CASE REPORT

Diagnostic challenges with acellular bacterial meningitis

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An immunocompetent adult presenting with acellular pneumococcal meningitis is a rare occurrence and may pose a diagnostic challenge.

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Acute bacterial meningitis is a medical emergency and requires prompt diagnosis because it is associated with significant morbidity and mortality.[1,2] The incidence ranges from 5 per 100 000 persons in southern Africa to 12 per 100 000 in Africa.[3,4] Up to 50% of survivors may suffer from long-term neurological sequelae.[5-7]

Better outcomes have resulted from early initiation of appropriate therapy; however, this has to be balanced with prompt confirmation of diagnosis, as inappropriate empirical therapy carries the risk of side-effects, cost burden and increased nosocomial infection.[8-11]

Case report

A 60-year-old woman with no comorbidities had complained of headache, fever, general malaise and photophobia. She had no symptoms of an upper respiratory tract infection and had not travelled recently. She had no surgical history of splenectomy and did not consume alcohol. This was her first presentation for medical care.

On examination she was haemodynamically stable with a temperature of 38°C. No rashes were present. She was alert and orientated. Signs of meningism were present, which included Kernig's and Brudzinsksi's signs. There were no cranial nerve palsies, and neither motor nor sensory abnormalities were elicited. Other systems were clinically unremarkable.

The laboratory investigations revealed a haemoglobin concentration of 9.5 g/dL, a normal platelet count (352 × 10^9/L) and leucocytosis (white cell count 14.98 × 10^9/L). Her C-reactive protein (CRP) was markedly raised at 381 nmol/L and the plasma glucose level was 7.1 mmol/L. As no clinical signs of raised intracranial pressure were present, a lumbar puncture was performed. The findings of the cerebrospinal fluid (CSF) examination are shown in Table 1. Other tests performed included a non-reactive HIV ELISA and syphilis serology.

The patient was started empirically on high-dose intravenous ceftriaxone in view of the clinical suspicion of meningitis. Her symptoms resolved 2 days later, and she had an uncomplicated inpatient stay with no neurological sequelae.

Discussion

We were fortunate that our patient presented with the classic signs and symptoms of meningitis. It is integral to note that the symptoms of meningitis, which may include headache, nausea and vomiting, have poor sensitivity and specificity for the diagnosis of meningitis, as demonstrated in a meta-analysis of 845 patients.[12] The classic clinical signs of Kernig and Brudzinski have value in ruling in the diagnosis of meningitis; however, these traditional signs have poor sensitivity and their absence cannot be used to rule out the disease.[8,13,14]

The performance of a lumbar puncture is fundamental, as CSF examination is needed to establish the diagnosis.[15] Consistent CSF findings with acute bacterial meningitis include a polymorphonuclear pleocytosis, hypoglycorrhachia and a raised CSF protein level.[2,8,16] Despite our patient's reduced CSF glucose and raised protein, the inconsistent polymorph cell count was striking. Based on clinical suspicion, CSF and laboratory determinants, she was treated for acute bacterial meningitis. CSF Gram stains and culture results confirming *Streptococcus pneumoniae* were only available after 48 hours. While CSF Gram stain testing has a high specificity for bacterial meningitis, it lacks sensitivity and was proven to be helpful in only 30 - 40% of patients.[17,18]

There have been documented cases of bacterial meningitis in the absence of pleocytosis, with a particular occurrence in children.[19,20] Normal CSF meningitis may occur when underlying immunosuppressive states are present; however, this acellular phenomenon is exceptionally rare in an immunocompetent adult.[15,21] We have noted only eight similar cases of acellular pneumococcal meningitis in the literature.[21-28]

Additional markers that may assist in the diagnosis of acute bacterial meningitis exist, but their diagnostic role in the current guidelines is modest. The CSF glucose/blood glucose ratio is a simple marker that is often utilised, but it should be emphasised that it was shown to predict the presence of bacterial meningitis more precisely than routine CSF measurements.[29] CSF lactate has the ability to differentiate bacterial meningitis from aseptic meningitis with robust

Table 1. Findings on CSF examination

CSF characteristics	
Appearance	Clear
Opening pressure (cm H_2O)	25
Glucose (mmol/L)	<1
Protein (g/L)	3.14
Polymorphs	0
Lymphocytes	0
Erythrocytes	0
Ratio CSF glucose/serum glucose	Very low
Gram stain	Positive
Culture	*Streptococcus pneumoniae* sensitive to penicillin G/ceftriaxone
Cryptococcal antigen test	Negative

accuracy; however, this test is often unavailable.[30,31] Serum CRP and procalcitonin are useful markers as well, with the latter carrying a strong diagnostic odds ratio.[32,33] Molecular diagnostic testing, such as nuclear acid amplification tests, has been shown to facilitate the diagnosis in 33% of patients in whom the diagnosis could not be made conventionally.[34] Other future diagnostic aids may include immunochromographic testing, and the use of complement component 3, apolipoprotein A-1 and kinnogen-1.[35]

Our experience highlights the rare occurrence of acellular bacterial meningitis in an immunocompetent adult. A heightened index of suspicion based on symptoms and clinical examination should prompt early appropriate antibiotic therapy. Swift, simple, highly sensitive investigations beyond routine tests may assist in supporting the diagnosis of meningitis in these challenging cases.

Learning points

- Acellular bacterial meningitis is rare in an immunocompetent adult.
- The CSF glucose/blood glucose ratio and CSF lactate may assist in the diagnosis of bacterial meningitis.
- Prompt empirical therapy improves outcomes.

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