

## **Analysis of correlation between the scores of residual bone cement and low back pain after percutaneous vertebroplasty in osteoporotic compression fractures.**

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### **Abstract**

**Objective:** To study the correlation between the scores of pedicle residual bone cement and the low back pain after percutaneous vertebroplasty for osteoporotic vertebral body compression fractures.

**Methods:** Eighty-four patients receiving percutaneous vertebroplasty from January 2013 to May 2015 were followed up for 1 y and had varying degrees of low back pain. They were selected as subjects. According to the patient's prognosis results, the patients were divided into group A (favourable prognosis) and group B (poor prognosis). Each group had 42 cases. The scores of pedicle residual bone cement between two groups were compared and the relationship of pedicle residual bone cement scores with VAS scores was analysed.

**Results:** There was a significant difference of VAS score between two groups. After treatment, VAS scores in group A ( $2.24 \pm 0.78$ ) were significantly lower than those in group B ( $4.52 \pm 0.95$ ,  $P < 0.05$ ). The scores of inside and outside pedicle residual bone cement in group A ( $0.21 \pm 0.05$  and  $0.25 \pm 0.07$ ) were significantly lower than those in group B ( $0.38 \pm 0.12$  and  $0.45 \pm 0.16$ ,  $P < 0.05$ ). There was a positive correlation between scores of inside and outside pedicle residual bone cement and low back pain following surgery ( $r = 0.749$ ,  $0.761$ ,  $P = 0.000$ ,  $0.000$ ). The incidence of refracture (0%) and the length of stay ( $7.62 \pm 2.45$ ) d in group A were significantly lower than those in group B ( $P < 0.05$ ).

**Conclusion:** There was a positive correlation between pedicle residual bone cement scores and the low back pain after percutaneous vertebroplasty for osteoporotic vertebral body compression fractures, which suggests that residue bone cement should be removed and so to improve the treatment effect and reduce the degree of low back pain.

**Keywords:** Osteoporotic vertebral body compression fractures, Percutaneous vertebroplasty, Bone cement, Postoperative low back pain.

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### **Introduction**

Osteoporotic compression fractures are more common in clinical practice, percutaneous vertebroplasty as a new treatment has begun to be widely used, to achieve the desired effect [1]. But many patients will appear after varying degrees of low back pain symptoms, thereby extending the bedtime bracing time, further affecting the quality of life and surgical results [2]. The causes of low back pain symptoms, is conducive to providing effective treatment, improve the quality of life of patients, to promote its early rehabilitation [3]. In this study, 84 patients with osteoporotic compression fractures with varying degrees of low back pain were treated with percutaneous vertebroplasty and followed up for 1 y. The relationship between pedicle cement score and postoperative low back pain was observed.

### **Materials and Method**

#### ***Clinical information***

A total of 84 patients with osteoporotic compression fractures with low back pain were treated with percutaneous vertebroplasty treated in our hospital from January 2013 to May 2015. The patients were followed up for one year. Inclusion criteria: (1) in line with clinical osteoporosis diagnosis [4]; (2) after long-term follow-up; (3) treatment compliance is better, no communication disorders; (4) the use of bone cement type polymethacrylic acid ester. Exclusion criteria: (1) incomplete medical records; (2) lead to pyramidal fracture causes of infection, cancer and so on. According to the prognosis is divided into group A (good prognosis) in 42 cases, group B (poor prognosis) in 42 cases. There were 27 males and

14 females in the A group, aged 61~83 years, with an average of (72.3 ± 4.5 y). There were 26 males and 15 females in the B group, aged 62~84 y, with an average of (72.5 ± 4.4 y). There was no significant difference between the two groups in basic data (P>0.05).

### Research methods

The VAS score, pedicle internal and lateral bone cement residual score, postoperative fracture rate and hospitalization time were compared between the two groups before and after treatment. VAS score determination criteria [4]: A total score of 10 scores, the higher the score that the more severe the degree of pain. Standard for bone cement residual score: In the pedicle, the lateral findings of bone cement beyond the prosthesis formation residual to 1 without residue for 0 score. Scoring is done by both Orthopedics and Imaging.

### Observe indicators

The VAS score of the two groups was compared between the two groups before and after treatment. The residual bone cement score of the pedicle was analysed. The relationship between the bone cement score and the low back pain was analysed. The incidence of fracture was compared between the two groups.

**Bone cement residue score:** Spiral scans were performed on all patients with 64-slice spiral CT. The CT images of all patients with metal artifacts were collected and counted according to the residual bone cement in the medial and lateral arch of the vertebrae. It was defined that the number of bone cement residues was found to be 1 score in the area, and no residuals were found as 0. Scoring work is done by orthopedic surgeons and radiologists.

### Statistical analysis

We use SPSS20.0 software to help us analysis the data. Measurement data to mean ± standard deviation ( $\bar{x} \pm s$ ), the difference between groups using t test, count data using  $\chi^2$  test to P<0.05 was statistically significant.

## Result

### VAS score

There were significant differences between the two groups in the VAS score before and after treatment, VAS score in group A was significantly lower than that in group B (Table 1).

**Table 1.** Comparison of VAS scores before and after treatment in both groups (n,  $\bar{x} \pm s$ ).

	n	Before treatment	After treatment	t-value	p-value
Group A	42	6.27 ± 1.15	2.24 ± 0.78	18.795	0.000
Group B	42	6.33 ± 1.17	4.52 ± 0.95	7.783	0.000
t-value		0.237	12.021		

p-value	0.813	0.000
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### Vertebral internal and lateral bone cement residual score

A group of pedicle internal and lateral bone cement residue scores were significantly lower than the B group, (Table 2).

**Table 2.** Comparison of the two groups of patients with pedicle internal and external bone cement residue score comparison (n,  $\bar{x} \pm s$ ).

	n	Medial area	Lateral area
Group A	42	0.21 ± 0.05	0.25 ± 0.07
Group B	42	0.38 ± 0.12	0.45 ± 0.16
t-value		8.475	7.422
p-value		0.000	0.000

### Correlation between pedicle cement residue score and postoperative low back pain

There was a positive correlation between bone mineral residue and postoperative low back pain in the medial and lateral regions of the pedicle (r=7.049, 0.761; P=0.000, 0.000) (Table 3).

**Table 3.** Correlation between pedicle cement residue score and postoperative low back pain.

	VAS score of postoperative low back pain	
	r-value	p-value
Bone cement residue score in medial zone	0.749	0
Bone cement residue score in the lateral zone	0.761	0

### The incidence of fracture and hospital stay

The recurrence rate and hospitalization time of group A were significantly lower than those of group B (Table 4).

**Table 4.** The incidence of postoperative fracture and the time of hospitalization were compared between the two groups (n, %,  $\bar{x} \pm s$ ).

	n	Re fracture rate	Hospital stay
Group A	42	0	7.62 ± 2.45
Group B	42	5 (11.90)	9.62 ± 3.71
$\chi^2$ /t-value		5.316	2.915
p-value		0.021	0.005

## Discussion

Osteoporotic compression fractures are mostly in the elderly population, with the increasing population aging in China, the

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incidence rate is increasing year by year [5]. Percutaneous vertebroplasty is mainly through the injection of bone cement to the vertebral body to enhance the strength and stability of the vertebral body, with a certain therapeutic effect [6]. But there are still many reports that, after percutaneous vertebroplasty treatment, some patients with low back pain [7]. To date, there have been few reports of causes of postoperative low back pain, and similar reports of the correlation between pedicle bone cement scores and postoperative low back pain are rare. Therefore, this study by comparing the osteoporotic compression fractures percutaneous vertebroplasty pedicle residual bone cement score and the relationship between postoperative low back pain, to prevent and alleviate patients with postoperative low back pain to provide a reference.

The treatment of osteoporotic vertebral compression fractures by vertebroplasty can quickly and effectively relieve pain and reduce bedtime, and its possible mechanisms are as follows: The injection of bone cement rapidly increases the biomechanical strength of the injured vertebral body and provides good support for the cortical bone [1]; In the polymerization reaction of bone cement can release energy, the nerve at the injured nerve at the end of the destruction and burning [8]; The residual methacrylic acid monomer in bone cement is toxic to sensory nerve endings [9]; studies have reported that vertebroplasty in the treatment of osteoporotic vertebral compression fractures after six months of pain relief satisfaction, good quality of life [10]. During the 1 y follow-up study, the VAS score was significantly lower than that before surgery ( $P < 0.05$ ). It was found that the effect of bone cement on pain relief was compared with preoperative pain can be maintained for a long time.

At present, the amount of bone cement injected into the vertebroplasty is not clear, theoretically that the more bone cement injection, postoperative vertebral biomechanical strength is higher, the effect is more obvious. However, the more bone cement injection, the higher the pressure in the vertebral body, easily lead to bone cement leakage, and thus cause the occurrence of complications. This study focused on observing the relationship between pedicle cement and postoperative pain. The results showed that the VAS score of group A was significantly lower than that of group B, and the residual score of lateral and lateral bone cement in group A was significantly lower than that in group B group. Suggesting that residual bone cement score and postoperative low back pain there is a certain correlation. The results showed that there was a positive correlation between bone mineral residue and postoperative low back pain in the medial and lateral regions of the pedicle and had a positive correlation. Bone cement as a bone filled with bone and implant material or bone cavity of the biological material, it has self-curing properties [11]. Although the bone cement technology has a certain development, but there are still a series of problems to be solved. Because of the poor mechanical properties of bone cement, which makes it under the action of human body prone to bone cement cracks, and even lead to bone cement layer fracture, thus affecting clinical efficacy, resulting in patients with low back pain. At the same time, bone cement in the

polymerization process will produce a lot of heat, may cause burning damage around the bone bed, causing pain [12]. Another study found that the pedicle bone cement may enter the blood circulation, which is easy to expand the blood vessels, reduce myocardial contractility, into the vein after pulmonary embolism, if not timely and effective treatment, and even lead to serious low blood pressure or cause heartbeat [13]. The results of this study found that the incidence of fracture in group A and hospital stay were significantly lower than the B group. The results showed that the patients with severe residual bone cement in vertebral pedicle were worse, and the postoperative effect was worse, and the correlation between residual bone cement score and therapeutic effect was also suggested.

There was a positive correlation between the bone cement score in the medial and lateral area of the pedicle after percutaneous vertebroplasty, and the bone cement residue was carefully removed during the surgical treatment to reduce or prevent the occurrence of postoperative low back pain.

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