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CASE REPORT
OLGU SUNUMU

Serratia Spp. Meningitis in A Child with Venticulo-Peritoneal Shunt

Ventrikulo-peritoneal Şantlı Çocukta *Serratia* Spp. Menenjiti

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Abstract

Serratia species are opportunistic, gram-negative, motile bacteria classified in the *Enterobacteriaceae* family. Sometimes they can also cause nosocomial infections. These infections are responsible for approximately 2% of infections, especially in newborns and patients in the intensive care unit. There are articles about this bacterium causing an epidemic. It is seen that they mostly cause pneumonia, urinary tract infections, sepsis and wound infections. In this study, acute bacterial infection due to *Serratia* spp in a three and a half year old girl with ventriculoperitoneal (VP) shunt was investigated. We aimed to present a case with meningitis.

Keywords: *Serratia*, ventriculoperitoneal shunt, acute bacterial meningitis, child

Öz

Serratia türleri *Enterobacteriaceae* familyasında sınıflandırılan fırsatçı, gram negatif, hareketli bakterilerdir. Bazen nozokomiyal enfeksiyonlara da neden olabilmektedirler. Bu enfeksiyonlar özellikle yenidoğanlarda ve yoğun bakımdaki ünitesindeki hastalardaki enfeksiyonların yaklaşık %2'sinden sorumludur. Daha çok pnömoni, idrar yolu enfeksiyonları, sepsis ve yara yeri enfeksiyonlarına neden oldukları görülmektedir. Bu bakterinin salgın yaptığına ait makaleler bulunmaktadır. Bu çalışmada,üç buçuk yaşındaki ventrikülöperitoneal (VP) şantlı bir kız çocuğunda *Serratia* spp'ye bağlı gelişen akut bakteriyel menenjitli olgu sunmayı amaçladık.

Anahtar Kelimeler: *Serratia*, ventrikülöperitoneal şant, akut bakteriyel menenjit, çocuk

INTRODUCTION

Serratia species are opportunistic, gram-negative, motile bacteria classified in the large family *Enterobacteriaceae* and differentiate from *Klebsiella* spp. with slow fermenting lactose and DNAase positivity (1,2). One of the characteristics of *Serratia* bacteria that distinguishes them from other bacteria is to synthesize the red prodigiosins. It can cause nosocomial infections especially in newborns and patients in intensive care units. *Serratia* spp.; responsible for approximately 2% of nosocomial infections; has been reported as the responsible agent especially in respiratory tract infections, urinary tract infections and bacteremia. An outbreak of *S. marcescens* blood stream infection has been identified in patients receiving contaminated parenteral nutrition bags (2). It has been reported to cause *S. marcescens* meningitis, wound infections, arthritis and outbreaks in pediatric wards (3). In this article, we aimed to present the case of a three and a half year old girl with ventriculoperitoneal (VP) shunt who developed acute bacterial meningitis due to *Serratia* spp.

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CASE REPORT

Three and a half years old female patient who had ventriculoperitoneal (VP) shunt due to hydrocephalus, was brought to our hospital by her relatives because of vomiting and continuous fever for the last 2-3 days. The patient was alert and non well oriented. The Glasgow Coma Scale (GCS) detected as 14, respiratory rate: 30/min, pulse: 100/min and oxygen saturation 96%. Neurological examination showed a stiff neck and Kernig-Brudzinski tests were negative. Fundoscopic examination was normal. Initial complete blood count showed a white blood cell (WBC) count of 16.5 10^9/L (Normal range (NR): 4-10 10^9/L), 73% neutrophils, hemoglobin 9 g/dL (NR: >12 g/dl), platelets 585 10^9/L (NR:>150 10^9/L), CRP 158 mg/L (NR <10 mg/L) urinalysis returned 2+ for leykocyte esterase, 1+ for nitrite and WBC: 20 p/hpf. Since there was a previous history of VP shunt infection in her medical history, neurosurgery was consulted to evaluate possible VP shunt dysfunction and central nervous system (CNS) infection and to perform cerebrospinal fluid (CSF) sampling. A computerized tomography (CT) scan showed no dysfunction of VP shunt or abscess. CSF sample was taken from the VP shunt reservoir under sterile conditions to rule out CNS infection. CSF culture had no growth. Analysis of CSF revealed a decreased glucose concentration of 5 mg/dL and an increased protein concentration of 165 mg/dL. Blood glucose level was 111 mg/dL. The patient was hospitalized with empiric meropenem 60 mg/kg/day (IV) and vancomycin 60 mg/kg/day (IV) treatments. Meropenem was increased to 120 mg/kg/day IV dose when the WBC: 36.7 10^9/L, CRP: 130 mg/L, which was checked upon the persistence of fever at the 48th hour of the hospitalization. CSF culture had suspicious red/pink pure colonies (**Figure 1**), so manuel identification (**Figure 2**) was performed.

TSI slant was detected as alkaline/acid (red slant/yellow butt), urea negative, sitrate positive, indole negative and rated as *Serratia* spp. Antibiotic selection was made according to The European Committee on Antimicrobial Susceptibility Testing (EUCAST) 2019 criteria and antibiogram was performed with disk diffusion method (**Figure 3**). Blood culture and urine culture had no growth. VP shunt function was evaluated and the shunt was changed. The current antibiotherapy was continued for a total of 21 days. CSF culture taken after shunt replacement remained sterile. The patient was discharged with full recovery and had no complaints in follow ups.

Figure 1. Red / pink pure colonies on Blood Agar Medium

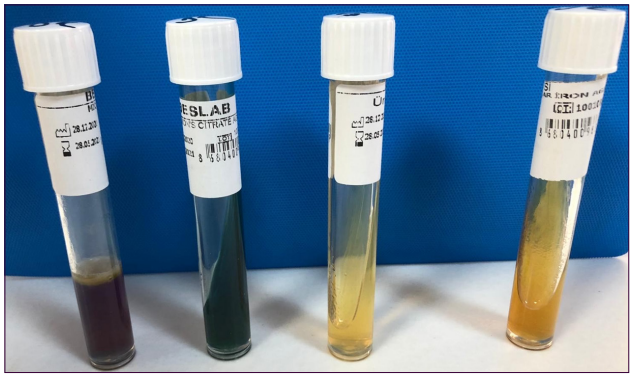

Figure 2. Manual Identification: TSI positive, Citrate positive, Urea negative, Indole

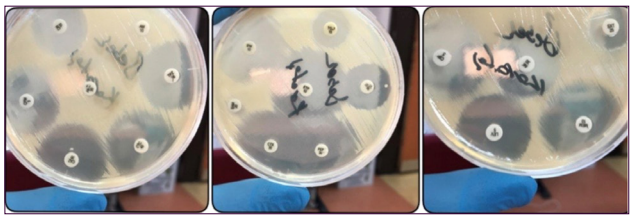

Figure 3. According to EUCAST 2019 Criteria according to the Müller Hilton Media Disc Diffusion Method-Imipenem, meropenem, ertapenem susceptible; cipro, levofloxacin susceptible; susceptible to amikacin, gentamicin; ampicilin, nitrofurantoin resistant.

DISCUSSION

Meningitis caused by *Serratia* spp., a rare pathogen of central nervous system, it was first reported in the year 1952 by two different researchers (4). Meningitis outbreak due to *S. marcescens* after spinal anesthesia in 12 patients was also reported from our country by Ersöz et al. (5). Apart from these cases, *Serratia* meningitis case or a similar case reported in a pediatric patient in our country were not found in the available literature.

However, in the international literature, CNS infection cases caused by *Serratia* spp. have been reported in newbors and children (6-11). The largest study on *S. marcescens* meningitis in the English literature available on this subject is the one made by Wu et al. (11). In this study, cases occurred sporadically over a period

of 10 years and all registered patients were detected in different wards or ICUs. It was important because it shows that *S. marcescens* may be a factor in meningitis outside of outbreaks. Our case was also sporadic and *Serratia* spp. reproduction was not detected. Also, no similar cases were found as a result of active surveillance performed by the infection control committee in the ward where the patient was admitted. Although nosocomial infection was considered in the patient, the patient whose VP change was performed 2 years ago had a growth at the time of admission.

Serratia meningitis or cerebral abscesses may develop in premature children and newborns with previous sepsis. Patients with a history of head trauma, cranial operation, lumbar puncture, or even epidural injection, brain tumor, mastoiditis, or chronic sinusitis are at risk of developing CNS infection (meningitis or cerebral abscess) due to *Serratia* spp. (1-11). Particularly, prosthetic devices, including external cerebrospinal fluid drainage catheters and VP shunts, facilitate bacterial colonization and provide a potential route intothe CNS (11). Compared with other Gram-negative meningitis, *S. marcescens* meningitis is more common in post-neurosurgical patients (11). In a study made by Chang et al. (12); a study about post-neurosurgical meningitis, *S. marcescens* has been reported to be the most common gram-negative pathogen, accounting for approximately 10% of the 69 isolates identified. The patient presented also had a VP shunt. Chang et al. (12) reported that 88.3% of the growths in CSF cultures of the patients were monomicrobial and 11.7% were polymicrobial. There was monomicrobial growth in the presented case.

Fever and vomiting are among the most common causes of concern for parents and admissions to the emergency departments (13). The symptoms described in cases with *Serratia* meningitis in the literature have been defined as headache, fever, vomiting, drowsiness, coma; which are typical symptoms seen in other gram-negative meningitis (6-10). The presented case also had fever and vomiting but the headache could not be clearly evaluated due to her age. She was also alert and oriented. The diagnostic criteria for *Serratia marcescens* meningitis were based on the isolation of *S. marcescens* from CSF cultures with at least one of the following findings consistent with meningitis: clinical manifestations, such as fever, seizure, altered consciousness, or signs of meningeal irritation; and laboratory evidence, including a decreased CSF glucose concentration, increased lactate (>36 mg/dL) and protein (>32 mg/dL) concentrations and pleocytosis (10 white blood cell/mL) with neutrophil predominance. The presented patient had a stiff neck, fever, decreased CSF glucose concentrations, increased protein concentrations and CSF culture positive. LDH could not be examined due to the lack of a kit.

Recent epidemiological data have shown an increased frequency of antimicrobial resistance among *S. marcescens* isolates. In a study, all *S. marcescens* isolates from the first positive CSF sampling, 31 of whom developed meningitis after neurosurgery, were found to be suspecible to ceftriaxone, ceftazidime, imipenem, amikacin and gentamicin. Esistance to third-generation cephalosporins wasonly detected in one CSF isolate (11). Antibiotic therapy with or without neurosurgical intervention (shunt removal and/or abscess drainage) was reported as the main treatment for the patients (5-12). We also applied meropenem treatment to our patient. After the patient's VP shunt was replaced, the control CSF culture remained sterile.

Serratia marcescens meningitis was reported to have a lower mortality rates than other gram-negative meningitis (5-10, 12). Wu et al. (11) reported that the comparison of GCS change between the onset of *S. marcescens* meningitis and at the end of treatment for meningitis could be more practical for physicians to predict the prognosis. In the presented case, GCS was 14 at the time of admission, and the patient recovered without sequelae after antibiotherapy and VP shunt replacement.

CONCLUSION

It should not be forgotten that *Serratia* genus may also be a factor in CNS infections in patients with a history of neurosurgery operation or VP shunt, and CSF culture should be taken.

ETHICAL DECLARATIONS

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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