Case report

Spontaneous Peritonitis, Meningitis, and Septicemia Induced by *Listeria monocytogenes*

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Un caso raro de peritonitis espontánea, meningitis y septicemia inducidas por *Listeria monocytogenes*

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Abstract
Case presentation. A 71-year-old man with a previous diagnosis of liver cirrhosis, in whom spontaneous bacterial peritonitis was initially suspected. **Treatment.** As the patient's condition progressed, the presence of *Listeria monocytogenes* was identified by MALDI-TOF MS Biotyper technology. Antibiotic therapy was adjusted using ampicillin with sulbactam and dexamethasone, along with the administration of gentamicin. **Outcome.** Despite treatment, the patient died on the eight day of hospitalization. It is concluded that early culture is crucial in patients with a history of alcoholism and cirrhosis to detect rare infections and reduce mortality is concluded.

Keywords
Listeria monocytogenes, Liver Cirrhosis, Peritonitis, Meningitis.

Resumen
Presentación del caso. Un paciente masculino de 71 años con diagnóstico previo de cirrosis hepática, en quien inicialmente se sospechó peritonitis bacteriana espontánea. **Intervención terapéutica.** A medida que avanzaba la condición del paciente, se identificó la presencia de *Listeria monocytogenes* mediante la tecnología MALDI-TOF MS Biotyper. Se ajustó la terapia antibiótica utilizando ampicilina con sulbactam y dexametasona, junto con la administración de gentamicina. **Evolución clínica.** A pesar del tratamiento, el paciente falleció al octavo día de hospitalización. Se concluye que la realización temprana de cultivos es crucial en pacientes con antecedentes de alcoholismo y cirrosis para detectar infecciones poco comunes y reducir la mortalidad.

Palabras clave
Listeria monocytogenes, Cirrosis Hepática, Peritonitis, Meningitis.

Introduction

Listeria monocytogenes is a gram-positive, anaerobic bacterium commonly found in decaying vegetation, soil, and water. It can also be part of the intestinal flora of numerous mammals, including healthy adults. It is considered one of the major zoonoses associated with high mortality.[i]

Listeria monocytogenes is identified as one of the bacterial hazards in humans with the greatest relevance to food safety, especially in the production and marketing of meat, fish, seafood, dairy products, fruits, and vegetables.[ii-iv] Poor hygienic practices can increase the risk of acquiring *Listeria monocytogenes*.[iv]

Listeria monocytogenes infection has shown a higher incidence in immunocompromised populations.[v-x] This bacterium is responsible for a variety of conditions such as endocarditis, brain infections including meningitis and meningoencephalitis, brain abscess formation, urinary tract infections, bacteremia with or without sepsis, and, although less frequent, spontaneous

bacterial peritonitis (SBP).[xi-xiv] In immunocompetent patients, the disease presents as acute gastroenteritis and has a lower mortality rate compared to immunocompromised patients.[xv-xvii]

The risk of developing SBP is significantly increased in patients with pre-existing chronic kidney and/or liver disease, specifically in patients with liver cirrhosis. Alcohol consumption is one of the identified risk factors for PBE in patients with cirrhosis.[xviii] Furthermore, *in vitro* studies have shown that iron favors the growth of *Listeria monocytogenes*, a relevant finding in patients with end-stage liver disease, who may present an increase in iron reserves in the body, favoring the appearance of *Listeria monocytogenes*-induced SBP.[ix].

In patients with liver cirrhosis who develop sepsis, mortality rates are higher compared to the general population due to an excessive innate immune response and liver dysfunction.[xix] This prognosis is compounded because PBE can present with mild symptoms or in an oligosymptomatic form, leading to delayed diagnosis and treatment.[i].

Case presentation

A 71-year-old man with a history of chronic alcoholism, arterial hypertension, and liver cirrhosis. He was admitted to the hospital with lower extremity edema, fever for four days before admission, and anasarca. During periods of alcohol consumption, the patient had been living on the streets, although he had not suffered from family neglect. He had been referred from another hospital, where he stayed only a few hours.

During physical examination in the emergency department, moderate jaundice of the skin and sclerae, gynecomastia, parotid hypertrophy, and telangiectasias in the abdomen were observed. Increased tactile phlegm and decreased vesicular murmur were detected in the left basal region of the thorax.

The abdomen was distended with a dull tone to percussion in all four quadrants due to painless abdominal wall edema. Asterixis was found in the extremities and grade III edema; there were no signs of meningeal irritation. The patient was hemodynamically stable, conscious, alert, and oriented, with a Glasgow scale score of 15. Pneumonia was ruled out by chest X-ray, although a left pleural effusion was identified.

Biomarkers on admission were: hemoglobin 12. 1 g/dL, platelets 150 000/mm^3, white blood cell count 10. 42/mm^3 (72 % neutrophils, 10 % lymphocytes), CRP 16. 5 mg/dL and procalcitonin 3. 0 ng/mg. Hepatic and renal levels were TGO 49 U/L, TGP 20 U/L, and creatinine 0. 83 mg/dL.

Acute febrile syndrome, West Haven grade I hepatic encephalopathy, liver cirrhosis and chronic ethylism were diagnosed. His/the patient's encephalopathy (Child-Pugh C, 14 points) was addressed with anti-ammonium measures and blood cultures. Empirical antibiotic coverage with ceftriaxone and metronidazole was started due to the suspicion of spontaneous bacterial peritonitis, due to fever and ascites, and the diagnosis of cirrhosis.

Treatment

At 24 hours after admission, biomarker alterations were observed: hemoglobin 12 g/dL, platelets 174 000/mm^3, white blood cell count 11 420/mm^3 with neutrophilia (83 % neutrophils), CRP 79. 67 mg/dL, procalcitonin 16. 34 ng/mg and creatinine 0. 83 mg/dL.

Abdominal ultrasonography showed chronic liver disease with ascites and signs of portal hypertension (Figure 1), in addition to cholelithiasis and age-related changes in the renal parenchyma, and a sample of ascitic fluid was taken for culture.

The peritoneal fluid was yellow and cloudy, with negative coagulation. The red blood cell count was 329. 3 mm^3, and the number of leukocytes was 8698. 9 mm^3. The proportion of lymphocytes was 22. 4 %, and the proportion of polymorphonuclear cells was 77. 6 %. Protein in the peritoneal fluid was 2. 12 g/dL.

At 48 hours after the patient's admission, *Listeria monocytogenes* was detected in the ascitic fluid sample by MALDI-TOF MS Biotyper technology. The treatment was adjusted to ampicillin plus intravenous sulbactam at 1. 5 grams every six hours. At 72 hours, he maintained consciousness; the Glasgow scale score was 14, with no signs of meningitis.

Four days after admission, *Listeria monocytogenes* was isolated in ascitic fluid culture. The patient presented agitation and disorientation; a cerebral computed axial tomography (CAT) scan was performed, which showed cerebral atrophy in the frontal and temporal regions of both hemispheres.

A lumbar puncture was performed, and cerebrospinal fluid showed a cloudy appearance, hyperproteinorrachia, hypoglycorrhachia, and leukocytosis with a predominance of neutrophils. A meningitis panel with FilmArray® 2. 0 technology using MALDI-TOF MS Biotyper identified the presence of *Listeria monocytogenes*. Due to the findings, antibiotic treatment was modified on the fourth day, using ampicillin plus sulbactam at a dose of 3 g intravenously

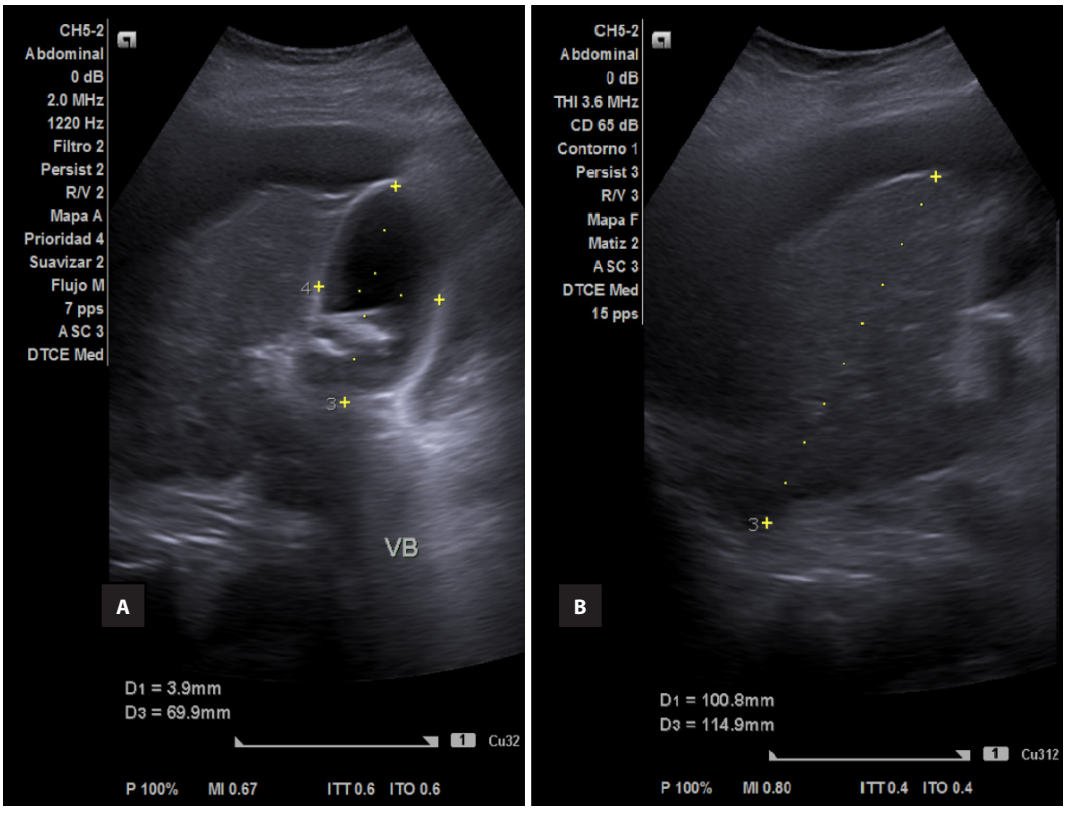

Figure 1. Abdominal ultrasonography shows in A) gallbladder with two mobile stones and posterior acoustic shadow, and in B) chronic liver disease with thick echotexture, hepatic volume redistribution, and presence of ascites, indicative of portal hypertension.

every six hours and dexamethasone at 10 mg every six hours.

The patient was transferred to an intermediate care unit due to neurological involvement, and gentamicin was administered at a dose of seven mg per kilogram as a loading dose, followed by five mg per kilogram.

During the fifth day of hospitalization, the patient experienced neurological deterioration, a mask with reservoir was placed and required the administration of vasopressors due to hemodynamic instability. Hepatic and renal deterioration was also noted (creatinine 2. 67 mg/dL, TGP 141 U/L, TGO 216 U/L), and he was diagnosed with septic shock with elevated biochemical parameters of sepsis (hemoglobin 11. 30 g/dL, platelets 175 000/mm^3, white blood cell count 14 790/mm^3 with 86 % neutrophils, CRP 110 mg/dL and procalcitonin 16 ng/mL). Due to this complication, he was transferred to the Intensive Care Unit.

The following day of hospitalization, due to the worsening of the Glasgow Scale score, the airway was secured using invasive mechanical ventilation. During the realisation of this process, the patient suffered cardiorespiratory arrest, requiring the implementation of advanced cardiopulmonary resuscitation maneuvers for four minutes, achieving evidence of return to spontaneous circulation.

Outcome

On his seventh day of hospitalization, the patient was in critical condition with septic shock, meningitis, and peritonitis due to *Listeria monocytogenes*. He presented multiorgan failure and required high doses of vasopressors. Severity scores such as SOFA, APACHE IV, and Child-Pugh indicated high mortality, with hazard ratios exceeding 95 %, 67. 6 %, and 82 %, respectively. On the eighth day of hospitalization, the patient suffered a second cardiorespiratory arrest and died.

Clinical diagnosis

Decompensated alcoholic liver cirrhosis, spontaneous bacterial peritonitis, bacterial meningitis and septic shock. Identification of *Listeria monocytogenes* in ascitic and cerebrospinal fluid confirmed bacterial infections.

Discussion

Listeria monocytogenes is a common bacterium in the natural environment.[xx] Its presence in the produce supply chain has become a growing food safety concern, as it has been associated with outbreaks caused by poor hygiene practices. Although listeriosis as a nosocomial infection is uncommon,

hospitalized patients are considered vulnerable, and outbreaks of hospital-acquired listeriosis have been reported.[vii] In the case of the patient addressed in this study, it is presumed that the source of infection was food ingestion. His situation was influenced by sociocultural factors, such as periods of poor personal hygiene, malnutrition, and wandering the streets in a drunken state due to alcoholism.

Listeria monocytogenes migrate from the gastrointestinal tract and spread from the lymph nodes through the circulatory system to other organs.[xxi] However, the precise mechanisms by which it invades the central nervous system are not defined.[xxii] Patients with cirrhosis often present with low complement and opsonin levels, an abnormally bacterially permeable intestinal mucosa, a dysfunctional reticuloendothelial system, and neutrophil dysfunction. This intestinal mucosal permeability may be even greater in patients with alcoholism.[xxiii]

Alcohol abuse can suppress the immune system by depressing phagocytic activity against gram-positive and gram-negative bacteria.[xix] In addition, alcohol consumption and proton pump inhibitors are risk factors for listeriosis.[xxiii] Previous research has shown an increased mortality rate from sepsis in patients with cirrhosis, regardless of the type of causative bacteria; however, *Listeria monocytogenes* is positioned as the third most common pathogen in cases of sepsis in adults.[xix]

Since the patient presented all these risk factors, samples for culture were taken from the first day of hospitalization in order to detect a possible bacterial infection. In patients with liver cirrhosis, spontaneous bacterial peritonitis is the most frequent infection. People with alcoholism and immunosuppressed systems are at greater risk of developing *Listeria monocytogenes* infections, with sepsis and meningitis being the most common manifestations.[xxiv]

Patients with bacterial meningitis who have liver cirrhosis have an unfavorable prognosis. One study analyzed the outcomes of bacterial meningitis in patients with liver cirrhosis over a 16-year period and found that MELD and Child-Pugh scores were predictive of prognosis.[xxv] It further concluded that elevated Child-Pugh scores are associated with an increased risk of mortality,[xxvi] which was observed in this case study.

Early diagnosis and adequate antibiotic treatment are essential for survival in cases of bacteremia due to *Listeria monocytogenes*. Direct identification of the bacteria allows rapid microbiological diagnosis, facilitating an efficient and effective therapeutic approach and improving the morbidity and mortality of affected patients.[xxvi] Beta-lactam antibiotics, such as penicillin and the aminopenicillins ampicillin or amoxicillin, are the treatment of first choice.[vii] Other studies recommend the use of gentamicin.[viii] However, so far, no controlled studies have been performed to determine the most appropriate drug or the optimal duration of treatment,[vii] despite the need to improve patient management and outcome.

Surveillance of patients with a history of alcoholism and liver cirrhosis for signs of spontaneous bacterial peritonitis is crucial, considering the possibility of acquiring organisms of etiologies caused by *Listeria monocytogenes* which causes multiple manifestations. Prompt administration of adequate antimicrobial treatment is essential to prevent deaths, complications, and long-term effects. Since local data on the prevalence of this bacterium are limited in El Salvador, diagnosis and treatment were based on international guidelines. Further local studies are needed better to understand the epidemiology of *Listeria monocytogenes* in the country and to improve prevention and treatment strategies.

Ethical aspects

The present work complies with the standards established in the Declaration of Helsinki and Belmont, respecting patient confidentiality and all ethical aspects, and was approved by the institutional ethics committee of the El Salvador National Hospital.

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