**CLINICAL VIGNETTE**

# Listeria Meningitis: A Case Study

Gloria S Kim, MD and Malena SC Law, MD

### *Case Presentation*

An 88-year-old female presented to her primary care physician with complaints of myalgias, nausea, and low-grade fevers of 99-100 degrees. On initial workup, the patient was found to have a Proteus mirabilis urinary tract infection and was treated with cefalexin. However, over the next 2-3 days, her symptoms progressed to include diffuse abdominal pain, nausea and diminished oral intake, but no vomiting. She presented to ER and was admitted for further evaluation.

Her past medical history was significant for hypertension, hyperlipidemia, hypothyroidism, osteopenia, as well as recurrent urinary tract infections. Her medications included levothyroxine, Lovastatin, metoprolol, and aspirin. The patient otherwise had an unremarkable family history and no significant smoking or alcohol history.

### *Physical Examination*

Vital Signs: Temperature 99.8 F, Heart Rate 86, Blood Pressure 143/90, Respiratory Rate 18, and Oxygen Saturation level of 96-99% on room air.

She was in no acute distress, but was somnolent and confused. Cardiovascular and abdominal exam was unremarkable and she was free of lymphadenopathy and organomegaly.

### *Laboratory Values*

White Blood Cell Count 18.1 x $10^3$/uL, Hemoglobin 12.7 g/dL, Hematocrit 35.2%, Platelet 290,000. Total Bilirubin 0.6 mg/dL, AST 40 U/L, ALT 28 U/L, Alkaline Phosphatase 67 U/L. Chemistry panel revealed Sodium 120, Potassium 4.0, Chloride 84, Bicarbonate 26, BUN 11, Creatinine 0.7, Calcium 8.4.

Urine cultures prior to admission grew out Proteus mirabilis sensitive to cephalexin (Keflex). Blood cultures drawn on admission eventually grew out Listeria monocytogenes.

CSF sampling revealed RBC Count 40/cmm, WBC Count 235/cmm, Neutrophil 45, Lymphocyte 40, Monocyte 15, Glucose Level 29 mg/dL, Protein Level 568 mg/dL. Bacterial, Acid-Fast, and Fungal cultures were negative. Gram Stain also did not reveal any bacteria.

### *Imaging*

Chest X-Ray taken on admission revealed diminished lung volume with patchy bilateral basilar opacities likely representative of atelectasis.

Echocardiogram revealed degenerative valvular changes with mild mitral regurgitation. MRI imaging of the brain revealed layering diffusion restricted material in the occipital horns of the lateral ventricles likely representing intraventricular pus. There was no evidence of cerebral abscess.

### *Treatment Course*

The patient was hospitalized and initiated on fluid resuscitation for hyponatremia. She was initially placed on iv ceftriaxone for Proteus UTI, but continued to be febrile with worsening mental status. The antibiotics were broadened to piperacillin/tazo-bactam, levofloxacin, and vancomycin. Blood cultures eventually grew Listeria monocytogenes in 1 out of 4 bottles and subsequent MRI imaging supported a meningeal diagnosis. Infectious disease consultation was obtained and patient was started on ampicillin and gentamicin. After stabilization and improvement in mental status, she was eventually discharged to a skilled nursing facility where she completed a month-long course of IV ampicillin along with rehabilitation for generalized physical deconditioning.

### *Discussion*

Listeriosis is a foodborne illness caused by the bacterium Listeria monocytogenes (L. mono-cytogenes), typically found in soil and water. The pathogen can be found in raw foods as well as in

processed foods, and foods made from unpasteurized milk. Nationwide, 1,651 cases of listeriosis occurring during 2009-2011 were reported to U.S. surveillance systems. The case-fatality rate was high at 21%. The average annual incidence was 0.29 cases in a population of 100,000 during this time period[1].

Listeriosis affects mainly immunocompromised patients, the elderly, pregnant women, and newborns from parental transmission. Most cases reported from 2009-2011 occurred among adults aged ≥ 65 years [58% (950)], and 14% (227) were pregnancy-associated. At least 74% of non-pregnant patients less than 65 years had an immunocompromising condition, most commonly immunosuppressive therapy or malignancy[1]. When healthy adults and children become infected with L. monocytogenes, they rarely become seriously ill. The symptoms of listeriosis include fever, myalgias, and nausea or diarrhea.

L. monocytogenes is known to spread to the nervous system, at which point meningeal symptoms such as headache, neck stiffness, confusion, or seizures can occur. Listeria is the third most common cause of bacterial meningitis. One study examined 30 cases of L. monocytogenes meningitis and found all patients were either immunocompromised or > 50 years old. The classic triad of fever, neck stiffness, and change in mental status was present in 13 (43%) of 30 patients. A cerebrospinal fluid indicator of bacterial meningitis was present in 23 (77%) of 30 cases. The initial antimicrobial therapy was amoxicillin based for 21 (70%) of 30 patients, however, the mortality rate was 17% (5 of 30), and 8 (27%) of 30 patients experienced what the authors described to be an unfavorable outcome based on the Glascow Outcome Scale[2].

Another study found that an increasing rate of unfavorable outcome among adults with listerial meningitis over a 14-year period (1998-2012), from 27% to 61%. The emerging L. monocytogenes genotype ST6 was identified as the main factor leading to poorer prognosis[3].

Treatment for L. monocytogenes typically requires IV antibiotics. Meningitis may be treated for 3-4 weeks while brain abscesses can require longer treatment. The initial treatment is usually parenteral ampicillin. Gentamicin is often added for immune compromised patients. Trimethoprim/sulfameth-oxazole also has been used successfully. Vancomycin and fluoroquinolones can be used in patients with penicillin allergy[4].

Guidelines recommended for the prevention of listeriosis are similar to those used to help prevent other foodborn illnesses, such as salmonellosis[5]. Because L. monocytogenes can grow in foods in the refrigerator, current Centers for Disease control and Prevention (CDC) recommendations are to keep refrigerator temperatures at 40°F or lower and the freezer 0°F or lower. Typically, outbreaks in the United States has been linked to ready-to-eat meat and poultry products[6].

L. monocytogenes, while not the most commonly suspected organism in gastrointestinal or meningeal infections, is a pathogen which should be considered in the differential diagnosis of those patients falling within high-risk populations.

## REFERENCES

1. Centers for Disease Control and Prevention (CDC). Vital signs: Listeria illnesses, deaths, and outbreaks--United States, 2009-2011. MMWR Morb Mortal Wkly Rep. 2013 Jun 7;62(22):448-52. PubMed PMID: 23739339.
2. **Brouwer MC, van de Beek D, Heckenberg SG, Spanjaard L, de Gans J**. Community-acquired Listeria monocytogenes meningitis in adults. *Clin Infect Dis*. 2006 Nov 15;43(10):1233-8. Epub 2006 Oct 10. PubMed PMID: 17051485.
3. **Koopmans MM, Brouwer MC, Bijlsma MW, Bovenkerk S, Keijzers W, van der Ende A, van de Beek D**. Listeria monocytogenes Sequence Type 6 and Increased Rate of Unfavorable Outcome in Meningitis: Epidemiologic Cohort Study. *Clin Infect Dis*. 2013 Jul;57(2):247-53. doi: 10.1093/cid/cit250. Epub 2013 Apr 16. PubMed PMID: 23592828.
4. **Temple ME, Nahata MC**. Treatment of listeriosis. Ann Pharmacother. 2000 May;34(5):656-61. Review. PubMed PMID: 10852095.
5. http://www.cdc.gov/listeria/prevention.html
6. **Cartwright EJ, Jackson KA, Johnson SD, Graves LM, Silk BJ, Mahon BE**. Listeriosis outbreaks and associated food vehicles, United States, 1998-2008. *Emerg Infect Dis*. 2013 Jan;19(1):1-9; quiz 184. doi: 10.3201/eid1901.120393. PubMed PMID: 23260661; PubMed Central PMCID: PMC3557980.

*Submitted on August 9, 2013*