

Early interceptive correction of anterior crossbite with 2×4 Appliance in Mixed Dentition: A Report of 2 Cases

Neema K A *, Madhu S, Bijumon C B and Salini V K

Department of Pediatric and Preventive Dentistry, Government Dental College (Affiliated to KUHS), Calicut, Kerala, India.

International Journal of Science and Research Archive, 2026, 20(01), 478-482

Publication history: Received on 23 May 2026; revised on 10 July 2026; accepted on 13 July 2026

Article DOI: <https://doi.org/10.30574/ijrsra.2026.20.1.1426>

Abstract

Anterior crossbite is a common malocclusion seen during the mixed dentition stage and requires early interception to prevent periodontal damage, traumatic occlusion, and the development of skeletal discrepancies. This case series highlights the successful management of anterior crossbite using a 2×4 fixed appliance in two pediatric patients. The first case involved an 11-year-old female with anterior crossbite in relation to the maxillary right central incisor associated with Miller's Class I gingival recession of the mandibular incisor. The second case involved a 10-year-old male presenting with anterior crossbite in relation to maxillary left central incisor along with facial asymmetry. Both patients were treated using a 2×4 appliance with sequential Ni-Ti arch wires, achieving correction within approximately four months. Improvement in periodontal condition and facial esthetics was also observed. The case series demonstrates that the 2×4 appliance is an effective modality for early correction of anterior crossbite in mixed dentition, providing favorable occlusal, periodontal, and esthetic outcomes.

Keywords: 2×4 appliance; Anterior crossbite; Esthetics

1. Introduction

The mixed dentition stage represents the transitional phase from primary to permanent dentition. During this period, it is important to distinguish between malocclusions that require intervention and those that may self-correct naturally. Common malocclusions observed in this stage include anterior and posterior crossbites, crowding, rotations, midline diastema, and spacing. These abnormalities may affect either a single tooth or multiple teeth within the dental arch¹.

Anterior crossbite refers to an abnormal labiolingual relationship involving one or more anterior maxillary and mandibular incisors. Clinically, it presents as a reverse overjet, where one or more maxillary incisors are positioned lingually in relation to the mandibular incisors during occlusion in centric relation². The etiology of anterior crossbite is multifactorial, with contributing factors classified into skeletal, dental, and functional categories, depending on the underlying nature of the malocclusion³. Anterior crossbite can have a detrimental impact on periodontal health, potentially resulting in gingival recession, alveolar bone thinning, and increased mobility of the opposing mandibular teeth.

Interception and treatment of anterior cross bites should be performed at an early stage since it is a self-perpetuating condition and if early treatment is not done, it has the potential of growing into skeletal malocclusion and might require major orthodontic treatment combined with surgical procedures at a later stage⁴. Various treatment options are available for the correction of anterior crossbite, such as removable appliances with Z-springs for maxillary incisors, Hawley appliances with auxiliary springs, inverted labial bows, acrylic inclined planes, Catlan's appliance, fixed multi-bracket systems, bonded resin composite slopes, and the 2×4 appliance. Among these, the 2×4 appliance has several advantages over other methods, including better control of anterior tooth movement, good patient acceptance,

* Corresponding author: Neema K A

elimination of the need for patient cooperation in appliance activation, and the ability to achieve efficient and precise tooth correction. The appliance is composed of brackets affixed to the maxillary incisors, bands placed on the maxillary first permanent molars, and a continuous arch wire connecting these components⁵.

The present case report series shows the use of 2X4 appliance for the correction of anterior crossbite in mixed dentition stage.

2. Case reports

2.1. Case 1

A 11-year-old female patient reported to the Department of Pediatric and Preventive Dentistry with a chief complaint of misaligned front teeth region and recession of gums on the lower front tooth. On examination, the maxillary right central incisor was in crossbite in relation to mandibular right central incisor. Also, a class 1 (Millers) gingival recession was noted on 41⁶(Fig 1). Patient was in mixed dentition stage with first permanent molars in class I relationship. The treatment was initiated by cementing molar band with buccal tube on 16 and 26. MBT brackets were placed on 12,11,21,22 and 0.012" round Ni-Ti arch wire was placed. A removable lower bite plane with labial bow was given to disocclude the occlusion to achieve a 2 mm incisal clearance and for retraction of 41 (Fig 2). In the monthly follow ups 0.014" Ni-Ti, 0.016", and 0.018 Ni-Ti" were sequentially placed. After about 4 months crossbite was corrected with sufficient overjet and recession was reduced. The lower PBP was removed, then followed by 0.018" Stainless steel wire. A Hawley's removable retainer was delivered as the retention appliance (Fig 3).



Figure 1 Pre-operative image



Figure 2 Intraoperative view



Figure 3 Post operative image

2.2. Case 2

A 10-year-old male patient was reported to the Department of Pediatric and Preventive Dentistry with a chief complaint of misaligned front teeth and facial depression on the left side. On extra oral examination mild depression/ concavity was observed over the left upper labial-paranasal area (Fig 4). On intra oral examination 21 was in crossbite relation to 31 and 22 was more labially placed with a 1mm midline shift to left (Fig 6). A 2 × 4 appliance therapy was planned. Molar band with buccal tube was cemented on 16 and 26. MBT brackets were placed on 12,11,21,22. Alignment correction was started with 0.012" round Ni-Ti wire, followed by 0.014", 0.016" and 0.018" Ni-Ti in the subsequent

months. After 4 months crossbite in relation to 21 was corrected and 22 was also aligned. An e-chain over 0.018" Stainless steel round wire was placed to correct the midline diastema that appeared after alignment correction (Fig 7). Post operatively the depression over the left labial area rectified and crossbite correction was achieved with sufficient overjet(Fig 8). A fixed lingual retainer was given for retention of the achieved corrections.



Figure 4 Pre operative Extra oral image



Figure 5 Post operative extra oral image



Figure 6 Preoperative intra oral view



Figure 7 Intra operative view



Figure 8 Postoperative intra oral view

3. Discussion

Anterior crossbite is a commonly encountered malocclusion during the mixed dentition stage and usually requires early interception to prevent the development of more severe skeletal discrepancies and periodontal complications. It is characterized by the lingual positioning of one or more maxillary anterior teeth relative to the mandibular incisors, resulting in a reverse overjet. Early correction is recommended because untreated anterior crossbite can lead to

abnormal enamel wear, traumatic occlusion, gingival recession, mobility of mandibular incisors, and disturbances in normal maxillofacial growth.

In the present case series, both patients exhibited dental anterior crossbite during the mixed dentition stage and were successfully managed using the 2×4 fixed appliance therapy. The appliance consisted of bands on the maxillary first permanent molars and brackets bonded to the erupted maxillary incisors, connected with a continuous arch wire. This appliance system provided effective three-dimensional control of tooth movement and allowed efficient correction within a relatively short treatment period.

The first case demonstrated anterior crossbite associated with Miller's Class I gingival recession in relation to 41. Traumatic occlusion due to anterior crossbite has been reported to contribute to gingival recession and thinning of the labial alveolar plate. Correction of the abnormal incisal relationship eliminated the traumatic forces acting on the mandibular incisor, which subsequently resulted in improvement of the gingival recession. Similar findings were reported by *Lee*², who emphasized that early correction of crossbite helps in preventing periodontal damage and occlusal trauma. The use of a lower removable bite plane in the present case aided in disocclusion and facilitated unhindered movement of the maxillary incisor. In a systematic review conducted by *Borrie F et al*⁷ concluded that early correction of anterior crossbite in the mixed dentition stage is generally recommended because it can prevent the development of more severe malocclusions, functional mandibular shifts, periodontal problems, and abnormal tooth wear. The review found that several treatment modalities—including removable appliances, fixed appliances, and inclined planes—were successful in correcting anterior crossbite with favorable outcomes.

The second case presented with anterior crossbite in relation to 21 along with mild depression over the left upper labial–paranasal region. The facial concavity was likely due to the lingual positioning of the maxillary incisor affecting the support of the upper lip and surrounding soft tissues. Following correction of the crossbite using the 2×4 appliance, improvement in facial profile and resolution of the labial depression were observed. This finding highlights the influence of anterior tooth position on soft tissue esthetics and facial appearance. *Yermalkar et al*⁸ also reported successful management of anterior crossbite using 2×4 appliance with favorable functional and esthetic outcomes.

The 2×4 appliance is considered a versatile and efficient method for the correction of anterior crossbite in mixed dentition. Compared with removable appliances, it offers superior control over tooth movement, does not rely heavily on patient compliance, and allows simultaneous correction of alignment and rotations. In a systematic review reported by *Jader Oliva et al*⁹ comparing removable and fixed appliances for non-skeletal anterior crossbite correction in children and adolescents about seven articles were included. The results showed that removable and fixed devices were equally efficacious for overjet correction. Removable and fixed devices can also present inconveniences regarding pain and discomfort levels, the accomplishment of everyday activities (leisure and school), and the performance of functions, such as chewing and speech. However, treatment time and costs were significantly lower in orthodontic therapy with fixed appliances. Sequential use of light round Ni-Ti arch wires in both cases enabled physiologic tooth movement with minimal discomfort. Crossbite correction was achieved within approximately four months in both patients, demonstrating the effectiveness of early interceptive orthodontic treatment. Appropriate retention using Hawley's retainer and fixed lingual retainer helped maintain the corrected incisor relationship and prevent relapse.

4. Conclusion

The present case series emphasizes the importance of early diagnosis and timely management of anterior crossbite during the mixed dentition period. The 2×4 appliance proved to be an effective treatment modality capable of providing satisfactory occlusal, periodontal, and esthetic outcomes within a short duration.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Statement of ethical approval

Ethical approval was obtained.

Statement of informed consent

"Informed consent was obtained from all individual participants included in the study."

References

- [1] McKeown HF, Sandler J. The Two by Four Appliance: A Versatile Appliance. *Dent Update* 2001; 28: 496-500
- [2] Lee BD: Correction of crossbite. *Dent Clin North Am.* 1978, 22:647-68.
- [3] Vithanaarachchi SN, Nawarathna LS: Prevalence of anterior cross bite in preadolescent orthodontic patients attending an orthodontic clinic. *Ceylon Med J.* 2017, 62:189-92
- [4] Gawali P, Jadhav G, Shigli A, Vaidya P. 2X4 Appliance: Effective Treatment Modality for Anterior Crossbite. *Annals of International Medical and Dental Research.* 2019;5(5):1
- [5] McKeown HF, Sandler J: The two by four appliance: a versatile appliance . *Dent Update.* 2001, 28:496-500
- [6] Miller PD Jr. A classification of marginal tissue recession. *Int J Periodontics Restorative Dent* 1985;5:8-13.
- [7] Borrie F, Bearn D. Early correction of anterior crossbites: a systematic review. *J Orthod.* 2011;38(3):175–184. doi:10.1179/14653121141443
- [8] Yermalkar G S, Gaonkar N, Shashikiran N, et al. (October 18, 2024) Correction of Single-Tooth Crossbite Using a 2x4 Appliance: A Clinical Case Report. *Cureus* 16(10): e71818. DOI 10.7759/cureus.71818
- [9] Jorge JO, Corradi-Dias L, Flores-Mir C, Pordeus IA, Paiva SM, Abreu LG. Comparison Between Removable and Fixed Devices for Nonskeletal Anterior Crossbite Correction in Children and Adolescents: A Systematic Review. *J Evid Based Dent Pract.* 2020 Sep;20(3):101423. doi: 10.1016/j.jebdp.2020.101423. Epub 2020 Mar 3. PMID: 32921377.