

## Evaluation and Management of Orbital Subperiosteal Abscess

BY SAMUEL BAHARESTANI, MD, CHRISTOPHER I. ZOUMALAN, MD, AND RICHARD D. LISMAN, MD  
EDITED BY INGRID U. SCOTT, MD, MPH, AND SHARON FEKRAT, MD

**S**ubperiosteal abscess (SPA) of the orbit is a well-described infectious process that affects the bones supporting the globe. It is capable of both rapid clinical deterioration of the bone and intracranial extension. Careful clinical monitoring, serial ophthalmologic examinations and comparative radiologic screening of persons with suspected SPA, followed by prompt and appropriate treatment, are necessary to decrease the risk of complications, such as permanent vision loss, cavernous sinus thrombosis and cerebral abscesses.

Management of this condition typically involves expectant treatment with intravenous antibiotics, with or without surgical intervention based on clinical improvement or emergent visual compromise.

The decision-making methodology presented here allows the ophthalmologist to assess whether the patient can be managed successfully without surgical drainage or whether prompt surgical intervention is necessary to prevent potentially grave complications.

### Etiology

The etiology of orbital infections includes a wide array of factors: sinusitis, skin infection, bacterial septicemia, orbital/paranasal surgery and penetrating injury.

The extension of periorbital sinusitis remains the primary mechanism for acute orbital SPA formation (see photo). Orbital involvement is thought

to be due to percolation of infection through a contiguous natural bony dehiscence; local thrombophlebitis; or distant thromboemboli along the valveless venous anatomy. SPA may affect all age groups but is most often encountered in the pediatric population.

Age, medical history and, in the case of known trauma, mechanism of injury play a predominant role in determining the microbiologic entity causing infectious orbital disease. Adults are more likely to be diagnosed with infections from *Staphylococcus* species, *Streptococcus* species and *Bacteroides* species, while unvaccinated children can present with sequelae from *Haemophilus influenzae*. In all age groups, dental abscess with mixed, aggressive aerobic and/or anaerobic infection must be considered if a suggestive history is elicited. Gram-negative rods are likely to be the causative organism recovered in abscesses secondary to trauma. Fungal infections, including mucormycosis/zygomycosis and aspergillosis, can play a role in SPA formation, especially in diabetic or immunocompromised hosts.

### History and Physical Examination

SPA should be suspected in cases of orbital cellulitis that fail to improve on broad-spectrum intravenous antibiotics. Patients often present with eyelid edema/erythema/warmth, conjunctival injection with chemosis and restricted ocular motility with or without diplopia. Careful serial clinical examinations are necessary to assess



**ABSCESS IN SIGHT.** Medial SPA of the left orbit (arrow) as an extension of adjacent ethmoid sinus disease in an 18-year-old man.

progression and the need for emergent surgical intervention. The clinician should ascertain the following history:

- Onset rapid or slow?
- Pain or tenderness to palpation?
- Recent fever, chills, rash or other systemic symptoms?
- Recent contact with other infected persons?
- Recent surgery, hospitalization or trauma?
- Stiff neck or change in mental status?
- History of cancer, diabetes, HIV, organ transplantation, pulmonary or renal disease?

A thorough ophthalmologic examination must be performed, serially, including evaluation for a relative afferent pupillary defect, proptosis, limitation of, or pain with, eye movements, increased resistance to retro-pulsion,

elevated IOP, decreased color vision, decreased skin sensation or an optic nerve or fundus abnormality. Non-axial displacement of the globe (as in hyper- or hypoglobus) and/or the presence of a palpable mass along the orbital rim should also be evaluated on external examination. Moreover, it is important to check vital signs, gross neurologic function and neck flexibility when performing serial examinations.

Proptosis can be evaluated with a Hertel exophthalmometer. Comparative serial measurements can help the clinician judge progression. Upper limits of normal are approximately 22 mm in Caucasians and 24 mm in African-Americans, with a difference between the two eyes of more than 2 mm being abnormal. When a Hertel instrument is not available, evaluate for proptosis by tilting the patient's head back and observing from below. Although not an exact science, this approach allows the examiner to assess for gross differences in proptosis.

Laboratory and radiographic studies should also be included in the workup. A complete blood count with differential and cultures is helpful for identifying the infectious nature of the condition. CT scan of the orbits and sinuses with intravenous contrast allows for the identification and measurement of an abscess and can be used serially to show clinical response to management.

**Management**

After SPA is suspected on clinical examination and confirmed on imaging, a systematic approach can help prevent catastrophic consequences, such as permanent loss of vision. Garcia and Harris have published much of the seminal work on the treatment of SPA in children.<sup>1</sup> Their recommendations provide the current guidelines for the management of pediatric patients with SPA, based on age at presentation and the likely bacteriologic etiology of the disease (see "Deciding on Surgery").

**Younger than 9.** According to cultures taken from surgical specimens, children younger than 9 are likely

**Deciding on Surgery**

AGE (YEARS)	LIKELY BACTERIOLOGIC CAUSE	NEED FOR SURGICAL DRAIN?
< 9	Sterile or single aerobic organism	No
9 to 14	Mixed aerobic and anaerobic organisms	+ / -
> 14	Mixed or only anaerobic organisms	Yes

either to be culture negative or to produce no more than one aerobic bacterial species. Garcia and Harris report that 93 percent of children in this age group did not require surgical drainage and were treated successfully with intravenous antibiotics.<sup>1</sup> Nonetheless, any patient with clinical evidence of an optic neuropathy should be surgically evacuated urgently, regardless of age.

**Older than 14.** For children over the age of 14, cultures are more likely to produce mixed flora, with anaerobic organisms being present nearly universally. As a result, current guidelines recommend surgical drainage in conjunction with intravenous antibiotics to achieve complete resolution of the infection.

**Ages 9 to 14.** Clinical experience and the art of medicine become more important in determining the need for surgical intervention in children between the ages of 9 and 14. Mixed aerobic and anaerobic cultures predominate in this age group, and the current recommendation is to consider surgical intervention according to clinical presentation and/or progression.

If any of the following criteria<sup>1</sup> are present, then surgical intervention is warranted:

- Presence of frontal sinusitis
- Large, nonmedial SPA
- Suspicion of anaerobic infection (presence of gas in abscess on CT)
- Re-accumulation of SPA after previous drainage
- Evidence of chronic sinusitis (e.g., nasal polyps)
- Acute optic neuropathy
- Infection of dental origin where anaerobic etiology is more likely

If none of those criteria is present, conservative management with medical therapy can be offered.

**Surgery.** Often a combined pro-

cedure with an orbital surgeon, an otolaryngologist and/or a neurosurgeon is necessary for optimal surgical management, as drainage may require an external incision as opposed to an endoscopic approach; the latter is reserved for small medial abscesses. After the patient returns from the operating room, the drain is typically left in for 24 to 48 hours to ensure complete evacuation of abscess contents, with rapid improvement to be expected during the early postoperative period. If improvement does not occur early on, additional exploration and drainage may be indicated based on repeat imaging and clinical deterioration.<sup>2</sup> However, it must be noted that improvement on imaging usually lags behind the patient's clinical response by 48 to 72 hours. This fact reinforces the importance of performing comparative serial clinical examinations for confirmation.

**Conclusion**

A systematic approach to SPA based on serial clinical examinations and imaging as well as familiarity with age-characteristic anatomic and microbiologic causes is paramount to achieving optimal clinical outcomes.

1 *Ophthalmology* 2000;107:1454-1458.

2 Souliere, C. R. Jr. et al. *Int J Pediatr Otorhinolaryngol* 1990;19:109-119.

*Dr. Baharestani is an ophthalmology resident at New York University Langone Medical Center and the Manhattan Eye, Ear, & Throat Hospital. Dr. Zoumalan is a clinical fellow in ophthalmic plastic and reconstructive surgery at NYU Langone Medical Center. Dr. Lisman is director of ophthalmic plastic surgery services at NYU Langone Medical Center and the Institute for Reconstructive Plastic Surgery at NYU.*