



MAXILLARY PROTRACTION ENHANCED BY ALT-RAMEC PROTOCOL IN A SKELETAL CLASS III PATIENT: A CASE REPORT

Orthodontics

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ABSTRACT

Skeletal Class III malocclusion resulting from maxillary deficiency presents a significant orthodontic challenge, particularly during the growth period. Early orthopaedic intervention aimed at maxillary protraction can improve skeletal relationships and reduce the need for future surgical correction. This case report describes the successful management of a 12-year-old male patient presenting with a skeletal Class III malocclusion characterized by a retrognathic maxilla, anterior crossbite, and mild crowding. Treatment was carried out in two phases. The first phase involved Alternate Rapid Maxillary Expansion and Constriction (Alt-RAMEC) protocol followed by facemask therapy to enhance maxillary protraction. The second phase consisted of comprehensive fixed orthodontic treatment for alignment, space management, and finishing. Post-treatment records demonstrated improvement in facial profile, correction of anterior crossbite, establishment of Class I molar and canine relationship, improved overjet and overbite, and enhanced facial esthetics. The results highlight the effectiveness of combining Alt-RAMEC protocol and facemask therapy with fixed orthodontic treatment in growing patients with maxillary deficiency.

KEYWORDS

Skeletal Class III malocclusion, Maxillary deficiency, Alt-RAMEC, Facemask therapy, Orthodontics.

INTRODUCTION

The management of developing skeletal Class III malocclusion is one of the most confusing issues that orthodontists deal with. When presented with a developing Class III malocclusion, the decision of "to or not to" intervene is a common conundrum.¹ Class III malocclusion may arise due to maxillary retrusion, mandibular prognathism, or a combination of both. Among these, maxillary deficiency is a common etiological factor.² Early orthopaedic intervention during growth can stimulate forward movement of the maxilla and improve skeletal relationships.³ Rapid maxillary expansion combined with facemask therapy has been widely used for correction of skeletal Class III malocclusion.

The Alternate Rapid Maxillary Expansion and Constriction (Alt-RAMEC) protocol was introduced to enhance circummaxillary suture disarticulation and facilitate greater maxillary protraction.⁴ When combined with facemask therapy, favourable skeletal and dentoalveolar changes can be achieved.⁵ The present case report describes the treatment of a growing patient with skeletal Class III malocclusion using Alt-RAMEC protocol, facemask therapy, and comprehensive fixed orthodontic treatment.

Case Report

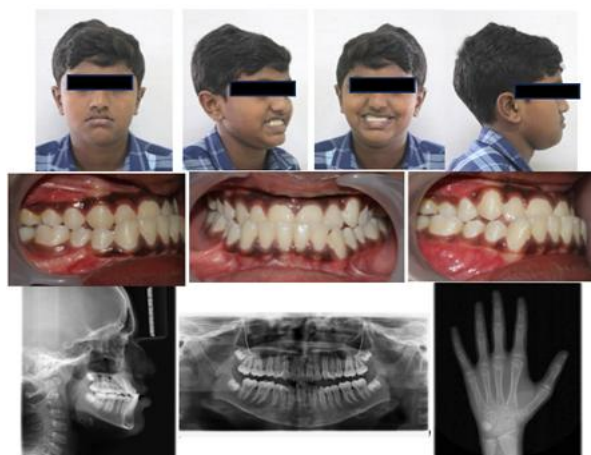


Figure 1: Pre-treatment extraoral and intraoral photographs and radiographs

A 12-year-old male patient reported with the chief complaint of irregularly placed upper front teeth. Extraoral examination revealed a mesocephalic, mesoprosopic face with a concave profile, anterior divergence, competent lips, and an acute nasolabial angle. Facial symmetry was satisfactory.

Intraoral examination revealed a U-shaped upper and lower arch with

mild crowding. The upper and lower dental midlines were shifted 2 mm to the left of the facial midline. The patient exhibited Class III molar and canine relationships, Class III incisor relationship, anterior crossbite, and a reverse overjet of 3 mm.

Panoramic radiograph showed the presence of all permanent teeth except the third molars. Cephalometric evaluation demonstrated a skeletal Class III relationship primarily due to maxillary retrusion. (Figure 1) Pretreatment SNA was 77°, SNB was 82°, and ANB was -5°. Hand wrist radiograph shows Fishman stage III and lateral cephalogram shows CVMI stage-II which means 60-65% growth active growth potential.

Diagnostic Summary

The patient was diagnosed with Angle's class III malocclusion on a skeletal class III base with retrognathic maxilla and normal mandible; proclined maxillary incisor, normal mandibular incisor, mild crowding in upper and lower anteriors, reverse overjet of 3mm; upper and lower midline shifted to left by 2mm, and with horizontal growth pattern. Soft tissue parameters revealed concave profile, acute nasolabial angle and competent lips.

TREATMENT OBJECTIVES

1. Correct the skeletal Class III molar, canine, incisor relationship.
2. Protract the maxilla and improve facial profile.
3. Eliminate anterior crossbite.
4. Establish positive overjet and overbite.
5. Relieve upper and lower arch crowding.
6. Achieve functional and esthetic occlusion.
7. Improve dental and facial esthetics.
8. Maintain long-term treatment stability.

Treatment Plan

Treatment was planned in two phases.

Phase I: Orthopaedic Correction

- Alt-RAMEC protocol using a Rapid Maxillary Expansion appliance.
- Facemask therapy for maxillary protraction.

Phase II: Fixed Orthodontic Treatment

- Extraction of 15, 25, 35, and 45.
- Banding and bonding of both arches.
- Upper trans palatal arch and lower lingual arch for anchorage.
- Levelling and alignment using nickel-titanium archwires.
- Space closure and retraction.
- Finishing, detailing, and retention.

Treatment Progress

Alt-RAMEC Protocol and Facemask Therapy:

Considering the patient's skeletal Class III malocclusion due to maxillary deficiency, the Alt-RAMEC protocol was employed to

enhance maxillary protraction.^{4,6} A bonded Hyrax expander was activated following a nine-week Alt-RAMEC regimen consisting of alternating weekly expansion and constriction at a rate of 1 mm/day, ending with expansion.

Subsequently, maxillary protraction was initiated using a Petit-type facemask delivering 400–500 g of force per side, directed 20°–30° downward and forward to the occlusal plane. The patient was instructed to wear the appliance for 12–14 hours daily. Facemask therapy was continued for 8 months until positive overjet and favourable sagittal correction were achieved.

The Alt-RAMEC protocol was selected because it has been shown to produce greater circummaxillary suture mobilization and enhanced maxillary advancement compared with conventional RME followed by facemask therapy.^{7,9} post-orthopaedic evaluation demonstrated improvement in the skeletal relationship, with SNA increasing from 77° to 80° and ANB improving from -5° to -1°, indicating successful maxillary protraction.

comprehensive fixed orthodontic treatment:

Following orthopaedic correction, phase II, or comprehensive fixed orthodontic treatment was initiated. Second premolars were extracted in all four quadrants. Pre-adjusted edgewise appliance 0.022" slot MBT prescription (Ormco Mini 2000 brackets, Glendora, CA) maxillary and mandibular teeth. Alignment and levelling were performed using sequential nickel-titanium archwires. Initial alignment was achieved using 0.014-inch NiTi archwires followed by 0.016 × 0.022-inch NiTi, 0.017 × 0.025-inch NiTi, 0.019 × 0.025-inch NiTi, 0.019 × 0.025-inch SS, archwires.

Space closure and retraction were performed after alignment, followed by finishing and detailing to achieve optimal intercuspation and root parallelism. The appliance was debonded after 14 months, and Hawley's retainers were delivered for both arches.

Post-treatment evaluation revealed significant skeletal, dental, and soft tissue improvements. Skeletally, maxillary advancement improved the maxillomandibular relationship, as reflected by favourable changes in SNA, ANB, and Wits appraisal. Dentally, anterior crossbite correction, positive overjet and overbite, Class I canine relationship, and satisfactory intercuspation were achieved. Soft tissue analysis showed improved facial profile, enhanced upper lip support, and better facial balance. Comparative pretreatment, post-orthopaedic, and post-treatment photographs demonstrate these changes (Figures 2 and 3), while cephalometric changes are summarized in Table 1.



Figure 2: (a): Comparison of pretreatment, post orthopaedic and post treatment intraoral photographs. (b): Comparison of pretreatment, post orthopaedic, post treatment lateral cephalogram and cephalometric superimposition



Figure 3: comparison of pretreatment, post orthopaedic and post treatment extra oral photos

Table 1: Comparison between pre-treatment, and post-treatment cephalometric values

Variable	Pre-treatment values	Post-treatment values
Skeletal Parameters		
SNA	77°	80°
SNB	82°	81°
ANB	-5°	-1°
Wits appraisal	8mm	2mm
SN-GO GN	33°	35°
FMA	28°	35°
Dental Parameters		
Upper incisor to NA (mm)	9 mm	5 mm
Lower incisor to NB (mm)	6 mm	4 mm
Upper incisor to SN plane (°)	123°	102°
Upper incisor to maxillary plane (°)	65°	57°
Lower incisor to mandibular plane (°)	100°	96°
Analysis Of Soft Tissues		
Upper lip to S-line (mm)	-2	4
Lower lip to S-line(mm)	3	
Nasolabial angle (°)	88	

DISCUSSION

Management of skeletal Class III malocclusion is challenging because of the interaction between skeletal and dentoalveolar components. In growing patients with maxillary deficiency, orthopaedic intervention is the preferred approach as it can modify the skeletal discrepancy and reduce the need for future orthognathic surgery.⁹ In the present case, maxillary retrusion was the primary etiological factor, making the patient suitable for maxillary protraction therapy.

Treatment timing is critical for successful Class III correction. Hand-wrist and cervical vertebral maturation assessments indicated active growth, allowing greater responsiveness of the circummaxillary sutures to orthopaedic forces and enhancing skeletal correction. Early treatment has been associated with more favourable and stable outcomes.^{10,11}

The Alt-RAMEC protocol was selected because it produces greater circummaxillary suture mobilization than conventional rapid maxillary expansion, thereby enhancing maxillary protraction. Previous studies have demonstrated greater forward movement of the maxilla with Alt-RAMEC-assisted facemask therapy compared with conventional protocols. Following treatment, SNA increased from 77° to 80° and ANB improved from -5° to -1°, indicating successful correction of the skeletal discrepancy.

In addition to skeletal improvement, correction of the anterior crossbite and advancement of the maxilla resulted in improved upper lip support, reduced facial concavity, and a more balanced facial profile. Comprehensive fixed orthodontic treatment further corrected crowding and dental compensations, establishing satisfactory intercuspation and occlusal relationships.

Long-term stability remains an important consideration in Class III treatment. Studies suggest that outcomes are more stable when treatment is initiated during active growth and adequate correction is achieved. In the present case, positive overjet, improved skeletal relationship, and satisfactory intercuspation were obtained, although continued follow-up is necessary because residual mandibular growth may affect long-term stability.¹²

CONCLUSION

The combination of Alt-RAMEC, facemask therapy, and comprehensive fixed orthodontic treatment effectively corrected skeletal Class III malocclusion due to maxillary deficiency. Significant improvements were achieved in skeletal relationship, facial profile, anterior crossbite, and occlusal function. Evidence suggests that the effects of maxillary protraction are generally stable, although continued mandibular growth remains the main cause of relapse.¹³ Therefore, long-term follow-up until growth completion is recommended

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