

A fatal acute bacterial meningoencephalitis with the highest cerebrospinal fluid white blood cell count ever reported in literature

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May 23, 2022

Abstract

We present a case of a man who had chronic otitis media caused acute bacterial meningitis due to *Streptococcus pneumoniae*. The neuroimaging indicated thick exudates in the CSF spaces. Our patient's CSF consisted of frank pus. The CSF white blood cell count was highly elevated, not reported in prior literature.

Abstract

Bacterial meningitis is one of the most life-threatening neurological emergencies. Delayed diagnosis and management results in high morbidity and mortality. Although most cases of bacterial meningitis do not have a precise mechanism, local spread from adjacent structures, such as the ear, nose, and throat is not uncommon. Many bacterial species cause bacterial meningitis; however, *Streptococcus pneumoniae* is the most frequent lethal pathogen. The cerebrospinal fluid (CSF) is often turbid with an elevated white blood count and proteins. We present a case of a middle-aged man who had chronic otitis media that caused acute fulminant bacterial meningitis due to *Streptococcus pneumoniae*. The CSF consisted of frank pus and neuroimaging indicated extensive parenchymal damage with thick exudates in the CSF spaces. There was also radiological evidence of cerebral venous thrombosis. Our case is a rare case of the CSF changing to a frank pus-like appearance. The CSF white blood cell count was highly elevated, not reported in prior literature. The radiological findings reported in this case are unique and highly educational.

Introduction : The estimated global incidence of bacterial meningitis is more than 1.2 million cases per year (1). *Streptococcus pneumoniae* is the most frequent pathogen causing bacterial meningitis in adults, with a frequency ranging from 9.6% to 75.2% (2,3). Recurrent community-acquired bacterial meningitis accounts for approximately 6% of meningitis cases, with *Streptococcus pneumoniae* responsible for the majority of the cases (4). In developing countries, the estimated mortality rate of bacterial meningitis was 22.1%, with 17.1% of the mortality attributed to *Streptococcus pneumoniae* (5). Although a high white blood cell count in the cerebrospinal fluid (CSF) is a hallmark of pyogenic meningitis, the frank pus-like appearance of CSF is extremely rare. We report a case of pyogenic meningitis with an exceptionally high CSF WBC count, with the CSF looking like frank pus. We propose that the pus-like appearance of CSF be termed pyorrhachia.

Case report: A 58-year-old man presented at the emergency room with a two-day history of headache, sore throat, cough, and fever. He had a past medical history of uncontrolled diabetes mellitus, hypertension, bronchial asthma, and chronic otitis media. He required an otomastoidectomy for the chronic otitis media, complicated by a tegmen tympani defect and secondary pseudomeningocele formation communicating with the left temporal horn (Figure 1). He had bacterial meningitis six years ago, complicated by hydrocephalus that required a temporary external ventricular shunt placement.

The patient was initially managed as a case of upper respiratory tract infection and discharged on the same day with a course of oral antibiotics. He returned to the emergency room one day later because of worsening headache and vomiting associated with altered sensorium. The patient was well built but sick-looking. His systolic blood pressure was 160/75mm Hg, heart rate 110 beats per minute, respiratory rate 27 per minute, the temperature 38 degrees Celsius, and oxygen saturation 96% at room air. His initial neurological examination revealed no eye-opening to pain, and he produced sounds only as a verbal response. His pupils' size was 4 mm and reactive to light, and he blinked to a threat in both eyes. With the fundus examination, there was bilateral papilledema. He had a normal vestibulo-ocular reflex, positive corneal reflex, no facial asymmetry, the gag reflex was preserved, and in response to painful stimulus on the sternum, he showed withdrawal response bilaterally. He had nuchal rigidity with positive Brudzinski and Kernig signs. His arterial blood gas results showed a pH of 7.512, pCO₂ of 30.8, pO₂ of 80.2, and an HCO₃ of 24.1. The laboratory results were significant with the white blood count (WBC) of 13,000 cells per microliter, the lactic acid was 2.49 mmol/L (0.5 to 2.2 mmol/L), and the potassium was 2.7 mmol/L (3.6 to 5.2 mmol/L). The other laboratory parameters including hemoglobin, platelets, renal function, liver function, coagulation profile and cardiac enzymes were within normal limits. A brain computerized tomography (CT) scan showed no significant structural abnormality. Following the brain CT, a lumbar puncture was performed. The appearance of the CSF was a thick yellow liquid resembling pus (Figure 2). The CSF WBC count was **158,000**cells/ μ L (0-5 cells/ μ L), the CSF protein **18.67** mg/mL (0.15 to 0.6 mg/mL), the CSF lactic acid 42.37 mmol/liter (0-3 mmol/liter), the CSF glucose **0.1** mg/100 mL (50 to 80 mg/100 mL), the CSF RBCs were less than 1 RBC/mm³ (<1 RBC/mm³) and the CSF culture indicated *Streptococcus pneumoniae* (see note). He was started on a regimen with ceftriaxone, vancomycin, ampicillin, metronidazole, and dexamethasone. Due to respiratory failure, he was intubated with an endotracheal tube and transferred to an intensive care unit. On the second day of admission, his level of consciousness deteriorated, and his Glasgow coma scale (GCS) was 3 out of 15. A repeated brain CT scan and brain venogram revealed multiple filling defects in the superior sagittal sinus (Figure 1). The brain magnetic resonance imaging (MRI) showed extensive gyri from diffusion restriction abnormality involving the frontal, anterior temporal lobes, insular cortices, and bilateral deep gray nuclei and brainstem suggestive of meningoencephalitis with gyri from hemorrhagic foci in the insula and frontal lobes (Figure 1). Multiple small collections were also noted along the leptomeningeal surface of the brain stem and cerebellar convexities representing exudates (Figure 1). Unfortunately, on the fifth day of admission, his physical examination continued to show GCS of 3 out of 15, and brainstem reflexes were absent. A brain perfusion scan showed no brain perfusion, and he was declared brain dead.

Discussion: Our patient's history of chronic otitis media with mastoiditis was possibly the most important factor of the recurrent severe bacterial meningitis. Otitis media have many serious complications, including mastoiditis, labyrinthitis, seventh cranial nerve palsy, meningoencephalitis, brain abscess, and cerebral venous thrombosis (6). Acute bacterial meningitis is a devastating complication of otitis media with a reported mortality rate of 41% and chronic otitis media was the cause in 74% of the mortality cases (7). Our patient had a significantly elevated CSF WBC count of 158,000 cells/ μ L as a result of severe bacterial meningoencephalitis, with no radiological evidence of abscess formation. However, the meningoencephalitis was severe enough to form brainstem and cerebellar convexity exudates observed on the brain MRI. The mean white cell count in the CSF investigated in children with bacterial meningitis was 4839 cells/ μ L, which is a significantly lower count than in our patient (8). There is no report in literature with a CSF WBC level as high as in our patient. We found one report of a 55-year-old woman with acute bacterial meningitis who had a high level of white cell count in the CSF of 104,000 cells/mm³, but unlike our patient the CSF appearance was turbid. Similar to our patient, the meningitis was due to *Streptococcus pneumoniae* bacteria; with no evidence of an intracranial abscess on brain imaging (9). Of the many factors contributing to our patient's mortality is his initial symptomatology of cough, sore throat, and headache that misled emergency physicians not to recognize meningoencephalitis early and administer the appropriate antibiotics. A delayed presentation to hospital, decreased level of consciousness on presentation, *Streptococcus pneumoniae* infection, abnormal brain imaging, and the use of intracranial measuring devices are some of the factors that predict a poor prognosis and mortality in an adult with fulminant bacterial meningitis (10). A history of prior complicated

bacterial meningitis and complicated chronic otitis media are essential factors to be considered in any patient presenting with fever and headache, regardless of other symptomatology to rule out central nervous system (CNS) infection.

Conclusions : Turbid CSF with a high WBC count is often present in bacterial meningitis; however, frank pus-like CSF with a WBC level of 158000 cells/ μ L is rare. The range of the white cells count at which the CSF turns from a turbid to a pus-like appearance is unknown. We propose that CSF resembling pus should be called pyorrhachia. More reports in future may support our understanding of this extremely rare phenomenon.

Note:

Our laboratory is College of American Pathologists accredited. CSF WBC count was done manually using a hemocytometer with 1/20 and 1/50 sample dilutions with saline. The differential count was performed by adding two drops of 5% bovine albumin solution to one mL of diluted CSF samples; 1/20 and 1/50 dilution in saline. Samples were centrifuged at 750 RPM for 5 minutes, and then the slides were stained with Wright's Giemsa stain.

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