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CASE REPORT

Bedside ultrasound in the diagnosis of orbital cellulitis and orbital abscess

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A 57-year-old female with no significant past medical history was sent to the emergency department (ED) by her primary care physician with worsening signs and symptoms of an ocular infection refractory to topical tobramycin therapy. One week prior to her ED visit, the patient had sustained a laceration to the right lower eyelid which was caused by a make-up pencil. Despite compliance with treatment, the involved eye developed worsening swelling, pain, and purulent discharge. The patient endorsed a history of subjective fevers and decreased visual acuity secondary to swelling.

The patient's relevant vital signs were as follows: blood pressure 151/101, pulse rate 109, and temperature of 98.5° F. Inspection of the right eye showed erythematous and swollen upper and lower eyelids with purulent drainage and mild proptosis. Visual acuity could not be tested in the affected eye due to eyelid swelling and blurry vision. Visual fields were intact. Extraocular movements in the affected eye were painful and restricted. Pupils were 4 mm bilaterally and reactive to light and accommodation. No corneal epithelial defect was identified with fluorescein stain. The conjunctiva and cornea were clear.

Labs drawn on the patient showed a leukocytosis of 13,000 with a left shift. In the ED, the patient underwent orbital computed tomography (CT) with contrast which showed extra-orbital inflammation and edema just medial to the right orbit suggestive of a possible phlegmon (Fig. 1). A bedside ultrasound was performed to further evaluate the region for the presence of an abscess. A well-defined anechoic fluid collection with echogenic borders was seen adjacent to and indenting the inferior most portion of the medial surface of the right orbit (Fig. 2). The diagnosis of orbital cellulitis with associated orbital abscess was made, the patient was started on IV vancomycin and ceftriaxone, and then admitted for further management and assessment by infectious disease and ophthalmology physicians. Blood cultures were drawn but failed to grow any significant organisms. Orbital cultures grew methicillin-resistant *Staphylococcus aureus*. The patient required anterior orbitotomy with incision and drainage of orbital abscess. The patient was discharged home on hospital day number 11 with a 4-week course of intravenous vancomycin and bacitracin ophthalmic ointment.

Discussion

Clinical findings suggestive of ocular infections include erythema, swelling, chemosis, displacement of the globe, and decreased visual acuity [1]. When considering the diagnosis of orbital cellulitis, initial diagnostic measures such as CT scan and ultrasound help compliment clinical judgment to identify and determine the severity of the inflammation [1–7].

Orbital cellulitis is an inflammatory process involving the soft tissue overlying the orbit and is usually separated into preseptal and postseptal causes. The infection may be caused by hematogenous seeding, direct inoculation, or more commonly through contiguous spread from a sinus infection. The most common organisms involved in the pathogenesis include *S. aureus, Streptococcus Pneumoniae,*

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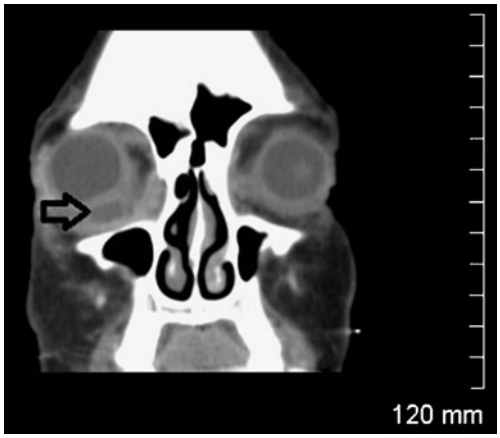

Fig. 1 Orbital CT scan in coronal imaging plane. Extra-orbital inflammation and edema is seen just medial to the right orbit suggestive of an organizing phlegmon (*arrow*)

and *Haemophilus Influenzae* [2]. Management of a patient with orbital cellulitis includes empiric intravenous antibiotics and frequent ophthalmological reevaluation in a hospital setting. Once clinical improvement is seen the patient is transitioned to 1–3 weeks of oral antibiotics [6]. If improperly treated, orbital cellulitis may progress into a subperiosteal or epidural abscess with subsequent neurologic sequela including death. As such, it should be considered a medical emergency. In cases of orbital abscess, management involves surgical incision and drainage with appropriate antimicrobial therapy based on culture sensitivities [1–4, 6, 7].

A high-frequency (>10 MHz) linear array transducer may be used to examine the orbit sonographically [3, 5, 7]. With the patient's eye, closed ample gel is applied and the orbit and soft tissues are evaluated in at least two imaging planes

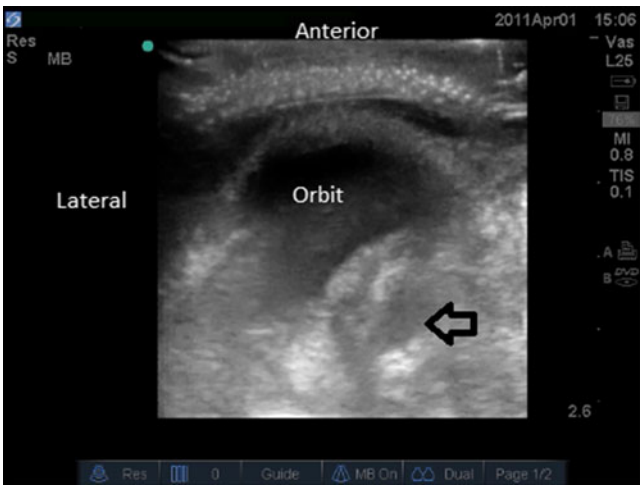

Fig. 2 Ultrasound of the right orbit in transverse imaging plane. An anechoic fluid collection (*arrow*) with echogenic borders is seen adjacent to and indenting the inferior most portion of the medial surface. Edematous swelling of the eyelid is seen anteriorly

Fig. 3 A high-frequency linear array transducer may be used to examine the orbit with the patient's eye closed. Ample gel is applied and the orbit and soft tissues are evaluated in at least two imaging planes

(Figs. 3 and 4). Pressure over the eye and soft tissues should be avoided. In cases of preseptal cellulitis, edematous swelling of the eyelids may be seen anteriorly (Fig. 2). In cases of postseptal cellulitis, a heterogenous collection of hyper- and hypoechoic material may be seen surrounding the orbit from within the orbital septum (Fig. 2) [3, 7]. In addition, extraocular muscles may become thicker and poorly defined compared to their normal counterparts suggesting inflammatory induced edema [3, 5]. In some cases, the inflammation causes a mass effect resulting in displacement of the rectus muscles. Orbital abscess appears as a hypoechoic or anechoic fluid collection and may impinge upon the orbit itself (Fig. 2) [3, 7].

Although CT is commonly used to distinguish preseptal and postseptal inflammation, it does not reliably detect orbital abscess and it is limited by availability, cost, and exposure to radiation [3, 7]. Ultrasound, on the other hand, is a cost-effective, quick, and painless alternative that can be

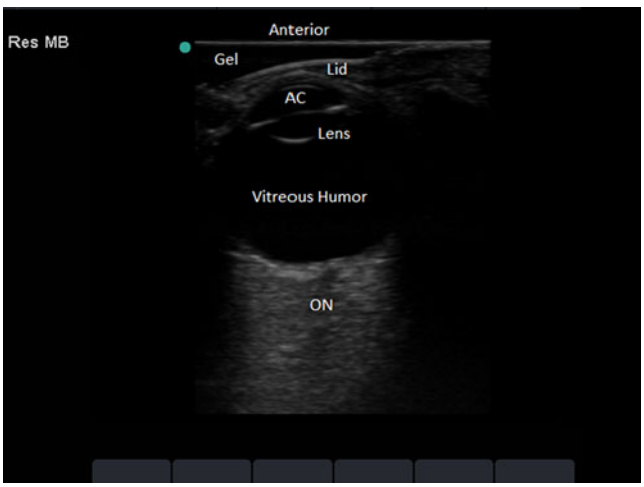

Fig. 4 Normal sonographic appearance of the orbit. *AC* anterior chamber, *ON* optic nerve

performed by the clinician at the bedside. Articles in the pediatric literature have shown that is effective in differentiating between preseptal and postseptal inflammation and that early use may avoid delays in the initiation of appropriate treatment [3, 7]. Finally, using ultrasound gives the examiner the ability to easily reassess the orbit and evaluate for response to treatment without additional exposure to radiation.

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