

# Management of skeletal Class III malocclusion with reverse pull headgear in a growing individual

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## Abstract

Skeletal Class III malocclusion is considered to be one of the most difficult orthodontic problems to treat. This malocclusion is associated with the retrognathic maxilla or prognathic mandible or sometimes a combination of both. The treatment of such cases requires an integrated approach and a comprehensive treatment plan including growth modification, dental camouflage, or orthognathic surgery. In a growing patient, orthopedic correction of skeletal Class III malocclusion with the help of a reverse pull headgear is crucial as it can reduce the chances of further surgical treatment to correct the skeletal discrepancy. This case report describes the management of skeletal Class III malocclusion in a 12-year-old female child with a retrognathic maxilla. The patient did not have any other genetic abnormality or significant known comorbidity. The treatment plan involved fixed orthodontic appliance therapy in combination with a reverse pull headgear for an orthopedic effect. This treatment was continued for 3 years, and well-aligned dental arches with a positive over jet were achieved at the conclusion of treatment. Using facemask therapy in conjunction with fixed orthodontic appliances has been a successful treatment option in growing children. Treatment should be carried out as early as possible to correct the skeletal discrepancy nonsurgically and achieve better results.

**Key words:** Appliances, growth modification, integrated approach, malocclusion, orthopedic, retrognathic, reverse pull headgear, skeletal discrepancy, surgically

## INTRODUCTION

Class III malocclusion is one of the most difficult problems to treat in the mixed dentition, often resulting in bilateral anterior and posterior cross-bites.<sup>[1]</sup> This malocclusion is most likely to be associated with a variety of environmental and genetic factors.<sup>[2,3]</sup> Prevalence of skeletal Class III malocclusion is greater among the Asian population as compared to Caucasians.<sup>[4]</sup> If left untreated, the skeletal discrepancy gets worse with time.

The dental and skeletal effects of maxillary protraction with a facemask during the mixed dentition phase have not been well documented in the literature. These cases are generally left untreated during the mixed dentition phase because of poor patient cooperation, leading to an increased skeletal discrepancy with time. Orthopedic therapy in the late-mixed or early permanent dentition can be successful, but the results are generally better when carried out in the deciduous or early-mixed dentition.<sup>[5,6]</sup> In this case-report, we describe clinical presentation, dental examination, radiological investigations, treatment plan, and outcomes of a 12-year-old female child with skeletal Class III malocclusion due to a retrognathic maxilla,

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Figure 1: Pretreatment extraoral and intraoral pictures



Figure 3: Pretreatment cephalogram radiograph



Figure 5: Posttreatment extra- and intra-oral pictures

seeking orthodontic treatment at a private orthodontic clinic.



Figure 2: Pretreatment orthopantomogram radiograph

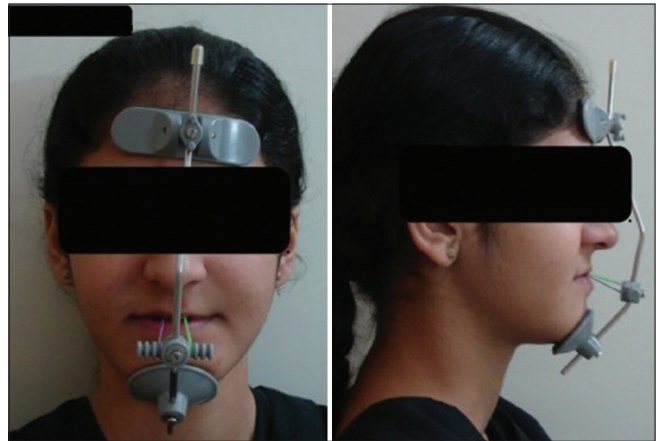


Figure 4: Reverse pull headgear

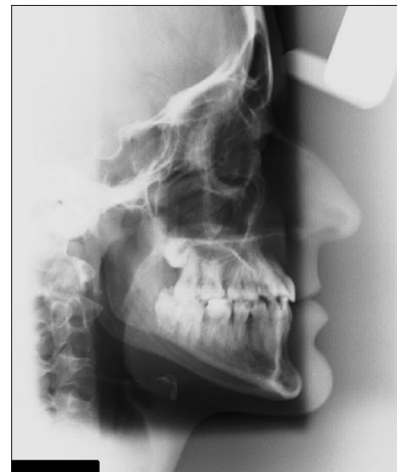


Figure 6: Posttreatment cephalogram radiograph

## CASE REPORT

A 12-year-old female patient reported to the orthodontic clinic, with a presenting complaint of a protruded lower jaw and irregular placement of the front teeth. The patient did not have any other dental complaint or prior history of seeking dental care. The patient did not have



**Figure 7:** Posttreatment orthopantomogram radiograph

any known comorbidity or genetic disorder or syndrome. There was no significant medical or surgical history and was not taking any medication at the time of presentation. Extraoral examination revealed a leptoprosopic face form with a concave profile and an obtuse nasolabial angle. The patient had a minimal smile line with decreased incisal visibility. Intraoral examination showed a Class III molar and canine relationship, bilateral anterior and posterior cross-bites along with a reverse overjet of 4 mm. Deciduous second molars were present bilaterally in the lower arch and unilaterally on the left side in the upper arch. No other significant abnormalities were observed during intraoral examination [Figure 1]. An orthopantomogram and lateral cephalogram were carried out as part of routine radiological investigations. The orthopantomogram confirmed the presence of deciduous teeth and their permanent successors [Figure 2]. Cephalometric evaluation revealed an SNA of  $70^\circ$  and an SNB of  $81^\circ$ , indicating that the patient had a skeletal Class III malocclusion because of a retrognathic maxilla with an ANB of  $-11^\circ$ . The upper incisors had normal inclination, indicated by a UISN angle of  $99^\circ$  while the lower incisors were retroclined according to the IMPA value of  $72^\circ$  [Table 1 and Figure 3]. Based on the extraoral/intraoral findings and the radiographic investigations carried out, a comprehensive and detailed treatment plan was made. The initial treatment plan involved fixed orthodontic appliance therapy. A few weeks after that, a reverse pull headgear was included in the treatment plan to achieve the ideal orthopedic effect required for the correction of skeletal discrepancy. The reverse pull headgear was attached to two hooks incorporated in the anterior region of the maxillary dentition. The approximate duration of wear for the reverse pull gear was 14–15 h as reported by the patient [Figure 4]. During this treatment phase, the patient was advised to wear Class III elastics for better results. The treatment continued for 3 years and led to improved facial esthetics [Figure 5]. The posttreatment cephalometric evaluation revealed an SNA of  $79^\circ$  and an SNB of  $78^\circ$ , indicating that the patient's malocclusion was primarily corrected by maxillary protraction and clockwise rotation of the mandible, correcting the ANB from  $-11^\circ$  to  $+1^\circ$ . An increase in the values of SNMP from  $31^\circ$  to  $38^\circ$  and FHMP from  $20^\circ$  to  $26^\circ$  confirmed the clockwise rotation of the mandible [Figure 6]. At the

**Table 1: Pre- and post-treatment cephalometric values**

| Measurements      | Normal      | Pretreatment | Mid treatment |
|-------------------|-------------|--------------|---------------|
| SNA ( $^\circ$ )  | 82 $\pm$ 2  | 70           | 79            |
| SNB ( $^\circ$ )  | 78 $\pm$ 2  | 81           | 78            |
| ANB ( $^\circ$ )  | 2 $\pm$ 2   | -11          | 1             |
| Mc-A (mm)         | 1 $\pm$ 2   | -7           | +1            |
| Mc-Po (mm)        | -3 $\pm$ 4  | +11          | +5            |
| UISN ( $^\circ$ ) | 102 $\pm$ 4 | 99           | 102           |
| IMPA ( $^\circ$ ) | 90          | 72           | 74            |
| SNMP ( $^\circ$ ) | 32 $\pm$ 4  | 31           | 38            |
| FHMP ( $^\circ$ ) | 25 $\pm$ 4  | 20           | 26            |

end of treatment, well-aligned dental arches with a positive overjet and a Class I molar and canine relationship were achieved [Figures 5 and 7].

## DISCUSSION

During orthopedic treatment, an attempt is made to change the morphology of craniofacial skeleton to correct the skeletal discrepancy. The reverse pull headgear provides a direct anterior force leading to downward and forward displacement of the maxilla.<sup>[7]</sup> This orthopedic effect allows the mandible to rotate downward and backward, increasing the lower facial height and acting as a major contributing factor in establishing a positive overjet. This is accompanied by an increase in the upper incisor inclination and a decrease in the lower incisor inclination aiding in the anterior cross-bite correction.<sup>[8]</sup> According to a study by Williams *et al.*, the average anterior movement of point A after the orthopedic treatment was 1.54 mm and that of maxillary teeth was 2.73 mm, confirming that the positive overjet obtained was due to both skeletal and dental effects.<sup>[9]</sup> Orthodontic fixed appliance therapy in combination with a reverse pull headgear for the correction of Class III malocclusion is believed to be more effective in early-mixed dentition as compared to late-mixed dentition.<sup>[10]</sup> Hence, the orthopedic correction of skeletal Class III malocclusion with the help of a reverse pull headgear in a growing patient is crucial as it aids in achieving a better esthetic profile and reduces the chances of further surgical treatment to correct the skeletal discrepancy.

## CONCLUSION

Skeletal Class III malocclusions due to a retrognathic maxilla in a growing individual can be successfully treated using fixed orthodontic appliances in combination with a reverse pull headgear to achieve the desired orthopedic effect. Careful case selection, patient cooperation, and long-term stabilization ensure ideal treatment results and stability. This treatment protocol is believed to be more effective in the early-mixed dentition as compared to

late-mixed dentition and reduces the chances of further surgical treatment to correct the skeletal discrepancy.

#### 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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Nil.

#### Conflicts of interest

There are no conflicts of interest.

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