

PARTICULAR CASES OF STREPTOCOCCAL MENINGITIS

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ABSTRACT

Bacterial meningitis is a severe infection of the central nervous system, necessitating prompt intervention to prevent serious complications. While *Streptococcus pneumoniae* is a commonly encountered pathogen in adult meningitis, *Streptococcus pyogenes* is a much rarer etiology. This summary addresses two atypical cases of streptococcal meningitis in adults, each presenting distinct diagnostic challenges. The first case involves a 50-year-old woman with chronic lymphocytic leukemia (CLL), admitted with altered consciousness, fever, and sepsis. Cerebrospinal fluid (CSF) analysis revealed hypoglycorrhachia accompanied by lymphocytic predominance, an unusual presentation for *S. pneumoniae* meningitis. This observation, when associated with CLL, might suggest meningeal infiltration by leukemic cells, a rare phenomenon. The second case concerns a 22-year-old man who developed headaches and fever following head trauma. Lumbar puncture revealed a predominance of neutrophils and the presence of Gram-positive cocci, identifying *S. pyogenes* as the causative agent. While this pathogen is generally associated with skin or respiratory infections, its occurrence in adult meningitis is extremely rare and often related to head trauma. The condition is associated with high mortality, underscoring its severity. These cases underscore the complexities of diagnosing and managing rare forms of bacterial meningitis, emphasizing the necessity of a precise diagnostic approach.

KEYWORDS: Bacterial Meningitis, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, Cerebrospinal Fluid, Atypical Presentation, Diagnostic Challenges.

INTRODUCTION

Bacterial meningitis is a serious infection of the central nervous system, which requires prompt diagnostic and therapeutic management. Among the pathogens involved, Streptococcus, especially *Streptococcus pneumoniae* and related species, are well-known pathogens that can affect patients of any age. However, in adults, certain cases of streptococcal meningitis are rare and distinguished by singular clinical and epidemiological features, requiring a specific approach and particular attention.

The objective of this article is to analyze in detail two particular cases of streptococcal meningitis in adults, highlighting the distinctive microbiological and clinical aspects, particular immune responses, underlying risk factors, as well as the diagnostic complexities specific to these situations. In this sense, it underlines the importance of personalized management for these patients, in order to optimize their prognosis and recovery.

Case 1: Lymphocyte-predominant pneumococcal meningitis in a patient with Chronic Lymphocytic Leukemia (CLL)

The first case concerns a 50-year-old female patient admitted to the multidisciplinary intensive care unit at Cheikh Zaid Hospital (HCZ) in September 2023 due to consciousness disorders accompanied by sepsis. The 50-year-old patient had previously been diagnosed with chronic lymphocytic leukemia (CLL), for which she received chemotherapy over 5 years ago. She was admitted urgently to Cheikh Zaid Hospital following fever, altered general condition followed by consciousness disorders.

Medical history reveals; CLL diagnosed in 2015, treated, and for which she had achieved a stable partial remission. She then experienced a relapse in 2018, revealed by cytopenia, and was treated again. At present, stage C CLL relapse is suspected.

Clinical examination shows; pronounced drowsiness, Glasgow score 13, headache, stiff neck, polypnoea, oxygen saturation 92% on room air, blood pressure 130/60 mmHg, tachycardic heart rate at 120 beats per

minute as well as body temperature of 39°C.

Biochemical results on admission revealed elevated C-reactive protein (CRP) >320 mg/L, hypoglycorrhachia at 0.19 g/L (blood glucose 1.07 g/L), elevated proteinorachia at 4.23 g/L, anemia with hemoglobin at 9 g/L, thrombocytopenia at 59000/uL, and white blood cell count at 81000/uL. Procalcitonin was measured at 3 ng/mL.

CSF analysis showed a slightly hematic fluid. Direct examination of the CSF revealed a blood count of 66

elements/mm³, composed mainly of lymphocytes (95%) and neutrophils (5%). Gram staining results showed the presence of Gram-positive cocci in the shape of a candle flame (Fig. 1). Cultures confirmed the presence of *Streptococcus pneumoniae*, an alphahemolytic streptococcus, which was detected on the meningitis panel. This streptococcus was found to be sensitive to ceftriaxone and augmentin.

Following antibiotic treatment, the patient showed progressive recovery of consciousness and disappearance of fever (apyrexia).

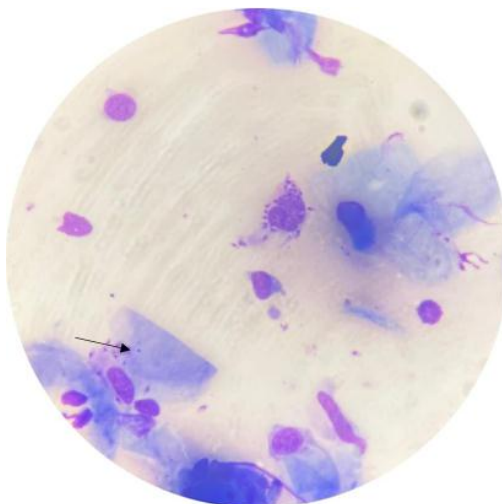


Fig. 1: *Streptococcus pneumoniae* in Fresh CSF at 100x Magnification

Case 2: *Streptococcus pyogenes* meningitis.

The second case concerns a 22-year-old male patient hospitalized with craniofacial trauma. His medical history revealed no cardiovascular risk factors.

The story of his illness begins with his admission to the emergency department on September 19, 2023, due to a craniofacial trauma that occurred under unclear circumstances. The trauma occurred during the night of the 17th to 18th, following a fall from a high place, resulting in a cranial impact and an initial loss of consciousness estimated by the patient at around 3 hours.

He also presented with headaches and intermittent episodes of vomiting, all progressing without fever.

Clinical examination revealed a conscious patient, with a Glasgow Coma Score (GCS) of 15, well oriented in time and space, hemodynamically stable and afebrile. However, he presented with left facial paralysis, left-sided otorrhea and facial ecchymosis, but no sensory-motor deficits or signs of meningeal hemorrhage.

Two days after hospitalization, the patient developed severe headache associated with fever and chills, leading to a lumbar puncture (LP). Cerebrospinal fluid (CSF) results showed a turbid appearance associated with a

high white blood cell count (430 elements/mm³) with a predominance of neutrophils (PNN) at 80%, the presence of red blood cells (4000 elements/mm³), and Gram-positive cocci. Glycorachy was 0.28 g/L, and proteinorachy 4.89 g/L.

Bacterial culture and antibiogram were performed on blood agar, revealing the presence of catalase-negative beta hemolytic colonies, as well as sensitivity to ceftriaxone and amoxicillin. To identify the type of *Streptococcus*, a rapid immunoagglutination test favored group A hemolytic *St. β*. Identification of the microorganism by MALDI-TOF revealed the presence of pyogenic streptococci.

The patient was treated with ceftriaxone 3g every 12 hours, plus paracetamol, which improved his headache and fever, making feeding easier. However, at 9 p.m. the same day, the patient suffered a sudden drop in oxygen saturation, necessitating his transfer to intensive care. Unfortunately, he died the following day.

DISCUSSION

In the context of classic bacterial meningitis, cerebrospinal fluid (CSF) displays specific biochemical characteristics. There is a significant increase in the number of neutrophils (PNN), an elevated protein concentration, high intracranial pressure and a marked decrease in CSF glucose content. These changes reflect

an acute inflammatory reaction, which distinguishes them from viral meningitis, generally characterized by a less pronounced reaction. Moreover, in the case of bacterial meningitis, it is possible to detect the presence of bacteria directly in the CSF, either by bacterial culture or by polymerase chain reaction (PCR) tests. These characteristics are crucial in diagnosing bacterial meningitis, and help differentiate it from viral meningitis.

However, the first clinical case presents several distinctive aspects that require further discussion. After a thorough review of the literature, no case of pneumococcal meningitis with lymphocytic predominance has been reported.

Infectious tendency in patients with chronic lymphocytic leukemia (CLL) is a major concern. Individuals with CLL often have a weakened immune system due to immunosuppression, resulting from an altered immune system due to the proliferation of abnormal lymphocytes. This makes patients more vulnerable to infection. In addition, treatments used for CLL, such as chemotherapy and immunotherapy, can further weaken the immune system, thus increasing the risk of infections, which is the case for our patient. A study carried out between 2004 and 2016 recorded a total of 7167 cases of invasive pneumococcal disease (IPD), including 1453 in patients with malignancies. Patients with hematological malignancies (HM) and solid organ malignancies (SOM) had incidence rates of 482/100,000 and 79/100,000 respectively, compared with 15/100,000 in malignancy-free controls. The highest incidence was observed in patients with multiple myeloma (3299/100,000), non-Hodgkin's lymphoma (2717/100,000) and chronic lymphocytic leukemia (559/100,000).^[1]

Moreover, in our case, it is important to note the lymphocytic predominance in cerebrospinal fluid (CSF) analysis. This observation is most likely due to the clonal proliferation of mature B lymphocytes in the context of this disease. These immune cells are produced in excess, which can lead to infiltration of tissues, including the CSF, which is already extremely uncommon. Indeed, meningeal infiltration is extremely rare in CLL, and in order to confirm the diagnosis, immunophenotyping of the lymphocytes present in the CSF is necessary to confirm that these are indeed leukemic cells. In 2009, a case of B-type CLL with meningeal infiltration was published. In this case, the leukocyte count was 41800/ μ l with 83% small lymphocytes, and cerebrospinal fluid (CSF) analysis revealed >1000 lymphocytes/ μ l, immunophenotypically identical to peripheral blood cells. Bone marrow aspiration and biopsy showed 95% lymphocytes. This is one of the few reported cases of CLL with meningeal infiltration.^[2] Another case, published in 2014, reports the case of a 75-year-old woman diagnosed in 2005 with chronic lymphocytic leukemia (CLL), presenting with various symptoms including headache, otalgia, fever, vertigo and dysphagia. CSF evaluation revealed a WBC count of 18

leukocytes/ mm^3 (mononuclear cells: 80%; neutrophils: 20%). Immunophenotyping of fluid cells confirmed the presence of CLL in the CSF.^[3]

It is important to note that leukemic meningitis and bacterial meningitis share similar clinical features. Both present with common symptoms such as headache, stiff neck and fever. Cerebrospinal fluid analysis often reveals increased cell counts and protein levels. The differential diagnosis between leukemic meningitis and bacterial meningitis is based on cerebrospinal fluid analysis, the presence of leukemic cells in the case of leukemic meningitis, and the presence of bacteria in the case of bacterial meningitis. Clinical symptoms and disease severity can also help distinguish the two conditions. In this case, however, we may be faced with both situations, but immunophenotyping of the lymphocytes present in the CSF is essential to confirm that this is indeed leptomeningeal meningitis.

This situation could also potentially induce diagnostic confusion by giving the appearance of viral rather than bacterial meningitis.

However, certain cases of bacterial meningitis are caused by unusual pathogens, setting them apart from the more common forms of bacterial meningitis typically associated with organisms like *Streptococcus pneumoniae* or *Neisseria meningitidis*.

In the second case, the patient was diagnosed with *Streptococcus pyogenes* meningitis, a condition that is exceptionally rare in adults. In fact, *Streptococcus pyogenes* meningitis accounts for only 0.2% to 1% of all meningitis cases, and merely 2% of patients with systemic *Streptococcus pyogenes* infections go on to develop meningitis. *Streptococcus pyogenes* is capable of causing a wide range of infections. According to data from the Centers for Disease Control and Prevention (CDC) in 2015, there were 15,540 cases of invasive disease due to *Streptococcus pyogenes* (cellulitis, bacteremia, pneumonia, fasciitis...). The prevalence of GAS meningitis was 0.06 cases per 100,000 children per year, with a mortality rate of 43%.^[4] The probable cause of *Streptococcus pyogenes* meningitis in this patient is cranial trauma, which can cause sinus-cranial breaches that promote bacterial penetration of the cerebrospinal fluid through membrane lesions, leading to bacterial meningitis. In 2002, Van de Beek et al. published that over a 14-year period, 11,327 cases of bacterial meningitis were reported, 44 of which were due to GAS in adults, representing 0.6% of the total number of cases.^[5] Of 41 patients with GAS meningitis, 60% had previously had otitis or sinusitis, and 5% of cases had had head trauma. Cerebrospinal fluid (CSF) analyses revealed leukocytosis in all patients. In most patients (89%), the ratio of glucose levels in CSF to blood was less than 0.5. Gram staining showed the presence of Gram-positive cocci in almost half the patients. Blood cultures were positive for Group A *Streptococcus* (GAS) in the

majority of patients (61%). During hospitalization, more than half the patients developed hyponatremia, some of them in a severe form. Antibiotic therapy was administered in the majority of cases, with a transition to penicillin within three days of initial treatment with a combination of antibiotics.

Finally, it was found that the mortality rate of the fulminant form of the disease was 27%, while neurological sequelae were observed in 43% of patients.

This case series showed that GAS meningitis in adults is a disease with a high mortality rate. These results underline the need for clinicians to recognize the potential seriousness of GAS meningitis in adults, despite its low incidence. Bacterial meningitis is a rare but serious complication of head trauma, and its incidence is estimated at around 1% of head trauma cases.^[6]

CONCLUSION

Atypical bacterial meningitis can pose specific diagnostic and therapeutic challenges due to their rarity and varied presentations. These two cases illustrate the diversity of atypical bacterial meningitis, and underline the importance of vigilance and a personalized approach in the management of these rare but potentially serious conditions.

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