



# **A Case of Listeria Monocytogenes Meningitis in an Elderly Female Complicated by Intracerebral Hemorrhage and Hydrocephalus**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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**Case Report**

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## **ABSTRACT**

An important bacterial pathogen in foodborne illness is *Listeria monocytogenes*, which affects immunocompromised patients, pregnant females, and people at the extremes of age, including neonates and elderly. The main clinical manifestations of infection in these hosts are central nervous system (CNS) invasion and bacteremia. In contrary to that, normal hosts who ingest high numbers of *Listeria* may develop self-limited febrile gastroenteritis. *Listeria* can lead to unusual and alarming complications such as hydrocephalus and intracerebral hemorrhage (ICH). ICH associated with *L. monocytogenes* has been observed sporadically. *Listeria* is the fifth most common cause of meningitis after *H.influenzae*, *S. pneumoniae*, *N. meningitidis* and streptococcus group B, although less common. Meningitis caused by

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monocytogenes was noted to have highest fatality rate of 22%. Adults with listeria meningitis who do not have serious underlying disease or are not on immunosuppressive drugs have a low mortality rate (0-13%).

A case of listeria meningitis is presented in this paper. An elderly female aged 74 years had bacteremia caused by monocytogenes, which got worsened by intracerebral hemorrhage. She presented at first with indefinite symptoms of fever and vomiting for 10 days and ASOC for 2 days and on later admission presented with sudden deterioration of consciousness which prompted further investigations that showed the presence of ICH.

**Keywords:** *Listeria meningitis; intracerebral hemorrhage; hydrocephalus; gram positive rods; elderly patients.*

## 1. INTRODUCTION

*Listeria monocytogenes* is a gram positive facultative intracellular bacillus. In healthy individuals, the illness usually appears as acute, self-resolving, gastroenteritis, making it a significant cause of foodborne illness. On the other hand, immunosuppressed patients may experience systemic (invasive) listeriosis, which can lead to more critical symptoms and increasing the days of hospital admission and so case fatality [1]. At refrigeration temperatures (4°C), it is capable of growing. The transmission to humans usually occurs when contaminated food (such as canned food, deli meats, and soft cheeses) is ingested. After ingestion, the primary bacteremia is followed by invasion of central nervous system (CNS), endocardium, and to placenta in pregnant females.

Specific group of people are essentially affected by it, including pregnant ladies, neonates, the immunodeficient (especially if cell-mediated immunity is impaired), and the elderly. It can possibly cause lethal infections such as bacteremia and meningoencephalitis. LM meningitis in healthy individuals is extremely rare occurrence, according to case reports [2]. Using various proteins, monocytogenes can invade host cells and escape the human T-cell immune system through cell-to-cell spreading. A secondary bacteremia can develop if the infection is not controlled when the bacteria is in the liver, for example, due to severe immunosuppression. By crossing the blood-brain barrier, monocytogenes reaches its preferred sites [3]. Fever is the most commonly reported symptom, affecting 60% to 100% of patients, followed by diarrhea (33% to 88%), arthralgia (20% to 100%), and headache (15% to 88%). At least one gastrointestinal symptom (such as abdominal pain, diarrhea, nausea and vomiting) was present in over 70%

of patients during most outbreaks [4]. The range of CNS manifestations can vary from a mild febrile illness with mental status changes to more severe ones, such as coma and death. The most frequent *Listeria* infection of the CNS is meningoencephalitis, which can lead to less frequent complications such as ventriculitis, rhombencephalitis, hemorrhage, and hydrocephalus. Hydrocephalus is probably caused by multiple factors, including high levels of CSF protein and impaired absorption of CSF due to blockage of the subarachnoid space by meningeal exudates or defective reabsorption of CSF through arachnoid granulations as a result of severe inflammatory response [5].

## 2. CASE PRESENTATION

A 74 years old female was hospitalized with 10 days history of intermittent fever upto 101F, vomiting, loose stools and altered sensorium for 2 days and 1 episode of generalized tonic clonic seizure during this period. She was known case of type 2 diabetes mellitus, essential hypertension and right breast cancer with bony metastasis. Before admission in our facility patient remained admitted in another hospital for 1 week where lumbar puncture was performed that was in favor of bacterial meningitis. She was treated there with empirical antibiotics.

On physical examination her Glasgow Coma Scale (GCS) was 8/15, doll's eye movements were present, pupils were reactive to light bilaterally, nuchal rigidity present and positive brudzinski sign. She was maintaining oxygen saturation at room air.

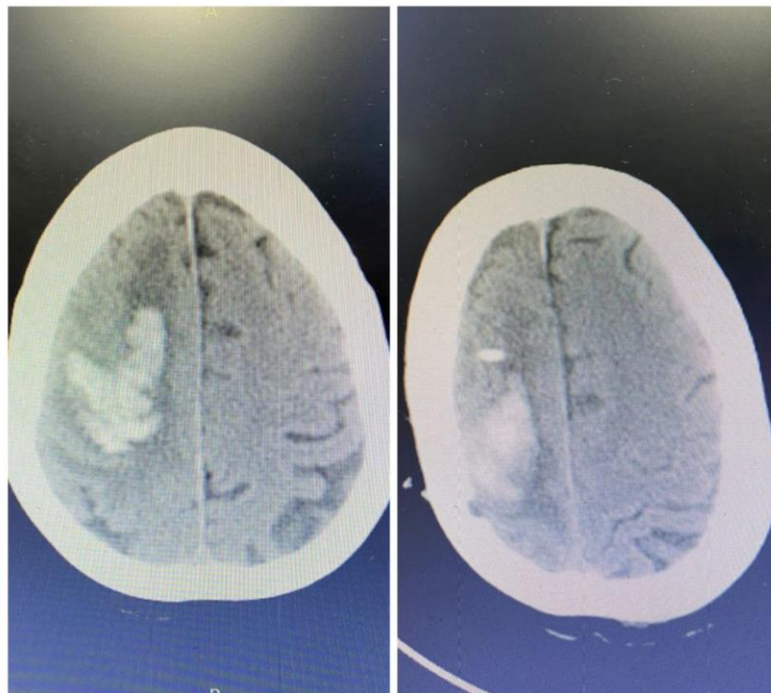
The blood laboratory findings showed raised total leukocyte count (TLC) and erythrocyte sedimentation rate (ESR), while hemoglobin, urea, creatinine, liver function test, coagulation profile, C reactive protein (CRP), urine complete

examination and serum electrolytes were normal. The lumbar puncture on admission revealed turbid cerebrospinal fluid (CSF), with 867 cells/microliter leukocytes (98% polymorphs and 2% lymphocytes), 800 mg/dl proteins, sugar 76 mg/dl, CSF gram staining showed gram positive coccobacilli and was negative for fungus and acid fast bacillus. On 3<sup>rd</sup> day urine culture and sensitivity showed candida spp. CSF culture showed no growth and on 8<sup>th</sup> day blood culture was positive for listeria monocytogens. Listeria meningitis was working diagnosis. So ampicillin 2 gram 4 hourly was started for total of 21 days. Patient then discharged home after 5 days of initiating ampicillin. She completed remaining course of intravenous antibiotics at home. CT Brain was unremarkable. Patient kept in follow up every week after that.

Almost after 3 weeks, patient again presented with sudden deterioration of consciousness. Her GCS was 9/15, pupils were reacting to light, maintaining oxygen saturation at 2 liters. Other examination was unremarkable. All baseline laboratory investigations complete blood count, urea, creatinine, CRP and serum electrolytes were in normal reference range. There was no growth on blood culture. In imaging, non contrast

CT scan of brain showed intracerebral hemorrhage as in Fig. 1. On 3<sup>rd</sup> day of repeat CT brain, there was right parietal lobe intracerebral bleed with interventricular ipsilateral extension as shown in Fig. 2. So, external ventricular drain was fixed and burr hole craniotomy done by neurosurgeon. Patient was put on ventilator after the procedure. Her conscious level did not improve and kept on deteriorating. And patient died on day 20<sup>th</sup> of admission.

The empirical antibiotic treatment for community acquired bacterial meningitis does not cover the treatment for LM in immunocompetent patients aged between 18 and 50 years, therefore the pertinent antibiotic treatment for LM meningitis in this case was a bit delayed. It means that LM should be considered in the differential diagnosis of patients presenting with atypical neurological symptoms or those that do not respond to classical treatment, regardless of age group or past medical history, especially in countries with a higher risk of infection with LM. Furthermore, LM should not be inclined to think only in immunosuppressed patients, as this was also reported in patients with no specific risk factors identified.



**Fig. 1. Intracerebral hemorrhage shown in Non contrast CT scan of brain (on right side) and**

**Fig. 2. Right parietal lobe intracerebral bleed with interventricular ipsilateral extension in CT scan of brain (on left side)**

### 3. DISCUSSION

Contaminated ready-to-eat foods are the main source of transmission for monocytogenes. Environmental recontamination at the farm or plant level by listeria species often causes contamination in food processing facilities [6]. It is not possible to permanently eradicate the listeria infection. Due to its widespread availability in the environment and numerous entry points into the facility, *Listeria monocytogenes* is often found in food environments. Active measures are needed to manage and eliminate the organism, such as ensuring proper disinfected design of the food premises and equipment, implementing effective cleaning and sanitation practices, and regulating personnel practices and movement of people and materials in areas where food products are exposed [7]. ICH, which is also one of the determining factor for unfavorable outcomes, can occur as an infrequent complication of *Listeria meningitis*. Intraventricular hemorrhage is caused by a specific pathophysiology. The cause of monocytogenes infection is not yet known, but it might be linked to abnormally regulated coagulation and fibrinolytic pathways, as well as swelling and activation of vascular endothelial cells. Bacterial meningitis can result in lethal complications such as intracranial hemorrhages, which occur in approximately 3% of adults [8]. *Listeria* is the second most common organism causing hydrocephalus, which develops in up to 14% of adults [9].

A case study from the Netherlands reported that out of 577 bacterial meningitis patients, 26 had hydrocephalus (4.5%) and four of those cases were caused by *Listeria meningitis* infection. All patients who had an external ventricular drain catheter (15%) were infected with monocytogenes. All patients with hydrocephalus had poor consequences, with three deaths (75%) indicating a high risk for unfavorable outcomes and death, and highlighting hydrocephalus as a serious risk factor [10]. Specific diagnostic tests are blood and CSF cultures. Early diagnosis of *neuro*listeriosis challenging due to the similarity of its CSF presentation to that of other bacterial meningitis, but also because around 50% of CSF Gram stains remain inconclusive [10].

Multiple case reports have linked the use of immunosuppressive drugs (Pembrolizumab) to the development of *Listeria* infections as in our patient. Being elderly and having diabetes

also put her at risk for developing listeriosis.

### 4. CONCLUSION

*Listeria* is an important source of systemic infection in immunosuppressed patients, and it can cause unusual symptoms in these patients, like fever, malaise, and mental status changes. To diagnose it, is usually demanding as most of the time it is not possible to clinically differentiate *L. monocytogenes* infection from infections with other entities that present with same symptoms. Intracranial hemorrhage is one of the most severe and rare complications of listeria infection, and it is linked with a high fatality rate. Timely diagnosis and appropriate antibiotics administration are essential for favorable consequences.

### CONSENT

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

### ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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