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Case Report

Efficient way for correction of sagittal problems with powerscope – A case report

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ABSTRACT

In orthodontics, the most prevalent sagittal problem is Class II malocclusion, which affects one-third of the population. During active growth, myofunctional appliances are usually used to address sagittal discrepancies associated with the retruded mandible. Due to non-compliance with traditional myofunctional appliances, fixed functional appliances have been developed. Powerscope appliance is used to successfully manage the growing skeletal class II malocclusion for the correction of skeletal and dental parameters. The patient's profile dramatically showed improvement with the reduction in ANB angle by 4° degrees.

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1. Introduction

Fixed functional appliances have experienced a significant level of success and popularity since Hans Pancherz reintroduced Emil Herbst's functional appliance as a mandibular advancement appliance in Class II cases.¹ They need not require patient compliance and provide constant force delivery for effective functioning, making them more suitable in circumstances when a limited percentage of growth remains.² The skeletal imbalance induced by such a combination, functional appliance therapy should be used in conjunction with conventional orthodontic treatment.^{3,4} In general, for the management of retrognathic mandible in adolescent individuals, fixed functional appliances have been primarily advocated. This article highlights the use of fixed functional appliance as a "Class II noncompliant corrector" in an adult without the use of Class II elastics. PowerScope, a direct derivation of the Herbst Type II appliance, is the most recent invention in the management of class II malocclusion. In 2014, Dr. Andy Hayes worked

with American Orthodontics to develop PowerScope.¹

2. Design and Working of Powerscope

PowerScope provides Class II correction with an unsurpassed mix of patient comfort and ease of use that no other appliance can match. It is a ready-to-use chair side solution that does not require laboratory installation, simplifying and expediting the installation procedure and appointment. It is made up of the following components, according to American Orthodontics.²

1. A strong 18 mm telescope mechanism that does not detach during therapy, thus reducing unnecessary hospital visits.
2. Reverse Screw Thread Assembly decreases screw loosening during treatment, and the hex head design ensures safe and simple appliance insertion.
3. Ball-and-socket joint with maximum lateral movement to increase patient comfort and acceptability.

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4. Spring Mechanism with NiTi delivers two hundred and sixty grams of force, thus reduces the treatment time.
5. The locking nut attachment has recently been upgraded to improve durability.^{5,6}

3. Case Report

A 16-year-old male patient reported to the department of orthodontics and dentofacial orthopedics with the chief complaint of forwardly placed upper front teeth. On extra oral examination, it was observed that the patient had a mesomorphic face, convex profile, and potentially incompetent lips. Intraoral examination revealed class II molar relation on the left side and right side. Canine relation was end on both sides with an increased overjet of 14 mm. Figure 1 shows pre treatment intraoral and extraoral photographs.



Fig. 1: Pre-treatment photographs

The temporomandibular joint was found to be normal in function, with a backward path of cl according to cephalometric study. His growth status was CVMI stage 5 (10-25%), indicates only small amount of growth is left. According to cephalometric analysis patient had an orthognathic maxilla and retrognathic mandible with horizontal growth pattern and proclined upper incisors suggest a class II skeletal base. (Figure 2)

3.1. Treatment objectives

1. Improve facial profile by accentuating mandibular growth
2. Restrict maxillary growth in sagittal plane.
3. To achieve class I canine and molar relation bilaterally.
4. To achieve ideal overjet and overbite.
5. To correct upper incisor proclination.
6. To achieve lip competency.

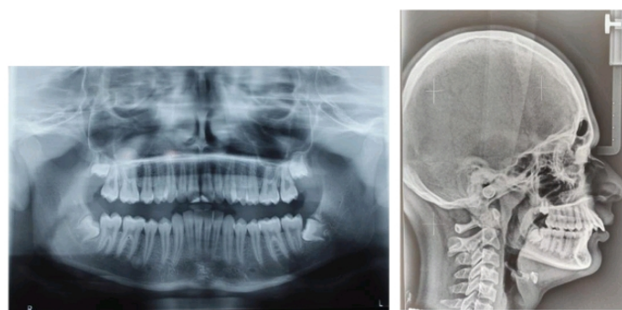


Fig. 2: Pre-treatment radiographs

3.2. Treatment plan

A non-extraction treatment approach with fixed mechanotherapy (MBT 0.022" slot) was planned. Powerscope was chosen to advance the mandible after leveling and alignment of teeth, followed by finishing and detailing.

3.3. Treatment progress

Maxillary and mandibular arches are bonded with a 0.022"MBT prescription a (American orthodontics) and first molars are banded. Transpalatal arch for maxillary arch was placed to augment the molar anchorage. Initial alignment wires progressed from 0.016 NITI, 0.018 SS, 0.17×0.25 NITI to finally 0.019×0.25 SS wire. (Figure 3)



Fig. 3: Intraoral photographs after 0.019×0.25 SS wire stage

At this stage, a powerscope appliance was inserted to correct the class II skeletal base. (Figure 4). The Powerscope appliance was used for six months. (Figure 5 depicts a radiograph taken during appliance insertion). 0.016 ss wire was inserted in the upper arch, settling elastics was given for final finishing and detailing of the occlusion.

3.4. Appliance insertion

Unlike other Class II correctors, powerscope does not require any measurements or appliance manipulation. The appliance is made up of a telescopic mechanism that includes an inner shaft/push rod, middle and outer tubing, and a nickel titanium (NiTi) spring that delivers a constant 260 g force between the middle and outer tubing. This

allows for wire-to-wire installation with attachments in the maxillary arch mesial to the first molar and distal to the canine in the mandibular arch, resulting in a horizontally directed force. This may cause a minor intrusive force component to the upper molars.

3.5. Appliance activation

The appliance's push rods (right and left) incorporate activation dot markings for visual reference, which aid in determining whether the appliance is activated or not. If the dot is exposed, it signifies that the appliance is inactive, and crimpable shims are put into the shaft to reactivate the device.⁷



Fig. 4: Insertion of powerscope

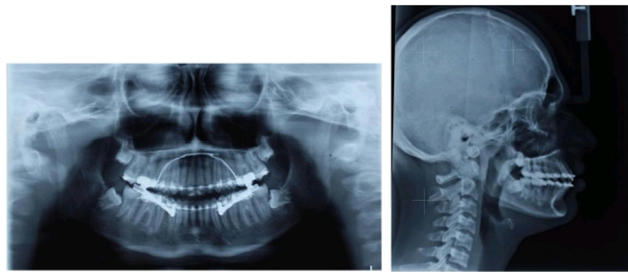


Fig. 5: Radiographs after insertion of powerscope

3.6. Treatment results

The achievement of lip competency significantly improved the patient's facial profile. The teeth were aligned with the ideal overjet and overbite. A class I canine and molar relationship was established by the end of the treatment. (Figure 6)

Figure 7 shows significant improvement in the anteroposterior skeletal relationship and the basal dentoalveolar relationship with slight proclination of lower incisors. Panoramic radiography revealed adequate root parallelism with no evidence of root resorption. Table 1 shows pre and post treatment cephalometric values. Figure 8 shows the superimposition of pre and post treatment cephalogram.

4. Discussion

Powerscope, the effective class II corrector is used in this patient to correct sagittal discrepancy due to functional jaw retrusion. Cephalometric analysis shows significant



Fig. 6: Post-treatment photographs

Table 1: Pre and post-treatment cephalometric values

Parameters	Pre treatment	Post treatment
SNA	83°	83°
SNB	76°	80°
Wits appraisal	AO is ahead of BO by 5mm	AO is ahead of BO by 3mm
Mandibular length(Go-Pg)	62mm	62mm
FMA	16°	22°
SN-MP	28°	25°
U1-NA(linear)	9mm	6mm
U1-NA(angle)	32°	28°
L1-NB(linear)	4mm	6mm
L1-NB(angle)	20°	26°
U1-SN	28°	25°
IMPA	97°	102°
E-line	Both upper & lower lips within E line	Both upper & lower lips within E line

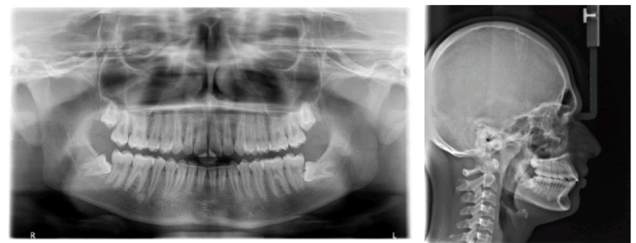


Fig. 7: Post -treatment radiograph

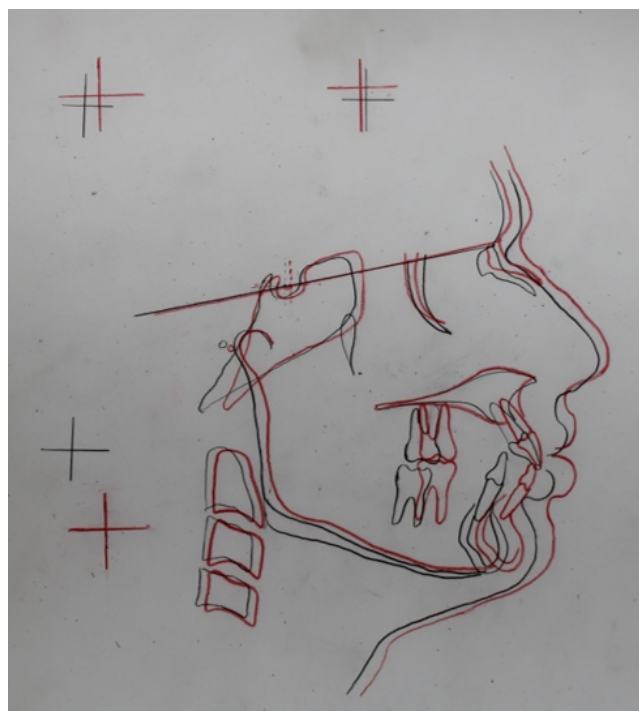


Fig. 8: Superimposition of pre-treatment (black) and post-treatment (red) cephalogram

improvement in skeletal and dental parameters. Post treatment cephalometric revealed significant improvement in sagittal plane. On comparing cephalometric values SNB angle increased from 76° to 80° .

The maxillary incisor's angulation decreased by 3 mm linear and 4° angular, whereas mandibular incisors proclined by 2 mm linear and 6° angular after correction. A slight proclination at the end of fixed functional appliance treatment may be due to force centered in the lower anterior segment. However, we were able to reduce the protrusive effect on mandibular incisors by using MBT brackets (3° torque in the lower incisor), molar to molar consolidation in both arches, and cinching off the lower archwire. An interincisal angle that was close to normal was established.

5. Conclusion

For the correction of skeletal mandibular retrognathism extraction of teeth should be avoided because it may alter the soft tissue profile of the patients. Generally fixed functional appliances are used to treat such patients. Excellent results are achieved with minimal patient

compliance and side effects. The sagittal displacement of the mandible by PowerScope improves the skeletal relationship as well as profile of the patients, hence assuring long-term stable results.^{6,7}

6. Source of Funding

None.


7. Conflict of Interest


None.

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