Case Report

Treatment of Class III Malocclusion with Activation–Deactivation Rapid Palatal Expansion and Reverse Headgear in a Growing Patient (Alternate-Rapid Maxillary Expansion and Contraction)

Abstract

Treatment of Class III malocclusion is a challenge for orthodontists. The best time to intercept this malocclusion is as early as in the deciduous dentition. Orthopedic management of Class III individuals with retruded maxilla is by protraction facemask along with rapid maxillary expansion (RME). It results in forward and downward maxillary growth and backward mandibular rotation. Alternate RME and contraction (Alt-RAMEC) produces faster and more efficient results than maxillary protraction alone. The present case report describes the clinical application of Alt-RAMEC protocol for the treatment of a Class III malocclusion.

Keywords: Alternate-rapid maxillary expansion and contraction, Class III malocclusion, facemask, rapid palatal expansion, reverse headgear

Introduction

Treatment of Class III malocclusion is a challenge for orthodontists. A Class III growth pattern is a disproportion with excessive mandibular growth, deficient maxillary growth, or combination of the two. According to Tweed, it can be pseudo Class III or skeletal Class III malocclusion. According to Moyers, it can be osseous, muscular, or dental in origin.

The prevalence of Angle Class III malocclusion varies from 0% to 26%. Class III individuals with reduced maxilla and normal mandible were reported as 19.5% (Ellis and McNamara, 1984), 25% (Guyer et al., 1986), 26% (Jacobson et al., 1974), 33% (Sanborn, 1955), and 37% (Williams and Anderson, 1986). The best timing to intercept this malocclusion is as early as in the deciduous dentition. Orthopedic management of Class III individuals with retruded maxilla is by protraction facemask along with (rapid maxillary expansion [RME]). It results in forward and downward maxillary growth and backward mandibular rotation. It is concluded by various studies that alternate RME and contraction (Alt-RAMEC) produces faster and more efficient results than maxillary protraction alone.

Alt-RAMEC was introduced by Liou and Tsai in 2005. It disarticulates circum-maxillary sutures without overexpansion. In the protocol, alternate expansion and contraction are to be followed for 1 week alternatively. Its rationale is equivalent to simple tooth extraction, as the tooth is loosened from the socket with buccal and lingual rocking movements.

The present case report describes the clinical application of Alt-RAMEC protocol for the treatment of a Class III malocclusion.

Case Report

A 9-year-old female patient reported to the department of orthodontics and dentofacial orthopedics with a chief complaint of backwardly placed upper front teeth. Extraoral examination revealed a concave facial profile with characteristic maxillary retrusion. Intraoral examination revealed an anterior crossbite with a reverse overjet of 4 mm and an overbite of 6 mm. There was no functional shift. The upper dental midline was shifted toward the right side by 2 mm. Molar relationship was super

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Class I bilaterally. The patient was in a mixed dentition phase. The patient had SNA and SNB of 77° and 80°, respectively, with ANB of −3°. U1 to NA was 22° and L1 to NB was 16° with an average toward horizontal growth pattern (SN-Gn = 30°, FMA = 23°), therefore, the patient was diagnosed as skeletal Class III [Figure 1 and Table 1]. Alt-RAMEC approach was chosen so as to loosen the circum-maxillary suture more extensively than RME alone.

**Treatment progress**

Initially, expansion was done with a hyrax expander for 1 week, i.e., the sagittal split screw was activated twice a day with 90° turns. After 1 week of expansion, the split screw was deactivated for a week of contraction. The Alt-RAMEC protocol was followed for a time of 8 weeks [Figure 2].

After 8 weeks of phase 1 treatment, the maxillary sutures were sufficiently loosened with normal transverse relation, thereafter followed by facemask (Petit) therapy [Figure 3] for 7 months. Alt-RAMEC was done to loosen the sutures so that protraction can be done with ease. A protraction force of 400 g was applied on each side from elastics which were connected to the facemask with downward and forward force vectors having an inclination of 20°–30° to the occlusal plane. The patient was instructed to wear the facemask for 10–12 h per day. Facemask therapy produced promising results in this patient [Figure 4]. After the protraction phase, the retention phase was followed with a retention plate for 10 months.

A fixed orthodontic treatment was initiated with a preadjusted edgewise appliance (slot 0.022” × 0.028”) and the wire sequence used to level and align the arch was 0.014”, 0.016”, 0.018” and 0.016”×0.022”NiTi, 0.016”×0.022” SS, 0.017”×0.025” SS and 0.019”×0.025” SS. In this case, surgical exposure was done with relation to 23, and Beggs bracket was bonded on 23. Traction was done to bring 23 into alignment. After leveling and aligning, 0.018 SS was used for final finishing. Marked cephalometric and photographic changes were obtained in this case [Figures 5, 6 and Table 1].

Figure 1: Pretreatment photographs and radiographs
Garg, et al.: Treatment with Alt-RAMEC therapy

Discussion

Class III malocclusion alters patient’s psychological status because of unfavorable facial appearance, thereby necessitating an immediate action to improve facial esthetics.[8] RME was proposed by Angell and clinically consolidated by Haas in 1961.[9] RME increases maxillary transverse dimensions skeletally and along with facemask, it is used in Class III individuals with maxillary retrusion.[10] An alternate approach to disarticulate circum-maxillary suture was proposed by Liou and Tsai in 2005 (Alt-RAMEC protocol). Comparative studies showed that Alt-RAMEC showed two times higher anterior maxillary displacement than the conventional method and the protraction was 8 weeks faster than that in the RME group.[6]

The present case was treated with Alt-RAMEC protocol followed by facemask therapy to get more benefits. In this case, SNA had increased by 7°, N perpendicular to point A increased by 6mm and ANB had increased by 4°, suggesting a significant increase to the cranial base. Baik concluded in a study that more maxillary advancement can be achieved with Alt-RAMEC, when used in conjunction with a facemask.[11] Westwood et al. also found significant improvement in maxillary advancement (SNA 1.6°).

Isci et al. reported significant increase in SNA (1.2°), ANB (1.6°), and overjet (2.2 mm) as compared to the Rapid Maxillary Expansion/ Facemask (RME/FM) group.[4]

In the present case, lower anterior facial height increased by 4.5 mm. It is due to the downward movement of the maxilla and downward and backward rotation of the mandible, which also reduced the facial concavity. The

Table 1: Cephalometric comparison at various stages of treatment

| Parameters                        | Pretreatment | Postfacemask | Posttreatment |
|----------------------------------|--------------|--------------|---------------|
| SNA degree                       | 77           | 84           | 84            |
| SNB degree                       | 80           | 81           | 83            |
| ANB degree                       | −3           | 3            | 1             |
| Wits appraisal                   | −4.5         | 0.5          | 0.5           |
| N perpendicular to point A       | −5           | 1            | 1             |
| N perpendicular to Pog mm        | −3           | −2           | −1            |
| FMA degree                       | 23           | 26           | 25            |
| IMPA                             | 87           | 84           | 86            |
| LAFH                             | 57           | 61           | 61.5          |
| Angle of inclination degree      | 88           | 87           | 87            |
| U1 to N-A mm                     | 3            | 5            | 5             |
| U1 to SN degree                  | 100          | 111          | 111           |
| U1 to NA degree                  | 22           | 26           | 26            |
| L1 to N-B mm                     | 4            | 5            | 4             |
| L1 to N-B degree                 | 17           | 17           | 18            |
| Interincisal degree              | 145          | 132          | 134           |
| L1 to A-Pog mm                   | 4            | 2            | 2             |
| Facial convexity                 | −3           | 10           | 8             |
| H line angle                     | 4            | 15           | 13            |
| E-line mm                        |              |              |               |
| Upper lip                        | −7           | −4           | −4            |
| Lower lip                        | 1            | 1            | 0             |
Figure 4: After facemask therapy

Figure 5: Posttreatment photographs and radiographs
soft-tissue effects included marked forward movement of the upper lip, whereas the lower lip did not show much improvement.

With Alt-RAMEC and facemask therapy, anterior and vertical movements of maxilla lead to skeletal changes. Significant downward and backward movement of the mandible contributes to Class III correction and improved facial profile.

**Conclusion**

Class III malocclusion requires early intervention to benefit and satisfy patients. Alt-RAMEC protocol is effective in the early treatment of Class III malocclusion. It provides quicker and good treatment outcomes with long-term stability. The Alt-RAMEC protocol produces forward movement of the maxilla and backward rotation of the mandible, which leads to skeletal correction of overjet and improves patient profile. Long-term follow-up is advised till the cessation of mandibular growth.

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**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

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