A 14-Year-Old Male with Swelling of the Forehead

Harbir Singh Arora, MD; and Nahed Abdel-Haq, MD

A 14-year-old male with no significant past medical history noticed swelling on his forehead one morning upon waking about 6 weeks prior to admission (Figure 1). He had mild intermittent headaches for a few days before the onset of swelling. He was taking ibuprofen as needed for headache, which resolved temporarily. There was no history of trauma, fever, vomiting, vision complaints, seizures, or altered sensorium. He didn’t report any nasal congestion, runny nose, or coughing.

On the day that the swelling was noted, he was taken to urgent care and was prescribed cetirizine for possible local allergic reaction to an insect bite. His swelling resolved in 1 week but the headache persisted intermittently for which he continued to take ibuprofen. Forehead swelling recurred 1 week later, and he was seen by his pediatrician the next day. As the swelling had already started to improve on the morning that he visited his pediatrician, no intervention was done on that visit.

The swelling resolved completely within 4-5 days. The next 2 weeks were uneventful until the same forehead swelling reappeared. The patient’s family waited for 1 week hoping for spontaneous resolution, but it did not subside. No new symptoms occurred with the recurrence of the swelling. He was taken to the pediatrician for a second visit; he was referred to the plastic surgery clinic at the Children’s Hospital of Michigan for evaluation of an underlying developmental abnormality—such as a dermoid cyst.

Vitals on admission were: temperature, 36.8°C; blood pressure, 104/74 mm Hg; pulse, 74 per minute; respiratory rate, 22 per minute. On physical examination, he was alert and oriented, but had mild distress due to headache. There was swelling on his forehead at the glabella, and the skin over the swollen area was not warm or nonerythematous. However, the swelling was firm and mildly tender to palpation. It measured about 4 cm in diameter, with swelling gradually fading into the skin of the forehead with no bony depression at the periphery.

His complete blood count with differential was the following: white count, 8.2 K/cm³ (normal range 4.9-13.3 K/cm³); neutrophils, 68%; lymphocytes, 23%; monocytes, 7%; hemoglobin, 13 gm/dL; hematocrit, 38%; platelets, 314 (normal range 130-440 K/cm³); C-reactive protein, 10.32 mg/L; erythrocyte sedimentation rate, 14 mm/hr.

Harbir Singh Arora, MD, is a Fellow, Pediatric Infectious Diseases, Children’s Hospital of Michigan. Nahed Abdel-Haq, MD, is an Associate Professor, Wayne State University, Division of Pediatric Infectious Diseases, Children’s Hospital of Michigan.

Address correspondence to Harbir Singh Arora, MD, Pediatric Infectious Diseases, Children’s Hospital of Michigan, 3901 Beaubien Street, Detroit, MI 48201; email: harora@dmc.org.

Disclosure: The authors have no relevant financial relationships to disclose.

doi: 10.3928/00904481-20141124-05

For diagnosis, see page 480

Editor’s note: Each month, this department features a discussion of an unusual diagnosis. A description and images are presented, followed by the diagnosis and an explanation of how the diagnosis was determined. As always, your comments are welcome via email at pedann@Healio.com.
COMPUTED TOMOGRAPHY FINDINGS

Computed tomography (CT) scan of his head with contrast was done to evaluate the anatomy of the swelling and its relation to adjacent structures. It showed frontal sinusitis on the left side and subperiosteal abscess of the frontal bone with loss of the outer table of the calvarium (Figure 2).

Considering the CT scan results, the patient was started on intravenous (IV) ceftriaxone and IV clindamycin to empirically cover for *Streptococcus pneumoniae*, *Staphylococcus aureus*, gram-negative organisms, and anaerobes. The ear, nose, and throat department was consulted and the patient was taken for incision and drainage of the subperiosteal abscess. Pus (3 mL) was drained from the subperiosteal plane in the midline of the frontal bone. Some of the necrotic bone tissue was removed; aerobic, anaerobic, and fungal cultures were sent. The left frontal sinus was irrigated followed by its trephination with a Penrose drain.

Gram stain of abscess revealed gram-positive cocci in pairs. The abscess culture grew nutritionally deficient streptococcus strain that failed to regrow for susceptibility testing. Anaerobic, fungal, or blood culture did not reveal any growth. The pathology report showed changes consistent with chronic and acute suppurative inflammation of paranasal sinus mucosa.

The Penrose drain was removed 2 days later. The patient was discharged home to complete 6 weeks of IV clindamycin and IV ceftriaxone for osteomyelitis of frontal bone. He returned to the infectious disease clinic 3 weeks after discharge for a check-up. His headache had resolved at that time. One day after the visit, he developed a drug rash. Antibiotics were changed to IV meropenem to complete the treatment course. At the end of the treatment, a follow-up CT scan showed complete resolution of sinus disease with reactive bone formation in the frontal bone.

**Figure 2.** A CT scan of the head showing subperiosteal abscess of the frontal bone with loss of the outer table of the calvarium.

**Diagnosis:**

Pott’s Puffy Tumor

**DISCUSSION**

Pott’s puffy tumor is characterized by swelling of the forehead due to underlying subperiosteal abscess with associated osteomyelitis of the frontal bone. Sir Percival Pott described this condition in relation to forehead trauma in 1768 and in relation to sinusitis in 1775. It is a well-known but rarely seen clinical entity. According to one recent case series, less than 50 pediatric cases have been reported in the literature worldwide.

Pott’s puffy tumor is most frequently a complication of an underlying frontal sinusitis. The pneumatization of frontal sinuses starts by age 2 years, and it is well formed by ages 12 to 13 years. Direct spread of infection from the frontal sinus to the frontal bone anteriorly may erode the cortex and lead to collection of pus below the periosteum leading to a swelling known as Pott’s puffy tumor. The direct spread of infection through the posterior table of frontal sinus may lead to complications such as meningitis, epidural abscess, or subdural abscess.

Another mechanism to potentially spread infection from the sinuses is via the hematogenous route. The mucosa of the sinuses is drained by thin-walled, valve-less diploic veins that anastomose with subdural venous plexus posteriorly and the veins in the periosteum anteriorly. The infected emboli can translocate through these veins without breaching the bone completely to cause osteomyelitis with subperiosteal abscess anteriorly (Pott’s puffy tumor) and subdural abscess posteriorly. Pott’s puffy tumor may be preceded by head trauma.

On review of the previously published case series, the most frequent organisms associated with Pott’s puffy tumor include *Streptococci* (alpha-hemolytic streptococci, beta-hemolytic streptococci, viridans streptococci, *S. milleri*, *S. pneumoniae*, *S. intermedius*), *S. aureus*, coagulase negative *Staphylococcus*, and anaerobes (including *Fusobacterium*, *Bacteroides*, and *Propionibacterium*). There are a few case reports of gram-negative organisms such as *Haemophilus influenzae*.

The majority of patients with Pott’s puffy tumor are adolescents and young adults. The youngest case reported in the literature was a 7-week-old premature infant born at 25 weeks of gestation who developed Pott’s puffy tumor secondary to methicillin-resistant *S. aureus* (MRSA) septicemia. Adult cases of varied range of age have also been reported. In addition to swelling on the forehead, other common symptoms include headache, fever, nasal discharge, periorbital edema, and fatigue. More serious presentations such as lethargy, seizures, obtundation, nausea, and vomiting are indicative...
of possible intracranial spread. It is rare that the forehead swelling is not accompanied by the classic symptoms of fever or nasal drainage as described in our patient.

CT scan with contrast enhancement is the preferred initial imaging study. It can detect bony erosions (occurring late in the course of illness), sinusitis, orbital cellulitis, extracranial fluid collections, and intracranial abscesses in the epidural, subdural spaces, or in the brain parenchyma. However, small extra-axial fluid collections or subtle leptomeningeal enhancements may be missed on CT. Magnetic resonance imaging with contrast enhancement is more sensitive than CT in delineating early bony changes indicating osteomyelitis when evaluating the extent of intracranial disease and detecting small intracranial abscesses. Magnetic resonance venogram is more sensitive than CT scan in detecting sinus thrombosis and should be performed when CT scan shows intracranial abscess in the anatomical vicinity of venous sinuses.

Surgical intervention is the mainstay treatment for Pott’s puffy tumor and the procedure depends on the extent of the disease. Debridement of the infected bone and drainage of intracranial abscess, if present, is required. Empiric parenteral antibiotics should be started before culture and susceptibility results are available and should include coverage for anaerobic organisms. Antibiotics can be modified based on the susceptibility results and if a prolonged course of treatment is required. A follow-up imaging study may be needed to evaluate the progress.

Pott’s puffy tumor has been associated with serious complications like epidural abscess, subdural abscess, orbital cellulitis, meningitis, seizures, brain abscess, and rarely, epidural-cutaneous fistula. In one case series, 9 of 14 cases (64%) with children younger than age 10 years had at least one intracranial complication. In another case series, 13 of 22 adult and pediatric patients (59%) had intracranial complications.

CONCLUSION

This case report highlights the unusual and subtle presentation of a patient with Pott’s puffy tumor. Our patient did not have the usual symptoms of sinus infection such as nasal congestion, nasal drainage, cough, or fever; this subtle presentation caused the delay in making the diagnosis. The abscess was slowly developing for 6 weeks, causing destruction of the anterior table of the frontal bone and thinning of the posterior table before diagnosis was made. Considering the proximity of vital intracranial structures, timely diagnosis is essential to prevent fatal complications in patients with Pott’s puffy tumor. Therefore, high index of suspicion for Pott’s puffy tumor is warranted on the part of the pediatrician when evaluating a child with a swelling of the forehead.

REFERENCES