

The 2 by 4 Appliance and its application in Mixed Dentition: A Case Series

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ABSTRACT

Background Interceptive orthodontic treatment is typically carried out in order to reduce the severity of developing malocclusion, consequent psychological distress, and the need for future orthodontic interventions in a growing child. A short course of fixed orthodontic treatment in the mixed dentition may get better function, aesthetics, reduce the possibility for teasing, future orthodontic need and remain quite stable once the appliance is removed. Thus, a simple, easy and short course of fixed 2 by 4 appliance was used for the treatment of anterior, posterior crossbites, anterior space regaining, alignment of ectopic incisors and orthodontic extrusion of incisors.

Keywords: Edgewise brackets, Fixed appliance, Occlusal problems, Space regaining, Extrusion, Alignment.

INTRODUCTION

The timing of early orthodontic treatment has always been the subject of much discussion over the time, with a number of variables being studied in depth; areas investigated include clinical effectiveness, psychological benefits, influence on the treatment outcome, duration and cost effectiveness.¹ The interceptive treatment, is frequently carried out in order to reduce the severity of developing malocclusion. The correction of anterior, posterior crossbite, an ectopic eruption of the incisor, impacted teeth, space loss and rotations are very often indicated and carried out in the mixed dentition, and bring with it unique challenges. Treatment with the removable appliance is challenged in mixed dentition because of patient non-compliance and which their effects are usually unsatisfactory. The problems with removable appliances are the lack of control and they can apply only single point contact on tooth surface leading to unsophisticated tipping

movement in most of the cases.² A removable appliance would be of very limited benefit in the case of correction of rotated teeth, and required bodily movement of teeth. All the above-mentioned problems could be overcome with a 2 by 4 appliance.^{3,4}

The 2 by 4 Appliance Design and components

The basic 2 by 4 appliance consists of molar bands; pre-adjusted edgewise orthodontic brackets, continuous archwire, orthodontic sleeve, ligature ties. Molar bands are cemented on maxillary first molars. Brackets are bonded onto erupted incisors, continuous archwire to provide or maintain good arch form as well as control of anterior teeth. Supporting sleeve placed in the long archwire spans between the molar to incisors (Fig-1). Consideration treatments to be done with 2 by 4 appliances are anterior, posterior crossbite corrections, ectopic eruptions, impacted anterior teeth, space gaining and anterior alignment.

Received: Feb. 4, 2017; Accepted: Mar. 23, 2017

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CASE REPORT**Case 1: Anterior Alignment and posterior crossbite correction**

An 11-year-old girl accompanied by her parents reported to the Department of Pedodontics and Preventive Dentistry, Sri Sai College of Dental Surgery, Vikarabad, Telangana, India, with the chief complaint of unaesthetic and irregularly placed upper front teeth. Intraoral clinical examination revealed class I molar relationship with a skeletal class I base in the mixed dentition. The maxillary anterior teeth were crowded with mandibular anterior teeth being well aligned, disto-palatal rotation of maxillary central incisors and labially placed maxillary left lateral incisor. On the right side, unilateral posterior crossbite was seen (Fig-2). The case was undertaken for posterior crossbite correction and anterior alignment with modified 2 by 4 appliances.

The maxillary first molars banded with a soldered quad helix, which was activated, and the 2 by 4 appliance was placed (Fig-3) (Centrino Standard MBT 0.018" Slot Bracket Kit, Lot No1214, Libral Traders Pvt Ltd, Buccal Tubes, Weldable, Nibha Dental Corporation). Archwire sequence of 0.014", 0.016", 0.016" x 0.022", 0.017 x 0.025" NiTi (N-Force, Nickel- Titanium preformed archwire, USA) and 0.017" x 0.025" Stainless Steel wire was followed at monthly intervals. It was observed that the desirable posterior crossbite corrected and simultaneously anterior alignment was achieved and palatal bondable retainer was given (Fig-4).

Case 2: Ectopic eruption and anterior crossbite correction

A 10-year-old girl accompanied by her parents reported to the Department of Pedodontics and Preventive Dentistry, Sri Sai College of Dental Surgery, Vikarabad, Telangana, India, with the chief complaint of irregularly placed upper front teeth. Intraoral clinical examination revealed the following features; she was in the mixed dentition, maxillary and mandibular anterior teeth were crowded. Anterior crossbite in relation to 11, 21, ectopically erupted 12 and the supplemental tooth was seen. Gingival recession was observed in relationship to 31, 41. She presented with a class I molar relationship with a skeletal class I base (Fig-

5). The case was undertaken for extraction of supplemental tooth followed by anterior crossbite correction and management of ectopically erupted tooth with modified 2 by 4 appliances.

The supplemental tooth was extracted under local anesthesia and the patient was scheduled next appointment. At the next appointment the 2 by 4 appliance was placed (Wonder Brace, MIM Technology MBT 0.018" Slot, Classic Orthodontics) and upper first molars banded with a soldered Nance space maintainer (Fig-6). The wire sequence progressed through 0.014", 0.016", 0.016" X 0.022", 0.017" X 0.025" NiTi and 0.017" X 0.025" Stainless Steel archwire was followed at monthly intervals. It was observed that the anterior crossbite was corrected simultaneously with the alignment of ectopically erupted tooth. The brackets were debonded and bondable palatal retainer was given (Fig-7).

Case 3: Anterior crossbite correction

A 10-year-old boy accompanied by his parents reported to the Department of Pedodontics and Preventive Dentistry, Sri Sai College of Dental Surgery, Vikarabad, Telangana, India, came with the chief complaint of irregularly placed upper front teeth. Intraoral clinical examination revealed the following features; he was in the mixed dentition with crossbite in relation to 11, 41, 42 and distal-palatal rotation of 21. The spacing was observed in between 21, 22 and lovely placed 41 (Fig-8).

The 2 by 4 appliance was positioned; anterior bite opened with the placement of Glass ionomer cement (GC Glass Ionomer, Lot No 1411181, GC Corporation, Tokyo, Japan) on the occlusal aspect of mandibular first molars, the maxillary right central incisor was tied with a ligature wire initially (Fig-9), 2 weeks later the ligature wire removed and archwire was engaged. The archwire sequence of 0.014", 0.016", 0.016" X 0.022", 0.017" X 0.025" (N-Force, Nickel- Titanium preformed archwire, USA), and the crossbite was corrected (Fig-10).

Case 4: Extrusion of Maxillary left central incisor

An 11-year-old boy reported to the Department of Pedodontics and Preventive Dentistry Sri Sai College of Dental Surgery,

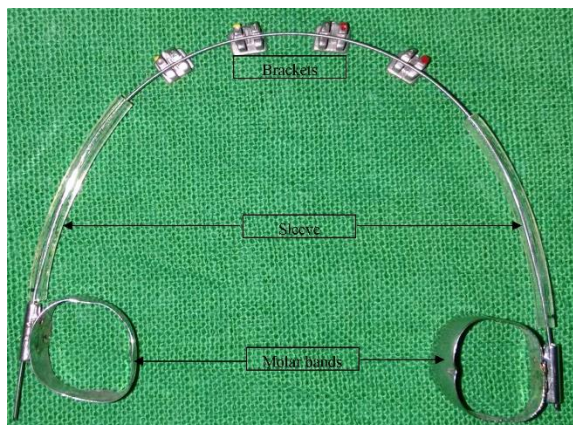


Fig 1: Appliance design and components.



Fig 2: Pretreatment photographs.



Fig 3: With 2 by 4 and Quad helix appliance.



Fig 4: Post treatment photographs.



Fig 5: Pretreatment photographs.

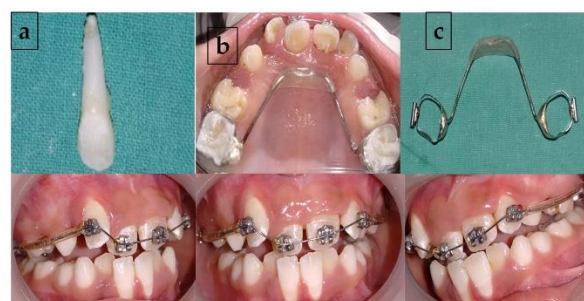


Fig 6: a) Extracted supplemental tooth. b) placement of 2 by 4 appliance. c) Nance appliance.



Fig 7: Post treatment photographs with palatal bonded retainer.

Vikarabad, Telangana, India; with the complaint of fractured front upper teeth. History revealed the bicycle accident one week before. The intraoral clinical presentation revealed, left maxillary central incisor was fractured at the level of the cervical area on the palatal surface and on the labially middle of the crown; the pulp was exposed (Ellis class III). The fractured fragment completely detached from the tooth. Radiographic examination confirmed the



Fig 8: Pretreatment photographs.

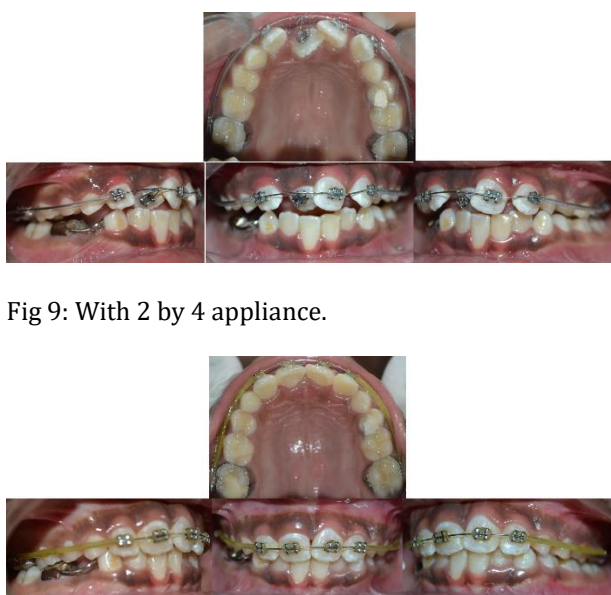


Fig 9: With 2 by 4 appliance.



Fig 10: Correction of anterior cross bite.

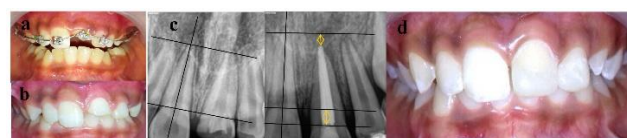


Fig 11: Pretreatment photographs and IOPA.



Fig 12: With 2 by 4 appliance. A) after extrusion. b) Pre and post IOPA.



Fig 13: Pretreatment photograph and IOPA.



Fig 14: a) With modified 2 by 4 appliance. b) after gaining space. c) IOPA. d) Replacement of 11 avulsed tooth crown.

clinical findings. Intra oral periapical radiograph showing the oblique fracture line extended at the level of alveolar bone on the palatal side, labial side 2 mm crown was intact. On the basis of clinical and radiographic findings, the diagnosis was confirmed as complicated crown-root fracture of maxillary left lateral incisor (Fig-11)

As the fracture line extended subgingivally, at the level of the alveolar crest on palatal surface, orthodontic extrusion was considered as the treatment of choice to establish a good cervical finish line above the supragingival margin before the final restoration. The prior extrusion endodontic procedure was performed.

The 2 by 4 appliance was placed, for left central incisor the bracket was bonded more towards gingivally for extrusion. NiTi archwire of 0.016" (N-Force, Nickel- Titanium preformed archwire, USA) being placed, the fractured tooth was engaged passively with a ligature wire initially, the subsequent bracket was fully engaged with arch wire over few appointments (Fig-12 a). At the next visit, 6 weeks later 21 was extruded 3mm (Fig-12 b, c), the brackets were debonded and palatal bondable retainer was given. The crown was restored with composite with a good cervical seal (Fig-12 d).

Case 5: Anterior space regaining

A 12-year-old boy accompanied by his parents reported to the Department of Pedodontics and Preventive Dentistry, Sri Sai College of Dental Surgery, Vikarabad, Telangana, India, with the chief

complaint of tooth loss in the upper front region one and half month ago in a road accident. History revealed that the patient had a bicycle accident one and half month earlier and one of the anterior tooth was avulsed and the patient brought an avulsed tooth along with him, to replace the saddle. Clinical examination revealed space loss in relation to the maxillary right central incisor, class I molar relation on both sides. Clinically a 4 mm space loss in relation to 11 was confirmed with an intraoral periapical radiograph (IOPA) (Fig-13). The case was undertaken for space regaining with modified 2 by 4 appliance.

Modified 2 by 4 appliance inserted and an aligning round Nickel Titanium arch wire of 0.016" (N-Force, Nickel- Titanium preformed archwire, USA) was placed. 0.016" AJ Wilcock stainless steel wire was placed in the next appointment with NiTi Open coil spring (0.010", 3M, USA) incorporated between 12 and 21 for space regaining (Fig-14 a). The patient was recalled every month for follow up. After four months follow-up, it was observed that the desirable space was regained, as depicted in the intraoral photographs and IOPA (Fig-14 b, c). The brackets were debonded and the saddle was replaced with patients avulsed tooth crown (Fig-14 d) using with a Resin pre- impregnated Glass Fiber (Interlig, Angelus, Model No 483, Brasil).

DISCUSSION

The advantages of fixed appliances over the removable appliances are the least discomfort, reduced need for patient cooperation and increase control of tooth movements in all three directions of space. ^{1, 5} Jonson introduced this concept in the 1930s, which is comprised of bands on the first permanent molars and bonds on the erupted maxillary permanent incisors. Continuous arch wires are used to provide complete control of the anterior dentition as well as a good arch form. This appliance permits rapid correction of several incipient malocclusions in a single short period of fixed appliance therapy in the mixed dentition stage. ³ Evidence seems to suggest that a short course of orthodontic treatment in the mixed dentition might get better function, aesthetics, and reduces the potential for teasing and remain moderately constant once the appliance is removed.¹

The 2 by 4 appliance offers many benefits over removable appliance as it provides complete control of anterior tooth position and extremely well tolerated, no adjustment is required by the patient and allows precise and rapid correction of the anterior teeth. ³ The anterior and posterior crossbites require early correction for aesthetics and functional reasons. ⁶ The dental features were the fourth most common target for teasing, on the other hand, comments about the teeth were considered to be more hurtful than any other feature, especially in the mixed dentition. ¹ The psychological influences on treatment timing, the younger children are good candidates for early treatment, have high self-esteem, body image and anticipate orthodontics to improve their lives. ^[1] Further treatment might be required in the permanent dentition, but early treatment in these cases will not only speedily restore anterior aesthetics, but may also lessen the complexity and duration of any subsequent orthodontic treatment.

Consideration must be taken wherever, by correcting anterior crossbite and anterior alignment there could be damage due to the closeness of their roots with that of the crown of the developing permanent canine. This could be confirmed with Orthopantomograph or Intra oral periapical radiograph. In the present cases, the favorable position of developing permanent canine and the root of lateral incisor was seen.

CONCLUSION

Despite the fact that there may be slightly more chair side time required to place the appliance, there is no laboratory cost involved as with a removable appliance.

The treatment was lesser time duration with fewer recall visits of the patients. The early orthodontic treatment might improve esthetics, rendering psychological well-being of the child, proper development of the dental arches and this appliance gives a significant advantage over the removable appliance in the mixed dentition problems.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Dowsing P, Sandler PJ. How to effectively use a 2 X 4 appliance. J Orthod 2004; 31:248-258.
2. Ninou S, Stephens C. The early treatment of posterior crossbites: a review of continuing controversies. Dent Update 1994; 21: 420-426
3. Mckeown HF, Sandler J. The two by four appliance: A versatile appliance. Dent Update 2001; 28: 496-500.
4. Skeggs RM, Sandler PJ. Rapid correction of Anterior Crossbite using a Fixed Appliance: A case Report. Dent Update 2002; 29: 299-302.
5. Mohammad Z, Cheruku SR, Penmetcha S, Bagalkotkar A, Kumari S. A Novel Approach to Regain Anterior Space Using Modified 2 by 3 Fixed Appliance: A Report of Two Cases. JCDR 2015; 9 (10): 23-25.
6. Mohammad Z, Cheruku SR, Penmetcha S, Namineni S, Vaaka PH. Customized Modified Haas Palatal Expansion in Mixed Dentition: A Case Report. JCDR 2016; 10(10):1-4.