

MANAGEMENT OF DEVELOPING CLASS III MALOCCLUSION THROUGH TIMELY INTERVENTION WITH RAPID MAXILLARY EXPANSION AND FACEMASK THERAPY

Balaji Kethineni¹, Ravindar Puppala², Triveni Titla³, Aakanksha Vyawahare³,
Uday Chowdary Birapu⁴, Krishnappa Srinath⁵

¹Professor, ²Professor & Head, ³Postgraduate, ⁴Assistant professor, Dept of Pedodontics, SVS Institute of Dental Sciences, Appanapally, Mahabubnagar, Telangana, India.

⁵Professor & Head, Dept of Pedodontics, Govt Dental College, Bangalore, Karnataka, India.

Corresponding Author:- **Balaji Kethineni**
E-mail: balajipgi@rediffmail.com

Article Info	ABSTRACT
<p>Received 15/05/2016 Revised 27/05/2016 Accepted 12/06/2016</p> <p>Key words: Class III, Facemask, Rapid Maxillary Expansion.</p>	<p>The orthodontic treatment, especially for children with developing class III malocclusions has always been a controversy with regards to the timing of intervention. Imbalances in facial growth occur, which worsen the facial profile with age. An 8 year old female child presented with Class III malocclusion associated with anterior and posterior cross bite, mid face deficiency, forwardly placed mandible and a concave profile. Early intervention by rapid maxillary expansion was planned followed by facemask therapy to improve the maxillary deficiency, facial profile and dental anterior and posterior cross bite. The treatment period was for 1 year and there was an observable change in the facial profile and correction of cross bite. Therefore early intervention helps in modifying the maxillofacial growth and providing facial balance when intervened at the right time.</p>

INTRODUCTION

Class III malocclusion is one of the most difficult conditions to diagnose and treat in orthodontics and is characterized by mandibular prognathism, maxillary retrognathism or a combination of both. It has been observed that skeletal class III malocclusions comprises two thirds which is due to either maxillary retrognathism or a combination of maxillary retrognathism and mandibular prognathism [1].

Proffit and Fields suggested mobilization of maxillary sutures by maxillary expansion before maxillary protraction. A thorough understanding of the craniofacial growth and development of the dental arches is necessary in order to provide the patient with the most effective treatment. One of the dilemmas facing the clinician is whether or not to intervene before the eruption of the permanent dentition. Literature supports it is better to intervene in the early mixed dentition and occasionally in the late deciduous dentition so as to eliminate or modify

the skeletal, muscular and dentoalveolar abnormalities before the eruption of the full permanent dentition, to prevent an abnormality from occurring rather than to wait until it has become fully developed [1]. Orthopedic treatment applied during this stage can shorten the treatment time, favorable occlusion and facial harmony can be obtained if mandibular growth is properly controlled during and after retention period

The present case report presents the treatment progress of early intervention of the class III malocclusion with rapid maxillary expansion followed by facemask therapy.

Case report:

An 8 year old female patient reported to the Department of pedodontics, with the chief complaint of forwardly placed and abnormal position of the lower jaw. On examination, extra oral findings revealed a concave



profile with competent lips and a shallow mentolabial sulcus (Fig no.1). Intra oral examination showed angles class III molar relation, posterior cross bite and reverse overjet of around 4 mm (Fig no 2). The child was in mixed dentition stage with retained 61, and completely erupted all first molars and central incisors except 11 (Fig no.2). Lateral cephalogram was taken and findings were recorded which showed a class III malocclusion with deficient maxilla (SNA=80°) and prognathic mandible (SNB=94°) (Fig no.3) and Table 1.

The children in mixed dentition stage usually have great potential of growth, so the main goal of the treatment was to correct the anterior cross bite and the functional forward deviation of the mandible.

Treatment:

Lateral Cephalogram

Occlusal Radiograph

The proposed treatment protocol comprised two stages: 1.The Rapid maxillary expansion (RME) followed by 2. Facemask therapy.

Bands were prepared on primary first molars and permanent first molars and impressions were made. Hyrax expansion screw was used for preparation of maxillary splint along with the extensions in the canine region for engaging extra oral elastics. Occlusal surfaces of posterior teeth covered with acrylic of 2 mm thickness to relieve the cross bite (Fig no.4).

Finished splint was cemented using GIC and left

without activation for 24 hours (Fig no.5). Once the child is adjusted with the splint, activation was done 2 turns per each day for 1 week followed by 1 turn per day till the desired expansion is achieved. 1 turn produces around 0.5 mm expansion of the maxilla. After 2 weeks clinically midline diastema was noted giving the indication of opening of mid-palatine suture. An occlusal radiograph at this period showed the separation of the mid-palatine suture giving the shape of a fan (Fig no.6). Once sufficient opening of mid-palatine suture noticed approximately after 2 weeks, activation was stopped and expansion screw sealed with GIC and treatment continued with facemask later treatment was continued with the facemask (Fig no.7). Hichkman type face mask was used utilizing 5/16 inch elastics for force application. Two elastics were engaged into the hooks at the canine region, one on each side, advised to change the elastics every 24 hours.

After a period of 6 months, there was good facial profile observed with considerable change to the initial concave profile (Fig no.8) and appreciable changes in the lateral cephalogram in comparison to the pre-operative radiograph(Fig no.9 and Table 1).

Once the crossbite has been corrected and sufficient anterior overjet and overbite achieved (Fig no.10), intentionally over correction is done expecting the relapse. Patient was advised to wear facemask with the same elastics changed after 2 days, as retention period. Then the splint was removed and hawleys appliance given for another 6 months of period to stabilize the occlusion.

Fig 1. Pre- treatment Extraoral Photographs



Fig no.1a

Fig no.1b

Fig no.1c

Fig 2. Pre- treatment Intraoral Photographs



Fig No.2a

Fig No.2b



Fig 3. Pre-treatment lateral cephalogram



Fig no. 3

Fig 4. Expansion Screw with posterior bite plate



Fig No.4

Fig 5. Splint in place and Follow up after 3 months



Fig No.5a



Fig No.5b



Fig No.5c

Fig 6. Occlusal Radiograph after 2 weeks

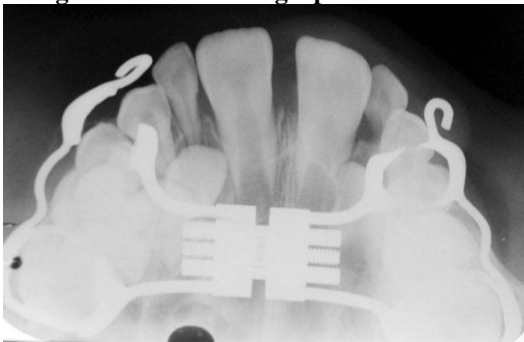


Fig No.6

Fig 7. Facemask on patient



Fig no.7

Fig 8. Comparison of profile views – Before and after treatment



Fig .no 8a



Fig no.8b

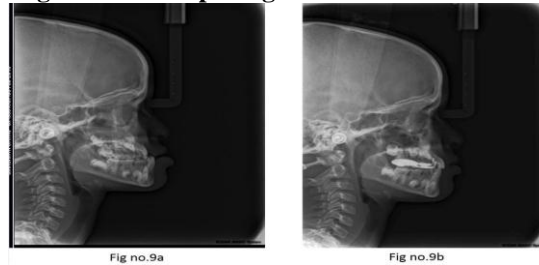
Fig 9. Lateral cephalogram -- Before and After**Fig 10. Intraoral photographs – Achievement of overjet and overbite**

Fig No.10a

Fig No.10b

Fig No.10c

Table 1. Cephalometric Measurements

Cephalometric Measurements	Normal	Pre- treatment	Post-treatment
ANB(Steiner)(degrees)	+2	-14	-6
SNA (degrees)	82	80	86
SNB (degrees)	80	94	92
Wits appraisal (mm)	-1	-11	-5.5
Facial angle	87.8	96	93
Mandibular plane angle	17-28(mean-21.9)	23	27
Interincisal angle	135.4	136	140
Incisor occlusal plane angle	145.5	80	80
Mandibular plane angle	32	31	21
Occlusal plane angle	14.5	10	08
FMPA	25	27	23
Incisor mandibular plane angle	90	83	93
FMIA	65	74	76

DISCUSSION

Several treatment options have been available for treating a Class III malocclusion in the late deciduous or the mixed dentition, few of which are Frankel appliance (FR-3) recommended in cases of maxillary skeletal retrusion, orthopedic chin cup in cases of mandibular prognathism, combination of rapid maxillary expansion and Orthopedic face mask in cases with maxillary retrusion and mandibular protrusion[1]. As the malocclusion is due to combination of maxillary retrusion and mandibular protrusion, the present protocol of RME followed by facemask is chosen as the treatment plan.

Orthopaedic treatment taken up at this stage shortens the duration of treatment, creates a favourable occlusion and facial harmony by proper control of mandibular growth during and after the retention period. Heavy orthopaedic forces are used to separate the two

halves of the maxilla at the midpalatal suture. Of the available treatment philosophies, maxillary expansion followed by facemask therapy produces the most dramatic results in the shortest period of time[1], as expansion causes the disruption of maxillary sutural system comprising of a complex of 8 sutures. The sutural complex comprises of frontonasal, zygomatico-maxillary, intermaxillary, mid-palatal and transpalatal sutures.[2] Along with the opening of the midpalatal suture, RME has an effect on the entire maxillary complex. According to Starnbach et al, palatal expansion does not only separate the midpalatal suture, but the circumzygomatic and circummaxillary sutural systems as well. Specifically, the nasal, the zygomatico-maxillary, and the zygomaticotemporal are some of the sutures affected by RME.[2] The expansion schedule according to Zimring and Isaacson, which states that, in young growing patients

2 turns per each day are recommended for 1 week followed by 1 turn per day till the desired expansion is achieved, produces about 0.5 mm expansion of maxilla per day and so anticipating to approximately 10 mm of maxillary expansion by the end of 2 weeks.[3] This produces around 10-20 pounds of pressure on the sutural system which is enough to create micro-fractures in the sutures and expand them. [4] Here the purpose of RME is not only to correct posterior cross bite and also to open the circum-maxillary sutural complex, before switching to the use of facemask so as to make the protraction of the maxilla easier and faster. [5,6]

Mid-palatine suture disruption showing it in the form of a fan shaped slit in the anterior teeth region is the best clinical indicator. This makes it easier for the protraction of the maxilla once the disruption of sutures is achieved. Once the appropriate expansion is achieved, the screw is sealed with GIC so as to prevent collapse of the arch. The eruption of the upper permanent central incisors is usually the ideal stage to begin face mask therapy. The achievement of a positive overjet and overbite of the incisors during treatment is a prerequisite to help maintain the achieved correction of cross bite in the original class III malocclusion.

RME appliances are basically of two types-Removable and Fixed. Fixed appliances are again classified as a) tooth borne b) tooth and tissue borne. The two main appliances of tooth and tissue borne category are Derichsweiller and Hass type. The examples of tooth borne are Isaacson and Hyrax type of appliances.

The Hyrax appliance makes use of a special screw called HYRAX (Hygienic Rapid Expander), which usually is adapted to the palatal contour of maxilla and soldered onto the first premolars and permanent molars

The conventional RME appliances taking anchorage of the first premolars and permanent molars [Haas, 1970], have shown to be the most efficient (Haas, 1965), but with few undesirable effects like buccal tipping of these teeth, potential root resorption due to high forces [7], pulp stones and relapse during the retention period. (Haas, 1970; Silva Filho et al., 1995)

Treatment initiated during the mixed dentition stage can prevent such undesirable effects when anchorage is taken from the primary second molars and canines (as

these teeth will be replaced). This can also prevent the permanent molars being subjected to direct forces (Cozzani et al., 2003). The palatal sutures in young children are also not as interdigitate as in adults [7]. Bacetti et al (2001) states that RME carried out prior to the pubertal peak has more effective long term changes in the maxillary sutural system and also the skeletal level.

Maxillary expansion at the appropriate age often makes it possible to overcome the problems of mandibular deviation due to interferences of teeth in the opposing arches and thus prevents the skeletal asymmetry.

In addition to the maxillary expansion, there is a need for the modification of the growth pattern of both maxilla and mandible. In this present case, as there is a maxillary deficiency with protraction of mandible the proposed treatment was use of facemask to redirect the growth. There are 4 types of facemask for the correction of class III malocclusion. They are 1.Hickhman type 2. Petit type 3. Tubinger type 4. Delaire type.

The use of facemask for approximately 12-14 hours a day will usually cause around 12 ounces of force on the jaws resulting in a forward and downward movement of maxilla with concomitant downward and backward rotation of mandible. Here the force provided by the use of elastics is 8 ounces (226 gm) on each side.

Immobilization period of approximately 3 months is required for closure and recalcification of the opened suture system [5,6]. This results in clinical appearance of closure of the midline diastema between the upper central incisors during this period.

There were certain side effects like pain, strap marks due to impingement on the chin by the heavy forces of the facemask and imprints of the appliance on the tongue which will disappear rapidly following the treatment [8,9].

CONCLUSION

Correction of class III malocclusion is to a great extent dependent on correct diagnosis and timely intervention which usually should be carried out in the early or mixed dentition period. Such timely intervention will prevent the development of severe consequences of facial disharmony and improper esthetics.

REFERENCES

1. James A. McNamara, William L. Brudon. (1993) Orthodontic and Orthopedic Treatment in the Mixed Dentition. Needham press.
2. Jessica L. Woller, Ki Beom Kim, Rolf G. Behrents, Peter H. Buschang. (2014) An assessment of the maxilla after rapid maxillary expansion using cone beam computed tomography in growing children. *Dental Press J Orthod*, 19(1), 26-35
3. Proffit WR. (2000) Contemporary Orthodontics. 3rd ed. Saint Louis: Mosby.
4. Sridhar Prem kumar. Graber's textbook of orthodontics, Basic principles and practice. 4th edition, Elsevier, 2000.
5. Arvind Kumar, Deepa Gurunathan, Muruganandham, Shivangi Sharma. (2011) Rapid Maxillary Expansion: A Unique Treatment Modality in Dentistry. *J Clin Diagn Res*, 5(4), 906-11.
6. Renato Rodrigues de Almeida, Luiz Eduardo Alecia, Renata Rodrigues de Almeida Pedrin, Marcio Rodrigues de Almeida, Arnaldo Pinzan, Luiz Sérgio Vieira. (2015) Management of the Class III malocclusion treated with maxillary expansion, facemask therapy and corrective orthodontic. A 15-year follow-up. *J Appl Oral Sci*, 23(1), 101-9



7. Sabrina Mutinelli, Mauro Cozzani, Mario Manfredi, Marco Bee and Giuseppe Siciliani. (2008) Dental arch changes following rapid maxillary expansion. *Eur J Orthod*, 30 (4), 469–76.
8. D. Gill, F. Naini, M. McNally and A. Jones. (2004) The Management of Transverse Maxillary Deficiency. *Dent Update*.
9. Muthukumar Karthi, Gobichettipalayam Jagatheeswaran Anbuselvan, Bhandari Pawan Kumar. (2013) Early correction of class III malocclusion with rapid maxillary expansion and face mask Therapy. *J. Pharm. and Bioall. Sci*, 5(2) 169-72.

