“CATCH THEM YOUNG – WATCH THEM GROW”

Management of developing malocclusion in early and late mixed dentition period using versatile 2x4 appliance.

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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 during this period. 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 which aids in the normal growth of jaws and surrounding structures. This article describes successful management of two cases with angles class 2 division 2 malocclusion 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.

Introduction

Children having malocclusion in the mixed dentition period are often delayed for treatment until all permanent teeth erupt or are given removable appliances which only result in limited tooth movement.1 A stage of transition from primary to permanent dentition is the period that mostly presents with malocclusion due to various factors. Among the problems most often seen in the mixed dentition period is the anterior crossbite.2

The transition period from primary to permanent dentition between 6 and 12 years of age is often a worrisome period for parents. Parents expect their children's permanent teeth to erupt into beautiful dental aesthetics following the shedding of the primary teeth.3 Even children are aware of the dental aesthetic of their teeth and that of others.4 However, nature's expressions often lead to the imperfection of teeth alignment in some children.

Malocclusion of teeth in dentitions is either a malrelationship of dental arches or malalignment of teeth.5 It refers to a significant deviation from the perfect occlusion of teeth that is aesthetically unsatisfactory.6 These malocclusions are categorized into skeletal or dental malocclusions, which are either hereditary or environmental in nature.7 Malposition of teeth refers to the altered positioning of one or more teeth from a well-aligned jaw.5 These malpositions are often caused by local factors such as the presence of supernumerary tooth or teeth, odontomas, cysts, trauma to the primary tooth that displaces the permanent
successor tooth germ, ectopic tooth germ, and bony defect of the alveolus due to cleft lip and palate, or other localized bony pathologies.8

Management of malpositioned teeth in the early stage of mixed dentition possesses a great dilemma for dentists. The type of treatment depends on the severity of the malposition, availability of the occlusal space, availability of alveolar bone architecture, availability of eruption path, and patient's compliance with treatment. Simple discrepancies in the teeth alignment can be corrected with some simple methods such as the use of a wooden spatula tongue blade, composite, or glass ionomer cement incline plane, Catlan's appliance and removable appliance with z-spring, and expansion screw or micro screw.1,9,10 However, correction of greatly rotated or malposition teeth away from the arch alignment requires slight improvisation in the alignment methods because the use of simple and removable appliances may not be effective in correcting the malpositioned teeth effectively.

This paper describes the series of two cases of malpositioned permanent teeth in the premaxilla treated with a two-by-four (2 × 4) orthodontic appliance.

Case 1:

A 10-year-old boy was referred to the Department of Pedodontics regarding irregularly placed teeth in upper front teeth region leading to unaesthetic appearance and bullying amongst his peer groups due to irregular teeth. He presented with a Class 2 div1 incisor relationship on a skeletal Class I base with an average maxillary mandibular planes angle. (figure -1) He was in the early mixed dentition phase, both the upper and lower arches were well aligned with reduced overjet and overbite. Radiographs revealed congenitally missing lower lateral incisor in relation to 42. (figure-2) Patient also had retained deciduous teeth in relation to 54, 64, 65 which were extracted.

Pre-operative photographs and impressions were taken and model analysis was done. Mixed dentition analysis inferred, excess space in the arch which can be utilized for alignment of 11, 12, 21, 22. A 2x4 appliance was placed with bondable buccal tubes on first permanent molars and brackets on the incisors. (figure-3) Initial aligning has been started with 0.014 nickel titanium wire. The archwire sequence was 0.014 nickel titanium, 0.016 nickel titanium. Active treatment time involved five visits over an 6-month

Figure 1: Pre-operative intra oral clinical images.
Figure 2: Congenitally missing lower lateral incisor in relation to 42.

Figure 3: Bonding of 2x4 appliance

Figure 4: Debonding of appliance and insertion of removable hawley’s retainer

Figure 5: Post operative after 6 months
Smile enhancement during after the treatment:

Case 2:

Figure 6: Pre-operative intra oral clinical images
**Figure 7:** Retained deciduous teeth in relation to 72

**Figure 8:** Bonding of 2x4 appliance

**Figure 9:** Debonding and placement of fixed palatal retainer

**Figure 10:** Alignment of crowded lower anteriors following selective removal of deciduous teeth and inherent tongue forces during growing stages.
period. After achieving minimum overjet debonding of the appliance has been done and removable hawleys retainer has been given. (figure-4) At 6-month review positive overjet and overbite have been maintained by regularly using the removable retainer. (figure-5)

Case2:

A 12-year-old boy was referred to the Department of Pedodontics regarding irregularly placed teeth in upper front teeth region leading to unaesthetic appearance. He presented with a Class 2 div1 incisor relationship on a skeletal Class 1 base with an average maxillary mandibular planes angle. (figure-6) He was in the late mixed dentition phase, both the upper and lower arches were well aligned with reduced overjet and overbite. Patient also had retained deciduous teeth in relation to 72 which was extracted. (figure-7)

Pre-operative photographs and impressions were taken and model analysis was done. Mixed dentition analysis inferred, excess space in the arch which can be utilized for treating malalignment of 11,12,21,22. A 2x4 appliance was placed with bondable buccal tubes on first permanent molars and brackets on the incisors. (figure-8) Initial aligning has been started with 0.014 nickel titanium wire. The archwire sequence was 0.014 nickel titanium,0.016 nickel titanium. Active treatment time involved five visits over an 10-month period. After achieving minimum overjet debonding of the appliance has been done and fixed palatal retainer has been given. (figure-9) As the patient was in developing dentition stage, in the lower arch only selective extraction of retained deciduous teeth irr 72 has been done and kept under constant supervision for minimal correction of malpositioned lower anterior teeth due to inherent tongue forces. (figure-10)

Discussion

The 2X4 is a fixed appliance that is made of bands on the first permanent molars, brackets bonded to the erupted maxillary incisors, and continuous arch wires to provide/maintain good arch form, as well as control of anterior teeth. Some limits of removable appliances in children are often lack of cooperation from the patient, lack of retention, and improper activation. Instead, fixed appliances in mixed dentition do not necessitate much patient cooperation.11 Advantages of fixed appliances to mention a few are-minimal discomforts, reduces the need for patient cooperation, increase control of tooth movements, and movement possible in all three planes of space.

The appliance described is versatile, easy to use, and well-tolerated by all patients. One of the important aspects while selecting a 2 x 4 appliance is the eruption of permanent molars and incisors. 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. Anterior crossbite can be a major esthetic and functional concern during the early stages of dental development. Anterior crossbite is defined as a situation in which one or more primary or permanent mandibular incisors occlude labially to their antagonists.12

McNamara et.al stated that anterior crossbites in the early mixed dentition are believed to be transferred from the primary to the permanent dentition and can have long-term effects on the growth and development of the teeth and jaws. Valentine and Howitt stated that anterior crossbite may lead to abnormal enamel abrasion or proclination of the mandibular incisors, which, in turn, leads to thinning of the labial alveolar plate and/or gingival recession.12

One of the most common modes 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 a few drawbacks which include 2 or 3 appointments, less control of tooth movements, improper activation that 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.13

**Ethical approval:** This study was approved by the Institutional ethics committee, SVS institute of dental sciences. (Reference ID: SVSIDS/PEDO/1/2021)

**Informed Consent:** All participants provided written informed consent prior to enrolment in the study.

Written informed consent was obtained from the patient for the publication of this case report.

**Conflicting Interest:** No

**References**