

## Case Report

# Cervical spinal tuberculosis combined with brucellosis

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### Abstract

**Introduction:** In some developing countries, tuberculosis and brucellosis, which are common causes of spinal infections, are still common infectious diseases. However, co-occurrence of spinal tuberculosis and brucellosis is rare.

**Methodology:** We report a case a 47-year-old male engaged in aquaculture with a medical history of numbness, weakness, fever, and night sweats in both upper limbs for about 10 days. Serum agglutination test (SAT) for *Brucella* revealed brucella infection. Cervical computed tomography (CT) scan and magnetic resonance imaging (MRI) suggested C6, C7 vertebral destruction and corresponding segmental nerve compression. Based on preoperative clinical symptoms and auxiliary examination, brucellar spondylitis was first suspected. According to the postoperative pathological examination, the patient was finally diagnosed as cervical spinal tuberculosis combined with brucellosis.

**Results:** The preoperative symptoms of the patient decreased significantly after surgery, and the patient recovered and leaved hospital within two weeks of starting treatment. At the 6-month follow-up, the patient's clinical symptoms completely disappeared, and all laboratory tests returned to normal.

**Conclusion:** Cervical spinal tuberculosis combined with brucellosis is a relatively rare condition. In areas with high rates of tuberculosis and brucellosis, we should conduct comprehensive examinations to avoid misdiagnosis and missed diagnosis.

**Key words:** Cervical tuberculosis; brucellosis, spine.

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### Introduction

Cervical tuberculosis is a rare type of spinal tuberculosis. In addition to systemic symptoms such as fever and night sweats, patients also have local symptoms such as neck pain and stiffness. Some cases also have severe clinical symptoms, such as paralysis caused by spinal cord compression [1]. An early diagnosis with prompt surgical and antibacterial therapies are critical for preventing such severe outcome. Brucellosis is an infectious disease caused by brucella. The main source of infection is sheep, cattle and pigs, which are spread through damaged skin mucosa, respiratory tract or digestive tract [2]. It can involve any organ or tissue, including the eyes, liver, lungs, nervous system, cardiovascular system, bone, and joints [3]. Clinical presentation of brucellosis is non-specific with symptoms such as fever, fatigue, hyperhidrosis, arthritis and orchitis, which makes the clinical diagnosis challenging. The most frequent complication of brucellosis is the infection of bones and joints [4].

We report a case of cervical tuberculosis combined with brucellosis. The special feature of this case is not

only that cervical tuberculosis is rare, but also combined with brucellosis.

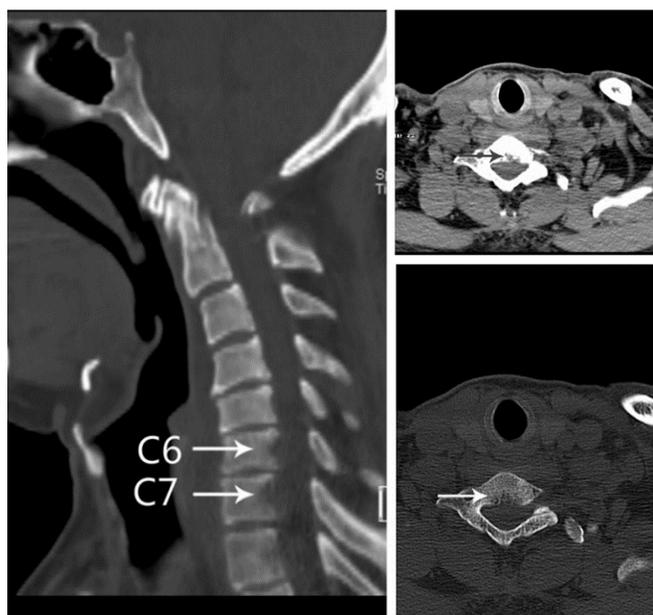
### Case report

A 47-year-old male with a 10-day history of bilateral upper limb numbness, weakness, fever and night sweats was admitted to the Orthopaedic Department of the Second Affiliated Hospital of Lanzhou university, China. Before admission, this patient had consulted the Shan Dan county hospital in Gansu Province for fever and numbness for 4 months, where he was treated with a second-generation cephalosporin (cefuroxime) and an organic compound (methylamine). This patient has always been living in Shan Dan county, Gansu Province, working in cattle and sheep breeding industry all year round and his diet consists mainly of wheat products (noodles). The patient had lost 5 kilograms in the past 4 months. He has a history of type 2 diabetes diagnosed 3 months prior to the occurrence of symptoms, and is currently on insulin-therapy. In addition, the patient was in good health and had no other medical or surgical history. No personal or family history of tuberculosis or HIV. The

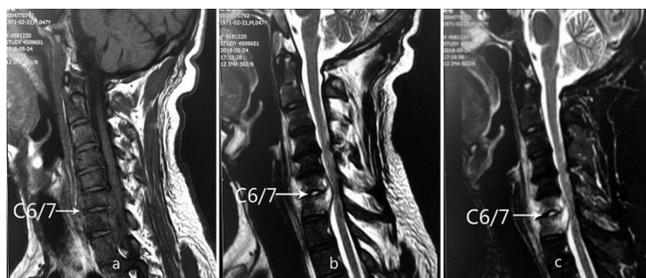
patient was found to be allergic to streptomycin during the treatment of bacillary dysentery when he was 10 years old. During the physical examination, his temperature was 37.9°C; pulse, 85 beats/min; respiration, 21/min; and blood pressure, 120/78 mmHg. The orthopedic physical evaluation revealed grade 3/5 myodynamia of his right upper limb, grade 4/5 myodynamia of his left upper limb, and hypermyotonia of both upper limbs. The rest of the examination revealed a passive mobilization of the neck, a decreased range of motion and positive percussion and palpation at the spinous processes of C6 and C7. There was no splenomegaly, hepatomegaly or lymphadenopathy detected.

Blood testing revealed a white blood cell count (WBC) of  $5.17 \times 10^9$  cells/L (reference range:  $4 \times 10^9$  to  $10 \times 10^9$  cells/L), neutrophil counts (NE) of  $2.66 \times 10^9$  cells/L (reference range:  $2 \times 10^9$  to  $7 \times 10^9$  cells/L), lymphocyte count (LY) of  $1.99 \times 10^9$  cells/L (reference range:  $0.8 \times 10^9$  to  $4 \times 10^9$  cells/L), erythrocyte sedimentation rate (ESR) of 60 mm/hour (reference range:  $< 15$  mm/hour), C-reactive protein (CRP) level of 39.39 mg/L (reference range:  $< 8.2$  mg/L), and procalcitonin (PCT) level of 0.056 ng/L (reference range:  $< 0.05$  ng/mL). Serum agglutination test (SAT) for *Brucella* was positive at 1/200 and Rose-Bengal PlateTest was positive.

**Figure 1.** CT of the cervical spine: Bone destruction can be seen in the diseased vertebra. Bone destruction foci are small and frequent, mostly confined to the vertebral body edge. Obvious proliferation and sclerosis are observed around the lesion, and new destruction foci are formed in the new bone tissue, forming the "lacy vertebra" feature.



**Figure 2.** MRI of the cervical spine. T1-weighted images, a: reveals decreased signal intensity of C6 and C7 vertebrae and the intervening disk, as well as end-plate erosions and narrowing disc space. T2-weighted images, b: shows increased signal intensity of the C6+C7 disk and the adjacent vertebrae. Fat-saturated sagittal image, c: shows signal increase at the same level.



A radiograph of the cervical spine shows: retro arcuation of the cervical spine and vertebral bone degeneration. Cervical CT found C6 and C7 vertebral body margin bone destruction (Figure 1). Cervical MRI was immediately conducted, abnormal C6 and 7 vertebral signals and peripheral abnormal signal shadows were found, and spinal compression was significantly observed at these levels (Figure 2).

Therefore, the diagnosis of brucellar spondylitis was considered. The patient was treated with rifampin (600 mg/day orally) and doxycycline (200 mg/day orally). Cervical anterior discectomy fusion (ACDF) was performed on six days after admission. The abscess and lesion (composed of sequestrum fragments, inflammatory granulation tissue, and smaller separate abscesses) were removed after collecting samples for pathology. Histopathological analysis of cervical vertebra detected granulation and fibrous tissue, fibrous cartilage, striated muscle tissue and a small amount of dead bone fragments. Polymerase chain reaction (PCR) test of paraffin-embedded tissue was positive to *Mycobacterium tuberculosis* (Figure 3).

The final diagnosis was a cervical tuberculosis combined with brucellosis, with a treatment consisting of doxycycline (200 mg per day) for *Brucella*, and rifampicin (600 mg per day), isoniazid (300 mg/day orally), ethambutol (750 mg/day orally) and pyrazinamide (1000 mg/day orally) for *Mycobacterium tuberculosis*.

The patient's condition improved 2 weeks after treatment initiation and was discharged after this period. Inflammatory markers were significantly lower at discharge than at admission, with an ESR of 40 mm/hour, CRP level of 10.5 mg/L. Doxycycline treatment was discontinued after 6 weeks. Anti-tuberculosis treatment for 12 months. At six-month of follow-up, the patient's fever and neurological

symptoms completely disappeared, and both CRP and ESR were measured at normal levels, while the Rose-Bengal plate test was negative in his serum three times together with a titer of antibodies to *Brucella* of 1/24.

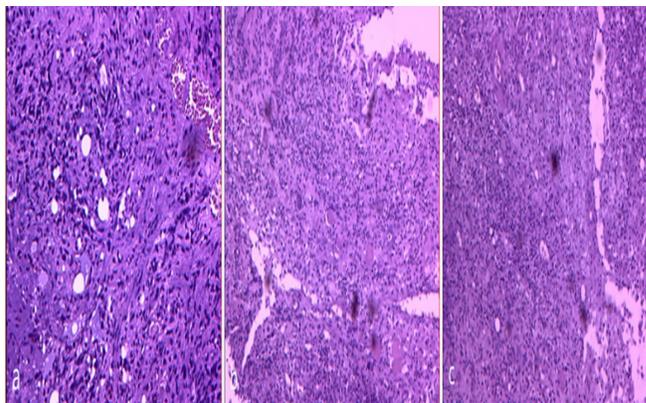
## Discussion

Spinal tuberculosis and brucellar spondylitis are two types of spinal infections [5]. Because the two diseases present with similar clinical manifestations and imaging findings, it is challenging to distinguish between these two diseases [6]. A clinical study have shown that brucellosis serologic tests have significant false-positives in patients with active tuberculosis [7]. In this study, none of the tuberculosis patients had an antibody titer equal to or greater than 1:160, so the authors believed that antibody titers greater than 1:160 were often considered positive. As an illustration, our patient was initially diagnosed with a brucellar spondylitis, based on preoperative information. However, we did not notice that the patient's clinical manifestations were consistent with the symptoms of spinal tuberculosis. Therefore, identifying these two diseases is necessary in clinical work.

Spinal tuberculosis and brucellar spondylitis can involve in any part of the spine. The former is mainly localized to the thoracolumbar spine, while the latter mostly involves the lumbar spine [8-10]. Cervical tuberculosis is a less common type of spinal tuberculosis [11]. When the two diseases occur in the same segment of the spine, their clinical manifestations are often similar, although a few differences can guide clinicians: spinal tuberculosis is more destructive, with local symptoms such as low back pain and nerve compression. Systemic symptoms such as fever and fatigue are mainly manifested in brucellar spondylitis [12]. Therefore, in endemic areas for these two diseases, it is not feasible to identify these two diseases only through medical history and clinical manifestations. Most routine laboratory findings are nonspecific, and tests such as Tuberculin test or *Brucella* agglutination test can only be used to assist diagnosis. Our patient suffered from a dual infection with *Mycobacterium tuberculosis* and *Brucella*, but only *Mycobacterium tuberculosis* was detected in the spine. Bacterial culture is the gold standard for distinguishing the two diseases, but the detection rate is often low for chronic patients (10%-20%) [13].

Nowadays, MRI is considered the first choice for evaluating spinal infections[14], showing key difference between spinal tuberculosis and brucellar spondylitis: first, vertebral height [15]. The vertebrae of most advanced spinal tuberculosis showed a severe

**Figure 3.** Pathological diagnosis :(cervical vertebra) sent for examination of granulation tissue, fibrous tissue, fibrous cartilage, striated muscle tissue and a small amount of dead bone fragments. PCR test of paraffin-embedded tissue tuberculosis showed positive results, indicating the presence of tuberculosis infection.



collapse on the MRI. The main reason is that the bone destruction of spinal tuberculosis is caseous granuloma and dead bone without new bone synthesis [16]. On the contrary, bone destruction of brucellar spondylitis is often accompanied by the formation of a new bone, and vertebral height loss is rare [17]. Second, SI uniformity on FS T2WI [18]. In brucellar spondylitis, the majority of vertebra was infected, so it shows a uniformly high SI on FS-T2WI. Contrarily, SI is often increased unevenly in spinal tuberculosis. Last, disc space. Several studies have shown that almost all the disc space at the lesion site was lost in spinal tuberculosis [15,19]. This rate is much higher than brucellar spondylitis. According to the above criteria, this case should be first considered spinal tuberculosis. The absence of vertebrae collapse may be due to the early stage of the lesion. For both spinal tuberculosis or brucellar spondylitis, a conservative treatment should be the one recommended. Postoperative drug treatment is the key to treat and these illnesses and prevent any relapse. At present, anti-tuberculosis drugs commonly use streptomycin (SM, S), isoniazid (INH, H), rifampicin (RFP, R), ethambutol (EMB, E) and pyrazinamide (PZA, Z). The duration of anti-tuberculosis treatment should be  $\geq 12$  months [20]. World Health Organization (WHO) recommends the combination of rifampicin (600 ~ 900 mg/d, oral 6 weeks) and doxycycline (200 mg/d, oral 6 weeks), or doxycycline (200 mg/d, oral 6 weeks), tetracycline (2 g/d, oral 6 weeks) and streptomycin (1 g/d, 2 ~ 3 weeks) for the treatment of brucellosis [21]. The degree of disease, spinal deformity and stability, the degree of nerve damage and the effect of conservative treatment decide whether surgical treatment is necessary for these two types of patients [22,23].

## Conclusions

In conclusion, cervical tuberculosis combined with brucellosis is rare in clinical practice. In the course of diagnosis and treatment, differentiating spinal tuberculosis and brucellar spondylitis is particularly important with different antibacterial strategies. This report highlights the importance of investigating *Brucella* in case of spinal tuberculosis and *Mycobacterium tuberculosis* in case of brucellar spondylitis.

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