

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Treatment Effects of Twin Block Therapy – A Cephalometric Study

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ABSTRACT

Class II malocclusion with mandibular retrognathism in growing patients is most commonly treated with twin block appliance therapy. This study is being carried out to evaluate the skeletal and dental effects of twin block therapy using Modified Pancherz's analysis. Pre-treatment and post-treatment lateral cephalograms of 12 patients treated with twin block appliance were collected from the Graduate Orthodontic Clinic at the Saveetha University, Chennai. Modified Pancherz's analysis was performed using FACAD (version 3.8.4.2) software to find the skeletal and dental effects of twin block therapy. Twin block appliance produced an overjet correction of 5.3mm and correction in the molar relation of 5.5mm. Mandibular base measurements showed significant increase of 9.61 ± 4.2 mm . The lower incisor inclination showed an increase of 8.7 ± 3.02 mm. Other variables were not statistically significant. Overjet correction and molar anteroposterior changes were statistically significant. This was skeletally contributed by the increase in the mandibular base measurements. Overjet correction could also be contributed by the increase in lower incisor proclination. The results showed skeletal as well as dental changes . However the skeletal changes were more prominent.

Keywords: Twin Block , Pancherz's Analysis , Skeletal Changes , Dental Changes

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INTRODUCTION

Class II malocclusion is one of the most frequent problems in an orthodontic set up[1] Skeletal Class II malocclusion can be due to maxillary prognathism , mandibular retrognathism , or both . However , the most common reason of Class II malocclusion is mandibular retrognathism, rather than maxillary prognathism[2]. One of the recommended therapeutic approaches to Class II malocclusion with mandibular retrognathism in growing patients is functional jaw orthopedics through the primary mechanism of mandibular advancement[3].

Functional appliance therapy has become an increasingly popular method of correcting Class II malocclusion in growing individuals . Functional appliances can be of two types – removable and fixed functional appliances . Some of the removable appliances are Activator , Bionator , Frankel , Twin block , etc . Fixed functional appliances include Jasper Jumper , Forsus , Herbst , etc . The functional appliance system that has shown increased use during the last two to three decades is the Twin-block appliance[4]. Twin block is the most common appliance used for the correction of class II div 1 malocclusion

The Twin-block Appliance was developed by William J. Clark of Fife, Scotland, for use in the correction of Class II malocclusions characterized in part by Mandibular Skeletal Retrusion[5]. The appliance consists of maxillary and mandibular bite blocks that are tooth and tissue borne. The main objective of therapy with functional appliances such as the Twin-block is to induce supplementary lengthening of the mandible by stimulating increased growth at the condylar cartilage[6].

The aim of the present study is to evaluate the significant skeletal and dental changes produced by twin block appliance therapy using Modified Pancherz's cephalometric analysis.

MATERIALS AND METHODS

The cephalometric records of 14 patients treated with twin block appliance were collected from the Graduate Orthodontic Clinic at the Saveetha University, Chennai . Pre-treatment and post-treatment cephalograms of all the patients were obtained. The inclusion criteria are Skeletal Class II with mandibular retrognathism , Angle's Class II molar relationship , CVMI stages of CVMI 2 AND CVMI 3 , no previous orthodontic treatment , compliant patient. The exclusion criteria are absence of full Class II molar relationship, poor film quality, additional orthodontic treatment, extractions of permanent teeth during the period of Twin-block therapy and non compliant patients. Two patients were dropped out from the study according to the exclusion criteria (did not wear the appliance regularly) . The remaining 12 sets of cephalograms were analyzed in the present study.

Lateral cephalograms were taken before the start of twin block appliance therapy (T1). The Twin-block appliances used in this study were of the design originally developed by Clark. The appliance consisted of maxillary and mandibular bite planes covering the second premolar and molars in the upper arch and first and second premolar in the lower arch . Delta clasps were placed in the upper first molar and lower first premolars . The mandibular appliance also consisted of ball end clasps in the incisor region .

The active treatment time with the twin block appliance ranged from 10-14 months. Though all the patients were asked to wear full-time, a wide range existed in the compliance. After the completion of twin block appliance therapy , a lateral cephalogram was taken (T2).

FACAD (version 3.8.4.2) software was used to perform the Modified Pancherz's analysis. (Fig 1) to find the effects of twin block appliance therapy .

The following variables were measured (Fig 2)

- is/OLp minus ii/OLp: overjet
- ms/OLp minus mi/OLp: molar relation (a positive value indicates a distal relation; a negative value indicates a mesial relation)
- A point/OLp: sagittal position of the maxillary base
- pg/OLp: sagittal position of the mandibular base

- co/OLp: sagittal position of the condylar head
- pg/OLp + co/OLp: composite mandibular length
- is/OLp minus A point/OLp: sagittal position of the maxillary central incisor within the maxilla.
- ii/OLp minus pg/OLp: sagittal position of the mandibular central incisor within the mandible
- ms/OLp minus A point/OLp: sagittal position of the maxillary permanent first molar within the maxilla
- mi/OLp minus pg/OLp: sagittal position of the mandibular permanent first molar within the mandible

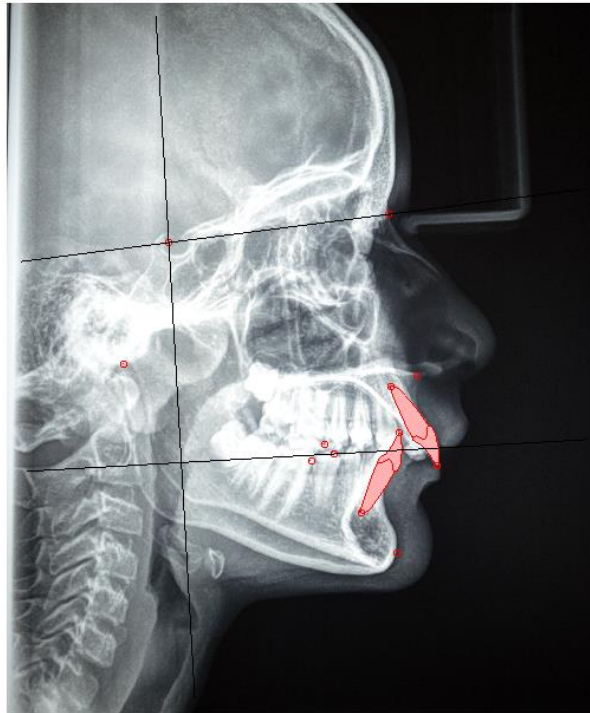


Figure 1: Analysis done in FACAD software

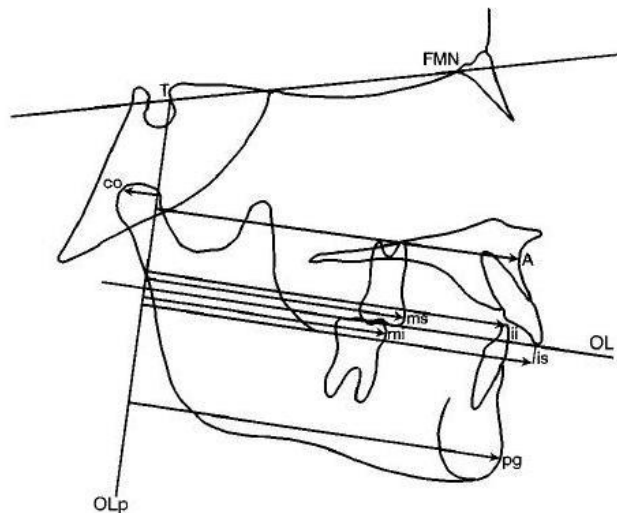


Figure 2: Modified Pancherz's analysis (OL – Occlusal line . OLp – Occlusal line perpendicular , is – incisor superioris , ii – incisor inferioris , ms –molar superioris , mi – molar inferioris , co – condylion , pg – pogonion)

Statistical Analysis

A paired t-test was done using statistical package for the social sciences (SPSS) 22 software to assess differences in the different variables before and after treatment and to check their level of significance .

RESULTS

Table 1 shows the results obtained . On comparing the pre-treatment and post-treatment values , the treatment with twin block appliance produced an overjet correction of 5.3mm and correction in the molar relation of 5.5mm. The skeletal contribution to the overjet correction is exclusively due to the mandibular base measurements. Mandibular base measurements showed significant increase of 9.61±4.2mm . The change in the sagittal position of the maxillary base was not significant . The change in the sagittal position of the condylar head is 2.42±1.3mm. The axial inclination of the upper central incisor reduced by 3.4mm±2.3mm , whereas the lower incisor inclination showed an increase of 8.7±3.02mm. The change in position of the upper molar was not significant . However , the change in the sagittal position of the lower molar improved by 9.975 ±3.02mm .

Table 1: A paired t-test to assess differences in the different variables before and after treatment and to check their level of significance.

Parameters	Mean	Sig (2 tailed)	95% confidence interval of the difference	
			Lower	Upper
Overjet	-5.325	.001	2.96428	7.68572
Molar relation	-5.5	.001	2.99353	8.00647
Sag position of Max base	2.0625	.179	-5.33229	1.20729
Sag position of Mand base	9.6125	.003	-14.83774	-4.38726
Sag position of condylar head	-2.425	.017	.59024	4.25976
Composite Mand length	7.1875	.006	-11.62808	-2.74692
Sag posn of U C.I within max	3.425	.067	-7.17254	.32254
Sag posn of L C.I within mand	8.7125	.002	-12.95012	-4.47488
Sag posn of max molar	3.3375	.087	-7.30258	.62758
Sag posn of mand molar	9.975	.001	-14.60541	-5.34459

DISCUSSION

Skeletal class II malocclusion is the most common malocclusion and there are several removable and fixed functional appliances to correct the skeletal class II malocclusion with mandibular retrognathism in growing patients. Because of its simple design, more patient acceptance , clinical advantage of control of vertical development of premolars and molars through selective removal of the acrylic , the Twin block has gained popularity in the recent years among the patients and the clinicians and has become the most common appliance used for the correction of skeletal class II malocclusion with mandibular retrognathism in growing individuals .

In the present study, pre-treatment and post-treatment cephalograms were obtained from the patients treated with twin block appliance and FACAD (version 3.8.4.2) software was used to perform the Modified Pancherz’s analysis to find the skeletal and dental effects of twin block appliance therapy.

The overjet correction was 5.325±1.02mm and the correction of molar relation was 5.5±1.14mm and these are statistically significant. The skeletal contributions to these occlusal changes is predominantly due to the change in the sagittal position of the mandibular base (9.61±4.2mm). Significant changes in the mandibular dimensions consisted of greater increments of the total mandibular length. However , the reduction of the overjet may also be due to the increase in proclination of the lower incisors . Mandibular incisors were proclined significantly by treatment, whereas the position of the maxillary incisors were retroclined by 3.4mm . Mills et al [7] and McNamara et al [6] also found proclination of the lower incisors. Another significant change is the sagittal position of the mandibular molar, which is due to the forward movement of the mandible.

As for the comparison of the results of the present study with those reported by the previous investigations on Twin Block therapy [4],[7],[8] an agreement exists with regard to the predominant

mandibular effect , the concomitance of dentoalveolar changes and a decreased effect on the sagittal position of the maxilla.

The drawback of this study is the sample size and thus more studies has to be done in the future to overcome this and several other analyses can also be done to evaluate the dental and skeletal effects of twin block therapy.

CONCLUSION

- The overjet correction was 5.325 ± 1.02 mm and the correction of molar relation was 5.5 ± 1.14 mm.
- Mandibular base measurements showed significant increase of 9.61 ± 4.2 mm . The change in the sagittal position of the maxillary base was not significant.
- The axial inclination of the upper central incisor reduced by $3.4 \text{mm} \pm 2.3 \text{mm}$, whereas the lower incisor inclination showed an increase of 8.7 ± 3.02 mm.
- The changes in the sagittal position of the maxillary base and the position of the maxillary molar were not statistically significant
- The change in position of the upper molar was not significant . However , the lower molar moved forward along with the mandible by 9.975 ± 3.02 mm.

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