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Sneh Kalgotra
Registrar Post graduate department of Orthodontics & Orthopaedics. Government dental college & hospital, Srinagar, Jammu & Kashmir, India

Dr. Mohammad Mushtaq
Professor & Head, Post graduate department of Orthodontics & Orthopaedics.
Government dental college & hospital, Srinagar, Jammu & Kashmir

Dr. Mariya Qadir
Ex PG student, Post Graduate Department of Orthodontics & Dentofacial Orthopaedics.
Government Dental College & Hospital, Srinagar, Jammu & Kashmir. India

Correspondence
Sneh Kalgotra
Registrar Post graduate department of Orthodontics & Orthopaedics. Government dental college & hospital, Srinagar, Jammu & Kashmir, India

Dento-skeletal changes in patients using twin-block appliance- A pre and post treatment comparison

Sneh Kalgotra, Dr. Mohammad Mushtaq, Dr. Mariya Qadir

Abstract
Background: Class II patients show specific clinical characteristics, such as a large overjet resulting in a soft tissue profile imbalance. This is closely related to patients' and parents' complaints concerning self-image and self-confidence. In order to reestablish their self-esteem, an early approach into correction of the dentoskeletal disharmony and improvement of facial esthetics may be indicated in the pre-pubertal stage, sometimes leading to two-phase orthodontic treatment.
Aim of study: To evaluate dentoskeletal changes in patients using twin-blockappliance.
Materials and method: The study was conducted in the post- graduate department of Orthodontics and Dentofacial Orthopedics of the Dental institute. 32 patients were selected from patients attending the out patient department of orthodontics. Cephalometric radiographs of the patients were obtained at the beginning of the study (T1) and after completion of the treatment (T2) (treatment time 1 year ±3.6 months). The changes in the dento-skeletal parameters were studied by comparing T1 cephalogram and T2 cephalogram.
Results: In case of skeletal changes we observed significant increase in the spatial position of the mandible related to the anterior cranial base (SND) and significant reduction in the measurements related to maxillomandibular sagittal position. In case of dental parameters, we observed statistical changes on upper incisors position (1/NA degree) and on lower incisors tipping (1/NB degree), which resulted in significant increase of interincisal angle.
Conclusion: From the results of present study we conclude that there is a significant improvement in the total mandibular length and anteroposterior relationship in patients treated with twin-block appliance.

Keywords: Twin-block, Class II malocclusion, mandibular relation

Introduction
Class II patients show specific clinical characteristics, such as a large overjet resulting in a soft tissue profile imbalance. This is closely related to patients' and parents' complaints concerning self-image and self-confidence [1, 2] In order to reestablish their self-esteem, an early approach into correction of the dentoskeletal disharmony and improvement of facial esthetics may be indicated in the pre-pubertal stage, sometimes leading to two-phase orthodontic treatment [3] Although, the controversy regarding the best time of Class II skeletal malocclusion correction still remains [4]. The Twin Block (TB) appliance is used to promote correction of Class II mandibular deficiency malocclusions. A number of authors have already discussed its effectiveness on mandibular changes, overjet and Class II correction in European and American sample, but different populations may have different results using the same appliance [5-8] Hence, the present study was planned to evaluate dentoskeletal changes in patients using twin-blockappliance.

Materials and method
The study was conducted in the post-graduate department of Orthodontics and Dentofacial Orthopedics of the dental institution. The protocol of the study was approved from the ethical board of the institute before the study. For the study 32 patients were selected from 2654 patients that reported to the outpatient department of Orthodontics in the month of April 2016 to May 2016.
Inclusion criteria were patients with i) skeletal Class II malocclusion with retrognathic mandible, ii) age range of 9-14 years, iii) Class II molar relation on both sides, iv) overjet of 6mm and more, v) horizontal growth pattern, vi) parent's and patient both willing for the

treatment, and vii) a positive VTO, viii) no crowding in upper or lower arch.

Patients with history of previous orthodontic treatment or a systemic condition were excluded from the study. We selected a total of 32 subjects. Cephalometric radiographs of the patients were obtained at the beginning of the study (T1) and at end of the treatment (T2) (1 year ±3.6 months). Twin block appliance that was used, was the basic design as described by Dr. Clark. A written informed consent was obtained from the parents or guardians of the subjects after verbally explaining them the procedure of the study. 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 they were followed once in every 4 weeks. The change in the dento-skeletal parameters were studied by comparing T1 cephalogram and T2 cephalogram (treatment time 1 year ±3.6 months). The parameters used were directly taken as described in Steiner's and Witt's appraisal.

The statistical analysis of the data was done using SPSS software version 10.0 for windows. Student's t-test and Chi-square test were used for checking the significance of the data. A p-value less than 0.05 was predetermined as statistically significant.

Results

A total of 32 patients were selected in the study. The age of the patients ranged from 9-14 years. The number of male patients was 16 and female patients were 16. Table 1 shows the mean change in dimensions of Skeletal and Dental parameters evaluated from T1 Cephalogram and T2 Cephalogram. In case of skeletal changes were observed significant increase in the spatial position of the mandible related to the anterior cranial base (SND) and significant reduction in the measurements related to maxillomandibular sagittal position (ANB, AO-BO)($p<0.05$)[Fig 1]. In case of dental parameters, we observed statistical changes on upper incisors position (1/NA degree) and on lower incisors tipping (1/NB degree), which resulted in significant increase of interincisal angle ($p<0.05$) [Fig 2].

Discussion

The present study was planned to evaluate dentoskeletal changes in patients using twin-block appliance. A total of 32 patients were selected in the study. The age of the patients ranged from 9-14 years. The number of male patients was 16 and female patients were 16. In case of skeletal changes e observed significant increase in the spatial position of the mandible related to the anterior cranial base (SND) and significant reduction in the measurements related to maxillomandibular sagittal position. In case of dental parameters, we observed statistical changes on upper incisors position (1/NA degree) and on lower incisors tipping (1/NB degree), which resulted in significant reduction of interincisal angle. The results were consistent with other similar studies from the literature. Saikoski LZ *et al* assessed the dentoskeletal effects of Class II malocclusion treatment performed with the Twin Block appliance. The experimental group comprised 20 individuals with initial mean age of 11.76 years and was treated for a period of 1.13 years. The control group comprised 25 individuals with initial mean age of 11.39 years and a follow-up period of 1.07 years. Lateral cephalograms were taken at treatment onset and completion to assess treatment outcomes. Intergroup comparison was performed by means of the chi-square and independent t tests. 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 maxillomandibular relationship. The maxillary and mandibular dentoalveolar components presented a significant inclination of anterior teeth in both arches. The maxillary incisors were lingually tipped and retruded, while the mandibular incisors were labially tipped and protruded. The authors concluded that the Twin Block appliance has great effectiveness for correction of skeletal Class II malocclusion in individuals with growth potential. Most changes are of dentoalveolar nature with a large component of tooth inclination associated with a significant skeletal effect on the mandible.de Abreu Vigorito F *et al* assessed the dentoskeletal changes observed in treatment of Class II, division 1 malocclusion patients with mandibular retrognathism. Treatment was performed with the Herbst orthopedic appliance during 13 months (phase I) and pre-adjusted orthodontic fixed appliance (phase II). Lateral cephalograms of 17 adolescents were taken in phase I onset (T1) and completion (T2); in the first thirteen months of phase II (T3) and in phase II completion (T4). Differences among the cephalometric variables were statistically analyzed (Bonferroni variance and multiple comparisons). From T1 to T4, 42% of overall maxillary growth was observed between T1 and T2, 40.3% between T2 and T3 and 17.7% between T3 and T4. As for overall mandibular movement, 48.2% was observed between T1 and T2 and 51.8% between T2 and T4 of which 15.1% was observed between T2 and T3 and 36.7% between T3 and T4. Class II molar relationship and overjet were properly corrected. The occlusal plane which rotated clockwise between T1 and T2, returned to its initial position between T2 and T3, remaining stable until T4. The mandibular plane inclination did not change at any time during treatment. It was concluded that mandibular growth was significantly greater in comparison to maxillary, allowing sagittal maxillomandibular adjustment. The dentoalveolar changes (upper molar) that overcorrected the malocclusion in phase I, partially recurred in phase II, but did not hinder correction of the malocclusion. Facial type was preserved [9, 10].

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. Twenty young adult patients (age 13-17 years, overjet 6-10 mm) with a Class II division 1 malocclusion were randomly divided into two groups: group I included 10 patients treated with TB, Group II included 10 patients treated with FRD. Dentoskeletal changes were analyzed on lateral cephalograms taken before (T1) and (T2) at the end of the treatment. Inter-group differences were evaluated with Wilcoxon signed rank test, and intra-group differences were assessed with Mann–Whitney test at the $P < 0.05$ level. Both were useful in improving the esthetics. However, more AP skeletal changes were seen with TB appliances as compared with Forsus. Vertical skeletal measurements were increased after functional appliances. These results were more pronounced with Forsus appliance than TB. Increase in incisor mandibular plane angle was seen in both groups, but was found to be more pronounced with Forsus group. Similarly, extrusion of upper and lower molars

and lower incisors was also seen in both groups. In this study we found TB to have more mandibular lengthening effect as compared to Forsus, and thus was found to be more effective in treatment of Class II cases. Ahmadian-Babaki F *et al* compared the treatment outcomes of these two appliances using cephalometric radiographs. Cephalometric radiographs of 33 patients who had class II division I malocclusion, before and after treatment were digitalized. The mean changes in twin block and bionator groups were compared using independent t test. Twin block and bionator showed no statistically significant differences in cephalometric parameters except for ANB, NA-Pog, Basal and Ar-Go-Me angles. The authors concluded that there were no statistically significant differences in dentoalveolar and mandibular position between twin block and bionator. Twin block was more efficient in inhibition of forward movement of maxilla [11, 12].

5 year follow-up studies by the authors are currently underway to assess the long-term stability of the Twin Block treatment effects reported in this study. Further studies with bigger sample size are warranted.

Table 1: Mean change in dimensions of Skeletal and Dental parameters evaluated from T1 Cephalogram and T2 Cephalogram

Skeletal parameters	Mean change in dimensions (T2-T1)	p-value	Dental parameters	Mean change in dimensions (T2-T1)	p-value
SNA	1.32	0.3	1/NA (mm)	0.81	0.21
SNB	1.22	0.78	1/NA (degrees)	1.47	0.004*
SND	0.44	0.02*	1/NB (mm)	0.42	0.09
ANB	0.03	0.03*	1/NB (degrees)	0.88	0.03*
AO-BO	0.80	0.001*	$1/G_0G_n$	0.22	0.33
LAFH	0.73	0.08	U_b/VL	2.88	0.92
SN-SGn	-0.51	0.12	L_b/VL	2.71	0.88

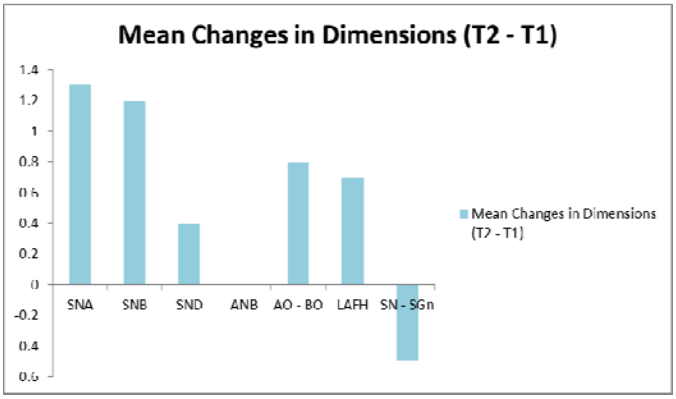

Fig 1: Mean change in dimensions of skeletal parameters

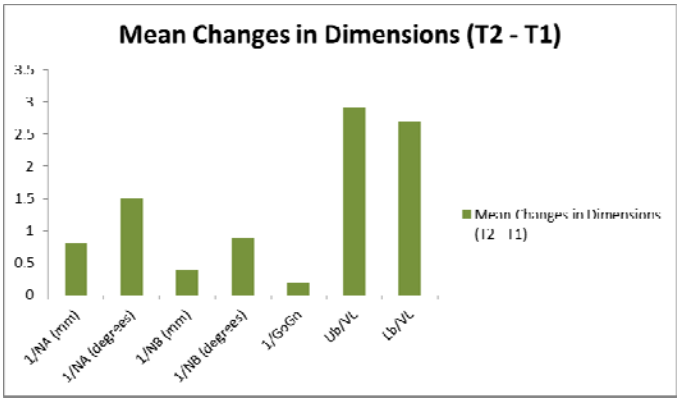

Fig 2: Mean change in dimensions of dental parameters

Conclusion

From the results of present study we conclude that there is a significant improvement in the total mandibular length and anteroposterior relationship in patients treated with twin-block appliance, thus leading to overall improvement of the facial profile.

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