ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 4, Issue – 5, October - 2021, Page No. : 287 – 303

Evaluation of the effects of power scope in late adolescent patients

[1]Dr. Hiba Ikhlas Zain, Post Graduate student, Department of Orthodontics and Dentofacial Orthopedics, A. J Institute of Dental Sciences, Mangalore.

[2]Dr. Anil Kumar, Reader, Department of Orthodontics and Dentofacial Orthopedics, A. J Institute of Dental Sciences, Mangalore.

[3]Dr. Shresha Shetty, Post Graduate student, Department of Orthodontics and Dentofacial Orthopedics, A. J Institute of Dental Sciences, Mangalore.

[4]Dr. Kishore Kumar, Associate Professor, Department of Orthodontics and Dentofacial Orthopedics, A. J Institute of Dental Sciences, Mangalore.

Corresponding Author: Dr. Anil Kumar, Reader, Department of Orthodontics and Dentofacial Orthopedics, A. J Institute of Dental Sciences, Mangalore.

Citation of this Article: Dr. Hiba Ikhlas Zain, Dr. Anil Kumar, Dr. Shresha Shetty, Dr. Kishore Kumar, "Evaluation of the effects of power scope in late adolescent patients", IJDSIR- October - 2021, Vol. – 4, Issue - 5, P. No. 287 – 303.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background and Objectives: To evaluate the skeletal and dental effects of power scope in late adolescent patients.

Materials and methods: The data were collected from 24 pre-fixed functional appliance therapy and post-fixed functional appliance therapy cephalograms of Class II patients (both males & females) and were assessed by cephalometric analysis and superimposition. The results were obtained and compared and the statistical analysis was done.

Results: Statistical analysis were done using SPSS version 18. Descriptive statistics in the form of mean and standard deviation were prepared. Comparison between the pre and post treatment were compared using paired t-test and the results were obtained.

The mandibular and the maxillary growth had occurred during orthodontic treatment even in the late adolescency which was observed in the cephalometric superimposition. Significant improvement was observed in the patient's dental aesthetics, including correction of the midline deviation, achievement of ideal overbite and overjet. Fixed functional systems offer absolute advantages over removable systems because of it being designed for 24 hours daily wear, there is a continuous stimulus for mandibular growth. The lower first molars had a significant change in their anteroposterior position, where the distance between the first molars and the Ptv line has increased. This indicates that the first lower

molar had mesialised to attain Angle's Class I molar relation. And the position of the lower 1st molar is observed the mean difference in men is found to be 1.455 with a p value of <0.001, while the mean difference in women is found to be 1.714 with a p value of <0.001. A slight increase in the lower incisor inclination was noted. But the values were not statistically significant. The inclination of the lower incisor in men showed a mean difference of 2.636 and a p value of 0.018 while the position of the lower incisor in men showed a mean difference of 0.455 with a p value of 0.053. The mean difference of the inclination of the lower incisor is 0.714 in women with a significant p value of 0.006. Mean difference in the position of the lower incisor in women is 0.571 and with a significant p value of 0.006. The SNA value has increased with a mean difference of 0.04 which is not statistically significant. The maxillary length has also altered which is also not significant (T1-100.72+/-5.232, T2-101.04+/-5.119; P>.001).In males, the SNA has less changes than in females.The anterior facial height has not changed significantly.

Conclusion: The position of the mandible as well as the mandibular dentition has anteriorly positioned indicating class II correction has occurred significantly whereas the distal movement of maxillary molars has also been contributed to a proper cusp fossa relationship. The SNA and SNB together have contributed to the decrease in ANB which improved the patient's profile.The chin prominence was increased which correlates with the late mandibular growth especially in the late adolescent patients.Maxillary length did not show any significant change whereas the dentoalveolar changes occurred in maxillary dentition.Dentoalveolar changes have also noticed in which the maxillary molars had a distal movement and the maxillary incisors had retruded which contributed to decrease the overjet whereas in the mandible, the first molars had a mesial movement and a minimal amount of lower anterior proclination.

Keywords: Powerscope, Skeletal changes, Dentoalveolar changes, Skeletal Class II malocclusion, late adolescent treatment.

Introduction

Class II malocclusions are a major part of orthodontic irregularities. The research suggests that mandibular retrognathia is the underlying cause, rather than maxillary prognathism.[1] In these patients, to stimulate mandibular growth by forward positioning of the mandible, removable or fixed functional orthopedic appliances are used.[2-4] It has been reported that the effectiveness of functional therapy depends on both the treatment timing and the type of functional appliance. [5-7] According to several studies, mandibular growth can extend beyond puberty, and minimal residual growth can only be stimulated with fixed functional appliances.[8-12] Ruf and Pancherz, [8,9] Konik et al, [11] and Kinzinger and Diedrich [12] stated that the treatment of late adolescents and young adults with rigid fixed functional appliances such as the Herbst or functional mandibular advancer resulted in correction of the Class II malocclusion with the skeletal and dental changes. However, the changes produced by semi-rigid fixed functional appliances might be different from those produced with rigid devices. In treatment with the Jasper jumper, which is a semi-rigid fixed functional appliance, Nalbantgil et al [13] found no significant effects in mandibular growth and in the degree of mandibular protrusion in late adolescents, but Stucki and Ingervall [14] reported that the skeletal mandibular effects were the same in subjects allocated to 2 groups based on whether they were younger or older than 15 years of age.

The need for Class II Correctors in young adults; according to Mc Namara, mandibular retrognathia is the underlying cause, rather than maxillary prognathism[15]. Thus, among the various orthodontic appliances introduced to treat Class II malocclusion, functional orthopedic appliances are widely used[16-19]. Contrary to removable appliances, fixed devices do not require the patient's co-operation and can be worn in association with multi-bracket therapy, so that Class II malocclusion can be corrected in a single phase treatment[20]. Powerscope is one of the recent advances introduced by American orthodontics in the year 2014. Its design maximizes the lateral movement as well as it guides the mandible in relation to maxilla. It has a wide popularity because of its ease of placement and patient compliance[8]. Functional appliance is usually used in growing patients. But there are literatures showing the effect of fixed functional appliances in non-growing patients as well. As Powerscope is a recent fixed functional appliance, this study will evaluate the effects of Powerscope in late adolescent patients which will assist the clinician in planning the treatment.

Skeletal Correction in patients with mild skeletal Class II malocclusion: can be of borderline cases with deficient mandible or with dental class II malocclusion. Borderline Class II cases with deficient mandible (ANB 4-8^{o}) are suitable for this approach. However, obvious surgical cases are a contra-indication to such treatments. It is also important to consider that these individuals should not be seeking drastic changes in their facial appearance. Dental Class II malocclusion correction only: Obviously, the amount of skeletal correction achievable in adults is much less than in adolescents (only 30-40% skeletal changes may be expected). Therefore, the best results in young adults are those cases which have mainly a dental component of Class II without an underlying skeletal discrepancy.

Aim of the study

The aim of this study is evaluate the skeletal and dentoalveolar effects of powerscope in late adolescent patients.

Objectives of the study

- To evaluate linear measurements between the pre and post treatment cephalograms.
- To evaluate angular measurements between the pre and post treatment cephalograms.
- To determine and compare the pre and post treatment skeletal and dentoalveolar changes of Powerscope treatment by superimposition technique in late adolescent patients.

Materials and methods

Source of data: Data were collected among the patients visiting the department of ORTHODONTICS, A.J INSTITUTE OF DENTAL SCIENCES, MANGALORE, to receive treatment with informed consent.

Methods of collecting Data: The sample consisted of 24 patients. Pre and post treatment cephalometic and handwrist radiographs of skeletal class II patients were obtained according to the inclusion and exclusion criteria.

The data obtained was analysed and compared.

Inclusion criteria

- Skeletal Class II (ANB more than 4 degree)
- Retrognathic mandible (SNB more than 83 degree)
- Patients with normal or low-angle growth pattern (Jarabak's ratio more than
- 65%).
- Post-peak growth period (Fishman's skeletal maturity assessment score -11)

- Good quality standardized lateral cephalograms and handwrist radiographs

Exclusion criteria:

- Congenitally missing teeth
- Periodontally compromised patient
- Patients with systemic diseases
- Patients with syndromes
- Patients with temporomandibular joint disorder
- Patients with habits.

Methodology

24 late adolescent subjects were selected after the skeletal maturity assessment (Fishman's skeletal maturity assessment score). Skeletal maturity indicator score 11 (fusion of epiphysis & diaphysis of radius) were assessed in patients in order to select late adolescent patients among the group of patients.

A prospective study was carried out on 24 lateral cephalometric radiograms which was taken before the placement and after the removal of the appliance.

Pre and post- treatment lateral cephalograms were collected from those who were treated by Powerscope. And the lateral cephalograms were analysed using various cephalometric parameters.

All radiographs used for the study were taken with the same x-ray machine KODAK 8000C machine (69kvp, 12Ma/2 sec). Cephalograms were traced by the same operator by hand.

The reliability of the single measurement was calculated using Dahlberg's formula of error method. SPSS statistical programme was used for calculations of mean values.

One way analysis of variance test were used to compare the differences (ANOVA) & Tukey test was also done

Ethical Clearance: The study protocol was reviewed and ethical clearance was provided by the Ethical Committee of A.J Institute of Medical Sciences.

Results

The growth of the patient is assessed in handwrist radiograph using Fishman's skeletal maturity score: 11. Then the pre and post treatment cephalograms were taken and assessed and the results were obtained after statistical analysis.

Paired Samples Statistics

		Mean	Std. Deviation	Mean difference	P value
SNA	Pre-Treatment	81.08	1.288	0.04	0.788
	Post-Treatment	81.04	1.207		
SNB	Pre-Treatment	75.40	1.258	-2.52	<0.001
	Post-Treatment	77.92	1.115		
ANB	Pre-Treatment	5.84	1.463		

				2.76	<0.001
	Post-Treatment	3.08	1.256		
Maxillary length	Pre-Treatment	100.72	5.232	-0.32	0.043
	Post-Treatment	101.04	5.119		
Mandibular length	Pre-Treatment	108.64	3.463	-1.2	<0.001
	Post-Treatment	109.84	3.275		
Anterior facial height	Pre-Treatment	111.52	3.043	-0.24	0.056
	Post-Treatment	111.76	3.072		
Posterior facial height	Pre-Treatment	79.20	1.581	-0.56	<0.001
	Post-Treatment	79.76	1.363		
Jarabak's ratio	Pre-Treatment	70.52	2.468	-0.44	0.005
	Post-Treatment	70.96	2.318		
Position of chin	Pre-Treatment	-11.52	2.064	-2.44	<0.001
	Post-Treatment	-9.08	1.552		
Inclination of upper incisor	Pre-Treatment	30.72	2.821	0.88	0.002
	Post-Treatment	29.84	2.035		
Position of upper incisor	Pre-Treatment	6.00	1.041	0.32	0.008
	Post-Treatment	5.68	.900		

Position of upper 1st molar	Pre-Treatment	20.52	1.229	0.32	0.018
	Post-Treatment	20.20	1.155		
Inclination of lower incisor	Pre-Treatment	32.40	2.380	1.56	0.003
	Post-Treatment	30.84	1.281		
Position of lower incisor	Pre-Treatment	6.84	.943	0.52	0.001
	Post-Treatment	6.32	.852		
Position of lower 1st molar	Pre-Treatment	20.32	1.030	1.6	<0.001
	Post-Treatment	18.72	1.100		

Comparison among men

		Mean	Std. Deviation	Mean difference	P value (paired t test)
SNA	Pre	81.00	1.483	-0.091	0.676
	Post	81.09	1.446		
SNB	Pre	74.64	1.206	-3.63	<0.001
	Post	78.27	1.348		
ANB	Pre	6.73	1.679	3.909	<0.001
	Post	2.82	1.168		
Maxillary length	Pre	102.36	5.904	-0.364	0.267
	Post	102.73	5.729		
Mandibular length	Pre	106.73	3.495	-1.45	0.012
	Post	108.18	3.219		

Anterior facial height	Pre	113.00	3.768	-0.273	0.082
	Post	113.27	3.717		
Posterior facial height	Pre	78.64	1.690	-0.545	0.025
	Post	79.18	1.471		
Jarabak's ratio	Pre	69.09	2.773	-0.455	0.096
	Post	69.55	2.464		
Position of chin	Pre	-11.73	2.649	-2.818	<0.001
	Post	-8.91	1.973		
Inclination of upper incisor	Pre	32.27	2.970	1.63	0.002
	Post	30.64	2.292		
Position of upper incisor	Pre	6.73	1.104	0.545	0.006
	Post	6.18	1.079		
Position of upper 1st molar	Pre	20.00	1.000	0.455	0.016
	Post	19.55	1.036		
Inclination of lower incisor	Pre	33.36	2.873	2.636	0.018
	Post	30.73	1.348		
Position of lower incisor	Pre	6.73	.786	0.455	0.053
	Post	6.27	.647		
Position of lower 1st molar	Pre	19.91	1.044	1.455	<0.001
	Post	18.45	.820		

COMPARISON AMONG MEN		Mean	Std. Deviation	Mean Difference	P value
SNA	Pre	81.14	1.167	0.143	0.5
	Post	81.00	1.038		
SNB	Pre	76.00	.961	-1.643	<0.001
	Post	77.64	.842		
ANB	Pre	5.14	.770	1.857	<0.001
	Post	3.29	1.326		
Maxillary length	Pre	99.43	4.433	-0.287	0.04
	Post	99.71	4.340		
Mandibular length	Pre	110.14	2.685	-1.0	<0.001
	Post	111.14	2.770		
Anterior facial height	Pre	110.36	1.692	30.143	<0.001
	Post	80.21	1.122		

Posterior facial height	**Pre**	79.64	1.393	-0.571	0.001
	Post	80.21	1.122		
Jarabak's ratio	**Pre**	71.64	1.499	-0.429	0.028
	Post	72.07	1.492		
Position of chin	**Pre**	-11.36	1.550	-2.143	<0.001
	Post	-9.21	1.188		
Inclination of upper incisor	**Pre**	29.50	2.066	0.286	0.263
	Post	29.21	1.626		
Position of upper incisor	**Pre**	5.43	.514	0.143	0.336
	Post	5.29	.469		
Position of upper 1st molar	**Pre**	20.93	1.269	0.214	0.272
	Post	20.71	.994		
Inclination of lower incisor	**Pre**	31.64	1.646	0.714	0.006
	Post	30.93	1.269		
Position of lower incisor	**Pre**	6.93	1.072	0.571	0.006
	Post	6.36	1.008		
Position of lower 1st molar	**Pre**	20.64	.929	1.714	<0.001
	Post	18.93	1.269		

Comparison between Males and Females

			Mean	Std. Deviation	Mean difference	P value (paired t test)	Interpretation
SNA	Males	Pre	81.00	1.483	-0.091	0.676	Not significant
		Post	81.09	1.446			
	Females	Pre	81.14	1.167	0.143	0.5	Not significant
		Post	81.00	1.038			
SNB	Males	Pre	74.64	1.206	-3.63	<0.001	Significant
		Post	78.27	1.348			
	Females	Pre	76.00	.961	-1.643	<0.001	Significant
		Post	77.64	.842			
ANB	Males	Pre	6.73	1.679	3.909	<0.001	Significant
		Post	2.82	1.168			
	Females	Pre	5.14	.770	1.857	<0.001	Significant
		Post	3.29	1.326			
Maxillary length	Males	Pre	102.36	5.904	-0.364	0.267	Not significant
		Post	102.73	5.729			
	Females	Pre	99.43	4.433	-0.287	0.04	Significant
		Post	99.71	4.340			
Mandibular length	Males	Pre	106.73	3.495	-1.45	0.012	Significant
		Post	108.18	3.219			
	Females	Pre	110.14	2.685	-1.0	<0.001	Significant
		Post	111.14	2.770			
Anterior facial height	Males	Pre	113.00	3.768	-0.273	0.082	Not significant
		Post	113.27	3.717			

	Females	Pre	110.36	1.692	30.143	<0.001	Significant
		Post	80.21	1.122			
Posterior facial height	Males	Pre	78.64	1.690	-0.545	0.025	Significant
		Post	79.18	1.471			
	Females	Pre	79.64	1.393	-0.571	0.001	Significant
		Post	80.21	1.122			
Jarabak's ratio	Males	Pre	69.09	2.773	-0.455	0.096	Not significant
		Post	69.55	2.464			
	Females	Pre	71.64	1.499	-0.429	0.028	Significant
		Post	72.07	1.492			
Position of chin	Males	Pre	-11.73	2.649	-2.818	<0.001	Significant
		Post	-8.91	1.973			
	Females	Pre	-11.36	1.550	-2.143	<0.001	Significant
		Post	-9.21	1.188			
Inclination of upper incisor	Males	Pre	32.27	2.970	1.63	0.002	Significant
		Post	30.64	2.292			
	Females	Pre	29.50	2.066	0.286	0.263	Not significant
		Post	29.21	1.626			
Position of upper incisor	Males	Pre	6.73	1.104	0.545	0.006	Significant
		Post	6.18	1.079			
	Females	Pre	5.43	.514	0.143	0.336	Not significant
		Post	5.29	.469			
Position of upper 1st molar	Males	Pre	20.00	1.000	0.455	0.016	Significant
		Post	19.55	1.036			
	Females	Pre	20.93	1.269	0.214	0.272	Not significant
		Post	20.71	.994			
Inclination	Males	Pre	33.36	2.873	2.636	0.018	Significant

of lower incisor		Post	30.73	1.348			
	Females	Pre	31.64	1.646	0.714	0.006	Significant
		Post	30.93	1.269			
Position of lower incisor	Males	Pre	6.73	.786	0.455	0.053	Not significant
		Post	6.27	.647			
	Females	Pre	6.93	1.072	0.571	0.006	Significant
		Post	6.36	1.008			
Position of lower 1st molar	Males	Pre	19.91	1.044	1.455	<0.001	Significant
		Post	18.45	.820			
	Females	Pre	20.64	.929	1.714	<0.001	Significant
		Post	18.93	1.269			

	Gender	Mean percentage difference	Std. Deviation	P value (student t test)	Interpretation
SNA	Male	-0.12	0.86	.445	Not Significant
	Female	0.17	0.95		
SNB	Male	-4.90	2.62	.003	Significant
	Female	-2.17	1.44		
ANB	Male	55.68	19.92	.041	Significant
	Female	36.63	23.27		
Maxillary length	Male	-0.37	1.05	.809	Not Significant
	Female	-0.29	0.48		
Mandibular length	Male	-1.38	1.49	.291	Not Significant
	Female	-0.91	0.61		
Anterior facial height	Male	-0.24	0.42	.826	Not Significant
	Female	-0.19	0.63		
Posterior facial height	Male	-0.70	0.88	.943	Not Significant
	Female	-0.72	0.65		
Jarabak's ratio	Male	-0.68	1.21	.855	Not Significant
	Female	-0.60	0.90		

Position of chin	Male	23.61	8.52	.072	Not Significant
	Female	18.75	4.05		
Inclination of upper incisor	Male	4.88	3.67	.006	Significant
	Female	0.83	3.09		
Position of upper incisor	Male	8.08	8.05	.111	Not Significant
	Female	2.14	9.48		
Position of upper 1st molar	Male	2.25	2.59	.285	Not Significant
	Female	0.91	3.36		
Inclination of lower incisor	Male	7.34	7.96	.061	Not Significant
	Female	2.18	2.50		
Position of lower incisor	Male	6.22	9.15	.673	Not Significant
	Female	7.78	8.99		
Position of lower 1st molar	Male	7.24	2.38	.435	Not Significant
	Female	8.33	3.99		

Discussion

Although the clinical studies on the effects of the powerscope are scarce in the literature, with no previous controlled clinical trial that investigated into the ideal treatment timing for this appliance. In order to provide this missing information, the present study analysed the skeletal and dentoalveolar changes produced by the fixed appliance treatment i.e. the powerscope in late adolescent individuals.This study was done in late adolescent patients. The study sample consisted of 24 skeletal class II cases with a Fishman‘s skeletal maturity score of 11 i.e., fusion of epiphysis and diaphysis in the radius. The skeletal as well as dental effects were evaluated in patients who were treated with powerscope. All the samples which were taken had a normal or low angle growth pattern in which the patients could benefit both the residual growth of the mandible and would have minimal chances of relapse due to the late growth potential and the postreatment dentoskeletal changes. The results revealed that Class II correction was achieved through dentoalveolar changes and that Forsus™ FRD had no skeletal effect on the maxilla. This finding is in accordance with the results of Weiland and Bantleon, Aelbers and Dermaut and Karacay et al On the other hand, many other investigators who applied fixed inter-arch appliances on growing patients stated that these appliances had a high-pull headgear effect on the maxilla.[8,11-13] This difference between the results may have arised from age variation among groups. However, unlike in the present study Nalbantgil et al observed a maxillary growth restraint effect of Jasper Jumper appliance on post-peak patients.[21] The mandibular and the maxillary growth had occurred during orthodontic treatment even in the late adolescency which was observed in the cephalometric superimposition. Significant improvement was observed in the patient‘s dental aesthetics, including correction of the midline deviation, achievement of ideal overbite and overjet. Fixed functional systems offer absolute advantages over removable systems because of it being designed for 24 hours daily wear, there is a continuous stimulus for mandibular growth. Also, their compact, concise and

small size design permitting better adaptation to functions such as a mastication, swallowing, speech and breathing. Hence, better patient tolerance and the fixed functional appliances are therefore usually known as non-compliance Class II devices. Where the skeletal pattern is milder, fixed appliances may be used to affect palatal/lingual root torque and/or proclination of the lower labial segment. The latter is indicated, sometimes in conjunction with interproximal stripping, where the lower arch exhibits mild to moderate crowding. Space required in the upper arch, for relief of crowding and correction of the incisor relationship may be created by moving the buccal segments distally, with headgear, or with the aid of temporary anchorage devices; alternatively extraction of upper first premolars only with anchorage reinforcement may suffice accepting a full unit Class II molar relationship. Where crowding is more marked, extraction of upper first and lower second premolars, will is some, but not all cases be necessary. This extraction pattern favours mesial movement of lower molars, with minimal lower incisor retroclination, and upper incisor retraction with less mesial movement of upper molars (anchorage loss). Currently, evidence is lacking as to the most effective means of treatment.[22]

One of the drawbacks while using a class II corrector devices is that the proclination of lower anteriors. In order to prevent further proclination and to stabilize the lower incisors certain steps were taken. The lower arch was cinched, elastic chains were used on the lower arch wire, and arch locks/stops posteriorly were incorporated. In addition to this, significant negative torque brackets (-6 to -10 degrees) for lower anterior teeth were given. Steel ligatures were used for lower canines to prevent their rotation during the treatment. The SNA value has increased with a mean difference of 0.04 which is not statistically significant. This is due to the growth remaining even in the late adolescency where, when the powerscope is placed there is an distalisation of maxilla. The maxillary length has also altered which is also not significant.(T1-100.72+/-5.232, T2- 101.04+/-5.119; P>.001).In males, the SNA has less changes than in females. The anterior facial height has not changed significantly. But in contrary to the normal values, while using a class II corrector there is clockwise rotation of the mandible which has less effect on the posterior facial height than that of anterior facial height as the mandible rotates in a clockwise direction the reference points in the mandible differs to a downward direction. But the posterior facial height has significantly increased. This signifies that the ramus length has increased due to the late mandibular growth which has been noticed in the late adolescent patients who had undergone powerscope therapy for advancing the retruded mandible further. Sato et al found that, in Japanese girls from 8 to 18 years of age, the mandibular length measured from condylion to gnathion increased 17.84 mm. If this amount was divided by 10 to obtain an annual rate, it would be 1.78 mm/year[23].The position of the chin has come forward, which also indicates there is late mandibular growth ($p < 0.001$). And in males it is less compared to females where the profile has improved more in females even in the late adolescency. The mandibular length has also significantly increased ($p < 0.001$). More changes are seen in females than in the males. Mandibular length is found to decrease with a mean of -1.45 in men and -1 in woman. When maxillary length is observed the mean difference in men is -0.364, whereas the mean difference in women is -0.287. With the limited population size, the p value of 0.04 among the women patients can be considered significant.

When anterior facial height is compared the mean difference of -0.273 is observed among men while the

mean difference is 30.143 among women. This difference is found to be highly significant with a p value of < 0.001. Posterior facial length is found to have a mean difference of -0.545 in men with a p value of 0.025 and a mean difference of 0.571 in women with a significant p value of 0.001. When the position of the chin is compared both men and women show a significant p value of <0.001 with a mean difference of -2.818 in men and -2.143 in women. Position of the chin is a parameter where both men and women exhibit considerable difference. In the present study, the position of the lower 1st molar also showed a significant p values of <0.001 in both men and women with mean difference in men being 1.455 and that of women being 1.714. Parameters that were observed to have significant values are inclination of the upper incisor, position of upper incisor, where the p values in men are 0.002 and 0.006 respectively and that in women are 0.263 and 0.336. The mean difference of the inclination of the upper incisor in men is 1.63 whereas that in women is 0.286. However, since retrusion of the upper incisors may cause an increase at the gingival display.

A slight increase in the lower incisor inclination was noted. But the values were not statistically significant. In order to prevent further proclination and to stabilize the lower incisors certain steps were taken. The lower arch was cinched, elastic chains were used on the lower arch wire, and arch locks/stops posteriorly were incorporated. In addition to this, significant negative torque brackets (-6 to -10 degrees) for lower anterior teeth were given. Steel ligatures were used for lower canines to prevent their rotation during the treatment.

The inclination of the lower incisor in men showed a mean difference of 2.636 and a p - value of 0.018 while the position of the lower incisor in men showed a mean difference of 0.455 with a p value of 0.053. The mean difference of the inclination of the lower incisor is 0.714 in women with a significant p value of 0.006. Mean difference in the position of the lower incisor in women is 0.571 and with a significant p - value of 0.006.

The lower first molars had a significant change in their anteroposterior position, where the distance between the first molars and the Ptv line has increased. This indicates that the first lower molar had mesialised to attain a Angle‘s Class I molar relation. And the position of the lower 1st molar is observed the mean difference in men is found to be 1.455 with a p value of <0.001, while the mean difference in women is found to be 1.714 with a p value of <0.001.

Conclusion

- The position of the mandible as well as the mandibular dentition has anteriorly positioned indicating class II correction has occurred significantly wheras the distal movement of maxillary molars has also been contributed to a proper cusp fossa relationship.
- SNA and SNB together have contributed to the decrease in ANB which improved the patient‘s profile.
- The chin prominence was increased which correlates with the late mandibular growth especially in the late adolescent patients.
- Maxillary length did not show any significant change whereas the dentoalveolar changes occurred in maxillary dentition.
- Dentoalveolar changes have also noticed in which the maxillary molars had a distal movement and the maxillary incisors had retruded which contributed to decrease the overjet whereas in the mandible, the first molars had a mesial movement and a minimal amount of lower anterior proclination. Hence, clinicians should take these advantages into

consideration in late adolescent patients for class II correction.

References

1. McNamara JA Jr. Components of Class II malocclusion in children 8-10 years of age. Angle Orthod 1981;51:177-202.
2. Weiland FJ, Ingervall B, Bantleon HP, Droschl H. Initial effects of treatment of Class II malocclusion with the Herren activator, activator-headgear combination, and Jasper jumper. Am J Orthod Dentofacial Orthop 1997;112:19-27.
3. Almeida MR, Henriques JFC, Ursi W. Comparative study of the Frankel(FR-2) and bionator appliances in the treatment of Class II malocclusion. Am J Orthod Dentofacial Orthop 2002;121:458-66.
4. Chen JY, Will LA, Niederman R. Analysis of efficacy of functional appliances on mandibular growth. Am J Orthod Dentofacial Orthop 2002;122:470-6.
5. Malmgren O, Omblus J, Hagg U, Pancherz H. Treatment with an appliance system in relation to treatment intensity and growth periods. Am J Orthod Dentofacial Orthop 1987;91:143-51.
6. Hagg U, Pancherz H. Dentofacial orthopaedics in relation to chronological age, growth period and skeletal development. An analysis of 72 male patients with Class II Division 1 malocclusion treated with the Herbst appliance. Eur J Orthod 1988;10:169-76.
7. Cozza P, Baccetti T, Franchi L, De Toffol L, McNamara JA. Mandibular changes produced by functional appliances in Class II malocclusion: a systematic review. Am J Orthod Dentofacial Orthop2006;129:599.e1-12.
8. Pancherz H, Littmann C. Morphologie und lage des unterkiefers bei der Herbst-behandlung. Inf Orthod Kieferorthop 1989;21:493-513.
9. Ruf S, Pancherz H. Dentoskeletal effects and facial profile changes in young adults treated with the Herbst appliance. Angle Orthod 1999;69:239-46.
10. Ruf S, Pancherz H. Herbst/multibracket appliance treatment of Class II Division 1 malocclusions in early and late adulthood. A prospective cephalometric study of consecutively treated subjects. Eur J Orthod 2006;28:352-60.
11. Konik M, Pancherz H, Hansen K. The mechanism of Class II correction in late Herbst treatment. Am J Orthod Dentofacial Orthop 1997;112:87-91.
12. Kinzinger G, Diedrich P. Skeletal effects in Class II treatment with the functional mandibular advancer (FMA). J Orofac Orthop 2005; 66:469-90.
13. Nalbantgil D, Arun T, Sayınsu K, Is¸ık F. Skeletal, dental and soft-tissue changes induced by the Jasper jumper in late adolescence. Angle Orthod 2005;75:382-92.
14. Stucki N, Ingervall B. The use of Jasper jumper for the correction of Class II malocclusion in the young permanent dentition. Eur J Orthod 1998;20:271-81.
15. Proffit WR, Fields HW, Moray LJ. Prevalence of malocclusion and orthodontic treatment need in the United States: estimates from the NHANES –III survey. Int J Adult Orthod orthognath Surg 1998;13:97-106.
16. Mc Namara JA Jr. Components of Class II malocclusion in children 8-10 years of age. Angle Orthod 1981;57:177-202
17. Nelson C. Harkness M, Herbison P. Mandibular changes during functional appliance treatment. Am J Orthod DentofacialmOrthop 1993;104:153-161

18. Patel HP, Moseley HC, Noar JH, Cephalometric determinants of successful functional appliances therapy. Angle Orthod 2002;72:410-41
19. Cozz P, Baccetti T, Franchi L, De Toffol L, Mc Namara JA Jr.Mandibular changes produced by functional appliances in Class II malocclusion: a systemic review. Am J Orthod Dentofacial Orthop.2006;129:599.e1-12
20. Schaefer AT, Mc Namara JA Jr, Franchi L, Bacetti T.A cephalometric comparison of treatment with the twin block and stainless steel crown Herbst appliance therapy. Am J Orthod Dentofacial Orthop.2004;126:7-15
21. Esen Ali Gunay, Tulin Arun, Didem Nalbantgil: Evaluation of the Immediate Dentofacial Changes in Late Adolescent Patients Treated with the ForsusTMFRD; European Journal of Dentistry October 2011 - Vol.5
22. Katsavrias EG, Voudouris JC. The treatment effect of mandibular protrusive appliances on the glenoid fossa for Class II correction. Angle Orthod 2004;74:79-85
23. Sato K, Mito T, Mitani H. An accurate method of predicting mandibular growth potential based on bone maturity.Am J Orthod Dentofacial Orthop.2001;120:286–290