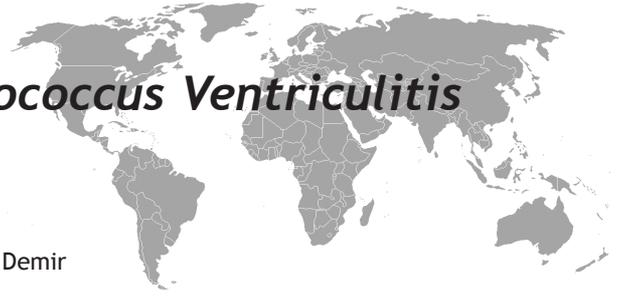


Vancomycin-resistant *Enterococcus* Ventriculitis in a Child



Nejmi Kıymaz, Burhan Oral GÜdü , Metehan Eseoğlu, İsmail Demir

ABSTRACT

One of the most frequently encountered problems associated with ventriculoperitoneal (VP) shunts which are used in the treatment of hydrocephaly is infection. *Staphylococcus* is considered the most prominent factor in VP shunt infections; *Enterococcus* is less likely to cause ventriculitis in such patients. A shunt ventriculitis was demonstrated in a 1.5-year-old boy. The VP shunts was removed and an external ventricular drainage system was inserted. Subsequently empiric vancomycin and cephotaxime treatment was started. Vancomycin-resistant *Enterococcus faecium* (VREF) began to proliferate in the cerebrospinal fluid culture, and therefore we initiated linezolid and imipenem therapy by the intravenous route. The patient underwent a VP shunt operation 45 days after. In this study, successful therapy with linezolid in VP shunt ventriculitis due to VREF is presented.

Key words: Child, ventriculitis, linezolid

Bir Çocukta Vankomisin Dirençli Enterokok Ventrikülit

ÖZET

Hidrocefalinin tedavisinde yaygın olarak kullanılan ventrikülo-peritoneal (VP) şantlarda, karşılaşılan zorlukların başında şant etkisizlikleri gelmektedir. VP şant enfeksiyonuna bağlı ventrikülit tespit ettiğimiz 1,5 yaşındaki erkek hastada VP şantı çıkarıp, eksternal ventriküler drenaja aldık. Ampirik olarak vankomisin ve sefotaksim tedavisi başlandı. Beyin omurilik sıvısı kültüründe vankomisine rezistans enterobakter *facium* üremesi üzerine intravenöz linezolid ve imipenam tedavisi başlandı. 45 gün sonra hastaya tekrar VP şant takıldı. Bu çalışmada vankomisine rezistans enterokok ventrikülitinin linezolid ile başarılı tedavisini sunduk.

Anahtar kelimeler: Çocuk, ventrikülit, linezolid

INTRODUCTION

One of the most important difficulties encountered with ventriculoperitoneal (VP) shunts, which are widely used in the treatment of hydrocephaly, is infection. Shunt infections occur in 0.17%-33% of cases and the mortality rate is 10%-13% (1,2). The most frequent pathogen underlying VP infections is coagulase-negative *Staphylococcus*; *Enterococcus* is a rare pathogen in VP infections (3,4). Clinically, *Enterococcus* may frequently cause urinary tract infections and urosepsis, while central nervous system infections are uncommon (5). There are only a few number of cases in the literature in which linezolid has been used in the treatment of VP shunt

ventriculitis due to *Enterococcus faecium* (VREF), a microorganism resistant to vancomycin in the pediatric group (6-9). Herein we introduce a treatment of a VP shunt ventriculitis by the means of linezolid.

CASE

The patient is a one year old boy who referred to our clinic due to a puffiness at the site of the ventriculoperitoneal shunt connector. The patient referred before because of the same complaints and the shunt was revised and the patient was treated at the hospital twice. The patient is conscious, agitated and his body temperature

Department of Neurosurgery, University of Yuzuncu Yil, School of Medicine, Van, Turkey

Correspondence: Nejmi Kıymaz, Yuzuncu Yil Üniversitesi Tıp Fakültesi, Araştırma Hastanesi, Beyin Cerrahisi Kliniği, Van, Turkey
Phone: 90.432.2164710/6841 - 90.532.4160980
fax: 90.432.2167519 E-mail: nejmikiymaz@yahoo.co.uk - nkiymaz@hotmail.com

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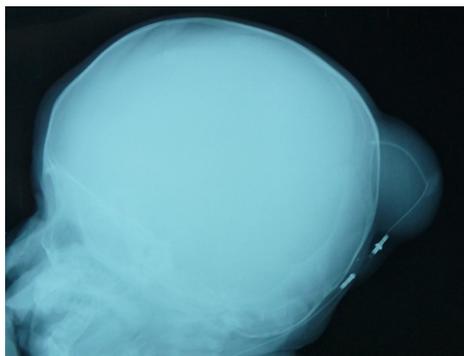


Figure 1. Dysfunctional VP shunt proximal catheter located in the collection under the scalp of the cranial lateral graph.



Figure 3. Appearance of the subdermal collection of a patient with VP shunt dysfunction prior to surgery.

is 37.2° C while there was no finding related with a stiff-neck. Radiological studies showed that, in direct cranial graphs the proximal catheter was collected under the scalp (Figure 1). In a brain tomography study, it was also found that the proximal catheter came out from the ventricle and was located under the scalp (Figure 2). The patient was diagnosed with a VP shunt dysfunction and immediately underwent surgery (Figure 3). During

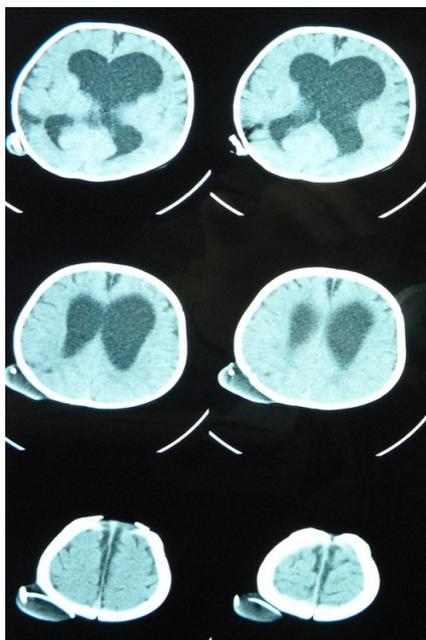


Figure 2. Axial-sectioned brain tomography demonstrating a malposition of the VP shunt proximal catheter located under the scalp.

surgery, a culture was obtained from the brain cerebrospinal fluid (CSF) and a direct cell count was performed. A direct microscopic study indicated 400 segmented leukocytes in the brain CSF, which suggested ventriculitis. Therefore, the VP shunt was removed and an external ventricular drainage system (EVDS) was inserted. Empiric vancomycin and meronem were administered. Enterococcus faecium resistant to vancomycin was demonstrated in two CSF cultures and the current therapy regimen was thus changed and a combination of 2 doses of linezolid (20 mg/kg/day) and 4 doses of imipenem (60 mg/kg/day) was started. The EVDS was replaced once every 10 days and the CSF cell count and CSF biochemical analysis were performed on a regular basis. A weekly hemogram and biochemical studies were conducted. Direct microscopic study indicated no cells in the CSF, whereas the CSF biochemical level was appropriate for a shunt insertion and a VP shunt was re-inserted after successful therapy with empiric vancomycin for 20 days, meronem, and linezolid for 10 days and imipenem. The 3-month follow-up was assessed as normal.

DISCUSSION

VREF is a rare pathogen causing meningitis; VREF arises from nosocomial infections. As the use of wide spectrum antibiotics increases, resistances occur (9). The most frequent problem of a VP shunt is infection. The most frequent shunt infection is caused by *S. epidermidis*, with *Staphylococcus aureus* ranked second, while *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus*, *Pseudomonas*, and *Enterococcus* are less frequent (10). *Enterococcus* is a

facultative, anaerobic gram-positive coccus formed in single, dual, or short chains. Enterococcus comprises the normal gastrointestinal system flora. Enterococcus frequently may lead to urinary system infections, intra-abdominal and pelvic infections, bacteremia, dermal and soft tissue infections, meningitis, and neonatal sepsis (11). Even though Enterococcus does not have a classic virulence factor, super-infections may occur due to resistant behavior against multiple antibiotics and the use of wide spectrum antibiotics. Enterococcus has an increasing tendency to produce hospital infections. The most important reservoir among patients who are hospitalized is gastrointestinal colonization. Colonization in devices and medical tools may serve as a reservoir. Transmission is possible from patient-to-patient by means of infected healthcare personnel. Vancomycin resistance observed in nosocomial Enterococcus infections has increased in the past 10 years, and therefore a necessity has emerged to use a new group of antibiotics. Linezolid, chloramphenicol, and quinupristin/dalfopristin are used in the treatment of VREF infections (12). The mentioned antibiotics were used successfully in the treatment of VREF that proliferated in two separate CSF cultures from our patient, as VREF was sensitive against linezolid and imipenem. Kremery et al. (13) described the major risk factors in the development of meningitis, including a neurosurgical operation (70%), VP shunt (42.9%), previous administration of wide spectrum antibiotics, use of central venous catheters, low birth weight, and the use of total parenteral nutrition. In our case, our patient had undergone a VP shunt revision and was treated with ceftriaxone and ampicillin, which were assessed as risk factors.

Linezolid is the first member of the oxazolidinone family and inhibits protein synthesis by connecting to the 50s ribosomal unit. The drug possesses a bacteriostatic effect. Linezolid can be used in adults and children with VREF infections, *E. faecalis* infections, methicillin-resistant *S. aureus* infections (MRSA), penicillin-resistant *S. pneumoniae* infections, which include coagulase-negative staphylococcal and streptococcal infections (14). Linezolid can pass the blood-brain barrier and provide an effective treatment of ventriculitis in sensitive infections in which the concentration in the plasma achieves a ratio of 70% (15). Dose-dependent neutropenia and thrombocytopenia have been reported in adult patients as side effects of linezolid; however, these conditions are less frequent in children. Linezolid may cause a

transient bone marrow depression if used over 2 weeks. It is essential to perform weekly blood counts of patients (16). In our case, no differences were observed in the weekly hemogram and biochemical values, which may be considered as side effects.

The presence of a shunt may significantly increase the risk of ventriculitis. The increase in the use of wide spectrum antibiotics and long-term hospitalization accompanied with neurosurgical operations, can lead to nosocomial infections. The therapy regime in a VP shunt ventriculitis is to remove the infected shunt and administer an appropriate antibiotic which is effective on the CSF culture and to re-insert the VP shunt after CSF is sterile. In the present study, it was demonstrated that linezolid is an effective and safe drug in the treatment of a VP shunt ventriculitis during the pediatric term.

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