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EVALUATION OF THE STABILITY OF POST TREATMENT SAGITTAL SKELETAL CHANGES AFTER TWIN BLOCK THERAPY ON CLASS II DIVISION 1 SUBJECTS

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ABSTRACT Twin Block appliances are largely used for the correction of skeletal class II malocclusions due to mandibular retrognathism. Due to its patient comfort and ease, this appliance became the major tool for class II skeletal correction. Literature review on this appliance shows mixed responses, some claiming that the results are good and stable while others just put this as an appliance giving temporal acceleration in growth. Hence a study was designed to investigate the stability attained in antero posterior skeletal correction attained with Twin Block appliance. 30 subjects who were treated for mandibular retrognathism were identified. Average age group was 12.9[T1], 14.8 [T2] and 16.5 years [T3]. Pre-treatment, post treatment and a minimum of one year post treatment cephalograms were collected and analyzed. Results obtained from the present study showed that the treatment outcomes that were achieved immediately after twin block therapy was stable and that twin block appliance could be recommended in patients with sufficient growth with mandibular retrognathism.

KEYWORDS : Twin Block Appliance, Antero-posterior, Skeletal Changes, Post Treatment, Stability

INTRODUCTION

The major objective of orthodontic treatment for children with malocclusion is to produce a well balanced facial profile in addition to an acceptable occlusion. To attain structural balance in class II skeletal cases due to mandibular retrognathism myofunctional appliances are employed. The most popular among the removable myofunctional appliances is the Twin Block appliance due to its ease and effectiveness. Several clinical investigations have shown varying degrees of success in immediate treatment outcomes after twin block therapy. However changes in the jaw relationship after short intensive treatment period are beneficial only if they prove to remain stable during and after retention period. An investigation was hence planned to find out the stability of treatment outcomes one year post treatment with Twin Block appliances employed for the correction of class II skeletal malocclusions due to mandibular retrognathism

AIMS AND OBJECTIVES

The aim of the present study was to evaluate the post treatment sagittal skeletal changes that occurred after successful correction of class II division 1 malocclusion due to mandibular retrognathism with twin block appliance using cephalometric radiographs taken at the beginning of Twin Block therapy [T1], at the completion of Twin Block therapy [T2] and minimum one year after completion of active treatment [T3]

OBJECTIVES

The objectives of this study are to evaluate cephalometrically the

1. Angle SNA
2. Angle SNB
3. Angle ANB
4. Angle of Convexity [N-A-Pog]

The changes in each variable in the post treatment period will be compared to the corresponding changes obtained during the active phase of treatment to evaluate the stability of the results obtained with Twin Block therapy.

MATERIALS AND METHODS

The present study was conducted in the Department of Orthodontics, Government Dental College, Calicut. Records of all the patients who had undergone Twin Block therapy followed by a minimum period of one year retention were collected from the files of post graduate clinic at Dental College Calicut. Ethics committee approval was taken before the study began. The patients were recalled and examined. Lateral cephalograms of those patients who were ready to cooperate with the study was taken, after getting informed consent from them in their mother tongue. The subjects included in this study thus consisted of 30 patients [20 females and 10 male] successfully treated Angles class II division 1 patients with retrognathic mandible. All 30 patients were corrected from a full cusp Class II molar relationship to a class I molar relationship using twin block appliance. None of the patients had undergone a second phase of fixed appliance treatment.

Lateral cephalograms taken before starting treatment [T1 mean age 12.9yrs] and after attaining a class I molar relationship and settled occlusion [T2] were obtained from records. A third cephalogram of the post treatment follow up subjects [T3 Mean age 16.9yrs] was taken. The mean retention period was 2.8yrs. All the cephalograms for the study were taken using the same machine in the Department of Oral Medicine and Radiology, Govt. Dental College, Calicut under standardized procedure. The cephalograms were traced on acetate matte tracing paper of 0.003 inch thickness with a sharp 3H drawing pencil on a view box using trans-illuminated light. Angular measurements were obtained to nearest 10 on the protractor. All tracings were done by a single operator under similar lighting conditions and using same instruments, so as to minimize the inter operator biases.

The cephalometric points were traced twice and if the differences between the two values of any variable exceeded 10, then the value was measured a third time. Of the three values the average of the two nearest values were taken. A total of 4 angular variables were utilized. All data were entered in Microsoft office excel datasheet and SPSS for windows software was used for statistical analysis. Statistical analysis was performed to determine the mean and standard deviation of each cephalometric variable measured in pretreatment, post treatment and retention period. In addition the rates of change of these variables were calculated for T1 to T2 period and for T2 to T3 period. Student's t test was used to compare the rate of change and determine the p value < 0.05

APPLIANCE USED IN THE STUDY

The Twin Block appliance used in the present study had the following basic components-occlusal bite block inclined at 700 to the occlusal plane, Adams clasp on upper molar and lower premolars, labial bow on both upper and lower arches and a midline screw to expand upper arch if required.

CEPHALOMERTIC LANDMARKS USED IN THIS STUDY

1. S [Sella Turcica]- the geometric centre of pituitary fossa
2. N [Nasion] – the intersection of the internasal and fronto nasal sutures, in the midsagittal plane. it is the anterior most point of

the fronto nasal suture in the median plane.

3. A [Point A]- The deepest midline point in the curved bony outline from the base of the alveolar process of maxilla i.e. the most posterior point between the anterior nasal spine and Prosthion.
4. B point [Point B] - The deepest midline point on the bony curvature of the anterior mandible between Infradentale and Pogonion.
5. Pog [Pogonion]- Anterior most point of the bony chin in the median plane

RESULTS

The following are the results of the current study:

1. Angle SNA decreased by 1.6 ± 0.84 degrees on an average in the T1-T2 period and is statistically significant (P< 0.05) It is found to increase by 0.4 ± 0.84 degrees on an average in the T2- T3 period. However, this change is not statistically significant
2. Angle SNB increased by 2.8 ± 0.92 degrees in the T1-T2 period. This change is found to be statistically significant. In the retention phase a mild increase of 0.8 ± 1.2 degrees is noted. This change is not statistically significant.
3. There is a statistically significant reduction in Angle ANB in the T1-T2 period by 4.4 ± 1.1 degrees. In the T2-T3 period a marginal decrease of 0.4 ± 1.5 degrees is observed which is not significant statistically.
4. Angle of facial convexity decreased by 4 ± 4.1 degrees in the T1-T2 period and further decreased by 0.5 ± 2.1 degrees in the T2-T3 period. The change in T1 -T2 is statistically significant where as that in T2-T3 is not

TABLE # 1

Table Showing Mean ± Standard Deviation Of Pretreatment (t1), Post Treatment (t2), Retention Period (t3) Values And T1-t2 & T2- T3 Changes

Sl. No	Variable	T1 Mean ± SD	T2 Mean ± SD	T3 Mean ± SD	T1 – T2 changes Mean ± SD	T2 – T3 changes Mean ± SD
Anteroposterior skeletal measurements						
1	SNA (degree)	82 ± 1.24	80.4 ± 0.84	80.8 ± 0.63	-1.6 ± 0.84	0.4 ±0.84
2	SNB (degree)	76.1 ± 1.96	78.9 ± 1.44	79.7 ± 0.95	2.8 ± 0.91	0.8 ± 1.22
3	ANB (degree)	5.9 ± 1.66	1.5 ± 1.17	1.1 ± 0.99	-4.4 ± 1.17	-0.4 ± 1.57
4	<NA - Pog (degree)	12.4 ± 4.64	8.4 ± 5.87	7.9 ± 6.26	-4 ± 4.16	-0.5 ± 2.06

TABLE # 2 TABLE SHOWING PAIRED SAMPLES TEST

Paired samples		Mean	SD	Std. Error mean	"t"	"P" value	Significance
Anteroposterior Skeletal measurements							
Pair 1	T1 SNA - T2 SNA	-1.6	.843	.267	6.000	.000	√
Pair 2	T2 SNA - T3 SNA	0.4	.843	.267	-1.500	.168	X
Pair 3	T1 SNB - T2 SNB	2.8	.919	.291	-9.635	.000	√
Pair 4	T2 SNB - T3 SNB	0.8	1.229	.389	-2.058	.070	X
Pair 5	T1 ANB - T2 ANB	-4.4	1.174	.371	11.854	.000	√
Pair 6	T2 ANB - T3 ANB	-0.4	1.578	.499	.802	.443	X
Pair 7	T1 NAPog - T2 NAPog	-4	4.163	1.317	3.038	.014	√
Pair 8	T2 NAPog - T3 NAPog	-0.5	2.068	.654	.764	.464	X

DISCUSSION

The success of treatment with any appliance depends upon patient cooperation, as this has a direct correlation with the extent of correction of the malocclusion. The Twin Block appliance has been described by patients as being comfortable to wear and gives good results relatively quickly, depending on patient cooperation. It is perhaps for these reasons that this appliance has become a popular choice of corrective appliance for growth guidance in Class II division 1 malocclusions with retrognathic mandible. The very few published materials on post treatment changes in patients treated with the Twin Block appliance are that of Clark[1], O'Brien[2] and that of Mills and McCulloch[3]. Clark's patients wore a Concorde headgear in addition to their Twin Block appliances, and this combined treatment makes it difficult to compare with the present study in which the Twin Block alone was used. Clark's post treatment findings generally were favorable, with the Twin Block patients and control patients growing in a similar fashion after active treatment. There appeared to be no substantial loss of the gain in mandibular length achieved during active treatment.

The patients included in this study were in the age group of 11. 8 to 14.3 years. To assess the effects of factors that influence craniofacial growth other than appliance therapy, it is necessary to have a control group. However, there is no tabled growth increment rate available for Malabar population, from which the samples for the current study was taken, for comparison of growth changes. Moreover, whatever control group is used, it must be remembered that facial growth varies at different ages, and between the sexes. In addition, differing amounts of natural growth would result from observation times of varying lengths.

There are also ethical problems in selecting control groups. Denying treatment for a selected group of needy patients solely for study purpose, by keeping as control group is difficult in our social setup. Hence it is inferred that the results obtained are largely due to the beneficial effects of twin block appliance.

ANTERO-POSTERIOR SKELETAL CHANGES

Changes in SNA Angle

The present study shows a mean reduction of angle SNA by 1.6 ± 0.84 degrees on an average in the T1-T2 period which is significant statistically and an increase of 0.4 ± 0.84 degrees in the T2-T3 period, which is not significant.

Mills and McCulloch[3] showed that the Twin Block inhibited forward maxillary growth, as evidenced by the reduction seen in Angle SNA by 0.9degrees in the immediate post treatment period. This seemed to demonstrate the head gear effect of the appliance. They also showed an increase of angle SNA by 0.3 ± 1.4 degrees in the twin block treatment group after 3 years of retention. Schaefer et al.[4]reported a reduction of SNA angle by 1 ± 1.2 degrees in the post treatment period of twin block appliance Lund and Sandler[5] reported a reduction in SNA by 0.1 degree using Twin Block Appliance thus exhibiting a slight maxillary restraining effect. Trenouth[6] in his study on the Twin block noted a small but statistically significant mean reduction in angle SNA by 0.60 degrees. As per the study conducted by Samir E. Bishara[7]using Iowa longitudinal study growth records, angle SNA increases by 0.2°/yr.

Changes in SNB Angle

In the present study, angle SNB increased by 2.8 ± 0.92 degrees in the T1-T2 period. This change is found to be statistically significant.

In the T2 T3 period a mild increase of 0.8 ± 1.2 degrees is noted. This change is however, not significant. Study by Mills and McCulloch[3] showed that the Twin Block increased the angle SNB by 1.9 ± 1.2 degree in the T1- T2 period and was maintained stable in the T2-T3 period with a non significant change of 0.3 ± 1.9 degrees. Similar findings are noted in the twin block studies by Lund and Sandler[5] (1.9 degrees), Illing et al.[8], Trenouth[6] (2 degree), Toth and McNamara[9] (1.6 degree). Schaefer et al[4] reported an increase of SNB by 1.5 ± 1.1 degrees. According to Bishara[7] the angle SNB normally increases with growth by 0.4°/yr. All the above findings showed an increase in angle SNB possibly due to an anterior relocation of point B and also due to the forward growth of the mandible when the Twin Block was used.

Changes in ANB Angle

There is a statistically significant reduction in Angle ANB in the T1-T2 period by 4.4 ± 1.1 degrees and this was stable in the T2-T3 period. These findings are well supported by the reports of Mills and McCulloch[3]. They showed a reduction of angle ANB by 2.8 ± 1.4 in the T1-T2 period as compared with -0.2 ± 1.0 of their control group. In the T2-T3 period this was 0 ± 1.6 for the Twin block group and 0.1 ± 1.1 for the control group. Schaefer et al.[4] reported a reduction of ANB by 2.5 ± 1.2 degrees. Lund and Sandler[5] reported a significant reduction in Angle ANB by 2.0 degrees. Illing et al.[8] in their study showed that the Twin block was most effective in reducing the sagittal inter maxillary relationship as was evident in the significant reduction in ANB angle.

Similar observations were reported by Trenouth[6] with significant reduction in angle ANB by 2.6° which was mainly due to the increase in angle SNB (2.0°) and partly due to the slight reduction in angle SNA (0.6°) due to the restraint of forward maxillary growth. Other similar studies is by Toth and McNamara[9](ANB was reduced by 1.8 degrees). Growth studies[7] reveal that the incremental reduction in angle ANB with growth is only 0.2°/yr.

Angle of facial convexity

Angle of facial convexity decreased in the present study by 4 ± 4.1 degrees in the T1-T2 period and further decreased by 0.5 ± 2.1 degrees in the T2- T3 period. The change in T1 -T2 is statistically significant where as that in T2-T3 is not, which means the result is maintained in the post treatment period. This is in accordance with the findings of Mills and McCulloch[3], who demonstrated a reduction in N-A-Pog angle by 5.7 ± 2.7 degrees in the immediate post treatment period of their twin block group. In the retention period their study revealed a marginal increase in this angle in the treated group compared with that of the non-treated controls (0.4 ± 3.1 degrees and -0.5 ± 2.6 degrees respectively). Similar findings are given by W.J Clark, who reported a significant reduction in the facial convexity angle in patients treated with Twin Block appliance for class II division 1 malocclusion.

SUMMARY AND CONCLUSION

A study to assess the stability of antero-posterior skeletal treatment effects of the Twin Block appliance in the post treatment period was carried out on successfully treated patients with skeletal Class II division 1 malocclusions with retrognathic mandible. It was found that most of the positive gains in the antero-posterior skeletal dimensions were maintained favourably in the post treatment period when the patients were assessed nearly 3 years later, on the average.

The following conclusions were drawn from this study:

- The twin block appliance successfully reduced overjet, molar discrepancies, and severity of malocclusion to statistically and clinically significant levels. These gains were successfully maintained in the retention period.
- Marked increase in SNB angle and lower incisor flaring was noted.
- Reduction in Angle ANB during treatment period was stable during post retention period
- Relapse noted in any of the values were mild and not statistically significant.

Thus it can be concluded that the Twin Block appliance is a very effective and efficient tool to correct skeletal Class II malocclusion with retrognathic mandible in growing children. Quantitatively the changes are impressive and stable.

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