BRITISH JOURNAL OF HOSPITAL MEDICINE

CASE REPORT

Listeria monocytogenes: a rare cause of rhomboencephalitis in an immunocompetent patient

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Abstract

We present an unusual case of *Listeria monocytogenes* rhomboencephalitis in a young, healthy patient. Although *L. monocytogenes* meningitis is usually associated with immunodeficiency, rhomboencephalitis is more commonly seen in immunocompetent patients. The wide differential for rhomboencephalitis can create a diagnostic challenge. Without prompt pathogen identification and appropriate antibiotic regimen, *L. monocytogenes* central nervous system infections can be fatal. Cerebro-Spinal Fluid (CSF) Polymerase Chain Reaction (PCR) aided a prompt diagnosis and adjustment of therapy to achieve a good patient outcome.

Key words: Anti-bacterial agents; Encephalitis; Listeria monocytogenes; Meningitis; Listeria; Real-time polymerase chain reaction

Submitted: 20 December 2023; Revised: 3 March 2024; Accepted: 5 March 2024

Introduction

A healthy 26-year-old male presented to the emergency department with history of seizures and headache. Clinically, cerebellar signs were present, indicating rhomboencephalitis. Cerebro-Spinal Fluid (CSF) was abnormal with a lymphocytic predominance and raised protein. In-house multiplex polymerase chain reaction (PCR) of CSF detected *L. monocytogenes,* in the setting of negative blood cultures. Rhomboencephalitis is an unusual presentation with a known association with *L. monocytogenes* in immunocompetent patients. An appropriate antibiotic regime was commenced as result of the CSF result and the patient completed a full treatment course for *Listeria* meningo-encephalitis, making a full clinical recovery.

Case report

A 26-year-old male was admitted to our centre with a 7-day history of headaches and multiple seizures. There were no other symptoms reported. The patient had a history of asthma but was not on any regular medications. He was of Pakistani origin and visited Pakistan regularly; the last time being 6 months before admission. There was no other recent foreign travel. He did not drink alcohol or smoke and denied illicit drug use.

On admission, Glasgow Coma Scale (GCS) fluctuated between 14 and 15. Findings on neurological examination were horizontal nystagmus and positive Romberg's test. A fever of 38.5 °C was recorded. An initial dose of intravenous (IV) Piperacillin-Tazobactam was administered as per local sepsis protocol and notably, blood cultures were taken after antibiotic administration. Subsequently, after further clinician assessment, the antibiotic regimen was adjusted to cover for meningo-encephalitis: IV ceftriaxone 2 g twice a day, a single dose of IV dexamethasone 9.9 mg and IV aciclovir at 10 mg/kg three times a day were commenced.

Significant blood results are shown in Table 1. Magnetic resonance imaging (MRI) of the head with contrast confirmed normal appearance of the brain. There was a delay in obtaining lumbar puncture (LP) as the initial attempt was poorly tolerated due to agitation and confusion. Cerebro-spinal fluid (CSF) was successfully obtained approximately 48 hours into admission. CSF parameters were abnormal; see Table 2. CSF Gram stain was negative and there was no growth on culture after 48 hours. Given the clinical presentation, travel history and abnormal CSF parameters, there was a concern for tuberculous (TB) meningitis. Therefore, empirical TB treatment was started (rifampicin, isoniazid, pyrazinamide and ethambutol).

How to cite this article:
Heard F, Sehgal A. *Listeria monocytogenes*: a rare cause of rhomboencephalitis in an immunocompetent patient. Br J Hosp Med. 2024. https://doi.org/10.12968/hmed.2023.0453

Case report (Continued)

QIAstat-Dx Meningitis/Encephalitis multiplex real-time PCR (RT-PCR) was performed on CSF and detected *Listeria monocytogenes*. The antibiotic regimen was rationalised to intravenous amoxicillin 2 g every 4 hours with adjunctive gentamicin 3 mg/kg once a day for the first week of therapy. The patient's clinical condition improved and inflammatory markers normalised over the course of admission. Repeat MRI performed 3 weeks into antibiotic therapy revealed multiple small foci of diffusion restriction within the subarachnoid spaces overlying the cerebral vertex, in keeping with pus/debris. Immunodeficiency testing was negative, including HbA1c, HIV screen, immunoglobulin levels, lymphocyte marker analysis of T, B and Natural Killer (NK) cells and pan T-cell marker expression.

The patient received 4 weeks of IV antibiotics in total and was switched to oral co-trimoxazole 30 mg/kg four times a day for a further 2 weeks, to complete a 6 week antibiotic course for *L. monocytogenes* rhomboencephalitis. The patient made a complete clinical recovery.

Table 1. Laboratory blood panel

Investigation	Result	Reference Range
Total WCC	15.27	4–11 × 10^9/L
Neutrophils	10.37	2–7.5 × 10^9/L
CRP	43	0–10 mg/L
Creatinine	70	64–104 umol/L
GFR	>90	60–200 mL/min
Albumin	29	35–52 g/L

CRP= C-Reactive Protein; GFR= Glomerular Filtration Rate; WCC= White Cell Count.

Table 2. Cerebro-spinal fluid (CSF) examination

CSF Parameter	Result	Reference Range
Lymphocytes	346 cells/uL	0–5 cells/uL
Polymorphs	37 cells/uL	0–5 cells/uL
Red cells	63 cells/uL	0 cells/uL
Glucose	0.8 mmol/L	2.2–3.9 mmol/L
Protein	1844 mg/L	150–450 mg/L

Discussion

L. monocytogenes meningoencephalitis accounts for 4% of all meningoencephalitis in the UK (Beek et al, 2016). Invasive listeriosis typically affects extremes of age and the immunocompromised, however the classical rhomboenephalitis syndrome is seen in the immunocompetent. *L. monocytogenes* meningocephalitis has a high mortality rate, up to 17% (Brouwer et al, 2006) and rhomboencephalitis is thought to occur in up to 24% of all invasive Listeriosis cases (Oevermann et al, 2010)

L. monocytogenes infection is acquired through consumption of contaminated food and is a notifiable disease. During epidemics of food-bourne invasive Listeriosis, meningitis can occur in healthy individuals of all ages, whereas sporadic meningitis cases are more likely associated with an underlying defect in immunity (Schlech, 2019).

UK national meningitis guidelines recommend the addition of *L. monocytogenes* cover in patients aged 60 years and over or immunocompromised (McGill et al, 2016). Consequently, empirical *L. monocytogenes* antibiotic cover was not indicated in this case.

Microbiological diagnosis of *L. monocytogenes* meningo-encephalitis can be challenging. Although *L. monocytogenes* is more commonly isolated from blood cultures than CSF in meningitis (Brouwer et al, 2006), prior administration of Piperacillin-Tazobactam may have affected blood culture yield in this case.

Multiplex PCR of CSF is a useful diagnostic tool in meningo-encephalitis. The *hly* gene is the target of PCR assays for *L. monocytogenes* (Monnier et al, 2011). EDTA whole blood PCR can also be used in suspected Listeria cases, but is not routine practice at our centre.

Rhomboencephalitis has a wide variety of causes which can lead to clinical confusion. In this case, the travel history led to suspicion of TB meningitis. Importantly, the use of multiplex PCR resulted in the correct diagnosis. Although it is appropriate to screen for potential immunodeficiency in any invasive Listeriosis case, *L. monocytogenes* must be considered as the causative pathogen in the presentation of rhomboencephalitis in an immunocompetent patient.

Learning points

- *Listeria monocytogenes* is an unusual cause of meningo-encephalitis in immunocompetent patients and should be considered in patients with no typical risk factors for invasive Listeriosis.
- Rhombocenphalitis is a distinct clinical syndrome of encephalitis involving the brainstem and/or cerebellum and has a notable association with *L. monocytogenes* especially the immunocompetent.
- In clinical uncertainty consider empirical antibiotic coverage for *L. monocytogenes* pending pathogen identification.
- The use of a meningo-encephalitis CSF PCR panel can be vital for the diagnosis of central nervous system infections, particularly when lumbar puncture is performed after administration of antibiotics.

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Availability of data and materials

All the data supporting the findings of this study are available within the manuscript.

Author contributions

FH and AS designed the work and the analysis of data for the work. AS drafted the manuscript and revised it for publication. Both authors contributed to editorial changes in the manuscript. Both authors read and approved the final manuscript. Both authors have participated sufficiently in the work and are accountable for the work.

Ethics approval and consent to participate

The patient signed an informed consent form to publish this case report.

Acknowledgement

Not applicable.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors have no competing interests to declare.

References

Beek D, van de Cabellos C, Dzupova O et al. ESCMID guideline: diagnosis and treatment of acute bacterial meningitis. Clin Microbiol Infect. 2016;22:S37–S62. https://doi.org/10.1016/j.cmi.2016.01.007

Brouwer MC, van de Beek D, Heckenberg SG, Spanjaard L, de Gans J. Community-acquired listeria monocytogenes meningitis in adults. Clin Infect Dis. 2006;43(10):1233–1238. https://doi.org/10.1086/508462

McGill F, Heyderman RS, Michael BD et al. The UK joint specialist societies guideline on the diagnosis and management of acute meningitis and meningococcal sepsis in immunocompetent adults. J Infect. 2016;72(4):405–438. https://doi.org/10.1016/j.jinf.2016.01.007

Monnier AL, Abachin E, Beretti J-L, Berche P, Kayal S. Diagnosis of Listeria monocytogenes Meningoencephalitis by Real-Time PCR for the hly Gene. J Clin Microbiol. 2011;49(11):3917–3923. https://doi.org/10.1128/jcm.01072-11

Oevermann A, Zurbriggen A, Vandevelde M. Rhombencephalitis caused by listeria monocytogenes in humans and ruminants: a zoonosis on the rise? Interdisciplinary Perspect Infect Dis. 2010;2010:1–22. https://doi.org/10.1155/2010/632513

Schlech WF. Epidemiology and clinical manifestations of listeria monocytogenes infection. Microbiol Spectr. 2019;7(3). https://doi.org/10.1128/microbiolspec.gpp3-0014-2018