EXTENSIVE SUBGALEAL ABSCESS AND EPIDURAL EMPYEMA IN A PATIENT WITH ACUTE FRONTAL SINUSITIS

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Abstract: Acute frontal sinusitis can be a serious condition because of its potential life-threatening complications. These complications, including spread of infection to the frontal bone and intracranially, require prompt diagnosis and intervention to avoid morbidity and mortality. We report a case of acute frontal sinusitis in a 16-year-old girl who presented with fever, severe headache, and vomiting of 3 days’ duration. Generalized fluctuant swelling of the nasal root, and bilateral supraorbital and frontoparietal regions was noted. Computed tomography (CT) demonstrated left pansinusitis, extensive subgaleal abscess and epidural empyema with osteomyelitis of the frontal bone. External frontoethmoidectomy with mucoperiostectomy were performed. Endoscopic sinus surgery was then conducted for intranasal ethmoidectomy. Intraoperative cultures grew viridans streptococci, coagulase-negative staphylococci and Peptostreptococcus micros. The patient received 3 weeks of treatment with intravenous antibiotics (penicillin 3 MU 4-hourly, ceftriaxone 500 mg 12-hourly, metronidazole 500 mg 6-hourly) and was discharged uneventfully and prescribed additional oral antibiotics for 5 weeks (clindamycin 150 mg 6-hourly and chloramphenicol 250 mg 6-hourly). CT revealed complete resolution of the abscess and clear maxillary and ethmoid sinuses at 7 weeks post-treatment. The patient was free of sinus infection at 4-year follow-up, without noticeable cosmetic deformity.

Key words: Abscess; Acute disease; Empyema; Frontal sinusitis; Streptococcal infections

Sir Percival Pott, in the 1700s, described an indolent, puffy, circumscribed swelling of the forehead caused by a localized subperiosteal abscess and osteomyelitis of the frontal bone. This entity became known as Pott’s puffy tumor. With the widespread use of antibiotics, the incidence of complicated frontal sinusitis has been greatly reduced. As a result, Pott’s puffy tumor has now become a rarity.1 Even less frequently encountered is the extensive subgaleal abscess that deprives the bone of its vascular supply and may additionally lead to the spread of osteomyelitis that is life-threatening.2 We report a case of acute sinusitis in a 16-year-old girl who developed extensive subgaleal abscess and epidural empyema with osteomyelitis of the frontal bone.

Case Report

A 16-year-old girl presented with fever, severe headache, and vomiting of 3 days’ duration. Her medical history was significant for occasional rhinitis but was otherwise unremarkable. On physical examination, her consciousness was clear and she had a fever of 38.6°C. Generalized fluctuant swelling of the nasal root, and bilateral supraorbital and frontoparietal regions was noted (Fig. 1). There was no meningism or focal neurological sign. Ocular examination revealed isocoric pupils...
with prompt light reflex, unimpaired visual acuity and unlimited extraocular muscle movement. Nasal examination revealed purulent discharge in the left middle meatus. Laboratory investigations showed leukocytosis with a left shift; C-reactive protein was 20.4 mg/dL (normal range, 0 to 5 mg/dL).

Computed tomography (CT) demonstrated left pansinusitis (Fig. 2A and 2B), extensive subgaleal abscess in the bilateral frontoparietal regions and epidural empyema of the frontal lobe (Fig. 3A and 3B). Bony destruction of the frontal sinus was noted, indicating osteomyelitis of the frontal bone (Fig. 4). A preoperative diagnosis of acute sinusitis complicated by subgaleal abscess and epidural empyema was made, and the patient was taken to surgery.

An eyebrow incision was performed in the gull wing fashion. As the scalp was incised, a significant amount of pus gushed from the incision. The scalp had been spontaneously dissected subgaleally by abscess formation. The outer table of the left frontal sinus was centrally eroded with a bony defect, actively discharging pus. The defect was widened and bone with abnormal appearance was removed using an air drill. Mucoperiosteotomy was performed. A bony defect of the inner table was found and a burr hole was drilled to drain the purulent, epidural accumulation. The inferior wall was removed with preservation of the supraorbital ridge. Endoscopic sinus surgery was then conducted for intranasal ethmoidectomy, particularly focusing on unroofing the frontal recess. Middle meatal antrostomy was also performed for the concomitant maxillary sinusitis. The scalp wound was vigorously irrigated and closed in layers. Catheters were placed subgaleally for drainage and removed 9 days after surgery.

Intraoperative cultures grew viridans streptococci, coagulase-negative staphylococci and Peptostreptococcus micros. The patient received 3 weeks of treatment with intravenous antibiotics (penicillin 3 MU 4-hourly,

Fig. 2. A) Pretreatment axial computed tomogram showing left maxillary opacification. B) Pretreatment coronal computed tomogram showing left ethmoid opacification.

Fig. 3. A) Coronal computed tomogram showing air-fluid level in the left frontal sinus and extensive subgaleal abscess in the bilateral parietal regions. Note: this section was taken in the supine position, showing fluid above air. B) Axial computed tomogram showing subgaleal abscess and epidural empyema.
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ceftriaxone 500 mg 12-hourly, and metronidazole 500 mg 6-hourly) and was discharged uneventfully with a 5-week prescription of oral antibiotics (clindamycin 150 mg 6-hourly and chloramphenicol 250 mg 6-hourly).

Post-treatment CT revealed complete resolution of the abscess and clear maxillary and ethmoid sinuses with patent drainage (Fig. 5A and 5B). The patient was free of sinus infection at the 4-year follow-up, without noticeable cosmetic deformity.

**Discussion**

The frontal sinus develops as an outpouching of the anterior ethmoid cells, invades, and insinuates itself between the inner and outer tables of the frontal bone, coming into close contact with the diploe. A very thin lamina of compact bone is all that separates the diploe from the sinus mucosa. The sinus mucosa, diploe, and frontal bone have common venous drainage via valveless diploic veins. Thus, frontal sinus infection readily invades the adjacent marrow spaces, with development of osteomyelitis by direct contiguity or by retrograde thrombophlebitis of diploic veins.3,4

Further progression of the infection would erode the outer table of the frontal bone, causing localized subperiosteal purulent accumulation, with puffy circumscribed swelling of the forehead, as in the original description of the condition by Sir Percival Pott. An even less frequently reported complication of acute frontal sinusitis is extensive subgaleal abscess.2 This is quite different from localized Pott’s puffy tumor. Extensive subgaleal abscess can strip the galea from the frontal bone and deprive the bone of its vascular supply. This leads to osteomyelitis that is more fulminant and likely to spread. Disease may also spread hematogenously or by direct extension through the inner table of the frontal bone and result in an intracranial complication such as meningitis, epidural empyema, subdural empyema, frontal lobe abscess or cavernous sinus thrombosis.5,6

The clinical presentation of complicated frontal sinusitis includes headache, fever, photophobia, signs of local inflammation and swelling, lethargy, confusion, slurred speech, vomiting, or seizures. The diagnosis of a more extensive subgaleal abscess and spreading osteomyelitis is usually uncomplicated. Swelling of the scalp appears. This is initially edematous and tender, corresponding to the cortical breakthrough of the frontal bone. The swelling, localized as a fluctuant abscess, then spreads subgaleally and results in extensive subgaleal abscess and spreading osteomyelitis. Appropriate imaging studies (CT or magnetic resonance imaging) should be performed to evaluate the underlying pathology and associated complications, including intracranial complications.
Plain films may not demonstrate mucosal thickening, bone erosion, or soft tissue changes seen with abscesses.

Aggressive surgical drainage and debridement of the osteomyelitic bone remain the mainstay of therapy. Pott’s puffy tumor is best treated by trephination through the medial aspect of the floor of the frontal sinus to decompress the infected sinus. Material may, thus, be obtained for culture and sensitivity tests. Recent advances in endoscopic sinus surgery have provided alternative access to the frontal recess to decompress the frontal sinus. Accurate assessment and thorough drainage of the abscess and removal of osteomyelitic bone up to the margins of normal bone is essential to treat an extensive subgaleal abscess and spreading osteomyelitis. Close cooperation with the neurosurgeon is necessary to deal with intracranial complications. Since patients who present with complications of acute frontal sinusitis frequently have multisinus disease, drainage of the other diseased sinus may prevent future episodes of sinusitis.

The cultures from frontal sinusitis with complications frequently reveal polymicrobial involvement. Streptococci, staphylococci and anaerobic bacteria are the predominant pathogens. Patients should be started on broad-spectrum intravenous antibiotics before availability of surgical culture results. A frequently chosen combination is: 1) a third-generation cephalosporin; 2) metronidazole; and 3) a penicillin or vancomycin. Although penicillin is active against most anaerobes, most strains of *Bacteroides fragilis* are resistant. It has been suggested, therefore, that unless anaerobes can be excluded, all paranasal sinus infections failing to respond promptly or developing complications should be treated with metronidazole in addition to the normal therapeutic regimen. Thus, we chose combination therapy with penicillin, ceftriaxone, and metronidazole to treat this patient. Microbiological identification of the pathogens is important for administration of the most appropriate antimicrobial therapy. The duration of antimicrobial therapy should be about 6 to 8 weeks.

Extensive subgaleal abscess and epidural empyema are rare complications of sinusitis in this postantibiotic era. Nonetheless, the clinical course is fulminating and potentially life-threatening. There must be a high index of suspicion for prompt identification of sinusitis complications and prompt management in order to avoid further progression and debilitating sequelae.

### References