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Management of Anterior Crossbite Using an Elastomeric Functional Apparatus (Orthoplus): A Case Report

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ABSTRACT

Anterior crossbite is one of the most common malocclusions encountered during the mixed dentition period and may negatively affect dental function, craniofacial development, and esthetics if left untreated. Early interceptive orthodontic intervention is therefore recommended to prevent the progression of more complex malocclusions. This case report aims to describe the management of anterior crossbite using a prefabricated elastomeric myofunctional appliance (Orthoplus EFT Slim) in a pediatric patient. The method involved clinical examination, radiographic evaluation, diagnosis of a Class I skeletal relationship with dentoalveolar anterior crossbite, and interceptive treatment using a removable elastomeric functional appliance. The patient was instructed to use the appliance daily in conjunction with myofunctional exercises to improve tongue posture, lip competence, and breathing patterns. Treatment progress was evaluated monthly over a three-month period. The results showed that correction of the anterior crossbite was achieved within the first month, as indicated by the transition from negative to positive overjet. Subsequent evaluations demonstrated stable occlusal relationships, improved anterior interdigitation, and enhanced orofacial muscle function, including improved nasal breathing and lip seal. No relapse or complications were observed throughout the treatment period. In conclusion, the use of a prefabricated elastomeric myofunctional appliance is effective for correcting anterior crossbite during the mixed dentition stage, providing both dental correction and functional improvement. Early intervention supports stable treatment outcomes and may help prevent the future development of more severe malocclusions; however, long-term follow-up is recommended to further validate these findings.

INTRODUCTION

Malocclusion is an abnormal occlusal condition that can significantly affect orofacial function, esthetics, and the psychosocial well-being of children. According to epidemiological surveys conducted in various countries, there is no significant difference in the prevalence of malocclusion among the primary, mixed, and permanent dentition stages, with prevalence rates ranging from 54% to 56% (Peres et al., 2019; Proffit et al., 2019). This condition not only affects masticatory function but also influences facial esthetics, craniofacial development, and the psychosocial aspects of children (Dimberg et al., 2015; Jin et al., 2016). The American Academy of Pediatric Dentistry (AAPD) and the American Association of Orthodontists recommend that the first orthodontic examination be performed at approximately 7 years of age to allow early detection of developing problems. Interceptive orthodontic treatment during the mixed dentition period aims to facilitate optimal jaw function, satisfactory occlusal

development, and the minimization of dentoalveolar and skeletal malocclusion problems that may interfere with growth, function, esthetics, and the psychological well-being of children (Batista et al., 2018; Zhou et al., 2020). During the early mixed dentition phase, craniofacial growth and development are still ongoing, allowing modification of jaw growth patterns and more optimal correction of tooth positions (Frey & Full, 1988; Proffit et al., 2013).

One of the most commonly observed forms of malocclusion in young children and during the mixed dentition phase is anterior crossbite. The prevalence of anterior crossbite in various countries worldwide ranges from 2.2% to 36%, suggesting that its occurrence may increase with the eruption of permanent teeth. This condition is characterized by the palatal positioning of the maxillary anterior teeth relative to the mandibular anterior teeth during centric occlusion and may result from dental, skeletal, or functional etiologies (Boushell & Sturdevant, 2022; Okeson, 2019; Schroeder et al., 2022). Anterior crossbite requires special attention because, if left untreated, it may lead to disturbances in jaw growth, tooth abrasion, gingival recession, and long-term occlusal imbalance (Proffit et al., 2019).

One effective approach for managing dental anterior crossbite during the mixed dentition period is the use of elastomeric functional appliances, such as the EF Line appliance. This device utilizes the elasticity of its material to generate light, continuous forces, thereby assisting in the guidance of jaw growth and correction of malpositioned teeth (Georgieva & Yordanova, 2025; Jayanth, 2019; Zhang et al., 2026). The use of this appliance also contributes to the improvement of orofacial muscle function, including tongue posture and swallowing patterns, to achieve a balanced stomatognathic system (American Academy of Pediatric Dentistry [AAPD], 2016; Proffit et al., 2013).

A 7-year-old female patient presented to the Dental Hospital of Universitas Padjadjaran (RSGM UNPAD), accompanied by her parents, with the chief complaint that her upper anterior teeth had erupted behind her lower anterior teeth and appeared irregular. The patient expressed a desire to improve the alignment of her teeth. There was no family history of similar conditions, and the patient had a habit of frequently posturing the mandible forward (Karibe et al., 2015; Soylu et al., 2026; Zardi et al., 2025). Extraoral examination revealed symmetrical body posture, a mesoprosopic facial form, and normal lip morphology. The facial profile appeared straight and symmetrical.

Figure 1. Extraoral Photographs Before Treatment

Temporomandibular joint examination revealed no abnormalities. Swallowing, speech, and masticatory functions were normal. Intraoral examination showed healthy gingival and periodontal conditions with moderate oral hygiene.

The patient had a reverse overjet of -1 mm, an overbite of 1 mm, a mandibular midline shift of 3 mm to the left, and bilateral Class I molar relationships (Figure 2). The depth of the curve of Spee was 1 mm. The latest panoramic radiographic examination indicated the patient was still in the mixed dentition period. (Figure 3)

Figure 3. Panoramic Radiograph Before Treatment

Panoramic and cephalometric radiographic examinations revealed slight asymmetry in condylar height. Cephalometric analysis using the Steiner method showed that the maxilla and mandible were in normal positions (orthognathic), consistent with a Class I skeletal relationship. Lateral cephalometric analysis of skeletal parameters indicated that the patient had a Class I skeletal denture base (ANB = 0°, SNB = 77°), while Wits analysis showed a skeletal Class III and Jefferson analysis indicated Class IIIB. (Figure 4). Downs analysis also supported an overall orthognathic facial pattern, with the mandibular plane angle and Y-axis within normal limits. Cervical vertebral maturation evaluation showed the patient was at CS-2 stage.

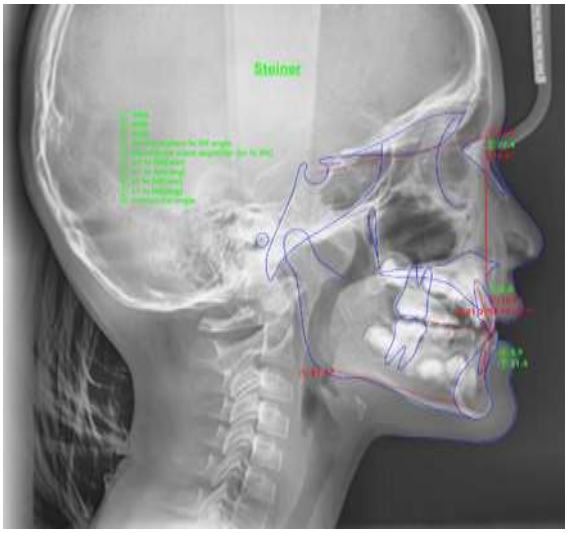

Figure 4. Lateral Cephalometric Radiograph Before Treatment and Steiner Analysis

METHOD

Following history-taking and clinical examination, a phased treatment plan was developed as part of the comprehensive patient management. At the initial visit, maxillary and mandibular impressions were obtained to fabricate study models, which revealed a Class I molar relationship according to Angle's classification. Mixed dentition space analysis using the Moyers and Tanaka–Johnston methods indicated a maxillary arch length discrepancy, reflecting an imbalance between available arch space and dental space requirements.

The malocclusion was treated using a myofunctional appliance, specifically the EFT Slim (Orthoplus). The appliance was prescribed for daily use over a period of approximately 4–6 months, with a minimum wear time of 2 hours during the day and continued use during nighttime sleep. During the first week, appliance use was limited to daytime wear to facilitate patient adaptation. In the first month of treatment, the patient performed myofunctional exercises focused on establishing nasal breathing habits and improving tongue posture and function. Lip muscle strengthening exercises were also performed to enhance lip competence and achieve an adequate lip seal. These exercises supported appliance adaptation and improved patient compliance throughout the treatment period.

Figure 5. Insertion of the EFT Slim Appliance (Orthoplus)

RESULT AND DISCUSSION

At the 1-month follow-up, evaluation was performed regarding appliance retention, patient comfort and adaptation, and changes in occlusal relationships. Clinical evaluation after 1 month of myofunctional EFT Slim (Orthoplus) appliance use showed significant early improvement in anterior occlusal relationships. Intraoral findings showed that the maxillary incisors, which had previously been in anterior crossbite, had undergone correction with labial movement relative to the mandibular anterior incisors, resulting in the beginning of positive overjet formation. Improvement in incisal relationships and anterior dental arch coordination was observed, although occlusal stabilization was still in its early stages and required further monitoring. This phenomenon indicated an anterior dental jump as a response to the use of the functional appliance.

Gingival tissue appeared in good condition with no signs of inflammation, indicating that oral hygiene was maintained during appliance use. The patient also demonstrated good adaptation to the appliance, with improved lip competence and a tendency toward nasal breathing pattern correction. This was consistent with the myofunctional exercises performed during the treatment period. Treatment with this appliance could be continued as planned with regular follow-up appointments to achieve optimal occlusal stability.

Figure 6. Evaluation at 1 Month of EFT Slim Appliance Use

Evaluation after 2 months of myofunctional EFT Slim (Orthoplus) appliance use showed a positive therapeutic response, particularly in early anterior crossbite correction. The anterior crossbite correction achieved during the first month remained stable, with incisal relationships maintaining a positive overjet. No tendency toward relapse to the original position was found, indicating good dentoalveolar and neuromuscular adaptation. Anterior occlusal relationships showed improved interdigitation, although occlusal refinement was still ongoing. These improvements pointed toward the establishment of a more functional and stable incisal relationship.

Evaluation after 3 months of myofunctional EFT Slim (Orthoplus) appliance use showed that the anterior crossbite correction achieved during the initial phase remained stable, with incisal relationships maintaining a positive overjet without signs of relapse. This stability indicated the success of the initial treatment phase accompanied by adequate neuromuscular adaptation. In the anterior region, improved occlusal interdigitation was observed, with increasingly harmonious incisal relationships. Anterior tooth positions appeared more stable within the dental arch, indicating consolidation of the dentoalveolar movement results achieved previously. (Figure 7)

Figure 7. Evaluation at 3 Months of EFT Slim Appliance Use

From a functional standpoint, the patient demonstrated a more consistent nasal breathing pattern and the ability to maintain lip seal spontaneously without excessive mentalis muscle contraction. Tongue posture also appeared improved, contributing to the maintenance of anterior tooth positions. Adaptation to the appliance remained good, with usage compliance supporting treatment success.

Findings at month 3 indicated that treatment had entered the stabilization and functional maturation phase, where equilibrium between dentoalveolar and neuromuscular factors was beginning to be achieved. This is important in preventing relapse and ensuring the sustainability of treatment outcomes in the long term. Treatment was continued with a focus on maintaining results and optimizing orofacial function.

This case describes the management of anterior crossbite in a 7-year-old child with a Class I skeletal relationship, indicating that the anomaly was predominantly dentoalveolar in nature. The literature states that anterior crossbite during the mixed dentition phase is generally related to local factors such as tooth eruption position, oral habits, or muscle function imbalance, rather than primary skeletal anomalies (Contemporary Orthodontics), and therefore early intervention carries a favorable prognosis.[1] The *early interceptive* treatment approach in this case was consistent with the recommendation that anterior crossbite correction should be performed as early as possible to prevent the development of functional mandibular shift, which may progress into skeletal malocclusion if left untreated.[9]

A body of literature demonstrates that anterior crossbite correction during the mixed dentition phase has a high success rate when performed early. Simple orthodontic intervention for dentoalveolar anterior crossbite has been reported to achieve success rates of 80–100%, particularly in patients with Class I skeletal relationships and without significant skeletal involvement.[10] Higher success rates have been reported when correction is performed before the establishment of persistent functional mandibular shift. In this patient, the correction that occurred during the first month, manifesting as a change to *positive overjet* indicated an anterior dental jump, which is a characteristic response in dentoalveolar cases with minimal occlusal interference.

The approach using removable or functional appliances during this phase has also been reported to have a favorable prognosis, with relatively short correction times ranging from several weeks to 3 months, depending on patient compliance and the number of teeth involved (Borrie & Bearn, 2011). This is consistent with the findings in this case, where anterior crossbite correction was first observed during the first month of myofunctional appliance use, demonstrating a biological response consistent with the literature.

The use of prefabricated elastomeric myofunctional appliances such as the EFT Slim (Orthoplus) provides an approach that is not only mechanical but also functional. This device is made of flexible elastomeric material designed to generate light and continuous forces while facilitating physiological tooth and jaw repositioning. Its design enables stimulation of neuromuscular activity through tongue position guidance, improvement of lip competence, and normalization of breathing and swallowing patterns (Graber et al., 2017).

Figure 8. Illustration of the Orthoplus Appliance Mechanism of Action

According to Proffit (1978), orofacial muscle equilibrium plays an important role in determining tooth position and treatment outcome stability. The success of anterior crossbite correction in this case was not only attributable to changes in anterior tooth position but also to functional improvements such as nasal breathing patterns, tongue posture, and lip competence. This supports the concept that orthodontic therapy combined with myofunctional re-education can enhance long-term stability.

Several studies emphasize that long-term success is not solely determined by correction of tooth position but also by elimination of etiological factors and stability of orofacial function (Moss & Salentijn, 1969). This supports the concept that myofunctional therapy plays an important role in reducing relapse risk compared to purely mechanical approaches, as it acts on the neuromuscular components that contribute to tooth position.

Comparison with other methods, such as the use of inclined planes or removable appliances with finger springs, shows that the myofunctional approach has both advantages and limitations. Inclined planes are known to be effective for rapid anterior crossbite correction, particularly in cases involving one or two teeth, as they provide direct mechanical force to push teeth into labial position. However, these appliances tend to address only the dental aspect without correcting functional etiological factors. Removable appliances with active components such as finger springs can provide more specific tooth movement control but are highly dependent on patient compliance. Removable appliances with active components such as finger springs can also provide more specific tooth movement control but are highly dependent on patient compliance and do not directly correct functional etiological factors, such as mouth breathing habits (Kutin & Hawes, 1969).

The *myofunctional* appliance used in this case works by modifying the neuromuscular system function of the oral cavity, thereby not only correcting tooth position but also improving the underlying functions that influence it. This approach is more comprehensive, particularly in patients with functional etiological factors. Treatment success is highly dependent on the level of patient compliance and requires a relatively longer adaptation period compared to appliances that work through direct mechanical means.

Longitudinal evaluation of this case showed consistent progress, starting from the correction phase in the first month, initial stabilization in the second month, to the consolidation phase in the third month. The absence of relapse demonstrated that equilibrium between dentoalveolar factors and neuromuscular factors was beginning to be achieved. This reinforces the statement that orthodontic outcome stability is greatly influenced by elimination of etiological factors and achievement of normal orofacial function (Proffit, 1978).

Overall, this case demonstrates that the combination of *early interceptive treatment* with a *myofunctional* approach constitutes an effective therapeutic option for anterior crossbite with a Class I skeletal relationship. This approach not only provides rapid occlusal correction but also supports long-term stability through functional improvement, although continued monitoring during the growth phase remains necessary.

Figure 9. Clinical Documentation of Anterior Crossbite Treatment with Orthoplus Appliance

This case has several limitations, including the fact that treatment outcome evaluation was limited to clinical observation during the initial period up to three months, so long-term stability could not be comprehensively evaluated. No post-treatment cephalometric evaluation was performed, which could have provided a more objective quantitative assessment of skeletal and dentoalveolar changes. These limitations should be considered in interpreting the results, given that orthodontic changes during the growth phase may still undergo modification as the patient develops. Another limitation is the absence of a comparison control with other treatment modalities, such as the use of inclined planes or active mechanical appliances, so the relative effectiveness of the myofunctional appliance cannot be directly compared within the context of this study. Therefore, although initial results indicate a favorable response, long-term monitoring is required to ensure outcome stability and to evaluate the potential for relapse during the craniofacial growth phase.

CONCLUSION

This case report demonstrated that anterior crossbite in a 7-year-old patient with a Class I skeletal relationship was effectively managed through early interceptive orthodontic treatment using a prefabricated elastomeric myofunctional appliance (Orthoplus EFT Slim). Significant improvement was observed within one month of treatment, characterized by the transition from negative overjet to positive overjet, indicating a typical dental correction response in dentoalveolar crossbite management. Continued evaluation over three months showed stable occlusal correction without relapse, accompanied by improved neuromuscular function, including enhanced lip competence and more consistent nasal breathing patterns. These findings suggested that treatment success was not solely dependent on tooth movement

but was also strongly influenced by functional adaptation of the orofacial musculature, supporting the effectiveness of early functional intervention in interceptive orthodontics.

Future studies are recommended to expand the clinical evidence base by incorporating longer follow-up periods to evaluate the long-term stability and relapse potential of anterior crossbite correction using elastomeric myofunctional appliances. Comparative studies involving prefabricated elastomeric appliances, inclined planes, and active removable appliances would also be valuable for determining their relative effectiveness under different clinical conditions. In addition, future research should include larger sample sizes and incorporate quantitative assessments, such as post-treatment cephalometric analysis and electromyographic evaluation of orofacial muscle activity, to provide more objective evidence of skeletal, dentoalveolar, and functional changes. These improvements would strengthen the scientific validity and clinical applicability of interceptive orthodontic approaches in growing patients.

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