

A 14-year-old female with nasal congestion, frontal headache and subjective fever

By James H. Brien, DO



A 14-year-old female began having nasal congestion, frontal headache and subjective fever, and her parent thought she had an upper respiratory tract infection and treated her symptomatically. She was given ibuprofen for the headache, without much relief, and 2 days later, as the symptoms worsened, she went to her local emergency room.

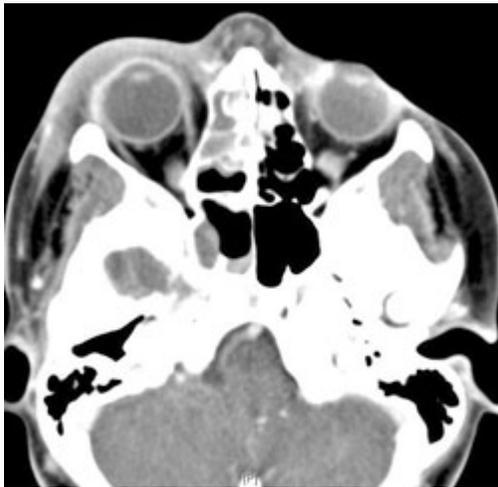
There, she was diagnosed with a sinus infection and treated with amoxicillin plus clavulanate (Augmentin, Glaxo-SmithKline). However, after 2 more days, her symptoms continued to worsen with the inclusion of some painful periorbital swelling with erythema of the right eye, and she went to her primary provider who admitted her for the treatment of preseptal cellulitis with IV ceftriaxone plus clindamycin. Her clinical condition continued to worsen during the next 24 hours, and an admitting blood culture was reported positive for gram-positive cocci in chains; therefore, she was transferred to the regional medical center pediatric ICU for further management.

Examination on arrival revealed normal vital signs and a generally alert and normal adolescent female with painful swelling and erythema of the area around her right eye and marked swelling with severe pain over the forehead (Figures 1 and 2). She also had a slightly blood-tinged nasal discharge from her right nostril. Her eye and the rest of her otolaryngologic and neurologic exam were normal. There were no other pertinent findings on the rest of her examination.

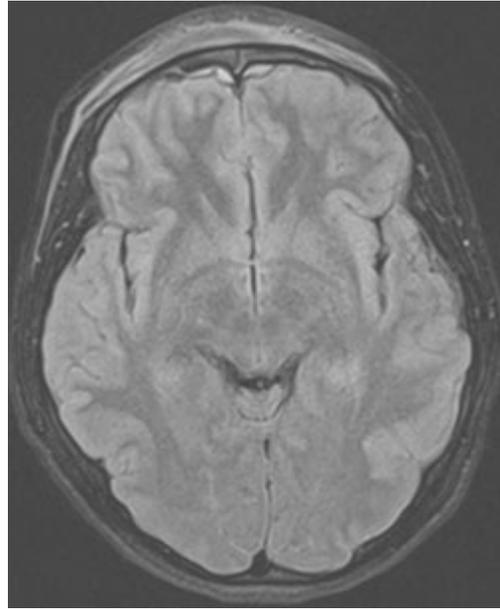
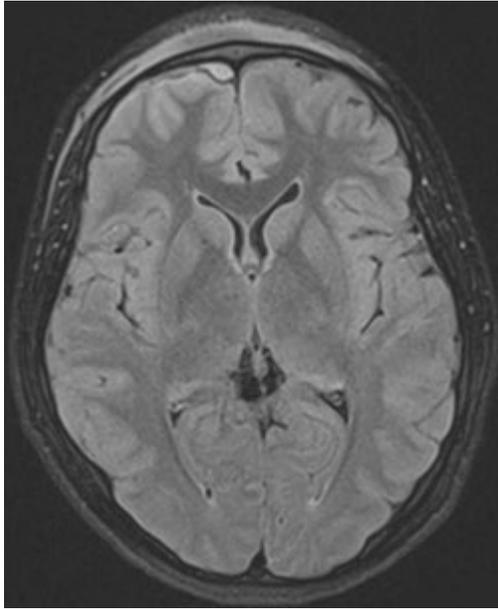


Figures 1-2: The patient has painful swelling and erythema of the area around her right eye and marked swelling with severe pain over the forehead.

Her complete blood count revealed a white blood cell count of 20,400, with 78% neutrophils. A computed tomography scan on admission is shown in Figures 3 and 4. Magnetic resonance imaging on the same day is shown in Figures 5 and 6 (representative T2 images).



Figures 3-4: A computed tomography scan on admission.



Figures 5-6: Magnetic resonance imaging on the same day is shown in (representative T2 images)

What's Your Diagnosis?

- A. Frontal lobe epidural abscesses
- B. Rhinocerebral mucormycosis
- C. Acute frontal sinusitis
- D. A and C

The answer is D (both frontal lobe epidural abscesses and acute frontal sinusitis). In fact, as seen on the CT images, she had right preseptal cellulitis and sinusitis involving the right ethmoid, maxillary and sphenoid. She had some fairly telltale history and physical findings; the acute onset of fever, congestion, frontal (forehead) pain and swelling, strongly suggestive of acute frontal sinusitis. Then the T2-weighted MRI images revealed the small, bilateral frontal lobe abscesses. This would require some ability to read these images, such as a radiologist who marked one of the abscesses (Figure 7). Then, even I can usually see them after someone else has pointed them out to me. So, if I were grading this quiz, I would give credit for answering either C or D.

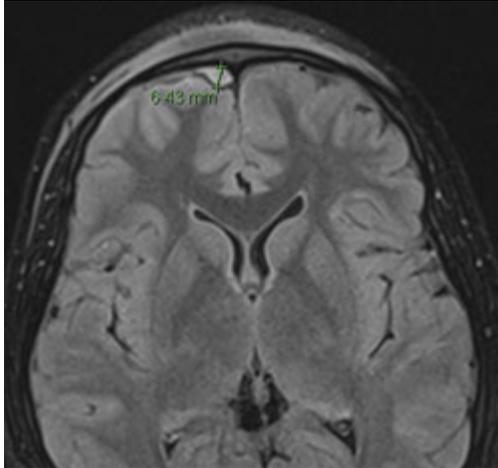


Figure 7: The T2-weighted MRI images revealed the small, bilateral frontal lobe abscesses.

I don't want to get into the sometimes confusing issue of diagnosis and management of childhood sinusitis. Very smart people, such as Ellen Wald, have written very eloquently on the subject in many resources, such as Sara Long's textbook, *Principles and Practice of Pediatric Infectious Diseases*, and such as Itzhak Brook, who has provided much of the research on the etiologies, including anaerobes and mixed pathogens in these infections, also in Long's textbook. I would refer you there for a more in-depth discussion of this subject. According to Dr. Wald, this patient would fit into the severe, acute sinusitis category. Common causes include, but are not limited to, *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Moraxella catarrhalis*; similar to what you might see in acute otitis media. Although these common aerobes are found in most of these infections, as Dr. Brook points out, these infections are usually polymicrobial with anaerobes in the mix. We just don't culture for anaerobes nearly often enough.

The patient presented had a positive blood culture for *S. pyogenes* (group A strep), which is a recognized cause of acute sinusitis, but relatively uncommon. Even though the patient went to the OR for a sinus washout, unfortunately, no cultures were sent. Presuming that this could be a mixed infection, she was initially treated with a combination of vancomycin plus ceftriaxone, but soon changed to ampicillin-sulbactam (Unasyn, Pfizer) plus metronidazole, pending clinical improvement. Nine days later, she was markedly improved and discharged home on home IV Unasyn to complete a 6-week course of total therapy. Her inflammatory markers normalized and a repeat MRI showed complete resolution of the frontal abscesses (Figure 8).

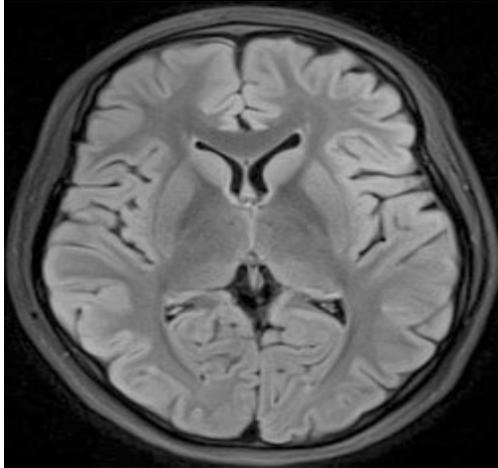


Figure 8: A repeat MRI showed complete resolution of the frontal abscesses.

Interestingly, within a month of discontinuing her IV Unasyn, she presented back to the pediatric infectious disease clinic with a recurrence of pain and mild swelling over the frontal area, but felt well otherwise. She was walked over to the otolaryngology clinic, where nasal endoscopy was performed, revealing purulent material draining from the right middle meatus that was culture positive for *S. pyogenes* and methicillin-sensitive *Staphylococcus aureus*. She was treated with high-dose amoxicillin-clavulanate, with a good response a week later. She is scheduled for sinus surgery, presuming an anatomic problem, to try to prevent this from occurring again. This scenario makes me think that the group A strep never cleared from her sinuses after all that therapy. To read more about the underlying causes of these infections, I would refer you to Dr. Brook's handy little textbook, *Diagnosis and Management of Pediatric Sinusitis* (Professional Communications Inc., 2007), page 66. It will easily fit in your white coat pocket.

In this case, the most likely pathophysiology of the epidural abscesses was by direct contiguous extension from the frontal sinus, possibly through venous connections. If the course had been a bit more indolent and there had been evidence of frontal bone osteomyelitis, this would be consistent with the diagnosis of Pott puffy tumor, as described by Sir Percivall Pott in 1760, and was featured in the November 2001 column.

There were not enough hints for rhinocerebral mucormycosis, which would likely be a more aggressive infection, with invasion through tissue and vessels resulting in necrosis of areas of involvement. It usually begins in the sinus and may invade in all directions with devastating consequences. Figures 9 and 10 are from a case of an adolescent with chronic diabetic ketoacidosis (DKA) sent to me many years ago by Basil Williams, DO, in Massachusetts, showing the inflammation and tissue destruction in the palate. The most common species responsible for this are actually from the class Zygomycetes, and most experts have gone to referring to this condition as zygomycosis, rather than mucormycosis. We don't see this very often in pediatrics, but it can happen and is happening more frequently, virtually always in a child with an underlying disease, such as poorly controlled type 1 diabetes with chronic DKA or other immune deficiencies, such as the neutropenia of cancer therapy or transplant therapy. The treatment is early, aggressive surgical debridement and antifungal agents, such as a lipid formulation of amphotericin B (Cancidas, Merck).



Figures 9-10: These photos are of an adolescent with chronic diabetic ketoacidosis (DKA), showing the inflammation and tissue destruction in the palate.

Columnist comments

I would like to thank my old friend, **Itzhak Brook, MD**, (Figure 11) for his input in this case, as well as all his contributions to the fields of complicated sinus and anaerobic infections. Over the years, Dr. Brook has contributed significantly to the knowledge in these areas, recently creating blog sites for each: sinusitisunderstood.blogspot.com and anaerobicinfections.blogspot.com. He has also taken on the issue of patient advocacy through his own experience as a survivor of hypopharyngeal cancer, by publishing another book, *My Voice: A Physician's Personal Experience with Throat Cancer*, and lecturing all over the country at numerous medical meetings on the subject. Dr. Brook has created a blog for this as well: dribrook.blogspot.com.



Figure 11: Itzhak Brook, MD, contributed to this case and has made countless contributions to the fields of complicated sinus and anaerobic infections.

I have mentioned Dr. Brook in several past columns but never said much about him as a person, only his medical accomplishments. It turns out that after he completed his medical education (medical school and pediatric residency) in Israel, he saw action in the Six-Day War (June 5-10, 1967) as an Israeli army medic. Six years later, he was a battalion physician in the Yom Kippur War (Oct. 6-25, 1973), during which he was also wounded. He then came to the United States to train in infectious diseases with the legendary Sydney Finegold at UCLA (and who probably sparked his interest in anaerobic infections). Dr. Brook joined the US Navy in 1980, with a faculty appointment at the Uniformed Services University of the Health Sciences in Bethesda, Md., where he served for 27 years. He has been on the faculty of Georgetown University since 1991.

As mentioned above, Itzhak travels a lot, speaking on the ethics issue of “the physician as the patient.” It’s my impression that we all could use a little more empathy when dealing with our patients (and parents). About 10 years ago, while visiting in New York, I saw the Pulitzer Prize-winning play *Wit* by Margaret Edson, which skillfully explores the same subject matter, as an English professor dying of ovarian cancer. In fact, if I had my way, all medical students, and physicians (who are about mid-career in their years), would be required to hear Dr. Brook speak or see *Wit* to obtain or renew their medical license. But, that’s just me. Aren’t you glad I’m not in charge?

If Dr. Itzhak Brook comes to your area to speak, do whatever it takes to hear him.

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