

Growth Modulation In Growing Skeletal Class III Patient: A Case Report

Siddeek Saudagar¹ Amit Handa² Sahil Kambale³ Aditi Sarda⁴ Shailesh Kulkarni⁵ Rishikesh Kolse⁶

¹ Department of Orthodontics and Dentofacial Orthopaedics, Aditya Dental College & Hospital, Beed, Maharashtra, India,

² Department of Orthodontics and Dentofacial Orthopaedics, Aditya Dental College & Hospital, Beed, Maharashtra, India.

³ Department of Orthodontics and Dentofacial Orthopaedics, Aditya Dental College & Hospital, Beed, Maharashtra, India.

⁴ Department of Conservative Dentistry and Endodontics, Aditya Dental College & Hospital, Beed, Maharashtra, India,

⁵ Department of Orthodontics and Dentofacial Orthopaedics, Aditya Dental College & Hospital, Beed, Maharashtra, India.

⁶ Department of Orthodontics and Dentofacial Orthopaedics, Aditya Dental College & Hospital, Beed, Maharashtra, India.

ABSTRACT

Background: This case report discusses the orthodontic treatment of a 13-year-old Boy who exhibited a skeletal Class III malocclusion, anterior crossbite, and a concave facial profile. The treatment plan included the use of rapid maxillary expansion (RME) for 15-20 days and a facemask over a period of six months. The RME appliance was utilised to widen the maxillary arch and open circummaxillary sutures, which play an important role in the expansion of the maxilla; by the late mixed dentition period, the maxilla fuses to other bones. so rapid maxillary expansion appliance is necessary. Creating the necessary space to correct the anterior crossbite and to overcome the problem of the foot and shoe principle (Shoe Refers to the widened maxilla after RME, or It's like expanding the shoe to accommodate a larger foot. Foot Represents the mandible. Just as a foot moves forward when placed in a wider shoe, the mandibular arch responds by posturing forward after the maxilla is widened). It will help in improving the sagittal relationship of jaws and improve the occlusion. Simultaneously, the facemask provided protraction forces to guide the maxilla forward, addressing the skeletal discrepancy. Significant improvements were observed in the patient's facial profile, with a noticeable reduction in facial concavity. The anterior crossbite was successfully corrected, resulting in a harmonious occlusion. This case highlights the effectiveness of combining RME and facemask therapy in managing complex skeletal malocclusions in growing patients.

Keywords: Growth modulation, skeletal class III, orthodontics.

INTRODUCTION

The skeletal Class III malocclusion varies widely, ranging from an edge-to-edge bite to a pronounced negative overjet, and can include a spectrum of underlying skeletal jaw base discrepancies. It may be due to retrognathic maxilla, prognathic mandible or due to combination of retrognathic maxilla and prognathic mandible. Early treatment plays vital role in such cases to avoid surgery. These developing Class III malocclusions are often deemed

among the most challenging to treat. Treatment approaches for Class III malocclusion include:

1. **Interception through Dentofacial Orthopedics:** This involves using appliances such as protraction facemasks, FR-III, reverse twin blocks, Class III Bionators, and chin cups to correct the developing malocclusion early when patient is growing.

Received: May. 14, 2024; Accepted: June. 21, 2024

*Correspondence Dr. Siddeek Saudagar.

Department of Orthodontics and Dentofacial Orthopaedics, Aditya Dental College & Hospital, Beed, Maharashtra, India.

Email: Not Disclosed

2. **Camouflage Treatment:** This approach involves dental compensations to mask the skeletal discrepancies without altering the underlying skeletal structure significantly with the help of fixed orthodontic treatment and extraction if required.
3. **Orthognathic Surgery:** This is typically considered when growth is complete and involves surgical correction of the jaw discrepancies.

Among the various treatment strategies for mixed dentition, the Orthopedic facemask has been shown to produce the most significant and rapid results. The facemask is often the appliance of choice for early or late mixed dentition patients, particularly those with maxillary retrognathism. Class III malocclusions are generally growth-related and tend to become more severe as the patient matures, which complicates the management of these cases during the growth phase and after growth completion.

The Orthopedic facemask system comprises three primary components: the facemask itself, a bonded maxillary splint, and elastics. The Petit-type facemask consists of a forehead pad and a chin cap connected by a robust steel support rod. A crossbow attached to this support rod connects to rubber bands that apply forward and downward elastic traction to the maxilla. The positions of the pad, cap, and crossbow can be easily adjusted by loosening and tightening the screws in each part of the appliance.

Recent studies have demonstrated significant improvements in patients with Class III deficiencies using protraction headgear. The optimal time to begin treatment for Class III malocclusion is during the early mixed dentition phase. Incorporating rapid maxillary expansion helps disarticulate the maxillary sutures, facilitating more efficient forward protraction of the maxilla.

CASE REPORT

A 13-year-old male patient presented to the Orthodontic Department with the chief complaint of an upper anterior teeth backwardly placed. The patient, had no relevant medical history, but having familial history as his father had anteriorly positioned lower jaw, extraoral examination

revealed a concave facial profile with anterior facial divergence, a forward chin position, and an acute nasolabial angle, all contributing to a class III skeletal pattern [fig.1(A)]. Intraoral examination showed erupted all permanent teeth except second and third molars in upper arch and third molars in lower arch, normal hard and soft tissues, a square-shaped arch form with asymmetry, and class III relationships for the molars & canines bilaterally. The patient exhibited a reverse overjet of 2 mm and a reverse overbite of 8 mm [fig.1(B)]. During radiographic examination it was found that he had class III skeletal base due to a retrognathic maxilla and prognathic mandible [fig.1 (C)], the treatment objectives included achieving ideal aesthetics, correcting the skeletal class III discrepancy, aligning molar and canine relationships to class I, and obtaining an ideal overjet and overbite. This case's complexity is heightened by the patient's unique craniofacial characteristics and dental arch form, necessitating a comprehensive and carefully planned orthodontic intervention to address both functional and aesthetic outcomes.

Treatment Progress

In orthodontics, understanding the difference between banded expander and bonded expander treatments is crucial for addressing various dental and jaw alignment issues. Both techniques aim to widen the upper jaw or maxilla but differ in their application and specific use cases. The main drawback of banded appliance is need for more chairside time and need for precise wire binding while our patient had reverse overjet so maxilla was locked with mandibular anterior teeth so the intraoral rapid palatal expansion appliance with bonded acrylic splint-type expander was placed the patient underwent treatment with a combination of a facemask and Rapid Maxillary Expansion (RME) until a positive overjet of 2 mm was achieved [fig.2(A)]. The treatment began with the activation of the RME appliance. For the first week, the expansion screw was turned twice daily to promote rapid expansion. Following this initial phase, the activation rate was adjusted to one turn per day until the desired level of maxillary expansion was attained. During activation of hyrax expansion screw midline diastema was achieved due to opening of circummaxillary and midpalatine suture which we can see on occlusal radiograph [fig.2. (A)]. After desired expansion was achieved expansion

screw was sealed with composite to prevent reverse rotation of screw.

Table 1: Cephalometric Parameters

SR NO	Parameter	Pre-Treatment	Post Facemask Therapy	Difference
1	SNA	75°	82°	7°
2	SNB	85°	81°	4°
3	ANB	-10°	1°	11°
4	YEN angle	132°	126°	6°
5	Beta angle	40°	32°	8°
6	Maxillary Length (Co-A)	89 mm	100 mm	11 mm
7	Mandibular Length (Co-Gn)	97 mm	99 mm	2 mm
8	UFH	43 mm	45 mm	2 mm
9	LFH	44 mm	51 mm	7 mm
10	Angle of Convexity	-17°	1°	18°
11	Nasion Perpendicular to A Point	-3 mm	1 mm	4 mm
12	FMA	23°	25°	2°
13	WITS Appraisal	-10 mm	1 mm	11mm
14	Nasolabial Angle	97°	101°	4°
15	S Line	Upper lip=0 mm Lower lip=5 mm	Upper lip =0 mm Lower lip=2 mm	0 mm 3 mm
16	Overjet	-3mm	2 mm	5 mm
17	Overbite	-8mm	2 mm	10 mm
18	Interincisal Angle	139°	128°	11°

A Petit-type facemask was employed as part of the treatment protocol. One week after starting the rapid maxillary expansion, the facemask was introduced [fig.2(B)]. The intraoral hook was made of 19-gauge stainless steel wire to hold elastic. The hooks were placed on the buccal surface between the first and second premolar and Protraction elastics were attached to the hooks. These elastics were oriented to pull downward and forward at an angle of 20 degrees to the occlusal plane, enhancing the forward movement of the maxilla. The elastics applied a force of 500 grams per side, precisely measured using a Dontrix gauge. The patient was instructed to wear the facemask for 14-16 hours daily. This extended wear time was essential to maximize the effectiveness of the protraction forces and achieve the desired skeletal and dental corrections. The consistent application of the facemask and elastics facilitated the forward movement of the maxilla and the correction of the anterior crossbite. Over time, this comprehensive and carefully monitored approach resulted in the successful attainment of a 2 mm positive overjet, marking a significant milestone in the patient's orthodontic treatment progress. After facemask treatment, a bilaterally lateral open bite was created due to acrylic bite blocks[fig.2(C)]; after

that, the patient was continued with MBT fix mechanotherapy.

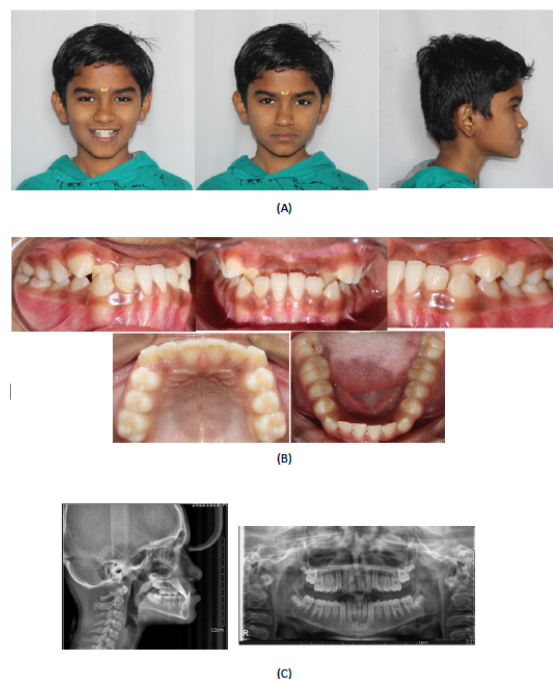


Fig 1: (A).Pretreatment extraoral photographs (B) Pretreatment intraoral photographs (C)Pretreatment radiographs.

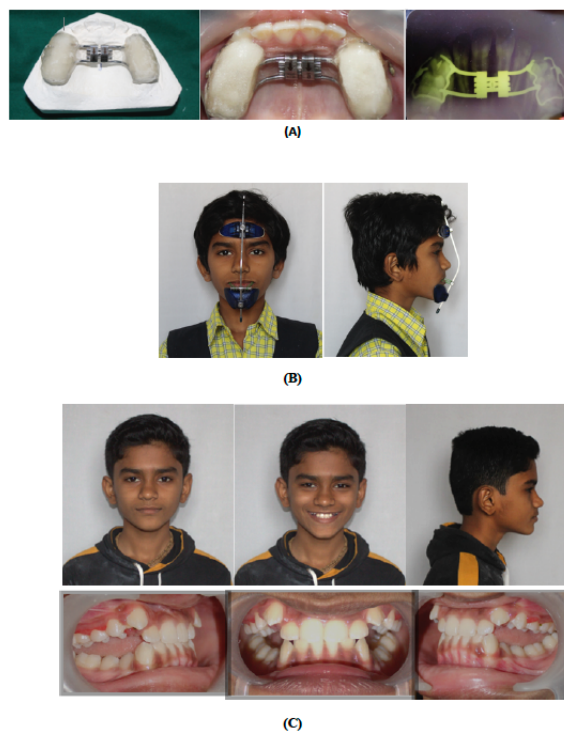


Fig 2: .(A)Hyrax expansion screw with bonded type,(B)Extraoral photographs with petit face

mask(C)Extraoral and Intraoral Photographs after
Face mask treatment.

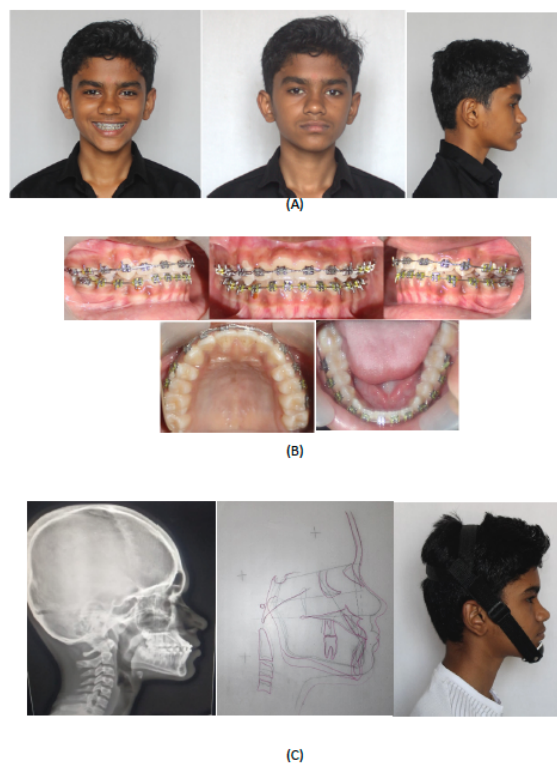


Fig 3: (A) Post Treatment extraoral Photographs, (B) posttreatment Intraoral photographs, (C) posttreatment radiograph, cephalometric superimposition and posttreatment picture of patient with chin cup.

Treatment Results

After six months of therapy combining Rapid Maxillary Expansion (RME) and facemask usage, significant improvements were observed in the maxillomandibular relationships. These changes were largely attributed to an increase in the SNA angle and a decrease in the SNB angle (fig 3 C), indicating forward movement of the maxilla and relative repositioning of the mandible. This skeletal adjustment contributed to an overall improvement in the patient's facial profile. The soft tissue profile showed noticeable enhancements as well. The upper lip moved forward, creating a more balanced and harmonious facial appearance, while the lower lip shifted backward, further contributing to the improved profile [fig.3(A)]. Intraorally, the upper incisors exhibited Proclination as a direct result of the RME and facemask therapy. This forward tipping of the upper incisors was a critical factor in achieving the corrected overjet and enhancing the

occlusal relationship. Pre- and post-treatment cephalometric values, detailed in Table 1, provide a quantitative summary of these changes, highlighting the effectiveness of the combined RME and facemask therapy in correcting the skeletal and dental discrepancies present at the outset of treatment. This comprehensive approach not only corrected the anterior crossbite but also significantly improved the patient's facial aesthetics and dental alignment. After facemask therapy expansion appliance was removed and MBT 0.022 brackets were placed simultaneously for retention of achieved treatment chin cup was given.

DISCUSSION

According to Bacetti et al., the Optimum time to start facemask therapy is in the Early mixed dentition period¹⁰; Baik concluded in his article that Face mask/expansion therapy in younger children was not significantly different from older children¹⁵. Whereas Franchi, Bacetti concluded in his article that 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 growth¹⁶. According to Takada 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.

CONCLUSION

Circummaxillary sutures play an important role in expansion of maxilla. By the late mixed dentition period, maxillary sutures become tortuous and fuse. So early mixed dentition period is best for such treatment, but in this case report we did successful treatment of a 13-year-old boy by using hyrax expansion appliance and petit face mask, so we found that in late mixed dentition period also we can expand maxilla.

REFERENCES

1. Liu WT, Wang YR, Wang XD, Zhou YH. A cone-beam computed tomography evaluation of three-dimensional changes of circummaxillary sutures following maxillary protraction with alternate rapid palatal expansions and constrictions. *Journal of Peking University. Health Sciences*. 2022 Apr 1;54(2):346-55.

2. Dehesa-Santos A, Iber-Diaz P, Iglesias-Linares A. Genetic factors contributing to skeletal class III malocclusion: a systematic review and meta-analysis. *Clinical Oral Investigations*. 2021 Apr; 25:1587-612.
3. Jha AK, Chandra S. Early management of Class III malocclusion in mixed dentition. *International journal of clinical pediatric dentistry*. 2021 Mar;14(2):331.
4. Sarangal H, Namdev R, Garg S, Saini N, Singhal P. Treatment modalities for early management of Class III skeletal malocclusion: a case series. *Contemporary clinical dentistry*. 2020 Jan 1;11(1):91-6.
5. Gokalp H. Quantitative Evaluation of Consecutively Rapid Maxillary Expansions and Constrictions Effects on Circum-Maxillary Sutures in Boys by SPECT Bone Scintigraphy. *EC Dental Science*. 2020; 19:48-59.
6. Plaza SP, Reimpell A, Silva J, Montoya D. Relationship between skeletal Class II and Class III malocclusions with vertical skeletal pattern. *Dental press journal of orthodontics*. 2019 Sep 5;24(04):63-72.
7. Muthukumar K, Vijaykumar NM, Sainath MC. Management of skeletal Class III malocclusion with face mask therapy and comprehensive orthodontic treatment. *Contemporary clinical dentistry*. 2016 Jan 1;7(1):98-102.
8. Cobourne M. Early treatment for class III malocclusion. *Journal of orthodontics*. 2016 Jul 2;43(3):159-60.
9. Feng GY, Zou BS, Gao XM, Zeng XL. Histological changes in the circum-maxillary sutures during alternate maxillary expansions and constrictions in a rat model. *Journal of Peking University. Health Sciences*. 2016 Feb 1;48(1):30-6.
10. Baccetti T, Franchi L, McNamara JA. Treatment and posttreatment effects of rapid maxillary expansion and facemask therapy in Class III patients. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2000 118(4), 404-413.
11. Ngan P, Yiu C, Hu A.M., Hägg U. Cephalometric and occlusal changes following maxillary expansion and protraction. *European Journal of Orthodontics*. 1998 20(3), 237-253.
12. Ngan P, Wei S.H.Y., Hägg U, Yiu C, Merwin D. The effect of protraction headgear on the sagittal dentofacial morphology. *Angle Orthodontist*. 1996 66(5), 365-374.
13. Kapust A.J., Sinclair P.M., Turley P.K. Cephalometric effects of facemask/expansion therapy in Class III children: A comparison of three age groups. *American Journal of Orthodontics and Dentofacial Orthopedics*. 1998 113(2), 204-212.
14. Merwin D.R., Ngan P, Hägg U, Yiu C. Timing for effective application of anteriorly directed Orthopedic force to the maxilla. *American Journal of Orthodontics and Dentofacial Orthopedics*. 1997 112(3), 292-299.
15. Baik HS. Clinical results of the maxillary protraction in Korean children. *Am J Orthod Dentofacial Orthop*. 1995; 108:583-592
16. Franchi L, Baccetti T, McNamara JA. Post-pubertal assessment of treatment timing for maxillary expansion and protraction therapy followed by fixed appliances. *Am J Orthod Dentofacial Orthop*. 2004; 126:555-68.