

Early management of class III malocclusion with bonded maxillary expansion and facemask therapy - A case report

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Abstract

A case report of a 10 year old pre-pubertal girl with skeletal class III malocclusion, anterior cross bite and concave profile. Patient was treated for a period of six months with rapid maxillary expansion and facemask. Significant improvements were obtained in facial profile and anterior cross bite correction was achieved.

Keywords: Class III malocclusion, Facemask, Rapid maxillary expansion.

Introduction

The clinical presentation of class III malocclusion has a wide spectrum ranging from edge to edge bite to a large negative overjet, with extreme variations of underlying skeletal jaw bases. Developing class III malocclusions are considered to be the most challenging malocclusions to treat. Treatment strategies in class III malocclusion¹ are,

1. Interception of problems through dentofacial orthopedics (Protraction facemask,⁽²⁾ FR-III, Reverse twin block, Class III bionator, chin cup)
2. Camouflage treatment
3. Orthognathic surgery (undertaken when growth is completed).

Of the different mixed dentition treatment strategies, the orthopaedic facial mask produces the most dramatic results in the shortest period of time. Orthopedic facemask is the customary appliance of choice for most class III patients seen in early mixed dentition or late mixed dentition period especially with maxillary retrognathism.

Class III malocclusions are usually growth related and becomes more severe by the time growth is completed. This is the main reason for difficulty in the management of growing class III cases.

The orthopaedic facemask system has three basic components.⁽¹⁾ The facial mask, a bonded maxillary

splint, and elastics. The facial mask of Petit type is composed of a forehead pad and a chin cap that are connected by a heavy steel support rod. To this support rod is connected a cross bow to which are attached rubber bands to produce a forward and downward elastic traction on the maxilla. The position of the pad / cap and crossbow can be adjusted simply by loosening and tightening the screws within each part of the appliance.

Recent studies, have shown significant improvement in class III deficient patients with the use of protraction headgear.^(2,3,4,5,6) The optimal time to begin class III treatment is in the early mixed dentition.⁽⁷⁾ The use of rapid maxillary expansion is considered to disarticulate the maxillary sutures and allow more efficient forward protraction of the maxilla.^(8,9)

Case Report

A 10 year old girl came with the chief complaint of anterior cross bite to Orthodontic department. Patient had no relevant medical and dental history. On extraoral examination, the facial profile was concave, anterior divergent face and acute nasolabial angle (Fig. 1).



Fig. 1: Extraoral examination

On intraoral examination (Fig. 2), all hard tissues and soft tissues were normal. Molar and incisor relationship were class III bilaterally and there was reverse overjet of 3 mm with overbite of 4mm. Canine relationship was also class III on the left and right. The patient had class III skeletal base with retrognathic maxilla and prognathic mandible. The objectives of treatment were (1) obtaining ideal aesthetics, (2) skeletal class III correction, (3) correction of molar and canine relationships and (4) obtaining ideal overjet and overbite.



Fig. 2: Intraoral examination

Treatment progress

Patient was treated with a combination of facemask and RME (Fig. 3, 4) until 2mm positive overjet was attained. The expansion screw was activated 2 turns / day for the 1st week and one turn was advised thereafter till desired amount of expansion was achieved. Petit type of facemask was used. The protraction elastics was attached to hooks placed buccal to the maxillary canines with a downward and forward pull of 20 degree to the occlusal plane. Elastics that delivered 500gms of force per side as measured by dontrix gauge, was applied. The facemask was placed after one week of rapid maxillary expansion and patient was instructed to wear facemask for a duration of 14 hours per day.



Fig. 3: Rapid Maxillary Expansion



Fig. 4: The facemask appliance

Treatment Results (following 6 months of RME facemask therapy)

Maxillomandibular relations (Fig. 5, 6) showed significant improvements in the treatment period, with changes primarily due to increase in SNA angle and decrease in SNB angle. There was improvement in the soft tissue profile with forward movement of upper lip and backward movement of the lower lip (Fig. 7). The upper incisors proclined following RME and facemask therapy. Pre and post treatment cephalometric values are given in Table 1.



Fig. 5: Post facemask intra oral photos



Fig. 6: Post facemask extra oral photos

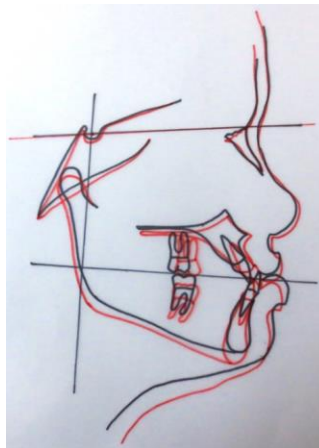


Fig. 7: Superimposition of pre and post treatment cephalogram

Skeletal Parameters

S. No	Parameter	Pre Treatment	Post Facemask Therapy	Difference
1	SNA	83°	85°	2°
2	SNB	88°	86°	-2°
3	ANB	-5°	-1°	4°
4	SN-PP	83.5°	86°	2.5°
5	Maxillary Length (Co- A)	65.5mm	68.5mm	3mm
6	Mandibular Length (Co-Gn)	90	90	0mm
7	UFH	39mm	40.5mm	1.5mm
8	LFH	45mm	48mm	3mm
9	Angle of Convexity	-14.5°	-2.5°	12°

10	Nasion Perpendicular to A Point	-4mm	-1mm	3mm
11	FMA	22 ⁰	22.5 ⁰	0.5 ⁰
12	BETA Angle	46 ⁰	39.5 ⁰	6.5 ⁰
13	WITS Appraisal	-7mm	-4mm	3mm

Soft Tissue Parameters

S. No	Parameter	Pre Treatment	Post Facemask Therapy	Difference
1	Nasolabial Angle	76 ⁰	82 ⁰	6 ⁰
2	Cant of Upper Lip	24 ⁰	23 ⁰	-1 ⁰
3	E Line	u/lip= -2.5mm l/lip= +2.5mm	u/lip= -2 mm l/lip= +1 mm	u/lip= 0.5mm l/lip= -1.5mm
4	S Line	u/lip= 0mm l/lip= 5mm	u/lip= 0mm l/lip= +2.5mm	u/lip= 0mm l/lip= -2.5mm

Dental Parameters

Table 1: Comparison of pre and post cephalometric values

S. No	Parameter	Pre Treatment	Post Facemask Therapy	Difference
1	Overjet	-3mm	2mm	5mm
2	Overbite	3mm	3mm	0mm
3	Interincisal Angle	131 ⁰	131 ⁰	0 ⁰
4	Upper Incisor Proclination (1-SN)	115.5 ⁰	120 ⁰	4.5 ⁰
5	Upper Incisor Proclination (1-NA)	32 ⁰	34.5 ⁰	2.5 ⁰

Discussion

The case reported shows that early management of class III malocclusion with a combination of rapid maxillary expansion and facemask is very effective. In properly selected cases, this modality of treatment can be a successful alternative to surgery or premolar extractions. **A post facemask fixed appliance therapy is required in this case to settle the occlusion.** The ideal age for facemask therapy is generally the early mixed dentition. But if the patient comes in late mixed

dentition also, the ideal treatment for class III due to maxillary deficiency would be RME facemask. If the facemask therapy is used in the early mixed dentition, a substantial amount of time may elapse before the final phase of fixed appliance treatment may be initiated. Multiple stages of orthopaedic intervention may be required, and thus these patients must be monitored until all major facial growth is complete.⁽¹⁰⁾

The ideal timing of facemask therapy as summarized by various authors are given in **Table 2.**

Table 2: Optimum time to start facemask therapy

Authors	Optimum time to start facemask therapy
Bacetti, Mc Gill, Franchi, McNamara ⁽¹¹⁾	Early mixed dentition.
Baik ⁽¹²⁾	Face mask/expansion therapy in younger children was not significantly different from older children
Kim, Viana, Graber ⁽¹³⁾	Before the patient is 10 years of age.
Takada ⁽¹⁴⁾	Pre and mid pubertal group showed significant increase in SNA and maxillary length, while late pubertal group showed only a less significant increase in SNA.
Kapust ⁽¹⁵⁾	4 to 7 and 7-10 age group responded better to treatment than 10-14 age group.
Franchi, Bacetti ⁽¹⁶⁾	Early mixed or late deciduous dentition produces significant favourable modifications in both maxillary and mandibular structures, whereas late

	treatment (late mixed dentition) induces only a restriction of mandibular growth.
William Proffit ⁽¹⁷⁾	The optimal time to intervene a class III malocclusion is when incisors erupt.

Rapid maxillary expansion was used along with facemask therapy in this case. Several circummaxillary sutures play an important role in the development of the nasomaxillary complex including the frontomaxillary, nasomaxillary, zygomaticotemporal, zygomaticomaxillary, pterygopalatine, intermaxillary, ethmoidomaxillary and lacrimomaxillary suture.⁽¹⁸⁾ These sutures are patent till eight years of age. Patients in the primary and early mixed dentition do not require maxillary expansion for protraction. However, by the late mixed dentition period, maxillary sutures become tortuous and fuse. The use of an expansion appliance helps in “disarticulating” the maxilla and initiate cellular response in the circummaxillary sutures thus allowing for a more positive reaction to protraction forces.

Prospective clinical trials have shown that maxilla remained stable for two years following facemask treatment.⁽¹⁹⁾ Long term studies revealed that that the treatment was successful in 67%-75% of the patients.^(20,21) The patients who revert back to anterior cross bite after facemask treatment would probably require orthognathic surgery after growth completion. Overcorrection of maxilla to 3-4mm overjet is generally recommended especially in cases where there is an excessive mandibular growth.

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