

Providencia rettgeri Meningitis: A Case Report

Wajiha Khan^{1*}, Hina Bai¹ and Syeda Ismat Bukhari²

¹Resident, Pediatrics and Child Health Department, The Aga Khan University Hospital, Karachi, Pakistan

²Senior Medical Officer, Pediatric Emergency Department, The Aga Khan University Hospital, Karachi, Pakistan

***Corresponding Author:** Wajiha Khan, Resident, Pediatrics and Child Health Department, The Aga Khan University Hospital, Karachi, Pakistan.

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Abstract

Providencia rettgeri is a gram negative opportunistic organism from Enterobacteriaceae family. These pathogens are mostly related to urinary tract and nosocomial infections but now are being seen to involve multiple organs. Meningitis by *Providencia* is rare and has been reported by *Providencia stuartii* in past. In our case report we are going to present a case of meningitis by *Providencia rettgeri* in 11 months old male who was known case of aqueductal stenosis and came with abdominal complications of ventriculoperitoneal shunt (VPS). Patient underwent exploratory laparotomy and VPS was removed due to persistent fever and switched to EVD. Repeat cerebrospinal fluid (CSF) cultures were showing growth of multiple organisms. After adequate treatment with both intravenous and intrathecal antibiotics as per drug sensitivity pattern, CSF cultures reported negative. VPS placed again. Patient also had malaria vivax infection which was treated as per malaria treatment guideline. With combined efforts of both medical and surgical management patient got improved and discharged home.

Keywords: *Providencia rettgeri*; Meningitis; Malaria; Ventriculoperitoneal Shunt; Case Report

Abbreviations

VPS: Ventriculoperitoneal Shunt; EVD: External Ventricular Drain; CSF: Cerebrospinal Fluid; IV: Intravenous; NDM-1 β -Lactamase: New Delhi Metallo-Beta-Lactamase 1

Introduction

Meningitis is a life-threatening illness which can be viral and bacterial. Most common organisms for meningitis are *Haemophilus influenzae* type b (Hib), *Streptococcus pneumoniae*, and *Neisseria meningitidis* during post neonatal period in children [1]. The incidence of bacterial meningitis has decreased markedly after introduction of vaccines in post neonatal periods as a part of routine immunization [2]. *Providencia* is a gram-negative urease-producing *Bacillus* belongs to the family Enterobacteriaceae including *Providencia rettgeri*, *P. stuartii*, *P. rustigianii*, *P. alcalifaciens*, and *P. heimbachae* [3]. It was first discovered by Rettger (1909) initially seen in chicken during a cholera like epidemic. It was anaerobic and was fermenting mannitol [4]. *Providencia* species have been found to cause mostly urinary tract infections and gastroenteritis [5]. It is an uncommon to cause infections but usually nosocomial. We are presenting a case of *Providencia rettgeri* which was isolated from the CSF of a patient.

Case Report

A term male infant (37 weeks) presented in ER at 11 months of age with weight 8.5 kg, Height 80 cm, FOC 53 cm, came with complaints of vomiting, abdominal pain, constipation and decreased oral intake. The infant was born to 2nd gravida mother with uneventful antenatal and postnatal course via elective cesarean section. Also had history of umbilical hernia repair at birth. Patient was alright up to 7 months of age then developed fever and increase in head circumference which was diagnosed as hydrocephalus secondary to aqueductal stenosis, right sided VPS placed but got blocked in about 2 months so left VPS placed which got blocked as well so underwent revision of lower end of shunt. CSF sample sent for culture that reported *Providencia rettgeri* and *Enterococcus* that was sensitive meropenem, vancomycin and resistant to trimethoprim-sulfamethoxazole, gentamycin, ceftriaxone and piperacillin-tazobactam. On clinical examination patient was sick pale looking lying on bed with sunset eyes. Abdomen was distended and shining with prominent veins. On palpation abdomen was soft non tender, tympanic on percussion shifting dullness was positive, gut sounds were not audible. Rest of systemic examination unremarkable.

Patient was suspected to have intestinal obstruction, kept Nil per oral on IV fluid, laboratory markers were suggestive of infection. Patient started on IV meropenem and vancomycin. Nasogastric tube passed. X-rays and CT scan abdomen with contrast reported small bowel obstruction, secondary to underlying adhesion/bands and bilateral VPS. CT head showed bilateral VPS with bilateral gross hydrocephalus involving lateral and third ventricle.

Patient had exploratory laparotomy + resection of distal ileum + end ileostomy + primary + lambert's repair of jejunum under general anesthesia. Intraoperative findings showed clear ascitic fluid filled bowel loop, dense adhesions between small bowel loops. Right VPS lying within distal segment of ileum. Left VPS tip adherent between jejuno-ileum adhesions. Postoperatively, the patient was initially kept nil per oral. Intravenous hydration was continued. Oxygen support was added. Nasogastric tube was passed, stoma output was measured and replaced with ringer lactate. Chest physiotherapy was done. Stoma care was explained to the family. Nasogastric tube was eventually removed as patient improved, and oxygen was tapered off. Orally allowed. Later on repeat CSF culture reported few colonies of *Streptococcus* Group D sensitive to ceftriaxone, chloramphenicol and vancomycin and few colonies of *Citrobacter diversus* sensitive to amikacin, ciprofloxacin, imipenem and meropenem so antibiotic was switched to ceftriaxone and amikacin.

Repeat CSF culture after 72 hours of antibiotics reported heavy growth of *Pseudomonas aeruginosa* that was sensitive to aztreonam and ceftazidime, with intermediate sensitivity to meropenem and colistin. Had issues of fever so antibiotics escalated to meropenem, vancomycin and colistin, fluconazole added as antifungal coverage. Patient underwent bilateral VP shunt removal and left side EVD placement under general anesthesia. Workup showed *Plasmodium vivax* so artemether/lumefantrine was given for 3 days followed by primaquine. Antibiotic changed to ceftazidime and intrathecal amikacin.

Patient had hyponatremia for which endocrinology team was taken on board. Sodium was optimized by per oral hypertonic saline and fludrocortisone. Repeated malarial parasite report was negative and CSF cultures finally showed no growth, intrathecal amikacin stopped after 7 days. EVD was removed and patient now underwent VA Shunt placement under general anesthesia. CBC showed raised WBC predominantly neutrophil so vancomycin added which also stopped once labs improved. Biopsy specimen of small bowel reported negative for granuloma and malignancy. Patient then discharged off antibiotics.

Discussion

Providencia is gram negative opportunistic pathogen found in both humans and insects [6]. They are known to cause urinary tract and nosocomial infections in humans [7]. First described by Rettgeri in 1909 during cholera epidemic from chicken resembling fowl cholera [4]. It has the following types including *Providencia rettgeri*, *P. stuartii*, *P. rustigianii*, *P. alcalifaciens*, and *P. heimbachae* [3]. *Providencia* species are usually most of the infection are related to *Providencia stuartii* that has frequently been found with other uropathogens in patients with indwelling long term catheter [8].

There are two cases of meningitis reported by *Providencia stuartii* in adult patients, both were males with the age of 36 years [9] and 57 years [10] but CSF infections with *Providencia rettgeri* are rare. There was one case report showing *Providencia rettgeri* as a cause of cryptogenic giant brain abscess in 39 years old male that mimicked as stroke, patient was having history of immunosuppressant therapy due to nephrotic syndrome and membranous nephropathy [11]. In pediatric population there is only one case report in our knowledge that reported *Providencia rettgeri* in blood culture of a neonate with the antibiotic sensitivity to meropenem, imipenem, chloramphenicol, and cotrimoxazole while resistance was found with ampicillin, amikacin, amoxicillin-clavulanate, cefazolin, cefepime, cefotaxime, ceftazidime, cefixime, ceftriaxone, cefoperazone-sulbactam, ciprofloxacin, colistin, ertapenem, gentamicin, levofloxacin, ofloxacin, piperacillin + tazobactam, piperacillin, ticarcillin, and tobramycin [12]. *Providencia rettgeri* has shown resistance to many drugs like penicillin, first-generation cephalosporins, polymyxins, and tigecycline, its multi-drug resistance pattern is becoming a challenge now [13]. One study by Tshisevhe, *et al.* has reported carbapenem-resistant outbreak with *Providencia rettgeri* including imipenem, ertapenem and meropenem in 4 patients admitted in intensive care unit of South Africa [14]. Another study from Korea reported carbapenem-resistant *Providencia rettgeri* which were co-producing NDM-1 and PER-1 β -lactamase [15].

Conclusion

Providencia rettgeri is a rare organism mostly opportunistic and associated with urinary tract infection but as the cases are now being seen in CSF as well along with broad spectrum antibiotics resistance. Its spectrum of infection has been reported in multiple organs over the period of time. One our case there was an abdominal VPS complication with co-infection of Malaria Vivax. Further studies must be done to estimate its prevalence, association, specifically in immunocompromised hosts in which it can lead to serious complications.

Ethical Approval and Consent to Participate and Publish

Informed consent was obtained from parents of patient for using the case details for publication in journal as well for other study purpose.

Availability of Data and Material

Case details are not publicly available but are available from the corresponding author upon reasonable request.

Conflicts of Interests

None.

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