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RESEARCH ARTICLE

Early orthopaedic correction of class III malocclusion with alternate rapid maxillary expansion and Constriction (ALT-RAMEC) and face mask: case report

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Abstract

Class III malocclusion cases are challenging so it has been subject of interest for many orthodontists. It is always advantage to treat at growing stage otherwise camouflage or surgery is required. It has multiple etiological factors like mandibular prognathism or growth excess (macrognathia), maxillary retrognathism or growth deficiency (micrognathia), or a combination of mandibular and maxillary discrepancies. A 12-year-old female patient with a skeletal Class III malocclusion and anterior crossbite without posterior crossbite was treated with Alt-RAMEC protocol which was published by Liou. According to this protocol rapid expansion and contraction of maxilla on an alternating week, this results in loosening of the sutures that connect the maxilla to the surrounding bones without expansion of maxillary arch. Than face mask was used for skeletal class III corrections which was achieved by this protocol within 6 months which is faster compared to contemporary protocol of only expansion.

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INTRODUCTION

Class III malocclusion has been the subject of difficulty, because of the challenges in its treatment. Clinicians have been trying to search that what is the best timing to intercept a Class III malocclusion. It is as early as the deciduous dentition develops. A Class III growth pattern is then defined as one with disproportionate excessive mandibular growth or deficient maxillary growth.

In 1966, Tweed¹ classified Class III malocclusions into 2 categories: category A is a pseudo- Class III malocclusion with a conventionally shaped mandible, and category B is a skeletal Class III malocclusion with a macrognathia mandible or a hypoplastic maxilla. Moyers² further classified malocclusions according to the cause of the problem: osseous, muscular, or dental in origin.

The prevalence of Angle Class III malocclusions varies greatly among and within populations, ranging from 0% to 26%.³ Large numbers of environmental factors have been suggested as a cause of the development of Class III malocclusion.

Orthopaedic management of skeletal Class III malocclusions associated with maxillary deficiency in growing patients most successful treated by using protraction facemask along with rapid maxillary expansion (RME).⁴ Circummaxillary sutures start to interdigitate during pubertal growth, making them difficult to protract in patients older than 15 years.⁵ Orthopaedic changes occur due to facemask includes forward and downward growth of maxilla (counter-clockwise) and backward rotation of mandible (clockwise).

During rapid maxillary expansion mid palatine suture opens along with circummaxillary sutures which help face mask to protract maxilla easily. Various studies concluded that alternate rapid maxillary expansions and contractions (Alt-RAMEC) protocol is faster and more efficient in maxillary protraction.⁶ So, this case was treated with Alt-RAMEC protocol.

Diagnosis and Etiology

A patient was 12 years old female with a major concern of 'backwardly placed upper jaw'. Patient had Angle's class III malocclusion with anterior cross bite, negative overjet of -0.5 mm, crowding in upper and lower arch, mandibular midline was deviated 1 mm toward her left. Skeletal class III pattern with recessive maxilla and vertical growth pattern slightly concave profile with protruded lower lip and shallow mento-labial sulcus.

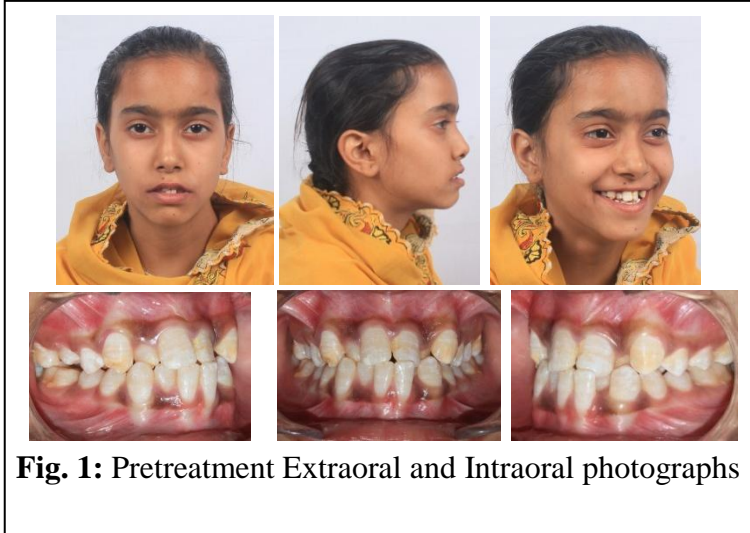


Fig. 1: Pretreatment Extraoral and Intraoral photographs

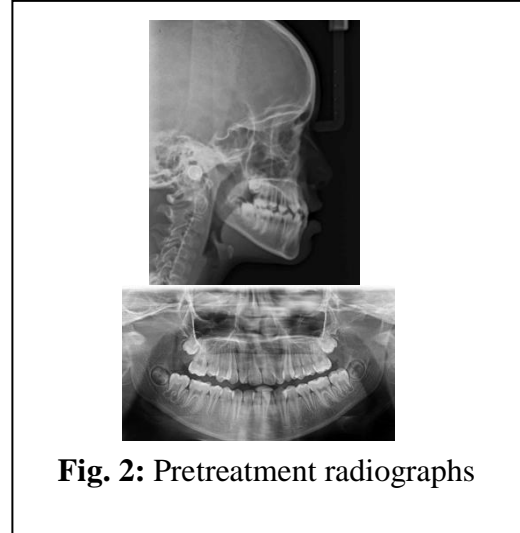


Fig. 2: Pretreatment radiographs

Treatment objectives

The treatment objectives were to: (I) obtain a normal profile line by skeletal correction, (II) Correct the Class III dental relationship. (III) Obtain class I canine and incisal guidance, (IV) Correction of anterior crossbite and crowding, and (V) place the dental midlines in the middle of the patient's face.

Treatment alternatives

1. Using an extraction protocol, doing a camouflage treatment.
2. Using the conventional RME and facemask therapy for correction of the maxilla.

Treatment plan

A decision was made to first correction of maxilla. As there was not any indication for the maxillary arch expansion so, the Alt-RAMEC protocol using Hyrax screw was chosen to lose the articulation of the maxilla followed by protraction with facemask therapy. Then decided not to extract any tooth in the maxillary arch but according to Bolton analysis in lower arch 5.8mm overall tooth material was excess so lower single incisor extraction required. This was followed by treatment with fixed mechano-therapy by using MBT bracket 0.022 slot for final occlusal settling.



Figure 3: Facemask and hyrax screw

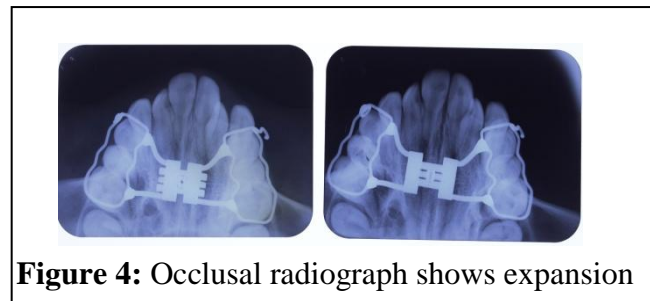


Figure 4: Occlusal radiograph shows expansion

Treatment progress

Treatment started with bonded RME (HYREX Screw-9mm). The Alt-RAMEC protocol used to disarticulate circummaxillary suture by rapid expansion and contraction on an alternating week up to 7-week this protocol was used.²¹The maxilla was expanded or contracted by 2 turns (1mm) per day (First turn in morning and second in the evening). The mobility of the maxilla was checked than only face mask delivered. The Petit type of protraction facemask was used for maxillary protraction. To avoid bite opening of the maxilla during protraction, the elastics were attached near the maxillary canines with a downward and forward pull of 20° to the occlusal plane. A Dountrix gauge was used to measure the elastic force which should be approximately 350-400 gm of force was

generated on each side. Patient was instructed to wear the facemask for 10 to 24 hours per day. Face mask continued for 4 months.

Treatment results

Table 1: skeletal parameter changes Pretreatment and after Orthopaedic correction.

Skeletal Parameter	Pre- treatment	Post –orthopaedic
SNA	77°	79°
SNB	76°	76°
ANB	1°	3°
Nasion ^L to point A	7mm	4mm
Wits appraisal	5mm point BO ahead	3mm point BO ahead
β angle	40°	36°
Jaraback's ratio	59%	57%
I to NA(linear)	5mm	2mm
I to NB(linear)	0.5mm	0.5mm

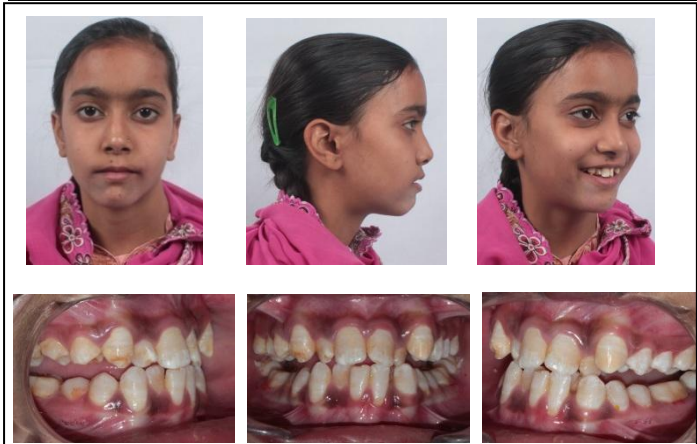


Fig. 5: Post orthopaedic Extraoral and Intraoral photographs

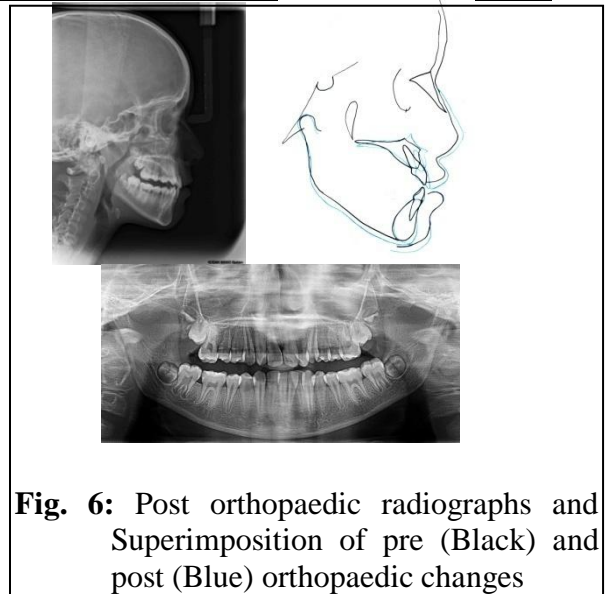


Fig. 6: Post orthopaedic radiographs and Superimposition of pre (Black) and post (Blue) orthopaedic changes

The post-treatment facial and intraoral photographs (Fig. 5) illustrate the improvement in the patient's profile. The post treatment cephalometric radiographs (Fig. 6) illustrate the orthopaedic correction of achieved by treatment. ANB angle changed by 2° which suggest correction of retrognathic maxilla and this result confirmed by wits appraisal and β angle (table 1). The mandibular incisors were uprighted over the basal bone to an IMPA angle of 84°. The Jarabak's ratio decreased to 57° from 59° suggests downward movement of maxilla. Post orthopaedic cephalometric values are given in Table 1. The changes can be seen on superimpositions of pre- and post orthopaedic cephalogram (Fig.6). The post-treatment panoramic radiograph (Fig. 6) exhibits no pathology.

Discussion

Cases with skeletal class III pattern and anterior crossbite usually associated with maxillary deficiency. In these cases important to evaluate growth status because most of clinicians try to intercept class III during deciduous dentition or early mixed dentition. Afterwards class III is difficult to treat due to only limited option of either camouflage or surgery.

Growing patients with class III malocclusion can be treated with more efficiently with Alt- RAMEC plus maxillary protraction.⁷ In growing patients circummaxillary sutures are patent and opening of these sutures with orthopedic force can correct maxilla. By use of alternate RME and constriction (Alt-RAMEC) found that more disarticulation of Circummaxillary sutures compared with the use of RME alone.^{7,8}

According to Melsen during 8 to 10 years of age the midpalatal suture is broad and smooth and becomes more squamous and overlapping at 10 to 13 years. Also, the circummaxillary sutures were smooth and broad before age eight and became more heavily interdigitated around puberty.⁹

The Alt-RAMEC protocol has been shown to produce significant forward movement of point A in cleft-palate patients when used in combination with intraoral protraction springs.¹⁰ Isci et al reported that a significant increase in SNA (+1.2°) and improvement in ANB (+1.6°) and overjet (+2.2 mm) in a group treated with Alt-RAMEC (0.4 mm of activation/deactivation per day over 4 weeks) and facial masks compared with an RME/FM group, both with a mean age of about 11.5 at the start of treatment.¹¹ In present case skeletal parameter ANB 2°, WITS 3mm corrected and positive overjet of 1.5mm also achieved.

Conclusion

In class III malocclusion always early intervention required to benefit and satisfy patients. Present case revealed that Alt-RAMEC protocol shows faster correction and good outcome of treatment with long term stability. Patient should be recalled after completion of treatment till the mandibular growth completes. In orthopaedic treatment success or failure depends on the patient compliance and growth potential.

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