

# PowerScope a Class II corrector – A case report

JOBY PAULOSE, PALATHOTTUNGAL JOSEPH ANTONY, BRIJESH SURESHKUMAR, SUSHA MARIAM GEORGE, MANU MUNDACKAL MATHEW, JOSEPH SEBASTIAN

## Abstract

Managing mild to moderate Class II malocclusion is a one of the common and major challenges to orthodontists. Class II discrepancies with mandibular deficiency during active growth are usually treated by myofunctional appliances. Fixed functional appliances evolved due to the noncompliance with conventional myofunctional appliances. This case report illustrates the efficiency of PowerScope in correction of skeletal Class II with mandibular deficiency in a patient aged 13 years who has reported to the department with a chief complaint of forwardly placed upper front teeth. This case with functional jaw retrusion was treated initially with MBT 0.022" prescription followed by PowerScope. Pre-, mid- and post-treatment cephalograms were obtained, and cephalometric analysis was performed. Stable and successful results were obtained with a substantial improvement in facial profile, skeletal jaw relationship, and overall esthetic appearance of the patient. A significant forward displacement of the mandible was the principal element for successful correction of Class II malocclusion. PowerScope provides the best results for Class II management, thus enables us to treat such cases by a nonextraction approach rather than contemplating extractions.

**Keywords:** Class II malocclusion, fixed functional appliance, nonextraction, PowerScope

## Introduction

Class II malocclusion presents a major and common challenge to orthodontists.<sup>[1]</sup> It may be a dental Class II or may have an unseen skeletal component.<sup>[2]</sup> Skeletal Class II jaw relation may be due to a prognathic maxilla, retrognathic mandible, or a combination of both. Mandibular retrognathism may be due to small mandible, posterior placement of condyle in glenoid fossa or may be due to functional retrusion of mandible. Management of Class II malocclusion depends entirely on the severity of the problem and the age at which the treatment is carried out. According to McNamara,<sup>[3]</sup> the most common characteristic of Class II malocclusion is mandibular retrusion, rather than maxillary prognathism. A functional appliance treatment for mandibular advancement is often advocated in Class II malocclusion due to mandibular retrusion.<sup>[4-7]</sup> In patients, who have not yet crossed the adolescent growth spurt, removable functional appliance such as activator,

bionator, Twin block, and Frankel may be used.<sup>[8]</sup> If the patient reports after the pubertal growth spurt or during the late stages of puberty fixed functional appliances such as fixed twin block, Jasper jumper, Herbst, Universal bite jumper, Ritto appliance, Eureka Spring, and Forsus fatigue resistant device (FRD) would be a better choice considering the patient compliance.


PowerScope is the latest innovation 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 [Figure 1].<sup>[9]</sup> This appliance addresses critical needs of the orthodontist including the patient comfort and acceptance, extensive range of motion, simple installation, and much more. No studies on treatment outcomes of comprehensive fixed appliance treatment combined with the PowerScope in Class II patients have been reported so far. This paper presents a nonextraction approach in the treatment of skeletal Class II using the PowerScope.

## Appliance design

PowerScope is delivered as a one size fits all appliances preassembled with attachment nuts for quick and easy chairside application.<sup>[9]</sup> The appliance allows intermaxillary

*Department of Orthodontics, Mar Baselios Dental College, Kothamangalam, Kerala, India*

**Correspondence:** Dr. Joby Paulose,  
Department of Orthodontics, Mar Baselios Dental College,  
Kothamangalam, Kerala, India.  
E-mail: drjobypaulose@gmail.com

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wire-to-wire installation using a nut with hexagonal screw. Ball and socket joint to maximize the lateral movements improving patient comfort. The appliance consists of a telescopic mechanism consisting of inner shaft/push rod, middle and outer tubing, between middle tubing and outer tubing. There is a nickel-titanium (NiTi) spring delivering constant 260 g force.<sup>[9]</sup> This appliance delivers unmatched patient comfort, eliminates the need for headgear tubes or special band assemblies, and can be used with either banded or bonded molar tubes.

### Appliance insertion

Unlike other Class II correctors, there was no need for assembly, taking measurements or appliance manipulation. The appliance allows wire-to-wire installation with attachments placed mesial to the first molar in the maxillary arch and distal to the canine of the mandibular arch generating a horizontal directed force [Figure 2]. This could also yield a slight intrusive force component to maxillary molars.

### Appliance activation

Activation dot marking for visual reference is provided at the push rods of the appliance (right and left) as shown in the diagram which helps us to determine if the appliance is activated or not. If the dot mark is exposed, it indicates the appliance is inactive and to reactivate the appliance crimpable shims are added to the shaft.

### Case Report

A 13-year-old female presented with a chief complaint of forwardly placed upper front teeth. Clinical examination revealed convex profile with posterior divergence, recessive chin, lip incompetence, and protrusion of the upper lip [Figure 3a and b]. The patient presented a Class II, Division 1 malocclusion with an overjet of 9 mm and an overbite of 6 mm.

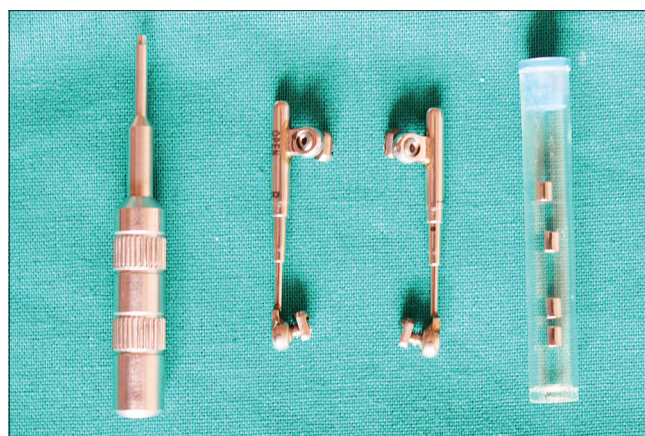
Cephalometric analysis revealed a convex skeletal profile with ANB angle of 7°, a severely retruded mandible, and a well-positioned maxilla [Figure 4a and Table 1]. Dentoalveolar readings suggested proclined upper anterior teeth with mild retroclination of mandibular incisors. The mandibular plane angle was normal, suggesting an average growth pattern. Hand-wrist X-rays indicated that the patient's growth was not completed.

### Treatment objectives

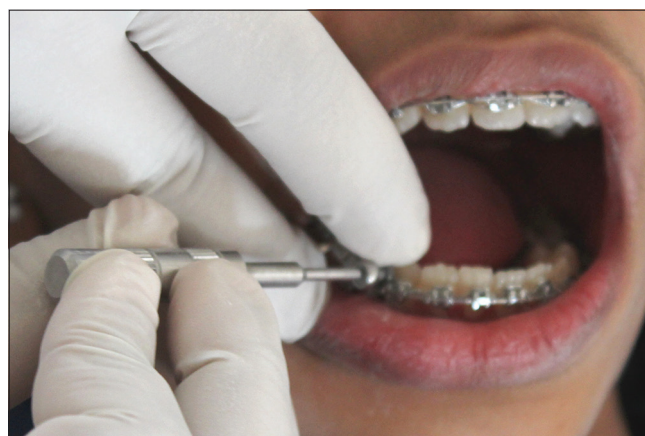
1. Obtain asymmetrical Class I occlusion ruling out extractions
2. Improve facial profile by accentuating mandibular growth
3. Restrict maxillary growth in sagittal and vertical plane
4. Avoid any undue backward rotation of the mandible.

### Treatment plan

A nonextraction approach was planned using MBT 0.022" slot preadjusted appliance. After leveling and aligning,



**Figure 1:** PowerScope appliance armamentarium consisting of telescopic push rods (right and left), hexagonal screwdriver, and crimpable shims



**Figure 2:** PowerScope insertion



**Figure 3:** (a and b) Pretreatment extraoral photographs

PowerScope was chosen to advance the mandible into a Class I relationship followed by finishing and detailing.

### Treatment progress

Treatment was started using 0.014" NiTi in both arches. Leveling and alignment was completed in 7 month time



period and 0.019" × 0.025" stainless steel wire was placed in both the arches. This was followed by mandibular advancement using PowerScope appliance [Figure 5a-f].

A 5° labial root torque was given in mandibular archwire to prevent the flaring of the lower anterior. A substantial improvement in the patients profile was noted after the mandibular advancement. Since the appliance was anchored onto the orthodontic wire, no debonding of lower canine

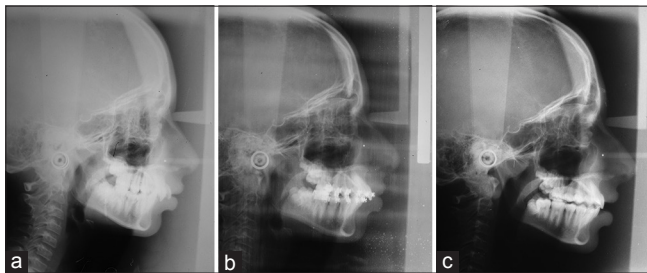
bracket/upper buccal tube was observed during the treatment with PowerScope appliance. Overall treatment was uneventful.

## Discussion

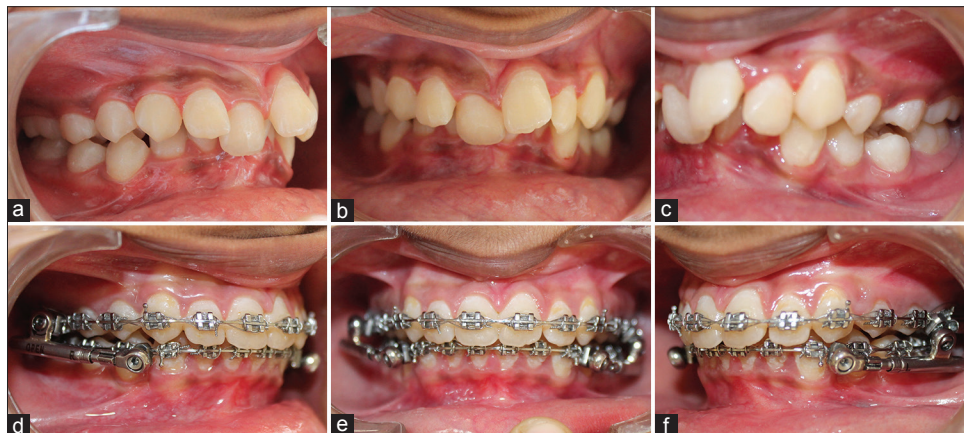
Among all malocclusion, Class II malocclusion presents a constant challenge to the orthodontists.<sup>[10]</sup> Many treatment approaches and various appliances have been endeavored for correcting the Class II malocclusion which can be as a result of skeletal abnormalities. Class II malocclusions due to mandibular retrusion are most commonly treated with functional orthodontic appliances. A functional appliance creates orthopedic force directed at the mandibular condyle. These appliances produce skeletal correction by initiating remodeling changes at the mandibular condyle and glenoid fossa as well as, repositioning the mandibular condyle in the glenoid fossa and autorotation of the mandibular bone.<sup>[11]</sup> They can be of two types – removable or fixed appliances. Among fixed functional appliance, PowerScope has been added to the inventory recently by American Orthodontics. Literature is abundant with studies on many fixed functional appliances such as Jasper jumper, Herbst, Universal bite jumper, Eureka Spring, and Forsus FRD, but no reports are currently available with regard to PowerScope.<sup>[12-15]</sup> The case discussed here was treated with PowerScope considering its advantage over the conventional ones. The PowerScope was a fixed one-piece appliance available in one size suiting all Class II patients when compared to the ones used until now. One piece concept prevents the dislodgment of the appliance on various jaw movements. Moreover, the size selection, ordering the appliance, and delay in receiving the appliance could be all avoided as the appliance is unisized. Customization of the appliance could be done with the help of crimpable shims supplied along with PowerScope armamentarium. The appliance allows the quick and easy wire-to-wire installation preventing bond failures of bracket and buccal tube. The ball and socket joint at the two ends of the appliance allows excellent jaw movements reducing much of patient discomfort. This paper illustrates the skeletal, dental, and soft tissue changes after treatment with PowerScope fixed functional appliance. Moreover, we have attempted to enumerate the advantages of

**Table 1: Skeletal changes in sagittal plane at pre-treatment, Leveling & Aligning and post-treatment**

Parameters considered	Pre-treatment	Leveling & Aligning	Post-treatment
SNA	810	810	810
SNB	740	750	790
ANB	70	60	20
Beta angle	270	270	300
Wits	BO behind AO by 6mm	BO behind AO by 6mm	BO behind AO by 1mm
<b>Skeletal change in maxillary and mandibular length</b>			
Maxillary	53	53	53
Mandibular	75	75	78
Maxillary	91	91	91
Mandibular	111	112	114
Ramus length	58	58	60



**Figure 4:** (a-c) Pretreatment, leveling and aligning, and posttreatment lateral cephalogram



**Figure 5:** (a-f) Before and after PowerScope insertion

this appliance over the conventional ones based on our clinical experience.

**Table 2: Skeletal changes in vertical plane at pre-treatment, Leveling & Aligning and post treatment**

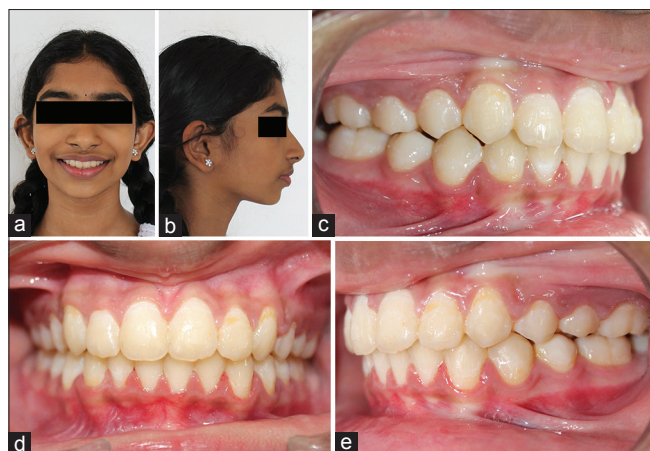
Parameters considered	Pre-treatment	Leveling & Aligning	Post-treatment
GoGn-SN	300	310	320
Basal plane angle	250	250	250
Y-Axis	630	630	660
FMA	240	240	250
Lower gonial angle	670	670	680
Sum of 3 angles	3850	3850	3870

**Table 3: Cephalometric assessment of dental and soft tissue pre-treatment Levelling & aligning and post-treatment**

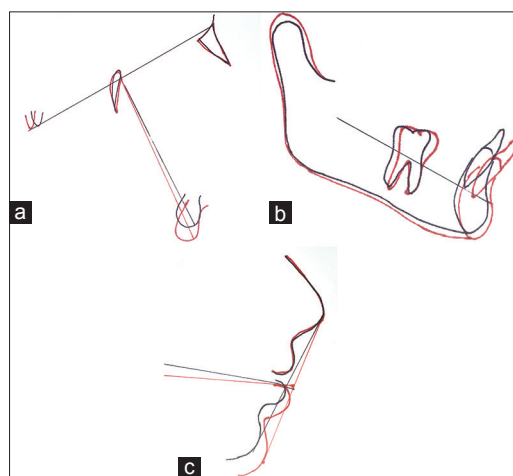
Parameters considered	Pre-treatment	Leveling & Aligning	Post treatment
<b>Maxillary incisor</b>			
U1-NA (Angle)	32°	25°	25°
U1-NA(MM)	6mm	5mm	5mm
U1-SN(Angle)	110°	103°	103°
U1-FHP	114°	108°	108°
<b>Mandibular incisors</b>			
IMPA ANGLE	95°	98°	100°
L1-NB ANGLE	24°	27°	28°
L1-NB (MM)	4mm	5.5mm	6mm
Interincisal angle	112°	124°	122°
LI- Pog LINE	0mm	2mm	3mm
<b>Soft tissue</b>			
Nasolabial angle	90°	95°	95°
E Line-U LIP	2mm	0mm	0mm
E Line-L LIP	-2mm	-1mm	1mm

On comparing the cephalometric outcomes, a considerable improvement in skeletal, dental, and soft tissue parameters was observed at the end of PowerScope treatment [Figure 4a-c and Tables 1-3]. The entire period of treatment with PowerScope was uneventful. The posttreatment cephalometric measurements revealed favorable sagittal skeletal changes. No change in SNA angle (81°) was observed all throughout the treatment. A mandibular advancement was clearly evident as SNB angle increased from 74° to 79° and a 5° reduction in ANB angle and 4 mm advancement of BO in Wit's appraisal was observed. Beta angle increased by 3° (from 27° to 30°). There was an increase in Schwarz mandibular length by 3 mm (75–78 mm) after PowerScope correction [Table 1]. A mild increase in lower facial height within normal limits was noticed at the end of the treatment as shown in Table 2.

The maxillary incisors angulation remained unchanged whereas mandibular incisors proclined by 2 mm linear and 4° angular after PowerScope correction [Table 3]. The slight proclination at the end of the treatment could be attributed to the force concentrated in the lower anterior segment during fixed functional appliance treatment. However, the use of MBT brackets (−6° torque in the lower incisor), molar to molar consolidation in both arches, cinching off the lower archwire, and use of pretorqued wire before insertion of the PowerScope has helped us to counteract the protrusive effect on mandibular incisors. A near to normal interincisal angle was established. A substantial improvement in soft tissue was appreciated with a tendency toward an orthognathic profile [Figure 6a-e]. The lower lip relation to E line improved greatly from −2 mm to −1 mm. Upper lip to E line along with nasolabial angle also showed substantial improvement. The treatment could thus accomplish a well-balanced face with a pleasant smile which could be well ascertained from the superimposition of soft tissue and hard tissue [Figures 6a, b, and 7a-c]. The results were stable and extremely satisfying for both the clinician as well as the patients.



**Figure 6:** (a-e) Posttreatment extraoral and intraoral photographs after mandibular advancement with PowerScope



**Figure 7:** (a-c) Hard tissue and soft tissue superimposition

The advantages of PowerScope appliance as per our experience could be enumerated as follows:

1. Fixed one-piece appliance available in one size suiting all Class II patients
2. Require no laboratory setup
3. Quick and easy wire-to-wire installation
4. Compliance free
5. Internal NiTi spring delivers 260 g of force for continuous activation during treatment
6. No headgear tube or special band assemblies required
7. Can be used with banded or bonded molar tube
8. No bond failure of canine bracket or buccal tube
9. Low profile and less bulky for more esthetic facial appearance
10. Smooth, rounded patient-friendly design for better patient comfort
11. Easy to clean – better oral hygiene
12. Ball and socket joint allowing maximum lateral movement
13. Telescopic device that does not displace or disengage during treatment.

## Conclusion

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.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published

and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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