

CASE REPORT

Early Management of Class III Malocclusion in Mixed Dentition

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ABSTRACT

Aim: Skeletal class III malocclusion are the most challenging orthodontic problem to treat. Diagnosis and treatment in early stage was important to boost self-esteem of patient. Our aim was to correct skeletal relationship and anterior crossbite to enhance the growth of maxilla.

Background: Class III malocclusion can be due to retrognathic maxilla, prognathic mandible or combination. Complexity of class III malocclusion depends upon abnormal growth pattern of maxilla and mandible. Maxilla growth ceases around 8–10 years and mandible continue till 16 years. Early intervention boosts self-esteem of the patient.

Case description: This case presents with clinical feature of retrognathic maxilla at the age of six years. The patient had concave profile with incompetent lips. The mentolabial sulcus was normal and obtuse nasolabial angle with high clinical Frankfurt mandibular angle (FMA). There was reverse overjet of 1 mm. Cephalometric analysis showed a class III skeletal pattern with retrognathic maxilla and orthognathic mandible with increase in lower facial height and increases in gonial angle. The rapid maxillary expansion (RME) with reverse pull face mask was planned. The expansion screw was activated to loosen the circumaxillary suture.

Conclusion: After active treatment anterior crossbite was corrected. The patient sagittal discrepancy was improved. Early mixed dentition period is the best time to begin class III treatment.

Clinical significance: Early treatment with maxillary protraction and palatal expansion can correct most anterior–posterior skeletal discrepancy.

Keywords: Anterior crossbite, Class III malocclusion, Early mixed dentition, Maxillary expansion.

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BACKGROUND

Skeletal class III malocclusion occurs because of undergrowth of maxilla, overgrowth of mandible, or both.^{1–3} Maxillary skeletal retrusion and normal sagittal relationship of mandible was found in 25% and combination of retrognathic maxilla and prognathic mandible was found in 22% of cases.¹ The class III malocclusion in European population is 1–5% and up to 13% in Asian population.^{4,5} Class III malocclusions are one of the most challenging orthodontic problems to treat due to the high chance of relapse. The various treatment modalities for patients having skeletal class III pattern malocclusions include growth modification in early growing period, dental camouflage, or orthognathic surgery once the growth has been ceased.

Orthopedic appliances such as reverse headgear with rapid maxillary expansion (RME) appliance have been used for growing patients with early class III malocclusion.⁶ An RME with a face mask can be used for correction of transverse and sagittal discrepancies in the initial phase of treatment.³ This has been reported to be the most successful in early mixed dentition before the maxillary posterior sutures close.

In this article, a young class III patient with anterior crossbite was treated with rapid palatal expander and protraction headgear and her treatment results are discussed.

CASE DESCRIPTION

The patient was a 6-year-old girl retrognathic maxilla in early mixed dentition. The facial analysis reflected mesocephalic whose chief complaint was “upper front teeth is behind the lower teeth”. Clinical examination reported with an angle class III molar relationship with skeletal pattern of retrognathic maxilla, orthognathic mandible,

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mesoprosopic facial form, and anterior facial divergence. The patient had mild concave profile with short upper lip length and normal lower lip length producing incompetent lip. The mentolabial sulcus is normal and obtuse nasolabial angle with high clinical Frankfurt mandibular angle (FMA). There is reverse overjet of 1 mm (Fig. 1).

Teeth present:

16	55	54	53	52	51	61	62	63	64	65	26
46	85	84	83	42	41	31	32	73	74	75	36

Maxillary arch is symmetrical, U shaped, spacing in anterior region.

Mandibular arch is symmetrical, U shaped with good alignment in anterior region (Fig. 2).

Cephalometric analysis suggests a class III skeletal pattern with a combination of retrognathic maxilla and prognathic mandible with increase in lower facial height and increase in gonial angle with normal length of ramus height and body of mandible. The

upper incisors are proclined and lower incisors have normal inclination.

Bjork, Grave, Brown: stage 3

Fishman skeletal maturity indicator: S.M.I-3

Singer method: prepubertal stage

Handwrist radiograph suggests initial ossification of hook of the hamate, initial ossification of the pisiform, and proximal finger of second phalanx of second being equal to its epiphysis. Patient is in the prepubertal growth stage.

Cervical vertebra evaluation: inferior border of C₂, C₃, and C₄ were flat at this stage. This suggests patients are in initial stage wherein 80–100% adolescent growth is expected.

Treatment Objective

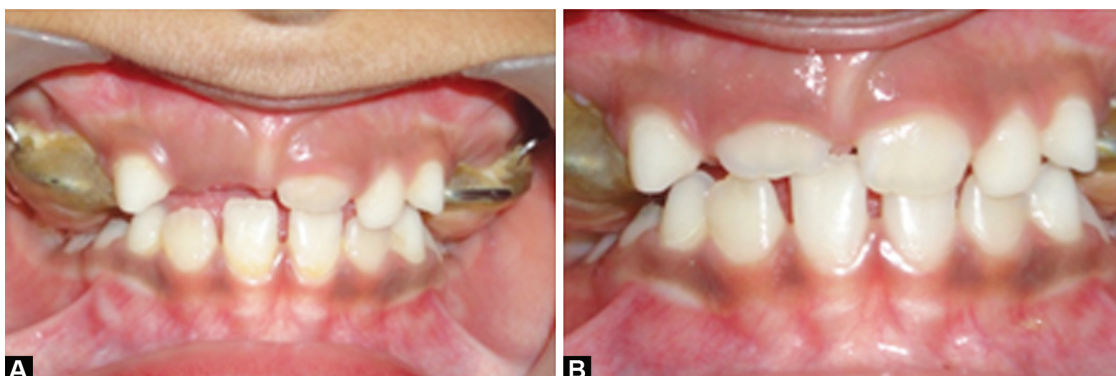
- Correction of anterior crossbite.
- Functional class I molar relationship.



Figs 1A and B: Pretreatment (extraoral): (A) Front view; (B) Profile view



Figs 2A to C: Pretreatment (intraoral): (A) Right side; (B) Front; (C) Left side



Figs 3A and B: Midtreatment: (A) After 3 months; (B) After 6 months

- Establishing a class I skeletal relationship.
- Creating an ideal overbite and overjet.
- Correction of soft tissue profile.

Treatment Alternative

The treatment alternatives such as chin cup appliances could be used during early treatment, but many studies suggest patients treated early with chin cup alone have latent catchup of mandibular in forward and downward directions.⁷ Another option was not to provide any treatment in growing phase. The final treatment was opted based on the severity of malocclusion. Camouflage treatment is provided for milder malocclusion and surgical option for severe dentofacial deformity. Most patients hope to begin their treatment early to avoid negative psychological effect on their personality development.⁸

The third treatment option was early palatal expansion in mixed dentition with face mask to correct the anterior crossbite and maxillary protraction as the patient is in growing phase. When patients are presented in early growth period, we advise face mask therapy with palatal expansion.

Treatment Progress

The intraoral rapid palatal expansion appliance with bonded acrylic splint-type expander was placed. An RME screw (liberal) was adapted anteriorly mesial to deciduous first molar and posteriorly distal to the permanent first molar. The intraoral hook was made of 19 gauge stainless steel wire to hold elastic. The hooks were placed on the buccal surface between the first and the second deciduous molars. The splint was cemented onto the posterior tooth with the glass ionomer cement. The screw was activated once a day, before the patient goes to bed. The screw was activated up to 6 weeks (Fig. 3).

After 1 week of activation of rapid palatal screw for maxillary expansion and reverse pull-face mask was advised on the forehead

and the chin of patient. Initially 7 oz elastics were worn for 2 weeks and later increased to 14 oz. Maxillary protraction require 300–600 g force per side. Elastics were placed on the buccal surface of first deciduous molar hook with a downward pull from 30° to 40° to occlusal plane, which produces the most translatory effect.⁹ Patient is instructed to wear elastic all the time except during school period and outdoor sports (16-hour/day) for 6 months.

RESULTS

After active treatment, anterior crossbite was corrected and the clinical overjet changes from –1 to +2 mm and class I molar relationship achieved on both sides with improvement in the soft tissue profile. The patient showed significant change in maxillomandibular relation. The sagittal discrepancy improved significantly. The cephalometric changes observed in maxilla by forward movement by +1 mm (N-I-A) and the Sella Nasion Angle (SNA) changes from 79° to 80°. Downward and backward rotations of mandible and SNB angle decreased from 81° to 77°.

Maxillomandibular relation (ANB, NA-Pg, Wit's) showed significant improvement during the treatment period. Mandibular plane angle increased and showed significant change in gonial and articular angle. The linear measurement suggests the maxilla move anteriorly and inferiorly. The anterior nasal spine (ANS), posterior nasal spine (PNS), Point A moved forward during treatment suggest forward growth of maxilla. The dental cephalometric measurement flaring of upper incisor and retroclination of lower incisor during reverse pull face mask treatment (Figs 4 and 5).

DISCUSSION

Early orthopedic treatment in young growing patients can correct most anterior–posterior discrepancies. Jean Deliaire is the most responsible individual for reviving interest in correcting early class III with orthopedic technique. Deliaire's approach involves applying traction to maxillary suture while reciprocally pushing on the mandible and the forehead through the anchorage provided by the face mask.¹⁰ It is suggested that to be successful forward displacement of the maxilla should be better at 7–8 years of age. In early age, predominate skeletal changes were observed compared to dental change. Mc-Namara suggests that early mixed dentition with eruption of maxillary central incisor is the best time to start forward traction to maxilla.³ The RME procedure is designed to produce displacement of skeletal structure by producing cellular response at articulation. Facemask moves maxilla anteriorly and often rotates in a counterclockwise direction, with the PNS moving inferiorly more than ANS. Face mask treatment produces downward and backward movements of chin, resulting in increased lower anterior facial height and decreased overbite.¹¹ Counterclockwise rotation of maxilla is observed due to posterior nasal spine moving inferiorly more than the anterior nasal spine. The primary goal of treatment of class III subjects should be acceptable soft tissue profile. The soft tissue profile plays an important aspect of orthodontic treatment. The soft tissue profile may improve, with nose and upper lip moving forward and soft tissue chin either remaining unchanged or moving downward and backward (Table 1).

The 6-week activation of rapid palatal expansion screw contributed to the correction of posterior crossbite. Expansion produces maxillary protraction by disrupting the maxillary sutural system. It facilitates correction of class III malocclusion by causing downward and forward displacements of the maxilla. Palatal expansion has been noted not only to affect the intermaxillary suture but also all of the circumaxillary articulation. It has been suggested that palatal expansion “disarticulates” the maxilla, initiating a cellular response which then allows a more positive reaction to protraction forces.^{12–14} Activation of the expansion screw produces a lateral load which is immediately directed against teeth. As soon as the expansion exceeds the width of the periodontal ligament, the facial skeleton acts as a unit in offering resistance to the expansion. The load produced by any activation, if the facial skeleton does not respond by immediate movement, is stored as potential energy in the appliance itself. Forward protraction of the maxilla helps to achieve a class I skeletal relationship and buccal uprighing of posterior molar, leading to an increase in posterior molar width.¹⁵ The maximum relapse potential of the involved skeletal elements is evaluated according to the loads remaining on the expansion appliance. If these remaining loads prove to be active through specific measurable distance, then judicious



Figs 4A and B: Posttreatment (extraoral): (A) Front view; (B) Profile view



Figs 5A to C: Posttreatment (intraoral): (A) Right side; (B) Front; (C) Left side

Table 1: Cephalometric analysis from lateral radiograph

	Pretreatment	Posttreatment
Skeletal variable		
Horizontal variable		
SNA	79°	80°
SNB	81°	77°
ANB	−1°	+3°
N-I-A	−1 mm	0 mm
N-I-Pog	+2 mm	−5 mm
Wit's	+7 mm	+4 mm
A-N Pog	−1 mm	+2 mm
NA Pog-FH	91°	87°
Vertical variable		
FMA	33°	34°
ANS-Me	68 mm	70 mm
Go-Gn/SN	37°	40°
Occl-p/SN	20°	24°
Pp/SN	10°	8°
<Ar-Go-N	64°	57°
<N-Go-Gn	82°	85°
Dental variable		
I/NA	28°/5 mm	31°/6 mm
I/NB	34°/8 mm	20°/6 mm
I<I	115°	127°
IMPA	90°	80°
Esthetic plane	+4 mm	+2 mm

overexpression is required to compensate for a predictable amount of relapse.

Rapid palatal expansion screw Haas-type, hyrax-type, or bonded acrylic splint expander may be used. The bonded expander not only widens the transverse dimension, but it produces changes in the vertical and anteroposterior dimension as well.¹⁶ The posterior occlusal pad is made with 2–3 mm cold-cure acrylic on the occlusal and buccal surface. Posterior occlusal pad acts as a bite block, inhibiting the eruption of the posterior teeth during treatment and controlling the lower anterior facial height. The acrylic coverage also opens the bite posteriorly, facilitating the correction of anterior crossbite.¹⁷ The choice of expander depends upon mandibular angle and lower anterior facial height. Bonded palate expander performs better in high mandibular plane angle and no increase in lower anterior facial height is required.

CONCLUSION

- The early treatment of class III malocclusion with protraction headgear is effective in early mixed dentition.
- Correction of profile is mainly by forward displacement of maxilla and downward, backward rotation of mandible.
- Use of reverse pull face mask causes more opening of gonial and articular angles, steepening the mandibular plane angle and increasing the lower anterior facial height.
- Correction of crossbite associated with class III malocclusion as early as possible to prevent the adverse effect on the growth of maxilla.

CLINICAL SIGNIFICANCE

It is necessary to start early treatment of class III malocclusion in growing patients. This topic is widely discussed in the literature, mainly due to uncertain long-term stability. Several treatment methods have been developed to treat at an early stage with intraoral and extraoral appliances. The use of RME and protraction face mask is an effective method to treat early mixed dentition.

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