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Clinical Characteristics and Management of Orbital Cellulitis: A Case Series

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Abstract

Background

Orbital cellulitis is a potentially sight- and life-threatening infection involving the tissues posterior to the orbital septum. It requires prompt diagnosis, systemic antimicrobial therapy, evaluation for an underlying source, and timely surgical intervention when indicated. Although sinonasal infection is a common source, orbital cellulitis may also occur secondary to lacrimal drainage disease, trauma, systemic illness, and hematogenous infection.[1–3]

Purpose

To describe the clinical characteristics, associated predisposing factors, treatment approaches, surgical interventions, and outcomes of a series of patients with orbital cellulitis.

Methods

A descriptive case series of seven patients diagnosed with orbital cellulitis was reviewed. Demographic characteristics, laterality, predisposing factors, systemic associations, antimicrobial therapy, corticosteroid use, surgical interventions, associated complications, and clinical outcomes were documented from the available clinical records.

Results

Seven patients with orbital cellulitis were included, with ages ranging from 7 to 76 years. Two patients had right-sided and five had left-sided disease. Predisposing or associated factors included lacrimal drainage abnormality, diabetes mellitus, hemodialysis, tuberculosis, local trauma, sinonasal disease, and intracranial abscess. Broad-spectrum intravenous antibiotics constituted the mainstay of treatment. Piperacillin-tazobactam with metronidazole was used in two patients, while meropenem or cefotaxime with metronidazole was used in others. Corticosteroids were administered in selected patients. Surgical treatment included orbital drainage, incision and drainage, and sinus drainage. One patient subsequently underwent dacryocystorhinostomy for an underlying lacrimal drainage problem. Six patients had documented clinical recovery, while one patient had residual ptosis.

Conclusion

Orbital cellulitis can occur in patients across a wide age spectrum and may be associated with local, sinonasal, traumatic, and systemic predisposing factors. Early antimicrobial therapy combined with appropriate identification and control of the underlying source resulted in favourable outcomes in most patients in this series. Persistent sequelae such as ptosis may occur despite resolution of the acute infection.

Keywords: orbital cellulitis; orbital infection; sinusitis; diabetes mellitus; tuberculosis; orbital abscess; lacrimal drainage; oculoplasty

I. Introduction

Orbital cellulitis is an acute infection involving the tissues posterior to the orbital septum. It is an ophthalmic emergency because progressive orbital inflammation and infection can result in optic neuropathy, visual loss, orbital abscess, cavernous sinus thrombosis, meningitis, intracranial abscess, and, rarely, death.[1–3]

The most frequent source of orbital cellulitis is adjacent sinonasal infection, particularly ethmoid sinus disease. The close anatomical relationship between the orbit and paranasal sinuses facilitates the spread of infection through the thin medial orbital wall, venous channels, and areas of anatomical dehiscence.[3,4] Other recognized causes include trauma, foreign bodies, lacrimal drainage infection, dental infection, facial infection, and hematogenous spread.[3,5]

The clinical spectrum varies with age and underlying disease. Orbital cellulitis is relatively more common in children and young adults, whereas adult patients may have polymicrobial infections and are more likely to have underlying systemic or sinonasal disease.[3,4] Diabetes mellitus, immunocompromised states, and renal disease may further increase the risk of severe infection or atypical presentations.

Diagnosis is primarily clinical and should include careful assessment of visual acuity,

pupillary function, ocular motility, proptosis, chemosis, and optic nerve function. Computed tomography or magnetic resonance imaging may be required to establish the extent of orbital disease, identify sinus involvement or an abscess, and detect intracranial complications.[3],[5]

Systemic antimicrobial therapy remains the cornerstone of treatment. Surgical intervention may be required in patients with an orbital or subperiosteal abscess, significant sinus disease, intracranial extension, foreign body, or inadequate response to medical treatment.[3],[5],[6] In children, selected subperiosteal abscesses may be managed conservatively depending on age, abscess location and size, visual function, and clinical response.[6],[7]

The role of corticosteroids as adjunctive therapy remains uncertain. A prospective comparative study reported earlier resolution of inflammatory signs with adjunctive corticosteroids,[8] whereas a subsequent Cochrane review concluded that the available evidence was insufficient to establish their routine benefit.[9]

The present case series describes seven patients with orbital cellulitis and highlights the diverse underlying factors, treatment approaches, and clinical outcomes encountered in clinical practice.

II. Materials and Methods

Study design

This was a descriptive case series of seven patients diagnosed with orbital cellulitis and treated at a tertiary ophthalmic care centre.

Data collection

The available clinical records were reviewed for:

- age and sex;
- laterality;
- relevant local history;
- systemic comorbidities;
- suspected predisposing factors;
- sinonasal or intracranial involvement;
- antimicrobial treatment;
- corticosteroid therapy;
- surgical intervention; and
- clinical outcome.

Because this was a retrospective case series based on available clinical records, complete microbiological, radiological, laboratory, visual acuity, and follow-up information was not available for every patient.

Management

Patients were managed according to the severity of infection and the suspected source. Broad-spectrum systemic antibiotics were administered. Surgical drainage was undertaken when a clinically significant collection or sinonasal source requiring drainage was identified. Corticosteroids were used selectively in patients in whom the treating clinicians considered them appropriate after antimicrobial treatment had been initiated.

III. Results

Seven patients with orbital cellulitis were included. The patients ranged in age from 7 to 76 years. Five patients had left orbital involvement and two had right orbital involvement.

The clinical characteristics and management of the individual patients are summarized in Table 1.

Case 1

A 72-year-old woman presented with right orbital cellulitis and a history of watering from the affected eye. She was treated with piperacillin-tazobactam, metronidazole, and corticosteroids. The patient recovered clinically. In view of the associated lacrimal drainage abnormality, dacryocystorhinostomy was subsequently performed.

Case 2

A 7-year-old girl presented with right orbital cellulitis. She received piperacillin-tazobactam and metronidazole and underwent drainage. Acid fast Bacilli was shown in collected pus, and linezolid was administered. The patient subsequently recovered.

Case 3

A 65-year-old man undergoing hemodialysis developed left orbital cellulitis. He was treated with piperacillin-tazobactam and corticosteroids for approximately two weeks. Clinical recovery was documented.

Case 4

A 75 year old female patient developed left orbital cellulitis associated with sinus involvement and a brain abscess. Meropenem was administered. The patient subsequently recovered.

Case 5

A 76-year-old patient with diabetes mellitus developed left orbital cellulitis following finger-nail trauma. The patient received intravenous antibiotics and underwent incision and drainage. Clinical recovery was achieved.

Case 6

A 36-year-old patient with diabetes mellitus developed left orbital cellulitis following splashing of kumkum over the left eyelid. Treatment consisted of cefotaxime (Taxim), metronidazole, and corticosteroids. The patient recovered clinically.

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Case 7
A 54-year-old man developed left orbital cellulitis with ethmoid sinus involvement. Sinus drainage was performed , Histopsthology report confirmed caseating necrosis . The patient was treated with antitubercular therapy and corticosteroids. The orbital infection resolved, but residual ptosis remained.

Table 1. Clinical characteristics, management and outcome of patients with orbital cellulitis

Case	Age/ Sex	Laterality	Predisposing/associated factor	Medical management	Surgical management	Outcome
1	72/F	Right	Watering/lacrimal drainage abnormality	Piperacillin-tazobactam + metronidazole + steroids	DCR subsequently	Recovered
2	7/F	Right	Tuberculosis	Piperacillin-tazobactam + metronidazole; linezolid	Drainage	Recovered
3	65/ M	Left	Hemodialysis	Piperacillin-tazobactam + steroids for 2 weeks	Medical management	Recovered
4	75/F	Left	Sinus involvement + brain abscess	Meropenem	Medical management	Recovered
5	76/F	Left	Diabetes mellitus + finger-nail trauma	IV antibiotics	Incision and drainage	Recovered
6	36/F	Left	Diabetes mellitus + kumkum exposure	Cefotaxime + metronidazole + steroids	Medical management	Recovered
7	54/ M	Left	Ethmoid sinus involvement + tuberculosis	Antitubercular therapy + steroids	Medical management	Recovered; residual ptosis

DCR: dacryocystorhinostomy; **IV:** intravenous.

IV. Discussion

Orbital cellulitis remains an important ophthalmic emergency because infection can extend rapidly from the orbit to the optic nerve, cavernous sinus, meninges, or intracranial compartment.[1–3] The present case series demonstrates the heterogeneous clinical context in which orbital cellulitis can occur.

Age and laterality

The patients in this series ranged from 7 to 76 years of age. This broad age range is consistent with the observation that orbital cellulitis can affect both children and adults, although pediatric disease is relatively more frequent.[3,4]

Five of the seven cases involved the left orbit, while two involved the right orbit.

Predisposing factors

An important finding was the diversity of predisposing factors.

The first patient had a history of watering from the affected eye and subsequently underwent DCR. Lacrimal drainage abnormalities and dacryocystitis are recognized potential sources of orbital infection.[3,5] Identification of an underlying lacrimal obstruction is particularly important because antimicrobial therapy alone may not address the underlying anatomical abnormality.

Two patients had diabetes mellitus. Diabetes is an important systemic risk factor for severe or complicated infections. In patients with diabetes presenting with orbital cellulitis, clinicians should carefully assess the extent of infection and monitor the clinical response to therapy.

One patient developed orbital cellulitis following finger-nail trauma, while another developed the condition following splashing of kumkum over the eyelid. Local trauma or contamination can disrupt the periocular barrier and provide a potential route for bacterial inoculation. Trauma is recognized among the non-sinogenic causes of orbital cellulitis.[3,5]

One patient was undergoing hemodialysis. Although a direct causal relationship cannot be established from this case series, significant systemic disease

may influence host susceptibility and the severity of infection.

Sinonasal disease and intracranial extension

Sinonasal disease was an important feature in two cases. One patient had ethmoid sinus involvement requiring sinus drainage, while another had sinus involvement associated with a brain abscess.

The ethmoid sinuses are particularly important in the pathogenesis of orbital cellulitis because of their close anatomical relationship to the medial orbital wall.[3],[4] Sinogenic orbital infection can progress to subperiosteal or orbital abscess and, in severe cases, intracranial extension.

The patient with brain abscess illustrates the potentially life-threatening nature of orbital cellulitis. Intracranial complications require prompt recognition and multidisciplinary management involving ophthalmology, otorhinolaryngology, infectious disease, and neurosurgical teams when appropriate.

Antimicrobial therapy

Broad-spectrum systemic antimicrobial treatment was the principal therapeutic intervention in this series. Piperacillin-tazobactam with metronidazole was used in two cases, while meropenem or cefotaxime with metronidazole was used in other patients.

The antimicrobial regimen for orbital cellulitis should be individualized according to local antimicrobial susceptibility patterns, severity of disease, age, underlying systemic conditions, suspected source, and microbiological findings when available.[3],[5] Empirical therapy generally needs to provide appropriate coverage for the likely bacterial pathogens, with subsequent modification based on culture and susceptibility results where available.

The current literature emphasizes that orbital cellulitis should generally be managed as an inpatient condition requiring close ophthalmic assessment and systemic antimicrobial therapy.[3],[5]

Role of surgical intervention

Three patients in the present series underwent documented drainage procedures: orbital drainage in the pediatric patient, incision and drainage in the patient with traumatic disease, and sinus drainage in the patient with ethmoid sinus involvement.

The decision to operate depends on several factors, including the presence and location of an abscess, visual compromise, optic nerve dysfunction, intracranial extension, foreign body, associated sinus disease, and response to medical treatment.[3],[6],[7]

In children with selected subperiosteal abscesses, conservative treatment may be appropriate in carefully selected patients, whereas orbital abscess and intracranial complications generally require surgical management.[6],[7]

In the present series, surgical drainage was associated with subsequent clinical recovery in the patients for whom the procedure was documented.

Corticosteroids

Corticosteroids were used as adjunctive therapy in several patients in this series. Their potential benefit is related to reduction of inflammatory edema and associated orbital pressure.

A prospective comparative study by Pushker et al. involving 21 patients reported earlier resolution of several inflammatory signs and shorter treatment duration among patients receiving corticosteroids after an initial response to intravenous antibiotics.[8]

However, the evidence base remains limited. A Cochrane systematic review identified only one eligible randomized trial and concluded that there was insufficient evidence to establish the efficacy and safety of adjunctive corticosteroids in orbital or periorbital cellulitis.[9]

Therefore, corticosteroids should be regarded as an individualized adjunct rather than a substitute for adequate antimicrobial treatment or surgical source control.

Tuberculosis-associated disease

Two patients in this series had tuberculosis (collected pus showed caseous granuloma). One was a child who received linezolid in addition to antimicrobial therapy, while another had ethmoid sinus involvement and was treated with antitubercular therapy and corticosteroids.

Clinical outcomes

Six patients had documented recovery following treatment. One patient had residual ptosis after resolution of the acute orbital infection.

Residual ptosis, proptosis, restricted ocular motility, or other orbital sequelae may persist following severe orbital inflammation. In the present series, the patient with residual ptosis had associated ethmoid sinus disease and tuberculosis, suggesting a relatively complicated clinical presentation.

The favourable outcome in most patients highlights the importance of early diagnosis, prompt antimicrobial therapy, evaluation of the underlying

source, and surgical intervention when clinically indicated.

Clinical Implications

This case series emphasizes several practical considerations in the management of orbital cellulitis:

1. **Orbital cellulitis should be treated as an ophthalmic emergency.**
2. **The underlying source should be actively investigated**, particularly the paranasal sinuses and lacrimal drainage system.
3. **Systemic diseases such as diabetes and significant renal disease should be documented and considered when planning treatment.**
4. **Imaging is important when severe disease, abscess, sinus involvement, poor response to treatment, or intracranial extension is suspected.**
5. **Drainage should be considered when a clinically significant orbital or sinonasal collection is present or when medical treatment is inadequate.**
6. **Corticosteroids should be used selectively**, because evidence supporting routine adjunctive use remains limited.[8,9]
7. **Long-term follow-up is important** to identify residual ptosis, motility restriction, optic nerve dysfunction, or other sequelae.

Limitations

This study has several limitations. First, the sample size was small and the cases were clinically heterogeneous. Second, complete clinical information was not available for every patient. Visual acuity, pupillary findings, ocular motility measurements, laboratory parameters, imaging findings, microbiological results, duration of symptoms, and duration of follow-up were not consistently documented in the information available for this manuscript.

Third, the study was descriptive and had no comparison group. Therefore, it is not possible to determine the relative efficacy of individual antibiotic regimens, corticosteroids, or surgical interventions.

Finally, the association between tuberculosis and orbital cellulitis in the two affected patients cannot be considered causal without appropriate microbiological or histopathological confirmation.

V. Conclusion

Orbital cellulitis presents with considerable clinical heterogeneity and may occur secondary to sinonasal disease, lacrimal drainage abnormalities, trauma, diabetes mellitus, systemic disease, or other infectious conditions.

In this case series, prompt systemic antimicrobial therapy, identification of associated pathology, and surgical drainage when indicated were associated with clinical recovery in most patients. The case with intracranial abscess demonstrates the potential severity of orbital infection and the importance of early recognition of intracranial extension.

Evaluation of the underlying source of infection is essential, particularly in patients with recurrent watering, sinus disease, trauma, diabetes, or systemic illness. Adjunctive corticosteroid therapy remains a selective treatment option, but current evidence is insufficient to recommend routine use.[8,9]

Larger prospective studies with standardized clinical, radiological, microbiological, and visual outcome measures are required to better characterize risk factors and optimize management strategies for orbital cellulitis.

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