Case report

Treatment of anterior crossbite using a myofunctional appliance: A case report

Ngoc Nhu Truong Vo[a], Binh Thi Do[b], Quang Minh Luu[b], Thuy Thanh Le[b], Tuan Anh Tran[a,*]

[a]*School of Dentistry, Hanoi Medical University, Hanoi, Vietnam*
[b]*Nhu Ngoc Dental Clinic, Hanoi, Vietnam*

Abstract

Anterior crossbite is a common condition in the mixed dentition stage and caused by several factors, including a lingual eruption path of the maxillary anterior incisors, trauma to the primary incisor resulting in lingual displacement of the permanent tooth germ, supernumerary anterior teeth, an overretained necrotic or pulpless deciduous tooth or root, odontomas, crowding in the incisor region, inadequate arch length, and a habit of biting the upper lip. When left untreated, this type of malocclusion can cause undesirable consequences such as gum recession, temporomandibular joint disorders, and mandibular deviation. The choice of treatment is subsidiary to the cause of the crossbite, the goals of treatment, and the level of cooperation of the patient. Several methods are provided to treat anterior crossbite. This case report describes a 7-year-old female patient with anterior crossbite and associated poor oral habits, which was treated using a functional appliance (Myobrace). After 3 months of treatment, the anterior crossbite was successfully corrected with normalization of overjet and overbite. She also showed improvement in tongue posture, tongue-thrust swallowing habit, and lower lip posture.

Keywords: Anterior crossbite, myofunctional appliance, poor oral habit.

Proof Version

An anterior crossbite is a misalignment caused by the labial position of the mandibular anterior teeth in relation with the maxillary incisors.[1] It may occur in one or more incisors. The incidence of anterior crossbite in children is 3.7%–10.5%,[2, 3] and causes may be divided into dental or bone factors. Dental factors include upper incisors with a lingual position, dental trauma, odontomas, lack of space in the upper incisor region, and tongue thrusting habit.[4–8]

The treatment of dental anterior crossbite aims at correcting the position of the anterior teeth to have a stable overjet and overbite. Depending on the teeth that are affected, the lingual movement of mandibular incisors, labial movement of maxillary incisors, or both are required.

Several methods are available to treat crossbites in the anterior incisor area. Appliances that can be used include removable devices with Z-springs, prefabricated stainless steel crowns, brackets, and tongue blades.[9–11] The choice of treatment device must be based on the cause, number of affected teeth, and type of teeth movement required to correct the malposition. It is also important to determine whether the anterior crossbite is caused by a poor oral habit, and it is essential to eliminate the poor oral habit first to avoid any relapse.[10]

This case report describes the management of an anterior crossbite associated with tongue-thrust habit and abnormal oral muscle function using a myofunctional appliance (Myobrace) in a growing child and the clinical outcomes achieved after treatment. This appliance is basically a resilient tray designed to cover both the upper and lower arch and includes two major components, a shaped silicone outside and a metal frame inside (this metal frame is also completely covered by a thin plastic layer). The silicone component helps create the appliance shape, which is favorable to the surrounding tissue. It also provides flexibility to the appliance to fit in different arch shapes and create the very first active force to move the teeth. In the second component, a metal frame is added to reinforce the silicone component and maintain it in

***Correspondence to: Tuan Anh Tran**, School of Dentistry, Hanoi Medical University, Hanoi, Vietnam.
E-mail: trananhtuan09302@gmail.com
Received: August 25, 2025
Revised: February 3, 2026
Accepted: April 30, 2026

Open Access 2027 Truong Vo., published by Faculty of Medicine, Chulalongkorn University. This work is licensed under the Creative Commons Attribution 4.0 International License.

shape. More importantly, it helps produce more effective force. Teeth movement occurs inside the tray under forces generated by the outer and inner walls until they are at a passive position[1] (no walls touch the teeth). Several appliances with different sizes may be necessary for a desirable movement.

Case presentation

Diagnosis

A 7-year-old female patient was referred to the dental clinic with a primary complaint of crossbite in the front teeth reported by her parents. Her medical history was noncontributory. Dental history revealed extraction of her upper right first primary molar 6 months earlier. Extraorally, she presented a normal profile with a full lower lip. When smiling, 100.0% of her lower incisors were visible **(Figure 1)**. No signs of temporomandibular joint disorder were observed. Her oral habits were evaluated through clinical observation during resting posture and functional swallowing examination. She exhibited a low tongue posture at rest, anterior tongue thrust during swallowing, and increased lower lip muscle contraction with a pursed lower lip posture.

Intraoral examination revealed crossed upper incisors. Her mandibular central incisors showed slightly labial gingival recession. There was no pocketing associated with the teeth. The overbite was 0.5 mm, and the overjet was “0.5 mm. The relationship molar and canine on the left arch were class I, and on the right side, the relationship molar was class II **(Figure 2)**. The lower dental midline was deviated 1 mm to the left side. She had a 2-mm diastema between the 11 and 21. Spacing was detected in both the upper and lower arches.

On the lateral cephalometric film, the measured indices revealed a skeletal relationship of class I (ANB = 2) and normal facial pattern (SN-GoGn, 33). The upper incisor was normal (U1-SN, 102), and the lower incisor was protrusive. The lower lip was in front of the E-line **(Figure 3)**. The anterior crossbite was classified as dental associated with functional oral habits, because the skeletal relationship remained class I with no evidence of skeletal discrepancy.

Proof Version

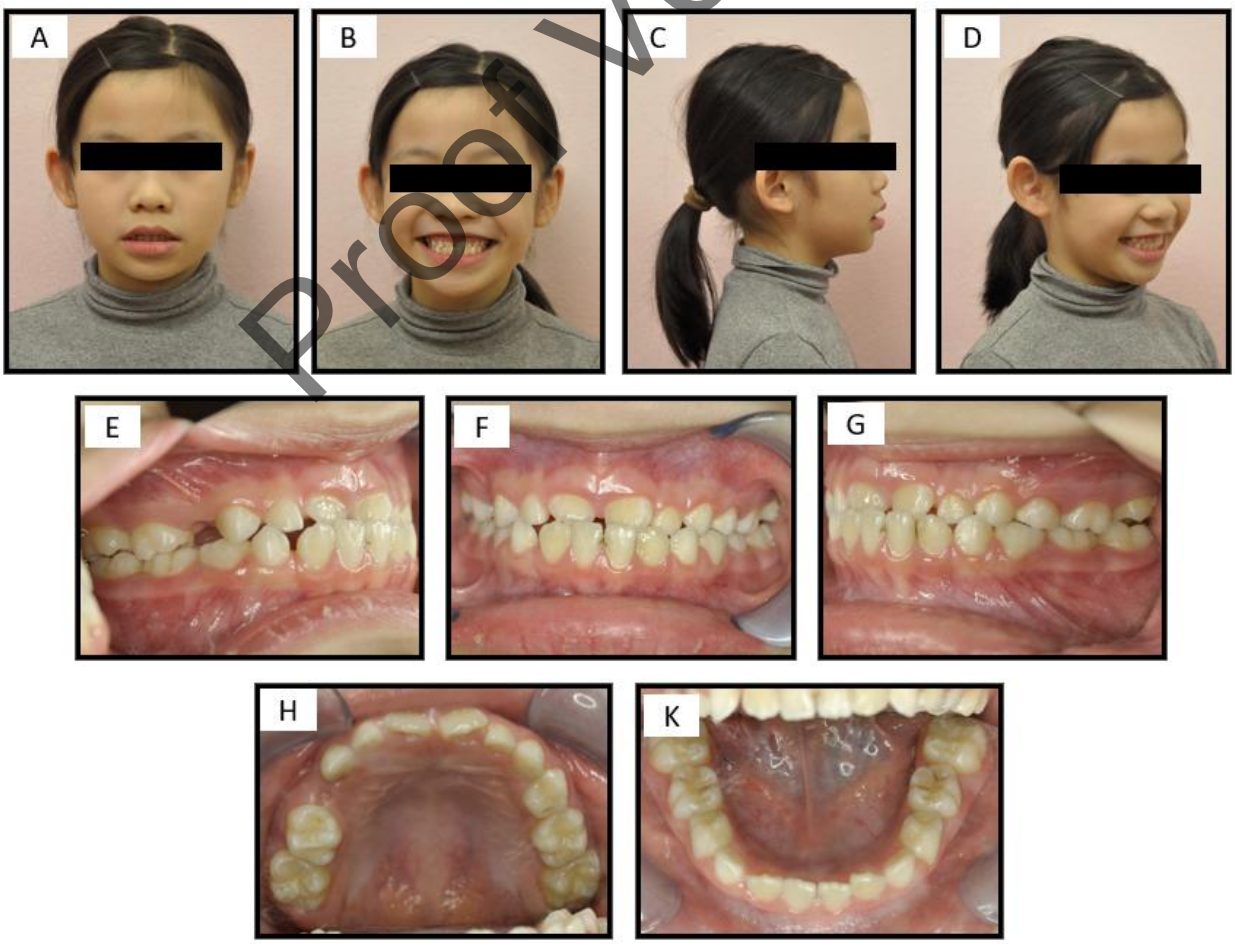


Figure 1. Photographs before treatment phase 1: **(A)** frontal view, **(B)** frontal smiling view, **(C)** right lateral view, **(D)** 3/4 smile view, **(E)** right dental view, **(F)** frontal dental view, **(G)** left dental view, **(H)** occlusal view of the upper dentition, and **(K)** occlusal view of the lower dentition.

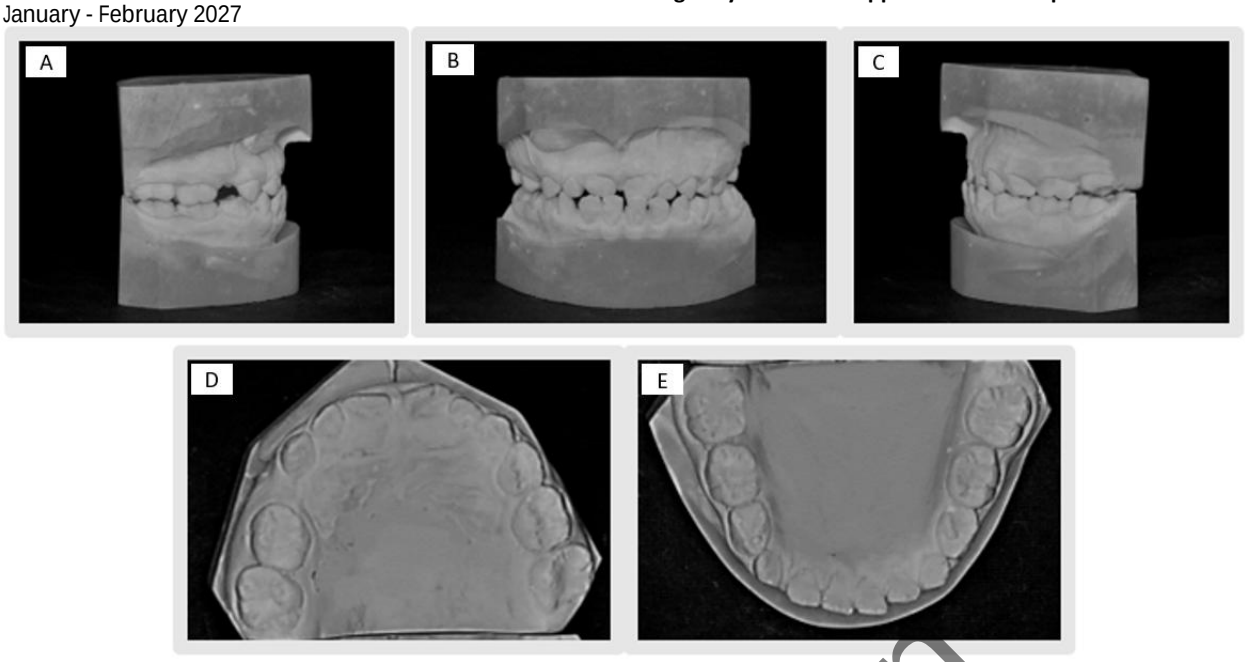
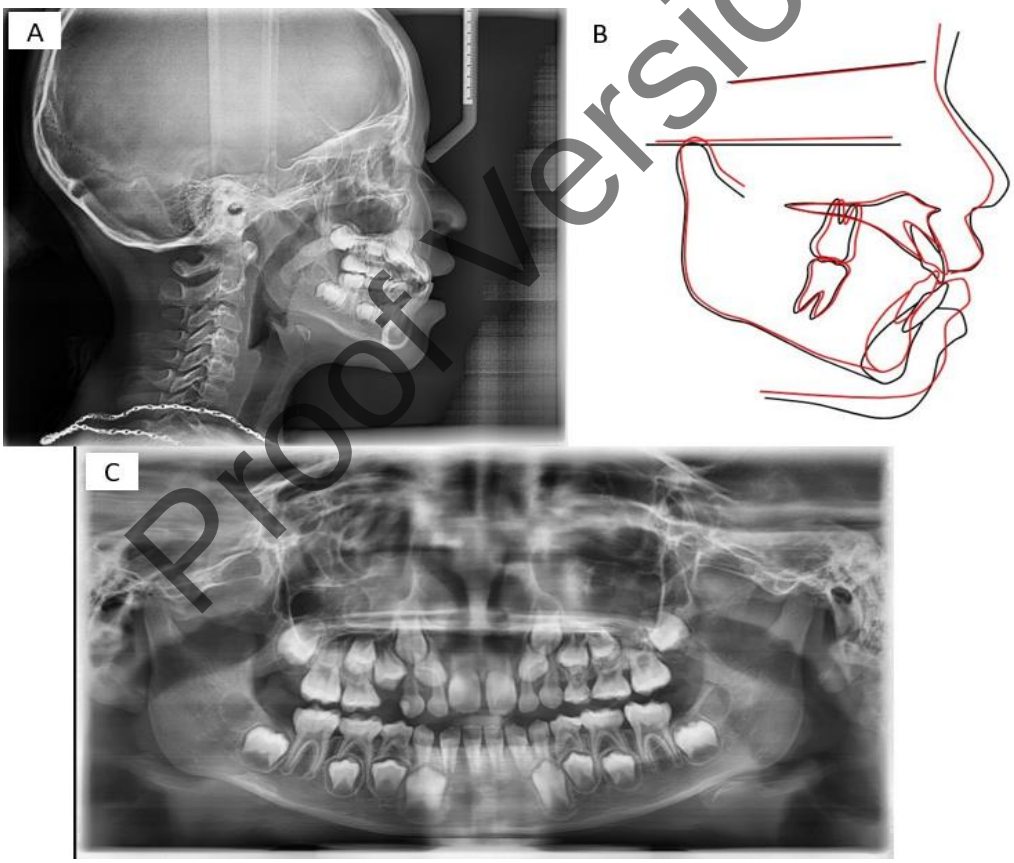


Figure 2. Models before treatment phase 1: **(A)** right dental view, **(B)** frontal dental view, **(C)** left dental view, **(D)** occlusal view of the upper dentition, **(E)** occlusal view of the lower dentition.



Proof Version

Figure 3. Radiographs and tracing before treatment: **(A)** lateral cephalogram, **(B)** tracing, **(C)** panoramic X-ray.

Treatment objectives

The treatment goals in phase 1 were to (1) eliminate the anterior crossbite, (2) correct the position of the tongue at rest, (3) eliminate the tongue-thrust habit during swallowing, and (4) prepare space for the erupting upper lateral incisors.

In phase 2, the objectives were (1) management of teeth eruption and arch development and (2) controlling the persisting poor habit.

Appliance selection

A myofunctional appliance (Myobrace), which is a premanufactured instrument available in various

sizes, was selected for treatment in this period **(Figure 4A-J)**. The choice of appliance size depends on the patient's arch size. After the initial orthodontic data collection, the M-size appliance was selected to be worn. The patient was instructed to use the device throughout the night, after dinner. She was also suggested to wear it for an additional 1–2 h in the day to help the muscles around the mouth adapt to the appliance. She was also instructed to place her tongue on the tongue tab of the appliance, with lips closed. Regular follow-up visits were scheduled at 4-week intervals for clinical monitoring, evaluation of treatment progress, and reinforcement of myofunctional training instructions. Good patient compliance with appliance use and follow-up attendance was observed throughout the treatment period.

Results

After phase 1 treatment, the therapy goals were successful. The anterior crossbite was eliminated after only 3 months of wearing the appliance. The habit of the low position of the tongue at rest, tongue thrust during swallowing, and pursed lower lip were also eliminated. Overjet and overbite reached normal values (2 mm). The gums of the mandibular central incisors were restored. The lower dental deviation also improved **(Figure 4).** The patient was happy with her new profile and smile especially.

On a subsequent cephalometric film, the measured indices still revealed a skeletal relationship of class I (ANB = 3), and the lower incisors were more upright **(Figure 5** and **Table 1)**.

Proof Version

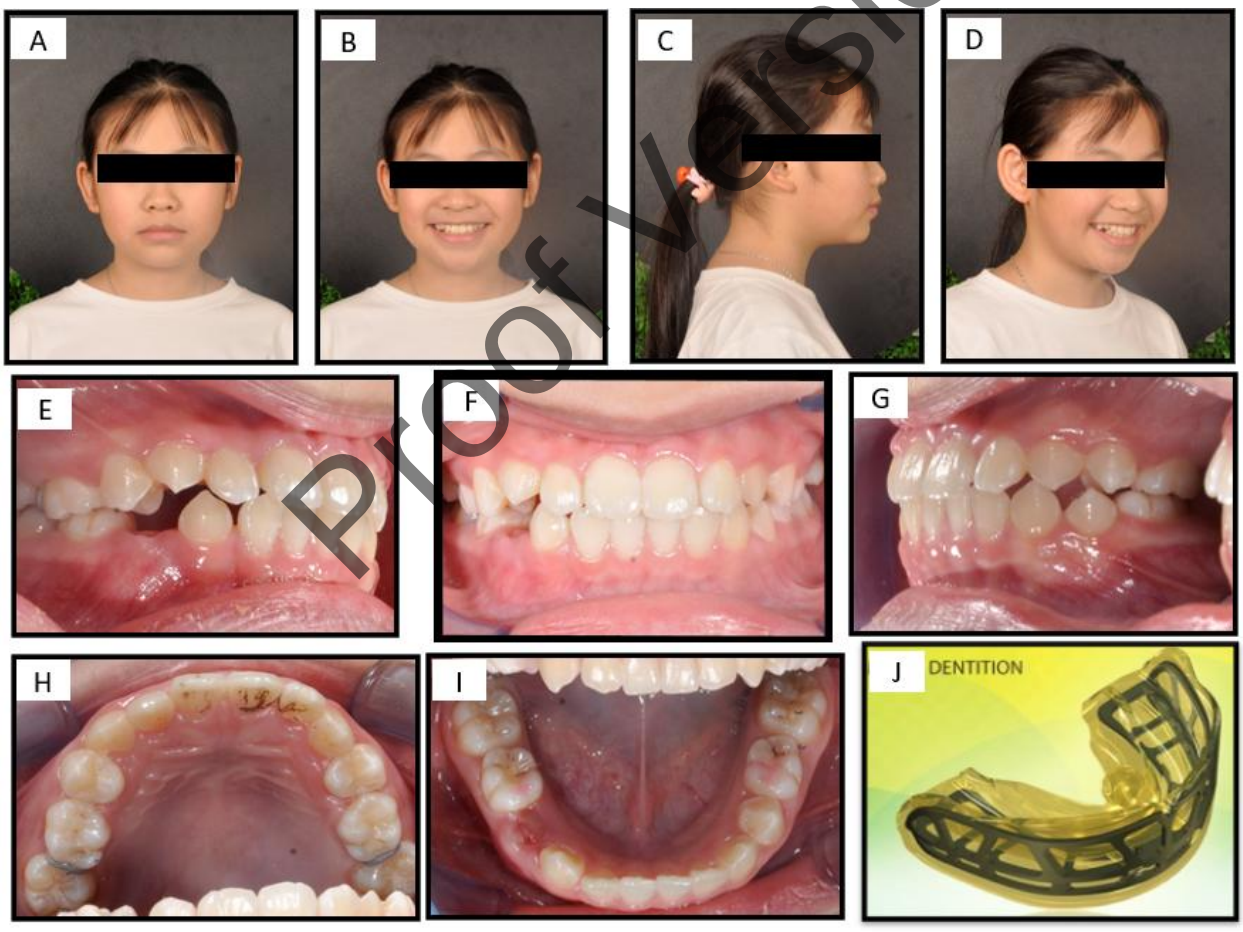


Figure 4. Photographs after treatment phase 1: **(A)** frontal view, **(B)** frontal smiling view, **(C)** right lateral view, **(D)** 3/4 smile view, **(E)** right dental view, (**F)** frontal dental view, **(G)** left dental view, **(H)** occlusal view of the upper dentition, **(I)** occlusal view of the lower dentition, **(J)** Myobrace appliance.

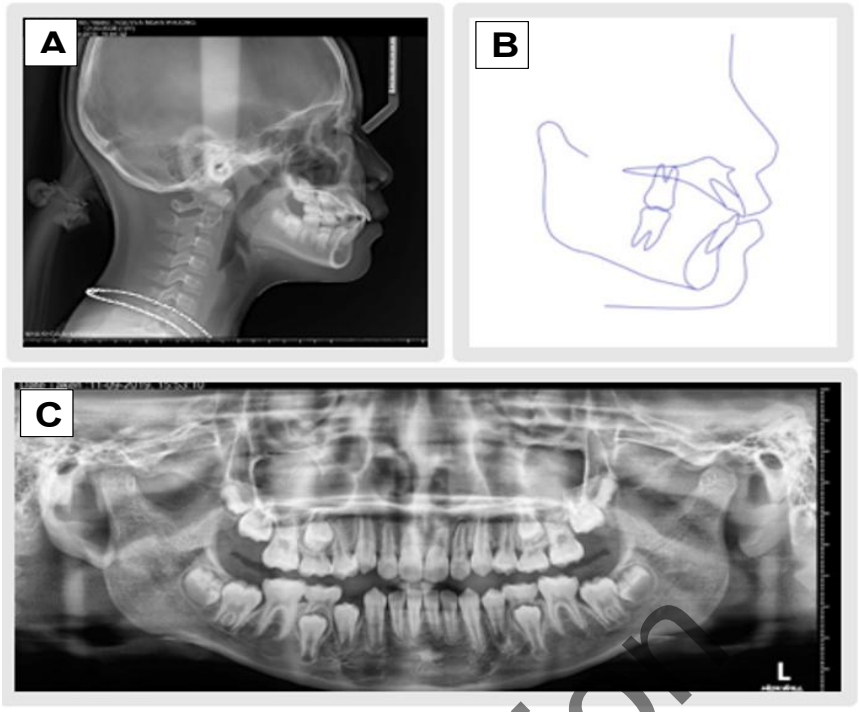


Figure 5. Radiographs after treatment phase 1: **(A)** lateral cephalogram, **(B)** cephalometric superimposition: black, before treatment; red, after treatment, **(C)** panoramic X-ray.

Table 1. Cephalometric analysis.

	Before treatment phase 1	After treatment phase 1
SNA (degree)	81	81
SNB (degree)	79	78
ANB (degree)	2	3
Wits appraisal (mm)	3,5	3
SN-GoGn (degree)	34	34
FMA (degree)	25	25
U1-SN (degree)	102	115
L1-MP (degree)	105	100
E-line-upper lip (mm)	1	2
E-line-lower lip (mm)	3	2

ANB, A-nasion-B angle; FMA, Frankfort-mandibular plane angle; L1-MP, lower incisor to mandibular plane angle; SNA, sella-nasion-A angle; SNB, sella-nasion-B angle, SN-GoGn, sella-nasion to Gonion-Gnathion angle; U1-SN, upper incisor to sella-nasion angle.

Proof Version

Discussion

Early treatment in mixed dentition is sometimes challenging because it is a multi-stage progress that requires long-term management to detect and control malocclusion, which could be dental, skeletal, or combined. This progress is very important to help create a normal condition for the development of dental and skeletal structures.[12]

Although there are several concepts on craniofacial development, a number of factors that influence it remain unknown. Such factors could be genetic, systemic, or environmental. Except for genetic syndromes, congenital defects, and trauma, most malocclusions must be evaluated as variation from normal development. Manlove et al. also mentioned similar concepts as follows: it should be considered a result of a sequence of normal developmental events, including (1) brain growth and development, (2) optic pathway development, (3) speech and swallowing development, (4) airway and pharyngeal development, (5) muscle development, and (6) tooth development and eruption.[13, 14] This implies that any abnormal dental developments should be corrected early but at the right time to maintain a normal environment for normal craniofacial complex growth, which is the most important aspect for future treatment.[15]

Anterior crossbite and poor oral habits can exert adverse effects on the growth of the mandible.[16] It can also cause additional problems such as temporomandibular joint disorders, teeth trauma, gum recession, and alveolar bone resorption. Unfortunately, several authors agree that secondary dysfunction, such as poor tongue posture at rest, can still persist after correction. In that situation, the continuous and light force produced by the tongue may cause clear

consequences to the anterior teeth that are more severe in the case of tongue thrusting. Hence, decision-making must not only focus on solving the problems themselves but also preventing their relapse. This issue makes selection of the appliance more difficult, i.e., whether dysfunction treatment separately or in combination with poor habit correction and how to perform it.[12]

There are various treatment options for an anterior crossbite, e.g., fixed or removable appliances, and selecting the appliance for each case depends on several factors. Hawley's appliance with Z-springs is a popular choice. The principle behind this design is to use Hawley's appliance as an anchorage unit to push the affected teeth using Z-springs. An open screw can be combined with Hawley's appliance for upper arch expansion.[17,18]

Another choice is the inclined anterior bite plane, an appliance manufactured using acrylic such as a mandibular jig with an inclined plane to guide the upper incisor to slide outward. This appliance can be easily fabricated; however, a cemented bite plane will create an openbite in the posterior area, which will cause difficulty in chewing food and may result in gingivitis.[19]

Tongue habit correction appliances according to the the level of intervention are as follows: 1) lingual night guard for protecting anterior teeth from tongue force (removable, night-time use, less cooperation required), 2) transpalatal bar with lingual pearl for tongue position practice (fixed appliance, practice cooperation required), and 3) tongue crib for forcing the tongue to be away from anterior teeth and in the correct position (active always). (Clinical design may be customized individually.)

The most possible combination from the abovementioned available choices is Harley's appliance with Z-springs used as a day and night guard. Other selections must be indicated separately due to their complexity when combined. Therefore, although Hawley's appliance with Z-springs can be indicated for the present case, it was not selected for several reasons as follows:[17] 1) high clinical first molar crown required for appliance retention, 2) laboratory fabrication–technician experiment required, 3) two-time appointment for application and regular check-ups and maintenance required, 4) experiment required to activate Z-springs, 5) dentist's guide and in-office practice for patients required, 6) high risk of breaking or malfunction in poor or incorrect preservation conditions, 7) appliance adjustment required for teeth replacement, 8) crossbite correction but tongue protection only (not correction), 9) losing time for tongue posture training next stage, and 10) other appliances may be required.

It has been reported that myofunctional appliances may improve oral muscle function, tongue posture, and correction of developing malocclusion during the mixed dentition stage.[20] Recent evidence also suggests that early interception of anterior crossbite improves occlusal development and reduces the risk of developing periodontal trauma and functional mandibular shift.[21] The findings of the present case are consistent with these reports, because there was improvement in overjet, overbite, tongue posture, and oral habits after wearing the Myobrace appliance. Similar outcomes have been described in the literature where myofunctional appliances exerted favorable effects on anterior dental alignment and oral habit correction in growing children.[20] In the present case, treatment outcomes were achieved within a relatively short period of 3 months with good patient compliance and without significant adverse effects. The final decision is for the Myobrace appliance. Some factors must be considered. The first is the appliance design, where one-block design with soft material is friendly to the patient, easy to use, has low risk of surrounding tissue trauma, and simple to clean. Second, the patient's cooperation is important. It only needs to be worn at night with an additional 1–2 h during the day. The third factor is that the myofunctional appliance is designed to produce all the effects we need to treat this patient, viz., muscle training, tongue positioning, anterior teeth protection from tongue thrusting, and teeth movement guidance.

Another reason for selecting the Myobrace appliance is the patient's pleasure. She can undergo the treatment without any unwanted changes to her normal life, including learning ability, social communication, and nutrition. Hence, she can easily maintain her routine as usual with full treatment cooperation. This is really helpful because she is at the very beginning of school age, and it is difficult to maintain all these aspects when wearing a tongue crib or lip bumper for a prolonged time period.[22]

Moreover, it is convenient for both the physician and patient because it is premade, unbreakable, and inexpensive. The patient can obtain the appliance immediately and try it on without any further steps. There is also no need to replace or adjust the appliance due to teeth replacement in a specific period of time. A larger one can be indicated for the remaining treatment. Nevertheless, like all other removable appliances, the Myobrace appliance requires strong

Proof Version

cooperation from the patient and parents to achieve effective treatment outcomes. There must be no interruption during treatment, and the patient has to wear it every day for a certain amount of time following the instructions.[22]

This case report has several limitations. First, it describes the outcome of a single patient, which restricts the generalizability of the findings. Second, the follow-up duration was relatively short; hence, the long-term stability of the treatment outcomes could not be completely evaluated. Further clinical studies with larger sample sizes and longer follow-up periods are required to confirm the effectiveness of myofunctional appliances in the management of anterior crossbite associated with oral habits.

Conclusion

Early management of anterior crossbite and associated oral habits may contribute to more favorable occlusal and functional development in growing children. In the present case, the Myobrace appliance demonstrated promising short-term outcomes in correcting anterior crossbite and improving oral habits without significant adverse effects. Nevertheless, further studies with larger sample sizes and long-term follow-up are necessary to confirm the effectiveness and stability of this treatment approach.

Author contributions

NVTN, BTD, and TAT contributed substantially to the concept and design of this study, acquiring the data, reviewing the literature, and its analysis and interpretation. TTL and QML contributed substantially to acquiring the data. NVTN and TAT contributed to drafting the manuscript. NVTN and TAT edited the manuscript critically for important intellectual content. All authors approved the final version submitted for publication and take responsibility for statements made in the published article.

Acknowledgments

We would like to express our gratitude to the patient and their family for trusting us with their care and for granting permission to publish this case report.

Conflicts of interest statement

The authors declare no conflict of interest.

Data sharing statement

Not applicable

ORCID

Ngoc Nhu Truong Vo https://orcid.org/0000-0001-7839-3607
Binh Thi Do https://orcid.org/0009-0001-4263-1025
Quang Minh Luu https://orcid.org/0009-0009-9562-6324
Thuy Thanh Le https://orcid.org/0009-0008-2539-4946
Tuan Anh Tran https://orcid.org/0009-0002-9041-943X

References

1. Tsai HH. Components of anterior crossbite in the primary dentition. ASDC J Dent Child 2001;68:27–32, 10.
2. Genji L, Mani G, Sandhya R. Prevalence of anterior crossbite in children visiting a university hospital in Chennai - a retrospective study. Indian J Forensic Med Toxicol 2020:14;5059–66.
3. Noman M, Enver N, Hashmi G, Yaqub A, Zaheer U, Shan S suleman. Frequency and pattern of anterior crossbite with primary and mixed dentition in school children. J Gandhara Med Dent Sci 2024;11:3–6.
4. Hannuksela A, Väänänen A. Predisposing factors for malocclusion in 7-year-old children; with special reference to atopic diseases. Am J Orthod Dentofacial Orthop 1987;92:299–303.
5. Staderini E, Patini R, Meuli S, Camodeca A, Guglielmi F, Gallenzi P. Indication of clear aligners in the early treatment of anterior crossbite: a case series. Dental Press J Orthod 2020;25:33–43.
6. Wiedel AP, Bondemark L. Fixed versus removable orthodontic appliances to correct anterior crossbite in the mixed dentition—a randomized controlled trial. Eur J Orthod 2015;37:123–7. doi:10.1093/ejo/cju005
7. Croll TP. Correction of anterior tooth crossbite with bonded resin-composite slopes. Quintessence Int 1996;27:7–10.
8. Woon SC, Thiruvenkatachari B. Early orthodontic treatment for Class III malocclusion: A systematic review and meta-analysis. Am J Orthod Dentofacial Orthop 2017;151:28–52.
9. Ulusoy AT, Bodrumlu EH. Management of anterior dental crossbite with removable appliances. Contemp Clin Dent 2013;4:223–6
10. Borrie F, Bearn D. Early correction of anterior crossbites: a systematic review. J Orthod 2011;38: 175–84
11. Reddy DC, Paul ST, Azher U, Nayak M, Smitha M. Early correction of anterior crossbite in deciduous dentition. RGUHS J Dent Sci 2019;11:54–9.

Proof Version

12. Graber LW, Vanarsdall RL Jr, Vig KWL, Huang GJ. Orthodontics: current principles and techniques. 6th ed. St. Louis (MO): Elsevier; 2017.
13. Nandaa RS. The contributions of craniofacial growth to clinical orthodontics. Am J Orthod Dentofacial Orthop 2000;117:553–5
14. Manlove AE, Romeo G, Venugopalan SR. Craniofacial growth: current theories and influence on management. Oral Maxillofac Surg Clin North Am 2020;32:167–75. doi:10.1016/j.coms.2020.01.007 PubMed PMID: 32151371.
15. Vucic S, Dhamo B, Jaddoe VWV, Wolvius EB, Ongkosuwito EM. Dental development and craniofacial morphology in school-age children. Am J Orthod Dentofacial Orthop 2019;156:229–37.e4.
16. Valentine F, Howitt JW. Implications of early anterior crossbite correction. ASDC J Dent Child 1970;37: 420–7.
17. Paudel S, Shrestha RM, Napit S. A century of Hawley retainer. Orthod J Nepal 2021;11:80–7.
18. Shrestha N, Upadhyay S, Luintel S, Shrestha R, Dallakoti P. Management of severely rotated anterior teeth using different techniques in mixed dentition - a report of two cases. J Nepalese Assoc Pediatr Dent 2023;4:25–9.
19. Croll TP, Riesenberger RE. Anterior crossbite correction in the primary dentition using fixed inclined planes. II. Further examples and discussion. Quintessence Int 1988;19:45–51.
20. Pham TT, Tran BC, Pham TTH. Effectiveness of myobrace therapy in correcting anterior crossbite in early mixed dentition: a retrospective study. Int J Clin Pediatr Dent 2025;18:1243–8.
21. Giancotti A, Mozzicato P, Carillo M, Pachì F. Case Report: Early treatment of anterior crossbite in young patients using clear aligners. Front Dent Med 2026;7:1761514.
22. Cen Z, Ren J, Xie X, Han M, Lei L, Li J, et al. Comparative effect of the Myobrace appliance versus traditional functional appliances in treating a class II malocclusion: a systematic review and meta-analysis. Australas Orthod J 2025;41:188–214.

Proof Version