Three-Dimensional Correction of Class II Division 1 Malocclusion Using Headgear Activator Combination: A Case Report

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DOI: https://doi.org/10.52403/ijhsr.20240835

ABSTRACT

Correction of Class II malocclusion in vertical growing patients poses particular challenges because vertical growth patterns can exacerbate the existing skeletal discrepancy between the upper and lower jaws. In such cases, orthodontic treatment often aims to address both the sagittal (front-to-back) and vertical dimensions of the malocclusion. This case report details the successful use of activator-headgear therapy for correction of Class II division 1 malocclusion in a vertically growing patient with a mandibular deficiency and a maxillary excess. The treatment caused correction in all three planes of space by improving the profile of the patient by sagittal correction, controlling the vertical growth pattern and correcting the transverse deficiency.

Keywords: growth modulation, activator-headgear, dentofacial orthopedics, Class II division 1 malocclusion, three-dimensional correction

INTRODUCTION

A mandibular deficiency, a maxillary excess, or a combination of the two may cause class II malocclusion. Improving the hard and soft-tissue profile, modifying the pattern of facial growth, and correcting the sagittal relationship are the goals of treatment for class II malocclusion. Most clinical studies acknowledge the beneficial role that functional appliances play in sagittal correction of the malocclusion, but they also concur that dentoalveolar changes are the main focus of treatment¹. Functional jaw orthopedic appliances bring the mandible in a corrected forward posture, promoting adaptive skeletal growth. One of such functional appliances is the Andersen activator II² ³. In hyperdivergent patients where the vertical dimensions need to be reduced or maintained, a high-pull face-bow linked to an activator is recommended. More cumulative skeletal growth is also provided by the combo appliance than by either device alone. Treating Class II division 1 malocclusion with a combination therapy of high-pull headgear and activator results in restraining the forward growth of the upper jaw, preventing forward and upward movement of the upper teeth, enhancing alignment of the lower back teeth, remodelling of the jaw joint and socket, and a positive shift in muscle activity patterns⁴. Correction of Class II division 1 malocclusion with high-pull
headgear activator combo therapy improves mandibular posterior teeth, condylar and glenoid fossa remodeling, muscle pattern, and inhibits forward maxillary development. It also keeps the maxillary teeth from moving mesially or vertically.

**CASE REPORT**

A 12 year old female patient with CVMI stage 2 presented to the Department of Orthodontics and Dentofacial Orthopedics at Rural Dental College Loni. The clinical examination revealed a convex profile, an acute nasolabial angle, and a short upper lip length. She had inadequate lip coverage and a non-consonant smile as well as an increased interlabial gap and maxillary incisor show during resting or smiling. The visual treatment outcome (VTO) was favorable. (Figure 1)

Intraorally, she had a Class II molar and canine relation with an 8 mm overjet and a 4 mm overbite. The patient exhibited a Bolton's discrepancy of 5.8 mm for maxillary anterior tooth material and 3.6 mm for maxillary total tooth material. Based on the cephalometric analysis, the patient was diagnosed as a case of skeletal Class II malocclusion with a vertical growth pattern, prognathic maxilla with vertical excess and a retrognathic mandible. The patient showed no signs and symptoms of any temporomandibular disorders.

**Prioritized Problem List:**
- Skeletal Class II malocclusion
- Class II molar relation and canine relation
- Proclination of upper anterior teeth
- Increased overbite and overjet
- Vertical growth pattern
- Convex profile
- Incompetent lips

**Treatment objectives:**
- Correction of sagittal skeletal discrepancy and obtaining an aesthetically pleasing facial profile
- Elimination of aberrant musculature for achieving neuromuscular balance
- Achieving Class I canine and molar relationship bilaterally
- Achieving optimum overjet and overbite
- Vertical control
- Upper and lower arch alignment and levelling

Figure 1: Pre-treatment photographs
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- To achieve a consonant smile
- To correct Bolton’s discrepancy.

**Treatment alternatives:**

1) Orthognathic surgical treatment will be initiated after the patient's growth had been finished. This strategy has the disadvantage of forcing the patient to wait a few more years.

2) Camouflage treatment for Class II, Division I malocclusion by extraction of maxillary first premolars. However, the patient's facial (frontal or profile) features would not support this treatment outcome.

3) Expansion activator with high pull activator as part of phase 1 therapy controlling the vertical maxillary excess and backward rotation of the mandible, followed by fixed mechanotherapy using pre-adjusted edgewise appliance for alignment and settling.  

The patient agreed with the third treatment option.

**Treatment progress:**

Diagnostic casts and working models were taken of the patient. A construction bite was obtained horizontally 3 mm short of maximum protrusion, ensuring there to be no lateral displacement and vertically exceeding the freeway space by 2–3 mm. The activator was incorporated with an expansion screw for transverse expansion of the arches. (Figure 2) The acrylic was trimmed lingual to the mandibular incisors so that only the upper arch expanded would expand without causing any unwanted effects in the lower arch as a consequence of the expansion screw.

After a week of usage, the headgear was secured to the tubes in the activator's acrylic blocks at the premolar-molar area. For 11 months, a high-pull force of 400 g on each side was applied for 12–16 hours per day. The extraoral force and outer bow were altered so that the force travelled through the centre of maxilla, roughly between the first and second premolar roots.

**Figure 2: The activator appliance fabrication and placement of headgear in the patient.**

The appliance was selectively trimmed to maintain contact with the maxillary posterior teeth; and the mandibular posterior teeth were allowed to erupt by trimming the acrylic on the occlusal and lingual aspect. The patient was followed up to 13 months and selective trimming of the appliance was done to accommodate the eruption of premolars bilaterally (Figure: 3)
After correction of jaw relation, the patient was shifted to fixed appliance therapy using MBT 0.22” slot prescription for alignment and levelling as part of the phase II treatment. Aligning and levelling was performed using 0.014 nickel-titanium archwire, progressively shifting to heavier archwires. After coordination of upper and lower arches, rigid stainless steel archwires with crimpable retraction hooks were placed for space closure and for appropriate expression tip and torque. (Figure: 4)

Retention phase:9 10 (Figure: 5)
As part of retention phase the patient was provided with a removable activator as a retainer to be worn after debonding.
Treatment objectives achieved:
- Skeletal sagittal correction achieved
- Angle’s Class I molar and canine relation bilaterally
- Optimum overjet and overbite
- Levelling of curve of Spee
- Control of vertical dimensions
- Lip seal achieved
- A pleasing soft tissue profile achieved

RESULT
The use of activator headgear successfully decreased the severity of Class II malocclusion through a combination of dental and skeletal changes. The overjet, SNB, and ANB angles greatly improved. The addition of an expansion screw in the appliance enabled for transverse expansion of the arches.

Six degrees of retroclination was achieved in the maxillary incisors with activator and headgear combination therapy. The lower incisors did procline by 5° towards the end of the treatment, which was inevitable with the functional therapy as seen in several studies throughout the literature. (Ahlgren and Laurin, 197611; Pancherz, 198412; Nelson et al., 1993).

The vertical dimensions were maintained by the end of the treatment. (Figure: 6)
There was a significant improvement in the soft tissue profile of the patient with the gained lip competency and mandibular advancement. (Figure: 7)

**DISCUSSION**

Several studies have investigated at the outcomes of treating patients with extraoral force and functional appliances, emphasizing the variety of responses and the significance of controlling the posterior vertical dimension. (Williams and Melsen, 1982; Altuğ et al., 1989; Jacobsson and Paulin, 1990; Dermaut et al., 1992; Öztürk and Tankuter, 1994; Başçiftçi et al., 2003)

The high-pull headgear and activator combination in Class II division I malocclusion limits maxilla forward growth, inhibits maxillary tooth mesial and vertical displacement, improves mandibular posterior teeth, condylar and glenoid fossa remodelling, and improves muscle pattern.

The alteration and anterior displacement of the glenoid fossa may have played a role in correcting the skeletal Class II malocclusion.

Although the patient did not have any particular complaints regarding the airway, the treatment did help improve significantly with the mandibular advancement and the maxillary transverse expansion.

In accordance with studies conducted by Isono et al., Horihata et al., where the activator therapy led to an increase in the anteroposterior width and total dimension of the upper airway. The anterior positioning of mandible causes anterior displacement of the base of the tongue, whereas the transverse expansion promotes widening of the nasal floor to reduce the resistance to airflow, and have a positive influence on nasopharynx function.

**CONCLUSION**

This case study provided further details on the application of activator headgear combination therapy to reduce upper incisor proclination and treat severe skeletal Class II. In phase 2, the patient underwent fixed appliance therapy to address the dental alignment after achieving the desired alterations to their face. As a result, the facial features showed a noticeable improvement, and the dental disharmony was corrected.

**Declaration of patient consent:**

The authors certify that all required patient consent paperwork is in their possession. The patient or patients have given their written authorization for the journal to publish their images and other clinical data. The patients understand that while all efforts would be taken to conceal their identity, including not publishing their names or initials, anonymity cannot be guaranteed.
Declaration by Authors

Ethical Approval: Not required

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES


How to cite this article: Shubhangi Mani, Aishwarya Thorat, Ravindra Manerikar, Vaishnavi Maniyar, Apoorva Tonde. Three-Dimensional correction of class II division 1 malocclusion using headgear activator combination: a case report. Int J Health Sci Res. 2024; 14(8):309-316. DOI: https://doi.org/10.52403/ijhsr.20240835

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