International Journal of Dentistry Research

Research Article

IJDR 2016; 1(1): 1-5
December

www.dentistryscience.com

Comparison between conventional Twin block and a modified Essix twin block in adolescents with Class II malocclusion

Abhishek Singh[1], Stephen Chain[2], Rohit Kulshrestha[3], Mayank Gupta[4], Deepak Passi[1], Mahinder Singh[5]*

1 *Senior Lecturer, Department of Orthodontics and Dentofacial Orthopedics, ESIC Dental College and Hospital Rohini New Delhi India*

2 *Assistant Professor, Department of Orthodontics and Dentofacial Orthopedics, Chandra Dental College and Hospital Barabanki, Uttar Pradesh, India*

3 *Consulting Orthodontist, Private Practice, Mumbai, India*

4 *Senior Resident, Department of Orthodontics and Dentofacial Orthopedics, GTB Hospital, Delhi, India*

5 *Reader, Department of Oral and Maxillofacial Surgery, UDMRI, Dehradun, India*

Abstract

Objective: To compare the changes in dento-skeletal structures between the conventional twin block and the modified Essix twin block and also to assess the patient's compliance with both the appliances. **Material and Methods:** A total of 14 female patients in the age group of 10 to 13 years were selected. They were divided into two groups, Group 1 was given the conventional twin block and the other group was given the modified Essix twin block. Lateral cephalograms were taken at two stages- pre-treatment and post treatment (after the completion of myofunctional therapy, 11 months). At the end of the functional treatment the patient's were asked to fill a questionnaire regarding the usage with both types of appliances. **Results:** The conventional twin block showed slightly greater retroclination of upper incisors SNA increased post treatment in the Essix group but remained nearly constant in the conventional group. The increase in SNB and ANB as well as beta angle change was greater in the Essix group. The Essix group also showed greater proclination of the lower incisors as an adverse effect. The Jarabaks ratio appeared to increase in the Essix patients whereas in the conventional group it decreased. From the questionnaire it was clear that the patients found the Essix twin block more comfortable, esthetic. **Conclusion:** The Essix twin block produces a greater advancement of the mandibular apical base and more favorable direction of growth. It also shows prospects of better patient acceptability and compliance. The observed dentoskeletal effects indicate that the appliance may be particularly beneficial in patients with an anterio-posteriorly normal maxilla and a vertical growth pattern.

Keywords: Twin-block, Modified essix twin block, Class II malocclusion.

INTRODUCTION

The main objective of functional appliance therapy is to encourage or to redirect the growth in a favourable direction. Many functional appliances have been fabricated and are presented in the literature for the correction of Class II division 1 malocclusion. The major differences in the effects between various orthopaedic appliances are mainly related to the technique of fabrication, construction bites, and hours of wear. The Twin-block (TB) appliance was originally developed by Clark[1] and is widely used as a functional appliance for the management of Class II malocclusion. Its popularity is attributable to its ability to produce rapid treatment changes and perhaps it is the only myofunctional appliance which has been extensively studied. However, it has certain undesirable effects, such as mandibular incisor proclination[2,3], an increase in the vertical facial dimension, which is not acceptable in high-angle patients[4], clockwise rotation of the maxillary plane[4], limited increase in mandibular growth, which might not be present in the long term[5] and moderate but not excellent patient compliance[6]. Over the years a need to overcome the adverse effects of the twin block led to the development of a modified version of the appliance, termed the Essix twin block appliance. It has been developed as an attempt to overcome some of these limitations especially dealing with the patients compliance. Thus, the present study was designed to evaluate the treatment effects of the conventional Twin Block and to compare its effects with the modified Essix twin-block appliance, in the treatment of Class II division 1 malocclusion. Assessing the patients compliance with both the appliances also was done with the help of a questionnaire.

***Corresponding author:**
Dr. Rohit Kulshrestha
Consulting Orthodontist, Private Practice, Mumbai, India

MATERIAL AND METHODS

A total of 14 female patients in the age group of 10 to 13 years were selected in this study. Each included subject met the following selection criteria:

- Class II division 1 malocclusion with normal maxilla and retrognathic mandible
- Frankfurt Mandibular Angle (FMA) in the range of 20–25 degrees
- Minimal or no crowding or spacing present
- Overjet of 5–10 mm

Subjects with a history of orthodontic treatment, anterior open bite, severe proclination of anterior teeth, or any systemic disease affecting bone and general growth were excluded from the study. Each subject in both the groups was either in the late mixed dentition or the early permanent dentition stage. They were divided into two groups conventional twin block (Figure 1) and Essix twin block (Figure 2). Each group consisted of 7 randomly selected female patients. Both the groups were treated for their malocclusion, Group 1 with the conventional twin block and Group 2 with Essix twin block.

Figure 1: Conventional Twin Block

Figure 2: Modified Essix Twin Block

The subjects of the twin-block group had a single-step mandibular advancement during the wax bite registration. An edge-to-edge incisor relationship with a 2- to 3-mm bite opening between the central incisors was taken for all of the subjects. The patients were instructed to wear the appliance 24 hours/day, especially during mealtimes as well. All of the subjects were followed once every 6 weeks until the end of active appliance therapy. Inter-occlusal acrylic was trimmed in all of the subjects, and the labial bow was kept passive during the treatment. Appliance use was discontinued when overjet and overbite were reduced to 1–2 mm. Duration of appliance therapy varied greatly depending on the level of patient cooperation.

The procedure was slightly different for the Essix twin block. The first step comprised trimming of the working models adequately with an aim to eliminate all the buccal and labial undercuts. The lower model was trimmed on the lingual too. Following this the working models were dried and Essix sheets (1mm thickness) were adapted and vacuum formed individually on the upper and lower casts. The adapted sheets were trimmed using a carborundum disc upto 3mm beyond the gingival margins of all teeth and the edges were smoothened. Construction bite registration was done in the mouth with the Essix sheets, accounting for the thickness of the sheets for the vertical opening. After the bite registration the upper and lower Essix sheets were transferred with the wax bite on the stone models and thereafter to the three point articulator. Acrylic bite blocks meeting at a 70 degree angle were fabricated on the Essix sheets essentially in the same way as for a conventional twin block. No wire bending was required. The appliances were inserted and delivered. Same protocol was followed as the conventional Twin Block group regarding the wear time and discontinuation of the appliance.

All the patients were recalled every 6 weeks to assess the dento-skeletal changes clinically. Lateral cephalograms were taken at two stages- pretreatment and post treatment (after the completion of myofunctional therapy) to evaluate the changes radio-graphically and compare these changes. For evaluation of skeletal and dentoalveolar changes that contributed to the Class II correction, composite analysis was used. The pretreatment and post treatment cephalograms were traced by the same operator on good quality acetate paper under optimal lighting conditions. At the end of the functional treatment the patient were asked to fill a questionnaire of the treatment giving information about the patients experience and usage with both types of appliances.

Statistical Analysis

A master file chart was created and the data was statistically analyzed on a computer with Statistical Package for Social Sciences (Version 15.0). A data file was created under dBase and converted into a microstat file..The values obtained were then subjected to Non parametric tests and to test the significance of the differences in the dento-skeletal changes between the two groups. The observed z value or the p value (</=0.05) was considered statistically significant. The tracing error was calculated with the help of the Dahlberg formula[11,12].

RESULTS

The mean age of the subjects at the beginning of the study and the duration of the study are described in Table 1. The results showed that the conventional twin block showed slightly greater retroclination of upper incisors post treatment (Table 2). SNA increased post treatment in the Essix group but remained nearly constant in the conventional group, although the difference was insignificant (Table 3). The increase in SNB and ANB as well as beta angle change was greater in the Essix group (statistically insignificant). The Essix group also showed greater proclination of the lower incisors as an adverse effect. The Jarabaks ratio appeared to increase in the Essix patients whereas in the conventional group it decreased and this difference was statistically significant (Table 4, 5). The questionnaire given to the patients showed that greater number of patients complained of speech difficulty (57%Twin Block, 28% Essix Twin Block), pain and discomfort (71.4%Twin Block, 42%Essix Twin Block) respectively. Aesthetically also the Essix twin block (85% no problem with the appearance) fared better than the conventional twin block (57%).

Table 1: Mean Ages and Duration of Study Among conventional Twin-Block, and modified Essix twin block groups

	Twin block Group (N=7) Mean ± D	**Modified Essix Twin block Group (N=7)** Mean ± SD
Age at the start of treatment, years	11.40 ± 0.90	11.28 ± 0.52
Duration of study, months	12.18 ± 3.17	11.08 ± 0.61
Age at the end of treatment, years	12.34 ± 1.22	12.45 ± 0.62

SD - Standard Deviation

Table 2: Cephalometric Values of patients treated with conventional Twin Block

Parameter	Subject 1		Subject 2		Subject 3		Subject 4		Subject 5		Subject 6		Subject 7	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
SNA ^{0}	80	80	87	85	75	75	73	75	77	75	81	84	80	80
SNB ^{0}	74	76	79	79	71	73	70	71	70	70	78	81	72	74
ANB ^{0}	6	4	8	6	4	2		4	7	5	3	3	8	6
Beta Angle^0	20	20	24	28	22	36	30	29	31	32	20	22	23	25
SN -MP^0	26	25	30	29	36	36	38	40	47	45	17	15	37	37
Jarabaks Ratio (%)	71.4	70.9	61.9	64.8	61.9	61.29	59.1	59.5	54.16	54.09	77.68	76.78	62.71	61.3
U1-NA mm	36	34	37	33	42	40	37	31	26	31	42	37	28	27
L1-NB mm	22	20	24	35	27	24	26	22	19	28	21	22	31	38
IMPA ^{0}	98	95	90	104	99	92	95	90	82	89	105	102	102	106

Table 3: Cephalometric Values of patients treated with Modified Essix Twin Block

Parameter	Subject 1		Subject 2		Subject 3		Subject 4		Subject 5		Subject 6		Subject 7	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
SNA^0	82	85	76	78	84	84	84	85	80	80	80	81	83	82
SNB^0	71	77	68	73	74	77	76	81	71	73	72	74	76	77
ANB^0	11	8	8	5	10	7	8	4	9	7	8	7	7	6
Beta Angle^0	23	25	20	20	19	24	22	27	26	28	11	21	21	26
SN -MP^0	39	31	31	28	33	27	27	25	38	40	30	28	25	26
Jarabaks Ratio%	60	67	50	75	67	70	67	70	61.2	61.2	65.1	65.28	69.91	72.64
U1-NA mm	26	27	44	45	22	26	37	31	40	30	23	25	44	37
L1-NB mm	37	36	33	42	37	40	41	39	32	34	27	32	30	32
IMPA^0	105	109	110	117	110	115	115	114	102	102	105	108	108	106

Table 4: Mean and standard deviation for all measurements among both the groups

Parameter	N	Mean	Std Deviation	Minimum	Maximum
Diff_SNA	14	-.5000	1.60528	-3.00	2.00
Diff _SNB	14	-2.4286	1.82775	-6.00	0.00
Diff_ANB	14	1.8571	1.29241	-1.00	4.00
Diff_Beta Angle	14	-3.6429	4.10641	-14.00	1.00
Diff_SN-MP	14	1.5714	2.79324	-2.00	8.00
Diff_Jarabak Ratios	14	-2.9086	6.75416	-25.00	1.41
Diff_U1-NA	14	2.1429	4.41775	-5.00	10.00
Diff_L1-NB	14	-2.6429	4.89281	-11.00	4.00
Diff_IMPA	14	-1.6429	5.67867	-14.00	7.00
Group	14	1.50	.519	1	2

Table 5: Test of significance for all the measurements

Mann Whitney	Diff_SNA	Diff_SNB	Diff_ANB	Diff_Beta Angle	Diff_SN-MP	Diff_Jarabaks Ratio	Diff_U1-NA	Diff_L1-NB	Diff_IMPA
	18.000	10.000	12.500	15.500	14.500	5.000	24.500	22.000	18.000
Wilcoxon W	46.000	38.000	40.500	43.500	42.500	33.000	52.500	50.000	46.000
Z test	-.853	-1.904	-1.605	-1.169	-1.296	-2.494	0.000	-.320	-.833
p value (2-tailed)	.393	.050	.108	.242	.195	.013	1.000	.749	.405
P value [2(1-tailed Sig.)]	.456^b	.073^b	.128^b	.259^b	.209^b	0.11^b	1.000^b	.805^b	.456^b

p - Value of significance, a - Grouping Variable: Group, b- Not corrected for ties.

DISCUSSION

The result of the present study showed that the forward growth of maxilla was slightly less in the conventional twin block subjects than the Essix twin block subjects. When the mandible was postured forward by the functional appliances, a reciprocal force acts distally on the maxilla and restricts its forward growth. Many previous studies also have reported restriction in the forward growth of maxilla by twin-block[13-17], and also by many other functional appliances.[13,15,17] There was a tendency for maxillary growth restriction and upper incisor retroclination in the conventional group although the difference was not statistically significant. This suggests that it might be more beneficial to use the conventional twin block in cases where a definite headgear effect is desired. On the other hand the Essix Twin Block shows a significantly greater increase in SNB and thereby greater advancement of the B point.

There was no significant difference between groups in the distance between Sella-Nasion during treatment. This lead to the suggestion that the general growth rate between the treatment groups was matched. Therefore, it was assumed that any differences in facial growth could have been achieved by the appliances effect. Also intra examiner reliability was assessed as being adequate on basis of the minimal tracing error.

The Essix twin block was developed in an attempt to improve some of the drawbacks of the conventional twin block the most predominant being the patient compliance and the mandibular incisor proclination. Full coverage of the lower incisors has been postulated to prevent lower incisor proclination has been shown in a previous study involving the comparison between Essix and Hawley retainers[7]. The present study deviates from the above viewpoint since the Essix sheets covered the incisors completely and yet there was no statistically significant difference in the resulting proclination between the two groups. In fact, the results suggest that the Essix twin block might result in slightly greater lower incisor proclination as compared to the conventional twin block. The reason for the above phenomenon could be the lack of a strong acrylic support from the anterior in case of the Essix Twin Block since the Essix sheet only covers the dentition area. An attempt to prevent the same can be done by adding acrylic on the lingual of the Essix twin block in the future. Lund and Sandler[2] reported a mean mandibular incisor proclination of 8°during Twin Block treatment. Possible explanations for smaller median changes which were found in our study could be due to incompletion of full treatment. Randomized controlled trials are required to determine the best retention regimen after functional appliance therapy. Toth and McNamara[13] have, mentioned that lingual tipping of the U1 is due to the contact of lip musculature during twin-block treatment. This lingual tipping could also be due to the labial wire in the appliance, which might come into contact with the incisors during sleep, causing them to retract. The most prominent effect in treatment subjects was proclination of mandibular incisors. This could be due to the mesial force on the L1 which is seen due to the forward posture of the mandible. This finding was in accordance with the effects of other functional appliances.[4,13,18-20] Such uprighting of the L1 was due to the restraining effect of the lower lip.[17]

In Twin Block subjects, Mills and McCulloch[14] reported more mesial eruption of the mandibular molars. This was seen in our study as well with increase in the Jarabaks ratio due to trimming of the twin blocks. In view of the vertical changes the Steiners mandibular plane angle as well as the Jarabak ratio shows a tendency for the Essix Twin Block patients to show greater horizontal growth and a decrease in the vertical with the Jarabaks ratio change showing a statistically significant difference between the Essix and conventional group. In the conventional group the cephalometric values showed an increase in the vertical dimension post treatment. One reason for the above could be the complete coverage of the anterior and posterior dentition with the Essix twin block resulting in some amount of intrusion of the teeth in comparison with the conventional twin block which could have allowed some posterior tooth eruption. The proclination and intrusion of the lower anteriors could have allowed greater mandibular closure and thereby more autorotation of the mandible in a favorable direction. This suggests that the Essix twin block poses a great advantage in vertical growers.

Problems of compliance with functional appliances have previously been recognized[9]. Previous studies have reported discontinuation rates of 21%[6] , 14%[10] and 10.7%[8] for the Twin Block appliance. The results of the questionnaire indicate that the Essix twin block lessens the speech problems, relatively reduces pain, discomfort and is aesthetically superior. All the above indicate that the Essix twin block can lead to better patient compliance in the long run thus increasing efficiency.

CONCLUSION

The Essix twin block produces a greater advancement of the mandibular apical base and more favorable direction of growth. The conventional twin block is more effective at restricting maxillary growth and results in lesser proclination of the lower incisors. The prime advantage of the Essix twin block is that it shows prospects of better patient acceptability and compliance in the future thus optimizing the advantages of the twin block appliance. The reduced wire bending, decreased chair side time lessens the burden on the dental technician and the orthodontist, thus making it a feasible option as a myofunctional appliance in the future. The observed dentoskeletal effects indicate that the appliance may be particularly beneficial in patients with an anteroposteriorly normal maxilla and a vertical growth pattern although further studies with a larger sample size are still required to confirm the same.

Questionnaire

1. Wearing braces caused you serious eating, chewing problems.
Agree
Disagree

2. Was wearing braces ever painful for you?
No
Yes, only once in a while
Yes, sometimes
Yes, most of the time

3. If braces are painful does the pain keep you from wearing the braces?
No, braces aren't painful
The pain doesn't keep me from wearing braces
Yes, pain occasionally keeps me from wearing braces
Yes, pain often keeps me from wearing braces
Yes, I couldn't wear braces because of the pain

4. Does wearing braces affect your speech?
No.
Yes, sometimes
Yes, all of the time

5. Has wearing braces ever been an embarrassment to you?
No, because I didn't wear
I have worn the braces but was never embarrassed
Yes, I have worn and was embarrassed sometimes
Yes, I have worn and was embarrassed a lot

6. Does wearing braces make chewing difficult?
No, I can chew okay
Yes, chewing is sometimes difficult
Yes, chewing is often difficult

Yes, chewing is always a problem.

7. Do your friends tease you about your looks because of your braces?
No, not at all
Yes sometimes
Yes, all the time

Financial support and sponsorship: Nil.

REFERENCES

1. Clarke WJ. The Twin block traction technique. Eur J Orthod1982;4:129-38.
2. Lund DI, Sandler PJ. The effects of Twin Blocks: a prospective controlled study. Am J Orthod Dentofacial Orthop 1998;113:104-10.
3. Mills CM, McCulloch KJ. Treatment effects of the twin block appliance: A cephalometric study. Am J Orthod Dentofacial Orthop 1998;114:15-24.
4. Illing HM, Morris DO, Lee RT. A prospective evaluation of Bass, Bionator and Twin Block appliances. Part 1—The Hard Tissues. Eur J Orthod 1998;20:501-16.
5. Mills CM, McCulloch KJ. Post treatment changes after successful correction of Class II malocclusions with the Twin Block appliance. Am J Orthod DentofacialOrthop2000;118:24-33.
6. McDonagh S. A prospective cephalometric and optical scanning assessment of the effects of functional appliances on the hard and soft tissues [thesis]. London: University of London; 1996.
7. Demira A, Babacanb H, Nalcacıc R, Topcuoglu T. Comparison of retention characteristics of Essix and Hawley retainers. Korean J Orthod 2012;42(5):255-262.
8. Tumer N, Gultan AS. Comparison of the effects of monoblock and twin-block appliances on the skeletal and dentoalveolar structures. Am J Orthod Dentofacial Orthop 1999;116:460-468.
9. Tulloch CJF, Proffit WR, Phillips C. Influences on the outcome of early treatment for Class II malocclusion. Am J OrthodDentofacial Orthop 1997;111:533-42
10. Morris DO, Illing HM, Lee RT. A prospective evaluation of Bass, Bionator and Twin Block appliances. Part II—The Soft Tissues. Eur J Orthod 1998;20:663-84.
11. Dahlberg G. Statistical methods for medical and biological students. New York: Interscience Publications; 1940.
12. Houston WJB. The analysis of errors in orthodontic measurements. Am J Orthod 1983; 83:382-90.
13. Toth LR, McNamara JA Jr. Treatment effects produced by the twin-block appliance and the FR-2 appliance of Frankel compared with an untreated Class II sample. Am J Orthod Dentofacial Orthop. 1999;116:597–609.
14. Mills CM, McCulloch KJ. Posttreatment changes after successful correction of Class II malocclusions with twin-block appliance. Am J Orthod Dentofacial Orthop. 2000;118:24–33.
15. Trenouth MJ. Proportional changes in cephalometric distance during twin-block appliance therapy. Eur J Orthod. 2002;24:485–491.
16. O'Brien K, Wright J, Conboy F, Sanjil Y, Mandall N, Chadwick S, *et al*. Effectiveness of early orthodontic treatment with twin-block appliance: a multicenter, randomized, controlled trial. Part-1: dental and skeletal effects. Am J Orthod Dentofacial Orthop. 2003;124:234–243.
17. Jena AK, Duggal R, Parkash H. Skeletal and dentoalveolar effects of twin-block and bionator appliances in the treatment of Class II malocclusion: a comparative study. Am J Orthod Dentofacial Orthop. 2006;130:594–602.
18. Valant JR, Sinclair PM. Treatment effects of the Herbst appliance. Am J Orthod Dentofacial Orthop. 1989;95: 138–147.
19. Pancherz H. The mechanism of Class II correction in Herbst appliance treatment: a cephalometric investigation. Am J Orthod. 1982;82:104–113.
20. Gonner U, Ozkan V, Jahn E, Toll DE. Effect of MARA on the position of the lower anteriors in children, adolescents and adults with Class II malocclusion. J Orofac Orthop. 2007;68: 397–412.