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ARTICLE

Exploration and Discussion on the Clinical Therapeutic Effects of the Application of Cross-Injury Vertebral Fixation and Via-Injury Vertebrae Fixation in the Treatment of Bone Tumor with Thoracolumbar Spine Fracture

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ABSTRACT

Objective: To explore and discuss the clinical therapeutic effects of the application of cross-injury vertebral fixation and via-injury vertebrae fixation in the treatment of bone tumor with thoracolumbar spine fracture. **Methods:** A total of 58 patients with bone tumors and thoracolumbar spine fractures admitted to our hospital from February to February 2019 were selected as the study subjects. They were randomly divided into control group and observation group, with 29 cases in each group. The patients in the control group received cross-injury vertebral fixation treatment, while the patients in the observation group were treated with via-injury vertebral fixation. The therapeutic effects of the two groups were compared. **Results:** The operation time and hospitalization time of the observation group were significantly shorter than those of the control group ($P<0.05$), and the postoperative drainage volume of the intraoperative blood loss was significantly less than that of the control group ($P<0.05$). There was no significant difference in postoperative pain and spinal JOA scores between the two groups ($P>0.05$); there was no significant difference in the compression ratio of the injured vertebrae and the kyphosis Cobb angle between the two groups ($P>0.05$), after the operation, the two groups of patients were significantly reduced, and the compression ratio of the injured vertebrae and kyphosis Cobb angle of the observation group were more obvious ($P<0.05$); the vertebral height loss and Cobb angle loss in the observation group were significantly lower than those in the control group ($P<0.05$). **Conclusion:** In the treatment of bone tumor with thoracolumbar spine fracture, compared with cross-injury vertebral fixation, via-injury vertebral fixation has a more significant clinical effect and is more suitable for clinical application and promotion.

1. Introduction

Bone tumors and spinal fractures are clinically serious orthopedic diseases, often accompanied by symptoms such as pain, swelling and dysfunction, which greatly affect the patient's physical health and quality of life[1]. At present, the main clinical treatment of plate screw fixation is the preferred treatment for thoracolumbar spine fractures, which not only effectively promotes the reduction and fixation of the spine, but also helps patients

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with bone tumor resection to enhance the stability of their spine. It has important clinical significance for patients with bone tumor with thoracolumbar spine fracture[2-4]. However, in the treatment of thoracolumbar spine fractures, the choice of surgical approach and the determination of fixed segments have been controversial[5], Here, the application effects of cross-injury vertebral fixation and via-injury vertebral fixation in the treatment of bone tumor with thoracolumbar spine fracture were explored and discussed in this paper, reported as follows.

2. Data and Methods

2.1 Data

A total of 58 patients with bone tumor with thoracolumbar spine fracture admitted to our hospital from February to February 2019 were enrolled in this study. They were randomly divided into control group and observation group, with 29 cases in each group. In the control group, there were 19 male patients and 10 female patients; the age ranged from 25 to 58 years, with average age of (32.5 ± 2.3) years old; according to the fracture sites, 8 cases were T_{11}, 7 cases were T_{12}, 11 cases were L_1, 2 cases were L_2, and 1 case was L_3. There were 18 male patients and 11 female patients in the observation group; the age ranged from 26 to 58 years, with average age of (32.6±2.5) years old; according to the fracture site, 9 cases were T_{11}, 8 cases were T_{12}, 10 cases were L_1, 1 case was L_2, and 1 case was L_3. There was no significant difference in the comparison of the basic clinical data between the two groups, $P>0.05$.

Inclusion criteria: (1) All participating patients were clinically diagnosed by imaging examination, all patients with bone tumor with thoracolumbar spine fracture; (2) All patients underwent tumor resection in our hospital; (3) All patients voluntarily participated in the study under informed consent and signed consent forms.

Exclusion criteria: (1) Exclude patients with severe spinal cord injury and coagulopathy; (2) Exclude patients who do not meet the indications for surgery and who have no surgical contraindications; (3) Exclude patients with other major diseases and mental disorders.

2.2 Methods

All patients underwent general anesthesia and underwent surgery in the prone position. The patient's sternum stem and pelvis position are raised, and the patient's injured vertebra is set as the center from the posterior middle part of the patient, and the patient's injured part is exposed by a minimally invasive approach.

Patients in the control group underwent cross-injury vertebral fixation treatment, and pedicle screws were placed in the pedicles on both sides of the upper and lower vertebrae of the injured vertebrae. The pre-bent longitudinal link is placed and then opened to help the patient's injured vertebrae height to be restored, and the kyphosis and the like are corrected.

Patients in the observation group were treated with via-injury vertebral fixation, on the basis of postoperative follow-up of the control group, two pedicle screws were placed at the bilateral pedicle position, then the pre-bent iron rod was placed and the injured vertebra was tightened. The longitudinal side of the patient whose vertebral body endplate is seriously injured is longitudinally opened. After the height of the injured vertebra is restored, the nut on the side is tightened, and the other side can be appropriately opened according to the actual situation, finally, carefully check and fix the nut after tightening.

2.3 Observation Indexes

(1) Compare the operation and hospitalization of the two groups, including the operation time, intraoperative blood loss, postoperative drainage and hospitalization time.

(2) Compare the postoperative pain level and spinal function in the two groups. VAS and JOA scores were used to assess the degree of postoperative pain and spinal function in patients. The higher the VAS score, the lighter the patient's pain, and the higher the JOA score, the better the spine function.

(3) Compare the compression ratio and kyphosis Cobb angle of the two groups of patients before and after surgery.

(4) Observe and record the fracture recovery of the two groups of patients within six months after surgery, including the height of the vertebral body and the loss of Cobb angle.

2.4 Statistics

The data of 58 patients were all processed by statistical software (SPSS20.0). The counts and measurement data were compared and analyzed by chi-square test and t-test respectively. $P<0.05$ indicated that the comparison data was very different.

3. Results

3.1 The operation time and hospitalization time of the observation group were significantly shorter than those of the control group ($P<0.05$), and the postoperative drainage volume of the intraoperative blood loss was significantly less than that of the control group ($P<0.05$).

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Table 1. Surgery and hospitalization of the two groups of patients (`x±s)

Group	Control group (n=29)	Observation group (n=29)	*t*	P
Operation time (min)	87.4±7.1	71.2±6.8	8.87	0.00
Intraoperative blood loss (ml)	265.3±16.8	221.5±15.7	10.26	0.00
Postoperative drainage (ml)	146.5±19.6	115.5±19.5	6.04	0.00
Hospital stays (d)	18.9±2.9	17.4±2.6	2.07	0.04

3.2 After recording and observation, there was no significant difference in postoperative pain and spinal JOA scores between the two groups (p>0.05).

Table 2. Postoperative pain and spinal function in both groups (`x±s)

Group	Cases (n)	VAS score	JOA score
Control group	29	2.5±0.8	23.9±2.0
Observation group	29	2.4±0.7	23.5±1.8
t	-	0.51	0.80
P	-	0.61	0.43

3.3 There was no significant difference in the compression ratio of the injured vertebrae and the kyphosis Cobb angle between the two groups (p>0.05), after the operation, the two groups of patients were significantly reduced, and the compression ratio of the injured vertebrae and kyphosis Cobb angle of the observation group were more obvious (P<0.05).

Table 3. Compression ratio of the injured vertebrae and kyphosis Cobb angle (`x±s) before and after surgery in both groups

Group	Time	Control group (n=29)	Observation group (n=29)	*t*	P
Compression ratio of the injured vertebrae (%)	pre-operation	44.6±4.6	43.4±4.4	1.02	0.31
	post-operation	6.8±1.6	3.3±1.2	9.42	0.00
kyphosis Cobb angle (°)	pre-operation	22.3±2.7	22.4±2.8	0.14	0.89
	post-operation	6.8±1.2	4.5±0.8	8.59	0.00

3.4 After follow-up observation and records, the vertebral height loss and Cobb angle loss in the observation group were significantly lower than those in the control group (P<0.05).

Table 4. Fracture recovery in the two groups of patients within six months after surgery (`x±s)

Group	Cases (n)	Vertebral height loss (%)	Cobb angle loss (°)
Control group	29	6.2±0.7	3.8±0.5
Observation group	29	1.3±0.3	0.8±0.3
t	-	34.65	27.71
P	-	0.00	0.00

4. Discussion

Spinal fractures are clinically common orthopedic diseases. The incidence of thoracolumbar fractures is the highest[6-8], mostly caused by indirect external forces, which have adverse effects on patients' physical and mental health and quality of life. In addition, according to clinical studies, most patients with thoracolumbar fractures are accompanied by nerve damage and spinal cord damage[9-11], therefore, surgery should be performed in time to promote rapid recovery of spinal function, especially for patients with bone tumor with spine fracture, the cause of spinal cord and nerve damage should be relieved as soon as possible[12,13].

Commonly used surgical methods are mainly cross-injury vertebral fixation and via-injury vertebral fixation[14-16]. Among them, cross-injury vertebral fixation can achieve certain clinical effects; however, its drawbacks are also obvious. The postoperative spinal stress is more concentrated, which can easily lead to various complications, which affects the rehabilitation effect[17]. In addition, cross-injury vertebral fixation mainly concentrates the screws on the upper and lower parts of the patient's injured vertebrae, resulting in lack of effective support in front of them, resulting in the patient's anterior column being unable to be effectively restored and reconstructed, even losing its correction has a serious impact on the patient's recovery and prognosis[18], moreover, the anti-rotation ability of the pedicle screw internal fixation system is not good, so its lateral stability is usually poor, so that the fracture site and the surrounding intervertebral disc and ligament are not well repaired, even due to the short distance between the leading edge of the upper and lower vertebral bodies and the kyphosis of the vertebral body, the suspension effect appears[19], which has a serious impact on the patient's corrective effect. Via-injury vertebral fixation is a new derivative of cross-injury vertebral fixation. Two pedicle screws were added on the basis of cross-injury vertebral fixation, and the pedicle screws were properly optimized to strengthen the top thrust of the injured screw and the firmness of the fixed segment, which greatly improved the patient's reduction effect,

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at the same time, the burden on other screws is reduced, which effectively reduces the incidence of adverse reactions in patients[20].

5. Conclusion

In the above study, the duration of surgery and hospital stay in patients treated with via-injury vertebral fixation were significantly shorter than those treated with cross-injury vertebral fixation ($P<0.05$), moreover, the postoperative drainage volume of intraoperative blood loss was significantly less than that of patients treated with cross-injury vertebral fixation ($P<0.05$). In addition, the compression fracture rate and kyphosis Cobb angle of the two groups were significantly improved after surgery, and the improvement of patients with via-injury vertebral fixation was more obvious ($P<0.05$), the loss of vertebral height and the loss of Cobb angle in patients treated with via-injury vertebral fixation were significantly less than those treated with cross-injury vertebral fixation ($P<0.05$). It can be seen that in the treatment of bone tumor with thoracolumbar spine fracture, via-injury vertebral fixation has a more significant clinical effect than cross-injury vertebral fixation, and is more suitable for clinical application and promotion.

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