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Observation and Analysis of the Treatment of Anterior Crossbite in Deciduous Dentition

YONGMEI HUA and SIZHEN SHI

*Department of Pedodontics, School of Dentistry, Shanghai Tiedao University
(Chief: Prof. Sizhen Shi)*

Summary

The purpose of this study was to analyze the factors related to anterior crossbite in deciduous dentition and observe relapse after correction until the eruption of permanent anterior teeth.

In this study, 50 Chinese children aged 4–6 years old with anterior crossbite of deciduous dentition were analyzed for the relevant factors and different correction methods. The occurrence of relapse was observed.

The relapse rate of the hereditary group was the highest. The relapse rate of the group treated with an inclined lower anterior bite plate was lower than that of those treated with a removable appliance with a posterior bite plate and anterior lingual springs.

Improper oral habits are a key problem in the anterior crossbite of deciduous dentition, and children with such oral habits-related anterior crossbite should be treated at their early age.

Introduction

Anterior crossbite is a prevalent malformation in preschool children and is strongly related to the development of occlusion, and of the jaws and face. It is difficult to determine the influence of the natural growth process of anterior crossbite on the growth and development of occlusion, and of the jaws and face longitudinally. There have been also no detailed relevant reports in China. In this study, study model from 50 children with anterior crossbite of deciduous dentition were analyzed for the relevant factors. The occurrence of relapse was observed until eruption of the permanent anterior teeth. Scientific references to the early diagnosis and treatment of the anterior crossbite in deciduous, to the complicated orthodontic treatment in the permanent dentition will be provided.

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Correspondence to : Dr. Yongmei Hua, *Department of Pedodontics, School of Dentistry, Shanghai Tiedao University, No. 399 Yanchang Zhong Road, Shanghai, P. R. China, 200072*

Material and methods

The subjects in this study were 50 Chinese children aged 4–6 years old (31 boys, 19 girls) with anterior crossbite of deciduous dentition. The average age was 5.4 years old. We used study model. Whoever of the patient's lineal relative (parents, uncles, aunts and grandparents) had the same pattern of malocclusion, we defined that the cause of the patient malocclusion was hereditary factors. The other causes of malocclusion except the four kinds of causes above-mentioned were defined as uncertain factors.

The relevant factors of the 50 cases are shown in Table 1.

The 50 cases were divided into 2 groups according to the extent of their negative overbite and negative overjet, and corresponding methods of correction were determined for each group. The periods needed for correction were also calculated.

Overbite was defined as the upper incisors overlapping more than one-third of the length of the lower incisors.

Overjet was defined as a distance of more than 3mm between the incisal edges of the upper and lower incisors in the horizontal plane.

When overjet was reversed in anterior crossbite, the distance between the labial edge of the upper incisors and the lingual edge of the lower incisors was measured and the determined value is expressed as a negative value.

In Group 1, 27 cases with anterior crossbite with more than 1 negative overbite and less than 1 negative overjet were corrected with an acrylic-cap inclined lower anterior bite plate, retained with a headgear chin cup. The mean period of treatment was 56.4 days. In Group 2, 23 cases with anterior cross-bites with less than 1 negative overbite and more than 1 negative overjet were corrected with removable appliances with a posterior bite plate anterior lingual springs, assisted with a headgear chin cup. The mean treatment period was 113.9 days. After treatment, the occurrence of relapse was examined until eruption of the permanent anterior teeth.

Results

The relapse in each group with various factors and various treatment methods was observed after correction of anterior crossbite until the full eruption of permanent incisors. The results were shown in Tables 2 and 3. If any individual permanent teeth crossbite occurred, it was regarded as relapse. Tables 2 indicates that the relapse rate of the hereditary factor group was the highest. These results indicated that this kind of crossbite is associated with skeletal disharmony and harmful teeth-facial relationships, and that the mandible has obstinate growth potential. As

Table 1 : Relevant factors of the 50 cases

Relevant factors	cases	Rate (%)
Improper Oral habits	24	48.0
Hereditary factors	14	28.0
Inadequate wear of the primary canines	5	10.0
Caries	4	8.0
Uncertain	3	6.0

Table 2 : Relapse rate in groups with various factors

Factors	Relapse cases/total	Relapse rate (%)
Oral habits	10/24	41.7
Hereditary factors	12/14	85.7
Inadequate wear of the primary	1/5	20.0
Caries	1/4	25.0
Uncertain	2/3	66.7

shown in Tables 3 the relapse rate of Group 1 was significantly lower than that of Group 2. It indicated that the appliance in Group 1 has achieved the effect of functional growth modification, and quickly eliminated the factors which hampered normal growth and development of the craniofacial complexity.

Table 3 : Relapse of groups with different methods of correction

Groups	Relapse cases/total	Relapse rate(%)
Group 1	12/27	44.4
Group 2	14/23	60.9

"There differences between the two groups were significant ($\chi^2=5.8, p<0.05$)."

Discussion

1. Analysis of relevant factors : Table 1 shows that improper oral habits (48%) were the main problems related to the anterior crossbite in deciduous dentition, in agreement with the report of Zhou and Su¹⁾. Meanwhile, improper oral habits were also very important in the etiology of other forms of malocclusion. According to the statistics of the Department of Orthodontics, Beijing Medical University, the percentage of cases of all kinds of malocclusions related to improper oral habits was 25%²⁾. Primary or secondary improper oral habits might lead to occlusal disorder, influence the growth and development of occlusion, and of the jaw and face, and interfere with their normal function, or even induce serious deformities in the jaw and face.

In this study, some cases in the hereditary factor group were also affected by improper oral habits. These observations indicated that multiple factors might act at the same time or one after another, but it is rather difficult to distinguish which is the most important, because any changes in one factor could be compensated for by reverse changes in another. Alternatively, changes in one factor may induce abnormal changes in other factors. Malocclusion is the complicated result of the actions of multiple factors on teeth, muscles and bones. Therefore, when making treatment plans, multiple factors should be considered at the same time.

2. Timing of treatment : Children with deciduous dentition or mixed dentition are in the rapid growth period, which provides an opportunity for early treatment. Orthodontists can successfully correct the disharmony of the jaws by growth modification and harmonious oral function will promote the normal growth of the jaws. Children 3 years old and under and in the occlusion rebuilding stage of deciduous dentition formation are too young to cooperate with doctors, and therefore are not suitable for early treatment. Older subjects are not suitable for treatment, because of the root absorption of primary teeth. Therefore, the best opportunity for treatment of the anterior crossbite in deciduous dentition is at the age of about 4 years old. For serious skeletal malocclusions, it is necessary for treatment to be conducted early during the primary dentition period. Sakamoto³⁾ and Sugawara et al⁴⁾ advocated early treatment of anterior crossbite in deciduous dentition, because the crossbite will not change following the eruption of the successor teeth and will be similar to mixed dentition⁵⁾. If the treatment is delayed to the permanent dentition period, most children will miss the rapid growth period and their growth potential will be limited. In such cases, disharmonious jaw relations can only be camouflaged by movement of the teeth. Therefore, most skeletal malocclusions should be treated in the preadolescence period by growth modification to improve maxillary relations. After the permanent dentition is built, the occlusion will be consummated by comprehensive treatment to obtain ideal results.

Some scholars mention that orthodontic treatment should be performed after eruption of the second permanent molars because at this time dentists can make a clear treatment plan which could be

completed in 2–3 years. In addition, it will not be necessary to consider unfavourable changes caused by abnormal growth since the patients will have passed the rapid growth period and the growth will have almost finished⁶⁾.

3. Problems of relapse after early treatment : Table 2 indicates that the relapse rate of the hereditary factor group was the highest. These results indicated that this kind of crossbite is associated with skeletal disharmony and harmful teeth–facial relationships and that the mandible has obstinate growth potential. Especially in the rapid growth period, the mandible will surpass the maxilla in growth velocity, and it will not be possible to establish normal muscle balance. This becomes the main reason for relapse. However, the fairly high relapse rate of the improper oral habits group was partly due to the patients and parents who neglected the importance of eradicating the oral habits. The oral habits may still exist after correction and again induce anterior crossbite of the permanent teeth.

As shown in Table 3, the relapse rate of Group 1 was significantly lower than that of Group 2. The inclined lower anterior bite plate could produce upward and backward migration of the condyle process, retrognathism of the mandible, labial movement of the upper anterior teeth and their long axes, and promote anterior development of the pre–maxilla region, elongation of the posterior teeth, reduce the anterior deep overbite, and quickly eliminate the factors which hamper normal growth and development of the craniofacial complexity, so as to achieve the effect of functional growth modification. Nevertheless, the courses of treatment were longer with application of the removable appliance with a posterior bite plate and anterior lingual springs, which was coordinated with the headgear chin cup. These results mainly showed that the marked labial proclination of the long axes of the upper anteriors could facilitate the backward physical migration of the mandible and the lower anteriors. However, the headgear chin cup could not effectively restrain the growth of the mandible. It is evident that early treatment can positively reduce the severity of the malocclusion, but cannot obstruct development of the abnormal growth pattern. This is not the action of modification, but can lead to relapse of the crossbite during the mixed dentition period.

The active cooperation of the patients is a key factor for success in early orthodontics. So long as orthodontists clearly explain the severity and the harmfulness of the malocclusion, and illustrate the necessity and anticipated results of wearing the appliances, the majority of patients and parents will positively cooperate during treatment. However, a careful and effective retention is often neglected. In most patients, the retention should be kept until the growth velocity slows down (permanent dentition period). For the few cases with serious skeletal deformities, long–term restraint of the growth potential should be performed, and the retention should be maintained until the end of the adolescent rapid growth period. However, in most cases the best time for wearing of retainers would be missed because the headgear chin cups are abandoned as soon as the anterior crossbite is relieved and the permanent incisors start to erupt. This constitutes another reason for relapse⁷⁾.

Although further treatment in the mixed dentition period and final fixed appliance treatment in the permanent dentition period were still needed in some cases because of relapse caused by the reverse influences of the continual abnormal growth pattern after correction of the crossbite, early treatment really improved the relationships between the upper and lower jaws, teeth and jaws, and among perioral muscles. This early treatment reduced the difficulty of comprehensive treatment of permanent dentition, shortened the duration of treatment necessary, and improved the effects of treatment.

The relapsing tendency in the cases of anterior crossbite of deciduous teeth in the mixed dentition or permanent dentition should be studied further.

Conclusions

Oral habits are key factors influencing the anterior crossbite of deciduous dentition. Children with oral habit-related anterior crossbite should be treated at their early time.

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抄録：乳歯列期における前歯部交叉咬合の処置法の検討および考察

華 咏梅, 石 四箴 (上海鉄道大学歯学部・小児歯科)

本研究は乳歯列期からの前歯部交叉咬合を永久前歯萌出に到るまでに矯正治療を行い、その後、後戻りを認めた症例と、その関連要因を検討する目的で研究を行った。

乳歯列期で前歯部交叉咬合を認めた4～6歳の50名の小児を対象に種々の処置法の選択と関連要因、後戻りの症例について考察を行った。

その結果、遺伝的要因を示す群の後戻りの割合は最も高かった。また、下顎前歯部にバイトプレートを装着し傾斜移動を行った群は、前歯部にリングスプリングと臼歯部バイトプレートを施した可撤式装置に比較して、後戻りの割合は低かった。

悪習癖は乳歯列期の前歯部交叉咬合の重要な問題と考えられる。したがって、悪習癖があり、前歯部交叉咬合を有する小児に対しては早期の処置が必要と考えられた。