

Dentoskeletal Changes in Class II Subjects following Treatment with Twin Block and Herbst Appliance

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ABSTRACT

Objective: To compare the mean changes in dentoskeletal parameters in Class II patients treated by Twin Block versus Herbst appliance.

Materials & Method: The study was conducted at the Orthodontic Department of Children's Hospital and Institute of Child Health and de'Montmorency College of Dentistry, Lahore. The study involved 50 patients those were randomized in equal numbers according to lottery method to either Group-1 (Twin block) or Group-2 (Herbst). Mean changes in SNA, SNB and IMPA at the end of treatment was calculated by subtracting Pretreatment measurements (T1) from post treatment measurements (T2). Student t-test was used to compare the mean changes in dentoskeletal parameters in both groups.

Result: The comparison showed that the mean difference recorded in SNA values was -1.06 ± 0.62 in Group-1 and -1.28 ± 0.61 in Group-2 (p -Value 0.07), SNB was 2.14 ± 0.70 in Group-1 and 1.22 ± 0.55 in Group-2, (p -Value 0.001) while IMPA was 1.58 ± 0.64 in Group-1 and 4.8 ± 1.31 in Group-2 (p -Value 0.001).

Conclusion: There was a significant difference between mean changes in dentoskeletal parameters in Class II patients treated by twin block when compared to Herbst appliance.

Keywords: Class II malocclusion, dentoskeletal, Twin Block, Herbst

INTRODUCTION

Treatment plan of growing Class II patients should be directed towards solving the dento-skeletal disharmony in order to obtain favorable facial aesthetics.^{1,2} Treatment of Class II malocclusion may involve the use of orthopedic appliances, extra oral traction and functional appliances. Functional appliance therapy is a commonly used treatment protocol for growing Class II patients with mandibular deficiency.³

The selection of functional appliances is dependent upon several factors which can be categorized into patient factors e.g. age and compliance, and clinical factors e.g. preference/familiarity and laboratory facilities. Different types of functional appliances are available for the correction of Class II skeletal and occlusal disharmonies.⁴ Twin Block (TB) and Herbst (HB) appliances are among the most popular functional appliances.⁵ TB appliance is the most preferred functional appliance in UK,⁶ and HB is most commonly used in USA.⁷

TB was first introduced by Clark in 1988 and consists of two separate, upper and lower, removable plates with acrylic blocks trimmed to an angle of 70 degrees.⁸ TB is widely used because of its high patient acceptability and ability to produce rapid treatment changes.⁸ The HB appliance was first introduced in 1900s by Emil Herbst as a fixed bite-jumping device, and later Panchez reintroduced it in the 1970's as a banded appliance.⁹ It has been reported that HB appliance can correct Class II skeletal problems by encouraging mandibular growth.¹⁰

Many studies have been carried out on soft tissue effects of these appliances,^{2,5} but only a few studies have compared the dentoskeletal effects of TB and HB in Class II patients.¹¹⁻¹³ In addition, no single study has been carried out specifically on dentoskeletal effects of TB and HB in South Asian population. It should be kept in mind that skeletal effects vary among subjects, between gender groups, with genetic influence and with the time of therapy.

Thus the objective of this study was to compare the mean changes in dentoskeletal parameters in Class II patients treated by Twin Block versus Herbst appliance. Our hypothesis was that there is a difference between mean changes of dentoskeletal parameters (SNA, SNB & IMPA) in Class II patients treated by twin block versus Herbst appliance.

MATERIALS AND METHOD

The randomized controlled trial was conducted after taking ethical approval and informed consent in the Orthodontic Department of Children's Hospital and Institute of Child Health and de'Montmorency College of Dentistry, Lahore, Pakistan. Sample size of 50 cases (25 in each group) was calculated with 95% confidence level, 80% power of test, and taking expected mean \pm S.D of mean change in SNA in both groups, i.e. -1.35 ± 1.11 in Herbst group vs. -0.75 ± 1.03 in Twin block group in Class II patients.¹³

Patients were selected according to following inclusion criteria: Skeletal Class II relationship (ANB $>4^\circ$, SNB $<78^\circ$), patients' age ranged between 9-13 years, Overjet ≥ 5 mm, SN-MP = $32^\circ \pm 4^\circ$ and bilateral Class II molar and canine relation. Patients with previous history of orthodontic treatment, congenitally missing or extracted permanent tooth (except third molars) and syndromes, skeletal dysplasia were excluded.

Study involved 50 patients those were randomized in equal numbers according to lottery method to either Group-1 (Twin block) or Group-2 (Herbst). For Group-I, Twin block group patients were instructed to wear the appliance full time. For Group II, Acrylic splint design of Herbst was inserted. When a normal or corrected overjet in retruded position was recorded, the active treatment was finished and cephalometric records of patients were taken in both groups.

Dentoskeletal measurements (SNA, SNB & IMPA) were measured on lateral cephalometric radiographs before start of the treatment and at the time of

removal of appliance and these measurements were taken by the researcher himself to address bias. Mean of dentoskeletal changes was measured at the end of treatment by calculating the difference between post-treatment and pre-treatment values taken on lateral cephalogram. In dental part; only one value of Lower incisor to mandibular plane angle (IMPA) was taken by measuring the angle between body of mandible and long axis of most proclined lower mandibular incisor. In skeletal part; two measurements were taken: SNA angle (SNA): inward angle between NA line and Sella-nasion (SN) plane with normal value $80-84^\circ$, SNB angle (SNB): inward angle between NB line and SN plane with normal value $78-82^\circ$.

All statistical analysis was done using SPSS 20.0. Pre-treatment and Post treatment dentoskeletal measurements and age were presented as means and standard deviation. Gender was presented by frequency and percentage. Mean changes in SNA, SNB and IMPA at the end of treatment was calculated by subtracting Pretreatment measurements (T1) from post treatment measurements (T2). Student t-test was used to compare the mean changes in dentoskeletal parameters in both groups. $p \leq 0.05$ was considered as significant. The data was stratified for age and gender, to address the effect modifiers. Post stratification student t-test was applied to check the significance, with $p \leq 0.05$ as significant.

RESULT

Age and gender distribution of the patients is shown in Table 1. Comparison of mean changes in dentoskeletal parameters in Class II patients treated by Twin block versus Herbst appliance is given in Table 2. The data were stratified for age and gender to control the effect modifiers, which showed insignificant findings with regards to age and gender.

Table 1: Distribution of sample according to age and gender

Sample		Group-1 (Twin block) n=25		Group-2 (Herbst) n=25	
		No.	%	No.	%
Age (in years)	9-11	18	72	16	64
	12-13	7	28	9	36
	Mean	10.66 \pm 1.32		10.86 \pm 1.41	
Gender	Male	10	40	9	36
	Female	15	60	16	64
Total		25	100	25	100

Table 2: Comparison of mean change in dentoskeletal parameters

Parameter		Group-1 (Twin block)		Group-2 (Herbst)		p-Value
		Mean	SD	Mean	SD	
Pre-treatment	SNA	82.24	0.82	82.08	0.97	0.37
	SNB	75.26	1.29	75.12	1.32	0.59
	IMPA	95.62	2.27	95.82	2.32	0.66
Post-treatment	SNA	81.18	0.77	80.80	1.16	0.05*
	SNB	84.38	1.07	76.34	1.44	0.001*
	IMPA	97.20	2.33	100.62	2.83	0.001*
Mean difference	SNA	-1.06	0.62	-1.28	0.61	0.07
	SNB	2.14	0.70	1.22	0.55	0.001*
	IMPA	1.58	0.64	4.80	1.31	0.001*

*Statistically significant at $p \leq 0.05$

The differences in mean pre-treatment SNA values were not statistically significant. Mean post-treatment SNA values were 81.18 in Group-1 and 80.8 in Group-2, SNB was 84.38 in Group-1 and 76.34 in Group-2, IMPA was 97.2 in Group-1 and 100.62 in Group-2. The differences were significant. The findings for post-treatment mean difference in SNA values was -1.06 in Group-1 and -1.28 in Group-2, SNB was 2.14 in Group-1 and 1.22 in Group-2, IMPA was 1.58 in Group-1 and 4.8 in Group-2. The differences were significant, except for SNA values.

DISCUSSION

Results of the current study showed that there was a significant difference between mean changes in dentoskeletal parameters (SNA, SNB, IMPA) in Class II patients treated by twin block when compared to Herbst appliance. In comparison of results of Baysal and Uysal,¹³ SNB angle was increased in Twin block group than in Herbst group. The change in SNA angle was greater for Herbst group than that in Twin block group. The increase in lower incisor proclination (IMPA) was also found greater in Herbst group than that in Twin Block group. Similar findings were recorded in our study.

Schaefer *et al*¹⁴ compared the effects of Twin-block vs. Herbst for correcting Class II disharmony, they were of the view that treatment effects of both protocols led to a normalization of dentoskeletal parameters at the end of the overall treatment period. However, only minor differences were detected in the treatment and

post-treatment effects of crown herbst and twin-block appliance.

It is well known that a point in disfavor of HB treatment is a proclination of lower incisors due to the forces exerted on the lower teeth by the same telescope device. Various modifications of original HB have been proposed to counter the proclination of mandibular incisors.¹⁵ It has been proved in the literature that functional appliances do not produce long term skeletal changes and most of their effects are dento-alveolar.¹⁶ In a prospective controlled trial 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 and there was no evidence of a restriction in maxillary growth.¹⁷

Limitations of this study are sample size and single centre approach. Further studies are required to validate results of current study.

CONCLUSION

There was a significant difference between mean changes in dentoskeletal parameters in Class II patients treated by twin block when compared to Herbst appliance.



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