Delayed Diagnosis of Subdural Empyema in a Septic Child

ADAM JANICKI, MD; GEOFFRY CAPRARO, MD

ABSTRACT

The prompt identification of sepsis in children is challenging, but once sepsis is identified, initiation of care and determination of proper disposition may be insufficient to ensure optimal outcomes. The best opportunity for full recovery also requires rapid identification and treatment of the infectious source. Acute bacterial sinusitis is common in the pediatric population, and although intracranial complications of sinusitis are rare, they are associated with significant morbidity and mortality. History and physical examination may be imperfectly sensitive for the presence of acute bacterial sinusitis and its intracranial complications. We present a case of pediatric sepsis in which the diagnosis of intracranial extension of bacterial sinusitis was not made during the first phase of care and describe complications that followed. Emergency physicians should consider subdural empyema in patients presenting with fever, nausea and headache with worrisome vital signs and laboratory values suggestive of a severe infection.

KEYWORDS: Pediatrics, Subdural Empyema, Sepsis, Sinusitis, Infectious Disease

INTRODUCTION

Sepsis, the systemic inflammatory response syndrome with an infectious source, is difficult to identify in the pediatric population since definitions are based on age-related vital signs cut-offs (Table 1). Further challenges to Emergency Department [ED] diagnosis stem from the facts that vital signs in the pediatric patient often change dramatically during the ED course and a sizable portion of children meet diagnostic criteria only after triage. Lastly, given that half of pediatric patients with sepsis are immunocompetent, emergency physicians must consider sepsis for the totality of patients seeking emergency care for infection. Once a sepsis diagnosis is made, ED clinicians must maintain a broad differential to identify and effectively treat the infectious source.

Acute bacterial sinusitis (ABS) is common, estimated to complicate 5-10% of upper respiratory tract infections. Suppurative intracranial complications of ABS are much less common. In a pediatric series, only 2.4% of all intracranial infections were due to sinusitis. This rare complication is associated with significant mortality, with rates estimated up to 10% in the pediatric population. Further, long-term neurologic deficits such as hemiparesis, aphasia, and epilepsy remain common, occurring in 8-19% of survivors. Subdural empyema [SDE] is the most common sinusitis-associated intracranial infection.

We present a pediatric patient presenting to the Emergency Department with a subdural empyema with significant diagnostic delay. This case highlights the importance of identifying pediatric sepsis; considering the diagnosis of bacterial sinusitis; and considering complications of bacterial sinusitis in the differential diagnosis of fever with unclear source. It illustrates the importance of rapid source identification and clearance to ensure optimal clinical outcomes.

CASE REPORT

An 11-year-old previously healthy boy presented to the ED with fever for 11 days. Family reported fevers reaching 39.4°C (103°F), runny nose, congestion, abdominal pain, nausea, and headache. The patient had negative rapid strep testing and urinalysis by his pediatrician three days prior to ED presentation.

Upon presentation to the ED he appeared uncomfortable, febrile to 38.6°C (101.5°F), with a heart rate of 98 beats per minute, and respiratory rate of 24 breaths per minute. He was awake and irritable but in no acute distress. Auscultation of the heart and lungs was normal. His abdomen was mildly tender in all quadrants, but was soft without rebound or guarding. The remainder of his exam was unremarkable. During his work-up, an hour and a half after his initial assessment, he developed a heart rate 132, and a respiratory

Table 1. International sepsis consensus systemic inflammatory response syndrome (SIRS) cut-off values by age

<table>
<thead>
<tr>
<th>Age Group</th>
<th>HR</th>
<th>RR</th>
<th>WBC (or bands &gt;10%)</th>
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</thead>
<tbody>
<tr>
<td>0-7 days</td>
<td>&gt;180, &lt;100</td>
<td>&gt;50</td>
<td>&gt;34K</td>
</tr>
<tr>
<td>7-28 days</td>
<td>&gt;180, &lt;100</td>
<td>&gt;40</td>
<td>&gt;19.5K, &lt;5</td>
</tr>
<tr>
<td>1-23 mo</td>
<td>&gt;180, &lt;90</td>
<td>&gt;34</td>
<td>&gt;17.5, &lt;5</td>
</tr>
<tr>
<td>2-5 yr</td>
<td>&gt;140</td>
<td>&gt;22</td>
<td>&gt;15.5, &lt;6</td>
</tr>
<tr>
<td>6-12 yr</td>
<td>&gt;130</td>
<td>&gt;18</td>
<td>&gt;13.5, &lt;4.5</td>
</tr>
<tr>
<td>13-18 yr</td>
<td>&gt;110</td>
<td>&gt;14</td>
<td>&gt;11, &lt;4.5</td>
</tr>
</tbody>
</table>
On follow-up two months later, he was free of any neurologic or cognitive deficits. Bone grafting was then performed.

**DISCUSSION**

This case demonstrates the need for vigilance to identify vital signs meeting pediatric sepsis definitions, the need to consider sinusitis and its intracranial complications in the differential of the septic child, and the potential for subdural empyema to rapidly progress. The complications suffered by this patient, despite receiving timely and appropriate antibiotics and undergoing a first surgical debridement, underscore how critical it is to facilitate early surgical intervention.

Subdural empyema results from two pathways – direct extension and, more commonly, retrograde thrombophlebitis. Thrombophlebitis that begins in the veins draining the sinuses can pass retrograde into the cavernous sinus and other dural venous sinuses.11 If infection reaches the subdural space, it often spreads rapidly and freely, typically resulting in an acute fulminant presentation.4 There is an adolescent male predominance. It is hypothesized that teenagers are at increased risk for SDE due to the rapid growth of the frontal sinuses and their blood supply during adolescence. The reason for male predominance is unclear.12 Diagnosis is difficult as patients more often present with nonspecific symptoms, most commonly fever, headache, and nausea, and do not reliably report nasal symptoms typically associated with sinusitis.6,7,12,13 Only 40% of patients have symptoms typically associated with sinusitis such as congestion or rhinorrhea.6 Patients may also present with altered mental status, focal neurologic symptoms, seizures, or coma; however, most lack any neurologic symptom and
have normal neurologic examinations at presentation. Laboratory studies often demonstrate elevated inflammatory markers such as white blood cell count, C-reactive protein, and ESR. Imaging studies are essential in confirming the diagnosis. Magnetic resonance imaging affords more detailed images of the brain and surrounding structures and is preferred. When MRI is not available, CT with contrast should be obtained as non-contrast studies may lack the necessary sensitivity to see subtle fluid collections.

Management of SDE involves antimicrobial therapy and surgical drainage. Broad-spectrum therapy with vancomycin, ceftriaxone, and metronidazole provides coverage for most intracranial pathogens. Microbial culture and infectious disease consultation should be obtained to help guide antimicrobial therapy. Surgical management of subdural empyema is an integral part of therapy and should be done without delay. Immediate consultation with neurosurgery and otolaryngology colleagues is critical.

In the case presented, the diagnosis of subdural empyema was not made in the Emergency Department. It was only later in the hospital stay that a clinical concern for CNS infection developed and imaging was obtained. It is noteworthy that initially this patient had reassuring vital signs, and only later in his ED course met consensus definition for sepsis, exhibiting fever, leukocytosis, tachycardia, and tachypnea above age-based threshold values. Two recent, single-center ED cohorts from tertiary children’s hospitals demonstrated that severe sepsis and septic shock are identified only after triage in sizable proportions of children. Once sepsis is identified, clinicians must entertain a broad differential to identify the infectious source and facilitate appropriate treatment.

References


Authors

Adam Janicki, MD, Department of Emergency Medicine, Alpert Medical School of Brown University, Providence, RI.

Geoffry Capraro, MD, Department of Emergency Medicine, Alpert Medical School of Brown University, Providence, RI.

Disclosures

None.

Correspondence

Adam Janicki, MD
Department of Emergency Medicine
Alpert Medical School of Brown University
55 Claverick Street, Suite 100
Providence, RI 02903
401-444-6489
adam_janicki@brown.edu