A COMPARATIVE CEPHALOMETRIC STUDY OF SKELETAL AND DENTAL CHANGES IN CLASS-2 DIVISION-1 MALOCCLUSIONS TREATED WITH TWIN BLOCK AND JASPER JUMPER APPLIANCE

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ABSTRACT

Skeletal jaw dysplasia or abnormal anteroposterior relationship of bony bases, accounts for as much as two third of all orthodontic patients. The purpose of the study is to evaluate the skeletal and dental changes brought about by the twin block and jasper jumper appliance in skeletal and dental class-2 division -1 malocclusion patients. The present study was conducted on 25 patients using twin block and jasper jumper and keeping 15 patients in control group. The class-2 correction occurs both by skeletal and dentoalveolar changes. Former was more with twin block and the later was more with jasper jumper.

INTRODUCTION

The orthodontic correction of dental relationship in patients exhibiting major skeletal discripencies rarely improves the facial pattern and can even exert a detrimental effect. Sassouni once stated-"Orthodontic therapy is aimed at the correction of dentoalveolar malocclusion, without any skeletal deviation in which tooth movement alone is desired. While orthopaedic therapy is aimed at the correction of skeletal imbalances with the correction of any dentoalveolar malocclusion of relatively less importance in which little or no tooth movement is desired.

Considerable research by Stockli and Petrovic on experimental animals demonstrate stimulation of posterosuperior condylar growth by forward positioning of mandible. Patient compliance is a major factor for success of first phases in past, innumerable appliances that corrected class-2 skeletal pattern relied on patient co-operation and thus jeopardized the obtainable results.

AIMS AND OBJECTIVES

1 To evaluate the skeletal and dental changes brought about by the Twin block and Jasper jumper appliance individually.

2 To compare the skeletal and dental changes brought about by the Twin block and Jasper jumper appliance.

3 To compare the skeletal and dental changes brought about by the Twin block and Jasper jumper appliances with a control group.

MATERIAL AND METHODS

Two different fixed functional appliances used for this study were-

1. A dual block appliance given by CLARK named TWIN BLOCK.
2. JASPER JUMPER appliance given by JAMES JASPER.

Sample Size:

Twin block group	:	15 Patients
Jasper jumper group	:	10 Patients
Control group	:	15 Patients

The control group consisted of those individuals who were skeletally and dentally similar to other two groups and had not undergone any kind of orthodontic treatment in the past.

Age Group: 8-13 years with a mean age of 10.5

All the cases were randomly selected for this study irrespective of sex keeping in mind that each case should fulfill the following criteria before treatment was initiated:-

1 Skeletal and dental angle's class-2 div-1 malocclusion.

2 High angle ANB with positive VTO.

3 Horizontal growth pattern.

4 Increased overjet.

5 Positive overbite.

6 Complete records available including lateral cephalograms, hand wrist radiographs and OPG.

7 No significant medical and dental history.

Lateral cephalogram, OPG and hand wrist radiographs were obtained for each of the subject. For proper comparisons it was mandatory to obtain serial lateral cephalometric radiographs before initiation of treatment and again after successful treatment in cases of treated groups. At the same time serial lateral cephalometric radiographs were obtained for the control group too. Criterion for the successful treatment in these cases was achievement of a class-1 molar relation and acceptable soft tissue facial profile. The average time taken to achieve this objective was 10 months. All the radiographs were taken from the standardized villa medical system Italian made FIAD x-ray machine on a standard Kodak x-omat blue sensitive 8inch×10 inch film with 80kvp voltage and 15mA current for 1.55 seconds. Radiographs taken with FH plane parallel to the floor and with lips in repose. The distance from the mid saggital plane of the patient to the film was kept at 16 inches and the x-ray source to the patient distance was kept at 5 feet.

After the cephalograms were obtained of all the 3 study groups. They were traced on lead acetate tracing paper of 50 microns thickness. The tracings were done using 0.5mm lead color pencils. The landmarks were recorded to the nearest 0.5mm in both vertical and horizontal plane. An x/y coordinate system was used to quantify the changes between the treatment and post treatment cephalograms. FH plane served as the X-axis and a vertical line perpendicular to the FH plane passing through the Sella served as the Y-axis.

CEPHALOMETRIC LANDMARKS

ANS	anterior nasal spine
Ba	basion
Co	condylion
Gn	gnathion
Go	gonion
Me	menton
N	nasion
Or	orbitale
Po	porion
Pog	pogonion
Point A	subspinale
Point B	supramentale
Ptm	Pterygomaxillary fissure
S	sella

CEPHALOMETRIC LINES AND PLANES

S-N Plane	Sella nasion plane
F-H Plane	Frankfort horizontal plane
Occ plane	Occlusal plane
Go-Me plane	Mandibular plane
A-Pog plane	A-Pogonion line
N4%	Nasion perpendicular
PtV	Pterygoid vertical
Pog4%	Pogonion perpendicular

STATISTICAL ANALYSIS

Prior to actual recording of the measurements, the reliability of the measurement was determined. The cephalograms were traced on two separate occasion by one operator after a period of three months. The two readings were then averaged for the final data.

The mean net changes and the standard deviation for each group were calculated. The effect was found using Paired t-test-

$$\text{Paired } t = \left| \frac{d}{SE_d} \right|$$

d = change in values after treatment

$\bar{d}$ = mean of change

$$SE_d = \sqrt{\frac{\Sigma (\bar{d} - d)^2}{n (n-1)}}$$

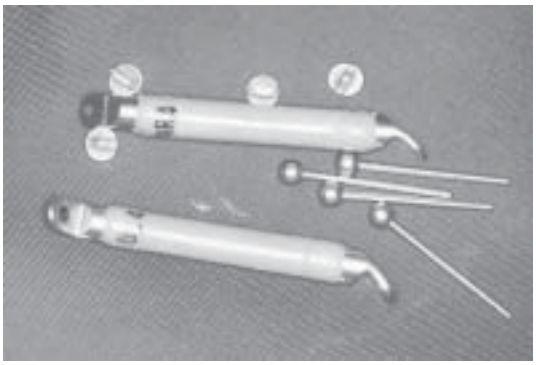
The mean changes in the two groups were compared using UNPAIRED t- test

$$t = \left| \frac{X_1 - X_2}{SE} \right| (\bar{X}_1, \bar{X}_2 = \text{means of two groups})$$

$$SE = \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \quad \sqrt{\frac{(n_1 - 1)S_1^{\,2} + (n2 - 1)S_2^{\,2}}{n_1 + n_2 - 2}}$$

S_1, S_2 = Standard deviations of the two groups.
n_1, n_2 = Sample sizes of the two groups.
Degrees of freedom (DF) = $n_1 + n_2 - 2$

The mean value and standard deviation were calculated for each difference in the pre and post treatment measurements. Matched pair 't'-tests were used to compare the differences between the treatment groups and control groups. 'p' value (0.05 denoted a significant difference)



JASPER JUMPER APPLIANCE

TWIN BLOCK APPLIANCE

RESULTS

For the purpose of comparison cephalometric analysis of the patients before and after a period of 9 to 10 months were carried out.The linear and angular measurements were done to record both skeletal and dental changes.Their significance were compared using the standardized student 't' test in order to obtain the difference.

Results obtained have been divided into 5 headings-

- Cranial base, Maxillary skeletal, Mandibular skeletal, Maxilla to mandible, Vertical relationship

DISCUSSION

The purpose of the present study was to examine the dental and skeletal changes contributing to the correction of class-2 div-1 malocclusion in 25 patients treated with fixed twin block and jasper jumper appliance over a period of 9 months. The age group of patients was 9 to 13 yrs. This was compared with a control group of 15 patients with comparable age and malocclusion.

Cranial base:

The results of cranial base measurement in the jasper jumper and twin block in this study suggested that it is morphologically similar to that of the control group. The cranial base angle N-S-Ba ,did not change significantly during the course of 9 months. The anterior length N-S showed slight increase in all the three groups but the increase was statistically not significant. In jasper jumper groups slight decrease in posterior lengths S-Ba while other two groups showed non significant increase. This could be attributed to short treatment duration of 9 months.

Maxillary skeletal and mandibular skeletal:

Maxillary angular and linear measurements showed significant inhibitory effect of jasper jumper appliance on the maxilla while insignificant effects of the twin block appliance.There was a decrease in SNA angle in jasper jumper group by mean of 1.5 degrees, when SNA increased in both twin block and control groups by mean of 0.33 and 0.8 degrees over a period of 9 months. Linear measurements, nasion perpendicular to point A revealed significant backward movement of point A in the jasper jumper group. However the backward movement of point A in the twin block group showed an insignificant movement as compared to forward movement in the control group. The mid face length, condylion to point A revealed a decrease of 0.5mm.In jasper jumper group while an increase of 0.47mm and 1.87mm in the twin block and the control group, respectively.

Jasper jumper showed little increase in SNB by 0.5 degrees and the twin block appliance resulted in the forward shift of point B, thus increasing angle SNB by a mean of 2.73 and 1.07 degrees in the control group. The linear

JASPER JUMPER GROUP : COMPARISON OF PRE AND POST TREATMENT MEAN VALUES

	Pre treatment Control		Post treatment Control		Difference			
	MEAN	SD	MEAN	SD	MEAN	SD	Paired t	p value
CRANIAL BASE								
∠ N-S-Ba (Degree)	127.90	4.38	128.50	4.45	0.60	2.07	0.92	>0.05
N-S (mm.)	71.00	2.36	72.30	2.95	1.30	1.49	2.75	<0.05
S-Ba (mm.)	46.40	3.13	46.30	4.27	-0.10	2.60	0.12	>0.05
MAXILLA TO CRANIUM								
∠SNA (Degree)	81.60	4.17	80.10	4.12	-1.50	2.17	2.16	<0.05
N⊥ PtA (mm.)	-0.40	3.81	-1.70	3.50	-1.30	2.45	1.68	>0.05
Co-A (mm.)	90.20	5.18	89.70	6.52	-0.50	4.70	0.34	>0.05
MANDIBLE TO CRANIUM								
∠SNB (Degree)	74.90	4.28	75.40	4.58	0.50	0.97	1.63	>0.05
N⊥ Pog (mm.)	-7.40	11.22	-4.60	11.60	2.80	4.61	1.92	<0.05
Co-Gn (mm.)	106.20	5.73	107.90	6.06	1.70	4.37	1.23	>0.05
MAXILLA TO MANDIBLE (Skeletal)								
∠ANB (Degree)	6.70	2.31	4.70	2.06	-2.00	1.70	3.72	<0.001
WITS (mm.)	4.00	1.33	1.90	1.85	-2.10	2.02	3.28	<0.001
Diff b/w CoGn-CoA (mm.)	15.20	4.71	19.10	5.45	3.90	4.46	2.77	<0.05
VERTICAL RELATIONSHIP								
∠FMA (Degree)	24.90	6.56	25.10	3.81	0.20	4.80	0.13	>0.05
Facial Axis (Degree)	90.90	7.42	88.00	4.11	-2.90	7.19	1.28	>0.05
LAFH (mm.)	60.50	2.32	63.80	3.61	3.30	3.06	3.41	<0.001
MAXILLARY DENTAL								
∠U1-NA (Degree)	32.40	8.46	24.00	3.68	-8.40	10.04	2.65	<0.05
U1-APog (mm.)	11.60	2.88	8.20	1.75	-3.40	3.31	3.25	<0.001
∠U1-SN (Degree)	112.60	10.52	104.80	5.29	-7.80	10.85	2.27	<0.05
MANDIBULAR DENTAL								
∠L1-NB (Degree)	29.80	4.85	36.80	5.56	7.00	7.88	2.85	<0.05
L1-APog (mm.)	1.80	1.40	5.10	1.97	3.30	2.45	4.26	<0.001
∠IMPA (Degree)	103.70	6.93	109.50	2.76	5.80	8.64	2.12	<0.05
MAXILLA TO MANDIBLE (Dental)								
∠U1-L1 (Degree)	112.00	6.51	115.60	5.26	3.60	6.64	1.72	<0.05
Over Jet (mm.)	9.20	3.08	3.30	2.00	-5.90	4.38	4.26	<0.001
Over Bite (mm.)	5.10	1.79	2.70	1.25	-2.40	1.90	4.00	<0.001

S = Significant, NS = Non Significant

TWIN BLOCK GROUP : COMPARISON OF PRE AND POST TREATMENT MEAN VALUES

	Pre treatment T.B.		Post treatment T.B.		Difference				
	MEAN	SD	MEAN	SD	MEAN	SD	Paired t	p value	
CRANIAL BASE									
∠N-S-Ba (Degree)	128.80	3.19	128.80	2.86	0	1.13	0	=1	NS
N-S (mm.)	70.00	3.42	71.00	3.38	1	0.65	5.81	<0.001	S
S-Ba (mm.)	44.40	2.90	45.20	2.70	0.8	0.67	4.58	<0.001	S
MAXILLA TO CRANIUM									
∠ SNA (Degree)	80.00	2.83	80.33	2.72	0.33	1.17	1.04	>0.1	NS
N⊥ Pt A (mm.)	-0.33	2.18	-0.60	1.79	-0.27	1.67	0.61	>0.4	NS
Co-A (mm.)	86.13	4.39	86.60	4.31	0.47	1.95	0.92	>0.2	NS
MANDIBLE TO CRANIUM									
∠ SNB (Degree)	73.40	2.16	76.13	2.47	2.73	1.7	6.18	<0.001	S
N ⊥ Pog (mm.)	-9.47	4.47	-7.40	4.25	2.03	3.54	2.21	<0.05	S
Co-Gn (mm.)	103.07	5.16	108.33	6.49	5.27	3.15	6.47	<0.001	S
MAXILLA TO MANDIBLE (Skeletal)									
∠ ANB (Degree)	6.57	1.47	4.20	1.93	-2.37	1.71	5.32	<0.001	S
WITS (mm.)	3.27	1.92	0.87	2.90	-2.4	2.91	3.18	<0.01	S
Diff b/w CoGn-CoA (mm.)	16.80	2.91	21.73	4.15	4.93	2.15	8.66	<0.001	S
VERTICAL RELATIONSHIP									
∠ FMA (Degree)	23.87	4.32	25.60	4.69	1.73	2.67	2.5	<0.05	S
Facial Axis (Degree)	87.20	3.91	87.73	4.29	0.53	2.23	0.91	>0.2	NS
LAFH (mm.)	59.33	4.82	62.37	4.95	3.03	1.7	6.86	<0.001	S
MAXILLARY DENTAL									
∠ U1-NA (Degree)	33.80	5.63	27.57	6.69	-6.23	6.77	3.56	<0.005	S
U1-APog (mm.)	11.20	1.66	7.97	1.36	-3.23	1.83	6.83	<0.001	S
∠ U1-SN (Degree)	113.40	6.10	107.87	7.41	-5.53	7.76	2.66	<0.025	S
MANDIBULAR DENTAL									
∠ L1-NB (Degree)	27.50	6.36	31.80	6.00	4.3	4.34	3.82	<0.005	S
L1-APog (mm.)	1.30	2.20	4.03	1.81	2.73	1.7	6.19	<0.001	S
∠ IMPA (Degree)	99.40	4.41	103.13	4.95	3.73	3.17	4.55	<0.001	S
MAXILLA TO MANDIBLE (Dental)									
∠ U1-L1 (Degree)	112.60	5.19	118.07	4.32	5.47	4.89	4.32	<0.001	S
Over Jet (mm.)	9.63	2.62	3.80	1.37	-5.83	2.65	8.5	<0.001	S
Over Bite (mm.)	5.00	1.31	3.30	1.26	-1.7	1.53	4.29	<0.001	S

S = Significant, NS = Non Significant

CONTROL GROUP : COMPARISON OF PRE AND POST TREATMENT MEAN VALUES								
	Pre treatment Control		Post treatment Control		Difference			
	MEAN	SD	MEAN	SD	MEAN	SD	Paired t	p value
CRANIAL BASE								
∠ N-S-Ba (Degree)	124.93	4.61	125.13	4.69	0.20	1.06	0.71	>0.4
N-S (mm.)	68.80	2.43	69.40	2.59	0.60	0.73	3.15	<0.01
S-Ba (mm.)	42.87	2.88	43.33	2.99	0.47	0.91	1.94	>0.05
MAXILLA TO CRANIUM								
∠ SNA (Degree)	80.27	2.89	81.07	2.87	0.80	1.08	2.86	<0.025
N ⊥ Pt.A (mm.)	-1.57	3.21	-0.97	2.91	0.60	1.92	1.15	>0.2
Co-A (mm.)	82.20	4.25	84.07	4.40	1.87	1.35	5.34	<0.001
MANDIBLE TO CRANIUM								
∠ SNB (Degree)	74.73	3.03	75.80	3.06	1.07	1.10	3.75	<0.005
N ⊥ Pog (mm.)	-10.87	5.53	-9.80	5.62	1.07	2.02	2.04	>0.05
Co-Gn (mm.)	100.73	6.69	102.17	6.19	1.43	1.67	3.30	<0.01
MAXILLA TO MANDIBLE (Skeletal)								
∠ ANB (Degree)	5.57	1.47	5.30	1.88	-0.27	1.39	0.73	>0.4
WITS (mm.)	1.47	1.26	0.83	1.23	-0.63	1.09	2.24	<0.05
Diff b/w CoGn-CoA (mm.)	18.20	3.69	18.97	4.20	0.77	2.14	1.38	>0.1
VERTICAL RELATIONSHIP								
∠ FMA (Degree)	26.00	4.69	25.93	4.98	-0.07	1.62	0.15	>0.5
Facial Axis (Degree)	85.83	4.72	87.07	4.56	1.23	1.34	3.53	<0.005
LAFH (mm.)	58.67	4.38	59.03	4.29	0.37	1.07	1.31	>0.2
MAXILLARY DENTAL								
∠ U1-NA (Degree)	33.73	5.04	33.67	4.45	-0.07	2.34	0.11	>0.5
U1-APog (mm.)	11.57	2.03	10.97	1.56	-0.60	1.07	2.16	<0.05
∠ U1-SN (Degree)	114.73	4.93	115.13	4.85	0.40	3.13	0.49	>0.5
MANDIBULAR DENTAL								
∠ L1-NB (Degree)	30.60	3.44	32.47	2.70	1.87	2.74	2.63	<0.25
L1-APog (mm.)	3.10	1.26	3.77	1.16	0.67	1.20	2.14	>0.05
∠ IMPA (Degree)	101.00	5.03	102.60	4.72	1.60	2.38	2.59	<0.05
MAXILLA TO MANDIBLE (Dental)								
∠ U1-L1 (Degree)	110.47	5.67	110.10	4.35	-0.37	4.73	0.29	>0.5
Over Jet (mm.)	7.43	1.61	7.07	1.87	-0.37	1.17	1.21	>0.2
Over Bite (mm.)	4.27	1.22	4.03	1.26	-0.23	0.56	1.60	>0.1

TWIN BLOCK v/s JASPER JUMPER : COMPARISON OF THE MEAN CHANGES AT THE END OF TREATMENT								
	MEAN	SD	MEAN	SD	DIFF.	t value	p value	
CRANIAL BASE								
∠ N-S-Ba (Degree)	0	1.13	0.60	2.07	-0.60	0.9396	> 0.05	NS
N-S (mm.)	1	0.65	1.30	1.49	-0.30	0.691	> 0.05	NS
S-Ba (mm.)	0.8	0.67	-0.10	2.60	0.90	1.2699	> 0.05	NS
MAXILLA TO CRANIUM								
∠SNA (Degree)	0.33	1.17	-1.50	2.17	1.83	2.7376	< 0.01	S
N ⊥ Pt.A (mm.)	-0.27	1.67	-1.30	2.45	1.03	1.2537	> 0.05	NS
Co-A (mm.)	0.47	1.95	-0.50	4.70	0.97	0.7182	> 0.05	NS
MANDIBLE TO CRANIUM								
∠SNB (Degree)	2.73	1.7	0.50	0.97	2.23	3.7439	< 0.001	S
N ⊥ Pog (mm.)	2.03	3.54	2.80	4.61	-0.77	0.4641	> 0.05	NS
Co-Gn (mm.)	5.27	3.15	1.70	4.37	3.57	2.3714	< 0.05	S
MAXILLA TO MANDIBLE (Skeletal)								
∠ANB (Degree)	-2.37	1.71	-2.00	1.70	-0.37	0.5313	> 0.05	NS
WITS (mm.)	-2.4	2.91	-2.10	2.02	-0.30	0.2827	> 0.05	NS
Diff b/w CoGn-CoA (mm.)	4.93	2.15	3.90	4.46	1.03	0.7752	> 0.05	NS
VERTICAL RELATIONSHIP								
∠FMA (Degree)	1.73	2.67	0.20	4.80	1.53	1.0251	> 0.05	NS
Facial Axis (Degree)	0.53	2.23	-2.90	7.19	3.43	1.7428	< 0.05	S
LAFH (mm.)	3.03	1.7	3.30	3.06	-0.27	0.2737	> 0.05	NS
MAXILLARY DENTAL								
∠U1-NA (Degree)	-6.23	6.77	-8.40	10.04	2.17	0.6479	> 0.05	NS
U1-APog (mm.)	-3.23	1.83	-3.40	3.31	0.17	0.1657	> 0.05	NS
∠U1-SN (Degree)	-5.53	7.76	-7.80	10.85	2.27	0.6113	> 0.05	NS
MANDIBULAR DENTAL								
∠L1-NB (Degree)	4.3	4.34	7.00	7.88	-2.70	1.0652	> 0.05	NS
L1-APog (mm.)	2.73	1.7	3.30	2.45	-0.57	0.6886	> 0.05	NS
∠IMPA (Degree)	3.73	3.17	5.80	8.64	-2.07	0.8532	> 0.05	NS
MAXILLA TO MANDIBLE (Dental)								
∠U1-L1 (Degree)	5.47	4.89	3.60	6.64	1.87	0.8124	> 0.05	NS
Over Jet (mm.)	-5.83	2.65	-5.90	4.38	0.07	0.0499	> 0.05	NS
Over Bite (mm.)	-1.7	1.53	-2.40	1.90	0.70	1.0186	> 0.05	NS

S = Significant, NS = Non Significant

measurements from nasion perpendicular to pogonion point in the jasper jumper and twin block group as compared to the control group, but their mean difference was not statistically not significant. The forward movement of symphysis at the gnathion measured 1.7mm in jasper jumper which measured 5.27mm in twin block appliance and 1.43mm in the control group. The mean difference between the two groups when compared to the control group was statistically significant. The forward positioning of mandible in jasper jumper was lesser than that reported by Weiland et al 1997, who found increase of 1.2 degrees in SNB angle.

Maxilla to mandible(skeletal):

The ANB angle was used to measure the change between the maxilla and the mandible. There was a decrease of in ANB angle-2 degrees in jasper jumper and 2.36 degrees in twin block group. This decrease in ANB angle can be attributed to the combination of maxillary restraint and slight mandibular growth in the jasper jumper group. While in twin block the changes can be attributed to the forward movement of B point. The mean increase in the difference between the effective length of mandible and the mid face length, was significant in the jasper jumper group(3.9mm) and highly significant in the twin block group(4.93mm)as compared to control group(0.766mm).The mean increase in the difference between the effective length of the mandible and the mid face length in the twin block group is attributed to the significant increase in the mandibular length and little increase in the jasper jumper group.

Vertical relationship:

In the jasper jumper group the mean frankfort mandibular plane angle increased non significantly by mea of 0.02degrees while in the twin block group,the mean frankfort mandibular plane angle increased significantly by 1.73degrees and in the control group decreased by 0.066degrees which was statistically not significant.Facial axis angle increased in both the twin block and control group.This increase in the twin block group was not statistically significant but the increase in angle was more significant in control group, suggesting an anti clockwise rotation of mandible in the control group patients.In jasper jumper, there was a slight increase in the lower anterior facial height.In the twin block group, there was a statistically significant increase in the lower anterior facial height as compared to the control group.

Maxillary dental and mandibular dental:

In the jasper jumper group and twin block group, the inclination of the upper incisors to NA line decreased significantly as compared to the control group.An increased degree of maxillary incisor retroclination in reference to SN plane was seen in the twin block group.In the control group, the maxillary incisors proclined, but the proclination was statistically not significant.The linear distance between the maxillary incisor in relation to A-Pog line was reduced significantly in all the groups.The reduction in jasper jumper and twin block can be attributed to the lingual tipping of the upper incisors and forward movement of the pogonion point. Our results showed that the lower incisor in relation to NB line and mandibular plane proclined significantly in all the three groups.A significant forward movement of the lower incisor in relation to A-Pog line was observed.

Maxilla to mandible(dental):

The inter incisal angle was increased 3.6 degrees in jasper jumper group and 5.466degrees in twin block groups.The overjet correction was a combined effect of maxillary incisor retroclination and mandibular incisors proclination with skeletal contribution.The overjet reduced significantly in the jasper jumper group and the twin block group as compared to the control group.Overbite reduced in the jasper jumper by 2.4mm and 1.7mm in the twin block group when 0.23mm in the control group.

CONCLUSION

1 The class-2 correction occurs both by skeletal and dentoalveolar change.Dentoalveolar changes were more pronounced with jasper jumper,while more of skeletal correction by twin block. Class-2 correction was in jasper jumper because of maxillary sagittal growth inhibition and by mandibular sagittal growth stimulation by twin block group.

2 Less vertical displacement was seen in jasper jumper appliance group as compared to the twin block group. The results of this study favour both jasper jumper and twin block as a fixed functional appliance with their differential effects on maxillary and mandibular sleletal and dentoalveolar segments.

3 This study considered only specific skeletal and dental measures.It doesnot evaluate the relative effects of the two functional appliance treatment on the soft tissue components.

The study describes the short term effects of jasper jumper and fixed twin block appliance treatment on the class-2 malocclusion. Further research is required to assess the long term results. In addition, larger samples will be needed to ascertain the present finding.

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