

## CASE REPORT

# A Rare Case of Primary Pyogenic Ventriculitis in a Patient with Community-acquired Meningitis

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## ABSTRACT

Pyogenic ventriculitis is defined as the inflammation of the ependymal lining of the cerebral ventricular system. It is characterized by the presence of suppurative fluid in the ventricles. It mostly affects neonates and children but rarely can be seen in adult population. In adults, it usually affects the elderly population. It is usually healthcare associated and occurs secondary to ventriculoperitoneal shunt, external ventricular drain, intrathecal drug delivery, brain stimulation devices, and neurosurgical intervention. Primary pyogenic ventriculitis though rare should be considered as one of the differential diagnoses in patients who do not improve despite an appropriate antibiotic regimen in bacterial meningitis. Our case report on primary pyogenic ventriculitis secondary to community-acquired bacterial meningitis in an elderly diabetic male patient illustrates the importance of utilization of multiplex polymerase chain reaction (PCR), repeated neuroimaging, and prolonged course of antibiotics for the successful management and outcome.

**Keywords:** Diabetic ketoacidosis, Ependymitis, Intensive care unit, Polymerase chain reaction, Primary pyogenic ventriculitis, Pyocephalus, Recurrent ventriculitis, Ventricular empyema.

*Indian Journal of Critical Care Medicine* (2022); 10.5005/jp-journals-10071-24273

## INTRODUCTION

Pyogenic ventriculitis is defined as the inflammation of the ependymal lining of the cerebral ventricular system. It mostly affects neonates and children but rarely can be seen in adult population. Healthcare-associated ventriculitis occurs secondary to ventriculoperitoneal shunt, external ventricular drain, intrathecal drug delivery, brain stimulation devices, and neurosurgical intervention.<sup>1</sup> Only a few case reports are available in the literature on primary pyogenic ventriculitis.<sup>2-5</sup> We present a rare case of primary pyogenic ventriculitis occurring as a complication of community-acquired bacterial meningitis due to *Streptococcus pneumoniae* in an elderly diabetic male. Our management includes early detection of organism using multiplex PCR, control of blood sugar levels, and prolonged targeted antibiotic therapy for 6 weeks. There should be high index of clinical suspicion in adult patients with preexisting comorbidities who are diagnosed with bacterial meningitis with therapeutic failure.

## CASE DESCRIPTION

A 64-year-old diabetic male presented to the emergency room with fever and altered sensorium since 1 day. On arrival, he developed one episode of focal seizure in ER, which was treated with a loading dose of intravenous levetiracetam and was resolved. In view of the low Glasgow Coma Score (GCS), invasive mechanical ventilation was initiated. Magnetic resonance imaging (MRI) of the brain showed features of leptomenigeal enhancement with a normal angiogram (Fig. 1). He was admitted to the medical intensive care unit (ICU). Initial laboratory investigations were collected (Table 1).

Diagnostic lumbar puncture was done and treated with an empirical antibiotic which included intravenous ceftriaxone and vancomycin as per the body weight (Table 2). Intravenous dexamethasone was administered with the first dose of antibiotics and continued for 4 days. He developed diabetic ketoacidosis (DKA)

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**How to cite this article:** Maheshwarappa HM, Rai AV. A Rare Case of Primary Pyogenic Ventriculitis in a Patient with Community-acquired Meningitis. *Indian J Crit Care Med* 2022;26(7):874–876.

**Source of support:** Nil

**Conflict of interest:** None

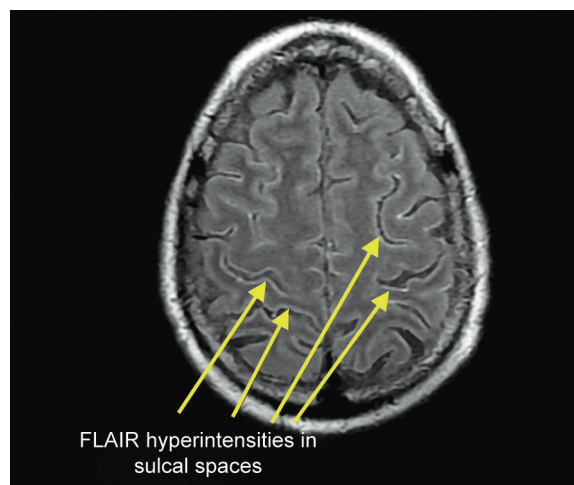


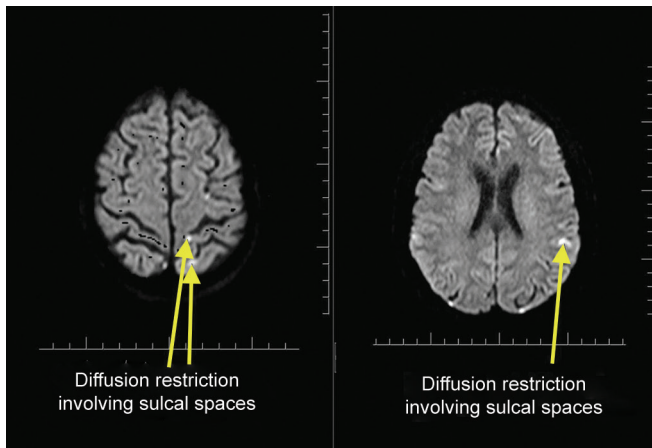
Fig. 1: Leptomenigeal enhancement

**Table 1:** Laboratory investigations

Hemoglobin	16.2 gm/dL
White blood count	28200 cells/mm <sup>3</sup>
Platelet count	211000 cells/mm <sup>3</sup>
Glucose	547 mg/dL
Urea	10 mg/dL
Creatinine	0.93 mg/dL
Sodium	137 mmol/L
Potassium	4.8 mmol/L
Calcium	9.8 mg/dL
Magnesium	2.9 mg/dL
Total bilirubin	1.8 mg/dL
Urine analysis	Ketones trace, 2–4 pus cells

**Table 2:** Cerebrospinal fluid examination findings

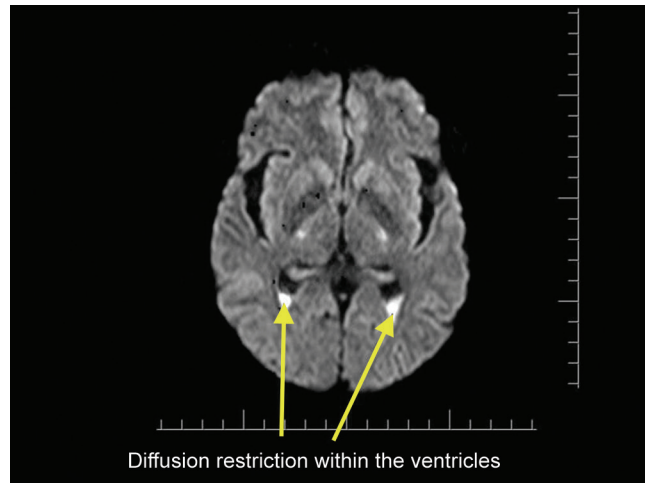
CSF appearance	Slight turbid
Cell count	375 cells/mm <sup>3</sup>
Cell type	Neutrophil predominant
Protein content	807 mg/dL
CSF glucose (corresponding RBS)	64 mg/dL (96 mg/dL)
Chloride	120 mg/dL
AFB stain	Negative
India ink preparation	Negative
Meningitis panel (BioFire film array)	<i>Streptococcus pneumoniae</i>
Bacterial culture	Contaminants
Fungal culture	No growth



**Fig. 2:** Infective collection in sulcal space

on admission to ICU, which was managed according to the DKA protocol. Diabetic ketoacidosis was resolved within the next 2 days. No further seizure episodes and he was maintained on intravenous levetiracetam. Bedside electroencephalogram also did not show electrographic seizures.

In view of new-onset acute kidney injury, vancomycin dose was adjusted accordingly. Renal function improved subsequently. Blood and urine cultures showed no growth. His sensorium did not improve despite normal metabolic parameters. Repeated MRI of the brain with diffusion-weighted imaging was done, which showed the findings in concern for infective collections in sulcal spaces with features of ventriculitis (Figs 2 and 3).



**Fig. 3:** Ventriculitis

Repeated cerebrospinal fluid (CSF) examination showed five cells which were all lymphocytes, glucose 82 mg/dL (corresponding blood sugar 246 mg/dL), protein 89 mg/dL, chloride 129 mmol/L, and culture showed no growth.

As there was no evidence of hydrocephalus, no neurosurgical intervention was done and was decided to manage conservatively using prolonged duration of antibiotics. Tracheostomy was done in view of the need for prolonged mechanical ventilation. In due course, he was successfully weaned from the ventilator and was decannulated once the sensorium was completely improved. He was discharged home after 3 weeks of admission with the advice to continue and complete a total of 6 weeks of systemic antibiotic therapy (intravenous ceftriaxone and vancomycin), control of blood sugar as per endocrinology advice, and undergo regular neurorehabilitation follow-up. On follow-up after 6 weeks, he was afebrile with no signs of recurrent infection and with no neurological sequelae.

## DISCUSSION

Pyogenic ventriculitis is characterized by the presence of suppurative fluid in the ventricles and is also referred to as pyocephalus, ventricular empyema, or ependymitis. It mostly affects neonates and children but rarely can be seen in adult population. In adults, it usually affects the elderly population (above 60 years)<sup>2,3</sup> as in our case. It is a recognized complication of nosocomial meningitis secondary to intraventricular surgery and drains, brain abscess, and otological disease. The most common organisms implicated in pathogenesis are *S. pneumoniae*, *Neisseria meningitidis*, and *Staphylococcus aureus*. Other organisms like *Enterococcus faecalis*, *Escherichia coli*, and *Peptostreptococcus* have also been isolated.<sup>6</sup> Signs of meningeal irritation were reported to be absent in most of the adult cases<sup>2</sup> as it was absent in our patient. Clinical presentation and CSF analysis may be similar in both meningitis and pyogenic ventriculitis. We were able to identify the organism early using multiplex PCR and start targeted antibiotic therapy despite culture being negative. Whenever symptoms persist despite appropriate antibiotic therapy, pyogenic ventriculitis should be suspected. Only nine adult cases have been reported till date.<sup>2–5</sup> Magnetic resonance imaging is more reliable than CT scan in detecting pus within ventricles. Ventricular debris is seen in 94% of cases.<sup>7</sup> Our patient had ventricular debris on repeated MRI.

Enhanced ventricular lining in bilateral occipital horns (60% cases),<sup>7</sup> hydrocephalus, and hyperintense periventricular signals are the other MRI findings. Ventriculitis complicating meningitis is difficult to treat with significant morbidity and mortality. No specific guidelines are mentioned in the literature for antibiotic therapy in pyogenic ventriculitis. However, it is advisable to administer antibiotics for a duration of 6–12 weeks.<sup>8,9</sup> Our patient was given 6 weeks of intravenous antibiotic therapy. Ventriculitis carries a poor prognosis with 1-year mortality rate close to 40%<sup>10</sup> versus 10–20% in contemporary cohorts of bacterial meningitis and brain abscess.<sup>11–14</sup> Amongst the survivors, 60% of patients had long-term neurological sequelae.<sup>10</sup> On follow-up at 6 weeks, our patient did not have any neurological sequelae.

## CONCLUSION

Primary pyogenic ventriculitis though rare should be considered one of the differential diagnosis in patients who do not improve despite routine meningitis treatment. Utilization of multiplex PCR helps in targeted antibiotic therapy. Repeated brain imaging is essential for the confirmation of diagnosis. Earlier initiation of appropriate antibiotics for a longer duration has better outcomes without the need of neurosurgical intervention.

## HIGHLIGHTS

Due to infrequent occurrence, primary pyogenic meningitis is likely to be underseen. This case report elucidates the importance of considering it as a differential diagnosis when a patient with suspected meningitis fails to recover despite appropriate treatment. Early detection of organisms using multiplex PCR, repeat neuroimaging, prolonged course of antibiotics, and control of comorbid conditions results in recovery and survival.

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