

# Early treatment of Class III malocclusion with a tandem traction bow appliance

Sneha Basaveshwar Valgadde,  
Kishor Chougule

Department of Orthodontics and  
Dentofacial Orthopedics, Tatyasaheb  
Kore Dental College and Research  
Centre, Kolhapur, Maharashtra, India

## Abstract

Since Class III malocclusion is progressive in nature, the facial growth of Class III malocclusion worsens with age. Class III malocclusion is associated with a deviation in the sagittal relationship of the maxilla and the mandible, characterized by a deficient maxilla, retrognathic mandible, or a combination of both. The early orthopedic treatment of Class III malocclusions, at the end of primary dentition or the beginning of mixed dentition, prior to growth spurt, allows the accomplishment of successful results, providing facial balance, modifying the maxillofacial growth and development, and in many instances, preventing a future surgical treatment by increasing the stability. Many treatment approaches can be found in the literature regarding orthopedic and orthodontic treatment of Class III malocclusion, including intra- and extra-oral appliances. The major problem with extraoral anchorage has been of patient compliance due to its physical appearance. The case report presents an intraoral modified tandem appliance for maxillary protraction that has been used clinically to achieve successful results without relying much on patient co-operation.

**Key words:** Maxillary protraction, skeletal Class III, tandem traction bow appliance

## INTRODUCTION

The worsening of Class III malocclusion increases with age.<sup>[1]</sup> A good facial balance can be obtained by modifying the maxillofacial growth and development with an early orthodontic intervention. Class III malocclusion is associated with sagittal malrelationship of the maxilla and the mandible, characterized by either deficiency and/or a backward position of the maxilla, or by prognathism and/or forward position of the mandible.<sup>[2]</sup> Many treatment approaches can be found regarding orthopedic and orthodontic treatment of Class III malocclusion.

These include intra- and extra-oral appliances such as a face mask, functional regulator, removable mandibular retractors, splints, Class III elastics, chin cup, and mandibular cervical headgear. The early orthopedic treatment of Class III malocclusions, at the beginning of mixed dentition, prior to growth spurt, provides facial balance, modifies the maxillofacial growth and development, and prevents a future surgical treatment by increasing the stability.<sup>[3]</sup> The early Class III treatment has advantages such as it allows the eruption of canines and premolars in normal relation, eliminates the traumatic occlusion of incisors, which might lead to gingival recession, provides maxillary growth and improves the self-esteem of the child.<sup>[2]</sup>

According to McNamara and Turley, rapid maxillary expansion (RME) enhances the protraction effect of the

Access this article online	
Quick Response Code:	Website: www.apospublications.com
	DOI: 10.4103/2321-1407.186439

### Address for Correspondence:

Dr. Sneha Basaveshwar Valgadde, Department of Orthodontics and Dentofacial Orthopedics, Tatyasaheb Kore Dental College and Research Centre, New Pargaon, Kolhapur - 416 137, Maharashtra, India.  
E-mail: drsnehav17@gmail.com

For reprints contact: reprints@medknow.com

**How to cite this article:** Valgadde SB, Chougule K. Early treatment of Class III malocclusion with a tandem traction bow appliance. APOS Trends Orthod 2016;6:228-31.

face mask by disrupting the maxillary suture. It is widely accepted that the midface deficient Class III patients should be treated before 7–8 years of age.<sup>[4-6]</sup> RME along with facemask therapy is the most common orthopedic treatment protocol for Class III malocclusion. Although maxillary expander-facemask appliances achieve excellent orthopedic effects, they demand special patient compliance and are not as esthetic or comfortable due to their physical appearance and discomfort from the anchorage pads. The major problem with extraoral anchorage is of patient compliance, due to the appearance of the extraoral appliance. Considering this problem, Chun *et al.* in 1999 introduced the tandem traction bow appliance (TTBA) for the treatment of growing Class III patients.<sup>[7]</sup> Klemperer did some modifications in the appliance later on.<sup>[8]</sup>

The case report presents an intraoral modified tandem appliance used for maxillary protraction to achieve clinically desirable results without relying much on patient co-operation.

## CASE REPORT

A 10-year-old boy reported to the Department of Orthodontics and Dentofacial Orthopedics with a chief complaint of forwardly placed lower front teeth. On extraoral examination, he had a concave facial profile with retrognathic maxilla, obtuse nasolabial angle, protrusive mandible, and competent lips. Intraorally, he had angle's Class I malocclusion, end-on canine relation on both sides, anterior crossbite, a unilateral crossbite on left side, and a reverse overjet [Figure 1].

The panoramic radiograph showed no missing teeth or pathologies. Cephalometric analysis indicated a skeletal Class III due to posteriorly positioned maxilla along with a horizontal growth pattern with retroclined lower incisors and a normal upper incisor inclination. The patient was



**Figure 1:** Pretreatment photographs

in Fishman's Stage II of growth status as per hand-wrist radiograph [Figure 2].

## Treatment objectives

1. Correction of skeletal Class III
2. Correction of overjet
3. Obtaining Class I canine relationship
4. Correction of crossbite
5. Achieving a pleasant soft tissue profile.

## Treatment plan

Early phase of orthopedic treatment was planned to induce harmonious skeletal growth and improve facial esthetics. The facemask could be plan but because it is not that esthetic than TTBA. Hence, RME and sagittal maxillary advancement with TTBA to correct Class III skeletal malocclusion. Fixed orthodontic mechanotherapy later on for the final detailing of occlusion.

## Treatment progress

The patient was treated with TTBA. The upper assembly comprised a Hyrex with first molars banded and soldered with 1 mm thick stainless steel wire extending up to premolars for RME [Figure 3]. The facebow was modified to the shape of a traction bow. The precise position of the elastic hooks on the upper assembly, and the tubes on the lower first permanent molar determines the direction of force. The protraction hooks in the maxilla were placed distal to the permanent canines, so that the elastic force passes through the center of resistance of the maxilla. The expansion screw was activated half turn twice a day for 1 week followed by an activation of half turn once a day every alternate day until the desired amount of expansion was achieved. On both sides, a force of 400–450 g was applied bilaterally for 14–16 h per day.

## Treatment results

The patient was assessed at an interval of 3, 5, and 9 months. Progress records taken after 9 months showed a favorable growth between the maxilla and the mandible and anterior crossbite correction [Figures 4 and 5]. Postprotraction cephalometric tracings revealed a forward



**Figure 2:** Pretreatment orthopantomogram lateral cephalogram hand wrist X-ray



Figure 3: Tandem traction bow appliance



Figure 4: Postfunctional photographs



Figure 5: Postfunctional lateral cephalogram and orthopantomogram

movement of maxilla and counterclockwise tipping of the palatal plane. The ANB angle changed from  $-8^\circ$  to  $1^\circ$ . FMA opened from  $26^\circ$  to  $27^\circ$ . Slight labial tipping of the maxillary incisors was also observed. The point A also shifted anteriorly by 6 mm approximately [Table 1].

## DISCUSSION

The success of orthodontic treatment with a developing Class III malocclusion depends on the growth of individual and timing of orthodontic or orthopedic intervention. For patients with moderate to severe

Table 1: Comparison of pre- and post-functional cephalometric values

Measurements	Pretreatment	Postfunctional
SNA ( $^\circ$ )	75	83
SNB ( $^\circ$ )	83	82
ANB ( $^\circ$ )	-8	1
Effective length of maxilla (mm)	79	81
Effective length of mandible (mm)	105	104
N $\perp$ to A point (mm)	-10	-4
FMA ( $^\circ$ )	26	27
Upper incisor to NA	30	34
IMPA ( $^\circ$ )	87	89
Lower anterior facial height (mm)	54	58

IMPA – Incisor mandibular plane angle

Class III malocclusions, the decision of whether to treat early or to wait is difficult until the end of growth. The incidence of Class III malocclusion was found to be 5% in whites and as high as 48% in Japanese.<sup>[9]</sup> The prevalence in North and South India was approximately 3.4% and 0.3%, respectively.<sup>[10]</sup> Takada *et al.* reported that the forward maxillary displacement with protraction was more favorable before or during the acceleration of a child's pubertal growth spurt.<sup>[6]</sup> Baccetti *et al.* reported that Class III treatment with maxillary expansion and protraction was effective in the maxilla only when it was performed before the peak (cervical Stage 1 or cervical Stage 2).<sup>[11]</sup> However, patient might have to undergo a surgical procedure later after early orthopedic and orthodontic treatment. A combination of maxillary protraction and RME has been used to treat young Class III patients with the maxillary deficiency.<sup>[5]</sup> The goal of combining RME with maxillary protraction was to disarticulate the maxilla from the surrounding bones connected by circum-maxillary sutures and to facilitate the forward movement of the maxilla.<sup>[12]</sup> Maxillary protraction along the occlusal plane is accompanied by counterclockwise rotation of the palatal plane and downward and backward rotation of the mandible plane, which results in tentative improvement of the skeletal relationship.<sup>[6]</sup> In this case report, postprotraction radiographs showed a counterclockwise tipping of the palatal plane and slight increase in the mandibular plane angle and lower facial height, thus leading to an overall improvement of the profile. A significant increase in ANB after TTBA treatment was due to the forward movement of the maxilla and the backward movement of the mandible.

Although maxillary expander-facemask appliances achieve excellent orthopedic effects, they demand special patient compliance and are not esthetic or comfortable due to their physical appearance and discomfort, and skin irritation

from the anchorage pads. Chun *et al.* in 1999 defined TTBA as comfortable and more esthetic device than conventional appliances because it is removable and worn intraorally. Its design allows the patient to open the mouth freely.<sup>[7]</sup> Tortop *et al.* compared the effects of the modified TTBA (MTTBA) and the facemask in treating patients with Class III malocclusion and found both appliances were found to be effective in the treatment of Class III malocclusion. Their skeletal and dental effects showed differences due to their design.<sup>[13]</sup> Ngan *et al.* concluded that hybrid hyrax bone-anchored RPE appliance minimized the side effect encounter by tooth-borne RPE appliance for maxillary expansion and protraction and may serve as an alternative treatment appliance for correcting Class III patients with a hyperdivergent growth pattern.<sup>[14]</sup>

## CONCLUSIONS

Satisfactory correction can be obtained with MTTBA appliance in patients with skeletal and dental Class III malocclusion with an average or horizontal growth pattern. As the appliance is more esthetic compared with a conventional facemasks, it could be a good alternative for noncompliant patients.

### 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.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Karthi M, Anbuselvan GJ, Kumar BP. Early correction of class III malocclusion with rapid maxillary expansion and face mask therapy. *J Pharm Bioallied Sci* 2013;5 Suppl 2:S169-72.
2. Pujari P, Shetty P, Quadros DD. Rationale for early treatment and different treatment modalities of class III malocclusion: A review. *Indian J Dent Sci* 2015;7:121-6.
3. Almeida MR, Almeida RR, Ultramari-Navarro PV, Conti AC, Navarro Rde L, Camacho JG. Early treatment of class III malocclusion: 10-year clinical follow-up. *J Appl Oral Sci* 2011;19:431-9.
4. McNamara JA Jr. An orthopedic approach to the treatment of class III malocclusion in young patients. *J Clin Orthod* 1987;21:598-608.
5. Turley PK. Orthopedic correction of class III malocclusion with palatal expansion and custom protraction headgear. *J Clin Orthod* 1988;22:314-25.
6. Takada K, Petdachai S, Sakuda M. Changes in dentofacial morphology in skeletal class III children treated by a modified maxillary protraction headgear and a chin cup: A longitudinal cephalometric appraisal. *Eur J Orthod* 1993;15:211-21.
7. Chun YS, Jeong SG, Row J, Yang SJ. A new appliance for orthopedic correction of class III malocclusion. *J Clin Orthod* 1999;33:705-11.
8. Klemptner LS. Early orthopedic class III treatment with a modified tandem appliance. *J Clin Orthod* 2003;37:218-23.
9. Kim HJ, Chun YS, Lim WH. Maxillary protraction effects of TTBA (tandem traction bow appliance) therapy in Korean class III children. *Korean J Orthod* 2007;37:231-40.
10. Kharbanda OP, Sidhu SS. Prevalence studies in India retrospect and prospect. *J Ind Orthod Soc* 1993;24:115-8.
11. Baccetti T, Franchi L, McNamara JA. The cervical vertebral maturation (CVM) method for the assessment of optimal treatment timing in dentofacial orthopaedics. *Semin Orthod* 2005;11:119-29.
12. Stambach H, Bayne D, Cleall J, Subtelny JD. Facioskeletal and dental changes resulting from rapid maxillary expansion. *Angle Orthod* 1966;36:152-64.
13. Tortop T, Kaygisiz E, Gencer D, Yuksel S, Atalay Z. Modified tandem traction bow appliance compared with facemask therapy in treating class III malocclusions. *Angle Orthod* 2014;84:642-8.
14. Ngan P, Wilmes B, Drescher D, Martin C, Weaver B, Gunel E. Comparison of two maxillary protraction protocols: Tooth-borne versus bone-anchored protraction facemask treatment. *Prog Orthod* 2015;16:26.