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Correction of maxillary hypoplasia with MSE (Maxillary Skeletal Expander) and facemask supported by mini-implants

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Abstract

Maxillary constriction is defined as a transverse deficiency of multifactorial etiology. The primary objective of the Maxillary Skeletal Expander II (MSEII) is to widen the maxilla by separating the midpalatal suture, maximizing skeletal expansion while minimizing dentoalveolar expansion. Facemask (FM) therapy stimulates anterior maxillary growth by applying traction forces directly to the bone via temporary anchorage devices (TADs) or dental anchorage. The combination of MSEII and FM has proven effective in correcting both transverse maxillary deficiencies and sagittal discrepancies in growing patients, particularly in Class III malocclusions, promoting forward maxillary projection.

This case report presents a 12-year-old male patient with skeletal Class I malocclusion, a tendency toward Class III, and maxillary constriction. A combined approach using skeletal expansion with MSEII and FM was employed to correct the transverse maxillary deficiency and improve the sagittal relationship between the maxilla and mandible. During phase I of the treatment, mini-implants and TADs were placed, and the facemask was used for 14-16 hours daily for seven months. Following maxillary expansion and advancement, significant improvements were achieved in the facial profile, occlusal relationship, and dental alignment. Clinical results revealed a maxillary expansion of 7.5 mm, increased facial convexity, and alleviation of severe crowding. This therapeutic approach provided a stable and less invasive correction of the malocclusion, avoiding the need for future orthognathic surgery while enhancing both function and aesthetics.

Keywords: TADs, Class III malocclusion, MSEII, facemask, skeletal expansion,

Introduction

Maxillary constriction is defined as a transverse deficiency of multifactorial etiology. The primary goal of MSEII expansion is to widen the maxilla by separating the midpalatal suture, thereby maximizing skeletal expansion and minimizing dentoalveolar expansion. Facemask (FM) therapy stimulates anterior maxillary growth by applying traction forces directly to the bone through TADs or dental anchorage^[1, 2].

Maxillary constriction, characterized by a transverse maxillary deficit, requires precise interventions to optimize skeletal development and minimize dentoalveolar effects. One of the most effective treatments is skeletal expansion using the Maxillary Skeletal Expander II (MSEII), which separates the midpalatal suture via bone anchorage. This procedure is particularly beneficial in combination with FM in patients with Class III malocclusion, achieving forward maxillary projection by applying traction forces^[3].

In growing patients, the combination of MSEII and FM has shown significant skeletal effects and long-term stability compared to traditional rapid maxillary expansion methods. Additionally, TADs allow direct traction on the maxillary bone, preventing unwanted dental movements and reducing adverse effects on the alveolar bone^[3, 4]. Recent studies demonstrate that MSE and FM therapy are particularly advantageous when initiated at an early age, as the biological response of the maxilla is more favorable during growth.

This approach enables the correction of maxillary deficiencies and prevents the progression of skeletal malocclusion, achieving long-term stability and evident functional and aesthetic improvements [5, 6]. Advances in orthodontics reflect a shift towards less invasive treatments, improving the patient experience while enhancing skeletal outcomes in complex Class III malocclusions [7].

Clinical Case

A 12-year-old male patient presented with the chief complaint, "I don't like how I bite." Diagnosis: Skeletal Class I malocclusion with a tendency toward Class III, narrow maxilla, vertical growth, dolichofacial biotype, slight mandibular hyperplasia, anterior crossbite, and posterior edge-to-edge bite. The patient exhibited Class III bilateral molar and canine relationships, bimaxillary dentoalveolar retroclination, lower incisor protrusion, upper incisor retrusion, ectopic canines, absence of the upper left first molar (tooth 26), 4 mm overbite, -1 mm overjet, severe anterior crowding in both arches, ovoid upper arch, square lower arch, 1 mm deviation of the upper dental midline to the right concerning the facial midline, straight profile, underdeveloped malar projection, and medium smile (Figure 1).



Fig 4: Placement of interradicular TADs

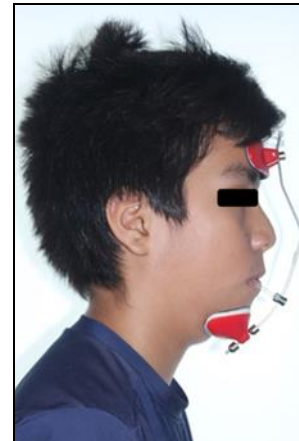


Fig 5: Facial Mask



Fig 1: Initial photographs and radiographs

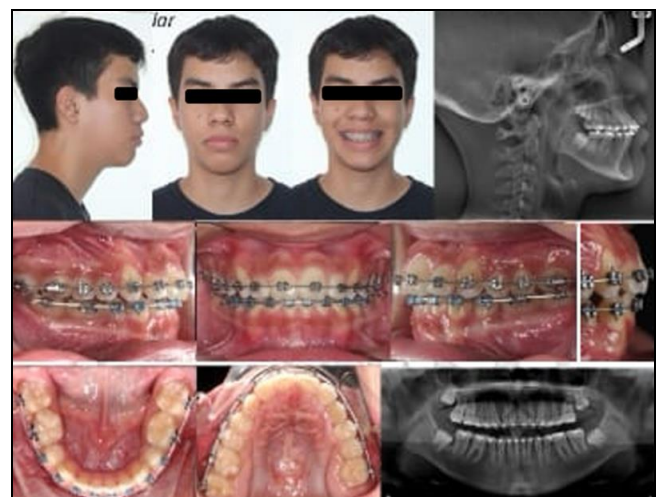


Fig 6: Photographs and radiographs after 8 months of orthopedic and orthodontic treatment

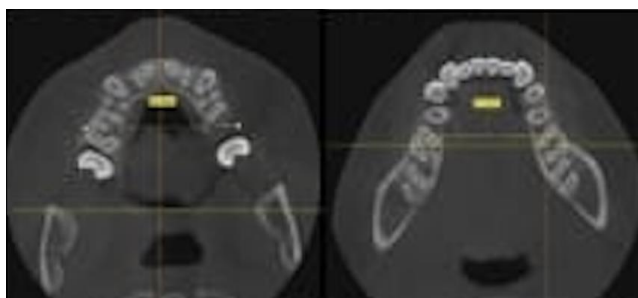


Fig 2: Penn Analysis



Fig 3: Expansion by MSE (Maxillary Skeletal Expander)

The treatment objectives were to correct the anterior and posterior crossbite, relieve severe anterior crowding in both upper and lower arches, achieve bilateral Class I canine relationships, and establish a functional bilateral Class III molar relationship.

- **Phase I:** Orthopedic and orthodontic treatment initiated with MSEII placement using 11 mm posterior and 13 mm anterior mini-implants, activated 2/6 turns per day for three weeks (Figures 2, 3). Interradicular TADs (2 × 8 mm) were placed bilaterally, along with FM worn for 14-16 hours daily for seven months, utilizing ½" 8 oz. extraoral elastics on each side and occlusal stops on the lower first molars (Figures 4, 5).
- **Phase II:** Cementation of upper and lower fixed metal appliances with MBT 0.022 prescription, alongside extraction of lower second premolars on both sides.

Results

Cone-beam computed tomography (CBCT) and radiographic images revealed maxillary expansion achieved through 7.5 mm midpalatal suture separation, accompanied by maxillary advancement and increased SNA angle. The ANB angle improved by 2°, and maxillary depth increased by 2°. Facial convexity increased by 2.5 mm, vertical dimension improved, crowding resolved, and ovoid arch forms were achieved. The facial profile became balanced and harmonious after eight months of orthodontic treatment (Figure 6).

Discussion

The treatment of maxillary constriction and Class III malocclusions in growing patients has significantly advanced with the introduction of less invasive, more controlled techniques. In this clinical case, the combination of skeletal expansion using MSEII and FM proved effective for correcting both transverse maxillary deficiency and sagittal maxilla-mandible discrepancies. MSEII facilitates midpalatal suture disjunction and controlled maxillary bone expansion, avoiding unwanted dental movements, while FM promotes maxillary advancement and Class III malocclusion correction [3, 4, 9].

Previous studies emphasize the efficacy of this approach in growing patients, given the favorable biological response of the maxilla, enabling significant and long-lasting skeletal expansion [5, 10]. The clinical outcomes, including improved facial profile and occlusal relationships, support the evidence that combining MSEII and FM is a viable, less invasive alternative to traditional rapid maxillary expansion methods [6].

Conclusion

Early detection of Class III malocclusion optimizes treatment prognosis and reduces the likelihood of requiring orthognathic surgery. Combining MSEII and FM with skeletal anchorage allows for anterior and transverse maxillary growth by disarticulating perimaxillary sutures without secondary dental effects, improving the facial profile and positively impacting the upper airway.

Conflict of Interest

Not available

Financial Support

Not available

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