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RESEARCH ARTICLE

CATCH THEM YOUNG: EARLY INTERCEPTION OF MALOCCLUSION IN MIXED DENTITION PERIOD USING 2X4 APPLIANCE

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ABSTRACT

Mixed dentition is the most crucial period because early treatment would correct the occlusion as well as ensure normal development of teeth and jaws. Interceptive procedures not only simplify but also eliminate the need for the later treatment procedures. A most important advantage of early interception is that the majority of the malocclusion can be corrected non surgically and without the extraction of permanent teeth. This article presents three cases of correction of malposed teeth in the mixed dentition period using a 2x4 appliance.

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INTRODUCTION

Interceptive treatment is usually indicated and undertaken in the mixed dentition period in order to decrease the severity of an increasing malocclusion. This type of treatment brings with it unique challenges. Children affected with malocclusion in the mixed dentition period are very often delayed for treatment until all permanent teeth erupt or are given removable appliances, which only result in limited tooth movement (Anterior Crossbite Correction in Early Mixed Dentition Period, 2010). The timing of orthodontic treatment has always been the subject of much debate over the years. The 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 need to be emphasized. A few of the most common malocclusions seen during this stage are the anterior and posterior crossbites, crowding, rotations, midline diastema, spacing etc (Shyamala Naidu and Anand Suresh, 2018).

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2x4 appliance is one such treatment option that helps in the early correction of simple and minor malocclusions that arise in the mixed dentition period. Complex malocclusions can also be modified, which are to be treated in two steps i.e early correction of mild malocclusions by 2x4 appliance which is a fixed partial appliance and complete treatment in the second step (Parikrama, 2017). 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 (White, 1998).Treatment undertaken at an early stage can boost the young child's self-esteem, improve their overall personality and aesthetic appearance and also avoid the need of undergoing cumbersome orthodontic treatment in the future. This article presents 3 case reports of different forms of malocclusion treated by 2x4 appliances.

CASE REPORT 1

A 12 year old female patient was brought to the pedodontia department with the chief complaint of palatally placed maxillary lateral incisors. On examination, lateral incisors were found in crossbite and central incisors in edge to edge relationship (Fig 1). Treatment began with a 2x4 appliance

engaging maxillary incisors and first permanent molars. Prefabricated band with the soldered tube was cemented on the maxillary first permanent molars and 0.022" slot brackets were bonded onto the incisor teeth (Fig 2). The bite was raised on both sides by bonding glass ionomer (Type I) cement on the occlusal surface of mandibular first permanent molars. 0.012" NiTi wire was used for initial alignment and leveling which was replaced by 0.014" NiTi wire after 4 weeks which was further replaced by 0.016" NiTi wire after another 4 weeks. Last and final arch wire used was 0.019" x0.025" rectangular stainless-steel wire for consolidation and kept for 1 month. At the end of 4 months, the incisors were aligned in the proper position (Fig 3). The patient was asked to follow up every month for at least 3-6 months.

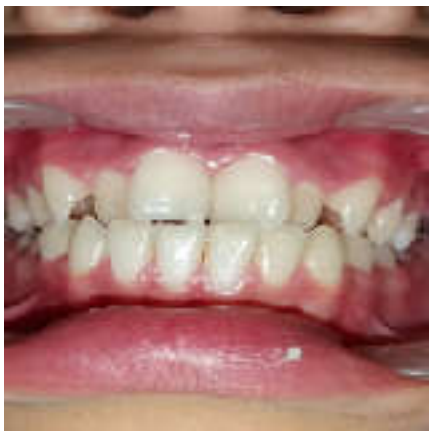

Fig 1. Pre op intraoral view

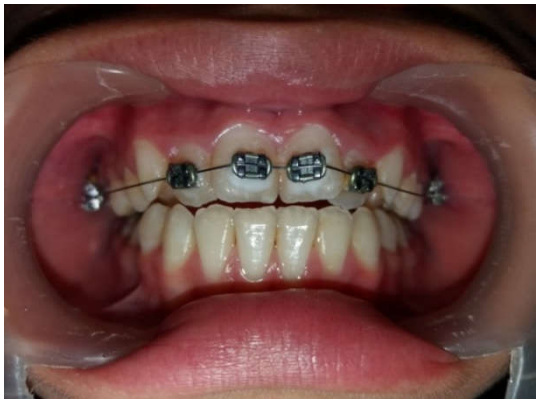

Fig 2. Bracket and band placement

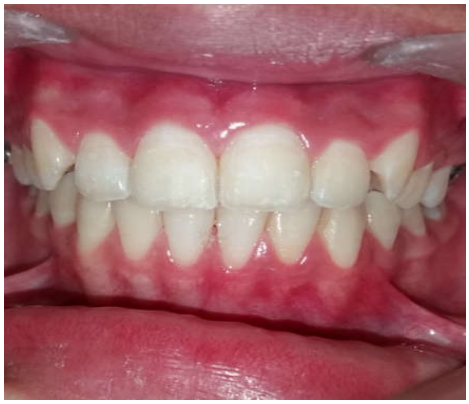

Fig 3. Post op intraoral view

CASE REPORT 2

A 10 year old male patient was reported to the pedodontia department with the chief complaint of missing right central incisor (Fig 4). Pre-operative OPG revealed the presence of an impacted right maxillary central incisor without any radiographic evidence of any physical barrier along the path of the eruption (Fig 5).

Fig 4: Pre op intraoral view

Fig 5. Pre op OPG view

Fig 6. Surgically exposure and orthodontic button placement

Fig 7: Flap closure

Surgical exposure of the incisor was performed and an orthodontic button was placed on the labial surface (Fig 6). A ligature wire was attached to the button and the flap was closed by suturing (Fig 7).

Fig 8: Orthodontic traction for closed eruption

Fig 9. Bracket placement

Fig 10.Post op intraoral view

Fig 11: Bracket and band placement

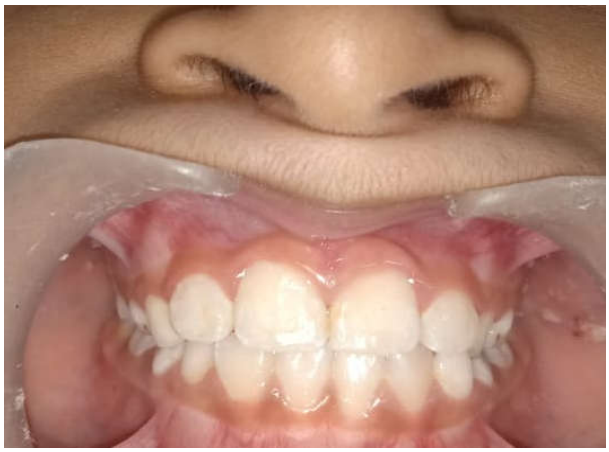

Fig 12. Post op intraoral view

Orthodontic traction was given by applying a light continuous force for facilitating the closed eruption of the right maxillary central incisor (Fig 8). After 3 months when incisal third of incisor was visible in the oral cavity, 0.022" slot brackets were bonded onto the tooth and prefabricated bands were cemented on the maxillary first permanent molars, with sequential change of wire starting from 0.012" NiTi followed by 0.014" NiTi and finally 0.016" NiTi wire, each changed at an interval of 4 weeks (Fig 9). Finally 0.019"x0.025" rectangular stainless-steel wire was used for consolidation and kept for 1 month. When all the teeth were in proper alignment, the brackets were removed and a lingual retainer was bonded onto the lingual surface of the four anterior teeth to prevent relapse (Fig 10). The entire treatment was completed in 7 months and the patient is recalled every month for follow up.

CASE REPORT 3

A 9 year old female patient reported to the pedodontia department with the chief complaint of irregularly positioned maxillary anterior teeth. On examination the central incisors were rotated, and the right lateral incisor was in crossbite. The choice of a 2x4 appliance was made to correct the minor malocclusions. It was done in the same technique with similar bands and brackets applied on the teeth as in the above cases and final correction was achieved in 4 months time (fig 11 and 12). A permanent bonded lingual retainer is given till the eruption of permanent canines. This is done because these malocclusions once corrected are highly susceptible to return back to their original state till its periodontium has adjusted to a final position.

DISCUSSION

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[5]. The appliance described is versatile, easy to use and well tolerated by all patients and tooth movements are possible in all three planes of space. If used cautiously, this appliance can be very advantageous in overcoming the limitations of removable appliances like lack of cooperation from the patient, lack of retention and improper activation.

As in case 1, which is a case of anterior crossbite can be a major aesthetic and functional concern during the early stages of dental development. 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 (Bindayel, 2012). Early correction of anterior crossbite is often advisable to prevent a much more complicated problem and treatment at a later stage. Early treatment allows harmonisation of the occlusion with time, as the permanent teeth are still in the eruptive phase during this stage of the dentition (Ulusoy, 2013). Impaction of maxillary permanent incisors, as in case 2, is not a frequent case in dental practice, but its treatment is challenging because of the importance of these teeth in facial aesthetics and the psychological problems that can occur owing to its anomalous eruption. The following factors are used to determine whether successful alignment of an impacted tooth can take place: (1) the position and direction of the impacted tooth, (2) the degree of dilacerations (3) the degree of root completion, and (4) the presence of space for the impacted tooth .Orthodontic and surgical intervention should not be delayed avoiding unnecessary difficulties in aligning the tooth in the arch[8]. In this case, the available space for tooth alignment was sufficient and the tooth was brought into the right anatomical position in the dental arch.

Tooth rotation, as in case 3, is a common anomaly we encounter in our daily practice. Tooth rotation poses greater difficulty for correction, if the rotated tooth is compounded with adjacent tooth malposition and inadequate space in the arch[9]. Although rotations can be treated at various stages of root development, early correction of rotated teeth before root completion is conducive to better retention[10]. The major advantage in carrying out this treatment with fixed brackets is the ease with which the force magnitude and vector can be controlled much more precisely than with a removable appliance. Although there are numerous advantages of 2x4 appliances, there are also some limitations which have to be kept in mind like:

- Cannot correct skeletal malocclusion
- Unsuitable for primary teeth
- Limited anchorage limits the kind of tooth movement that can be taken up by this method.
- Need of retention till the eruption of permanent teeth.

After careful evaluation of the case and cautiously measuring the risk benefit ratio, we can readily head towards the treatment at an early stage and need not delay till the eruption of all permanent teeth.

Conclusion

One of the keys to achieving a successful orthodontic treatment results lies in the hands of the parents as well as the dentist. Identifying a malocclusion at an early stage and diagnosing it at a correct age can help to achieve stability in the treatment results. The three case reports described clearly demonstrate the versatility of using the 2x4 appliance. The functional improvement coupled with the obvious psychological benefit gives this simple and easily placed appliance a significant advantage over the traditional method of treating these potentially challenging mixed dentition problems.

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