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Non Surgical Treatment of Severe Class III Skeletal Discrepancy with RME and Reverse Pull Headgear - A Case Report

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Abstract: ***This case report describes the treatment of a 12 year old female with a severe skeletal Class III malocclusion, maxillary retrusion and a vertical growth pattern. She was treated non surgically with an orthopedic face mask in conjunction with rapid maxillary expansion and pre-adjusted edgewise appliance. Treatment resulted in a remarkable improvement of the soft tissue profile with forward movement of maxilla, slight downward and backward rotation of mandible and retroclination of mandibular incisors.***

Keywords: Class III malocclusion, face mask, rapid maxillary expansion

1. Introduction

Treatment of Class III malocclusion in growing subjects is a challenging part of orthodontic practice. Many treatment approaches can be found in the literature regarding orthopedic and orthodontic treatment of Class III malocclusion, including intraoral and extraoral appliances such as a facial mask[1], removable mandibular retractor[2], FR-3 appliance of Frankel[3], chincup[4], splints, Class III elastics and chin cup[5] and mandibular cervical headgear [6, 7].

Mandibular prognathism is the cause of many Class III malocclusions; however, some class III malocclusions are the result of a deficient maxilla and the treatment plan of choice would be to protract the maxilla downward and forward [6, 8, 9].Successful orthopedic correction through growth modification has increased the chances of nonsurgical correction of the growing Class III patient. In addition, maxillary expansion is frequently needed in the treatment of Class III malocclusions to increase the transverse width of the maxilla.

Rapid maxillary expansion (RME) may enhance the protraction effect of the face mask by disrupting the maxillary suture system as suggested byMcnamara [10] and Turley [11].RME and face mask therapy is the most common orthopedic treatment approach for Class III malocclusion. The dentoskeletal changes induced by therapy consist of a combined effect of the protocol on both maxillary and mandibular components. Optimal timing for the orthopedic approach to Class III malocclusion is related to early treatment, at either a prepubertal or a pubertal phase of development.[12, 13]

Features commonly found in Class III malocclusion are:

1) Class III molar relationship.
2) Incisor relationship edge to edge or in anterior cross bite.
3) Narrow and short upper arch while lower arch is broad.

Thus, posterior cross bites are a common feature of Class III malocclusion.

4) Pseudo class III malocclusion is characterized by the presence of occlusal prematurities resulting in a habitual forward positioning of the mandible. These patients may exhibit a forward path of closure.

Sketelal features of class III malocclusion:

1) A short or retrognathic maxilla
2) A long or prognathic mandible
3) A combination of the above.

Etiology of class III malocclusion:

1) Class III has strong hereditary components.
2) Anteriorly positioned tongue.
3) Abnormal incisal guidance (pseudo class III).

2. Case Report

Diagnosis

A 12 year old female patient reported to the Department of Orthodontics with a chief complaint of irregular teeth. (Fig 1).

The patient had a history of complete unilateral cleft of lip, alveolus and palate on left side.She got operated for cleft lip at the age of 6 months and for cleft palate at age of 18 months. Patient had a visible scar on left lip due to cleft lip repair.

On extra-oral examination (Figure 1), patient had a dolico-cephalic head shape, lepto-prosopic facial form, nonconsonant smile arc, concave profile, anterior divergence, acute nasolabial angle and shallow mentolabial sulcus. All parameters for functional examination were normal.

On intraoral examination (Figure 2), maxillary arch was constricted while mandibular arch was broad. Molar relationship was Class I on right side and end on on left side. Incisor relationship was Class III and teeth present in arch were 16, 15, 14, 13, 53, 11, 21, 23, 24, 65, 26, 36, 35, 34, 33, 32, 31, 41, 42, 43, 44, 85, 46.There was a reverse over jet of 5 mm, overbite of 5 mm and anterior and posterior cross bites bilaterally. Upper dental midline was shifted towards right side in relation to the facial midline. Upper arch was tapered in shape and lower arch was ‘U’ shaped. There was

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severe crowding, rotations and constriction in the upper arch. There was a need for expansion in both premolar and molar regions as indicated by pont's analysis, arch shape and increased buccal corridor width. The patient had Class III skeletal base with retrognathic maxilla and prognathic mandible having vertical growth pattern (Figure 3 and Table 1).

Treatment Goals were to:

1) To correct the Class III skeletal discrepancy
2) To expand the upper arch
3) To correct the severe crowding and rotations in the upper arch.
4) To achieve normal overjet and overbite
5) To improve the soft tissue profile.
6) To improve the smile aesthetics.

Treatment progress

Patient was treated with a combination of RME and facemask (Figures 4 and 5). Initially both the first premolars and first molars were banded in the upper arch. A fixed bonded acrylic plate with a jackscrew incorporated in the premolar region was given to the patient. As the patient had a vertical growth pattern the height of the acrylic block was kept high (4mm) so as to achieve a good vertical control. Patient was instructed to turn the screw for 1 turn (0.25mm/turn) for 2 days in a week for rapid palatal expansion. This expansion protocol was continued for 15 days. After 15 days midpalatal suture opening was noticed in the occlusal radiograph. The maxilla was over expanded in anticipation of the relapse of the expansion. After the overexpansion the jackscrew of the RME plate was locked by placing acrylic over the screw. This served many purposes, first of all it prevented the overexpansion, secondly it prevented the rolling back of the screw and it also helped in stabilising the expansion which had been achieved. After the sutural dysjunction the patient was given a petit type of reverse pull headgear for maxillary protraction. 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 in the premolar region.The force generated by the elastics was 600-800 g bilaterally. The orthopaedic correction lasted for 9 months after which a positive overjet was achieved and all records were taken (Figure 6).The lateral cephalogram at this stage (Figure 7) showed the forward position of the maxilla, some restriction of mandibular growth and and excellent improvement in the facial profile was noted. After duration of 9 months of orthopedic correction, then the preadjusted edgewise appliance was given for alignment, levelling and for finishing and detailing of occlusion (Figure 8).After 12 months of active treatment both upper and lower arches were aligned, levelled and coordinated. The upper right lateral incisor which was palatally blocked was extracted at this stage and left upper lateral which was impacted was planned for extraction at the time of alveolar bone grafting in the same side canine region. At this stage all records were taken (Figure 9).

Treatment results

Maxillomandibular relations (Figures 7 and 9 (c)) showed significant improvements during the treatment period, with changes due primarily to the increase in the Sella –nasion-point A angle (SNA) angle. The Sella-nasion-point B (SNB) angle showed no significant changes during protraction. The dental measurements showed a tendency for the upper incisors to flare during treatment; the lower incisors were uprighted significantly. Upper or lower molar angulations did not change during treatment. (Table 1).

Retention Plan:

During retention phase it is planned to give the patient a Class III activator with a posterior bite block for maintenance of sagittal correction and to have a good vertical control.

3. Discussion

It is a well known fact that maxillary protraction may result in significant sagittal skeletal advancement of maxilla, downward and backward rotation of mandible and retroclination of mandibular incisors. The primary effects of Petit face mask therapy are skeletal in nature, with the greatest impact on the maxillary position, with significant sagittal advancement with an increase in SNA.[14]The vertical and mandibular effects of PFM are attributable to the downward rotation of the maxilla during application of protraction forces.[15]Significant orthopedic changes can occur with palatal expansion and face mask therapy. This case report showed the results of the treatment of a patient with class III malocclusion at an early stage with an efficient combination orthodontic therapy of RME plus maxillary protraction.

Class III combination therapy is a comprehensive non‐surgical treatment modality for developing skeletal class III malocclusions which combines orthodontic and orthopedic mechanics to effectively improve the patient's occlusion and soft tissue profile. This modality of treatment can be a successful alternative in some cases as later surgical correction of malocclusion can be alleviated by early approach. Musich proposed a growth treatment response vector (GTRV) analysis to warn of excessive mandibular growth after early orthopedic treatment. GTRV equals the horizontal growth of A-point divided by the horizontal growth of B-point. The norm for patients age 6 to 16 years is 0.77. If the ratio falls below 0.60, the patient might need surgical treatment. This patient also needs a continuous follow up with GTRV analysis to assess the mandibular growth.

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