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Case Report

Management of skeletal class iii malocclusion using rme and facemask followed by fixed orthodontic treatment- A Case Report

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ABSTRACT:

Skeletal Class III malocclusion is one of the most challenging orthodontic corrections to perform. The resolution of this type of malocclusion usually requires effective and early intervention. Indeed, timing is crucial for providing a more favourable growth pattern and improving the occlusal relationship. In the field of Class III interceptive treatment, there is moderate evidence to show that the use of facemask results in positive improvements in both skeletal and dental development in the short term. In Class III maxillary deficiency, the combining of face mask (FM) and rapid maxillary expander (RME) are reported to be the most effective therapy in the short and long term.

This case report describes an orthodontic correction of class III maxillary deficiency with a combination of face mask and rapid maxillary expander. A 10year old boy presented with a bilateral class III molar relation with narrow maxilla, proclined upper and retroclined lower incisors, crossbite irt 11,12,15,21,22,25, a negative overjet of 2mm and an overbite of 0.5mm.

The patient was treated with Rapid Maxillary Expansion followed by maxillary protraction by Petit type Facemask in first phase of treatment. After correction of skeletal problem, dentoalveolar correction was done by MBT preadjusted edgewise appliance using .022 SLOT using continuous arch mechanics, followed by finishing and detailing. A well aligned maxillary and mandibular arches was established with a class I molar and canine relation after 22 months of orthodontic treatment.

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INTRODUCTION

The primary goal of the orthodontic treatment at the beginning of 20th century was to achieve normal occlusion. Therefore, orthodontists focused on the ideal positions and relations of the teeth and their basal bones. However, the facial appearances of the patients was primarily determined by the soft tissues. Today, the patients and parents are more esthetically concerned so the orthodontists should plan their orthodontic treatments to achieve a balanced and esthetic soft tissue profile, a beautiful smile, ideal and stable occlusion, and a healthy temporomandibular joint (TMJ).[1] Skeletal Class III malocclusion is one of the most challenging orthodontic corrections to perform. The resolution of this type of malocclusion usually requires effective and early intervention. Indeed, timing is crucial for providing a more favourable growth pattern and improving the occlusal relationship. In the field of Class III interceptive treatment, there is moderate evidence to show that the use of facemask results in positive improvements in both skeletal and dental development in the short term. A systematic review evaluating the effect of RME treatment on sutures in all three dimensions pointed out that particularly the zygomaticomaxillary and frontomaxillary sutures are affected by the maxillary expansion. For this reason, the skeletal expansion has some important clinical implications and may explain the forward and downward displacement of the maxilla, which can be beneficial in Class III corrections in young patients. Some other immediate perceived benefits associated with rapid maxillary expansion (RME) in conjunction with maxillary protraction therapy include disarticulation of the circummaxillary sutures to determine more pronounced orthopedic effects.[2] In Class III maxillary

deficiency, the combining of face mask (FM) and rapid maxillary expander (RME) are reported to be the most effective therapy in the short and long term. While many studies have indicated a high response to maxillary advancement, the same cannot be said with regard to mandibular growth control. It is a commonly held view that solving maxillary hypoplasia by RME will produce a slight advancement of the basal bone and, in association with face mask therapy, facilitate and improve maxillary protraction.[3] Petit modified the facemask of Delaire by increasing the amount of force generated by the appliance and decreasing the overall treatment time. McNamara suggested that rapid maxillary expansion (RME) may enhance the protraction effect of the facemask by disrupting the maxillary suture system, and described a version of the Petit facemask, attaching to a rapid maxillary expander bonded to the posterior dentition. In the last two decades, RME-facemask combination has become the standard protocol in the management of growing patients with maxillary deficiency with long-term studies showing successful outcomes in 70 to 80% of patients. Turley described RME-facemask combination as 'a predictable and effective approach to manage that was once considered difficult'.[4]

This case report describes the use of the above procedure for the management of Class III malocclusion with maxillary deficiency in an adolescent boy.

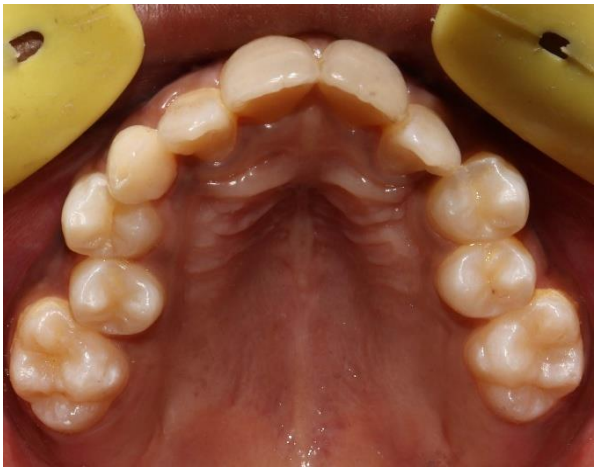
CASE REPORT

A 10-year-old male patient complains of backwardly placed upper front tooth. There was no relevant medical and dental history reported. No relevant familial history was reported. On extraoral examination (Fig. 1), the patient had a leptoprosopic face and concave profilewith slight maxillary deficiency.

Fig 1: Pre treatment extraoral views

On intraoral examination (Fig. 2)

Fig 2: Pre treatment intraoral views



the patient had bilateral class III molar relation with narrow maxilla, proclined upper and retroclined lower incisors, crossbite irt 11,12,15,21,22,25, a negative overjet of 2mm and an overbite of 0.5 mm. 15 & 25 was lingually placed and space loss irt 23 and a midline shift to right by 1mm was also present.

A standard OPG and lateral cephalogram of the patient were obtained (Fig. 3).

Fig. 3: Pretreatment OPG and lateral cephalogram

Developing second molars were observed in all the four quadrants. Cephalometric analysis (Table 1)

Table: 1

Cephalometricvalues	PRE	MID	POST
SNA(Degree)	73^0	79^0	79^0
SNB(Degree)	77^0	77^0	77^0
ANB(degree)	-4^0	2^0	2^0
WITS	-4.5mm	-1mm	+0.5mm
UI-NA(angular)	29^0	32^0	30^0
L1-NB(angular)	22^0	20^0	26^0
IMPA(Degree)	85^0	83^0	91^0
NAper-pt.A	-2mm	+1mm	+1mm
NAper-pog	+6mm	+7mm	+2mm
FMA	27^0	30^0	30^0
LAFH	50mm	56mm	56mm
Interincisalangle	132^0	128^0	130^0
Y-Axis	59^0	63^0	60.5^0
Nasolabial Angle	95^0	100^0	102^0

indicated a Class III sagittal relationship (SNA=73º, SNB=77º, ANB = -4°) and vertical skeletal growth pattern (FMA = 27°, JARABAK's ratio = 59.7% and facial axis angle = -5º). In addition, the upper incisors were proclined (UI-NA =29°, 5mm) and the lower incisors were retroclined (LI-NB = 22°, 3.5mm).

Moyer's mixed dentition analysis revealed space discrepancy of 0 mm in maxillary and mandibular arches.Tanaka &Johnston analysisrevealed space discrepancy of 0 mm in mandibular arch and 0.5mm space available in maxillary arch.

DIAGNOSIS

A 10year old male growing patient in CVMI 2 stage with Angle's Class III Malocclusion on Class III Skeletal bases with vertical growth pattern. Proclined upper and retroclined lower anteriors with cross-bite in 11, 12, 15, 21, 22, 25 region. Lack of space irt 23.Protrusive upper and lower lip, overjet of -2 mm with concave profile.

TREATMENT OBJECTIVES

The treatment objectives for this patient were as follows:

1. To correct the Skeletal Class III to Skeletal Class I Base.
2. To correct cross bite in 11, 12, 15, 21, 22, 25 region.
3. To create space i.r.t. 23.
4. To attain the class I molar relation and class I canine relation bilaterally.
5. To attain normal overjet and overbite.

6. To correct the inclination and align the proclined upper and retroclined lower anteriors in the basal bone.
7. To attain lip competency.
8. To improve the smile and aesthetics and overall appearance.

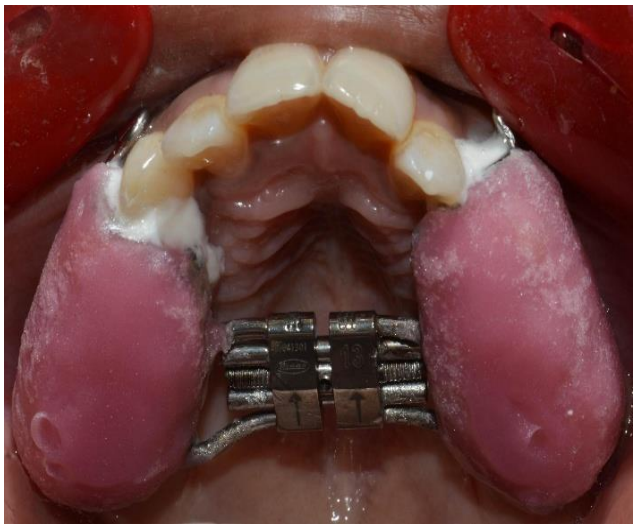
TREATMENT PLAN

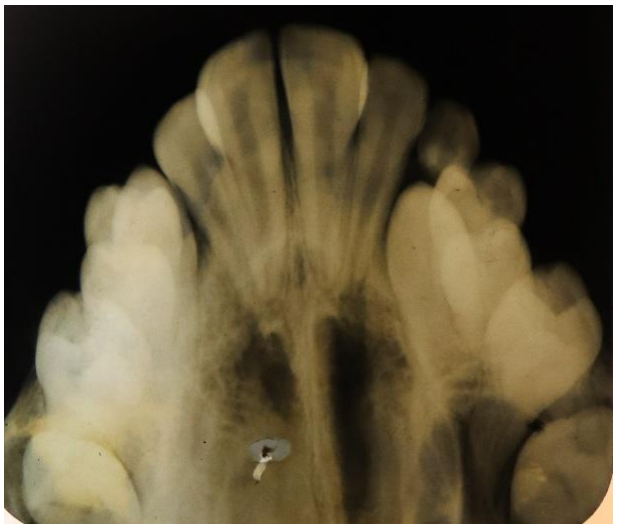
The patient was planned to be treated with Rapid Maxillary Expansion followed by maxillaryprotraction by Petit type Facemask in first phase of treatment. After correction of skeletal problem, dentoalveolar correction was done by MBT preadjusted edgewise Appliance using .022 SLOT using Continuous arch mechanics, followed by finishing and detailing.

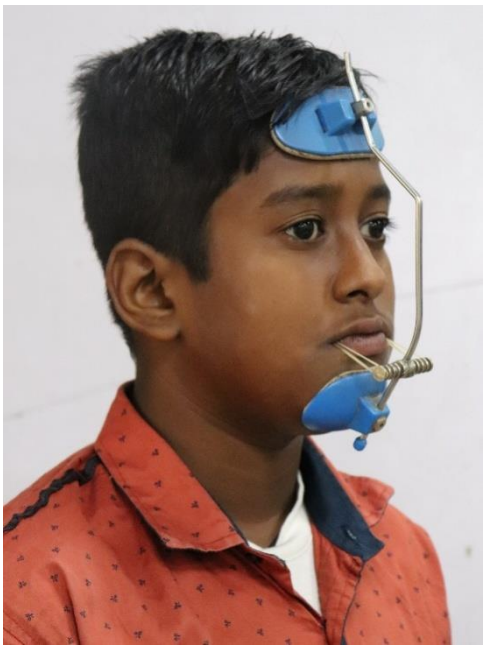
TREATMENT PROGRESS

A bonded Hyrax Expander (Leone, Italy) with an expansion range of 13 mm was cemented on upper molar-premolar area with hooks incorporated above the first premolars (Fig. 4).

Fig. 4: Phase 1: Pre Rapid Maxillary Expander and Petit-type maxillary protraction facemask

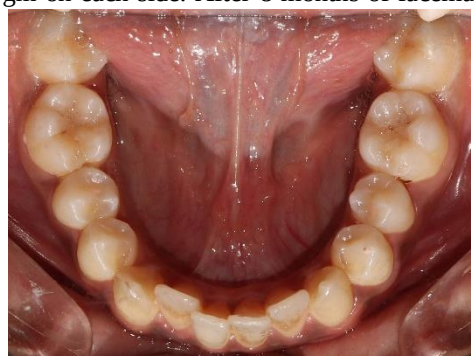






The patient was instructed to turn the screw one time per day, until correction of posterior crossbite was achieved. Following expansion, the screw was sealed and the patient instructed to wear a Petit-type maxillary protraction facemask daily for as many hours as possible except when she was attending school (Fig. 5).

Fig. 5: Phase 1 completion-during retention period



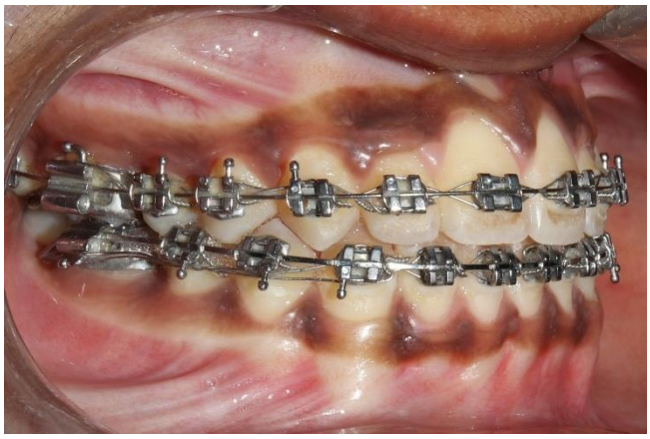
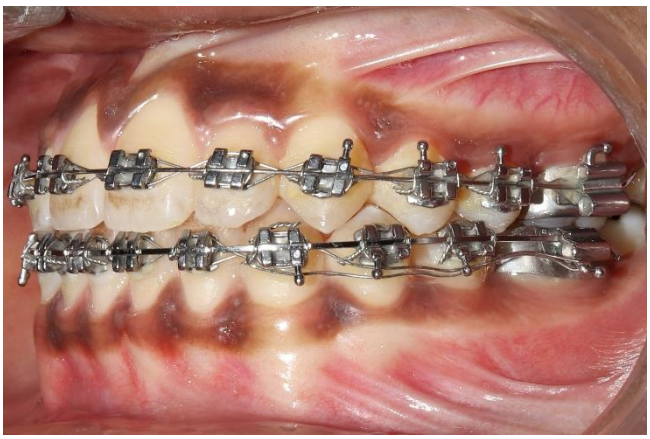
The direction of pull was forward and downward, directed approximately at 30° to the maxillary occlusal plane. Beginning with a force level of 150 gm on each side, it was increased to 300 gm on each side from the second week. After 1 month of wear, force imparted was increased to and maintained at 450 gm on each side. After 8 months of facemask wear, a positive overjet was achieved, following which facemask wear was discontinued, the expansion assembly removed, and a removable hawley's plate had been given for about 4 months to prevent the relapse and to promote passive settling of posterior occlusion.

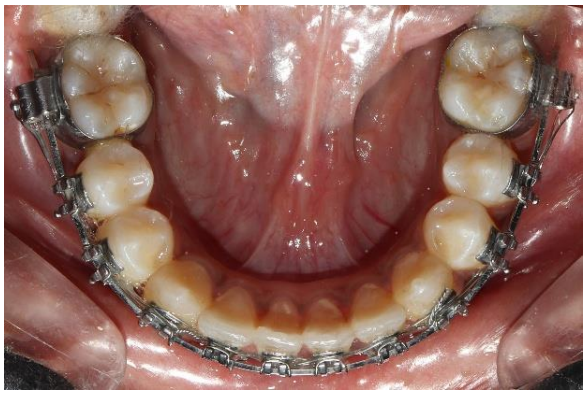
Fig. 6: Phase 1 completion-after retention



Detailing of the occlusion in both arches was carried out with fixed pre-adjusted edgewise appliances (0.022" slots, MBT prescription) (Fig. 7).

Fig. 7: Phase 2: Fixed Mechanotherapy

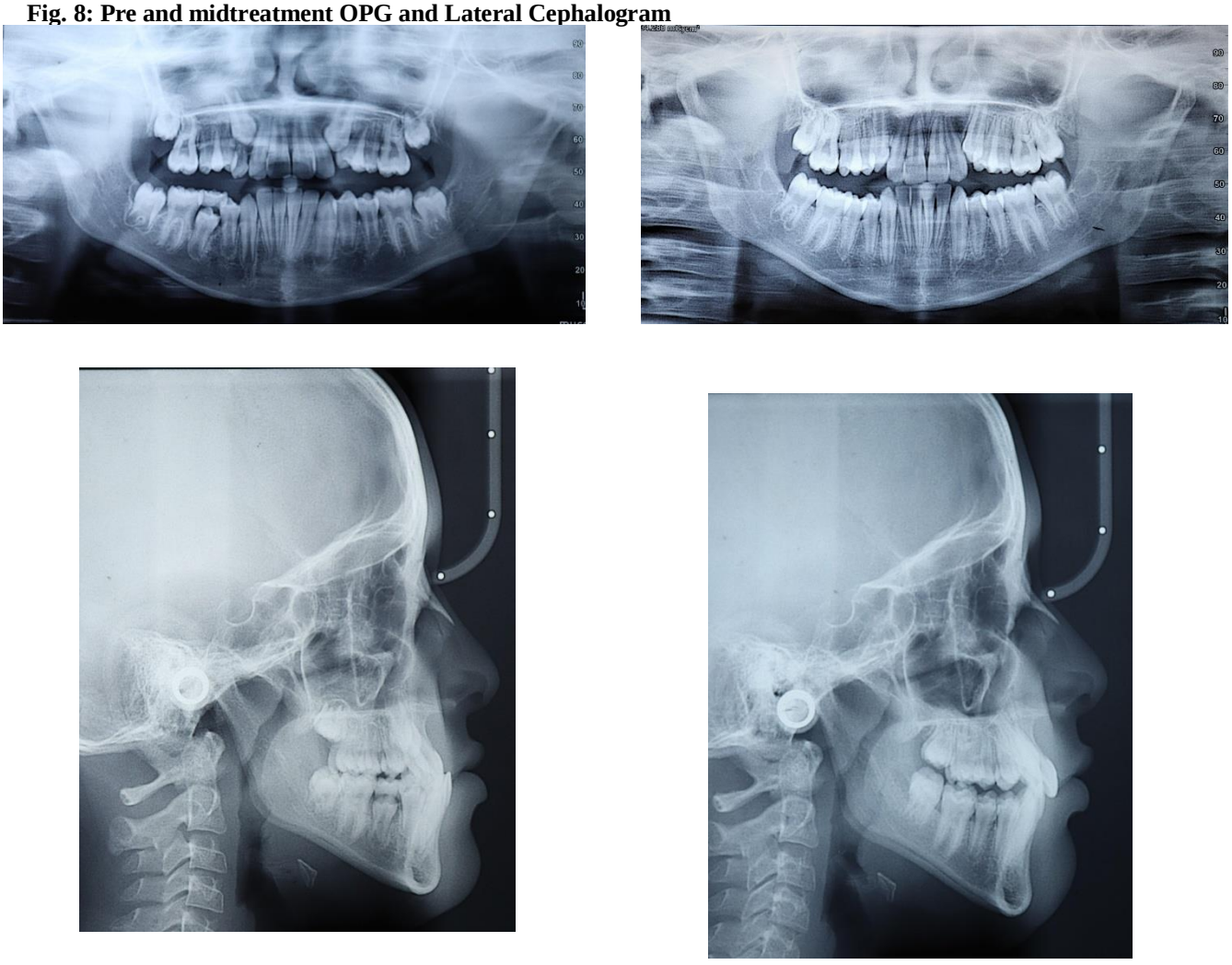





Leveling and alignment began with 0.012",0.014" and 0.016" nickel-titanium wires and progressed up to 0.019" × 0.025"- stainless steel wires. At this stage 3/16" Class III elastics were worn to help maintain the overjet correction. Vertical finishing elastics and 0.014"- stainless steel wires were used to settle the occlusion.

Total duration of active treatment was 22 months. Following appliance removal, a fixed-spiral-wire (FSW) retainer was bonded to the lingual surfaces of maxillary and mandibular canine to canine region. In addition, Hawley's retainers were fabricated and the patient instructed to wear full-time for 6 months, followed by nighttime wear for 1 year.

Fig. 8: Pre and midtreatment OPG and Lateral Cephalogram



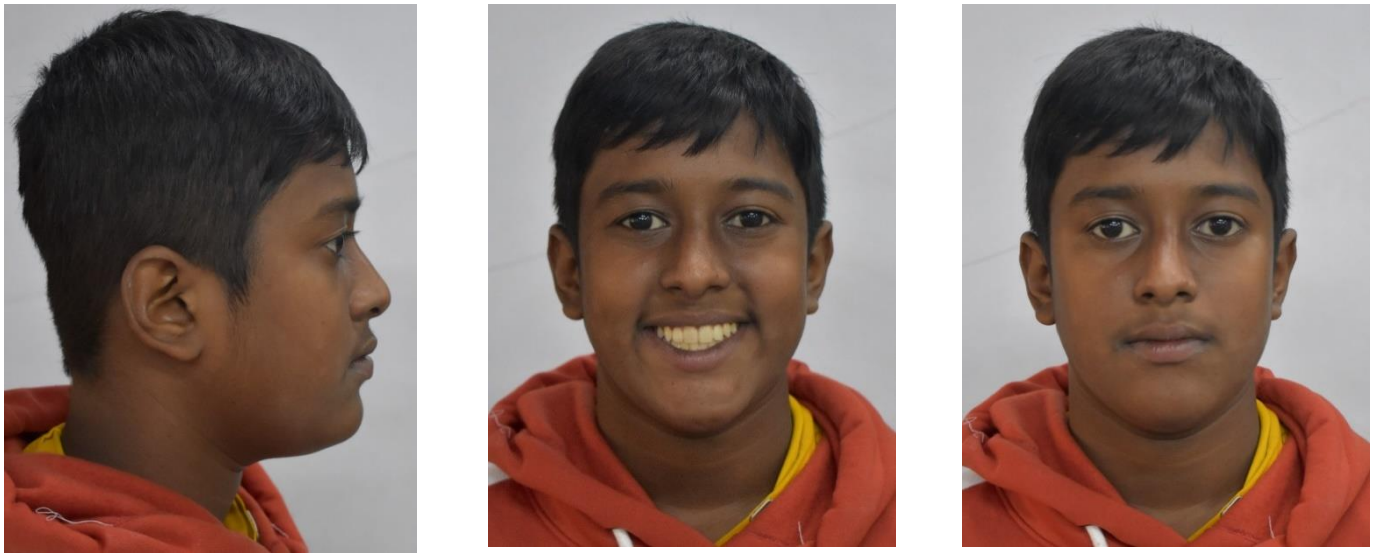
TREATMENT RESULT

There was a noticeable improvement in lip-nose-chinrelationships and a full smile with appreciably reduced buccalcorridors. Correction of anterior and posteriorcrossbite was achieved and space regained for 23resulting in a well-aligned dentitionwith normal overjet and overbite. Molar and caninerelationships were corrected to Class I (Fig. 9).

Fig. 9: Post treatment intraoral views

There was significant improvement in the maxillo-mandibular relationship, evidenced by changes in the ANBangle and Wits appraisal. Slight downward and backwardrotation of the mandible occurred, shown by changes in FMA,SN-MP and lower anterior facial height. Retroclination of the mandibular incisors got corrected (Table 1). The soft tissues responded favorably resulting in a noticeably pleasant profile (Fig. 10).

Fig. 10: Post treatment extraoral views



DISCUSSION

The use of facemask therapy for the management of midfacedeficient Class III malocclusions has conventionally beenrecommended in the deciduous and mixed dentitions.[5-8] Little maxillary protraction is expected when it is used in thepermanent dentition.[9] However, clinical correction of themalocclusion has been shown to occur by a combination ofskeletal and dental movements in both the anteroposterior andvertical planes of space.[10] Also, the orthopedic approach hasa significantly lower cost and risk potential associated with,making it an attractive alternative to orthognathic surgery,though the esthetic results and occlusal stability with the lattermay be superior.[11] Also, following growth modification therapy, there is aclear reestablishment of the Class III craniofacial pattern, necessitating overcorrection to prevent clinical relapse.[8] Recent case reports[12,13]have

demonstrated successful management of Class III malocclusion in adolescent patients using the RME-facemask protocol.

In this patient, posterior crossbite was corrected throughRME and a positive overjet was achieved following facemasktherapy. Throughout active treatment, there was no increasein effective mandibular length, while effective maxillarylength increased by 2 mm (Table 1). In addition, favorabledentoalveolar changes as well as slight downward and backwardrotation of the mandible occurred, which aided in the favorableocclusal result. These are usual side effects of Class IIImechanotherapy.[14,15] Backward rotation of the mandible alsomakes it appear less prognathic and contributes toimprovement of the facial profile.[16]

CONCLUSION

This case report demonstrates that Class III malocclusion with maxillary deficiency can be successfully managed in the permanent dentition, using RME-facemask protocol followed by fixed orthodontic treatment. Careful case selection,excellent patient cooperation and deliberate overcorrectioncould ensure a treatment result that is stable, functional andesthetic in the long-term.

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