Longitudinally Extensive Transverse Myelitis (LETM): A Rare Neurological Complication of Listeria Infection

Piyush Pathak[1], Agrata Sharma*[2], Naman Sahu[3], Mayur K Bhat[4]

[1]*Department of Gastroenterology, All India Institute of Medical Sciences, Bhopal Madhya Pradesh, India*
[2,3,4] *Department of Neurology, All India Institute of Medical Sciences, Bhopal Madhya Pradesh, India*

***Corresponding Author:** Agrata Sharma*
**Department of Neurology, AIIMS Bhopal, E-mail: dragrata@gmail.com*

KEYWORDS
Longitudinally Extensive Transverse Myelitis (LETM), listeria monocytogenes, autoimmune hepatitis

ABSTRACT
We present a case of longitudinally extensive transverse myelitis (LETM) associated with Listeria monocytogenes who was recently diagnosed with autoimmune hepatitis and was on treatment for the same. A 20-year-old female diagnosed with chronic liver disease with portal hypertension secondary to autoimmune hepatitis presented with progressive numbness and tingling sensations in bilateral lower limbs followed by weakness and difficulty in walking. Infectious work up revealed Listeria monocytogenes. She received plasmapheresis and complete 8 week course of ampicillin and gentamycin.

Introduction

Longitudinally extensive transverse myelitis (LETM) is a severe and uncommon inflammatory condition affecting the spinal cord. It is defined by a lesion spanning three or more vertebral segments on magnetic resonance imaging (MRI), distinguishing it from acute transverse myelitis (ATM), which typically involves shorter segments (1). LETM can result in significant neurological deficits, including weakness, sensory disturbances, and bowel and bladder dysfunction, often leading to substantial disability (2). The pathogenesis of LETM is complex and not fully understood, but it is thought to involve a combination of inflammatory, demyelinating, and sometimes necrotic processes (3). While various aetiologies have been associated with LETM, including multiple sclerosis, neuromyelitis optica spectrum disorders (NMOSD), and idiopathic inflammatory demyelinating diseases, infections are a less common but important cause (4). Identifying the underlying cause is crucial for appropriate management and prognostication. Listeria monocytogenes, a gram-positive bacterium primarily known for causing foodborne illness, is a rare but recognized cause of central nervous system infections, including meningitis, meningoencephalitis, bacteraemia and, less frequently, myelitis (5). Listeria-associated myelitis, particularly presenting as LETM, is exceedingly rare (6). It is commonly encountered in patients with predisposing conditions such as extremes of age (neonates, elderly), pregnant females, immunocompromised states and diabetic patients. Listeria can grow at low temperature and produce biofilms which enable it to survive harsh environment. It disrupts the host cellular mediated immunity. This reports a case of 20 year old female with autoimmune hepatitis and LETM associated with listeria infection.

Case report

A 20-year-old female with a history of chronic liver disease and portal hypertension secondary to autoimmune hepatitis (biopsy proven) presented to the emergency department with a two-day history of progressive bilateral lower extremity weakness and sensory loss below the umbilicus (T10 dermatome). Two days prior to presentation, she had attended a large gathering (mela) and was asymptomatic. She first noticed left leg weakness at night which progressed rapidly overnight to involve bilateral lower limbs. She also reported sensory loss (touch, pain, temperature, vibration, and proprioception) below T10, urinary retention requiring catheterization, and an inability to pass flatus. Severe abdominal pain secondary to urinary retention was also present. She was taking immunosuppressive therapy with consisted of prednisolone and azathioprine. She denied trauma, travel, unusual food intake, animal bites, or exposure to ticks or mosquitoes. She also denied other neurological symptoms like headache, confusion, seizures , speech or swallowing difficulties, visual changes, or hearing loss.

There was no involvement of upper extremities. She never smoked, drank alcohol or used illicit substances. She did not travel internationally in the preceding 6 months prior to presentation. In past she was having history of upper gastrointestinal bleed for which she was evaluated and was diagnosed as autoimmune hepatitis. She was on immunosuppressant (azathioprine and steroids) drugs for autoimmune hepatitis.

On examination, her vitals were as follows: afebrile, pulse 90 beats per minute, respiratory rate of 20 per minutes, blood pressure 126/80 mm Hg and oxygen saturation of 100% on room air. She was conscious oriented to time place and person. Her kernigs and brudzinskis sign were negative. There was no papilledema at the time of presentation.
She had decreased tone with 0/5 strength in both lower extremities. Deep tendon reflexes were absent with plater reflexes down going bilaterally (i.e negative Babinski sign). Sensory loss was confirmed below T10, encompassing all modalities. Upper limb examination was absolutely within normal limits. A diagnosis of rapidly progressive hyperacute paraplegia with bladder, bowel, and sensory involvement was made.
As the patient was on immunosuppressant therapy, possibility of infectious myelitis was kept as first possibility. Also considering autoimmune hepatitis (which was biopsy proven diagnosis) there was consideration of autoimmune myelitis as other differential.
Initially, the patient was treated for presumed acute transverse myelitis with intravenous methylprednisolone pulse therapy. Cerebrospinal fluid (CSF) analysis revealed low glucose, elevated leukocytes, and high protein. This prompted the initiation of antitubercular therapy (ATT) with dexamethasone.

CSF PARAMETER	
CSF PROTEINS	266 mg/dl
CSF GLUCOSE	18.19 mg/dl Corresponding blood sugars 176 mg/dl
TOTAL LEUKOCYTE	82 WBC/ul
LYMPHOCYTE	80% of total leukocytes
NEUTROPHILLS	20% of total leukocytes

MRI spine showed longitudinally extensive T2 hyperintense intramedullary signal in dorso-lumbar spine. Cord expansion predominantly in dorso-lumbar spinal cord with associated altered T2 hyperintense intramedullary intra-medullary signals was noted involving posterior column and central grey matter extending superiorly from dorsal spine D3 inferiorly up to L1 vertebral level involving all of its cross sectional area. There was post contrast enhancement in the cauda equina nerve roots at L2- L3 level. MRI findings was suggestive of myeloradiculopathy. This could be consistent with either an infectious or autoimmune process. MRI brain was within normal limits.

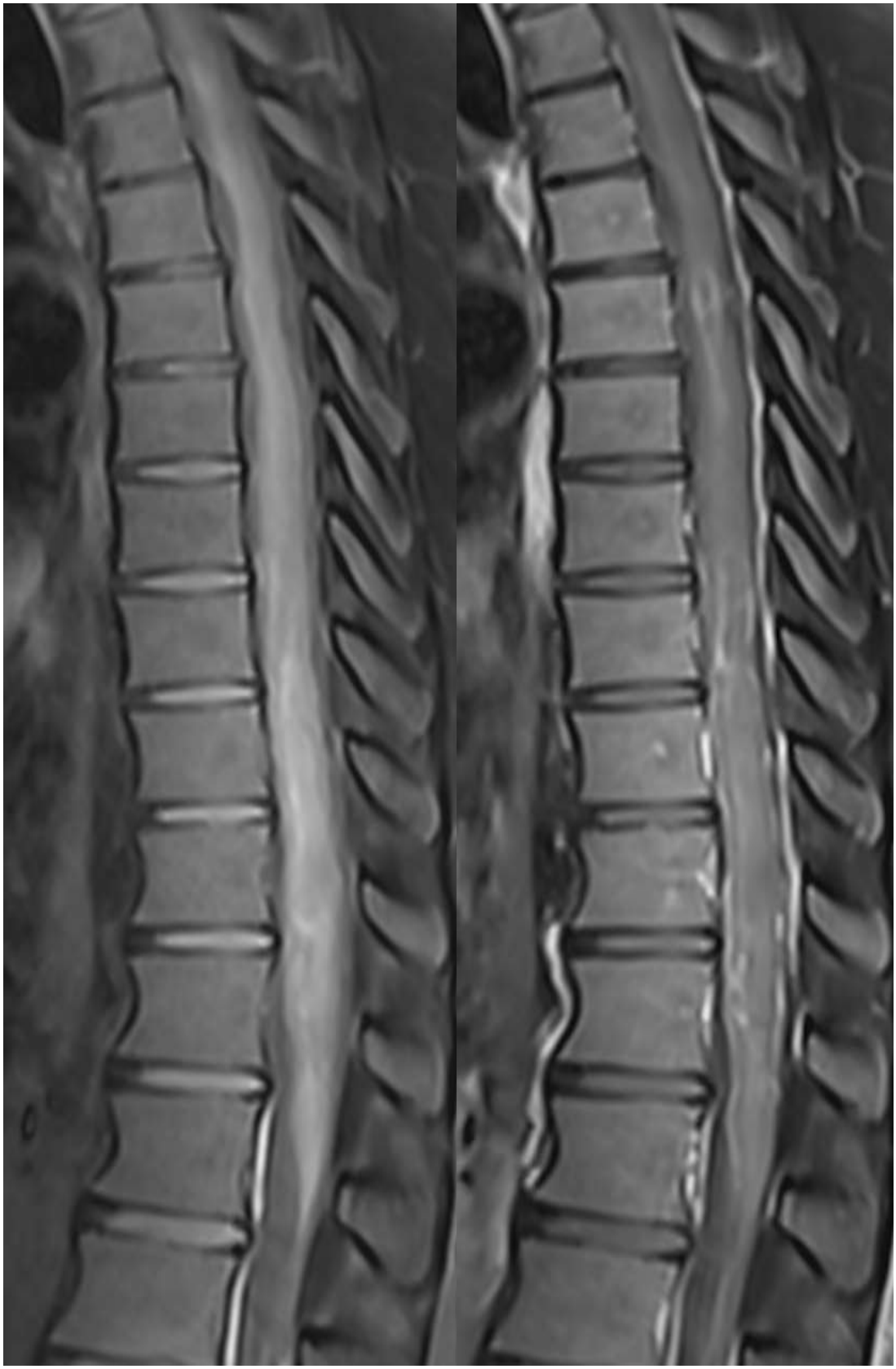

Figure 1: T1 and T1 contrast images showing patchy enhancement of the spinal cord.

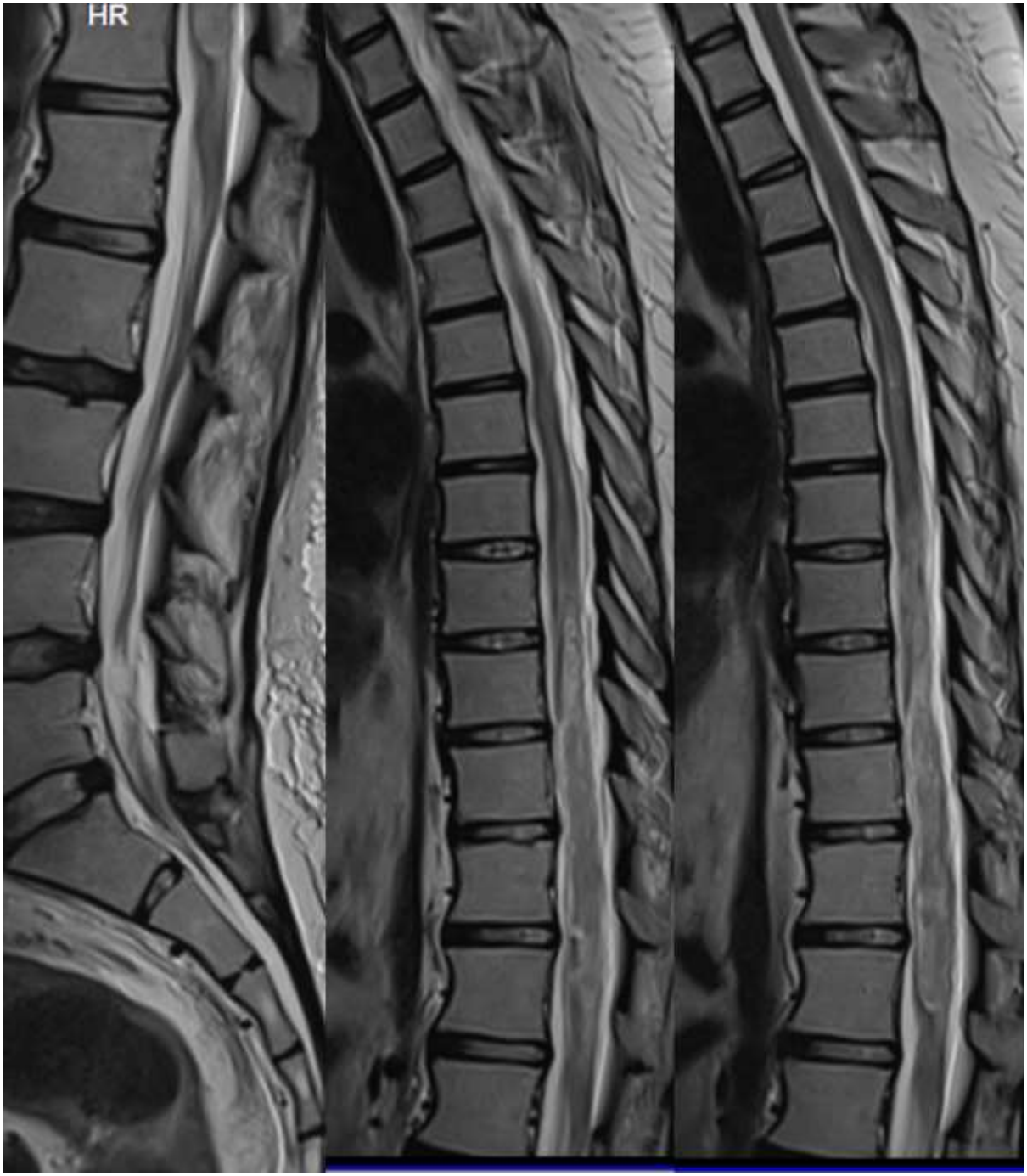

Figure 2: MRI spine (T2) showing hyperintense intramedullary signals in dorso-lumbar spine.

Figure 3: MRI spine (T2) showing cord expansion with hyperintense signals in dorso-lumbar spine.

Patient received 5 cycles of plasmapheresis. Extensive testing for autoimmune, systemic lupus erythematosus (SLE), vasculitis, and infectious aetiologies was performed. NMO-MOG antibodies, serum and CSF oligoclonal bands, vasculitis markers (ANA, ANCA, ENA, complement levels, anti-dsDNA, MPO/PR3/GBM antibodies), serum ACE, 24-hour urinary calcium, and a CSF autoimmune panel were all negative.
A comprehensive infectious workup, including testing for varicella-zoster virus, West Nile virus, herpes simplex virus, CMV, Flavivirus, syphilis, and Epstein-Barr virus, was negative except for BioFire testing of the CSF, which was positive for Listeria monocytogenes. This prompted a change in antibiotic therapy to ampicillin and gentamicin. ATT was discontinued after CSF PCR was positive for listeria. Repeat MRI showed decreased grey matter hyperintensity in the spinal cord. She received 8 weeks of complete antibiotic course for listeria myelitis. There was minimal improvement in power of bilateral lower limbs.

DISCUSSION:

This case report describes a rare presentation of longitudinally extensive transverse myelitis (LETM) in an immunocompromised patient, associated with Listeria monocytogenes. LETM is a severe and uncommon inflammatory condition affecting the spinal cord, characterized by a lesion spanning three or more vertebral segments on MRI. The patient's presentation with rapidly progressive hyperacute paraplegia, sensory loss, and bladder and bowel dysfunction is consistent with LETM. However, the identification of Listeria monocytogenes in the CSF was unexpected, as this organism is more commonly associated with meningitis, encephalitis, and brain abscesses. Listeria-associated myelitis is extremely rare, with only a few reported cases in the literature(6). The majority of these cases have been in immunocompromised individuals, such as those with HIV/AIDS or receiving immunosuppressive therapy(6). In this case, the patient's immunocompromised state was secondary to long term steroid usage for autoimmune hepatitis. The presence of Listeria monocytogenes in the CSF suggests that the infection may have played a role in the development of LETM.

Listeria monocytogenes, although an uncommon cause of illness in general population but is an important pathogen in pregnant females, neonates, elderly individuals and immunocompromised individuals(7). Patients with cancer particularly those of blood are also at high risk of listeria infection(8). Incidence rate of listeria infection is low but the mortality caused by listeria is as high as 20-30%(9). Listeria can cross the blood brain barrier and cause intracranial infection which leads to meningitis. Listeria tolerates high salt, wide pH, and wide temperature range and can grow under 4 degree Celsius conditions. Listeria can be obtained from refrigerated food and can cause wide range of neurological symptoms(10). It is typically food borne infection. Usually meningitis caused by this infection is dangerous and have high mortality and can have atypical presentation. Since it can have atypical presentation early diagnosis and management is crucial.

Despite treatment with antibiotics and plasmapheresis, the patient showed no clinical improvement. This may be due to the severity of the infection, the patient's underlying immunocompromised state, or the delay in diagnosis and treatment. Bacteraemia and meningitis are serious manifestation of listeria infection that can affect individuals at high risk. Unless recognized and treated early listeria infections can result in significant mortality and morbidity.

This case highlights the importance of considering Listeria monocytogenes as a potential cause of LETM in immunocompromised individuals. It also emphasizes the need for prompt diagnosis and treatment. Intravenous antibacterial should be started immediately when the diagnosis is suspected and confirmed. Diagnosis is established by the culture of the organism from bloods or other sterile body fluid. Ampicillin is the drug of choice for listeria infection(11). It interferes with bacterial cell wall synthesis during active multiplication, causing bactericidal activity against susceptible organism. Gentamycin is an adjunctive therapy that can be used in conjunction with ampicillin(12). Penicillin allergic patients should be skin tested and desensitized if necessary or treated with trimethoprim- sulfamethoxazole, which inhibits bacterial synthesis of dihydrofolic acid by competing with Para aminobenzoic acid which results in inhibition of bacterial growth.

References:

1. The clinical course of neuromyelitis optica (Devic's syndrome) | Neurology [Internet]. [cited 2025 Mar 3]. Available from: https://www.neurology.org/doi/10.1212/WNL.53.5.1107
2. Trebst C, Raab P, Voss EV, Rommer P, Abu-Mugheisib M, Zettl UK, et al. Longitudinal extensive transverse myelitis--it's not all neuromyelitis optica. Nat Rev Neurol. 2011 Nov 1;7(12):688–98.
3. Kerr DA, Ayetey H. Immunopathogenesis of acute transverse myelitis. Curr Opin Neurol. 2002 Jun;15(3):339–47.
4. Kerr DA, Ayetey H. Immunopathogenesis of acute transverse myelitis. Curr Opin Neurol. 2002 Jun;15(3):339–47.
5. Mylonakis E, Hohmann EL, Calderwood SB. Central nervous system infection with Listeria monocytogenes. 33 years' experience at a general hospital and review of 776 episodes from the literature. Medicine (Baltimore). 1998 Sep;77(5):313–36.
6. Henke D, Rupp S, Gaschen V, Stoffel MH, Frey J, Vandevelde M, et al. Listeria monocytogenes spreads within the brain by actin-based intra-axonal migration. Infect Immun. 2015 Jun;83(6):2409–19.
7. Qu L, Meng GL, Wang Q, Yang L, Wang LB, Xie Y. A comprehensive analysis of listeriosis in 13 pregnant women and 27 newborns in Xi'an from 2011 to 2020. Transl Pediatr. 2022 Sep;11(9):1482–90.
8. Eisa M, Tefera K, Alvanpour A. Listeria peritonitis and bacteremia in a patient with cholangiocarcinoma. IDCases. 2018 Aug 9;14:e00430.
9. Choi MH, Park YJ, Kim M, Seo YH, Kim YA, Choi JY, et al. Increasing Incidence of Listeriosis and Infection-associated Clinical Outcomes. Ann Lab Med. 2018 Mar;38(2):102–9.
10. Osek J, Lachtara B, Wieczorek K. Listeria monocytogenes – How This Pathogen Survives in Food-Production Environments? Front Microbiol. 2022 Apr 26;13:866462.
11. Grosboillot V, Keller I, Ernst C, Loessner MJ, Schuppler M. Ampicillin Treatment of Intracellular Listeria monocytogenes Triggers Formation of Persistent, Drug-Resistant L-Form Cells. Front Cell Infect Microbiol. 2022 May 12;12:869339.
12. Bibi S, Chisti MJ, Akram F, Pietroni MAC. Ampicillin and Gentamicin Are a Useful First-line Combination for the Management of Sepsis in Under-five Children at an Urban Hospital in Bangladesh. J Health Popul Nutr. 2012 Dec;30(4):487–90.