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To evaluate skeletal dental and soft tissue treatment changes with Advansync appliance and Forsus Fatigue resistant device

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Abstract

Aims and Objectives: The purpose of the 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 subjects were included in the study. They were divided into two groups: Group 1 subjects treated with Advansync-2. appliance and Group 2 subjects treated with Forsus Fatigue Resistant Device. Pre-treatment and post-functional (6 months after appliance delivery) lateral cephalograms were taken of all the subjects using Kodak 8000C in the department of Oral Medicine and Radiology, Inderprastha Dental College and Hospital. The lateral cephalograms were manually traced by one investigator. 46 parameters were evaluated for each subject to assess the treatment changes produced by Advansync-2 and Forsus Fatigue Resistant Device.

Results: Statistically significant changes were observed in SNB, ANB and Witts for both treatment groups. Group 2 subjects showed statistically significant greater changes in SNB, ANB and effective mandibular length than Group 1 subjects. 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: Esthetic, Forsus, Fatigue.

Introduction

Malocclusion is the second most common dental problem in children and young adults, next to dental caries in India. Orthodontic malocclusion may have adverse effects on oral functions, esthetics, speech and social behaviours of patients. Class II malocclusion is one of the most common orthodontic problems. In growing individuals, the success of treatment is dependent on the ability of the clinician to influence the relative growth changes in the maxilla and mandible. In individuals with Class II malocclusions, there is an anteroposterior discrepancy between the maxillary and mandibular dentitions, which may or may not be accompanied with a skeletal discrepancy. One of the consistent diagnostic findings in Class II malocclusion is mandibular skeletal retrusion. A major reason for development of functional appliances was recognition that function had an effect on ultimate morphologic structure of dentofacial complex.

In this study we will evaluate skeletal, dental and soft tissue changes in patients treated with Advansync-2 appliance and compare the effects with changes produced by Forsus Fatigue resistant device in correction of class 2 malocclusion.

Need for study

In individuals with Class II malocclusions, there is a consistent diagnostic finding that is mandibular skeletal retrusion. A therapy able to enhance mandibular growth is indicated in these patients. The main treatment choice in Class II malocclusion with mandibular retrusion is functional therapy. This study is conducted to evaluate skeletal, dental and soft tissue changes in patients treated with Advansync-2 appliance and compare the effects with changes produced by Forsus Fatigue resistant device in correction of class 2 malocclusions.

Aim and objective.

1. To evaluate skeletal, dental, and soft tissue treatment changes with Advansync appliance and Forsus Fatigue resistant device.
2. To compare the treatment changes produced by Advansync appliance and Forsus Fatigue resistant device.

Material and method

Source of data: The study was conducted on 40 patients coming to the department of orthodontics and dentofacial orthopaedics, Inderprastha dental college and hospital, Ghaziabad, seeking orthodontic treatment.

Inclusion criteria for the study is:

1. Patients during pubertal growth spurt as indicated by cervical vertebral maturation.
2. Class II molar relationship with mandibular retrusion (ANB>4 degree)
3. SNB<80 degree, overjet – 5 to 10 mm.
4. Average mandibular plane angle (SN/GoGn 32±6˚, FMA 25±5˚)

Exclusion criteria for the study is:

1. Medical history of respiratory problem or upper airway surgery.
2. Syndromic or craniofacial anomaly
3. Missing teeth (excluding third molar)
4. Presence of functional shift or dual bite
5. Class I or class III molar relationship

Methodology

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

2. Forsus fatigue resistant device
3. Advansync 2 appliance.
4. 0.022'' MBT pre-adjusted edgewise tainless steel and ceramic brackets.

The study was initiated with 40 patients who were divided into 2 groups. Pre-treatment lateral cephalograms of all the selected patients were taken. Initial alignment was done with fixed mechanotherapy on the patients after which, fixed functional therapy with AdvanSync appliance was given in group 1 (20 patients) and fixed functional therapy with Forsus Fatigue Resistant device was given in Group 2 (20 patients) till class I dental and skeletal relationship is achieved.

After achievement of class I molar relationship or 6 months post-functional therapy, lateral cephalograms were taken. Treatment changes were evaluated using linear and angular measurements on the pre and post treatment lateral cephalograms. Comparison of treatment changes were made between the patients treated with Advansync appliance and patients treated with forsus fatigue resistant device.

Figure 1: Armamentarium

Figure 2: Forsus fatigue resistant device

Figure 3: Advansync 2 appliance

Figure 4: Cephalogram machine

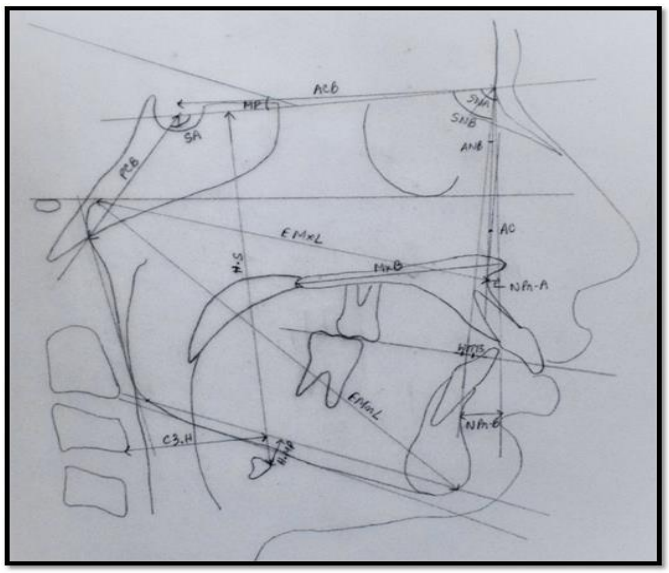

Figure 5: Skeletal parameters tracing

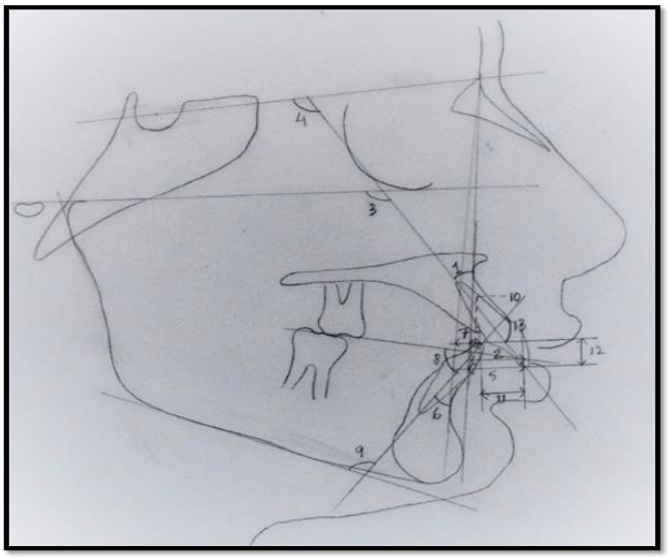

Figure 6: Dental parameters tracing

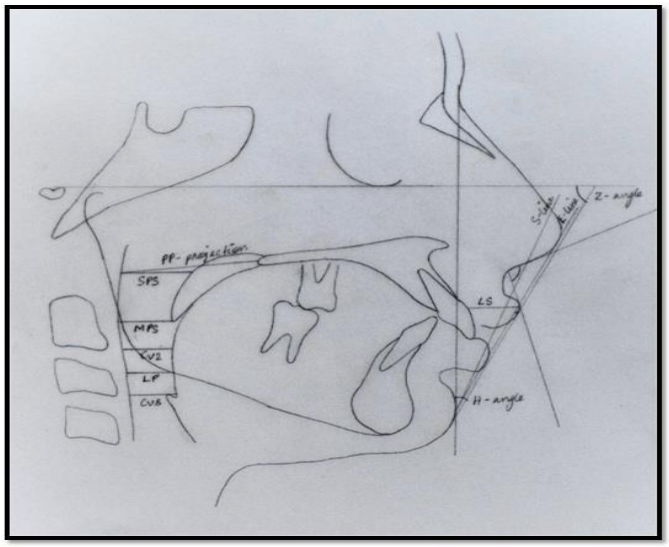

Figure 7: Soft tissue parameters tracing

Result and observation

Table 1 shows the comparison between post functional skeletal change among the two groups (group 1- advansync appliance and group 2 - forsus fatigue resistant device).

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.

Also, SN, effective mandibular length these were increased more in group 1 as compared to group 2, but showing statistically non-significant results as well .

Whereas parameters such as saddle angle, SNA, were increased more in group 2 than group 1, also being non-significant.

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-M and. 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

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

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

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

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, except overjet(p=0.04) which were shown to be increased in group 1 than group 2.

Whereas the dental parameters which showed non-significant difference between the 2 groups were L1-OP angle, IMPA, and interincisal angle.

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

Table 3 shows the comparison between post functional soft tissue change among the two groups (group 1- advansync appliance and group 2 - forsus fatigue resistant device).

Statistically highly significant change was seen in LL-E line with a increased value in group 1 (p=0.006). 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.

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. Vhyu

The skeletal parameter SNB showed statistically significant difference in pretreatment 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 pretreatment 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 pretreatment 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 pretreatment 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 statistically significant difference in pretreatment 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 pretreatment 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 pretreatment and post treatment values in group 1 and group 2 after fixed functional appliance therapy. These findings were in accordance with **Cacciatore et al**[12]**.** Soft tissue parameter lip strain showed statistically significant difference in pretreatment 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[62]. The findings were in concurrence with the **Dean et al**[13]**, Prajwal et al**[14] who also found statistically significant change in lip strain using fixed functional appliance.

Coming to the comparison between group 1 and group 2 , Skeletal parameter ANB showed statistically significant difference in between both the groups with group 2 showing increased value in comparison with group 1. ANB was decreased because of the retrusion of maxilla and protrusion of the mandible as when the upper incisors are retracted due to distalising force in maxilla, palatal tipping of the roots can shift the point A posteriorly and point B anteriorly[81].

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.

Conclusion

The following conclusions can be made from this study:

• Both the fixed functional appliances were found to be effective in correcting class II malocclusion.

• There was statistically significant skeletal, dental and soft tissue changes observed in patients who underwent treatment with Advansync appliance and Forsus Fatigue resistant device.

• 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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