Clinical and Medical Research and Studies

www.alcrut.com

Case Report **Clinical and Medical Research and Studies** **Open Access**

Management of Rare Intraventricular Empyema Secondary to Late Onset Neonatal Meningitis in an Infant: A Case Report

Selemon Gebrezgabiher Asgedom[1*], Dejen Tekiea Gebrewahd[2], Million Gebrewold Abdi[3], Yoseph Abebe Wondie[4], Ephrem Ashagrie Melese[1]and Kefyalew Taye Belete[5]

[1] School of medicine, Yekatit 12 Hospital Medical College, Addis Ababa Health Office, Federal Ministry of Health, Ethiopia.

[2]Department of Surgery, Neurosurgery Division, Addis Ababa University, Addis Ababa, Ethiopia

[3]ALERT Comprehensive Specialized Hospital, Federal Ministry of Health, Addis Ababa, Ethiopia

[4]Department of Diagnostic Radiology, Yekatit 12 Hospital Medical College, Addis Ababa Health Office, Federal Ministry of Health, Ethiopia

[5] Department of Public Health, College of Health Sciences and Referral Hospital, Ambo University, Ambo, Ethiopia

***Corresponding Author:** Selemon Gebrezgabiher Asgedom, School of medicine, Yekatit 12 Hospital Medical College, Addis Ababa Health Office, Federal Ministry of Health, Ethiopia, India.

Received Date: May 02,2025; Accepted Date: May 18,2025; **Published Date:** May 20,2025

Citation: Selemon Gebrezgabiher Asgedom, Dejen Tekiea Gebrewahd, Million Gebrewold Abdi, Yoseph Abebe Wondie, Ephrem Ashagrie Melese, Kefyalew Taye Belete, Management of Rare intraventricular Empyema secondary to Late Onset Neonatal Meningitis in an Infant: A Case Report, J Clinical and Medical Research and Studies, V (4)I(3), DOI: 10.59468/2836-8525/105

Abstract:

Background: Intraventricular empyema is a rare and life-threatening complication of late-onset neonatal meningitis. Reporting such cases is important due to their diagnostic and therapeutic challenges. This case underscores the successful management of intraventricular empyema caused by Escherichia coli in a neonate, demonstrating the value of early diagnosis, advanced imaging, and multidisciplinary care.

Keywords; Intraventricular empyema, ventriculitis, Escherichia coli, Neuroendoscopic lavage

Case Presentation

A 44-day-old male Ethiopian infant presented with fever, irritability, vomiting, poor feeding, and abnormal body movements. Physical examination revealed bulging fontanelle and lethargy, suggesting raised intracranial pressure. Cerebrospinal fluid analysis confirmed bacterial meningitis, and brain imaging revealed bilateral intraventricular abscesses. The patient was diagnosed with intraventricular empyema secondary to late-onset meningitis caused by *Escherichia coli*. Management included intravenous administration of meropenem, external ventricular drainage to relieve pressure and remove purulent material, Neuroendoscopic lavage for direct intraventricular cleaning, and later placement of a ventriculoperitoneal shunt to managehydrocephalus. The patient responded well to treatment, showing marked clinical improvement. He was discharged in stable condition and scheduled for follow-up.

Conclusions: This case demonstrates the importance of early recognition and a comprehensive medical and surgical approach in managing intraventricular empyema in neonates. Neuroimaging, targeted antimicrobial therapy, and the use of endoscopic surgical techniques can significantly improve outcomes in these critically ill patients.

Introduction:

Intraventricular empyema is a rare and life-threatening condition characterized by the accumulation of purulent material within the brain's ventricular system. It often arises from complications of intracranial infections such as meningitis, brain abscess, or subdural empyema. This condition typically presents with nonspecific but severe symptoms, including high fever, headache, altered mental status, and signs of increased intracranial pressure, such as nausea, vomiting, and neurological deficits. Diagnosis relies heavily on neuroimaging, with MRI providing greater sensitivity for detecting pus and associated complications like ventriculitis.

Management of intraventricular empyema requires a multidisciplinary approach, including immediate empirical broad-spectrum antibiotics, surgical interventions such as external ventricular drainage (EVD) to relieve hydrocephalus and remove infected material, and, in some cases, intraventricular antibiotics or craniotomy for abscess drainage. Despite advances in treatment, mortality rates remain high, and survivors often face long-term neurological deficits. Early diagnosis and aggressive treatment of predisposing conditions, such as meningitis or brain abscess, are critical to preventing this devastating condition. This case highlights the multidisciplinary approach required to manage such cases and emphasizes the importance of early intervention.

Case Presentation A 44-day-old male Ethiopian infant born at term by spontaneous vaginal delivery to a 32-year-old para 5 mother with a history of prolonged rupture of membranes (PROM) presented with fever, trouble of breast feeding, irritability, vomiting, abnormal body movement of 3 days duration with 2 to 3 episodes daily. The patient was diagnosed and treated for late-late onset neonatal sepsis of CNS focus, and he was treated with intravenous ampicillin and gentamycin, paracetamol and antiepileptic agent phenobarbital for 3 weeks. Despite the treatment the patient had no improvement, and he

continued to have persistent high-grade fever, worsening in the frequency of ABM, and altered mental status.

On admission, physical examination revealed an infant with a fever record of 39.3 $c^{0,}$ lethargy, bulging anterior fontanelle, hypertonia, absent Moro reflex and signs of increased intracranial pressure. Laboratory tests showed leukocytosis (21.5K/mm^3, 71% neutrophils) and elevated C-reactive protein (127 mg/L). CSF analysis revealed pleocytosis (1776 cells/mm^3, 86% neutrophils), protein of 593 mg/dL, and glucose of 5 mg/dL. Blood and CSF culture isolated *Escherichia coli* sensitive to gentamicin, amikacin, meropenem, ciprofloxacin, and chloramphenicol. Trans fontanel ultrasound demonstrated an echogenic, irregularly marginated collection within the bilateral lateral ventricles, particularly involving the posterior and temporal horns of the ventricle. These findings were consistent with intraventricular abscesses. The surrounding ventricular walls appeared thickened and hyperechoic, indicative of inflammation or ventriculitis.

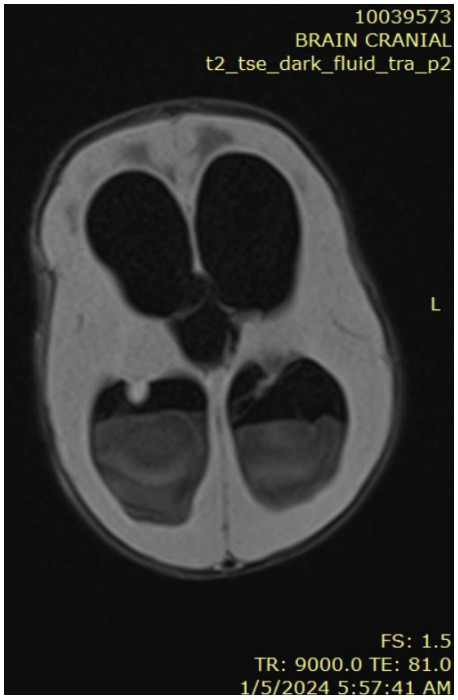

Figure 1: FLAIR

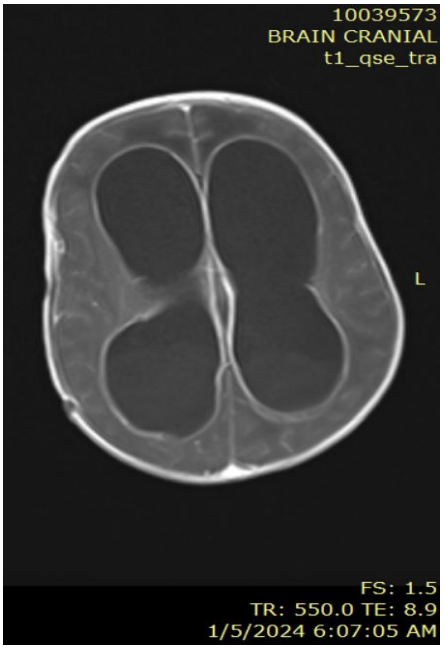

Figure 2: post-contrast T1

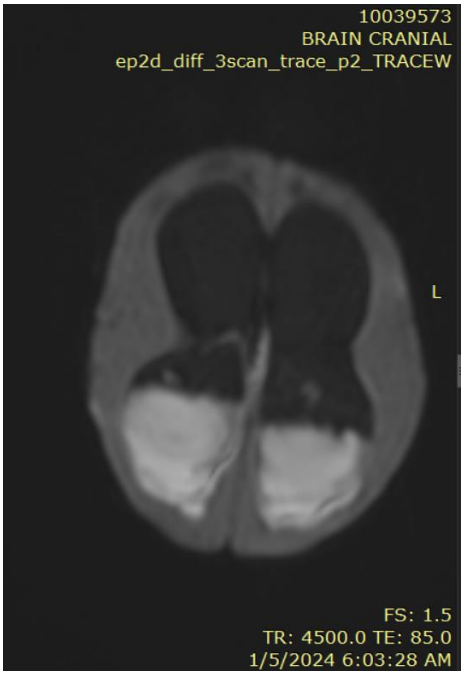

Figure 3: DWI

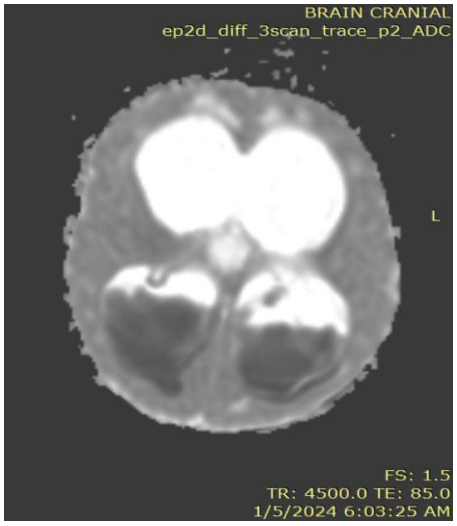

Figure 4: ***ADC***

Brain MRI: FLAIR (Figure 1) sequence shows **ventriculomegaly** with **hyperintense intraventricular contents** on bilateral lateral ventricles, post-contrast T1(Figure 2) sequence demonstrate **ventricular wall enhancement (ependymal enhancement)**, indicative of **ventriculitis.** and DWI (Figure 3) sequence shows **marked hyperintensity** within the intraventricular abscess, with corresponding **low ADC values (Figure 4),** confirming **restricted diffusion** consistent with **intraventricular purulent collection (empyema).**

Management

The patient initially stabilized with bolus intravenous fluids. Upon admission, cerebrospinal fluid (CSF) analysis and brain MRI were performed on Day 1, revealing bacterial meningitis and features consistent with intraventricular empyema. Blood and CSF cultures isolated Escherichia coli after 48 hours. The infant was initially treated with intravenous ampicillin and gentamycin. On Day 3, due to lack of clinical improvement and confirmed E. coli infection, antibiotics were escalated to intravenous meropenem (40 mg/kg every 8 hours). On the same day, following written informed consent, the patient was taken to the operating room for endoscopic intervention. Through the right Kocher's point, an external ventricular drain (EVD) was inserted using a No. 10 nasogastric tube. Through the right Keen's point incision and burr hole, Neuroendoscopic lavage and septostomy were performed. The ventricles were irrigated with Ringer's lactate and intrathecal gentamycin (2 mg daily) was administered for the first 5 days post-procedure.

Postoperatively, the EVD was maintained for two weeks alongside intravenous meropenem. Serial transfontanel ultrasound imaging, CSF analysis, and laboratory tests were used to monitor treatment progress. Despite the initial improvement, persistent hydrocephalus was noted. At the end of the fourth week, a medium pressure ventriculoperitoneal (VP) shunt was inserted to manage the hydrocephalus. The patient showed marked clinical improvement and was discharged after 28 days of hospitalization, with oral antibiotics and plans for close outpatient follow-up. No adverse drug reactions or surgical complications were reported during the hospital stay. The parents were initially very worried about their infant's condition. However, after receiving clear explanations from the medical team and witnessing the comprehensive care provided, they expressed deep gratitude for the successful treatment and recovery of their child.

Discussion

Intraventricular empyema in infants represents a rare but life-threatening complication of late-onset meningitis. This condition often arises from hematogenous dissemination or contiguous spread from infections like meningitis or brain abscess, necessitating early recognition and a multidisciplinary treatment approach. The high morbidity and mortality rates associated with intraventricular empyema emphasize the importance of timely diagnosis and intervention. In this case, *Escherichia coli* was identified as the causative pathogen, a common agent of neonatal meningitis, particularly in infants with risk factors such as prolonged rupture of membranes (PROM) or preterm birth. Gram-negative bacterial infections are known to cause more severe forms of meningitis, often leading to complications like ventriculitis and empyema (1). The patient's clinical presentation, including fever, irritability, vomiting, and altered mental status, aligns with previous reports of intraventricular infections (2).

Neuroimaging remains a cornerstone in diagnosing intraventricular empyema. While cranial ultrasound is commonly used as the initial modality in neonates, MRI is the gold standard due to its superior sensitivity in detecting intraventricular pus collections, ependymal enhancement, and associated ventriculitis (3). In this case, MRI findings of hyperintense intraventricular contents on FLAIR sequences, ventricular wall enhancement on T1 post-contrast images, and restricted diffusion on DWI were consistent with intraventricular empyema.

Management of intraventricular empyema involves a combination of medical and surgical interventions. Prompt initiation of empirical broad-spectrum antibiotics followed by targeted antimicrobial therapy based on culture results is critical. Meropenem was appropriately chosen in this case due to its excellent cerebrospinal fluid penetration and activity against Gram-negative bacteria (4). Surgical intervention, including external ventricular drainage (EVD), Neuroendoscopic lavage, and septostomy, is often required to drain purulent material, relieve hydrocephalus, and facilitate antibiotic administration. This combination has been shown to improve outcomes in pediatric intraventricular infections(5). Despite aggressive treatment, long-term neurological sequelae such as hydrocephalus, seizures, and cognitive impairment are common among survivors. The insertion of a ventriculoperitoneal (VP) shunt in this case highlights the frequent occurrence of post-infectious hydrocephalus in infants with intraventricular empyema. Comprehensive outpatient follow-up and multidisciplinary care are essential to optimize neurodevelopmental outcomes in affected patients.

Conclusion

This case report highlights the rare occurrence of intraventricular empyema secondary to late-onset neonatal meningitis, emphasizing the importance of early diagnosis and a multidisciplinary approach. Timely intervention with antibiotics, Neuroendoscopic lavage, and ventricular drainage significantly improved the patient's clinical outcome, underscoring the role of combined medical and surgical management in such life-threatening infections

List of abbreviations

CSF-Cerebrospinal Fluid, EVD- External Ventricular Drainage, FLAIR-Fluid-Attenuated Inversion Recovery sequence, MRI-Magnetic Resonance Imaging, DWI-Diffusion Weighted Imaging, ADC -Apparent Diffusion Coefficient, VPS-Ventriculoperitoneal shunt, PROM-Prolonged Rupture of Membranes

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Written informed consent was obtained from the infant's parents for publication of this case report and accompanying images.

Availability of data and materials

The data supporting the findings of this case report are available within the article. Additional information is available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that they have no competing interests.

Funding
The authors received no financial support for the research, authorship, and/or publication of this article.

Authors'contributions
Conceptualization: Selemon Gebrezgabiher Asgedom.
Case narration: Selemon Gebrezgabiher Asgedom, Yoseph Abebe Wondie, Kefyalew Taye Belete.
Manuscript review and editing: Dejen Tekiea Gebrewahd, Million Gebrewold Abdi, Yoseph Abebe Wondie, Ephrem Ashagrie Melese.

Acknowledgements

The authors would like to thank the patient's family for their cooperation and the clinical team involved in the patient care.

References:

1. Bardeen, J.R. & Fergus T.A. (2014). An examination of the incremental contribution of emotion regulation difficulties to health anxiety beyond specific emotion regulation strategies. *J Anxiety Disord*., 28(4),394 - 401.

2. Nolen-Hoeksema, S. & Aldao. A. (2011). Gender and age differences in emotion regulation strategies and their relationship to depressive symptoms. *Personality Individ Differ*, 51(6), 704-708.

3. Mennin, D.S., Heimberg, R.G., Turk, C.L. & Fresco, D.M. (2002). Applying an emotion regulation framework to integrative approaches to generalized anxiety disorder. *Clinical Psychology: Science and Practice*, 9 (1), 85–90.

4. Rusch, S., Westermann. S. & Lincoln, T. M. (2012). Specificity of emotion regulation deficits in social anxiety: An internet study. *Psychol Psychother Theory Res Pract*., 85(3), 268 - 277.

5. Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of psychopathology and behavioral assessment*, 26(1), 41-54.

6. Madhava Chandran, K., Navena, K., Vijayaraghavan, N., Valsan, T. & Sreevallabhan, S. (2021). Effect of yoga practice on psychological and physical health parameters. *International Journal of Yoga and Allied Science*, 10 (2),105-113.

7. Madhava Chandran, K., Unniraman, P., Unnikrishnan, K.K. & Ram Subramanian (2024). A study on the emotional state of yoga practitioners. *J Clin Res Case Stud*., 2 (3), 1-5.

8. Madhava Chandran, K., Bijunath, A., Unniraman, P. & Anjana, K.J. (2023). Influence of yoga in maintaining a positive mental state. *Acta Neurophysiol*, 4(2):180014.

9. Madhava Chandran, K. & Sasidharan, K. (2024). Quality of Life Before and After the Practice of Yoga: A Comparative Analysis. *Ind J Anct Med Yoga*, 17(2), 69-76.

10. Madhava Chandran, K., Unniraman, P., Unnikrishnan, K.K. & Sasidharan, K. (2024). Contentment in Life Before and After the Practice of Yoga: A Study. *OA J Behavioural Sci Psych*, 7(1):180083.

11. Madhava Chandran, K., Ajith, B. Nair & Sasidharan, K. (2024). Effect of yoga on the resilience ability of the practitioners. *Acta Neurophysiol*, 4(4):180030.

12. Madhava Chandran, K., Unniraman, P. & Unnikrishnan, K.K. (2024). Experience of disgusted feelings before and after the practice of yoga: A comparative study. *Sun Text Rev Neuro Psychol*, 5(2), 179.

13. Madhava Chandran, K., Unniraman, P., Unnikrishnan, K.K., Sathiyan, C. & Sai Prakash, M.T. (2024). Distress tolerance: A comparative study before and after the practice of yoga. *Acta Neurophysiol*, 5(4):1800094.