CASE REPORT

MANAGEMENT OF CLASS III MALOCCLUSION IN A GROWING PATIENT USING RAPID MAXILLARY EXPANDER, FACEMASK AND FIXED ORTHODONTIC APPLIANCE

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ABSTRACT

Class III malocclusion with multifactorial etiology manifests with dental or skeletal discrepancies. If severe, could lead to compromised facial esthetics and function, thereby compromising the patient's quality of life. The deleterious effects tend to pile up more in a preadolescent/growing patient hence need timely intervention. Even though the management in the late mixed or early permanent dentition can be successful, good results are generally achieved when done in the deciduous or early mixed dentition The present article describes a case of management of class III malocclusion with anterior crossbite in a 9-year-old boy using a bonded Rapid Maxillary Expansion and petit type facemask appliance, followed by fixed orthodontic therapy. The total treatment duration was 2 years and 2 months.

KEY WORDS

Class III malocclusion, crossbite, rapid maxillary expansion, petit type facemask

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INTRODUCTION

Class III malocclusion is any discrepancy of dental or skeletal components in antero-posterior or vertical directions. Common clinical presentation of skeletal class III malocclusion is retrognathic and narrow maxilla, prognathic and wider mandible, and/ or a combination of both. The magnitude of the discrepancy may compromise facial esthetics variably and motivates individuals to seek orthodontic treatment.[1]

The Class III malocclusion may be hereditary in occurrence further affected by environmental factors such as mouth breathing habit.[2] Its prevalence varies among different ethnic groups ranging between 1% and 4% in Caucasians,[3] 4% and 5% among the Japanese[4] and 4% and 14% among the Chinese.[5] However its frequency is higher among Asians as large percentage of patients exhibit maxillary deficiency. In European royal families, the mandibular prognathism is commonly inherited. Since it is an autosomal dominant inheritance with incomplete penetration, the expression of mandibular prognathism is influenced by a major gene.[6]

Cephalometric, facial and occlusal analysis is a reliable tool in determining the structural etiology of Class III malocclusion. Description of the craniofacial morphology may require an analysis of antero-posterior (A-P) measurements as suggested by Ricketts,[8] Harvold,[9] and Steiner analyses.[10]

The following factors help to differentiate a dental crossbite from a skeletal one:

1. Dental assessment
2. Functional assessment: True relationship of the maxilla to mandible is assessed to determine the presence of centric relation/ centric occlusion (CR CO) discrepancy. No shift on closure suggests a true Class III malocclusion.
3. Profile analysis

The success or failure of early treatment could depend on inclination of the condylar head, the maxilla-mandibular vertical relationship together with the width of the mandibular arch. Successful

outcomes with 95% degree of accuracy were predicted using ramal and corpus length, mandibular position, and gonial angle.

Since maxillary deficiency is commonly a component of skeletal Class III malocclusion, the recent treatment strategy is aimed at promoting maxillary growth, for which the data from randomized clinical trials are not available.[9] However In children, inhibiting mandibular growth or stimulating maxillary growth tends to modify the growth in skeletal Class III malocclusion.[15]

There are three approaches to manage maxillary deficiency: Frankel's FR-III functional appliance is the most effective method followed by reverse-pull headgear (facemask) and Class III elastics to skeletal anchors is the least effective.[9]

Protraction forces are applied to the peri-maxillary sutures using Facemask which encourages the forward growth of maxilla. The facemask and rapid palatal expander (RPE) are often used together.[17] The ideal time to reposition the maxilla forward is before the age of 8 years as orthodontic tooth movement can overwhelm skeletal change, and more recent studies comparing untreated Class III children to those treated with maxillary protrusion have confirmed greater skeletal change at earlier ages.

A list of factors was proposed, both positive (good facial esthetics, mild skeletal disharmony, no familial prognathism, presence of antero-posterior functional shift, convergent facial type, symmetric condylar growth, and growing patients with expected good cooperation) and negative (poor facial esthetics, severe skeletal disharmony, familial pattern established, no antero-posterior shift, divergent facial type, asymmetric condylar growth, growth complete, and poor cooperation) which help the clinician to decide the time of interception for a developing Class III malocclusion.[12] Early treatment is suggested for those patients who present with positive characteristics and that treatment can be postponed till the completion of the growth for patients with negative characteristics.

CASE REPORT

A 9-year-old boy presented in the department with the chief complaint of backwardly placed upper front teeth. The extra-oral examination revealed a mesocephalic head form, mesoprosopic facial form, concave prolife, anterior divergence, and protruded lower lip (Fig 1). The intra-oral examination revealed

Fig 1: extraoral pre treatment photgraphs

Fig 2: Intraoral pre treatment photographs

Fig 3: pre-treatment radiographs

an anterior crossbite in relation to all incisors and Class III molar relationship. The maxillary incisors were retroclined whereas the mandibular incisors were upright. Reverse overjet of 4mm and overbite of5 mm was observed (Fig2). The cephalometric analysis revealed a class III skeletal base, a retrognathic maxilla (SNA=78o) and an average mandible (SNB=82o). The skeletal age of the child was determined as CVMI stage 2 which suggested that at least 25 to 65% growth was still expected (Fig3).

TREATMENT OBJECTIVES

Objectives of the treatment were

1. To correct the skeletal class III relation and concave profile
2. To correct the crossbite and attain normal overjet and overbite
3. To attain class I molar, canine, relation bilaterally
4. To improve the smile and aesthetics and overall appearance

Fig 4: bonded RME appliance

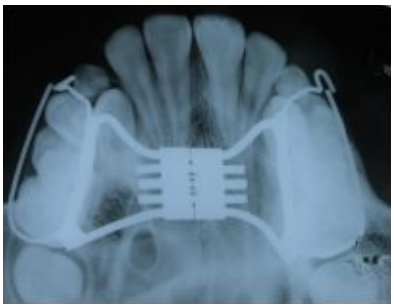

Fig 5: occlusal radiograph after placement of rapid maxillary expander

Fig 6: Appearance of diastema

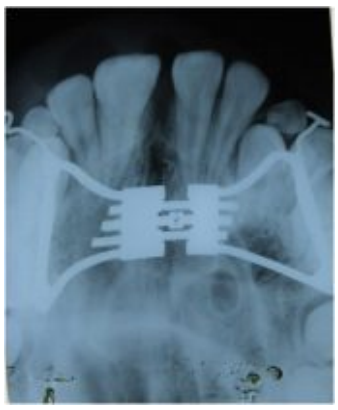

Fig 7: occlusal radiograph showing split in the midpalatal suture

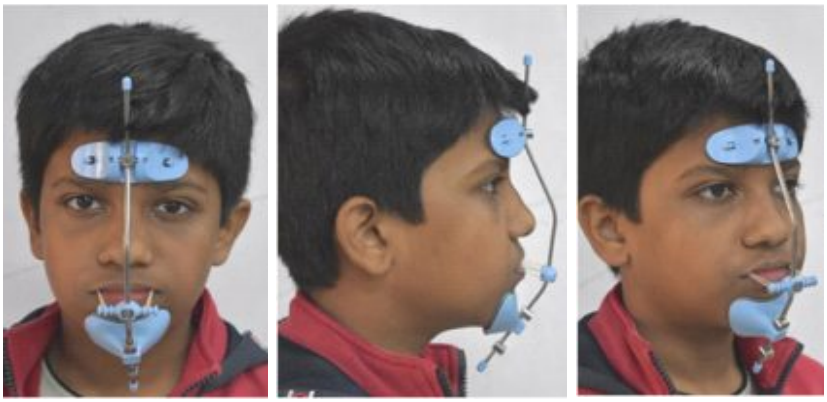

Fig 8: extraoral photographs of patient wearing petit type facemask

Fig 9: retention plate after phase I therapy

Fig 10: extraoral mid treatment photographs

Fig 11: Intraoral mid treatment photographs

TREATMENT PLAN

Patient was planned to be treated in two phases. Phase one treatment comprised of use of rapid maxillary expander according to Alt-RAMEC protocol, followed by protraction by petit type facemask. After correction of skeletal problem, dentoalveolar correction was done in phase two by pre adjusted edgewise appliance using MBT 0.022 slot continuous arch mechanics. Retention planned was clear, thermoformed retainers.

TREATMENT PROGRESS

An RME was cemented and activated twice daily, opened and closed, according to the Alt-RAMEC protocol. Each turn was 0.25 mm/ 90^0.

The appliance covered the maxillary buccal and occlusal segments, thereby disoccluding the posterior teeth and enabling crossbite correction.

After 4 weeks of the bonded appliance, facemask use was initiated and continued for 6 months, for


Fig 12: mid treatment radiographs

atleast 16 hours a day.

The extraoral elastics protocol followed was: 3/8", 8 oz, then ½", 14 oz and finally 5/16", 14 oz. The phase 1 treatment was completed by 7 months, following which, a retention plate was kept in place for 3 months.

The ANB angle improved, mandibular plane angle increased, anterior crossbite was corrected and the upper incisors were labially inclined. Later, a full mouth, fixed, edgewise appliance was used to treat the patient for another 16months.

TREATMENT RESULT

After 26 months of treatment, an acceptable occlusion, overbite and overjet was achieved.

The patient displayed a bilateral Class I canine occlusion and a Class I molar relationship. The arch forms were symmetrical and well aligned. The SNA angle had increased, resulting in a normal jaw relationship (ANB = 2o). Normal overbite (1 mm) and overjet (2 mm) were achieved, and the midlines were centered. Vertical skeletal measurements remained near-constant.Harmonious occlusion was established; lateral and jaw-opening excursions were smooth and straight.

Fig 13: extraoral post debonding photographs

Fig 14: post treatment intraoral photographs

Fig 15: intraoral photograph of clear, thermoformed retainers

DISCUSSION

In children having true maxillary problems, this type of treatment is most suited. However, some evidence suggests that the effects of treatment on mandibular growth may exceed the changes caused by clockwise mandibular rotation. In our case report, petit-style facemask was used because it provides more comfort while sleeping and is easy to adjust. Bonded RME was used to relieve the circum-maxillary sutures. For a narrow maxilla, palatal expansion should be done with maxillary protraction for which, the expansion device is an effective splint; however, maxilla should not be expanded just to improve the protraction. Whatever the method of attachment, the appliance must be attached to the facemask using hooks in the canine-primary molar area above the occlusal plane. This places the force vector closer to the purported center of resistance of the maxilla thereby limiting rotation of the maxilla. The force applied should be in the range of 350 to 450 gm. per side for 14 hours per day. It is better to postpone protraction of the maxilla until the permanent incisors and first molars have erupted. Spontaneous crossbite correction of permanent incisors can be induced by RPE anchored on deciduous teeth in the early mixed dentition. In our case, bonded RME was used to correct anterior crossbite as well as slightly retrognathic maxilla with the use of face mask. Camouflaging for Class III cases would be successful if malocclusion was corrected without affecting the facial appearance and involves a combination of lower incisor retraction and forward movement of maxillary incisors. When the lower incisors are retracted, the chin generally appears prominent. Several studies have shown the importance of early treatment in Class III patients. We have chosen Facemask RME therapy for achieving maxillary skeletal protraction, redirecting mandibular growth in downward and backward direction. Maxillary protraction is recommended for patients with skeletal Class III malocclusion and maxillary deficiency. For most patients with Class III malocclusion seen in the early mixed dentition or late deciduous dentition, Facemask is the commonest choice.

CONCLUSION

Class III patients with maxillary deficiency can be treated using appliances such as RME and the protraction facemask to eliminate anterior crossbite, CO/CR discrepancy, and maximize the growth potential of the nasomaxillary complex. Ideally, treatment using protraction facemask is done during CVMI stages 1 and 2. After treatment completion using protraction facemask, a follow-up lateral cephalogram can be taken to assess the horizontal growth of the maxilla and the mandible as well as the growth vector or direction. During the early permanent dentition period, the Growth Treatment Response Vector (GTRV) ratio is calculated and patients are informed if camouflaging with orthodontic treatment is sufficient to correct the malocclusion or if surgical treatment may be necessary at a later age.

REFERENCES

1. T. M. Graber, R. L. Van, and K. W. L. Vig, "Treatment of patients in the mixed dentition," in Orthodontics: Current Principles and Techniques, T. M. Graber and R. L. Vanarsdall, Eds., pp. 565– 569, Mosby, St. Louis, Mo, USA, 2009.

2. G. Cozzani, "Extraoral traction and class III treatment," American Journal of Orthodontics, vol. 80, no. 6, pp. 638–650, 1981.

3. L. De Toffol, C. Pavoni, T. Baccetti, L. Franchi, and P. Cozza, "Orthopedic treatment outcomes in Class III malocclusion: a systematic review," Angle Orthodontist, vol. 78, no. 3, pp. 561– 573, 2008.

4. J. A. McNamara Jr., "An orthopedic approach to the treatment of Class III malocclusion in young patients.," Journal of Clinical Orthodontics, vol. 21, no. 9, pp. 598–608, 1987.

5. P. Ngan, "Early timely treatment of class III malocclusion," Seminars in Orthodontics, vol. 11, no. 3, pp. 140–145, 2005.

6. J. Delaire, "Confection dur masque orthopedique," Revue de Stomatologie et de Chirurgie Maxillo-Faciale, vol. 72, pp. 579– 584, 1971.

7. P. Ngan, "Early treatment of Class III malocclusion: is it worth the burden?" American Journal of Orthodontics & Dentofacial Orthopedics, vol. 129, no. 4, supplement, pp. S82–S85, 2006.

8. P. V. Westwood, J. A. McNamara Jr., T. Baccetti, L. Franchi, and D. M. Sarver, "Long-term effects of class III treatment with rapid maxillary expansion and facemask therapy followed by fixed appliances," American Journal of Orthodontics and Dentofacial Orthopedics, vol. 123, no. 3, pp. 306–320, 2003.

9. P. Ngan, S. H. Wei, U. Hagg, K. Y. Yiu, D. Merwin, and B. Stickel, "Effect of protraction

headgear on class III malocclusion," Quintessence International, vol. 23, no. 3, pp. 197–207, 1992.

10. P. K. Turley, "Managing the developing Class III malocclusion with palatal expansion and facemask therapy,"American Journal of Orthodontics & Dentofacial Orthopedics, vol. 122, no. 4, pp. 349–352, 2002.

11. S. J. Sung and H. S. Baik, "Assessment of skeletal and dental changes by maxillary protraction," American Journal of Orthodontics and Dentofacial Orthopedics, vol. 114, no. 5, pp. 492–502, 1998.

12. J. S. McGill and J. A. McNamara Jr., "Treatment and post-treatment effects of rapid maxillary expansion and facial mask therapy," in Growth Modification: What Works What Doesn't and Why, J. A. McNamara, Ed., vol. 36 of Monograph, Craniofacial Growth Series, Center for Human Growth and Development, Ann Arbor, Mich, USA, 1999.

13. M. D. Williams, D. M. Sarver, P. L. Sadowsky, and E. Bradley, "Combined rapid maxillary expansion and protraction facemask in the treatment of class III malocclusions in growing children: a prospective long-term study," Seminars in orthodontics, vol. 3, no. 4, pp. 265–274, 1997.

14. J. S. McGill, Orthopedic alterations induced by rapid maxillary expansion and face mask therapy [M.S. thesis], University of Michigan, Ann Arbor, Mich, USA, 1995. [15] D. Gencer, E. Kaygisiz, S. Yuksel, and T. Tortop, "Comparison ¨ of double-plate appliance/facemask combination and facemask therapy in treating Class III malocclusions," Angle Orthodontist , vol. 85, no. 2, pp. 278–283, 2015.

15. D. Gencer, E. Kaygisiz, S. Yuksel, and T. Tortop, "Comparison ¨ of double-plate appliance/facemask combination and facemask therapy in treating Class III malocclusions," Angle Orthodontist , vol. 85, no. 2, pp. 278–283, 2015.

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