

# Neurolisteriosis in a 31-year-old man: A Case Report

Pamela Alyssa E. Olaguera, MD<sup>1</sup>, Maritzie R. Eribal, MD<sup>2</sup>

## Abstract

**Introduction.** Neurolisteriosis is caused by *Listeria monocytogenes*, a gram-positive microorganism. It usually affects vulnerable population including pregnant women, neonates, immunocompromised individuals, and elderly persons. This report describes a case of neurolisteriosis in a 31-year-old immunocompetent man.

**Case Summary.** This case involves a 31-year-old Filipino male who presented with decrease sensorium. A lumbar puncture was performed, and polymerase chain reaction (PCR) testing of the cerebrospinal fluid confirmed the presence of *Listeria monocytogenes*. On the fifth day of hospitalization, the patient developed unilateral sixth cranial nerve palsy and facial nerve palsy. He was treated with intravenous ampicillin for 21 days, resulting in significant improvement in the cranial nerve deficits.

**Conclusion.** It is the first neurolisteriosis case in this institution. There is only one published neurolisteriosis case in the Philippines which presented with brain abscess. Neurolisteriosis, although uncommon, is one of the differential diagnoses in patients presenting with fever, headache, and nuchal rigidity. Isolation of *Listeria monocytogenes* in the cerebrospinal fluid and blood culture is diagnostic. Neurolisteriosis is an invasive disease which can result in neurologic sequelae such as cranial nerve palsies. Targeted treatment aids in good clinical outcomes.

**Keywords:** Neurolisteriosis, *Listeria monocytogenes*, rhombencephalitis, case report

## Introduction

Infections of the central nervous system (CNS) may arise in patients with traumatic brain injury following the placement of external ventricular drainage (EVD) catheters or, more generally, after any neurosurgical procedure. An infection rate ranging from 2% to 33% is associated with external ventricular drainage, one of the most common neurosurgical procedures. The incidence of shunt-associated infections ranges from 1% to 18%, and various independent risk factors have been identified. (1) Organisms causing shunt-associated infections generally stick to the device surface and develop biofilms, making clinical and laboratory diagnosis and treatment difficult. (3) Due to the rise of multidrug-resistant bacteria, such as *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Klebsiella*

*pneumoniae*, treating CNS infections has become more challenging. Modifications to treatment, such as a more significant daily dose and prolonged or continuous administration, could increase antibiotic concentrations at the site of infection and promote pathogen clearance. In the event of therapeutic failure or infection caused by difficult-to-treat bacteria, direct antibiotic instillation into the cerebrospinal fluid (CSF) and intravenous antibiotic administration may aid in the resolution of infection. (2) Colistin has been introduced as a therapeutic agent for *A. baumannii* infections that are resistant to antibiotics. Because intravenous colistin is limited in its penetration into the CSF, its use in sterilizing CSF has been used off-label (15).

## Case Summary

A 31-year-old single male, college student, was admitted due to a change in sensorium. His past medical history revealed he is not hypertensive, diabetic, or asthmatic. The patient has not undergone any previous medical treatment. His family history was free of neurologic diseases, no familial history of hypertension, diabetes mellitus and malignancies. The patient had no known

<sup>1</sup>Department of Internal Medicine, Visayas Medical Hospital, Cebu City, Philippines

<sup>2</sup>Section of Infectious Disease, Department of Internal Medicine, Vicente Sotto Memorial Medical Center, Cebu City, Philippines

Corresponding author: Pamela Alyssa E. Olaguera, MD email: pamelolaaguera@yahoo.com

genetic disorders. He was a non-smoker, non-alcoholic beverage drinker, denied any use of illicit drugs, and reported no previous sexual contact. He has no history of travel and lived alone in a boarding house near his school. His 24-hour food recall included only leftover cheese, and his usual diet consisted mainly of cooked canned goods and street foods.

Five days prior to admission, the patient noted loose watery stools more than five episodes, amount was not quantified, not associated with abdominal pain, no associated nausea, vomiting, no febrile episode. Four days prior to admission, patient had generalized headache, pain score of 8/10, non-radiating, not associated with nausea or vomiting, no febrile episode. One day prior to admission, the patient had undocumented fever, still with generalized headache now with a pain score of 10/10, no recurrence of abdominal pain, no neck pain. He sought consultation at his school clinic and was given an unrecalled medication which provided temporary relief. Among his classmates, the patient was the only one who was sick.

Several hours prior to admission, there was persistence of fever with noted change in sensorium. Patient was seen at the emergency room confused, disoriented, restless, tachycardic, febrile with a temperature of 39.9°C, with an elevated blood pressure of 150/90 mmHg. Complete blood count taken noted to have leukocytosis with neutrophilic predominance, and urinalysis noted to have pyuria. The patient was managed as a case of urosepsis. Patient was then referred to an infectious disease specialist, who elicited a Brudzinski sign, nuchal rigidity, and Glasgow coma score of 7 (E1V1M5)

indicating no spontaneous eye opening, no verbal response, and moves to localized pain. Patient was prophylactically intubated. Empiric antibiotic was started, Ceftriaxone was given at 2g intravenous infusion every 12 hours as meningitic dose. Procalcitonin was increased to more than 50 ng/mL. Computed tomography scan of the brain without contrast was unremarkable. Urine culture and sensitivity yielded no growth. Patient was referred to a neurologist for further evaluation.

On Hospital Day two, Lumbar tap was done, opening pressure was increased to 45 mmHg or 611.77 mmH<sub>2</sub>O. Cerebrospinal fluid noted to be clear and colorless, cell count, and differential count noted to have pleocytosis WBC: 3-5/hpf or 309-515 cells/μL, elevated protein of 207.8 mg/dl and hypoglycorrhachia of 39 mg/dl (Table 1).

On hospital day three, meningitis and encephalitis panel polymerase chain reaction test detected the presence of *Listeria monocytogenes* in the Cerebrospinal fluid. Culture of the CSF was noted to have moderate growth of gram-positive bacilli; however, sensitivity testing and identification was not available in the institution, hence, which is one of the limitations in this study. Blood culture and sensitivity had no growth. Empiric antibiotic coverage for the gram-positive bacilli, presumably *Listeria monocytogenes* was given and he was started on high dose Ampicillin at 2g intravenously every four hours.

**Table 1. Laboratory Results**

Parameter	Complete Blood Count			Reference
	HD	HD 3	HD 6	
White blood cells	14.43	10.64	9.70	4.1-10.9
Segmenters	80.8	76.6	79.9	47-80
Lymphocytes	10.8	15.3	12.0	13-40
Monocytes	8.2	7.9	4.9	2-11
Eosinophils	0	0	3.1	0-5
Basophils	0.2	0.2	0.1	0-2
Red Blood Cells	4.27	3.97	3.43	4.5-5.9
Hemoglobin	13.7	12.4	10.7	13.5-17.5
Hematocrit	38.5	36.4	33.2	41053
Mean corpuscular hemoglobin	90.2	91.7	96.8	80-100
Mean corpuscular hemoglobin concentration	35.6	31.2	32.2	31-36
Platelet	168	161	293	140-440

**Immunology and Serology**

Sars-Cov 2 (COVID-19) rapid antigen test	Negative
Anti-HIV	0.384 Nonreactive
Anti-nuclear antibody	Negative

**Miscellaneous**

Urine Culture and sensitivity	No growth after 48 hours of incubation
CSF Culture and sensitivity	Moderate growth of gram-positive bacilli (Sensitivity testing and identification not available)
CSF KOH wet mount	No fungal elements seen
CSF India ink mount	Negative for <i>Cryptococcus neoformans</i>
CSF Xpert MTB/RIF	MTB not detected
CSF Acid fast stain	No acid-fast bacilli seen

Note. HPF – high power field; uL – microliter; HD = Hospital Day

**Urinalysis**

<b>Macroscopic</b>	
Color	Dark yellow
Appearance	Hazy
pH	6.0
Specific gravity	1.020
Protein	+1
Glucose	Negative
<b>Microscopic</b>	
RBC	6-8
WBC	10-20
Epithelial cells	Moderate
Bacteria	Few

**Clinical Chemistry**

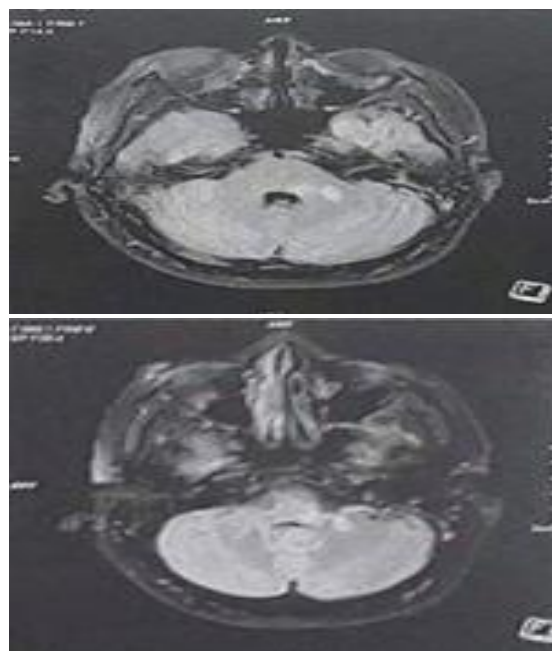
Procalcitonin	>50 ng/mL
CSF Glucose	39 mg/dL
CSF Protein	2.078 g/L

**Cell count and Differential Count**

<b>CSF</b>	
<b>Macroscopic</b>	
Color	Colorless
Transparency	Clear
<b>Microscopic</b>	
WBC	3-5/hpf or 309-515

During the fourth day of hospitalization, the patient was screened for Human Immunodeficiency Virus and Antinuclear antibody test to further rule out presence of immunosuppressive condition, both results came out negative. At the fifth day during the hospital course, no

growth was detected on the blood culture and sensitivity. The patient had improving Glasgow coma score of 11 (E3V3M5), which indicates eye opening to voice, presence of incomprehensible speech, and localizes pain. However, there was noted new-onset ptosis on the right eye, unilateral 6<sup>th</sup> cranial nerve palsy and facial nerve palsy, right. Repeat Computed tomography scan of the brain without contrast was unremarkable. Advised for Magnetic resonance imaging with contrast however, due to financial constraints was not performed. During the seventh hospital day, the patient was extubated. Patient was transferred-out from intensive care unit, and during the ninth hospital day, magnetic resonance imaging without contrast was performed and results showed presence of subacute mildly hemorrhagic infarct at the left dorsolateral medulla and cerebellar peduncle, no evidence of focal mass lesion and acute or hyperacute ischemia. Presence of bilateral mastoiditis and right maxillary sinusitis. Patient was referred for physical therapy for rehabilitation and was discharged with outpatient antibiotic therapy to continue for a total of 21 days of antibiotic treatment. During the follow-up, the patient received outpatient care and successfully finished a 21-day course of intravenous antibiotics. There were no reported adverse reactions from the outpatient antibiotic therapy. No follow-up tests were recommended. Significant improvement was observed in cranial nerve palsies, and the patient regained the ability to walk without assistance. There were no recurrence of febrile episodes, and sensorium changes. Notably, the patient achieved the milestone of graduating with a bachelor's degree and continued to pursue pastoral ministry.



**Figure 1:** Magnetic Resonance Imaging Brain Plain  
**Note:** Subacute mildly hemorrhagic infarct at the left dorsolateral medulla and cerebellar peduncle. No evidence of focal mass lesion. No evidence acute or hyperacute ischemia.

## Discussion

*Listeria monocytogenes* (Lm) is a gram-positive microorganism. It is ubiquitous, it can be in the soil, vegetations and animals, its reservoir include mammalian species. It is transmitted via the fecal-oral route. It can thrive in a low-pH and in an environment with high salinity<sup>1-8</sup>. Virulence factors include listeriolysin O (LLO) which enables the bacteria to evade intracellular killing and enter the host cell. In addition, Internalin (InlA and InlB) are bacterial proteins for host cell attachment; Actin polymerization (ActA), for transport of bacteria within cells, and Phosphatidylinositol-specific phospholipase C (PI-PLC) which causes bacteria to evade host cell vacuole and lead to cell disruption<sup>11</sup>.

Listeriosis is a foodborne disease. Evidence on outbreaks showed source from soft cheese with unpasteurized milk, salads, sprouts, cantaloupe, caramel apples, frozen vegetables, ready to eat meat such as hotdogs and delis. In rare cases, individuals with no risk factors develop invasive listeriosis due to heavy contamination of *Lm* in the food. Incubation period differs among individuals an average of less than 24 hours or as long as 11 days<sup>8</sup>.

Invasive listeriosis is rarely seen in individuals other than the vulnerable populations, increasing risk over 59 years of age. It can affect healthy individuals usually asymptomatic or having mild febrile gastroenteritis to invasive disease such as bacteremia and neurolisteriosis which is seen in vulnerable populations such as pregnant women, neonates, immunocompromised individuals, and elderly persons<sup>8</sup>. In this case, the patient, a 31-year-old male, experienced symptoms of diarrhea along with an undocumented fever episode. To rule out immunosuppressive comorbidities, tests including Antinuclear Antibody Immunofluorescence and Human Immunodeficiency Virus antibody testing were conducted, both of which were negative.

According to the MONALISA study that was done in France, 3-month mortality was higher for presence of bacteremia in neurolisteriosis, and the strongest mortality predictor includes patients with active cancer, presence of multi-organ failure, aggravation of ongoing multi-organ dysfunction, and monocytopenia. In addition, neurolisteriosis mortality was higher in patients who are receiving adjunctive dexamethasone treatment<sup>2</sup>. In the case of our patient, there was no history of corticosteroid intake.

The patient presented with fever, headache and nuchal rigidity which typically is a sign of meningitis. A study by Tracy and Waterfield (2020) indicates that the presence of positive meningitic signs, such as Brudzinski and Kernig, increases the likelihood of diagnosing meningitis, whereas the absence of these signs decreases DNA fragments within a single reaction tube. Compared to CSF culture, the sensitivity and specificity of the multiplex-PCR were 90% and 92.2%, respectively<sup>12-13</sup>. Furthermore, in a study by Monnier (2011), *PCR-hly* testing was positive in all 214 CSF samples from patients suspected of having CNS listeriosis where *L.*

*monocytogenes* was isolated through culture<sup>24</sup>. CSF analysis in neurolisteriosis can sometimes be nonspecific. However, it frequently reveals elevated protein levels, low or normal glucose levels, and lymphocytosis, although CSF neutrophilia may also occur<sup>19</sup>. CT imaging techniques have been found to be insufficient for diagnosing encephalitis associated with *L. monocytogenes*. In comparison to CT scans, MRI is regarded as more effective for detecting abnormalities in patients with brainstem diseases, including rhombencephalitis<sup>17</sup>. Noncontrast MRI showed subacute mildly hemorrhagic infarct at the left dorsolateral medulla and cerebellar peduncle. Intracranial hemorrhage linked to *Listeria monocytogenes* is even rarer than hydrocephalus, with the majority of cases occurring in children. However, it has also been observed in adults, where it has been identified as an independent indicator of poor outcomes<sup>18</sup>.

Treatment of Listeriosis includes high dosage of ampicillin which is 2 grams intravenously every 4 hours or penicillin G of 4 million units intravenously every 4 hours. The dosage plays a critical role in the management of invasive disease, necessitating a minimum dose of 6 grams or more. Penicillin has a weak anti bactericidal property against *Listeria monocytogenes*, adding gentamicin is synergistic. In patients with drug allergy to penicillin, alternative treatment includes administration of trimethoprim-sulfamethoxazole (TMP-SMX) which is 5 mg/kg per dose of the trimethoprim component, given IV every 6-12 hours<sup>7-8</sup>. However, TMP-SMX is contraindicated in first-trimester pregnant patients due to associated neural tube defects and cardiovascular abnormalities. Treatment duration varies, it is recommended that treatment should be at least two weeks for patients with bacteremia, three weeks for meningitis, 4-6 weeks for endocarditis and 6-8 weeks for brain abscess or encephalitis. Treatment is longer in the vulnerable population or in individuals who are not clinically improving<sup>8</sup>. Repeat lumbar puncture is not required in patients who are clinically improving. The patient was started with 3<sup>rd</sup> generation Cephalosporin which can cross blood brain barrier, however after identifying the causative microorganism via PCR, Ceftriaxone was shifted to Ampicillin, targeted therapy was done, and patient improved.

In a 2020 case report by Patas et al., a 61-year-old male presented with fever, confusion, irritability, and a severe bitemporal headache radiating to the occipital region. Lumbar puncture revealed pleocytosis (760 leukocytes/mm<sup>3</sup>) and hypoglycorrhachia (34 mg/dL). The patient was initially managed empirically for bacterial meningitis. Subsequent cerebrospinal fluid (CSF) analysis confirmed *Listeria monocytogenes* infection, which was associated with reduced serum IgM levels. The patient was treated with ampicillin and gentamicin, resulting in recovery without neurological deficits<sup>21</sup>.

Similarly, a retrospective study described a rare case of *Listeria monocytogenes* infection. The patient presented with neurological symptoms, including fever, headache, altered consciousness, and vomiting. Laboratory tests

demonstrated elevated white blood cell count, C-reactive protein, and Procalcitonin levels. Cultures from cerebrospinal fluid and blood confirmed *Listeria monocytogenes* infection. Treatment with penicillin and meropenem led to full recovery, and the patient was discharged without any residual complications<sup>22</sup>.

Prevention of listeriosis involves proper washing and handling of foods. Keeping refrigeration at 40-degree Fahrenheit or lower and using leftovers within 3-4 days to prevent *Listeria monocytogenes* from growing. In addition, thoroughly cooking meat and poultry with an internal temperature of 165-degree Fahrenheit, these includes hotdogs, luncheon meats, cold cuts, fermented and dry sausages. Choosing safer foods and avoiding raw unpasteurized milk and soft cheeses unless labeled with pasteurized milk. There is still no vaccine for *Listeria monocytogenes*.

## Conclusion

It is the first neurolisteriosis case in this institution. There is only one published neurolisteriosis case in the Philippines which presented with brain abscess. Neurolisteriosis, although uncommon, is one of the differential diagnoses in patients presenting with fever, headache, and nuchal rigidity. Isolation of *Listeria monocytogenes* in the cerebrospinal fluid and blood culture is diagnostic. Neurolisteriosis is an invasive disease which can result in neurologic sequelae such as cranial nerve palsies. Neurolisteriosis remains a significant yet an underdiagnosed condition in the Philippines, underscoring the need to raise awareness, enhance diagnostic resources, and ensure timely therapeutic interventions. Given its potentially severe consequences, particularly in high-risk populations, increased vigilance and the adoption of molecular diagnostic techniques, such as PCR, are vital for early detection and effective management of this life-threatening infection.

## Disclosure

The authors have nothing to disclose.

## Informed Consent

Informed consent was obtained from the patient after a thorough explanation and rarity of the patient's case. It will assist in reporting emerging food-borne pathogen in the Philippines.

## Informed Consent

The author declares that there is no conflict of interest.

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