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Comparison of the Clinical Effects of Internal Fixation Combined with Vertebroplasty and Internal Fixation Alone on Patients with Spinal Fractures

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Abstract: *Objective:* This study aims to explore and analyze the comparison of clinical treatment effects of internal fixation combined with vertebroplasty and internal fixation alone on patients with spinal fractures. *Methods:* The experimental time was from April 2021 to April 2023. 80 spinal fracture patients treated by spinal surgery in our hospital were used as research objects, and grouped by double-blind method into study group (n = 40) and control group (n = 40). The study group received internal fixation combined with vertebroplasty, and the control group received internal fixation alone. The restoration of spinal structure, treatment, surgical treatment index, and incidence of adverse events were compared between the groups. *Results:* Before operation, the Cobb angle of the affected vertebra, the degree of spinal canal invasion, and the compression ratio of the prevertebral height of the two groups were compared, and there was no statistically significant difference ($P > 0.05$). The degree of compression and the compression ratio of the affected prevertebral height in the study group were significantly better than those of the control group, and the difference was statistically significant ($P < 0.05$). The rating of the treatment situation in the study group was significantly higher than that of the control group, the difference was statistically significant ($P < 0.05$). The surgical treatment indicators such as tissue bleeding volume, hospitalization time, and intraoperative operation time in the study group were significantly better than those in the control group, and the difference was statistically significant ($P < 0.05$). The incidence of adverse events in the study group was significantly lower than that in the control group, and the difference was statistically significant ($P < 0.05$). *Conclusion:* Internal fixation combined with vertebroplasty is more effective than internal fixation alone in treating spinal fractures.

Keywords: Internal fixation combined with vertebroplasty; Simple internal fixation; Spinal fracture

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1. Introduction

Spinal fracture is a very serious bone injury, which is mainly resulted from traumas. There are spinal cord and nerves in the spine, thus fractures can cause spinal cord and nerve damage, which can lead to disability of patients, and death in severe cases [1]. Most patients with spinal fractures are men, and the elderly with osteoporosis, workers

with physically demanding jobs, and patients with rheumatoid diseases are all prone to this disease [2]. Spinal fractures can cause severe pain, limited movement of the neck or chest and back, and affect the overall movement of the limbs [3]. Spinal fractures are mainly treated with surgery, and patients with undamaged spinal cords can be treated with rehabilitation therapy. Internal fixation is the most common way to treat spinal fractures. It can restore the physiological height of the spine and reduce the pain of patients. The short-term curative effect after surgery is ideal, but there are certain disadvantages in the long-term curative effect. The height of the intervertebral space of patients will gradually change [4]. Based on this, vertebroplasty is added to improve the long-term treatment effect [5]. The purpose of this paper is to study and analyze the clinical effect of internal fixation combined with vertebroplasty and internal fixation alone on patients with spinal fractures.

2. Methods

2.1. General information

The experimental time was from April 2021 to April 2023. 80 spinal fracture patients treated by spinal surgery in our hospital were used as the research object, grouped by double-blind method into study group (n = 40) and control group (n = 40). The males and females in the study group are 27 and 13 cases, respectively, aged 33–57 years old, with an average of 46.22±1.34 years old. The males and females in the control group are 26 and 14 cases, respectively, aged 33–57 years, with an average of 46.36±1.43 years old. There was no statistically significant difference ($P > 0.05$) in the general information such as gender and age between the groups.

Inclusion criteria included patients who met the diagnosis of spinal fracture, patients with clear indications for surgery and anesthesia, and patients with informed consent.

Exclusion criteria were patients with coagulation disorders, patients with diabetes, hypertension, and other diseases, patients with incomplete clinical data, and patients with mental illness.

2.2. Methods

The control group received simple internal fixation, where X-rays were taken, and the fracture site was marked. After the patient was anesthetized, an incision was made to expose the bone tissue, the pedicle was placed, the misplaced bone tissue was reset, and the incision was sutured.

The study group received internal fixation combined with vertebroplasty. The internal fixation method was the same as above. Bone cement was used as the main material for vertebroplasty. The needle tip was placed in a suitable position under fluoroscopy while lying on the side. The powder and calcium hydrochloride were injected into the fracture site, and the plane was sealed with 4ml bone wax.

2.3. Observation indicators

The indicators below were observed for both the study and control groups.

(1) The recovery of vertebral structure was compared between the two groups, including the Cobb angle of the affected vertebra, the degree of spinal canal invasion, and the compression ratio of the prevertebral height of the affected vertebra.

(2) The treatment situation between the groups was compared, and the Prolo score was used to evaluate the treatment results, including excellent (17–20 points), good (9–16 points), and poor (4–8 points).

(3) Surgical treatment indicators were compared between the groups, including tissue bleeding volume, hospitalization time, and intraoperative operation time.

(4) The incidence of adverse events between the groups was compared, including hypostatic pneumonia, deep vein thrombosis of lower extremities, loosen nails, and infection.

2.4. Statistical analysis

SPSS 21.0 statistical software was selected to process and analyze the data, the count data were expressed by the number of cases (n) and percentage (%), the x^2 test was implemented, the measurement data were expressed by the mean ± standard deviation (SD), and the t test was implemented, $P < 0.05$ were considered statistically significant.

3. Results

3.1. Comparison of the recovery of spinal structure

Before operation, the Cobb angle of the affected vertebra, the degree of spinal canal invasion, and the compression ratio of the prevertebral height of the two groups were compared, and there was no statistically significant difference ($P > 0.05$). As shown in **Table 1**, the compression ratio of prevertebral height of patients in the study group was significantly better than that of control group, and the difference was statistically significant ($P < 0.05$).

Table 1. The comparison of spinal structure recovery between groups (mean ± SD)

Group	Affected vertebra Cobb angle (°)		Degree of spinal canal invasion (%)		Compression ratio of prevertebral height (%)	
	Before surgery	After surgery	Before surgery	After surgery	Before surgery	After surgery
Study group (n = 40)	15.57±3.55	5.31±1.55	33.24±4.31	19.27±3.21	59.37±4.33	94.31±5.28
Control group (n = 40)	15.68±3.69	9.57±1.69	33.35±4.26	26.31±4.56	59.63±4.15	81.49±5.22
t value	0.1358	11.7490	0.1148	7.9843	0.2741	10.9203
P value	0.8923	0.0000	0.9089	0.0000	0.7847	0.0000

3.2. Comparison of the treatment situation with Prolo score

Based on **Table 2**, the excellent and good rate of treatment in the study group was significantly higher than that of the control group ($P < 0.05$), the difference was statistically significant.

Table 2. The treatment comparison between the groups [n (%)]

Group	Excellent	Good	Poor	Excellent rate
Study group (n = 40)	28 (70.00)	11 (27.50)	1 (2.50)	39 (97.50)
Control group (n = 40)	23 (57.50)	9 (22.50)	8 (20.00)	32 (7.94)
x^2 value	-	-	-	6.1346
P value	-	-	-	0.0132

3.3. Comparison of surgical treatment indicators

As presented in **Table 3**, the surgical treatment indicators such as tissue bleeding volume, hospitalization time, and intraoperative operation time in the study group were significantly better than those in the control group ($P < 0.05$), and the difference was statistically significant.

Table 3. Comparison of surgical treatment indicators between groups (mean ± SD)

Group	Tissue bleeding	Hospitalization time	Intraoperative operation time
Study group (n = 40)	79.24±8.31	9.21±2.64	59.22±4.56
Control group (n = 40)	95.24±9.33	13.58±2.66	77.32±5.33
t value	8.0991	7.3747	16.3198
P value	0.0000	0.0000	0.0000

3.4. Comparison of the incidence of adverse events

The incidence of adverse events in the study group was significantly lower than that in the control group ($P < 0.05$), and the difference was statistically significant. The data are shown in **Table 4**.

Table 4. The incidence of adverse events between groups [n (%)]

Group	Collapsing pneumonia	Lower extremity deep vein thrombosis	Loosen nails	Infection	Total incidence
Study group ($n = 40$)	1 (2.50)	0 (0.00)	0 (0.00)	0 (0.00)	1 (2.50)
Control group ($n = 40$)	3 (7.50)	1 (2.50)	1 (2.50)	1 (2.50)	6 (15.00)
x^2 value	-	-	-	-	3.9139
P value	-	-	-	-	0.0478

4. Conclusion

Spinal fracture refers to the fracture of the spine bones under the action of external force, and the thoracolumbar segment is the most common site for spinal fractures [6]. Mild spinal fractures can present as spinal pain and limited movement, while severe spinal fractures can damage the patient's spinal cord and nerves. Internal fixation is a surgical method used to treat fractures, and it is a relatively traditional type of surgery [7]. Internal fixation returns the fractured bone to its original physiological position. Using steel plates, screws, steel wires, and other materials as support can strengthen the strength of the fixation, and external fixation after surgery is no longer mandatory. External fixation is performed depending on the situation. However, the fixation materials used in internal fixation are exogenous items [8]. It is a foreign body in the human body, and it is prone to loosen nails or infection. After infection, it will prolong the healing of the fracture, and it is an open operation, which will affect the blood supply of the human body during the operation. In order to avoid the above adverse events, an improvement was made on the basis of internal fixation [9]. Internal fixation combined with vertebroplasty is a combined operation method. Calcium sulfate powder is perfused at the site of injured vertebral body to further strengthen the fixation of the vertebral body and stabilize the bone fixation. It is effective for osteoporosis and loose nails with certain preventive effect [10]. Vertebroplasty can reduce the stress of the fixed metal, prevent the occurrence of postoperative adverse events such as loosen nails and collapsing pneumonia, and provide a guarantee for the long-term effectiveness of surgical treatment [11,12]. In the process of vertebroplasty, injecting bone cement in the cavity can maintain the height of the vertebral body for a long time. The bone cement is relatively safe without harming the tissues of the human body and will not cause damage to the spinal cord and nerves [13,14].

Before surgery, the Cobb angle of the affected vertebra, the degree of spinal canal invasion, and the compression ratio of the affected vertebra in the two groups were compared ($P > 0.05$), and the difference was not statistically significant. The degree of tube invasion and the compression ratio of the affected prevertebral height were significantly better than those in the control group ($P < 0.05$), and the difference was statistically significant. The excellent and good rate of the treatment in the study group was significantly higher than that of the control group ($P < 0.05$), the difference was statistically significant. The surgical treatment indicators such as tissue bleeding volume, hospitalization time, and intraoperative operation time in the study group were significantly better than those in the control group ($P < 0.05$), and the difference was statistically significant. The incidence of adverse events in the study group was significantly lower than that in the control group ($P < 0.05$), and the difference was statistically significant. Internal fixation combined with vertebroplasty is

a combined surgical plan. The short-term effect of internal fixation is relatively stable. Vertebroplasty can strengthen the long-term effect of internal fixation, promote the recovery of the anatomical position and physiological function of the spine, and shorten the recovery time of fractures and reduce tissue damage [15].

In summary, internal fixation combined with vertebroplasty in the treatment of spinal fractures has a high short-term curative effect, better recovery of spinal physiological functions and anatomical positions, and it is relatively reliable and safe. This treatment plan is worthy of widespread clinical application.

Disclosure statement

The author declares no conflict of interest.

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