

**A Case Report-Early Management of Skeletal Class III malocclusion with Facemask therapy**

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**Abstract**

The most significant changes in the area of early treatment in recent times is the management of developing class III malocclusion. Class III malocclusion present in various forms and poses a major challenge in Orthodontics owing to continued growth of mandible and early caesation of maxillary growth. The development of technique of using facemask with palatal expansion have provided an effective approach to manage treatment that was once considered difficult. The case describes early management of class III in a patient with biphasic approach, Facemask with RME followed by fixed appliance therapy.

**Keywords:** Class III Malocclusion; Dentofacial Orthopaedics Early Orthodontic treatment; Hyrax appliance Petit’s Facemask.

**Introduction**

Class III malocclusion is unique in presentation, it may range from retrognathic maxilla, prognathic mandible ,a combination of both, pseudo or functional class III, or a dental Class III.

Prevalence of Class III is greater in Asian population compared to Caucasians, ranging between 4% and 13% in Japanese, 7.8–15.2% in Iranians, and between 4% and 14% among Chinese.<sup>1,2,3</sup> .The incidence of class III malocclusion in India is 1.2%.<sup>4</sup>

Ellis and McNamara found the most common type of Class III malocclusion to be Maxillary skeletal retrusion combined with Mandibular skeletal protrusion (30.1%), followed by pure Maxillary retrusion (19.5%) and pure mandibular protrusion (19.2%).<sup>5</sup> The treatment of Class III depends on the underlying discrepancy of jaw bases whether skeletal or dental and the age at the time of presentation.

**Treatment options include**

1. Orthopaedic correction: When patient is in growing stage  
Retrognathic maxilla-Facemask-Delaire, petit type(ideal age-pre puberty mixed dentition stage)  
Prognathic mandible-Chin cup(ideal age-As mandible continuous to grow-early interception to as late as growth caesation)

Functional jaw orthopaedics-frankel III. Reverse Twin block(mostly used for retention after treatment)

2. Camouflage treatment(ideally after growth completion)

3. Orthognathic surgery(ideally after growth completion)

All these may be followed by phase II Therapy of using multi -bracket edgewise appliance therapy.

Early presentation of such cases provides clinician ample opportunity to utilize the growth spurts of the children and correct the skeletal jaw base relationships avoiding surgical intervention.<sup>6</sup>

Of the several design of facemask,Petit type is most ergonomic,and comfortable to wear.The appliance therapy causes a forward and downward movement of maxilla and maxillary dentition as well as downward and backward rotation of mandible causing improvement in skeletal jaw base relation.

In the last two decades, a combination of rapid maxillary expansion (RME) along with a facemask to protract the maxilla has become a standard protocol in the early

**Cephalometric findings include**

Table 1: Composite cephalometric findings sagittal and vertical parameters showing skeletal Class III with horizontal growth.

Variable	Pretreatment	Normal values	Inference
SNA	78 <sup>0</sup>	82 <sub>±</sub> 2	Skeletal Class III malocclusion
SNB	82 <sup>0</sup>	80 <sub>±</sub> 2	
ANB	-5 <sup>0</sup>	2 <sub>±</sub> 2	
WIT's	-7mm	0mm	
A-B plane angle	9 <sup>0</sup>	-4.6 <sup>0</sup> (-9 to 0)	
Angle of convexity	-11mm	-8.5 to 10mm	

Variable	Pretreatment	Normal values	Inference
Vertical skeletal			
SN-Mandibular plane	30 <sup>0</sup>	32 <sup>0</sup>	Horizontal growth pattern
FH-Mandibular plane	21 <sup>0</sup>	21.9 <sup>0</sup> (17 to 28)	

management of cases with maxillary deficiency.<sup>7</sup>This case report presents the use of the above procedure for the successful management of Class III malocclusion with maxillary deficiency in a 10-year-old patient

**Case Report**

A 10 year old girl presented with chief complaint of forwardly placed lower jaw.Patient had no relevant medical and dental history.On extraoral examination,the facial profile is concave,anterior divergent facial profile and protuberant lower lip.

On intraoral examination,all hard and soft tissues were normal.Patient had anterior cross bite,with reverse overjet of -1mm and overbite of 3mm.She was in early mixed dentition phase with canine in erupting stage.Molar and incisor relation are class III on both sides.Patient had class III skeletal base with retrognathic maxilla.

FMA	21 <sup>0</sup>	25 <sup>0</sup> (16-35)	
Facial Axis	-5	0±3.5 <sup>0</sup>	
Y -Axis	60 <sup>0</sup>	59.4 <sup>0</sup>	
Jaraback ratio	66.3%	62-65%	
SN-Occlusal plane	10 <sup>0</sup>	14.5 <sup>0</sup>	

Variable	Pre-treatment	Normal values	Inference
Upper incisors to NA	34 <sup>0</sup> /10mm	22 <sup>0</sup> /4mm	Proclined upper and lower incisor
Lower incisors to NB	35 <sup>0</sup> /9mm	25 <sup>0</sup> /4mm	
Interincisal angle	108 <sup>0</sup>	131 <sup>0</sup>	Acute nasolabial angle
Nasolabial angle	90 <sup>0</sup>	102±8	
Upper lip to E-line	-5mm	-4mm	Protuberant lower lip
Lower lip to E-line	6mm	-2mm	

**Pretreatment Radiographs**



Fig. 1: Pretreatment Lateral Cephalogram



Fig. 2: Pretreatment Orthopantomogram

**Skeletal Maturity Indicator**

CVMI stage 3-transition stage with 25-65% of growth expected.

Hand Wrist Radiograph-Sigmoid bone yet to be distinct- so growth remaining.SMI-4



Fig 3-Hand wrist radiograph of the patient

**Pretreatment photographs**



Fig. 4: Pre treatment photographs Extraoral



Fig. 5: Pretreatment photographs Intraoral

**Treatment Objectives**

The parents were made aware of the problem and that Orthognathic surgery may be required at a later stage .They were explained the possibility of growth modification procedure which may alleviate the need for future surgical intervention.

The treatment objectives were:-

1. To correct the anterior crossbite
2. To utilize remaining growth period to ensure downward and forward growth of maxilla
3. To level and align the arches
4. To achieve ideal overjet and overbite

**Treatment Plan**

**Phase 1**

Petit Facemask applying Orthopaedic force to maxilla,with elastics attached to bonded acrylic splint with hyrax expansion screw and hooks.

**Phase 2**

Fixed Mechanotherapy {0.022 x 0.028 inch MBT Slot}  
Alignment and levelling of both the arches



Moderate anchorage requirements

Remaining space closure

Finishing and detailing of occlusion



Fig. 6: Bonded hyrax splint appliance



Fig. 7: Patient wearing petit facemask with extraoral elastics

### Phase 1

An acrylic splint with hooks at position of deciduous canine for engaging elastics for facemask was bonded. The splint had a Hyrax expansion screw 13mm (Leone) which was activated daily by one half turn for 10 days for maxillary dysjunction at sutural area.

After maxillary sutural dysjunction, Petit's facemask therapy was started with 8oz 3/8" elastics providing 150 g of force on each side. The direction of pull was  $30^{\circ}$  to the occlusal plane so that maxilla moves downward and forward. After one week elastic forces were increased to 300 g on each side by 14oz 1/2" Extraoral elastics and

patient instructed to wear the facemask for atleast 12-14 hours.

After 6 months of continued wear, mid stage photographs and radiographs were taken. At mid stage, patient shows improvement in facial profile, facial concavity reduced and positive overjet obtained.

### Mid stage photographs



Fig. 8: Mid stage photographs showing improvement in lip protrusion (before phase II begins.)



Fig. 9: Mid-Stage Lateral Cephalogram showing improvement in maxillary position



Fig. 10: Intraoral Photographs showing improvement in cross bite

### Phase 2

Fixed appliance therapy was started with pre-adjusted edgewise appliance 0.22 slot MBT prescription. Levelling and alignment was started with 0.014 Niti wire and erupting canines and premolars were guided into the arch during leveling to achieve ideal molar and canine relationship.

Leveling continued till 0.020 Niti wire, then 0.019x0.025 SS wire were ligated followed by 0.021x0.025 SS wire for torque expression.

Finishing and detailing of occlusion was done by light round 0.016 ss wire and settling elastics. Duration of Fixed appliance therapy was 18 months. Retention was started with reverse twin block.



Fig. 11: Current progress of the patient –Extraoral and Intraoral photographs.



Fig. 12: Current Progress Lateral Cephalogram



Fig. 13: Current progress Orthopantomogram

### Results

Comparing the pre and post values, it can be seen that nearly all skeletal and dental objectives have been fulfilled. The anterior crossbite has been corrected; the sagittal discrepancy is improved significantly. The maxilla has moved forward, SNA angle has increased from  $78^{\circ}$  to  $82^{\circ}$ , ANB from  $-4$  to  $2$  and Wit's appraisal from  $-7\text{mm}$  to  $3\text{mm}$ .

Soft tissue values show improvement in nasolabial angle and lip protrusion has reduced.

Proclination of upper and lower incisors has reduced.

The growth continuous to be in normodivergent and backward direction may also have contributed to the pattern, indicating the rotation of mandible in downward improvement in profile.

Table 2: showing composite cephalometric values-Comparison of Pre-treatment, Mid-treatment and Current progress values-Showing improvement in skeletal malocclusion.

variables	Pretreatment	Midtreatment	Current progress	Inference
Sagittal skeletal				
SNA	78 <sup>0</sup>	82 <sup>0</sup>	83 <sup>0</sup>	Skeletal Class I Occlusion
SNB	82 <sup>0</sup>	82 <sup>0</sup>	81 <sup>0</sup>	
ANB	-4 <sup>0</sup>	0 <sup>0</sup>	2 <sup>0</sup>	
WIT's	-7mm	1mm	3mm	
A-B plane angle	9 <sup>0</sup>	-4 <sup>0</sup>	-3 <sup>0</sup>	
Angle of convexity	-11mm	3mm	2mm	
Vertical skeletal				
SN-Mandibular plane	30 <sup>0</sup>	33 <sup>0</sup>	32 <sup>0</sup>	Average growth pattern
FH-Mandibular plane	21 <sup>0</sup>	33 <sup>0</sup>	25 <sup>0</sup>	
FMA	21 <sup>0</sup>	28 <sup>0</sup>	26 <sup>0</sup>	
Facial Axis	-5	0 <sup>0</sup>	2 <sup>0</sup>	
Y -Axis	60 <sup>0</sup>	61 <sup>0</sup>	60 <sup>0</sup>	
Jaraback ratio	66.3%	66%	67.2%	
SN-Occlusal plane	10 <sup>0</sup>	14 <sup>0</sup>	13 <sup>0</sup>	
Dental and soft tissue values				
Upper incisors to NA	34 <sup>0</sup> /10mm	30 <sup>0</sup> /5mm	25 <sup>0</sup> /4mm	Proclination reduced Soft tissue profile improved.
Lower incisors to NB	35 <sup>0</sup> /9mm	25 <sup>0</sup> /5mm	23 <sup>0</sup> /4mm	
Interincisal angle	108 <sup>0</sup>	125 <sup>0</sup>	125 <sup>0</sup>	
Nasolabial angle	90 <sup>0</sup>	102 <sup>0</sup>	100 <sup>0</sup>	
Upper lip to E-line	-5mm	-1mm	-3mm	
Lower lip to E-line	6mm	2mm	-2mm	



### Comparison –pre and post photographs



### Discussion

The treatment effects of facemask are combination of effects produced by rotation of both the maxilla and mandible as well as dental effects. Maxilla moves anteriorly and vertically, as a consequence mandible also rotates downward and backward thus increasing lower facial height.<sup>2</sup> This therapy is better suited for horizontal to average growers, as the effect of mandible rotation is more esthetic.

Skeletal class III malocclusion should be treated early because circumaxillary suture are yet to be consolidated. There are changes at circumaxillary sutures and maxillary tuberosity, including opening of sutures, stretching of sutural connective tissue fibers and new bone deposition along stretched fibres.<sup>9</sup>

The early mixed dentition period is the appropriate time for facemask therapy[10]. Whereas other reported ages 4-7 and 7-10 responded better to facemask treatment than 10-14 years age group.<sup>11</sup>

Increase in SNA angle, as much as  $+3.71^{\circ}$ , Increase in nation to A point, as much as  $+3.30\text{mm}$  and increase in maxilla to cranial base,  $3.39\text{mm}$  and forward movement of ANS of  $2\text{mm}$  has been reported.<sup>11</sup>

Further when the orthopaedics is combined with maxillary expansion, not only tranverse effect but sagittal effect is also observed.<sup>12</sup>

This is because forces generated by protracting maxilla after orthopaedic maxillary expansion are higher than when facemask is used alone.<sup>13</sup>

### Conclusion

Facemask combined with rapid maxillary expansion is thus an effective approach to correct developing class III Malocclusion in hypodivergent growth pattern if treated at an early age. Long term follow up and recall visits are required to monitor the growth status of the patient and stability of treatment. Patient may require continued chin cup therapy if mandibular growth is excessive.[14]

### References

1. Proffit WR, Fields HW, Jr, Moray LJ. Prevalence of malocclusion and orthodontic treatment need in the United States: Estimates from the NHANES III survey. *Int J Adult Orthodon Orthognath Surg.* 1998;13:97–106.
2. Ishii H, Morita S, Takeuchi Y, Nakamura S. Treatment effect of combined maxillary protraction
3. Borzabadi-Farahani A, Borzabadi-Farahani A, Eslamipour F. Malocclusion and occlusal traits in an urban Iranian population. An epidemiological study of 11- to 14-year-old children. *Eur J Orthod.* 2009;31:477–84.
4. Soh J, Sandhsm A, Chan Y.H. Occlusal status in Asian male adults: prevalence and ethnic variation. *Angle Orthod.* 2005;75:814–820
5. Ellis E, 3rd, McNamara JA., Jr Components of adult class III malocclusion. *J Oral Maxillofac Surg.* 1984;42:295–305.
6. Harrington C, Gallagher JR, Borzabadi-Farahani A. A retrospective analysis of dentofacial deformities and orthognathic surgeries using the index of orthognathic



- functional treatment need (IOFTN) Int J Pediatr Otorhinolaryngol. 2015;79:1063–6.
7. Westwood PV, McNamara JA, Jr, Baccetti T, Franchi L, Sarver DM. Long-term effects of class III treatment with rapid maxillary expansion and facemask therapy followed by fixed appliances. Am J Orthod Dentofacial Orthop. 2003;123:
  8. Miyajima K, McNamara JA Jr, Sana M *et al.* An estimation of craniofacial growth in untreated Class III female with anterior crossbite. Am J Orthod Dentofacial Orthop 1997; 112: 425-434
  9. Kambara T. Dentofacial changes produced by extraoral forward force in the Macaca irus. Am J Orthod Dentofacial Orthop 1997; 112: 249-277
  10. Bacetti.T,Franchi L,Mucedero M & Cozza P. Treatment and posttreatment effects of facemask therapy on the sagittal pharyngeal dimensions in class III subjects. European journal of Orthodontics 2010,32 ,346-350
  11. Kapust A.J,Sinclair PM,Turley PK. Cephalometric effects of facemask/expansion therapy in class III children;a comparison of three age group. Am J Orthod Dentofacial Orthop 1998; 113: 204-212.
  12. Foersch M,Jacobs C,Wriedt S,Hechtner M ,Wehrbein H 2015. Effectiveness of maxillary protraction using facemask with or without maxillary expansion:A systemic review and meta analysis. Clinical Oral Investigation 19,1181-1192.10.1007
  13. Baik HS. Clinical results of the maxillary protraction in Korean children. Am J Orthod Dentofacial Orthop 1995; 108(6): 583-92.
  14. Turley PK. Orthopedic correction of class III malocclusion: Retention and phase II therapy. J Clin Orthod. 1996;30:313–24.