EDITORIAL

The Menace of Meningitis!

Hemanshu Prabhakar

Received on: 18 November 2022; *Accepted on:* 18 November 2022; *Published on:* 30 November 2022

Keywords: Bacterial meningitis neurosurgical cerebrospinal fluid lactate, Meningitis after craniotomy, Neurocritical care, Postoperative critically Ill.
Indian Journal of Critical Care Medicine (2022): 10.5005/jp-journals-10071-24368

Postneurosurgical meningitis is one of the most feared complications in neurocritical care units. It not only increases morbidity and mortality but also adds to the financial burden in resource-limited nations. The reported rates of meningitis vary from 0.3% to 8.6%,[1] and an Indian study suggests similar findings.[2] Postneurosurgical meningitis is caused mainly by cutaneous organisms such as coagulase-negative staphylococci, *Staphylococcus aureus* and *Propionibacterium acnes*. Antibiotic prophylaxis in neurosurgery is directed mainly against gram-positive bacteria. There remains variability in the use of antibiotics between hospitals, which depends on the epidemiology of the local postneurosurgical meningitis.

With the use of antibiotic prophylaxis and antibiotic-coated devices directed mainly against gram-positive bacteria, a shift toward gram-negative bacteria has been observed. However, it is imperative to have knowledge of the local epidemiology in order to treat postneurosurgical meningitis. At the same time, diagnosing postneurosurgical meningitis is difficult because the symptoms are less specific.

Early diagnosis of this menace called bacterial meningitis is extremely important. Recently, cerebrospinal fluid (CSF) nanopore 16S sequencing has been found to be more effective than conventional CSF culture studies in postoperative bacterial meningitis and may contribute to evidence-based decisions for antibiotic maintenance and discontinuation.[3] Although serum procalcitonin showed limited performance for the diagnosis of postoperative meningitis in a study. However, the authors suggest it could be a useful adjunct for the improvement of diagnostic sensitivity when used in combination with other inflammatory markers.[4] A recent meta-analysis indicated that the CSF lactate concentration has relatively high sensitivity and specificity for the diagnosis of postneurosurgical bacterial meningitis and thus has relatively good efficacy.[5] A group of researchers has demonstrated that raised CSF tumor necrosis factor-α, interleukin-1β, and interleukin-8 in a temporal manner may indicate early bacterial meningitis development in neurosurgical patients, thereby enabling early diagnosis resulting in improved patient outcomes.[6]

It has also been observed there is an increasing rate of infection caused by multidrug resistant gram-negative bacteria, *Acinetobacter baumannii* being the major organism in some centers.[7] In a prospective, single-center study, adult patients hospitalized during a 12-year period were reviewed and pathogens were isolated from postneurosurgical cases of meningitis. They found gram-negative pathogens more frequently and *A. baumanni* was the predominant pathogen. Gram-negative pathogens had worse clinical and prognostic outcomes than gram-positive pathogens.[8]

Similar findings have been reported by the authors of the article published in this issue. In this retrospective study, the authors have collected data for patients who suffered postneurosurgery meningitis in a tertiary care center in northern India. This study determines the risk factors, the spectrum of pathogenic microorganisms, multidrug resistance, and the nature of intracranial lesions isolated among the patients who developed bacterial meningitis following intracranial surgery. An interesting study with useful insight.[9] More data are required from different regions of the country, for a comprehensive understanding of the epidemiology of bacterial meningitis in India. Data on the clinical outcome of such patients would be very useful.

Several complications can be seen in bacterial meningitis and the crucial role of a neurointensivist is to anticipate and address these complications. Some of the complications of bacterial meningitis are seizures, status epilepticus, cerebral edema, intracranial hypertension and herniation, septic shock, multiorgan failure, venous thromboembolism, and neurological deficits such as hemiparesis, sensorineural hearing loss, aphasia, and cranial nerve palsy.[10]

Prophylactic antibiotics are popularly used before craniotomy to prevent postoperative infections. In a meta-analysis conducted to examine the effect of prophylactic antibiotics on meningitis after craniotomy, the authors concluded that prophylactic antibiotic use significantly decreases meningitis infections after craniotomy.[11]

To conclude, infections can be life-threatening neurological emergencies. They require prompt diagnosis and management. The vigilant role of a neurointensivist cannot be overemphasized.

Department of Neuroanaesthesiology and Critical Care, All India Institute of Medical Sciences, New Delhi, India

Corresponding Author: Hemanshu Prabhakar, Department of Neuroanaesthesiology and Critical Care, All India Institute of Medical Sciences, New Delhi, India, Phone: +91-011-26593474, e-mail: prabhakaraiims@yahoo.co.in

How to cite this article: Prabhakar H. The Menace of Meningitis! Indian J Crit Care Med 2022;26(12):1231–1232.

Source of support: Nil

Conflict of interest: None

Orcid

Hemanshu Prabhakar https://orcid.org/0000-0001-7830-3296

References

1. Hussein K, Bitterman R, Shofty B, Paul M, Neuberger A. Management of post-neurosurgical meningitis: Narrative review. Clin Microbiol Infect 2017;23(9):621–628. DOI: 10.1016/j.cmi.2017.05.013. DOI: 10.1016/j.cmi.2017.05.013.
2. Srinivas D, Kumari VHB, Somanna S, Bhagavatula I, Anandappa CB. The incidence of postoperative meningitis in neurosurgery: An institutional experience. Neurol India 2011;59(2):195–198. DOI: 10.4103/0028-3886.79136.
3. Jang Y, Kim S, Kim N, Son H, Ha EJ, Koh EJ, et al. Nanopore 16S sequencing enhances the detection of bacterial meningitis after neurosurgery. Ann Clin Transl Neuro. 2022;9(3):312–325. DOI: 10.1002/acn3.51517.
4. Choi SH, Choi SH. Predictive performance of serum procalcitonin for the diagnosis of bacterial meningitis after neurosurgery. Infect Chemother 2013;45(3):308–314. DOI: 10.3947/ic.2013.45.3.308.
5. Xiao X, Zhang Y, Zhang L, Kang P, Ji N. The diagnostic value of cerebrospinal fluid lactate for post-neurosurgical bacterial meningitis: A meta-analysis. BMC Infect Dis 2016;16(1):483. DOI: 10.1186/s12879-016-1818-2.
6. Liu ZH, Tu PH, Chen NY, Yip PK, Bowes AL, Lee CC, et al. Raised proinflammatory cytokine production within cerebrospinal fluid precedes fever onset in patients with neurosurgery-associated bacterial meningitis. Crit Care Med 2015;43(11):2416–2428. DOI: 10.1097/CCM.0000000000001188.
7. Metan G, Alp E, Aygen B, Sumerkan B. *Acinetobacter baumannii* meningitis in post-neurosurgical patients: Clinical outcome and impact of carbapenem resistance. J Antimicrob Chemother 2007;60(1):197–199. DOI: 10.1093/jac/dkm181.
8. Kurtaran B, Kuscu F, Ulu A, Inal AS, Komur S, Kibar F, et al. The causes of postoperative meningitis: The comparison of Gram-negative and Gram-positive pathogens. Turk Neurosurg 2018;28(4):589–596. DOI: 10.5137/1019-5149.
9. Kar M, Jamwal A, Dubey A, Sahu C, Patel SS. Bacterial Meningitis among Intracranial Surgery Patients at a University Hospital in Northern India. Indian J Crit Care Med 2022;26(12):1244–1252.
10. Johnson NJ, Gaieski DF. Central nervous system infections. In: Neurointensive Care. Prabhakar H, editor. Oxford University Press, 1st Edition, New Delhi, 2019, pp.278–287.
11. Alotaibi AF, Hulou MM, Vestal M, Alkholifi F, Asgarzadeh M, Cote DJ, et al. The efficacy of antibacterial prophylaxis against the development of meningitis after craniotomy: A meta-analysis. World Neurosurg 2016;90:597–603.e1. DOI: 10.1016/j.wneu.2016.02.048.