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METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* MENINGITIS FROM TRANSANAL MIGRATION OF A VENTRICULOPERITONEAL SHUNT

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Abstract—Background: Bowel perforation is a rare complication of ventriculoperitoneal (VP) shunt placement that can result in anal protrusion of a VP shunt. Retrograde migration of bacteria through the shunt can lead to central nervous system (CNS) infections, such as meningitis, most commonly caused by *Escherichia coli* or other enteric pathogens. Here we present a case of methicillin-resistant *Staphylococcus aureus* (MRSA) meningitis from transanal migration of a VP shunt. **Case Report:** A 2-month old female with a history of VP shunt placement presented to the emergency department (ED) after her mother noticed a tube in the patient’s diaper. On examination, a white tube was noted to be protruding from the patient’s anus. Plain radiographic shunt series showed an intact VP shunt terminating outside of the patient’s body. Cerebrospinal fluid (CSF) cultures grew MRSA. A diagnosis of MRSA meningitis secondary to spontaneous bowel perforation of a VP shunt was made. The patient went to the operating room for externalization of her shunt. **Why Should an Emergency Physician Be Aware of This?:** To our knowledge, this is the first case of MRSA meningitis following transanal migration of a VP shunt to be reported in the literature. While anal protrusion of a VP shunt is rare, CNS infection from this complication results in a high mortality rate. In addition, not all cases of bowel perforation from a VP shunt will present with the shunt exiting the body. Therefore, in a patient with a history of a VP shunt who presents with symptoms of meningitis, it is important for emergency physicians to heavily consider intestinal perforation by VP shunt as a possible etiology. © 2019 Elsevier Inc. All rights reserved.

Keywords—MRSA; methicillin-resistant; *Staphylococcus aureus*; meningitis; transanal; migration; protrusion; ventriculoperitoneal; shunt; perforation

INTRODUCTION

Spontaneous bowel perforation is a rare complication following ventriculoperitoneal (VP) shunt placement. This complication has an incidence of 0.1%–0.7%; however, the exact pathogenesis remains unclear (1). More than half of the reported cases of bowel perforation following VP shunts were in pediatric patients younger than 11 years old (2).

Anal extrusion of a VP shunt is a possible presentation after bowel perforation and places the patient at risk for complications such as peritonitis and meningitis (1). Transanal migration of VP shunts is estimated to occur in 15% of bowel perforations (1). Although there have been reports of meningitis following transanal migration of a VP shunt, to our knowledge there have been no cases involving meningitis caused by methicillin-resistant *Staphylococcus aureus* (MRSA).

CASE REPORT

History

The patient is a 2-month-old female with a history of grade III intraventricular hemorrhage status post-VP

shunt placement who was born prematurely at 35 weeks gestation. She was brought into the pediatric emergency department (ED) by her mother, who noted a white tube protruding from the patient's anus. The mother reported that the patient had been eating and drinking well, acting normally, and was afebrile. The patient has no history of seizures and had no seizure-like activity at home before presentation. Surgical history is significant only for the VP shunt placement.

Physical Examination

Upon arrival, her heart rate was 148 beats/min, blood pressure was 114/62 mm Hg, respiratory rate was 36 breaths/min, temperature was 36.6°C, and pulse oximetry measured 100% on room air. On initial evaluation, the patient was noted to have a white tube protruding from her anus (Figure 1).

ED Course

The patient began seizing with left eyelid twitching, left outward eye deviation, and left arm twitching, which generalized to a tonic-clonic seizure. She was given midazolam and stopped seizing. She was given a loading dose of levetiracetam. The neurosurgical team was consulted and cerebrospinal fluid (CSF) was obtained from the VP shunt. The patient was started on vancomycin, ceftriaxone, and gentamicin. Plain radiographic shunt series showed an intact VP shunt terminating external to the patient's body (Figures 2 and 3). A computed tomography (CT) scan of the head was obtained, which showed enlargement of the ventricles and a subdural hemorrhage.



Figure 1. Ventriculoperitoneal shunt protruding from anus.



Figure 2. Intact intracranial ventriculoperitoneal shunt.

RESULTS

Laboratory evaluation of the patient's blood showed a white blood cell (WBC) count of $36.3 \times 10^9/L$, hemoglobin of 7.4 g/dL, hematocrit 23.7%, and platelets of $828 \times 10^9/L$. CSF studies showed WBC count of 5385 cells/mL with 92% segmented neutrophils, 35 red blood cells/mL, glucose < 5 mg/dL, and protein of 586 mg/dL. CSF Gram stain was positive for Gram-positive cocci. CSF cultures grew MRSA. Blood cultures showed no growth at 5 days.

Outcome

The CT scan was concerning for worsening hydrocephalus, likely due to shunt dysfunction secondary to distal displacement. This dysfunction, in addition to a confirmed shunt infection, prompted urgent transfer of the patient to the operating room for externalization of her shunt. The patient was then admitted to the pediatric intensive care unit. After CSF cultures returned positive for MRSA, her treatment regimen was changed to vancomycin and linezolid. Her condition improved and she was discharged from the hospital 5 weeks after her initial presentation.

DISCUSSION

This case demonstrates an unusual complication of a VP shunt. A review by Hai et al. reported 94 cases of bowel perforation from a VP shunt, with 55 of those cases resulting in anal protrusion of the VP shunt (2). A search of the available literature revealed there are now 67 cases



Figure 3. Tip of the ventriculoperitoneal shunt extends outside the patient inferiorly.

describing anal protrusion of a VP shunt, including this patient (1,3–12). Of those, 17 cases presented with meningitis, 11 of which were due to *Escherichia coli* (1,2,9). None of these cases reported meningitis caused by MRSA. To the best of our knowledge, this is the first case of MRSA meningitis as a complication from transanal migration of a VP shunt to be reported in the literature.

It is unclear where this patient acquired MRSA. Although traditionally associated with health care institutions, community-acquired MRSA is increasing in prevalence (13). Physicians should therefore be on the lookout for more cases of community-acquired MRSA in the future.

WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?

This is a patient who had a complicated course of a shunt that had eroded into the colon and migrated outside the

anus. However, not all intestinal perforations from VP shunts will present so apparently. Furthermore, VP shunt bowel perforation is so rare that physicians outside of neurosurgery may not be aware of this complication in cases where the shunt is not protruding from the body, leading to a delay in diagnosis.

Additionally, nearly 50% of patients with a VP shunt bowel perforation can present with no signs of infection or abdominal pain (4). This is particularly pertinent in a pediatric setting, where patients are often unable to communicate their pain. Thus, it is important to consider the evaluation of CSF for infection in patients with a history of VP shunt placement due to the possibility of retrograde bacterial migration.

When meningitis is suspected, empiric antibiotic therapy should be initiated immediately after CSF fluid is obtained. A delay in treatment can result in detrimental outcomes. The overall mortality rate of a CNS infection after bowel perforation of a VP shunt is between 15% and 22% (14,15). Therefore, in a patient with a history of a VP shunt who presents with symptoms of meningitis, it is important for emergency physicians to heavily consider intestinal perforation by VP shunt as a possible etiology.

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