CASE REPORT

Streptococcal pharyngitis: an uncommon cause of subdural empyema

Jeffrey Howard Walden,¹ Bryan Hess,² Michael Rigby²¹Department of Family Medicine, University of North Carolina Chapel Hill, Greensboro, North Carolina, USA²Cone Health Family Medicine Residency, Greensboro, North Carolina, USA

Correspondence to

Dr Jeffrey Howard Walden, jeff.walden@conehealth.com

Accepted 5 September 2015

SUMMARY

A 7-year-old girl with an unremarkable medical history presented to a local paediatric emergency department with a 7-day history of fever, sore throat and vomiting, and a 1-day history of rash. She was admitted to the hospital, with presumed Kawasaki disease. A few hours after admission, the patient had sudden onset of two witnessed tonic-clonic seizures and subsequent decreased mental status. She was transferred to the paediatric intensive care unit and started on broad-spectrum antibiotics. On hospital day 2, cerebral spinal fluid cultures and blood cultures grew *Streptococcus pyogenes*, and repeat physical examination was consistent with acute streptococcal pharyngitis. On hospital day 3, the patient developed left-sided hemiparesis and had another witnessed seizure. A CT scan was obtained and revealed a subdural abscess. She was transferred to a tertiary care centre and underwent craniotomy with evacuation of her subdural abscess. Surgical cultures eventually grew *S. pyogenes*.

BACKGROUND

Subdural empyema (SDE) is a fairly uncommon diagnosis, accounting for only 20% of intracranial infections.¹ In children, the usual source for SDE is direct extension from a contiguous source, such as acute sinusitis or otitis media,¹ although in one-fourth of cases no source of infection is found.² The usual causal organisms are anaerobes, aerobic streptococcal species, staphylococci, *Haemophilus influenzae* and other Gram-negative bacilli.¹ Intracranial infections caused by *Streptococcus pyogenes* are unusual, and SDE resulting from *S. pyogenes* is even more rare.³ SDE has a protean presentation and therefore can be misdiagnosed at initial presentation, despite early diagnosis being critical to management of this condition.⁴ We present a case of a young girl with a febrile illness, eventually found to have SDE secondary to invasive *S. pyogenes* with presumed source of infection being streptococcal pharyngitis.

CASE PRESENTATION

A 7-year-old African-American girl with no significant medical history and up-to-date on all recommended vaccinations presented to our local paediatric emergency department (ED), with a 7-day history of fevers, headache, sore throat and non-bloody, non-bilious vomiting. She also had a 1-day history of diffuse, lacy maculopapular rash. Throughout the prior week, her mother had contacted her primary care physician's office multiple times by phone, and had been advised to administer antipyretics for fever and, if the child could not

tolerate oral liquids or experienced worsening fevers, to have her evaluated. The child had also, on day 4 of her illness, presented to the same ED, where she had a negative urinalysis, negative point of care testing for streptococcal pharyngitis and was discharged home with a diagnosis of viral gastroenteritis. An oropharyngeal examination was not documented at that visit. On the seventh day of her illness, she was seen at her primary care provider's office due to persistent symptoms along with interval development of bilateral conjunctivitis and a lacy, maculopapular rash on her chest, back and abdomen. She was diagnosed with a presumptive viral febrile illness. Kawasaki disease was considered, but she did not meet full criteria at that time. Blood work was drawn and consisted of a complete metabolic profile, complete blood count, erythrocyte sedimentation rate (ESR) and C reactive protein (CRP). The child was discharged home with instructions to follow-up in clinic the next day.

That evening, the patient presented to the paediatric ED due to parental concern for persistent fevers, and worsening nausea and vomiting. Her rash had extended to her upper extremities, and she was noted to have red rosy cheeks, dry cracked lips and an erythematous tongue. She was generally uncooperative on physical examination and would not allow the ED physician to examine her oropharynx. Owing to her inability to tolerate fluids by mouth, she was admitted to the hospital, with the working diagnosis of Kawasaki disease.

INVESTIGATIONS

Her work up prior to admission had included a negative rapid streptococcal antigen test as well as a urinalysis, which revealed only concentrated urine and trace leucocytes. Laboratory results obtained on the day of admission revealed leucocytosis of 29 000 white cell counts/ μ L with neutrophilic predominance. ESR was elevated at 130 mm/h and CRP was also elevated at 37.60 mg/dL. The child's liver and renal function laboratory results were within normal limits. Her sodium was low at 128 mEq/L and her albumin was also decreased at 2.8 g/dL. Influenza PCR testing, including testing for H1N1 virus and enterovirus, was obtained on admission and found to be negative. Rocky Mountain Spotted Fever (RMSF) titres were drawn.

The night of her first hospital day, the patient had two witnessed tonic-clonic seizures. She was transferred to the paediatric intensive care unit with the presumptive diagnosis of aseptic meningitis complicating Kawasaki disease versus RMSF, and started on intravenous vancomycin,

CrossMark

To cite: Walden JH, Hess B, Rigby M. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2015-211312

ceftriaxone, doxycycline and acyclovir. She underwent lumbar puncture on transfer to the intensive care unit. Initial cerebral spinal fluid (CSF) analysis revealed normal glucose of 75 mg/dL and normal protein of 45 mg/dL, but contained 128 white cell counts/mm³, with a neutrophilic shift. Blood, urine and CSF cultures as well as herpes simplex titres were all obtained prior to the administration of antibiotics.

Owing to concern for Kawasaki disease, intravenous immunoglobulin (IVIG) was administered but stopped prematurely as the patient developed shortness of breath and periorbital oedema. These symptoms resolved after cessation of IVIG.

The patient remained febrile with decreased level of consciousness despite the administration of broad-spectrum antibiotics. On hospital day 3, blood and CSF cultures returned positive for growth of *S. pyogenes*. The patient's oropharynx was examined and revealed oedematous and erythematous tonsils with multiple exudates present, consistent with acute streptococcal pharyngitis infection. By this time, her RMSF and herpes simplex titres had returned preliminarily negative, and her doxycycline and acyclovir were stopped with intravenous clindamycin added to her antibiotic regimen. Later during the evening of hospital day 3, she developed left-sided hemiparesis and had another witnessed tonic-clonic seizure. An emergent non-contrasted CT scan revealed a right frontoparietal fluid (figure 1) collection almost 9 mm in diameter, consistent with subdural fluid collection, with resultant 7 mm right to left midline shift (figure 2).

DIFFERENTIAL DIAGNOSIS

The patient's initial presentation of fevers, headache, sore throat and vomiting included a broad differential diagnosis, with primary concern for streptococcal pharyngitis infection, viral respiratory illness and viral gastroenteritis. Our patient later developed a fine maculopapular rash along with desquamation of her oral mucosa and conjunctivitis, at which point the differential included Fifth's disease, Sixth's disease, Kawasaki disease and RMSF. With development of a new-onset seizure in a paediatric patient, one must consider complex-partial seizures, febrile seizures, herpes simplex encephalitis, meningitis (aseptic or bacterial), intracranial abscess, or intracranial haemorrhage secondary to accidental or intentional trauma.^{1 5}

TREATMENT

The decision was made to transfer the patient that same day to a tertiary care facility and obtain paediatric neurosurgery

Figure 1 CT image of 8.6 mm thick low attenuation right frontoparietal subdural fluid collection representing subdural empyema.

Figure 2 CT image of 6.9 mm right to left midline shift secondary to frontoparietal subdural fluid collection.

consultation. The patient underwent emergent decompressive right-sided craniotomy, which confirmed the fluid collection to be a SDE. The evacuated purulent fluid cultures grew *S. pyogenes*.

OUTCOME AND FOLLOW-UP

The patient was eventually discharged from the tertiary care centre, with a peripherally inserted central catheter, and received a total of 12 weeks of intravenous antibiotics. MRI performed 2 months after her initial presentation revealed surgical changes from her craniotomy but no residual subdural fluid. She underwent several months of physical and occupational therapy to treat her left-sided hemiparesis, which had completely resolved at her follow-up appointment with her primary care physician 3 months after initial diagnosis. Currently, 2 years later, she is doing well in school, and has no residual weakness or sequelae of her disease.

DISCUSSION

SDE, a life-threatening infection first reported in the literature about 100 years ago,¹ is a focal intracranial collection of purulent material located between the meningeal spaces of the dura and the arachnoid mater of the brain.^{1 5} SDE accounts for 20% of all intracranial abscesses.¹ Prior to the advent of antibiotics, SDE was uniformly fatal,⁵ and ever since, the mortality rate remains from 14% to 28%.⁶ Two-thirds of cases occur in patients between 10 and 40 years of age.⁵ In infants, SDE usually results from complications of purulent meningitis, while in older children, it usually results from infection of the paranasal sinuses or spreads from middle ear infection, skull fracture, intracranial surgery or distant spread from sites such as a pulmonary infection.⁶ SDE acts as a space-occupying lesion in the brain and can rapidly expand, causing increased intracranial pressure, cerebral oedema, cerebral infarction, seizures and, eventually, coma and death.¹

The rate of success of culturing bacteria from surgically evacuated pus from a SDE varies from 54% to 81%.^{1 6} Of the fluid collected, the most common organisms grown include aerobic and anaerobic streptococci, staphylococci or *H. influenzae*. The most common *Streptococcus* spp are *S. milleri* and *S. anginosus*.¹ In children, particularly, SDE is commonly secondary to *H. influenzae* or *Streptococcus pneumoniae* meningitis.¹

Patients with SDE can present with a multitude of symptoms including headache, nausea, vomiting, altered mental status, neurological deficits and new-onset seizures. Diagnosis of SDE relies on a careful history and physical examination, although it can be difficult clinically to differentiate between meningitis and SDE. The common clinical triad for SDE is fever, sinusitis and neurological deficits, followed by a rapid, downhill course.¹ Headache is present in as many as 90% of patients and, as the infection progresses, focal neurological signs and signs often appear, with seizures in as many as 50% of patients.¹ Recommended laboratory studies for patients with SDE include white cell count, ESR and CRP levels, which can all be elevated.⁵ CT scan with contrast and MRI with gadolinium enhancement of the brain are the imaging studies of choice when SDE or other brain abscess is suspected.^{1 3 5} Previously, CT scan with contrast was the standard of care for patients with suspected SDE, due to the rapidity of testing,⁷ although there has been at least one case report of SDE missed on initial CT and later found on MRI.³ Currently, MRI with gadolinium enhancement is considered the most sensitive method to diagnose intracranial abscess.⁷

Early and accurate diagnosis, timely surgical intervention, treating the source of infection, and high-dose intravenous antibiotic therapy are the mainstays of treatment for SDE,^{1 6} with any evacuated purulent collections being sent for culture. Delay in surgery can lead to poor results, with the cut-off of 72 h providing a clinical decision point; one study demonstrated an almost 70% chance of disability or death in patients if surgery is delayed >72 h.⁴

Our patient initially presented with fevers, headaches, sore throat, vomiting and rash. The initial working diagnosis after admission was Kawasaki disease with aseptic meningitis, based on CSF results, versus RMSF, a diagnosis that changed considerably after the patient began having seizures. Her blood, CSF and surgically evacuated fluid cultures all grew *S. pyogenes*, with the suspected source being streptococcal pharyngitis based on oropharyngeal examination, despite negative previous testing. Intracranial infections caused by *S. pyogenes* are rare and nearly always associated with significant meningitis or a contiguous focus.^{2 3 8} In a review of SDE and its management, *S. pyogenes* is listed as a source for infection for SDE only when originating from either the paranasal sinuses, otomastoiditis or acute otitis media.² The portal of entry for invasive group A streptococcal disease (GAS) disease remains undetermined for about one-fourth of *S. pyogenes*.² In the same review, among children

and adults with confirmed GAS meningitis, two children were found to have brain abscess, two had subdural hygromas and none had SDE.² From our literature search, we found no cases of SDE resulting from *S. pyogenes* originating from an acute pharyngeal infection.

Learning points

- ▶ An intracranial process should be suspected in children with persistent fevers, headaches and nausea that do not resolve with administration of antibiotics.
- ▶ If it is suspected, MRI with gadolinium enhancement is the imaging study of choice. If an emergent imaging study is needed, CT is recommended.
- ▶ Early diagnosis and treatment are critical in the management of subdural empyema.

Contributors JHW had the idea for the article and contributed to the Discussion, Learning points and Background sections. MR contributed to the Case presentation and Treatment sections. BH co-wrote the Case presentation section and contributed to the Investigations and Differential diagnosis sections. All three authors reviewed the work and incorporated corrections into the final document.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Agrawal A, Timothy J, Pandit L, *et al.* A review of subdural empyema and its management. *Infect Dis Clin Pract* 2007;15:149–53.
- 2 Ulloa-Gutierrez R, Dobson S, Forbes J. Group A streptococcal subdural empyema as a complication of varicella. *Pediatrics* 2005;115:e112–14.
- 3 Viola S, Montoya G, Arnold J. Streptococcus pyogenes subdural empyema not detected by computed tomography. *Int J Infect Dis* 2009;13:e15–17.
- 4 Renaudin JW, Frazee J. Subdural empyema—importance of early diagnosis. *Neurosurgery* 1980;7:477–9.
- 5 Dunn B, McCalla C, Hiestand B, *et al.* The pediatric headache that would not go away. *Pediatr Emerg Care* 2013;29:1283–6.
- 6 Nathoo N, Nadvi SS, van Dellen JR, *et al.* Intracranial subdural empyemas in the era of computed tomography: a review of 699 cases. *Neurosurgery* 1999;44:529–35.
- 7 Younis RT, Anand VK, Davidson B. The role of computed tomography and magnetic resonance imaging in patients with sinusitis with complications. *Laryngoscope* 2002;112:224–9.
- 8 Goodkin HP, Harper MB, Pomeroy SL. Intracerebral abscess in children: historical trends at Children's Hospital Boston. *Pediatrics* 2004;113:1765–70.

Copyright 2015 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow