folia medica

Folia Medica 63(2):253-63
DOI: 10.3897/folmed.63.e52892

Original Article

Treatment Effects of "PowerScope" Fixed Functional Appliance – a Clinical Study

Anirudh Kalra, Vinit Swami, Veera Bhosale

Department of Orthodontics and Dentofacial Orthopaedics, Bharati Vidyapeeth Dental College, Pune, India

Corresponding author: Anirudh Kalra, Department of Orthodontics and Dentofacial Orthopaedics, Bharati Vidyapeeth Dental College, Pune, India; E-mail: dranirudhkalra90@gmail.com

Received: 4 Apr 2020 ♦ **Accepted:** 21 Oct 2020 ♦ **Published:** 30 Apr 2021

Citation: Kalra A, Swami V, Bhosale V. Treatment effects of "PowerScope" fixed functional appliance – a clinical study. Folia Med (Plovdiv) 2021;63(2):253-63. doi: 10.3897/folmed.63.e52892.

Abstract

Aim: To study the skeletal, dental effects and evaluate the soft tissue changes with PowerScope-fixed functional appliance in class II malocclusion.

Materials and methods: This clinical study was carried out where a total of 10 growing (CVMS 3 and 4) Class II Division 1 malocclusion patients, indicated for treatment with fixed functional appliance were allocated based on specific inclusion criteria. PowerScope (American Orthodontics) was used as the fixed functional appliance. Skeletal, dental and soft tissue effects of the appliance with various angular and linear parameters on a digital lateral cephalogram were evaluated for all 10 participants. Records were collected before the insertion of PowerScope appliance (T0) and after 5 months, during the appliance removal (T1). All participants were treated with 0.018″×0.025″ MBT (3M Unitek) prescription. Statistical analysis was performed using a paired t-test to compare individual mean changes for each treatment category.

Results: Statistically significant changes were seen in skeletal parameters such as forward positioning of the mandible with an increase in SNB angle and N perpendicular-Pogonion distance, the class II jaw base relationship improved with reduction in ANB angle and Wits appraisal. Significant changes were observed in dental parameters such as forward positioning of mandibular incisors, maxillary molar distalization and intrusion with reduction in overbite and overjet respectively. In the soft tissue, a significant improvement in facial profile was seen due to an increase in labiomental angle.

Conclusions: The results of this study have shown that statistically significant changes in skeletal, dental and soft tissue parameters.

Keywords

class II malocclusion, fixed functional appliance, non-extraction, PowerScope

INTRODUCTION

Class II malocclusion commonly presents a major challenge to present-day orthodontics. It may be a skeletal or a dental class II.[1] Among different skeletal and dental combinations that can create a Class II malocclusion, mandibular retrusion is one of the most common characteristics.[2] Treatment of Class II malocclusion continues to be a serious challenge orthodontists face daily in clinical practice that depends entirely upon the severity of the problem and the age at which it presents for treatment. Various orthodontic techniques and appliances have been introduced over the years to treat these problems and a popular treatment approach for correction of class II malocclusion with retruded mandible is that of growth modulation through the use of various functional appliances.[3]

Functional appliances are used to redirect the mandibular growth by forward posturing of the mandible when treated in patients' pubertal growth spurt. In case of age beyond pubertal growth spurt or later stages of puberty, fixed functional appliances such as Jasper Jumper, Herbst, Ritto appliance, Eureka spring, Churro jumper, Forsus fatigue resistant device etc. are being used commonly to treat class II malocclusion.[4] Fixed devices for sagittal advancement of the mandible that do not require the patient's collaboration and that can be worn in association with fixed appliances have been introduced to the orthodontic community in order to overcome certain major limitations of removable functional appliances that is the need for patient cooperation and the lack of possibility of combining the use of the fixed functional appliance with multibracket therapy in order to shorten treatment duration. These appliances have recently been gaining immense popularity as "non-compliance Class II correctors" and are highly useful in those groups of patients who fail to commit themselves to faithful wearing of functional appliance.[5]

PowerScope appliance is the latest innovation and refinement of fixed functional appliances in Class II correction which is a direct derivative of the Herbst Type II appliance. Dr Andy Hayes worked in conjunction with American Orthodontics to develop PowerScope appliance which is an inter-maxillary Class II corrector appliance designed to address the critical needs of the orthodontist, including patient comfort and acceptance, extensive range of motion, and simple installation. It is delivered as a one-size-fits-all appliance preassembled with attachment nuts for quick and easy chair side application. The appliance has a wire-to-wire installation. NiTi spring mechanism delivers 260 grams of force for continuous activation during treatment. Appliance is low profile and less bulky for more esthetic facial appearance, smooth, rounded patient-friendly design for better patient comfort, a telescopic device that does not displace or disengage during treatment, making it more patient friendly.

This study is an in vivo study conducted to evaluate the skeletal, dental and soft tissues changes observed with PowerScope fixed functional appliance in class II malocclusion.[6]

AIM

To study the skeletal, dento-alveolar effects and to evaluate the soft tissue changes with PowerScope fixed functional appliance.

MATERIALS AND METHODS

In accordance with the approval accorded by the ethical committee of the institution (Ortho. IV-1/2016-17), the following sequential steps were taken to conduct the study.

Screening of participants

All patients undergoing fixed appliance therapy using a non-extraction approach at the Department of Orthodontics and Dentofacial Orthopedics were screened. Participants for the study were selected on the basis of inclusion and exclusion criteria.

Inclusion criteria

1. Patients undergoing routine orthodontic treatment for correction of Angle's class II malocclusion and mandibular advancement with non-extraction approach were selected.
2. Patients with an increased overjet of 5 mm or more.
3. Retrognathic mandible.
4. Growing patients falling under cervical vertebral maturation status (CVMS 3-4).
5. Positive Visual treatment objective (VTO)

Exclusion criteria

Patients with previous history of any orthodontic treatment, extraction of premolars for the treatment, with neuromuscular and temporomandibular joint disorders were excluded from the study. Additionally, patients with Class I and Class III malocclusions and also patients with poor periodontal health were excluded from the study.

Methods

Ten participants fulfilling the inclusion criteria were selected for the sample size. Participants were selected according to cervical vertebral maturation status (CMVS) as determined on the lateral cephalometric radiograph taken prior to the initiation of the treatment phase (T_0). CVMS 3 and 4 were taken into consideration as the greatest increment in mandibular and craniofacial growth occurs during this phase.[19]

Sample size was calculated by measuring a continuous outcome y (Dental Cephalometrics) in each subject at the start and end of the study period. For each subject, the change $\Delta = y_{start} - y_{end}$ was calculated and the mean value of Δ to 0 was compared. The estimate of Standard Deviation i.e. S(Δ) was based on data from other subjects who were followed for similar time periods. The confidence level =95%, type I error, α (two-tailed): 5% =0.05 (threshold probability for rejecting the null hypothesis). Standard normal deviate for $\alpha=Z_\alpha=1.960$, type II error, β error =20%=0.20 (probability of failing to reject the null hypothesis under the alternative hypothesis). Standard normal deviate for $\beta=Z_\beta=0.842$, effect size: E=0.5, standard deviation of the outcome in the population: S=2.0, within subject correlation of the outcome: $r_{within}=0.8$.

Calculated Standard Deviation of change:

$S(\Delta)=(S(2(1-r_{within}))^{1/2} = (1.25\ (2(1-0.8))^{1/2}$; $S(\Delta)=0.56$
$A=1.0$; $B=(Z_\alpha+Z_\beta)^2=(1.96+0.842)^2=7.849$;
$C=(E/S(\Delta))^2=0.797$ and Sample size=AB/C

All participants were explained the nature of the study. Their written consent was obtained from the prescribed form for their participation as volunteers to undertake records at stipulated intervals during the study.

Records were collected at the beginning of study period, before PowerScope appliance insertion (T_0) and after five months that is during appliance removal (T_1).

All participants were treated with 0.018″×0.025″ MBT prescription (3M Unitek) and complete levelling and alignment stage was achieved. Thereafter, 0.017″×0.025″ stainless steel rectangular archwire was inserted in maxillary and mandibular arch respectively. Before inserting the mandibular 0.017″×0.025″ stainless steel archwire, 10° labial root torque was given in the arch wire in the mandibular incisor segment to prevent labial proclination in all the participants. The angle was checked with the help of a jig and measured onto the sym grid **(Figs 1A, 1B)**

PowerScope appliance insertion phase (T_0)

At the beginning of the study period, before appliance insertion, initial lateral cephalogram was taken (T_0) along with intraoral photographs. A rectangular stainless steel archwire of 0.017″×0.025″ was inserted in maxilla and the wire of same dimension was inserted in mandible with a 10° labial root torque in the incisor segment and arch wires were cinched distal to mandibular second molars. Thereafter, a pair of PowerScope appliance was inserted in right and left quadrants respectively with an activation of 5 mm with the help of crimpable shims. This procedure was per-

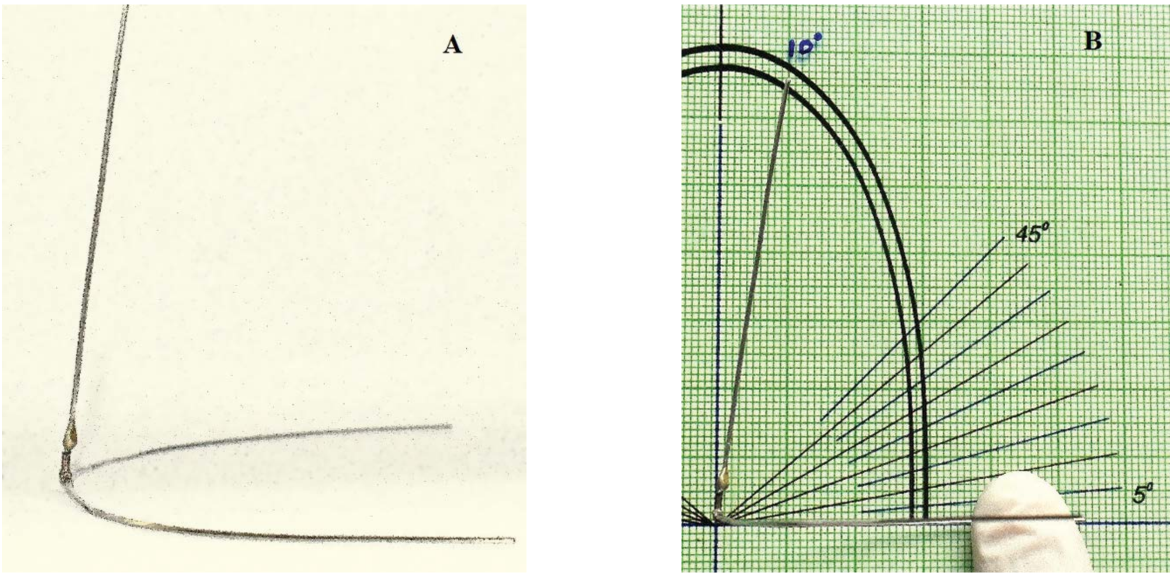

Figure 1. **A.** Jig crimped onto 0.017″×0.025″ mandibular archwire to check 10° labial root torque in the wire. **B.** Labial root torque checked onto the symmetric grid with the use of jig.

Figure 2. Appliance placement (right and left quadrants).

formed for all the participants. Instructions to them were given regarding the maintenance of the appliance and oral hygiene **(Fig. 2)**.

PowerScope appliance removal phase (T_1):

The appliance was removed after 5 months along with the arch wires and a cephalogram was taken. This procedure was repeated for all participants.

Analysis of records

The following angular and linear parameters **(Table 1)** were used to evaluate the changes **(Figs 3A, 3B)**.

Statistical analysis

SPSS Inc. released 2007, SPSS for Windows, version 16.0. Chicago, SPSS Inc software was used to analyze the data. Statistical analysis was done by using tools of descriptive statistics such as mean and SD for representing quantitative data. A paired t-test was used to assess the difference in the parameters from T_0 to T_1 phase to compare individual mean changes for each treatment category. All results were tabulated and graphically represented to visualize the statistically significant differences. A p value less than 0.05 was considered statistically significant and less than 0.001 was considered statistically highly significant.

RESULTS

Significant differences were found for various skeletal, dental and soft-tissue parameters from T_0 to T_1. The results summarized for skeletal angular and linear measurements are given in **Table 2** and graphically presented in **Fig. 4**. There was a statistically significant increase in SNB angle by 3.5° indicating forward displacement of the mandible along with an increase in mandibular length by 3.7 mm. Significant improvement in sagittal jaw base relationship was observed with improvement in ANB angle by 4.5° and reduction in Wits appraisal by 2.33 mm. There were no significant changes observed in maxillary skeletal parameters after appliance removal as determined by SNA angle, N perpendicular-Point A and Co-Point A. Although maxillary growth restriction was observed with reduction in SNA angle by 1° and N perpendicular-Point A by 0.15 mm, mandibular plane showed clockwise rotation which was fa-

Table 1. Skeletal, dental, and soft tissue parameters

	Skeletal parameters	
	Angular parameters (degrees)	**Linear parameters (mm)**
1	SNA angle	N perpendicular-PtA
2	SNB angle	Co-PtA
3	ANB angle	N perpendicular-Pog
4	FH plane - mandibular plane angle	Co-Gn
5	Palatal plane - mandibular plane angle	WITS
6	SN - Occlusal plane angle	N-ANS
7	-	ANS-M
	Dental parameters	
	Angular parameters (degrees)	**Linear parameters (mm)**
1	Inter incisal angle	U1-Na
2	U1 - Na angle	U6 -PTV
3	U1 - SN angle	L1-NB
4	L1 - mandibular Plane angle (IMPA)	U1-PtA
5	L1 - NB angle	U6-Nasal floor
6	-	L6-PTV
7	-	Overjet
8	-	Overbite
	Soft tissue parameters	
	Angular parameters (degrees)	**Linear parameters (mm)**
1	H-angle	Lip strain
2	Nasolabial angle	Upper lip-E line
3	Labiomental angle	Lower lip –E line

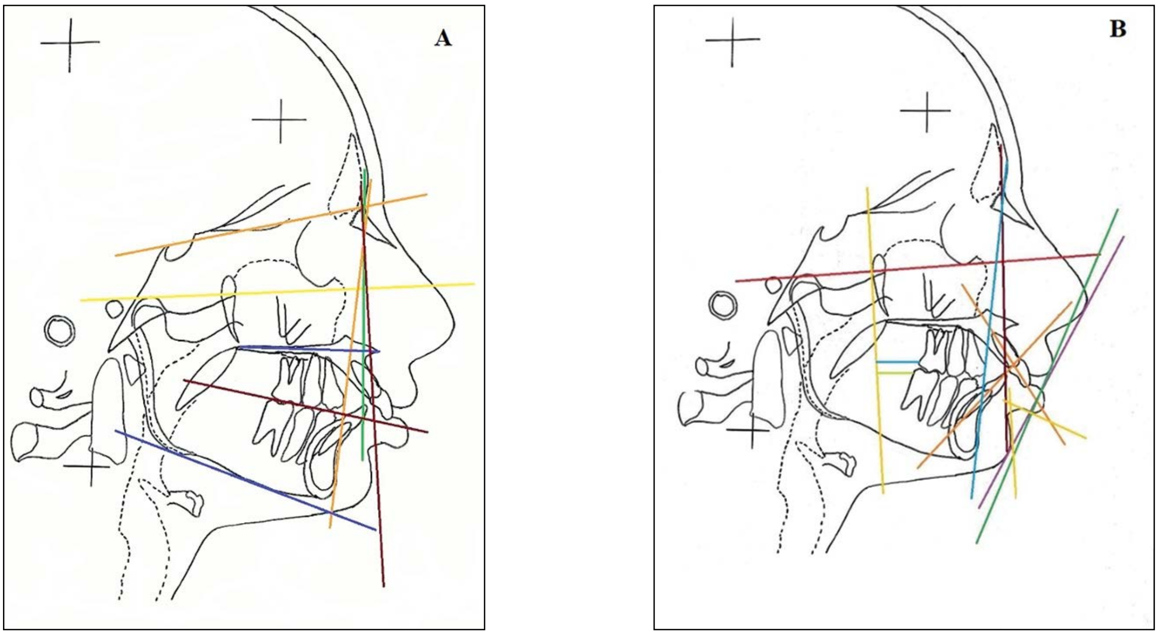

Figure 3. A. Lateral cephalogram showing the skeletal parameters (angular and linear); **B.** Lateral cephalogram showing the dental and soft parameters (angular and linear).

Table 2. Comparison of skeletal angular and linear measurement changes

	Appliance insertion (T_0)		Appliance removal (T_1)		Paired t test	p value
	Mean	SD	Mean	SD		
SKELETAL ANGULAR						
SNA	82.8	2.97	81.8	2.97	0.752	0.462
SNB	76.6	3.65	80.1	2.28	-2.567	0.019*
ANB	6.2	2.48	1.7	0.82	5.435	< 0.001**
FH-Mand.plane	22.1	7.21	23.4	6.44	-0.425	0.676
Pal.-Mand. plane	23.4	6.88	21.6	7.69	0.551	0.588
SN-Occ.plane	14.1	5.56	16.6	5.14	-1.043	0.311
SKELETAL LINEAR						
N perp.-A	-0.65	3.14	-0.5	2.58	-0.117	0.908
Co-A	90.6	3.86	98.2	3.89	-0.704	0.490
N perp.-Pog.	-9.2	4.66	- 4.25	3.04	-2.810	0.012*
C0-Gn	108.8	5.71	112.5	9.16	-1.098	0.287
Wits	4.8	2.21	1.6	2.57	2.977	0.008*
N-ANS	49.8	2.52	50.2	2.65	-0.345	0.734
ANS-Me	60.5	3.8	58.4	5.37	1.008	0.327

p>0.05 – not significant; * p<0.05 – significant; ** p<0.001 – highly significant

vourable in low angle patients but statistically insignificant.

Table 3 shows dental angular and linear measurements which are graphically presented in **Fig. 5**. Maxillary incisors retroclined by 3.6° (U1-SN angle) and 3° (U1-NA angle) and retropositioned by 2.2 mm (U1-NA), although these values were statistically insignificant. Mandibular incisors were forwardly placed by 3.4 mm with statistically significant *p* value of 0.021. A marked improvement in molar relation was observed from Class II to Class I in five months. The maxillary molars moved distally by 4.5 mm. A statistically significant value was observed regarding intrusion of maxillary molars by 1.75 mm. Mandibular molars mesialized by 3.4 mm which was however statistically not significant. Overbite and overjet reduced by 1.4 mm and

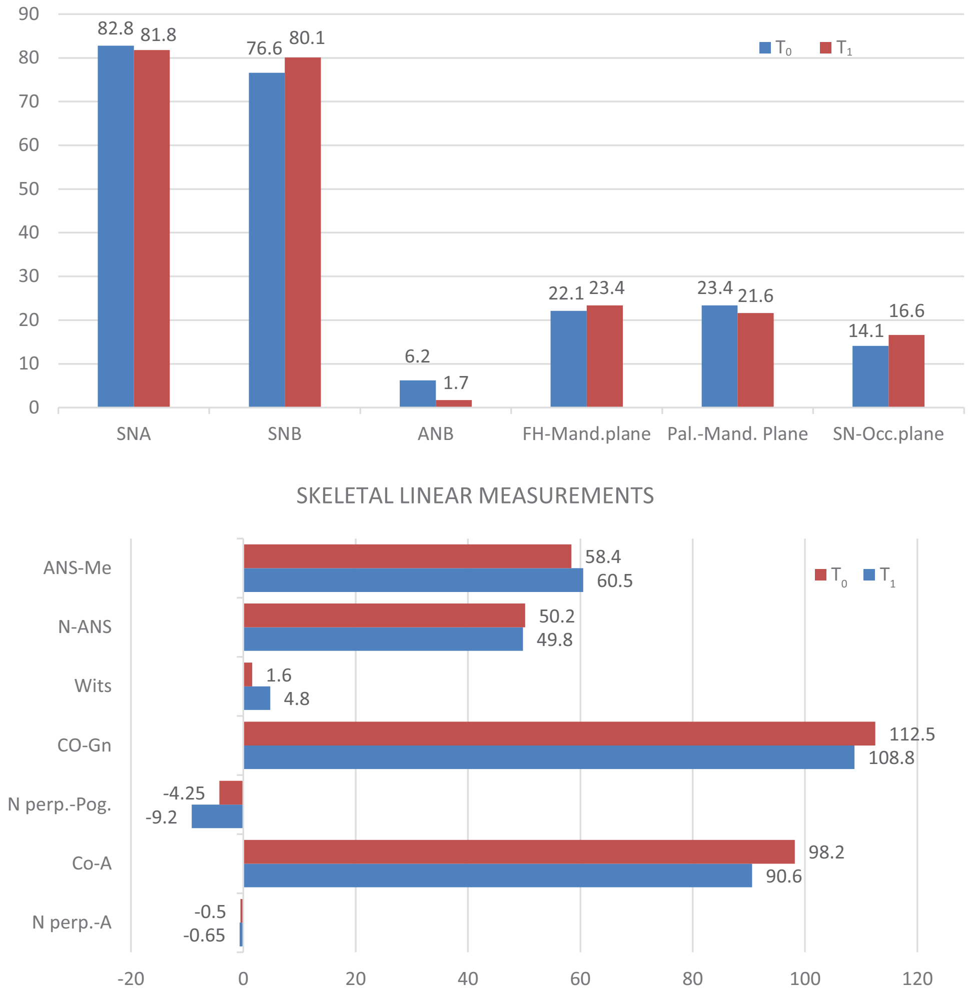

Figure 4. Comparison of skeletal angular and linear changes at T_0 and T_1.

Table 3. Comparison of dental angular and linear measurement changes

	Appliance insertion (T_0)		Appliance removal (T_1)		Paired t test	p value
	Mean	SD	Mean	SD		
DENTAL ANGULAR						
Interincisal	116.7	8.85	112.1	12.72	0.938	0.361
U1-NA	28.8	5.32	25.2	6.44	1.362	0.190
U1-SN	111	4.76	108	4.71	1.416	0.174
L1-NB	31.6	5.33	34.5	5.60	-1.185	0.251
IMPA	104.8	9.79	108.3	9.61	-0.806	0.431
DENTAL LINEAR						
U1-NA	6.15	2.28	3.95	2.29	2.15	0.733
U6-Ptv	17.2	2.85	12.70	1.82	4.192	0.001*
U6-Nasal floor	22.6	1.77	20.85	2.45	1.829	0.047*
L1-NB	6.05	2.4	7.85	2.28	-1.714	0.021*
U1-A	6.8	1.6	5.3	1.56	2.117	0.106
L6-Ptv	13.9	3.14	17.3	4.19	-2.052	0.173
Overjet	5.95	1.01	2.6	1.14	6.915	<0.001**
Overbite	2.85	0.74	1.45	1.106	3.401	0.003*

$p>0.05$ – not significant; * $p<0.05$ – significant; ** $p<0.001$ – highly significant

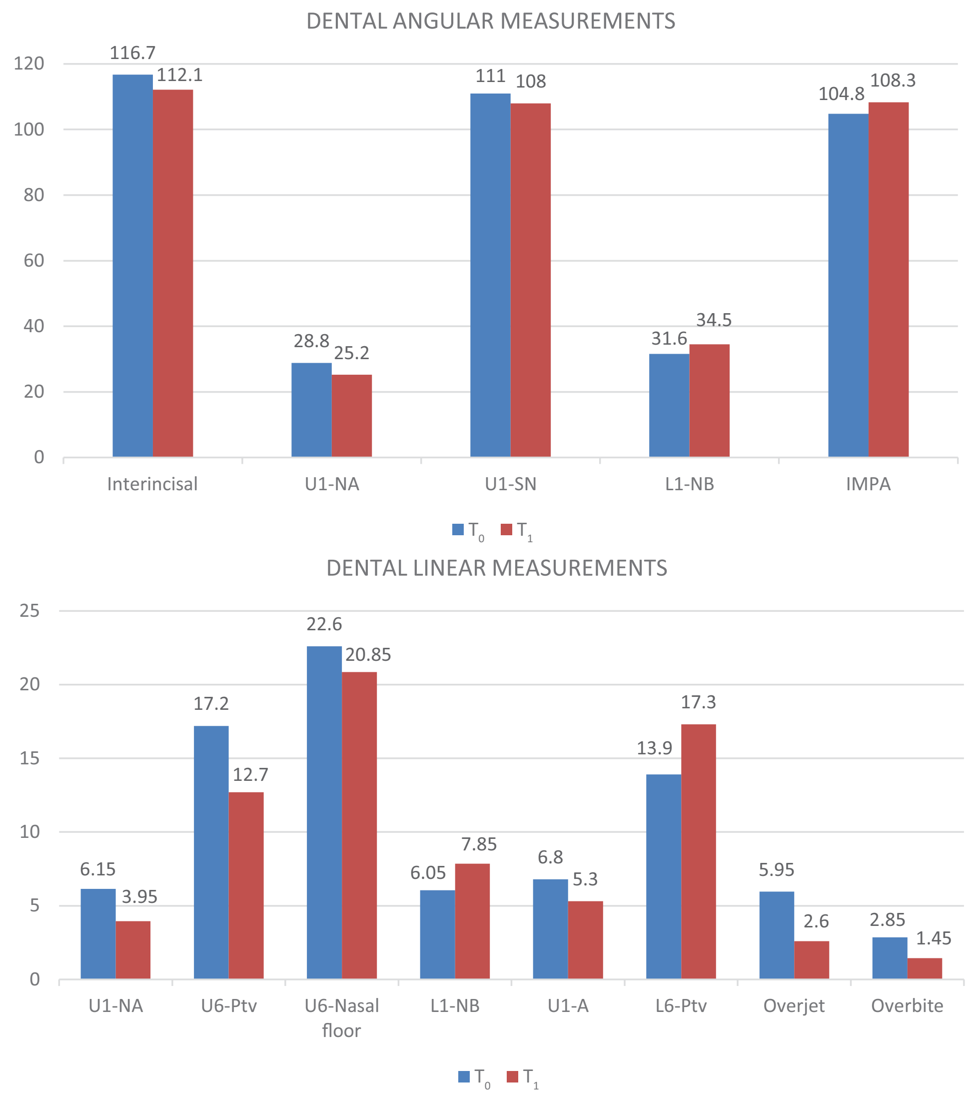

Figure 5. Comparison of dental angular and linear changes at T_0 and T_1.

Table 4. Comparison of soft tissue angular and linear measurement changes

	Appliance insertion (T_0)		Appliance removal (T_1)		Paired t test	p value
	Mean	**SD**	**Mean**	**SD**		
SOFT TISSUE - ANGULAR						
H angle	23.4	3.97	20.5	4.06	1.613	0.124
Nasolabial	105.8	9.55	106.3	6.48	-0.137	0.893
Labiomental	96.7	17.78	115.9	12.31	-2.807	0.012*
SOFT TISSUE - LINEAR						
Lip strain	10.10	2.68	11.1	3.44	-0.724	0.478
U lip - E line	-0.25	1.68	-0.65	2.68	0.399	0.695
L lip – E line	1.25	2.41	2.05	3.02	-0.654	0.522

$p>0.05$ – not significant; * $p<0.05$ – significant; ** $p<0.001$ – highly significant

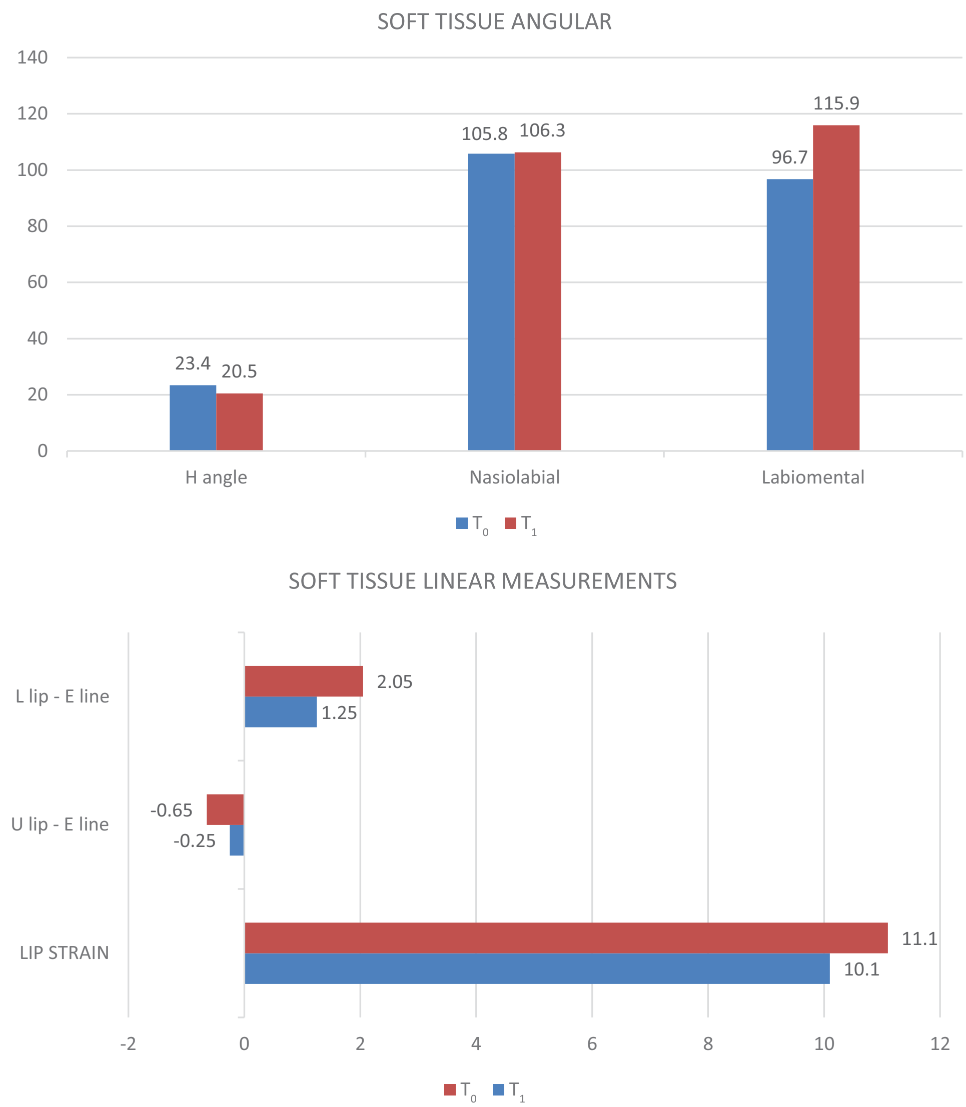

Figure 6. Comparison of soft tissue angular and linear changes at T_0 and T_1.

3.35 mm, respectively. These changes were significant.

Among the soft-tissue measurements, given in**Table 4** along with graphical presentation in **Fig. 6** respectively, labiomental angle increased by 19.2° with a statistically significant value of 0.012.

DISCUSSION

The skeletal findings in this study showed that there was an increase in the mandibular growth upon investigation with an increase in SNB angle from T_0 to T_1 with an average increase of 3.5° improving the position of mandible. Also, N perpendicular to pogonion distance increased by an average of 4.95 mm from T_0 to T_1 phase indicating forward mandibular repositioning. These parameters were statistically significant with a *p* value of 0.019 and 0.012, respectively. Also, mandibular length increased by an average of 3.7 mm from T_0 to T_1 in all the participants but was statistically insignificant (p=0.287). These findings were similar to other studies conducted by Pancherz[7,8] who reported an increase in SNB angle by 1.5° with a significant *p* value (p<0.05) and increase in mandibular length by 3.2 mm with statistically insignificant *p* value with the use of Herbst appliance. Similar results were found in a study conducted by Jones and Buschang[16] with Forsus appliance where they reported that mandibular length increased by 4.4 mm with statistically insignificant *p* value (p=0.33). The present study results were not in concordance with the results obtained from a study conducted by Servello and Fallis[23] who found that mandibular length increased by 1.59 mm with the use of Forsus in growing class II patients falling under CVMS 3 and 4 and had a statistically significant value (p<0.05) which was not similar to the statistical value in our study. They concluded that the Forsus appliance treatment initiated during cervical vertebral maturation status (CS) 3–4 elicits more effective and efficient correction of Class II molar relationships than when initiated during CS 5–6. The reason that mandibular length increased was because of condylar growth stimulation.[12] A slight reduction in SNA angle by 1±2.97° in T_1 phase was observed in all participants which indicates that there was inhibition of maxillary growth but was statistically not significant (p=0.462) and is in concordance with the studies conducted by Pancherz H.[7] He reported that maxillary growth inhibition was observed along its redirection. The distension of the musculature that holds the mandible in constantly advanced position causes transmission of the action of this muscular force in posterior direction on the maxilla.[10,17] Our study results were contrary to those reported in a previous study conducted by Aras and Ada[19], and others[21,22,24,26] showed no change in SNA angle concluding that there was no maxillary restriction.

Furthermore, this study shows that the ANB angle value reduced by 4.5° from T_0 to T_1 which was statistically highly significant (p=0.001) indicating improving the class II jaw base relation. This observation was similar to those of other studies conducted by Manfredi and Cimino[13] who also found out a statistically highly significant changes (p=0.001) in reduction of ANB angle with the use of Herbst appliance. Another study conducted by Paulose and George[27] found a statistically significant (p<0.05) reduction in ANB angle with the use of PowerScope appliance.

A clockwise rotation of occlusal plane with respect to cranial base was observed in our investigation by an increase in angle of 2.5° (occlusal plane – SN plane) averagely in all the patients from T_0 to T_1 but was statistically not significant (p=0.311). Similar results were obtained from studies conducted by Nalbantgil, Arun and Sayinsu[14] who reported a clockwise rotation of occlusal plane with the use of Jasper Jumper fixed functional appliance with sectional arches which had similar statistical insignificant value. A study conducted by Malhotra, Negi and Mahajan[28] also reported a clockwise rotation of occlusal plane with the use of PowerScope fixed functional appliance. There was a statistically insignificant (p=0.588) increase in mandibular plane angle in our study by an average of 1.8°. This appliance can be used in low angle without any side effects resulting in downward and backward rotation of mandible which is usually seen after treatment with fixed functional appliances[9,10,14,16,21,25]

Wit's appraisal reduced by 3.2 mm and was statistically significant (p=0.008) and it was similar to the results observed by Paulose and George[27] where they evaluated the efficiency of PowerScope fixed functional appliance and found out that BO advanced in Wit's appraisal by 4 mm .

The dento-alveolar findings in the present study showed distalization of the upper molar by an average of 4.5 mm which was statistically significant (p=0.001). This finding was similar to the findings reported in the study conducted by Pancherz[11] where he found out that the upper molar distalized by an average of 4.5 mm and was statistically significant (p<0.05). Another study conducted by Aslan, Kucukkaraca and Turkoz[21] found out similar results where maxillary molar distalization took place by an average of 2.11 mm with the use of Forsus appliance which was a statistically significant finding (p<0.01).

The present study shows that mandibular molars moved mesially by 3.4 mm which did not reach statistical significance (p=0.021). This finding was dissimilar to the study conducted by Bassarelli T and Franchi L[24] where they found a mesial movement of mandibular molars which was statistically significant (p=0.011) with the use of Jasper jumper appliance. Other studies[16,18,20,24,26,28] on various fixed functional appliances also reported sagittal advancement of mandibular molars with statistically significant values (p≤0.05). This indicates that in our study the correction of class II molar correction was a combination of more distal movement of maxillary molars and less mesial movement of mandibular molars compared to the rest of the studies. Another significant finding was the intrusion of upper molars with an average intrusion to be found was 1.75 from T_0 to T_1. This result was in concordance with various other studies.[11,18,25] Pancherz[11] reported an intrusion of maxillary molar of 3.5 mm with the use of Herbst appliance with a statistically significant p value (p<0.05). A significant uprighting effect was seen on maxillary incisors in the present study but this uprighting was not statistically significant (p=0.190). The inclination of incisors reduced by 3.6° from T_0 to T_1. Nalbantgil D, Arun T and Sayinsu K[14] found similar results with reduction of the incisor inclination by 1.5° which was statistically insignificant. This result was similar to other studies conducted by various investigators who also found out significant reduction of the maxillary incisor inclination.[14,28]

As reported with other functional appliances, there was proclination of mandibular incisors by 2.9° observed in our study which was statistically not significant (p=0.251). The lower incisors moved forwardly by 1.8 mm in relation to apical base and was statistically significant (p<0.05). One of the reasons that our investigation did not show statistical significance in an increase in mandibular incisor proclination was due to the addition of 10° labial root torque in the archwire in mandibular incisor segment reducing the tendency of incisors to flare out. This side effect might have been due to the telescopic mechanism of PowerScope which exerts a mesially directed force on mandibular anteriors. This unfavourable outcome of fixed functional appliances cannot be totally prevented as the point of force application in mandibular anterior region is above the center of resistance of dentoalveolar unit.[15,28] Anchorage reinforcement by micro implants is being increasingly used with fixed functional appliances to limit this proclination.[21]

Overbite and overjet reduced by 1.4 and 3.5 mm respectively from T_0 to T_1 and was statistically significant (overjet - p<0.001, overbite - p<0.05), which was in concordance with other studies conducted by Nalbantgil D, Arun T and Sayinsu K[14] who also reported reduction in the overjet and overbite in their study. Cacciatore and Ghislanzoni[22] reported the Forsus fixed appliance group exhibited no significant sagittal or vertical skeletal changes, while significant improvements were recorded in overjet (3.8 mm), overbite (1.5 mm), and molar relationship (+3.7 mm) and concluded that the FRD protocol was effective in correcting Class II malocclusion mainly at the dentoalveolar level. Treatment effects of PowerScope fixed functional appliance in class II correction are not only a combination of skeletal and dentoalveolar effects but also such that affect the soft tissue. As has been reported with other appliances[14,28], there was a marked improvement in soft tissue profile in this study as well. Retroclination of maxillary incisors resulted in backward movement of upper lips by 0.4 mm thereby reducing the lip strain and increase in nasolabial angle by 0.5° but these differences in the readings were statistically insignificant (p=0.478 and 0.893, respectively). Also, there was an increase in mentolabial angle by 19.2° which was statistically significant (p<0.05). A mentolabial angle of approximately 107°-118° is deemed to be most attractive.[29] This result showed significant improvement in the profile aesthetics of the participants.

CONCLUSIONS

The treatment effects of the PowerScope in Class II correction were a combination of skeletal and dentoalveolar effects, as well as improvement in soft tissue. Extraction correction of Class II malocclusion due to functional mandibular retrusion should be avoided as it can lead to detrimental changes in the soft tissue profile of the patient. Such patients will be very well benefited by treatment using Class II correctors such as PowerScope. Excellent results can be achieved by limiting the side effects, minimizing the need for patient compliance, and avoiding appliance breakage. PowerScope could be one of the best treatment options for Class II correction, especially in noncompliant patients with a drastic improvement in the soft tissue profile and esthetic appearance of the patient by the sagittal forward displacement of mandible ensuring excellent long-term stable results.

REFERENCES

1. Graber TM, Rakosi T, Petrovic A. Dentofacial orthopedics with functional appliances. St. Louis: C.V. Mosby Co.; 1997.
2. McNamara Jr JA. Components of class II malocclusion in children 8-10 years of age. Angle Orthod 1981; 51:177–202.
3. Papadopoulos MA. Orthodontic treatment of the Class II noncompliant patient. Edinburgh: Elsevier Ltd; 2006.
4. Paulose J, Antony PJ, Sureshkumar B, et al. PowerScope a Class II corrector – a case report. Contemp Clin Dent 2016; 7(2):221–5.
5. Cozza P, Baccetti T, Franchi L, et al. Mandibular changes produced by functional appliances in Class II malocclusion: a systematic review. Am J Orthod Dentofacial Orthop 2006; 129(5):599.e1–12.
6. American Orthodontics. PowerScope™ 2 Class II Corrector [Internet]. Available from: http://www.americanortho.com/powerscope.html
7. Pancherz H. Treatment of Class II malocclusions by jumping the bite with the Herbst appliance: a cephalometric investigation. Am J Orthod Dentofacial Orthop 1979; 76:423–41.
8. Pancherz H, Hägg U. Dentofacial orthopedics in relation to somatic maturation. An analysis of 70 consecutive cases treated with the Herbst appliance. Am J Orthod 1985; 88:273–87.
9. Hansen K, Pancherz H, Hägg U. Long-term effects of the Herbst appliance in relation to the treatment growth period: a cephalometric study. Eur J Orthod 1991; 13(6):471-81.
10. McNamara Jr JA, Howe R, Dischinger TG. A comparison of the Herbst and Frankel appliances in the treatment of Class II malocclusion. Am J Orthod Dentofac Orthop 1990; 98:134–44.
11. Pancherz H, Anehus-Pancherz M. The headgear effect of the Herbst appliance: a cephalometric long-term study. Am J Orthod Dentofacial Orthop 1993; 103:510–20.
12. Pancherz H, Ruf S, Kohlhas P. “Effective condylar growth” and chin position changes in Herbst treatment: a cephalometric roentgenographic long-term study. Am J Orthod Dentofacial Orthop 1998; 114(4):437-46.
13. Manfredi C, Cimino R. Skeletal changes of Herbst appliance therapy investigated with more conventional cephalometrics and European norms. Angle Orthod 2001; 71:170–6.
14. Nalbantgil D, Arun T, Sayinsu K, et al. Skeletal, dental and soft-tissue changes induced by the Jasper Jumper appliance in late adolescence. Angle Orthod 2005; 75:382–92.
15. El-Sheikh MM, Godfrey K, Manosudprasit M, et al. Force-deflection characteristics of the fatigue-resistant device spring: an in vitro study. World J Orthod 2007;8(1)30–6.
16. Jones G, Buschang PH, Kim KB, et al. Class II nonextraction patients treated with the Forsus Fatigue Resistant Device versus intermaxillary elastics. Angle Orthod 2008;78:332–8.
17. Sood S, Kharbanda O, Duggal R, et al. Muscle response during treatment of Class II division 1 malocclusion with Forsus fatigue resistant device. J Clin Pediatr Dent 2011; 35(3):331–8.
18. Franchi L, Alvetro L, Giuntini V, et al. Effectiveness of comprehensive fixed appliance treatment used with the Forsus Fatigue Resistant Device Class II patients. Angle Orthod 2011; 81:678–83.
19. Aras A, Ada E, Saracoglu H, et al. Comparison of treatments with the Forsus fatigue resistant device in relation to skeletal maturity: a cephalometric and magnetic resonance imaging study. Am J Orthod Dentofacial Orthop 2011; 140:616–25.
20. Chhibber A, Upadhyay M, Uribe F, et al. Long-term stability of Class II correction with the Twin Force Bite Corrector. J Clin Orthod 2013; 44:363–76.
21. Aslan BI, Kucukkaraca E, Turkoz C, et al. Treatment effects of the Forsus Fatigue Resistant Device used with miniscrew anchorage. Angle Orthod 2014; 84:76–87.
22. Cacciatore G, Ghislanzoni LT, Alvetro L, et al. Treatment and post-treatment effects induced by the Forsus appliance: a controlled clinical study. Angle Orthod. 2014; 84(6):1010–7.
23. Servello DF, Fallis DW, Alvetro L. Analysis of Class II patients, successfully treated with the straight-wire and Forsus appliances, based on cervical vertebral maturation status. Angle Orthod 2015; 85(1):80–6.
24. Bassarelli T, Franchi L, Defraia E, et al. Dentoskeletal effects produced by a Jasper Jumper with an anterior bite plane. Angle Orthod 2016; 86(5):775–81.

25. Antony T, Amin V, Hegde S, et al. The evaluation and clinical efficiency of power scope: An original research. J Int Soc Prev Comm Dent 2018; 8(3):264–70.
26. Arora V, Sharma R, Chowdhary S. Comparative evaluation of treatment effects between two fixed functional appliances for correction of Class II malocclusion: A single-center, randomized controlled trial. Angle Orthod 2018; 88:259–66.
27. Paulose J, Antony PJ, Sureshkumar B, et al. PowerScope a Class II corrector – A case report. Contemp Clin Dent 2016; 7(2):221–5.
28. Malhotra A, Negi KS, Kaundal JR, et al. Cephalometric evaluation of dentoskeletal and soft-tissue changes with Powerscope Class II corrector. J Indian Orthod Soc 2018; 52(3):167–73.
29. Naini F, Cobourne M, McDonald F. Mentolabial angle and aesthetics: a quantitative investigation of idealized and normative values. Maxillofac Plast Reconstr Surg 2017; 39(1):3–7.

Лечебные эффекты несъёмного функционального аппарта „PowerScope“ – клиническое исследование

Анирудх Калра, Винит Суами, Виира Бхосале

Кафедра ортодонтии и дентофациальной ортопедии, Колледж дентальной медицины „Бхарати Видяпет“, Пуне, Индия

Адрес для корреспонденции: Анирудх Калра, Кафедра ортодонтии и дентофациальной ортопедии, Колледж дентальной медицины „Бхарати Видяпет“, Пуне, Индия; E-mail: dranirudhkalra90@gmail.com

Дата получения: 4 апреля 2020 ♦ **Дата приемки:** 21 октября 2020 ♦ **Дата публикации:** 30 апреля 2021

Образец цитирования: Kalra A, Swami V, Bhosale V. Treatment effects of “PowerScope” fixed functional appliance – a clinical study. Folia Med (Plovdiv) 2021;63(2):253-63. doi: 10.3897/folmed.63.e52892.

Резюме

Цель: Изучить скелетные и дентальные эффекты и оценить изменения в мягких тканях при применении несъёмного функционального аппарата PowerScope при неправильном прикусе II класса.

Материалы и методы: Это клиническое исследование было проведено в общей сложности у 10 пациентов (стадии развития шейных позвонков (CVMS) 3 и 4) с аномалиями прикуса II класса подкласса 1, которым было назначено лечение с использованием несъёмного функционального аппарата, и которые были выбраны на основе конкретных критериев включения. PowerScope (American Orthodontics) использовался в качестве несъёмного функционального аппарата для лечения. Воздействие аппарата на скелет, зубы и мягкие ткани с различными угловыми и линейными параметрами цифровой боковой цефалограммы оценивалось для всех 10 участников. Данные были собраны перед установкой PowerScope (T0) и через 5 месяцев при снятии устройства (T1). Все участники лечились по рецепту 0.018 × 0.025 МБТ (3M Unitek). Статистический анализ проводился с помощью t-критерия для двух зависимых выборок для сравнения индивидуальных средних изменений для каждой категории лечения.

Результаты: Статистически значимые изменения наблюдались в параметрах скелета, таких как положение передней нижней челюсти с увеличением угла SNB и расстояния между перпендикуляром и точкой Pog. (pogonion) как класс 2, связь между челюстью и основанием улучшилась за счет уменьшения угла ANB и оценки „Wits“.

Значительные изменения наблюдались в стоматологических параметрах, таких как переднее расположение резцов нижней челюсти, дистализация и интрузия моляров верхней челюсти с уменьшением соответственно прикуса и сагиттального межрезцового расстояния. В мягких тканях наблюдалось значительное улучшение профиля лица за счёт увеличения губного угла.

Заключение: Результаты этого исследования показали, что наблюдались статистически значимые изменения параметров скелета, зубов и мягких тканей.

Ключевые слова

неправильный прикус II класса, несъёмный функциональный аппарат, без удаления, PowerScope