Group A *Streptococcus* Brain Abscess in a Previously Healthy Child

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Responsible for many childhood diseases, group A Streptococcus (GAS) is a rare cause of central nervous system infections. We present a previously healthy boy with brain abscesses caused by M/emm type 12 GAS, and review the case in the context of published literature and recent epidemiological data.

Case Report

A 17-month-old previously healthy Caucasian boy was in his usual state of good health until 2 weeks prior to admission, when he was diagnosed with acute otitis media and began a 7 day course of oral amoxicillin. One wk prior to admission, he developed rhinorrhea and a nonproductive cough, followed 2 days later by the onset of intermittent emesis. On the day of admission he was noted to be lethargic and had stopped walking and talking, and was brought by his parents to an outside emergency department (ED). No known ill contacts were reported, and no significant history of medical problems in the family was volunteered.

While in the ED, the patient suffered a generalized tonic-clonic seizure followed by decorticate posturing. Physical exam at this time was also notable for the absence of fever and a concern of bilateral papilledema. A complete blood count with differential revealed a white blood cell count of 42,000/mm$^3$, with 76% neutrophils, 2% band forms, 16% lymphocytes, 5% monocytes and 1% eosinophils. C-reactive protein was 2.3 mg/dl. Chemistry and liver function panels were normal. The patient was intubated for airway protection, and transferred to the
Pediatric Intensive Care Unit at our Children’s Hospital. Computerized tomography (CT) scan of the head with intervenous contrast revealed large abscess collections in the right posterior parietal (5.9 x 2.7 cm) and left temporal (2.2 X 1.9 cm) lobes (Fig. 1). The patient was treated empirically with intravenous meropenem, vancomycin and a tapering dosage of dexamethasone. An echocardiogram was normal.

On the second hospital day, the patient underwent neurosurgical drainage of his abscesses. Intra-operative samples were collected and transported appropriately for aerobic and anaerobic culture, and Gram stain of the abscess fluid revealed Gram-positive cocci in pairs and short chains. Cultures from each abscess grew β-hemolytic Streptococcus pyogenes (group A streptococcus, GAS) as the sole isolate; no anaerobes were identified. On hospital day 3, vancomycin was discontinued and intravenous penicillin G initiated. Blood and urine cultures from admission demonstrated no growth. An immunological evaluation revealed normal immunoglobulin levels, normal total and alternate complement activity (CH50/AH50), normal pneumococcal and tetanus antibody titers, a normal dihydrorhodamine assay (to exclude chronic granulomatous disease), and a non-reactive HIV ELISA. On the tenth hospital day, the patient was discharged home to complete a six-week course of parental antibiotic therapy with ceftriaxone. Repeat CT scan at 4 weeks of therapy demonstrated almost complete resolution of his abscesses, and the patient eventually made a complete recovery. Genetic analysis, by the Centers for Disease Control Streptococcus Laboratory (B. Beall, Director), revealed the GAS isolate to be M/emm type 12, T type 12. The emm genotyping was performed by the method of Li et al. (5) and the T typing by the method of Johnson and Kaplan (7).
Despite its ubiquity and well established invasive disease potential, GAS has rarely been described as a pathogen in central nervous system (CNS) infections. A PUBMED search of the English language literature revealed four previous reports of brain abscess caused by GAS in any age group (2, 4, 6, 9) (Table 1), while a 2001 review of GAS meningitis in children described only 29 well-documented cases in the world’s literature since 1976 (11). The clinical presentation and laboratory manifestations of CNS infections produced by GAS do not appear to differ from those of other more common CNS pathogens (2, 4, 6, 9, 11).

The epidemiology of invasive GAS infection in the United States is studied by the Centers for Disease Control and Prevention’s Active Bacterial Core surveillance (ABCs), part of the Emerging Infections Program Network (http://www.cdc.gov/ncidod/dbmd/abcs). From 3,234 cases of sterile site infections registered between 2002-04 from areas including all or parts of 10 states, 35 (1.1%) carry the clinical description of meningitis, and in 23 (0.7%) of these cases GAS was isolated from the CSF (B. Beall, CDC, personal communication). Of these, 20/35 (57%) were male, 17/35 (49%) were in pediatric patients, and 6/35 (17%) in patients < 2 yrs of age. The GAS strain producing the brain abscesses in our reported case belongs to M/emm type 12. In the 2002-04 ABCs data, M/emm type 12 is among the 4 most common cause of invasive GAS infection (8.7% of genotyped isolates), along with M/emm types 1 (23%), 3 (8.9%), and 28 (9.1%). Of the 28 genotyped GAS isolates within this time period (blood or CSF) from patients with meningitis, 3 (11%) were M/emm type 12, tied with M/emm type 28 as second most commonly associated with CNS infection behind M/emm type 1 (7 cases, 25%).
The relative absence of GAS in the reported brain abscess literature may reflect a basic observation regarding the microbiology of CNS infections in children outside the neonatal period. In previously healthy children, the microbiology of brain abscess parallels to a great extent that of otitis media and sinusitis. Antecedent otitis media or chronic sinusitis is reported in 23-31% of pediatric brain abscess (3, 10). In contrast to pharyngitis, GAS is a much less common cause of childhood otitis media (OM) and sinusitis, accounting for only ~2% of isolates from cultures collected from middle ear or sinus aspirates (1, 8). Nevertheless, antecedent OM or sinusitis is reported in 24% of children with GAS meningitis (11), and both our patient and one of the four earlier reported cases of GAS brain abscess (2) carried an antecedent diagnosis of OM. An alternative etiology for our patient’s condition would be blood-brain barrier penetration by the GAS pathogen during the course of bacteremia, akin to the mechanism of pathogenesis accepted for the more common streptococcal CNS pathogen of early childhood, *Streptococcus pneumoniae*.

The absence of neurological sequelae in all five reported cases of GAS brain abscess (Table 1) contrasts with reports of brain abscess secondary to other pathogens in children and adults. Persistent neurological sequelae were reported in 44-65% percent of children with brain abscess in the larger published series (3, 10, 12). Though the small number of brain abscesses caused by GAS reported in the literature prevents definitive conclusions, such abscesses may carry a better prognosis than those from more common CNS pathogens.
ACKNOWLEDGEMENTS:

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REFERENCES:


subtypes in 1064 recent invasive group A streptococcus isolates recovered from the active bacterial core surveillance. J Infect Dis 41:4194-216.


Table 1. Summary of five reported cases of group A *Streptococcus* brain abscess.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>M/emm type</th>
<th>T type</th>
<th>Signs/Symptoms</th>
<th>Predisposing Factor</th>
<th>Sequelae</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>M1</td>
<td>T1</td>
<td>Headache, emesis, fever, photophobia</td>
<td>None</td>
<td>None</td>
<td>(4)</td>
</tr>
<tr>
<td>48</td>
<td>M22</td>
<td>T12</td>
<td>Headache, seizure, slurred speech, left arm/face parésis</td>
<td>None</td>
<td>None</td>
<td>(9)</td>
</tr>
<tr>
<td>10</td>
<td>N/A</td>
<td>N/A</td>
<td>Headache, emesis</td>
<td>None</td>
<td>None</td>
<td>(6)</td>
</tr>
<tr>
<td>22</td>
<td>M5</td>
<td>N/A</td>
<td>Headache, emesis, fever</td>
<td>Acute otitis media</td>
<td>None</td>
<td>(2)</td>
</tr>
<tr>
<td>1.5</td>
<td>M12</td>
<td>T12</td>
<td>Emesis, lethargy</td>
<td>Acute otitis media</td>
<td>None</td>
<td>This case</td>
</tr>
</tbody>
</table>

N/A = not available
FIGURE LEGEND

Figure 1. Head computerized tomography scan with intravenous contrast on day of admission. Image on left shows a 58.6 x 27.1 mm abscess collection in the right posterior parietal region; image on right reveals a 21.7 x 19.0 mm abscess in the left temporal lobe.