

Clinical Case Analysis of Orbital Complications of Rhinosinusitis in Children Under 3 Years of Age

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Abstract: Acute rhinosinusitis is a significant condition in young children, often leading to serious complications due to the unique anatomical and developmental characteristics of their paranasal sinuses. In this paper, we discuss a detailed clinical case involving a child under three years old who presented with acute purulent maxillary and ethmoidal sinusitis, which also affected the upper eyelid. We focus on the comprehensive evaluation of clinical symptoms, inflammatory markers, and the effectiveness of ultrasonography as a diagnostic tool.

Through conservative treatment, we achieved significant improvement in the child's sinonasal and orbital inflammation, ultimately avoiding the need for surgery. Ultrasonography proved to be a safe and effective imaging method that allowed us to monitor mucosal thickening and fluid accumulation in the sinuses, as well as the restoration of sinus ventilation during treatment. These findings can be valuable in clinical practice, helping healthcare providers make informed decisions regarding the management of rhinosinusitis in pediatric patients.

Keywords: acute rhinosinusitis, pediatric ultrasonography, orbital complications, conservative management, sinonasal infection.

INTRODUCTION

Rhinosinusitis is one of the most prevalent inflammatory disorders affecting children, characterized by inflammation of the nasal cavity and paranasal sinuses. In early childhood, the condition often progresses rapidly due to the immature structure and function of the sinonasal area, increased mucosal sensitivity, and frequent upper respiratory infections. Studies indicate that the incidence of rhinosinusitis is rising globally by about 1.5–2% annually, with pediatric cases representing nearly 5% of the overall disease burden. Additionally, research shows that rhinosinusitis accounts for 27–30% of inflammatory conditions affecting a child's upper respiratory tract.

The risk of complications in young children is closely linked to the anatomical development of their paranasal sinuses. The early formation of the ethmoidal sinuses, the thinness of the lamina papyracea, and the proximity of the sinuses to the orbit create a pathway for infections to spread quickly into the eye area. Rapidly developing complications can include various forms of orbital infections, such as periorbital edema, orbital cellulitis, and, in severe cases, cavernous sinus thrombosis. Delayed diagnosis can lead to serious consequences, including optic nerve damage and permanent vision loss, underscoring the importance of timely and effective treatment.

While *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis* are commonly recognized as causative agents, recent research highlights the role of polymicrobial infections involving anaerobic bacteria in complex cases of rhinosinusitis. The mechanisms by which infections spread to the orbit include direct extension, lymphatic spread, retrograde venous dissemination, and inflammatory damage to the sinus walls.

Early and accurate diagnosis of orbital complications is especially crucial in young children, as their symptoms may be vague and progress rapidly. Initial signs may resemble an eye condition, necessitating a collaborative diagnostic approach involving otorhinolaryngologists, pediatricians, and ophthalmologists. Evidence suggests that early-stage orbital complications can often be managed conservatively, while more severe cases may require surgical intervention.

Given the quick progression of these complications, the diverse presentation of symptoms, and the potential for severe outcomes in children under three years old, this topic is particularly relevant to pediatric otorhinolaryngology. This paper aims to review the clinical, diagnostic, and treatment considerations for cases of rhinosinusitis that involve the orbit in early childhood.

METHODS

This study is a descriptive clinical case evaluation of a child under three years old diagnosed with acute rhinosinusitis complicated by orbital issues. The investigation adhered to the Declaration of Helsinki, and informed consent was obtained from the child's legal guardian for diagnostic procedures, treatments, and the publication of anonymized data.

A multidisciplinary team, including an otorhinolaryngologist, pediatrician, and ophthalmologist, conducted a thorough clinical evaluation. Clinical findings were documented at admission and during follow-up. Laboratory tests included a complete blood count, differential, and erythrocyte sedimentation rate, all adjusted for age. Ultrasonography of the paranasal sinuses revealed inflammatory changes, such as mucosal thickening and fluid accumulation. Treatment response was monitored through ultrasonography, and conservative management was provided according to current clinical guidelines. Treatment effectiveness was assessed based on clinical improvement, normalization of laboratory markers, and reduction of ultrasonographic signs of inflammation.

RESULTS

A child under three years old was admitted with a 3–4-day history of fever (up to 38.9 °C), nasal congestion, purulent nasal discharge, and swelling of the left upper eyelid. On examination, significant periorbital edema was noted, along with limited eye movement and tenderness over the maxillary sinus. Laboratory tests showed leukocytosis ($15.5 \times 10^9/L$) with a predominance of neutrophils and an elevated erythrocyte sedimentation rate (38 mm/h), indicating an acute purulent inflammatory response. Urinalysis results were normal. Anterior rhinoscopy revealed mucopurulent discharge and swollen, red nasal mucosa. Eye examination showed reactive edema in the orbital soft tissue and an upper eyelid abscess, without involvement of the anterior segment.

Table 1

Parameter	Findings
Patient characteristics	Child under 3 years of age
Duration of symptoms	3–4 days
Main clinical complaints	Fever up to 38.9 °C, nasal obstruction, purulent nasal discharge, swelling of the left upper eyelid
General condition on admission	Severe
Physical examination	Pronounced edema of the left upper eyelid, narrowing of the palpebral fissure, limitation of ocular movements, tenderness over the left maxillary sinus
ENT findings	Mucopurulent nasal discharge, hyperemic and edematous nasal mucosa, enlargement of inferior and middle turbinates
Ophthalmological findings	Reactive edema of left orbital soft tissues, conjunctival chemosis, restricted ocular motility, no anterior segment pathology
Laboratory findings	Leukocytosis ($15.5 \times 10^9/L$), neutrophilic predominance, elevated ESR (38 mm/h), mild anemia
Urinalysis	Within normal limits
Ultrasonographic findings	Left-sided maxillary–ethmoidal sinusitis with mucosal thickening and intrasinus fluid; right side without pathology

Final clinical diagnosis	Acute purulent left-sided maxillary–ethmoidal sinusitis complicated by an upper eyelid abscess
Clinical outcome	Regression of orbital inflammation with conservative management; no surgical intervention required
Length of hospital stay	10 days
Condition at discharge	Satisfactory

Table 1 presents a concise summary of the key clinical, laboratory, and ultrasonographic findings observed in the child with acute purulent maxillary–ethmoidal sinusitis complicated by an upper eyelid abscess, highlighting disease severity at presentation and favorable clinical outcome following conservative management.

Ultrasonography revealed swelling of the mucosal lining and fluid buildup in the left-sided maxillary and ethmoidal sinuses, indicating sinusitis, while the sinuses on the opposite side appeared normal. Thanks to conservative treatment, the patient showed rapid clinical improvement, with a noticeable decrease in orbital swelling, a return to normal body temperature, and restored eye movement. By day 10, the complete resolution of the orbital issue was achieved without the need for surgery, and the patient was discharged in good condition.

DISCUSSION

This clinical scenario highlights how quickly rhinogenic orbital complications can develop, especially in young children under the age of three. At this age, children are particularly vulnerable to severe illness due to the immature anatomy and physiology of their paranasal sinuses, which can lead to a swift progression of disease from the sinuses to the orbit. In this patient, the brief time between the onset of sinusitis symptoms and the emergence of orbital issues was consistent with previously documented cases. Common signs included high fever, swelling around the eyes, limited eye movement, and indications of systemic inflammation.

Laboratory tests showed an increase in white blood cells, particularly neutrophils, along with a raised erythrocyte sedimentation rate, which supported the diagnosis of an acute purulent infection. The absence of abnormalities in urinalysis and other systemic tests indicated that the infection was localized rather than affecting multiple systems.

A key point in this case is the use of ultrasonography to assess paranasal sinus issues in young children. This imaging technique helped confirm the involvement of the maxillary and ethmoidal sinuses without exposing the child to ionizing radiation. Given the limitations of repeated CT scans in pediatric cases, this case provides evidence that ultrasonography is a valuable, safe, and repeatable tool for evaluating both uncomplicated and complicated rhinosinusitis in young children.

The successful outcome achieved through conservative treatment aligns with data showing that early-stage rhinogenic orbital complications can often be managed effectively without surgery if diagnosed and treated promptly. Timely interdisciplinary assessment and close clinical monitoring helped reduce the orbital inflammation and prevent more serious complications, such as abscess formation that would require surgical intervention.

CONCLUSION

This clinical case demonstrates that acute rhinosinusitis in children under three can quickly lead to serious orbital complications due to their age-related anatomical and functional immaturity. The findings emphasize the need for heightened clinical awareness. In this instance, prompt identification and conservative management completely resolved the orbital inflammation without surgery, suggesting that non-invasive treatments can be effective for certain patients. Ultrasonography proved to be an effective diagnostic and monitoring tool, offering a safe, reproducible, and radiation-free way to evaluate sinonasal conditions characterized by mucosal swelling and fluid accumulation. It is essential to minimize ionizing radiation exposure in young children, making conventional imaging methods unnecessary. In summary, this case underscores the critical importance of recognizing

rhinogenic orbital complications in children, highlighting the role of interdisciplinary clinical evaluations and judicious conservative treatment in achieving better clinical outcomes for children suffering from these conditions.

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