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Type of Article: Case Series

Orbital cellulitis as a Sequelae/Complication: ClinicoBacteriological& Radiological profile.

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Abstract

Background: Orbital cellulitis is a severe, potentially life-threatening condition that often arises as a complication of sinusitis, trauma, or dental infections. Prompt diagnosis and effective management are crucial to prevent serious outcomes such as vision loss and intracranial complications. This case series explores the diverse clinical presentations, radiological findings, and management strategies for orbital cellulitis, with a particular focus on cases complicated by underlying systemic conditions and coexisting orbital pathologies.

Methods: A retrospective analysis was conducted on five patients diagnosed with orbital cellulitis at a tertiary care center in India. The cases included orbital cellulitis secondary to sinusitis, trauma, dental infections, and in an immunocompromised patient with uncontrolled diabetes. Each case was evaluated based on clinical presentation, radiological imaging (CT and MRI), bacteriological findings, and treatment outcomes. The results were compared with findings from other studies to provide a comprehensive understanding of the condition.

Results: Sinusitis was the most common etiology, consistent with global data, but trauma and dental infections also played significant roles. Radiological imaging, particularly CT scans, was essential in identifying abscess formation and guiding surgical intervention. MRI was crucial in cases with suspected intracranial extension. Complications such as intracranial abscess and prolonged recovery were observed, particularly in the immunocompromised patient. Multidisciplinary management, including intravenous antibiotics and timely surgical intervention, was vital in achieving favorable outcomes.

Conclusion: This case series underscores the complexity of orbital cellulitis, particularly when complicated by systemic conditions or coexisting orbital pathologies. Accurate and

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timely diagnosis using radiological imaging, coupled with a multidisciplinary approach, is critical in managing this condition effectively. Future research should continue to explore the impact of emerging antibiotic resistance and refine treatment protocols for high-risk populations.

Keywords: Orbital cellulitis, sinusitis, trauma, dental infections, immunocompromised, radiological imaging, CT scan, MRI, intracranial complications, multidisciplinary management.

Introduction

Orbital cellulitis is a potentially life-threatening condition characterized by an infection of the soft tissues surrounding the eye, extending posteriorly beyond the orbital septum. This condition is particularly significant due to its potential for severe complications, including vision loss, intracranial spread, and even death if not promptly diagnosed and treated. In India, where access to healthcare can be variable, and conditions like sinusitis and trauma are common, orbital cellulitis represents a critical public health concern.[1,2]

The etiology of orbital cellulitis is often linked to sinusitis, especially in pediatric populations, but can also result from trauma, dental infections, or spread from adjacent facial infections. Studies from India have shown that Streptococcus species and Staphylococcus aureus are the most common causative organisms, reflecting global patterns but with local variations in antimicrobial resistance patterns.[2,3]

The clinical presentation of orbital cellulitis can range from mild periorbital swelling to severe proptosis, ophthalmoplegia, and vision loss. In the Indian context, where late presentations to healthcare facilities are not uncommon, the severity at diagnosis is often higher, necessitating a multidisciplinary approach to management.[4]

Radiological imaging plays a crucial role in diagnosing and managing orbital cellulitis, particularly in distinguishing it from preseptal cellulitis, which is more benign but can present similarly. Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are essential in assessing the extent of infection, identifying abscess formation, and planning surgical intervention if necessary.[5,6]

This case series aims to provide a comprehensive analysis of orbital cellulitis as a sequel or complication, focusing on the clinico-bacteriological and radiological profiles of patients. By presenting these cases, we hope to shed light on the complexities of managing this condition in the Indian setting, where factors such as delayed presentation, antibiotic resistance, and limited access to advanced healthcare facilities can significantly influence outcomes.

Case Descriptions

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Case 1: Orbital Cellulitis Secondary to Acute Sinusitis

Clinical Presentation:
A 5-year-old male presented with acute onset of right-sided periorbital swelling, redness, and severe pain, exacerbated by eye movements. He also reported a high-grade fever and nasal congestion for the past week. The patient had a history of recurrent sinusitis.

Radiological Findings:
CT imaging revealed extensive opacification of the right maxillary and ethmoid sinuses, with evidence of soft tissue swelling and proptosis in the right orbit. A subperiosteal abscess was noted, displacing the medial rectus muscle laterally.

Bacteriological Findings:
Blood cultures were positive for Streptococcus pneumoniae. Nasal swab cultures also showed growth of Streptococcus pneumoniae, confirming the bacterial origin of the sinusitis and subsequent orbital cellulitis.

Management and Outcome:
The patient was started on intravenous ceftriaxone and metronidazole. Due to the presence of a subperiosteal abscess, the patient underwent endoscopic sinus surgery to drain the abscess. The patient responded well to treatment, with significant improvement in orbital symptoms within 48 hours. He was discharged on oral antibiotics, and follow-up imaging showed resolution of the abscess and reduction in orbital inflammation.

Case 2: Orbital Cellulitis Following Orbital Trauma

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Clinical Presentation:
A 45-year-old male presented with left periorbital swelling, bruising, and decreased vision after sustaining blunt trauma to the eye during a fall. Over the following two days, the swelling increased, and the patient developed fever and pain on eye movement.

Radiological Findings:
CT imaging showed a blowout fracture of the left orbital floor with herniation of orbital contents into the maxillary sinus. There was significant soft tissue swelling and gas bubbles in the retro-orbital space, indicative of secondary infection.

Bacteriological Findings:
A wound swab from the site of trauma cultured Staphylococcus aureus, including a Methicillin-Resistant Staphylococcus aureus (MRSA) strain. Blood cultures were negative.

Management and Outcome:
The patient was started on intravenous vancomycin and ceftriaxone. Due to the presence of an orbital fracture, surgical repair was performed to stabilize the orbital floor and debride infected tissue. The patient showed gradual improvement, with resolution of the cellulitis and stabilization of vision over the next week.

Case 3: Orbital Cellulitis Associated with Dental Infection

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Clinical Presentation:
A 50-year-old female presented with rapidly progressing swelling of the right lower eyelid, associated with pain, fever, and difficulty opening her mouth. She had a history of a recent dental extraction, followed by a tooth abscess.

Radiological Findings:
CT scan showed soft tissue swelling extending from the right infraorbital region into the orbit, with diffuse enhancement and a localized abscess near the maxillary sinus. The maxillary sinus was opacified, suggesting a spread of infection from the dental origin.

Bacteriological Findings:
Cultures from the abscess drainage grew mixed anaerobic bacteria, predominantly Fusobacterium species, indicating a polymicrobial infection.

Management and Outcome:
The patient was treated with intravenous amoxicillin-clavulanate and metronidazole. Incision and drainage of the abscess were performed through an intraoral approach. The patient responded well, with resolution of symptoms within a week, and was discharged with oral antibiotics.

Case 4: Orbital Cellulitis in Immunocompromised Patient

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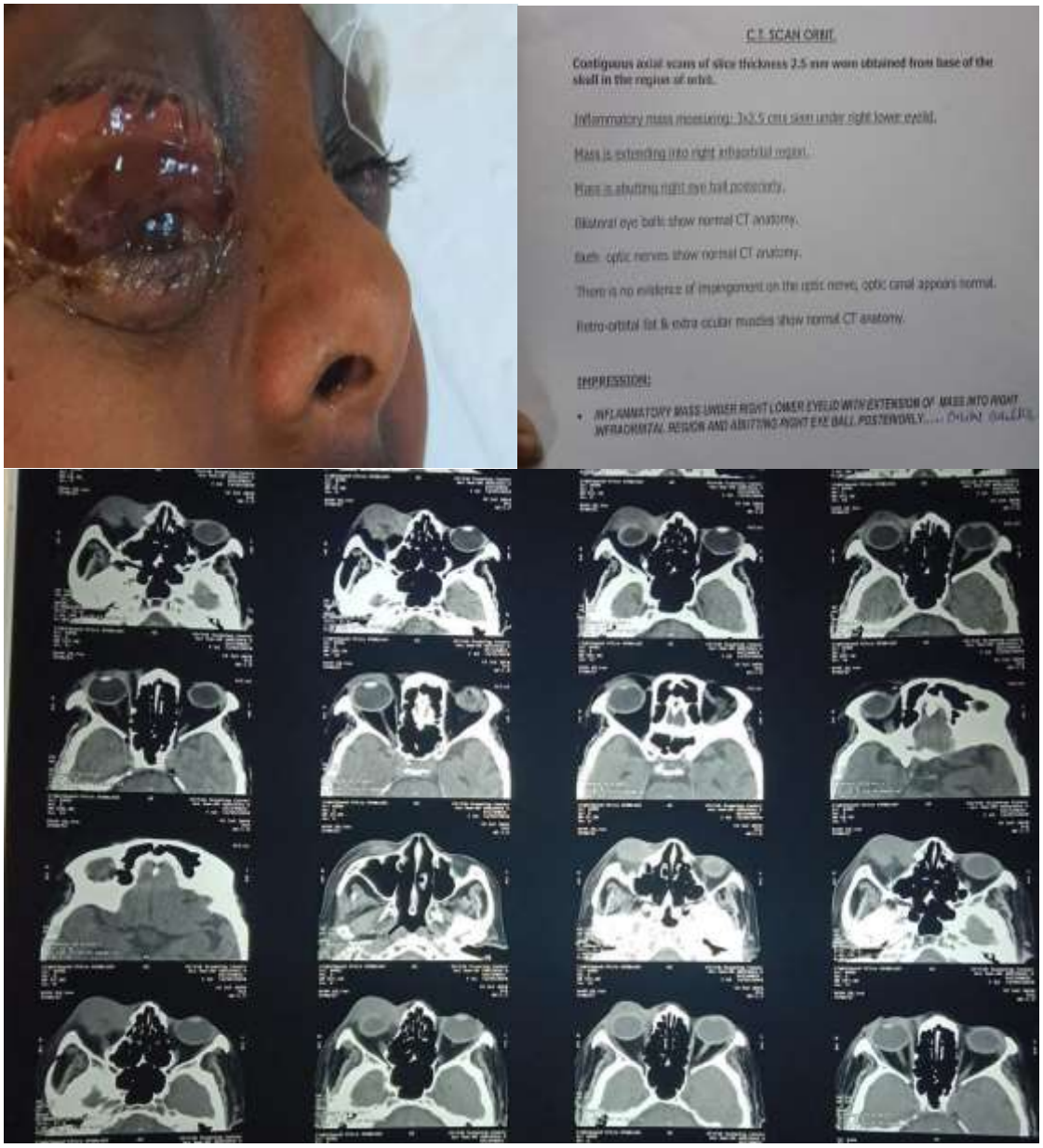

Clinical Presentation:
A 50-year-old female with poorly controlled diabetes mellitus presented with bilateral periorbital swelling, redness, and pain, with associated fever and general malaise. The patient reported a history of a recent upper respiratory tract infection.

Radiological Findings:
MRI revealed bilateral diffuse orbital cellulitis with marked inflammation of the periorbital tissues and sinuses. There was no evidence of abscess formation or intracranial extension.

Bacteriological Findings:
Blood cultures and nasal swabs grew Escherichia coli, a less common but significant pathogen in immunocompromised patients. A nasal swab showed similar findings.

Management and Outcome:
The patient was initiated on broad-spectrum intravenous antibiotics (piperacillin-tazobactam and vancomycin) and strict blood sugar control. Despite the aggressive treatment, the patient

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required prolonged hospitalization due to slow recovery and the development of diabetic ketoacidosis. After three weeks of intensive care, the patient was discharged with significant improvement but required close outpatient follow-up.

Case 5: Orbital Cellulitis with Intracranial Extension

Clinical Presentation:
A 25-year-old female presented with severe left periorbital swelling, proptosis, headache, and vomiting. The patient had a three-week history of sinusitis treated with over-the-counter medications. She reported blurred vision and photophobia in the left eye.

Radiological Findings:
CT imaging showed extensive sinusitis with erosion of the orbital walls and the presence of an intracranial abscess in the left frontal lobe. There was marked proptosis and soft tissue swelling extending into the orbit.

Bacteriological Findings:
Lumbar puncture and blood cultures revealed Streptococcus milleri, known for its association with abscess formation. Cultures from the sinus drainage confirmed the same organism.

Management and Outcome:
The patient underwent emergency craniotomy for drainage of the intracranial abscess, followed by endoscopic sinus surgery to clear the infected sinuses. She was treated with intravenous ceftriaxone and metronidazole. Postoperatively, the patient showed significant neurological improvement, and the orbital cellulitis resolved over two weeks. However, she required long-term antibiotic therapy and rehabilitation for mild residual neurological deficits.

Discussion

Orbital cellulitis is a significant medical condition that requires prompt and effective management to prevent serious complications. The cases presented in this series reflect the complex and varied nature of orbital cellulitis, emphasizing the need for a multidisciplinary approach to its diagnosis and treatment.

The most common etiologies for orbital cellulitis in this series were sinusitis, trauma, and dental infections. These findings align with those from other studies, where sinusitis, particularly of the ethmoid sinuses, is identified as the leading cause of orbital cellulitis in both children and adults. In a study by McClay et al., sinusitis was responsible for 86% of orbital cellulitis cases in children, highlighting its role as a primary risk factor.[7]

The trauma-related case in our series also mirrors findings from studies that emphasize the importance of early identification and management of orbital fractures to prevent secondary

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infections. A study by Chandler et al. reported that up to 24% of orbital cellulitis cases are associated with trauma, particularly in adults.[8] The case involving a dental infection is consistent with findings from the literature, where dental origins, although less common, are recognized as significant contributors to orbital cellulitis, particularly in adults.[9]

The clinical presentations observed in our series, characterized by periorbital swelling, pain, and fever, are typical of orbital cellulitis. These findings are consistent with other studies, such as one by Davies et al., which reported that over 90% of patients with orbital cellulitis present with these symptoms.[10] However, the bilateral involvement in the immunocompromised patient is less common, aligning with reports that suggest a higher risk of bilateral disease in patients with systemic conditions such as diabetes or immunosuppression.[11]

Radiological imaging, particularly CT and MRI, is crucial in diagnosing orbital cellulitis and guiding treatment. The findings in this series reinforce the importance of CT scans in detecting abscesses, sinusitis, and bone involvement, as supported by research from Jyani R et al., who found that CT imaging was essential in 92% of orbital cellulitis cases for surgical planning.[12]

MRI's role in detecting intracranial complications, as seen in the patient with an intracranial abscess, is well-documented in the literature. A study by Duong MT, et al. highlighted MRI's superiority in detecting soft tissue involvement and intracranial extension, particularly in cases with neurological symptoms.[13] This underscores the importance of using MRI in cases where there is a suspicion of central nervous system involvement.

Complications such as abscess formation, intracranial extension, and vision loss were observed in some cases in this series, reflecting the severe potential outcomes of untreated or poorly managed orbital cellulitis. The case with an intracranial abscess is particularly significant, as it underscores the rapid progression that can occur in orbital cellulitis. This is consistent with findings from the study by Berdouk S et al., which reported that intracranial complications occur in up to 7% of orbital cellulitis cases, with a higher incidence in patients with delayed treatment.[14]

The increased risk of complications and prolonged recovery observed in the immunocompromised patient is also supported by other studies. For example, a study by

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Anjum Khanamet al. reported that diabetic patients with orbital cellulitis had a significantly higher risk of complications and required longer treatment durations compared to non-diabetic patients.[1] This highlights the importance of aggressive management and careful monitoring in patients with underlying systemic conditions.

The management strategies employed in this series, including broad-spectrum intravenous antibiotics and surgical intervention when necessary, are in line with current best practices. A study by Vincent Wu et al. emphasized the importance of early antibiotic therapy and timely surgical drainage in cases with abscess formation, which significantly improves outcomes.[15]Our findings reinforce the need for tailored treatment approaches based on the severity of the condition and the presence of complications.

The role of multidisciplinary care, involving ophthalmologists, radiologists, ENT specialists, and infectious disease experts, was critical in managing the cases in this series. This approach is supported by findings from other studies that advocate for a team-based approach to reduce morbidity and prevent complications.

Conclusion

The cases presented in this series highlight the complexity of diagnosing and managing orbital cellulitis, particularly in the presence of complicating factors such as trauma, dental infections, and systemic diseases. Our findings are consistent with other studies, emphasizing the importance of accurate radiological assessment and prompt, multidisciplinary management.

Future research should focus on improving diagnostic protocols, particularly in the context of emerging antibiotic resistance, and on refining treatment strategies to enhance outcomes in high-risk populations, such as those with diabetes or immunosuppression. The continued integration of advanced imaging techniques will also be vital in ensuring that patients receive timely and effective care.

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