LISTERIA MONOCYTOGENES, A CASE OF MISTAKEN IDENTITY

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ABSTRACT

A 74 years old female patient who was a known case of Diabetes Mellitus, Hypertension, and Breast Cancer presented in the Accident and Emergency Department with complaints of fever, seizures, and an altered state of consciousness. The patient was febrile with a temperature of 40° C, blood pressure was 140/80 mmHg, and pulse was 90 beats/min. She was in an altered state of consciousness with a Glasgow Coma Scale score of 10/15. The rest of the physical examination was unremarkable. The pleomorphic nature of this bacterium and clinical presentation similar to meningitis caused by other micro-organisms make the laboratory and clinical diagnosis respectively rather difficult. We illustrate the clinical presentation, antibiotic therapy, and laboratory diagnosis of *L.monocytogenes* in a patient with weak immune status. A high clinical suspicion of Listeriosis is essential for prompt and accurate treatment if a case of meningitis is not responding to traditional empirical antibiotics, and especially in immunocompromised.

Key words: Listeria monocytogenes, Meningitis, Encephalitis, Antibiotics, Case report

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INTRODUCTION

A facultative anaerobe and a gram-positive pathogenic bacterium, *Listeria monocytogenes (L. monocytogenes*) is the causative organism of listeriosis[1]. Listeriosis is a foodborne infection and is associated with food items such as meat and dairy products[2]. Infections caused by *Listeria monocytogenes* can present in human beings as bacteremia and Meningoencephalitis in patients who are immunocompromised and in older patients. It can also present as a vertical infection in pregnant women[3].

Listeria monocytogenes is considered to be the third most common causative agent of bacterial meningitis with a prevalence of 5% to 6% of adult cases. The mortality rate associated with listeriosis is reported to be around 30% and 36% and the morbidity rate is reported to be up to 61%[4]. *Listeria* colonizes the gastrointestinal tract in the host. After colonization, it crosses the intestinal barrier and is disseminated via blood to the target organs in the host[5]. The clinical presentation of meningitis caused by L.monocytogenes is quite similar to meningoencephalitis caused by other pathogens and third-generation cephalosporins fail as the first-line treatment in this case[6]. Therefore, a correct diagnosis is the mainstay of appropriate and timely antibiotic therapy in listeriosis. To raise awareness, we report a case of meningoencephalitis

caused by *Listeria monocytogenes* in a seventy-four years old cancer patient admitted to the Medical Intensive Care Unit of Shalamar Institute of Health Sciences, Lahore, Pakistan.

CASE PRESENTATION

A 74 years old female patient who was a known case of Diabetes Mellitus, Hypertension, and Breast Cancer presented in the Accident and Emergency Department with complaints of fever, seizures, and an altered state of consciousness. The patient had already been receiving treatment at another hospital with Vancomycin, Ceftriaxone, and Acyclovir. But there was no improvement in the patient's condition. The patient's symptoms started thirteen days before admission to the hospital. On presentation, the patient was febrile with a temperature of 40° C, blood pressure was 140/80 mmHg, and pulse was 90 beats/min. She was in an altered state of consciousness with a Glasgow Coma Scale score of 10/15. Positive finding on physical examination was a stiff neck and the patient was having seizures. The rest of the physical examination was unremarkable. Laboratory tests showed elevated white blood cell (WBC) counts of 15,600/mmc (80% neutrophils) while the Erythrocyte segmentation rate (ESR) was 40 mm/1sthour (normal 10-20mm). Glycohaemoglobin (HBA1C) was 7.4% (normal 4.80-5.70%) and plasma ammonia was found to be 63 μmol/L (normal 10-47 μmol/L. All other tests were within normal range.

A computed tomography scan of the brain was conducted which was found to be normal. A lumbar puncture was performed and the microscopic examination of a turbid, yellow cerebrospinal fluid (CSF) revealed 870 cells /microliter with neutrophilic predominance and glucose and protein concentrations of 76mg/dl (normal 45-80mg/dl) and 800 mg/dl (normal 20-45mg/dl) respectively. Gram staining showed gram-positive cocci. Empirical parenteral antibiotic treatment with Ceftriaxone (100mg/kg/day) along with intravenous antiviral therapy with Acyclovir (30mg/kg/day in 3 doses) was continued.

On CSF culture, a gram-positive rod was identified which had tumbling motility and a narrow zone of hemolysis on blood agar, while the blood culture was negative. The bile esculin test and CAMP (Christie, Atkins, Munch-Peterson) test was performed and both turned out to be positive the next day. Antibiotic susceptibility testing was done which showed that the organism was susceptible to Ampicillin, Gentamicin, Vancomycin, Teicoplanin, Linezolid, and Meropenem. The treating doctor was informed about the suspicion of *Listeria monocytogenes* and as a result, the treatment of the patient was modified. The administration of Ceftriaxone and Acyclovir was discontinued and intravenous Ampicillin (200mg/kg/day in 4 doses) was initiated.

The situation of the patient improved rapidly after the treatment with Ampicillin was started. She was afebrile by day 8 and was gradually becoming alert and started to communicate by day 12. The therapy was continued for a total of 21 days and the patient was discharged on day 24 in generally good condition and without any sequelae of neurological symptoms. The patient followed up after fifteen days of discharge and was in good condition, without any signs and symptoms of the disease.

DISCUSSION

The primary cause of infections and mortality in a developing country like Pakistan is foodborne diseases. *Listeria monocytogenes* is one of the major foodborne infections that is emerging worldwide as a threat to public health[7]. Immuno-competent individuals typically do not have any manifestations or may have a self-limiting fever or diarrhea after ingestion of food contaminated by *L.monocytogenes*. However, when an immunocompromised person is exposed to *L.monocytogenes*, the infection is inevitable. These include pregnant women, diabetic individuals, those with malignancy, individuals with acquired immunodeficiency syndrome, individuals taking steroids, or elderly individuals[8]. The patient in this case report was a seventy-four years old, immunocompromised cancer patient and had a likelihood of getting infected.

Diagnosing Listeria meningitis can be very challenging, and adequate medication is hence delayed frequently. This can be due to several reasons mainly because the presentation of meningitis caused by Listeria is quite similar to meningitis caused by other bacteria and viruses and in contrast to other bacteria, Listeria monocytogenes is resistant to the first-line treatment with extended-spectrum cephalosporin[9].

Of all the staining techniques, Gram staining is often the first diagnostic test performed when investigating the source of infection. It distinguishes between gram-positive and gram-negative organisms. The use of Gram stain guides the rapid use of appropriate antibiotics. However, the use of this test in our case was a little misleading.

Listeria monocytogenes is a gram-positive rod, which is susceptible to excessive decolorization during Gram's staining. This can potentially lead to misinterpretation of Gram stain and a presumptive diagnosis of gram-negative rods or gram-positive cocci such as seen in *Streptococcus pneumoniae*. Moreover, the growth of *Listeria* on the blood culture plate can result in a small zone of beta hemolysis, further confusing its resemblance with *Group B Streptococcus*[10].

This is what happened in our case. Our patient was an immunocompromised individual, who had been diagnosed with breast cancer. Her CSF came to the lab and on the Gram stain of the CSF, gram-positive cocci were seen. The patient had been receiving empirical Ceftriaxone and she was kept on it. The patient remained unresponsive. After three days, an initial report from culture was given to the physician of Gram-positive rods, most likely *Listeria sp*, to be fully identified on the following day. The treatment was immediately switched to Ampicillin and the patient showed signs of recovery after 1 full day.

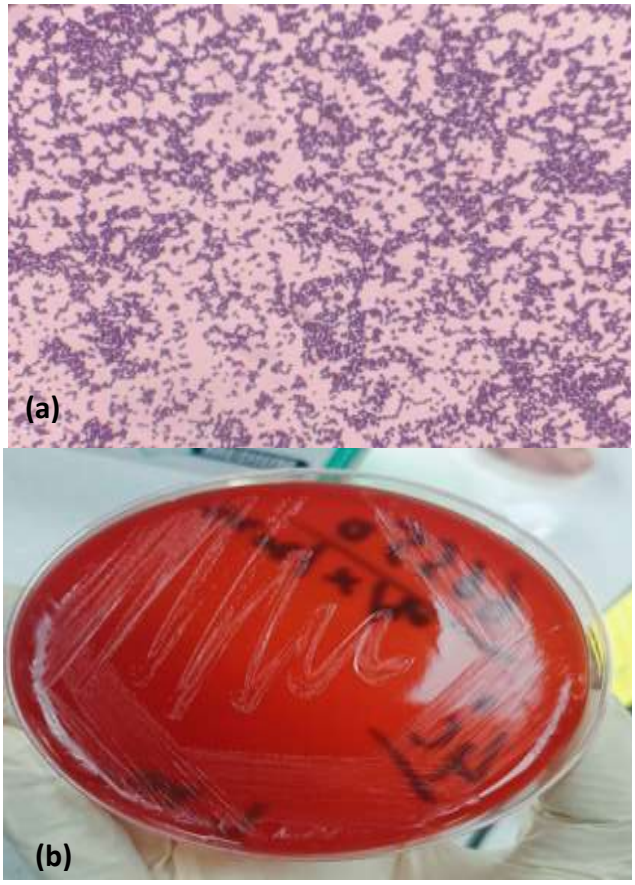

Figure 1: (a) Gram-positive rods on Gram stain, presumptively *L. monocytogenes.* (b) Colony morphology of L. monocytogenes

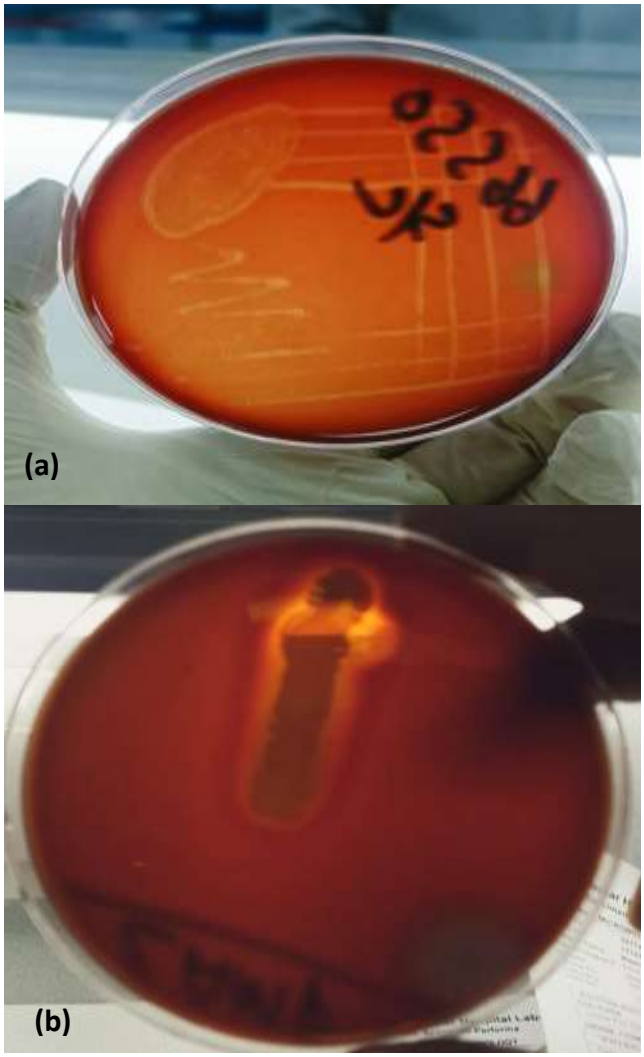

Figure 2: (a) Hemolysis demonstrated by *L. monocytogenes* on blood agar. (b) CAMP test - showing enhanced hemolysis

CONCLUSION

There have been many reports stating that *Listeria* is pleomorphic and gram variable. The laboratory findings in the case of meningoencephalitis caused by *L. monocytogenes* are unpredictable because of the variability in the size, shape, Gram stain, and also hemolysis demonstrated on the blood culture agar. So, a high clinical suspicion of Listeriosis is essential for prompt and accurate treatment if a case of meningitis is not responding to traditional empirical antibiotics, and especially if the patient is in some way immunocompromised.

REFERENCES

1. Zhang Z-Y, Zhang X-A, Chen Q, Wang J-Y, Li Y, Wei Z-Y, et al. Listeria monocytogenes bacteremia in a centenarian and pathogen traceability: A case report.World J Clin Cases 2021;9(18):4873-4880.
2. Ueno T, Ohta T, Imanaga H, Nakazawa M, Sato Y, Sugio Y, et al. Listeria monocytogenes bacteremia during isatuximab therapy in a patient with multiple Myeloma. Intern Med 2021;60(22):3605-3608.
3. Disson O, Moura A, Lecuit MJTiM. Making sense of the biodiversity and virulence of Listeria monocytogenes. Trends Microbiol 2021;29(9):811-822.
4. Engelen-Lee J-Y, Koopmans MM, Brouwer MC, Aronica E, van de Beek D. Histopathology of Listeria meningitis. J Neuropathol Exp Neurol 2018;77(10):950-7.
5. Quereda JJ, Morón-García A, Palacios-Gorba C, Dessaux C, García-del Portillo F, Pucciarelli MG, et al. Pathogenicity and virulence of Listeria monocytogenes: A trip from environmental to medical microbiology. Virulence 2021;12(1):2509-45.
6. Castellazzi ML, Marchisio P, Bosis SJIJoP. Listeria monocytogenes meningitis in immunocompetent and healthy children: a case report and a review of the literature. Ital J Pediatr 2018;44(1):152.
7. Zafar N, Nawaz Z, Anam S, Kanwar R, Ali A, Mudassar M, et al. Prevalence, molecular characterization and antibiogram study of Listeria monocytogenes isolated from raw milk and milk products. Pur Appl Biol 2020;9(3):1982-1987.
8. Barton JC, Edmunds HSJCRiH. Listeria monocytogenes infection in hairy cell leukemia: a case report and literature review. Case Report in Hematol 2018; https://doi.org/10.1155/2018/5616898
9. Brisca G, La Valle A, Campanello C, Pacetti M, Severino M, Losurdo G, et al. Listeria meningitis complicated by hydrocephalus in an immunocompetent child: case report and review of the literature. Ital J Pediatr 2020;46(1):1-8.
10. Hauser N, Luethy PM, Stamatos N. Listeria Meningitis: An inconsistent organism causing an inconsistent disease. Am J Med 2021;134(1):e64-e5.