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Case report

Early intervention of anterior crossbite and unfavorable tongue posture with a prefabricated myofunctional appliance: A case report

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ABSTRACT

Background: *Anterior crossbite in the primary dentition may be an early indicator of a developing Class III malocclusion. Clinical findings, hereditary factors, and environmental influences, such as breathing problems and tongue posture, should be considered for early intervention.* ***Purpose:*** *This case report describes the early diagnosis and intervention of anterior crossbite and unfavorable tongue posture as potential risk factors contributing to a Class III growth pattern.* ***Case:*** *An 8-year-old girl with a history of preterm birth and a familial history of Class III malocclusion presented with the chief complaint: lower teeth in front of upper teeth. Clinical findings included anterior crossbite in the primary canines, mild lower incisor crowding, and mesiocclusion in both second primary molars. The cephalogram revealed bimaxillary retrusion (SNA = 79°, SNB = 74°), a skeletal Class I (ANB = 4°, Wits = –2 mm), and a forward tongue posture.* ***Case Management:*** *An ENT specialist diagnosed the patient with allergic rhinitis, without any airway obstruction. A prefabricated myofunctional appliance was prescribed to guide the eruption of permanent teeth into their ideal positions, eliminate maxillary growth restriction, and retrain tongue posture. The anterior crossbite of the primary teeth and the crowding were corrected within 9 months. Use of the appliance is ongoing until all permanent incisors have fully erupted and ideal occlusion is achieved.* ***Conclusion:*** *Myofunctional therapy during early mixed dentition may serve as a beneficial interceptive treatment to retrain orofacial muscles and guide the eruption of permanent teeth into an ideal occlusion.*

Keywords: *Anterior crossbite; tongue posture; Class III malocclusion; myofunctional appliance; interceptive treatment*
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INTRODUCTION

Anterior crossbite is a sagittal plane discrepancy that may be an early sign of a developing Class III malocclusion. This dental discrepancy can cause a forward shift of the mandible, consequently favoring a growth pattern toward mandibular prognathism.[1] Literature reveals that most adults with Class III malocclusion were once children with relatively normal maxillary and mandibular relationships. These untreated malocclusions tend to worsen with age, as mandibular growth progresses unchecked by maxillary development. Class III malocclusion affects 26.7% of the global population, with Southeast Asia having the highest prevalence (15.8%) and Malays being the most affected ethnic group (16.59%).[2] More than 60% of all Class III cases are attributed to a retrognathic maxilla.

Historically, many practitioners have delayed treatment until the permanent dentition period, based on the belief that Class III malocclusions are primarily hereditary. This perspective is reinforced by a limited understanding of the interaction between genetic and environmental factors in the development of malocclusion.[3]

The skeletal topography of Class III malocclusion is highly variable and may result from discrepancies in maxillary and mandibular growth, often accompanied by vertical or transverse issues. This variability makes early identification and diagnosis particularly challenging in growing children.[2] Environmental factors, such as mouth

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breathing, play a significant role in the development of Class II malocclusion, whereas Class III malocclusion is more strongly influenced by genetic factors, including hereditary traits and specific gene variants. Although condylar growth regulation in prognathic and Class III malocclusion occurs at the genetic level, it is also stimulated by environmental influences, such as habitual forward positioning of the mandible. Therefore, early intervention targeting environmental factors that contribute to forward mandibular posture is a logical approach to preventing the progression of Class III malocclusion.[3]

Previous studies have documented the impact of tongue size on mandibular morphology. A case-control study reported lower tongue posture in Class III patients compared to Class I patients.[4] Enlargement of the tonsils and adenoids, previously associated with mandibular retrognathism, is now also commonly linked to prognathic mandibles. Tonsillar obstruction of the oropharyngeal airway prompts the patient to position the tongue forward to maintain airway patency, thereby encouraging mandibular protrusion.[5]

Removable prefabricated myofunctional appliances—also known as trainers and activators—are designed to improve poor breathing and tongue posture while guiding the eruption of permanent teeth into their correct positions before maturation of the periodontal ligaments.[1,6] This case report follows the CARE (CAse REport) Guideline[7] and aims to describe the early diagnosis and intervention of anterior crossbite and unfavorable tongue posture as potential risk factors favoring a Class III growth pattern.

CASE

An 8-year-old girl presented with her parents, whose chief complaint was that her "lower teeth [are] in front of the upper teeth" since the primary dentition period (Figure 1). Both parents had a history of crossbites and underwent orthodontic treatment during adolescence. They were eager to know whether early intervention could help prevent Class III malocclusion in their child.

The patient had a history of premature birth and intrauterine growth restriction, with a birth weight of 1,200 g. Although she reached developmental milestones appropriately, she remained below the third percentile on her growth chart. She had not received any prior orthodontic treatment. Clinically, she exhibited a straight facial profile, a normal nasolabial angle and upper lip inclination, and good facial symmetry, with the lower facial third slightly longer than the middle and upper thirds.

Intraoral examination revealed mixed dentition with a bilateral Class I molar relationship and mesiocclusion in both primary second molars. Crossbites were observed between teeth 53–83 and 63–73 in the transverse plane. All permanent lower incisors had partially erupted, except for tooth 42, as tooth 82 had not yet exfoliated. The patient was caries free. A panoramic radiograph (Figure 2) revealed agenesis of tooth 35, normal alveolar bone and periodontal tissues, no premature tooth loss, and no impacted teeth.

Cephalometric analysis (Figure 2) indicated a skeletal Class I malocclusion with retrusion of both the maxilla and mandible (SNA = 79°, SNB = 75°), and a negative

Figure 1. Intraoral and extraoral photographs before treatment.

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Wits appraisal of –2 mm. The skeletal profile was straight (angle of convexity = 8°), with excessive lower third facial growth directed posteriorly and inferiorly (FMPA = 37°). Down's analysis showed a retruded mandible (N-Pog and FHP = 78°). Based on cervical vertebral maturation, the patient's skeletal age was at stage II. Airway analysis showed a normal upper pharyngeal width; however, the lower pharyngeal width was wider than normal, indicating a forward tongue posture (Table 1). Overall, the patient was diagnosed with skeletal Class I malocclusion with canine crossbites.

CASE MANAGEMENT

Treatment objectives for this case were as follows: to correct anterior crossbite, to maximize maxillary growth and achieve a harmonious intermaxillary relationship, to guide the eruption of the permanent incisors, to train the patient to breathe through the nose, and to re-educate tongue posture to prevent forward mandibular shift. At this phase, the primary objective was to establish proper breathing habits and tongue posture, which would contribute to improved jaw relationships and dental alignment.

Table 1. Cephalometric analysis

Parameter	Normal reference	Results	Interpretation
SNA	80–84	79	Retruded maxilla
SNB	76–80	75	Retruded mandible
ANB	0–4	4	Class I skeletal relationship
Wits	–1 to 0 mm	–2 mm	Class III development tendency
FMPA	20–30	37	Vertical grower
N-Pog and FH	82–95	78	Retruded mandible
The distance from Point A to NP	A is 1 mm ahead of NP	A is 7 mm posterior to NP	Retruded maxilla
Upper pharyngeal width	>5 mm	6 mm	No potential of airway obstruction
Lower pharyngeal width	11–14 mm	19 mm	Anterior positioning of tongue

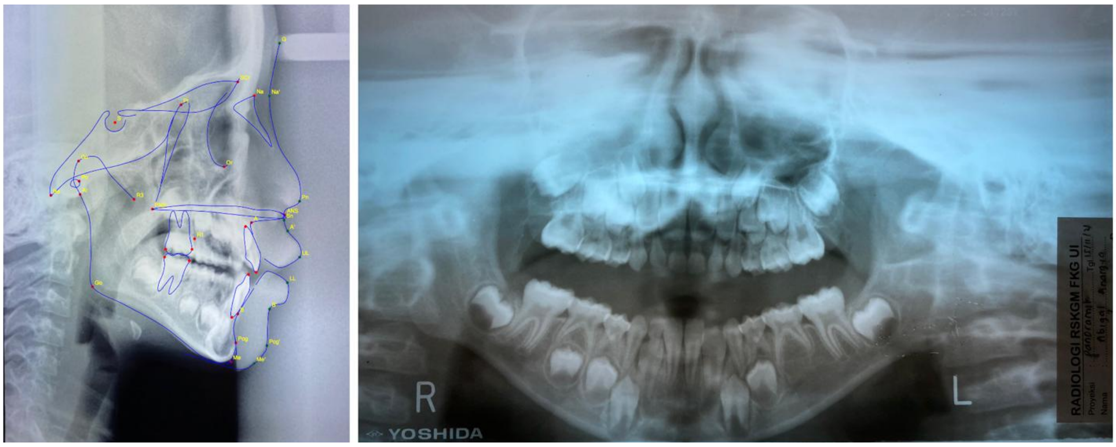

Figure 2. Cephalometric and panoramic radiographs before treatment.

Figure 3. Clinical photographs of the patient using Myobrace i3 Stage 1 (left) and Stage 2 (right).

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Given that the patient was still in the early mixed dentition period and only the lower permanent teeth had partially erupted, a prefabricated myofunctional appliance (Myobrace® Interceptive Class III Stage 1–3, Myofunctional Research Co., Australia) was selected as the treatment of choice. The design of this appliance provides a combined effect: it guides eruption, trains oromotor function, and corrects tongue posture—aligning with the aims of this case.[8,9] The prefabricated myofunctional appliance also has the advantage of not requiring full-time wear, making it more practical for children and promoting better compliance. Continuous reassessment will be conducted to determine future treatment needs.

Treatment began with a small-size Myobrace Interceptive Class III (i3) Stage 1, selected based on the size of the upper incisor arch from the working model. The patient was instructed to wear the appliance for 15 minutes during the day for the first 7 days, gradually increasing to 1 hour per day over the following 7 days (Figure 3). Night-time wear was then introduced after toothbrushing for an additional 14 days. After this adaptation period, the patient was instructed to wear the appliance for 2 hours during the day and overnight.[10,11]

Once the patient successfully wore the appliance overnight for 30 consecutive days without it falling out, reevaluation was conducted to transition to Stage 2. Follow-up appointments were scheduled every 3 months. After 9 months of appliance use, the canine crossbite was resolved (Figure 4). The previously negative canine overjets were corrected to 0–1 mm. Mild lower incisor crowding was also corrected. Transverse dimension analysis showed an increase in maxillary and mandibular intermolar widths by 1.5 and 0.5 mm, respectively, and an increase in maxillary intercanine width by 1 mm. Treatment will continue until all permanent anterior teeth have fully erupted, with follow-up every 3 months.

DISCUSSION

Clinical examination revealed left and right primary canine crossbites and a straight soft tissue profile. Four lower permanent incisors were partially erupted, while all four upper primary incisors had not yet exfoliated. Considering that the eruption path for permanent teeth lies lingual to their primary predecessors, it is possible that during the primary dentition period, not only the canines but all anterior teeth experienced crossbite. In this case, the anterior crossbite was a transverse discrepancy that appeared uncomplicated due to its limitation to the canines, yet it had the potential to inhibit maxillary growth and cause forward mandibular displacement. This non-physiological mandibular position during the growth and development period may contribute to a Class III growth pattern.

Figure 4. Clinical photographs 9 months post-treatment.

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Early treatment of the maxilla is recommended to establish a favorable sagittal relationship before the intermaxillary sutures close—typically around ages 14–15 in girls and 15–16 in boys. Untreated Class III malocclusion generally worsens with age, as mandibular growth exceeds and is not restricted by maxillary development.[1]

Airway analysis based on lateral cephalometric radiographs showed a normal upper pharyngeal width, indicating no potential for airway obstruction.[13,14] These findings were confirmed by an ENT consultant, who reported no enlargement of the tonsils or adenoids and no other airway obstructions. However, the patient was diagnosed with allergic rhinitis. The lower pharyngeal width measured 19 mm (normal reference: 11–14 mm), suggesting anterior tongue positioning.[13,14]

Forward tongue posture may result from airway obstruction or habitual positioning.[13,14] Breathing difficulties may cause the patient to position the tongue forward to open the airway, thereby pushing the mandible into a protrusive position.[4,5] In this case, although there was no tonsillar or adenoidal enlargement, the diagnosis of allergic rhinitis may still be associated with airway compromise. In such conditions, the nasal mucosa becomes swollen due to exposure to dust particles, pollen, or cold air, leading to reduced airflow.[12,15]

Breathing is the second most frequent physiological function after heartbeat. Therefore, even minor but persistent disturbances in breathing can have significant developmental impacts. The presence of anterior tongue posture in this patient supports the possibility of a developing Class III malocclusion, alongside other risk factors, such as anterior crossbite and a familial history of malocclusion.

Respiratory needs are fundamental factors influencing jaw and tongue posture. The core philosophy of myofunctional treatment is that malocclusion and craniofacial growth abnormalities stem from soft tissue dysfunction. This aligns with Moss's functional matrix theory, which posits that maxillary and mandibular bone growth occurs in response to orofacial functional demands. The treatment objective is to establish proper nasal breathing habits and tongue posture to achieve a harmonious intermaxillary relationship. Accordingly, the treatment plan in this case involved the use of a prefabricated myofunctional removable appliance—specifically, the Myobrace Interceptive I-3 Stage 1–3 (Figure 5).

The Myobrace Interceptive I-3 Stage 1–3 functions by stimulating and/or inhibiting the activity of the masticatory and facial muscles, thereby triggering modeling and remodeling of the maxilla and mandible.[16] These appliances are based on the mechanisms of conventional Frankel appliances and Andresen activators.[17] This treatment approach allows for the management of unfavorable occlusal conditions—such as anterior crossbite—as part of the broader development of malocclusion.

To retain the appliance intraorally, the patient must exert effort to keep their lips closed, thereby activating the perioral muscles. This muscular engagement also stimulates oral proprioception, aided by the flexible silicone material of the appliance.[6] The effort to maintain lip seal further encourages nasal breathing during sleep. In this case, the chronic mild airway obstruction caused by allergic rhinitis may have predisposed the patient to partial mouth breathing, which the appliance is expected to help correct.

The Stage 2 appliance includes a Frankel-cage inner core that increases buccal shield resistance, counteracting the buccinator muscle forces on the posterior teeth and promoting transverse maxillary development. The tongue tag encourages the patient to place the tip of the tongue on the incisive papilla, rather than behind the upper or lower incisors.[10,16,17] This feature is particularly important, as McNamara airway analysis indicated a forward tongue posture in this patient.

Another study reported successful intervention of a functional anterior crossbite using prefabricated myofunctional therapy. The patient in that case exhibited a tendency toward mandibular protrusion and a normodivergent growth pattern. The objective was similar: to prevent the development of unfavorable occlusal conditions that could lead to a Class III growth pattern. One advantage of prefabricated appliances is that, rather than applying active forces, they harness natural eruptive and functional forces to guide permanent teeth into optimal occlusion.

From the patient's perspective, this myofunctional appliance is painless and causes minimal psychosocial impact. While some discomfort may occur during the initial days of wear, the parent reported that once the patient adapted, compliance became relatively effortless. Many patients find removable appliances unsightly or inconvenient.[18] However, this prefabricated appliance requires only night-time wear and 2 hours of daytime use, making it more suitable for children.

Figure 5. The Myobrace Interceptive I-3 Stage 1–3.[16]

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A limitation of this case report is that it was compiled during an ongoing treatment—after 9 months of appliance use. Although progress has been notable, treatment is not yet complete. Continuous evaluation is being conducted, and treatment plans are being adjusted accordingly, considering the dynamic growth in this age group. As with any removable appliance, patient compliance is essential for treatment success. It is crucial to educate parents or caregivers on the importance of daily appliance use and to emphasize that treatment outcomes rely heavily on consistent wear.

Parents should also be informed that night-time wear is particularly important, as most eruptive forces occur during sleep. In this case, a custom appliance-wear tracker was created by the patient in collaboration with the clinical team. The patient contributed ideas for what to track, designed the timetable, and selected her favorite stickers for the tracker. Allowing children to take ownership of their treatment fosters responsibility and improves compliance.

Despite ongoing debate, the use of prefabricated myofunctional appliances in interceptive orthodontic treatment is gaining attention. First, high-quality evidence on their effectiveness—particularly for crossbite correction—remains limited. Second, there is currently no universally accepted method for assessing tongue posture and function across dental and ENT disciplines.[10,19] Well-designed randomized controlled trials are needed to compare these appliances with other functional devices and to standardize outcome measures.

Although prefabricated, appliances such as the Myobrace (Myofunctional Research Co., Australia) or LM-Activator™ (LM-Dental) should not be considered “one-size-fits-all” solutions for all interceptive orthodontic cases. Nevertheless, they have demonstrated value in treatment and retention, particularly during growth and development.[10] More importantly, they align with the goals of oral myofunctional therapy, which emphasizes proper tongue posture and nasal breathing.

Chronic respiratory issues and forward tongue posture are often overlooked in diagnosis, yet they can contribute to mandibular forward shift and malocclusion development. Early identification and timely intervention are critical—not only to reduce the severity of future malocclusion in the permanent dentition but also to enhance the child’s current biopsychosocial well-being. In conclusion, removable prefabricated myofunctional appliances offer a promising alternative in interceptive orthodontic treatment. They are relatively easy to use in pediatric patients and utilize natural eruptive and perioral muscle forces to address oral habits that may contribute to malocclusion.

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