

Analysis of teleroentgenograms in the lateral projection showed that the majority of patients had skeletal class II with retrognathia of the lower jaw, which makes it possible to assess the skeletal pathology of occlusion. Most patients also had maxillary anteinclination and hyperdivergence.

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ОЦЕНКА РАЗВИТИЯ ВЕРХНЕГО ЗУБНОГО РЯДА В ТРАНСВЕРЗАЛЬНОЙ ПЛОСКОСТИ ПОСЛЕ РАННЕГО ОРТОДОНТИЧЕСКОГО ЛЕЧЕНИЯ ПЕРЕКРЕСТНОЙ ОККЛЮЗИИ В ПЕРИОД ВРЕМЕННОГО ПРИКУСА

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Аннотация

Введение. Трансверзальные аномалии окклюзии являются распространенной аномалией зубочелюстной системы. В период временного и сменного прикуса

наиболее часто встречается односторонний перекрестный прикус с функциональным смещением нижней челюсти в сторону. В случае отсутствия раннего ортодонтического лечения перекрестного прикуса в период временного и раннего сменного прикуса, с возрастом развиваются скелетные нарушения. **Цель исследования** – анализ отдаленных показателей ширины верхнего зубного ряда после раннего ортодонтического лечения детей 3-5 лет с перекрестной окклюзией. **Материал и методы.** Проведено раннее ортодонтическое лечение 20 детей 3-5 лет с перекрестной окклюзией. **Результаты.** В ходе исследования проведен анализ трансверзальных размеров зубных рядов до и после раннего ортодонтического лечения детей с перекрестной окклюзией в сравнении с контрольной группой. **Выводы.** Установлено, что в отдаленные сроки после раннего ортодонтического лечения детей 3-5 лет с перекрестной окклюзией во всех случаях определялось благоприятное развитие верхнего зубного ряда в трансверзальной плоскости (достаточная ширина верхнего зубного ряда).

Ключевые слова: раннее ортодонтическое лечение, перекрестная окклюзия.

EVALUATION OF THE DEVELOPMENT OF THE MAXILLARY ARCH IN THE TRANSVERSAL PLANE AFTER EARLY ORTHODONTIC TREATMENT OF POSTERIOR CROSSBITE IN THE DECIDUOUS DENTITION

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Absrtact

Introduction. Transversal malocclusions are common anomaly of the dentoalveolar system. Unilateral posterior crossbite with functional lateral mandible displacement often occurs in the deciduous and early mixed dentition. In the absence of early orthodontic treatment of the posterior crossbite in the deciduous and early mixed dentition, skeletal disorders develop with age. The purpose of the study is to analyze the long-term parameters of maxillary width after early orthodontic treatment of children aged 3-5 years with posterior crossbite. **Material and methods.** 20 children aged 3-5 years with posterior crossbite underwent early orthodontic treatment. **Results.** This research analyses transverse dimensional characteristics of maxillary and mandibular arch before and after early orthodontic treatment of children with posterior crossbite compared with control group. **Conclusions.** It was found that the favorable development of the maxillary arch in the transversal plane (sufficient width of the maxillary arch) was achieved in all cases in the long-term perspective after early orthodontic treatment of children aged 3-5 years with posterior crossbite.

Keywords: early orthodontic treatment, posterior crossbite.

INTRODUCTION

Transversal malocclusions are common anomaly of the dentoalveolar system. Unilateral posterior crossbite with functional lateral mandible displacement often occurs in the deciduous and early mixed dentition, with its prevalence ranging from 5 to 23% [1].

Orthodontists prefer to expand the maxillary arch after the eruption of the first permanent molars. However, if there is narrow maxillary arch in the deciduous dentition, first permanent molars will erupt also in reverse closure in the transversal plane [1]. The expansion of the maxillary arch in the early mixed dentition may be difficult due to defective eruption of the first permanent molars in the alveolar process.

In the absence of timely treatment of the posterior crossbite and constriction of the maxillary arch, the maxilla is blocked by the mandibular arch, the growth of maxilla in the transversal plane is limited and maxillary skeletal constriction develops, while there are no obstacles to the development of the mandibula. Treatment of posterior crossbite in permanent dentition is longer and more complex and requires more aggressive intervention, including skeletal expansion of the maxilla, up to the use of surgical manipulations (surgical support for midpalatal suture opening, using of orthodontic miniscrews). Thus, as the child grows, a skeletal form of posterior crossbite develops, which requires not only orthodontic, but also orthopedic and/or surgical treatment.

The correction of posterior crossbite in older age requires correction myofunctional disorders, which is difficult due to abnormal muscular patterns. It is necessary to develop normal (correct) maxillofacial muscular patterns. The longer the disorders of myofunctional balance, the longer and more complex correction of posterior crossbite. Due to the incorrect position of the tongue on the floor of the mouth and the lack of pressure on the maxillary arch, there is a discrepancy in the width of the maxillary and mandibular arch. In the absence of correction of the tongue position and function after early orthodontic treatment, risk of relapse of constriction of maxillary arch and expansion of mandibular arch increases.

Unilateral posterior crossbite in the majority cases is associated with lateral mandible displacement, which leads to an asymmetric condyles position, which in turn leads to an asymmetric mandible growth and the transition of the dentoalveolar anomaly of the posterior crossbite to the skeletal one [2]. Without timely orthodontic treatment, as the child's maxillofacial region grows and develops, there is increased growth on the non-crossbite side and insufficient growth on the crossbite side, which leads to facial asymmetry [3].

The purpose of the study is to analyze the long-term parameters of maxillary width after early orthodontic treatment of children aged 3-5 years with posterior crossbite.

MATERIAL AND METHODS

20 children aged 3-5 years with posterior crossbite underwent early orthodontic treatment (EOT) at the Department of Pediatric Dentistry and Orthodontics of Ural state medical university.

All patients underwent comprehensive examination. Discrepancies in the width of the maxillary and mandibular arch were assessed using the Tubingen index of

deciduous dentition developed by Dausch-Neumann [4]. Measurements of the anterior and posterior widths were taken on both jaws. The anterior width was measured between the most bulging points on the oral surface of the primary canines. Posterior width was measured between points in the sulcus on the palatal surface of the second upper primary molars and on the lingual surface of the second lower primary molars. The obtained results were compared with the table values of the norm, which are determined as the total of the mesiodistal dimensions of four incisors on the relevant jaw. These parameters were assessed before orthodontic treatment (main group – MG1). In this group, the difference in discrepancies in the width of the maxillary and mandibular arches relative to the table norm was compared. In the long term after orthodontic treatment after 3-5 years (MG2), transversal parameters were assessed using the Pont method.

To compare the parameters of the width of the maxillary and mandibular arches in MG1, a control group (CG) (10 children aged 3-5 years) was formed which included children with physiological development of the dentoalveolar system, who had not received early orthodontic treatment.

The research materials were subjected to statistical processing using the methods of parametric and non-parametric analysis. Accumulation, correction, systematization of initial information and visualization of the obtained results were carried out in spreadsheets Microsoft Office Excel 2016. Statistical analysis was carried out using Medstatistic. Quantitative parameters were assessed for compliance with the normal distribution, for this the Shapiro-Wilk test was used (with the number of subjects less than 50). Sets of quantitative parameters, the distribution of which differed from normal, were described using the values of the median (Me) and the lower and upper quartiles (Q1-Q3). The calculated values of the Mann-Whitney U-test were compared with the critical values at a given significance level: if the calculated U value was equal to or less than the critical value, the statistical significance of the differences was recognized.

RESULTS

Before orthodontic treatment in children aged 3-5 years bilateral posterior crossbite was found in 30% of cases (6 children), unilateral posterior crossbite was diagnosed in 70% of cases (14 children, of which 11 children had a combination of unilateral posterior crossbite and lateral mandible displacement). Functional lateral mandible displacement was found in 60% of cases (12 children).

All children had a maxillary arch constriction before treatment. The average parameters of the anterior and posterior width of the maxillary arch in MG1 are less than the same parameters in CG, while the parameters of the anterior and posterior width of the mandibular arch in MG1 and CG correspond to each other. This indicates the presence of a maxillary arch constriction in MG1 with normal transversal dimensions of the mandible arch (Figure 1).

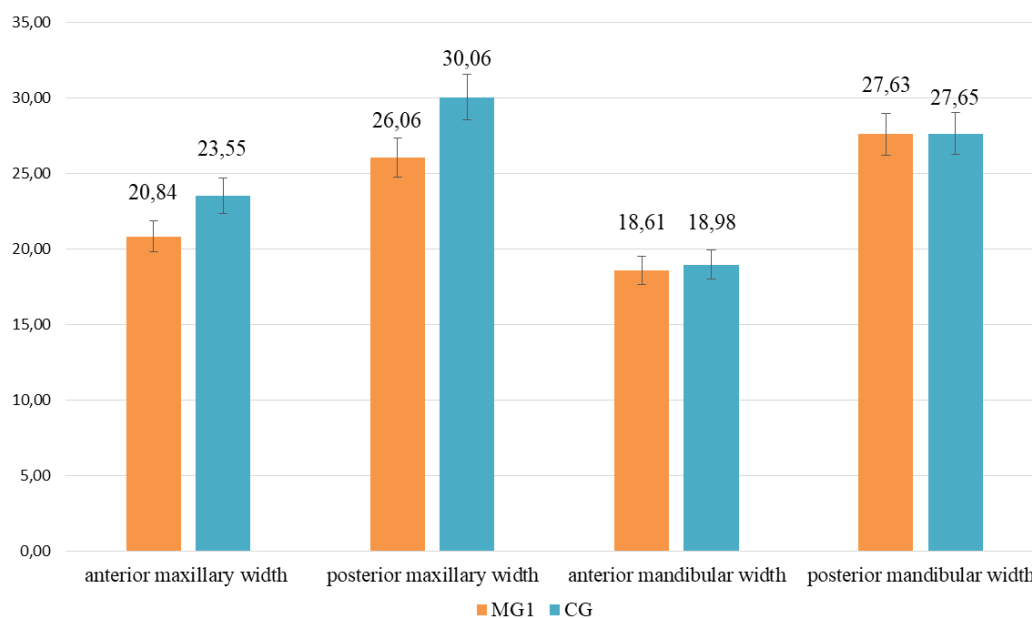


Fig. 1 Parameters of the anterior and posterior width of the maxillary and mandibular arches (in mm) in the main group before treatment and in the control group.

In 95% of cases (19 children), there was a delay in the physiological abrasion of primary teeth and premature contacts in the primary canines, which prevents the free sliding of the mandible and is an etiological factor in development of posterior crossbite. Selective grinding of primary teeth was carried out in all patients to eliminate premature contacts.

Despite the fact that in most patients (70% of cases, 14 children) unilateral posterior crossbite was detected, the expansion of the maxillary arch was carried out using devices that provide symmetrical expansion. When there is lateral mandibular displacement in the deciduous dentition, dentoalveolar compensation cannot occur in the form of asymmetric maxillary arch constriction, so the expansion of the maxillary arch must be symmetrical.

Patients were treated with fixed appliances with a screw in the midline or removable expansion plates (with a screw in the midline) on the maxilla. The devices were chosen depending on the severity of the discrepancy in the width of the maxillary and mandibular arch. So, when discrepancy was more than 4 mm (mean value was 4.63 mm), detected in 70% of cases (14 children), the device of choice was a fixed maxillary appliance with a midline screw and occlusal overlays (providing a slow activation rate of 0.25 mm per week). When discrepancy was less than 4 mm (mean value was 3.47 mm), detected in 25% of cases (5 children), the appliance of choice was a removable expansion plate on the maxilla with a screw in the midline. Type I Frankel functional regulator was used in 1 child, which provides passive expansion of the maxillary and mandibular arches by eliminating cheek pressure and normalizing the position of the mandible and tongue position.

Analysis of the long-term results of treatment of children in MG2 is shown in Figure 2.

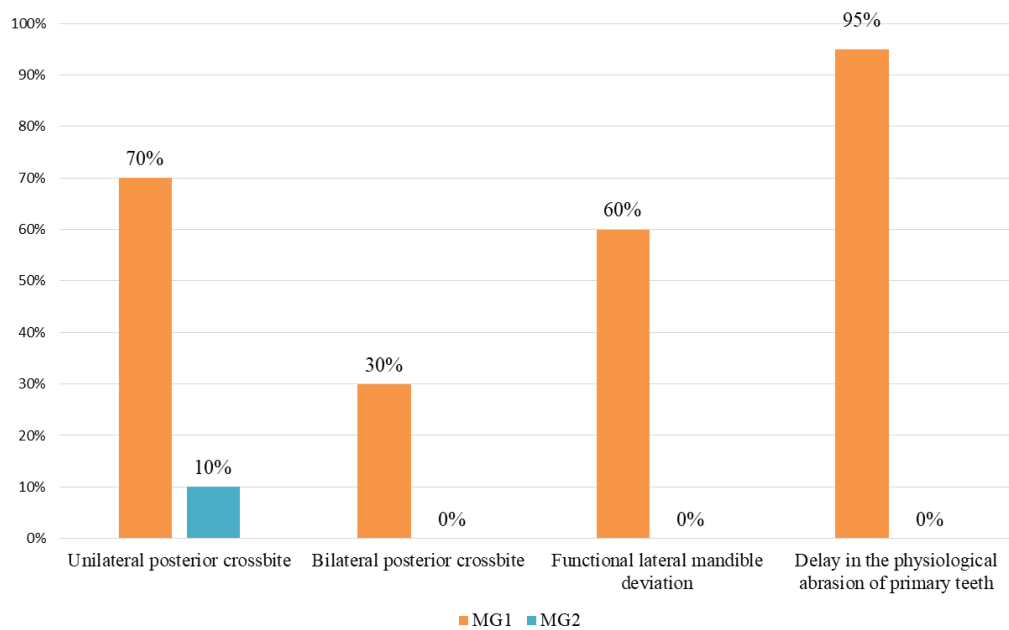


Fig. 2 Disorders in the main group before and after early orthodontic treatment.

DISCUSSION

Posterior crossbite, the discrepancy in the width of the maxillary and mandibular arch and lateral mandible displacement were eliminated after early orthodontic treatment in all children, it ensured the harmonious development of the maxillofacial region.

The variability in the parameters of the maxillary arch constriction before orthodontic treatment and the absence of the maxillary arch constriction in the long term perspective after orthodontic treatment is shown in Figure 3.

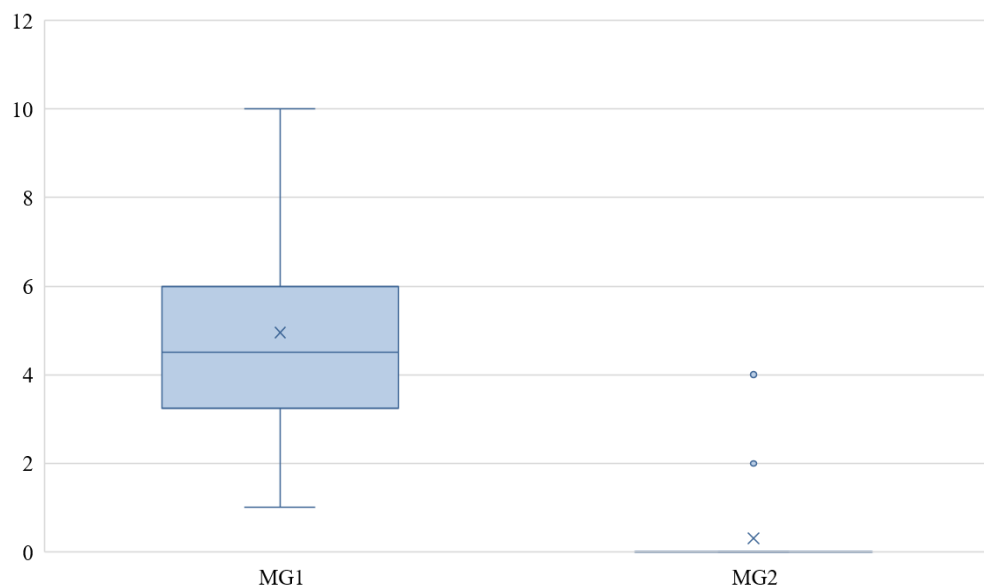


Fig. 3 Variability in the parameters of the maxillary arch constriction (in mm) in main group before and after orthodontic treatment.

The diagram shows that despite the fact that the average value of the maxillary arch constriction in MG1 was 4.95 mm, the maximum values reached 10 mm. A sufficient width of the maxillary arch was determined in all children in the long-term

perspective after treatment. All children had the correct proportion of the first permanent molars in the transversal plane.

However, in 2 children at the stage of dynamic observation after 1 and 3 years, respectively, unilateral posterior crossbite was found; it was associated with the persistence of myofunctional disorders. In case 1, the tongue, occupying a low position (tongue position on the floor of the mouth), had a greater influence on the mandible arch, causing the mandible arch to overexpand relative to the maxillary one. In case 2 there is lateral mandible displacement, caused by an anomaly in the position of the premolars.

CONCLUSIONS

It was found that the favorable development of the maxillary arch in the transversal plane (sufficient width of the maxillary arch) was achieved in all cases in the long term perspective after early orthodontic treatment of children aged 3-5 years with posterior crossbite. In 10% of cases, children showed recurred development of posterior crossbite due to myofunctional disorders.

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