

Case Report

Multi drug resistant *Acinetobacter baumannii* infection in post traumatic hydrocephalus. A case report

Dr. Riaz Ahmed Syed

Abstract

Consultant Paediatric neurologist,
King Fahad Military Hospital, Jeddah-
21159, Saudi Arabia

E-mail: paedbrain@yahoo.com; Tel:
00966 535556205

Managing *Acinetobacter baumannii* infection is challenging during the treatment of infected ventriculoperitoneal shunt due to its propensity to develop multi drug resistance (MDR) to commonly used potent antibiotics in hospital settings. We present one such case with the challenge in its management.

Keywords: *Acinetobacter baumannii*, hydrocephalus, multi-drug resistance (MDR)

INTRODUCTION

Open Head injuries are likely to get complicated with meningitis and children are no exception. The incidence has been quoted from as low as 0.3% to 25% (Lau et al., 1986). *Streptococcus pneumoniae*, namely, group A streptococcus, and *Haemophilus influenzae* are common causative organisms responsible for most of the cases (Wilson et al., 1991). *S. pneumoniae* however has been the most common bacteria, and this favors the recommendation that children with head trauma and cerebrospinal fluid leakage should receive pneumococcal vaccine along with close monitoring later (Santos et al., 2011). Hydrocephalus is a common complication after head injury in children which invariably require placement of ventriculoperitoneal shunt. Children with ventriculoperitoneal shunt face higher risk of infection, compared to normal. The bacteriological profile of such patients is different than the normal children and requires a different line of management plan. The most common organisms isolated from cerebrospinal fluid (CSF) shunts are coagulase-negative staphylococci, followed by *Staphylococcus aureus* and *Pseudomonas aeruginosa* (Filka et al., 1999). However anaerobic bacteria like *Bacteroides* spp., *Bacteroides fragilis*, *Fusobacterium* spp., and *Clostridium* spp.

Peptostreptococcus, *Veillonella*, *Actinomyces*, *Propionibacterium acnes*, and *Eubacterium* are less

commonly isolated from shunt infections (Brook, 2002). *Acinetobacter baumannii* has emerged as a major cause of healthcare-associated infections and it is an important pathogen which causes severe nosocomial infections such as meningitis. *Acinetobacter baumannii* meningitis has been reported in the recent past from patients who have ventriculoperitoneal shunts (Brook, 2002). *A. baumannii* is a pleomorphic aerobic gram-negative bacillus (similar in appearance to *Haemophilus influenzae* on Gram stain) commonly isolated from the hospital environment and hospitalized patients. Multidrug resistance is a growing problem throughout the world. Various modalities have been tried by different centers; a consensus does not exist for pediatric population due to limited case reports as well as lack of uniform approach. The use of toxic fourth generation of antibiotic is also less documented. Here we report first case of its kind from pediatric population treated without intrathecal use of antibiotic and colistin in combination of tigecycline from kingdom of Saudi Arabia.

CASE REPORT

Seven years old Yemeni girl developed post traumatic hydrocephalus following sequel of road traffic accident

along with other injuries to hip joint and blunt abdominal trauma. She was treated in Yemen, in a private hospital intensive care unit, for more than a month; a craniotomy was done and a ventriculoperitoneal shunt was placed. She was discovered to have mastoid and middle ear infection along with meningitis, and cerebro-spinal fluid grew *Pseudomonas aeruginosa* as well in blood and sputum. She had received vancomycin, meropenem and azithromycin (undocumented duration and doses) from the referral hospital earlier. A poor clinical response with recurring fever along with persistence VP shunt infection and ventriculitis were documented and referred to our service, for better medical facilities. The MRI brain at the primary hospital showed persistence of dilated ventricular system along with post contrast enhancement of the tract of VP shunt, denoting persistence of infection. Her clinical examination showed an obtunded bedridden girl with hemiparesis of left side and no verbal response. There was no cranial nerve palsy; however she needed NG feeding for nutrition. She was found to have MRSA positive from the skull wound on initial screening on admission which was sensitive to Vancomycin, ticoplanin and clindamycin along with trimethoprim-sulfamethoxazole. The CSF however grew *Acinetobacter baumannii* with resistance to all third generation cephalosporins including cefepime, ceftazidime, imipenem, meropenem, and piperacillin/tazobactam. A trial combination of clindamycin (3 days) cotrimoxazole (10 days), fluconazole (14 days) Meropenem (12) cefotaxime (7 days) was started as an initial management by general pediatrician for the two weeks; the neurosurgeon removed the VP shunt and placed an external drain for CSF drainage. However it did not produce the desirable clinical response with persistent constitutional symptoms of low grade fever and the constant presence of resistant *Acinetobacter baumannii* shown in CSF. The case was referred to pediatric neurology service later for opinion and management; the sensitivity of CSF culture was reviewed and revisited and it was found to be sensitive only to tigecycline, cotrimoxazole Teicoplanin; however sensitivity to Colistin was not available in our laboratory. A simultaneous growth of *Enterococcus Faecium* was also found, sensitive to Teicoplanin and vancomycin once only.

Tigecycline with a dose of 3 mg / kg / day divided in two dosages intravenously along with Colistin 90,000 units per kg per day divided three times a day intravenously was instituted for 6 weeks produced clearance of CSF in two weeks. Routine liver functions as well blood count were monitored during the therapy. CSF culture sensitivity was checked regularly through the external drainage system which became sterile after 6 weeks and enabled the neurosurgeon to place new shunt. Her general condition improved remarkably; she started to take orally and became more interactive, even though a persistence colonization of sputum with *Pseudomonas aeruginosa* was observed. Blood culture revealed no

growth throughout. During three months of stay in our hospital, an extensive physiotherapy and rehabilitation was ensured along with placement of new shunt. She was successfully discharged. A three monthly follow up for one year showed marked improvement in cognition and mobility from dependant to self sufficient state.

DISCUSSION

Acinetobacter baumannii is a major cause of nosocomial infections worldwide. The infection caused by *Acinetobacter* is difficult to control due to multidrug resistance, which limits therapeutic options in critically ill and debilitated patients, especially those in intensive care units (Cisneros and Rodríguez-Baño, 2002). *Acinetobacter baumannii* is a pleomorphic aerobic gram-negative bacillus (similar in appearance to *Haemophilus influenzae* on Gram stain) commonly isolated from the hospital environment and hospitalized patients. *A. baumannii* is preferentially colonizes in aquatic environments. This organism is often cultured from hospitalized patients' sputum, respiratory secretions, wounds, and urine. The organism has low virulence but capable of infecting the cavities with high water content like respiratory tract, urine infections and also associated with continuous ambulatory peritoneal dialysis (CAPD), or catheter-associated bacteremia and CSF.

Nosocomial meningitis may occur in colonized neurosurgical patients with external ventricular drainage tubes (Nguyen et al., 1994; Krol et al., 2009). *Acinetobacter baumannii* meningitis is a low virulent organism but once colonizes the body fluid cavities, a subsequent clinical infection is not only difficult to treat but also carries high mortality (Huttova and Freybergh, 2007). A blood count is nonspecific, and leukocytosis, even with a left shift, cannot be used to differentiate infection from non infection or bacterial infection from colonization. Culture of the appropriate body fluid that is properly transported, plated, and incubated can grow *Acinetobacter baumannii*. Recovery of the organism from a non sterile body site (e.g., endotracheal secretions, urine in patients with a Foley catheter) does not indicate or imply an infectious pathogenic role.

A. baumannii is intrinsically multidrug resistant. Relatively few antibiotics are active against this organism (Michalopoulos and Falagas, 2010; Giamarellou, 2010; Neonakis et al., 2011). First line of antibiotics used against *Acinetobacter baumannii* infection is aminoglycosides, cephalosporin III generation and fluoroquinolones but their use is limited in meningitis because of poor CSF penetration. Cephalosporins (First to third generation), macrolides, and penicillins have little or no anti-*Acinetobacter* activity, and their use may predispose to persistent *Acinetobacter* colonization like

our case, mentioned. Antibiotic found usually sensitive to *Acinetobacter Baumannii* are carbapenems like Meropenem and imipenem, ureidopenicillin like Piperacillin, polymyxins like Colistin, aminoglycosides like Amikacin, Rifampin, tetracycline like Minocycline, and glycolcyclycline antibiotic group like Tigecycline.

However *Acinetobacter baumannii* is very likely to become drug resistant and more so as Multidrug resistance (MDR). Tigecycline, carbapenems and polymyxins are found only sensitivity to MDR *Acinetobacter baumannii*. High dose meropenem has been used by some, claiming a successful eradication (Suzan et al., 2007) but it was not sensitive in our case along with a failed trial of complete two weeks of meropenem before starting the combination of Tegicycline and colistin. John Hopkins antibiotic guidelines recommend the use of imipenem, meropenem, ampicillin/sulbactam, colistin, tigecycline and amikacin for *Acinetobacter baumannii* meningitis (Lisa and Trish, 2008). Khan FY has reported six case of *A. baumannii* meningitis from Qatar who had undergone neurosurgical procedure. Multi-drug resistance was observed in 50% and carbapenem resistance was noted in two cases (33%). All patients had received empirical antibiotics and these were appropriate in five cases (83%). The mean duration of antimicrobial treatment was 12.5 days. Two of the six patients (33%) died in hospital (Khan et al., 2012). Rodríguez Guardado A from Spain has reported similar Multidrug resistance in a case series 51 cases and has compared the different drug regimes as intravenous monotherapy with carbapenems, ampicillin/sulbactam. They have tried a combination therapy of intravenous and intrathecal regimens: colistin by both routes, carbapenems, iv and intrathecal or only intrathecal aminoglycosides, and others. Seventeen patients died due to the infection. They however found no difference between the regimes but at the cost of high mortality (Rodríguez Guardado et al., 2008). A small series of eight cases has been reported by Ali Faisal Saleem et al treated with polymixin, used by both intravenous and intrathecal routes, where they achieved clearance in one week (Ali et al., 2011).

Reports of use of colistin in the treatment of multi drug resistance meningitis with *Acinetobacter Baumannii* are sparse in children; however a 36 years old man with a complex craniofacial trauma, who developed a nosocomial meningitis due to MDR *A. baumannii* was cured by intrathecal colistin as reported by Cascio A (Cascio et al., 2010). However we successfully treated this case by only intravenous route and achieved complete clearance in two weeks time. However a concomitant Tigecycline was safe to use especially in pediatric patients and we had achieved a good response in our case. A one year follow up showed significant neuro cognitive improvement and she required a reinsertion of a VP shunt which is in place with no further complications.

CONCLUSION

Acinetobacter baumannii meningitis is difficult to treat, with its propensity for multidrug resistance but 4th generation antibiotics like Tigecycline and colistin proved a safe and successful choice which had not been used frequently in pediatric patients in the past. Intrathecal route may not be necessary if appropriate dosage and duration of therapy are followed up.

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