MODERN APPROACHES TO THE SURGICAL MANAGEMENT OF RHINOSINUSOGENIC ORBITAL COMPLICATIONS IN CHILDREN

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Abstract. This thesis examines modern approaches to the surgical management of rhinosinusogenic orbital complications in children, focusing on the indications for surgical intervention, the selection of appropriate operative techniques, and the prevention of severe ophthalmological and intracranial complications. Particular attention is paid to the clinical characteristics of orbital cellulitis, subperiosteal abscesses, and orbital abscesses associated with acute rhinosinusitis. The importance of computed tomography, endoscopic endonasal surgery, external drainage techniques, and multidisciplinary postoperative management is discussed. The analysis highlights the significance of individualized surgical decision-making based on the localization and extent of the infectious process, the child's clinical condition, and the preservation of visual function. The integration of timely surgical intervention and adequate antimicrobial therapy is considered an essential factor in improving treatment outcomes.

Key words: rhinosinusogenic orbital complications, children, orbital cellulitis, subperiosteal abscess, orbital abscess, surgical treatment, endoscopic endonasal surgery, drainage, acute rhinosinusitis.

Introduction. Rhinosinusogenic orbital complications are among the most serious consequences of acute inflammatory diseases of the paranasal sinuses in children. Their development is associated with the anatomical proximity of the paranasal sinuses to the orbit, particularly the ethmoid sinus and the thin orbital wall. The spread of infection into the orbital tissues may lead to preseptal cellulitis, orbital

cellulitis, subperiosteal abscess, and orbital abscess. In severe cases, these conditions may cause optic nerve damage, permanent visual impairment, and intracranial infectious complications [1,2].

The management of these conditions requires an integrated therapeutic approach involving otolaryngologists, ophthalmologists, pediatricians, radiologists, and, when necessary, neurosurgeons. Although intravenous antibiotic therapy remains the primary treatment for many children with orbital cellulitis, surgical intervention is essential in cases of progressive infection, abscess formation, deterioration of visual function, or insufficient response to conservative treatment. Modern surgical approaches are aimed at eliminating the infectious focus, restoring the drainage of affected paranasal sinuses, and preserving the anatomical and functional integrity of orbital structures [3].

Relevance of the study. The relevance of this study is determined by the potentially severe consequences of rhinosinusogenic orbital complications in childhood. Delayed diagnosis and inadequate treatment may contribute to the progression of the inflammatory process, the formation of purulent collections, damage to the visual apparatus, and the spread of infection beyond the orbital region. The anatomical and physiological characteristics of the developing facial skeleton and paranasal sinuses make pediatric patients particularly vulnerable to the progression of infectious processes. Therefore, early identification of indications for surgical treatment is an important aspect of preventing irreversible complications.

Another important aspect is the development and implementation of minimally invasive surgical techniques, particularly functional endoscopic endonasal surgery. These methods provide opportunities for effective drainage of affected paranasal sinuses and appropriately localized orbital collections while minimizing surgical trauma. However, the choice between endoscopic and external approaches remains dependent on the anatomical localization of the abscess, the severity of the disease, and the patient's individual clinical characteristics. Consequently, the comparative

assessment of modern surgical techniques and the development of individualized treatment strategies remain important issues in pediatric otorhinolaryngology and ophthalmology [4,5].

Aim of the study. The aim of the study is to analyze modern surgical approaches to the treatment of rhinosinusogenic orbital complications in children, determine the principal indications for surgical intervention, evaluate the advantages and limitations of endoscopic and external drainage techniques, and identify the importance of an individualized multidisciplinary approach in improving treatment outcomes and preserving visual function.

Materials and methods. The study is based on a review and comparative analysis of scientific publications, clinical observations reported in the literature, and contemporary recommendations concerning the diagnosis and surgical treatment of rhinosinusogenic orbital complications in children. Particular attention was given to publications addressing orbital cellulitis, subperiosteal abscesses, orbital abscesses, and complications associated with acute rhinosinusitis.

The literature analysis included studies describing the clinical manifestations and anatomical characteristics of orbital infectious processes in pediatric patients. The Chandler classification was considered to assess the severity and progression of orbital complications, ranging from preseptal inflammation to orbital abscess and intracranial extension. This classification provides an important basis for determining the severity of the pathological process and selecting an appropriate treatment strategy [2,6].

Descriptive and comparative analytical methods were used to examine the indications for surgical intervention. Particular emphasis was placed on clinical parameters such as visual acuity, proptosis, ocular motility, pain during eye movement, the general condition of the child, and the dynamics of inflammatory symptoms during antimicrobial therapy. Laboratory indicators, including leukocyte

count, absolute neutrophil count, and C-reactive protein levels, were also considered as supplementary indicators of disease severity.

Radiological assessment was analyzed with particular reference to contrast-enhanced computed tomography of the paranasal sinuses and orbital structures. The evaluation included the localization, dimensions, and extent of subperiosteal or orbital abscesses, the condition of the affected paranasal sinuses, and the possibility of intracranial extension. The role of magnetic resonance imaging was also considered in cases where intracranial involvement or complications involving adjacent soft tissues were suspected.

Comparative analysis was performed to identify the indications, advantages, and limitations of endoscopic endonasal drainage and external surgical approaches. The principles of postoperative management were also examined, including continued antimicrobial treatment, ophthalmological monitoring, assessment of visual function, and the early detection of recurrent or progressive infection. The analysis focused on the selection of the most appropriate surgical method according to the anatomical localization and clinical severity of the pathological process.

Results and discussion. The analysis of scientific publications demonstrates that surgical intervention in children with rhinosinusogenic orbital complications should be determined by the severity of the inflammatory process and the risk of functional damage to the visual apparatus. Small medial subperiosteal abscesses in clinically stable children with preserved visual acuity may be managed initially with intravenous antibiotic therapy and close observation. However, progressive visual impairment, increasing proptosis, ophthalmoplegia, significant abscess formation, intracranial extension, or the absence of clinical improvement after 48-72 hours of appropriate antimicrobial treatment may indicate the need for surgical intervention [3,4].

Functional endoscopic endonasal surgery represents one of the principal modern approaches to the treatment of selected rhinosinusogenic orbital

complications. The procedure allows surgeons to access the affected paranasal sinuses, remove infected contents, restore physiological sinus drainage, and drain appropriately localized medial subperiosteal abscesses. Its minimally invasive nature helps reduce external tissue trauma and preserves the anatomical structures of the facial region. The use of endoscopic techniques is particularly important in pediatric patients, in whom preservation of developing anatomical structures is an important consideration [5,7].

External surgical approaches, including medial and lateral orbitotomy, remain necessary in certain clinical situations. These procedures may be indicated when abscesses are located in superior, lateral, or other anatomical regions that cannot be adequately accessed through an endonasal approach. In selected cases, a combined surgical strategy involving endoscopic sinus surgery and external orbital drainage may provide more effective elimination of the infectious focus. Therefore, the choice of surgical technique should be based on the anatomical localization of the abscess, its extent, the condition of the orbital structures, and the surgeon's clinical assessment [2,6].

Postoperative management is an essential component of successful surgical treatment. It includes appropriate antimicrobial therapy, regular assessment of visual acuity, monitoring of ocular motility and proptosis, and evaluation of the child's general clinical condition. Ophthalmological and otolaryngological follow-up is necessary to assess the effectiveness of drainage and identify possible residual infection or recurrence. The reviewed literature also emphasizes that coordinated multidisciplinary management contributes to timely clinical decision-making, reduces the risk of severe complications, and improves the likelihood of preserving visual function [1,8].

Conclusion. Modern surgical management of rhinosinusogenic orbital complications in children requires an individualized approach based on the severity of the inflammatory process, the anatomical localization of the abscess, radiological

findings, and the functional condition of the visual apparatus. Endoscopic endonasal drainage is an effective and minimally invasive method in appropriately selected patients, particularly in cases involving medial subperiosteal abscesses and affected paranasal sinuses. Nevertheless, external or combined surgical approaches remain important for the management of abscesses located in anatomically inaccessible orbital regions.

The effectiveness of treatment depends on the timely identification of surgical indications, adequate elimination of the infectious focus, appropriate antimicrobial therapy, and continuous postoperative monitoring. Close cooperation between otolaryngologists, ophthalmologists, pediatricians, and other specialists is essential for preventing irreversible visual impairment and intracranial complications. The implementation of modern surgical techniques and individualized treatment strategies can contribute to improved clinical outcomes and the preservation of children's visual function.

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