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William Clark's Myofunctional Appliance Therapy for Correction of Decreased Mandibular Length in a Growing Class II Skeletal Pattern Patient – a Case Report

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ABSTRACT

Twin block appliance from its inception and evolution itself has been widely accepted as a more competent Class II corrector compared to earlier bulky monoblock appliances. Functional appliances can be used successfully in growing patients with certain skeletal Class II patients. Twin block appliance is very effective in a growing patient. The successful use of this appliance in the treatment of skeletal Class II malocclusion is based upon factors such as; age of patient, compliance of the patient and other case selection criteria. This appliance is very successful in a patient with a retrognathic mandible and well aligned arches with a positive VTO. This efficiently enables the mandibular forward positioning and improves the profile. This case report is of a 12-year-old growing female patient with a Skeletal Class II Pattern and a recessive lower jaw who was treated with Twin block appliance. The profile changes and treatment results were demonstrated. In permanent dentition, twin block appliance produces a similar effect as in mixed dentition phase. With proper case selection and good patient cooperation, we can obtain a significant result with twin block appliance.

Keywords: Twiblock, William Clark's appliance, Myofunctional appliance, Fixed Appliance Therapy, Recessive Mandible, Class II skeletal pattern, Case report, Fishman's Index, SMI stages

INTRODUCTION

Twin block appliance is very effective in a growing patient. The successful use of this appliance in the treatment of skeletal Class II malocclusion is based upon factors such as; age of patient, compliance of the patient and other case selection criteria. Dentofacial orthopedic treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Functional appliance therapy can be used successfully in Class II malocclusion, e.g., in a growing patient. Twin blocks are simple bite blocks that interlock at a 70° angle and correct the maxilla-mandibular relationship through functional mandibular displacement. The twin block appliance was developed by Clark in 1980s. They modify the occlusal inclined plane, guiding the mandible forward into correct occlusion. The use of these appliances is greatly dependent on patient's compliance and they simplify the fixed appliance phase. Functional appliances may be defined as orthodontic appliances that use the forces generated by the muscles to achieve dental and skeletal changes.[1,2] These appliances have been used

in clinical orthodontics for a long time and are extensively featured in the literature.[3,4] Their effect is produced from the forces generated by the stretching of the muscles.[5] It is a commonly used functional appliance partly due to its acceptability by patients (Chadwick et al., 1998).[6] The muscles and soft tissues are stretched with the generated pressure transmitted to the skeletal and dental structures potentially resulting in skeletal growth modification and tooth movement[6] This case report is of a 12 year old female patient having a recessive mandibular jaw with a Class II skeletal pattern and posteriorly divergent face.

CASE REPORT

EXTRA-ORAL EXAMINATION

A 12 year 4 month old male patient presented with the chief complaint of forwardly placed upper and irregular lower front teeth and a backwardly placed lower jaw. On Extra-oral examination, the patient had a convex profile, grossly symmetrical face on both sides with a retruded chin, potentially incompetent lips, deep mentolabial sulcus and an decreased Nasolabial angle, a Mesoprosopic facial form, Dolicocephalic head form, Average width of nose and mouth, minimal buccal corridor space, a consonant smile arc and posterior divergence of face . The patient had no relevant prenatal, natal, postnatal history, history of habits or a family history.

PRE TREATMENT EXTRA ORAL PHOTOGRAPHS

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INTRA-ORAL EXAMINATION

Intraoral examination on frontal view showed presence of a deep overbite, on lateral view the patient showed presence of Class II div 1 incisor relationship, Class II canine relationship on both sides and an end on molar relationship on both sides. Patient had an overjet of 9 mm and an overbite of 5mm. The upper showed presence of a "U" shaped arch form and lower arch showed a "V" shaped arch form. OPG of the patient showed presence of all four 3rd molars in a developing stage. Hand wrist radiograph showed SMI stage 3 and lateral cephalogram was indicative of a Class II Skeletal pattern with convex facial profile and a recessive mandibular jaw.

PRE TREATMENT INTRA ORAL PHOTOGRAPHS

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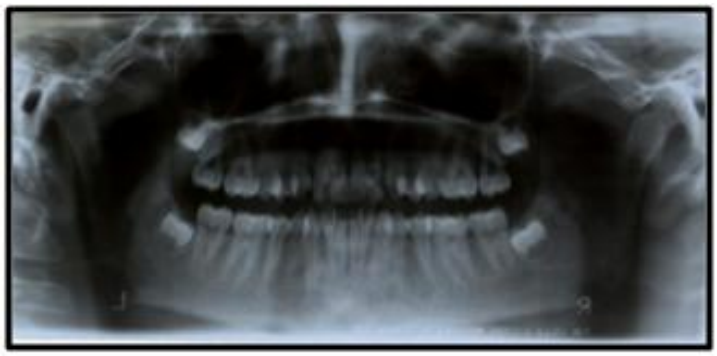
PRE TREATMENT RADIOGRAPHS



PRE TREATMENT CEPHALOMETRIC READINGS

PARAMETERS	PRE- TREATMENT
SNA	82°
SNB	76°
ANB	6°
WITS	5mm
MAX. LENGTH	99mm
MAN. LENGTH	92mm
IMPA	102°
NASOLABIAL ANGLE	89°
U1 TO NA DEGREES	32°
U1 TO NA mm	7mm
L1 TO NB DEGREES	31°

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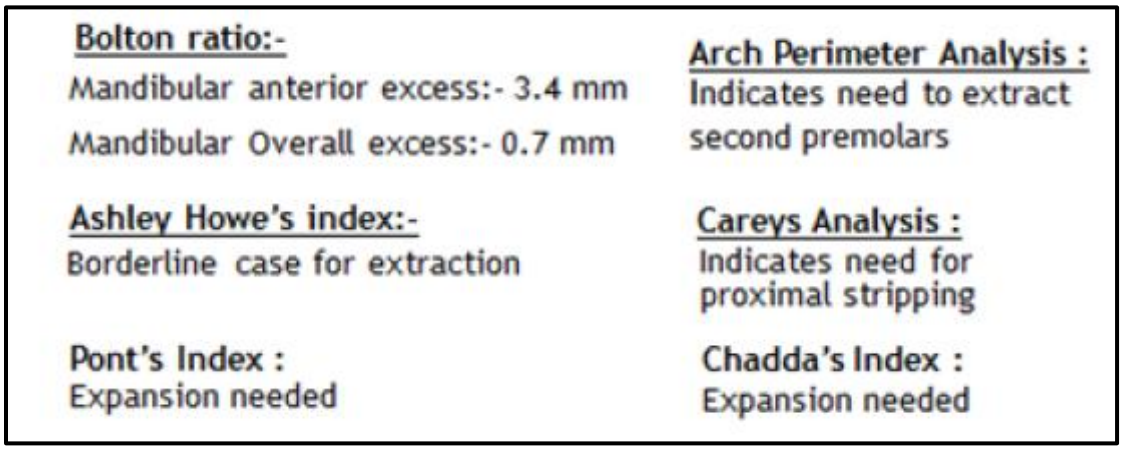
L1 TO NB mm	**6mm**
U1/L1 ANGLE	**112°**
SADDLE ANGLE	**134°**
ARTICULAR ANGLE	**151°**
GONIAL ANGLE	**142°**
FMA	**24°**
Y AXIS	**69°**

1) Steiners analysis shows an average maxilla and a retrognathic mandible, Class II Skeletal pattern, an Average to Horizontal growth pattern, proclined maxillary and mandibular anteriors, forwardly placed maxillary and mandibular anteriors and protrusive upper and lower lips
2) Tweeds analysis shows a Horizontal growth pattern and proclined mandibular incisors
3) Wits appraisal shows AO ahead of BO by 5 mm indicating Skeletal Class II pattern
4) Ricketts analysis shows a retrognathic mandible,retropositioned condyles and proclined mandibular anteriors
5) McNamara analysis shows a retrognathic mandible, a horizontal growth pattern, decreased lower anterior facial height and proclined mandibular incisors
6) Rakosi Jaraback analysis shows a Horizontal growth pattern and proclined maxillary and mandibular incisors
7) Holdaway soft tissue analysis shows increased maxillary and mandibular sulcus depth and increased strain of lips
8) Downs analysis shows a retropositioned chin, a Class II Skeletal pattern, a horizontal growth pattern and proclined maxillary and mandibular anterior teeth.

MODEL ANALYSIS



DIAGNOSIS

This 12 years 4 month old female patient was diagnosed with Angle's Class II div 1 malocclusion with a Class II Skeletal pattern , an average maxilla, retrognathic mandible and a horizontal growth pattern, increased overjet and overbite, proclined upper and lower incisors with crowding in the lower anterior region, deep mentolabial sulcus and protrusive upper and lower lips

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TREATMENT OBJECTIVES

1. To correct mandibular retrognathism
2. To correct proclination of upper and lower anteriors
3. To correct crowding in lower anteriors
4. To correct overjet and overbite
5. To achieve a Class I incisor, canine and molar relationship
6. To correct a deep mentolabial sulcus
7. To achieve a pleasing smile and a pleasing profile

TREATMENT PLAN

a) Myofuntional Therapy: Removable Twinblock appliance

b) Appliance design: Sagittal advancement: 7 mm and Vertical opening: 4 mm

TREATMENT

The treatment plan followed 2 phases of orthopedic and orthodontic correction. 1st phase involved correction of sagittal discrepancy using Twinblock functional appliance therapy. The appliance used was a standard Clark's original Twinblock with a sagittal advancement of 7 mm and a vertical opening of 4 mm. The 2nd phase of treatment involved fixed orthodontic treatment with MBT 0.022 inch slot.

TWINBLOCK DESIGN

The design of the upper component of the twin block involved an acrylic base plate, which covers the palate and occlusal surfaces of the 2nd molars and second premolars. There was an inclined plane at the end of the mesial end of the acrylic block. Lower labial bow was used for anterior retention of the appliance and also to prevent further proclination of lower incisors. A midline screw was also included. The lower component consisted of a lingual acrylic base plate covering the edge of the lower incisors.

TWINBLOCK THERAPY

TREATMENT PROGRESS

Construction bite of the patient was registered by training the patient to bite in the desired anterior position which corrected the profile and enabled a class I molar relation bilaterally. Construction bite was taken with 7mm advancement and 4 mm opening. Clark's Twinblock was fabricated and the

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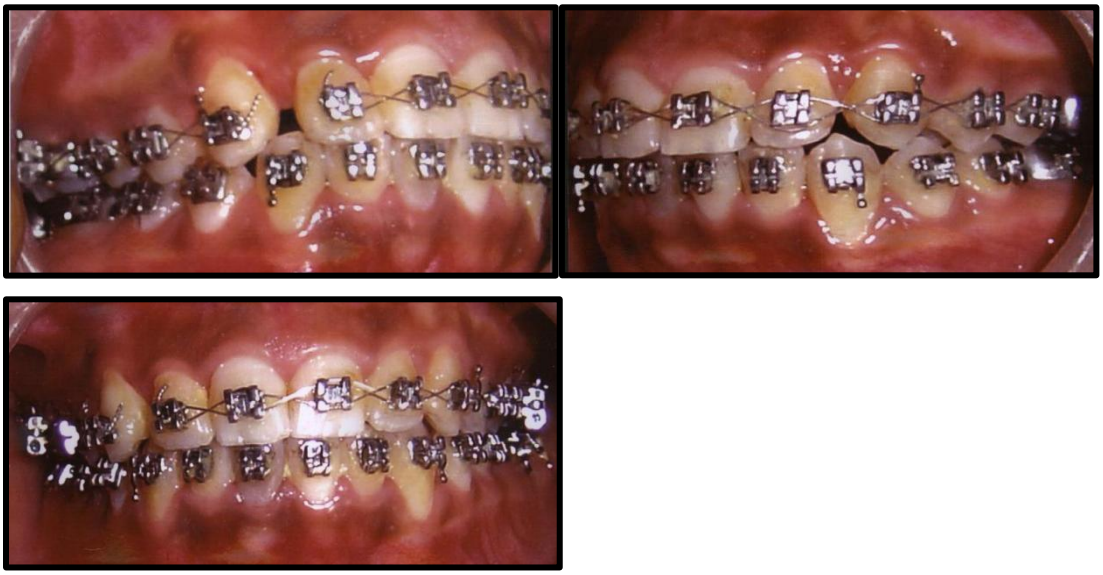
removable appliance was delivered to the patient and proper post appliance delivery instructions were given. Follow ups were carried out regularly. Pterygoid response was observed in the patient within 28 days of delivery of the appliance. Trimming of the appliance was done in an occluso-gingival direction at an interval of 3 weeks. Regular activation of the palatal expansion screw was done to promote expansion of the palate along with sagittal correction into a class I molar relation. The desired sagittal and transverse correction was achieved in 8 months. Photograph of Profile change after myofunctional therapy show the positive change in patients profile.

FIXED APPLIANCE THERAPY WITH MBT0.022 INCH SLOT

Treatment Rationale of Phase I of the treatment involved the use of functional appliance to reduce the overjet and overbite, achieve a class I incisor, canine and molar relationships, and to gain anchorage at the start of the treatment for ease and simplification during the fixed appliance stage. The treatment greatly improved the patient's profile by causing a skeletal change. This phase was followed with upper and lower fixed appliances (0.022″ slot brackets) for leveling and alignment of the dentition, detailing, and finishing of the case. Settling elastics were given bilaterally for correction of posterior occlusion. The overall treatment time was 24 months, i.e., 12 months of functional appliance wear and 12 months of fixed appliance treatment. The molar relationship was overcorrected to a super Class I on the right and left side and a Class I incisor and canine relation was achieved. Retention by means of both removable Hawley's retainer was given for 1 year and permanent Lingual Bonded retainers in upper and lower arch were given.

MID TREATMENT INTRAORAL OF FIXED APPLIANCE THERAPY



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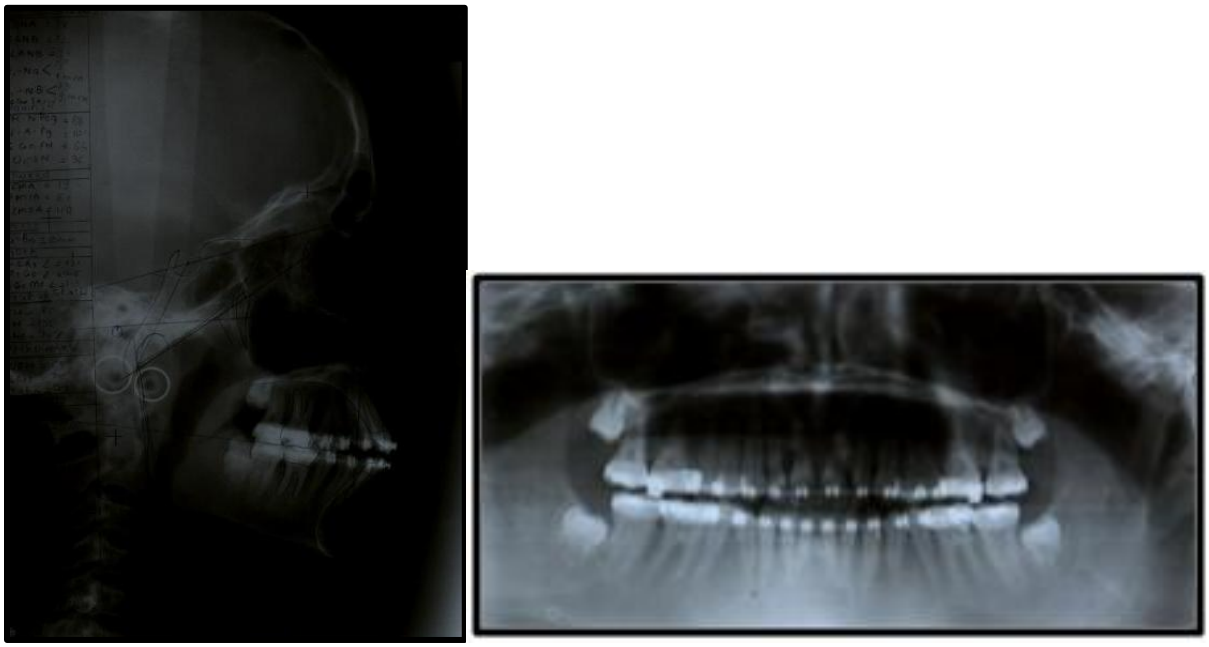
MID TREATMENT XRAYS



DISCUSSION

Class II malocclusion might have any number of combination of skeletal and dental components. Hence, identifying and understanding the etiology and expression of Class II malocclusion and identifying differential diagnosis is helpful for its correction. Twin block functional appliance has several well established advantages including the fact that it is well tolerated by patients and it can be used in the mixed and permanent dentition[7,8]. There are potential disadvantages such as the proclination of the lower incisors and development of posterior open bites. In this case, the treatment objectives were achieved largely due to good patient compliance. The patient's chief complaint was forwardly placed upper and irregular lower front teeth and a backwardly placed lower jaw. The selection of functional appliances is dependent upon several factors which can be categorized into patient factors, such as age and compliance, and clinical factors, such as preference/familiarity and laboratory facilities [9-11]. The myofunctional therapy resulted in an improvement in the patient's profile, which is largely attributed to the favorable growth and partly to the functional appliance. It has been proved in the literature that functional appliances do not produce long-term skeletal changes and most of their effects are dentoalveloar[13,14]. In a prospective controlled trial[8] with twin blocks and controls to investigate the skeletal and dental effects showed that the ANB angle reduced by 2°, which was almost entirely due to mandibular length increase which was 2.4 mm compared to the controls as measured from Ar-Pog[15]. There was no evidence of a restriction in maxillary growth[16]. Successful results were obtained after the myofunctional therapy within 12 months of time. The overall treatment time was 24 months, i.e., 12 months of functional appliance wear and 12 months of fixed appliance treatment. After this active treatment phase, the profile of this 14 year old female patient improved significantly as seen in the post treatment extra oral photographs.

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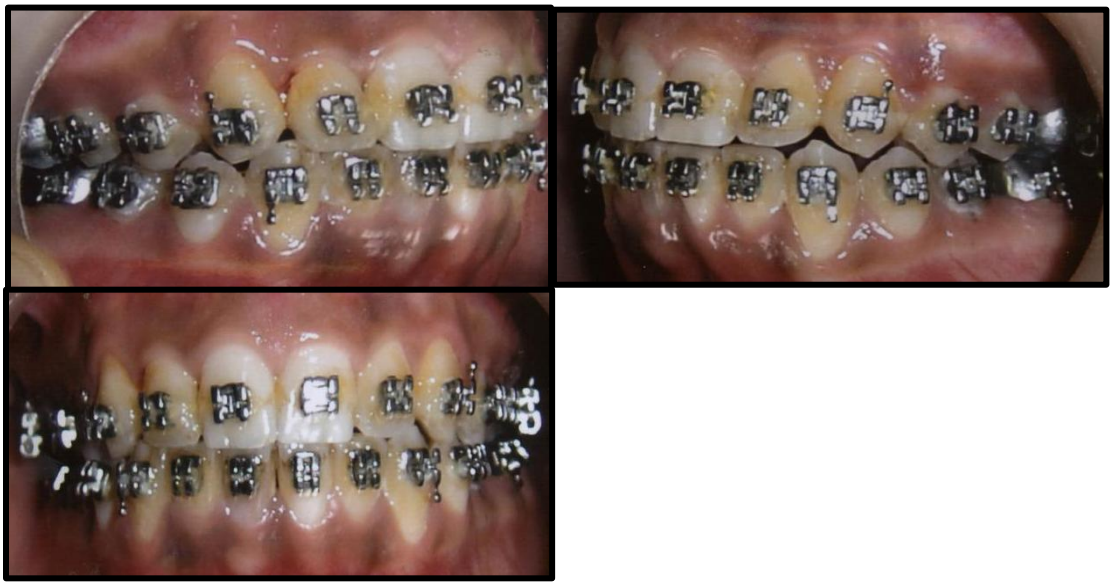
PRE FINISHING INTRAORAL



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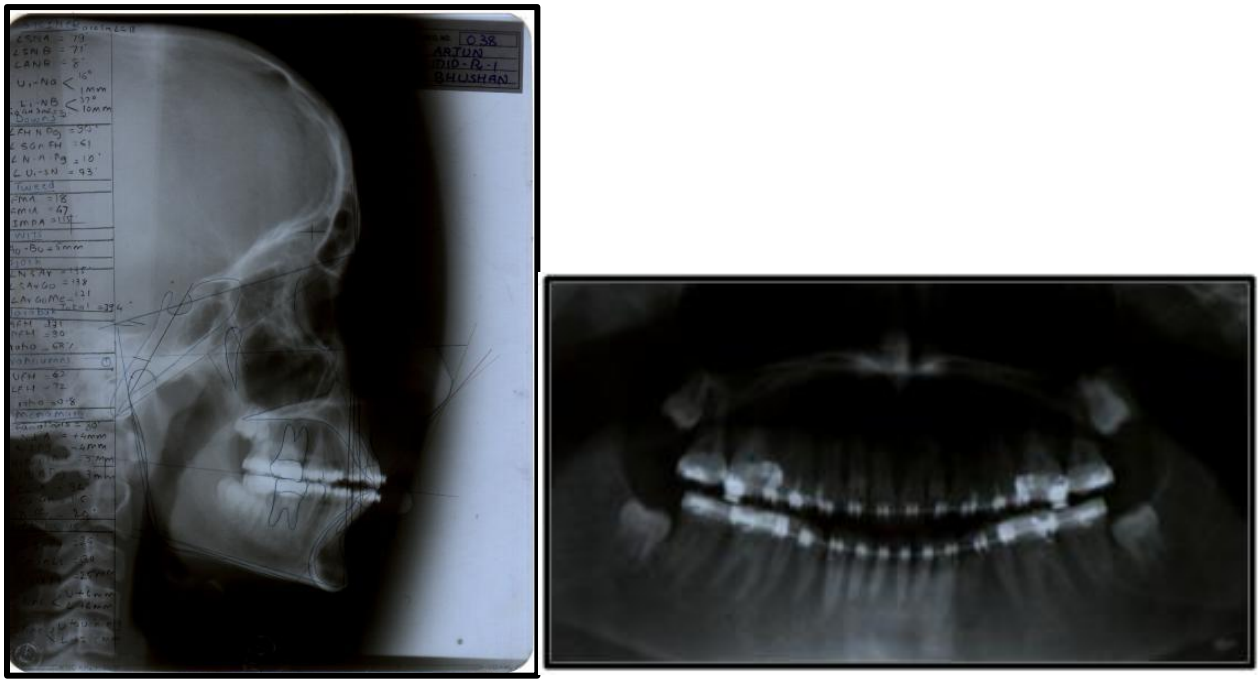

POST TREATMENT CEPHALOMETRIC READINGS

PARAMETERS	POST-TREATMENT
SNA	81°
SNB	80°

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ANB	**1°**
WITS	**1.5mm**
MAX. LENGTH	**94mm**
MAN. LENGTH	**101mm**
IMPA	**95°**
NASOLABIAL ANGLE	**103°**
U1 TO NA DEGREES	**27°**
U1 TO NA mm	**3mm**
L1 TO NB DEGREES	**24°**
L1 TO NB mm	**2mm**
U1/L1 ANGLE	**131°**
SADDLE ANGLE	**128°**
ARTICULAR ANGLE	**147°**
GONIAL ANGLE	**131°**
FMA	**25°**
Y AXIS	**71°**

POST TREATMENT EXTRA ORAL PHOTOGRAPHS

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POST TREATMENT XRAYS

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POST TREATMENT INTRA ORAL PHOTOGRAPHS

COMPARISON OF PRE AND POST TREATMENT CEPHALOMETRIC READINGS

PARAMETERS	PRE- TREATMENT	POST-TREATMENT
SNA	82°	81°
SNB	76°	80°
ANB	6°	1°
WITS	5mm	1.5mm
MAX. LENGTH	99mm	94mm
MAN. LENGTH	92mm	101mm
IMPA	102°	95°

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NASOLABIAL ANGLE	**89°**	**103°**
U1 TO NA DEGREES	**32°**	**27°**
U1 TO NA mm	**7mm**	**3mm**
L1 TO NB DEGREES	**31°**	**24°**
L1 TO NB mm	**6mm**	**2mm**
U1/L1 ANGLE	**112°**	**131°**
SADDLE ANGLE	**134°**	**128°**
ARTICULAR ANGLE	**151°**	**147°**
GONIAL ANGLE	**129°**	**131°**
FMA	**24°**	**25°**
Y AXIS	**69°**	**71°**

PROFILE CHANGES PRE AND POST TREATMENT

CONCLUSION

Functional appliance therapy is an effective way of treating skeletal Class II malocclusion with mandibular retrusion via growth modification. The effect of twin block functional appliances is mostly dentoalveloar with small skeletal component[17,18]. However, there are a number of situations where functional appliances can be successfully used to correct Class II malocclusion. It is important that functional appliances are used in a growing patient to achieve the maximum benefit. They simplify the following phase of fixed appliance by gaining anchorage and achieving Class I molar relationship. In this case, the patient was treated with a twin block appliance followed by fixed appliance therapy which gave satisfactory results at the end of the treatment

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