

Research Article

Safety Evaluation and Clinical Efficacy of Limited Lesion Clearance and Posterior Internal Fixation Combined With Individualized Chemotherapy in the Treatment of Brucella Spondylitis

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Abstract

Objective: To evaluate the clinical efficacy of patients with Brucellar Spondylitis (BS), who were treated with limited lesion clearance posterior internal fixation combined with individualized medication therapy.

Methods: From June 2014 to January 2019, 44 patients with BS who were admitted to the First Affiliated Hospital of Hebei North University and met the inclusion criteria were selected, including 26 males and 18 females. Pathological entity: T11 /T12 2 cases; T12 /L1 8 cases; L3 /L4 6 cases; L4 /L5 20 cases; L5 /S1 8 cases Visual Analogue Scale (VAS) of waist and back C-Reactive Protein (CRP), Erythrocyte Sedimentation Rate (ESR) were checked before surgery, and the Bengal plate agglutination test and serum tube agglutination test were positive. Before surgery, 16 patients were associated with neurological symptoms including 6 patients with grade C and 10 patients with grade D according to American Spinal Injury Association (ASIA). Six patients were allergic to the first-line anti-Brucella drug. Preoperative standardized drug therapy was performed. The dosage and frequency of the individualized drug were determined according to the individual's physical condition nutritional status and liver and kidney function, and the operation of posterior internal fixation was performed after limited lesion removal. After the operation, the patient continued to receive individualized treatment or adjusted the sensitive antibiotics according to the results of drug sensitivity test. The operation time, bleeding volume and related complications of all patients were observed and recorded. VAS, CRP, ESR, Bengal plate agglutination test, serum tube agglutination test, X-ray examination were performed before surgery and after 3, 6 and 12 months of follow-up. MRI examination were performed after 6 and 12 months of follow-up. ASIA nerve functional rating evaluation was performed at the last follow-up. Data were processed with repeated measures analysis of variance and paired t test.

Results: The operation process of all patients was smooth, the average operation time and bleeding volume were (2.2 ± 0.2) h (360 ± 50) mL. Forty-four patients had good postoperative wound closure, no surgical complications occurred, and liver and kidney functions were not damaged at the last follow-up all of which reached clinical cure. The VAS of 44 patients were (6.3 ± 1.3) , (2.3 ± 0.8) , 0, and 0 points at the time of before surgery and 3, 6, 12 months after surgery, respectively, the difference was statistically significant ($F = 64.26$, $P < 0.05$). CRP of 44 patients were (65.31 ± 4.01) , (4.31 ± 0.12) , (3.05 ± 0.01) , (1.33 ± 0.12) mg /L at the time of before surgery and 3, 6, 12 months after surgery, respectively, the difference was statistically significant ($F = 226.13$, $P < 0.05$). The ESR of 44 patients were (54.78 ± 3.12) , (13.08 ± 1.01) , (6.21 ± 1.32) , (2.32 ± 0.38) mm/h at the time of before surgery and 3, 6, 12 months after surgery, respectively, the difference was statistically significant ($F = 182.38$, $P < 0.05$). Comparison of VAS, CRP and ESR before surgery and 3 months after surgery, the differences were statistically significant ($t = 1.749, 5.763, 4.219$; with P values below 0.05). Bengal plate agglutination test and serum tube agglutination test were negative at 3 months after surgery. The results of X-ray at 6 and 12 months after surgery showed that pedicle screws were strong, the spine was stable, and intervertebral bone grafting was performed. At the 6 and 12 months after surgery. MRI showed that the vertebral body and paravertebral tissue showed inflammatory absorption, and the spinal cord in the spinal canal showed no compression. Preoperative ASIA neurological function grading was grade C in 6 cases, and postoperative improvement was grade D in 2 cases, and grade E in 4 cases. There were 10 patients with grade D before surgery and all were improved to grade E after surgery.

Conclusions: Limited lesion clearance posterior internal fixation combined with individualized medication therapy is safe and feasible for BS to control infection, rational medication eliminate inflammation relieve pain relieve spinal nerve compression and promote rapid recovery. The clinical effect is satisfactory.

INTRODUCTION

Brucellosis, also known as brucellosis, is a zoonotic infectious disease caused by brucellosis. In China, the epidemic of brucellosis mainly exists in Inner Mongolia, Hebei and other regions [1]. The main reason for people suffering from brucellosis is contact with

cattle, sheep and other animals with brucellosis and their milk and meat products [2-4]. Brucella enters the human body through the respiratory system, skin and digestive system, parasitizes, propagates and enters the blood, and releases endotoxin, resulting in human fever and multiple organ damage, and the osteoarthral-muscle system is its predisposition [5-8]. Brucella mainly invades

the major joints of the body, and the most frequently affected part is the spine, known as brucellosis spondylitis, which is a spinal infectious diseases caused by *Brucella* invading into the intervertebral disc or vertebral body tissue, with the highest incidence of lumbar incidence rate [8-10]. In clinical work, the vast majority of patients with brucellosis spondylitis can achieve satisfactory results through regular and reasonable use of drug treatment, but the drug treatment is ineffective or brucellosis spondylitis causes neurological symptoms, serious involvement of intervertebral disc, intraspinal abscess (or granulation tissue swelling) compression of spinal dural sac, and other conditions require surgical treatment [11]. This study retrospectively analyzed 44 patients with brucellosis spondylitis who were treated with limited debridement and internal fixation combined with individualized drugs in the orthopedics department of the First Affiliated Hospital of Hebei North University from June 2014 to January 2019, and summarized the clinical efficacy of this treatment plan for the disease. The report is as follows.

MATERIALS AND METHODS

Case Inclusion and Exclusion Criteria

Inclusion criteria:

- It was diagnosed as brucellosis spondylitis, and no more than 2 vertebral bodies were involved, that is, single space;
- Inflammatory destruction of intervertebral disc cannot tolerate pain;
- Inflammatory granulation tissue swelling or abscess appears in the spinal canal with obvious neurological symptoms;
- Damaged spinal stability;
- After 1 course of normal and reasonable non-surgical treatment, the symptoms did not improve.

Exclusion criteria:

- Brucellosis spondylitis with other infections of the spine;
- Due to the combination of other diseases, currently taking drugs that have a great impact on the operation and cannot be stopped;
- Incomplete follow-up data.

Clinical Data

Select 44 patients with brucellosis spondylitis admitted to the Department of Orthopedics of the First Affiliated Hospital of Hebei North University from June 2014 to January 2019, all patients were treated with limited debridement and posterior internal fixation combined with individualized drug therapy. There were 26 males and 18 females, ranging in age from 29.0 to 65.0 years, with an average age of (43.8 ± 3.3) years. Lesion site:

T11/T12 in 2 cases, T12/L1 in 8 cases, L3/L4 in 6 cases, L4/L5 in 20 cases, L5/S1 in 8 cases. Six patients were allergic to first-line anti-*Brucella* drugs, including 2 patients who were allergic to 2 drugs, 2 patients who could not tolerate them, and 4 patients who were allergic to 1 drug. One patient with endocarditis and one patient with orchitis. In this study, 16 patients suffered from pain in the affected spinal region and limited daily life and labor, with neurological symptoms, of which 6 were classified as Grade C by the American Spinal Injury Association, and 10 were classified as Grade C.

This study was approved by the Ethics Committee of the First Affiliated Hospital of Hebei North University (batch number: 2013-10), and informed the patients and their families of the relevant examination, test and treatment before treatment, and signed the relevant informed consent form.

Treatment Method

Basic admission treatment: After admission, the patient was instructed to avoid spinal activity as much as possible and to rest in bed. The patient must wear a spinal hyperextension brace when getting out of bed. Reasonable, balanced and nutritious diet should be given to the patient to correct malnutrition caused by chronic wasting disease of brucellosis spondylitis, so as to avoid the influence of nutritional status on surgical treatment. Patients with long-term bedridden lung function decline and poor expectoration are prone to pendant pneumonia. They should adhere to active practice of cough and expectoration every day [12-13]. Patients with poor compliance should be given symptomatic treatment such as intervention and atomization inhalation. For patients who are bedridden for a long time and result in reduced lower limb activity, easy to form lower limb venous thrombosis and increase the risk of pulmonary embolism, comprehensive evaluation should be given after admission, early intervention with antithrombotic drugs, and active exercise of lower limbs should be guided in bed, and physical therapy with lower limb plantar-pressure pump should be used if necessary [14].

Preoperative examination: All patients underwent routine examination before operation, including visual analogue score of low back pain, C-reactive protein, erythrocyte sedimentation rate, tiger red plate agglutination test and serum test tube agglutination test were all positive. X-ray examination of all patients before operation showed that there were different degrees of damage to the affected vertebral body, the width of the affected vertebral space was lower than normal, and osteosclerosis showed different degrees at the edge of the vertebral body; CT examination showed that bone destruction occurred in the center of the affected vertebral body, and the hyperplastic bone around the bone destruction focus showed typical "lace vertebral" changes. The affected intervertebral disc had different degrees of destruction, and some cases involved the articular surface; MRI examination showed that inflammatory granulomatous tissue swelling or abscess appeared in the vertebral canal, inflammatory changes in different degrees were

found in the affected vertebral body and intervertebral disc, and upper and lower endplates were involved in some diseased vertebral bodies.

Individualized drug treatment of preoperative brucellosis spondylitis: The treatment scheme of doxycycline + sulfamethoxazole + rifampicin is the first choice for all patients admitted before operation [15]. Select drugs according to the adverse reactions and allergies of patients; the individualized dose and frequency of doxycycline were determined according to the individual constitution, nutritional status, liver and kidney function. Doxycycline 2.2mg/(kg/d), the maximum dose 200.0mg/(kg/d), once a day, for 56 consecutive days Rifampicin 10mg/(kg/d), maximum dose 0.6mg/(kg/d), once a day, for 56 consecutive days; Compound sulfamethoxazole 1.0g (including sulfamethoxazole: 800 mg, trimethoprim: 160 mg), double for the first time, twice a day, for 56 consecutive days.

Among them, 2 patients with allergic reactions to doxycycline and sulfamethoxazole were changed to rifampicin + fluoroquinolones + streptomycin, and 4 patients with allergic reactions to rifampicin were changed to doxycycline + sulfamethoxazole + tobramycin [16]. Patients with complications of endocarditis and orchitis were treated with individualized drugs for brucellosis spondylitis, and three generations of cephalosporin's and short-term low-dose glucocorticoids were added respectively. Close monitoring of liver function and renal function in all patients during drug treatment [17]. Operation can only be performed after individualized drug treatment until the patient's nutrition and physique are improved, the ESR index shows a downward trend, and it is not higher than 40 mm/h [18].

Operation method: After successful general anesthesia, the patient was taken to the prone position [19,20]. After re-positioning with C-arm X-ray machine combined with preoperative image data, the spine was taken and fixed through the median incision to expose the spinous process, lamina and articular process of the diseased vertebra, and the operation field within the range of 1 vertebral body above and below the diseased vertebra was exposed. The pedicle screw was accurately placed with the help of C-arm X-ray machine. At this time, the selection of the vertebral body for screw placement should be determined according to the preoperative image data and the height and bone condition of the diseased vertebral body observed during the operation. If the height of the diseased vertebral body is half or more and the bone condition of the pedicle is good, the diseased vertebral body should be selected for screw placement; If the retention height of the diseased vertebra is less than half and/or the bone condition of the pedicle is not good, the screw shall be placed across the diseased vertebra segments. Streptomycin should be applied to the diseased vertebra before nailing to prevent postoperative infection. After the screw placement, the diseased vertebral region was decompressed, the dural sac and nerve root of the diseased vertebral segment were exposed, and the inflammatory lesion tissue and pus in the vertebral canal were removed.

After the removal, the intervertebral space was carefully exposed, the fibrous ring of the intervertebral disc was cut, and the upper and lower end plates of the diseased intervertebral disc and the diseased intervertebral space were removed, and the curette was carefully removed until the bone surface exuded blood. Paravertebral or prevertebral abscesses that are more limited and less than 1 vertebral height should not be removed; For large paravertebral or prevertebral abscess, carefully and gently remove it with curettes of various models and directions during the operation to avoid iatrogenic injury, carefully stop bleeding after removal, wash the operation area with 0.9% sodium chloride solution, place small bone particles mixed with 1g dose of streptomycin into the intervertebral space of the lesion, and then insert an appropriate amount of gelatin sponge behind the intervertebral space to prevent the inserted bone particles from falling into the vertebral canal; After washing the wound, place the drainage tube and suture it layer by layer. After the operation, clear tissue pathological examination, bacterial culture and drug sensitivity test were given.

Postoperative treatment: The patients were given postoperative care of spinal surgery. The drainage tube was removed according to the drainage condition 2 days after the operation. If the drainage flow of the wound was less than 50 mL on the same day, the tube could be removed. The patients were given antibiotics to prevent wound infection within 3 days after the operation, and the dressing was changed regularly; the suture shall be removed according to the wound condition at 2 weeks after operation. Interventional treatment to prevent pneumoconiosis and venous thrombosis of lower extremities should be carried out during the bedridden period as before the operation. Three weeks after operation, the patients can exercise the lumbar and back muscles according to their own conditions.

The patients with thoracic spine and thoracolumbar surgery should wear the spinal hyperextension brace. The patients with lumbar spine and lumbosacral surgery should start to get out of bed with the steel bar waist circumference. After operation, the patients should continue to adjust the antibiotic application according to the individualized BS drug treatment plan before operation or according to the drug sensitivity test results, and give the patients 2 courses of treatment, 8 weeks per course, Until the tiger red plate agglutination test turns negative, the drug will be used for another 2 weeks. For patients with endocarditis and orchitis complicated before operation, the preoperative treatment plan will be continued after operation, and the relevant departments will be consulted to adjust the medication of related complications.

Follow-up and efficacy evaluation

Observe and record the operation time, bleeding volume and related complications of patients. All enrolled patients were followed up and evaluated before operation and 3,6 and 12 months after operation. VAS, CRP, ESR, tiger red plate agglutination test, serum tube agglutination test laboratory examination and X-ray examination were performed on the patients. According to VAS,

whether the pain in the spinal lesion area or radiation pain in the lower limb relieved or disappeared after operation was judged. The score was 0 - 10 points, 0 for painless, 10 for severe pain, The middle 2 to 9 points indicate different degrees of pain; Determine the control of inflammation according to CRP, ESR, tiger red plate agglutination test, serum tube agglutination test, etc.; X-ray examination for looseness or displacement of internal fixation and fusion of implanted bone; RI examination was performed at 6 and 12 months after operation to check the inflammatory absorption of the vertebral body and intervertebral disc and the swelling and clearing of granulation tissue that compressed the dura mater or nerve root in the vertebral canal. At the last follow-up, determine whether the spinal cord function of the patient has improved according to the neurological function grading of the American Spinal Injury Association. There are five grades in total. Grades A to E represent the gradual improvement of spinal cord function, grade A is complete injury, and grade E is normal.

Statistical processing

SPSS 21.0 statistical software was used for data processing. The measurement data was expressed as mean \pm standard deviation ($\bar{x} \pm s$). The VAS, CRP and ESR at each time point before and after the operation were compared by repeated measurement analysis of variance. The paired t test was used for comparison at different time points. $P < 0.05$ was statistically significant.

RESULT

Operation Conditions and Complications

The anesthesia process and operation process of all enrolled patients were smooth, the operation time was 2.0 ~ 3.0 h, the average operation time was (2.2 ± 0.2) h, the operation bleeding volume was 200 ~ 600 mL, and the average operation bleeding volume was (360 ± 50) mL. After extubation, 15 patients had fever, with the highest temperature of 38.4°C. In order to absorb heat, the patient was given physical cooling and other symptomatic treatment, and the temperature of all patients with fever returned to normal within 2 days. 44 patients had good wound healing after suture removal 2 weeks after operation. Except for the patients with endocarditis and orchitis before operation, there were no complications in the remaining 42 patients after operation. 44 patients in this group had no damage to liver and kidney function in the last follow-up, and Brucellosis spondylitis reached the clinical cure standard [1].

Comparison of evaluation indexes before and after operation

There were statistically significant differences in VAS, CRP and ESR between patients before and 3,6 and 12 months after surgery ($F = 64.26, 226.13$ and 182.38 , P values were less than 0.05), as shown in (Table 1). There were statistically significant differences in VAS, CRP and ESR between patients before and 3 months after operation ($t = 1.749, 5.763, 4.219$, $P < 0.05$). The patient's tiger red plate agglutination test and serum test tube agglutination test were positive before operation, and the tiger

Table 1: Comparison of ESR, CRP, and VAS scores before and after individualized treatment in 44 patients ($\bar{x} \pm s$).

Group	ESR/mm/h	CRP/mg/L	VAS
Preoperative	54.78 \pm 3.12	65.31 \pm 4.01	6.33 \pm 1.33
3 months	13.08 \pm 1.01*	4.31 \pm 0.12*	2.31 \pm 0.81*
6 months	6.21 \pm 1.32*	3.05 \pm 0.01*	0*
12 months	2.32 \pm 0.38*	1.33 \pm 0.12*	0*
F	182.38	226.13	64.26
P	0	0	0.003

Note: * is for compared with preoperative, $P < 0.05$.

red plate agglutination test and serum test tube agglutination test were negative after 3,6 and 12 months of operation. The X-ray examination of 44 patients at 3 months after operation showed that the internal fixation and the implanted bone were in good position. At 6 and 12 months after operation, it showed that the pedicle screw was firm, without looseness and broken screw, without spondylolisthesis and stability, and without fusion sign of intervertebral bone graft falling off. MRI examination at 6 and 12 months after operation showed that the inflammation and absorption of the vertebral body and paravertebral tissues, the spinal dura mater in the spinal canal was not compressed, and the cauda equine nerve sequence was good. Of the 16 patients with BS with neurological symptoms, 6 patients had ASIA neurological function grade C before operation, 2 patients improved to grade D after operation, and 4 patients had grade E; There were 10 patients with grade D before operation and all improved to grade E after operation; The other 28 patients had ASIA nerve function grading of E before and after operation.

Typical Case

A 62-year-old female patient with persistent lumbosacral pain, low fever, fatigue, activity limitation for 1 year, radiation pain in both lower limbs, and numbness in perineum for 1 month. The patient complained that he had never been to the pastoral area and liked to eat more beef and mutton at ordinary times. He visited the local hospital one month ago and was diagnosed as BS and given corresponding drug treatment. After 56 days, the above clinical symptoms did not improve, but instead he was diagnosed as "L4/L5 BS" in the department of orthopedics of the First Affiliated Hospital of Hebei North University. Physical examination on admission: moderate malnutrition, anemia and hypoproteinemia, body mass index 16.2 kg/m², slight lumbar scoliosis, L4 vertebral spinous process and Para spinal tenderness obviously accompanied by radiation pain of both lower limbs, muscle strength of both lower limbs is grade 4, muscle tension is normal, perineal area, right lower leg and foot skin hypoesthesia, lumbar flexion, extension, lateral bending, and rotation activities are limited. The dorsalis pedis artery beats well. The straight leg elevation test is positive, and the Babinski sign on both sides is negative.

The ASIA grade is C, and the VAS score is 6.0. CRP 55.48 mg/L, ESR 45.78 mm/h, tiger red plate agglutination test and serum test tube agglutination test were positive, preoperative MRI examination showed that L4/L5 vertebral body bone and intervertebral disc were damaged, and L4/L5 anterior margin

soft tissue inflammatory infiltration (Figure 1). T lymphocyte dot test was used to detect the resistance to rifampicin. According to the patient's own constitution, drug allergy history and liver and kidney function, the patient was treated with doxycycline + sulfamethoxazole + fluoroquinolone individualized drugs until the nutritional improvement (hemoglobin \geq 100 g/L, albumin \geq 45 g/L) and ESR showed a downward trend. All indicators were controlled stably during the perioperative period, and limited focus clearance and posterior internal fixation were performed. After the operation, according to bacterial culture the results of drug sensitivity test continued to be treated with doxycycline + sulfamethoxazole+ streptomycin. After operation, the clinical symptoms, VAS, laboratory examination, imaging examination and ASIA neurological function grading were significantly improved compared with those before operation.

After 6 months of follow-up, VAS was 0, CRP 4.31 mg/L, ESR12.08 mm/h, tiger red plate agglutination test and serum test tube agglutination test were negative. X-ray examination showed L4/L5 interbody fusion, pedicle screw was well fixed on the original disease vertebra, spine was stable, MRI examination showed L4 bone destruction was repaired, L4/L5 interbody bone graft fusion is good, the cauda equine nerve sequence is good, the spine is stable, and the inflammatory abscess at the anterior edge of the vertebral body has been absorbed (Figure 2,3). ASIA neural function grading improved to grade E and was clinically cured.

DISCUSSION

Brucellosis spondylitis is an infectious inflammation caused by brucellosis invading the spine, and the lumbar spine is the high incidence site of brucellosis spondylitis [21]. The vast majority of patients with brucellosis spondylitis can be cured by drug treatment, but the patients who are ineffective or dissatisfied with drug treatment still need surgical treatment account for 3% to 29% of all patients with brucellosis spondylitis [22,23]. The longer the spinal cord or nerve is compressed, the higher the risk of paralysis or nerve root injury [24]. In this group, 44 patients were treated with reasonable individualized drug treatment scheme, and after meeting the requirements

of surgery, they were treated with limited focus clearance and posterior internal fixation. After surgery, the patients continued to be treated with reasonable individualized drug treatment, and the medication was adjusted according to the drug sensitivity test results. During the follow-up, most patients felt good, and a few patients complained that the pain sensation in the affected spinal region had improved significantly compared with that before the operation, but still had discomfort from time to time. However, the imaging and laboratory examinations after the operation showed no recurrence, no change in the internal fixation position, and fusion of the implanted bone. Therefore, it was considered that the patient's high expectation of the postoperative effect might be the cause. To sum up, the clinical efficacy of this treatment scheme can be confirmed for patients with single intervertebral space invasion and mild vertebral bone destruction.

Advantages of Posterior Internal Fixation for Brucellosis Spondylitis:

At present, the main surgical approaches of BS include: anterior approach, posterior approach, and combined anterior and posterior approach. Anterior surgery can make the operator have a broader vision in the process of removing the focus, and can remove the focus as much as possible. However, during the process of internal fixation, the internal fixation will directly contact with the focus, increasing the risk of infection, which is not conducive to the subsequent treatment and rehabilitation of the patient. Moreover, because the anterior side of the vertebral body is fixed, the effect of anterior surgery on improving the kyphosis of the patient is not ideal, which is not conducive to the rehabilitation exercise of the patient's spine after surgery. The operation of the anterior and posterior combined approach is more complicated than the other two approaches, which requires high technical level of the operator, and involves the turning of the patient during the operation, which increases the risk of infection; The patient is prone to accidents when changing position under general anesthesia; Moreover, the operation is traumatic, and the disease is a chronic wasting disease, which is not conducive to postoperative recovery of patients.

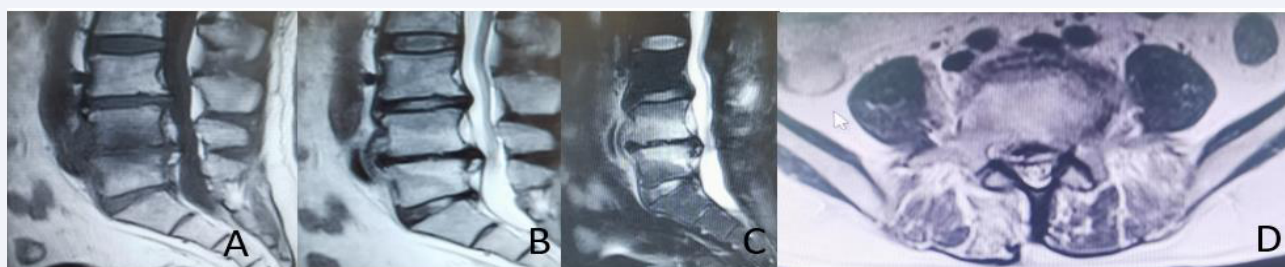


Figure 1 MRI examination of L4/L5 BS patients before operation. A showed that the signal of L4/L5 vertebral body and intervertebral disc was decreased and the bone of vertebral body was destroyed on T1-weighted imaging; B showed enhanced signal of L4/L5 vertebral body and intervertebral disc on T2-weighted imaging, and bone destruction of vertebral body; C showed that the signal of L4/L5 vertebral body and intervertebral disc was enhanced, and the abnormal strip shadow of L4/L5 anterior edge inflammation was detected by short time reversal recovery sequence technology; D shows the enhanced signal of L4/L5 intervertebral disc, inflammatory infiltration, and abnormal signal of L4/L5 anterior edge inflammation in cross section examination; BS is brucellosis spondylitis.

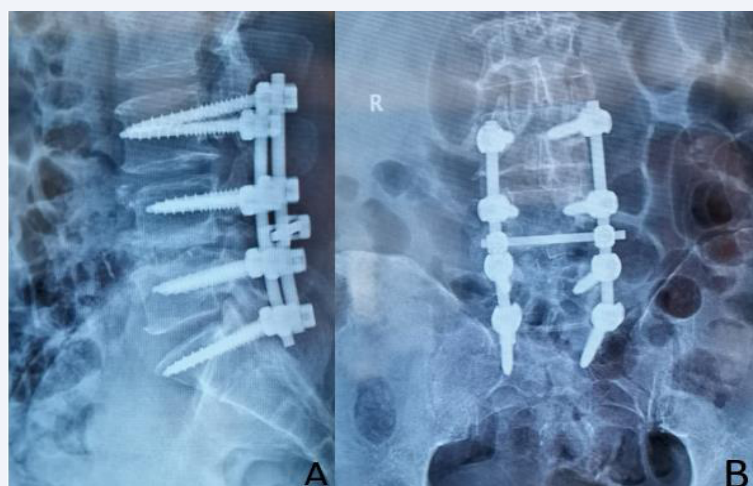


Figure 2 X-ray examination of L4/L5 BS patients 6 months after limited debridement and internal fixation. A shows that the pedicle screw is well fixed on the original disease vertebra in the X-ray positive position; B shows X-ray lateral view shows that the pedicle screw is well fixed on the original disease vertebra, interbody bone graft fusion, and the spine is stable; BS is brucellosis spondylitis.

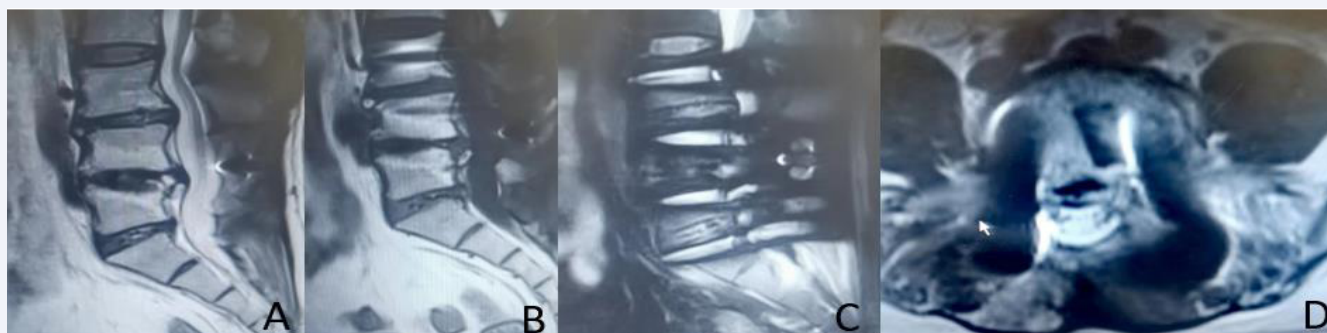


Figure 3 Fixation, a shows that the spine is stable and L4 bone destruction is repaired by T1-weighted imaging; B showed that the L4/L5 interbody fusion was good, the spine was stable, the L4 bone destruction was repaired, and the cauda equine nerve sequence was good; C shows that the inflammatory abscess at the anterior edge of L4/L5 vertebral body has been absorbed, the spine is stable, and the spinal canal is unobstructed by using the short time reversal recovery sequence technique; D shows that the inflammatory infiltration signal of L4 vertebral body disappears, bone destruction is repaired, L4/L5 vertebral body inflammatory abscess at the front of the body has been absorbed; BS is brucellosis spondylitis.

Posterior surgery is now the most widely used surgical approach, because the posterior approach can directly expose the focus, away from important organs and large blood vessels, the surgical approach is safe, the incision is small and trauma is small, the destruction of tissue is small, the operation time is short, and the amount of bleeding is relatively small. Now it is widely used in the surgery of spinal infection [21-25]. With the development of medical instruments and minimally invasive techniques in spinal surgery, it is easier to remove the diseased tissue and necrotic intervertebral disc in the spinal canal in the posterior approach surgery. For the paravertebral or anterior vertebral abscess, curettes of various directions and models can be used for scraping, or the abscess can be removed under the guidance of intervertebral foramen mirror. There are two main methods

of operation, namely focus removal, bone graft fusion and focus removal, bone graft fusion and internal fixation. First of all, it should be emphasized that the bone graft fusion for infectious spondylitis (commonly known as brucellosis spondylitis and spinal tuberculosis) is confirmed. Because clearing the intervertebral space will cause the loss of intervertebral bone and the loss of intervertebral height, leading to poor bone healing of the intervertebral space, thus affecting the stability of the spine, It is not conducive to the recovery of the patient's spinal function, so bone graft fusion is necessary to provide long-term stability for the spine, while avoiding the occurrence of broken nails and rods due to excessive long-term load and stress concentration of pedicle screws [26]. For example, for patients with simple focus removal and interbody bone grafting, because the spine is

unstable after surgery and the implanted bone is not fused in a short time, the patient needs to stay in bed for a long time, and the incidence of complications will also increase. The internal fixation of vertebral arch and heel screw can solve this problem.

The pedicle screw can largely solve the kyphosis deformity of the diseased spine, and the use of the pedicle screw can give immediate stability to the spine. Therefore, postoperative patients can get out of bed earlier than those without internal fixation surgery, thus reducing the occurrence of postoperative complications, and more conducive to the fusion of implanted bone. Only when the stability of the spine is reconstructed, can the recovery of infectious spondylitis be beneficial [27,28]. Tian Ye and Yang Xinming [29] performed posterior debridement, bone grafting and internal fixation on 62 patients with lumbar brucellosis spondylitis requiring surgical treatment, and all patients achieved satisfactory results. Therefore, posterior internal fixation has better advantages for patients with brucellosis spondylitis, and has a positive role in promoting their rapid recovery; All 44 patients in this group were treated with posterior pedicle internal fixation. Postoperative follow-up also confirmed the advantages of posterior approach internal fixation. All patients had good spinal stability, no spondylolisthesis, good kyphosis correction, intervertebral space bone grafting and fusion, and the pedicle screw had firm force, no looseness, no broken screw or broken rod.

The Significance, Feasibility and Advantages of Limited Debridement for Brucellosis Spondylitis:

The key to the successful operation of brucellosis spondylitis is to remove the focus. The removal of the diseased tissue can alleviate or relieve the pain symptoms of the affected spinal region of the patient, eliminate the preoperative fever, anorexia and malnutrition caused by inflammation. Only by removing the focus can provide a reliable recovery condition for the patient after recovery, reduce drug resistance and prevent the recurrence of the disease. But in clinical practice, sometimes in order to achieve the goal of so called complete removal of diseased tissue, expanding the scope of surgery and removing normal peripheral tissue, but bringing greater trauma and burden to patients, so in recent years, scholars at home and abroad are more inclined to limited focus removal. The so-called limited focus removal, compared with traditional focus removal, does not mean that the removal is not complete enough, but that the limited surgical incision is scientifically and safely implemented Limited trauma, limited fixation of spinal segment and limited removal of lesion during operation. The limited surgical incision is compared with the traditional surgical incision. Before the operation, the lesion vertebral segment is judged according to the image data, and the disinfection is performed with a single C-arm X-ray machine.

Accurate positioning ensures the correct position of the incision during the operation. Only one normal vertebral body above and below the diseased vertebral body is exposed during the operation, which is different from the traditional operation that requires more than one normal vertebral body above and

below the diseased vertebral body. This method has small incision, small trauma, less bleeding, and small tissue scar after the operation, which significantly reduces the discomfort in the wound area after the operation, and is conducive to the rapid recovery of patients. Before operation, the residual height of the diseased vertebral body and the degree of bone destruction of the vertebral body and pedicle were judged according to the image data and the direct vision during the operation. If the height of the diseased vertebral body is $\geq 1/2$ of the normal vertebral body, the bone of the pedicle and the upper part of the vertebral body is intact, the damage of the lower part of the vertebral body is light, and the sclerotic bone is less, and the pedicle screw can be placed in the diseased vertebral body after being smeared with streptomycin; If the height of the diseased vertebral body is less than $1/2$ of the normal vertebral body, the vertebral body is severely damaged or the spine is unstable, select the inter-disease vertebral segment screw placement [27-29]. Therefore, the so-called diseased vertebra nail placement does not mean that all diseased vertebra can be nailed, which needs to be determined according to the residual height of the diseased vertebra and the bone conditions of the vertebral body and pedicle.

In recent years, the placement of screws in diseased vertebrae was accepted. In the past, it was believed that the placement of screws in diseased vertebrae was easy to cause infection or disease recurrence, and the insertion of bone in diseased vertebrae into pedicle screws was not good, which was easy to cause internal plant loosening and prolapse, leading to the failure of internal fixation surgery. With the improvement of orthopedic pedicle screw design and the selection of clinical sensitive drugs, the placement of diseased vertebral screw is widely used in clinical practice and the curative effect is gradually affirmed. Domestic scholars Sun Chaofan and Yang Xinming [30] performed focus nailing and short segment internal fixation on 20 patients with BS involving the lumbar spine. All the evaluation indexes of follow-up after the operation recovered well, and infectious spondylitis was cured. Clinical research shows that the length of the fixed segment of the spine is positively correlated with the incidence of adult spinal deformities and adjacent vertebral diseases. The longer the fixed segment, the higher the incidence [31,32]; the limited internal fixation uses short segment fixation to meet the maximum range of motion of the lumbar spine. The incidence of spinal deformities and adjacent vertebral diseases is extremely low. The patients are better than the surgical patients who implement long segment internal fixation in terms of postoperative rehabilitation, long-term curative effect and the cost of internal fixation of the spine [33].

The removal of the focus is the basis and key to the success of the operation. It mainly removes the abscess or inflammatory granulation tissue swelling, necrotic disc, large paravertebral abscess, damaged endplate, vertebral body and facet joints that invade the vertebral canal; with the in depth study of infectious spondylitis, the traditional radical debridement is lack of unified standardization. The radical debridement is not a single purpose of surgery, but the fundamental purpose is to remove the large abscesses, necrotic discs and inflammatory tissues

that compress the spinal cord nerves through surgery. Small localized abscesses at paravertebral or prevertebral sites can be absorbed through standard and reasonable drug treatment [1,12,34]. The clinical observation and postoperative follow-up of 44 patients in this group showed that the VAS score gradually decreased and the back pain gradually relieved over time; There were 16 patients with neurological impairment before operation, and the ASIA neurological function grading was significantly improved and recovered after operation; Imaging also showed that the inflammatory absorption of the vertebral body and paravertebral tissues, the spinal dura mater in the spinal canal was not compressed, and the cauda equine nerve sequence was good; The above instructions implement limited focus clearance and limited spinal segmental fixation (short segmental fixation) It is feasible and has many advantages for controlling the development of inflammation, relieving pain, relieving spinal cord nerve compression and promoting rapid recovery.

Advantages of Individualized Drug Treatment for Brucellosis Spondylitis

The policy of drug treatment is to continuously, adequately, jointly, regularly and in a variety of ways. On the basis of the first-line and second-line drugs given in the "Guidelines for the Diagnosis and Treatment of Brucellosis (Trial)", and in combination with the individual differences of patients, drug sensitivity test results and adverse reactions, the type, dose and frequency of individual drugs are formulated to achieve the best effect of drug treatment, The treatment scheme of doxycycline + sulfamethoxazole + rifampicin is the first choice. The combined use of drugs is the fundamental basis for curing brucellosis spondylitis and preventing recurrence. For the relapse cases after the drug cure, most patients can also achieve good curative effect by adjusting the drug use [21]. However, with the abuse of antibiotics, *Brucella* also gradually appears drug resistance phenomenon [35-37]; the most common clinical *Brucella ovis* has shown resistance to rifampicin and sulfamethoxazole, and these two drugs are also drugs in the triple regimen commonly used in the first-line treatment of BS in China [35].

In this group, 2 patients were allergic and intolerant to doxycycline and sulfamethoxazole in the first-line plan, and changed to rifampicin + fluoroquinolones + streptomycin according to the allergy and individual physical condition, and 4 patients were allergic to rifampicin, and changed to doxycycline + sulfamethoxazole + tobramycin. Patients with endocarditis and orchitis were treated with third-generation cephalosporin and short-term low-dose glucocorticoid under the guidance of the specialist. After the operation, continue to adjust and apply the sensitive drugs for the treatment of brucellosis spondylitis according to the individualized treatment plan before the operation or the drug sensitivity test results.

On the premise of closely monitoring the liver and kidney functions, make a good choice of drugs, compatibility, dosage, route and frequency of administration, and complete the standardized course of drug treatment [1,38,39]. The 44 patients

in this group were treated with individualized drug treatment scheme before and after operation for brucellosis spondylitis. The follow-up showed that the indicators for evaluating the control of inflammatory reaction, CRP, ESR, tiger red plate agglutination test, and serum tube agglutination test, were normal after 3 months of operation, and the last follow-up patients met the clinical cure standard, indicating that the individualized drug treatment scheme implemented by the patients in this group was effective for early control of infection It is feasible and effective to eliminate inflammation in the later stage.

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