Case report

SOONER THE BETTER: EARLY INTERCEPTION USING 2X4 APPLIANCE IN MIXED DENTITION PERIOD-A CASE REPORT

ABSTRACT

The transition period from primary to permanent dentitions between 6-12 years of age is often a worrisome period for parents. Following the shedding of the primary teeth, parents expect their children's permanent teeth to develop into beautiful dental aesthetics. The term interceptive orthodontics is defined as a phase of science and art of orthodontics employed to recognize and eliminate the potential irregularities and malpositions in the developing dentofacial complex. The 2x4, a versatile appliance is used in the mixed dentition. With this approach, a single short phase of fixed appliance therapy in the early mixed dentition period helps in rapid correction of early malocclusions. 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.

Keywords: Mixed dentition, interceptive orthodontics, odontome, 2x4 appliance

1. INTRODUCTION

The transition period from primary to permanent dentitions between 6-12 years of age is often a worrisome period for parents and guardians. Parents or guardians expect their children's permanent teeth to erupt into beautiful dental aesthetics following shedding of the primary teeth. Even children are nowadays aware of dental esthetic of their teeth. Guidance of the eruption and development of the primary and permanent dentitions is an integral part of the care of pediatric patients which contribute to the development of a permanent dentition that is in a harmonious, functional and with an esthetically acceptable occlusion. The orthodontic correction of teeth in the mixed-dentition is often a challenging task for paediatric dentists.

Shaw et al.[1,7] found that dental features were the fourth most common target in children for being exposed to nicknaming, teasing and harassment especially in the 9–10-year-old. Treatment of younger children within the early mixed dentition period offers advantages in terms of stability and avoidance of future complications, which helps them build their self-respect and aesthetic appearance, thus improving their overall personality (Tung et al., 1998).[1]

In 1980, Ackerman and Proffit introduced interceptive orthodontics as a means of correcting problems in the developing dentition and defined it as the elimination of the existing interferences with the key factors involved in the development of the dentition. Interceptive treatment is foundational to reduce the severity of a developing malocclusion often being indicated and executed in the mixed dentition and bringing with it unique challenges. Timing of such treatment has always been the subject of much debate over the

years. Most common malocclusions seen during mixed dentition stage are the anterior and posterior crossbites, crowding, rotations, midline diastema, spacing etc. Children affected with malocclusion in this period are fairly often delayed for treatment until all permanent teeth erupt or are given removable appliances, which only end in limited tooth movement as there is often lack of cooperation, lack of retention and improper activation. Many aspects of orthodontics have been taken into consideration, such as the clinical effectiveness, the orthodontists' preference, the outcome of early treatment, and psychological influences related to it. [6]

Malocclusion of teeth in dentitions are either a mal-relationship of dental arches or malalignment of teeth. Malposition of teeth refers to altered positioning of one or more teeth often caused by local factors. Supernumerary teeth are the teeth that exceed the normal dentition, regardless of their morphology and location with commonly associated complications being impaction, delayed eruption, crowding, and diastema. The prevalence in permanent dentition varies from 0.15%–4%, while in deciduous dentition is 0.2%–1.9%. They vary from a simple odontome, a conical or tuberculate tooth, to a supplemental tooth resembling a normal tooth and have a strong predilection for being mostly seen in the premaxillary region.

The 2x4 appliance used in the mixed dentition is a versatile appliance, consisting of bands on the first permanent molars and bonded brackets on the erupted maxillary permanent incisors. A continuous arch-wire is used to provide complete control of the arch form. With this approach, a single short phase of fixed appliance therapy in the early mixed dentition period helps in rapid correction of early malocclusions. Treatment undertaken at an early stage can boost the young child's self-esteem, improving their overall personality and aesthetic appearance and also avoid the need of undergoing cumbersome orthodontic treatment in the future.

This paper describes the management of a case of rotated permanent teeth along with a supernumerary tooth (odontome) in the premaxilla treated with the help of 2X4 orthodontic appliance.

2. CASE PRESENTATION

A 10-year-old male patient reported to the Department of Pediatric and Preventive Dentistry, K D Dental College & Hospital, Mathura with a chief complain of extra teeth in upper front tooth region since 1 year. There wasn't any significant family or medical history. Extra oral examination revealed convex profile of the patient. Intra oral examination revealed a complex odontome between the maxillary central incisors. In addition, the permanent maxillary left lateral incisor was mesiolabially rotated and permanent maxillary right central incisor had an Ellis Class I fracture **(Fig. 1.)**. Clinical examination revealed carious maxillary and mandibular primary second molar. Both the teeth were near to exfoliation and hence were not extracted. An intraoral periapical radiograph of the maxillary central incisor region and a

maxillary occlusal radiograph was carried out to detect any other radiographical deformity other than the presence of odontome. Patient was in the mixed dentition stage with a U-shaped maxillary arch with Class I molar relationship on both sides. Space analysis showed that there was enough space for eruption and alignment of all permanent teeth. Based on the intraoral and radiographic examination (both IOPAR and maxillary occlusal radiograph showing the presence of odontome) it was decided to correct the midline diastema and rotation of the maxillary left lateral incisor with interceptive orthodontics using 2X4 appliance therapy **(Fig.2)**.

Fig.1. PRE-TREATMENT PHOTOGRAPHS

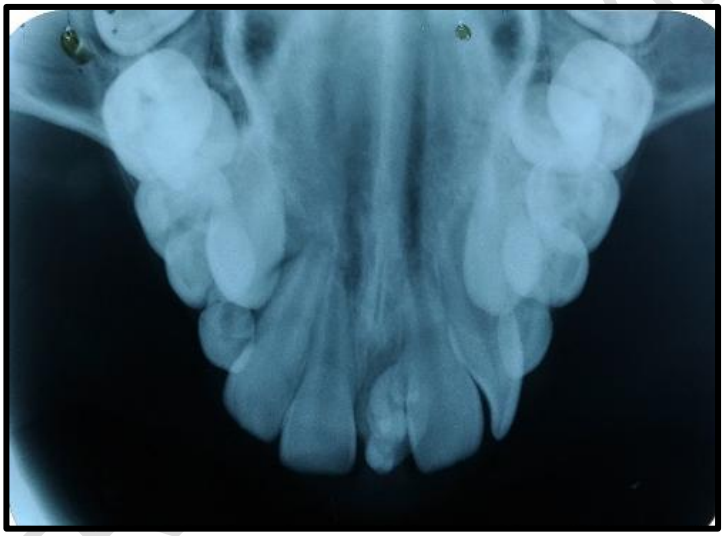

Fig.2. PRE-TREATMENT MAXILLARY OCCLUSAL RADIOGRAPHS

The odontome was extracted under local anesthesia without any complications and the patient was recalled after 1 week. After 1week, orthodontic molar bands (stainless steel preformed bands) with buccal tubes were bonded on permanent first molars and edgewise brackets with 0.022" slot (MBT orthodontic bracket system) were placed on all permanent incisors (2x4 appliance). A 0.012 NiTi arch-wire was inserted in the brackets for initial movement and further sequential change of wire from 0.014 NiTi arch-wire to 0.016 NiTi arch-wire and lastly to 0.018 NiTi arch-wire was done and each wire changed at 1.5month interval. O rings were used to keep the arch-wire in place and replaced at every follow-up visit **(Fig.3)**.

Fig.3. Initial wire placement of 0.012 NiTi wire

Fig. 4. Change of 0.018 NiTi wire with e-chains

Lastly power e-chain was placed for minute space closures along with 0.018 NiTi arch wire **(Fig. 4)**. Finally, 0.019/0.025 SS wire was placed at consolidation phase for 1 month. At the end of 7 months, the incisors had been properly aligned with closure of midline diastema and correction of rotated maxillary left lateral incisor. With all the teeth in proper alignment, the brackets were removed and a lingual bonded retainer was placed on the four anterior teeth to prevent relapse. The patient is kept on follow-up and recall **(Fig.5)**.

Fig. 5. After debonding

3. DISCUSSION

Malocclusion or malposition of teeth if left untreated may lead to complications in the developing dentition which may be detrimental either to the functions or aesthetics. As pediatric dentists, our role is to minimize the impact of malocclusion on the developing dentition and facilitate a smooth transition to orthodontists later on. Orthodontists and pediatric dentists need to work together to streamline what is possible to achieve. American Academy of Orthodontics in 1969 defined interceptive orthodontics (IO) as, “That phase of the science and art of orthodontics employed to recognize and eliminate potential irregularities and malpositions in the developing dentofacial complex”. The majority of interventive orthodontic treatment is administered in the mixed dentition since it takes advantage of the amount of growth and development that occurs during adolescence. Cross bites, midline diastemas, malocclusion caused by oral habits, crowding, scissor-bites, space loss, etc. are among the malocclusions that would benefit from IO treatment.

Supernumerary teeth may vary from a simple odontoma, to a conical or tuberculate tooth, closely resembling a normal tooth with its presence more frequently seen in permanent dentition, with a higher likelihood in the upper arch. Supernumerary teeth can be managed differently based on their type and position. Rotation of the teeth, such as in the case presented here, is a common anomaly we see in our daily practice. Ulusoy AT et al stated that tooth rotation poses greater difficulty for correction, if the rotated tooth is compounded with adjacent tooth malposition and inadequate space in the arch. Although rotations can be treated at various stages of root development, early correction of rotated teeth before root completion is conducive to better retention.[3]

In our case, the compound odontome was interfering with the proper arch alignment in the premaxillary area. Timely removal of supernumerary teeth facilitated for the proper function of orthodontic appliance, resulting in desired arch alignment in our case. In order to manage any condition affecting the developing dentition, it's necessary to conduct a comprehensive clinical examination, identify the cause, develop a differential diagnosis, create a sequential treatment plan, and keep progress records. It is suggested that anterior tooth discrepancies can be corrected with the use of removable appliances. Fiona Mckeown et al stated that lack of control over tooth position, and single-point contact on teeth may lead to undesired tipping movements which is the drawback of removable appliances.[2] Ninou and Stephens et al said that the success of removable appliances depends mainly upon patient compliance, both for wearing and adjusting the appliance.[2]

For this reason, our choice was the 2X4 appliance, a versatile one, easy to use and well tolerated by most patients and tooth movements being possible in all three planes of space. As opposed to removable appliances, this appliance overcomes the limitations like lack of cooperation from the patient, lack of retention, and improper activation of them.

Despite the many advantages of 2x4 appliances, there are also some drawbacks that need to be considered such as

- Cannot correct skeletal malocclusion
- Unsuitable for primary teeth

- Limited anchorage which limits the kind of tooth movement that can be taken up by this method.
- Need of retention till the eruption of permanent teeth.

The charm of this IO procedure is that it helps improve function and esthetics reducing the potential for subsequent treatment and remaining relatively stable once the appliance is removed.

4. CONCLUSION

Parental involvement and the dentist are key components of achieving a successful orthodontic treatment outcome. Early detection and diagnosis of malocclusions can improve treatment outcomes by stabilizing the process. A growing child just catching on to their appearance, who may be becoming more aware of their appearance, will find this simple and easily placed appliance to have a significant advantage over the traditional technique of treating these mixed dentition problems.

CONSENT (WHERE EVER APPLICABLE)

The patient parents signed informed consents, and kept in the records of departmental hospital**.**

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ABBREVIATIONS

IOPAR: Intra Oral Peri Apical Radiograph
NiTi: Nickel Titanium
SS: Stainless Steel
AAO: American Association
IO: Interceptive Orthodontics