CASE REPORT

Streptococcus pyogenes subdural empyema not detected by computed tomography

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Introduction

Streptococcus pyogenes is a common cause of pharyngitis, deep neck abscesses, and skin and soft tissue infections. Less common head and neck infections in which S. pyogenes is the primary pathogen include sinusitis and acute otitis media, which can occasionally invade the central nervous system causing devastating intracranial abscesses. S. pyogenes meningitis without a contiguous focus is even more unusual and can lead to subdural empyemas. Lumbar puncture and contrast enhanced computed tomography (CT) are the mainstays of diagnosing intracranial infections. There is a small, but growing body of evidence that emphasizes the limitations of CT in identifying small intracranial abscesses. Accurate and timely diagnosis of intracranial abscesses is vital for appropriate surgical and medical treatment plans.

The case

A previously healthy 5-year-old boy presented with fever to 102 °F (38.9 °C) and two brief convulsive events. In the emergency department his mental status was altered and another generalized convulsive event occurred. Review of systems revealed a history of sore throat and congestion for two days. Ongoing symptoms prompted a magnetic resonance imaging, which revealed a subdural empyema. Our patient diverges from the few previously reported S. pyogenes intracranial infections in that there was neither an adjacent infection nor a bacterial meningitis. In addition, we discuss the few studies addressing the sensitivity of CT for the diagnosis of bacterial intracranial infections.

Summary

A previously healthy 5-year-old boy presented with a non-specific febrile illness and seizures. Streptococcus pyogenes was identified in his blood culture. The spinal fluid revealed minimal pleocytosis and an axial computed tomography (CT) scan of the head was normal. Ongoing symptoms prompted a magnetic resonance imaging, which revealed a subdural empyema. Our patient diverges from the few previously reported S. pyogenes intracranial infections in that there was neither an adjacent infection nor a bacterial meningitis. In addition, we discuss the few studies addressing the sensitivity of CT for the diagnosis of bacterial intracranial infections.

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KEYWORDS

Streptococcus pyogenes; Intracranial infections; Computed tomography
S. pyogenes meningitis and a subdural empyema, which grew S. pyogenes. Kahn et al. described an S. pyogenes brain abscess in a 10-year-old boy whose chief complaint was frontal headache but lacked fever or systemic signs of infection. Finally, Ulloa-Gutierrez et al. reported a 3-month-old child who developed an S. pyogenes subdural empyema as a complication of a varicella-zoster virus infection, although a preceding meningitis could not be ruled out since a lumbar puncture was never performed. Our patient lacked most of the clinical signs of meningitis, had minimal CSF pleocytosis, CSF cultures (done prior to initiation of antibiotic therapy) were negative, and there were no other laboratory or physical findings suggesting that meningitis preceded the empyema. In addition, there was no contiguous focus of infection. Although isolating S. pyogenes from the subdural empyema would have been definitive proof of causation, ceftriaxone was given for over a week prior to obtaining the cultures.

Compared to CT scans, MRI is expensive and is not always readily available. In children the need for anesthesia is an additional complicating factor. CT scans are a faster and more practical procedure for initial imaging of the head when ruling-out intracranial bacterial infections. Studies comparing CT and MRI in diagnosing intracranial bacterial infections (parenchymal brain abscesses and empyemas) highlight the need for contrast enhanced CT scans to increase the ability to diagnose such infections. A retrospective chart review compared the diagnostic accuracy of CT versus MRI for diagnosing intracerebral infections resulting from preceding sinus infections, and found that 97% of the intracerebral infections were diagnosed with MRI while only 87% were seen on CT, although there was no comment on whether these CT scans were contrast-enhanced. A review of 12 cases of intracerebral empyema described four cases not initially diagnosed with non-contrast CT (NCCT) of the head. The diagnoses of intracerebral empyema in these cases were later made with contrast-enhanced CT (CECT) or MRI. The initially undiagnosed cases showed fluid collections in the middle cranial fossa or near the sinuses and resulted in a delay in diagnosis ranging from 2 to 36 days. The authors also noted that one case was initially missed with CECT showing standard axial views, but the diagnosis was later made with reconstructed coronal views. This study suggests that there is little difference between CT and MRI, provided the CT scan is enhanced with intravenous contrast and both axial and coronal views are obtained.

Our case suggests that a subdural empyema was missed by CT that was later seen on MRI, although an interval development of the empyema cannot be ruled out. The seizures at the time of presentation strongly argue for the presence of a focal intracranial infection at that time. When we felt that an intracranial bacterial focus had been 'ruled-out' by contrast enhance CT, we chose to give ceftriaxone at 50 mg/kg/day to complete 10 days, to treat the bacteremia. Although 50 mg/kg/day of ceftriaxone is considered sub-optimal for CNS infections, we feel it is unlikely that an empyema would have been absent at the time of the CT scan but developed over that interval due to treatment failure, given the exquisite susceptibility of S. pyogenes to ceftriaxone and the negative intraoperative cultures.

**Discussion**

Intracranial infections caused by S. pyogenes are unusual and nearly always associated with significant meningitis or a contiguous focus. Crum and Dehority et al. reported a 22-year-old male and a 17-month-old female, respectively, with S. pyogenes brain abscesses following otitis media.

Jagdis reported a 12-year-old female with S. pyogenes meningitis and a subdural empyema, which grew S. pyogenes. Kahn et al. described an S. pyogenes brain abscess in a 10-year-old boy whose chief complaint was frontal headache but lacked fever or systemic signs of infection. Finally, Ulloa-Gutierrez et al. reported a 3-month-old child who developed an S. pyogenes subdural empyema as a complication of a varicella-zoster virus infection, although a preceding meningitis could not be ruled out since a lumbar puncture was never performed. Our patient lacked most of the clinical signs of meningitis, had minimal CSF pleocytosis, CSF cultures (done prior to initiation of antibiotic therapy) were negative, and there were no other laboratory or physical findings suggesting that meningitis preceded the empyema. In addition, there was no contiguous focus of infection. Although isolating S. pyogenes from the subdural empyema would have been definitive proof of causation, ceftriaxone was given for over a week prior to obtaining the cultures.

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**Figure 1** Axial T1 post-gadolinium magnetic resonance image demonstrating unilateral meningeal enhancement and subdural empyema.
We present a case of subdural empyema presumed to be caused by *S. pyogenes*, which lacked the usual predisposing factors of meningitis or a contiguous focus. Although the contrast-enhanced head CT scan was normal, a subdural empyema was later diagnosed by MRI. The data presented suggest that although a more timely diagnosis might have been made if coronal views were a routine part of head CT at our institution, MRI remains the most sensitive method to diagnose intracranial infections.

*Conflict of interest:* No conflict of interest to declare.

References