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Case Report

Neurobrucellosis complicated by primary pyogenic ventriculitis: a case report

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Abstract

Neurobrucellosis is a serious focal brucella infection. Ventriculitis is a special form of central nervous infection where pyogenic infection of the ependymal linings hinders antibiotics' accessibility to the cerebrospinal fluids and leads to protracted infection. We present a case of a 37-year-old Shepherd who had low-grade fever for 5 months followed by a brief history of vomiting, abdominal pain, and gait imbalance. Investigations showed neutrophilic leukocytosis, high titers of serum anti-brucella antibodies, and lymphocytic pleocytosis. Mycobacterial tuberculosis workup was negative. Magnetic resonance imaging of the brain revealed cervical and spinal meningeal enhancement in addition to mild hydrocephalus. The patient was presumptively diagnosed with neurobrucellosis. He received treatment with ceftriaxone-based combination antibiotics therapy for 6 months with complete resolution of his symptoms. Central nervous infection by brucella is a challenging diagnosis. The possibility of primary ventriculitis due to *Brucella* infection mandates early recognition and prolonged antimicrobial therapy to achieve full recovery.

Keywords: brucellosis, neurobrucellosis, ventriculitis, zoonosis

INTRODUCTION

Brucellosis is the most spread zoonosis worldwide that is acquired through ingestion, inhalation, or direct contact with infected animal tissues or fluids [1]. Neurological involvement is a serious complication of brucellosis occurring in 4–7% of the cases affecting the brain, brainstem, cerebellum, spinal cord, cranial, and/or peripheral nerves [2]. Ventriculitis is a pyogenic inflammation of the ventricular fluids and linings that is commonly described following ventricular shunt insertion or trauma. Primary pyogenic ventriculitis is rare in adults although it was reported in immunocompromised children [3]. In ventriculitis, cerebrospinal fluid (CSF) flow obstruction leads to symptoms of increased intracranial pressure and impairs systemic antibiotics accessibility to the ventricular CSF [4]. The diagnosis of ventriculitis should be suspected in patients with meningitis who fail to respond to initial antimicrobial therapy and it is confirmed by neuroimaging and CSF analysis [3, 4]. Herein, we describe a rare case of primary pyogenic ventriculitis secondary to neurobrucellosis in a 37-year-old Bangladeshi shepherd who presented with fever, headache, and impaired gait.

CASE REPORT

A 37-year-old Shepherd presented to the emergency department (ED) with a 10-day history of abdominal pain, vomiting, dizziness, and gait imbalance. He also reported a history of daily low-grade fever over the past 5 months which was associated with fatigue, arthralgia and 10-kg weight loss.

Physical examination was only remarkable for a low-grade fever of 37.8°C orally with a wide-based unsteady gait and scanned speech. Laboratory investigations showed leukocytosis with a shift to the left (WBC count of $20.8*10^3$/ul with 92% neutrophils), normal renal and liver function tests, and a C-reactive protein of <5 mg/l. Brucella antibody test was positive for IgG but not IgM antibodies with a titer of 1:320 for *Brucella abortus* and 1:160 for *Brucella melitensis*. The CSF analysis showed predominantly lymphocytic leukocytosis (RBC count 6, WBC count 250, 80% lymphocytes) with high protein (63 mg/dl) and low glucose (1.8 mmol/l compared to 6.5 mmol/l serum level). The CSF gram stain and culture, acid-fast bacilli stain, mycobacterial tuberculosis (TB) PCR, TB Culture, and cryptococcal antigen tests were negative. Also, the patient had a negative QuantiFERON TB gold plus test as well as negative serological markers for HIV, hepatitis B, hepatitis C, and syphilis.

Magnetic resonance imaging of the brain and spine revealed post-gadolinium meningeal enhancement around the brainstem, bilateral V, VII, and VIII cranial nerves, cervical and lumbar spinal meninges as well as enhancement of the ependymal linings (Fig. 1). Also, there was evidence of ventricular enlargement of the third and fourth ventricles consistent with mild hydrocephalus.

The patient was started on triple antibiotics therapy for a presumptive diagnosis of neurobrucellosis including intravenous Ceftriaxone two grams twice daily for 4 weeks plus oral rifampicin

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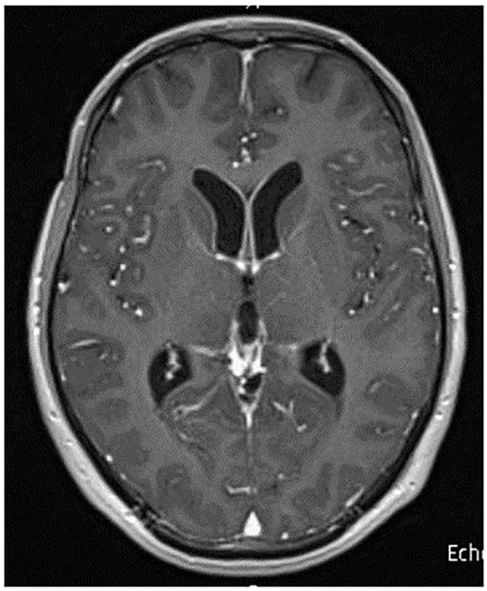

Figure 1. Axial T1 post gadolinium injection image showing ependymal enhancement consistent with ventriculitis. There is also meningeal enhancement and mild enlargement of the anterior and temporal horns of the lateral ventricles.

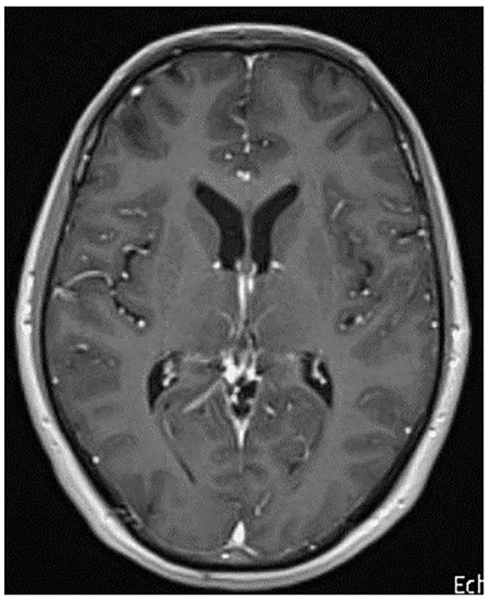

Figure 2. Follow up axial T1 post gadolinium injection image done 3 weeks post treatment showing significant improvement of the ventriculitis, hydrocephalus and meningeal enhancement.

600 mg once daily and doxycycline 100 mg twice daily for 6 months. He developed confusion 1 day after starting antimicrobial therapy, so he was commenced on pulse steroid therapy (500 mg methylprednisolone intravenously for 3 days) followed by a tapering dose of oral prednisolone for 1 month. Two days later, his confusion improved. A repeated brucella antibody test showed a decline in the titer to 1:160 for *Brucella abortus* and *Brucella melitensis*.

The patient's gait continued to improve, and he was able to walk without assistance. He remained free from headache, vomiting, or fever for 3 weeks. A repeated MRI of the brain at week three post-treatment showed regression of the meningeal enhancement and ventricular dilatation with minimal residual changes (Fig. 2). The patient completed 4 weeks of parenteral ceftriaxone as inpatient, then he was discharged on rifampicin and doxycycline for a minimum duration of 6 months.

DISCUSSION

Definitive diagnosis of neurobrucellosis requires the isolation of the organism, its DNA, or specific antibody from the CSF. However, these diagnostic tests are often technically demanding and not widely available [5]. Given the low sensitivity (37%) and specificity (20–28%) of Brucella cultures in general, and CSF cultures in particular (10% isolation rate), other diagnostic tests are needed to aid in establishing the diagnosis of neurobrucellosis [6]. Different types of serological methods could be utilized in these cases; however, they should be interpreted with caution as persistent low titers of anti-brucella antibodies are not uncommon in endemic areas [7].

Brucella is a distinct form of bacteria with characteristic proinflammatory nature [8]. Due to the intracellular nature of brucellosis and high relapse rate with monotherapy, successful treatment of neurobrucellosis necessitates the use of a combination of antibiotics with adequate intracellular concentration for at least 3–6 months until complete resolution of clinical symptoms and CSF findings [6]. Ceftriaxone has excellent CNS penetration and its use in combination with doxycycline and rifampicin has been shown to be superior to non-ceftriaxone-based combination antibiotics [9]. The role of corticosteroids in neurobrucellosis is also controversial as no controlled trial investigated their role [10]. In our case, we added steroid therapy after the patient developed acute confusion post-antimicrobial therapy initiation with rapid improvement in his symptoms.

The CSF changes described in our case are consistent with the results from other case series and reports [6]. Nevertheless, it should be noted that the predominantly CSF lymphocytic leukocytosis, high protein, and low glucose are not pathognomonic for neurobrucellosis and do not differentiate this entity from other important endemic neurological infections such as neurotuberculosis. The patient in our case comes originally from an endemic area for TB. However, investigations for TB including two separate sets of acid-fast bacilli smears, PCR, and cultures of the sputum and CSF were negative as well as he had normal chest X-ray and negative QuantiFERON TB gold plus test.

To the best of our knowledge, this is the first case that described primary ventriculitis that is probably related to *Brucella* infection. Neurobrucellosis is a protean disease that can cause serious complications if left untreated. Timely diagnosis and management of neurobrucellosis are crucial for full recovery. The diagnosis relies on suggestive signs and symptoms in patients with exposure risk, positive microbiological and/or serological tests, CSF analysis, neuroimaging, and clinical response to the appropriate antibiotic therapy.

CONFLICT OF INTEREST STATEMENT

None declared.

FUNDING

None.

ETHICAL APPROVAL

This case report was approved by the Institutional Review Board at Hamad Medical Corporation, Doha, Qatar (reference number: MRC-04-23-414).

CONSENT

Informed consent was taken from the patient for the publication of this case report and accompanying images without the patient identifying information.

GUARANTOR

Dr. Mohammed Alhatou
Dr Anwar I. Joudeh

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REFERENCES

1. Khoshnood S, Pakzad R, Koupaei M, Shirani M, Araghi A, Irani GM. *et al*. Prevalence, diagnosis, and manifestations of brucellosis: a systematic review and meta-analysis. *Front Vet Sci*. 2022;**9**:9.
2. Shakir R. Brucellosis. *J Neurol Sci*. 2021;**420**:117280.
3. Fahmy M, Pillai S. Adult primary ventriculitis as a complication of acute otitis media: a comprehensive review of reported cases. *Otolaryngol Case Rep*. 2021;**21**:100365.
4. Harris L, Munakomi S. Ventriculitis. In: *StatPearls*. Treasure Island, FL: StatPearls Publishing, 2023.
5. Guven T, Ugurlu K, Ergonul O, Celikbas AK, Gok SE, Comoglu S. *et al*. Neurobrucellosis: clinical and diagnostic features. *Clin Infect Dis*. 2013;**56**:1407–12.
6. Soares CN, Angelim AI, Brandão CO, Santos RQ, Mehta R, Silva MT. Neurobrucellosis: the great mimicker. *Rev Soc Bras Med Trop*. 2022;**55**:e05672021.
7. Khan MZ, Zahoor M. An overview of brucellosis in cattle and humans, and its serological and molecular diagnosis in control strategies. *Trop Med Infect Dis*. 2018;**3**:65.
8. Rodríguez AM, Delpino MV, Miraglia MC, Giambartolomei GH. Immune mediators of pathology in neurobrucellosis: from blood to central nervous system. *Neuroscience*. 2019;**410**:264–73.
9. Tajerian A, Sofian M, Zarinfar N, Ramezani A. Manifestations, complications, and treatment of neurobrucellosis: a systematic review and meta-analysis. *Int J Neurosci*. 2022;**1-1**:1–11.
10. Bosilkovski M, Keramat F, Arapović J. The current therapeutical strategies in human brucellosis. *Infection*. 2021;**49**:823–32.