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Cross-Bite Treatment and Problems during the Early Stages of Developing of the Dentition in the Frontal Area

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Abstract: ***Cross-bite is a severe orthodontic problem, which requires on time treatment. The consequences of neglecting the problem lead to more severe orthodontic problems such as underdevelopment of the maxilla-facial area. The cross-bite can be observed in the frontal segment as well as in the posterior segment. The authors have found out prevalence of the problem from 2% to 8% among the different nations. One of the main reasons for the cross-bite is the ectopic eruption of the teeth- palatal for the upper and vestibular for the lower. A cross-bite in the anterior area can lead to the TMJ disorders, class III predisposition, periodontal problems and aesthetic problems. The problem should be treated right way when being diagnosed. The treatment of the problem can include removable or fixed appliances. The removable appliances have advantages, but the biggest disadvantage is the lack of the patient's cooperation during the treatment. The patients with mixed dentition are in age when they are not so cooperative. That's why we prefer to treat the problem with the fixed appliance. We suggest an alternative fixed appliance used in our clinical practice which is not dependable on the patient's cooperation.***

Keywords: cross-bite, early treatment, underdevelopment, alternative fixed appliance

1. Acknowledgment of the Problem and Literature Review

The patients usually see the cross-bite as a severe aesthetical problem. The orthodontists see the problem as a severe functional and anatomical disturbance.

The cross-bite in the frontal area is a sagittal malocclusion between the upper and lower jaw, which affects one or more primary or permanent teeth. The cross-bite can be observed as in the frontal as in the distal area affecting one or more teeth, combined with other relationships in the other planes or it can be observed as a single malocclusion.

The problem "cross-bite" is a result of an anatomical or functional disturbance in the occlusion. It also may be a result of other accompanying deformations in the other planes of the dimensions.

In the literature it is said that the frequency of this problem is near 4-5% (Hannuksela and Vaananen, 1987; Heikinheimo et al., 1987; Major and Glover, 1992) [8, 9 and 14] and it is observed mainly in the early mixed dentition. In a study of 2004 Tausche et al. [21] reported cross-bite in 8.2%. Keski-Nisula et al. 2003 [11] find anterior cross-bite in 2.2% of the children. In Bulgaria Petrunov [17] reports that the frequency of this problem is 4.1% as (4.3%) are male patients and (3.8%) are female patients.

We can divide the etiology of cross-bite in the frontal area according to the changes found in the eruption of the upper (palatal) and lower (vestibular) incisors.

The time for developing of the primary and permanent dentition matches to the most intense growth of the facial skeleton. The disturbed functions in the maxillofacial complex and the malocclusions result in improper growth processes. The cross-bite leads to delayed and blocked growth of the maxilla. If all of the frontal teeth are involved, this will result in the skeletal changes and impaired sagittal relationships. The patient develops class III predisposition [19]. An improper masticatory function is observed which resulted in the occlusal trauma and TMJ dysfunctions. The thicker vestibular crest in lower frontal teeth and their labial torque will lead to gingivitis and recessions. Because of the retrusion of the lower frontal teeth and the reduced dimensions for tongue articulation, the speech is often disturbed, but for the patient the most dramatic problem is the aesthetics. All this conditions make the early treatment of cross-bite obligatory. The anterior cross-bite in the early mixed dentition is believed to be transferred from the permanent dentition and have long-term effect.

Treating the dental problems we assure proper skeletal growth and extra oral appearances. When the cross-bite is not treated early, its negative effect is multiplied on the skeletal growth till the end of the growth period [3].

For a proper early orthodontic treatment, we must know the factors that have led for this malocclusion. If the anterior is due to skeletal malformation, it is a part of a bigger problem most often class III malocclusion (Rabie 2000) [18]. The pure form of anterior cross-bite is due to abnormal position of the upper (retro inclined) or lowers (proclined) teeth or combinitation between the two ones. There is no presence of discrepancy between the jaws but only between the positions

of the teeth. This is most often caused by teeth crowding in both of the jaws or unilateral or bilateral tooth agenesis of the lateral incisors. We can observe the palatal eruption of the permanent teeth in the following conditions: trauma of the primary teeth, which affects the position of the germ and moves it palatal; late extraction of the primary teeth that leads to palatal eruption; super numerous teeth in the frontal area or odontoma collection; hereditary palatal eruption; bad habits lip biting and chewing; lack of space in the dental arch which leads to crowding and palatal movement of the incisors.

Labial inclination of the lower frontal teeth occurs when: disfunction of the tongue leading to protrusion of the lower frontal teeth; lack of space in the lower jaw resulting in the vestibular movement and inclination of the incisors; hereditary vestibular eruption of the lower incisors or trauma of the primary teeth, which affects the germ of the permanent teeth.

The anterior cross-bite is often combined with an upper midline deviation. Because of the palatal location of the one of the incisors, the other teeth are displaced in the released space. This effect can be seen in the lower jaw because of the vestibular displacement of some incisors. (Kurol 1992)[12].

The removable appliances have the advantages to easier maintenance and oral hygiene care for young patients (Littlewood)[13]. He describes the treatment principle and efficiency as follows: removable appliances work by simple tipping movements of the crowns of the teeth about a fulcrum close to the middle of the tooth. They also allow differential eruption of the teeth, for example by using bite planes. They differ from the fixed appliances, which are capable of complex movements of the multiple teeth, including body movement, root torque and rotation. Hawley appliance with auxiliary springs is one of the earliest appliances introduced to produce proclination of the upper incisors. The removable appliance with protrusion screws and occlusal surfaces are often used. The use of these appliances requires the patient's cooperation [22].

Patients with early mixed dentition are not so willing to cooperate in the orthodontic treatment. They are not enough mature to realize the need of the treatment. That is why the treatment with removable appliance is not guaranteed to succeed. Bonding brackets to the four maxillary incisors and two permanent first molars (2x4) is one of the successful methods [15]. The method has been proposed and described by Dowsing[6], 2004 and result in the correction of anterior cross-bite in mixed dentition. With the fixed appliance the patients do not change the speech. Other reported treatment includes the use of fixed acrylic planes, bonded resin-composite slopes (Bayrak 2008)[2], clean removable appliances (Park 2009)[16], treatment with quick fix appliance[4,5,10].

The fixed appliance haves greater power of action and provides more continuous forces when compared to removable [20]. These appliances allow three-dimensional control of teeth that move. They reduce the need for patient cooperation. Another reason to use fixed appliance is the time needed for the movement of the upper and lower frontal teeth when in edge to edge bite and the enormous disarticulation in the distal area. At this period the masticatory function is impossible. The patient feels more comfortable and stable if the appliance is fixed. These considerations insist using fixed appliance in our practice for correction of the cross-bite. With this appliance we assure protrusion of the upper frontal teeth.

The used by us appliance was consistent of two plastic over denture caps, covering the palatal, occlusal and vestibular surfaces of the posterior teeth (permanent molar, primary molars and canines). The plastic caps were connected with a transpalatinal arch. From the two plastic caps begins protruding spring, touching the palatal surfaces of the frontal teeth. The appliance is fixed with the help of glass-ionomer cement. Before fixing of the appliance the spring is separated and covered with a rubber tube. By this we assure its activation and soft tissue care.

With the plastic caps we have achieved disarticulation during the treatment. The patient's lower posterior teeth are occluding with the plastic caps. This is comfortable during eating. The desired effect of this appliance is achieved for about 4 to 5 weeks, after that it is removed. The new relations between the frontal teeth are enough to keep the result.

In severe cases the action of the appliance can be supported with the brackets 4x2 system. In these cases we don't band the first molars, but include tubes in the vestibular surface of the plastic caps. Anderson et al. states that pseudo-Class III patients who receive early intervention with a 4x2 appliance, will be stable in the long term and will not need further orthodontic treatment [1]. Hagg reported that the growth of the jaw was corrected after early treatment of pseudo class III and dental compensation [7].

2. Clinical Cases

2.1 Clinical Case 1

We present a 7.5 years old patient with an early mixed dentition and cross-bite between upper and lower central incisors (fig.1). We used the fixed appliance for protrusion of the upper central incisors. The height of the occlusal caps let to edge to edge occlusal relationships in the front. We achieved correction of the cross-bite for 4 weeks (fig.2).

The protrusion spring was separated in the area of the central incisors and the tension was in the area of the lateral incisors. The appliance was fixed until the eruption of the lateral incisors. After that the appliance was de-bonded and the treatment in the early teeth dentition was over.

Figure 1: Clinical Case 1

First row: position of the teeth before the treatment

Second row: the start of the treatment and placing of the appliance.

Third row: activation of the appliance

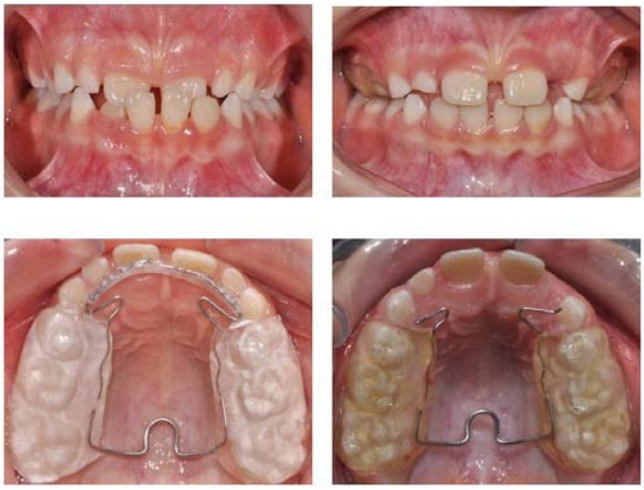

Figure 2: Clinical Case 1

First row: before and after the treatment

Second row: placed appliance

2.2 Clinical Case 2

Clinical case 2 is about patient of 8.5 years old first class molar occlusal relationships, cross-bite in the area of the central incisors and deep bite. The crowns of the upper frontal incisors were fully covered by the lower frontal incisors. The deep bite was caused by the retrusion of the upper frontal teeth (fig. 3).

Our treatment included disarticulation and protrusion of the upper frontal teeth. We used the fixed appliance for protrusion combined with braces on the incisors and anchor (tubes) bonded on the vestibular surface of the caps.

Figure 3: Clinical Case 2

First row: position of the teeth before the treatment

Second row: the start of the treatment and placing of the plastic appliance

Third row: activation of the plastic appliance and fix the brackets

The treatment time was 3.5 mounts till the correction of the cross-bite. Three NiTi wires were used for the alignment of the upper anterior teeth during the treatment (fig. 4). After the treatment we observed normal eruption of the distal permanent teeth and normal occlusal relationships.

Figure 4: Clinical Case 2

First row: alignment of the upper anterior teeth

Second row: occlusal view of the upper jaw

Third row: before and after the treatment

2.3 Clinical Case 3

We present 7 years old patient with cross-bite in the central incisors and normal molar occlusal relationships. We diagnosed underdevelopment of the frontal maxillary bone area. We observed symptoms for furthermore recession of the lower frontal teeth caused by traumatic occlusion.

Our aim was to procline the upper frontal teeth and stimulate bone development in the apices area. We used a fixed appliance with protrusion spring for the movement of the upper central incisors and lip pads (fig. 5). The treatment time was 3 mounts. After that the appliance was removed. We followed up the eruption of the lateral incisors and after that the eruption of the premolars and the canines. The orthodontic treatment finished with an alignment of the teeth.

Figure 5: Clinical Case 3

First row: position of the teeth before the treatment

Second row: the start of the treatment and placing of the plastic appliance with lip pads, occlusal view of the appliance

Third row: the treatment progress achieved.

3. Discussion

The patient's adaptation period toward to the fixed appliance for frontal incisors' protrusion is in very short time. The therapy result with this appliance is fast and no need for the patient's cooperation. The advantage of this type of construction is the ability to make changes in a transversal dimension (expansions) as well, using the effect from the transpalatal arch. When the appliance is combined with a jackscrew for rapid palatal expansion, it may correct a cross-byte in the frontal and distal segment at the same time. In cases with pseudo class III malocclusions there are good results if the construction includes lip pads for growth stimulation in the frontal segment of the maxilla. Another advantage is that the appliance construction can be supplied with hooks for face mask. These futures of the appliance construction make it preferable for the use in our practice.

4. Conclusion

The early diagnostic and treatment of the cross-bite in frontal segment decrease the risk of development of the class III malocclusion.

The fast therapy result contributes to the normal skeletal face growth. The treatments are performed more often in the period of the early mixed dentition before the growth peak during the puberty has started. The correction of the cross-bite in frontal segment is really important for the appropriate development in nasomaxillary complex.

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