Review Article

A Clinical Comparative Evaluation of skeletal, dental and soft tissue treatment changes with Advansync appliance and Forsus Fatigue resistant device.

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Abstract

Background:

The Aim of this study was to evaluate skeletal, dental and soft tissue treatment changes with Advansync appliance and Forsus Fatigue resistant device and to compare the treatment changes produced by Advansync appliance and Forsus Fatigue resistant device

Materials and Methods: A sample size of 40 Patients were included in the study. They were divided into two groups: Group 1 were treated with Advansync-2 appliance .(20 Patients)and Group 2 subjects treated with Forsus Fatigue Resistant Device.(20 Patients). Pre-treatment and postfunctional (6 months after appliance delivery) lateral cephalograms were taken and compared.

Results: Statistically significant changes were observed in SNB, ANB and Witts for both treatment groups.. Dentally, statistically significant decrease in overjet and overbite were found in both groups. Changes seen in soft tissue parameters were statistically significant in both groups.

Conclusion: Forsus had more skeletal effects on the mandible, whereas Advansync-2 had less skeletal effects on the mandible and more dentoalveolar effects, contributing to class II correction.

Keywords: Forsus, Fatigue, Advansync, Skeletal, Dental, Soft tissue, Resistant

Introduction

One of the most prevalent orthodontic issues is class II malocclusion. Treatment effectiveness in growing patients depends on the clinician's capacity to modify the relative growth changes in the mandible and maxilla. One persistent diagnostic characteristic in patients with Class II malocclusions is mandibular skeletal retrusion. In these patients, a treatment capable of promoting mandibular growth is recommended. Functional therapy is the primary treatment option for mandibular retrusion associated with Class II malocclusion. Therefore, the purpose of this study is to clinically assess how the Advansync appliance and the Forsus Fatigue Resistant Device affect changes in skeletal, dental, and soft tissue treatment.[1,2]

Materials and Methods

The study was conducted on 40 patients coming to the Department of Orthodontics and Dentofacial Orthopaedics, seeking orthodontic treatment. Patients during pubertal growth spurt as indicated by cervical vertebral maturation, Class II molar relationship with mandibular retrusion (ANB>4 degree) , SNB<80 degree, overjet – 5 to 10 mm., Average mandibular plane angle (SN/GoGn 32±6˚, FMA 25±5˚) were selected for the study. Medical history of respiratory problem or upper airway surgery, Syndromic or craniofacial anomaly, Missing teeth (excluding third molar), Presence of functional shift or dual bite , Class I or class III molar relationship were excluded.

Armamentarium -Lateral cephalogram, Tracing paper (Gateway), 0.5 mm Camlin mechanical pencil, Set square (Figure 1) ,Forsus fatigue resistant device (Figure 2) ,Advansync 2 appliance(Figure 3) , 0.022" MBT pre-adjusted edgewise Stainless steel and ceramic brackets were used in the study.

Figure 1. Lateral cephalogram, Tracing paper (Gateway), 0.5 mm Camlin mechanical pencil, Set square

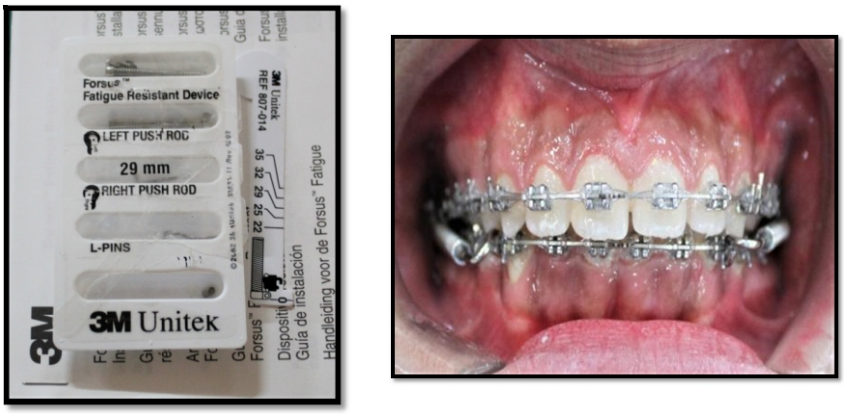

Figure 2. Forsus fatigue resistant device

Figure 3 Advansync 2 appliance

The pre treatment and post treatment cephalometric linear and angular measurements were compared within the two groups to determine changes brought about by each appliance therapy.Independent t-test. was used to find significant difference in treatment changes between the two groups.

Results:

The **Skeletal Parameter** ANB (p=0.043) and SNB (p=0.003) were reduced in group 1 as compared to group 2 showing statistically significant p value., whereas parameters such as saddle angle, SNA , were increased more in group 2 than group 1, also being non significant.

Table 1 (Figure 4) shows the comparison between post functional skeletal change among the two groups (group 1- Advansync appliance and group 2 - Forsus Fatigue resistant device).

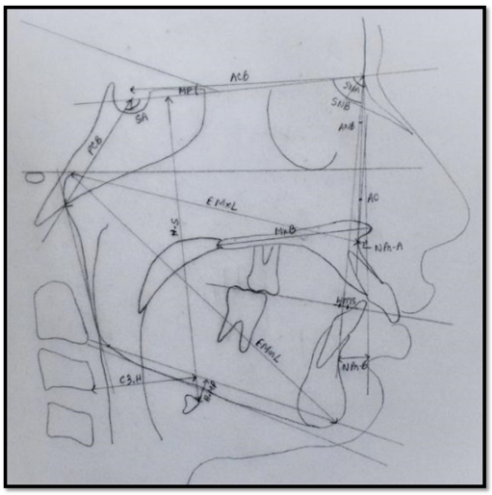

Figure 4: Skeletal Parameters

Table 1 : Comparison of post treatment changes for maxillomandibular skeletal parameters among the two groups

Variable	Group I		Group II		p-value
	Mean	S.D.	Mean	S.D.	
Anterior cranial base (mm)	-0.40	0.01	-0.600	0.81	0.690
Posterior cranial base (mm)	-0.35	0.05	-0.350	0.57	0.763
Saddle angle	0.40	0.02	0.00	0.62	0.891
SNA angle	0.40	0.08	1.27	0.09	0.505
N-Pr-A	0.90	0.07	1.10	0.28	0.795
Effective maxillary length	0.0	0.16	0.10	0.26	0.820
Maxillary base length	-0.22	0.02	-1.00	0.61	0.814
SNB angle	-1.35	0.48	-2.325	0.47	0.003*
N-Pr-B	-0.80	0.51	-0.900	0.34	0.95
Effective mandibular length	-1.70	0.72	-1.77	0.70	0.703
ANB	1.05	0.15	2.95	0.42	0.043*
Wits	1.00	0.14	1.00	0.14	1.0
Angle of convexity	1.25	0.68	1.20	0.68	0.98
Max-Mand. Length diff	-1.30	0.92	-1.30	0.92	1.00
SN-GoGn	-0.95	0.20	-0.950	0.20	1.00
H-MP	0.50	0.33	0.50	0.33	1.00
H-Sn	0.475	0.30	0.475	0.30	1.00

The **Dental Parameters** U1-NA angle (p=0.001), U1-NA linear (p=0.001), U1-FH angle(p=0.009), U1-SN angle (p=0.001), U1-APog(p=0.005), L1-NB angle(p=0.002), L1-NB linear (p=0.045), L1-APog (p=0.014) and overbite(p=0.040) were shown to be increased in group 2 as compared to group 1 ,Whereas the dental parameters which showed non-significant difference between the 2 groups were L1-OP angle , IMPA, and interincisal angle .

Table 2 : Comparison of post treatment changes for maxillomandibular Dental parameters among the two groups

Variable	Group I		Group II		p-value
	Mean	S.D.	Mean	S.D.	
U1-NA angle	8.45	0.14	10.45	0.56	0.001*
U1-NA linear	2.05	0.19	3.905	0.26	0.001*
U1-FH angle	8.45	0.09	10.35	0.93	0.009*
U1-SN angle	7.95	0.29	12.90	0.66	0.001*
U1-APog	1.25	0.29	3.03	0.97	0.005*
L1-NB angle	-10.20	0.18	-11.15	0.49	0.002*
L1-NB linear	-1.975	0.56	-2.56	0.92	0.045*
L1-OP angle	-7.05	0.00	-7.20	0.75	0.882
IMPA	-7.45	0.75	-8.60	0.93	0.383
L1-APog	-1.65	0.56	-2.50	0.31	0.014*
Overjet	5.55	0.42	5.025	0.59	0.04*
Overbite	2.15	0.68	3.19	0.13	0.040*
Interincisal angle	-0.85	0.45	-1.25	0.76	0.853

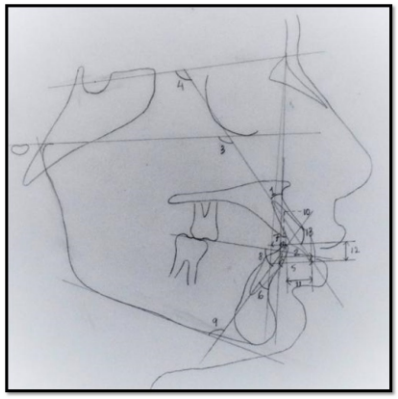

Figure 5 : Dental Parameters

The **Table 2 (Figure 5)** shows the comparison between post functional dental change among he two groups (group 1- advansync appliance and group 2 - forsus fatigue resistant device).

Lip strain (p=0.022) , LL- S line (p=0.001) , LL-E line (p=0.006) showed reduction in group 2 with statistically significant p value. Upper pharynx (p=0.042) and Z (p=0.048) angle was increased more in group 2 with statistically significant change. Statistically highly significant change was seen in LL-E line with a increased value in group 1 (p=0.006). **Table 3 (Figure 6)** shows the comparison between post functional soft tissue change among the two groups (Group 1- Advansync Appliance and Group 2 - Forsus Fatigue Resistant Device)

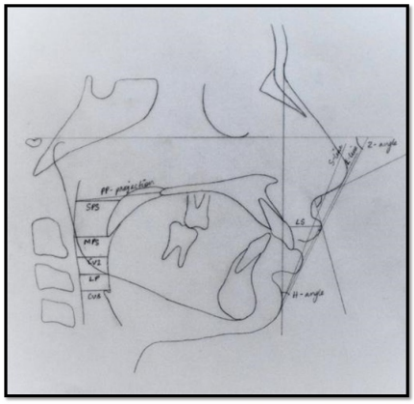

Figure 6. Soft tissue Parameters

Table 3: Comparison of post treatment changes for maxillomandibular soft tissue parameters among the two groups

Variable	Group I		Group II		p-value
	Mean	S.D.	Mean	S.D.	
UL-E line	-0.200	0.38	-0.20	0.58	1.00
UL-S line	-0.125	0.89	0.595	0.76	0.546
Lip strain	1.75	0.89	1.390	0.50	0.022*
LL-E line	0.65	0.54	0.840	0.23	0.006*
LL-S line	0.35	0.33	0.075	0.22	0.001*
H angle	1.35	0.64	1.715	0.93	0.946
Z angle	-2.75	0.02	-3.35	0.55	0.048*
Nasolabial angle	-4.45	0.18	-5.05	0.71	0.009*
Upper pharynx	-0.60	0.30	-1.40	0.09	0.042*
Lower pharynx	-0.30	0.79	-0.84	0.74	0.081
PP Projection	-0.550	0.15	-1.30	0.78	0.260
SPS	-0.90	0.37	-1.45	0.49	0.113
7MPS	-0.85	0.39	-1.545	0.37	0.154
CV2 Projection	-0.40	0.83	-0.835	0.31	0.188
Cv3 Projection	-0.825	0.09	-1.235	0.73	0.268

Discussion:

The treatment of skeletal class II malocclusion depends upon the age of the patient, growth potential, compliance and which jaw involved. Mandibular retrusion has been found to be a common feature of class II malocclusion and a therapy able to enhance mandibular growth is indicated in these patients.

The skeletal parameter SNB showed statistically significant difference in pre treatment and post treatment values in group 1 and group 2 using fixed functional appliance therapy. These findings were in accordance with previously reported studies by **Clark**[1], **Illing et al.**[2], **Sandler**[3], **Trenouth**[4])as fixed functional appliance provides stimulation of mandibular growth by causing more forward positioning of the mandible.

The skeletal parameter ANB showed statistically significant difference in pre treatment and post treatment values in group 2 after fixed functional appliance therapy .Similar findings was reported by **Linjawi et al**[5] showing decrease in ANB value with Forsus appliance ,because of the retrusion of maxilla and protrusion of the mandible with the use of fixed functional appliance.

Whereas study by **Gunay et al**[6] showed that during the active phase of treatment with Forsus , no significant changes were found in the ANB parameter . This outcome however disagrees with our findings. The possible reason could be the age factor; and hence different neuromuscular responses.

The effective mandibular length (Co-Gn) showed statistically significant difference in pre treatment and post treatment values in group 1 and group 2 after fixed functional appliance therapy. This increase is a combined effect of normal growth increment and the effect of forward posturing of the mandible by appliance. Change in effective mandibular length by functional appliance therapy is one of the major controversies in orthodontics. **AK Jena and Duggal R**[7] found 1.98 mm increase in effective length of mandible in patients treated with functional appliances. Similarly, **Toth and McNamara**[8] found 3.0 mm additional increase in condylion to gnathion length with functional appliances therapy .

In this study, SNA parameter showed statistically non significant difference in pre treatment and post treatment values in group 1 and group 2 after fixed functional appliance therapy .These findings were in accordance with **Clark**[1], **Illing et al.**[2]

whereas study by **Toth and McNamara**[8]**; Mills and McCulloch**[9], found statistical significant difference in pre treatment and post treatment values after fixed functional appliance therapy. This was attributed to the fact that, functional appliances produce a distally directed force to maxilla as the mandible is repositioned forward .

The dental parameters U1-NA , U1-FH, U1-SN,U1-APog , L1-NB, L1-APog overjet and overbite showed statistically significant difference in pre treatment and post treatment therapy in group 1 and group 2 after fixed functional appliance therapy

Dental parameter IMPA and interincisal angle showed statistically non-significant difference in pre treatment and post treatment values in group 1 and group 2 after fixed functional appliance therapy. These findings were in accordance with **Cacciatore et al**[10]**.** Soft tissue parameter lip strain showed statistically significant difference in pre treatment and post treatment values in group 1 and group 2 after fixed functional appliance therapy, which was due to decrease in upper incisors inclination as functional appliance gives a distalizing force on maxilla. The findings were in concurrence with the **Dean et al**[11]**,** who also found statistical significant change in lip strain using fixed functional appliance.

The skeletal parameter SNB showed statistically significant increase in group 2 as compared to group 1 .This was due to the increased flexibility of forsus appliance as compared to advansync 2 appliance which provides stimulation of mandibular growth by causing more forward positioning of the mandible.

Statistically significant decrease was observed in inclination of upper incisors and Statistically significant increase was observed in lower incisors in group 1 and group 2 which is due to distal forces working over maxillary dentition in both the appliances. Statistical significant decrease in overjet and overbite was found in group 1 and group 2 ,which was associated with significant retroclination of the maxillary incisors and proclination of the mandibular incisors.

Soft tissue changes were statistically significant in lip strain, LL- E line , Z angle and upper pharynx . Statistical significant decrease in lip strain was found in group 1 and group 2 which was due to decrease in upper incisors inclination as functional appliance gives a distalizing force on maxilla Statistically significant increase in LL- E line and LL- S line were found in group 1 and group 2, this was attributed to the fact that lower jaw comes in a forward position with the functional appliance along with a slight retroclination of the upper incisors.

Skeletal class II malocclusion due to mandibular retrusion was reported to be a risk factor for upper and lower airway deficiencies.The importance of the deficiency in the airway is that it is related to breathing disorders that may affect the pulmonary ventilation, oxygenation, sleep quality, sweating,

and nocturnal enuresis. Therefore, the correction of mandibular retrusion using intraoral appliances is expected to improve the pharyngeal airway deficiency. In this study, the advansync 2 group and forsus group showed a significant increase in airway dimensions.

Although ,there are limited studies comparing the effects of Advansync-2 and forsus fatigue resistant device. Forsus fatigue resistant device have been proven to have better skeletal effects than Advansync-2 whereas dental changes were more significant with Advansync-2.

Limitations of the Study:

The difference in overall result were due to their design , site of placement and their resultant vectors of force. It is suggested that further studies need to be done to determine accurate reason for the difference in treatment outcome of both the appliances .

Further researchers can incorporate 3 dimensional atudies and,stereophotogrammetry studies .Advanced diagnostic tools for cephalometry and force measurement and vector calculation shall be useful for more accurate result.

Conclusion:

Both the fixed functional appliances were found to be effective in correcting class II malocclusion. Forsus had more skeletal effects on the mandible, whereas Advansync-2 had less skeletal effects on the mandible and more dentoalveolar effects, contributing to class II correction. Forsus group showed a significant increase in airway dimensions as compared to Advansync-2 group.

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Conflict of Interest : Nil

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References:

1. Clark WJ. New horizons in orthodontics and dentofacial orthopaedics. J Orthodont Sci 2012;1:60
2. Morris, David & Illing, H & Lee, R. (1999). A prospective evaluation of Bass, Bionator and Twin Block appliances. Part II - The soft tissues. European journal of orthodontics
3. Sandler et al. Class II malocclusion treatment using combined Twin Block and fixed orthodontic appliances - A case report. Saudi Dent J. 2011 Jan;23
4. Michael J. Trenouth. (2017) Rationale behind Twin-block incline. American Journal of Orthodontics and Dentofacial Orthopedics.
5. Linjawi AI, Abbassy MA. Dentoskeletal effects of the forsus™ fatigue resistance device in the treatment of class II malocclusion: A systematic review and meta-analysis. J Orthod Sci. 2018 Feb 15;7:5
6. Gunay EA, Arun T, Nalbantgil D. Evaluation of the Immediate Dentofacial Changes in Late Adolescent Patients Treated with the Forsus(™) FRD. Eur J Dent. 2011 Oct;5(4):423-32
7. Ashok Kumar Jena, Ritu Duggal. Treatment Effects of Twin-Block and Mandibular Protaction Appliance-IV in the correction of Class II Malocclusion. Angle Orthod 2010; 80:485-491
8. McNamara JA ,Toth et al. Orthodontics and Dentofacial Orthopedics. Ann Arbor Mich. 2001
9. R. E. Mills & Katherine W. L. Vig (2000) An Approach to Appliance Therapy, British Journal of Orthodontics.
10. Cacciatore G, et al. Treatment and posttreatment effects induced by the Forsus appliance: A controlled clinical study. Angle Orthod. 2014 Nov;84(6):1010-7
11. Dean et al (2017). Forsus Fatigue Resistant Device a Fixed Functional Appliances: An Update. International Medical Journal.