



REVIEW ARTICLE

POWERSCOPE- NON-COMPLIANCE CLASS II CORRECTOR- A REVIEW

*Dr. Indu Dhiman and Dr. Priyanka Dhiman

Orthodontics and Dentofacial Orthopaedics, India

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ABSTRACT

Treatment of Class II malocclusion continues to be a great challenge that orthodontists face in day to day clinical practice. In order to succeed, it is very important to have the most effective tool. One of the latest evolution in Class II correctors is the PowerScope which is manufactured by American Orthodontics in conjunction with Dr. Andy Hayes. This intermaxillary Class II corrector appliance was developed to address the critical needs of the orthodontist, including patient comfort and acceptance, extensive range of motion, and simple installation. PowerScope provides one of the best non extraction treatment options for non-compliant patients. The appliance is a 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. So the objective of this article is to review the details about PowerScope which is the latest innovation in the non compliant class II Correctors.

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INTRODUCTION

Class II malocclusion is most frequently encountered malocclusion in our day-to-day clinical practice. Treatment options for class II malocclusion depends upon various factors such as the severity of the malocclusion and the age at which the patient reports for the treatment. (Paulose *et al.*, 2016) Accordingly, the treatment plan for class II malocclusion can either be extraction or non- extraction. For non- extraction treatment options are either functional appliances when there is growth phase or fixed functional treatment option during the deceleration phase or when the growth has been completed. Numerous orthodontic techniques and appliances have been introduced to treat the Class II malocclusion. Although the biological understanding and advancements in treatment mechanics have substantially improved the efficiency of the orthodontic treatment. (Papadopoulous, 2006) However, its outcome is still to a large extent depends on the patient's compliance. It is recognized that compliance is a problem with a considerable challenge in orthodontic patient's management. Orthodontic treatment in patients with limited compliance can result in a longer treatment time, destruction of the teeth and periodontium, extraction of additional teeth, frustration for the patient, and additional stress for the orthodontist. (Southard *et al.*, 1991) During the last decades, many appliances and techniques that reduce or minimize the need for patient compliance have been introduced in order to correct Class II malocclusion. Popular treatment approach for the correction of

skeletal class II malocclusion with retruded mandible is that of growth modulation through the use of various functional appliances, provided the patient is in the pubertal growth phase (Savanna *et al.*, 2016). Numerous functional appliances aimed to redirect mandibular growth by forward posturing of the mandible is currently available to correct this type of skeletal and occlusal disharmony. (Cozza *et al.*, 2006; Chen *et al.*, 2002) During the period of active growth, myofunctional appliances like the Activator, Bionator, Frankel's regulator and the twin block are used as Class II correctors. (Papadopoulous, 2006) While during the deceleration stages of growth, the use of fixed functional appliances like fixed twin block, Jasper Jumper, Herbst, universal bite jumper, Forsus FRD, PowerScope etc. are commonly being prescribed to the patient. (Ritto and Ferreira, 2000) The fixed functional appliances has recently been gaining immense popularity as "non-compliance Class II correctors" because they are highly useful in non-compliant patients as these appliances are impossible to remove by the patients themselves. Hence, it permits better control by the orthodontist. So the objective of this article to focus on PowerScope a new innovation in non-compliance class II correctors.

Power scope

The PowerScope is the latest innovation in Class II correctors. Dr. Andy Hayes (B.S., D.D.S. and M.S.D. degrees from Indiana University) worked in conjunction with American Orthodontics to develop the Power Scope. (Keerthi *et al.*, 2016; <http://www.americanortho.com/PowerScope> brochure) It is a semirigid telescoping system which stands on the desired treatment planning of the orthodontist which includes patient

*Corresponding author: Dr. Indu Dhiman (MDS),
Orthodontics and Dentofacial Orthopaedics, India.
Contributing Author :-Priyanka Dhiman (BDS)

comfort and acceptance, extensive range of motion and simple installation. (<http://www.americanortho.com/PowerScope> brochure)

Components of PowerScope (Fig.1)

The components of power scope divided into two parts :-

- a) Main parts of PowerScope
- b) Accessories of PowerScope

Main parts of PowerScope

- **Locking nut attachment.** The attachment nut has a slot that is closed with the screw thread, so the screw forms a fourth surface to capture the wire when tightened.
- **Telescopic system.** An 18mm telescoping mechanism.
- **Hex-head screws.** Situated at the upper and lower ends of the telescopic system, they are located inside a metallic cavity and it is impossible to remove them. They form a spheroidal joint that allows ample movement of the jaw.
- **NiTi spring.** An internal spring that produces 260 grams of force.

Accessories of Power Scope

- **Crimpable shims.** Available in 1mm, 2mm or 3mm, they can be used to set the initial activation, or reactivate the appliance during the treatment.
- **Hex-head driver:** It's allen-type to tighten the screws.
- **Driver Magnets:-** Magnetic sleeve slides onto driver for secure hold of appliance(part of PowerScope 2) [Fig 14]

Factors considered during case selection

- Indicated for use in treating Class II Malocclusions during orthodontic treatment of both growing and non-growing patients with full permanent dentition.
- Patient with horizontal or average growth pattern with retruded mandible.
- Patient with positive Visual Treatment objective.
- Patient with the average axial inclination of upper and lower incisors.

Placement of Powerscope:-(Fig2)

PowerScope is delivered as a one-size-fits-all appliance with right and left pre-assembled arm with attachment nuts for quick and easy chairside application. The appliance is a 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. (Fig. 3) To start with the placement of the appliance, first engage the maxillary attachment nut using the hex head driver and place it on the mesial to the first molar on the maxillary rectangular stainless steel arch wire, preferably a 17x25 (.018 slot) or a 19x25 (.022 slot) cross section for maximum fit and stability of appliance. After placing the appliance apply downward force on the attachment nut than rotate onto the wire until it get snapped into the place (Fig4). After that engage the mandibular attachment nuts using hex head driver and place the attachment nuts distal to the canine onto mandibular rectangular stainless steel arch wire and then tighten the screw. (Fig. 5)

Points to be noted during placement

- Attachment nuts should not pinch the wire when installed. Attachment nut should hang on the wire and screw acts as the fourth wall to capture the wire when tightened. (Fig. 6)
- Place the finger on top of the attachment nut to provide stability to the nut mechanism when tightening the screw.(Fig7)
- Reverse Thread Assembly (left direction tightening) on right side screw attachments avoids screw back-out during treatment. Right side appliance has markings which indicates the direction in which the appliance get loosened.(Fig 8)
- Ensure that the screw tip does not extend past attachment nut before engaging the
- wire.(Fig 6 and 9)

Activation of the appliance

To determine the appliance activation there is visual aid in the form of Dot marking on the appliance. (Fig10) If it is exposed in occlusion, add crimpable shims to reactivate Power Scope appliance. (Fig. 11) For further activation and advancement during treatment, apply crimpable shims to the appliance. When the patient returns for the next appointment, ask him or her to bite in maximum intercuspation, pull back the middle tube with an instrument such as a dental probe, and check how much it moved or the amount of pushrod uncovered (Fig. 12). This is the quantity that must be reactivated. Fill the gap created on the lower pushrod with shims, taking care to not over-activate and reposition the mandible. (Moro, 2016)

Removal of the appliance

- Unscrew lower mandibular attachment nut using the hex head screw until it get disengaged from the arch wire.
- Then unscrew the upper maxillary nut attachment until it also get disengaged from the main arch wire.
- After that the appliance has been removed from patient's mouth and discarded.

Indications

- Class II correction with dentoalveolar compensation of occlusion (Class II elastics effect)
- Class II division 1 malocclusions
- Class II division 2 malocclusions
- Unilateral correction of Class II
- Asymmetric cases - midline correction
- Distalizing upper posterior teeth (headgear substitute)
- Mini-screw alternative - anchorage for mandibular arch space closure (aplasia)
- Aid with opening space for future implants
 - Anterior maxilla
 - Posterior mandible

Contraindications

- PowerScope Class II Corrector is contraindicated for use with patients who have a history of severe allergic reactions to nickel.
- Patient with proclined lower incisors and vertical growth pattern.
- Patient with compromised periodontium or absence of complete permanent dentition



Figure 1. PowerScope and its components



Figure 2. Anterior view of placed PowerScope

Advantages

PowerScope is a simple, efficient, Class II corrector with the following unlimited advantages:-



Figure 5. How to engage PowerScope on mandibular arch wire distal to canine



Figure 3. Wire to wire installed PowerScope



Figure 6. Position of Attachments nuts at the time of placement

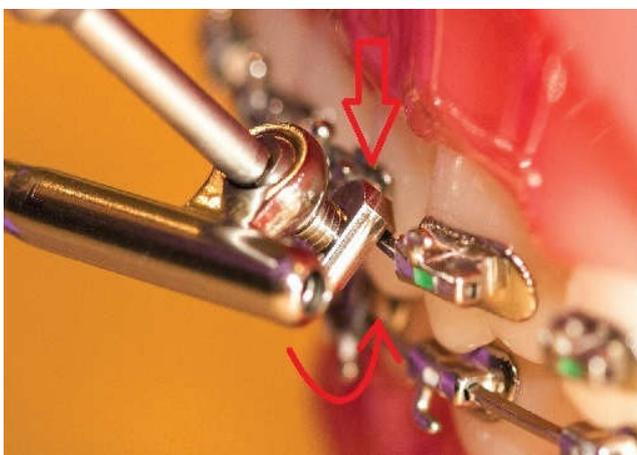


Figure 4. Showing how to engage PowerScope on maxillary arch wire mesial to first molar



Figure 7. Finger position at the time of placement



Figure 8. Reverse thread assembly

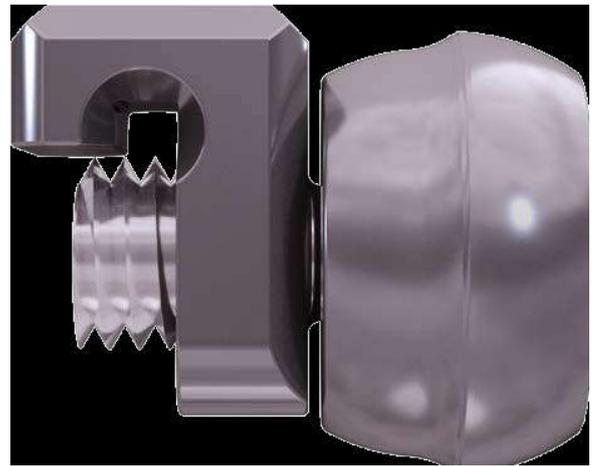


Figure 13. Redesigned attachment of PowerScope2

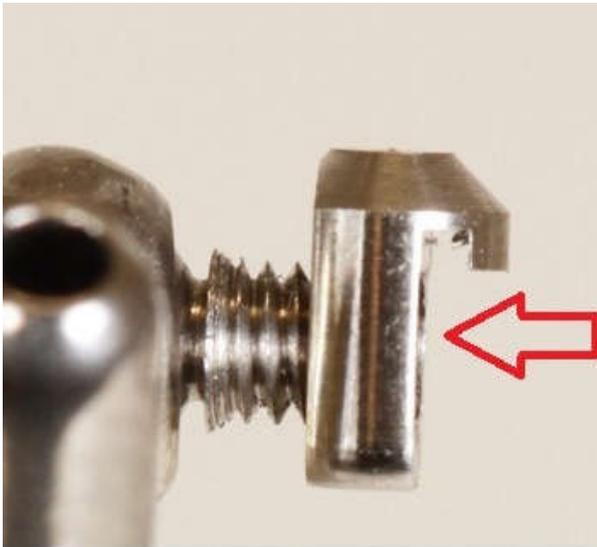


Figure 9. Correct position of screw tip at the time of placement



Figure 14. Magnetic sleeve (Accessory part of PowerScope2)



Figure 10. Dot marking on the Appliance

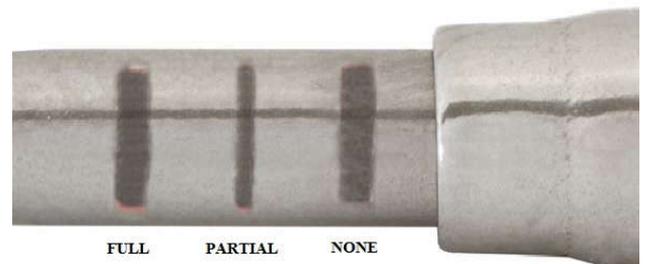


Figure 15. Three Activation lines marked on middle tube of PowerScope2



Figure 11. Crimpable shims

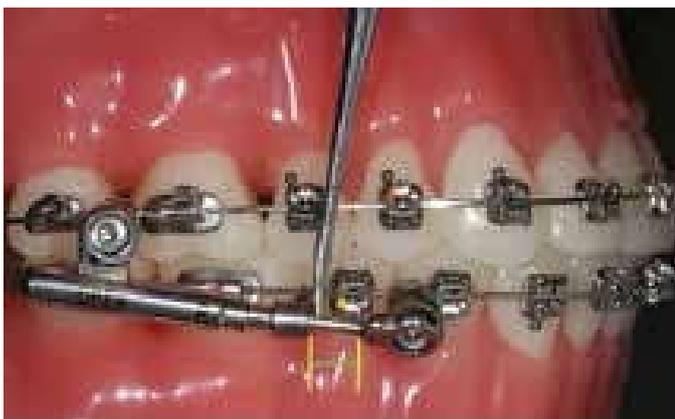


Figure 12. Activation of the appliance

Patient-Friendly Design

Its smooth, rounded design provides better patient comfort. As there is no piston extending distally from the upper molars, so there will be no ulceration on the cheek mucosa.

Ready to Use

PowerScope goes from package to treatment in just seconds, and unlike other Class II correctors, there's no need for assembly, measuring and no need of laboratory assistance.

Hex Head Screws

These screws allow safe and easy appliance delivery along with this reverse screw thread assembly minimizes screw loosening during the treatment.

18mm Telescoping Mechanism

This 18 mm durable telescoping design will not disengage during the treatment which will avoid unnecessary emergency visits of the patient.

Nickel titanium Internal Spring Mechanism

Internal spring is made up of Nickel titanium which provides force of 260gm during its activation which will reduce the treatment time.

Ball and Socket joint

Such unique joint design improves the patient comfort and acceptance as it maximizes the freedom for the lateral movement.

Wire Attachment Nuts

Simple wire-to-wire installation reduces inventory of special band attachments and headgear tubes and it can be used with either banded or bonded molar tubes.

Disadvantages

- Side effects of pushing mechanism may result in intrusive forces that are placed on teeth
- Proclination of lower incisors
- Minimal tendency for the maxillary molars to procline buccally
- Possible rotation of lower canines

How to prevent increase in the axial inclination of lower anterior teeth or the opening of spaces distal to the canines?

The lower dentition should be stabilized by one of the following methods

- Cinching of the lower arch wire
- Elastic chain should be used on lower arch wire.
- Arch locks/stops posteriorly should be used.
 - Significant negative torque brackets (-6 to -10 degrees) for lower anterior teeth
 - Steel ligatures should be used for lower canines to prevent their rotation during the treatment
 - Use of non-convertible molar tubes on maxillary first molar.

Modified power scope: - powerscope2

PowerScope 2 provides the same Class II correction as the master power scope but the ease of use by the orthodontist and the patient comfort has been increased through the introduction of the following modifications (<http://www.americanortho.com/PowerScope2> brochure).

Improved Attachment

Redesigned attachment nut increases durability and ease of installation. (Fig13) Power scope is modified in the form of rectangular slot installed in the attachment nuts instead of round configuration of the slot in the earlier power scope so that there will be more stability as well as ease during the installation of the appliance.

New Magnetic Feature

Another modification that has been introduced is the magnetic sleeve. Magnetic sleeve slides onto driver for secure hold of appliance during installation. (Fig14) It is placed on the non-metallic counter top with conical chamfer slot opening facing up. After that the Hex Head Driver is held over the magnet and the slot opening is approached while pointing driver tip to the center of the hole. Magnetic sleeve will seat itself on driver tip due to the magnetic forces.

Activation Lines

Three distinct lines provide a clear visual reference to aid in activation of the appliance instead of the DOT marking in the master PowerScope. To facilitate the activation control of the spring, visual activation lines were introduced in PowerScope2. This consists of three marks on the middle tube spaced 2mm apart. (Fig 15) Depending on the teeth size and the Class II severity, it can be necessary to use spacers at the initial installation to activate the appliance. When patient is in maximum intercuspation and the three marks appear, it means that the spring has no activation. When two marks appear, it means that the spring has a partial activation. When the marks do not appear, it means that the spring has a full activation.

Conclusion

PowerScope provides one of the best non extraction treatment options for class II situations due to functional retrusion of the mandible, especially for non-compliant patients. Thus it brings a new evolution in the non compliance class II correctors through its extensive range of motion, and simple installation.

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