

Case Report: Bilateral Intra-Parenchymal Hematomas Caused by Ventricular Flood Complicating Neonatal *Salmonella typhi* Meningitis

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Abstract

Salmonella meningitis is an uncommon condition in neonates, and when it does occur, it is often linked to serious complications, such as subdural collections and abscesses. We present a case involving a 23-day-old neonate diagnosed with Salmonella meningitis, who developed complications including bilateral intra-parenchymal hematomas with ventricular involvement. The infant showed significant improvement following an extended course of systemic antibiotics and supportive care.

Keywords

Neonate, Meningitis, Salmonella, Complications

1. Introduction

Meningitis caused by Salmonella organisms is considered a rare occurrence, despite numerous references in the literature. This condition tends to affect newborns particularly and is associated with a significantly high mortality rate during this period. Current treatment methods are inadequate, which is why this case is presented—to raise awareness of this potential risk in neonates [1].

2. Case Report

A 23-day-old female neonate presented with fever of three days duration and poor

activity, excessive crying and clonic convulsion. The baby was born at term with a birth weight of 3.2 kg and a head circumference of 35 cm, originating from a rural area, the antenatal and postnatal periods were uneventful, and the newborn was breastfed. Baby was drowsy at the time of admission. The pulse rate was 185 beats per minute, the respiratory rate was 42 per minute, the temperature was 39.6° and the weight was 3400 grams. The anterior fontanel was bulging and non-pulsatile, and the head circumference was 37 cm. On neurologic examination, a generalized increased tone, an incomplete moro and a poor suck reflex were observed.

The initial laboratory studies showed: Hemoglobin at 14.5 g/dL, leukocyte count at 3270/cumm with neutrophilia, and a low platelet count at 19,000/cumm. The morphology of red blood cells was normal. The patient was not evaluated for immunodeficiency. The serum electrolytes including calcium, the liver function test and the renal function test were normal. The C-reactive protein was positive (268 mg/L), also the Procalcitonin was 49.14 ng/ml and the blood glucose was 0.62 g/l. The Cerebrospinal Fluid (CSF) analysis was suggestive of meningitis, with protein of 5 g/dL, glucose of 0.25 g/dL and 2894 leukocytes per cumm (70% pnn; 30% Lym). The blood and the CSF culture grew *Salmonella typhi*, and a stool test was performed two times, but were not conducted. The cerebral (CT) scan at admission showed meningitis complicated by bilateral intra-parenchymal hematomas with ventricular flood (Figure 1).

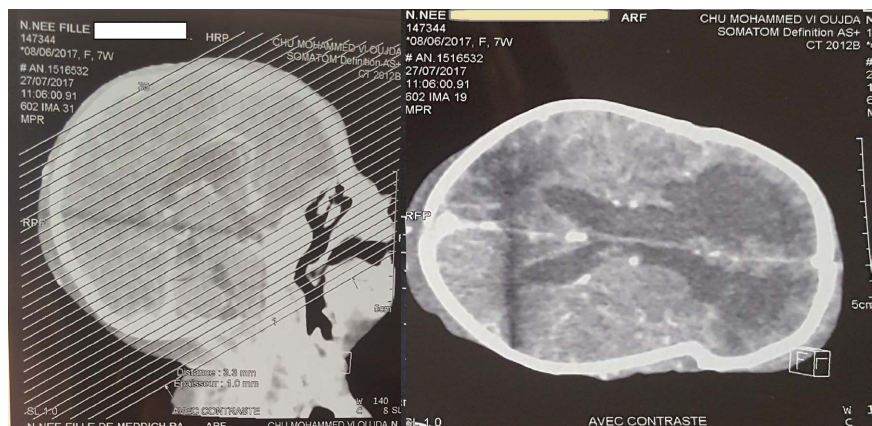


Figure 1. Axial CT sections showing bilateral intra-parenchymal hematomas with ventricular flood.

The baby was initially treated with the IV antibiotics, ceftriaxone and amikacin, aximicyne and antiepileptics, iv fluids and symptomatic treatment before adapting the treatment according to the results of the antibiogram. The baby improved after 10 days but he developed fever and convulsions during the first week of the treatment. The repeat investigations were suggestive of sepsis with an increased total leukocyte count and thrombocytopenia. An MRI of the brain showed bilateral intra-parenchymal hematomas with ventricular flood. A neurosurgery opinion was taken and no active intervention was advised. Now, on follow up, the child's

growth and development was found to have become normal for age. The consent of the parents was taken before the reporting of this case was done.

3. Discussion

Salmonella meningitis can affect individuals of any age but is more prevalent in young infants. According to Watson's review from 1958, 40% of 138 cases occurred within the first month of life, with 81% occurring within the first year [2].

Salmonella meningitis typically arises in the context of typhoid fever accompanied by diarrhea in children or due to maternal carriage of *Salmonella typhi*, leading to contamination through direct contact between the child and the mother. In our case, the newborn experienced diarrhea in the two days prior to hospitalization. However, serodiagnostic tests and stool cultures for the parents were not conducted, raising questions about the source of the newborn's contamination [3]-[5].

Salmonella meningitis is a diagnostic and therapeutic emergency. It typically occurs within a specific clinical context, where the child exhibits classic symptoms of a salmonella infection, such as fever, diarrhea, irritability, deterioration of general condition, convulsions, and bulging fontanelles. Our case showcases these typical signs of salmonella infection. Diagnosing meningitis in newborns presents common challenges associated with identifying any form of meningitis at this age. It's important to note that while diarrhea from Salmonella enteritis can occur, it may be mild, as seen in our case, and easily overlooked, or even absent in other instances [6] [7].

Bacteriological: *S. typhimurium* is implicated in 90% of cases of salmonella meningitis occurring before the age of one year [8] [9]. This was the case of our observation also due to *S. typhi*.

West *et al.* conducted a review of the acute neurological complications of Salmonella meningitis and identified ventriculitis, subdural empyema, hydrocephalus, and chronic neurological abnormalities in up to 43% of cases, with a relapse rate of 64% [10]. In our case, the complication manifested as bilateral intraparenchymal hematomas with ventricular involvement.

In the mid-1980s, the American Academy of Pediatrics recommended a minimum 3-week treatment of these meningitis with third-generation cephalosporins [11]. However, the outcomes did not meet expectations [4]. The introduction of fluoroquinolones (FQ), especially ciprofloxacin, has significantly improved the prognosis of salmonella meningitis. Initially used as second-line therapy for cerebral abscesses and relapses, fluoroquinolones were later recommended as first-line treatment [12] [13].

In 2003, a team from Ghana reviewed the literature and found cure rates of 88.9% with fluoroquinolones and 84.6% with third-generation cephalosporins. Chloramphenicol, on the other hand, showed a cure rate of only 41.2%, with a relapse rate close to 12% and a mortality rate of 44.7%. The authors recommended a combination of third-generation cephalosporins and ciprofloxacin for treating

salmonella meningitis [14]. Similar recommendations were made by Price *et al.* in 2000 [15]. In our practice, the standard approach for any newborn suspected of meningitis involves initiating broad-spectrum antibiotic treatment, which is then adjusted based on the results of antibiotic susceptibility testing. In this specific case, the newborn was treated with a combination of third-generation cephalosporins and ciprofloxacin, resulting in a positive outcome.

Salmonella, being a facultative intracellular microorganism, presents challenges in treatment due to inadequate drug penetration, which can lead to the progression of the infection. Additionally, there is growing evidence of increasing resistance to commonly used antibiotics such as Chloramphenicol, Ampicillin, Cephalosporins, and Cotrimoxazole. Given these issues, third-generation cephalosporins are considered the drugs of choice. It is recommended that the duration of therapy with parenteral antibiotics be extended to at least four weeks to ensure effective treatment [16] [17].

4. Conclusion

Salmonella meningitis is uncommon, despite the prevalence of salmonellosis in Morocco. This condition presents a therapeutic challenge due to the rising antibiotic resistance of Salmonella strains. Additionally, the severe sequelae and high mortality rates associated with this infection in infants further compound the issue.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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