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Anterior Cross Bite Correction with Three Different Approaches: A Series of Three Cases

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Abstract
An abnormal labiolingual association between one or more maxillary and mandibular incisor teeth is called anterior cross bite. It is not an unusual finding during mixed dentition. Early diagnosis will aid the expert to treat minor irregularities seen in developing dentition with ease. The current paper presents three case series which describe the successful treatment of anterior cross bite in children with mixed dentition using three different modalities.
Keywords: *Anterior Cross bite, Removable Appliances, Expansion Jack Screw, Z- Spring.*

Introduction

Minor malocclusion is one of the major concerns of Peadiatric dentist or Orthodontist, that require guidance in the developing dentition to a state of normalcy in line with the stage of oral-facial growth and development. Anterior cross bite can be defined as upper frontal primary or individual permanent teeth lingual position in relationship to lower incisor teeth.[1]

An old orthodontic apothegm states "The best time to treat a cross bite is the first time it is seen." Anterior dental cross bite has a reported incidence of 4-5% and is usually the result of a palatal malposition of the maxillary incisors resulting from a lingual eruption path. [2]

Other etiological aspects include trauma to the primary maxillary incisors ensuing in lingual displacement of the permanent tooth buds, presence of supernumerary anterior teeth, crowding in the incisor region, a habit of biting the upper lip, an over retained, necrotic or pulpless deciduous tooth or root, delayed exfoliation of the primary incisors; and odontomas.[3]

Nevertheless the origin of malocclusion – skeletal or dentoalveolar, the treatment of anterior cross bite is recommended in primary and early mixed dentition. However early treatment does not always eliminate orthodontic treatment need in permanent occlusion.[4] The aim of early treatment

of this type of malocclusion is to correct anterior cross bite, as otherwise it can often lead to very serious Class III malocclusion which necessitates complex combined orthodontic and orthognatic method.[5-8]

The following article, elaborates three cases of anterior cross bite managed with different approaches with composite inclined plane, Hawley's appliance with Z-spring and posterior bite plane and Jack screw.

Case Series

Case 1

A 12 year old patient reported to the department of Peadiatric and Preventive Dentistry with the chief complaint of "crooked teeth". Examination showed the normal profile of the patient, the same whether the mandible was at rest or when the teeth were occluded. Intraoral examination showed that the maxillary permanent central incisors were erupted but the right 21 had deflected lingually. There was gingival recession in 71 [Figure -1] Space analysis showed adequate space was available, hence an inclined plane was constructed, made of composite, following 45degree inclination it produced a forward sliding motion of the maxillary incisors on closure. [Figure -2,3] In this case, anterior cross bite correction was seen within 15days.[Figure-4]

Figure 1- Cross bite irt 21, 31

Figure 2- Immediate post-operative composite inclined plane

Figure 3 - Post operative follow up after 1 week

Figure 4 - Post operative follow up after 15 days

Case 2

8 year old patient reported to the Department of Peadiatric and Preventive Dentistry with the chief complaint of unaesthetic appearance. Extra oral examination revealed normal profile of the patient. Intraorally, it was observed that the 11 was lingually locked and 74, 85 were grossly carious. Chronic irreversible pulpitis irt 74, 85 was diagnosed. [Figure -5, 6]. Pulpectomy followed by stainless steel crowns were performed. Space analysis showed, sufficient space for movement of 11.A Hawley's appliance with a double cantilever spring with the posterior bite plane was planned and fabricated. [Figure – 7]. A posterior bite plane was constructed to provide sufficient opening of vertical dimensions to facilitate movement of tooth in cross bite. In

this case Z- spring was indicated as there was adequate space for the labialization of the maxillary lateral incisor. The patient was recalled after one week and the double cantilever spring was activated and the desired result was seen within two weeks. Excellent patient cooperation resulted in early correction of the cross bite [Figure –8]. Appliance was continued for a further 2 weeks for maintenance of correction.

Figure 5 –Cross bite irt 11, 41

Figure 6- Grossly carious 74,85

Figure 7- Hawley's appliance with a double cantilever spring with the posterior bite plane

Figure 8 - Post operative follow up after 2 weeks

Case 3

A 12 year-old girl reported to the department of Paediatric and Preventive dentistry with the chief complaint of unnesthetic appearance. Extraorally, she had protruded chin, with the maxillary dental midline coincident with the facial midline. The 11 and 12 were lingually locked. [Figure – 9] She presented in the permanent dentition stage with Class I left and Class III right molar relationships. In cephalometric- Steiner's analysis, showed skeletal class III malocclusion.

Based on the above findings, the patient was scheduled for limited early interceptive treatment to restore normal occlusion. A removable appliance was chosen, incorporated a 2D jackscrew set to act in an anteroposterior direction to tip the maxillary right permanent central and lateral incisor labially and bilateral posterior bite planes (about 4 mm thick) to disengage the bite and facilitate tooth movement. [Figure -10,11] The patient's parents were asked to activate the jackscrew a quarter turn every second day. The patient was instructed to wear the appliance full-time (day and night) except for eating and teeth cleaning. Patient was instructed regarding the care of the appliance and oral hygiene measures to be maintained. Upon treatment completion, an upper Hawley retainer was planned to ensure stability of the corrected malocclusion. Patient was recalled after 1 week and 15 days and desired result was achieved in 2 months duration. [Figure– 12] Following the anterior cross bite correction patient was referred to department of Orthodontics for correction of class III malocclusion.

Figure 9- Anterior crossbiteirt 11,21,41,42

Figure 10- Immediate post-operative removable plate with 2d jack screw

Figure 11- Refabricaton of removable plate with 2d jack screw

Figure 12 - Post operative follow up after 2 months

Discussion

Anterior cross bite is a condition which rarely self corrects, because the maxillary incisor is locked behind the mandibular incisors and the discrepancy continues to progress leading to severe malocclusion.

Thus early treatment can reconstruct proper muscle balance and a well-balanced occlusal development. Early treatment is also directed towards averting dysplastic growth of both skeletal and the dentoalveolar components. (Prakasha and Durgesh, 2011)

The ideal age for the correction of permanent anterior dental cross bite is between 8 to 12 years during which the roots are developing and the tooth is in the active stage of eruption. Age is not the single factor for consideration, motivation for treatment, how he or she perceives the problem also plays a role.(Susan A and Eroy, 1983)

The clinician must first extricate cross bites of dental origin from those of skeletal origin. Dental cross bite implicates localized tipping of a tooth or teeth and does not involve the basal bone (Bayrak and Tunc, 2008). Pseudo Class III malocclusion is an example of dental anterior cross bite that needs to be differentiated from sagittal skeletal discrepancies. It encompasses retroclination of maxillary incisors that cause the mandible to shift forward (Rabie and Gu, 2000). That is why treatment of these cases should purpose to correct maxillary incisor inclination (Hagg et al., 2004). Moyers has renowned pseudo Class III malocclusion from cases with simple linguoversion. The latter involves palatal positioning of one or more maxillary anterior teeth and does not produce a positional relationship brought about by early interference (Moyers, 1988).

There is altered treatment methods for the correction of anterior dental cross bite which can be used in early mixed dentition period. These include tongue blade therapy, reverse stainless steel crowns, jack screw removable Hawley retainer with anterior Z-springs, bonded resin composite slopes and fixed therapy.

The tongue blade therapy is efficacious in early developing stage and with patient cooperation and there is no precise control over the amount and direction of force applied. The reverse stainless steel crowns have been shown to be successful but the two main drawbacks here are the unaesthetic appearance of the crown form and the limitations of working with an inclined slope that is formed. (Ulusoy and Bodru Mlu, 2013)

Because of the disadvantages of the methods mentioned above, a composite inclined plane was given in Case 1.The inclined plane caps the lower incisors and is at about 45°angle to the occlusal plane. On closing the upper incisors, which earlier occlude behind the lower incisors, bite on the inclined plane and the pressure of the bite (P) divides into two force vectors P1 and P2. The pressure (P1) proclines the upper incisors and the Pressure (P2) intrude the incisors. The steeper the plane, the greater the forward pressure on the maxillary incisors. The advisable angle is 45°.The desirable results in Case 1 were seen as early as fifteen days with good patient compliance.

In Case 2, as there was sufficient space for the 11 to move labially, a Hawley's appliance with a double cantilever spring was given. A maxillary posterior bite plate was inserted to countenance clearance for the cross bite correction. Excellent patient compliance, guaranteed early correction (15 days).

In case 3, pre-treatment molar relationship was Class I on the left side and a class III on the right. In cross bite cases with a mandibular shift, studies have indicated that molars on the cross bite side showed a partial Class III relationship (Hesse et al., 1997). In the present case, the right molar relationship had been not corrected to a Class I relation by the end of treatment so patient was referred to department of Orthodontics.

The principle of the orthodontic screw is that its ends are threaded in opposite directions and when it is turned, the plates move apart. Since it is rigid, it can only be activated by small increments, at a time, to prevent the distortion of the appliance. The activation is done one-quarter turn which separates the acrylic by about 0.25 mm producing forces ranging from 3 to 10 pounds. This compresses the teeth in the socket by 0.12mm per side. It is within the width of Periodontal Ligament (0.25mm). Such a mild reduction of periodontal ligament space will not interpose the blood circulation and creates an ideal condition for the tooth movement and bone transformation. More common adjustments, of up to one-quarter turn twice a week is occasionally possible. But care must be taken not to overdo it as this may result in an ill-fitting appliance. Generally, the acclaimed activation frequency of similar appliances is every second or third day (Kennedy and Osepchook, 2005). In this case, we followed an every-other day activation protocol, which was found to be efficient and effective in the management of this case. Activation every third day is suggested during the first week of therapy for improved patient comfort and acceptance. Other authors advocate activation twice a week (Al-Sehaibany and White, 1998) and once a week (Cunha et al., 1999)

For the appliance, an acrylic thickness of 4 mm was specified (i.e., barely enough to disengage the anterior cross bite tooth). Increased and unnecessary amounts of bite opening may lead alteration of the vertical relationship and decreased the patient's compliance.

The duration of treatment with removable appliances is reported to range from 6 to 12 weeks (Kennedy and Osepchook, 2005). With a slower expansion rate, treatment can take up to 6 (Al-Sehaibany and White, 1998) and 12 months (Cunha et al., 1999). The appliance therapies lasted for 2 months, which is in agreement with the above-mentioned range.

Increased treatment time and cost have been concomitant with the use of fixed (eg, quadhelix) versus removable appliances for cross bite correction (Hermanson et al., 1985; Ranta, 1988). Nevertheless, treatment of this case was confined to the expected treatment time and matched the reported treatment duration using similar removable appliances. This highlights the

importance of case selection and the inevitability of enlisting patient and parental compliance before the start of treatment.

Conclusion

The above-mentioned cases designate the satisfactory alternative methods for correction of anterior dental cross bite instead of complex fixed treatment modalities in mixed dentition period. Therefore it is essential to realize that early diagnosis and correction may prevent the vision of any deleterious effects upon the growth and development of the child.

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