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Calil Darzé Neto *

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Case Report

Listeria Monocytogenes Meningitis: Two Case Reports and Literature Review

Calil Darzé Neto [1]*, Pedro Sandes Pereira [2]

[1]Medical Professor at the Bahiana School of Medicine and Public Health, Salvador, BA/Brazil.

[2]Medical student at Bahiana School of Medicine and Public Health, Salvador, BA/Brazil.

***Corresponding Author:** Calil Darzé Neto, Medical Professor at the Bahiana School of Medicine and Public Health, Salvador, BA/Brazil.

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Abstract

Introduction: Listeria monocytogenes is a pathogen widely distributed in nature, but its clinical manifestations are uncommon, being more relevant in populations with low immunity. This bacterium is acquired through improper food handling and mainly presents itself in the form of meningitis and septicemia. Methods: Retrospective survey of patients with L. monocytogenes meningitis at Couto Maia Hospital, a reference center for infectious diseases in the state of Bahia, between 1972 and 2009. Two reported cases will be the focus of the study. Case series: Case 1: male, 20 years old, previously healthy, presented with headache, fever, vomiting, and signs of meningeal irritation. Lumbar puncture, cerebrospinal fluid (CSF) study and culture, and complete blood count were performed. Culture was positive for L. monocytogenes. Treated with ceftriaxone, progressing to death. Case 2: female, 15 years old, diagnosed with juvenile rheumatoid arthritis, presented with headache, fever, and nausea. CSF culture positive for L. monocytogenes. Antibiotic therapy was conducted with changes in the course and remission of the condition. Treated with ampicillin and ceftriaxone. Discussion: Meningitis and sepsis are the most common manifestations caused by L. monocytogenes. After escaping the immune system, the pathogen reaches the bloodstream and central nervous system. The clinical presentation is similar to that of meningitis caused by other etiologies. CSF shows pleocytosis, hyperproteinorrhachia, and a tendency toward hypoglycorrhachia. The antibiotic of choice is ampicillin, and the outcome is multifactorial. Conclusion: L. monocytogenes meningitis is uncommon but should be considered in immunocompromised patients.

Keywords: listeria monocytogenes; listeria meningitis; meningitis; case report

Introduction

L. monocytogenes is described as a gram-positive, aerobic, and facultative anaerobic bacillus that can be isolated in organic fluids such as cerebrospinal fluid, blood, or amniotic fluid1. It is a facultative intracellular bacterium, and this location is a protective factor against the host's humoral response2. This bacterium is widely distributed in nature and can be found in soil, decaying vegetables, and tap water [1,3,4,26,30]. It is mainly acquired through the ingestion of undercooked foods, vegetables, milk and dairy products, fish, and chicken [2,4,5].

The clinical aspects of listeriosis are pleomorphic, with subacute, acute, and chronic presentations possible, depending on the site of infection in humans [6]. Thus, symptoms can range from flu-like symptoms to fulminant meningoencephalitis and sepsis [2,7]. Meningitis caused by L. monocytogenes is one of the most common manifestations of listeriosis, the other being septicemia [6,8-11]. L. monocytogenes meningitis is important because it mainly affects newborns, pregnant women, the elderly, alcoholics, and immunocompromised individuals (patients with acquired human immunodeficiency syndrome, transplant recipients, diabetics, and patients with neoplasms), but it can also occur in immunocompetent individuals [2,3,5,6,8,9,12-14,26,27].

Objectives

This study aims to describe the demographic, clinical, laboratory, and therapeutic aspects of two cases of L. monocytogenes meningitis that occurred between 1972 and 2009 at Couto Maia Hospital (HCMaia), a referral hospital for infectious diseases in the state of Bahia.

Methods

This study is a descriptive case report that describes the demographic, clinical, laboratory, and therapeutic data of the cases studied. To constitute the sample, cases of meningitis caused by L. monocytogenes were collected from the records of the Medical and Statistical Archive Service and, simultaneously, from the results of cerebrospinal fluid (CSF)

cultures with growth of L. monocytogenes in the Biochemistry Laboratory, in the period between 1972 and 2009 at HCMaia. A literature review was conducted in Scielo, Pubmed, and Bireme, using the keywords meningitis, listeria monocytogenes, listeriosis, and neurolisteriosis in Portuguese, English, and Spanish, for the period between 1970 and 2025.

Case Studies

Case 1

A 20-year-old male patient, born and raised in Porto Sauípe, Bahia, sought care at a local health clinic with a 12-hour history of intense, holocranial headache with photophobia. He was prescribed dipyrone, but his condition did not improve. He developed a fever (39°C), at which point he sought another health service and was referred to HCMaia for a CSF study. On the way, he had two episodes of vomiting. Upon admission to HCMaia, he reported anorexia and asthenia. As a history, his mother reported measles, chickenpox, and mumps in childhood. He reported living in a residence without basic sanitation and electricity and working in farming and cattle raising.

Physical examination revealed torpor, hypochromia (+/4+), temperature of 36.5°C, systemic blood pressure of 130X80 mmHg, palpable tonsillar lymph nodes, and signs of meningeal irritation (neck stiffness, positive Lasegue and Kernig signs).

The cerebrospinal fluid study revealed a cloudy appearance, 6,000 cells/mm³ with a predominance of polymorphonuclear cells, glucose <20mg%, positive globulins, and proteins of 250mg%. The cerebrospinal fluid culture was positive for L. monocytogenes. The blood count showed hematocrit 43.7%, hemoglobin 14.3g%, leukocytes at 17,400 (with 2% rods, 72% segmented, 22% lymphocytes, 4% monocytes).

He was treated with 2 g of ceftriaxone intravenously every twelve hours and 4 mg of dexamethasone every six hours. The patient progressed with fever, episodes of vomiting, disorientation, agitation, followed by hypoactivity, progressing to torpor, culminating in death on the fourth day of hospitalization.

Case 2

Female patient, 15 years old, student, born in Ilhéus, Bahia, coming from Salvador, Bahia. She was admitted to HCMaia complaining of severe headache for twenty-four hours. This patient had a previous diagnosis of juvenile rheumatoid arthritis, with pain, edema, and heat in her wrists and ankles, and had been taking 10 mg/week of methotrexate for a year and a half. The patient reported worsening arthritis and mood swings fifteen days ago, progressing seven days later with mild headache, predominantly frontal, responsive to analgesics, but recurrent. There is a report of fever forty-eight hours prior to admission, accompanied by nausea, vomiting, and worsening headache twenty-four hours ago. Her medical history included bacterial pneumonia one year ago, amenorrhea for two months, chronic anemia treated with polymaltose ferric hydroxide complex with folic acid, and allergy to acetylsalicylic acid. She reported living in a house with basic sanitation but in poor socioeconomic conditions.

Physical examination revealed fair general condition, facial expression of acute distress, pain on palpation of chondrosternal joints, soft, painless subcutaneous nodules on both feet, deformity and difficulty in extending the fingers, claw-like position of the toes, absence of meningeal or localized signs.

A lumbar puncture was performed. The cerebrospinal fluid study showed a cloudy appearance, 3,200 cells/mm³ with a predominance of neutrophils, glucose of 20mg%, positive globulins, and proteins of 200mg%. The cerebrospinal fluid culture was positive for L. monocytogenes. The direct smear study was negative. The complete blood count showed hemoglobin of 8.0 g%, hematocrit of 25%, hypochromia ++, anisocytosis +, leukocyte count of 4,400 cells/mm³ (3% rods, 80% segmented, 15% lymphocytes, 2% monocytes), erythrocyte sedimentation rate of 63 mm in the first hour, CRP positive.

The patient was initially treated with ampicillin, but the antibiotic was changed to ceftriaxone on the second day of hospitalization (HD), combined with chloramphenicol on the sixth HD, and ceftriaxone was changed back to ampicillin on the tenth HD, maintaining the combination with chloramphenicol until the nineteenth HD. Prednisone 25 mg/day was administered orally on the first and ninth to nineteenth HD, and dexamethasone was administered intravenously every six hours between the second and eighth HD. He also received indomethacin 100 mg PO/day, methotrexate 5 mg PO on Mondays and Tuesdays, and polymaltose ferric hydroxide complex with folic acid orally, one tablet every twelve hours.

She developed diffuse abdominal pain, fluctuations in consciousness, fever spikes (39-40°C), strabismus, diplopia, and signs of meningeal irritation (neck stiffness, positive Lasegue, Brudzinski, and Kernig signs), improving on the seventh day. On the nineteenth day of hospitalization, she was pain-free and lucid, and was discharged due to improvement, continuing on indomethacin, prednisone, and methotrexate, with instructions for outpatient follow-up.

Discussion

Meningitis and sepsis, as reported by several authors, are the most common manifestations of L. monocytogenes infection [1,6,7,15,16]. In the literature, studies show evidence of a link between these presentations and their follow-up with a previous state of immune system compromise [1,2,3,5,6,11,13-19], since the host response to this infection is primarily based on the cell-mediated response [1,7,15]. Thus, in patients with certain pathologies, such as alcoholism, diabetes, acquired human immunodeficiency syndrome, neoplasms, and collagenoses, as well as in non-pathological situations, such as neonates, pregnant women, and the elderly, infections by this agent are more common [1,2,6,7,10,11,19]. Thus, the patient described in case 2 had a condition favorable to infection by L. monocytogenes, since he had juvenile rheumatoid arthritis and was using methotrexate, a drug that can depress hematopoiesis and cause anemia, leukopenia, and/or thrombocytopenia, leading to a state of immunodeficiency. However, in the first case, no immunodeficiency was identified, reflecting the possibility of infection even in previously healthy patients, which has been observed in previous studies [2,3,5,6,8,9,12-14].

Regarding incidence, it is stated that L. monocytogenes infections were initially considered zoonoses, but currently, a higher frequency of these infections has been described in urban areas, ruling out the need for contact with animal handling areas for their acquisition1. Thirteen serovars of the bacterium are described, classified based on their somatic and flagellar antigens, with serovars 1/2a, 1/2b, and 4b being the most pathogenic [1,8,9,10,15,26,28]. In a study of the occurrence of L. monocytogenes in different soil samples, serovars 1/2b and 4b were identified in samples from pastures and vegetable gardens, and serovar 4b in urban areas [4]. Although L. monocytogenes is widely disseminated in nature, its incidence as an infectious agent in humans is sporadic [12,20,21]. As possible risk factors for the occurrence of L. monocytogenes in the cases in this study, references were made to housing without basic sanitation, farm work, and cattle breeding in patient 1 and poor socioeconomic status in patient 2, but none of the cases had a record of the infecting serovar in their medical records.

After oral acquisition, L. monocytogenes crosses the intestinal wall, multiplying in various types of cells, such as phagocytes and Peyer's patch cells 1,7,15. Analyzing the behavior of L. monocytogenes, cell invasion appears to be mediated by the bacterial protein internalin, comparable to the integrins of Legionella, Bordetella pertussis, or the invasins of Yersinia pseudotuberculosis [11,28]. L. monocytogenes also uses listeriolysin O to escape through the vacuolar membrane, reaching the cytoplasm of the host cell, where conditions are favorable for growth and

replication. However, whether or not it passes through the membrane depends on the virulence of the serovar [7,10,16,22,26,28]. After crossing the mucosal barrier of the gastrointestinal tract and reaching the bloodstream, L. monocytogenes has tropism for the central nervous system, suggesting that infection of this site is the most common among the clinical manifestations of listeriosis [6,9,15,16,19]. The picture of meningitis is described as similar to that present in meningitis caused by other etiological agents, presenting fever, headache, vomiting, neck stiffness, and other neurological symptoms such as irritability and sensory changes ([2,4,6,7,9,23,24]. Regarding the clinical picture, both cases initially presented with severe headache, vomiting, and fever spikes. There was a difference in the presence of signs of meningeal irritation (neck stiffness, positive Kernig and Lasegue signs), which appeared at the onset of symptoms only in case 1.

The CSF study is essential for diagnostic confirmation when L. monocytogenes is detected through culture. The literature also describes other common findings, such as cloudy appearance, pleocytosis with a predominance of polymorphonuclear cells, hyperproteinorrhachia, and normal to low glycorrhachia [2,3,5,6,11,14,17,24,25,26,27]. The complete blood count usually shows leukocytosis [3,5,11,13].There was similarity between the CSF studies of cases 1 and 2, which presented leukocytosis, with a predominance of polymorphonuclear cells, hypoglycorrhachia, hyperproteinorrhachia, and positive culture for L. monocytogenes. The blood count showed leukocytosis in case 1 and leukopenia in case 2,

Ampicillin is the antibiotic most described in the literature as the treatment of choice [6,11,15,16,18,20,22,24,25,26,29], a finding corroborated by the demonstration of sensitivities to ampicillin, chloramphenicol, erythromycin, gentamicin, and tetracycline in the antibiogram [6,22,24,25]. Ceftriaxone is also described as an option for empirical treatment, associated with ampicillin, as well as ampicillin associated with gentamicin [5,29]. Both patients in this series received adjunctive corticosteroids; the benefit of adjunctive dexamethasone in L. monocytogenes meningitis remains controversial, with cohort studies reporting conflicting effects on outcome. [31] Ampicillin was frequently chosen for the treatment of meningitis caused by L. monocytogenes in several patient samples reported in the literature, either as monotherapy [3,11,17] or in combination with chloramphenicol [25], gentamicin [3], amikacin [18], or amikacin and sulbactam [2]. The treatment chosen for cases 1 and 2 was different. The patient in case 1 was treated with ceftriaxone for three days. In case 2, treatment for juvenile rheumatoid arthritis with oral methotrexate was maintained, and antibiotic therapy was changed during follow-up: initially treated with ampicillin, but the antibiotic regimen was changed to ceftriaxone on the second HD, combined with chloramphenicol on the sixth HD, and changed again to ampicillin on the tenth HD, maintaining the combination with chloramphenicol until discharge on the nineteenth HD.

The evolution of patients with meningitis described in the literature is variable, depending on the previous immune status, pathological potential of the serovar, and bacteremia [3,27]. Complete remission of the clinical picture was reported by some authors [2,3,5,6,11,18,23,25], but there was unfavorable evolution with death in five studies analyzed [2,6,16,17,25]. The cases described here evolved with fever spikes and fluctuation in the level of consciousness, diverging in the follow-up by hypoactivity, torpor, maintenance of hyperthermia, and death in case 1, and gradual improvement, with the emergence and remission of neurological signs and symptoms (strabismus, diplopia, signs of meningeal irritation) and discharge in case 2, demonstrating the broad spectrum of disease progression.

Conclusion

Meningitis caused by L. monocytogenes is an uncommon infection of the central nervous system, as clearly shown in the literature and consistent with the rare occurrence of cases in a referral hospital described in this study. Despite its incidence, the clinical picture is similar to that of other types of meningitis, with fever, headache, vomiting, and neck stiffness. Laboratory tests include complete blood count, cerebrospinal fluid (CSF) study, and culture, presenting characteristic elements. According to the literature, the treatment of choice focuses on ampicillin and ceftriaxone, which can be combined with each other or with amikacin, gentamicin, or chloramphenicol. The prognosis varies depending on the host's immunity and the load and pathogenicity of the infecting serovar. Due to the numerous descriptions in the literature of cases associated with low organic resistance and the occurrence of meningitis caused by L. monocytogenes, this etiology should be considered, especially in the investigation of patients with compromised immune systems, whether due to an immunodeficiency disorder or because they are neonates, pregnant women, or elderly individuals, who present with fever, headache, vomiting, and neck stiffness.

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