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Early orthopaedic correction of skeletal Class III malocclusion using bite opening maxillary plate with Petit Face Mask: A case report

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Abstract
Class III malocclusion can arise either due to any skeletal or dental discrepancies and often leads to aesthetic and functional impairment to the individual. In growing children skeletal Class III malocclusion requires early intervention to modify unfavourable growth patterns, and also to avoid future surgical procedures. It can be done with orthodontic correction. This case report describes the successful management of a 6-year-old female patient presenting with skeletal Class III malocclusion. The treatment plan involved the use of a using a bite opening maxillary plate with an anterior face mask hook. A Petit face mask was used for maxillary protraction by utilizing the child's natural growth potential. The outcomes were highly satisfactory, resulting in improved facial aesthetics, a skeletal Class I with a Dental Class I molar and canine relationship, an ideal overjet and overbite. Thus, early orthopaedic intervention combined with growth modification can effectively correct developing Class III malocclusion and improve facial aesthetics.

Keywords: Class III malocclusion, facemask therapy, growth modification

Introduction
Until the 1970s, skeletal Class III malocclusion was considered to originate only from the mandible [1]. However, with improved diagnosis and understanding of craniofacial growth patterns, maxillary growth deficiency can also be a source of such malocclusion. Orthodontic use of face mask treatment has been used more often. The mechanism of action of FM is by sutural remodelling and produces forward movement of the maxilla [1, 2]. Class III malocclusion in young children is commonly characterized by maxillary deficiency, mandibular prognathism, or a combination of both [3]. Early orthopaedic treatment aims to protract the maxilla and guide growth in a favourable direction before skeletal maturity is reached. Traditionally, maxillary protraction is combined with rapid maxillary expansion to disarticulate circum-maxillary sutures. However, in very young patients with active growth potential and minimal transverse discrepancy, protraction without RME may still yield favourable outcomes. However, Class III skeletal malocclusion is acclaimed for relapsing. Significant mandibular prognathism patients need ongoing observation and can be benefited from further facemask therapy. Therefore, long term follows up is important to ensure the stability of orthopaedic growth modification. This case report demonstrates the successful use of early orthopaedic intervention for managing skeletal class III malocclusion with maxillary deficiency in a 6-year-old patient.

Case Presentation
A 6-year-old female patient reported with the chief complaint of forwardly placed lower teeth. There was no relevant pre- and post-natal history or family history was reported. She had an average clinical FMA and an acute nasolabial angle. On Intraoral examination showed the patient to be in a mixed dentition stage with anterior crossbite in 51,52,53,61,62 region. The first molars were in a Class III relation on both sides. On extraoral examination Concave facial profile, retrusive midface, no facial asymmetry, no significant transverse maxillary deficiency. (Fig 1a & b; Fig 2a & b) The inter-canine width of upper jaw was 3mm and lower was 3.22 mm suggesting inter arch discrepancy.
Cephalometric analysis (Fig 3) [Table 1] indicated a Class III sagittal relationship (ANB = -2.5, AO-BO = -2mm) with a retrognathic maxilla (SNA = 79°), and mild prognathism of the mandible (SNB = 85°). The upper incisors were moderately proclined (U1-NA =4 mm). The upper lip was retro positioned, and the lower lip was positioned forward with respect to Rickett's E line (UL-E line = 6 mm, LL-E line = 5 mm).

Parameter	Pretreatment	Posttreatment
SNA (°)	79	82
SNB (°)	85	80
AO-BO (mm)	-2.0	2.0
ANB (°)	-2.5	4
FMA (°)	21	24
SN Go-Gn (°)	28	31
U1-NA (mm)	4	6
L1-NA (mm)	2	5
IMPA (°)	95	92
Nasolabial Angle (°)	90	92
UL E Line (mm)	-6	-3
LL E Line (mm)	5	1.5
Overjet (mm)	-1.5	2
Overbite (mm)	-1	2

Fig 1 a & b: Intraoral pre-treatment photographs

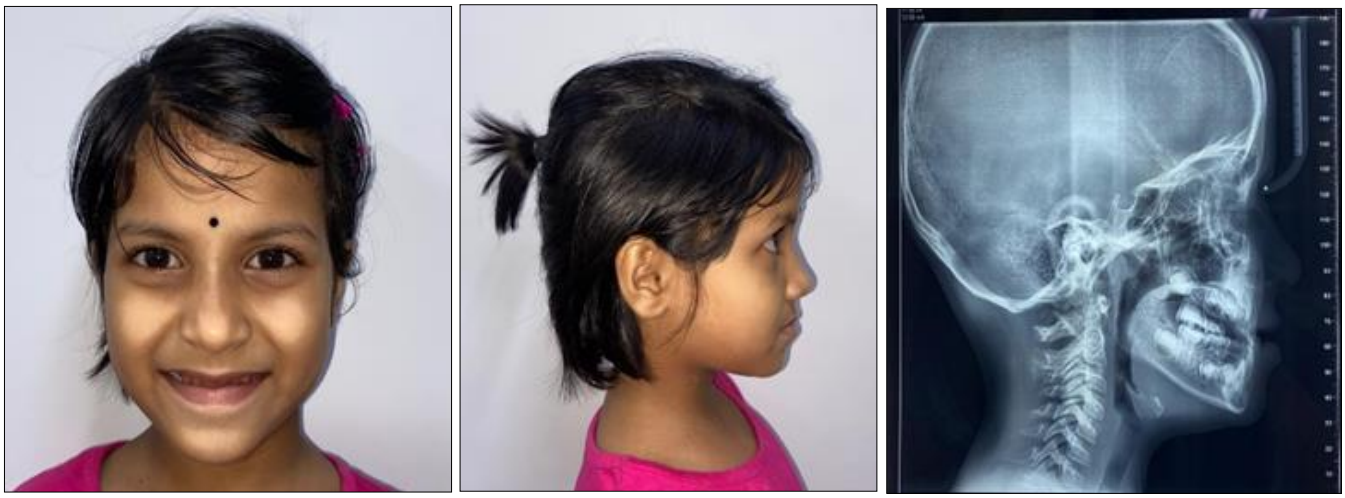

Fig 2 a & b: Extraoral photographs

Fig 3: Lateral cephalogram

Treatment Objectives

Parents were made aware of the skeletal disharmony present in the patient and the need for management at an earlier stage with the innate growth modification as possible. They were informed about the use of a Petit face mask for maxillary protraction. Informed Consent was taken from patient's guardian. The treatment approach was explained as utilizing the child's active growth phase and the favourable responsiveness of the circum-maxillary sutures to achieve skeletal correction in a conservative manner.

The treatment objectives were:

- Correct anterior crossbite
- Achieve positive overjet
- Stimulate forward growth of the maxilla
- Improve facial profile
- Avoid rapid maxillary expansion

Fig: 4 Use of maxillary bite opening plate with facemask

Treatment Plan

To correct the anteroposterior maxillary deficiency, it was decided to protract the maxilla using a facemask. Fabrication of a bite opening maxillary plate with acrylic coverage over the dentulous area and incorporation of a face mask hook for anterior traction by the face mask [4]. (Fig 4). Use of Petit face mask for maxillary protraction, no rapid maxillary expansion was planned at a young age, since, the circum-maxillary sutures are highly patent and biologically responsive, allowing effective maxillary protraction without prior suture disarticulation.

Appliance Design: The appliance consisted of: Wires which was adapted in the molar region extending till canine to make a hook incorporated on the buccal aspect at the position of the deciduous canines to engage the elastics, an acrylic bite opening plate was fabricated over the molars. Elastics were engaged from intraoral hooks to the Petit face mask for traction of the maxilla.

Force applied: 8 ounce per side

Duration: 12–14 hours per day

The direction of pull was forward and downward, directed approximately 30° to the maxillary occlusal plane.

Treatment Results

The patient demonstrated good compliance. Monthly follow-ups were conducted to monitor progress.

Within 3 months: Anterior crossbite was corrected, Positive overjet of +2 mm had been achieved. There was improvement in facial convexity, forward movement of maxilla observed clinically. (Fig 5 a & b) No rapid maxillary expansion was performed at any stage.

There was a perceptible improvement in the lip-nose-chin relationship as indicated by the following outcomes:

- Establishment of positive overjet
- Improved facial profile
- Stable occlusal relationship during follow-up

Thus, dentoalveolar camouflage, if done in properly selected cases, alleviates the need for surgical intervention. Follow up was done at 6 months and 1-year interval which showed good results.

Fig 5 a: Post-operative intraoral photographs

Fig 5 b: Post- operative extraoral photographs

Discussion

Maxillofacial growth modification with FM therapy is an effective approach for resolving maxillary deficiency in children and adolescents [1].

Early orthopaedic intervention in skeletal Class III malocclusion is strongly advocated to intercept unfavourable growth patterns before they become fully established. In the present case, treatment was initiated at 6 years of age, a period characterized by high sutural plasticity and significant growth potential. At this stage, the circum-maxillary sutures are less interdigitated and more responsive to orthopaedic forces, allowing effective maxillary advancement.

The use of a bite opening maxillary plate combined with a Petit face mask allowed forward displacement of the maxilla by harnessing natural growth rather than relying on aggressive mechanical disarticulation. Unlike conventional protocols that incorporate rapid maxillary expansion (RME), this approach avoided unnecessary expansion. Therefore, in certain cases, like with active growth potential, such dentoalveolar camouflage minimizes the need for surgery, whereas continuous observation until the completion of growth is required [5].

Literature suggests that RME primarily enhances protraction outcomes in cases with transverse maxillary constriction [6]; Whereas, in very young patients with adequate transverse

dimensions, protraction alone can produce significant skeletal changes.

Therefore, this method represents a favourable early intervention strategy, as it leverages natural growth potential, reduces treatment complexity, and avoids unnecessary expansion procedures while achieving stable orthopaedic correction.

Further evidence supporting stable orthodontic correction has been reported by an *vitro* study by Tanne *et al*. concluded that a downward pull from 45° to 30° in the facemask therapy lead to significant translatory effect in the maxilla [7].

A retrospective study by Koray Halicioglua *et al* [1] compared the skeletal, dental, and soft tissue effects of FM therapy with and without RME in young adult patients. Both groups, showed a statistically significant increases in SNA angle, A-N perpendicular, and Co-A length indicating forward displacement of the maxilla, further a clockwise rotation of the mandible was observed contributing to and improved maxillomandibular harmony. Along with the skeletal changes, changes were also seen in soft tissue profile resulting in a more convex profile [8]. A notable finding was seen, where the maxillary incisors in the FM group were more proclined than in the RME+FM group. While, mandibular incisors demonstrated a tendency toward retroclination in both groups [1].

The newer concept of alt-RAMEC (alternating RME and contraction) enhances face mask treatment but further meta-analysis was done by Moritz Foersch *et al* [9] reported that this protocol has a positive impact on sagittal maxillary growth. However, these findings also suggest that these effects are not primarily dependent on transverse expansion. Furthermore, dental side effects were more pronounced where expansion was not performed. Despite these results, further randomized controlled studies are required with regard to the new concept of alternating maxillary expansion and compression protocol [9]. Overall, early orthopaedic intervention with maxillary protraction and palatal expansion plays a crucial role in correcting anterior-posterior skeletal discrepancy [10]. Therefore, treatment implemented during the active growth phase, can effectively provide better results and reduce the need for future surgical intervention.

Although there are concerns regarding the stability of orthopaedic treatment in class III malocclusion; Turley *et al* reported that patients who had a maxillary deficiency while normal mandibular dimensions generally showed favourable stability following orthodontic treatment [11]. Further, it was seen that the degree of relapse is inversely related to the duration of stabilization [12]. Post 2 years of facemask therapy, the orthopaedic changes produced remained stable, with well settled occlusion, and an improved soft tissue aesthetics. Early stage treatment helped undesirable tooth movements such as the development of anterior open bite, mandibular incisor supraeruption [13].

Conclusion

There have been few evidences to show the early intervention with a facemask resulted in positive improvement in both skeletal and dental effects [14]. This case report underscores the efficacy of early intervention using the facemask therapy in managing skeletal Class III malocclusion with maxillary deficiency in a growing individual. Facemask when utilized without rapid maxillary expansion, in a patient of active growth potential can successfully achieve positive overjet and favourable maxilla-mandibular growth [12]. Utilizing natural growth potential plays a crucial role in achieving stable and favourable skeletal correction. The concave soft tissue profiles of the Class III subjects were corrected by forward movement of the maxilla and a significant aesthetic improvement in the soft tissue profile of the upper lip [8].When compared to patients treated with facemask therapy and rapid maxillary expansion, the post-treatment findings demonstrated a significant improvement in the facial profile with class I molar relationship [15].Hence, early orthopaedic management provides a stable, good outcome, and further reducing the need for surgical intervention.

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