



The Applications of 2 x 4 Appliance During Mixed Dentition Treatment

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Abstract

Mixed dentition period is considered as one of the most crucial age for undergoing orthodontic treatment. One of the common myth's parents have is that orthodontic treatment should be done only after the complete eruption of all the permanent teeth. According to the American Association of Orthodontists (AAO) the ideal age for a child to seek orthodontic treatment can be as early as 7 years. Certain malocclusions if treated early can not only correct the occlusion but also can ensure a proper growth and development of jaws and surrounding structures. One of the appliances which can intercept the prevalence of more serious malocclusions in the future is the 2 x 4 appliance. The aim of this article is to emphasize the importance of 2 x 4 appliance in treating certain malocclusions in mixed dentition period.

Keywords: 2 x 4 Appliance; Interceptive Orthodontics; Mixed Dentition Treatment

Introduction

Over the year's treatment during the mixed dentition phase has always been a topic of debate. Some authors have put forth their concern on the psychological impact, clinical effectiveness, growth of the craniofacial structures and outcome of treatment while undergoing orthodontic treatment at an early stage. Mixed dentition stage is a period of transition from primary teeth to permanent teeth. Due to this transition the differences between a malocclusion requiring correction with those which are self-correcting needs to be emphasized. Few of the most common malocclusion seen during this stage are the anterior and posterior crossbites, crowding, rotations, midline diastema, spacing etc. These malocclusions can occur involving a single tooth or a set of teeth in the arch. Some parents feel that orthodontic treatment for a child should wait until the eruption of all the permanent teeth. However, the ideal age for referring a child to an orthodontist is as early as 7 years of age. By this age a child's criteria of "good looks" is same as that of adults, of which a good and balanced smile plays a very important role. According to some authors fixed orthodontic treatment with bands on the posterior teeth and brackets on all the remaining teeth are necessary for proper control over the tooth movement. Correction of malocclusion at an early stage not only intercepts the improper

occlusion but also can alter the growth and development of jaws and surrounding structures which leads to malocclusion [1]. Interceptive orthodontic treatment at an early stage can not only boost the young child's self-esteem but also avoid the need of undergoing cumbersome orthodontic treatment in the future [2].

The 2 x 4 appliance

One of the important aspects while selecting a 2 x 4 appliance is the eruption of permanent molars and incisors. The appliance consists of bands cemented to the first permanent molars on both sides for anchorage with brackets bonded onto the erupted permanent incisors. Continuous arch wires are inserted into the molar tubes attached to the bands on either side to maintain a correct arch form as well as for a controlled tooth movement. Since the primary teeth are not suitable for bonding brackets, a stainless-steel supported tubing is placed on the arch wire spanning between the molars and incisors. This tubing's helps to support the arch wire from being distorted from occlusal forces [3]. Care must be taken to ensure that the stainless-steel tubing expands to the entire space in between the molars and incisors. A nickel titanium open coil spring can be inserted into the tubing in case of additional requirement of space. In case of additional space require-

ment for incisor proclination a nickel titanium closed coil spring can be added advantage. If there is a need for expansion a quad helix can be incorporated by soldering it to the bands in the molars. Additional care should be taken by annealing the extra wire distal to the molar tube for prevention of damage to soft tissues and preventing unwanted movement of the molars. The 2 x 4 appliance can be stated as partial fixed orthodontic treatment during the early stages to correct many malocclusions which are common during the mixed dentition period.

Correction of Common Malocclusions with 2 x 4 appliance

Correction of rotated teeth

In a case report by Radhika., *et al.* [4], orthodontic derogation in a 12-year-old girl with rotated 22 was performed using 2x4 appliance and Circumferential supracrustal fiberotomy (CSF) with laser, followed by splinting with a bonded lingual retainer. According to the author the correction of derogated teeth was achieved in short duration of time which states that early treatment in these cases can not only prevent the extensive orthodontic treatment in the future but also can have functional improvement coupled with psychological impact on the individual.

Correction of Midline Diastema

Harika., *et al.* [5] reported a case of 10-year-old girl who reported with spacing and rotations in the upper maxillary incisor teeth. A labial frenectomy combined with 2 x 4 appliance to correct the midline diastema and rotation were performed. The malocclusions were corrected in a short period of time with ease and significant advantage over the traditional methods. Another case report by Hussaina., *et al.* [6], stated the importance of 2 x 4 appliance in the management of midline diastema with multidisciplinary approach.

Correction of Crossbite

In a case report by Mckeown., *et al.* [2], a 9-year-old girl had reported with a unilateral crossbite on the right side with class III incisor relationship. A removable quad helix was placed to expand the upper arch and to derogate the mediolaterally rotated maxillary first permanent molars. Brackets were then placed on the upper incisors and levelling and aligning were performed. Correction of the posterior crossbite, alignment of the maxillary incisors and space closure required nine visits over a 13-month period. Another series of cases were reported by Agarwal., *et al.* [7], of a 11 and 14-year-old boys who were treated with 2 x 4 appliance for the correction of crossbite and concluded that the 2 x 4 appliance therapy had been advantageous over the conventional removable appliances. In this appliance continuous arch wires provided complete

control of the anterior dentition as well as maintenance of good arch form was achieved. Rapid correction of malocclusion took place in a single short phase of therapy. 2 x 4 offers a more effective and efficient tooth positioning and allows three-dimensional control of the involved teeth during correction of anterior cross bite.

Correction of Palatally Displaced Teeth

Fatima., *et al.* [8], reported a case of 11-year-old girl who reported with a reverse bite and minor crowding. For the reverse bite treatment was done using chin cup and jack screw on maxillary incisors and the fine adjustments of alignment and consolidation of overjet and overbite was obtained by similar partial fixed appliance which was a 2 X 4 appliance. The treatment time reported was 4 weeks. Another case report by same author of a 10-year-old boy with irregularly positioned maxillary central incisor was corrected within 2 months after undergoing the 2 x 4 appliance treatment.

Bodily Movement of Canine

Bodily movement of ectopically erupted canine requires careful diagnosis and appropriate treatment planning to avoid root resorption. In a case report by Tsui., *et al.* [9], a 9-year-old girl with Class I malocclusion and ectopically positioned upper left canine (23) were treated with extraction of all first premolars and alignment was done using a modified 2 x 1 appliance. According to the author the modified 2 by 1 appliance allows individualized bodily tooth movement of canine by providing light and continuous force for physiological orthodontic movement with minimal root resorption.

Correction of Impacted Teeth

In a case report by Dowsing., *et al.* [10], an 8-year-old boy was reported with delayed eruption of upper left central incisor due to the presence of supernumerary tooth. The treatment initiated with the removal of the supernumerary tooth and the impacted central incisor was brought to occlusion using a 2 x 4 appliance. The entire treatment duration was reported to be 10 months.

Advantages of 2 x 4 Appliance

1. Ease of application
2. Versatility
3. Prevention of malocclusion at an early stage
4. Shorter duration of treatment
5. Less application of force compared to the conventional orthodontic treatment.
6. Minimal root resorption
7. Improves the self-esteem at an early stage.

Disadvantages of 2 x 4 Appliance

1. Cannot correct skeletal malocclusions
2. Needs significant patient cooperation
3. Unsuitable for primary teeth

Discussion

One of the most common mode of treatment during the mixed dentition period is the use of removable appliances. Removable appliances although are easy to wear and patient comfort is more satisfactory, there are few drawbacks which includes 2 or 3 appointments, less control of tooth movements, improper activation can lead to unwanted tooth movements and requires immense patient cooperation. In contrast to this fixed appliance treatment can be initiated immediately as soon as the permanent molars and incisors have erupted, have minimal patient discomfort except while placing the bands and brackets, produces active and controlled tooth movement and due to the high application of force the treatment duration is comparatively faster compared to the removable appliances [11].

Treatment Duration

Treatment with 2 x 4 appliance can be started as soon as the permanent incisors and molars have erupted. According to Sandler, *et al.* [12], the use of 2 x 4 appliance at an early stage can correct the malocclusion efficiently within a couple of weeks or months compared to the conventional fixed appliance treatment. One of the main advantages of this appliance is it is not patient dependent as the removable appliance, which provides the orthodontist of total control over the tooth movement.

Conclusion

One of the keys to achieve a successful orthodontic treatment results lies in the hands of the parents as well as orthodontist. Identifying a malocclusion at an early stage and diagnosing the malocclusion at a correct age can lead to achieve stability in the treatment results. Correction of simple malocclusions need not be waited till the eruption of all the permanent teeth. A 2 x 4 appliance is a versatile, easy to use and effective appliance which can intercept simple malocclusions at an early stage with shorter treatment time duration compared to the traditional treatment. Due to this, the malocclusions can be treated early boosting the self-esteem of the child at an early stage.

Conflict of Interest

Nil.

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