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# ВИПАДКИ З ПРАКТИКИ

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## SPECIFIC ASPECTS OF COMPLEX TREATMENT FOR ACUTE ORBITAL CELLULITIS IN CHILDREN (CLINICAL CASE)

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***Summary.***

*Orbital cellulitis represents an urgent challenge in ophthalmology, particularly in pediatric practice. An individualized approach to each patient is essential due to the severity of potential complications and treatment-related sequelae. Strict adherence to therapeutic protocols is critical during both the acute phase and long-term follow-up. This report presents a clinical case of acute orbital cellulitis in a child, managed with adjunctive intravenous immunoglobulin (IVIG) as part of complex surgical and medical treatment. While immune modulation during active infection remains debated, IVIG administration in this case proved clinically justified and pivotal.*

***Results and their discussion.*** *A 1-year, 8-month-old male was admitted to the City Children's Clinical Hospital for 16 days with a diagnosis of acute orbital cellulitis. On examination, the child was in severe condition, exhibiting marked pain, hyperthermia, and tense solid edema of both upper and lower eyelids. The eyelids were cyanotic, hyperthermic on palpation, with minimal serous discharge and blepharospasm. Eyelid opening could not be achieved without anesthetic and sedative assistance. Complete examination of the globe and posterior segment structures remained unfeasible under these conditions. Additional instrumental and laboratory studies were performed, which confirmed the diagnosis. The patient underwent multidisciplinary consultations with specialists in neurology, otolaryngology, dentistry, maxillofacial surgery, and pediatrics. Concurrent diagnoses included acute sinusitis and rhinitis. No contributory allergological, genetic, or epidemiological risk factors were identified. The treatment regimen consisted of antibacterial therapy, nonsteroidal anti-inflammatory drugs (NSAIDs), analgesics, and symptomatic management. However, the child's general condition remained severe during the first 72 hours of treatment, with no clinical improvement observed. On day 4 of hospitalization, surgical orbital drainage was performed, yielding serous exudate, and antibiotic therapy was escalated, yet the condition remained refractory. Therefore, on day 9, immunoglobulin was administered in three doses as an adjunct to the ongoing treatment. Within 24 hours, the child demonstrated resolution of fever, reduction in periorbital edema and inflammation, and normalization of inflammatory markers. By day 16 of hospitalization, the patient was discharged in satisfactory condition.*

***Conclusions.*** *1. The use of immunoglobulin in the complex treatment of acute orbital cellulitis in children appears clinically justified, as it contributed to rapid clinical improvement in this refractory case. 2. The development of standardized treatment protocols incorporating immunoglobulin therapy may improve prognostic outcomes in similar cases. 3. Further research is required to elucidate the precise immunomodulatory mechanisms of immunoglobulin in the treatment of acute orbital cellulitis in pediatric patients.*

***Keywords:*** *Orbit; Skull; Soft Tissue; Optic Nerve; Retinal Ischemia; Inflammation; Child; Immunoglobulin; Orbital Cellulitis; Preseptal Cellulitis; Ophthalmoplegia; Proptosis (Exophthalmos); Eyelid Edema; Orbital Drainage.*

### Introduction

Orbital cellulitis is defined as an infectious process affecting the orbital muscles and adipose tissue posterior to the orbital septum, while sparing the globe itself. This soft tissue infection, frequently secondary to bacterial sinusitis [1-6], is characterized by ocular dysfunction and represents a medical emergency requiring hospitalization. Potential complications include neuritis, optic nerve atrophy, exposure keratitis, central retinal artery occlusion, retinal and choroidal ischemia, subperiosteal abscess, orbital abscess, cavernous sinus thrombosis, meningitis, cerebral abscess, and septicemia [1,7-9].

The diagnostic triad of ophthalmoplegia, proptosis, and visual impairment distinguishes orbital cellulitis, with imaging confirmation via computed tomography (CT) or magnetic resonance imaging (MRI) being mandatory. Visual loss occurs in approximately 11% of cases [1,10]. Essential laboratory investigations include complete blood count with differential, blood cultures, and microbiological analysis of nasopharyngeal or wound swabs to identify causative pathogens and guide antibiotic therapy. While culture positivity rates range from 0% to 33% statistically, pediatric cases demonstrate higher microbiological yield than adult counterparts [1,11-13]. Proptosis represents both a cardinal symptom and severity marker, with severe presentations necessitating immediate hospitalization. Early periorbital findings typically include eyelid edema, which may progress to chemosis, proptosis, and visual impairment [1,14].

Current evidence suggests urgent surgical intervention is warranted when orbital cellulitis coexists with frontal sinusitis due to elevated intracranial complication risks. Absolute indications for drainage include multiloculated sinus involvement, abscesses exceeding 1.0×0.4 cm dimensions, or visual compromise – particularly crucial in pediatric patients to prevent optic nerve compression. Notably, older patients frequently present with polymicrobial infections and chronic sinusitis, often demonstrating reduced responsiveness to medical management alone [1,3-7,15-17].

Given these considerations, orbital cellulitis remains a critical concern in pediatric ophthalmology due to its potentially devastating complications and long-term sequelae. Optimal management requires strict adherence to treatment protocols while maintaining individualized therapeutic approaches based on current evidence-based recommendations.

**Aim of the study:** to evaluate the therapeutic efficacy of immunoglobulin in the complex treatment of pediatric acute orbital cellulitis.

## Results and their discussion

Broad-spectrum antibiotics represent the cornerstone of orbital cellulitis treatment, with initial empirical therapy being subsequently adjusted based on culture results when available.

The evidence regarding corticosteroid use in pediatric orbital cellulitis remains limited, though recent studies suggest potential benefits of adjunctive steroid therapy. One randomized controlled trial enrolled patients aged over 10 years who had received 3-5 days of intravenous antibiotics, demonstrating comparable clinical outcomes between those continuing antibiotic therapy alone versus those receiving additional steroids [6-8].

Another investigation utilizing C-reactive protein (CRP) levels as a biomarker found that pediatric patients administered oral steroids after CRP decreased below 4 g/L experienced reduced hospitalization duration [6-8]. These findings highlight the need for further research to establish optimal timing and indications for steroid incorporation into treatment protocols.

In our case, a boy (1 year, 8 months) was hospitalized at City Children's Clinical Hospital for 16 days (from 05.06.2023 to 20.06.2023) with acute orbital cellulitis. Symptom onset was reported on 03.06.2023, beginning with rhinorrhea. Admission complaints included left orbital pain and firm swelling of both eyelids.

Clinical examination revealed severe systemic manifestations including hyperthermia (38.6 °C) and concurrent pansinusitis. The child was conscious but inconsolable and non-interactive. Nasal breathing was impaired with evident respiratory effort. Pulmonary auscultation revealed vesicular breath sounds without adventitious noises. Cardiac examination demonstrated rhythmic heart sounds with tachycardia. The abdomen appeared normosthenic, exhibited normal respiratory movement, and was soft and non-tender on palpation.

Ophthalmic evaluation documented bilateral eyelid edema with characteristic inflammatory features: tense consistency, cyanotic discoloration, localized hyperthermia, and minimal serous discharge. Severe blepharospasm necessitated sedation for adequate examination. Magnetic resonance imaging confirmed preseptal cellulitis with concurrent pansinusitis.

Neurological consultation revealed no focal pathology, with age-appropriate psychomotor development. Magnetic resonance imaging (MRI) of the brain excluded intracranial hypertension, demonstrating no evidence of abscess, hematoma, or neoplastic lesions. The scan showed normal brain parenchyma without edema, well-visualized convexital spaces, and slightly dilated interhemispheric fissure with Sylvian sulcus changes suggestive of nonspecific encephalopathy. Ventricular system appeared symmetrical without compression or dilation, and choroid plexuses were unremarkable with no structural abnormalities. Otolaryngological consultation confirmed sinusitis and rhinitis. Dental and maxillofacial surgical evaluations revealed no pathology. Pediatric assessment excluded comorbid conditions. No significant allergological, genetic, or epidemiological risk factors were identified.

Inflammatory markers were confirmed through serial testing (Tables 1-4).

**Table 1**

**Complete blood count**

| № | Indicators | 1 day | 7 day | 11 day |
|---|---|---|---|---|
| 1 | C-reactive protein | 12 (mg/L) (qualitative, semiquantitative) | 24 (mg/L) (qualitative, semiquantitative) | |
| 2 | Potassium | 4.3 mmol/L | | |
| 3 | Sodium | 135 mmol/L | | |
| 4 | Leukocytes (WBC) | 18.85 | 15.02 | 11.77 ×10<sup>9</sup>/L |
| 5 | Lymphocytes (LYM)<br>Lymphocytes (LYM%) | 5.29 | 5.35<br>35.6 | 6.55 ×10<sup>9</sup>/L<br>55,7% |
| 6 | Monocytes (MID)<br>Monocytes (MID%) | 2.72 | 1.67<br>11.1 | 1.49 ×10<sup>9</sup>/L<br>12,7% |
| 7 | Granulocytes (GRA)<br>Granulocytes (GRA%) | 10.84 | 7.99<br>53.2 | 3.72 ×10<sup>9</sup>/L<br>31,6% |
| 8 | Erythrocytes (RBC) | 4.41 | 4.71 | 4.2 ×10<sup>9</sup>/L |
| 9 | Hemoglobin (HGB) | 11.7 | 117.5 | 115.3 g/L |
| 10 | Hematocrit (HCT) | 35.76 | 38.38 | 34.18% |
| 11 | Mean corpuscular volume (MCV) | | 81.5 | 81.4 fL |
| 12 | Mean hemoglobin content in erythrocytes (MCH) | | 25 | 27.5 pg |
| 13 | Red blood cell size distribution width (RDWsd) | | 41.7 fL; | |
| 14 | Red blood cell volume distribution width (RDWcv) | | 16.6% | |
| 15 | Mean hemoglobin concentration in red blood cell mass (MCHC) | | | 337.3 g/L |
| 16 | Absolute platelet content (PLT) | | 550 | 43.0 ×10<sup>9</sup>/L |
| 17 | Thrombocrit (PCT) | | 0.40 | 0.03% |
| 18 | Mean platelet volume (MPV) | | 7.3 | 6.9 fL |
| 19 | Platelet size distribution width (PDWsd) | | 16.2 | 15.8 fL |
| 20 | Platelet volume distribution width volume (PDWcv | | 39.6 | 41.8% |
| 21 | Absolute large platelet count (PLCC) | | 143 | 11 ×10<sup>9</sup>/L |
| 22 | Percentage of large platelets | | 25.9 | 24.5% |

**Table 2**

**Complete blood count (+microscopy)**

| № | Indicators | 1 day | 7 day | 11 day |
|---|---|---|---|---|
| 1 | Eosinophils | 1 | 1 | 4% |
| 2 | Rodular neutrophils | 7 | 5 | 2% |
| 3 | Segmented neutrophils | 56 | 47 | 40% |
| 4 | Lymphocytes | 33 | 42 | 50% |
| 5 | Monocytes | 3 | 5 | 4% |
| 6 | ESR | 30 | 27 | 10 mm/h |
| 7 | Platelets | 400 ×10<sup>9</sup>/L | | |
| 8 | Erythrocytes | 4,5 ×10<sup>12</sup>/L | | |
| 9 | Hemoglobin | 136 g/L | | |
| 10 | Metamyelocyte(juni) | - (%) | | |

**Table 3**

**Coagulogram**

| № | Indicators | 1 day | 7 day | 11 day |
|---|---|---|---|---|
| 1 | Prothrombin index according to Quick | 109,1% | | |
| 2 | Prothrombin time | 11 s | | |
| 3 | Recalcification time | 61 s | | |
| 4 | Fibrinogen A | 4.44 g/L | | |
| 5 | Activated recalcification time | 52 s | | |
| 6 | International normalized ratio (MHB) | 0,92 | | |
| 7 | Hematocrit | 30% | | |
| 8 | Coagulation time (unstabilized blood) | | 3:00-4:00 min | 2:10-3:10 min |

**Table 4**

**Coprogram**

| № | Indicators | 1 day | 7 day | 11 day |
|---|---|---|---|---|
| 1 | Leukocytes | 1-3 (in the field of view) | | |
| 2 | Osmolarity | 280 mosmol/L | | |
| 3 | Procalcitonin | 0.1 | 0.1 ng/ml | |
| 4 | Blood chlorides | 103 mosmol/L | | |
| 5 | Alanine aminotransferase (ALT) | 31 U/L | | |
| 6 | Aspartate aminotransferase (AST) | 27 U/L | | |
| 7 | Calcium | 2.0 mmol/L | | |
| 8 | Creatinine | 59.0 | 47.3 μmol/L | |
| 9 | Blood urea | 3.73 | 4.3 mmol/L | |
| 10 | Total bilirubin | 11.8 | 10.2 μmol/L | |
| 11 | Total protein | 53.0 | 63.3 g/L | |
| 12 | Glucose blood | 5.9 | 5.6 mmol/L | |
| 13 | Thymol test 0 | | 0.16 units | |

**Treatment.** The therapeutic regimen consisted of broad-spectrum aminoglycoside antibiotics administered intravenously once or twice daily, supplemented with nonsteroidal anti-inflammatory drugs, analgesics, and symptomatic management. During the initial 72 hours of treatment, the child's condition remained severe, characterized by persistent high fever and extreme restlessness. The local examination revealed persistently swollen, tense, and cyanotic eyelids with notable hyperthermia upon palpation. Serous discharge and complete blepharospasm were observed, precluding examination of ocular structures.

On hospital day 4, surgical orbital drainage was performed, yielding minimal serous exudate.

By day 7, despite ongoing treatment, the clinical picture showed no improvement, with persistent pyrexia and absence of local response. Laboratory parameters similarly demonstrated no positive trends, prompting escalation to fourth-generation broad-spectrum cephalosporin antibiotics administered parenterally.

As of hospital day 9, the patient's status remained critical with sustained fever and marked irritability. Local findings included persistent bilateral eyelid edema with cyanotic discoloration and elevated temperature, though blepharospasm showed minimal reduction allowing slight spontaneous eyelid opening. Ocular examination remained impossible. Given the lack of response to both medical and surgical interventions, a multidisciplinary consultation was convened, resulting in the decision to administer intravenous immunoglobulin at an initial dose of 50 mg as adjunctive therapy.

By hospital day 11, the patient exhibited modest clinical improvement with transition to subfebrile temperature and reduced restlessness. Local examination showed decreased upper eyelid edema while lower lid swelling persisted, with complete resolution of discharge. Blepharospasm further diminished, permitting limited independent eyelid movement though detailed ocular examination remained challenging. Concomitant laboratory investigations demonstrated positive trends (Tables 1, 2, 3), leading the treatment team to administer a second 100 mg dose of immunoglobulin following repeat consultation.

On the 12th day of inpatient treatment, the child's general condition showed improvement with normalization

of body temperature. Local examination revealed complete resolution of upper eyelid edema, while lower eyelid swelling persisted but had decreased significantly. No pathological discharge was observed. Blepharospasm had diminished sufficiently to allow independent eyelid opening, though detailed examination of ocular structures remained challenging; fundoscopic reflex was noted to be bright. Based on the recommendation of the multidisciplinary team, a third dose of immunoglobulin (100 mg) was administered.

By the 14th day of hospitalization, the child remained afebrile with complete resolution of both upper and lower eyelid edema. All signs of blepharospasm had disappeared, and eyelid function returned to normal. Examination of ocular structures demonstrated no conjunctival injection, with transparent optical media and well-preserved bright fundal reflex.

On the 16th treatment day, given the sustained positive clinical dynamics and satisfactory general condition with normal body temperature, the decision was made to discharge the patient. Final local examination showed complete absence of eyelid edema, normal palpebral function with no discharge or blepharospasm. Ocular evaluation revealed quiet anterior segments with transparent media and bright fundal reflexes. Optic nerve heads appeared pale-pink with sharp margins, retinal examination showed normal macular and paramacular reflexes. All hematological parameters had normalized at this point.

The clinical course demonstrated that despite comprehensive treatment including multiple broad-spectrum antibiotics and surgical drainage, the child's condition remained severe through the 9th hospital day with persistent fever and no improvement. The expert council decision to introduce immunoglobulin therapy in three doses (50 mg, then two 100 mg doses) resulted in marked clinical improvement. This was evidenced by rapid defervescence, progressive resolution of local inflammation, and normalization of laboratory parameters, culminating in successful discharge on day 16.

While the role of immunomodulation in active infection remains subject to debate, this case clearly illustrates that immunoglobulin administration proved clinically decisive..

## Conclusions

1. Administration of immunoglobulin as adjunctive therapy in pediatric acute orbital cellulitis demonstrates clinical efficacy, contributing to accelerated resolution of symptoms and improved recovery outcomes.

2. Incorporation of immunoglobulin into standardized treatment protocols shows significant prognostic potential for refractory cases. 3. Further investigation is warranted to elucidate the precise immunomodulatory mechanisms of immunoglobulin in pediatric orbital cellulitis.

**Prospects for further research.** Comprehensive literature review is required to evaluate existing evidence regarding immunoglobulin efficacy in pediatric orbital cellulitis management.

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# ОСОБЛИВОСТІ КОМПЛЕКСНОГО ЛІКУВАННЯ ГОСТРОГО ОРБІТАЛЬНОГО ЦЕЛЮЛІТУ У ДІТЕЙ (КЛІНІЧНИЙ ВИПАДОК)

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## Резюме.

Орбітальний целюліт є актуальною проблемою офтальмології, особливо дитячої. Індивідуальний підхід щодо конкретного пацієнта зумовлений серйозністю ускладнень і наслідків лікування. Як гострий період захворювання, так і віддаленні результати потребують чіткого виконання протоколів лікування. З цією метою ми висвітлюємо окремий клінічний випадок гострого орбітального целюліту у дитини із застосуванням імуноглобуліну в комплексному хірургічному лікуванні. Хоча потенціал імуносупресії за наявності інфекції викликає суперечки, проте у нашому випадку призначення імуноглобуліну в комплексному лікуванні орбітального целюліту у дитини було доречним і визначальним.

Результати та їх обговорення. На стаціонарному лікуванні у КНП «Міська дитяча клінічна лікарня» впродовж 16-ти діб перебував хлопчик (1 рік, 8 місяців) з діагнозом «Гостре запалення очної ямки». При огляді стан дитини важкий. У пацієнта значний больовий синдром, гіпертермія, локально інтенсивний солідний набряк обидвох повік (верхня і нижня). Останні синюшного кольору, гарячі на дотик, виділення незначні серозні, блефароспазм. Відкрити повіки не вдається без анестезії та седації. Огляд очного яблука та глибших структур неможливий. Виконано додаткові інструментальні та лабораторні дослідження, що підтвердили діагноз. Також, дитина проконсультована невропатологом, лор-спеціалістом, стоматологом, щелепно-лицевим хірургом та педіатром. У дитини явища гострого синуситу та риніту. Алергологічний, генетичний та епідеміологічний анамнез не обтяжені. Хоча потенціал імуносупресії за наявності інфекції викликає суперечки, проте у нашому випадку призначення імуноглобуліну було доречним і визначальним. Лікування включало антибіотикотерапію, нестероїдні протизапальні, знеболюючі засоби і симптоматичне лікування. Проте протягом перших трьох діб загальний стан дитини залишався важким без позитивної динаміки. На 4-ту добу стаціонарного лікування виконано дренування орбіти (отримано серозний ексудат) та призначено інший антибіотик. Однак, стан залишався без змін. Тому на 9-ту добу додатково до призначеного консервативного лікування було додано імуноглобулін (три дози). Позитивну динаміку (зниження температури тіла, покращення загального та локального статусу, а також покращення показників лабораторних досліджень) відмічено на наступну добу після призначення препарату. На 16-ту добу перебування в стаціонарі дитина в задовільному стані виписана додому.

**Висновки.** 1. Застосування імуноглобуліну в комплексному лікуванні гострого орбітального целюліту у дітей є доцільним, це сприяє позитивній динаміці та одужанню. 2. Розробка алгоритмів лікування з корекцією імуноглобуліном є обіцяючим щодо прогнозу захворювання. 3. Вивчення механізму впливу імуноглобуліну при лікуванні гострого орбітального целюліту у дітей є актуальним та потребує подальшого вивчення.

**Ключові слова:** орбіта, м'які тканини, зоровий нерв, ішемія сітківки, запалення, дитина, імуноглобулін, орбітальний целюліт, пресептальний целюліт, офтальмоплегія, проптоз (екзофтальм), набряк повік, дренування орбіти.

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