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Reality of fixed functional appliance in correction of class II malocclusion- A Case Report

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KEYWORDS

Class II malocclusion, fixed functional appliance, non-extraction, esthetic

ABSTRACT:

Introduction: 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.

Objectives: This case report illustrates the efficiency of PowerScope 2 in correction of skeletal Class II with mandibular deficiency.

Methods: Pre- and post-treatment cephalograms were obtained, and cephalometric analysis was performed.

Results: 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.

Conclusions: PowerScope 2 provides the best results for Class II management, thus enables us to treat such cases by a nonextraction approach rather than contemplating extractions.

1. Introduction

Class II malocclusion presents a major and common 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 great challenge that orthodontists face daily in clinical practice and 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, the use of fixed functional appliances like 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 the 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 group of patients who fail to commit themselves to faithful wearing of functional appliance [5].

PowerScope 2 appliance is the refinement of fixed functional appliances in Class II correction which is a direct derivative of the Herbst Type II appliance. American Orthodontics developed 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.[6] (Figure 1)

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This case report presents a nonextraction approach in the treatment of skeletal Class II using the PowerScope 2.

2. Appliance Design-

PowerScope is a semi-rigid telescoping system which 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. NiTi spring mechanism delivers 260 grams of force for continuous activation during treatment. This appliance is low profile and less bulky for more esthetic facial appearance, smooth, rounded patient-friendly design for better patient comfort, telescopic device that does not displace or disengage during treatment, making it more patient friendly [6].

Figure 1-Powerscope 2 Appliance Kit:
(A) Hex screw
(B) Crimpable shims
(C) Driver magnets
(D) Powerscope left and right arms

3. Case Report:

A 16-year-old female presented with a chief complaint of forwardly placed and malaligned upper front teeth. Extraoral clinical examination revealed a convex profile with an orthognathic maxilla (dentoalveolar protrusion), a retrognathic mandible and a horizontal growth pattern. The patient presented a Skeletal Class II malocclusion and an intra-oral examination revealed the patient exhibited an overjet of 7 mm and an overbite of 4 mm. Molar relation was Angle's Class II, Division 1 malocclusion and a scissor bite with respect to 17 and 47 along with constricted maxillary arch. She had an average nasolabial angle, deep mentolabial sulcus and protrusive upper lip respectively. (Figure 2 and 3).

Figure 2 (A, B and C) - Pre Treatment extraoral pictures.

Figure 3 (A-E) - Pretreatment intraoral pictures.

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Figure 4- Pretreatment lateral cephalogram and OPG.

Pretreatment cephalometric readings show Skeletal class II malocclusion with an increased ANB angle, retrognathic mandible with decreased SNB angle, reduced mandibular length and an average growth pattern towards horizontal and a reduced lower anterior face height. Dental parameters portray proclined maxillary and mandibular incisors. Upper molar to Rickett's Pterygoid vertical was increased whereas lower molars to PTv was reduced. Soft tissue analysis shows an average nasiolabial angle, increased upper lip strain and decreased mento-labial angle respectively. (Figure 4) (Table 1).

4. Treatment objectives

To correct the skeletal class II malocclusion, correct the scissor bite with maxillary right upper second molar, improve facial profile, achieve adequate over bite and overjet relations and to obtain Class I canine and molar relation without extracting teeth.

5. Treatment plan

A non-extraction approach was undertaken using MBT 0.018" x 0.025" slot preadjusted appliance. After leveling and aligning, PowerScope2 was chosen to advance the mandible into a Class I relationship followed by finishing and detailing.

6. Treatment Progress

Treatment was started using 0.016" NiTi in both arches. A transpalatal arch with a distal extension was banded on the molars which also aided in correcting the scissor bite with maxillary right second molar. (Figure 5).

Leveling and alignment was completed in 10 months time period and 0.017" × 0.025" stainless steel wire was placed in both the arches. Before inserting the

Figure 5- Transpalatal arch with distal extension.

mandibular 0.017" ×0.025" stainless steel archwire, 10° labial root torque is given in the arch wire in the mandibular incisor segment to prevent labial proclination,the angle was checked with the help of a jig (19 gauge wire soldered onto a crimpable hook) and measured onto the sym grid. (Figure 6) This was followed by mandibular advancement using the PowerScope 2 appliance. (Figure 7)

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Figure 6. -10 degree labial root torque.

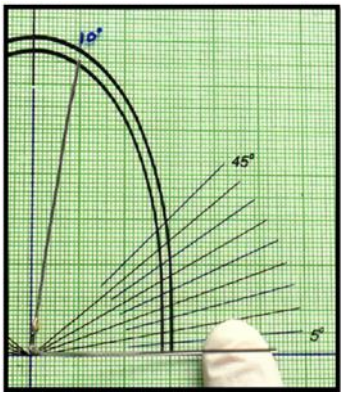

Figure 7 (A and B) –PowerScope appliance insertion after leveling and alignment of arches right and left.

7. **Appliance insertion and activation-**

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. Activation dot marking for visual reference is provided at the push rods of the appliance (right and left) 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 (Figure 8 A and B).

Figure 8 – PowerScope insertion and activation.

The PowerScope was employed for a period of seven months and following its removal,Class II vertical elastics (5/16,4oz) was used to achieve interdigitation and to support achieved sagittal correction. Final stage OPG, lateral cephalograms and photographs were taken (Figure 9 and 10). Pre-treatment and posttreatment cephalometric readings were compared (Table1) and superimpositions were made (Figure 11). The total treatment time was 21 months; then after upper arch-wrap around retainer full time wear for one year and lower arch- lingual bonded retainer from canine to canine.

Figure 9 – Post treatment OPG and Lateral cephalogram.

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Figure 10 – Post treatment Extraoral and Intraoral photographs.

8. Discussion

Many treatment approaches and various appliances have been endeavored for correcting the Class II malocclusion which can be as a result of skeletal abnormalities [7]. 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. [8]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 limited reports are currently available with regard to PowerScope.[9,10] 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 quick and easy wire-to-wire installation. The ball and socket joint at the two ends of the appliance allows excellent jaw movements reducing much of patient discomfort. This case report illustrates the skeletal, dental, and soft tissue changes after treatment with PowerScope fixed functional appliance.

On comparing the cephalometric outcomes, a considerable improvement in skeletal, dental, and soft tissue parameters was observed at the end of PowerScope treatment. (Figure 9 and 10). The posttreatment cephalometric measurements revealed favorable sagittal skeletal changes. A slight change in SNA angle (83°) and reduction in effective maxillary length by 2.5mm was observed all throughout the treatment. A mandibular advancement was clearly evident as SNB angle increased from 77° to 79° along with an increase in mandibular length by 3.5mm and n perpendicular to pogonion increased by 6mm. A3° reduction in ANB angle was observed.A mild increase in lower facial height was noticed at the end of the treatment. (Table 1)

The maxillary incisors angulation reduced by 6 degrees whereas mandibular incisors proclined 4° after PowerScope correction. 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 second 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. Upper molars distalized by 2mm and intruded by 1 mm whereas lower molars moved forward by 3mm. (Table1)

A substantial improvement in soft tissue was appreciated with a tendency toward an orthognathic

profile. The lower lip relation to the E line improved greatly by 5mm. Upper lip to S line reduced by 3mm and an increase in labiomental angle was noted. 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 (Figure 11)

The results were stable and extremely satisfying for both the clinician as well as the patient.The patient was also

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advised removal of impacted third molars but was adamant of not undergoing any extraction procedures.

Advantages of PowerScope appliance could be enumerated as follows:

- Fixed one-piece appliance available in one size suiting all Class II patients
- Quick and easy wire-to-wire installation
- Compliance free
- Internal NiTi spring delivers 260 g of force for continuous activation during treatment
- Can be used with banded or bonded molar tube
- Low profile and less bulky for more aesthetic facial appearance
- Smooth, rounded patient-friendly design for better patient comfort
- Easy to clean – better oral hygiene
- Ball and socket joint allowing maximum lateral movement

9. 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.

10. 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. 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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Nil.

12. Conflicts of interest-

There are no conflicts of interest.

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