Cerebral Venous Thrombosis in an Infant with Pneumococcal Meningitis: A Case Report and Review of Literature

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Abstract

Bacterial meningitis in childhood is a life-threatening disease leading to neurological sequelae. A 35-day-old male infant presented with pneumococcal meningitis and had a recurrence of seizures, and magnetic resonance venography revealed multiple cerebral venous thromboses. The baby was managed with anticoagulant therapy. Neurological examination and neuroimaging were normal at 3-month follow-up. A high index of suspicion and early neuroimaging led to earlier diagnosis and normal neurodevelopmental outcome.

Keywords: Children, complications, meningitis, Streptococcus pneumoniae, thrombosis

INTRODUCTION

After routine immunization with Haemophilus influenzae b vaccine, Streptococcus pneumoniae has become the most common cause of meningitis in young children.[1,2] Complications such as cerebral venous thrombosis (CVT) are increasingly diagnosed because of improved diagnostic modalities and sensitization of clinicians. About 6%–12% cases of CVT are caused by infectious etiology.[3] Here, we describe the case of an infant with pneumococcal meningitis who developed multiple CVT.

CASE REPORT

A 35-day-old male infant was referred to the pediatric emergency room with complaints of fever for 4 days, rapid breathing for 2 days, poor feeding and lethargy for 1 day, after a dose of intravenous cefotaxime 50 mg/kg and dexamethasone 0.15 mg/kg. The patient was intubated for respiratory failure and put on pressure-controlled ventilation. Physical examination revealed diffuse bilateral crepitations, anterior fontanelle at the level and pulsatile, no focal neurological deficit, and no papilledema. Chest X-ray was suggestive of pneumonia [Figure 1]. Laboratory tests showed leukopenia (3500/µL; neutrophils 38%, lymphocytes 60%) and positive qualitative C-reactive protein. The cerebrospinal fluid (CSF) was turbid, with a protein of 54 mg/dl and sugar of 34 mg/dl and blood sugar of 110 mg/dl; ratio - 0.31. CSF Gram stain showed lanceolate-shaped Gram-positive cocci with sterile culture, and latex agglutination was positive for S. pneumoniae (BD Directigen™ meningitis combo test).

He developed generalized tonic seizure at admission and was managed with phenobarbitone. He was continued on cefotaxime 50 mg/kg every 6 hourly for 14 days. Repeat lumbar puncture reports were normal. Contrast-enhanced computed tomography (CECT) of the brain at admission was normal. The patient was successfully extubated after 7 days of ventilation. He had a recurrence of seizures on day 11 and was treated with phenobarbitone. On day 12, magnetic resonance imaging (MRI) brain showed normal study, but magnetic resonance venography (MRV) revealed superior sagittal, right transverse, and left cortical vein thrombosis [Figure 2].

The patient was treated with low molecular weight heparin (LMWH) 1 mg/kg every 12 hourly along with monitoring of head size (at admission - 36 cm, at discharge - 36.5 cm, showed normal neurodevelopmental outcome.

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The patient was discharged after 18 days of hospital stay. At discharge, neurological examination and auditory screening were normal. At 3-month postdischarge, the patient was neurologically normal with normal neuroimaging (MRI) results. The anticoagulant therapy was discontinued after 12 weeks. Procoagulant workup was planned after 3 months of discontinuation of anticoagulant.

**Discussion**

About 40% of survivors have neurological sequelae following pneumococcal meningitis; about 26% have hearing loss. Low CSF leukocyte count, low neutrophils, early admission to intensive care unit, and infection by penicillin-resistant *S. pneumoniae* are predictors of unfavorable outcome. In our patient, low CSF cell count (7/mm³) was noted and responded well to cefotaxime.

Intracranial complications are common in pneumococcal meningitis, occurring in up to 75% of adults. In a consecutive series of 87 adults with pneumococcal meningitis, CVT occurred in 9.2% of cases. When neonates are excluded, the reported incidence of CVT is 0.34 per 100,000 children per year. The factors responsible for this low incidence are old imaging techniques, anatomical variations, and rapid canalization leading to underdiagnosis. Risk factors include common childhood illnesses such as infection, dehydration, acute and chronic medical conditions (nephrotic syndrome, congenital heart disease, systemic lupus erythematosus, and malignancy), and metabolic disorders. In the index case, there were no other identifiable risk factors other than systemic infection.

The pathogenesis of vascular damage in pneumococcal meningitis is not limited to vasculitis. Local bacterial invasion through the perivascular spaces could trigger the release of procoagulant and antifibrinolytic factors, which may result in intraparenchymal extension of intravascular coagulation, as reported in adult patients. A delayed cerebral thrombosis occurring after excellent initial recovery from pneumococcal meningitis in adult patients with lesions located in the posterior circulation has been described by Schut et al. The CVT on a CECT is seen as hyperdensity of a cortical vein or dural sinus and may show the classic “empty delta” sign. As MRV is noninvasive, invasive cerebral angiographic procedures are less commonly needed to confirm the diagnosis of CVT. Clinicians might go for repeat neuroimaging if suspicion is high even if initial imaging was normal. Similar observation was noticed in our case as initial neuroimaging did not reveal CVT which was diagnosed later in subsequent neuroimaging. Treatment regimens are different in different centers, with either parenteral unfractionated heparin, subcutaneous LMWH or oral warfarin. Supportive measures should include adequate hydration, control of seizures, and management of raised intracranial pressure. In infant beyond the 1st month of life, it is reasonable to treat with full-dose LMWH even in the presence of intracranial bleed, and it is sensible to continue LMWH or oral Vitamin K antagonists for 3–6 months with follow-up neuroimaging to monitor for additional bleeding complication.

To the best of our knowledge, this is the first case report of CVT in an infant with pneumococcal meningitis. A high index of suspicion led to earlier diagnosis, and timely management enabled a good neurodevelopmental outcome.

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**Conflicts of interest**

There are no conflicts of interest.
Jain, et al.: CVT with pneumococcal meningitis in an infant

REFERENCES

1. Stockmann C, Ampofo K, Byington CL, Filloux F, Hersh AL, Blaschke AJ, et al. Pneumococcal meningitis in children: Epidemiology, serotypes, and outcomes from 1997-2010 in Utah. Pediatrics 2013;132:421-8.

2. Østergaard C, Konradsen HB, Samuelsson S. Clinical presentation and prognostic factors of Streptococcus pneumoniae meningitis according to the focus of infection. BMC Infect Dis 2005;5:93.

3. Carvalho KS, Bodensteiner JB, Connelly PJ, Garg BP. Cerebral venous thrombosis in children. J Child Neurol 2001;16:574-80.

4. Kastenbauer S, Pfister HW. Pneumococcal meningitis in adults: Spectrum of complications and prognostic factors in a series of 87 cases. Brain 2003;126(Pt 5):1015-25.

5. deVeber G, Andrew M, Adams C, Bjornson B, Booth F, Buckley DJ, et al. Cerebral sinovenous thrombosis in children. N Engl J Med 2001;345:417-23.

6. Dlamini N, Billinghurst L, Kirkham FJ. Cerebral venous sinus (Sinovenous) thrombosis in children. Neurosurg Clin N Am 2010;21:511-27.

7. Vergouwen MD, Schut ES, Troost D, van de Beek D. Diffuse cerebral intravascular coagulation and cerebral infarction in pneumococcal meningitis. Neurocrit Care 2010;13:217-27.

8. Schut ES, Brouwer MC, de Gans J, Florquin S, Troost D, van de Beek D. Delayed cerebral thrombosis after initial good recovery from pneumococcal meningitis. Neurology 2009;73:1988-95.

9. Saposnik G, Barinagarrementeria F, Brown RD Jr., Bushnell CD, Cucchiara B, Cushman M, et al. Diagnosis and management of cerebral venous thrombosis: A statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke 2011;42:1158-92.

10. Sébire G, Tabarki B, Saunders DE, Leroy I, Liesner R, Saint-Martin C, et al. Cerebral venous sinus thrombosis in children: Risk factors, presentation, diagnosis and outcome. Brain 2005;128(Pt 3):477-89.