

RETROSPECTIVE ANALYSIS ON CLINICAL FEATURE AND TREATMENT STRATEGY OF LUMBAR BRUCELLOSIS

CAO CHEN¹, CHUNHUI WANG², YUANZE GAO¹, YONGJUN DU¹, HUA LIU^{1*}

¹Department of Orthopedics, The 474 Hospital of PLA, urumqi, Xinjiang 830013, China - ²Department of Orthopedics, Shihezi People's Hospital, Shihezi, Xinjiang 832002, China

ABSTRACT

Objective: discuss clinical feature and treatment strategy of lumbar brucellosis to improve the diagnosis and treatment of this disease.

Methods: retrospective analysis on clinical features, signs and auxiliary examination results of 35 patients with lumbar brucellosis admitted to our department between January, 2012 and August, 2015 was performed, through visual analogue pain scale (VAS), spine Japanese Orthopaedic Association (JOA) Score and X-ray films and MRI imaging observation after 8 expectant treatments and 27 operative treatments, the clinical effect of patients was assessed.

Result: • 35 patients all had contact history of flocks and herds, medical history of significant fever with night sweat and repeated lumbago, among which, 18 patients had medical history of significant joint pain of four limbs. • Imaging examination showed the lesions of all patients were distributed in lumbar vertebra and sacral vertebra, bone destruction was mild, which are common in moth-eaten destruction and hyperostosis osteosclerosis around the diseased vertebra, some patients had significant stenosis of intervertebral space and formation of small amount of abscess around diseased vertebra. • Laboratory examination showed >1:200 in brucella agglutination test, RBPT showed positive, erythrocyte sedimentation rate was increased basically, and white blood cell examination showed normal. • The symptoms of all patients were significantly improved after treatment, the effect was satisfied, average VAS score was 8.6 before treatment and 1.7 in the latest follow-up after treatment, average spine function JOA score was 7.4 before treatment and 15.2 in the latest follow-up after treatment.

Conclusion: lumbar brucellosis has the distinctive imaging features and epidemiological characteristics, the diagnosis rate can be increased through contact history, clinical feature, laboratory examination and imaging examination in early stage and the satisfied effect can be obtained by using appropriate treatment method.

Keywords: lumbar vertebra, bacterium burger, focal clearance, bone graft fusion.

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Introduction

Brucellosis is an infectious, allergic and zoonotic disease, it is mainly prevalent in Mediterranean region and part of pasturing areas of our country. Bone and joint damage is one of the major signs of Brucella invading into the body, it mainly occurs in knee joint, hip joint and spine, especially the occurrence rate in spine is 2% to 60%⁽¹⁾, among which, the predilection site is lumbar vertebra, the pathological change is focused on inflammatory change of intervertebral disc.

Xinjiang is the high-prevalence area of this disease, and according to the analysis on cases of clinical diagnosis of our hospital, there is a trend of epidemic outbreak gradually, however, there are few reports on the treatment of brucellar spondylitis presently, to explore the effective therapeutic schedule is extremely important for the prevention and cure of this kind of disease in the epidemic area. In this article, the clinical features and treatment of 35 patients with lumbar brucellar spondylitis admitted to our department between January, 2012 and August, 2015 were analyzed, the evaluation is as follows.

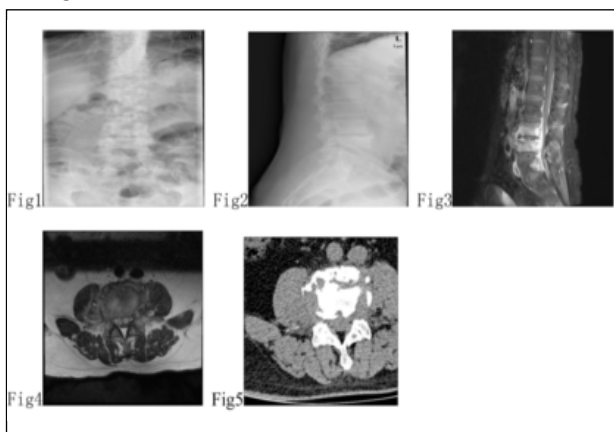
Clinical material

General material

There were 35 patients in this study, 24 males and 11 females; the age was between 24 and 77 years old, the average age was 55 years old. The course of disease was 3 to 18 months, the average is 9 months. 8 patients with L2 and L3 involvement, 16 patients with L3 and L4 involvement, 9 patients with L4 and L5 involvement, 2 patients with L5 and S1 involvement, 9 patients with different degrees of nerve function impairment, 18 patients with history of significant joint pain of four limbs and all patients had history of fever with night sweat. There were 8 expectant treatments and 27 operative treatments.

Auxiliary examination

Laboratory examination: WBC 4.85-17.10 x 10⁹ / L, ESR25-111mm/h, CRP9-54mg/L, brucella agglutination test>1:200, RBPT showed positive. **Imaging examination:** 35 patients had degeneration of intervertebral disc and bone destruction of vertebral body according to the lumbar vertebra MRI, 27 patients had paravertebral or intraspinal abscess in corresponding stage. The specific cases are shown in Fig 1 to 5.



The patient is male, 46 years old, farmer, diagnosis: L3-4 brucellosis, Fig 1 and Fig 2 preoperative X-ray PA&LAT film shows L3 L4 intervertebral space, bone of end plate of vertebral body reveals worm-eaten destruction. Fig 3 and Fig 4 preoperative MRI shows vertebral body reveals uneven signals, dural sac compressed by abscess of intervertebral space and intraspinal epidural abscess. Fig 5 preoperative CT imaging shows multiple damaged lesions of vertebral edge, hyperostosis osteosclerosis around focus and formation of damaged lesions of new bone.

Treatment

Expectant treatment: after admission, the patient had strict bed rest, nutrition was strengthened, oral administration of doxycycline 0.1g, 1 time/d, rifampicin 0.45g, 1 time/d, continuing for 21 days; expectant treatment of liver protein was performed at the same time, regular reexaminations of blood biochemistry, blood sedimentation and C-reactive protein were performed. Among which, night sweat and lumbago of 8 patients were significantly relieved after expectant treatment, because there were no stable conditions of nerve and spine, the expectant treatment of oral administration after discharge was continued for 6 months, reexaminations of blood sedimentation and liver and kidney function were performed every two weeks and reexaminations of Brucella agglutination test and lumbar MRI were performed monthly.

Operative treatment

The 21-day expectant treatment of 27 patients was ineffective, simple posterior approach operation was performed: trachea intubation under general anesthesia, the patient was in prone position, spinal posterior median incision was made by taking the segment of focus as the center, spinous process, vertebral plate and articular process of the diseased vertebra were exposed as routine, for large extent of disease, the margin of exposure was extended to the normal vertebra up and down the lesion, accurate implantation of pedicle screw was performed under C-arm fluoroscopy.

Whole laminectomy of diseased segments was performed, the normal bone of spinous process was soaked in streptomycin solution for preparation, spinal cord or dural sac and nerve root of diseased segment were exposed, intraspinal fester was removed, posterior edge of vertebra and intervertebral space were exposed, local fusiform-coated inflammatory granuloma or abscess in front of posterior longitudinal ligament and around nerve root was cut open, damaged area of bone of posterior edge of vertebra was removed, fibrous rings, infected intervertebral tissues of intervertebral space and damaged cartilage surface and sequestrum between two diseased vertebrae were removed, significant sclerous vertebral bone was incised until errhysis of bone surface appeared.

For large anterior vertebral and paravertebral abscess, different angles of excochleation of abscess or inflammatory granuloma and damaged

bone area of anterior edge of vertebra was performed under the guidance of C arm X-ray machine, hemostasis by compression was performed, hydrogen peroxide, normal saline and gentamicin were used to repeatedly rinse the wound surface, after making sure there were no significant active bleeding and purulent tissues in the exploration, streptomycin powder was implanted in the focal area and normal bone block kept for preparation was trimmed and implanted in intervertebral space, if bone block is not enough for ilium bone grafting, then connecting bar with appropriate length shall be selected for compression fixation. Negative pressure drainage was implanted in focal area, operative incision was closed layer by layer, excised tissues during operation were all used for pathological examination and bacterial culture.

Postoperative treatment

The patient had bed rest after operation and wore thoracolumbar support to sit up or take activity off bed one week later, antibiotics were selected according to the results of bacterial culture and drug sensitivity test, standard oral administration of doxycycline and rifampicin was performed after operation for 6 months, regular reexaminations of blood biochemistry, blood sedimentation, C-reactive protein and serum agglutination test were performed, X-ray and CT reexaminations were performed 3 months after operation.

Evaluation method

Follow-up was performed every three months, clinical evaluation included: VAS, spine function JOA Score and blood sedimentation C-reactive protein and serum agglutination test and X-ray and CT reexamination, the condition of treatment and healing of operative patients was evaluated according to Ozdemir (2), etc.'s clinical and imaging standards: no pain was found in the activity of fused segment, no significant absence of corrected angle was found, no abnormal local activity was found, bone bridge was formed between bone graft and vertebral body, non-low density area of bonding interface of bone graft and vertebral bone was bone graft fusion.

Statistical method

SPSS15.0 statistical package was used to analyze. Measurement data was represented as mean \pm standard deviation, repeated measure of analysis of variance was used in comparison among groups, q

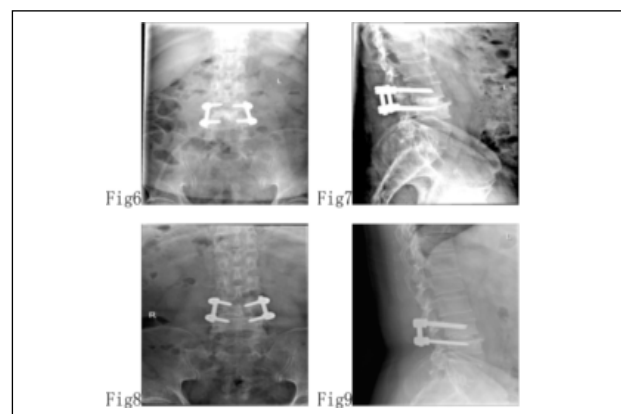
test was used in pairwise comparison; χ^2 test was used in enumeration data, Ridit was used to analyze comparison of ranked data among groups; test level $\alpha=0.05$.

Result

After the expectant or operative treatments of drugs, lumbago of 35 patients in this group disappeared, spine functional recovery was good, incision of operative patients had stage I union, related early complication was not found, formation of sinus tract and recurrence were not found.

Tissues kept during operation were submitted for pathological examination and accorded with pathological change of brucellosis. VAS Scores were respectively (8.6 ± 0.4) , (3.4 ± 0.7) , (2.1 ± 0.2) and (1.7 ± 0.4) in three follow-ups before and after treatment, JOA spine function scores were respectively (7.4 ± 0.4) , (11.2 ± 0.6) , (14.4 ± 0.2) and (15.2 ± 0.4) in three follow-ups before and after treatment, each timing after treatment was improved significantly than that before treatment, the difference had statistical significance ($P < 0.05$); the specific cases are as follows Fig 6 to 9.

(Fig 6 and Fig 7 postoperative X-ray PA&LAT film shows intervertebral bone grafting is good, internal fixation is stable. Fig 8 and Fig 9 last postoperative follow-up X-ray film shows bone graft fusion of intervertebral space is good, internal fixation is stable.)



Conclusion

Due to the geographical condition of wide grassland and life style and custom in Xinjiang, contact of flocks and herds is likely in daily life so that to cause the prevalence of brucellosis. Bone and joint damage is one of the major features of Brucella, hip and knee joint and spine are predilec-

tion sites, among spinal lesions, lumbar vertebra is the predilection site and the second is thoracolumbar segment, the manifestations of the patients usually are hyperpyrexia, night sweat and lumbago, the pathological change is focused on^(3, 4) intervertebral disc inflammation, it seriously influences the patients' daily life. Therefore, early accurate diagnosis and effective treatment are especially important for patients' union.

Clinical feature and differential diagnosis

Because the clinical features of this kind of disease are extremely similar to that of tuberculosis, it brings big difficulty to the diagnosis of disease, the understanding about this disease is few in early stage, it is usually treated as tuberculosis of lumbar spine, therefore, in the process of treatment, it shall be identified through epidemic disease, medical history, laboratory examination and imaging examination.

Combining with cases in this group, we found that lumbar brucellosis has the following clinical features:

- patients with brucellosis have defined contact history of flocks and herds or epidemic area, typical afternoon high fever, revealing typical wavy type, night sweat, lumbago, and most patients have joint pain of four limbs;

- Brucellar spinal pathological changes usually occur in lumbar vertebra, revealing mild bone destruction in imageology, it is mostly seen in worm-eaten destruction and hyperostosis osteosclerosis around diseased vertebrae, some patients have significant stenosis of intervertebral space, revealing vertebral edema, degeneration of intervertebral disc and few paravertebral abscess⁽⁵⁾. However, significant vertebral edema, degeneration of intervertebral disc and formation of small amount of paravertebral abscess were not found in the spine MRI of two patients in the initial diagnosis, in the reexamination of spine MRI two months later, vertebral edema and formation of small amount of abscess were found, which indicates that the occurrence of negative results is possible in the early imageological examination of the patients, and this should be noticed in the process of routine diagnosis and treatment in case of missing diagnosis;

- Blood sedimentation and C-reactive protein usually reveal increased in the laboratory examination, but leukocyte can be normal, serum agglutination test of brucellosis >1:160, blood brucella culture shows positive⁽⁶⁾. Because the clinical features are similar to that of spinal tuberculosis, the treat-

ment often shall be distinguished, while patients with spinal tuberculosis have long course of disease, the characteristic of fever is focused on afternoon low fever, with contact history of tuberculosis, based on lumbago, without joint pain of four limbs, though blood sedimentation and C-reactive protein are increased in the laboratory examination, serum agglutination test of brucellosis <1:160, or blood brucella culture is negative, while tuberculosis antibody can be positive, bone destruction of corresponding segments of vertebrae is shown in imageology, which usually causes collapse of vertebra and formation of sequestrum, vertebral edema, degeneration of intervertebral disc and formation of paravertebral abscess in large area⁽⁷⁾.

Treatment

Because brucellosis is a recurring bacteremia and has significant endemicity, due to the restriction of medical condition and few studies on this disease, there is a lack of uniform therapeutic schedule presently, drug treatment is still dominant in domestic and abroad, it is considered that cases in acute stage, without symptoms of nerve damage, vertebra destruction not significant in imaging findings and without paravertebral soft tissue swelling can be cured by using expectant treatment and drug treatment. Presently, therapeutics are mainly focused on tetracycline antibiotics, bed-rest immobilization is performed during treatment process and nutrition support therapy is strengthened. The current first-line drugs: doxycycline 0.1g, 1time/d, double dose at the first time, successive administration for 45 days; streptomycin 1.0g, intramuscular injection 1time/d, 14 days in total, or gentamicin 160,000 U, intramuscular injection 2 time/d, 7 days in total. The second-line drugs: doxycycline 0.1g, 1time/d, double dose at the first time, successive administration for 45 days+ rifampicin 0.45g taken at a draught after getting up in the morning for 45 days⁽⁸⁾. The cases in this group were all given doxycycline 0.1g/d and rifampicin 0.45g/d as expectant treatment for 3 weeks, and reexaminations of blood routine, blood sedimentation and C-reactive protein were performed, after the preliminary expectant treatment, 8 patients obtained good effect, the symptoms were completely relieved after successive expectant treatment for 6 months, spinal function was significantly improved and daily life was not influenced.

For insignificant effect of expectant treatment, operative treatment is used, it is believed in the cur-

rent studies that on the basis of standardized drug therapy, patients with one the following symptoms should undergo operative treatment:

- (1) significant spondylitis, with intractable lumbago and backache;
- (2) combined radiculalgia;
- (3) pathological fracture;
- (4) significant paravertebral abscess⁽⁹⁾.

Because the objective of operation is to remove abscess, granulation and diseased tissues of intervertebral disc, improve circulation and rebuild the stability of spine, therefore, combining with the cases in this group, we think the operative indications are:

(1) persistent lumbago, limitation of motion, the effect is not significant after expectant treatment and daily life is seriously influenced.

(2) Intraspinal space occupying lesion, spinal cord or nerve root compression, relevant neurological signs occur, the compression should be relieved in early stage.

(3) Significant destruction of diseased vertebra and normal physiological structure and stability of spine are influenced. And paravertebral abscess is not the absolute operative indication.

Combining with the current literature reports, operation method such as anterior or anterior and posterior combined approach with pedicle screw fixation is mainly used in the treatment of lumbar brucellosis. Abscess, necrotic intervertebral disc and other tissues can be thoroughly removed under direct vision in simple anterior approach operation, after debridement is finished, internal fixation of bone graft fusion is performed, but the direct contact of implant and focus can increase the risk of repeated infection after operation, simple anterior approach of focus debridement and posterior lumbar intervertebral fusion can be performed as well, but because the lack of effective internal fixation can cause bone resorption and shifting, thus to bring a series of complications.

While the anterior and posterior combined approach can not only thoroughly remove focus, necrotic intervertebral disc and other tissues through anterior approach, especially infection of the anterior of vertebra, but also achieve internal fixation of bone graft fusion via pedicle of vertebral arch through posterior approach, and create stable internal environment and avoid implant infection, but the operative wound is great, the risk is high and postoperative complications are multiple⁽¹⁰⁾.

Because spinal brucellosis is different from spinal tuberculosis, bone destruction of vertebra is few, paravertebral abscess is few and the lesions are mainly focused on intervertebral space, therefore, simple posterior approach of focus debridement, posterior lumbar intervertebral fusion and internal fixation of pedicle screw we are using presently can effectively remove focus, paravertebral abscess, necrotic intervertebral disc and other tissues, after debridement is finished, internal fixation of posterior lumbar intervertebral fusion, implant of internal fixation does not directly contact focus, which can reduce the probability of postoperative repeated infection, recurrence and ineffective internal fixation and has the advantages of short operation time, less bleeding and postoperative complications, thus to obtain the satisfactory effect.

The advantage and matters needing attention of posterior approach operation

For lumbar brucellosis, we think posterior approach operation can reach the satisfactory effect and has significant advantage:

- single incision is performed to complete focus debridement, bone graft fusion, internal fixation of pedicle of vertebral arch, position change is not needed, the operative wound is slight;
- nerve and vascular injury of the anterior lumbar vertebrae are effectively reduced, operation time is relatively short, postoperative complication is reduced and length of stays is shortened;
- intervertebral bone graft fusion combined with internal fixation of pedicle of vertebral arch can reach the effect of stabilizing three columns of spine, effectively recover the normal physiological curvature of spine and rebuild the stability of spine;
- focus debridement from 270° anterior approach, satisfactory decompression of vertebral canal is obtained from anterior, lateral and posterior all different directions.

However, any operating method has certain risks and complications, therefore, in the operation, we should pay attention to the following items:

- vertebral plate and upper and lower articular process of the diseased intervertebral space shall be completely removed, so that to expose dural sac and lateral nerve root clearly, and the upper and lower pedicle of vertebral arch of diseased vertebra can be explored. Pay attention to protect dura mater and nerve root.
- The incision of diseased vertebra and superior border of pedicle of vertebral arch of inferior dis-

eased vertebra can enlarge the exposure of diseased intervertebral space, in focus and bone graft debridement under direct vision and implantation of big bone graft in intervertebral space, pay attention to enter sideways and place upright.

- Combination of scrape and incision shall be used to thoroughly clean the necrotic intervertebral tissues, osseous and cartilage endplate, thoroughly scrape granulation tissue and caseous necrosis of the wall of paravertebral abscess, and put washing pipe into paravertebral abscess cavity and wash it clean with large amount of iodophor and normal saline and to create a relatively ideal graft bed.

- normal autogenous bone such as spinous process, vertebral plate and facet joint removed at the same period are used as bone graft materials, if bone graft mass is not enough, ilium can be used, big bone block shall be implanted to the greatest extent, and defect area shall be completely implanted at the same time. The application of titanium mesh and interbody fusion cage in focal area is not suggested.

Conclusion

By combining the cases of this group and clinical experience in recent years, we think that through epidemic characteristics, typical clinical features, laboratory examinations and imageological examinations of the patients, lumbar brucellosis can be diagnosed in early stage, for patients in early onset period, with mild vertebral destruction and without neurological symptoms, drug expectant treatment shall be selected and satisfactory effect can be obtained, but the course of treatment needs to be long enough, for patients without significant improvement and even with progressive condition 3 weeks after expectant treatment, surgical intervention shall be performed as early as possible, the operation time of stage I focus debridement and reconstruction through posterior approach is short, the wound is slight, the effect of focus debridement and spinal cord decompression is satisfactory, at the same time, on the basis of strong internal and external fixation, off-bed activity in early stage is available. The operation is a kind of operation method suitable for the treatment of lumbar brucellosis, but due to the short follow-up time and few case load, for long-term effect and recurrence of brucellar spondylitis after operation treatment, further follow-up shall be performed. And in the process of this operation, and relatively small exposed area,

extensive focal area or combining with large paravertebral abscess, focus is difficult to be removed thoroughly, extensive stripping of paravertebral muscle is likely to cause different degrees of lumbago and backache after operation, these shortcomings need to be further improved and more effective solutions shall be searched.

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Corresponding author

LIU HUA

The people's liberation army 474 hospital

Email: 27988132@qq.com

(China)