

Interceptive Segmental Orthodontics: Role in Early Mixed Dentition

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ABSTRACT

Mixed dentition is important to evaluate and intercept developing malocclusion as it otherwise becomes worse and can lead to various consequences. This is the article presenting clinical cases of anterior cross bite, midline diastema, crowding due to supplemental teeth and impacted teeth and correction of these anomalies using segmental fixed orthodontics. It provides an alternative to removable appliances as it offers many advantages.

Keywords: Mixed dentition, Crossbite, Diastema, Impaction, segmental fixed orthodontics

INTRODUCTION

The mixed dentition period is valuable to evaluate and identify the developing malocclusion and performing the requisite treatment. However, mostly patients seek treatment in early permanent dentition in age of 12+13 years but it has been found that the comments done regarding teeth are more distressing in the age group of 9-10 yrs. [1]

Tung and Kiyak questioned younger children and their parents and investigated the psychological influence on early orthodontics treatment and concluded that early treatment provide self-confidence, body image and improve their lives. [2]

Interceptive treatment is done in mixed dentition to reduce the severity of developing malocclusion, this include a number of measures such as habit breaking appliance, removable appliance, management of anterior and posterior cross bite, space maintaining and regaining, managing impactions and blocked teeth, skeletal orthopedics and ectopic eruption. Among all these, three conditions that most commonly encountered for early treatment

are anterior crossbite, a posterior crossbite, midline diastema and delayed eruption of a central incisor due either to impaction or ectopic position. [3]

Clinical cases involving anterior cross bite, midline diastema, impacted teeth and supplemental teeth are being presented here and illustrate the effectiveness of early interceptive orthodontics in mixed dentition stage.

Abnormal axial inclination of maxillary teeth lead to a condition named anterior cross bite as defined by Moyers; the best time to intercept and treat dental crossbite is when it is detected. An old orthodontic maxim states "the best time to treat a cross bite is the first time it is seen." [4]

A common problem of mixed dentition and early permanent dentition is midline diastema, a space between upper central incisors. A number of treatment options are available such as use of interceptive appliances, extraction of supernumeraries, surgical correction of impeding factors, use of direct composite

resin, use of habit breaking appliances and orthodontic corrections. [5]

Supernumerary teeth classified according to shape by Primosch in to two types, normal shape and size are called 'supplemental', or 'incisiform', whereas teeth of abnormal shape and smaller size are termed 'rudimentary' and include 'conical', 'tuberculate' and 'molariform' teeth. Supplemental teeth are of normal shape and size, so they are often overlooked and less common. These teeth may lead to various problems if not treated early such as esthetic problems, delayed eruption and crowding. [6]

When a tooth fails to erupt in the arch, it is called impacted tooth, it may happen because of lack of space or interruption in the path of eruption. Although it is multifactorial, it may be due to genetic predisposition or anomalies of upper lateral incisors, it can lead to psychological impact on individual as patient is of younger age and also causes speech problems, so this condition of impacted or ectopic teeth should be treated as early as possible. [3]

CASE DESCRIPTION

Correction of anterior cross bite

A 10 yr old boy reported to the department with the chief complaint of irregularly placed upper front teeth. No relevant medical and familial history was found. On extra oral examination, no facial asymmetry present and TMJ was normal. On intra oral examination, there was cross bite of maxillary incisor teeth while remaining teeth were in normal occlusion (Figure 1- A, B). Panoramic radiograph did not reveal significant finding except unerupted maxillary canines.(Figure 1-C) Treatment was planned to be done by anteroposterior expansion with posterior bite plane (Figure 1-D) and segmental fixed orthodontics in which brackets were bonded onto the erupted maxillary incisors and continuous arch wire to provide/maintain good arch form placed(Figure 1- E). Firstly 0.014" nickel –titanium edgewise wire

placed followed by sequential change of arch wire (0.016", 0.018", 0.017x 0.025 NiTi wire, 0.017x0.025", 0.019x0.025" stainless steel wire) in every 3-4 weeks (Figure 1-F) and this lead to correction of cross bite with expansion in 4 months. (Figure 1-G, H, I)

Correction of midline diastema

A patient of 8 yr age reported with the chief complaint of spacing in upper front teeth. Medical and familial history was not significant, intraorally midline diastema of 4mm was found in maxillary central incisors and lateral incisors were not erupted.(Figure 2-A,B) After evaluation of all factors correction by segmental fixed orthodontics was planned , so two brackets were bonded on maxillary central incisors and 0.016" NiTi base arch wire placed as shown in figure.(Figure 2-C) Ligature wire was tightened in 10 days followed by continuous incremental change in round of arch wire(0.018", 0.017x 0.025 NiTi wire, 0.017x0.025", 0.019x0.025" stainless steel wire). After about 4 months, diastema closed, brackets debonded and lingual bonded retainer was given to prevent relapse (Figure 2-D).

Correction of crowding due to supplemental tooth

A 9 yr old boy reported to the department with the chief complaint of irregular alignment of upper front teeth. The medical and familial history was not significant, intraorally there were rotated maxillary central incisors along with supplemental teeth bilaterally, and also there is bulge of erupting lateral incisors on both sides (Figure 3- A, B). Intra oral periapical radiograph and panoramic radiograph was done and it revealed presence of supernumerary tooth bud on palatal aspect of left central incisor with presence of supplemental central incisors on both sides (Figure 3-C, D). After clinical and radiographical evaluation, extraction of supplemental lateral incisors followed by alignment by 2x4 fix orthodontics was planned (Figure 3-E). After extraction,

brackets placed on incisors and bands cemented on first permanent molars and 0.012 NiTi arch wire placed. No treatment done for supernumerary tooth as it was not causing any problem and kept on follow up for the evaluation of same. Sequential change of arch wire done after about 3-4

weeks (0.014NiTi, 0.016", 0.018", 0.017x0.025 NiTi wire, 0.017x0.025", 0.019x0.025" stainless steel wire) and all incisors got aligned in about 5 months, brackets were removed and palatal bonded retainer was placed to prevent relapse(Figure 3-F,G,H,I).



Figure 1-(A, B)-Pre operative right and left view showing anterior tooth in crossbite while posterior tooth in occlusion. (C) - Pre operative Panoramic radiograph. (D)-Anterior expansion appliance with posterior bite block. (E)-Sectional short span wire fixed orthodontic appliance placed. (F)-During treatment. (G, H,I)- Post treatment picture showing front view, right and left view after correction of crossbite.



Figure 2-(A) - Pretreatment front view showing midline diastema of 4 mm. (B) - Occlusal view. (C)- Sectional short wire fixed orthodontic appliance placed. (D)-Post treatment picture after correction of diastema

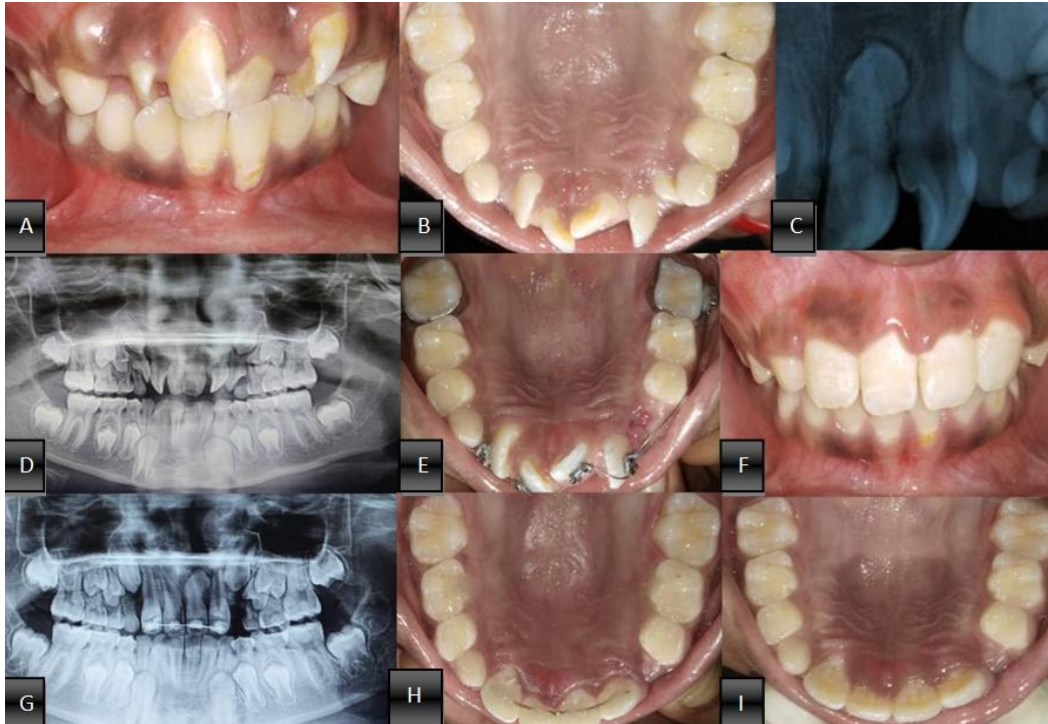


Figure 3-(A)- Pretreatment frontal view showing crowding in maxillary arch.(B)- Occlusal view.(C)- IOPA showing supernumerary tooth bud in relation to left central incisor.(D)-Panoramic radiograph showing bilateral supplemental lateral incisor teeth. (E)- Short span fixed orthodontic appliance placed. (F)- Post treatment front view. (G)- Post treatment panoramic radiograph, (H, I)-occlusal view with palatal retainer in place.



Figure 4-(A)-Pretreatment intraoral view showing missing left upper central incisor.(B)-Pretreatment panoramic radiograph showing impacted left central incisor.(C)- Brackets bonded in upper arch with coil spring between right central incisor and left lateral incisor to regain space.(D)-Impacted tooth exposed and button placed and ligated to main arch wire.(E)- Bracket bonded to left central incisor and continuous arch wire placed.(F)- Post treatment picture showing left central incisor in position.

Correction of impacted tooth

A 9 yr old girl came to the department with complain of ugly appearance due to missing front teeth. Extra oral examination revealed patient have a straight profile, intraorally there was missing maxillary left central incisor (Figure 4- A). Radiographically, it was

found that impacted left central incisor along with supernumerary tooth present coincidentally(Figure 4- B), so extraction of supernumerary tooth along with traction of impacted tooth was planned using fixed orthodontics in upper arch. After extraction, incision was given on bulge of central incisor and a button was bonded and a

ligature wire was tied. Brackets bonded to the remaining tooth, bands were cemented on upper first permanent molars and arch wire secured with elastic modules (Figure 4-C, D). Coil spring added to regain the space and ligature wire was tied to the main arch wire and tightened every 10 days. When tooth was exposed and start coming downwards and bracket was bonded to it and a 0.014 NiTi wire placed (Figure 4-E). After coming in arch form, tooth was aligned with sequential change of wires and complete correction occurred in 6 months (Figure 4- F).

DISCUSSION

Early treatment in mixed dentition not only corrects occlusion but also assure normal emergence of teeth and jaws and majority of malocclusions treated without extraction of permanent teeth. To avoid inappropriate treatment, an accurate diagnosis, decisive treatment planning and experience is necessary and it also helps to distinguish the cases which to be done early and which have to postpone until post pubertal growth spurt.^[1]

Removable appliances are used in mixed dentition commonly as they are easy to wear and satisfying but have several disadvantages like these require 2 or 3 appointments, less control of tooth movements, improper activation can lead to unwanted tooth movements and immense patient cooperation. On the contrary, fixed appliance treatment can be initiated soon as permanent incisors and molars erupted and give minimal patient discomfort except while placing the bands and brackets and produce active and controlled tooth movement. Duration of treatment is also shorter than removable appliances.^[8]

Anterior cross bite in mixed dentition occur due to many reasons but mostly are of dental origin such as presence of supernumerary tooth/teeth, odontomas, trauma to the primary predecessor, ectopic position of permanent tooth germ, retained primary predecessor, anomalies in tooth shape and size, arch length inadequacy, and

upper lip biting habit. Depending upon patient compliance, age, eruption status of teeth, space availability and etiology various treatment modalities are available for example Catlan's appliance, removable appliances with z-spring(s) or expansion screw or microscrew(s) and segmental fixed orthodontics while crossbite of skeletal origin involves complex modalities like as rapid maxillary expansion and Frankel III appliances.^[9]

For deciding treatment of midline diastema, correct diagnosis by clinical and radiographical evaluation is necessary as physiological diastema closes after the eruption of permanent maxillary canines and also space of 2 mm closes spontaneously so no treatment is required while midline diastema of pathological origin have to be managed separately. Pathological causes such as midline soft tissue anomalies, supernumerary teeth, are removed surgically and spaces are closed orthodontically while oral habits like thumb sucking and tongue thrusting have to be corrected before closure of the space. Among all treatment options, space closure by orthodontic management is more suitable.^[10]

Supernumerary teeth may be associated with developmental disorder while multiple supernumerary occur in many syndromes like cleft lip and palate (16.7% of patients), Gardner's syndrome, and cleidocranial dysostosis. When supplemental tooth is present and erupted, it becomes very difficult to distinguish between normal tooth and supplemental tooth, in that case if both tooth are healthy, the tooth which is distal in the line of arch have to be extracted to relieve crowding. No treatment of supernumerary teeth is indicated in deciduous dentition although all related outcomes to permanent dentition should be informed to the parents.^[7]

Impacted tooth is diagnosed when there is delay in eruption, various treatment options for impacted central incisor include-extraction of impacted tooth and restore with implant or bridge when growth has

come to an end, extraction of impacted tooth and closure of the space substituting the lateral incisor for the central incisor with subsequent prosthetic restoration and last is surgical exposure, orthodontic space opening and traction of the impacted central incisor into proper position. [11]

One of the simple fixed orthodontic appliance is two by four (2x4) appliance that is versatile as it allows three dimensional tooth movement and can correct various malocclusion like crossbite, rotated teeth, teeth with incorrect angulations and inclination, and diastema. [2] It has many advantages such as ease of application, versatility, prevention of malocclusion at an early stage, shorter duration of treatment, less application of force compared to the conventional orthodontic treatment, minimal root resorption, improves the self-esteem at an early stage while disadvantages are- cannot correct skeletal malocclusions and needs significant patient cooperation. [8]

CONCLUSION

It is advised to treat anterior crossbite, midline diastema, crowding due to supplemental teeth and impacted tooth with the sectional short-span wire-fixed orthodontic appliance during mixed dentition, and it offers an alternative treatment option to consider. This early intervention not only simple and tolerable but also improve aesthetics and self confidence of preadolescent children. Nevertheless, severely rotated tooth, teeth with extreme angulations or inclination and wide diastema may need further clinical evidence and orthodontist consultation for the practice of sectional short-span wire-fixed orthodontics. [9]

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