

Early Orthopedic Correction of Skeletal Class III Malocclusion in Growing Child: A Case Report

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ABSTRACT

Skeletal class III malocclusion can occur due to deficient maxilla/ retrognathic maxilla with orthognathic mandible or due to orthognathic maxilla with excess/ prognathic mandible or due to combination of both retrognathic maxilla with prognathic mandible. Skeletal malocclusion can become severe if not treated at the right time. Early treatment, in growing individuals will reduce the chances for orthognathic surgery. Maxillary deficiency in growing patients with skeletal Class III malocclusion can be treated by either extraoral or intraoral appliances. Extraoral appliances include face mask, reverse chin cup, reverse headgear, and protraction headgear. Intraoral appliances include tongue appliance, fixed tongue appliance, tongue plate, Frankel III, miniplat in combination with Class III elastics, and miniscrew in combination with Class III elastics. In this case report we explained about management of class III condition with the help of facemask appliance along with maxillary expansion screw.

Keywords: Skeletal Class III Malocclusion, Maxillary Deficiency, Growing Patients, Maxillary Retrusion, Facemask, Orthognathic Surgery.

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INTRODUCTION

One of the most significant changes in the area of early treatment in recent decades concerns managing the developing Class III malocclusion.¹ Class III malocclusion most commonly occurs due to maxillary deficiency or excessive growth of mandible. It has been found that 65% to 67% of all Class III malocclusions were characterized by maxillary deficiency.² In patients having a deficient maxilla in which the mandible is not markedly affected, treatment proceeds with stimulation and guidance of maxillary growth by orthopaedic forces. Class III malocclusion is growth related problem and become more severe and difficult to treat if left untreated in the early ages.³ Whenever maxillary deficiency is the cause of Class III malocclusion, decreased maxillary basal length and/or retruded position of the maxilla coupled with anterior cross bite are contributing factors.⁴

Skeletal Class III malocclusion usually is a three-dimensional problem and patients often exhibits maxillary constriction that is manifested as an anterior and/or posterior cross bite. Sagittal discrepancy may worsen with age due to the retarded maxillary growth and discrepancy is coupled with unimpeded growth of the mandible. Further, if the patients reports in late mixed or permanent dentition, the degree to which orthopedic alteration is possible is limited. Typically, treatment approaches for young patients with Class III malocclusion have been directed at growth modification. Face mask/reverse head gear is an orthopedic appliance which when worn 10-14 hours a day for 9-12 months can skeletally advance the maxilla in the range of 2-4 mm in order to correct the Class III Malocclusion along with maxillary expansion can result in best treatment outcome.⁵

CASE REPORT

A 7 year old healthy female patient reported with the chief complaint of forward placement of lower front teeth as compared to upper front teeth with large lower jaw. On extra oral examination (Figure 1), patient's facial profile was concave, anterior divergent face and obtuse nasolabial angle. Lower lip was positioned ahead of the upper lip. On intraoral examination (Figure 2), occlusion relationship was class III molar relation bilaterally with reverse overjet of 3 mm and

anterior cross bite in relation to 51, 52, 53, 62, 63. The patient was advised for orthopantomogram, and lateral cephalogram (Figure 3). Cephalometric analysis showed a Class III sagittal relationship ($ANB = -3$, $AO-BO = -4$ mm) with a retrognathic maxilla ($SNA = 77^\circ$, N perp to $A = -3$ mm), and prognathism of the mandible ($SNB = 81^\circ$, N perp to $Pog = +1.0$ mm). The patient had class III skeletal malocclusion with retrognathic maxilla and mild prognathic mandible with decreased effective maxillary length (table 1).



Figure 1: Pretreatment extraoral photographs



Figure 2: Pretreatment intraoral photographs



Figure 3: Pretreatment cephalometric radiographs



Figure 4: Placement of Expansion Screw

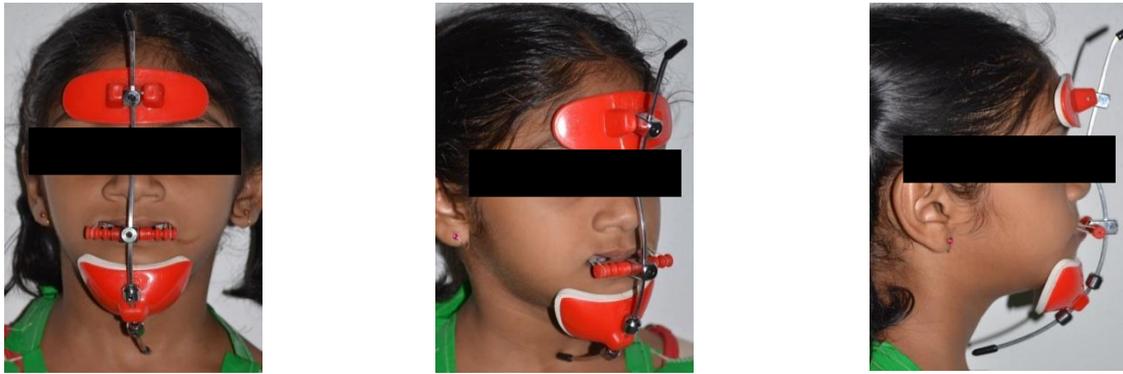


Figure 5: Facemask therapy



Figure 6: Post treatment extraoral photographs



Figure 7: Post treatment extraoral photographs



Figure 8: Retention phase FR-3 appliance



Figure 9: Post treatment cephalometric radiographs

Table 1: Composite analysis

MEASUREMENT	MEAN	Pre-Rx	Post-Rx
SNA	82°	77°	83°
SNB	80°	81°	81°
Go-Gn to SN	32°	28°	30°
ANB	2°	-3°	2°
N-perpendicular to Point A	0± 2 mm	-3	1
N-perpendicular to Pog	0 to - 4 mm	1	1
Facial axis angle	90°	85°	89°
Effective-Max length		76	79
Effective- Man length		102	103
LAFH		54	56
Sum of posterior angle	396± 6°	390°	394°
Y-axis[N-S-Gn]	66°	63°	65°
Naso labial angle	90°to 110°	110°	99°

TREATMENT PROGRESS

Phase I: Functional Jaw Orthopedics – Face Mask with maxillary expansion with hyrax

Phase II: Retention with FR III appliance

Phase III: Comprehensive orthodontics

Correction of skeletal class III, overjet and overbite, molar relationship and obtaining ideal aesthetics were the treatment objectives. The patient was treated with bonded rapid maxillary expansion along with face mask therapy.

Treatment was started with Bonded Rapid Maxillary Expansion device which consisted of an 11 mm HYRAX screw (Leone, Italy). HYRAX screw was soldered with wire framework (Figure 4), in which hooks were incorporated on the buccal aspect and distal to deciduous canines for the engage the extra oral elastics. This appliance was cemented with Glass Ionomer Cement. The expansion screw was daily activated for 2 turn for the first week and then 1 turn for next week. The bonded RME should be activated for 10 days prior to facemask therapy. After the dysjunction of maxilla, petit facemask therapy was started. The patient was advised to wear the facemask daily for 14-15 hours. The direction of pull was downward and forward and, directed 20° to the occlusal plane (figure 5). In the first week of facemask therapy, force level was 200 gram on each side initially and then it was increased to 350 gram in second week on each side and maintained for next 6 months.

Correction of anterior teeth cross bite, skeletal malrelationship was achieved with significant improvement of patient profile after 6 months of facemask therapy. Same was continued for 3 months. Intraoral examination revealed establishment of the positive overjet (Figure 7) and the cephalometric findings indicated a forward protraction of the maxilla as well as proclination of the maxillary incisors besides attaining a positive overjet of teeth.

15 months of active retention by a Frankel III appliance (Figure 8). The intraoral photographs revealed establishment of the positive overjet and settling of occlusion (Figure 7). The extraoral examination and radiographic findings indicated protraction of the maxilla and improvement of the profile (Figure 6,9).

DISCUSSION

The results of Face mask therapy as agreed by various investigators are essentially maxillary anterior displacement, improvement in facial profile, counter-clockwise rotation of the maxilla, mandibular backward and downward rotation, proclination of the maxillary incisors retroclination of the mandibular incisors, and increase in vertical dimension.^{6,7}

Maxillary protraction is generally considered to be stable and success rate of 66 to 75% has been reported^{8,9} However, there is a potential risk that some patients might require orthognathic surgery later in life because of unfavorable growth pattern usually due to horizontal mandibular growth.^{10,11}

Stability of Facemask Therapy

Wisth et al¹² investigated the post-treatment growth of 22 children treated with facemask and quad-helix, and compared them with 40 Class I controls. During the post-treatment period, changes in the maxilla, the mandible, and the overbite were not statistically different from the controls. These results suggest that growth is normalized after facemask therapy.

Shanker et al¹³ compared 25 Chinese children treated with maxillary protraction/hyrax expansion with untreated Class III patients matched for age, sex, and race. No significant differences were found in the horizontal or the vertical movement of Point A during the 12- month observation period. These latter studies suggest that patients treated with facemasks continue to grow similarly to Class III patients after treatment.

Studies suggest that facemask therapy does not normalize growth but, rather, that treated patients resume a Class III growth pattern, characterized primarily by deficient maxillary growth. Although a longer follow-up period is needed, the data support the practice of overcorrection to compensate for deficient posttreatment maxillary growth.

Benefits of Palatal Expansion

Palatal expansion has been advocated as a routine part of Class III correction with facemask therapy. The benefits of palatal expansion might include expansion of a narrow maxilla and correction of posterior crossbite, increase in arch length, bite opening, loosening or activation of circummaxillary sutures, and

initiating downward and forward movement of the maxillary complex.

Clinicians have advocated maxillary expansion a week before starting facemask use, even without maxillary constriction or crowding.

A Petit type reverse pull facemask was used in the present case, in a growing child, to correct Class III

malocclusion due to maxillary deficiency. The splint was fitted with hooks to attach elastics to the facemask, and an expansion screw was incorporated in the appliance. Mid facial orthopedic expansion could produce a slight anterior movement of Point A and a slight inferior and anterior movement of the maxilla.

The protocol followed for protraction as regards the direction and amount of force is 300 to 500 g of force per side, 10-14 hours a day for entire period of treatment. The facemask projects a downward and forward pull on the maxilla with protraction elastics attached near the maxillary canines, with a downward and forward pull of 20° from the occlusal plane. The treatment was done at a very young age in early mixed dentition to enhance forward displacement of the maxilla by sutural growth. Another important factor was retention of the positive overjet once achieved, for which Frankel III was given as a retention device for approximately a year-and-a-half. This was supported by a prospective clinical trial, where protraction facemask treatment starting in the mixed dentition was found to be stable two years after the removal of the appliances, due to the overcorrection and the use of a functional appliance as a retainer for one year.¹⁴

The patient, however, still has to be recalled for follow-up till the growth of the mandible is complete as there are variations in the rate, growth direction, and rotation of the maxilla from child to adulthood.

CONCLUSION

Accurate diagnosis and understanding of the individual growth pattern is crucial in determining the proper timing of Class III treatment. This case report focuses on early management of class III malocclusion, thus providing normal skeletal, dental development along with psychological development, in later ages of the individual. Combination of maxillary expansion along with the use of protraction appliance will increase the amount of skeletal effect.

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