

TEACHING FILES (GRAND ROUNDS)

SALMONELLA ENTERICA MENINGITIS IN A NEONATE

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Clinical Problem:

A 15-day-old boy presented with a complaint of poor feeding and fever for two days. The child was previously alert and was breastfeeding normally since birth. He was born at full term by vaginal delivery and birth weight was 2.5 kg. Mother had no fever during pregnancy and there were no antenatal complications. He was admitted to the hospital for further evaluation and management. On examination, the neonate had a bulging anterior fontanelle and was lethargic. Heart rate was 130/min, respiratory rate was 36/min and blood pressure was 90/60 mm of Hg in right upper arm. Weight was 3.5 kg (25th centile as per World Health Organization (WHO) growth charts). Other general examination findings were normal. Systemic examination was normal. Other central nervous system examination findings were normal. Tone was normal. Cry was shrill. There were no focal neurological deficits in form of muscle weakness or paralysis. Meningeal signs could not be elicited. Investigations revealed hemoglobin of 14 gm/dl, white cell count of 17,500 cells/cumm (80% polymorphs, 19% lymphocytes), platelets of 1,98,000 cells/cumm and CRP of 110 mg/dl. Cerebrospinal fluid (CSF) analysis showed sugar 30.5 mg/dl with simultaneous blood sugar of 85 mg/dl, protein- 95mg/dl, nucleated cells- 60 cells/cumm (polymorphs-70% and lymphocytes 30%). CSF culture grew Salmonella enterica.

How did the child get Salmonella enterica in the CSF and what would be the best possible treatment?

Discussion:

Salmonella bacteria are gram-negative, facultatively anaerobic flagellate bacilli that are found in contaminated food. Non-typhoidal salmonella bacilli are a known cause of bloodstream infections in children.¹ The incidence of Salmonella meningitis is speculated to be between 0.8 and 6% of cases of bacterial meningitis, with figures varying between developed and developing countries. It primarily affects children under the age of five, particularly infants (6%) and neonates (16%).² In a study by van Sorge et al, it was shown that Salmonella enterica can adhere to, invade and penetrate

human brain microvascular endothelial cells (hBMECs), which form the blood-brain barrier (BBB).³ The bacterial infection triggers a proinflammatory immune response that targets the signaling of neutrophils and helps in their recruitment. This emphasizes the crucial role of BBB penetration in the development of Salmonella meningitis.³ There are several possible routes for vertical transmission of S. enterica, however, the role of breast milk has not been explicitly described. It might be possible that the child acquired the organism primarily through breast milk (which had already been infected through hematogenous or lymphatic spread within the mother), or through another external route that further infected the breast milk while the child was suckling.⁴ The best step in the management of this child with meningitis would be through antibiotics such as cephalosporins, gentamicin, ampicillin and fluoroquinolones. No standard effective treatment has emerged, although it has been recommended that the use of third-generation cephalosporins can provide a good treatment option. Essentially the best treatment is determined by culture sensitivity.⁵ Our patient was treated with intravenous ceftriaxone for 3 weeks to which the child responded. Mother's blood culture was negative for any organism and HIV Elisa in the mother was negative. Lymphocyte subset assay as well as immunoglobulins were normal in the child. Salmonella meningitis can cause morbid acute and chronic complications in newborns and infants, increasing the likelihood of a poor outcome. As a result, it is critical to identify such patients and provide appropriate care as well as regular follow-up.

Compliance with ethical standards

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Conflict of Interest: None

References:

1. Graham S, Molyneux E, Walsh A, Cheesbrough J, Molyneux M, Hart C. Graham, S.M., Molyneux, E.M., Walsh, A.L., Cheesbrough, J.S., Molyneux, M.E. & Hart, C.A. Nontyphoidal Salmonella infections of children in tropical Africa. *Pediatr. Infect. Dis. J.* 19, 1189-1196. *The Pediatric infectious disease journal.* 2001 Jan 1;19:1189-96.
2. De Malet A, Ingerto S, Gañán I. Meningitis Caused by Salmonella Newport in a Five-Year-Old Child. *Vallès X, editor. Case Reports in Infectious Diseases.* 2016 Dec 12;2016:2145805.

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3. Van Sorge NM, Zialcita PA, Browne SH, Quach D, Guiney DG, Doran KS. Penetration and activation of brain endothelium by *Salmonella enterica* serovar Typhimurium. *J Infect Dis.* 2010/12/24 ed. 2011 Feb 1;203(3):401-5.
4. Cooke FJ, Ginwalla S, Hampton MD, Wain J, Ross-Russell R, Lever A, et al. Report of neonatal meningitis due to *Salmonella enterica* serotype Agona and review of breast milk-associated neonatal *Salmonella* infections. *J Clin Microbiol.* 2009/07/15 ed. 2009 Sep;47(9):3045-9.
5. Lakew W, Girma A, Triche E. *Salmonella enterica* Serotype *Arizonae* Meningitis in a Neonate. *Case Rep Pediatr.* 2013/09/30 ed. 2013;2013:813495-813495.