

Curative effect comparison of anterior and posterior approach in debridement combined with bone graft fusion for the treatment of spinal tuberculosis.

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Abstract

Objective: To compare the curative effect of anterior or posterior approach debridement combined with bone graft fusion in treatment of spinal tuberculosis.

Methods: 92 cases of thoracic and lumbar tuberculosis patients in our hospital were collected in recent 3 years. All patients were randomly divided into two groups (Group A and B), 42 cases in each group. The patients of Group A and B were respectively treated with anterior or posterior debridement combined with bone graft fusion. Comparing the clinical efficacy in the two groups.

Results: There was no significant difference in the time of operation, the intraoperative and postoperative bleeding volume, and hospital stays after operation in the two groups ($P>0.05$). After surgery, nerve function, mean Cobbs of the two groups of patients, VAS score, erythrocyte sedimentation rate were significantly improved compared with before operation ($P<0.05$). And the B group of kyphosis correction rate was significantly higher than A group ($\chi^2=5.446$ $P=0.019$), meanwhile the improvement of VAS score ($\chi^2=9.237$ $P<0.001$) and the time of recovery of ESR ($\chi^2=7.005$ $P<0.001$) group was significantly better than group A.

Conclusion: Compared with the anterior approach, posterior approach for correction of kyphosis was higher, the pain improvement and erythrocyte sedimentation rate of the effect is more obvious, and less traumatic, so the posterior surgical treatment is relatively better.

Keywords: Spinal tuberculosis, Debridement, Bone graft, Internal fixation, Comparison.

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Introduction

China remains one of the most highly burdened countries in global TB with its incidence ranking second in the world [1]. Spinal tuberculosis is one of the common extrapulmonary tuberculosis, which has a higher incidence ratio in the tuberculosis of bone and joint [2]. The spinal tuberculosis mostly occurs in thoracic and lumbar tuberculosis, because of patients' bone destruction, abscess formation, and kyphosis or scoliosis, which complicated with muscle spasms, back pains, nerve compression, even led to paralysis of lower limbs in severe cases [3]. Related research shows that it has achieved remarkable curative effect to treat spinal tuberculosis by the surgical operation of which the core is anterior debridement. Therefore, anterior debridement and bone graft fusion combined with anterior or posterior internal fixation has become the main mode of operation for the treatment of spinal tuberculosis nowadays [4,5]. In recent years, with the progress of posterior spinal surgery and internal fixation, the treatment of posterior debridement as well as bone graft fusion with internal fixation for spinal tuberculosis has also gotten a certain development. However, there is a certain controversy of the operation difficulty, and rationality, etc. because the posterior

approach operation is conducted in non-direct vision [6,7]. For this reason, 92 cases of patients with thoracolumbar spinal tuberculosis in our hospital were chosen as the research object. Comparing the clinical treatment effect of anterior and posterior debridement as well as bone graft fusion with internal fixation for spinal tuberculosis, it can provide a reliable reference for the clinic. The specific reports are as follows.

Materials and Methods

General materials and grouping

Total of 92 patients with thoracolumbar tuberculosis admitted in the Third Hospital of HeBei Medical University in the period of July 2012~July 2015 were collected, of which there were 54 male and 38 female cases. All the patients were confirmed the diagnosis of thoracic or lumbar tuberculosis by X slice imaging and pathological examination, etc and were excluded the following situations: 1) relapse patients after the surgery of spinal tuberculosis; 2) patients concomitantly suffering from severe osteoporosis, spinal tumors, etc; 3) patients with severe pulmonary or kidney tuberculosis and other important organs' structural or functional disorder; 4)

patients with respiratory or circulatory system disease; 5) patients in disagreement to accept this treatment. The patients in this group of 92 cases were randomly divided into two groups of A and B. Group A had 46 cases with the distribution of ages in 18~67, the average age (37.1 ± 14.3) years old, and kyphotic deformity of 17 cases (Cobb's angle of $5.3^\circ \sim 47.2^\circ$, average of $22.5 \pm 9.3^\circ$). The observation group had 46 cases with the distribution of ages in 17~66, the average age (36.5 ± 13.2) years old, and kyphosis of 19 cases (Cobb's angle of $9.7^\circ \sim 79.3^\circ$, average of $28.3 \pm 14.6^\circ$). There were no significant differences between the two groups in genders, ages, types of tuberculosis, kyphotic deformity, nerve function classification of American Spinal Injury Association (ASIA classification) ($P > 0.05$) (Table 1).

Table 1. Comparison of the general situation (n%, $\bar{x} \pm s$).

General data	Group A (n=46)	Group B (n=46)	χ^2 or t	P value
Male/Female	28/18	26/20	0.179	0.672
Average ages(years old)	37.1 \pm 14.3	36.5 \pm 13.2	0.209	0.835
Thoracic vertebra tuberculosis	15 (32.6%)	14 (30.4%)	0.050	0.822
Thoracolumbar tuberculosis	11 (23.9%)	10 (21.7%)	0.062	0.804
Lumbar and sacral vertebra tuberculosis	20 (43.5%)	22 (47.8%)	0.229	0.633
Kyphotic deformity	17 (40.0%)	19 (41.3%)	0.222	0.637
Dysneuria	16 (34.8%)	18 (39.1%)	0.223	0.637

Treatment methods

All the patients received the treatment of conventional four or five combinations of anti-tuberculosis drugs for 3~4 weeks, each patient was given with general anesthesia combined with tracheal intubation and perspective orientation by X-ray machine. The patients in group A received the treatment of anterior debridement as well as bone graft fusion with internal fixation: different approaches were used in thoracic, thoracolumbar and lumbar segments to reach the anterior lateral of vertebral body. Pus, dead bone and soft tissue necrosis were removed from vertebral lesions area, and resection of the lesion and part of tissue in adjacent intervertebral disc was also conducted until the normal vertebral bone. Then bolts were implanted in the upper and lower vertebral bodies of lesion area, which were considered as a supporting point to install distractor. Meanwhile, the repair and recovery of abnormal vertebral bodies to reach normal

Table 2. Comparison of operation situation ($\bar{x} \pm s$).

Index	Group A (n=46)	Group B (n=46)	t	P value
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height and normal vertebral gap width were made to corrected kyphosis deformity. The appropriate titanium mesh was filled with autograft bone or allograft bone, implanting into defective vertebral clearance, then screws and steel plate were implanted. Patients in group B were given posterior debridement as well as bone graft fusion with internal fixation: make excision of intervertebral facet joints on both sides and pedicle of vertebral arch with diseased vertebral body as midpoint and posterior median of spinous process as incision. Meanwhile, clear the pathological tuberculosis in anterior column and its surrounding, and flushed the lesions, cut off the upper and lower vertebral endplate of the lesion area or repair the bone surface of vertebral body, then on repair of vertebral cartilage endplate, and then implant screw into vertebral pedicle, place connecting rods, and separate intervertebral space. The next step was to select the appropriate titanium mesh or allogeneic tubular bone, fill in it with bone granule to implant into intervertebral space via lateral direction, and pressure to be fixed after right position with transverse connection between the fixed rods. Drainage tube was retained at the end of operation, all patients were given with Holter monitoring and regular treatment after operation and follow-up after discharge.

Observation index

Observing and recording the operation situation of the two groups of patients (including the operation time, intraoperative and postoperative bleeding volume, and hospital stays after operation) was needed. Meanwhile, the changes of patients' neurological function, segmental kyphosis Cobb angle, Visual Analogue Score (VAS score) of pain and (erythrocyte sedimentation rate, ESR) during preoperative and postoperative follow-up period (postoperative 1 month, 3 months, 6 months, and 12 months) were also plus.

Statistical analysis

SPSS19.0 statistical software were used for data analysis, and measurement data were expressed as ($\bar{x} \pm s$) by t test and count data as (n,%), by χ^2 test $P < 0.05$ meant the difference has statistical significance.

Results

Comparison of surgery situation of the patients in two groups

As shown in Table 2, there was no significant difference in the time of operation, the intraoperative and postoperative bleeding volume, and hospital stays after operation in the two groups ($P > 0.05$).

Curative effect comparison of anterior and posterior approach in debridement combined with bone graft fusion for the treatment of spinal tuberculosis

Time of operation (min)	285.4 ± 135.4	269.8 ± 151.6	0.521	0.604
Bleeding volume(ml)	914.6 ± 312.4	891.6 ± 485.2	0.27	0.788
Hospital stays after operation(days)	22.8 ± 5.3	21.0 ± 4.5	1.756	0.082

Comparison of changes of neurological function before and after operation in two groups

As shown in Table 3, compared to preoperative situation, postoperative nerve function of the patients in two groups

received better recovery, however, there was no significant difference between the two groups (P>0.05).

Table 3. Comparison of changes of neurological function before and after operation.

Group	ASIA classification	Preoperative ASIA classification	Postoperative 3 months ASIA classification	Postoperative 12 months ASIA classification
Group A (n=46)	A	0	0	0
	B	3	1	0
	C	9	6	3
	D	21	17	14
	E	13	22	29
Group B (n=46)	A	0	0	0
	B	4	2	0
	C	12	9	4
	D	20	15	11
	E	10	20	31
Hc		0.968	0.742	0.317
P		0.333	0.458	0.751

Comparison of Cobb's angle change before and after operation

As seen in Table 4, compared to preoperative situation, postoperative Cobb's of the two groups of patients were

significantly improved, and kyphosis correction rate of the patients in group B was significantly higher than that of group A (P<0.05).

Table 4. Comparison of Cobb's angle change before and after operation (% , $\bar{x} \pm s$).

	Group A (n=46)	Group B (n=46)	t/x ²	P
Preoperative (°)	22.5 ± 9.3	23.3 ± 11.6	0.313	0.755
Postoperative 1 month (°)	6.5 ± 4.3*	12.2 ± 7.7*	3.342	0.001
Postoperative 12 months (°)	11.2 ± 10.1*	17.1 ± 11.4*	2.627	0.011
Correction rate	30.4%	56.7%	5.446	0.019
Correction loss rate	25.7%	25.9%	0.047	0.828

Note: * means the comparison between postoperative and preoperative situation in group A, and P<0.05.

Comparison of VAS scores before and after operation in patients of two groups

As seen in Table 5, compared to preoperative situation, postoperative VAS score of pain in patients of two groups were

significantly improved (P<0.05), and the degree of pain decline in B group after surgery was significantly higher than that in group A (P<0.05).

Table 5. Comparison of VAS scores before and after operation ($\bar{x} \pm s$).

Group	Preoperative VAS score	Postoperative 3 months VAS score	Postoperative 6 months VAS score	Postoperative 12 months VAS score
Group A	6.89 ± 0.93	4.36 ± 0.53*	3.76 ± 0.25*	2.74 ± 0.43*
Group B	7.19 ± 1.03	4.01 ± 0.51*	3.12 ± 0.32*	2.01 ± 0.32*
t	1.466	3.227	10.689	9.237
P	0.146	0.002	<0.001	<0.001

Note: *means the comparison between postoperative and preoperative situation, and P<0.05.

Comparison of ESR changes before and after operation in the patients of two groups

As can be seen from Table 6, compared to preoperative situation, there were significant improvement in the erythrocyte sedimentation rate of the two groups of patients after 1 weeks of surgery (P<0.05), and the rate of improvement of group B was better than that of group A (P<0.05).

Table 6. Comparison of ESR changes before and after operation ($\bar{x} \pm s$).

Group	Preoperative (mm/h)	Postoperative 1 week (mm/h)	Time of recovery to normal level (weeks)
Group A	43.5 ± 6.7	87.1 ± 7.4*	9.9 ± 2.6
Group B	42.9 ± 5.8	80.3 ± 5.9*	6.8 ± 1.5
T	0.459	4.873	7.005
P	0.647	<0.001	<0.001

Note: *means the comparison to preoperative situation, and P<0.05.

Discussion

The damage from spinal tuberculosis to vertebral body and intervertebral disc is a slow process, and it will eventually cause the spinal stability become worse, resulting in kyphosis deformity, nerve compression symptoms, and even paralysis. The main clinical treatment method is surgical operation based on effective anti-tuberculosis drug for the removal of diseased tissue, relieve of spinal compression, correction of kyphosis deformity, and reconstruction of spinal stability [8,9]. Thus surgical treatment can be seen to play an important role in treating spinal tuberculosis.

At present, there are mainly two approaches such as anterior and posterior ones in surgical debridement. Due to spinal tuberculosis mostly accumulating front and middle column structure, adopting anterior debridement can make lesions fully exposed and directly and thoroughly removed under direct vision. Therefore, the anterior surgery whose core is anterior debridement or anterior and posterior combination surgical treatment of thoracolumbar spinal tuberculosis has been widely applied in recent years. Zhuo et al. [10] has adopted cervicothoracic spinal tuberculosis debridement and bone graft with internal fixation for the treatment of cervicothoracic

spinal tuberculosis by anterior approach, and all the patients have been safe through the perioperative period. In addition, there have been no tuberculosis recurrence, and the patients with symptoms of nerve compression have gotten significant improvement comparing with preoperative period. It indicates that anterior debridement as well as bone graft with internal fixation for the treatment of cervicothoracic spinal tuberculosis has the functions of recovery on spinal biomechanics, correction on kyphosis deformity, etc. However, the traumatic degree and risk of the surgery are both high for some patients with long segment lesions. Moreover, due to complicated anatomic approach of anterior surgery, it may cause some degrees of damage to the thoracic and abdominal organs, so the patients with poor pulmonary function appear low tolerance of anterior surgery.

Jianglong et al. [11] believes that although the effect of anterior surgery has been basically recognized, the anterior surgical approach will cause a certain degree of damage to the large blood vessels, causing bleeding increased and operation time extended. Thus operators of the surgery are required to be careful. In recent years, with the continuous development of the posterior spinal surgery and internal fixation techniques, some scholars start applying the posterior debridement as well as bone graft fusion with internal fixation to the treatment of spinal tuberculosis. Shuofu et al. [12] thinks the anterior approach has less bleeding volume and correction loss angle, relatively fast bone fusion and other advantages through the comparison of anterior and posterior debridement for spinal tuberculosis treatment. Wei et al. [13] performed the comparison between anterior and posterior internal fixation of anterior debridement and bone graft fusion on clinical effect for multi-segment thoracolumbar tuberculosis. The results showed that the operation time and postoperative hospitalization days of anterior internal fixation was less than that of posterior one. Meanwhile, anterior surgery had less bleeding volume, which prompted posterior surgery on multi-vertebral tuberculosis had important significance in kyphosis correction. In addition, compared with the anterior surgery requiring two incisions and two surgeries, posterior surgery can achieve the operation under direct vision of vertebral body in the range of 270° in epidural decompression.

Adequate decompression can also achieve the purpose of complete removal of the lesions by anterior surgery, no damage to the spinal cord, minimizing the pain of operation to patients,

Curative effect comparison of anterior and posterior approach in debridement combined with bone graft fusion for the treatment of spinal tuberculosis

as well as reducing the cost of surgery. The results of this study showed that there were no significant differences between anterior and posterior debridement and body graft fusion with internal fixation on the operation time consumption, amount of bleeding during and after surgery, postoperative hospitalization days and recovery time of nerve function. However, the improvement degree of kyphosis correction rate, VAS score and ESR index in posterior surgery was significantly superior to that of group A ($P < 0.05$), which had a consistent conclusion with those reported [14-16].

In summary, anterior and posterior debridement as well as bone graft fusion with internal fixation for the treatment of spinal tuberculosis can both obtain good clinical curative effect. But the kyphosis correction rate of posterior operation for spinal tuberculosis was significantly higher than that of anterior surgery, and the improvement of pain and ESR indicators of patients was significantly better than that of anterior surgery. Meanwhile, posterior has less trauma, so it is worth further clinical promotion and application.

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