Bangladesh Crit Care J September 2025; 13 (2): 120-123

Case Report

Hemorrhagic Transformation in Pneumococcal Meningitis: A Rare but Devastating Complication

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DOI: https://doi.org/10.3329/bccj.v13i2.84409

Abstract:

Bacterial meningitis is a neurological emergency with significant morbidity and mortality. Streptococcus pneumoniae is the leading cause in adults, with complications such as cerebral infarction, hydrocephalus, and seizures. Haemorrhagic transformation is extremely rare, reported in 2–9% of cases, but is associated with poor prognosis. We report a case of pneumococcal meningitis complicated by extensive frontal lobe and cerebellar haemorrhages. The patient presented with classic meningitis symptoms and rapidly developed a generalized tonic–clonic seizure. Neuroimaging revealed multiple haemorrhages without vascular malformations, hypertension, anticoagulant exposure, or coagulopathy. Venous sinus thrombosis was excluded. Systemic sepsis and vasculitis were considered the likely contributors to haemorrhagic transformation. Despite the severity, the patient showed significant neurological recovery following targeted antibiotics, intensive care, and multidisciplinary rehabilitation. This case emphasizes the need for early neuroimaging in meningitis patients with neurological decline, even in the absence of vascular risk factors, to enable timely recognition and intervention.

Keywords: *Cerebral Vasculitis, Hemorrhagic Transformation, Intracranial Hemorrhage, Neuroimaging, Neurocritical Care Pneumococcal Meningitis, Sepsis.*

Background:

Bacterial meningitis requires urgent attention due to its significant potential for illness and fatal outcomes. Streptococcus pneumoniae accounts for approximately 70% of community-acquired bacterial meningitis in adults. While common complications include ischemic stroke and hydrocephalus, intracranial hemorrhage (ICH) remains a rare entity, occurring in only 2%–9% of cases. Hemorrhagic transformation in pneumococcal meningitis is associated with poor prognosis and limited reported cases. Herein, we present a unique case of pneumococcal meningitis complicated by fatal cerebellar and frontal lobe hemorrhage, with a discussion of clinical course, diagnostic challenges, and management strategies.

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Case Presentation:

A 52-year-old woman with a known history of diabetes mellitus presented to the emergency department with altered mental status, high-grade fever, and respiratory distress. Initial evaluation revealed a GCS of E1V2M4 with stable hemodynamics and no focal neurological deficits. Preliminary imaging suggested pansinusitis. Empirical treatment with ceftriaxone, vancomycin, acyclovir, and dexamethasone was initiated. She was promptly intubated due to low GCS and admitted to the MICU.

A lumbar puncture performed on day one showed turbid CSF with normal opening pressure. CSF analysis and culture later confirmed Streptococcus pneumoniae. Antibiotic therapy was escalated to meropenem based on sensitivity. with no organomegaly, mass or ascites.

Received : August 10, 2025; Accepted : August 30, 2025

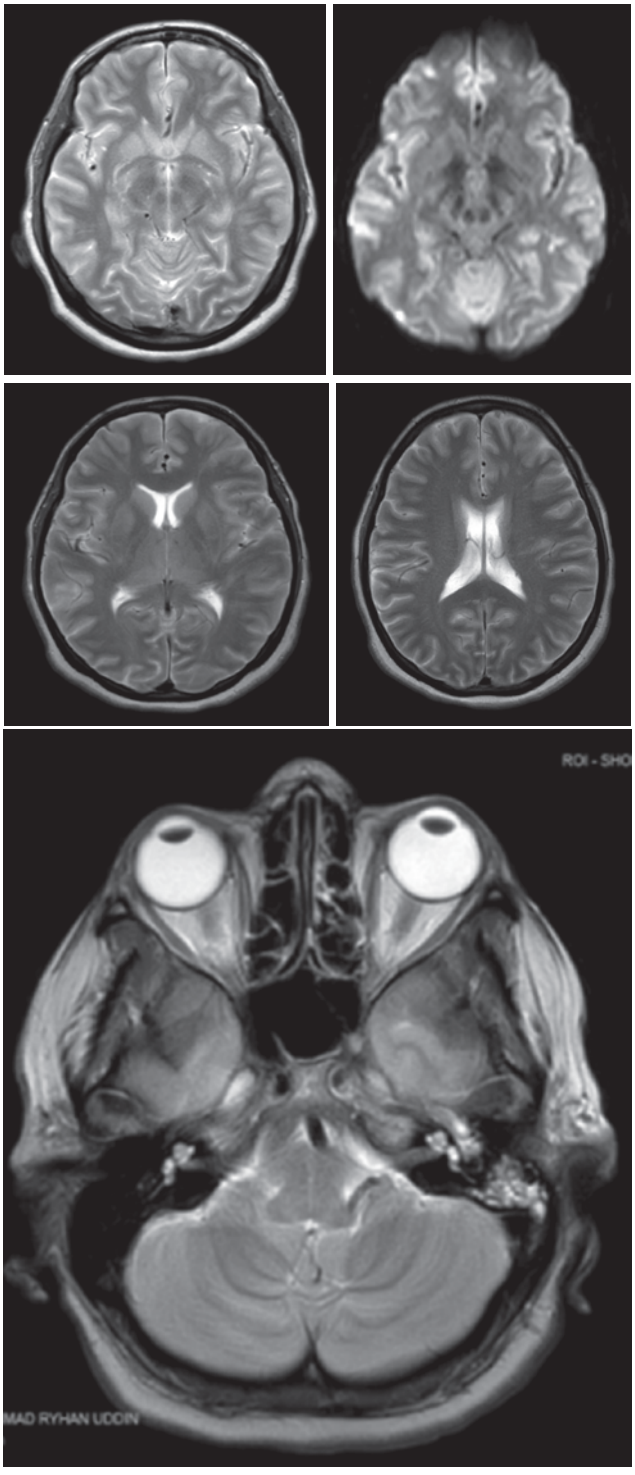

Fig 1: MRI OF BRAIN (1st Scan)

Despite initial improvement in sensorium (GCS E3VtM4), the patient experienced a generalized tonic-clonic seizure (GTCS) on day 3, prompting neuroimaging. A CT scan revealed a left-sided frontal lobe hemorrhage.

MRV with contrast was performed to rule out venous sinus thrombosis or arteriovenous malformation but showed no vascular abnormalities. MRI demonstrated bilateral T2/FLAIR hyperintensities with diffusion restriction, cerebral edema, and sulcal effacement. A second GTCS occurred on day 4, accompanied by signs of raised intracranial pressure (ICP), managed with hyperosmolar therapy.

Over the following days, the patient showed gradual neurological recovery. Sedation was tapered, and spontaneous breathing trials were successfully initiated. She was extubated on day 9 and transferred to a step-down unit with improved GCS and stable oxygenation.

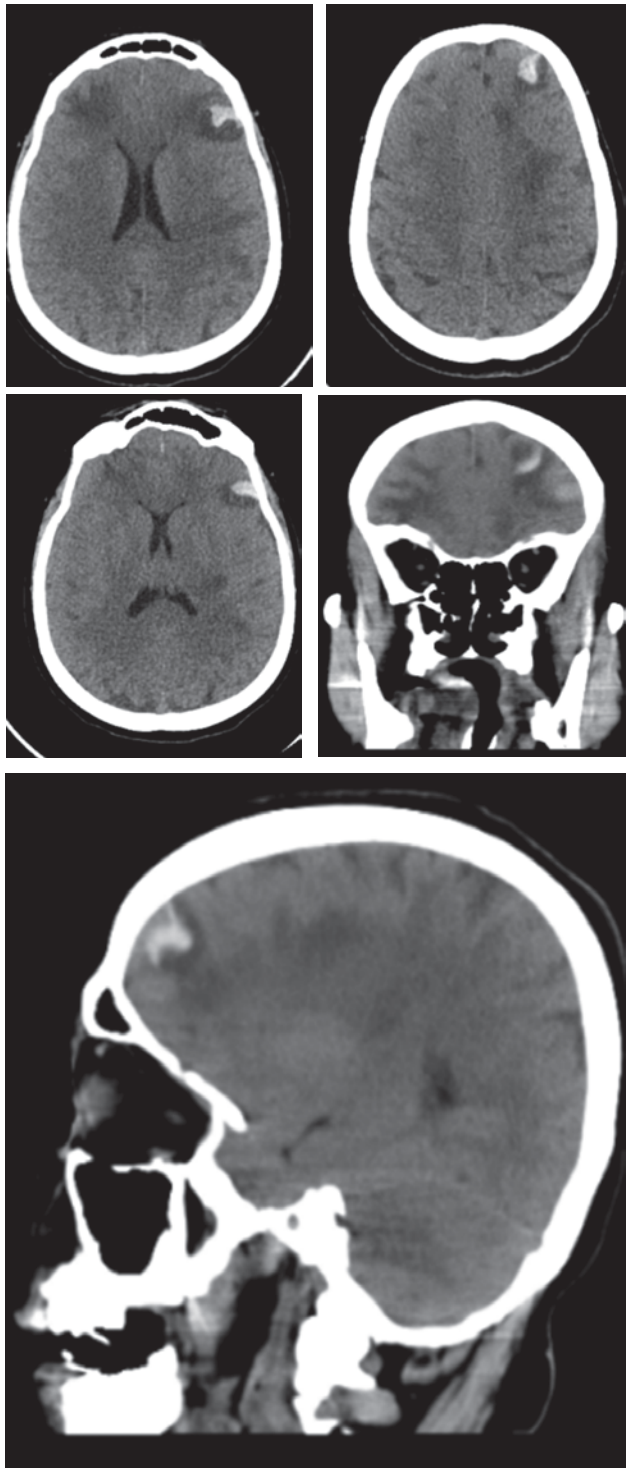

Fig 2: CT SCAN OF BRAIN

Subsequent complications included dysphagia and hoarseness of voice. ENT evaluation with fiberoptic laryngoscopy (FOL) revealed left vocal cord palsy. Speech & language therapy assessments guided re-initiation of oral feeding. A follow-up MRI showed resolving encephalitis with no new hemorrhagic events. By day 25, nasogastric tube was removed, and she resumed soft oral diet. The patient was discharged on day 27 with baseline cognitive function, residual vocal impairment, and outpatient follow-up.

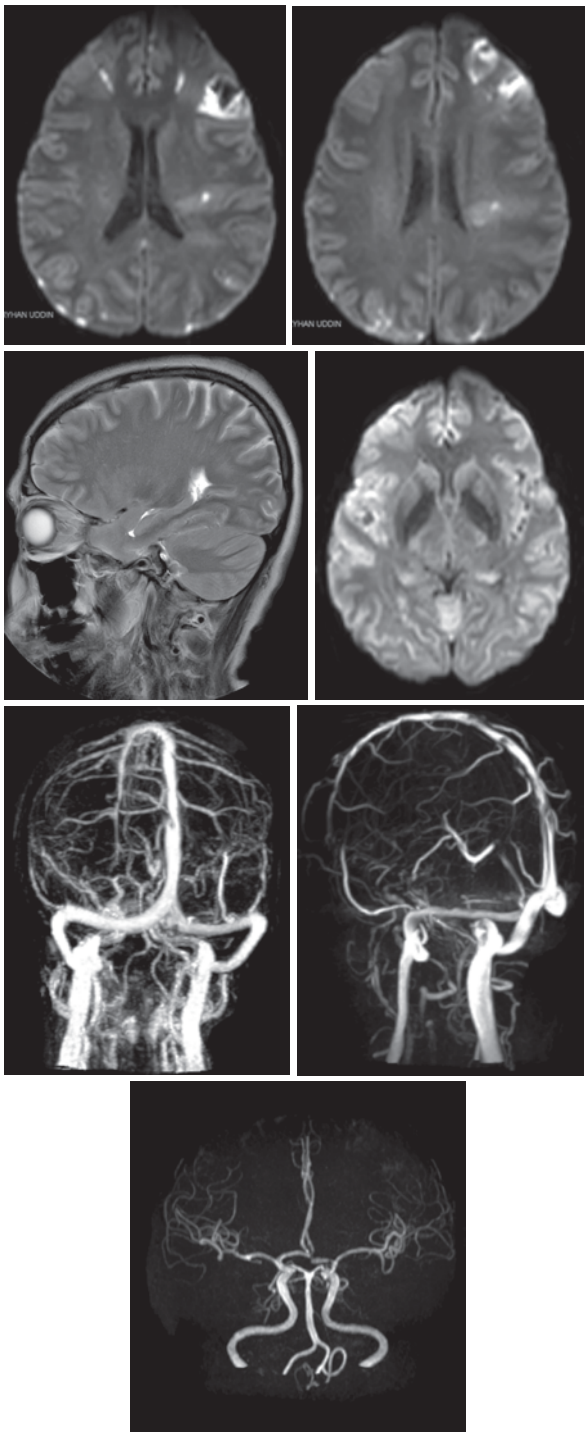

Fig 3: MRV OF BRAIN

Discussion:

We present a case report highlighting a rare yet critical instance of hemorrhagic transformation (HT) occurring with pneumococcal meningitis**.** While meningitis itself is a serious infection, the occurrence of HT significantly exacerbates its severity and prognosis. Pneumococcal meningitis remains one of the most serious forms of bacterial meningitis in adults, with Streptococcus pneumoniae accounting for 70–80% of community-acquired cases.[1] While its typical neurological complications include cerebral infarction, hydrocephalus, and seizures, hemorrhagic transformation is exceptionally rare—occurring in approximately 2–9% of cases.[2,3] This case highlights a devastating instance of cerebellar and frontal lobe hemorrhage complicating pneumococcal meningitis, with significant implications for diagnosis and management. There are several interacting factors contribute to the precise mechanisms of hemorrhagic transformation in meningitis. Intense inflammatory responses in bacterial meningitis can cause vasculitis, endothelial damage, and blood-brain barrier breakdown—all of which predispose to vascular leakage and hemorrhage.[4,5] Possible mechanisms include vasculitis changes in cerebral vessels due to inflammatory cytokine release, disruption of the blood-brain barrier, or septic arteritis. In our patient, the absence of hypertension, anticoagulant therapy, or vascular malformation underscores the role of the inflammatory milieu and possibly a septic vasculopathy. Clinical suspicion of hemorrhagic complications is challenging due to symptom overlap with other neuro-infective features such as altered mental status and seizures. In our case, the development of a generalized tonic-clonic seizure (GTCS) prompted urgent neuroimaging, which revealed a frontal lobe hemorrhage. This underscores the critical need for early CT/MRI when neurological deterioration or seizures occur, even in the absence of classic vascular risk factors.[6,7]

Contrast-enhanced MR venography ruled out venous sinus thrombosis or vascular malformations, and serial imaging helped guide further management. Notably, diffusion restriction and T2/FLAIR hyperintensities indicated cerebral edema and inflammation, which are often seen in complicated meningitis cases.[8]

Several risk factors for hemorrhagic transformation in bacterial meningitis have been proposed, including CNS vasculitis or arteritis; Septic emboli or mycotic aneurysm rupture; Complicated infective endocarditis; Use of anticoagulants; Coagulopathies, thrombocytopenia, or platelet dysfunction; Severe systemic illness (e.g., sepsis, renal failure). In our patient, none of these were evident except for systemic sepsis, suggesting that sepsis-induced cerebral vasculitis was the likely trigger.

Despite the severity, our patient demonstrated remarkable recovery due to early diagnosis, targeted antimicrobial therapy, aggressive ICU care & gradual neurological recovery and rehabilitation—including speech and swallowing therapy—enabled functional recovery despite initial poor GCS.

Conclusion:

Hemorrhagic transformation in pneumococcal meningitis is a rare yet life-threatening complication. Its early identification is challenging due to overlapping clinical features with other neuro-infective conditions. Neuroimaging plays a pivotal role in diagnosis, while outcome hinges on prompt antimicrobial therapy, neurocritical care, and a multidisciplinary approach. Despite the grim initial presentation, full recovery is achievable with vigilant management, as demonstrated in this case.

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