Management of Superiorly Based Subperiosteal Orbital Abscess

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Abstract

Subperiosteal orbital abscess (SPOA) is an uncommon but serious consequence of sinusitis, especially in the pediatric population. Historically, medical and surgical arms have been utilized in the treatment of SPOA. Below is a case report of a 14 year-old-boy with recalcitrant, superiorly based SPOA followed by a literature search and discussion.

Introduction

Subperiosteal orbital abscess is defined as a purulent fluid collection between the periorbita and adjacent bony orbital wall. The etiology of a SPOA is normally via direct extension through bony dehiscences of the lamina papyracea or along ethmoidal artery foramina secondary to an ethmoiditis. Other possible sources include extension from acute or chronic frontal sinusitis or retrograde hematogenous spread via the ophthalmic venous plexus. SPOAs are included along a spectrum of orbital complications secondary to rhinosinusitis. Chandler’s classification system grades orbital complications in increasing severity as preseptal cellulitis, orbital cellulitis, subperiosteal abscess, orbital abscess, and cavernous sinus thrombosis. Treatment consists of medical, surgical, and combined regimens.

Case History

An outside facility referred a 14-year-old boy for worsening right periorbital swelling, erythema, chemosis, decreased visual acuity, and proptosis. The patient failed outpatient antibiotics (oral amoxicillin, 875 mg, twice a day) for 48 hours prior to hospital admission. The family denied recent sick contacts as well as complaints of headaches, nasal congestion, rhinorrhea, and cough preceding the orbital symptoms. On arrival, the patient had low-grade fever with a white blood cell (WBC) count of 18. Otherwise, all vital signs and laboratory studies were within normal limits. Ophthalmologic examination revealed elevated intracocular pressure of 37 mmHg, decreased visual acuity (20/600), and normal fundoscopy examination in the affected eye. Extraocular muscle function was difficult to assess secondary to extreme periorbital swelling. Computed tomography (CT) scan from the outside facility revealed right-sided maxillary and ethmoid sinusitis, proptosis, and intraorbital air without evidence of discrete abscess.

At this point, it was determined that surgical intervention in the form of endoscopic sinus surgery with medial wall decompression was indicated. Upon entry into both the maxillary and ethmoid sinuses, purulent drainage was noted and cultured. Following evacuation of the maxillary sinus contents and total ethmoidectomy, we decompressed the medial orbital wall. A caudal elevator was used to sharply dissect through the lamina papyracea, and a strip of bony orbit was removed with resultant hemiation of orbital fat into the field. No purulent drainage was noted. We ended our procedure, and the patient was transferred to the pediatric floor where he received intravenous vancomycin and zosyn as well as ophthalmic antibiotic ointment and drops.

Over the next 48 hours, the patient improved clinically with better extraocular movement and decreased swelling, proptosis, and chemosis. Repeat ophthalmologic examination revealed intracocular pressure of 20 mmHg and visual acuity of 20/50.

Physical examination on the morning of postoperative day 3 revealed a sudden increase in swelling, induration, chemosis, and proptosis of the right eye. CT scan revealed significant proptosis and a hypodense collection of fluid and gas for a superiorly based subperiosteal abscess with partial opacification of the lateral frontal sinuses. We noted no evidence of abscess connection to the medial orbital wall. At this point, the patient returned to surgery for external drainage of orbital abscess via a modified Lynch incision. After incision down to the peristeum of the superior orbital wall, the peristeum was elevated with penetration into the abscess cavity. Approximately 5-6 cc of purulent material were cultured and drained followed by copious irrigation. A Penrose drain was sutured in place, and the incision was closed. Functional endoscopic sinus surgery followed with revision maxillary antrostomy and ethmoidectomy.

The patient immediately began to improve clinically, the Penrose drain was removed 3 days later, and the patient was discharged home on oral antibiotics shortly thereafter.

Discussion

A serious complication of rhinosinusitis, SPOA in the pediatric population requires a team-based treatment approach. Ophthalmology, infectious disease, and otolaryngology are among the groups essential to caring for this patient population.

An exceedingly important, initial decision must be made between medical treatment with observation or immediate surgical intervention. Coenraad and Buwalda performed a structured literature search in 2009 with the goal of determining which SPOAs can be cured with antibiotics alone as well as the absolute criteria for surgical treatment. Compiling data from five studies (4 retrospective, 1 prospective), they showed commonalities across all studies. First, medially based SPOAs were associated with ethmoid sinusitis. Furthermore, patients were younger, all under 11 years old. They also determined absolute criteria for surgical intervention: decreased visual acuity, signs of systemic involvement, and non-medially based abscess were all considered indicators of the need for first-line surgical intervention, with surgery also reserved for patients who did not clinically improve after 48-72 hours of intravenous antibiotic therapy. In the event of a medially based abscess without vision loss or systemic involvement, intravenous antibiotic therapy can be instituted primarily, with surgical intervention reserved for medical failure.

If surgical intervention is indicated, the surgeon must determine what approach to use. The common goals of surgical intervention are drainage of the abscess, decreasing intraocular pressure, and obtaining microbiologic data for culture-driven antibiotic therapy. Surgical drainage can be achieved through an external approach via a Lynch or transcranular incision or via transnasal endoscopic (TNE) drainage.

Traditionally, TNE drainage is reserved for medially based abscesses. In 2008, Tanna performed a retrospective chart review to determine clinical and radiographic factors predicting successful treatment with TNE drainage alone. No statistically significant difference was noted between the endoscopic and external groups with regards to age, temperature, WBC count, or duration of periorbital edema at initial evaluation, but there was a statistically significant difference between the groups when comparing superolateral extension and the number of extraocular muscles involved. That is, the group successfully treated with TNE alone lacked superolateral extension and demonstrated fewer extracocular muscles involved in the disease process. This supports the traditional theory of reserving endoscopic drainage for medially based abscesses with minimal extraocular involvement.

With recent advances in nasal endoscopy, endoscopic drainage of superiorly based abscesses has been reported. In 2008, Rothmann and Wormald described a technically challenging procedure requiring specialized equipment. They cited advantages that include faster orbital recovery with less postoperative edema secondary to less anterior soft tissue dissection necessitated by an external approach. Furthermore, diseased sinuses can easily be cleared before draining the abscess. Finally, endoscopic drainage avoids a facial scar.

Conclusion

SPOA is an uncommon but serious complication of sinusitis for which medical, surgical, or combined treatments are utilized. Currently, medical therapy is initiated in patients with normal intraocular pressure and medially based SPOA without vision loss or systemic symptoms. Surgical therapy is reserved for medical failures, superiorly based abscesses, and acute visual changes. Traditionally, external approaches facilitated drainage, but the advent of TNE may shift the paradigm to a less invasive methodology.

References