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Listeria Monocytogenes Meningoencephalitis in an Immunocompromised Patient: A Diagnostic and Therapeutic Challenge

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ABSTRACT

Neuro-meningeal listeriosis is a rare CNS infection primarily affecting immunocompromised patients. We report a 25-year-old woman with lupus nephritis on azathioprine, presenting with febrile altered consciousness, gastrointestinal symptoms, and seizures. MRI showed deep temporo-occipital hyperintensities without enhancement. Diagnosis was confirmed by positive blood cultures and CSF multiplex PCR. Treatment with ampicillin and gentamicin led to recovery. This case illustrates the diagnostic challenge of atypical presentations and underscores the importance of combining imaging and molecular diagnostics for timely management.

Keywords: Listeria monocytogenes, Neuro-meningeal infection, Immunocompromised patient, Molecular diagnostics.

INTRODUCTION

Neuro-meningeal listeriosis is a rare but serious infection of the central nervous system caused by Listeria monocytogenes, a facultatively intracellular Gram-positive bacterium [1]. It primarily affects newborns, pregnant women, the elderly, and immunocompromised individuals [1]. Diagnosing this condition remains challenging due to its often atypical clinical presentation, which can mimic other central nervous system infections, as well as the variability of radiological findings that may be mistaken for vascular, tumoral, or inflammatory lesions [1].

In immunocompromised patients, neuro-meningeal listeriosis may present as meningitis, encephalitis, or brain abscess, making the distinction from other neurotropic infections particularly complex [1]. Although brain imaging plays a key role in guiding the diagnosis, it often reveals non-specific abnormalities, ranging from simple FLAIR and T2 hyperintensities to infiltrative or abscess-like lesions [1]. This radiological heterogeneity contributes to diagnostic delays and underscores the need for close correlation with microbiological investigations [1].
We present the case of a young female patient with lupus nephritis on immunosuppressive therapy who developed listerial meningoencephalitis with atypical radiological findings. This case illustrates the diagnostic complexity of neuro-meningeal listeriosis and highlights the importance of early recognition to optimize treatment and improve outcomes.

CASE REPORT

We describe a 25-year-old female patient with a history of class III lupus nephritis, treated with azathioprine for the past seven years, who was admitted for febrile altered consciousness. Her symptoms began six days prior to admission with acute watery diarrhea and vomiting, evolving in a febrile context (39°C). On the day of admission, her condition worsened with the onset of intracranial hypertension syndrome, characterized by headaches, vomiting, and decreased visual acuity. She also experienced a generalized tonic-clonic seizure lasting two minutes, followed by postictal recovery of consciousness.

Upon admission, the patient was confused, with a Glasgow Coma Scale score of 13/15 and blindness, though pupils were symmetric and reactive, and there were no motor deficits. Capillary blood glucose was normal at 1.8 g/L, and her temperature was 38.5°C. She was hemodynamically and respiratory stable. No other abnormalities were found on physical examination.

Laboratory tests revealed leukopenia with a white blood cell count of 1,000/mm^3, neutrophils at 600/mm^3, and elevated C-reactive protein at 84 mg/L. Initial non-contrast brain CT scan showed a spontaneously hyperdense punctate lesion in the left globus pallidus suggestive of a cavernoma, along with a 4.5 mm calcified nodule in the left thalamus, with no evidence of coagulopathy (Figure 1). Lumbar puncture revealed clear cerebrospinal fluid with elevated protein (1.09 g/L), low glucose (0.31 g/L, CSF/serum ratio: 0.34), and pleocytosis (380 cells/mm^3) with a lymphocytic predominance (90%).

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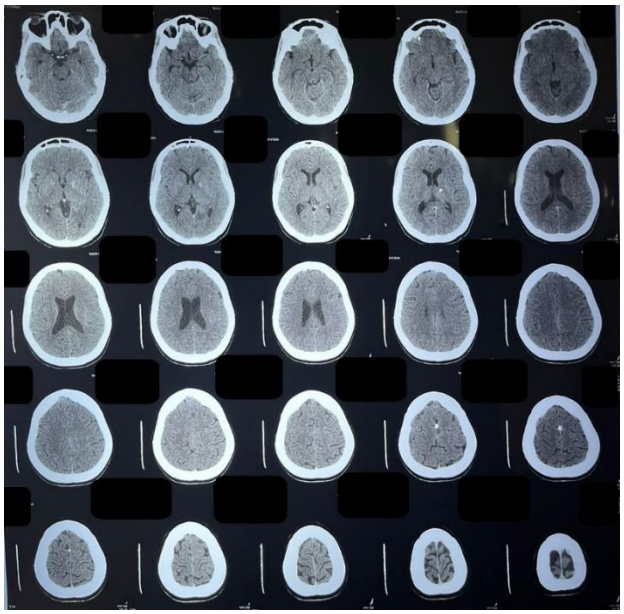

Figure 1: Non-contrast brain CT scan – Suspicion of left pallidal cavernoma

Microbiological investigations revealed Listeria monocytogenes bacteremia on blood cultures and a positive multiplex PCR for Listeria monocytogenes in the cerebrospinal fluid. Urine cytobacteriological examination and stool culture were negative. Brain MRI subsequently performed showed a deep left temporo-occipital parenchymal infiltration, appearing as FLAIR and T2 hyperintensity, T1 hypointensity, diffusion hyperintensity with elevated ADC values, and no enhancement after gadolinium administration. This lesion caused a moderate mass effect on the left occipital horn (Figure 2).

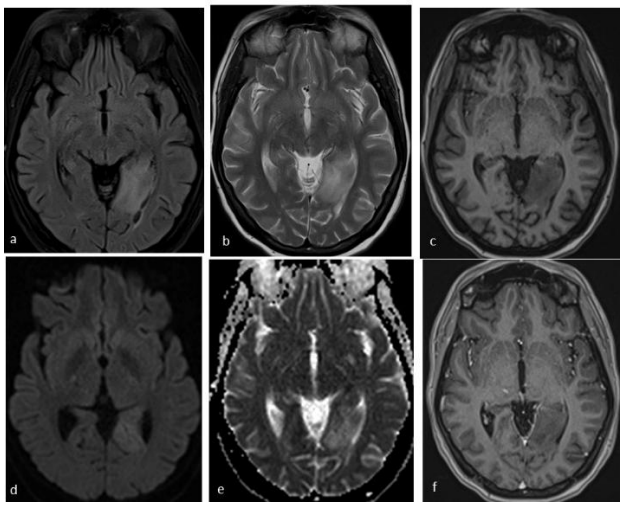

Figure 2 : Brain MRI in listerial meningoencephalitis showing deep left temporo-occipital involvement.

a: FLAIR sequence / b: T2-weighted sequence / c: pre-contrast T1 / d: diffusion-weighted imaging (DWI) / e: ADC map / f: post-gadolinium T1-weighted sequence.

The diagnosis of listerial meningoencephalitis was established, and treatment with ampicillin (4 g every 8 hours) combined with gentamicin (160 mg daily) was initiated. Clinical and

biological evolution under treatment was favorable, with progressive improvement of symptoms, allowing for the patient's transfer to the nephrology department.

DISCUSSION

Neuro-meningeal listeriosis is a rare but serious infection of the central nervous system (CNS), associated with high mortality and a significant risk of long-term neurological sequelae, particularly in cases of delayed diagnosis [1]. It predominantly affects vulnerable populations such as neonates, pregnant women, the elderly, and immunocompromised individuals, the latter being particularly susceptible due to their impaired ability to control intracellular infections [2]. In these patients, listeriosis can present with a broad spectrum of clinical manifestations, ranging from classic meningitis to rhombencephalitis or cerebral abscesses, complicating differential diagnosis with other neurotropic infections such as tuberculosis, herpes encephalitis, or neurosyphilis [3].

Moreover, the radiological polymorphism observed in this condition adds to the diagnostic challenge. Brain involvement may be limited to FLAIR and T2 hyperintensities, or may present as deep abscesses or infiltrative lesions mimicking vascular, tumoral, or inflammatory pathologies [4]. Early recognition of atypical clinical and radiological signs, in combination with sensitive microbiological tests such as CSF multiplex PCR and blood cultures, is thus essential for prompt diagnosis and timely initiation of appropriate antibiotic therapy, which is key to improving prognosis [5].

This case illustrates an atypical presentation of neuro-meningeal listeriosis in a young immunocompromised patient being treated for lupus nephritis with azathioprine for seven years. Unlike classical forms, which typically affect elderly or severely immunosuppressed patients, this patient presented only moderate neutropenia ($600/mm^3$) and leukopenia ($1,000/mm^3$), without other major risk factors commonly associated with fulminant opportunistic infections. Similar findings have been reported in other studies, showing that listeriosis can occur in moderately immunocompromised individuals and manifest with various clinical forms including meningitis and bacteremia [6].

An unusual feature in this case was the initial presentation with acute febrile diarrhea prior to the onset of severe neurological symptoms, whereas gastrointestinal manifestations are often underemphasized in neuro-meningeal listeriosis. However, it is known that Listeria infection can begin with gastrointestinal symptoms such as abdominal pain and diarrhea, especially in immunocompromised hosts, and may progress to invasive forms like meningoencephalitis [7]. The subsequent development of intracranial hypertension syndrome with blindness and generalized tonic-clonic seizures, along with the MRI findings of deep temporo-occipital involvement, further complicated the diagnostic process. Similar cases have described Listeria meningoencephalitis mimicking stroke in immunocompromised patients, with focal MRI lesions and atypical clinical presentations [3].

Neuro-meningeal listeriosis is characterized by marked clinical polymorphism, making its diagnosis particularly challenging [8]. It can present in various neurological forms—from subacute meningitis to rhombencephalitis, deep cerebral abscesses, or even spinal cord abscesses, as reported in a rare case by Hohweiller et al. [9]. This clinical variability is further complicated by the non-specific nature of early symptoms, particularly gastrointestinal

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disturbances such as diarrhea and vomiting, which may delay the consideration of a neurological etiology [6].

In this context, lumbar puncture remains a key diagnostic tool, typically showing moderate pleocytosis, elevated protein levels, and hypoglycorrhachia. However, these findings may resemble those seen in other neurotropic infections, complicating interpretation [10]. Blood cultures, often positive in listeriosis, are crucial for confirming the diagnosis, particularly in immunocompromised patients [2]. Nonetheless, identifying Listeria monocytogenes in CSF remains difficult due to the limited sensitivity of conventional cytobacteriological analysis [5]. Therefore, multiplex PCR of the CSF has become an essential diagnostic tool, enabling rapid and specific detection of the pathogen and facilitating early intervention, which is vital for improving patient outcomes [6].

Brain MRI plays a central role in the diagnostic approach to neuro-meningeal listeriosis, despite its relatively non-specific findings [4]. In this case, it revealed a deep temporo-occipital infiltration with FLAIR and T2 hyperintensity, no post-gadolinium enhancement—a pattern that can mimic tumoral, vascular, or inflammatory lesions [3]. Such features may resemble infiltrating gliomas, primary CNS lymphomas, subacute ischemic strokes, inflammatory vasculopathies, autoimmune encephalitis, or neurosarcoidosis [4].

The differential diagnosis also includes neuro-meningeal tuberculosis (nodular enhancement), herpes simplex encephalitis (medial temporal lobe involvement), and cerebral toxoplasmosis (multifocal abscesses) [11]. The absence of contrast enhancement and the presence of deep cortical infiltration are distinguishing features that may point toward listeriosis, emphasizing the importance of correlating imaging findings with clinical and microbiological data for accurate diagnosis [11].

Management of neuro-meningeal listeriosis is based on appropriate antibiotic therapy, typically combining ampicillin (4 g every 8 hours) with gentamicin (160 mg daily) to enhance bactericidal activity, in accordance with current guidelines [12]. Early treatment initiation is critical to reduce the risk of severe neurological complications, such as cognitive deficits, motor impairment, or cerebral abscess formation [13].

In this case, prompt antibiotic therapy led to a favorable outcome, with gradual neurological improvement and resolution of biological and radiological abnormalities [13]. Nevertheless, prognosis largely depends on early diagnosis and treatment, underscoring the importance of recognizing atypical presentations to avoid potentially life-threatening delays in therapy [14].

CONCLUSION

This case highlights the diagnostic complexity of neuro-meningeal listeriosis, particularly in immunocompromised patients, where the clinical presentation may be atypical, combining initial gastrointestinal symptoms with severe neurological involvement. The heterogeneity of radiological findings—such as deep cortical infiltration without enhancement—emphasizes the need for better-defined imaging criteria to facilitate differential diagnosis with other CNS pathologies. Furthermore, the contribution of modern microbiological techniques, especially multiplex PCR, is crucial for the rapid identification of Listeria monocytogenes and early therapeutic intervention. In the future, the development of specific biomarkers and improved

imaging protocols may allow for faster and more accurate diagnosis, thereby optimizing outcomes in patients affected by this serious infection.

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