

Treatment of Anterior Crossbite with Inverted Bracket Position, Case Report

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ABSTRACT

Background: Anterior crossbite is an abnormality in the sagittal direction of one or more maxillary anterior teeth against the mandibular teeth. Although the incidence of this case is small, it can cause aesthetic problems, tooth abrasion, caries, gingivitis, bone resorption, and gingival recession. **Case Report:** A 24-year-old female patient presented with her upper front teeth positioned behind her lower teeth and a noticeable gap between her upper front teeth. She exhibited an anterior crossbite involving teeth 22 to 32, a central diastema, and crowding of the upper and lower front teeth. Treatment was carried out using a fixed orthodontic with an MBT system and the bracket placement of 22 in an inverted position to get a labial torque effect on the roots. **Conclusion:** The use of pre-adjusted brackets with the MBT system and the placement of the lateral incisor bracket in an inverted position successfully corrected the anterior crossbite in these teeth both at the crown and root without additional wire bending or auxiliary spring.

Keywords: Anterior crossbite, inverted bracket, MBT System

ABSTRAK

Latar Belakang: *Crossbite* anterior merupakan kelainan dalam arah sagital pada satu atau lebih gigi anterior rahang atas terhadap gigi rahang bawah. Meskipun insidensi kasus ini kecil, namun dapat menyebabkan permasalahan estetik, abrasi gigi, karies, gingivitis, resorpsi tulang serta resesi gingiva. **Laporan Kasus:** Seorang perempuan usia 24 tahun datang dengan keluhan gigi depan atas terlihat lebih ke belakang daripada gigi bawahnya serta terdapat celah di tengah gigi depan atasnya. Pasien mengalami *crossbite* anterior gigi 22 terhadap 32, diastema sentralis serta crowding gigi anterior atas dan bawah. Perawatan dilakukan menggunakan piranti ortodonti cekat sistem MBT dengan penempatan breket gigi 22 secara terbalik untuk mendapatkan efek torque labial pada akar. **Kesimpulan:** Penggunaan breket *pre-adjusted* dengan sistem MBT dan penempatan breket insisif lateral secara terbalik berhasil mengoreksi *crossbite* anterior pada gigi tersebut baik pada mahkota maupun akar tanpa membutuhkan tambahan *wire bending* maupun *auxillary spring*.

Kata Kunci: *Crossbite* anterior, breket terbalik, sistem MBT

1. Introduction

Anterior crossbite is an abnormality in the sagittal direction of one or more maxillary anterior teeth against the mandibular teeth.¹ Anterior crossbite can be of dental or skeletal origin, where dental crossbite is due to the abnormal inclination of the anterior teeth. The incidence of these cases is 4-5% and usually results from palatal incisive positioning due to the palatal eruption path. Other etiologic factors include trauma to the deciduous incisive teeth, causing permanent tooth germ displacement, supernumerary teeth in the anterior region, crowding in the incisive region, and persistence of deciduous teeth.²

Anterior dental crossbite usually involves one or two teeth, where the crossbite teeth are usually upright or reclined without significant maxillary-mandibular discrepancy.³ Anterior crossbite can cause aesthetic problems, tooth abrasion in the incisal region of both upper and lower incisors, caries, gingivitis, alveolar bone resorption in the labial region, and gingival recession.⁴ Anterior dental crossbite can be treated using removable or fixed appliances, but removable

appliances can be used if there is sufficient space.⁵ The simplest treatment can use a tongue blade or Catlan's appliance in the early phase of anterior crossbite development when the teeth erupt. Removable appliances with Z-spring and expansion screws and lower inclined planes can also be used.^{1,3} Fixed appliances are usually needed for cases that require bodily tooth movement and in the period of permanent dentition.⁵ This case report discusses a patient with a single anterior crossbite in the permanent dentition. Management was carried out with a fixed orthodontic MBT system for this patient by positioning the bracket of the crossbite tooth in an inverted position.

2. Case Report and Case Management

2.1 Case Report

A 24-year-old female came to the RSGM with a chief complaint about the position of her upper front teeth, which looked more backward than her lower teeth, and a space in the center of her upper front teeth. The patient had no bad habits and no history of disease. The patient has a symmetrical face and a convex facial profile (Figure 1). Intra-oral examination showed an anterior crossbite of 22 to 32, a central diastema, and minimal crowding on the maxillary and mandibular anterior teeth. The Blanch test showed normal labial frenulum attachment. Study model examination showed class I right and left molar relationships, class I right and left canine relationships, low palate, 2 mm overbite, 3 mm overjet, and a 1.5 mm shift of the mandibular midline to the left (Figure 2).



Figure 1. Extra-oral photos of the patient before orthodontic treatment

Panoramic radiographs showed 38 and 48 impacted in the mesioangular position, while 18 and 28 impacted in the distoangular position (Figure 3). The lateral cephalometric radiograph before treatment is shown in Figure 4. The cephalometric analysis showed a class II skeletal malocclusion with SNA 80°, SNB 75°, and ANB 5° (Table 1). Based on the examination, the patient's diagnosis was class II skeletal malocclusion, class I dentoalveolar malocclusion with maxillary and mandibular anterior crowding, anterior crossbite, diastema central, and the deep curve of spee.

Figure 2 shows intraoral photos of the patient before orthodontic treatment from various perspectives. The top row (from left to right) includes: a lateral view of the right side displaying the alignment of the upper and lower teeth; a frontal view showing the alignment of the upper and lower front teeth, highlighting the central diastema (gap) and anterior crossbite; and a lateral view of the left side showing the alignment of the upper and lower teeth. The bottom row (from left to right) includes: an occlusal view of the upper arch showing the spacing and crowding of the upper teeth; and an occlusal view of the lower arch showing the spacing and crowding of the lower teeth. These photos provide a detailed visual representation of the described dental issues, including the anterior crossbite, central diastema, and crowding of both the upper and lower anterior teeth.



Figure 2. Intra Oral photos of the patient before orthodontic treatment

Figure 3 shows a panoramic radiograph of the patient before orthodontic treatment. The radiograph provides a comprehensive view of the entire upper and lower jaw, including all the teeth and surrounding bone structures. Key observations include the alignment of the upper and lower teeth, highlighting visible crowding and misalignment. All permanent teeth, including third molars (wisdom teeth), are present. The central diastema (gap) between the upper front teeth and the anterior crossbite, where the upper front teeth are positioned behind the lower front teeth, are clearly visible. The overall health of the jawbone and the roots of the teeth appears normal. This radiograph is essential for diagnosing and planning the patient's orthodontic treatment.

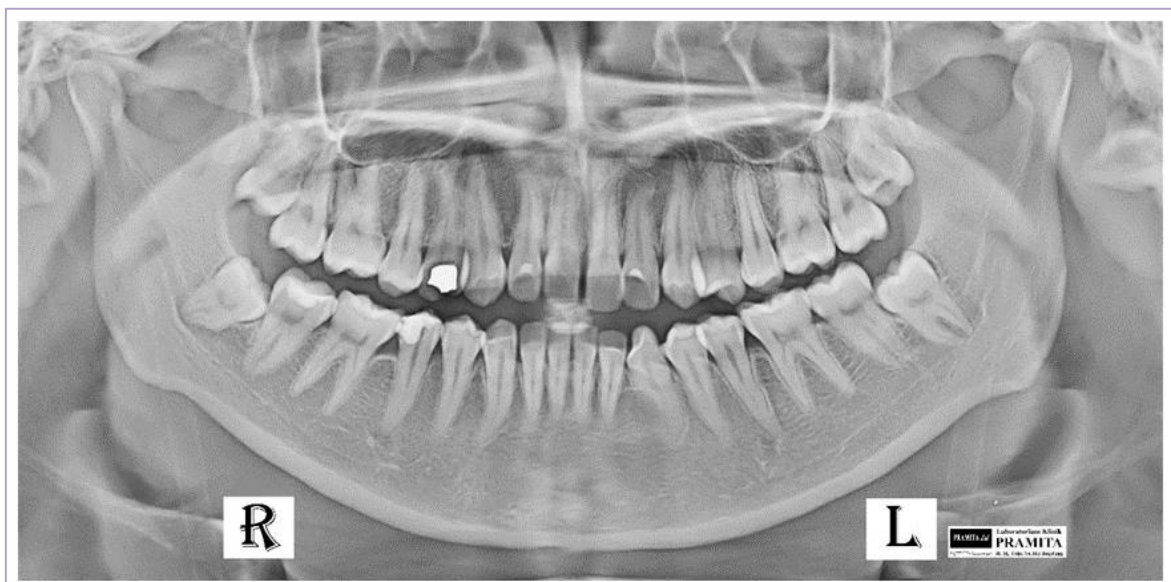


Figure 3. Panoramic radiograph of the patient before orthodontic treatment

Figure 4 shows a lateral cephalometric radiograph of the patient before orthodontic treatment. This side view of the patient's head reveals detailed dental and skeletal structures. Key observations include the relative positions of the upper and lower jaws, highlighting discrepancies in jaw alignment, and the evident anterior crossbite where the upper front teeth are positioned behind the lower front teeth. The radiograph also shows the alignment and angulation of the teeth, particularly the incisors, and the relationship between the teeth and the supporting bone structures.

Additionally, the patient’s profile, including the soft tissue outline, is visible, which can be used to assess faciaand l aesthetics and growth patterns. This radiograph is essential for detailed orthodontic diagnosis and treatment planning, providing valuable insights into both dental and skeletal relationships.

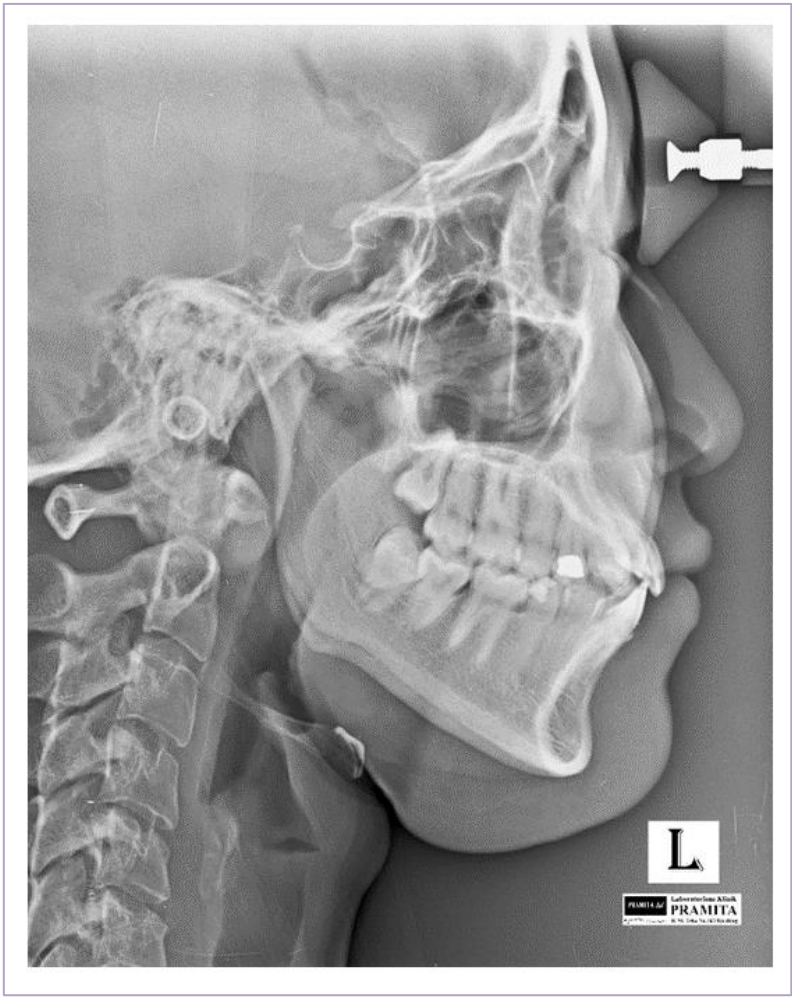


Figure 4. Lateral cephalometric radiograph before orthodontic treatment

Table 1 presents the cephalometric analysis of the patient before treatment compared to average values and normal ranges. In the skeletal analysis, the patient’s SNA and facial angle values are within the normal range, while the SNB, ANB, SN-MP, and Y axis values are outside the normal range. In the dental analysis, the patient’s U1-NA (mm) and L1-NB (mm and degrees) exceed the normal limits, whereas the U1-NA angle, U1-L1 angle, and U1-SN angle are within or slightly above the normal range. These parameters that fall outside the normal limits require special attention in the orthodontic treatment plan.

Table 1. Cephalometric analysis before orthodontic treatment

Measurement	-	Mean	+	Pre- treatment
Skeletal analysis				
SNA °	78	82	86	80
SNB °	76	80	84	75*
ANB °	0	2	4	5*
SN-MP °	20	32	40	44*
Facial Angle	82	87,8	95	95
Convexity angle	10	0	-8.5	10
Y axis	66	59,4	53	70
Dental analysis				
U1-NA mm	2mm	4mm	6mm	8*

Measurement	-	Mean	+	Pre- treatment
U1-NA °	15	22	32	30
L1-NB mm	2mm	4mm	6mm	11,5*
L1-NB °	15	25	32	36*
U1-L1	150	131	120	109
U1-SN	93	101	109	110

2.2 Case Management

The treatment objective was to correct the anterior crossbite, central diastema, and crowding in the maxillary and mandibular anterior teeth. The patient used the MBT bracket system with a 0.22-inch slot. The bracket position followed the MBT bracket placement rules, with the tooth 22 bracket placed in an inverted position for crossbite correction. Initial leveling alignment used 0.012 inch NiTi wire, followed by 0.014 inch, 0.016 inch, and 0.018 inch NiTi wire. The patient did not have an additional bite riser because the tooth was not locked when the patient was in a centric relation position. Anterior crossbite was corrected after six months of treatment. The diastema corrected spontaneously during leveling alignment (Figure 5).

Figure 5 shows intraoral photos of the patient's teeth after 11 months of orthodontic treatment, highlighting the progress made. The top row includes a lateral view of the right side, a frontal view, and a lateral view of the left side, all showing the alignment and position of the upper and lower teeth with braces. The frontal view, in particular, displays significant improvement in the alignment and closure of the central diastema. The bottom row includes occlusal views of both the upper and lower arches, showing improved alignment and spacing of the teeth. These photos illustrate the effectiveness of the orthodontic treatment over 11 months, demonstrating significant improvements in the alignment of the teeth and the correction of the initial dental issues.



Figure 5. Patient treatment progress after 11 months

Treatment continued for the working phase using a 0.016 x 0.022 inch SS rectangular wire. The inverted bracket position was maintained to get the root torque effect in the labial direction. The finishing phase continued with 0.017 x 0.025 inch, 0.018 x 0.025-inch wire. The bracket position was returned to the correct position after the root position was in good condition to avoid the root position being too labial. At the end of treatment, a 0.019 x 0.025 inch SS wire was used to achieve torque expression on the root. The treatment results showed that the facial profile did not change significantly even though the patient was treated without extraction. The maxillary dental arch followed the mandibular smile line, and the dental midline was aligned with the facial midline (Figure 6). The position of the patient's teeth had improved where the central diastema was closed, the anterior crossbite and crowding were corrected, and the interdigitation of the patient's teeth was good. The root position of 22 was in good condition in the labio-palatal direction. The maxillary and mandibular midline were in line (Figure 7). The total duration of treatment was 18 months. The

patient used Essix retainer to maintain the position of her teeth. A comparison of cephalometry before and after treatment can be seen in Table 2 (Figure 8). There were minor changes in the position and inclination of the mandibular incisors but no changes in the skeletal profile. Panoramic radiographs at the end of treatment showed a good root position of the dentition in both the maxilla and mandible (Figure 9).

Figure 6 shows extraoral photos of the patient after completing orthodontic treatment, taken from three different angles. The left image presents a frontal view with a neutral expression, showing overall facial symmetry and alignment post-treatment. The middle image captures a frontal view with a smile, highlighting the improved aesthetics and dental alignment. The right image displays a lateral view, demonstrating changes in the profile and the enhanced relationship between the upper and lower jaws. These photos provide a comprehensive view of the patient's facial aesthetics after treatment, indicating significant improvements in both dental alignment and facial harmony.



Figure 6. Extra oral photo after orthodontic treatment

Figure 7 shows intraoral photos of the patient's teeth after completing orthodontic treatment, taken from various angles. The top row includes a lateral view of the right side, a frontal view, and a lateral view of the left side, all showing the final alignment and position of the upper and lower teeth. The frontal view displays the closure of the central diastema and the correction of the anterior crossbite. The bottom row includes occlusal views of both the upper and lower arches, showing the final alignment and spacing of the teeth. These photos illustrate the successful outcome of the orthodontic treatment, demonstrating significant improvements in the alignment and spacing of the teeth, as well as the correction of the initial dental issues.



Figure 7. Intraoral photograph after orthodontic treatment

Figure 8 shows a lateral cephalometric radiograph taken at the end of the patient's orthodontic treatment, providing a side view of the head that highlights the dental and skeletal

changes achieved. The radiograph reveals the improved alignment and angulation of the teeth, particularly the incisors, and the corrected relationship between the upper and lower jaws, addressing previous discrepancies. Additionally, the patient's profile, including the soft tissue outline, demonstrates enhancements in facial aesthetics and harmony. The relationship between the teeth and supporting bone structures indicates the stability and success of the orthodontic treatment. This radiograph is essential for evaluating the final outcomes of the treatment, offering a detailed view of the dental and skeletal improvements.



Figure 8. Lateral cephalometric radiographs at the end of orthodontic treatment

Figure 9 shows a panoramic radiograph at the end of the patient's orthodontic treatment, providing a comprehensive view of the upper and lower jaws. The radiograph highlights the significant improvements in the alignment and spacing of all the teeth compared to the initial state. It shows the proper positioning of the brackets and wires, indicating the completion of the orthodontic treatment. The overall health of the jawbone and the roots of the teeth appears stable and well-supported. Additionally, the corrected dental arches demonstrate the achieved symmetry and alignment. This radiograph is essential for evaluating the overall success of the orthodontic treatment, confirming that the dental and skeletal structures are in their optimal positions and that the treatment goals have been met.

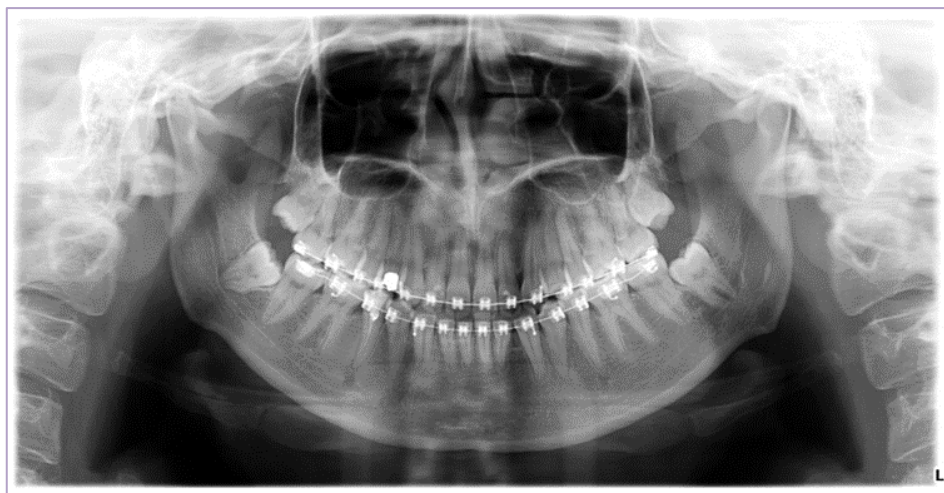


Figure 9. Panoramic radiograph at the end of orthodontic treatment

Table 2 compares the patient's cephalometric analysis results before and after orthodontic treatment. Skeletal analysis showed that most values, including SNA and facial angle, remained within normal ranges, while SNB, ANB, SN-MP, and Y-axis stayed outside normal ranges with no

changes. Dental analysis revealed that U1-NA measurements remained constant, with the angle within normal limits but the millimeter value above. The L1-NB measurements increased slightly, both remaining above normal. Notably, the U1-L1 angle improved significantly from 120° to 109°, indicating positive progress, while the U1-SN angle remained slightly above normal. Overall, some parameters improved, but others still require further evaluation.

Table 2. Results of lateral cephalometric analysis before and after orthodontic treatment

Measurement	-	Mean	+	Pre- treatment	Post-treatment
Skeletal analysis					
SNA °	78	82	86	80	80
SNB °	76	80	84	75	75
ANB °	0	2	4	5	5
SN-MP °	20	32	40	44	44
Facial Angle	82	87,8	95	95	95
Convexity angle	10	0	-8,5	10	10
Y-axis	66	59,4	53	70	70
Dental analysis					
U1-NA mm	2mm	4mm	6mm	8	8
U1-NA °	15	22	32	30	30
L1-NB mm	2mm	4mm	6mm	11,5	12,5
L1-NB °	15	25	32	36	38
U1-L1	150	131	120	109	108
U1-SN	93	101	109	110	110

3. Discussion

Orthodontic treatment aims to achieve good occlusion, function, and aesthetics.⁶ Anterior crossbite is an abnormality in the scan of one or more maxillary anterior teeth against the mand, in this caseibular teeth, that should be treated to avoid aesthetic, occlusion, and functional problems.^{1,4} Dental anterior crossbite can be treated using removable or fixed appliances. Fixed appliances are usually used for cases that require bodily tooth movement.⁵ Treatment using a fixed appliance aims to achieve good tooth alignment at both the root and crown. However, standard brackets for lateral incisors cannot provide enough labial root torque to move the roots correctly during crossbite correction. Labial root torque can be applied to the wire using torque pliers or an auxiliary to torque a single tooth.⁷

An anterior crossbite was on the upper left lateral incisor in this case. This crossbite condition can cause the crown to move labially and the root to be left palatally, requiring additional wire bending and increasing the duration of treatment. Another procedure that can be done to address such cases is to create enough space for the crossbite teeth using an open coil spring and positioning the brackets in an inverted position.⁸ Rotating the position or switching the left and right sides of the brackets can be helpful for biomechanical purposes. Teeth with a palatal position are fitted with brackets inverted or rotated 180 degrees to obtain more labial root torque. Orthodontists recognize the "flip, don't switch" rule to get a reversed torque without changing the tip.⁹ In this case, the patient used an MBT prescription to increase the lateral incisor's labial root torque by 20°, from 10° to -10°, with a fixed tip value of 8° (Figure 10). This position will guide the labial root torque during the rectangular wire phase. The brackets are fixed in their respective positions: the left bracket is fixed in the left region, and the right bracket is fixed in the right region.⁷⁻⁹

Figure 10 illustrates the technique for managing a lateral incisor crossbite by inverting the bracket position. The diagram is divided into two sections: "Tip" and "Torque." In the "Tip" section, the left diagram shows the standard bracket position on a lateral incisor, aligned with the tooth's natural inclination, while the right diagram shows the bracket inverted 180°, altering the angle and direction of the applied force. In the "Torque" section, the left diagram depicts the torque effect with the standard bracket position, showing how the tooth moves in response to the applied force, whereas the right diagram demonstrates the torque effect with the inverted bracket position, indicating a different force direction that aids in correcting the crossbite. By inverting the bracket, the orthodontist can more effectively control the tip and torque of the lateral incisor, facilitating the correction of the crossbite and allowing for precise adjustments to achieve the desired tooth alignment.

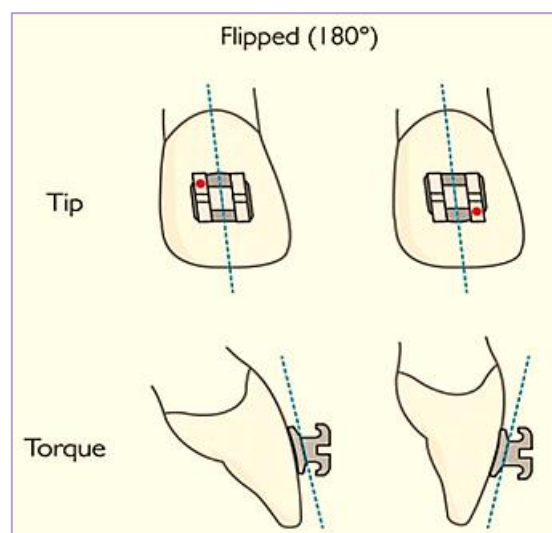


Figure 10. Management of lateral incisive crossbite with inverted bracket position⁹

The final treatment showed an excellent lateral incisive root position without additional wire bending on tooth 22. This crossbite treatment management has been suggested by McLaughlin et al. and has been done by Abrar et al. The brackets' placement in an inverted position effectively corrects the root position of crossbite teeth without requiring wire bending or an auxiliary spring.⁸⁻¹⁰ Proper diagnosis and treatment plans can make treatment more effective and efficient.

4. Conclusion

A proper diagnosis and treatment plan will affect the success of the treatment. In the treatment of this case, the use of pre-adjusted brackets with the MBT system and the placement of the left upper lateral incisive bracket in an inverted position successfully corrected the anterior crossbite on the tooth both at the crown and root without the need for additional wire bending or auxiliary spring.

5. Conflict of Interest

There were no reported conflicts of interest that are pertinent to this article.

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Authors Contribution

Contribution	Khairiyah Ulfah	Ilham Mulkhairul	Andayani R
Concepts or ideas	√		
Design	√		√
Definition of intellectual content	√	√	√
Literature search	√		
Experimental studies	√	√	√
Data acquisition	√		
Data analysis	√	√	√
Statistical analysis			
Manuscript preparation	√	√	√
Manuscript editing	√		√
Manuscript review	√	√	√



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