Overjet (mm)	8	3	-5
Overbite (mm)	6.2	2	-4.2
FMA (^{0})	28.6	24.3	-4.3

The lower incisors exhibited some amount of proclination. The mandibular first molars also showed mesializing movement and extrusion.

These findings are similar to the outcomes reported by Rothenberg et al.[11] This effect has been reported previously for the appliance in combination with fixed appliances both in pre-pubertal and post pubertal stages.[12] The results found in our study were similar to results obtained by

Rothenberg et al[11]i.e., minimal skeletal effects were seen which may be accounted to deceleration growth status.

Table 3: Cephalometric changes: Case C

Measures	Pretreatment	Posttreatment	Difference
SNA(^{0})	77.4	78	0.6
SNB(^{0})	73.2	74.5	1.3
ANB(^{0})	4.2	3.5	-0.7
Facial Axis (^{0})	87.8	88	0.2
1 to NA (mm)	4.5	4.4	-0.1
1 to NA (^{0})	29.8	23.9	-5.9
1 to NB (mm)	4	6.3	2.3
1 to NB (^{0})	23.1	33.8	10.7
IMPA (^{0})	92.8	103.7	10.9
Overjet (mm)	5	1	-4
Overbite (mm)	5	1	-4
FMA (^{0})	24.4	27.6	3.2

Soft-tissue changes revealed an improvement in the facial profile by the virtue of retrusion of the upper lip but not a forward position of the lower lip. A possible reason is a significant retrusive effect of the upper incisors combined with a protrusion of the lower incisors similarly to that reported in a randomized clinical trial.[13] Because both lips are supported more significantly by the upper incisors, changes in the anteroposterior position of the upper incisors more significantly affects the lip position than changes in the lower incisors. There are some distinct advantages such as quick and easy chairside fabrication, wide range of mandibular excursive movements, small and hygienic design.

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, but anonymity cannot be guaranteed.

SOURCES OF FUNDING:

None to declare

CONFLICT OF INTEREST:

The authors have no conflict of interest to declare.

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