

Group A streptococcal meningitis in a pediatric patient

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A case of group A streptococcal meningitis is reported in a 14-year-old girl with a history of recurrent otitis media. She presented to the emergency room with an altered level of consciousness; the organism was isolated from her spinal fluid and blood. Her course was complicated by a left-sided sinus vein thrombosis with extension to the external jugular vein, which has previously been reported in the literature only once. *Streptococcus pyogenes* is a common cause of invasive infections, but is a highly uncommon cause of meningitis.

Key Words: Group A streptococcus; Meningitis; Otitis media; Thrombosis

Invasive infections due to *Streptococcus pyogenes* include bacteremia, pneumonia, skin and soft tissue, and toxic shock syndrome. However, meningitis due to *S pyogenes* is rare. *S pyogenes* meningitis complicated by venous thrombosis has only been reported once in the literature (1). Rates of complications appear to be higher in children. The present case is a reminder that while *S pyogenes* is a common cause of invasive infections, it is a highly uncommon cause of meningitis.

CASE PRESENTATION

A 14-year-old Caucasian girl presented to the emergency room at The Children's Hospital of Winnipeg (Winnipeg, Manitoba) after being discovered by her mother in a state of decreased consciousness. She had been well until the previous day, when she awoke with left-sided headache and otalgia, anorexia, fatigue, tactile fevers and left-sided otorrhea. She had seen her family doctor 10 days previously for a sore throat and left ear pain, and was given one week of amoxicillin; there was some improvement. A throat swab for group A streptococcus (GAS) was negative. The patient had a history of frequent otitis media as a child, which were generally not treated with antibiotics. She had tympanostomy tubes placed at four years of age. Her immunizations were up to date.

Her level of consciousness was decreased, with a Glasgow Coma Scale of 11/15, with moderate dehydration and a

Un patient pédiatrique atteint de méningite à streptocoque de groupe A

Un cas de méningite à streptocoque de groupe A est déclaré chez une fille de 14 ans ayant des antécédents d'otite moyenne récurrente. À son arrivée à l'urgence, son niveau de conscience était altéré. Les médecins ont isolé l'organisme dans le liquide rachidien et le sang. L'évolution de la maladie a été compliquée par une thrombose du sinus veineux gauche étendue à la veine jugulaire externe, une occurrence qui n'a fait l'objet que d'une publication auparavant. Le *Streptococcus pyogenes* est souvent responsable d'une infection invasive, mais c'est une cause très peu courante de méningite.

temperature of 38.8°C. There was a foul-smelling discharge from the left ear canal, and the right tympanic membrane was erythematous. Her left mastoid was slightly red and swollen. The remainder of her physical examination was unremarkable. A computed tomography (CT) scan of the head and mastoid showed opacification of the left mastoid, with no obvious bony destruction; a possible area of fluid or pus adjacent to the left sigmoid and transverse sinus was noted. There were no signs of thrombosis. Laboratory tests revealed a white blood cell count of $29.3 \times 10^9/L$ (93% neutrophils and 7% lymphocytes). Lumbar puncture results included a nucleated cell count of $7200 \times 10^6/L$, (92% neutrophils, 7% lymphocytes and 1% monocytes), protein level 1.79 g/L (normal 0.2 g/L to 0.40 g/L) and glucose level 2.3 mmol/L (2.2 mmol/L to 3.8 mmol/L). The cerebrospinal fluid (CSF) Gram stain showed Gram-positive cocci in chains; it subsequently grew beta-hemolytic GAS (sensitive to penicillin, vancomycin and erythromycin). A peripheral blood culture had grown the same organism. Swabs of the left ear discharge were negative for bacterial culture, acid-fast bacilli and fungi. The patient was admitted to the pediatric intensive care unit, and was started on intravenous (IV) vancomycin (60 mg/kg/day), IV meropenem (120 mg/kg/day) and ciprofloxacin/hydrocortisone drops. She was assessed by both the otolaryngology and neurosurgery departments, who both opted for initial clinical observation. The patient improved over the next 36 h, was transferred to the ward and had a

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central line insertion. On day 3 of admission, she developed a headache and diplopia. On examination, a slight left esotropia was noted. A CT scan of the head showed left-sided sinus venous thrombosis extending into the external jugular vein, with possible left petrosal thrombosis. She was taken to the operating room for cortical mastoidectomy and tympanostomy tube placement. Intraoperatively, pus was noted in the air cells surrounding the sigmoid sinus. A mastoid drain was inserted and was removed after five days.

The hematology department was consulted for further coagulation workup. Positive findings included a heterozygous mutation for factor V Leiden. She was started on enoxaparin (low-molecular-weight heparin), and was subsequently transitioned to warfarin. On day 6 of admission, the antibiotics were changed to IV penicillin G 3.1 million U every 6 h. On day 9, a repeat CT scan of the head showed only a small enhancing area anterior to the sigmoid sinus and medial temporal bone. There was re-expansion of the sigmoid sinus and only partial thrombosis. The patient's audiogram showed a left-sided moderate-severe conductive hearing loss.

The patient was discharged after 15 days in hospital. She was enrolled in the local home IV program to complete six weeks of IV penicillin G. She did well and had no major issues when seen as an outpatient. A CT scan of the head performed one month after discharge showed no filling defects in the sigmoid or transverse sinuses. Due to her factor V Leiden mutation, the hematology department elected to anticoagulate her for a total of six months. Magnetic resonance imaging scan of the head performed three months later showed normal sinuses and vessels. Repeat audiology was normal.

DISCUSSION

Recent reports (2,3) have noted the increasing rates of invasive disease associated with GAS. Common sites of infection include blood, lungs and soft tissue. Meningitis due to GAS is much less frequent, limited to case reports and series, and accounts for fewer than 1% of cases of bacterial meningitis (4). Canadian experience has shown similar results. A two-year, prospective surveillance study (3) of invasive GAS infections in Ontario showed an annual incidence of 1.5 cases per 100,000 population. Of 323 cases of invasive disease, only three (0.93%) were due to meningitis. More recent data (4) from the Centers for Disease Control and Prevention in the United States revealed 5400 cases of invasive GAS disease over a four-year period. Meningitis and central nervous system disease were seen in 52 cases (1% overall), and significant differences in prevalence were noted between patients younger than 10 years of age and those 10 years of age and older (3% versus 0.7%, respectively) (4). There are approximately 30 pediatric cases reported in the medical literature. A pediatric case of meningitis secondary to GAS is reported in the present article.

In our patient, meningeal involvement was preceded by a recognized focus of infection (otitis media). This has been seen in previous case reports and series of GAS meningitis, in both adult and pediatric patients. One adult series (5) studied 41 patients between 1987 and 2000. Acute otitis media was seen in 43%, chronic otitis media in 10% and sinusitis in 8% of patients. A case report and review (6) of pediatric patients described 25 patients between six weeks and 13 years of age. Recognized focus of infection was seen in 68%, with otitis media and pharyngitis being most common. These results are

not dissimilar with previous pediatric case series. Shetty et al (7) reported approximately 50% of cases with a primary focus of infection in the upper respiratory tract, and positive blood cultures in approximately 60% of cases. With GAS infections of the upper respiratory tract being common, and GAS central nervous system infections being uncommon, the exact mechanisms and host-microbe interactions warrant further study.

Another risk factor for meningitis is cochlear implants. Up to May 2003, 118 cases of cochlear implant-associated bacterial meningitis were noted (8). Of the 70 cases with positive CSF cultures, typical organisms were seen, including *Streptococcus pneumoniae* and *Haemophilus* species, but no GAS. The first reported case (8) of GAS meningitis in a cochlear implant patient was published in 2005. A more recent study (9) focusing on the risk of meningitis after 24 months postimplantation, found only one of 10 cases (confirmed bacterial CSF culture) that was positive for GAS, with the remainder positive for *S pneumoniae*. Overall, having a positioner device with the implant was the greatest risk factor for meningitis (now withdrawn from the market). In the two reported implant-associated GAS cases, one had no significant risk factors, while the other had a positioner, recurrent otitis media and a prior episode of meningitis. While generally uncommon, GAS should still be considered for implant-associated meningitis.

First-line treatment should include high-dose IV penicillin G, given that there has been no documented resistance of GAS to this antibiotic (5). Most pediatric cases of uncomplicated GAS meningitis have been treated for 10 to 14 days (1,7,10,11). Prolonged courses of therapy should be considered for those with complications. A noticeable difference in outcomes between adult and pediatric patients has been observed. In general, children appear to have higher rates of morbidity and mortality when compared with adults. A case series (12) of 51 patients (mixed adult and pediatric patients), showed a 44% prevalence rate of sequelae in pediatric patients (the majority being neurological) compared with approximately 7% in adults. Also morbidity rates were lower when compared with rates for pneumococcal, group B streptococcus and Gram-negative meningitis, but equivalent to rates for *Haemophilus influenzae* or meningococcal infections. Rates of sequelae appear greater compared with pneumococcal and meningococcal infections. Shetty et al (7) confirmed these results with a 46% rate of neurological sequelae in a series of 29 children. Only one other case (1) of GAS meningitis complicated by thrombosis or jugular phlebitis could be found.

SUMMARY

A case of GAS meningitis, in the setting of a history of recurrent otitis media is described in the present study; the patient recovered well with a prolonged course of IV penicillin G. This illustrates that while GAS meningitis is rare, it should be considered for meningitis cases, especially when there is a history of recurrent otitis media or upper respiratory tract infection.

DISCLOSURE: Verbal consent for publication of case details (without identifying information) was obtained from the patient.

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