

Early prevention and intervention of Class II division 1 in growing patients

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Abstract

Early screening and diagnosis help in preventing and intercepting the severity of the malocclusion which helps in addressing the esthetic and functional concerns. Growth modulation such as mandibular advancement has been an effective procedure in orthodontics. Mandibular growth advancer (MGA) and PowerScope are gaining popularity recently as these are effective in achieving the mandibular advancement and ease of fabrication, placement, and wear. MGA was fabricated by making the upper and lower splints separately and are placed in the oral cavity by joining the two splints in the new construction bite using cold cure, MGA when worn during growth phase helps in condylar remodeling in the temporomandibular joint thus helps in advancement of the mandible. The proclination of the upper anteriors in Class II division 1 can be moved lingually by activating the labial bow in the splint. Dr. Andy Hayes worked in conjunction with American orthodontics developed PowerScope. PowerScope delivers Class II correction with a combination of patient comfort and ease of use that was unmatched among other appliances. This ready to use chairside solution required no laboratory setup, making for a much quicker, and easier installation process and appointment. PowerScopes high quality, fixed one-piece design requires no patient compliance. These superior qualities of PowerScope help in correction of Class II skeletal growing patient in conjunction with fixed orthodontic therapy. MGA and PowerScope were chosen as a functional appliance for this study, which shows decreased ANB angle and effective mandible length was increased.

Key words: *Functional, mandibular growth advancer, PowerScope*

INTRODUCTION

As the proverb says “Prevention is better than cure” this should be applied to the orthodontics as it can help us in reducing the severity of the malocclusion and early correction of the skeletal abnormality. Orthodontics as a branch is more concerned with facial growth, development of dentition, and occlusion. Knowledge of these helps in better diagnosis and helps in prevention,

interception, and treatment of skeletal and dental malocclusions.^[1] The orthopedic appliances help us in treating the skeletal abnormalities during growth. Functional appliances were widely/used in orthodontics for skeletal Class II correction, i.e., advancement of the mandible.^[2] The Class II division 1 patients with deficient mandible should be diagnosed and treated during the pubertal period.^[3] The assessment of growth

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is important to identify abnormal growth from normal growth which can be assessed by pubertal markers and skeletal maturity indicators.^[4] Various appliances were indicated for this treatment but failed to reach the expectations of the orthodontists.^[5] These led to further research for effective functional appliance. The mandibular growth advancer (MGA), a functional appliance which was a modified activator suggested by Yokota *et al.* in 1993 can be used in these conditions which help to achieve skeletal Class I profile by progressively advancing the mandible,^[6] and Dr. Andy Hayes worked in conjunction with American orthodontics developed PowerScope. The PowerScope Class II corrector delivers an anterior force to the lower arch and a posterior force to the maxilla to produce dentoalveolar movement with the skeletal advancement of the mandible.

CASE REPORTS

Case report 1

A young boy, age 12 years and 2 months, came to the department with retrognathic mandible and orthognathic maxilla showing a skeletal Class II profile with posterior divergence. Patient skeletal age was determined using cervical vertebral maturity indicator (CVMI) and hand- wrist Fishman index. It showed that the patient was in 2nd stage of CVMI and Fishman index showed 3rd stage. This denotes that 85% of growth was expected for the patient.^[4] Intraorally, the patient exhibited a protruded upper incisor with constricted upper arch and spaced lower arch which follows U-shaped arch form. The maxillomandibular relationship exhibits angles Class II malocclusion on both the left and right side. The overjet was around 10.0, and the overbite was 6.0 mm, respectively [Figure 1a-d].

The cephalometric values showed that the angle of SNA was 81.7°, and the angle of SNB was 75.7°, with an ANB difference of 6°. Wits appraisal was 2 mm and N perpendicular to point A was 2 mm and N perpendicular to point B were 9 mm with the mandibular plane angle of 23.8° and effective mandible length of 124° which indicates skeletal Class II mandible.^[7] The diagnosis of the patient was angled Class II malocclusion on skeletal Class II base with retrognathic mandible with orthognathic maxilla. The objectives of the treatment were to correct skeletal and dental relationship and improve the soft tissue profile. The treatment plan was to correct the skeletal Class II by advancing the mandible.^[8]

Bite registration was not required for MGA. The impression of the patient was taken for both the maxilla and mandible. The casts were poured with dental stone. The casts were used to construct the splints both on maxillary arch and mandibular arch separately with short labial bow in the anterior region and posterior bite plane, palatal aspect of upper incisors, and lingual aspects of lower incisors were covered with thick acrylic in case the incisors needed to be retroclined.^[6] Then, the splints are checked in the patients mouth. Both the upper and lower splints are joined temporarily extraorally with cold cure acrylic at two different points [Figure 2a], and the splint was placed in the patient mouth and advised to advance the mandible to the pre-trained position, and both the splints were sealed [Figure 2b and c]. The advancement in this case was up to 7 mm in a single-step as he was in acceleration phase of Lamparkshi in 1972 and Hassal and Farman in 1995.

The patient was wearing the appliance for 8 months with monthly check up. During the check up, the appliance was removed, and the bite is evaluated. After achieving the required result such as straightening the profile angles Class I malocclusion, and correcting the overjet [Figures 3a-d]. Posttreatment cephalometric evaluation showed that SNA was 81°, SNB was 78°, Wits appraisal was - 1 mm, effective mandibular length was 131°, and N perpendicular to point B was 2 mm which indicates increased mandibular length [Figure 4a and d].^[9]

Advantages of the appliance

- Ease of fabrication
- Easy to wear
- Oral hygiene maintained
- Cost effective
- Minimal laboratory procedure
- Single-step advancement
- Single unit appliance which has more strength and less breakage
- Proclination of the anteriors can be corrected.

Disadvantages of the appliance

- Advancing the mandible with cold curing resins placed between the two spots-less curing time
- Posterior open bite due to bite plane effect.

Case report 2

A female patient of 13 years reported with the compliance of retrognathic mandible and orthognathic maxilla, showing skeletal Class II profile with posterior divergence. Intraoral examination revealed proclined



Figure 1: (a and b) Pretreatment extraoral photographs (c and d) pretreatment intraoral photographs

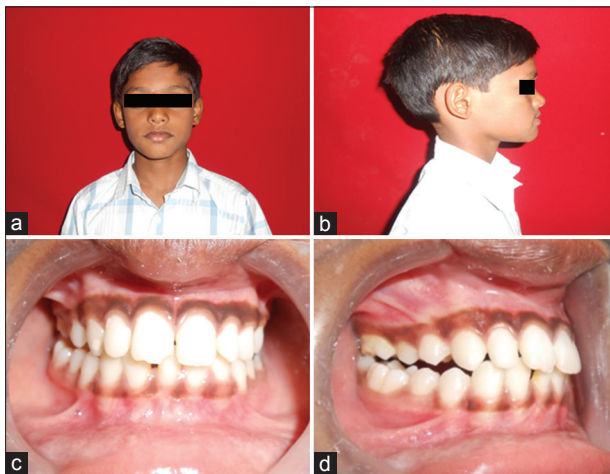


Figure 3: (a and b) Post treatment extraoral photographs (c and d) post treatment intraoral photographs

upper incisors with spacing in upper anterior teeth. The maxilla-mandibular relationship showed angles Class II malocclusion. The overjet was around 10 mm with overbite of 5 mm [Figures 5a-d].

The cephalometric values showed that the angle of SNA was 80° , and the angle of SNB was 75° , with an ANB difference of 5° . Wits appraisal was 6 mm, N perpendicular to point A was 4 mm, N perpendicular to point B was 13 mm, the mandibular plane angle was 27° , and effective mandibular length was 111 mm which indicated skeletal Class II mandible.^[7] Patient skeletal age was determined using CVMI and hand-wrist Fishman index. It showed that the patient was in 4th stage of CVMI and Fishman index showed 8th stage. This denotes that 25% of growth was expected for the patient.^[4] The diagnosis of the patient was angles Class II malocclusion on Class II skeletal base with retrognathic mandible and



Figure 2: (a-c) Mandibular growth advancer

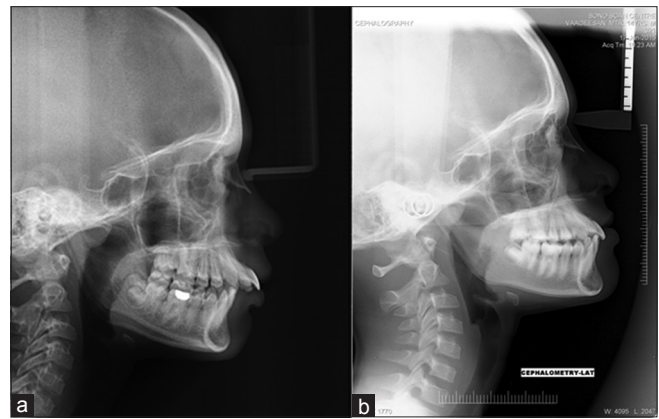


Figure 4: (a) Pretreatment ceph (b) post treatment ceph

orthognathic maxilla. Treatment objective was to correct skeletal and dental relationship and improve the soft tissue profile.^[10] The treatment plan was to correct the skeletal Class II by advancing the mandible.^[5]

Pretreatment records (photographs, impression) were taken. MBT 022 slot brackets were bonded to the teeth, initial aligning, and leveling was done using nickel titanium wires with the sequence of 0.014, 0.016, 0.016 \times 0.022, 0.017 \times 0.025 NiTi. Canine to canine consolidation was done in lower arch. Then, in upper 0.019 \times 0.025 stainless steel wire was placed and 0.019 \times 0.025 SS wire with reverse curve was given in lower arch, individual ligation was done in the lower canine bracket. Lower arch wire should be cinched posterior to the molar teeth. PowerScope is delivered as one-size-fits-all appliance preassembled with attachment nuts for quick and easy chair side 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. Engage maxillary attachment nut using the driver provided and place mesial to the first molar on the maxillary rectangular stainless steel arch wire 0.019×0.025 for maximum fit and stability of appliance. Engage mandibular attachment nuts using driver and place distal to the canine onto mandibular rectangular stainless steel archwire then tighten screw. Crimpable shims can be used for further activation and advancement during treatment. PowerScope (Fixed functional appliance) was placed with the advancement of 5 mm on each side. Class III elastics were provided to avoid flaring of the [Figure 6a and b].

The appliance has two arms, one for the right side and another for the left side. Each arm has a large head and a small head; large head is attached to the upper base arch wire mesial to the molar buccal tube, and the small head is attached to the lower base arch wire distal to the canine bracket. The head part of the arm has a screw, which has to be tightened to fix the appliance. Crimpable shims are available with the dimension of 2 mm and 3 mm, according to the measurement of advancement, the crimpable shims can be chosen.

The patient was wearing the appliance for 9 months with regular checkup. After achieving the required results such as straightening of the profile angles Class I malocclusion with ideal over jet, and overbite [Figures 7a-d]. Postfixed functional appliance treatment cephalometric evaluation showed SNA was 81, SNB was 79, Witts appraisal was 2 mm, effective mandibular length was 114 mm, and N perpendicular to point B was 7 mm which indicated increment in mandibular length [Figure 8a and b].^[9]



Figure 5: (a and b) Pre treatment extraoral photographs (c and d) pre treatment intraoral photographs



Figure 6: (a and b) Power scope



Figure 7: (a and b) Post treatment extraoral photographs (c and d) post treatment intraoral photographs

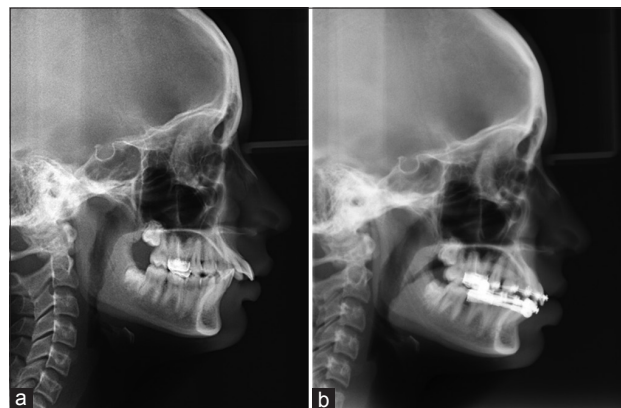


Figure 8: (a) Pre treatment ceph (b) post treatment ceph

Advantages of PowerScope appliance

- Patients compliance is not required
- Full time wear appliance
- Single-step advancement
- Debonding of the bracket is avoided
- Proclination of the upper anteriors can be corrected simultaneously.

Disadvantages of PowerScope appliance

- Initially, when the appliance was placed in the oral cavity, posterior open bite was present.

CONCLUSION

Both MGA and PowerScope exhibits an effective treatment options in growing Class II skeletal cases in achieving the desired treatment objectives such as skeletal Class I and angles Class I malocclusion with orthognathic mandible with competent lips. However, the indication of the appliance varies depending on the patient age. As MGA was indicated in prepubertal growth phase and treated early as bite registration was not required, and PowerScope was indicated in pubertal growth phase in conjunction with fixed orthodontic appliance. The other main advantage of PowerScope was correction of skeletal abnormality cases. Early screening and diagnosis help in preventing and intercepting the severity of the malocclusion which helps in addressing the esthetic and functional concerns.

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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