

# Intra-Optic Nerve Abscess: A Rare Complication of Acute Sinusitis

Akshay Sanan MD<sup>1</sup>, Gurston Nyquist MD<sup>1</sup>, Christopher Farrell MD<sup>2</sup>, Marc Rosen MD<sup>1</sup>

<sup>1</sup>Department of Otolaryngology-Head and Neck Surgery, Thomas Jefferson University Hospital, Philadelphia, PA;

<sup>2</sup>Department of Neurosurgery, Thomas Jefferson University, Philadelphia, PA

## ABSTRACT

**Introduction:** Intracranial complications from acute sinusitis are rare. In particular, intra-optic nerve abscess has not been described. A case report and review of orbital complications from sinusitis is presented here to emphasize the extreme rarity of this clinical entity.

**Methods:** Case report and literature review. The patient's pertinent history, clinical findings and radiologic studies are examined.

**Results:** The case of a 33 year old male who was transferred to a tertiary care academic medical center with acute vision loss after developing signs and symptoms consistent with acute sinusitis is presented and reviewed. A computed tomography scan demonstrated pansinusitis with worse severity on the left side. Magnetic resonance imaging revealed a right-sided abscess along the roof of the right sphenoid sinus and the right optic nerve towards the optic chiasm. The patient's clinical exam was consistent with right-sided optic neuropathy. He underwent an emergent functional endoscopic sinus surgery and subsequent right-sided craniotomy for drainage of an epidural and intracranial abscess involving the right optic nerve, chiasm, and optic tract. The sinusitis was odontogenic in origin. The patient was treated for six weeks with IV ceftriaxone, penicillin and metronidazole and transitioned to five months of PO amoxicillin. At 3-month follow-up, the patient had no evidence of sinusitis and stable ophthalmologic findings.

**Conclusions:** The occurrence of an intra-optic nerve abscess is a rare but possible sequela of acute sinusitis. A multidisciplinary approach involving otolaryngology, neurosurgery, ophthalmology, neuroradiology and infectious diseases is paramount. Surgery and antibiotic therapy is the standard of care.

## CASE REPORT

A 33 year-old African American male with no past medical history was evaluated at an outside urgent care center for fever, nasal obstruction, congestion and purulent rhinorrhea and diagnosed with acute sinusitis. He was given a prescription for amoxicillin-clavulanic acid, but over the subsequent 24 hours his symptoms worsened and he developed orbital pain. He was evaluated at a local emergency room where he was reassured and told to continue oral antibiotics. Overnight, he developed right-sided vision loss and ophthalmoplegia and was transferred to a tertiary care medical center.

On initial evaluation, he was noted to be afebrile. There was right-sided periorbital swelling. There was no eye discharge. The patient was noted to have multiple caries and poor oral hygiene but no pus noted. Cranial nerve examination revealed a right II, III, IV and VI palsy. The right eye demonstrated no light perception. Sensation was intact bilaterally and cranial nerve exam was normal on the left. Nasal endoscopy revealed edematous nasal mucosa and mucopus from the right and left maxillary ostia and bilateral sphenoid-ethmoidal recesses.

Computed tomography (CT) of the orbit and paranasal sinuses revealed acute sinusitis involving left greater than right paranasal sinuses and multiple carious and periapical lucencies (Figure 1). The diagnosis of odontogenic sinusitis complicated by orbital apex syndrome was made.

## CASE REPORT, CONTINUED

He was started on intravenous Vancomycin and Piperacillin/Tazobactam and taken to the operating room for urgent functional endoscopic sinus surgery. Intra-operatively he was noted to have pus in his left maxillary sinus and bilateral ethmoid sinuses. Cultures and sensitivities were taken. Post-operatively he had no interval improvement of his ophthalmologic exam. A magnetic resonance imaging (MRI) scan was performed and revealed an epidural empyema along the right frontal floor with extension along the right optic nerve, optic chiasm and optic tract (Figure 2). The neurosurgical team elected to proceed to the operating room for a craniotomy given these findings. Intra-operatively the epidural abscess was drained and the optic nerve sheath was decompressed extending from the right optic nerve to the chiasm. Pus was drained and cultures sent. Post-operatively the patient's vision exam remained unchanged.

Postoperatively, the orbital infection improved. The oral surgery team removed all carious teeth. However, the afferent pupillary defect on the right persisted and the patient's vision could not be saved. Cultures revealed mixed organisms including *Actinomyces*, *Staphylococcus lentus*, and *Prevotella*. He was observed for a week because of close perioperative monitoring and social reasons. He was discharged home on IV ceftriaxone, penicillin and metronidazole. The patient subsequently completed a total of six months oral amoxicillin 875 mg bid.

At the most recent clinic evaluation, the patient had no evidence of sinus disease, resolution of right-sided orbital proptosis and ophthalmoplegia but persistent blindness. His most recent MRI (Figure 3) demonstrated postoperative changes after drainage of abscess along the right optic nerve, chiasm and right optic tract with significant decrease in the peripheral enhancement along the right optic tract.

## RESULTS

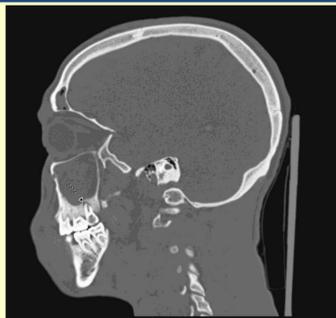


Figure 1 (Left): Sagittal CT demonstrating opacification of left maxillary sinus with dehiscence of maxillary sinus floor

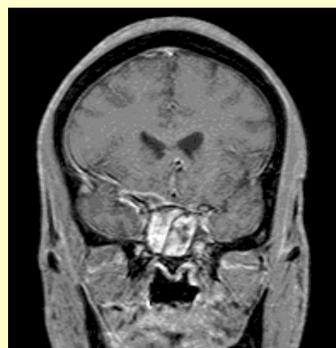


Figure 2 (Right): Coronal T1 MRI demonstrating epidural enhancement on the right.

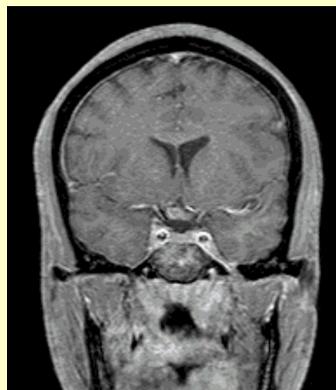


Figure 3: Coronal T1 MRI demonstrating optic chiasm abscess

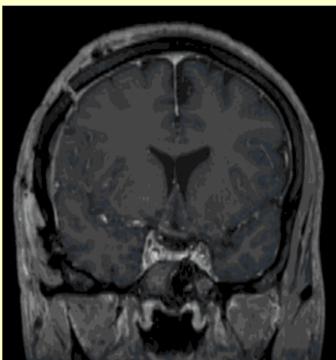


Figure 4: Coronal MRI 3 months post op showing resolution of epidural and optic nerve enhancement

## DISCUSSION

Orbital cellulitis or orbital abscess is almost always secondary to acute sinusitis. Other possible etiologies include spreading of infection from the eyelids, tonsils, and middle ear.<sup>3,6</sup> Infection spreading from odontogenic origin is very rare.<sup>1,7,8</sup> Odontogenic infection can spread to the orbit through several routes. First, infection from the maxillary premolar or molar teeth may perforate the maxillary buccal plate and spread posteriorly into the pterygopalatine and infratemporal fossae, both finding their way into the orbit via the inferior orbital fissure. Second, infection of the maxillary or ethmoid sinuses may continue directly to the orbit via bone erosion, pre-formed dehiscence in the orbital floor, the infraorbital neurovascular canal or via the lamina papyracea. Third, spread of the infection can also be accomplished through the valveless anterior facial, angular and ophthalmic veins. The valveless nature of these veins allows the rapid and uninterrupted spread of infection. Finally, the infection can enter through the septal space via infection of the eyelid.

The most common cause of odontogenic sinusitis includes an abscess and periodontal disease. Causes of this perforation include maxillary trauma, dental extraction, maxillary osteotomies or placement of a dental implant.<sup>6</sup> In this case, the poor dentition likely served as the bacterial source which then penetrated the maxillary sinus and spread retrograde causing the intra-optic nerve abscess. This is the first reported case of intra-optic nerve abscess from sinusitis.

Odontogenic sinusitis is believed to be a mixed aerobic and anaerobic infection with the number of anaerobes outnumbering the number of aerobes. The common organisms for odontogenic sinusitis are *Peptostreptococcus spp*, *Fusobacterium spp*, and pigmented *Prevotella spp* and *Porphyromonas spp*. In our case, the culture of the pus from the maxillary sinus revealed mixed growth. When an orbital infection is suspected, early aggressive broad-spectrum antibiotic therapy should be initiated, including the use of anaerobic coverage.

Surgical intervention is paramount when there is an orbital abscess in order to obtain adequate drainage of pus, release pressure on the orbit and obtain a culture sample. In this case, surgical intervention was accomplished both endoscopically and via a craniotomy approach in order to gain exposure and decompression of the optic nerve, optic chiasm, and optic tract. The goal of treatment is to restore visual acuity and to prevent further intracranial complications.

## CONCLUSIONS

We present the first case of an intra-optic nerve abscess secondary to odontogenic sinusitis. The occurrence of an intra-optic nerve abscess is a rare but possible sequela of acute sinusitis. A multidisciplinary approach involving otolaryngology, neurosurgery, ophthalmology, oral surgery, neuroradiology and infectious diseases is paramount. Surgery and antibiotic therapy are the standard of care.

## REFERENCES

- 1) Rosen D, Ardekian L, Abu el-Naaj I, Fischer D, Peled M, Laufer D. Orbital infection arising from a primary tooth: a case report. *Int J Paediatr Dent* 2000;10:237-9.
- 2) Bullock JD, Fleishman JA. The spread of odontogenic infections to the orbit: diagnosis and management. *J Oral Maxillofac Surg* 1985;43:749-55.
- 3) Tovilla-Canales J, Nava A, Pomar JLT. Orbital and periorbital infections. *Curr Opin Ophthalmol* 2001;12:335-41.
- 4) Chandler JR, Langenbrunner DJ, Stevens ER. The pathogenesis of orbital complications in acute sinusitis. *Laryngoscope* 1970;80:1414-28.
- 5) Zachariades N, Vairaktaris E, Mezitis M, Rallis G, Kokkinis C, Moschos M. Orbital abscess: visual loss following extraction of a tooth. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2005;100:E70-3.
- 6) Schramm VL, Curtin HD, Kenerdell JS. Evaluation of orbital cellulitis and results of treatment. *Laryngoscope* 1982;92:732-8.
- 7) Towbin R, Han B, Kaufmann R, Burke M. Postseptal cellulitis: CT in diagnosis and management. *Radiology* 1986;158:735-7.
- 8) Bizakis JG, Papadakis CE, Prassopoulos P, Kyrmizakis DE, Prokopakis EM, Helidonis ES. Transcranial evacuation of an orbital abscess following a molar tooth extraction. *Am J Otolaryngol* 1997;18:277-9.