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Surgical management for lumbar brucella spondylitis

Posterior versus anterior approaches

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Abstract

There has been no ideal surgical approach for lumbar brucella spondylitis (LBS). This study aims to compare clinical efficacy and safety of posterior versus anterior approaches for the treatment of LBS.

From April 2005 to January 2015, a total of 27 adult patients with lumbar brucella spondylitis were recruited in this study. The patients were divided into 2 groups according to surgical approaches. Thirteen cases in group A underwent 1-stage anterior debridement, fusion, and fixation, and 14 cases in group B underwent posterior debridement, bone graft, and fixation. The clinical and surgical outcomes were compared in terms of operative time, intraoperative blood loss, hospitalizations, bony fusion time, complications, visual analog scale score, recovery of neurological function, deformity correction.

Lumbar brucella spondylitis was cured, and the grafted bones were fused within 11 months in all cases. It was obviously that the operative time and intraoperative blood loss of group A were more than those of group B ($P = .045$, $P = .009$, respectively). Kyphotic deformity was signifcantly corrected in both groups after surgery; however, the correction rate was higher in group B than in group A ($P = .043$). There were no significant differences between the two groups in hospitalizations, bony fusion time, and visual analog scale score in the last follow-up ($P = .055$, $P = .364$, $P = .125$, respectively).

Our results suggested that both anterior and posterior approaches can effectively cure lumbar brucella spondylitis. Nevertheless, posterior approach gives better kyphotic deformity correction, less surgical invasiveness, and less complications.

Abbreviations: LBS = lumbar brucella spondylitis, VAS = visual analog scale, WHO = World Health Organization.

Keywords: anterior, lumbar brucella spondylitis, posterior

1. Introduction

Brucellosis was first described approximately 130 years ago by David Bruce who isolated the bacteria from soldiers who had died from Malta fever. The World Health Organization (WHO) reported that there are half a million new patients with brucellosis worldwide; therefore, it remains a severe health problem, mainly in the Middle East, America, and the Mediterranean.[1] Brucellosis affects the entire body, with the spine being the most commonly affected. Brucella spondylitis was first described by Kulowski and Vinke in 1932[2] and has a reported incidence of 6% to 58%.[3–6] The lumbar spine is the most commonly affected in patients with spondylitis, followed by the thoracic and cervical spine.[7,8] Antimicrobial chemotherapy is the mainstay of brucella spondylitis treatment but is ineffective in preventing progressive kyphotic deformities and neurologic deficits. With the development of medical technologies and advances in the understanding of brucella spondylitis, aggressive surgical interventions have been developed; however, the ideal surgical approach for lumber brucella spondylitis (LBS) is still controversial. Therefore, this study compared the clinical efficacy and safety of posterior versus anterior approaches for the treatment of LBS.

2. Materials and methods

The study was approved by the Ethics Committee of the First Affiliated Hospital of University Of South China (201606LC31). And all parents or caregivers provided written informed consent. This study involved 27 patients with LBS who underwent surgical treatment in our hospital between June 2005 and June 2015. The patients were divided into 2 groups according to the surgical approach, 14 patients (5 males and 8 females with an average age of 39.8 ± 12.2 years old) in group A who underwent one-stage anterior debridement, fusion, and fixation, and 13 patients in

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Table 1

Clinical data of patients.

	Group A (n=13)	Group B (n=14)	*P*
Sex (male/female)	5/8	4/10	.695
Age, y	39.8±12.2	43.5±11.3	.418
Amount of bleeding, mL	430.0±75.1	350±70.7	.009
Operation time, min	234±36.2	206.7±26.3	.045
Time in hospital, days	13.4±1.6	14.7±1.7	.055
Duration of follow-up, mo	31.6±6.3	32.8±4.8	.580
Fusion time, mo	7.9±1.9	8.8±1.4	.125
VAS			
Pre	7.1±1.2	6.9±0.9	.257
FFU	1.2±0.8	1.1±0.9	.364

Pre=preoperative, FFU=final follow-up, VAS=visual analog scale.

group B (4 males and 10 females, with an average age of 43.5±11.3 years' old) underwent posterior debridement, bone graft, and fixation. The duration of symptoms before admission was on average 2.6±1.4 months and patients presented with constitutional symptoms, back pain (100%), stiffness/restricted back activity (100%), intermittent fever (45%), and nerve injury (50%). The diagnosis of LBS was based on a therapeutic response to anti-tuberculosis therapy, positive bacterial culture of a biopsy specimen, a histologic finding of inflammation in the granulomatous tissue, or a minimum brucella antibody titer >1:160 in the brucellosis agglutination test. The kyphotic angle was measured by drawing 2 lines, one was along the top surface of the immediate upper normal vertebral body, and the other away from the diseased segment.[9] The clinical outcome was assessed preoperatively and at the last follow-up visit using the visual analog scale (VAS) questionnaire. The exclusion criteria were previous surgery; lumbosacral lesion induced by disease, such as tuberculosis, metastasis, or multiple myeloma; patients with poor health status. There were no significant differences between the two groups in age, sex ratio, preoperative Cobb angle, and VAS. Patients' general information is summarized in Table 1.

2.1. Preoperative management

All patients received antibrucellosis chemotherapy orally in the form of doxycycline (100 mg, every 12 hours) and rifampicin (15 mg/day, daily) for at least 2 weeks before surgery. Surgery was performed when their temperature significantly decreased.

2.2. Surgical procedure

The anterior group underwent debridement and interbody fusion, as well as internal fixation via the anterior approach,[10] whereas a posterior approach was applied in the posterior group.[11] A representative case is shown in Figure 1.

Figure 1. A 45-year-old male patient with brucella spondylitis at L4-5, who underwent posterior only surgery. (A and B) Preoperative radiograph showed severe narrowing of the intervening disk space. (C and D) Preoperativ computed tomography showed erosions at the level of the inferior end plate of L4 and superior end plate of L5 vertebra. (E and F) Postoperative radiograph showed that lumbar brucella spondylitis was cured.

2.3. Postoperative procedure

The patients were treated with antibrucellosis chemotherapy for at least three and six months and the drainage tube was removed when the drainage flow was <50 mL/24 hours. The patients were allowed to start walking 5 days postoperatively. The operative time, intraoperative blood loss, hospitalization, bony fusion, the incidence of complications, VAS score, recovery of neurological function, and correction of the kyphotic deformity were measured. All statistical analyses were performed using SPSS 19.0 and the data are presented as mean ± standard deviation. The χ^2 tests and paired Student t test were used in this study, with a $P < .05$ considered statistically significant.

3. Results

All patients had significant improvement in constitutional symptoms postoperatively, recovering all neurological functions. The posterior approach group achieved better outcomes with regard to operative time and blood loss than the anterior approach group ($P = .045$, $P = .009$, respectively). The kyphotic deformity was significantly corrected in both groups postoperatively, but the correction rate was higher in the posterior group than in the anterior group at the final follow-up ($P = .043$). There were no significant differences between the 2 groups regarding hospitalization, bony fusion time, and VAS score at the last follow-up ($P = .055$, $P = .364$, $P = .125$, respectively). No severe complications were observed in both groups. There were 2 cases with complications postoperatively in group A: 1 patient suffered a wound infection and one patient suffered loosening of fixation because of osteoporosis. The internal fixation was removed after interbody fusion was found at the follow-up. Patients' information is summarized in Tables 1 and 2.

4. Discussion

The incidence of brucellosis in China is 1 per 100,000 population annually, most commonly involving the spine and it is the foremost cause of debilitating and disabling complications.[12–15] Antimicrobial chemotherapy remains the mainstay of LBS treatment and the WHO recommends that antimicrobial chemotherapy should consist of doxycycline and rifampicin or doxycycline and streptomycin. However, surgical treatment is necessary in the following cases: failure of conservative treatment, spinal cord compression or radiculopathy, or spinal instability.

Currently, there is no criterion standard surgical treatment for LBS, and the surgical approach for LBS is controversial and has developed from the experience in treating spinal tuberculosis, which was first described by Hodgson and Stock.[10] In 1988, Redfernet et al[16] reported successful treatment of non-tuberculous spinal infection by anterior debridement, fusion, and fixation, whereas Katonis et al[17] treated brucella spondylitis with anterior corpectomy and reconstruction. More recently, Yin et al showed good clinical outcomes of anterior debridement, interbody fusion, and instrumentation for the treatment of LBS.[10] Generally, the anterior approach provides the surgeon with direct visualization of radical debridement and nerve decompression without affecting the stability of the spinal posterior column. Nonetheless, the anterior procedure has some disadvantages, it is time-consuming compared to the posterior approach[18] and associated with complications such as vascular injury, graft failure, and postoperative ileus.[19–21] In our series, the operative time was longer, with more intraoperative blood loss and complications in the anterior group compared to the posterior group ($P < .05$). Furthermore, it is very difficult to perform multilevel or lumbosacral junction (L4-S1) instrumentation owing to the anatomic characteristics and the anterior approach fails to correct the preexisting deformity and prevent its progression.[22] Consistent with the other reports, the average kyphosis angle was 44.32° ± 7.26°preoperatively, returning to 11.72° ± 2.85°6 weeks after the operation, with an apparent loss of the correction at the final follow-up and greater loss of the correction angle at the 2-year follow-up. Also, the anterior fixation provides poor pullout strength in the osteopenic bone.[23]

Recently, surgeons confirmed that posterior instrumentation in spine surgery can significantly correct the preexisting deformity and improve the sagittal alignment, hence, posterior debridement, translaminar lumbar interbody fusion, and internal fixation has become widely applied in spinal surgery.[6] Also, we have accumulated abundant experience in treating spinal tuberculosis, achieving good clinical efficacy. However, the posterior approach destroys the healthy posterior spinal column, so posterior approaches are considered unsafe.[24,25] Moreover, surgeons are concerned that the posterior approach could cause intraspinal and central nervous system infection.[26] In 2016, Chen et al[11] reported no recurrence of BS in 24 patients with BS who underwent posterior debridement, bone graft, and instrumentation, with a significant improvement in VAS scores and neurologic function. Also, a study reported that 62 LBS patients underwent posterior debridement, bone graft, and fixation to remove the brucella lesion, and all patients were cured at the final follow-up, concluding that the posterior approach was more suitable for LBS.[27] In our cohort, the findings are consistent with Lee et al and Chen et al, with no cases of intraspinal and central nervous system infection, attributed to effective antimicrobial chemotherapy preoperatively and postoperatively. In addition, rigid stabilization of the spine plays an important role in treating spine infection, which is beneficial to suppress the infection and provide a relatively stable internal environment to prevent relapse.[28]

The posterior approach is far away from the abdominal cavity, thereby avoiding the possibility of severe postoperative complications. Also, in our study, the complication rate was similar in the posterior group and research has shown that minimal paravertebral abscess, if present, is smaller than that usually observed in tuberculosis.[11] The abscess seldom involves the psoas. There was direct visualization of the operating space (270°) by resection of one side of the lamina, facet joints, and pedicle for performing the radical debridement. Also, the posterior pedicle screws can provide sufficient spinal 3-column stability, effectively correct kyphosis, and obviate the evolution of correction.[29] The kyphotic deformity was significantly corrected in both groups after surgery, with a higher correction rate in group B than in group A ($P = 0.043$). Hirakawa et al[30]

Table 2

Kyphosis correction.

	Group A (n = 13)	Group B (n = 14)	P
Mean Cobb angle, degrees			
Pre	14.6 ± 1.2	15.4 ± 1.8	.173
Post	6.1 ± 1.3	5.2 ± 0.8	.035
FFU	7.7 ± 1.5	6.6 ± 0.9	.043

Pre = preoperative, Post = postoperative, FFU = final follow-up.

demonstrated in their experiments that spinal stability promotes neurological recovery and accelerate interbody fusion. The posterior surgical approach is simpler than the anterior surgery, achieving better clinical outcomes owing to minor surgical invasion, effective kyphosis correction, and fewer complications. It can also be performed on patients for who the anterior fusion has failed.

This study had some limitations, for example, a relatively small study sample and lack of long-term observation; hence, further prospective studies involving more patients are required to assess the long-term effectiveness and safety of the posterior approach.

5. Conclusion

The posterior approach provided better clinical and radiographic outcomes than the anterior approach; hence, it is a more appropriate surgical approach for lumbar brucella spondylitis associated with smaller incisions, reduced, blood loss, and early recovery.

Author contributions

Investigation: Peng Na, Xinhua Yin.
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