Case Report

Staphylococcus lugdunensis infection of ventriculoperitoneal shunt in adult: Case report and literature review

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Abstract

Ventriculoperitoneal Shunt (VPS) placement is one of the most commonly performed treatment modality in patient with hydrocephalus and infection is usually seen in such patients with shunt complication. Multiple shunt revision and its complications are related to various causes including mainly Coagulase negative Staphylococcus (CONS) infection. VPS obstruction occurring in proximal catheter is he most common cause of VPS malfunction. Here we present a case of Venticuloperitoneal shunt infection caused by CONS in a adult patient.

Keywords: Extraventricular device, staphylococcus lugdunensis, ventriculoperitoneal shunt infection

Introduction

Ventriculoperitoneal shunt (VPS) surgeries are one of the most common treatment options in neurosurgical practice.[1] It involves the surgical insertion of a shunt system that drains the excessive fluids into other body cavities where it can be reabsorbed. However, its effectiveness has been overshadowed by complications, such as infection and mechanical malfunction.[2] Shunt infection is one of the dreaded complications mainly associated with shunt placement and with an incidence ranging from 2 to 27%.[3] It is responsible for significant morbidity, leading to shunt malfunction and chronic ill-health.[4] Shunt infection is generally defined as the identification of a bacterial pathogen from the cerebrospinal fluid (CSF) both by gram stain and culture, in conjunction with CSF pleocytosis, fever, neurologic symptoms, and signs of shunt malfunction.[5] These infections are most frequently caused by skin colonizers like coagulase-negative *Staphylococcus* (CoNS) and *Staphylococcus aureus*. The most commonly associated CoNS species include *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, *Staphylococcus lugdunensis*, *Staphylococcus simulans,* and *Staphylococcus saccharolyticus.*[6] Gram negative bacteria are the next most frequent pathogens, accounting for 19 to 22% cases. First, shunt infection occurs due to infection, which may be acquired during the surgery or the retrograde spread from peritoneum, and second, when the shunt tube itself acts as nidus for infection by allowing organisms to form biofilm. The early detection and management of shunt infection with appropriate antibiotics along with prompt removal and replacement of alternative drainage system has been the mainstay of management. Here, we present a case of ventriculoperitoneal shunt infection (VPS) caused by coagulase-negative *S. lugdunensis*.

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Case Report

A 32-year-old female with a VPS presented to the neurosurgery outpatient department (OPD) of our tertiary care hospital with chief complaints of weakness in bilateral upper and lower limbs and altered sensorium for the past 2 weeks. She was a known case of pineocytoma along with obstructive hydrocephalus and had undergone right frontal burr hole with endoscopic third ventriculostomy and ventriculoperitoneal shunting 6 months back [Figures 1 and 2]. She was admitted for radiotherapy in the hospital 1 month back and after 6 days of radiotherapy developed limb weakness along with a headache and vomiting, which was managed conservatively. On the second day of admission, she had four episodes of generalized seizures and was admitted to intensive care unit (ICU), where further she had altered sensorium along with difficulty in moving limbs. Upon physical examination, the patient was febrile and conscious having Glasgow Coma Score (GCS) of 4/15 and all the deep tendon reflexes were diminished. Computed tomography (CT) scan brain revealed heterogeneous lesion with predominantly solid component in pineal recess–residual tumor along with obstructive hydrocephalus with trans ependymal CSF seepage. The initial investigation revealed fasting blood sugar 126 mg/dl and random blood sugar 289 mg/dl. The shunt was tapped, yielding ventricular fluid with 20 RBC/mm^3 and 40 WBC/mm^3 (70% neutrophils and 30% mononuclear cells), glucose of 79 mg/dl, protein of 71.4 mg/dl, and gram-positive cocci on gram stain. The shunt was externalized and an extraventricuar device was placed. Two ventricular fluid samples were sent and processed as per standard microbiological protocol, and Vitek 2 AST card was used for both identification and sensitivity. Both cultures grew *Staphylococcus lugdunensis* resistant to penicillin, but they were susceptible to all other antibiotics tested.

She became afebrile after 3 days of intravenous (IV) vancomycin and was discharged home after 10 days of IV oxacillin and reinternalization of her VPS. She was asked to follow-up to neurosurgery OPD after one month.

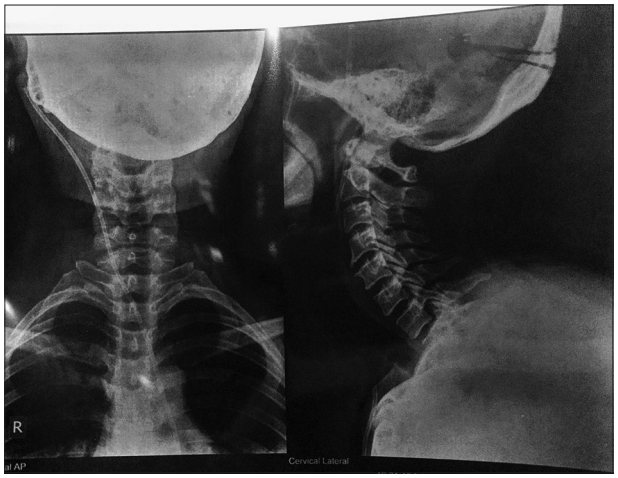

Figure 1: Cervical lateral X-ray showing the ventriculoperitoneal shunt

Discussion

VPS placement is one of the most commonly performed neurosurgical procedures and is necessary to treat most forms of hydrocephalus. Unfortunately, complications related to VPS placement are common, and multiple shunt revisions are almost expected throughout a patient's lifetime.[7] Infection is the second most common cause of shunt malfunction, with a considerable variation worldwide. Risk factors for shunt infection as reported by multiple studies include young age, postoperative (postop) CSF leak, glove holes during shunt handling, previous shunt infections, and etiology of intraventricular hemorrhage.[8-10]

Most *Staphylococcus* species are distinct from *Staphylococcus aureus* and known as CoNs, named for their inability to produce the enzyme coagulase. CoNs, which often occur as skin commensals, were considered innocuous or, rarely, opportunistic pathogens of low virulence. However, the important role of CoNS as pathogens, with particular regard to infections associated with indwelling medical devices, such as VP shunt, is becoming increasingly recognized as they have been notoriously found to be responsible for producing biofilms.[11] In 1988, Freney *et al.* isolated a new CoNS from human specimens. They called it *Staphylococcus lugdunensis* for Lyon, where the organism was first isolated.[12] The pathogenicity of this organism became apparent from the description of infections, including infective endocarditis, septicemia, deep tissue infection, vascular prosthesis infection, osteomyelitis, and skin infections.[13–16] It has also been identified in the central nervous system (CNS) infections. In our case, the shunt infection manifested an acute infection similar to that caused by *S. aureus* rather than that caused by S. *epidermidis*. The disease here had a virulent and prolonged clinical course with the production of destructive lesions again very similar to that of *Staphylococcus aureus*. Identification of *S. lugdunensis* is difficult because of the presence of its clumping factor, which is a heat-stable DNAse, easily misidentified as coagulase on the slide screening tests to differentiate *S. aureus* from CoNS. However, the tube coagulase test often used confirm the slide test, can properly

Figure 2: Abdomen supine anteroposterior showing ventriculoperitoneal shunt tip perforating the stomach and migrating up the esophagus

identify it as *S. lugdinensis*. In a recent study done by Krishna *et al.* in Kerala, CoNS were found to be present in 36% of the total isolates, where majority of them were methicillin-resistant.[17]

The preferred treatment involves surgical removal of the infected shunt, IV antimicrobial therapy, and installation of an extraventricuar device (EVD) as was done in this case to achieve complete clearance of the infecting organism. These EVDs are kept in place till the infection is cleared completely so that a new shunt can be placed safely.[18] It has been observed that the outcome of such patients is influenced considerably by the shunt infection itself.[19] However, many aspects of therapy are controversial because few controlled, comparative studies have been reported.

Conclusion

CSF shunt infection plays a significant role in patients who have undergone any neurosurgical procedure. Early detection and management of shunt infection with appropriate antibiotics along with prompt removal and replacement of the alternative drainage system has provided the best results. Therefore, isolates of CoNS grown from ventricular fluid samples with shunt infection should be speciated to identify *S. lugdunensis* infection so as to recommend a longer course of therapy (as recommended for *S.aureus* infections).

In addition, it is imperative that the surveillance of shunt infection be done with a feedback of appropriate data to surgeons in an attempt to reduce infection rate.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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