

Facemask therapy: A non-surgical conventional approach for an orthodontic treatment of post pubertal class iii patient with an impacted canine- A case report

Shah S¹, Kothari B², Jain A³, Gupta S¹

¹ PG student, M.D.S Orthodontics, Department of Orthodontics & Dentofacial Orthopaedics, Pacific Dental College & Hospital, Rajasthan, India

² Professor, M.D.S Orthodontics, Department of Orthodontics & Dentofacial Orthopaedics, Pacific Dental College & Hospital, Rajasthan, India

³ Private practitioner, M.D.S Orthodontics, Department of Orthodontics & Dentofacial Orthopaedics, Pacific Dental College & Hospital, Rajasthan, India

Abstract

Orthodontic treatment of post-pubertal Class III patients, characterized by a protruded lower jaw about the upper jaw, poses unique challenges due to the completion of growth. This highlights the orthopedic treatment approach for correcting Class III malocclusion in post-pubertal patients. The use of functional appliances, such as facemask therapy, combined with orthodontic techniques, aims to achieve favourable skeletal and dental changes. Here is a case report of a 14-year-old female patient with skeletal Class III malocclusion. The patient was diagnosed with a normodivergent growth pattern, having a retrusive maxilla and prognathic mandible with proclined upper anterior, retroclined lower anterior, concave profile, potentially competent lips, reverse overjet, and deep overbite. In addition to this, the patient showed impacted canine with relation to 13. The treatment was planned with a hybrid hyrax-face mask therapy and Class III elastics for Phase 1 and Phase 2 fixed appliances using pre-adjusted edgewise brackets. The facial changes produced as a result of treatment were directly related to skeletal and dentoalveolar modifications that were designed as goals for patient treatment.

Keywords: Class III malocclusion, facemask therapy, impacted canine

Introduction

Class III malocclusion may occur as a result of skeletal or dental discrepancies and is a source of aesthetic and functional impairment to the individual [1]. The prevalence of Class III malocclusion is widely varied among the various ethnic groups [2]. Prevalence of Class III is greater in the Asian population compared to Caucasians, ranging between 4% and 13% in Japanese, 7.8–15.2% in Iranians, and between 4% and 14% among Chinese [3, 4]. The prevalence of this malocclusion in the Indian population is reported to be about 3.4% [5].

Ellis and McNamara concluded that the most common combination of variables in an adult Class III malocclusion were a retrusive maxilla, protrusive maxillary incisors, retrusive mandibular incisors, a protrusive mandible, and a long lower facial height. Further, on average, 60% of Class III malocclusions are characterized by maxillary deficiency [6].

Since Class III malocclusions are the most prevalent type which requires orthognathic surgery, early treatment of this discrepancy is of paramount importance as it can minimize or even avoid surgeries at a later stage [7]. However, Class III skeletal malocclusion is notorious for relapsing after the early stage of treatment is completed. Patients with significant mandibular prognathism require constant monitoring and may need further facemask therapy [8].

Hence, proper case selection, prolonged duration of treatment, and long-term follow-up are necessary for orthopedic growth modification to be deemed successful. In

the last two decades, a combination of rapid maxillary expansion (RME) along with a facemask to protract the maxilla has become a standard protocol in the early management of cases with maxillary deficiency [9]. This case report presents the use of the above procedure for the successful management of Class III malocclusion with a maxillary deficiency in a 14-year-old female patient who has completed her growth. The patient also showed an impacted canine which added to the severity of malocclusion.

Diagnosis

A 14-year-old female patient reported to the Department of Orthodontics at Pacific Dental College & Hospital, Udaipur with a chief complaint of forwardly placed lower teeth. Extra oral examination reveals a concave profile and competent lips (Fig 1). On case analysis, the patient showed skeletal class III with normodivergent jaw bases with retrusive maxilla and prognathic mandible. Dentally, the patient has Angle's class III malocclusion proclined upper and retroclined lower incisors, impacted 13 and class III molar relation on the left side while class I right side, class III canine relation on the left side, crowding & spacing in upper anterior, retrusive upper & protrusive lower lip, with anterior and posterior crossbite present. Cephalometric analysis showed skeletal class III relation as SNA – 74°, SNB- 82°, ANB – negative 8°, normodivergent jaw growth as SN-GoGn was 29°, FMA – 25° while UI-SN was 114° and LI-MP was 87° (Fig 2).

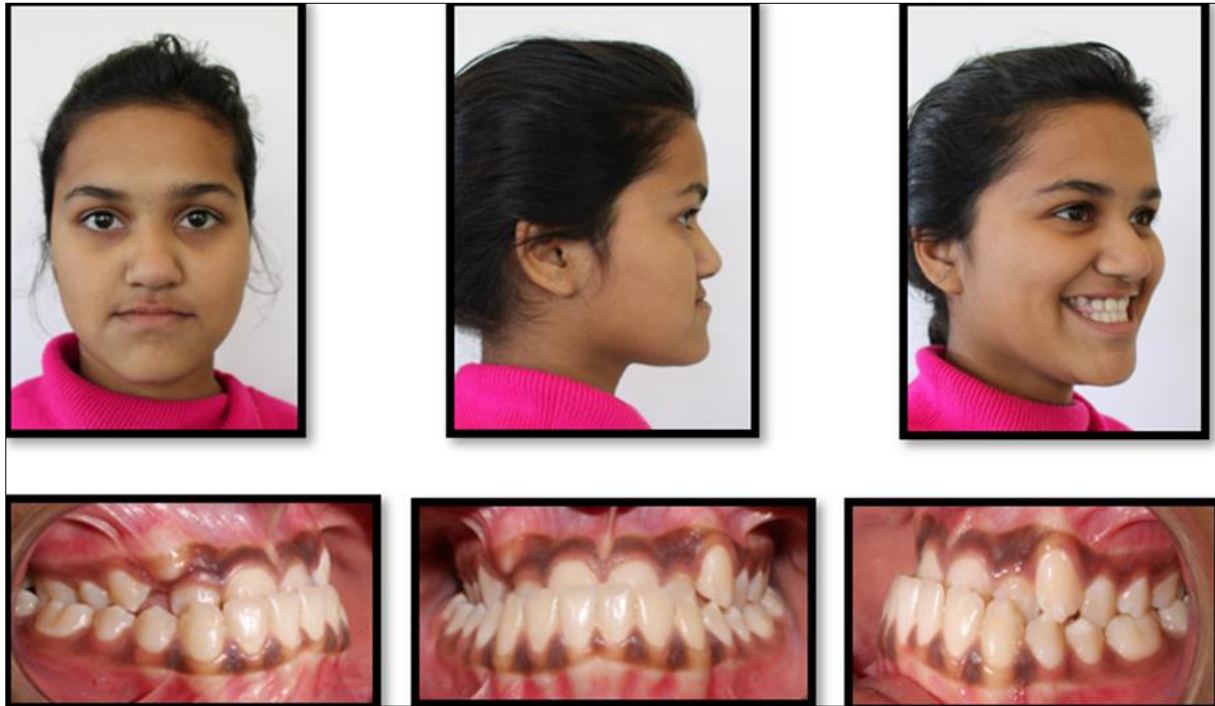


Fig 1: Pretreatment records – Extraoral & Intraoral photographs

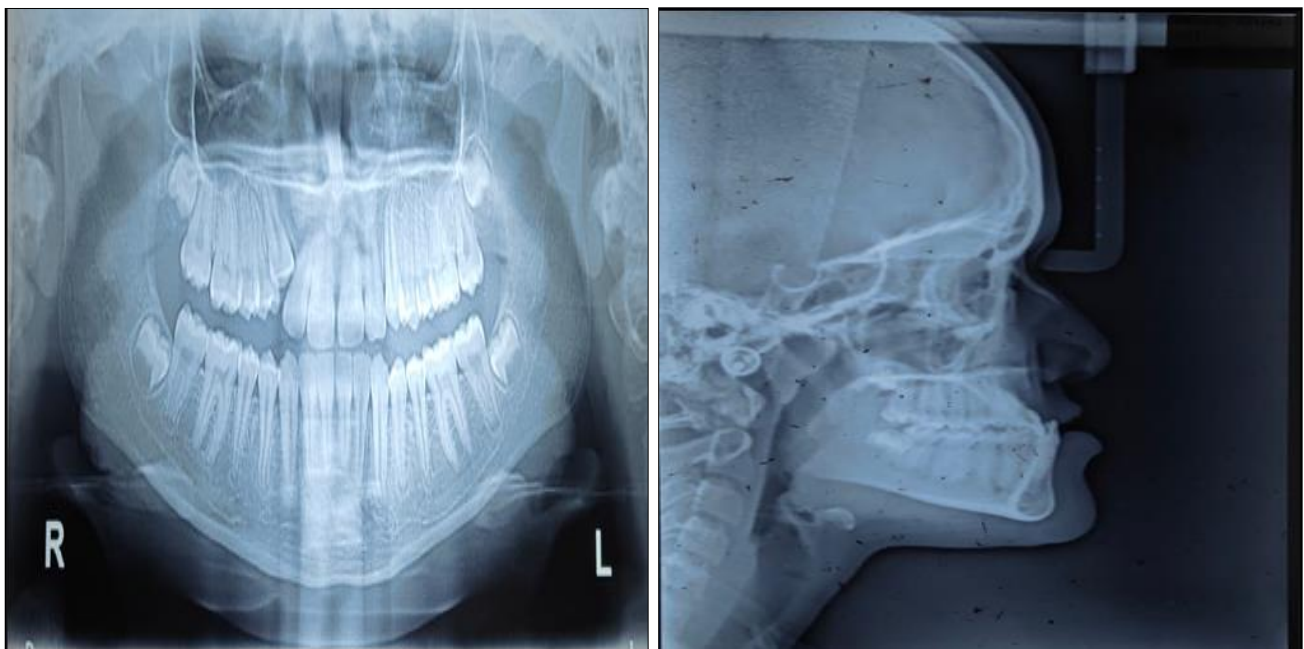


Fig 2: Pretreatment radiographs

Treatment objectives

- To correct skeletal class III pattern
- Correction of the narrow maxillary arch
- Anterior & posterior cross-bite correction
- Exposure w.r.t 13
- Alignment of the upper and lower arch
- Achieving a balanced soft tissue profile.

Treatment plan

The patient was suggested to undergo orthognathic surgery since the patient had already completed growth. Due to side effects and prolonged treatment time, the patient rejected this treatment. Hence, the patient was advised for orthopedic treatment along with Rapid Maxillary Expansion. To correct the vertical and anteroposterior maxillary deficiency, it was

decided to protract the maxilla using a facemask while simultaneously expanding it using an RME device as it disrupts the maxillary suture system and promotes maxillary protraction, followed by finishing and detailing with the fixed orthodontic appliance in two-phase treatment. In anticipation of the prognathic mandible which may offset the treatment changes, the parents were also made aware of the possible need for corrective jaw surgery in the future.

Phase I – Facemask therapy

Treatment was started with a bonded RME device which consisted of a HYRAX screw (Leone, Italy) with an expansion range of 9 mm (Fig 3). It had hooks incorporated on the buccal aspect at the position of the canines to engage the elastics for a facemask. This appliance was cemented in

place in the patient’s mouth. The screw was daily activated for a ½ turn for a period of 10 days. It has been stated that even in patients who do not require any increase in transverse dimension; the appliance should be activated for

8–10 days before facemask placement. After the disjunction, the screw was sealed, and PETIT-type face mask therapy was started (Figure 3).

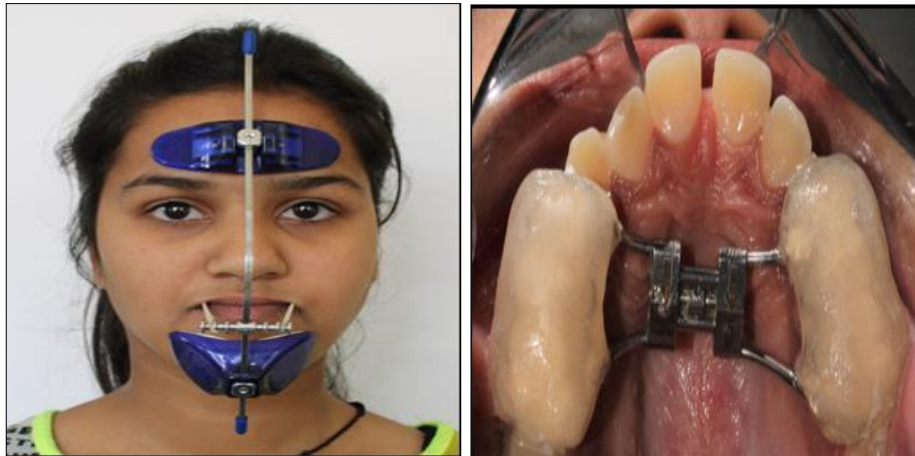


Fig 3: Petit facemask & Bonded RME Hyrax appliance

The patient was advised to wear the device daily for as many hours as possible except during school time. The approximate duration of wear as reported by the patient’s parents 2 weeks later was 14–15 h. The direction of pull was forward and downward, directed approximately 30° to the maxillary occlusal plane. Starting with a force level of 150 g on each side, it was increased to 300 g on each side from the 2nd week. After 1 month of wear, the force imparted was increased to and was maintained at 450 g bilaterally. Positive overjet and Class I molar relation was achieved after 7 months, but the device was maintained for 12 months to achieve overcorrection. The RME device was then removed and replaced with a transpalatal arch cemented to the molars.

Pre-adjusted edgewise MBT brackets of 0.022 x 0.028 “size was bonded in the upper & lower arch. Levelling and alignment began with 0.012” NiTi wire and progressed to 0.018 “Stainless steel wire where a step was created for using 0.012” NiTi wire as a piggyback for bringing impacted 13 into the arch. The treatment progressed to 0.019 x 0.025 “Stainless steel arch wire. Finishing and detailing were done with light Class III elastics. The fixed appliance was removed after 25 months. The total duration of active treatment including face mask and fixed appliance was 37 months (fig- 4). Post-treatment a lingual retainer was placed from canine to canine in the upper & lower arch and a removable Begg’s retainer was inserted in the upper & lower arch. The patient was given post-insertion instructions for full-time wear of the removable retainer.

Phase 2 – Fixed Orthodontic treatment

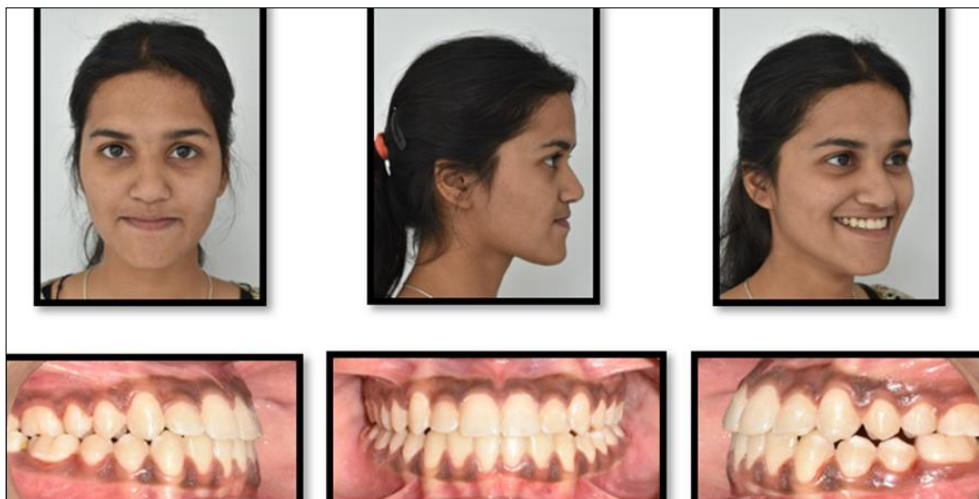


Fig 4: Post treatment results

Treatment results

The patient’s profile was improved from concave to straight. Anterior & posterior crossbite correction was achieved with normal overjet and overbite. The permanent teeth had erupted into a well-aligned dental arch; molar and canine relationships were Class I and overjet and overbite were

ideal. The smile was aesthetic, and the patient and parents were satisfied with the treatment results. The vertical proportions of the tooth display on smiling were greatly improved. There was a significant change in the maxillomandibular relationship as observed from the lateral cephalogram. There was an improvement in ANB and Wits

appraisal; the mandible had rotated downward and backward as shown by changes in FMA. The superimposition of pre and post treatment shows there was protraction of maxillary arch along with its slight downward and clockwise rotation of mandible (fig 5).

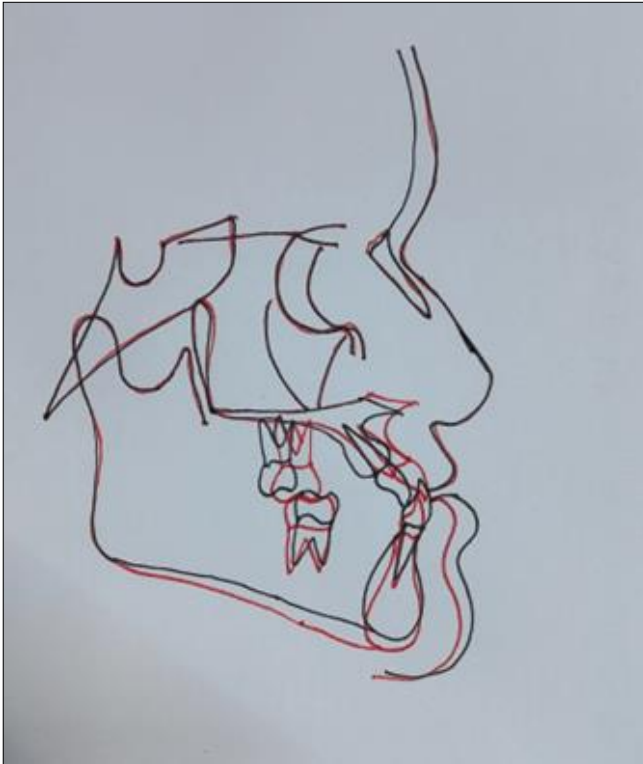


Fig 5: Superimposition of pre & post treatment results (black line – pretreatment & red line – post treatment).

Discussion

The treatment effects of the facemask are a combination of skeletal and dental changes in the maxilla and mandible [10]. In this patient, the maxilla moved downward and forward as a result of the protractive force. As a consequence of this effect, the mandible rotated downward and backward, thus improving the maxilla-mandibular relationship in the sagittal dimension. However, this led to an increase in the lower facial height. Since the patient has a relatively low to normal mandibular plane, the effect was aesthetic. This rotation of the mandible was a major contributing factor in establishing an improvement in anterior overjet [11]. Williams *et al.* in their prospective long-term study regarding the effects of maxillary expansion during facemask therapy, concluded that the average anterior movement of point A posttreatment was 1.54 mm, and that of maxillary teeth was 2.73 mm [12]. They stated that the positive overjet obtained was due to both orthopedic and dental contributions. Further, they stated that few statistically significant changes occurred in the mandible and its dentition, but those changes further contributed to Class III correction.

The skeletal and soft tissue profile was thus straightened and the posture of the lips improved. An *in vitro* study by Tanne *et al.* concluded that a downward pull from 45° to 30° in the facemask gave the most translatory effect [13]. Similar to the study by Ngan *et al.*, we favoured a 30° angulation to produce an acceptable clinical response [14]. The downward movement of the maxilla increased the upper incisor exposure, thus producing a more pleasing smile. While a

few recent studies states that sagittal maxillary development by a facemask is not primarily influenced by transverse expansion, a systematic meta-analysis concluded that dental side effects were more distinct when no expansion was carried out [15]. They also stated that the newer concept of alt-RAMEC (alternating RME and contraction) enhanced face mask treatment but further randomized controlled studies were needed [16]. Recent methods of maxillary protraction include the use of bone anchors to produce a pure orthopedic effect and to decrease the treatment duration, thereby minimizing unwanted dentoalveolar changes during protraction [17-19]. However, the need for eight surgical interventions for the placement and removal of bone plates and the possibility of root damage decreased its favourability for this young patient. Although there are concerns regarding the stability of Class III orthopedic treatment; Turley [20] showed that treated patients who had a maxillary deficiency but normal mandibular dimensions generally showed good stability. In addition, the degree of relapse is negatively correlated with the length of stabilization [21]. The patient is still being monitored to ensure long-term stability.

Conclusion

This case report shows that skeletal Class III malocclusion with a maxillary deficiency in a growing individual can be successfully managed using the RME-facemask procedure followed by fixed orthodontic treatment. Thus, careful case selection, patient cooperation, and long-term stabilization ensure a treatment result that is successful, stable, and aesthetic.

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