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Case report

Listeria monocytogenes brain abscess on MR imaging mimicking the track of a migrating worm like a sparganum: A case report

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ABSTRACT

Listeria monocytogenes (*L. monocytogenes*) infection is a rare cause of meningoencephalitis. Brain abscess represents only 1–10% of *Listeria* central nervous system (CNS) manifestations. The typical magnetic resonance image (MRI) of the brain finding is ring enhancement after contrast administration. No previous study reported an atypical MRI from this infection that mimics migratory worm infection such as sparganosis in tunnel sign enhancement and bead-like serpiginous tubular lesion. Thus we report a 36-year-old female patient with systemic lupus erythematosus (SLE) who developed a fever and deterioration of consciousness caused from a brain abscess. This imaging closely resembles a parasitic infection and initially leads to a diagnosis of parasitic infection. Finally, the brain abscess was removed and culture confirmed a *L. monocytogenes* infection.

1. Introduction

Listeria monocytogenes is an uncommon cause of infection in humans. It is a gram positive bacillus and usually is a contaminant in food and water. Brain abscess is extremely rare as a complication of this organism. Immunocompromised patients are at high risk for infection and the disease can be life-threatening. Meningoencephalitis is the most common central nervous system (CNS) manifestation of listeriosis. However, brain abscess represents only 1–10% of all CNS listeriosis [1]. There is no specific characteristic from the radiograph but the most common manifestation is ring enhancement. Until now, this is the first case reported as an atypical presentation of listerial brain abscess which mimicked the tunnels along the tracks of the parasitic infection similar to cerebral sparganosis on magnetic resonance imaging (MRI) of the brain.

2. Case report

The patient wrote inform consent before this article was established and the data collection was approved by institutional ethics committee for reference number 58-203-10-4. We report the case of a 36-year-old female who was diagnosed in 2002 as SLE. She was taking 30 mg/day of prednisolone. The clinical presentation was progressive headache with a high-grade fever for 4 days before she came to the hospital. The examination showed her body temperature was 39.1 °C. The blood pressure, respiratory rate, and heart rate were 140/88 mm Hg, 26/min and 110 beats/min, respectively. She looked drowsy but conscious and could follow verbal commands. The neurological examination revealed hemiparesis of right side. There was no neck stiffness in this patient. Routine laboratory findings that included urinalysis and chest radiography were all within normal limits. A complete blood count (CBC) with differential count was obtained. It showed a hemoglobin level of 12 g/dL, a white blood cell count of 11,310 cells/mm^3 (PMN 88%, lymphocytes 7%, monocytes 5%), and a normal platelet count. A sample for blood culture was taken immediately. Computer tomography (CT) of the brain with contrast was performed and it revealed poorly defined rim enhancement in the left frontal lobe of 2.5 × 3.7 cm in size. Marked vasogenic edema was observed around the lesion causing minimal midline shift. MR brain imaging was done and it showed the lesion was confined to the left frontal lobe and extended to the left basal ganglia through the dorsal mid brain. MR T1-weighted imaging with contrast detected an enhanced pattern of bead-like serpiginous tubular lesion or tunnel sign. Another feature was multiloculated rim enhancement and restriction on diffusion weighted imaging (DWI) at the left frontal lobe and basal ganglia (Figs. 1, 2). MRI was reviewed by a neuroradiologist who suggested parasitic infection rather than the pyogenic brain abscess. A parasitic infection plays a role in the differential diagnosis as it is compatible with the endemic area of infection and the risk of the host. The most common form of a brain abscess is a bacterial infection which cannot be excluded. The suspected parasite was sparganum and the treatment of choice was surgical removal. An *anti*-parasitic drug is not effective for this parasite.

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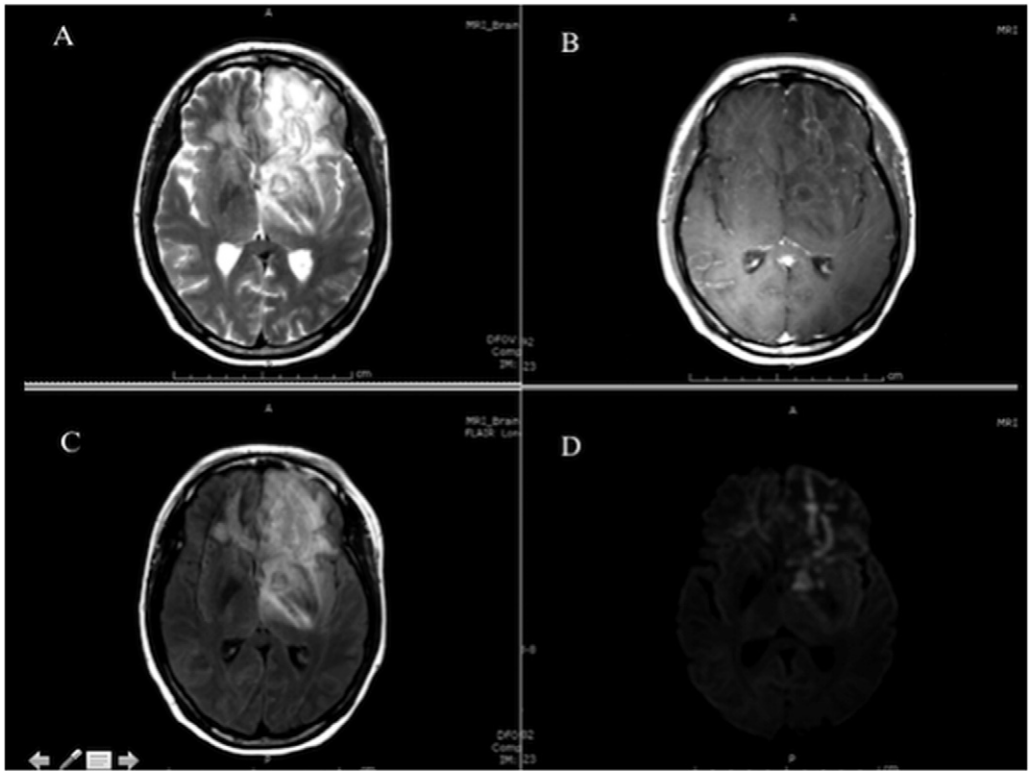

Fig. 1. Axial view of T2-weighted MRI (A), T1-weighted with contrast (B), FLAIR (C), diffusion weighted imaging (DWI) (D).

The treatment plan for this case was to obtain the organism by removing it by surgery and exclude bacterial brain abscess by tissue microbiology. Craniotomy at the left frontal lobe was performed and the brain abscess was removed. Intraoperatively, we found only 5 mL of frank pus and could not find any parasite or other organism like a parasite under a microscopic. Pus culture was taken and a Gram's strain

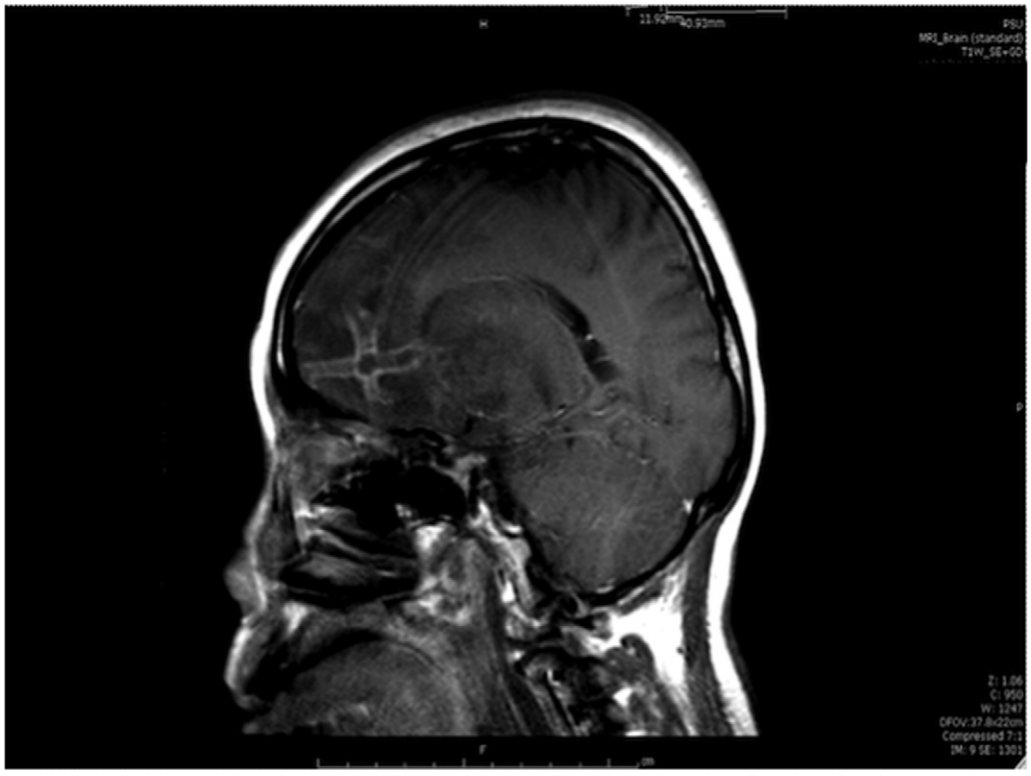

Fig. 2. The MR imaging of the brain demonstrates the sagittal view T1-weighted with contrast and revealed abnormality of both frontal lobes. Left side is more severe than right side of the brain. It shows conglomerate ring-enhanced lesions with bead-like serpiginous tubular enhanced lesion.

showed numerous PMN cells with no organism. *L. monocytogenes* was grown from the culture after the third day. The patient was treated intravenously with gentamicin and ampicillin for 6 weeks. Her clinical condition improved and her pupil size and ptosis were completely resolved. MRI of the brain was performed after treatment with antibiotics at week 6 and it revealed resolution of the abscess and swelling of the brain. MRI of the brain after 3 months of treatment showed complete disappearance of the lesion. The patient was doing well after discharge from the hospital and came for follow-up at the outpatient department.

3. Discussion

Listerial brain abscesses are extremely rare and were reported in only 56 cases in the world from 1968 to 2011 [2]. The most common form of listerial CNS infection is meningitis. Brain abscess occurred in only 1–10% of all listerial CNS infections and the common locations were the thalamus, pons, and medulla. Hematogenous spreading is the main route of infection. *L. monocytogenes* is found in soil and water. Humans are infected by this organism from ingestion of contaminated food especially seafood and vegetables. The predisposing factor which can cause serious infection in humans is the immunocompromised host. It can penetrate the small bowel and accumulate in mesenteric lymph nodes and blood stream. If it passes through the blood brain barrier via cerebral capillary endothelium, it will cause a brain parenchyma abscess. Headache and neurological deficit are the presentations if the size of the abscess is larger and is surrounded by edema. MRI does not have a specific pattern for the abscess, but usually presents with ring enhancement.

To date, there is no literature review on the imaging of bacterial infection that mimics a parasitic infection, especially the migrating feature on brain imaging. Cerebral sparganosis is one of the parasitic brain infections which demonstrates the migrating feature on MR brain imaging. Sparganosis is rare for a parasitic infection in the brain and has been reported mostly in Southeast Asia. Humans are considered an accidental intermediate host of the second-stage larva of *Spirometra mansoni*. It can cause an infection in patients who eat uncooked frog or snake or drink contaminated water. A sparganum larva is characteristically a ribbon-shape worm of varying length. Movement of this worm causes brain tissue injury leading to the formation of an inflammatory granulomatous lesion that can explain the characteristic radiological appearance such as the tunnel sign. However, Song T et al. [3] tried to report the specific characteristics of the imaging of this parasite was the tunnel sign in post-contrast MR imaging that represented the moving track of the migrating worm and corresponded to inflammatory granulomatosis. The second most common feature was a conglomerated ring-like enhancement which was seen as bead-shaped. Other features seen on imaging are intraparenchyma bleeding or ring enhancement [4]. This parasite can demonstrate contralateral hemispheric migration on follow-up imaging after a long time. The tool for the diagnosis of cerebral sparganosis is the specific character of MRI (tunnel sign and bead-like lesion) and coexistent active migration and degenerative lesions on the same image. However, a definite diagnosis is made when the larval worm is surgically removed. From the specific uniqueness of the MRI character of this parasite, we felt the need to report this case when we were quite amazed that the final diagnosis was *L. monocytogenes* in this patient who represented with imaging that appeared to be a parasitic infection.

4. Conclusion

To our knowledge, listerial brain abscess is an uncommon disease in humans. It can mimic the radiographic appearance of a parasitic infection like a sparganum infection. We cannot imply a diagnosis from the imaging as bacterial or parasitic infection. Finally, we need to perform surgical management to obtain pus for a culture for a definite diagnosis and optimal antibiotic treatment.

Conflict of interest

Authors state no conflicts of interest. All authors have read the journal's publication ethics and publication malpractice statement available at the journal's website and hereby confirm that they comply with all its parts applicable to the present scientific work.

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