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**Research Paper**

# Exploring Management Techniques for Crossbite Correction: A Case Series Demonstrating Successful Treatment Strategies.

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***Abstract:***
*Anterior crossbite is a dental misalignment where the upper front teeth are positioned behind the lower front teeth. This type of malocclusion is commonly observed in children during the development of their teeth. The single-tooth anterior dental crossbite is the most encountered type of malocclusion during the mixed dentition period. If left untreated, anterior crossbite can lead to various complications such as recession of the gums, temporomandibular joint (TMJ) dysfunction, and worsening of mandibular displacement. Therefore, it is important to diagnose and treat anterior crossbite in children at an early stage to avoid potential problems in the future. Effective treatment of anterior crossbite depends on correct indication and motivation. Various treatment modalities are available for correcting anterior crossbite in children, and the decision on which approach to use depends on the cause of the crossbite, treatment goals, and the child's behaviour.*
*This paper describes four case studies where different treatment modalities were used to successfully correct anterior crossbite in children with mixed dentition. These cases highlight the importance of early diagnosis and appropriate treatment for anterior crossbite to prevent complications and ensure optimal outcomes.*

***Keywords:*** *Crossbite, inclined plane, tongue blade therapy, 2/4 appliance, Hawley's with Z spring.*

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## I. Introduction:

The lingual position of the upper frontal primary or individual permanent teeth in respect to the lower incisor teeth is known as an anterior cross bite[2]. "The first time a crossbite is noticed is the best time to treat it". Anterior dental crossbite is a condition that occurs in about 4-5% of the population and is often caused by a malposition of the maxillary incisors resulting from a lingual eruption path. Other possible causes include trauma to the primary maxillary incisors leading to lingual displacement of the permanent tooth buds, crowding in the incisor region, supernumerary anterior teeth, a habit of biting the upper lip, delayed exfoliation of primary incisors, over-retained or pulpless deciduous teeth or roots, and odontomas.[3] Regardless of the cause of the malocclusion, whether skeletal or dentoalveolar, early treatment of anterior crossbite is recommended during primary and early mixed dentition. However, early treatment may not always eliminate the need for orthodontic treatment in permanent occlusion.

It is crucial to diagnose and treat anterior crossbite early to avoid complications such as gum recession, TMJ dysfunction, and mandibular displacement. Therefore, regular dental checkups should be scheduled for children to identify any dental misalignment and commence treatment promptly.[4]

It is highly recommended to correct anterior crossbite during early mixed dentition as this type of malocclusion does not naturally improve with age. failure to correct anterior crossbites can lead to various complications. Abnormal wear of the lower incisors can occur due to their contact with the upper incisors, which can result in enamel loss and sensitivity. Dental compensation of the mandibular incisors can also occur, which can lead to thinning of the labial alveolar plate and/or gingival recession. This type of malocclusion is not uncommon during mixed dentition, and early diagnosis can help orthodontists treat minor irregularities in developing dentition with ease.

Various treatment options are discussed in the case series below. Early treatment of anterior crossbite can prevent future complications and provide the best possible outcome for the patient. Regular dental checkups can help identify dental misalignments, enabling prompt treatment of the condition

**Case 1:**

An 8-year-old female patient reported to the Department of Pedodontics and Preventive dentistry with the chief complaint of irregularly placed upper front tooth. There was no history of parafunctional habits. On clinical examination, the patient was found to have a mesochocephalic head, mesoprosopic face, straight profile, and competent lips. Examination of dentition revealed class 1 molar and canine relationship on both sides with upper central incisor (11) placed palatally. Negative overjet is observed in relation to 11. Based on clinical condition it was diagnosed as anterior crossbite in relation to 11(maxillary right central incisor). Based on analysis, there was sufficient mesiodistal width to achieve labial movement of the maxillary tooth without any alteration of profile.

The treatment planned was to use inclined plane to correct the cross bite. an inclined plane with a slope of 45 degrees to the long axis of the tooth is created using acrylic material. The acrylic inclined plane is then cemented onto the mandibular incisors and canines using a type of dental cement called zinc oxide eugenol cement. After cementation, the only contact point was present at the incisor region in the state of occlusion. Patients were advised to maintain good oral hygiene and were recalled every week to clinically evaluate the progress of the treatment. The parents were advised that the child may feel unusual with the new bite for some time. The child was expected to adjust to the new bite, and a softer diet than usual was recommended for the first few days. Follow-up examination revealed, after 3 weeks there was complete correction of cross bite. The Catlan's appliance was therefore taken out, and the enamel surface was polished and topical fluoride (APF gel) was applied. After six months, the patient was evaluated, and the crossbite regarding the maxillary right central incisor had not recurred.

**CASE :1**

**Preoperative**

**Intraoperative**

**Post operative**

**FIGURE: 1** Shows pictures of case 1 (Preoperative, Intra operative and Postoperative)

**Case 2:**

An 8-year-old female patient reported to the Department of Pedodontics and Preventive dentistry with the chief complaint of irregularly placed upper front teeth. There was no history of parafunctional habits. On clinical examination, the patient was found to have a mesochocephalic head, mesoprosopic face, straight profile, and competent lips. Examination of dentition revealed class 1 molar and canine relationship on both sides with upper central incisor (21) placed palatally. Negative overjet is observed in relation to 21. Based on clinical condition it was diagnosed as anterior crossbite in relation to 11(maxillary left central incisor). Based on analysis There was sufficient mesiodistal width to achieve labial movement of the maxillary tooth without any alteration of profile.

The treatment planned was to use tongue blade therapy to correct the cross bite. The tongue blade is made to rest on the mandibular anterior teeth in cross bite that acts as fulcrum and the patient is asked to rotate the oral part up and forwards. Patients were advised use it for 1-2 hrs for about 2-3 weeks. Patient was recalled weekly to evaluate the treatment progress. The parents were informed that the child's bite would feel unusual for a while, but the child would adjust to it. Follow-up examination revealed, after 3 weeks there was complete correction of cross bite.

**CASE 2**

**Preoperative** **Intraoperative** **Post operative**

**FIGURE :2** Shows pictures of case 2 (Preoperative, Intra operative and Postoperative)

**Case 3:** An 10-year-old female patient reported to the Department of Pedodontics and Preventive dentistry with the chief complaint of irregularly placed upper front tooth. There was no history of parafunctional habits. On clinical examination, the patient was found to have a dolicocephalic head, leptoprosopic face, covex profile, and competent lips. Examination of dentition revealed class 1 molar and canine relationship on both sides with upper central incisor (11) placed palatally. Negative overjet is observed in relation to 11. Based on clinical condition it was diagnosed as anterior crossbite in relation to 11(maxillary right central incisor). Based on analysis There was sufficient mesiodistal width to achieve labial movement of the maxillary tooth without any alteration of profile.

The treatment planned was to use Hawley's with z spring appliance to correct the cross bite. To activate the Z spring, open the coils with the help of universal pliers until the tip of the active arm is deflected by 2 millimetres, or one third of the mesiodistal dimension of the tooth to be moved. This little force (25-30 g) lasts for two to three weeks. Patients were advised use it for 2-3 weeks. Patient was recalled every week for activation and to clinically evaluate the progress of the treatment. The parents were informed that the child's bite would feel unusual for a while, but the child would adjust to it. Follow-up examination revealed, after 3 weeks there was complete correction of cross bite.

**CASE-3**

**Preoperative** **Intraoperative** **Post operative**

**FIGURE :3** Shows pictures of case 3 (Preoperative, Intra operative and Postoperative)

**Case 4:**

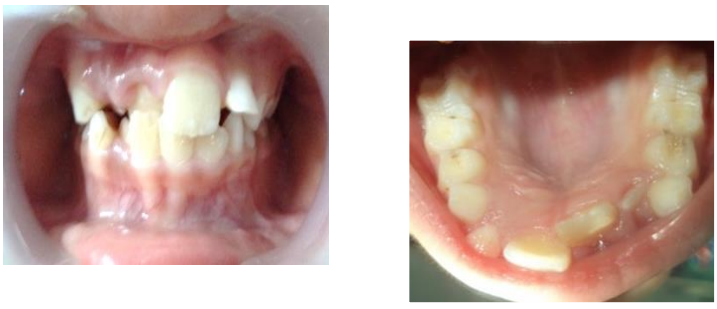
An 7-year-old female patient reported to the Department of Pedodontics and Preventive dentistry with the chief complaint of irregularly placed upper front tooth. There was no history of parafunctional habits. On clinical examination, the patient was found to have a mesocephalic head, mesoprosopic face, straight profile, and competent lips. Examination of dentition revealed class 1 molar and canine relationship on both sides with upper central incisor (21) placed palatally. Negative overjet is observed in relation to 21. Based on clinical condition it was diagnosed as anterior crossbite in relation to 21(maxillary left central incisor). Considering analysis The maxillary tooth was able to shift labially without changing its profile as there was enough mesiodistal width.

The treatment planned was to use Hawley's with z spring appliance along with 2/4 appliance to correct the cross bite and alignment was done using 2/4 appliance. To activate the Z spring, open the coils with universal pliers until the tip of the active arm is deflected by 2 millimetres, or one third of the mesiodistal dimension of the tooth to be moved. This little force (25-30 g) lasts for two to three weeks. 2/4 appliances use Niti wires elastic property for alignment of tooth in arch.

All these approaches provided a successful outcome with no significant complications or discomfort to the patient. Regular monitoring of the patient's oral hygiene and follow-up appointments were essential to ensure the maintenance of a proper bite alignment.

**CASE-4**

**Preoperative**



**Intraoperative**

**Post operative**

**FIGURE :4** Shows pictures of case 4 (Preoperative, Intra operative and Postoperative)

## II. Discussion:

Anterior crossbite is a dental condition that typically does not correct itself without intervention. This is because the upper incisors are positioned behind the lower incisors, causing the discrepancy to worsen over time and leading to significant misalignment of the teeth. Fortunately, early treatment can help restore proper muscle balance and promote healthy occlusal development. By addressing this issue early on, it is also possible to prevent any abnormal growth of both the skeletal and dental components, which can contribute to more serious malocclusion problems in the future. [5] To correct permanent anterior dental crossbite, the ideal age range is typically between 8 to 12 years old. This is because during this time, the roots of the teeth are still developing, and the teeth are in an active stage of eruption, making it easier to correct the misalignment. However, it is important to note that age is not the only factor to consider. The patient's motivation for treatment and how they perceive the problem are also important factors to consider when determining the best course of action. Ultimately, early intervention is often recommended to prevent the condition from worsening and to achieve the best possible outcome for the patient's oral health and well-being. [6]

Before treating a crossbite, it is important for the clinician to determine whether it is of dental or skeletal origin. A dental crossbite involves the localized tipping of a tooth or teeth and does not involve the underlying basal bone. In contrast, a skeletal crossbite is caused by a discrepancy in the size or position of the upper and lower jaws, which can result in malocclusion of the teeth and require a different approach to treatment.[7] Pseudo Class III malocclusion is a type of dental anterior crossbite that must be distinguished from sagittal skeletal discrepancies. In this condition, the maxillary incisors are retroclined or tilted backwards, causing the appearance of a Class III malocclusion or an underbite. However, the underlying cause of the malocclusion is due to dental factors rather than skeletal issues. That is why treatment of these cases should purpose to correct maxillary incisor inclination. Moyers is recognized for his pseudo-Class III malocclusions can be corrected by linguoversion. The latter does not result in a positional connection caused by early interference and entails palatal placement of one or more maxillary anterior teeth (Moyers, 1988)[3].

The removable orthodontic appliance used has three major advantages[4,8]:

i) Reducing chair side time
ii) Easily placement and removal.
iii) Improved oral hygiene.

The alignment of the dentition is the primary goal of employing a removable or fixed device for preventative purposes.

2. The harmony and stability of the skeletal, muscular, and dental components.

3. To ensure the optimal intercuspation[1],

Tongue blade, inclined plane, composite plane, reverse stainless-steel crown, Hawley's appliance with 'z' spring, and screws embedded in acrylic are some of the appliances used to treat "anterior" crossbites.[4,9,10,11]. Removable appliances are one of the most often used treatment modalities throughout the mixed dentition phase. Removable devices are simple to wear and provide better patient comfort.

Tongue blade therapy:

Tongue blade therapy is effective during the early stages of tooth development, but requires patient cooperation as the amount and direction of force applied cannot be precisely controlled. This procedure works best on young children with partially erupted permanent teeth that can be gently tipped into proper position. Single tooth cross-bite cases with still erupting incisors are the suggested candidates. The blade is placed at an angle between the teeth and the patient is instructed to bite down tightly for five seconds, repeated twenty-five times a day. If no changes are observed after two days, the therapy is discontinued. However, its main drawback is its dependence on full patient cooperation.[6]

Inclined plane:

For treating multiple teeth, an acrylic inclined plane is recommended. It works by creating a forward sliding motion upon closure of the upper teeth. The plane caps the lower incisors at a 45° angle to the occlusal plane. When the upper incisors bite down on the plane, the pressure is divided into two force vectors - P1 and P2. P1 proclines the upper incisors, while P2 intrudes them. The steeper the plane, the greater the forward pressure on the maxillary incisors, with the recommended angle being 45°. Positive results can be seen as early as 15 days with good patient compliance, but it should be used for no more than four weeks to avoid supra-eruption of the posterior teeth and anterior bite opening.[5]

Hawleys with Z-spring:

The Hawley's appliance with a z-spring is a possible treatment for multiple teeth in crossbite. It includes an Adam's clasp and labial bow as retentive components, both made from 21-gauge round stainless-steel wire. The active component is the Z-spring, which pushes the incisors into the arch once space is gained. Additionally, a posterior bite plane is included to disocclude the anterior teeth.[12]

In Case 3, a Hawley's appliance with a double cantilever spring was provided to correct a cross-bite issue as there was enough space for the teeth to move in the desired direction. Additionally, a maxillary posterior bite plate was used to create clearance for the correction and prevent interference from the mandibular incisors. The patient was compliant with the treatment, resulting in early correction within 15 days.

While removable appliances are easy to wear, there are some drawbacks such as requiring multiple appointments, limited control over tooth movement, and the potential for unwanted tooth movements if not activated properly. These appliances also require significant patient cooperation. In contrast, fixed appliances can be used immediately after the eruption of permanent molars and incisors, have minimal patient discomfort except during the placement of bands and brackets, produce controlled tooth movement, and have a faster treatment duration due to the high application of force.[14]

2 x 4 appliance:

The 2x4 appliance, a sectional fixed appliance, allows for more effective and efficient positioning of teeth by providing three-dimensional control during correction of malaligned anterior teeth.[15] This technique can easily and quickly treat diastemas, rotations, and improper inclinations of teeth. Partial fixed treatment with the 2x4 appliance is an option for early correction of simple and minor malocclusions involving one or more teeth.[16,17] It can also be used to correct complex malocclusions in two steps, with the early correction of mild malocclusions by a fixed partial appliance followed by comprehensive treatment.[18]

Composite Plane: An inclined plane is made up of composite on the lower incisors.

Reverse stainless steel crown:

A crown can also be used to correct a "single tooth" crossbite by placing it on the upper incisor to force the tooth away from the lower teeth towards the lip. This correction typically takes two to four weeks. Reverse stainless steel crowns have been effective in this procedure, but the primary drawbacks are the crown's unsightly look and the difficulties in working with an inclined slope that results.[21]

Medium, mini, or micro screws embedded in acrylic can be used to correct crossbite. These screws are activated daily to bring about the necessary correction.

According to a study by Prakash et al in 2011, the ideal time for anterior dental crossbite correction is between 8 to 11 years of age, as it is during this period that the roots are forming and the teeth are actively erupting. However, the motivation and cooperation of the child during treatment are also important factors to consider.[22]

## III. Conclusion:

The cases mentioned above demonstrate satisfactory alternative methods for correcting anterior dental crossbites during the mixed dentition period. It is important to recognize the need for early diagnosis and correction. Early correction of simple and minor malocclusions, as part of interceptive orthodontic treatment, can rapidly correct anterior crossbites using either removable or fixed appliances. Primary treatment not only restores aesthetics but may also reduce the complexity and duration of any subsequent required treatment. This can help prevent potential adverse effects on the growth and development of the child.

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