

Early orthopaedic correction of skeletal class III malocclusion in a growing child: A Case Report

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Abstract

Correcting a class III malocclusion is usually challenging for an orthodontist as the deformity presents itself with extreme variations which not only involves the dentition but also the facial bones. The key to successful correction of class III malocclusion is its early detection and intervention. The usual methods of intervention include maxillary expansion and protraction followed by orthodontic correction. These methods are useful in growing patients. After growth completion treatment options become limited and more invasive in nature and will also add on to the cost of the treatment. The objective of this case report is to present successful treatment of class III malocclusion in a 10 year old male patient by maxillary expansion and protraction and to describe the associated dental and skeletal changes following the conclusion of the active phase of the treatment.

Keywords: Orthopaedic, RME, Facemask

Introduction

Skeletal Class III malocclusion is one of the most challenging and difficult malocclusions to treat. Young patients when diagnosed with Class III malocclusion can be treated easily with growth modification appliances. Class III malocclusion may be hereditary or caused by environmental factors such as deleterious habits. Retrognathic and narrow maxilla along with Prognathic mandible and obtuse nasolabial angle are the characteristic features of Class III malocclusions. These cases require careful diagnosis and treatment planning. Depending upon the extent of discrepancy the treatment should be planned concerning in three dimensional controls and correcting the malocclusion in all three planes of space. Successful orthopaedic correction through growth modification in growing patients has reduced the need for surgery in the future. In addition, maxillary expansion is frequently needed in the treatment of class

III malocclusions to increase the transverse width of the maxilla.¹

According to McNamara and Turley, rapid maxillary expansion (RME) may enhance the protraction effect of the face mask by disrupting the maxillary suture system and it is widely accepted among the orthodontic community that the mid-face deficient class III patients should be treated before 7-8 years of age.²

Skeletal malocclusion can become severe if not treated at the right time.² If right treatment is not initiated at the right time, the severity of the discrepancy may increase and orthognathic surgery may be required at a later stage.

This case report explains a case in which the malocclusion is treated with facemask appliance along with rapid maxillary expansion.

Case Report

Clinical presentation and Diagnosis

A 10 year old healthy male patient reported to the Department of Orthodontics and Dentofacial Orthopaedics with the chief complaint of forwardly placed lower front teeth as compared to upper front teeth with large lower jaw. On extra oral examination, patient's facial profile was concave with anterior divergence, obtuse nasolabial angle and positive lip step.

He had increased lower anterior facial height, vertical growth pattern, skeletal class III malocclusion with retrusive maxilla and prognathic mandible.

On intraoral examination, occlusal relationship was Class I bilaterally, with reverse overjet of 3 mm and reverse overbite of 5mm.. The patient was advised for orthopantomogram, and lateral cephalogram. Cephalometric analysis showed a Class III sagittal relationship (ANB = -2, AO-BO = - 3) with a retrognathic maxilla (SNA = 81°, N perp to A = -2mm), and prognathic mandible (SNB = 83°, N perp to Pog =

+3 mm). Therefore, our diagnosis was class III skeletal malocclusion with retrognathic maxilla and mild prognathic mandible with decreased effective maxillary length.

Treatment Objectives

- Correction of concave profile
- Levelling and aligning
- Correction of anterior crossbite
- Achieve ideal overjet and overbite
- Attain an esthetic smile

Treatment Plan

- Growth modification with functional jaw orthopedic treatment
- RME for orthopedic expansion of maxilla followed by facemask therapy.
- Followed by fixed appliance therapy with MBT 0.022" slot

Appliance Mechanotherapy

- Facemask
- RME
- Fixed mechanotherapy with Preadjusted Edgewise Appliance, MBT 0.022 slot.



Figure 1: Pre-treatment extraoral and intraoral photographs

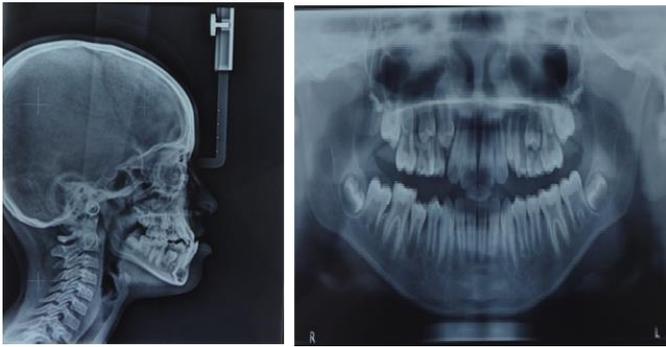


Figure 2: Pre-treatment Lateral cephalogram and OPG



Figure 3: Pre-treatment Hand wrist Radiograph

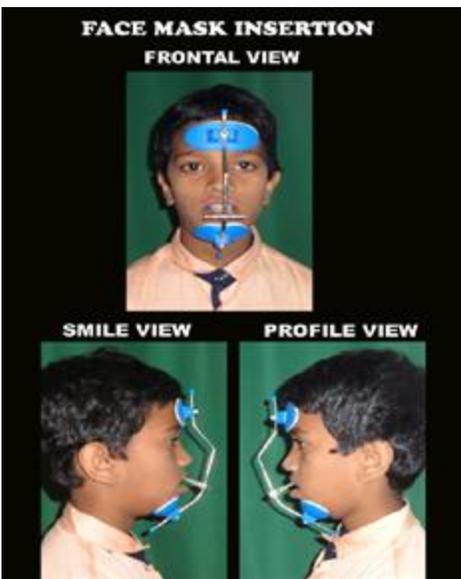


Figure 4: Face Mask insertion



Figure 5: RME Insertion Photographs



Figure 6: Post RME Photographs

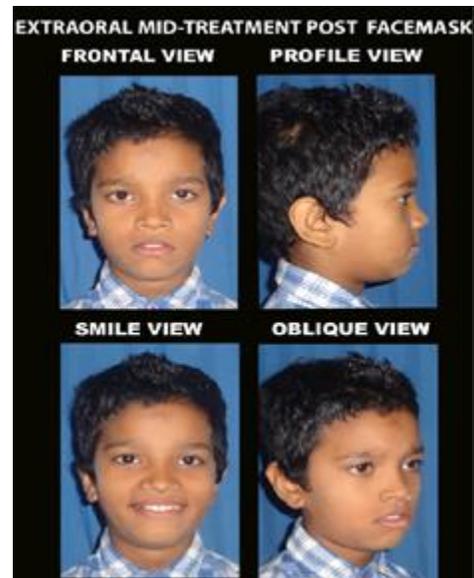


Figure 7: Post Face Mask



Figure 8: Strap up Photographs

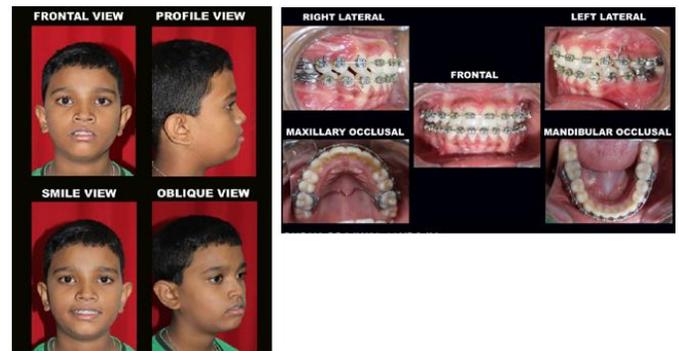


Figure 10: Treatment progress Intra-oral and Extra-oral Photographs

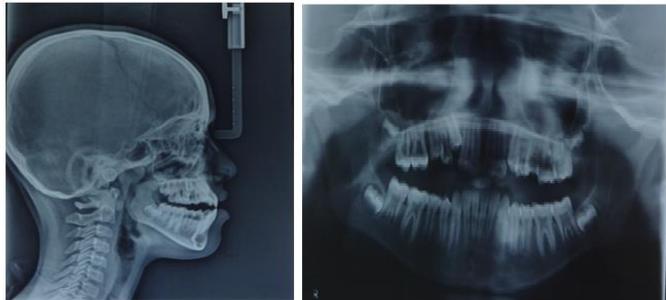


Figure 9: Post RME Face Mask Lateral cephalogram and OPG

Cephalometric analysis

Parameters	Pre- Treatment	Mid treatment	Post treatment
SNA	81	82	82
SNB	83	79	81
ANB	-2	3	1
SND	78	76	78
Mandibular Plane Angle (Down's / Steiner's)	28/35	29/35	28/36
Upper Incisor - NA	34/ 4 mm	29/4 mm	30/5 mm
Lower Incisor - NB	21/5mm	28/5mm	23/6mm
Angle of Convexity	-1	+4	+3
AB Plane Angle	+1	-5	-3
N-Perpendicular to Point A	+1	-5	-3
N-Perpendicular to Pogonion	+2	+3	+5
Saddle Angle	127	124	127
Articular angle	130	147	141
Gonial angle	138	128	131
Basal plane Angle	28	30	29
Upper Incisor to A pog	0mm	+5mm	+6mm
Upper Incisor to SN	100	108	109

Lower Incisor to MP	89	91	89
Lower Incisor to A- Pog	+6mm	+2mm	-1mm
Inclination Angle	81	82	80
Upper Incisor to NF	24mm	24mm	24mm
Upper Molar to NF	18mm	17mm	18mm
Lower Incisor to MP	35mm	36mm	36mm
Lower molar to MP	26mm	25mm	28mm

Treatment Progress

Patient was treated with a combination of face mask and RME until 2 mm positive overjet was achieved. The expansion screw was activated one to three turns (0.25 mm/turn) at weekly visits until the desired amount of expansion had been achieved. The face mask was adjusted to rest on the forehead and the chin of the patient. Elastics (5/16 inch by 14 ounces) were worn from hooks located 2-3 cm in front of the lips to the intraoral attachments located on the expansion appliance, approximately at the gingival level of the canine. The force generated by the elastics was 600-800 g bilaterally. 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 and the cephalometric findings indicated a forward protaction of the maxilla as well as proclination of the maxillary incisors besides attaining a positive overjet of teeth.

Treatment Results

There was significant improvement in the maxilla mandibular relationships. There was significant improvement in the SNB angle. Dental changes were also observed with flaring of incisors in both arches.



Figure 11: Post treatment



Intra-oral Photographs

Figure 11: Post treatment Extra-oral Photographs

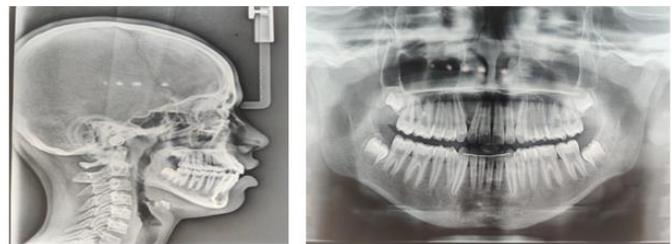


Figure 12: Post-treatment Lateral cephalogram and OPG

Discussion

Growth modification carried out at the right age always bears fruitful results. 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.^{3,4}

Stability of Facemask Therapy

Wisth⁵ et al 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 al⁶ 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. Therefore the major factor that contributes to the success of the treatment is not the amount of forward traction of the maxilla achieved but rather it is the direction and the amount of growth left in the mandible^{7,8}. Although a longer follow-up period is needed, the data support the practice of overcorrection to compensate for deficient posttreatment maxillary growth.⁹

Benefits of palatal expansion

Palatal expansion is an important therapy and a routine part of Class III correction along with facemask therapy. The benefits of palatal expansion are forward and downward inclination of maxilla along with expansion of narrow maxilla and correction of posterior crossbite.¹⁰

The facemask therapy brought about forward and downward movement of maxilla. 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.

Mid facial orthopedic expansion produced a slight anterior movement of Point A and a slight inferior and anterior movement of the maxilla. The amount of force delivered was 300-500 gm per side and used for 12-14 hours/ day. The treatment was done in the mixed dentition period to enhance forward displacement of the maxilla. Another important factor was achieving positive overjet.

The patient, however, needed to be recalled for follow-up until the growth of the mandible is complete as variations could arise in the rate, growth direction, and rotation of the maxilla from child to adulthood.

Conclusion

Early diagnosis and intervention of class III malocclusion remains the most important key to a successful treatment outcome. The growth status of the patient and the direction of mandibular growth also plays important roles. This case report mainly focuses on early intervention and successful correction of a true class III malocclusion using maxillary expansion and protraction appliances, thus preventing further progression of the deformity which could have become a psychosocial and financial burden to the patient in the future.

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