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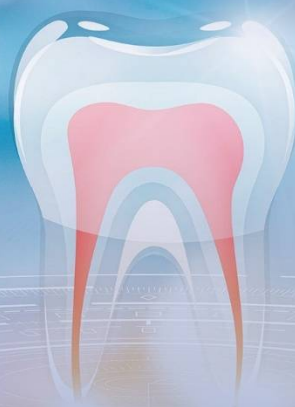
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IMPROVEMENT OF METHODS FOR EARLY DETECTION OF MAXILLOFACIAL DEFORMITIES IN CASE OF PREMATURE TOOTH LOSS



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ANNOTATION

Premature tooth extraction is a significant factor in the development of morphofunctional disorders of the dentoalveolar system. Early tooth loss leads to changes in occlusal relationships, displacement of adjacent teeth, disruption of alveolar bone growth, and the development of maxillofacial deformities. Therefore, improving methods for the early diagnosis of these changes is particularly important. The aim of this study is to optimize diagnostic approaches aimed at the early detection of maxillofacial deformities in patients with premature tooth loss. This paper analyzes modern clinical, radiographic, and morphometric examination methods that enable the timely detection of early signs of dental and jaw deformities. It is noted that the integrated use of clinical examination, orthopantomography, telerradiography, and digital diagnostic technologies improves diagnostic accuracy and facilitates the earlier detection of pathological changes. The analysis results demonstrate that the integration of modern diagnostic methods can improve the effectiveness of preventive and therapeutic measures aimed at preventing the development of severe maxillofacial deformities. Improving early diagnosis is essential for timely orthodontic and orthopedic intervention and maintaining the functional and aesthetic condition of the dentofacial system.

Keywords: premature tooth extraction, maxillofacial region, dental deformities, early diagnosis, dentofacial system, orthodontic disorders, radiographic diagnostics, prevention.

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СОВЕРШЕНСТВОВАНИЕ МЕТОДОВ РАННЕГО ВЫЯВЛЕНИЯ ДЕФОРМАЦИЙ ЧЕЛЮСТНО-ЛИЦЕВОЙ ОБЛАСТИ ПРИ ПРЕЖДЕВРЕМЕННОЙ ПОТЕРЕ ЗУБОВ

АННОТАЦИЯ

Преждевременное удаление зубов является одним из значимых факторов формирования морфофункциональных нарушений зубочелюстной системы. Ранняя утрата зубов приводит к изменению окклюзионных взаимоотношений, смещению соседних зубов, нарушению роста альвеолярных отростков и формированию деформаций челюстно-лицевой области. В связи с этим особую актуальность приобретает совершенствование методов ранней диагностики данных изменений. Целью настоящего исследования является оптимизация диагностических подходов, направленных на раннее выявление деформаций челюстно-лицевой области у пациентов с преждевременной утратой зубов. В работе анализируются современные клинические, рентгенологические и морфометрические методы обследования, позволяющие своевременно определить начальные признаки деформаций зубных рядов и челюстей. Отмечается, что комплексное применение клинического осмотра, ортопантомографии, телерентгенографии и цифровых диагностических технологий повышает точность диагностики и способствует более раннему выявлению патологических изменений. Результаты анализа свидетельствуют о том, что интеграция современных диагностических методов позволяет повысить эффективность профилактических и лечебных мероприятий, направленных на предупреждение развития выраженных деформаций челюстно-лицевой области. Совершенствование ранней диагностики имеет важное значение для своевременного ортодонтического и ортопедического вмешательства и сохранения функционального и эстетического состояния зубочелюстной системы.

Ключевые слова: преждевременное удаление зубов, челюстно-лицевая область, деформация зубных рядов, ранняя диагностика, зубочелюстная система, ортодонтические нарушения, рентгенологическая диагностика, профилактика.

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TISLARNING MUDDATIDAN OLDIN YO'QOLISHIDA YUZ-JAG' DEFOMATSIYALARINI ERTA TASHXISLASH USULLARINI TAKOMILLASHTIRISH

ANNOTATSIYA

Tishlarni muddatidan oldin olib tashlash dentoalveolyar tizimning morfofunktsional buzilishlari rivojlanishida muhim omil hisoblanadi. Tishlarni erta yo'qotish okklyuzion munosabatlarning o'zgarishiga, qo'shni tishlarning siljishiga, alveolyar suyak o'sishining buzilishiga va yuz-jag' deformatsiyalarining rivojlanishiga olib keladi. Shuning uchun, bu o'zgarishlarni erta tashxislash usullarini takomillashtirish ayniqsa muhimdir. Ushbu tadqiqotning maqsadi tishlarni muddatidan oldin yo'qotish bilan og'rigan bemorlarda yuz-jag' deformatsiyalarini erta aniqlashga qaratilgan diagnostika yondashuvlarini optimallashtirishdir. Ushbu maqolada tish va jag' deformatsiyalarining dastlabki belgilarini o'z vaqtida aniqlash imkonini beruvchi zamonaviy klinik, rentgenografik va morfometrik tekshirish usullari tahlil qilinadi. Ta'kidlanishicha, klinik tekshiruv, ortopantomografiya, teleradiografiya va raqamli diagnostika texnologiyalaridan kompleks foydalanish diagnostika aniqligini oshiradi va patologik o'zgarishlarni erta aniqlashga yordam beradi. Tahlil natijalari shuni ko'rsatadiki, zamonaviy diagnostika usullarini integratsiyalash og'ir yuz-jag' deformatsiyalari rivojlanishining oldini olishga qaratilgan profilaktika va terapevtik choralar samaradorligini oshirishi mumkin. Erta tashxisni yaxshilash o'z vaqtida ortodontik va ortopedik aralashuv hamda yuz-jag' tizimining funktsional va estetik holatini saqlab qolish uchun juda muhimdir.

Kalit so'zlar: tishni muddatidan oldin sug'urib olish, yuz-jag' sohasi, tish deformatsiyalari, erta tashxis qo'yish, yuz-jag' tizimi, ortodontik kasalliklar, rentgenologik diagnostika, oldini olish.

Premature tooth loss remains one of the important problems in modern dentistry, as it often leads to functional and morphological disturbances in the dentoalveolar system. Early extraction of teeth, especially in children and adolescents, can disrupt the natural development of the jaws and dental arches. As a result, displacement of adjacent teeth, changes in occlusal relationships, and the formation of various dentofacial deformities may occur. These pathological changes can negatively affect not only the aesthetics of the maxillofacial region but also important functions such as mastication, speech, and overall oral health[1,2].

In recent years, particular attention has been paid to the early detection of dentofacial abnormalities associated with premature tooth loss. Timely diagnosis of initial structural and functional changes in the maxillofacial region allows clinicians to implement preventive and interceptive orthodontic measures, thereby reducing the risk of severe deformities and complex treatment in the future. However, despite advances in diagnostic technologies, the early identification of such changes remains challenging in clinical practice[3,4].

Therefore, the optimization and improvement of methods for early diagnosis of dentofacial deformities associated with premature tooth extraction represent an important and relevant scientific task. The development of effective diagnostic approaches can contribute to more accurate assessment of risk factors, early detection of pathological changes, and the implementation of timely therapeutic and preventive strategies aimed at maintaining the normal development and function of the dentofacial system. The preservation of the structural and functional integrity of the dentofacial system is one of the key objectives of modern dental science. Premature extraction of teeth is considered a significant etiological factor that can disrupt the normal development of the dental arches and surrounding anatomical structures. The early loss of teeth often results in migration of adjacent teeth, changes in occlusal relationships, and the development of dentofacial deformities that may progress over time.

Such alterations can have long-term consequences for the maxillofacial region, including impaired masticatory efficiency, aesthetic concerns, and functional disturbances of the stomatognathic system. In growing patients, these complications

may become more pronounced due to the active processes of craniofacial growth and development. Therefore, identifying early signs of pathological changes following premature tooth removal is crucial for preventing severe orthodontic and orthopedic problems in the future[5].

Modern dentistry increasingly emphasizes the importance of early diagnostic strategies that enable clinicians to detect initial deviations in the development of the dentoalveolar system. The application of comprehensive diagnostic approaches, including clinical evaluation and advanced imaging techniques, provides valuable information about the structural condition of the maxillofacial region[6,8].

In this context, the optimization of methods for the early diagnosis of dentofacial deformities caused by premature tooth extraction represents a relevant scientific and clinical challenge. Improving diagnostic accuracy and timeliness can significantly enhance preventive care and contribute to better long-term outcomes in dental practice.

In childhood, premature tooth extraction leads to a reduction in the length of the dental arches and delayed growth of the alveolar processes of the upper or lower jaw. This can lead to intraosseous displacement of the follicles of permanent teeth, disrupting their proper position in the dental arch during eruption. Loss of molars can lead to a deepening of the bite, distal displacement of the lower jaw, changes in the relationship between the elements of the temporomandibular joint, and a tendency toward the development of a pathological bite. The absence of chewing teeth makes chewing difficult, forcing a diet primarily consisting of soft foods. As a result of inadequate nutrition and lack of stress on the dentition, jaw growth is delayed. Removal of anterior teeth impairs speech and appearance, and can lead to aesthetic problems, which contribute to a deterioration in a person's quality of life. Research is being conducted worldwide on the diagnosis of maxillofacial deformities resulting from premature tooth extraction[9].

Despite the variety of methods and orthopedic devices used to correct dental defects, many authors disagree regarding their effectiveness and impact on oral tissue health.

Targeted and practical measures are being implemented to improve the quality of medical services provided to the public. In this regard, conditions for providing care, recommendations,

and forms of treatment have been defined. A clear definition of dentofacial anomalies has been provided. It has been determined that these are developmental imbalances (relationships) of the jaws, characterized by functional and aesthetic impairments. Anomalies and deformities can affect the upper and lower jaws, zygomatic bones, nasal structures, and other facial bones. It is necessary to improve the quality of medical care in diagnosing maxillofacial deformities resulting from premature tooth extraction and to implement high-tech diagnostic and treatment methods[10].

The problem of early diagnosis of maxillofacial deformities resulting from premature tooth extraction is currently relevant and serves as the rationale for this study. "The implementation of a multi-stage diagnostic process, including initial screening and in-depth assessment, will enable a shift from a reactive approach to preemptive and preventative strategies[12,14]. This requires not only equipping clinics with modern equipment but also changing the professional thinking of clinicians, developing their skills for interdisciplinary collaboration and communication with patients and their families." These objectives necessitate scientific research aimed at improving the quality of specialized medical care and the early diagnosis of complications of dental diseases.

Goal

The aim of this study was to investigate and optimize methods for the early diagnosis of dentofacial deformities associated with premature tooth extraction.

Objectives of the Study

- To assess the quantitative characteristics of early tooth loss.
- To evaluate the effect of prosthetic treatment on the hygienic condition of the oral cavity.
- To assess changes in the functional state of the maxillofacial system during prosthetic treatment.
- To study the changes in the dentoalveolar system associated with early tooth loss.
- To determine the effectiveness of diagnostic methods for detecting dentofacial deformities following premature tooth extraction.

CLASSIFICATION OF DENTAL DEFECTS IN CHILDREN.

Class I. The crown portion of one tooth is prematurely removed or missing in various areas of the dental arch.

Subclass I - on one jaw

Subclass II - on both jaws

Class II. Included defects of the dental arch. The crown portion of two or three adjacent teeth is prematurely removed or missing.

Subclass I - included defects of the dental arch on one side

Subclass II - included defects of the dental arch on both sides

Class III. Terminal defects of the dental arch. Teeth or their crown portions are missing.

Subclass I - unilateral terminal defects

Subclass II - bilateral terminal defects

Class IV. Complete absence of teeth or their crown portions

1st subclass — on one jaw

2nd subclass — on both jaws

During the mixed dentition period, the prevalence of dental anomalies (occlusal disorders) in 1,242 out of 2,234 children with prematurely removed primary teeth was $83.17 \pm 1.06\%$. In contrast, in children with intact dentition, this figure was $47.68 \pm 1.59\%$. Consequently, premature removal of primary teeth is one of the main causes of dental anomalies.

Based on archival data from dental records, the cause-and-effect relationship between caries, early removal of primary teeth, and the frequency and severity of dental anomalies was studied in 1,056 children aged 12–13 years. Of the 1,056 individuals (84%), 896 had a history of premature extraction of primary teeth due to complicated caries. We classified the resulting dental arch and occlusion deformities by severity and, using multivariate correlation and regression analysis, examined mathematical models of dentofacial pathology of varying severity, depending on the time of onset of dental arch defects. Screening examinations were conducted during rehabilitation activities at the aforementioned preschool and school institutions. The examination results were recorded in the "Dental System Examination Cards." We developed these cards based on the Using the data entered into the archival data from the rehabilitation records of the observed children, a personalized electronic database was created for analyzing and assessing the significance of individual factors within the complex of causes influencing the development of dental arch deformities due to premature extraction of primary teeth.

This study was conducted by constructing a mathematical model of pathology by severity, using multivariate correlation and regression analysis. To construct this model, a database schematic and tabular map was developed.

Study Results and Discussion. According to our study of 3,625 children aged 3 to 16, the caries prevalence in the primary dentition was 3.10, in the mixed dentition it was 4.99, and in the permanent dentition it was 3.18. It is noteworthy that caries in primary teeth occurs at a very early age: in 3-year-old children, the prevalence was 1.94, and by age 6, it increased to 4.26.

In the period of permanent dentition (12–16 years), complete destruction of the crowns of the first permanent molars was observed in 32 out of 92 schoolchildren, which accounted for 19.85%. With increasing age, the frequency of extraction of the first permanent molars also rises: from 3.22 % (16 out of 20 children) among those aged 6–7 years to 5.98% (18 out of 1,012 children) in the 9–12 age group, and up to 5.87% (8 out of 31 children) among adolescents aged 12–16 years.

Based on the analysis and systematization of epidemiological data obtained during a screening examination of 2,8 children aged 3 to 16 years, a clinical and morphological classification of occlusal disorders associated with premature tooth loss during the period of primary dentition was proposed and applied. Unlike previously suggested classifications, this approach takes into account not only defects of the dental arches, that is, missing teeth, but also teeth that are severely destroyed as a result of the carious process and therefore functionally inactive.

The results of the analysis demonstrated that the most significant factors influencing the development of dentoalveolar deformities of varying severity are the child's age at the time of premature extraction of primary teeth and the timing of eruption of permanent teeth ($r = 0.71$). These factors showed a strong intragroup correlation and were closely interrelated ($r = 0.87$).

In the studied model, the next most important factor was the number of missing teeth or the loss of their coronal portion ($r = 0.67$). The intensity of the carious process also demonstrated a strong association with the development of dentoalveolar anomalies in children with defects of the dental arches ($r = 0.59$). The child's health status during the first and subsequent years of life influenced both the intensity of dental caries ($r = 0.64$) and the early loss of primary teeth ($r = 0.57$), and therefore was related to the development of dentoalveolar pathology.

For the formation of dentoalveolar deformities of different severity, it was also important which functional group (anterior or posterior) the destroyed or extracted primary teeth belonged to ($r = 0.51$). Correlation analysis of the studied factors also revealed an interrelationship between the early loss of anterior primary teeth and tongue parafunctions, including disturbances in tongue position during swallowing ($r = 0.68$). Other factors

showed statistically significant but less pronounced correlations within the studied model.

It is well known that the timeliness, symmetry, and sequence of the replacement of primary teeth by permanent teeth play a decisive role in the proper formation of the dental arch and the establishment of correct occlusal relationships.

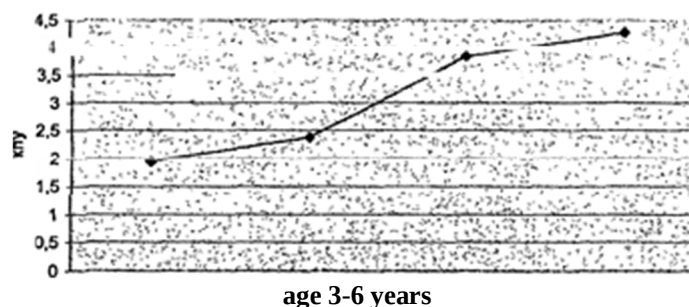


Fig. 1. Dynamics of caries intensity indicators in children of Kaeani from 3 to 6 years old

Conclusion

The findings of the present study indicate that premature loss of primary teeth plays a significant role in the development of dentoalveolar deformities and occlusal disturbances in children. The results demonstrate that the age at which early tooth extraction occurs, the timing of eruption of permanent teeth, the number of missing teeth, and the intensity of the carious process are among the key factors influencing the formation and severity of dentofacial abnormalities.

It was also established that children with intact dental arches show significantly more favorable conditions for the physiological eruption of permanent teeth compared with children who experience premature loss of primary teeth. Early loss of teeth leads to structural and functional alterations within

the dentoalveolar system, which may further contribute to the development of orthodontic pathology.

The study also confirms the importance of timely preventive and interceptive orthodontic measures. Early orthodontic treatment using functional appliances demonstrated substantially higher effectiveness compared with preventive prosthetic treatment. Among the devices used in clinical practice, elastomeric trainers showed the highest therapeutic efficiency in correcting early dentofacial disturbances in young children.

Therefore, the optimization of early diagnostic methods and the timely application of orthodontic treatment strategies are essential for preventing the progression of dentofacial deformities and ensuring proper development of the dentoalveolar system.

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