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ASSESSMENT OF FUNCTIONAL DISORDERS IN CHILDREN WITH NARROWING OF DENTITION FROM THE PERSPECTIVE OF THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING

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ОЦЕНКА ФУНКЦИОНАЛЬНЫХ НАРУШЕНИЙ У ДЕТЕЙ С СУЖЕНИЕМ ЗУБНЫХ РЯДОВ С ПОЗИЦИИ МЕЖДУНАРОДНОЙ КЛАССИФИКАЦИИ ФУНКЦИОНИРОВАНИЯ

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Objective. To assess functional disorders in children with narrowing of the dentition from the perspective of the international classification of functioning.
Materials and methods. The indicators of the components of the international classification of functioning were analyzed and assessed in 75 children with narrowing of the dentition aged 6–9.
Results. Nasal breathing impairments and speech disorders were found in children with narrowing of the dentition.
Conclusions. Orthodontists, otorhinolaryngologists, and speech therapists can use the parameters of the international classification of functioning to assess functional disorders in children with narrowing of dentition. It will help interdisciplinary planning in early diagnosis and treatment.
Keywords. International Classification of Functioning, rhinomanometry, nasal breathing.

Цель. Оценить функциональные нарушения у детей с сужением зубных рядов с позиции Международной классификации функционирования. Деформации зубного ряда часто являются причинами развития функциональных нарушений зубочелюстной системы, а при наличии ротового дыхания у детей существующие отклонения усугубляются. Оценка нарушенных функций с использованием меж-

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дународной классификации функционирования поможет сформировать комплексный подход к лечению детей с сужением зубных рядов.
Материалы и методы. Проведен анализ доменов и оценка показателей составляющих Международной классификации функционирования у 75 детей с сужением зубных рядов в возрасте 6–9 лет.
Результаты. У детей с сужением зубных рядов выявлены нарушения носового дыхания и изменения функций речи.
Выводы. Врачи-ортодонты, оториноларингологи, а также логопеды могут использовать параметры международной классификации функционирования для оценки функциональных нарушений у детей с сужением зубных рядов, что помогает междисциплинарному планированию в ранней диагностике и лечении.
Ключевые слова. Международная классификация функционирования, риноманометрия, носовое дыхание.

INTRODUCTION

Modern studies reveal that the narrowing of the upper jaw leads to impaired nasal breathing. Others believe that the impairment of nasal breathing results in narrowed dental arches. The narrowing of the dental arches in children with impaired nasal breathing increases with every year of a child's life. This is especially pronounced at the beginning of tooth change, when improper tooth eruption prevails.

MATERIALS AND METHODS

To determine functional disorders in children, we used the domains of the international classification of functioning in 75 children aged 6–9 years undergoing orthodontic treatment at the Department of Pediatric Dentistry and Orthodontics of Perm State Medical University and the "Lyubimyi doctor" ("Favorite Doctor") medical center, Perm. The main and additional examination methods were carried out in the following sequence: collection of complaints, anamnesis, examination, photometric analysis of the face, cephalometric and morphometric calculation, determination of the condition of the upper respiratory tract by an otorhinolaryngologist, speech assessment by a speech therapist. To determine the degree of narrowing of the upper jaw, we used the measurement of the width of the dental arch using the Pont index – the distance between the points of the first permanent molars of the upper jaw. Moreover, the patients underwent orthopantomographic and teleroentgenographic studies with the description of the condition of the maxillary sinuses and nasal septum. For an objective assessment of nasal breathing, otorhinolaryngologists used the method of anterior active rhinomanometry with the Rhinoscan SRE 2000 INTERACOUSTIC equipment. The results were generated into an Excel database and processed using the SPSS Statistics 5.0 software. The average value of the analyzed indicators, standard deviation, average error and Student's *t*-test were calculated. The differences were considered significant at $p < 0.05$.

RESULTS AND DISCUSSION

75 examined children aged 6–9 years were divided into two groups: 42 children with

habitual mouth breathing and narrowing of the upper dental arch, where the distance between the palatine surfaces of the first permanent molars was less than 35 mm (main group). The comparison group included 33 children with nasal breathing and with a sufficient width of the upper dental arch.

We evaluated the indicators and selected domains suitable for our study from the components of the International Classification of Functioning (ICF): "functions and structure of the body", "activity and participation". Then we used the ICF evaluation system for children with distal occlusion and functional disorders and assessed the selected domains.

For effective analysis, the ICF evaluation displays were used for the presented classification components ("functions", "structures", "activity and participation"), which were assigned codes. Differences in treatment dynamics were analyzed using a color scale opposite each code.

Among the components of the classification of "functions", we selected the following domains: articulation functions (b320), voice functions (b310), respiratory functions (b440); among the "structure" components: teeth (s3200), nose structure (s310), mouth structure (s320), respiratory system structure (s430), hard palate (s32020); among the "activity and speech" components: speech (d330), oral care (d520), conversation (d350), parent–child relationship (d7600).

Each domain was evaluated in a comprehensive clinical examination using the methods brought to the unified definitions of the ICF:

xxx.0. NO problems (none, not present, negligible, ...) 0–4 %.

xxx.1. MINOR problems (insignificant, mild, ...) 5–24 %.

xxx.2. MODERATE problems (average, significant, ...) 25–49 %.

xxx.3. SEVERE problems (high, intense...) 50–95 %.

xxx.4. ABSOLUTE problems (complete, ...) 96–100 %.

xxx.8. Not identified (NI).

xxx.9. Not applicable (NA).

Special displays were compiled to work with children who had verified narrowing of the dentition, as well as speech and breathing disorders. They are shown in the figure.

As a result, it was found that, despite the presence of narrowing of the dentition in children of both groups, statistically significant differences were revealed between them in the components of the classification of "functions", "structures" and "activity and speech", assessed with the Mann-Whitney *U*-test ($p = 0.034$).

When analyzing the children in the main group, three domains were identified as being most significantly disrupted in the "functions" component of the classification, five in the "structures" component, and four in the "activity and speech" component. In contrast, in the children from the comparison group, there were only one, two, and one maximally disrupted parameter in each of these components of the classification respectively.

In a comparative analysis, the average functional impairment in children from the main group ranged from 32 % to 51 %, while in patients from the comparison group, it ranged from 6 % to 23 % ($p = 0.026$). In addition, more pronounced impairment in the categories of "activity and speech" was identified among children with narrowing of the dentition, reaching 52 % compared with those in the comparison group (up to 23 %). This was mainly manifested in the assessment of the domains of speech, conversation, and parent-child relationship ($p = 0.021$).

A comparative analysis of the components of the "structures" domain in assessing the size of the upper dentition revealed a narrowing and shortening of the dental arch in patients with impaired nasal breathing. The narrowing of the upper dental arch leads to a decrease in space in the dentition, which can cause crowding or retention of teeth. The narrowing of the upper jaw results from a complex interaction between various factors that affect the myodynamic balance in the maxillofacial region.

The impairment of the myodynamic balance affects both the growth of the jaw and the position of the teeth. Lip closure becomes disrupted, the position of the tongue changes, and the imbalance of the chewing muscles increases.

Conclusion

The application of the International Classification of Functioning in children with narrowing of the dental arches reveals the breadth of assessment of impaired functions and the possibility of its use in dynamics to analyze the effectiveness of complex treatment. The developed evaluation display facilitates the process of diagnosing disorders in children with narrowing of the dentition using the International Classification of Functioning and will allow assessing these disorders in the dynamics of treatment.

Evaluation at the beginning of treatment								
Components of ICF		Definition of ICF						
Functions		0	1	2	3	4	NI	NA
b 440	Respiratory functions							
b 310	Voice functions							
b 320	Articulation functions							
Structures		0	1	2	3	4	NI	NA
s 310	Nose structure							
s 320	Mouth structure							
s 430	Respiratory system structure							
s3200	Teeth							
s32020	Hard palate							
Activity and speech		0	1	2	3	4	NI	NA
d 330	Speech							
d 350	Conversation							
d 520	Oral care							
d7600	Parent-child relationship							

Fig. The ICF Evaluation Display for patients with narrowing of the dentition and functional disorders

An integrated approach to early detection and correction of the dentition narrowing, assessed in accordance with the International Classification of Functioning, at an early age, facilitates normal child development.

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