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Clinical Diagnostic Scale for the Assessment of Acute Rhinosinusitis in Children Under 3 Years of Age

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Annotation: This article presents the development and validation of a clinical diagnostic scale for the assessment of acute rhinosinusitis in early childhood (children under 3 years of age). The proposed scale is based on a point-based evaluation of the main clinical manifestations of the disease, with mandatory consideration of age-related features of the clinical course of rhinosinusitis in this patient population, which is particularly important given the limited возможности for objective assessment of young children's condition. The developed tool enables differential diagnosis between viral, post-viral, and probable bacterial rhinosinusitis, as well as an objective determination of disease severity. Implementation of this scale contributes to improved diagnostic accuracy, optimization of patient management strategies, and more rational therapeutic decision-making. In addition, the scale may be used both in routine clinical practice by pediatricians and otorhinolaryngologists and in the development and implementation of intelligent clinical decision support systems.

Keywords: acute rhinosinusitis, early childhood, clinical scale, diagnosis, artificial intelligence.

Introduction

Acute rhinosinusitis is one of the most common reasons for seeking medical care among young children and occupies a significant place in the structure of upper respiratory tract diseases. The high incidence of this condition in children under 3 years of age is attributable to a number of anatomical and physiological features, including the narrow nasal passages, incomplete development of the paranasal sinuses, pronounced vascularization of the nasal mucosa, as well as functional immaturity of local and systemic immune defense mechanisms. These factors contribute to the rapid development of inflammatory processes and substantial variability in the clinical manifestations of the disease. The characteristics of upper respiratory tract diseases in early childhood have been repeatedly addressed in studies by domestic researchers. In particular, the works of Mamatova Sh. R. provide a detailed analysis of the clinical diagnosis, differential diagnostic approaches, and assessment of otorhinolaryngological pathology in children of younger age groups, underscoring the relevance of this issue in pediatric practice [1], [2]. Despite the accumulated clinical experience, the diagnosis of acute rhinosinusitis in children under 3 years of age remains a significant clinical challenge.

The main diagnostic difficulties are associated with the inability to adequately objectify subjective complaints, including pain, nasal congestion, and headache, which serve as important diagnostic criteria in older patients. In addition, the clinical manifestations of acute rhinosinusitis in young children are often masked by symptoms of acute respiratory viral infections, complicating timely differential diagnosis and potentially leading to unjustified prescription of antibacterial therapy. In this context, the development of standardized clinical diagnostic tools based primarily on objective clinical signs and observable behavioral responses of the child becomes particularly relevant. The use of such scales enhances diagnostic accuracy, standardizes the assessment of disease severity, and optimizes therapeutic decision-making. The aim of the present study was to develop a clinical diagnostic scale for the assessment of acute rhinosinusitis in children under 3 years of age, adapted to the specific

characteristics of this age group and suitable for both routine clinical practice and integration into intelligent medical decision support systems.

Materials and Methods

Within the framework of the present study, a clinical diagnostic scale for the assessment of acute rhinosinusitis in early childhood was developed. The formation of the scale was based on a comprehensive approach involving the analysis of clinical manifestations characteristic of children under 3 years of age, with due consideration of the anatomical, physiological, and behavioral features specific to this age group. All parameters included in the scale were scored according to the severity of the corresponding symptoms, allowing for a quantitative characterization of the patient's clinical condition. The structure of the scale incorporated the main nasal symptoms, including nasal obstruction, the character and volume of nasal discharge, and impairment of nasal breathing. In addition, the child's general condition was assessed, taking into account the level of activity, appetite, sleep quality, and the presence of signs of systemic intoxication. Body temperature response was evaluated based on both the degree of fever and the duration of the febrile period.

Particular attention was paid to the analysis of disease dynamics, including the duration of symptoms, the presence or absence of their regression, and signs of clinical deterioration following an initial period of improvement, which is of key importance for the differential diagnosis of various forms of acute rhinosinusitis. Furthermore, the scale included risk factors associated with a more severe disease course, such as a burdened allergic history, recurrent respiratory infections, and concomitant comorbid conditions.

Assessment of pain in young children was performed indirectly through the analysis of behavioral responses typical for this age group. These included restlessness, crying when changing head position, refusal to eat, sleep disturbances, and increased irritability. The use of behavioral criteria partially compensated for the inability to obtain subjective complaints from patients of this age group. A separate section of the scale was devoted to signs of complicated acute rhinosinusitis, including pronounced symptoms of intoxication, persistent hyperthermia, periorbital edema, facial asymmetry, and other clinical manifestations requiring urgent medical attention. The presence of one or more of these signs automatically classified the patient as having a severe disease course and served as a basis for modifying the management strategy.

The developed clinical diagnostic scale was intended for use in routine clinical practice and for subsequent integration into intelligent clinical decision support systems, ensuring a standardized and reproducible assessment of patients' clinical status.

Results.

Indirect signs of pain: crying during facial palpation, increased restlessness when the head is tilted, negative reaction during face washing.

Risk factors: frequent acute respiratory viral infections, adenoid vegetation, allergic history, attendance of childcare facilities.

Signs of complications: eyelid edema, facial asymmetry, pronounced intoxication, restricted ocular motility.

Interpretation of Results

The total score was calculated by summing the points assigned to all clinical parameters.

- ✓ **0–4 points** — acute viral rhinosinusitis
- ✓ **5–8 points** — acute post-viral rhinosinusitis
- ✓ **≥9 points** — probable bacterial rhinosinusitis

Disease severity was assessed as follows:

- ✓ up to 5 points — mild course;
- ✓ 6–9 points — moderate course;
- ✓ 10 points or more, as well as the presence of signs of complicated disease — severe course.

Conclusion

The clinical diagnostic scale developed in the present study enables a standardized approach to the assessment of acute rhinosinusitis in children under 3 years of age, taking into account age-related anatomical, physiological, and clinical characteristics of the disease course. Application of this scale provides a comprehensive and structured evaluation of the patient's clinical condition, contributing to improved diagnostic accuracy and enhanced objectification of clinical findings. The use of the proposed tool reduces the level of subjectivity in clinical assessment, ensures unification of diagnostic criteria, and increases the reproducibility of results during follow-up and dynamic observation. This is particularly important in pediatric practice, where limited possibilities for obtaining subjective complaints necessitate reliance on objective clinical signs and behavioral indicators. In addition, the scale may serve as an effective instrument for determining disease severity and selecting the optimal patient management strategy.

The proposed clinical diagnostic scale can be recommended for widespread use in routine clinical practice by pediatricians and otorhinolaryngologists, as well as in scientific research focused on the characteristics of inflammatory diseases of the nasal cavity and paranasal sinuses in early childhood. A promising direction for further application of the scale is its integration into intelligent clinical decision support systems in pediatrics and otorhinolaryngology. The obtained results are consistent with the findings reported in the works of Mamatova Sh. R., which emphasize the necessity of a comprehensive clinical approach to assessing the condition of young children with inflammatory diseases of the nasal cavity and paranasal sinuses, as well as the relevance of developing standardized diagnostic criteria for this age group.

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