

Original Research

Assessment of skeletal changes using Twin block appliance: A cephalometric study

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ABSTRACT:

Background: Class II malocclusion is one of the most common orthodontic problem. The main reason for seeking orthodontic treatment for Class II malocclusions is aesthetic improvement. In case of skeletal malocclusion, treatment options change according to patient's age. In younger patients with significant growth potential, best treatment result is usually achieved by growth modification by using myofunctional appliances. The present study was done to assess the skeletal changes using Twin block appliance. **Material and methods:** The study was conducted in the department of Orthodontics and dentofacial orthopaedics to assess the skeletal changes using Twin Block in 15 patients. Cephalometric radiographs of the patients were obtained at the beginning of the study (Ceph1) and at end of the treatment (Ceph 2). Standard twin block appliance was used to correct class II malocclusion with deficient mandible. Steiner's analysis and Witt's appraisal were used to assess the skeletal changes. Statistical analysis was performed using the Statistical Package for the Social Sciences software version 21.0 (SPSS Inc., Chicago, IL, USA). A p-value <0.05 was predetermined as statistically significant. **Results:** In the present study total sample size was 15 in which 53% were boys and 47% were girls. The study showed significant variations between pre treatment and post treatment findings. SNA value was found to be decreased which showed a restrictive effect of Twin block on maxilla. An increase in the SNB angle indicated a forward shift of mandible. The spatial position of the mandible related to the anterior cranial base (SND) was found to be increased whereas a significant reduction ($p < 0.05$) in the measurements related to maxillo mandibular sagittal position (ANB, AO-BO) was obtained. **Conclusion:** Result of the present study showed significant improvement in spatial position of mandible and in the relative sagittal position of maxilla and mandible.

Key words: Maxillomandibular, Sagittal, Twin block appliance.

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INTRODUCTION:

The most frequently encountered problems within orthodontic practice is Class II malocclusion.¹ Class II malocclusion can be caused by many contributing factors, both dental and skeletal. Although maxillary protrusion and mandibular retrusion are both found to be possible causative factors,² the most consistent diagnostic finding in Class II malocclusion is mandibular skeletal retrusion. To enhance mandibular growth, a growth modification therapy is indicated in these patients.^{2,3}

A wide range of functional appliances that include both removable and fixed appliances, are available for correction of class II skeletal and occlusal disharmonies. However the twin block appliance has gained popularity over the last decade.⁴ Twin block was developed by Dr. William J. Clark in Scotland. By virtue of its configuration it has gained wide spread popularity due to its patient friendly nature. Contrary to all other functional appliances, Twin block is made of two separate occlusal blocks which are not directly connected. They make contact through an inclined plane designed in such way that they favourably direct occlusal forces by causing a

functional mandibular displacement. This appliance is based on the same principle as the protrusive functional appliances.⁵ Twin Block induce supplementary lengthening of the mandible by stimulating increased growth at the condylar cartilage.⁶ The present study was done to assess the skeletal changes using twin block appliance.

MATERIAL AND METHODS:

A total of 15 patients (8 males and 7 females) were selected from the outpatient department of orthodontics and dentofacial orthopaedics The study was conducted to assess the skeletal changes using Twin Block appliance. Before the commencement of the study ethical approval was taken from the ethical committee and informed consent was duly signed by the parents. Patients with skeletal Class II malocclusion with retrognathic mandible , age ranging from 9-14 years, Class II molar relation on both sides, overjet of 6mm and more, horizontal growth pattern, a positive VTO, no crowding in upper or lower arch, no history of previous orthodontic treatment or a systemic condition were included in the study. Cephalometric radiographs of the patients were obtained at the beginning of the study (Ceph 1) and at end of the treatment (Ceph 2).The treatment duration was 1 year ± 4 months. The class II malocclusion in treatment group subjects was corrected by standard twin-block appliance. One-step mandibular advancement was carried out during the wax bite registration. An edge-to-edge incisor relationship with 2- to 3-mm opening between the maxillary and mandibular central incisors was maintained for all subjects. The patients were instructed to wear the appliance 24 h/day, especially during mealtimes and during night. Patients were followed once in every 4 weeks.

The lateral cephalogram was taken for all subjects selected under this study. Target film distance of 5 feet or 152.4 centimetres was used for all cephalograms (ceph 1 and ceph 2) obtained. The cassette-film assembly was positioned parallel with the midsagittal plane of the subject such that the x-ray beam is directed perpendicular to it. . A voltage of 80kvp and a current of 20mA was used with an exposure time of 2.5 seconds to obtain the lateral head film.

Lateral cephalograms were traced upon a 0.003 mm matte acetate tracing paper with 3H lead pencil. The tracings were analysed using linear and angular measurements according to Steiner’s analysis and Witt’s appraisal (Figure 1). Linear and angular measurements were done to an accuracy of 0.5 mm and 0.5 degrees respectively. The changes in the skeletal parameters were studied by comparing Ceph 1 and Ceph 2 cephalograms. Statistical analysis was performed using the Statistical Package for the Social Sciences software version 21.0 (SPSS Inc., Chicago, IL, USA). A p-value <0.05 was predetermined as statistically significant.

RESULTS:

In the present study total sample size was 15 in which 53% were boys and 47% were girls [table 1].Significant

differences were found between pre treatment and post treatment values.Angle SNA indicates the sagittal relationship of anterior limit of maxillary apical base to the anterior cranial base. An increase in this angle is expected in growing children. However in the present study , a significant decrease in SNA angle was reported which indicated a restrictive influence of Twin block appliance over maxilla. Study showed an increase in the value of SNB angle which was statistically significant (p=0.001).Increase in the value of SNB indicated a forward shift of mandible. Increased SNB indicated statistically significant improvement in the spatial position of mandible. The value of SND was found to be increased in ceph 2 which indicated an increase in the spatial position of mandible related to anterior cranial base. The values of ANB and AO-BO, which indicate sagittal position of maxilla and mandible, were found to be reduced significantly (p= 0.029 and p=0.012 respectively).

Figure 1: Linear and angular measurements used in the study.

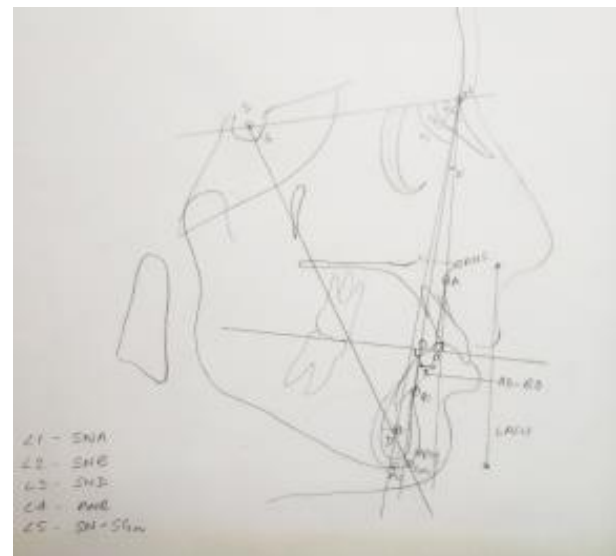


Table 1 : Distribution according to gender.

Gender	N(%)
Boys	8(53%)
Girls	7(47%)
Total	15(100%)

Table 2: Mean change in dimensions of skeletal parameters assessed from Ceph 1 and Ceph 2 cephalograms.

Skeletal parameter	Mean change in dimension (Ceph 2-Ceph 1)	p-value
SNA	-0.5	0.049
SNB	2.4	0.001
SND	0.46	0.018
ANB	-0.04	0.029
AO-BO	-0.83	0.012
LAFH	0.75	0.09
SN-SGn	-0.54	0.16

DISCUSSION:

Twin block appliance is a removable myofunctional appliance to correct the skeletal malocclusion during the growth phase. It is actually made up of two acrylic bite blocks, one on the upper and the other on the lower arch, hence called "twin block."⁸ The two acrylic bite blocks are made inclined at an angle of 70° to each other. The mechanism of action of the twin block depends on the functional displacement of mandible to a favourable position to correct the maxillo-mandibular discrepancy. The two piece design of the twin block enables the patient to use the appliance round the clock which improves orofacial function by bringing about both dental and skeletal changes.⁹

In the present study total sample size was 15 in which 53% were boys and 47% were girls. Statistically significant variations were found in SNA, SNB, SND, ANB, and the value of AO-BO ($p < 0.05$) [table 2]. Twin block restricts the forward growth of maxilla which is indicated by a significant decrease in SNA angle. SNB angle was found to be increased along with SND which indicated a more anteriorly positioned mandible whereas a reduced value of ANB, and the value of AO-BO indicated a more anterior placement of mandible in relation to maxilla.

Similar results have been reported in various other studies in literature. Saikoski LZ et al¹⁰ studied the dentoskeletal effects of Class II malocclusion treatment performed with the Twin Block appliance. He reported that the Twin Block appliance did not show significant effects on the maxillary component. The mandibular component showed a statistically significant increase in the effective mandibular length (Co-Gn) and significant improvement in the maxillo-mandibular relationship. The authors concluded that the Twin Block appliance has great effectiveness for correction of skeletal Class II malocclusion in individuals with growth potential.

Tarvade SM et al evaluated skeletal and dentoalveolar effects of Forsus fatigue resistant devices (FRD) and twin-block (TB) appliance in Class II malocclusion cases. However, more AP skeletal changes were seen with Twin block appliances as compared with Forsus. In this study authors found Twin block appliance to have more mandibular lengthening effect as compared to Forsus, and thus was found to be more effective in treatment of Class II cases.¹¹

Ahmadian-Babaki F et al compared the mean changes in the skeletal parameters using twin block and bionator. Twin block and bionator showed no statistically significant differences in cephalometric parameters except for ANB, NA-Pog, Basal and Ar-Go-Me angles.

Authors concluded that Twin block was more efficient in inhibition of forward movement of maxilla.¹²

CONCLUSION:

The present study showed that there was significant improvement in spatial position of mandible and maxillo-mandibular sagittal position and hence twin block appliance can be effectively used to treat class II patients with retrognathic mandible.

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