



SKELETAL AND DENTAL EFFECTS OF REMOVABLE VS FIXED FUNCTIONAL APPLIANCE : A COMPARATIVE STUDY

Orthopaedic

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ABSTRACT

Introduction : Myofunctional and fixed functional appliances have been the mainstay of treatment of class II malocclusion with retrognathic mandible. The purpose of this study was to compare the skeletal and dental treatment effects of both. **Method :** A sample size of 20 subjects were divided into two groups : Group 1 subjects treated with myofunctional appliance and Group 2 subjects treated with Advansync-2. Pre-treatment and post-functional lateral cephalograms were taken of all the subjects. The lateral cephalograms were manually traced by one investigator. **Results :** Statistically significant changes were observed in SNB, ANB and Wits for both treatment groups. Group 1 subjects showed statistically significant greater changes in SNB, ANB and effective mandibular length than Group 2 subjects. Dentally, statistically significant decrease in overjet and overbite were found in both groups. Advansync-2 showed statistically significant increase in L1-NB, L1-OP and IMPA angles. **Conclusion :** Myofunctional appliances produce better skeletal result when compared to Advansync-2 in the correction of skeletal class II malocclusion and the effects produced by Advansync-2 is a combination of skeletal and dentoalveolar changes.

KEYWORDS

Functional appliance , Advansync, Class II,

INTRODUCTION

The treatment of skeletal class II malocclusion depends upon the age of the patient, growth potential and compliance of patient. According to McNamara, mandibular retrusion is the most common feature of class II malocclusion in growing children.¹ The term "functional appliance" refers to a variety of removable appliances designed to alter the arrangement of muscle groups that influence the function and position of the mandible.² The advantages of fixed functional appliances over the removable appliances are that they do not require patient compliance and treatment time is shorter so can be used after the peak of pubertal growth spurt.

A variety of fixed functional appliances have been introduced in orthodontics. One of the latest to be introduced is the AdvanSync-2 (Fig. 1), also known as Molar to Molar appliance developed by Drs. Bill and Terry Dischinger in 2012.³ The appliance consists of crowns cemented to the maxillary and mandibular permanent first molars, which are connected by telescoping rods. The Advansync was designed to allow simultaneous use of conventional edgewise appliances which allows the treatment time to be shortened by at least 6 months.



Figure 1. Advansync-2

Few studies have been published in the literature that evaluated the effects of AdvanSync-2.^{4,5} The present study was to evaluate the skeletal and dental changes in patients treated with Advansync-2 appliance and compare it with removable functional appliance.

METHODS

30 patients reporting to the Department of Orthodontics and

Dentofacial Orthopedics, Inderprastha Dental College and Hospital, Ghaziabad for orthodontic treatment were considered for the study.

Inclusion criteria

1. Patients treated with myofunctional appliance to be in cervical maturation stage CS2-CS3
2. Patients treated with Advansync2 to be in cervical maturation stage CS4-CS5
3. Class II molar relationship with mandibular retrusion (ANB>4 degree)
4. SNB<80 degree, Overjet 5 to 10 mm.
5. Average mandibular plane angle

Pre-treatment lateral cephalograms of the patients were taken with Kodak 8000C digital cephalometric system. The patients were randomly divided in to 15 each , Group 1 were treated with a removable functional appliance and group 2 were treated with AdvanSync-2.

After achievement of class I molar relationship or 6 months post-functional therapy, lateral cephalograms were retaken and linear and angular measurements were measured. The collected data was subjected to Wilcoxon signed rank test to find changes within each Group and Mann Whitney U test was used for changes between the two groups.

RESULTS

Changes in Group 1 : Significant increase in SNB angle, ANB angle and Wits appraisal was seen . A significant decrease in overjet and overbite was seen. A slight increase of mandibular plane angle was also seen but it was statistically non-significant.

Changes in Group 2 : Significant changes in SNB angle, ANB angles and Wits appraisal were found. Advansync-2 caused statistically significant increase in IMPA , L1-NB , L1-OP, decrease in overjet and overbite (Table 1)

Table 1: Comparison of Pre-treatment and Post-treatment Parameters in both Groups

S. No	Parameters	Pre-treatment Group 1		Post-treatment Group 1		p-value	Pre-treatment Group 2		Post-treatment Group 2		p-value
		Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	

1.	Saddle Angle	125.4	4.86	125.07	4.74	0.851	126.67	6.59	125.47	5.50	0.593
2.	SNA angle	81.67	1.79	81.53	1.68	0.836	82.53	2.20	82.10	2.02	0.579
3.	N-Pr-A	-1.83	2.47	-1.20	1.99	0.447	-0.23	2.82	-0.40	2.61	0.868
4.	Effec. Max. Length	76.13	4.17	76.87	4.70	0.655	76.53	4.38	76.73	4.35	0.901
5.	SNB angle	74.80	2.01	77.33	1.87	0.001*	75.93	1.16	77.50	1.18	0.001*
6.	Effec. Mand. Length	93.80	8.01	97.17	7.59	0.247	95.27	4.86	97.03	4.69	0.320
7.	ANB angle	6.60	1.64	3.93	1.62	0.001*	6.53	1.99	4.87	2.20	0.038*
8.	Wits	4.67	1.09	2.83	1.47	0.001*	5.30	1.53	3.83	1.36	0.010*
9.	SN-GoGn	30.07	6.66	31.47	7.22	0.585	26.90	5.99	27.93	5.58	0.629
10.	Overjet	10.13	3.83	6.40	2.23	0.003*	8.73	3.87	4.50	1.26	0.0001*
11.	Overbite	5.60	2.19	3.73	2.05	0.023*	5.20	1.21	3.10	0.967	0.0001*
12.	Interincisal Angle	113.93	9.72	111.07	9.22	0.746	119.27	16.47	115.20	9.52	0.415
13.	U1-NA Angle	33.80	7.08	32.13	7.04	0.523	33.80	7.08	32.13	7.04	0.523
14.	U1-NA Linear	7.87	3.67	7.13	2.80	0.543	6.20	3.36	4.53	1.98	0.110
15.	U1-FH Angle	121.80	5.27	120.07	6.10	0.412	118.80	10.56	114.27	7.29	0.182
16.	U1-SN Angle	114.13	5.46	112.60	6.42	0.487	103.67	27.04	96.20	41.74	0.185
17.	L1-NB Linear	5.13	2.03	6.57	2.04	0.064	24.20	6.85	33.87	4.82	0.0001*
18.	L1-NB Angle	27.87	6.98	30.73	6.53	0.255	4.70	2.99	6.73	2.66	0.060
19.	L1-OP Angle	26.53	6.58	28.33	4.95	0.404	27.53	6.74	33.87	5.86	0.010*

Comparison of Group 1 and Group 2 :

Statistically significantly greater increase in SNB angle and effective mandibular length was seen in Group 1 than Group 2 subjects. Group 2 subjectsshowed a slight reduction of SNA angle and NPr-A measurement. Dental changes showed statistically significant difference between the 2 groups only in the parameters LI-NB, L1-OP and IMPA angles where Group 2 subjects showed greater increase in these angles. (Table 2).

Table 2: Comparison Between Myofunctional And Advansync 2 Groups

S. No.	Parameters	Group 1		Group 2		P-Value
		Mean	S.D.	Mean	S.D.	
1.	Saddle Angle	-0.33	3.77	-1.20	3.80	0.536
2.	SNA angle	-0.13	0.74	-0.43	0.62	0.241
3.	N-Pr-A	0.63	1.15	-0.17	0.84	0.039*
4.	Effec. Max. Length	0.73	2.25	0.20	0.68	0.387
5.	SNB angle	2.53	0.74	1.57	0.73	0.001*
6.	Effec. Mand. Length	3.37	1.97	1.77	0.90	0.008*
7.	ANB angle	-2.67	1.18	-1.67	0.72	0.009*
8.	Wits	-1.83	1.48	-1.47	1.20	0.463
9.	SN-GoGn	1.40	1.64	1.03	1.01	0.467
10.	Overjet	-3.73	2.76	-4.23	3.46	0.665
11.	Overbite	-1.87	1.50	-2.10	1.19	0.642
12.	Interincisal Angle	-1.13	2.32	-4.07	6.28	0.231
13.	U1-NA Angle	-1.67	2.47	-6.03	9.71	0.103
14.	U1-NA Linear	-0.73	2.14	-1.67	2.83	0.316
15.	U1-FH Angle	-1.73	2.71	-4.53	11.53	0.368
16.	U1-SN Angle	-1.53	1.85	-17.47	36.32	0.101
17.	L1-NB Angle	2.87	2.75	9.67	7.83	0.004*
18.	L1-NB Linear	1.43	1.35	2.03	2.52	0.423
19.	L1-OP Angle	1.80	3.09	6.33	7.98	0.049*

DISCUSSION

The results of this prospective cephalometric study showed that at the completion of functional phase (T2-T1), Group 1 subjects showed a statistically significant increase in SNB angle. This increase in SNB angle is in accordance with previously reported studies by Clark⁶, Illing et al⁷. The effective mandibular length (Co-Gn) increased by 3.37 mm. Toth and McNamara⁸ and Illing HM et al⁷ also reported 3.5 mm additional increase. Functional appliances produce a distally directed force to maxilla as the mandible is repositioned forward. In this study, only slight restriction of maxillary growth was found with a 0.13° decrease in SNA angle which was statistically non-significant. Some studies showed that functional appliances cause restriction of maxilla (Toth and McNamara⁸, Mills and McCulloch⁹), while there are authors who do not support this view (Clark⁶, Illing et al⁷).

An increase of 1.4° in the mandibular plane angle (SN-GoGn) was found in this study but this increase was not statistically significant. Control of the vertical dimension is one of the proposed benefits of the Twin-Block appliance. However, slight reduction in the mandibular plane after treatment with Twin-block appliance has also been reported (Baysal A and Uysal T¹⁰).

As already reported in a number of studies on myofunctional appliances, a statistically significant decrease in the overjet and overbite was found in this study. Myofunctional appliance caused a slight retroclination of upper incisors and proclination of lower incisors. Corroborating the findings of this study, Varlik SK et al¹¹ reported retroclination of upper incisors and proclination of lower incisors with the Twin-block and Basciftci FA et al¹² also found same with Activator.

Treatment with the Advansync-2 produced statistically significant changes in SNB and ANB which is in accordance with previous reports by Dischinger³, Al Jewair et al⁴ and Jayachandran S et al⁵. A slight decrease in the SNA angle was found but was not statistically significant. The effective mandibular length was found to increase by 1.77 mm in this study. Al-Jewair et al⁴ reported a 4 mm increase while increases of 1.3–3.4mm in mandibular length with Herbst appliance have been reported by Pancherz¹³, Valant and Sinclair¹⁴.

Statistically significant changes were observed in overjet, overbite and proclination of lower incisor, similar result was reported by Al-Jewair⁴. As the Advansync causes proclination of lower incisors, the use of this appliance may be contraindicated in patients with already proclined incisors.

Myofunctional appliances have been proven to have better skeletal effects than fixed functional appliances. In this study, myofunctional appliance was found to have statistically significant greater changes in SNB, ANB and effective mandibular length than Advansync-2. A study by Baysal A and Uysal T¹⁰ comparing the effects of Twin-block and Herbst found similar results.

The dental effects of myofunctional appliances and fixed functional appliances have been well documented in literature. Fixed functional appliances are known to have greater dentoalveolar change than myofunctional appliances. The study by Baysal A and Uysal T¹⁰ show that Herbst appliance caused more retroclination of upper incisor and more proclination of lower incisor than Twin-block.

CONCLUSION :

The findings in our study show that

1. Myofunctional appliances produce better skeletal result when compared to Advansync-2
2. The effects produced by Advansync-2 is a combination of skeletal and dentoalveolar changes.

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