

CASE REPORT

Salmonella typhi Meningitis in an Infant: A Case Report

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ABSTRACT**Key words:**

Salmonella typhi, meningitis, infant, Cerebrospinal fluid

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Salmonella typhi is a rare cause of purulent meningitis. We reported a case of meningitis due to S. typhi in five month old Indian male infant. Diagnosis was established based on Cerebrospinal fluid (CSF) findings and blood culture. The infant responded well to prolonged systemic antibiotics and recovered completely without any neurological complications after proper surgical and supportive measures. Child was also followed up for 5 months and found to be doing well without any sequelae. The importance of bacteriological diagnosis and prolonged antibiotic treatment for S. typhi meningitis is discussed.

INTRODUCTION

Meningitis due to salmonella group is relatively uncommon condition but is an important public health problem in developing countries, because of high mortality and morbidity rates associated with poor socioeconomic status and poor hygienic practice especially in infants and young children¹⁻³. Regardless of the use of appropriate antibiotic therapy, the mortality due to salmonella infections is very high during early infancy and the chance of relapse in the survivors is very high. We are reporting an infant with *S.typhi* meningitis with subdural collection.

CASE PRESENTATION

A five month-old, Indian male infant was presented to the Emergency Department in an Tertiary Care Hospital, Makah, Saudi Arabia, with a history of intermittent fever one week ago. The patient gradually became lethargic and irritable. Enlargement of the head was also noticed. There was no history of cough, jaundice, rashes, or ear discharge.

Assessment of vital signs on presentation revealed a temperature of 39.6°C, pulse of 110 beats per minute, and blood pressure of 80/40 mmHg. The physical examination revealed that the infant was toxic, irritable, drowsy with tense anterior fontanel, and a head circumference of 46.0 cm. Cardiovascular and respiratory systems were normal. Laboratory investigations revealed hemoglobin 9.5g/dl, total leukocyte count 13,900 cells per cubic millimeter. Liver and renal function tests, serum electrolytes, calcium and magnesium were within normal limits (Table 1)

Table 1: Patient's parameters on admission

WBC'S	13.9 (10 ³ /µl)
Hb	9.5 (g/dl)
Urea	11 (mg/dl)
Creatinine	0.3 (mg/dl)
Blood glucose	96 (mg/dl)
Sodium –Na	128 (mmol/L)
Potassium – K	4.3 (mmol/L)
ALT	36 (IU/l)
AST	28 (IU/l)
Bilirubin, total	0.30 (mg/dl)
Bilirubin, direct	0.09 (mg/dl)
Alkaline Phosphatase	149 (IU/L)

In view of suspected central nervous system infection, lumbar puncture was done. Cerebrospinal fluid (CSF) analysis showed an elevated protein level of 460 mg/dl (reference range, 15 to 45) and low glucose concentration of 1 mg/dl (reference range of 40 to 70 mg/dl). Gram stain of CSF showed no bacteria, but white blood cells were increased 209.700 (10³/µl with 96% neutrophils. With the conclusion of pyogenic meningitis, patient was started on intravenous ceftriaxone (100mg/kg/day) and infant became afebrile within 48 hours of starting antibiotics.

A non-contrast computed tomography (CT) of the head showed bilateral subdural collection with mixed density compressing the right cerebrum, bilateral subdural drainage were done to relieve the compression (Figure 1).

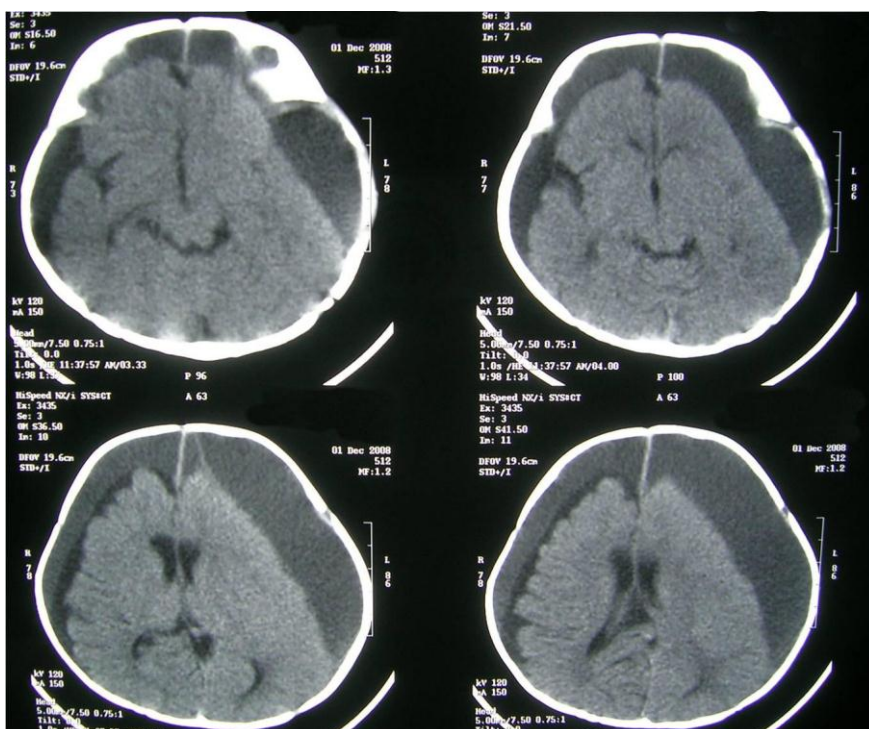


Fig. 1: A computed tomography (CT) of the head

Routine bacterial cultures of urine and stool were negative after 4 days of hospital stay positive cultures were reported from blood and CSF which were collected on the first day of admission. Bacteria identification and antibiotic susceptibilities were determined by automated microbiology system (Siemens Micro Scan WalkAway-96 Plus System, USA), *S. typhi* was identified from blood and CSF specimens which was sensitive to ceftriaxone, ampicillin and fluoroquinolones. Widal screening test was also positive for *S.typhi*-O.

After one week, CT scan of the head was repeated and showed marked reduction of bilateral subdural collection, the infant became more alert, afebrile and lax anterior fontanel. Ceftriaxone continued for 4 weeks and the patient was discharged in good condition without neurological deficits.

Follow-up after 5 months, showed that the infant recovered completely and was fully conscious, alert and moving the four limbs well. Head circumference was reduced to 45cm with normal developmental milestones, whereas CT scan of the head showed no more collection in subdural space (Figure 2)

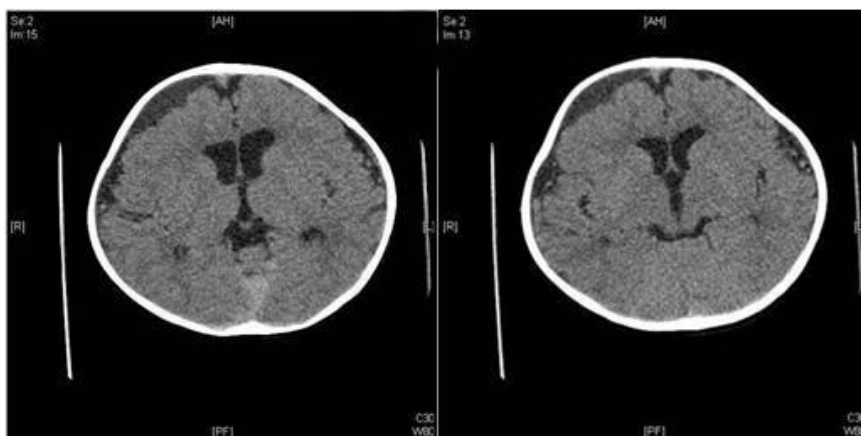


Fig. 2: CT of the head after 5 months followup

DISCUSSION

Bacterial meningitis is an important pediatric disease because it generally has poor prognosis in infants and young children, but intact survival without neurological sequel can be expected if the illness is diagnosed early and treated promptly⁴. Central nervous system infections caused by salmonella are extremely rare, with the first proven case reported by Ohlmacher in 1897⁵. Up to year 2002, only around 80 cases of salmonella meningitis had been reported in the literature⁶, with 83 percent of the patients being less than 2 years of age and 50 percent being less than 2 months old⁷. Most cases of salmonella meningitis involve children less than 1 year of age⁸. The incidence of salmonella meningitis has been reported to be about 6% of those with salmonellosis².

The infant under report is an Indian from tropical area where salmonella as a cause of bacterial meningitis is reported primarily⁹, accounting for 5-13% of acute bacterial meningitis in young children in the 1980s-2000s. Whereas in industrialized countries salmonella infection is rare (1% or less), but still is a threat to children below the age of two years¹⁰.

The source of infection and mode of transmission in our patient is not clear. Salmonella infection is almost always by the feco-oral route¹¹, and non-typhoidal salmonellae are a common cause of foodborne illnesses¹². Also, feco-oral transmission from an infected adult including the mother in the household is a possibility¹³. Relative gastric achlorhydria, the lack of *Salmonella*-specific antibody in infants and young infants <2 years of age¹⁴, decreased neutrophil intracellular killing function, reduced macrophage function, and poor opsonin activity contribute to the vulnerability of these children to complications due to salmonella infection¹⁵.

The patient under report was treated for 4 weeks with intravenous third-generation cephalosporin's (ceftriaxone); which is recommended by the American academy of pediatrics¹³, as empirical chemotherapy for meningitis caused by gram-negative bacteria because of high bactericidal activity with low minimum inhibitory concentrations, high cure rate (>80%) and less mortality (<10%)¹⁰. Ceftriaxone has poor intracellular penetration; but better than both gentamicin and chloramphenicol; and enter the intercellular compartment that contains engulfed bacteria only by diffusion. In such a case the intracellular ability of the antibiotics is dependent on the extracellular concentration achieved. Therefore, American Academy of Pediatrics recommends that for successful treatment of meningitis caused by *Salmonella* species high dose of the third generation cephalosporin's should be used and the therapy should be continued for 4 weeks to ensure

complete killing of the organism and to prevent relapse¹³.

Salmonella meningitis was associated with a very high prevalence (50-90%) of morbidity, presenting variable complications¹⁰. The case was presented with bilateral subdural empyema which is a common (34-48%) acute complication of salmonella meningitis². Other complications include ventriculitis, acute hydrocephalus, seizures and chronic neurological abnormalities are known to occur in most cases^{2, 7, 10}. Prompt surgical drainage is necessary for a favourable outcome⁷, which was done to the patient; this early surgical management of the intracranial lesions gave a better prognosis of the case. In the past, mortality rates due to meningitis were 40 to 70%, these numbers have reduced significantly due to optimal diagnosis and management^{10, 15}.

CONCLUSION

Early diagnosis of the salmonella meningitis and salmonella subdural collections, together with an adequate surgical evacuation, appropriate choice of the antibiotic at the initial presentation, followed by their prolonged therapy, and regular follow up till patients completely recover can improve the outcome significantly.

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