INTRODUCTION

Listeria monocytogenes meningoencephalitis (LMM) is an infectious disease caused by the infection of the central nervous system by listeria monocytogenes (LM). It has a fast progression, high misdiagnosis rate, and a poor prognosis. The main susceptible populations are immunocompromised or defective. The diagnosis was mainly dependent on the bacteriology tests of body fluid. Nowadays, early application of sensitive antibiotics is the main treatment method. Bacteriological examination takes a long time and lacks specific clinical manifestations, which are important factors affecting early diagnosis and prognosis. This study reports the process of diagnosis and treatment of LMM, which is misdiagnosed because of its atypical clinical manifestations, so as to provide reference for the diagnosis and treatment of similar cases in the future.

CASE PRESENTATION

2.1 Illness introduction

Male patient, 77 years old, 1 day before admission, there was no obvious cause of coughing, expectoration, fever (38.5°C), and vomiting. The patient is sanity, and auscultation revealed moist rales in the lower lung fields. Pulmonary computed tomography (CT) showed that lung texture thickening, disorders, emphysema and bulla formation double lower lung floccus oozing shadow. Laboratory tests (peripheral blood...
showed the following: white blood count $27.33 \times 10^9 / L$, neutrophil proportion 90.2%, C-reactive protein (CRP) 321 mg/L, and erythrocyte sedimentation rate (ESR) 40 mm/h. Initial diagnosis is as follows: (a) acute exacerbation of chronic obstructive pulmonary disease and (b) pulmonary infectious.

2.2 | Treatment process

Antiasthmatic, expectoration, and ceftazidime (2 g/TID* ivgtt × 2 days) anti-infective therapy were given after the patient admission, but the symptoms continued to worsen and the body temperature was maintained at 39.5-40.4°C. Then, patient was in a state of shallow coma, meningeal irritation, and bilateral pathological signs were positive. Brain CT (Figure 1, A1-A2) showed lesions that significant dilatation of bilateral ventricles, hydrocephalus with interstitial cerebral edema. We performed multiple lumbar puncture on the patient. The first measurement of intracranial pressure was 280 mmH$_2$O. Laboratory tests of cerebrospinal fluid (CSF) showed the following: gross appearance: yellow and slightly turbid, protein quantitative: 147.7 mg/dL, white blood count: $390 \times 10^6 / L$, chloride: 116 mmol/L, and monocytes proportion: 20%. Then, we changed the antibiotics to meropenem (1.5 g/TID* ivgtt × 5 days) and vancomycin (0.05 g/qod*intrathecal injection × 2 times) to combine with anti-infection. Then, the above index values and body temperature were gradually decreased (Figure 2), and the spirit becomes clear. Five days later, the bacterial culture of CSF showed LM. Combine the above results, we given patient with meropenem(1.5 g/TID* ivgtt × 11 days)+vancomycin(0.15 g/BID* ivgtt × 11 days)+ vancomycin(0.05 g/qod*intrathecal injection × 4 times)+ dexamethasone(5 mg/qod* intrathecal injection × 4 times) to anti-infections. Then, the temperature and cerebrospinal fluid tests were recovered to the normal range of 10 and 11 days, respectively, and the meningeal irritation sign was obviously improved. Review brain CT (Figure 1B1-B2) showed that ventricle dilatation and cerebral interstitial edema are obviously improved.

**FIGURE 1** The CT scan of the brain of this patient. A1-2, B1-2, and C1-2 represent the brain CT imaging of the same level of the different parts, respectively, before diagnosis, during, and after treatment. The red arrows show obvious dilatation of the bilateral ventricular, esp in the posterior corner of the temporal region and the surrounding brain interstitial edema as indicated by the blue arrows.
sodium (4:1) (2.5 g/TID*ivgtt × 20 days) alone to complete the total treatment of antibacterial. After 20 days, there was no obvious abnormality in the re-examination of the brain CT (Figure 1C1-C2). We followed him for 1 month when the patient was discharged from the hospital and had no special symptoms, and all the laboratory tests of CSF were normal.

3 | DISCUSSION

Listeria monocytogenes is a kind of gram-positive budless bacillus that is widespread in nature. It mainly occurs in European and American countries, and high onset in summer. Human beings are mainly infected by eating contaminated food, and infants can also be infected through the placenta or birth canal, and the main sources of pollution are refrigerated dairy products and raw meat, etc.\(^1,2\) LM invades the body under natural conditions will lead to cellular immune response, and then clear the corresponding pathogen bacteria, but if the body’s immunity is low or defective, they will multiply in the body and invade different organs and causes disease. It mainly causes neonatal septicemia, prematurity delivery, abortion, and central nervous system infection. Among them, central nervous system infection is mainly caused by simple meningitis, about 10% of which is involved in parenchymal involvement.\(^3\) Because the patient’s early symptoms are not typical, so the misdiagnosis rate is very high. Its cerebrospinal fluid tests are characterized as follows: White blood count and protein quantitative are slightly higher than normal values, generally less than <100 × 106/L, and the mononuclear cells were dominant; glucose quantitative and chloride are opposite to the previous two. The diagnosis of LMM depends on the CSF bacterial culture, most of them take about a week, meanwhile, because of LM’s natural drug resistance to empirical cephalosporin antibiotics in China, so often diagnosed with the disease severity, mortality rate is more than 30%, some is higher for combined immunodeficiency or bacteremia.\(^4\) Combined with the 44th edition of “THE SANFORD GUIDE TO ANTIMICROBIAL THERAPY” and reported in some literatures\(^5\) recommended the first-line drugs: penicillin or ampicillin, with aminoglycosides class synergistic effect, and second-line drugs: vancomycin, carbapenems, compound sulfamethoxazole, fluoroquinolones, etc. Recommended effective antibacterial total course of treatment for 4 weeks, immunocompromised or combined bacteremia should increase medication time. The standard of cure: No clinical symptoms in 1 month after the antibiotics were discontinued, and the various testing indexes of CSF were normal. Some studies have found that the application of penicillin alone for the treatment of body temperature and CSF test indicators returned to normal average time required for 20 and 25 days, respectively.

This case is an elderly patient with weakened immune system. The clinical manifestations were mainly related to respiratory diseases. At the same time, because the meningeval irritation sign was not typical and the vomiting symptom
was not relatively specific, so it did not cause our attention, resulting in missed diagnosis. Because LM has a natural resistance to our first antibiotic, resulting in the condition was aggravated. His CSF examination showed that the percentage of monocytes increased progressively, up to 90%. Then, we learned that it had a history of eating refrigerated dairy products before it was ill. The reasons for the poor effect of the treatment are considered as follows: (a) The disease is caused by some special pathogenic bacteria or mixed bacterial infection and the antibiotic we selected ineffective to them; (b) there is no effective bactericidal concentration in CSF. Based on the above reasons, combined with past treatment experience and consult relevant literature, we know that CSF test indexes are similar to LM meningitis. Meanwhile, he had the susceptible factors of LM (eg, dietary history and low immunity). Although the pathogen was unknown at the time, our treatment scheme (direct use of antibiotics with broad antimicrobial spectrum, low resistance rate, and high efficiency) is worthy of recognition, because a single application of antibacterial drugs in this case, if the antimicrobial spectrum cannot cover the main pathogen, will directly endanger the lives of patient. The symptoms of the patient after treatment gradually relieved, indicating that the treatment scheme is effective. At the same time, the CSF culture suggests LM, because the patient is still in a critical condition and cannot exclude any other bacterial or systemic infections. Therefore, we continue to give broad antimicrobial spectrum antibiotics and added dexamethasone (intrathecal injection) to prevent intracranial adhesion. Then, the symptoms of the patient were relieved quickly, and all the test indexes gradually recovered to the normal level. After the condition was stable, the total treatment course of antibiotics was completed with penicillin alone. The patient’s body temperature and all the index of CSF test returned to normal level obviously earlier than those reported previously, and we considered this related to local intrathecal injection of drugs. This is also a more innovative place in this case treatment program and provides a reference for the treatment of similar cases in the future.

Although the patient eventually recovered completely, the fact of missed diagnosis in early stage made us fully realize that all symptoms, signs, and diet habits (eg, the diet of the people in the plateau is mainly refrigerated dairy products and meat) should be emphasized in the future clinical work. At the same time, when we encounter similar cases that the pathogen is not clear, but the CSF analysis showed the above relative “specificity” changes and has LM susceptibility factors, we should consider the possible infection of LM, the treatment plan should give up the empirical application of the single antibiotic, but choose the broad antibacterial spectrum, high potency, low resistance rate, and easy to penetrate the blood-brain barrier antibiotic, if necessary, combine the drugs and select the appropriate administration route such as intrathecal injection. Of course, because of the patient’s body was in a high metabolic state, given adequate energy to the treatment and made the CSF replacement when doing lumbar puncture to reduce the number of bacteria, all played the positive role for treatment effect and prognosis. Finally, we should note that enhancing awareness of food hygiene to those who live in plateau pastoral areas and those who like eating cold food is of great significance in preventing LM infection.

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CONFLICT OF INTEREST

None declared.

AUTHORSHIP

XBP: involved in patient management and wrote the manuscript. MHM and GFG: involved in patient management. ZWX and HBW: processed data and images; HNF: provided editing and review of the manuscript.

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