International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Fatal Pseudomonas Septicemia in a Late Preterm Infant: A Case Report

Ander Arranz

Children Teaching Hospital, Kosice, Slovakia
Detská fakultná nemocnica Košice

Abstract: ***Background: Sepsis is a primary cause of morbidity and mortality among children worldwide. The most frequently isolated etiologic agents in newborn septicemia are Group B streptococci and Escherichia coli. Pseudomonas aeruginosa - related neonatal infections frequently have late onset, nosocomial origin, and epidemic patterns. It is a rare cause of neonatal bloodstream infections in affluent nations, and the majority of research only mentions its occurrence when an outbreak is present. The management of Pseudomonas sepsis remains challenging despite improvements in newborn care, particularly when prompt and effective treatment is required. Regardless of the age of onset, P. aeruginosa must be taken into account in all newborn infections so that early, appropriate, and frequently lifesaving antibiotic therapy can be started. Case presentation: We present the rare case of a 10 - day - old newborn boy who was admitted to the hospital with late - onset sepsis and hypercapnic respiratory failure caused by Pseudomonas aeruginosa infection. The patient soon developed severe metabolic acidosis upon admission for which he was intubated and connected to artificial ventilation. Cultures revealed positivity of Pseudomonas aeruginosa in blood and viscera including the lungs, liquor, suprarenal glands and spleen. The treatment regimen consisted of ampicillin - sulbactam, sodium chloride, furosemide, mannitol, sodium bicarbonate and heparin. Conclusion: Pseudomonas aeruginosa infection is frequently associated with fatal late - onset sepsis in neonates. However, the clinical course and prognosis might vary greatly depending on the specific serotype, immune status of the patient and associating symptoms and comorbidities should always be considered. Early diagnosis and timely referral are paramount for a favorable outcome.***

Keywords: sepsis, septic shock, Pseudomonas aeruginosa, respiratory failure

1. Introduction

Pseudomonas aeruginosa is an ubiquitous gram - negative rod that can survive in extreme conditions not suitable for most bacteria. This bacterium can be found in environmental sources such as soil, water and air but is also present as part of the normal human skin flora, respiratory tract and intestines. Additionally, it has been isolated from medical devices such as blood gas analyzers, nasopharyngeal catheters, breastfeeding bottles and also from healthcare personnel. It is considered an opportunistic pathogen, because it rarely causes serious disease in the normal host; however, it is a cause of hospital - acquired infections and infections in those persons with serious underlying medical conditions including preterm infants [1]. Although potentially fatal, Pseudomonas aeruginosa rarely causes serious disease in the normal host and mostly affects immunocompromised hosts, such as preterm newborns.

Owing to the higher survival of smaller and younger neonates, the risk of hospital - acquired infections has notably increased in recent years. Neonatal late - onset sepsis (LOS) continues to threaten morbidity and mortality in the NICU and poses ongoing diagnostic and therapeutic challenges [2]. Infants in the neonatal intensive care unit (NICU), particularly those with very low birth weight (VLBW), are at a higher risk of infection due to a combination of developmental and environmental factors. This microbe causes a wide array of clinical syndromes, including sepsis, pneumonia, meningitis, conjunctivitis, diarrhea and cutaneous infections. Pseudomonas aeruginosa is most commonly related to LOS and is considered an infrequent cause of newborn sepsis in the industrialized world. On the other hand, Pseudomonas sepsis is encountered rarely as a community - acquired infection in infants without previously identified medical problems [3].

2. Case Presentation

A multigravida (gravida 8, para 8) was admitted acutely to the hospital because of the sudden onset of placental bleeding at 36 weeks of gestation. The mother gave birth via a normal vaginal delivery to a male baby on the same day of admission. The male baby weighed 2350 g at birth and was posteriorly discharged. At the time of the first admission, the 10 - day - old white newborn presented with poor oral intake and somnolence. Infusion treatment with 10% glucose was started. An arterial blood gas (ABG) test proved respiratory alkalosis. Upon the second day of hospitalization, the baby refused oral intake and the level of consciousness was decreased. The respiratory rate dropped to less than 12/min at which point the baby was prescribed oxygen therapy with oxygen glasses. The patient soon developed prolongation of apneic pauses and desaturated to 70% despite increased oxygen therapy. During the physical examination, a markedly reduced level of consciousness and dry mucous membranes was present. An abnormal vital sign examination with bradycardia (60 beats/minute) was detected.

The child was intubated by the anaesthesiologist and diluted epinephrine was administered. Following intubation and suction, oxygen saturation improved and the child became responsive to physical stimulation. The child was finally extubated when saturation levels reached 98%. Ionogram showed hypochloremic hyponatremia that was corrected by the administration of sodium chloride solution. Methylxanthine infusion was administered and the respiratory rate increased to 20/min with raised alertness. The child soon developed combined metabolic and respiratory acidosis (pH 6.9; pCO2 6.6; HCO3 11.1) with marked hypotension (BP 45/15). Sodium bicarbonate IV was prescribed for the correction of acidosis and calcium gluconate was used to treat cardiac arrest. Following

successful CPR, the child developed hypothermia (T 35º) with worsening hypotension (BP 36/18) and hematemesis. The latter was treated by the administration of etamsylate. Cold and pale extremities were noted during the physical examination. The child was transferred to our center for respiratory insufficiency.

Following readmission, the child was re - intubated and connected to artificial ventilation. Bicarbonate was prescribed for repeated metabolic acidosis and anti - edematous treatment with mannitol was prescribed. Empiric antibiotic therapy and norepinephrine, epinephrine, atropine and etamsylate were added to the therapeutic regimen with only mild effect. Laboratory results revealed anemia, leukopenia and coagulation abnormalities. Biochemical parameters proved hypoalbuminemia (corrected by albumin administration), hyponatremia, hypokalemia and mild elevation of inflammatory markers. Blood cultures revealed the positivity of Pseudomonas aeruginosa. These findings were highly suggestive of septic shock by Pseudomonas aeruginosa. Fresh blood vas aspirated and bleeding was present following injections. The child developed bradycardia and CPR was started again along with pharmacological resuscitation. Despite the best efforts of our team, vital functions ceased.

3. Discussion

As demonstrated above, Pseudomonas aeruginosa is responsible for ventilator - associated pneumonia (VAP) and various sepsis syndromes with fatal outcomes. Likewise, it has become a worrisome cause of hospital - acquired infections in the past years due to its characteristic multidrug resistance, intrinsically advanced antibiotic resistance mechanisms and increasing prevalence. Early detection of this potentially fatal illness is essential for prompt treatment and a successful outcome since complications like shock, disseminated intravascular coagulation, and multi - system organ failure can lead to the fulminant and lethal course of infection [4]. Blood culture analysis has been traditionally considered the gold standard in sepsis diagnostics despite controversy. On a specific note, culture - negative does not preclude sepsis because nearly 26% of neonatal sepsis could be due to anaerobic organisms [5]. Furthermore, risk factors associated with the development of Pseudomonas septicemia include prolonged ventilatory support, total parenteral nutrition (TPN), chronic antibiotics use, prematurity, Very Low Birth Weight (VLBW) and increased duration of hospitalization. Premature babies with low birth weight have a risk of developing sepsis three to ten times higher than fullterm babies with normal birth weight [6]. Conversely, in the exposed case report the patient did not present with major risk factors except mild prematurity (36. weeks) and Low Birth weight (2350 gr).

In summary, this is a clear case of failure of the immune system to react against infection in an otherwise healthy individual despite appropriate antibiotic therapy. Sepsis mortality is associated with delays to “appropriate” antimicrobial therapy, and hence optimal treatment for sepsis relies on the accurate selection of antimicrobials to ensure activity against the major pathogens [7, 8, 9, 10]. Major antibiotics which were previously sensitive are now emerging resistant. This is especially problematic in healthcare facilities because patients may be exposed to a variety of antibiotics, fostering an environment that encourages the emergence and spread of resistant strains. Tigecycline and colistin seem to be the new drugs of focus, hence used with all precautions to prevent their resistance [11]. A comprehensive strategy, including optimal antibiotic use, infection control procedures, and the development of innovative treatment options, is needed to prevent and manage antibiotic resistance in Pseudomonas aeruginosa.

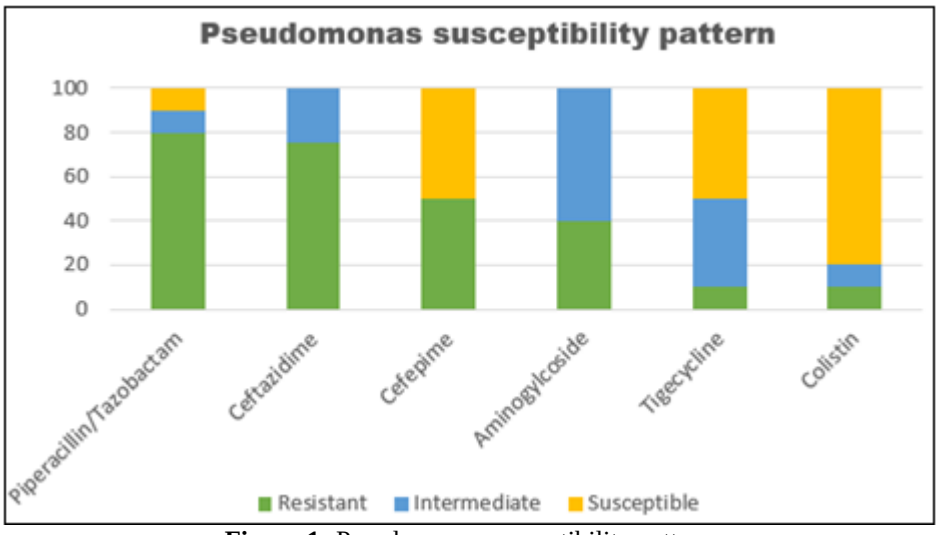

Figure 1: Pseudomonas susceptibility pattern

Combination therapy including two or more antibiotics may be utilized under some circumstances, or alternative antimicrobial drugs having activity against Pseudomonas, such as colistin, may be taken into consideration. To reduce these deaths, WHO has issued guidelines that comprise breastfeeding, cord care, eye care, thermoregulation, management of asphyxia, recognition of danger signs, immunization and care of the low birth weight infant [12]. Currently, there is a lack of literature regarding neonatal pseudomonas sepsis and most reports mentioned this as exceptional. However, we believe that case studies such as ours could help shed light on this morbidity and pave the

way for further investigations.

4. Conclusion

In developed nations, P. aeruginosa is a very infrequent cause of late - onset sepsis in neonates, although it is linked to a high fatality rate. Clinical signs and standard laboratory tests are unable to distinguish this lethal pathogen from other gram - negative bacteria. Certain environmental circumstances along with widespread antimicrobial resistance genes, guarantee the long - term survival of this organism in the hospital environment. Effective case detection and surveillance of possible personnel reservoirs as well as the environment are necessary for outbreak control. Following case isolation, conventional epidemiologic control procedures including cohorts of patients and contact isolation should be put into practice. Aside from that, enhancing results and lowering the risk of fatalities linked to Pseudomonas antibiotic resistance depends on early infection detection, rapid application of the proper therapy, and close patient monitoring.

References

[1] Foca, M. D. (2002) 'Pseudomonas aeruginosa infections in the neonatal intensive care unit', *Seminars in Perinatology*, 26 (5), pp.332–339. doi: 10.1053/sper.2002.36266.
[2] Coggins, S. A. and Glaser, K. (2022) 'Updates in late - onset sepsis: Risk assessment, therapy, and outcomes', *NeoReviews*, 23 (11), pp.738–755. doi: 10.1542/neo.23 - 10 - e738.
[3] Ara, Dr. R. *et al. (*2023) 'The causative organism of neonatal sepsis by blood culture', *Global Academic Journal of Medical Sciences*, 5 (1), pp.39–44. doi: 10.36348/gajms.2023. v05i01.007.
[4] Chusid, M. J. and Hillman, S. M. (1987) 'Community - acquired pseudomonas sepsis in previously healthy infants', *The Pediatric Infectious Disease Journal*, 6 (7), pp.681–684. doi: 10.1097/00006454 - 198707000 - 00013.
[5] Khadka, P. *et al. (*2022) 'Economic and diagnostic biomarker tests of neonatal sepsis: A prospective study from a tertiary care hospital in a low - income country', *BioMed Research International*, 2022, pp.1–9. doi: 10.1155/2022/5166380.
[6] Shane, A. L., Sánchez, P. J. and Stoll, B. J. (2017) 'Neonatal sepsis', *The Lancet*, 390 (10104), pp.1770–1780. doi: 10.1016/s0140 - 6736 (17) 31002 - 4.
[7] Rhodes A, Evans LE, Alhazzani W et al (2017) Surviving sepsis campaign: international guidelines for management of sepsis and septic shock: 2016. Intensive Care Med 43: 304–377
[8] Weiss SL, Fitzgerald JC, Balamuth F et al (2014) Delayed antimicrobial therapy increases mortality and organ dysfunction duration in pediatric sepsis. Crit Care Med 42: 2409–2417
[9] Barie PS, Hydo LJ, Shou J et al (2005) Influence of antibiotic therapy on mortality of critical surgical illness caused or complicated by infection. Surg Infect (Larchmt) 6: 41–54
[10] Kumar A, Ellis P, Arabi Y, Cooperative Antimicrobial Therapy of Septic Shock Database Research Group et al (2009) Initiation of inappropriate antimicrobial therapy results in a fivefold reduction of survival in human septic shock. Chest 136: 1237–1248
[11] Shah, P. *et al. (*2020) 'Neonatal sepsis - blood culture, antibiotic stewardship and Clinico - Bacteriological Study', *International Journal of Contemporary Pediatrics*, 7 (12), p.2376. doi: 10.18203/2349 - 3291. ijcp20205100.
[12] West, B. and Tabansi, P. (2013) 'Prevalence of neonatal septicaemia in the University of Port Harcourt Teaching Hospital, Nigeria', *Nigerian Journal of Paediatrics*, 41 (1), p.33. doi: 10.4314/njp. v41i1.6.