Brucellosis Spinal Epidural Abscess: A Case Series of Fourteen Patients

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Abstract

Objective: In the present study, we aimed to describe the clinical features, diagnosis, treatment and prognosis of Brucellosis spinal epidural abscess (BSEA).

Methods: The complete clinical data of 14 BSEA patients who were treated in our hospital system from January 2014 to February 2019 were retrospectively analyzed. Moreover, the clinical features, diagnosis, treatment and prognosis of 60 BSEA cases collected from the English literature from 1994 to 2019 were also investigated.

Results: 3 cases were positive for blood culture, 6 cases were positive for Brucella latex agglutination test, and 9 cases were positive for tissue culture. All 14 cases showed focal spinal pain, 11 cases showed neurological deficits, and 7 cases showed fever. Of the 14 cases, 12 involved the lumbosacral spine and 2 involved the cervical spine. 13 cases were cured, 1 case left limb numbness, and the follow-up time was 12-20 months.

Conclusion: The classic diagnosis of triad (focal spinal pain, neurological deficit and fever) is less specific for the diagnosis of BSEA. MRI examination can find epidural abscess, brucella latex agglutination test, blood culture, tissue culture and biopsy can be used for etiological diagnosis. Brucellosis is an uncommon cause of epidural abscess. For BSEA, early detection, early diagnosis, and early treatment should be performed, and the most suitable treatment method should be selected through comprehensive evaluation.

Introduction

Brucellosis caused by the genus *Brucella* has been recognized as one of the most common zoonotic diseases in the world, affecting multiple organ systems [1]. In China, human brucellosis is still a serious public health problem. From 2007 to 2017, the number of reported cases increased by 7.8% every year [2]. Bone and joint infections are one of the common complications of human brucellosis [3], of which the spine is most commonly involved [4]. *Brucella* spinal epidural abscess is a rare and serious complication [5]. At present, there are few reports on *Brucella* spinal epidural abscess in the literature. This study mainly analyzes and discusses the clinical features, diagnosis, treatment, and prognosis of spinal epidural abscess caused by *Brucella*.

Methods

Clinical manifestation

This study is a retrospective case analysis. It has been approved by the Ethics Committee of Qingdao University and the patient's informed consent has been obtained. There were 7 males and 7 females, aged 45–73 years old, with an average age of 56 years. 3 cases were positive for blood culture, 6 cases were positive for *Brucella* latex agglutination test, and 9 cases were positive for tissue culture. 12 cases

involved lumbosacral spine and 2 cases of cervical spine. All 14 cases showed different degrees of focal spinal pain, 11 cases had neurological dysfunction, and 7 cases had fever. The course of illness ranges from 7 to 240 days, with an average course of 98 days. Eight cases had a history of contact with cattle and sheep, or consumed unpasteurized dairy products. See Table 1, 2, 3, 4 and Fig. 1, 2, 3.

Inclusion criteria

(1) Physical examination and laboratory examination suggest spinal infection; (2) MRI reveals epidural abscess; (3) Brucella latex agglutination test is positive, blood culture is positive, tissue culture is positive (conforms to one of them) Positive is enough;

Exclusion criteria

(1) Purulent, tuberculous, fungal and other types of spinal infections; (2) Incomplete clinical data.

The course of treatment

All patients underwent neutrophil count (WBC, white blood cell), C-reactive protein (CRP, C-reactive protein), erythrocyte sedimentation rate (ESR, erythrocyte sedimentation rate), X-ray, CT, MRI, and Roussiella latex agglutination test, blood culture examination. Among the 14 patients, 1 case had elevated WBC (1/14), 12 cases had elevated CRP (12/14), and 11 cases had elevated ESR (11/14). There were 3 cases (3/14) with positive blood culture, 6 cases (6/14) with positive Brucella latex agglutination test, and 9 cases (9/11) with positive tissue culture during operation. See Table 1, 2, and 3.

Treatment plan

14 patients were given bed rest, nutritional support, rifampicin + levofloxacin or rifampin + doxycycline + levofloxacin or rifampin + minocycline + levofloxacin, or rifampin + doxycycline Anti-Brucella treatments such as vitamins, conservative treatments are ineffective, or those with progressive aggravation of neurological symptoms undergo surgery combined with anti-brucella treatment. The time of antibacterial treatment is determined according to the regular detection of WBC, CRP, ESR levels and spine MRI results. The antibacterial treatment time is 12-20 weeks, with an average of 15 weeks. See Table 1, 2, and 3.

Results

3 cases were cured by conservative treatment. 11 cases underwent surgical treatment, 10 cases improved, and 1 case left limb numbness. The follow-up time was 15–24 months, with an average follow-up time of 16 months. See Table 3.

BSEA in the literature

Among the 60 cases in the literature (see Table 4), 52% were men, aged 35-75 years, with an average age of 56 years. The most common symptom is local spinal pain (100%), followed by fever (57%) and neurological impairment (52%). The most common violation is the lumbosacral spine (55%), followed by

the cervical spine (35%) and the thoracic spine (17%). The positive rate of *Brucella* latex agglutination test was 87%, and the rate of exposure to cattle and sheep or consumption of unsterilized dairy products was 68%. 18% of cases underwent surgery. Symptoms improved 88%.

Discussion

Human brucellosis is one of the most common zoonotic infectious diseases [6, 7]. It is more common among animal breeders, those who consume unpasteurized dairy products, farmers, veterinarians, and laboratory workers [8, 9]. In China, human brucellosis is still a serious public health problem. From 2007 to 2017, the number of reported cases increased by 7.8% every year, and the natural foci were also more widespread [2, 7, 10]. Spinal epidural abscesses caused by brucellosis are rare [9, 11–18]. Among the 14 cases in this group, 8 cases had a history of contact with cattle and sheep and a history of eating unpasteurized dairy products. Among the 60 cases in the literature, 28 cases had a history of contact with cattle and sheep, and a history of eating non-pasteurized dairy products.

In this group of cases and literature, the most common clinical manifestations of SEA are focal spinal pain, neurological dysfunction, and fever, that is, the typical SEA diagnosis of triad [19]. Some patients have arthritis, low-grade fever, night sweats, fatigue, loss of appetite, hepatosplenomegaly, etc. [18, 20]. The clinical symptoms of SEA are often not typical enough, with poor specificity [14], and clinical diagnosis is often delayed [21]. SEA often invades the lumbar spine, followed by the cervical and thoracic spine [5]. The most common in this group and literature review is the lumbar spine, followed by the cervical and thoracic spine.

SEA requires early diagnosis and appropriate treatment to improve the prognosis [22]. CRP and ESR can be increased in the early stage of infection, and have a high specificity for the diagnosis of infection [23]. The etiological diagnosis of *Brucella* usually requires *Brucella* latex agglutination test, blood culture, tissue culture, etc. [24]. *Brucella* species can be cultured in blood or tissue samples to authoritatively diagnose brucellosis, but the positive rate is low. Most reports in the literature are diagnosed by *brucella* serology [12, 25, 26]. Magnetic resonance imaging (MRI) is the gold standard for diagnosis of SEA [15, 27, 28]. X-ray and CT are convenient and quick, and can better show the condition of bone involvement, but the diagnosis of SEA is not as good as MRI. The typical manifestations of MRI are: low signal on T1WI, high signal on T2WI, heterogeneous signal and enhanced thick-walled abscess (ring enhancement) on T1WI enhanced image [25]. Research by Xinxin Liu et al. [29] showed that, compared with tuberculous spondylitis, brucellosis spondylitis can be observed on MRI with complete vertebral height and more uniform high signal intensity.

At present, there is no guideline to guide the standardized treatment of SEA, and there are still great differences in the best clinical treatment of SEA [30]. The decision to choose non-surgical or surgical treatment for spinal epidural abscesses depends to a large extent on whether the patient has a movement disorder and whether it is at risk of developing a movement disorder [31]. Pourtaheri S et al [32] found that compared with the use of antibiotics alone, SEA patients undergoing surgery or drainage can obtain

greater infection clearance and lower mortality. Historically, early surgery combined with antibacterial therapy has always been the mainstream treatment for SEA [30]. In the past 10 years, SEA medical management has been chosen by more and more people [33, 34], that is, when there is no neurological dysfunction or mild neurological dysfunction, conservative treatment can be performed first, and conservative treatment is not good. Or when the condition deteriorates, surgery is performed again; patients with mild or more neurological dysfunction should be treated immediately. In this group of cases, 11 patients (11/14) underwent surgery combined with anti-brucella treatment. Since our hospital is a large regional tertiary medical diagnosis and treatment center and teaching hospital, most of the patients admitted are difficult and severe patients and referrals from lower-level hospitals. Most of them cannot be improved with conservative treatment, so multiple operations are combined with anti-brucella treatment.

Regardless of whether it is associated with epidural abscess, Brucella infection must be treated with antibiotics once it is diagnosed [18]. The ideal antibiotic treatment plan and duration of treatment for brucella spinal abscess are still controversial [12]. The WHO recommends combining doxycycline (also known as doxycycline) and streptomycin for at least 12 weeks as the first-line treatment [35]. Stahl JP and others recommended the use of doxycycline combined with rifampicin for antibacterial therapy [24]. Tan Hu et al. [17] recommended the use of doxycycline, rifampicin and levofloxacin for 8–12 weeks, but the specific duration depends on the clinical response (including blood routine, ESR, CRP, renal and liver function, X-ray Film or even MRI etc.). Most cases in this group were treated with doxycycline, rifampicin and levofloxacin for 12 weeks or more. ESR, CRP, renal and liver function, and Brucella latex agglutination test titers were reviewed regularly.

Conclusions

Brucella spinal epidural abscess is clinically rare and easy to be misdiagnosed and missed. Early diagnosis, early treatment, comprehensive evaluation and comprehensive evaluation are needed to select the most suitable treatment to avoid serious complications. The classic diagnosis of triad (focal spinal pain, neurological dysfunction, and fever) has poor specificity for diagnosis of SEA. MRI is highly specific to SEA. Blood culture and Brucella latex agglutination test are widely used in the diagnosis of Brucella. When necessary, tissue culture and biopsy can be used to assist in the diagnosis. The medical management of SEA is gradually being applied. Antibiotic therapy is still the basic treatment. For patients with progressive neurological dysfunction and those who have failed conservative treatment, surgery combined with anti-brucella therapy is feasible.

Limitation

The number of cases in this group is small, and the research design is a retrospective study. More accurate research conclusions still need prospective, multi-center randomized controlled trials.

Declarations

Ethics approval

This study was approved by the ethics committees of Affiliated Hospital of Qingdao University.

Conflict of interest

The authors declare that they have no conflict of interest.

Informed consent

All patients involved gave written informed consent to review their medical records. All personal details were erased before analysis to cover patient data confidentiality and comply with the Declaration of Helsinki.

Consent for publication

Written informed consent was obtained from all of the patients for publication of this research and any accompanying images.

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Availability of data and material

All the data and material can be available from WeiLiang Su, BoHua Chen and HongFei Xiang for reasonable request.

Authors' contributions

WeiLiang Su, BoHua Chen and HongFei Xiang designed the study; WeiLiang Su¹, GuoHua Dai¹, Zhu Guo, Chang Liu, Shuai Yang, XiaoLin Wu and ChenSheng Qiu enrolled subjects and collected data; WeiLiang Su, HongFei Xiang analyzed the data; WeiLiang Su, BoHua Chen and HongFei Xiang discussed the results and wrote the manuscript. All authors reviewed and approved the manuscript.

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Tables

Table 1
Clinical and laboratory characteristics of the 14 patients in this case series

Cases	Age	Sex	Spinal pain	Fever	Neural symptom	WBC($\cdot 10^9/L$)	CRP(mg/L)	ESR(mm/h)
1	54	M	Y	N	Y	5.76	12.01	30
2	49	F	Y	Y	Y	5.87	85.4	23.3
3	56	F	Y	N	Y	5.18	4.13	38
4	53	F	Y	Y	Y	6.55	90.84	97.5
5	53	M	Y	Y	N	5.97	47.97	30.6
6	73	M	Y	N	N	5.69	41.01	42
7	58	F	Y	Y	Y	8.93	2.16	44
8	57	M	Y	N	Y	7.05	50.66	73
9	45	F	Y	Y	N	6.81	30.01	28
10	49	F	Y	N	Y	11.2	86.28	103
11	52	M	Y	N	Y	5.7	18	19
12	56	M	Y	Y	Y	6.72	29.92	39
13	71	M	Y	N	Y	8.43	119.53	29
14	62	F	Y	Y	Y	9.29	37.9	73
Note: F, female; M, male; Y, yes; N, no.								

Table 2
Imaging findings and diagnosis of the 14 patients in this case series

Cases	Contact history of cattle and sheep	Level	Brucella latex agglutination test	Blood culture	Tissue culture
1	Y	L3-5	P	Ne	Ne
2	N	L4-S1	P	P	P
3	Y	C5-6	P	P	P
4	Y	L3-5	Ne	Ne	P
5	N	L4-S1	P	Ne	Ne
6	Y	L4-S1	P	Ne	Ne
7	N	L5-S1	Ne	Ne	P
8	N	C5-6	Ne	Ne	P
9	Y	L3-4	Ne	P	Ne
10	Y	L3-4	Ne	Ne	P
11	Y	L4-S1	Ne	Ne	P
12	N	L4-S1	P	Ne	Ne
13	Y	L5-S1	Ne	Ne	P
14	N	L4-S1	Ne	Ne	P
Note: Y, yes; N, no; P, positive; Ne, negative.					

Table 3
Treatment and prognosis of 11 patients in this case series

cases	Course of disease(day)	surgery	Antibacterial treatment	outcome	Follow-up (month)
1	120	Laminectomy, Debridement, decompression, Instrumentation, (posterior)	Levofloxacin, rifampin, 16 weeks,	recovery	12
2	60	Laminectomy, Debridement, decompression, Instrumentation, (posterior)	Rifampicin, doxycycline, levofloxacin, 12 weeks	recovery	12
3	55	Debridement, decompression, Instrumentation(anterior)	Levofloxacin, rifampin, 16 weeks	recovery	14
4	105	Laminectomy, Debridement, decompression, Instrumentation, (posterior)	Rifampicin, doxycycline, levofloxacin, 14 weeks	recovery	18
5	180	NO	Minocycline hydrochloride capsule, Levofloxacin, rifampin, 20 weeks	recovery	16
6	45	NO	Rifampicin, doxycycline, levofloxacin, 18 weeks	recovery	18
7	40	Laminectomy, Debridement, decompression, Instrumentation, (posterior)	Rifampicin, doxycycline, levofloxacin, 12 weeks	recovery	20

cases	Course of disease(day)	surgery	Antibacterial treatment	outcome	Follow-up (month)
8	180	Debridement, decompression, Instrumentation(anterior)	Rifampicin, doxycycline, 14weeks	recovery	18
9	240	NO	Rifampin, doxycycline, levofloxacin, 18weeks	recovery	20
10	75	Laminectomy, Debridement, decompression, Instrumentation, (posterior)	Streptomycin sulfate, rifampicin, doxycycline, 12weeks	recovery	16
11	7	Laminectomy, Debridement, decompression, Instrumentation, (posterior)	Rifampicin, doxycycline, levofloxacin, 13 weeks	recovery	15
12	20	Laminectomy, Debridement, decompression, Instrumentation, (posterior)	Rifampicin, levofloxacin, minocycline, 13weeks	recovery	12
13	70	Laminectomy, Debridement, decompression, Instrumentation, (posterior)	Rifampicin, doxycycline, levofloxacin, 12 weeks	Residual limb numbness	20
14	180	Laminectomy, Debridement, decompression, Instrumentation, (posterior)	Rifampicin, doxycycline, levofloxacin, 14 weeks	recovery	15

Table 4
Clinical characteristics of 14 cases in this case series and 60 cases in the literature

variables	60 cases in the literature	14 cases in this series
Average age	56	56
Male	31 of 60 (52%)	7 of 14 (50%)
Female	29 of 60 (48%)	7 of 14 (50%)
Symptom		
Local spine pain	60 of 60 (100%)	14 of 14 (100%)
Motor/sensory deficit	31 of 60 (52%)	11 of 14 (79%)
Fever	25 of 44 (57%)	7 of 14 (50%)
Level		
Cervical	21 of 60 (35%)	2 of 14 (14%)
Thoracic	10 of 60 (17%)	0
Lumbar and sacral	33 of 60 (55%)	12 of 14 (86%)
laboratory examination		
Elevated CRP	35 of 36 (97%)	12 of 14 (86%)
Elevated ESR	22 of 40 (55%)	11 of 14 (79%)
Brucellosis agglutination test	52 of 60 (87%)	6 of 14 (43%)
Contact history of cattle and sheep	28 of 41 (68%)	8 of 14 (57%)
Positive blood culture	15 of 43 (35%)	3 of 14 (21%)
surgery	11 of 60 (18%)	11 of 14 (79%)
conservative treatment	49 of 60 (82%)	3 of 14 (21%)
course of disease(day)	10–180	7-240
Duration of treatment(weeks)	6–24	12–20
improvement	38 of 43 (88%)	14 of 14 (100%)
Aggravation or no change	5 of 43 (12%)	0

Figures

Figure 1

X-ray (preoperative)

Figure 2

C5-6 epidural abscess (T2WI)

Figure 3

C5-6 epidural abscess (enhanced T2WI)