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An Eye Popping Case of Orbital Necrotizing Fasciitis Treated with Antibiotics, Surgery, and Hyperbaric Oxygen Therapy

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Conflict of interest: None declared

Patient: Female, 60
Final Diagnosis: Necrotizing fasciitis of the eye
Symptoms: Eye pain
Medication: —
Clinical Procedure: —
Specialty: Infectious Diseases

Objective: Unusual clinical course
Background: Necrotizing fasciitis (NF) of the orbit is a rare and deadly condition that requires prompt surgical and medical management to decrease morbidity and mortality.
Case Report: Here we present an interesting case of an individual who developed fulminant NF of the left orbit requiring emergent surgical intervention, antibiotics, and subsequent hyperbaric oxygen therapy in an attempt to save the eye.
Conclusions: With an early and aggressive multifaceted approach using antibiotics, surgery, and hyperbaric oxygen it may be possible to preserve eye structure and function. Without treatment NF is a rapidly progressive condition and can result in significant morbidity.

MeSH Keywords: Fasciitis, Necrotizing • Hyperbaric Oxygenation • Infectious Disease Medicine • Ophthalmology

Full-text PDF: <http://www.amjcaserep.com/abstract/index/idArt/902535>

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Background

Necrotizing fasciitis (NF) is a rapidly progressive disease of the subcutaneous tissue that carries a high mortality within hours to days without prompt medical and surgical interventions [1]. Fasciitis of the orbit is particularly concerning because of lasting morbidity of the eye even after successful treatment of the fulminant systemic toxicity. The causative organism of NF is usually polymicrobial but streptococci and enterococci are the most common isolates. It can also be caused by anaerobic organisms and occasionally *Staphylococcus aureus* or *Pseudomonas* species [2]. Predisposing factors are older age, male gender, diabetes mellitus, peripheral vascular disease, intravenous drug use, and trauma [1,3]. The major determinant of survival is the time from admission to the operating room for debridement [1].

Case Report

Our patient was a 60-year-old female nursing home aide with well controlled chronic obstructive pulmonary disease (COPD), pulmonary histoplasmosis with subsequent right upper lobe wedge resection, and well controlled hypertension who was transferred from an outside hospital (OSH) for evaluation of left eye pain and swelling that persisted for three days prior to admission. The patient denied any direct trauma to the eye but stated that she works in the laundry area of a nursing home and comes into contact with sick patients and laundry chemicals; she was not aware of any specific incident of exposure. Of note, she was not on systemic steroids for COPD management. The OSH orbital computed tomography (CT) showed possible pre-septal cellulitis. Upon arrival to our facility's emergency department, she was noted to have significant erythema, swelling, and tenderness of the left upper eyelid with edema extending down to the lateral aspect of the face and neck. The patient's near vision in the affected eye was 20/30, no relative afferent pupillary defect was present, and motility was significantly restricted in all directions of gaze. She was diagnosed with orbital cellulitis and started on intravenous vancomycin and piperacillin/tazobactam for empiric coverage. She also received timolol, dorzolamide, and brimonidine eye drops three times a day to the left eye.

After 48 hours on antibiotics, only minimal improvement in swelling was noted (Figure 1A); she continued to report a significant amount of pain. A repeat CT of the orbit with contrast (Figure 2A) showed significant worsening of the left sided orbital cellulitis with interval development of a large abscess of the left eyelid and lateral orbit that extended into the extraconal space. It also showed left-sided proptosis and straightening of the left optic nerve. On examination, the patient had progressive worsening swelling and pain. Clinical suspicion for

NF was high; therefore, she was taken to the operating room emergently for incision and drainage by the oculoplastic surgery service. Using a lid crease incision, the upper eyelid and superior orbit were extensively explored. Cheesy, white, necrotic-appearing tissue was noted (Figure 1B). A small amount of pus was drained from the upper eyelid. A Penrose drain was placed, and the incision was loosely closed (Figure 1C). Post-operatively, wound culture returned positive for methicillin-resistant *Staphylococcus aureus* (MRSA). After consultation with the infectious disease (ID) service, her antibiotic therapy was narrowed to vancomycin alone. After 36 hours of careful observation, lid and facial edema showed no improvement and continued to have significant areas of induration. She was taken back into the operating room for another debridement. The lid crease incision was reopened and a canthotomy and cantholysis were performed to gain greater exposure. The superior orbit, the upper lid, and the tissues lateral to the lateral canthus were explored. Fibrous white tissue was noted in the superior and lateral orbit, and also in the subcutaneous layers temporal to the lateral canthus. This tissue was avascular and did not bleed when incised; much of it was debrided. Surgical pathology specimens were sent from the superior orbit, the orbital septum, preaponeurotic fat, and temporalis fascia; all were found to be fibrous. The hematoxylin and eosin stain noted marked acute inflammation and focal necrosis (Figure 2B). A second Penrose drain was placed. Finally, a partial tarsorrhaphy was placed to protect the ocular surface.

Post-procedure she was transferred to another tertiary care facility for hyperbaric oxygen treatment (HBOT). The protocol used was HBOT therapy at 2.5 atmospheric absolute pressure for 90 minutes daily. She received a total of five treatments with two 5-minute air breaks after each 30 minutes of oxygen breathing. She clinically improved and was discharged with appropriate infectious diseases and oculoplastics follow-up.

Discussion

Necrotizing fasciitis (NF) is a surgical emergency that is often misdiagnosed as cellulitis or abscess. It can be triggered by a predisposing factor such as diabetes or a penetrating trauma [4–6]. Once it develops, the patient can present with rapidly progressive skin lesions fulminant septic shock [1]. Admission antibiotics sometimes mask the fulminant features of necrotizing infections. Therefore, clinicians should have a high degree of suspicion of all bacterial skin infections especially if they continue to spread while on antibiotics. On physical examination, lesions are typically warm and erythematous with tense edema [7]. However, clues such as crepitus, bullae formation, or pitting edema may help raise the index of suspicion [8]. Patients will also present with systemic signs such as fever and altered mental status [9]. Laboratory data may



Figure 1. (A) Significant edema, purulence, and erythema on presentation that did not improve with empiric antibiotics. (B) Intraoperative image shows extensive cheesy, white, necrotic tissue. (C) A Penrose drain was inserted to drain the purulence. (D) Significant improvement in edema and erythema noted after surgical debridement, hyperbaric oxygen therapy, and antibiotics. Taken at a follow-up eye clinic three days post-discharge from tertiary care facility.

support evidence of systemic infection with elevated white counts, hyponatremia, and elevated blood urea nitrogen [8]. Roentgenographic evidence of subcutaneous gas or magnetic resonance imaging that shows soft tissue edema is also valuable in differentiating necrotizing versus non-necrotizing infections [10,11]. Once a diagnosis of NF is suspected, the immediate and definite therapy should be surgical debridement [12]. Postoperative broad-spectrum antibiotics should be initiated to cover streptococci, anaerobic polymicrobials, and MRSA. The incidence of MRSA as an etiology for NF has been on the rise [13]. Hyperbaric oxygen therapy as an adjuvant to

surgery and antibiotics has shown to be beneficial in some clinical studies [14].

Hypoxia present in hypo-perfused necrotic tissue often complicates wound healing. HBOT can double or triple oxygen delivery to necrotic tissue thus increasing oxygen tension by up to 400 mm Hg resulting in improved wound healing [15]. Free radicals produced by HBOT therapy can also be bactericidal and helpful in directly fighting active bacterial infections. Although the bactericidal effects of HBOT have been extensively studied and confirmed in clostridium myonecrosis [16],

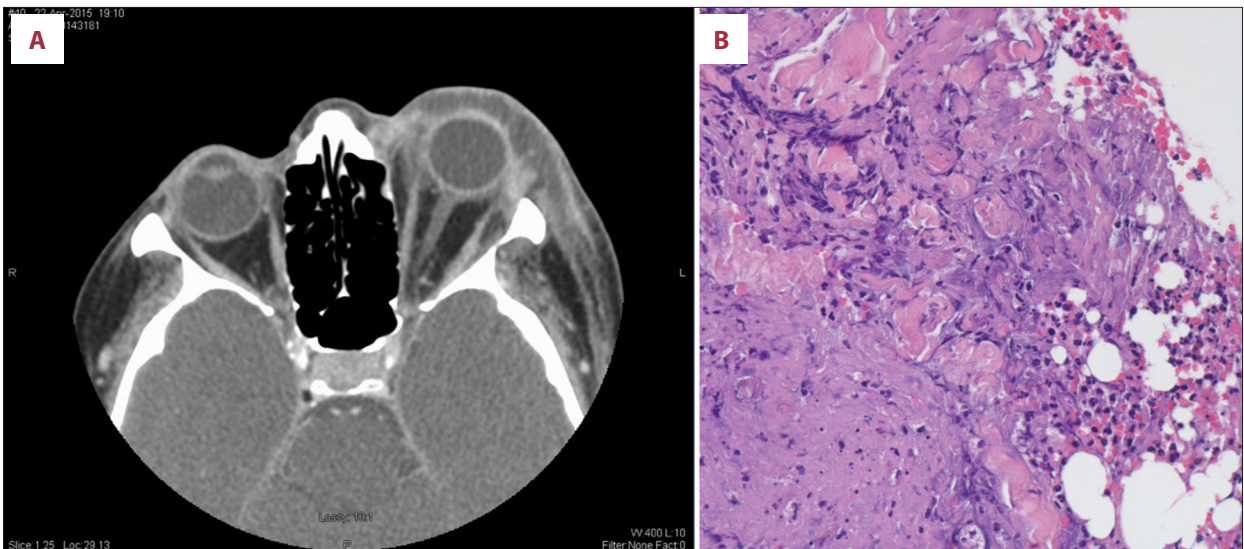


Figure 2. (A) CT orbit with contrast shows straightening of the optic nerve along with abscess formation, edema, and proptosis. (B) 40× photomicrograph of hematoxylin and eosin stain shows tissue necrosis in the lower left corner and acute inflammation in the lower right corner.

more studies are needed to confirm the effectiveness of therapy in non-clostridia infections. However, there are several case studies, and retrospective analyses of several studies showed the potential benefits in treating NF with HBOT therapy [17,18]. As in this case, utilizing the bactericidal and tissue re-perfusion techniques of HBOT may provide a distinct advantage in the treatment of this rapidly progressive and deadly disease.

Conclusions

NF of the orbit is relatively uncommon and has been only described in individual case studies. Patients usually have a predisposing factor such as diabetes or inciting traumatic event. Interestingly, our female healthcare worker did not have predisposing factors nor did she have any identifiable trauma

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around the infected site. She developed unprovoked and rapidly progressive NF that required two emergent debridement procedures. Eye cultures were positive for MRSA. After rapid and aggressive surgical and medical therapy in conjunction with HBOT, her eye was saved from permanent blindness. At her last follow-up visit, she had no afferent pupillary defect, and her distance uncorrected vision was 20/50. She had ptosis due to poor levator muscle function but this was gradually improving (Figure 1D).

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