ISSN: 2754-4923

Journal of Diagnosis & Case Reports

SCIENTIFIC Research and Community

Case Report

Open Access

Relapsed Bacterial Meningitis in an Adolescent Patient with Aberrant Patent Foramen Caecum

Sobia Nawaz[1]*, Stephen Kohlhoff[2], Mathew Hansen[3] and Ratna Basak[4]

[1]Pediatrician, MD, MBBS, ECFMG & PMDC Certified, USA

[2]Department of Pediatrics, SUNY Downstate Health Sciences University, Box 49, 450 Clarkson Ave, Brooklyn, NY, 11203, USA

[3]Associate Professor of Emergency Medicine, Co-founder IDEA-EM, Co-founder ProMedix Inc, USA

[4]Attending Physician & Associate Prof of Pediatrics, Brookdale Hospital Medical Center, Brookdale Hospital, USA

ABSTRACT

Bacterial meningitis is a serious life-threatening condition. Recurrent meningitis is defined as two independent episodes of meningitis that are separated by a period of convalescence and full recovery. Therefore, true recurrence results from a re-infection with the same or a different bacterial organism. In contrast, recrudescence and relapsed meningitis (RBM) represent persistence of the initial infection resulting from treatment failure. Both are uncommon and could be due to anatomic anomalies of the skull, traumatic head injury with secondary CSF fistula, complement deficiency or spread from a para meningeal infection.

We present a case of a 13 years old healthy adolescent boy with no significant past medical history, who presented with flu like symptoms and altered mental status. His work up showed Streptococcus pneumoniae meningitis. While receiving effective IV treatment, on day 7 the patient became symptomatic again with fever, vomiting and prostration. Repeat blood tests showed an increase in total white cell count, neutrophils and inflammatory markers. In order to determine the underlying pathology, a repeat CT-scan of head followed by an MRI was done that showed an aberrant patent foramen caecum, that appeared to be the most likely cause of the relapse. This case report illustrates the importance of a search for an anatomical abnormality to be a cause of RBM, even in an adolescent.

***Corresponding author**

Sobia Nawaz, Pediatrician, MD, MBBS, ECFMG & PMDC Certified, USA.

Received: July 03, 2024; **Accepted:** July 08, 2024; **Published:** July 15, 2024

Case Summary

A 13-year-old adolescent male with no significant past medical history presented with flu-like symptoms for 1 week and altered mental status for 1 day. Upon presentation, his labs were significant for leukocytosis 26.14 k/uL (Normal 4-10 k/uL) with neutrophilic predominance along with elevated inflammatory markers and coagulation profile. The urine analysis, urine drug screen, and the serum drug screen were unremarkable. A 12-lead ECG and troponins were normal. The viral panel was positive for influenza B virus. CT head showed severe paranasal sinus disease, but no intra-cranial pathology. The CSF analysis was significant for leukocytosis of 798 cells/UL (Normal <5 cells/UL) and elevated CSF protein to 73 mg/dl (Normal 15-45 mg/dl). CSF PCR was positive for Streptococcus pneumoniae. He was started on IV Ceftriaxone and Vancomycin. He improved clinically with down trending of the inflammatory markers. A naso-pharyngeal endoscopy was performed which showed bilateral purulent in orbito-maxillary cavities. MRA, MRV and MRI were unremarkable for stroke or any intra-cranial pathology except for paranasal sinus disease on MRI. However, on day 7 of treatment, he was noted to be febrile, with prostration and emesis. Repeat labs at that time showed an increase in WBC to 19.15 k/uL (normal 4-10 k/uL) and elevated C-reactive protein to 175.4 mg/L (normal 0.0-5.0 mg/L). Antibiotics were changed for a broader coverage with Meropenum, with Vancomycin continuing. A thorough reading was sought of the CT and MRI scans which showed an aberrant foramen caecum to be the possible underlying cause of RBM. Pediatric neurosurgery and ENT were consulted, and after a multi-disciplinary consensus, patient was transferred to have a neurosurgical repair of the defect.

Discussion

Bacterial meningitis is the inflammation of the meninges of the brain by the bacteria and bacterial products leading to altered blood-brain barrier and brain insult [1]. It is a life-threatening condition with a mortality rate of 3-7% in children [2]. A suspicion of bacterial meningitis in a patient, is considered to be a medical emergency necessitating empiric management [3]. Underlying causative organism may vary depending upon factors like patient age, underlying immune and immunization status and the geographic location of the patient [3]. Bacterial invasion of meninges may occur following one of the three underlying mechanisms: spread from the adjacent infections (sinusitis, chronic suppurative otitis media), direct CNS invasion as in head trauma or via bacteremia. Recurrent bacterial meningitis may be defined as re-occurrence of the infection after it has been adequately treated, usually after 3 weeks [4]. Important causes include immune deficiency, anatomic defects at the skull base or at the cribriform plate, and chronic

para meningeal infections [3]. However, if the relapse is within 3 weeks of the initial infections, it is usually due to head trauma with CSF fistula, or due to anatomical defects at the skull base [4]. Recurrent or relapsed episodes of meningitis demand an exhaustive search for underlying cause. The basic underlying work up to look for a cause for recurrent or relapsed bacterial meningitis may include CT-scan of brain, immunological work up and an audiological evaluation.

The anatomical defects of the skull base are rare anomalies that serve as a source for repeated transmission of infectious agents leading to ongoing infection and should be the first consideration in any child with RBM or recurrent bacterial meningitis, in the absence of a history suggestive of immune deficiency or head trauma. In a study conducted at Jordan University Hospital, out of 13 children with recurrent meningitis, 59% had an underlying anatomical defect of the skull while immunodeficiency and chronic para-meningeal infections accounted to 36% and 5% of the cases respectively p [5]. The causative organism may travel along congenital or acquired passage to the sub-arachnoid space [6]. In a study conducted in Beijing, the skull base defects were found to be responsible for 65.1% of the cases of recurrent bacterial meningitis [7]. These anatomical defects may range from encephaloceles, due to failure of the mesenchymal clefts to close during embryogenesis, basilar clefting which are various forms of canalis basilaris medianus that are considered as developmental basilar anomalies close to the foramen magnum, dysplasia of cribriform plates or empty Sella [6-9]. Amongst the skull base anomalies, cribriform plates and ethmoid roof anomalies are more common [10]. Kiem showed that approximately 90% of the patient with recurrent episode of meningitis had otolaryngological abnormalities [11]. In a study by Adriani, S.pneumoniae was found to be the most common causative organisms of bacterial meningitis, and N.meningitides being the second most common one [12]. However, empiric antibiotic therapy should be directed against other organisms commonly found in facial sinuses. Our patient had a prompt and favorable response to broad coverage antibiotics with activity against Gram-negative and anaerobic organisms, hence a repeat lumbar puncture was not performed, as the source for RBM was identified.

Our case sheds light on patent foramen caecum as a cause of RBM in a relatively older child while undergoing antibacterial management for an episode of bacterial meningitis in the same hospital admission. This case report illustrates the necessity of timely investigating the possibility of an anatomical defect to be the underlying cause of the RBM to avoid mortality and complications. In another study 27% of the patients treated for bacterial meningitis suffered long-term neurological sequalae with hearing impairment. This correlated strongly with abnormal brain imaging and pneumococcal etiology [13]. Other important long-term complications related to RBM may include but are not limited to hemiparesis, cranial nerve palsies and seizures that can decrease the quality of life [14]. The definitive treatment in most cases of anatomical defects is endoscopic surgical closure of the fistulas with a very high success rate of 94-98% [2,15].

References

1. Kim KS (2010) Acute bacterial meningitis in infants and children. Lancet Infect Dis 10: 32-42.
2. Wang HS, Kuo MF, Huang SC (2005) Diagnostic approach to recurrent bacterial meningitis in children. Chang Gung Med J 28: 441-52.
3. Agrawal S, Nadel S (2011) Acute bacterial meningitis in infants and children: epidemiology and management. Paediatr Drugs 13: 385-400.
4. Tebruegge M, Curtis N (2008) Epidemiology, etiology, pathogenesis, and diagnosis of recurrent bacterial meningitis. Clin Microbiol Rev 21: 519-537.
5. Masri A, Alassaf A, Khuri Bulos N, Zaq I, Hadidy A, et al. (2018) Recurrent meningitis in children: etiologies, outcome, and lessons to learn. Childs Nerv Syst 34: 1541-1547.
6. Drummond DS, De Jong AL, Giannoni C, Sulek M, Friedman EM (1999) Recurrent meningitis in the pediatric patient-the Otolaryngologist's role. Int J Pediatr Otorhinolaryngol 48: 199-208.
7. Chen T, Chen H, Hu B, Hu H, Guo X, et al. (2021) Characteristics of Pediatric Recurrent Bacterial Meningitis in Beijing Children's Hospital, 2006–2019. J Pediatric Infect Dis Soc 10: 635-640.
8. Habermann S, Silva AHD, Aquilina K, Hewitt R (2021) A persistent craniopharyngeal canal with recurrent bacterial meningitis: case report and literature review. Child's Nervous System 37: 699-702.
9. Otto HD (1994) Teratogenic and clinical aspects of abnormalities of the head and neck region. Eur Arch Otorhinolaryngol Suppl 1: 15-100.
10. Schick B, Prescher A, Hofmann E, Steigerwald C, Draf W (2003) Two occult skull base malformations causing recurrent meningitis in a child: a case report. European Archives of Oto-Rhino-Laryngology 260: 518-521.
11. Keim RJ (1978) Meningitis: the influence of routine otolaryngologic consultation on morbidity and mortality in 290 cases. Laryngoscope 88: 1-30.
12. Adriani KS, Van de Beek D, Brouwer MC, Spanjaard L, De Gans J (2007) Community-Acquired Recurrent Bacterial Meningitis in Adults. Clinical Infectious Diseases 45: 46-51.
13. Svendsen MB, Ring Kofoed I, Nielsen H, Schønheyder HC, Bodilsen J (2020) Neurological sequelae remain frequent after bacterial meningitis in children. Acta Paediatr 109: 361-367.
14. Snoek L, Van Kassel MN, Koelman DLH, Van der Ende A, van Sorge NM, et al. (2023) Recurrent bacterial meningitis in children in the Netherlands: a nationwide surveillance study. BMJ Open 13: 077887.
15. Le C, Strong EB, Luu Q (2016) Management of Anterior Skull Base Cerebrospinal Fluid Leaks. J Neurol Surg B Skull Base 77: 404-411.