

CLINICAL VIGNETTE

Brain Abscess as a Complication of Acute Bacterial Rhinosinusitis

Alina Katsman, M.D.

Case

A 19-year-old male presents to his primary care doctor's office with a one-week history of fever, increased sinus pressure, and purulent nasal discharge. He has been taking acetaminophen for the fever and using over-the-counter cough and cold medication for symptomatic relief. He has no significant past medical or surgical history. He takes no chronic medications or supplements and has no known drug allergies. His family history is remarkable for his mother dying from a cerebral aneurysm with subarachnoid hemorrhage. Social history is negative for any tobacco or alcohol but positive for cannabis. On physical exam, his blood pressure is 120/80, heart rate 90, temperature 100.8 F (38.2 C), and respiratory rate 12. HEENT exam reveals tenderness to palpation over the maxillary sinuses and yellow nasal discharge. The rest of his cardiovascular, respiratory, gastrointestinal, skin, and neurological exam is normal. He is diagnosed with acute bacterial rhinosinusitis and prescribed a 10-day course of amoxicillin-clavulanate.

Two days after starting antibiotics, the patient presents to the local Emergency Department with ongoing fever, severe headaches, nausea, and vomiting. On physical exam, his blood pressure is 116/67, heart rate 96, temperature 99.4 F (37.4 C), respiratory rate 18, and oxygen saturation 98% on room air. On physical exam, he appears to be in mild distress with diaphoresis. His HEENT exam is unremarkable. Neck exam shows mild meningismus but with full range of motion. Cardiac exam reveals regular rate and rhythm with no murmurs. Lung exam is normal. The rest of his physical exam is normal. Laboratory tests reveal an elevated white cell count of 15.4 with 77.9% neutrophils and 13.5% lymphocytes. Comprehensive metabolic panel is notable for sodium 132, potassium 3.0, chloride 94, CO₂ 26, BUN 9, creatinine 0.74, glucose 100, alkaline phosphatase 150, AST 89, and ALT 126. Electrocardiogram is normal. Given concern for acute meningitis, a lumbar puncture is performed and reveals CSF white cell count of 28 (lymphocytes 66%), <2 total protein, glucose 53, and negative gram stain. CSF culture is sent for HSV (human simplex virus), varicella, fungal stain, and bacteria. Blood cultures are sent as well. The patient is given Ceftriaxone 1 gm IV in the Emergency Department.

The patient is admitted to the hospital for further monitoring. The patient's antibiotic regimen is broadened to ampicillin/sulbactam. Shortly after admission to the hospital, the patient has two grand mal seizures. Urgent MRI of the brain raises concern for an epidural intracranial abscess (Figure 1 and Figure 2, axial and coronal views).

Neurosurgery and ENT are consulted for emergency craniotomy and evacuation of the infection. The patient undergoes a successful craniotomy over the frontal sinus; three separate pockets of pus are identified. Multiple cultures are taken, and irrigation and drainage are performed. Antimicrobial coverage is increased to ampicillin/sulbactam, Vancomycin, and metronidazole. Levetiracetam is also started for seizure prophylaxis. He then undergoes endoscopic sinusotomy with septal repair. Intraoperative cultures grew *Streptococcus anginosus* susceptible to cephalosporins. His brain abscesses are believed to be a direct extension from acute pansinusitis. Five days after admission, the patient is discharged on Ceftriaxone for a total of four weeks of antibiotic therapy.

The patient follows-up two weeks after discharge. He is still on IV Ceftriaxone, his incisions are healing well, and he has no neurological sequelae.

Discussion

Acute bacterial rhinosinusitis is a common diagnosis seen in the ambulatory care setting. It is one of the 10 most common conditions treated in ambulatory practice in the United States, accounting for an estimated 25 million office visits per year. Acute bacterial rhinosinusitis is suspected when patients present with 10 or more days of symptoms (purulent rhinorrhea, nasal congestion, and facial pressure). Complications from acute bacterial rhinosinusitis are rare and include orbital abscess, epidural abscess, meningitis, and brain abscess.

Extensions of infection into the orbital area generally occur in pediatric patients who present with proptosis, periorbital swelling, and erythema. In immunocompromised hosts, intracranial infections are more likely secondary to acute invasive fungal sinusitis. Orbital and/or intracranial complications may also occur in immunocompetent children, teenagers, and adults who are untreated or incompletely treated for bacterial rhinosinusitis. Contrast-enhanced CT scan is best imaging to diagnose orbital and/or intracranial complications.¹ Surgical intervention is generally required for these complications.

In one 20-year cohort study of 50 patients with intracranial complications from rhinosinusitis, *Streptococcus anginosus* was the most common bacterial pathogen in 14 of the cases (28%).² Another retrospective study from the UK found *Streptococcus anginosus* group bacteria in 61.3% of paranasal

sinus pus samples, 83.3% of orbital infections and 77.8% of intracranial infections. All *Streptococcus anginosus* isolates were sensitive to penicillin; no penicillin-resistant organisms were isolated.³ Rhinosinusitis associated with the *Streptococcus anginosus* group are considered more serious relative to those caused by other pathogens. *Streptococcus anginosus* group bacteria are significantly more likely to cause more severe intracranial complications and neurologic deficits and to require neurosurgical intervention.

One may question whether treatment of acute bacterial rhinosinusitis in the outpatient setting prevents such orbital and intracranial complications. One retrospective cohort study from the Netherlands found severe acute rhinosinusitis complications in an otherwise healthy population estimated at 1:12,000 pediatric and 1:32,000 adult cases. The study suggested that antibiotic treatment of acute rhinosinusitis in general practice does not play a role in preventing complications.⁴

In the primary care setting, acute bacterial rhinosinusitis is a very common presenting complaint. Complications from bacterial rhinosinusitis are very rare, but should be suspected in patients who are not improving on antibiotics, have new symptoms like proptosis, or new onset seizures. Such complications are serious and require prompt diagnosis with appropriate imaging and urgent surgical intervention.

Figures

Figure 1. Axial view.

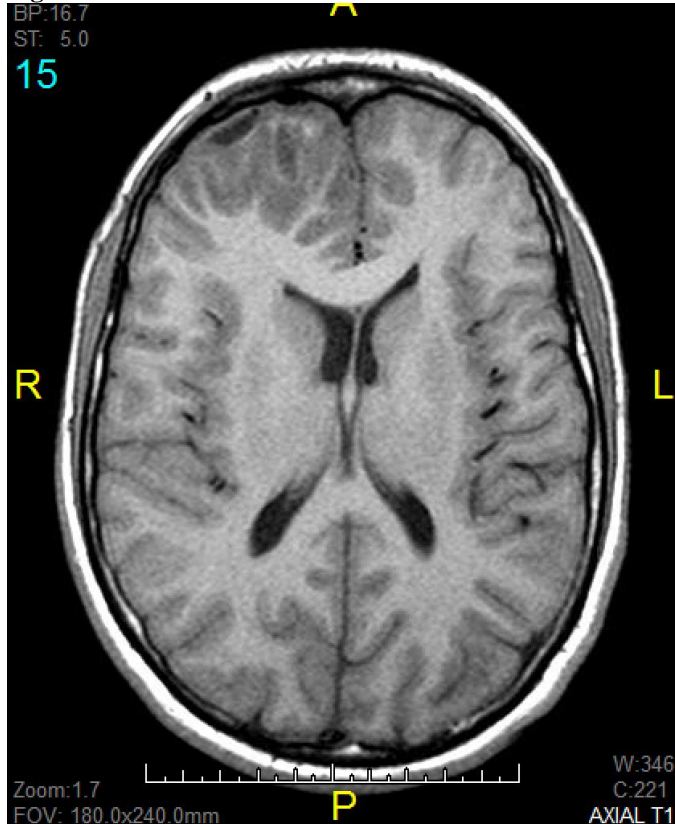
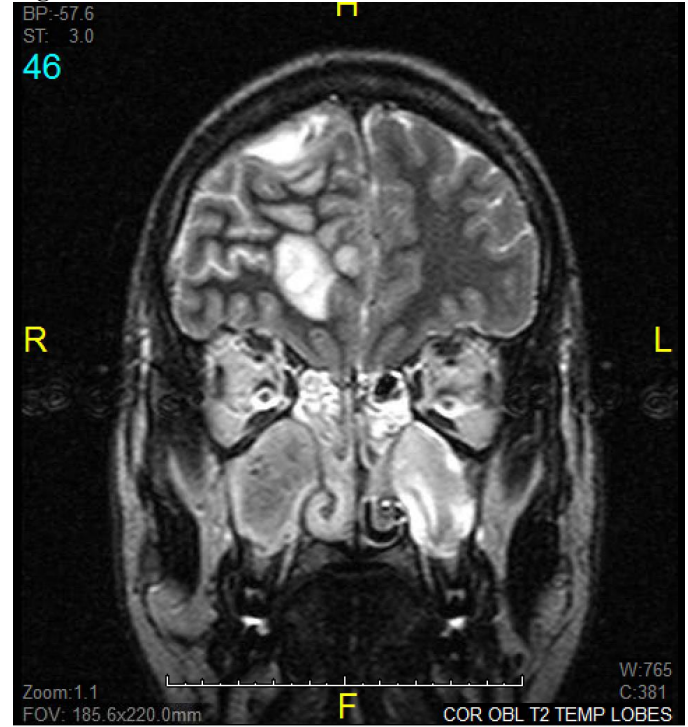


Figure 2. Coronal view.



REFERENCES

1. **Hoxworth JM, Glastonbury CM.** Orbital and intracranial complications of acute sinusitis. *Neuroimaging Clin N Am.* 2010 Nov;20(4):511-26. doi:10.1016/j.nic.2010.07.004. Review. PubMed PMID: 20974374.
2. **Deutschmann MW, Livingstone D, Cho JJ, Vanderkooi OG, Brookes JT.** The significance of *Streptococcus anginosus* group in intracranial complications of pediatric rhinosinusitis. *JAMA Otolaryngol Head Neck Surg.* 2013 Feb;139(2):157-60. doi: 10.1001/jamaoto.2013.1369. PubMed PMID: 23429946.
3. **Miah MS, Nix P, Koukkoullis A, Sandoe J.** Microbial causes of complicated acute bacterial rhinosinusitis and implications for empirical antimicrobial therapy. *J Laryngol Otol.* 2016 Feb;130(2):169-75. doi: 10.1017/S0022215115003369. Epub 2015 Dec 18. PubMed PMID: 26678822.
4. **Hansen FS, Hoffmans R, Georgalas C, Fokkens WJ.** Complications of acute rhinosinusitis in The Netherlands. *Fam Pract.* 2012 Apr;29(2):147-53. doi:10.1093/fampra/cm062. Epub 2011 Sep 5. PubMed PMID: 21896505.

Submitted January 10, 2016