Received: 12th December 2013 Accepted: 4th March 2014 Conflict of Interest: None

Source of Support: Nil

Original Research

Dentoskeletal Comparison of Changes Seen in Class II Cases Treated by Twin Block and Forsus

Suchita Madhukar Tarvade[1], Charushila Vinay Chaudhari[2], Sadashiv Gopinath Daokar[3], Suhas Shriram Biday[2], Sheetal Ramkrishna[2], Amit Satish Handa[4]

Contributors:

[1]Professor, Department of Orthodontics, Chhatrapati Shahu Maharaj Shikshan Sanstha's Dental College and Hospital, Aurangabad, Maharashtra, India; [2]Post Graduate Student, Department of Orthodontics, Chhatrapati Shahu Maharaj Shikshan Sanstha's Dental College and Hospital, Aurangabad, Maharashtra, India; [3]Professor, Department of Conservative Dentistry, Chhatrapati Shahu Maharaj Shikshan Sanstha's Dental College and Hospital, Aurangabad, Maharashtra, India, [4]Consulting Orthodontist, Aurangabad, Maharashtra, India.

Correspondence:

Dr. Tarvade SM. Department of Orthodontics, Chhatrapati Shahu Maharaj Shikshan Sanstha's Dental College & Hospital, Aurangabad, Maharashtra, India. Phone: +91–9822523556. Email: suchitadaokar@gmail.com

How to cite the article:

Tarvade SM, Chaudhari CV, Daokar SG, Biday SS, Ramkrishna S, Handa AS. Dentoskeletal comparison of changes seen in class II cases treated by Twin Block and Forsus. J Int Oral Health 2014;6(3):27-31.

Abstract:

Background: To evaluate skeletal and dentoalveolar effects of Forsus fatigue resistant devices (FRD) and twin-block (TB) appliance in Class II malocclusion cases.

Materials and Methods: 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.

Results: 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.

Conclusion: 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.

Key Words: Class II malocclusion, Forsus, Twin block

Introduction

The goal of functional appliance therapy is to encourage or to redirect the growth in a favorable direction. Several functional appliances are presented in the literature for the correction of Class II division 1 malocclusion. The major differences in the effects between various orthopedic appliances are mainly related to the technique of fabrication, construction bites, and hours of wear. Among various removable and fixed functional appliances, the twin-block (TB) and Herbst appliance, respectively, are most efficient in correcting a Class II malocclusion. [1]

Moreover, removable appliances are considered uncomfortable and unesthetic by many patients and require patient compliance. Consequently, a primary advantage of fixed functional appliances is independence from the need for patient co-operation. For the advancement of the mandible along with multibonded fixed appliances, various clinicians have designed many fixed functional appliances.[2-7] Forsus is gaining importance due to greater patient compliance.

Thus, the present study was designed to evaluate the treatment effects of fatigue resistant devices (FRD) and to compare its effects with the most popular removable functional appliances, the TB appliance, in the treatment of Class II division 1 malocclusion.

Materials and Methods

Twenty-four patients exhibiting Class II division 1 malocclusion in the age group of 13-17 years exhibiting overjet of 6-10 mm, retrognathic mandible and horizontal growth pattern were selected.

Method

Lateral cephalograms were taken at start (T0) and at the end (T1) of the removable and fixed functional treatment. The tracings were carried out on pre- and post-lateral cephalograms and checked for changes in these parameters (Figure 1).

1. SNA angle
2. SNB angle
3. ANB angle
4. U1-SN angle
5. UI-ANS-PNS (mm)
6. U6-ANS-PNS (mm)
7. LI-GO-ME Angle
8. L1-GO-ME (mm)
9. L6-GO-ME (mm)
10. OP-SN angle

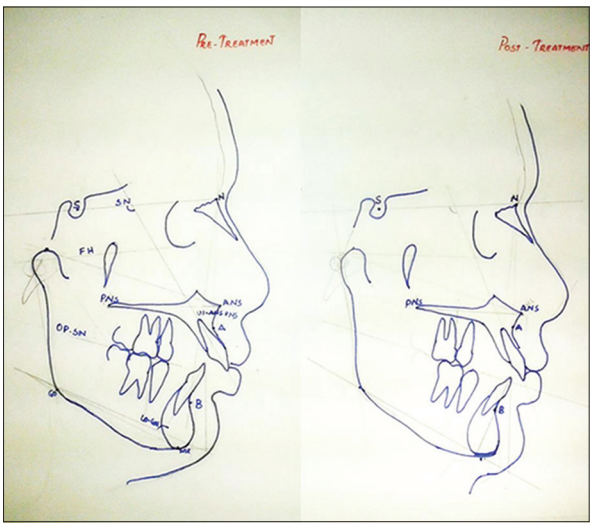

Figure 1: Pre and post treatment cephalometric tracings .

11. Frankfort horizontal-mandibular plane (FH-MP) angle
12. Maxillary length
13. Mandibular length.

Dentoskeletal changes were analyzed on lateral cephalograms taken before (T0) and (T1) 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.

Results

Skeletal changes

Anteroposterior disharmony between the jaws was corrected, as assessed by ANB angle TB (TB = 1.5°, Forsus = 0.75°). This when compared was found to be statistically significant in both groups ($P = 0.002$, $P = 0.021$) (Tables 1-3). The values

Table 1: Comparison between pre- and post-treatment mean and standard deviation of the skeletal and dento-alveolar changes of the patients treated with twin-block appliance.

	N	Minimum	Maximum	Mean	Standard deviation	*Z* value	Asymp. significant (2-tailed)
SNA						−2.126[b]	0.033
Pre	12	76	84	81.83	2.209		
Post	12	75	84	82.5	2.68		
SNB						−3.115[b]	0.002
Pre	12	70	78	76.08	2.275		
Post	12	71	80	78.25	2.667		
ANB						−3.035[c]	0.002
Pre	12	4	8	5.75	0.965		
Post	12	4	6	4.25	0.622		
UI-SN1						−2.561[c]	0.01
Pre	12	99	121	114.58	8.163		
Post	12	101	116	109.67	5.297		
U1-ANS-PNS						−2.825[b]	0.005
Pre	12	20	29	25.42	2.503		
Post	12	26	29	27.58	1.379		
U6-ANS-PNS						−2.654[b]	0.008
Pre	12	19	27	21.83	2.082		
Post	12	19	32	23.58	3.059		
L1-GO-ME						−2.695[c]	0.007
Pre	12	68	92	78.58	7.267		
Post	12	62	84	74.5	7.465		
L1-GO-ME						−1.513[b]	0.13
Pre	12	36	40	38.67	1.371		
Post	12	37	42	39.33	1.57		
L6-GO-ME						−2.214[b]	0.027
Pre	12	27	36	29.75	2.34		
Post	12	30	36	31.75	1.865		
OP-SN						−2.222[c]	0.026
Pre	12	17	24	20.83	2.725		
Post	12	14	26	18.5	3.371		
FH-MP						−3.111[b]	0.002
Pre	12	23	29	25.75	1.815		
Post	12	25	32	27.75	1.913		
Maxillary length						−3.126[b]	0.002
Pre	12	84	91	86.75	2.598		
Post	12	85	92	88.42	2.644		
Mandibular length						−3.100[b]	0.002
Pre	12	99	113	105	4.824		
Post	12	102	116	108.83	4.687		

Table 2: Comparison between pre- and post-treatment mean and standard deviation of the skeletal and dento-alveolar changes of the patients treated with Forsus appliance.

	N	Minimum	Maximum	Mean	Standard deviation	*Z* value	Asymp. significant (2-tailed)
SNA						−2.414[b]	0.016
Pre	12	77	82	79.83	1.801		
Post	12	78	83	80.92	1.505		
SNB						−3.097[b]	0.002
Pre	12	74	79	76.5	1.834		
Post	12	76	80	78.42	1.311		
ANB						−2.310[c]	0.021
Pre	12	3	4	3.33	0.492		
Post	12	2	4	2.58	0.669		
UI-SN1						−3.077[c]	0.002
Pre	12	97	121	110.75	10.119		
Post	12	95	117	107	8.924		
U1-ANS-PNS						−0.134[c]	0.893
Pre	12	23	30	26.25	2.417		
Post	12	21	29	25.92	2.151		
U6-ANS-PNS						−1.447[b]	0.148
Pre	12	20	24	22	1.477		
Post	12	19	27	23.17	2.082		
L1-GO-ME						−3.089[b]	0.002
Pre	12	85	102	97.67	4.658		
Post	12	98	107	102.92	2.906		
L1-GO-ME						−1.988[c]	0.047
Pre	12	36	42	39.75	1.545		
Post	12	37	42	38.5	1.508		
L6-GO-ME						−3.089[b]	0.002
Pre	12	22	32	27.67	3.114		
Post	12	25	34	30.17	2.823		
OP-SN						−3.115[b]	0.002
Pre	12	17	24	22.42	2.575		
Post	12	20	28	25.58	2.466		
FH-MP						−3.090[b]	0.002
Pre	12	26	33	30.25	2.896		
Post	12	29	36	32.67	2.425		
Maxillary length						−3.090[b]	0.002
Pre	12	83	91	88.08	2.712		
Post	12	85	95	90.5	2.747		
Mandibular length						−3.081[b]	0.002
Pre	12	102	113	108	3.693		
Post	12	105	115	110.33	3.025		

when compared between both groups were also found to be significant ($P = 0.028$).

SNB angle was increased in both TB (2.17°) and Forsus (1.92°). Even though TB showed to produce greater mandibular advancement, when compared between the two groups, SNB angle values were found to be insignificant ($P = 0.358$).

SNA angle showed a decrease of (0.67°) with TB, whereas a decrease of (1.09°) was seen with Forsus appliance. The difference when compared between the two groups were found to be insignificant ($P = 0.669$).

Linear measurements also showed that TB led to greater mandibular lengthening of (3.83 mm) as compared to that of Forsus (2.33 mm). When compared the difference was found to be insignificant ($P = 0.400$) (Tables 1-3).

Vertical changes as seen by assessing FH-MP (2.0°, 2.42°) and OP-SN angles (2.33° and 3.16°) was found to be increased in both groups, respectively. When compared between the groups the results were found to highly significant ($P = 0.000$).

Dentoalveolar changes

The inclination of lower incisors showed a significant decrease in TB group (4.08° and $P = 0.007$) and a significant increase in Forsus group (5.25° and $P = 0.002$). There was statistically significant difference in both groups ($P = 0.000$) in terms of changes in incisor mandibular plane angle (IMPA) (Tables 1-3).

A significant decrease in the inclination of upper incisors (U1 to SN) was seen in both, TB group (4.91° and $P = 0.010$), while in Forsus group showed decreased (3.75° and $P = 0.002$),

Table 3: Comparison between twin-block and Forsus appliance.

	N	Mean rank	Sum of ranks	Mann–Whitney U-test	Wilcoxon	*Z* value	Asymp. Sig.(2-tailed)
SNA	12	11.92	143.00	65.00	143.00	−0.428	0.669
	12	13.08	157.00				
SNB	12	13.75	165.00	57.00	135.00	−0.929	0.358
	12	11.25	135.00				
ANB	12	9.54	114.50	36.50	114.50	−2.195	0.028
	12	15.46	185.50				
U1-SN	12	11.58	139.00	61.00	139.00	−0.645	0.519
	12	13.42	161.00				
U1-ANS-PNS	12	15.13	181.50	40.50	118.50	−1.855	0.064
	12	9.88	118.50				
U6-ANS-PNS		13.67	164.00	58.00	136	−0.832	0.405
		11.33	136.00				
L1-GO-ME	12	6.50	78.00	0.00	78.00	−4.190	0.00
	12	18.50	222.00				
L1-GO-ME	12	16.08	193.00	29.00	107.00	−2.529	0.011
	12	8.92	107.00				
L6-GO-ME	12	12.00	144.00	66.00	144.00	−0.361	0.718
	12	13.00	156.00				
OP-SN	12	6.92	83.00	5.00	83.00	−3.936	0.00
	12	18.08	217.00				
FH-MP	12	11.13	133.50	55.50	133.50	−1.016	0.310
	12	13.88	166.50				
Maxillary	12	9.79	117.50	39.50	117.50	−1.991	0.046
	12	15.21	182.50				
Mandibular	12	16.42	197.00	25.00	103.00	−2.792	0.005
	12	8.58	103.00				

FH-MP: Frankfort horizontal-mandibular plane

even though these changes were not significant between two groups ($P = 0.519$).

Vertical measurement showed significant extrusion of upper incisors (2.16 mm, $P = 0.005$) and molar (0.75 mm, $P = 0.008$) in TB group. Forsus showed intrusion of upper incisors (0.33 mm, $P = 0.893$), which was non-significant and extrusion of molars (1.17 mm, $P = 0.148$) which was significant. When compared between the two groups, both upper incisors and molars showed to have non-significant differences ($P = 0.64$, $P = 0.405$).

Extrusion of lower incisors (0.66 mm, $P = 0.130$) and molars (2.00 mm, $P = 0.027$) was found in TB group, whereas significant extrusion was found in both incisors (1.25 mm, $P = 0.047$) and molars (2.50 mm, $P = 0.002$) in Forsus group. When compared between two groups differences were found to be significant ($P = 0.01$) for lower incisors, but insignificant ($P = 0.718$) for lower molars (Tables 1-3).

Discussion

Functional appliances are a valuable means of correcting sagittal skeletal discrepancies caused by a retrognathic mandible. This study compared the treatment effects of two standardized Class II treatment modalities, one protocol.

Incorporating the TB appliance and other Forsus appliance for the first phase of treatment. No major differences in terms of skeletal, dental relationship exhibited at the start of the treatment. This was essential to prevent any chances of susceptibility of bias in treatment modality selection.

Significant differences in skeletal changes were seen in treatment results between the two groups. This was mainly due to a significant decrease in the ANB (1.5°) and increase in mandibular length (3.83 mm) seen with TB group as compared with the Forsus group.

Vertical changes were seen in both groups as assessed by OP-SN and FH-MP. The results were found to be more pronounced in Forsus group as compared with the TB group. This may be due to increased extrusion of upper and lower molars seen with Forsus than the TB, as the later due to its occlusal blocks reduces the extrusion.

Another significant difference was seen in IMPA angle between the two groups. There was 5.25° proclination seen with Forsus, whereas TB appliance showed retraction of 4.08°. This fact may be attributed to the design of TB used in this study (labial bows and incisal capping provided where-ever necessary).

The results of this study resembles to the study conducted by Sharma *et al.*[8] who concluded that in TB therapy the maxilla (SNA) was restricted sagittally (head gear effect) with marked maxillary dental retraction. Significant mandible sagittal advancement (SNB) with minimum dental protraction was

observed with a significant increase in the mandibular length. The maxilla-mandibular skeletal relation (ANB and WITS appraisal) reduced considerably, which improved the profile and facial esthetics. Pronounced correction of overjet and overbite was seen.

Results of Mahamad *et al.*[9] are similar to the results found in our study. They found more skeletal and dentoalveolar changes with TB appliance as compared with dentoalveolar and less skeletal changes found with Forsus.

Results of our study are in agreement with one done by Franchi *et al.*[10] who concluded FRD group showed a significant restraint in the sagittal skeletal position of the maxilla, a non-significant increase in mandibular length, and a significant improvement in maxillomandibular sagittal skeletal relationships. The lower incisors were significantly proclined while the lower first molars moved significantly in a mesial and vertical direction.

The absence of age and gender matched groups, due to which it was not possible to quantify how much of a change produced was a part of the natural growth process. Results obtained from the current study have to be confirmed using a larger sample. No uniform distribution between male and female subjects; hence, gender based comparison could not be carried out. Stability of the results needs to be established by conducting long-term studies.

Conclusion

This study compared the treatment effect of TB with those Forsus appliance. Both groups showed similar results in normalization of dentoskeletal parameters, leading to correction of Class II malocclusion. The TB appliance seemed to be more efficient in correcting mandibular retrognathism as more mandibular lengthening was found with TB appliance.

References

1. Firouz M, Zernik J, Nanda R. Dental and orthopedic effects of high-pull headgear in treatment of Class II, division 1 malocclusion. Am J Orthod Dentofacial Orthop 1992;102:197-205.
2. Jasper JJ. The Jasper Jumper – A Fixed Functional Appliance. Sheboygan, WI: American Orthodontics; 1987.
3. Coelho Filho CM. Mandibular protraction appliances for Class II treatment. J Clin Orthod 1995;29:319-36.
4. Coelho Filho CM. Clinical applications of the mandibular protraction appliance. J Clin Orthod 1997;31:92-102.
5. Coelho Filho CM. The mandibular protraction appliance No. 3. J Clin Orthod 1998;32:379-84.
6. Coelho Filho CM. Mandibular protraction appliance IV. J Clin Orthod 2001;35:18-24.
7. Pangrazio-Kulbersh V, Berger JL, Chermak DS, Kaczynski R, Simon ES, Haerian A. Treatment effects of the mandibular anterior repositioning appliance on patients with Class II malocclusion. Am J Orthod Dentofacial Orthop 2003;123:286-95.
8. Sharma AK, Sachdev V, Singla A, Kirtaniya BC. Skeletal and dentoalveolar changes concurrent to use of Twin Block appliance in class II division I cases with a deficient mandible: A cephalometric study. J Indian Soc Pedod Prev Dent 2012;30 (3):218-26.
9. Mahamad IK, Neela PK, Mascarenhas R, Husain A. A comparision of Twin-block and Forsus (FRD) functional appliance – A cephalometric study. Int J Orthod Milwaukee 2012;23 (3):49-58.
10. Franchi L, Alvetro L, Giuntini V, Masucci C, Defraia E, Baccetti T. Effectiveness of comprehensive fixed appliance treatment used with the Forsus Fatigue Resistant Device in Class II patients. Angle Orthod 2011;81:678-83.