

Interceptive Orthodontic Treatment using the Versatile 2 x 4 Appliance: A Case Report

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Abstract

The mixed dentition period is considered one of the most ideal ages for undergoing interceptive orthodontic treatment. Children possess a higher perception of dental esthetics. Dental malocclusions were found to affect the self-esteem of the children. American Association of Orthodontics recommends that a child can undergo orthodontic treatment at the early age of 7 years. Certain malocclusions can be corrected during the mixed dentition period aids in the normal growth of jaws and surrounding structures. This article describes successful management of a case with angles class I malocclusion with upper anterior proclination treated using 2 x 4 appliance. The 2 x 4 appliance is a partially fixed orthodontic appliance that is used in children in a mixed dentition period to correct simple malocclusions associated with permanent anterior teeth.

Keywords: 2 x 4 appliance, Interceptive orthodontics, Mixed dentition, Children, Malocclusion, Increased overjet.

Introduction

The mixed dentition period is regarded as one of the most critical ages for receiving orthodontic treatment. One common misconception among parents is that orthodontic treatment should begin

only after all permanent teeth have fully erupted. Early orthodontic intervention is usually aimed at decreasing the severity of the malocclusion. Early correction of malocclusion aids in normal growth and development of jaws and surrounding structures which leads to malocclusion. Moreover, the esthetic

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appearance and a balanced smile at an early age improve the self-confidence and overall personality of the child.¹⁻³

Crossbite, midline diastema, increased overjet, ectopic eruption of teeth are the commonly occurring malocclusions. Most of these malocclusions are treated using a removable appliance in mixed dentition period. The removable appliances require patient cooperation which is difficult to achieve in this age group. Another drawback of removable appliances is that only limited tooth movement is achieved using removable orthodontic appliances.^{4, 5} Initial speech difficulty due to palatal coverage of the appliance, progressive loosening of the appliance used, and the tendency of the patient to flick the loose appliance in and out with the tongue were the common problems associated with removable appliances.⁵

A 2x4 appliance is a versatile fixed appliance used to correct various malocclusions associated with permanent incisors. The appliance 2 x 4 comprises four brackets bonded onto the erupted permanent incisors, two bands cemented with molar tubes bonded on the first permanent molars, and a continuous archwire to provide/ maintain good arch form.⁵ Rotations, ectopic eruption of incisors, crossbites, midline diastema can be corrected using this versatile appliance in a short duration.^{6 - 11} This simple appliance helps in the rapid correction of simple malocclusions more effectively and efficiently.

The present article highlights a case report of successful correction of ectopic eruption of permanent incisors using the versatile 2 x 4 appliance.

Case Report

A nine-year-old female patient reported to the Department of Pedodontics and Preventive dentistry, with the chief complaint of forwardly placed upper anterior teeth. No abnormal oral habits were detected. Extra-oral examination revealed an orthognathic profile. Intra-oral examination showed U shaped arch with proclination of 21, 22. Overjet was found to be 4mm with respect to 21 and 22. The patient was in a mixed dentition period. A midline shift in the mandibular anterior on right side was noticed due to the congenitally missing lower right lateral incisor. Orthopantomogram was taken. Impressions

made in relation to the upper and lower arches and mixed dentition analysis was done. Moyers analysis revealed the presence of adequate space for teeth alignment. The diagnosis was made as Angle's class I malocclusion with upper anterior proclination of 21 and 22. 2x4 fixed orthodontic treatment was planned. The treatment plan was explained to the parents and written consent was taken before starting the treatment. Orthodontic molar bands with buccal tubes were cemented on permanent first molars. Brackets were bonded on the upper permanent incisors. Initial alignment was done using 0.014 NiTi wire. We replaced the wire to 0.016 NiTi wire at 1-month follow-up. After 2 months the desired result was achieved. 19 x 25 stainless steel rectangular wire used for retention for 6 months. (Fig 1-3)



Figure-1 Pre-treatment photo (front view)



Figure-2 Post-treatment photo (front view)



Figure-3 Post-treatment photo (occlusal view)

Discussion

The 2x4 appliance can be used as soon as the permanent incisors and first permanent molars have erupted into the oral cavity. It is used to correct various malocclusions during the mixed dentition period associated with the permanent incisors such as crossbite, increased overjet, ectopic eruption, and rotations. The permanent central incisors are bonded and the permanent molars are banded along with a molar tube in which the continuous archwire is inserted.⁵

The main advantage of the versatile 2 x 4 appliance is that it reduces the need for patient co-operation. Better patient compliance can be achieved using this appliance than a removable appliance. It produces minimal discomfort and increased control of tooth movement in all three planes of space.⁶ Moreover, it is a single visit procedure and no laboratory work is needed which is beneficial for both clinician and patients. The application of force is lesser than the conventional fixed orthodontic treatment. A proper arch form and controlled force for the tooth movement are achieved. It corrects the malocclusion thereby it improves the self-esteem of the patient at an early age.⁷

The disadvantage of 2x4 appliance is the banding on the first permanent molars. Banding could be difficult if the first permanent molar is not fully erupted into the oral cavity or if its clinical crown is short. Also, banding increases the risk of dental caries as it interferes with cleaning. Good oral health must be maintained throughout the treatment period.¹²

The present article describes a successful case treated using 2 x 4 appliance in a patient with Angle's class I molar relation with upper anterior teeth proclination. Early treatment was planned and achieved to reduce the psychological trauma associated with malocclusion.

Maxillary anterior teeth proclination has to be treated as early as possible because there is a direct relationship exists between increased overjet and dental trauma. Proclined upper incisors are more prone to be fractured.¹³ Children with increased overjet have higher chances of dental trauma than children with any other malocclusion. Increased

overjet was 1.57% more likely to cause greater esthetic impact, especially in girls.¹⁴ In general, the upper anterior teeth proclination is believed to occur as a consequence of the presence of an abnormal oral habit such as thumb sucking, tongue thrusting. As already mentioned, no abnormal oral habits were detected in this case. Hence, the proclination of incisors must be due to the ectopic eruption of the upper incisors.

Treatment was initiated using 014 NiTi wire. At 1 month follow up 016 NiTi wire was placed. The results were achieved in a shorter duration of 2 months. 19 x 25 rectangular stainless steel wire was placed for retention for a period of 6 months. The treatment was completed in 8 months. No relapse was reported at 6-month follow-up.

Case selection is an important criterion in 2x4 appliance. The clinician should have a sound knowledge of using this fixed handy appliance during the mixed dentition period. This is because many self-correcting anomalies exist in the mixed dentition period which will be corrected after the transition happens. So, a thorough assessment of the patient's facial and dental profile should be performed to make an appropriate diagnosis and treatment plan.

Conclusion

Certain dental malocclusions can be corrected immediately after the eruption of permanent incisors and need not wait until the eruption of all the permanent teeth. The 2 x 4 appliance is an easy-to-use, handy appliance. It provides functional improvement with psychological benefits at an early stage of life.

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