A new modified tandem appliance for management of developing Class III malocclusion

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Abstract

Most developing Class III patients display a retruded maxilla. Early intervention in mixed dentition is associated with better patient compliance and possibly a better orthopedic response, which can produce favorable results. The aim of this article is to present the fabrication of the new modified tandem appliance and its use in management of developing Class III malocclusion. The therapeutic results of a new modified tandem appliance are presented in an 8 year-old male patient with anterior cross bite and retrognathic maxilla at the mixed dentition stage. Anterior cross bite was corrected in 3 months and the positive overjet of 4 mm after continued use of the appliance for 1 year. There was a significant improvement in profile of the patient. The use of this appliance in this type of malocclusion enabled the correction of malocclusion in a few months and encouraging favorable skeletal growth in the future.

Keywords: Anterior cross bite, developing Class III malocclusion, early intervention, new modified tandem appliance

Introduction

In the development of Class III malocclusion, hereditary along with environmental factors plays a significant role. The prevalence of Class III malocclusion is variable and depends upon the different ethnic groups and different methods of classification used. In Asian population, the frequency of Class III malocclusions is higher due to a large percentage of patients with midface deficiency. However, the incidence of pseudo-Class III malocclusion in Chinese children was estimated to be 2-3%. Individuals with Class III malocclusion may have combinations of skeletal and dentoalveolar components. According to Guyer et al., 57% of patients with either a normal or prognathic mandible showed a deficiency in the maxilla.

The early management of Class III malocclusion with midface deficiency is necessary because maxilla is the template for the mandible in the early stage of development. The current clinical protocol for midface deficiency was orthopedic maxillary protraction by means of elastics to an extraoral facemask. The dental and skeletal effects of this appliance are well-documented in the literature. However, the major problem, however, has been of compliance, due to both the physical appearance and bulkiness of the extraoral appliance. The tandem appliance was used successfully by Klempner for early treatment of Class III malocclusion. Here, we present a new modified tandem appliance for the management of developing Class III malocclusion, which is more patient friendly and simpler than the earlier one.

Appliance design

The appliance has three components, two fixed and one removable. The upper fixed appliance consist of bands on deciduous second molars, transpalatal arch and palatal expansion arms. Soldered buccal arms are used for elastic traction. The lower appliance comprises bands on deciduous second molars, lingual holding arch, fixed bite plane for posterior occlusal coverage and buccal facebow tubes. A 0.045” headgear facebow with the outer bows was modified for elastic attachment is inserted into the lower tubes. Pin head clasps between the first deciduous molars and deciduous canines are used for mechanical retention, which augment the stability of lower appliance and prevent rocking of it in the upward direction at anterior segment during elastic traction.

Case Report

This was a case report of an 8-year-old young boy who had a complaint of reverse relation of the front teeth. On extraoral examination, he has mild concave facial profile with midface...
deficiency, competent lips and no temporomandibular joint disorder or facial asymmetry [Figure 1]. Intra oral examination revealed anterior cross bite and tendency toward Class III malocclusion (as multiple anterior teeth were in cross bite), with a 2 mm reverse overjet and 40% overbite [Figure 2]. No forward functional shift of mandible was noted on closing movement of mandible. Patient was unable to achieve the edge to edge contact on the incisors. The family history was contributory as patient’s father has similar malocclusion.

On analysis of lateral head cephalogram patient had Class III maxillomandibular relation (ANB = −2°, Wits appraisal = −2 mm). There was horizontal growth tendency with FMA 18°, SM-MP 4°, and Jarabak ratio was 69.5%. Maxilla was deficient and retrognathic with normal mandible. Upper and lower incisors were normally placed in there basal bone [Figures 3 and 4, Table 1].

**Treatment plan and progress**

For early management of the case we planned to use of new modified tandem appliance with keeping objectives in our mind to relieve anterior cross bite as early as possible to provide harmonious jaw growth. Bite registration was done after fabrication of the band on upper and lower second deciduous molars. The upper and lower models were mounted on the articulator with wax bite and then appliance was fabricated in laboratory. After fabrication of appliance; it was properly finished, polished and bands were cemented by glass ionomer luting cement [Figure 5]. Modified face bow was adjusted so that the junction of outer and inner bow should fall at the commissure of lips for easy elastic traction application. An 8 oz, elastic was used for 4 weeks, followed by a 14 oz. Initially, patient was instructed to wear the appliance minimum of 10-12 h/day, including while sleeping. The wear time was gradually increased up to 14-16 h/day. Patient was advised to visit after 1 week to monitor the compliance and check the proper adjustment of appliance and then scheduled to recall at every 4 weeks to monitor the progress.

| Table 1: Cephalometric data |
|-----------------------------|
| Variables | Pre-treatment | Post-treatment | Norm |
| ANB | −2° | 3° | 2° |
| Wits | −2 mm | 0 mm | 1 mm |
| SN-GoGn | 24° | 25° | 32° |
| A-Na perpendicular | −2 mm | 1 mm | 1 mm |
| Midfacial length | 84 mm | 88 mm | 79.8-100 mm |
| Mandibular length | 104 mm | 107 mm | 97-131 mm |
| Jarabak ratio % | 69.5 | 68 | 59-63 |
| U1-NA | 3 mm/28° | 5 mm/30° | 4 mm/22° |
| L1-NB | 5 mm/26° | 5 mm/21° | 4 mm/25° |
| S line-upper lip | −1 mm | 2 mm | 0 mm |
| S line-lower lip | 4 mm | 1 mm | −2 mm |

**Figure 1:** Pre-treatment extraoral photograph

**Figure 2:** Pre-treatment intraoral photograph
Result

After 3 months of appliance wear anterior cross bite was fully corrected, so at this stage we have removed posterior bite block and continued with the protraction of maxilla. After another 4 months of appliance wear, there was positive overjet of 3 mm and for over correction of the existing malocclusion, we have advised the patient to wear the appliance for another 2 months as a safety protocol. The oral hygiene maintenance with the appliance was excellent and we have also prescribed the antiplaque mouthwash to be used intermittently. After 1 year of appliance wear, there was positive overjet of 4 mm, Class I molar occlusion and pleasing facial profile [Figures 6 and 7]. Cephalometric evaluation revealed a significant skeletal improvement, an increased vertical dimension, and a substantial improvement in facial balance [Figures 8-10, Table 1]. Further we have planned to put the patient on reverse twin block to maintain the correction until the pubertal growth spurt.

Discussion

Mesio-occlusion is a sagittal dentoalveolar relationship characterized by a more anterior position of the mandibular dentition compared to the maxillary dentition. Clinically, mesio-occlusion is two types. The first type is a positional form, due to mesial displacement of the mandible into an anterior position and has been named differently such as functional, pseudo or apparent Class III malocclusion. The second type of mesio-occlusion is a true skeletal Class III malocclusion. Moyers proposed the pseudo-Class III relationship as a positional malocclusion with an acquired neuromuscular reflex and considered the hypothesis that the positional relationship in “apparent Class III” may occur with an early interference with the muscular reflex of mandibular closure.

Hard and soft-tissue characteristics of pseudo Class III malocclusion have been compared with normal occlusion, Class I malocclusion and skeletal Class III malocclusion previously. In the patient of skeletal Class III malocclusion with maxillary deficiency the maxilla tends to be more retrusive than in pseudo-Class III patients. In pseudo-Class III malocclusion patients exhibit retroclined maxillary incisors and proclined mandibular incisors, in contrast with skeletal Class III malocclusions. In a skeletal Class III malocclusion the patient often displays a concave facial profile with a short upper lip and in the pseudo-Class III profile appears normal in centric relation and slightly concave in centric occlusion.

The developing Class III malocclusion is one of the most challenging problems in orthodontics. It requires the early diagnosis and management. The objective of early orthodontic treatment of developing Class III malocclusion is to create an environment in which a more favourable dentofacial development can occur. The optimal time to intervene a developing Class III malocclusion is at the...
The various treatments strategies and appliance have been suggested in the literature for the correction of developing Class III malocclusion. Turley presented the therapeutic results of orthopedic treatment with palatal expansion and custom protraction headgear. Tsai suggests the use of rapid palatal expansion and standard edgewise appliance to resolve an anterior cross bite in a 7 years old boy. Rabie and Gu have used a simple method for the early management of pseudo-Class III malocclusion in the mixed dentition with fixed appliance. The therapeutic use of a Balters’ Bionator appliance is suggested in three subjects with anterior cross bite in mixed dentition by Giancotti et al. The therapeutic use of a new modified tandem appliance is suggested in developing Class III malocclusion. A positive overjet and overbite at the end of the treatment appears to maintain the anterior occlusion. The overcorrection is required for long term stability in growing Class III malocclusion; because skeletal patterns generally continue...
to grow in the original direction after initial treatment.\cite{18,24}
The new modified tandem appliance provides a tooth born anchorage system that combines skeletal and dentoalveolar movement. The increased level of patient cooperation with this appliance, combined with the ability to protract the maxilla, makes this appliance extremely valuable in early treatment of developing Class III malocclusion. The patient selected in the present case report have mild skeletal malocclusion and the appliance showed appreciable changes, it warrant that the appliance can also be used in more severe form of skeletal malocclusion.

**Conclusion**

The new modified tandem appliance has more fixed components, simple and patient friendly. It can also be used with upper arch expansion. It will be a valuable tool in the armamentarium of orthodontics to cope up with the developing Class III malocclusions.

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