Treatment of Class III Malocclusion in an Adolescent with Banded RPE/Face Mask and Self-Ligating System

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Abstract

This case report describes the treatment of a 12-years-old female with a Class III skeletal profile and dental malocclusion. The clinical examination showed concave profile, class III dental relationship, buccal crossbite on the right side, and mild crowding. The cervical vertebral maturation analysis showed the patient was on the CS3 stage. The class III malocclusion was treated with combination of banded rapid palatal expander and face mask followed by non-extraction orthodontic treatment with self-ligating system. Banded rapid palatal expander and face mask were used to improve the skeletal discrepancy. Class I maxilla-mandibular relationship was achieved along with class I molar, incisor, and canine relationship. The buccal crossbite and mild crowding were corrected, the overbite and overjet were normal, and the facial profile was improved. This case demonstrates a good result of a class III malocclusion treatment in an adolescent patient with banded rapid palatal expander/face mask and self-ligating system.

Keywords: adolescent, class III, face mask, rapid palatal expander, self-ligating

Introduction

Class III malocclusion is one of the most difficult cases in orthodontics. The prevalence of this malocclusion in South East Asia reaches to 15.8% of the population. It may occur as a result of skeletal and dental discrepancies and could lead to aesthetic and functional impairment. Patients with this malocclusion could have maxilla retrognathism, mandibular prognathism, or combination of both, reverse over jet, anterior and buccal crossbites, proclination of upper incisors, and retroclination of lower incisors. The treatment plans of class III malocclusion were determined by the age of the patient and the severity of the cases. In growing patient, orthopedic correction through growth modification has proven to be success, and it reduced the need of orthognathic surgery at later age. Meanwhile in adult patient, the options are camouflage treatment or orthognathic surgery for severe cases.

Growth modification using the combination of face mask and rapid palatal expander has become a standard protocol in the early management of class III malocclusion. This treatment produces the forward movement of the maxilla and clockwise rotation of the mandible which could lead to better facial profile of the patient. Bacetti et al (2005) stated that class III treatment with expansion and protraction is effective in both jaws when is performed before the peak, whereas is only effective in the mandible during the pre-pubertal and pubertal stage. Meanwhile Yavuz et al in their research concluded that forward displacement of maxilla and clockwise rotation of the mandible occurred in both adolescent and young adults. This case report demonstrates the orthodontic correction of a class III malocclusion using a banded RPE and FM in an adolescent patient.

Case Report

Diagnosis

A 12 years old girl came to Clinic of Orthodontics, Faculty of Dentistry, Universitas Indonesia with her mother who concerned about her forward appearance of the mandible. On extra oral examination, the patient had concave profile and mesocephalic head (Figure 1). On intraoral examination, she had an anterior crossbite in relation to all incisors, class III molar relationship, class III canine relationship, buccal crossbite on the right side, mild crowding in upper and lower arch, reverse over jet of 1 mm, and overbite 2 mm (Figure 2).
From the cephalometric evaluation, patient had a skeletal class III base with prognathic maxilla and mandible (SNA = 86° and SNB = 88°). Maxillary incisors were proclined relative to the maxilla plane (UI-Mx = 123°) and mandibular incisors were retroclined relative to the mandibular plane (LI-MP = 85°). The lower anterior facial height was short (UAFH: LAFH = 52:59) and normal vertical growth pattern (Facial axis = 88°). Regarding the soft tissues, her upper lip was retrusive relative to the E-line and positioned behind the lower lip. Patient was still growing and from the cervical vertebral maturation analysis, patient was in CS3 stage (Figure 3 and Table 1). From the panoramic evaluation, there was no sign of pathological condition, no missing teeth and the roots of the teeth were not parallel (Figure 4).
Treatment Objectives
The treatment objectives were: (1) To improve the skeletal jaw relationship by protracting the maxilla anteriorly in relation to the cranium; (2) To achieve well-aligned teeth in maxillary and mandibular arches with class I incisor, canine, and molar relationship; (3) To correct the buccal crossbite by expanding the maxilla; (4) To obtain ideal overjet and overbite; (5) To obtain ideal aesthetic and function.

Treatment Plan
The treatment was divided into two phases. The first phase was to protract the maxilla using a facemask while simultaneously expanding it using RPE. The RPE disrupts the intermaxillary suture and thus promotes maxillary protraction. The treatment was followed by fixed orthodontic appliance using self-ligating system to level and align the teeth, correction of incisors, canine, and molar relationship.

Treatment Progress
Treatment was started with banded RPE which had hooks incorporated on the buccal side between the permanent canine and first premolar. This appliance was activated for 1 turn/day (0.25 mm) for 8 days. It was stated before that even in patients who do not need any maxillary expansion; RPE should be activated for 8-10 days prior to facemask placement. After 8 days, petit type face mask therapy was begun. Posterior bite blocks were built in permanent mandibular first molars. Extra oral elastic was placed from the hook of the RPE to the face mask bar to obtain forward and downward traction in the maxilla. Patient was instructed to use the FM and TigerTM elastics (3/8", 8oz) for 15 hours/day minimum 12. The approximate duration of wear as reported by the patient’s mother 1 month later was only 8-10 hours. After 6 months of phase one treatment, the overjet was edge to edge and the face mask therapy was stopped (Figure 5 and 6). The fixed orthodontic treatment was started with CuNiti .014 archwires in the upper and lower jaw. Posterior bite blocks were built in the permanent mandibular first molars to open the occlusion, and the patient was instructed to wear the class III elastics (CliffTM; ¼", 3.5oz). Space closure was done using 0.019 x 0.025 stainless steel (SS) archwire. Settling of occlusion was done with 0.019 x 0.025 SS wire in upper and lower arch and vertical settling elastics in posterior. Retention was given with essix retainer in the upper arch and fixed retainer in the lower arch.

Treatment Results
The patient exhibited excellent profile after RPE/FM treatment. There were significant changes in the maxillomandibular relationship (ANB = 1°) and lower anterior facial height increased as
observed from the lateral cephalogram (Figure 7 and 8). After 18 months of fixed orthodontic appliance treatment, the patient’s smile became more aesthetic. The teeth in the upper and lower arches were aligned and leveled, the incisors, canines, and molar relationships were corrected into class I (Figure 9 and 10). The cephalometric analysis indicated that the lower facial height was increased and the inclination of upper incisors was normal. However, the inclination of lower incisors was still retroclined (Figure 11 and 12). Total duration of active treatment including face mask and fixed appliance was 24 months.

Figure 7. Lateral cephalogram after FM/RPE treatment

Figure 8. Panoramic film after FM/RPE treatment

Figure 9. Facial photographs after fixed appliance treatment

Figure 10. Intraoral photographs after fixed appliance treatment
Discussion

The skeletal jaw relationship in this patient was corrected through the orthopedic treatment of the class III malocclusion by using the FM and RPE. The skeletal effects were seen in both jaws. There was a forward and slightly downward movement of the maxilla as a result of the protractive force. As the consequence of this, the mandible rotated downward and backward, thus resulting class I skeletal relationship in this patient.16-18 This effect also caused the lower anterior facial height increased. Since the patient had short lower facial height, this effect was advantageous. Other effects were shown in the changes of Go angle, MMPA, SN-MP, angle of convexity, and the wits (Table 1).

Treatment timing in class III malocclusion is an important thing to consider especially when dealing with growing patient. The skeletal maturation of the patient needs to be analyzed before we decided to do the growth modification treatment. Baccetti et al13 stated that the use of FM/RPE would be optimum on both jaw in patient with CS 1 and CS 2 stage, meanwhile in older patients, the skeletal effect only shown in the mandible.14 However, another research by Kapust et al18 showed that although early treatment may be the most effective, FM/RPE treatment can provide a viable option for older children. This result supported by Yavuz et al15 who stated that the forward movement of maxilla and clockwise rotation of the mandible was seen in both groups, adolescent and young adults. After 6 months of the FM/RPE treatment, this patient showed the skeletal improvement on both jaws.

Similar to the study by Podesser et al,19 Lione et al,20 and Tanaka et al,21 the RPE in this patient succeeded to correct the buccal crossbite on the right side by expanding the maxilla. After the RPE treatment, there was overcorrection. It was then corrected and finished by the fixed appliance, so the patient has normal posterior over jet by the end of the treatment. The fixed orthodontic appliance treatment was done with self-ligating system. The bracket in this system has mechanical door so it does not need elastomer or ligature wire. This design allowed the wire to move freely inside the slot so the friction between the bracket’s slots and wire is low and the tooth movement would be more efficient.22,23 Harradine24 in his research stated that treatment with self-ligating system could be finished in 4 months faster and 4 visits lesser than conventional system.

Posterior bite block was built in the permanent mandibular first molar to open the occlusion and relieve the tension from the facial muscles. This allowed the wire to work optimally and the teeth would be positioned in their neutral zone. The patient was instructed to use class III early elastic. The combination of posterior bite blocks and early light elastics made it possible to improve the sagittal and vertical relationship since the beginning of the treatment.25,2 After 3 months of fixed appliance treatment, the reverse over jet of this patient were corrected and the molar relationship became class I. At the finishing stage, we instructed patient to use vertical settling elastic to correct the open bite on the buccal side. This technique caused the lower anterior facial height increased which improved the facial profile. The stability of the treatment could be influenced by the incisors relationship, growth pattern, interdigitation of the teeth, muscle’s tension, and the severity of the case. In this patient, we achieved the class I incisors relationship and good interdigitation. We also instructed the patient to use the retainer to maintain the result of the treatment.

Conclusion

This case report shows that class III skeletal malocclusion in adolescent can be successfully managed using the combination of FM and RPE procedure followed by fixed orthodontic treatment with self-ligating system.
References


