

# Treatment of osteoporotic vertebral compression fractures by unilateral puncture through the posterior outer upper part of the vertebral body

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**Abstract:** Objective: To comprehensively analyze the effect of unilateral and bilateral puncture in the treatment of osteoporotic vertebral compression fractures (OVCFs). Methods: The main subjects of this study were: OVCFs patients (a total of 100 cases, starting from October 2020 and ending from October 2021). According to the different treatment methods, two groups (50 cases in each group) were named, one group was the control group (applying bilateral puncture treatment through the vertebral body), the other group was the experimental group (unilateral puncture treatment through the vertebral body). Results: Compared with the control group, the operation time of the experimental group was shorter,  $P < 0.05$ ; Compared with the control group, the amount of intraoperative blood loss in the experimental group was less,  $P < 0.05$ ; Compared with the control group, the amount of bone cement filling and X-ray exposure in the experimental group were significantly less,  $P < 0.05$ ; Compared with the control group, there was no difference in bone cement leakage rate in the experimental group ( $P > 0.05$ ). Before treatment, compared with the control group, there were no differences in Cobb Angle, pain degree score, spinal dysfunction score and quality of life score between the experimental group and the control group,  $P > 0.05$ ; After treatment, compared with the control group, the quality of life score of the experimental group was higher,  $P < 0.05$ ; Compared with the control group, the Cobb Angle, pain degree score and spinal dysfunction score of the injured vertebrae in the experimental group were lower,  $P < 0.05$ . Conclusion: Unilateral puncture through posterior and upper vertebral body is more effective than bilateral puncture in OVCFs patients.

**Keywords:** posterior, external and upper transvertebral body; Unilateral puncture therapy; Bilateral puncture treatment; Osteoporotic vertebral compression fracture

## 1. Introduction

Osteoporosis tends to occur in elderly people, and imaging examination shows a significant reduction in bone mass<sup>[1]</sup>. At the present stage, vertebral compression fracture is more likely to occur in patients with osteoporosis, and the harm degree is the greatest. Osteoporotic vertebral compression fractures (OVCFs) will lead to intractable lumbago and back pain, which will lead to digestive dysfunction and respiratory dysfunction in severe cases, and ultimately significantly reduce the quality of life of PATIENTS with OVCFs<sup>[2]</sup>. At present, the commonly used surgical methods for patients with OVCFs include (1) open surgery; (2) Minimally invasive surgery; (3) Conservative treatment<sup>[3]</sup>. Conservative treatment and open surgery have major drawbacks, while minimally invasive surgery (such as percutaneous kyphoplasty) has the advantages of less trauma, less pain and less intraoperative bleeding, so it is widely used in clinical practice. In order to further clarify the unilateral and bilateral puncture effects of percutaneous kyphoplasty, relevant analysis will be conducted in this paper.

## 2. Data and methods

### 2.1. General Information

The main objects of this study are: OVCFs patients (a total of 100 cases, starting from October 2020 and ending from October 2021). In the control group, 32 male and 18 female patients were aged (71.23±2.78) years, respectively. There were 31 male and 19 female patients in the experimental group, aged (72.11±2.53) years. There was no difference in general data between the two groups of OVCFs patients ( $P > 0.05$ ).

## 2.2. Methods

Patients in the two groups of OVCFs were routinely monitored by ELECTROcardiography, the abdomen was suspended, thoracolumbar vertebrae were appropriately extended, and the radiography direction of the injured vertebrae was confirmed under the C-arm machine, and the position of the surgical vertebrae was marked in detail.

In the experimental group, unilateral puncture was applied : (1) unilateral pedicle puncture was performed and unilateral percutaneous kyphoplasty was performed; (2) The needle tip entered vertically from the projection of the pedicle under fluoroscopy, and the needle drilled into the middle third of the anterior posterior pedicle; (3) Replace the inner core of the puncture needle, replace it with the guide needle, and then place the expansion tianguan into the pinhole along the guide needle, and then place the fine drill; (4) Drill into the anterior part of the vertebral body and reach the spinous process shadow; (5) Put the pressure expansion balloon into the first three quarters of the vertebral body; (6) When the guide wire was removed, the height of the collapsed vertebral body returned to normal; (7) Remove the balloon, place the modulated bone cement along the working channel, pull out the working casing, and suture layer by layer.

In the control group, bilateral puncture was applied : (1) the puncture method was the same as that in the experimental group, bilateral pedicle puncture and balloon dilation were performed successively; (2) Bone cement was implanted simultaneously on both sides, and other measures were the same as those in the experimental group.

After bone cement was completely hardened, OVCFs patients in both groups were assisted to maintain supine position for at least 3h to 6h. The bed was raised 12h after surgery. After 24h, lumbar vertebrae were fixed according to the recovery of OVCFs patients and they were encouraged to get out of bed and move.

## 2.3. Observation Indicators

Surgical indicators, bone cement leakage rate, Cobb Angle of injured vertebrae before and after treatment, pain degree score<sup>[4]</sup> (VAS scale, the higher the score indicates the higher the pain degree of OVCFs patients), spinal dysfunction score<sup>[5]</sup> (ODI scale, A higher score indicates a higher degree of spinal dysfunction in OVCFs patients) and quality of life score<sup>[6]</sup> (SF-36 scale was adopted, a higher score indicates a higher quality of life in OVCFs patients).

## 2.4. Statistical Analysis

SPSS 22.0 statistical software was used for data analysis. The bone cement leakage rate was tested by  $\chi^2$  test. The surgical indicators, Cobb Angle of injured vertebrae, pain degree score, spinal dysfunction score and quality of life score were tested by T test.

## 3. Results

### 3.1. Comparison of bone cement leakage rate and surgical indexes between the two groups

Table 1: Comparison of bone cement leakage rate and surgical indexes between the two groups

group	Bone cement leakage rate(n/%)	Operation time (min)	Intraoperative bleeding (ml)	Bone cement filling amount (ml)	X-ray exposure times (Times)
experience group (n=50)	2 (4.00)	29.02±2.61	1.32±0.22	3.02±0.11	9.45±0.68
control group (n=50)	3 (6.00)	51.14±2.32	3.44±0.51	4.23±0.19	18.88±0.74
$\chi^2$ value	0.2105				
T value		44.7907	26.9894	38.9714	66.3492
P value	0.6463	0.0000	0.0000	0.0000	0.0000

Compared with the control group, the operation time of the experimental group was shorter,  $P < 0.05$ ; Compared with the control group, the amount of intraoperative blood loss in the experimental group was less,  $P < 0.05$ ; Compared with the control group, the amount of bone cement filling and X-ray exposure in the experimental group were significantly less,  $P < 0.05$ ; Compared with the control group, there was no difference in bone cement leakage rate in the experimental group ( $P > 0.05$ ), as

shown in Table 1.

### 3.2. Comparison of clinical indicators between the two groups before and after treatment

Before treatment, compared with the control group, there were no differences in Cobb Angle, pain degree score, spinal dysfunction score and quality of life score between the experimental group and the control group,  $P > 0.05$ ; After treatment, compared with the control group, the quality of life score of the experimental group was higher,  $P < 0.05$ ; Compared with the control group, the Cobb Angle, pain degree score and spinal dysfunction score of injured vertebrae in the experimental group were lower ( $P < 0.05$ ), as shown in Table 2.

Table 2: Comparison of clinical indicators between the two groups before and after treatment

group	Cobb angle of injured vertebra (°)		Pain score (branch)		Spinal dysfunction score (branch)		Quality of life score (branch)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
experience group (n=50)	23.26±2.51	15.35±1.34	8.12±0.17	3.02±0.36	44.22±3.71	23.66±1.94	62.23±8.21	89.92±2.33
control group (n=50)	23.42±2.17	20.12±2.36	8.15±0.14	5.56±0.51	44.19±3.82	33.03±2.41	62.16±8.17	77.17±3.13
T value	0.3409	12.4282	0.9632	28.7709	0.0398	21.4155	0.0427	23.1049
P value	0.7338	0.0000	0.3378	0.0000	0.9683	0.0000	0.9660	0.0000

## 4. Discuss

With the increasing number of elderly population in China, the number of PATIENTS with OVCFs is also increasing year by year<sup>[7-8]</sup>. In the past, although conservative therapy has a certain effect, it requires patients to stay in bed for a long time, resulting in a high incidence of pressure ulcers complications, which ultimately reduces the clinical efficacy. With the development of minimally invasive technology, percutaneous kyphoplasty has gradually gained the favor of the majority of doctors and patients. Percutaneous kyphoplasty can gradually normalize the height of the injured vertebrae by pressurizing and injecting bone cement, so as to relieve pain and ultimately significantly improve the quality of life of patients.

Bilateral puncture and bone cement injection requires two puncture operations, thus prolonging the operation time and increasing the incidence of surgical risk. Unilateral puncture and bone cement injection can significantly restore the height of the injured vertebra, and the incidence of postoperative complications is low, thus accelerating the recovery of OVCFs patients<sup>[9-10]</sup>. Unilateral puncture with bone cement has the advantages of less X-ray exposure and less intraoperative blood loss. However, unilateral puncture and bone cement injection have high requirements for doctors.

In this study, after treatment, compared with the control group, the quality of life score of the experimental group was higher,  $P < 0.05$ ; Compared with the control group, the experimental group had lower Cobb Angle, pain degree score and spinal dysfunction score ( $P < 0.05$ ). Compared with the control group, the experimental group had shorter operation time ( $P < 0.05$ ). Compared with the control group, the amount of intraoperative blood loss in the experimental group was less,  $P < 0.05$ ; Compared with the control group, the amount of bone cement filling and X-ray exposure in the experimental group were significantly less,  $P < 0.05$ ; Compared with the control group, there was no difference in bone cement leakage rate in the experimental group ( $P > 0.05$ ).

## 5. Conclusions

In summary, unilateral puncture through the posterior and external vertebrae is more effective than bilateral puncture in treating OVCFs patients.

## References

- [1] Tao Zongfei, KONG Zhiyang, Wang Zhigang. Effect of unilateral and bilateral percutaneous kyphoplasty on the treatment of osteoporotic compression fractures [J]. Journal of Clinical and Experimental Medicine, 201,20(3):303-306.
- [2] ZHANG Jiongtao, CUI Wenbo, ZHAO Jifu, et al. Comparison of clinical efficacy and value of

- unilateral and bilateral percutaneous vertebroplasty for the treatment of osteoporotic vertebral compression fractures [J]. Heilongjiang medical journal,2019,43(3):216-217,219.*
- [3] Yang Lin, Yang Jincui, Hai Yong. *Treatment of osteoporotic multi-vertebral compression fractures with single and bilateral approach through percutaneous kyphoplasty [J]. Chinese Journal of Clinical Physicians, 201,49(6):714-717.*
- [4] Zhao Lei, Wang Gangrui, ZHENG Shengnai, et al. *Treatment of multiple vertebral compression fractures with unilateral and bilateral percutaneous kyphoplasty [J]. J orthopaedics, 2019,22(6):650-654.*
- [5] Zheng Yong, ZHENG Grim, Lin Xu, et al. *Comparison of digital target unilateral and traditional bilateral percutaneous kyphoplasty for the treatment of osteoporotic vertebral compression fractures in the elderly [J]. Agricultural reclamation medicine,2018,40(4):319-322.*
- [6] Wang Y, Wang Y, Wang Y, et al. *The effect of percutaneous balloon expansion kyphoplasty on osteoporotic vertebral compression fractures [J]. Kang yi, 2020,15 (9):175.*
- [7] Zhu Yanbing. *Comparison of unilateral and bilateral percutaneous kyphoplasty for the treatment of osteoporotic thoracolumbar compression fractures in the elderly [J]. China health and nutrition,2020,30(36):80-81.*
- [8] Ge Jun, SHAO Hongwei. *Comparison of single and bilateral puncture balloon kyphoplasty for the treatment of osteoporotic vertebral compression fractures in the elderly [J]. Chinese journal of disability medicine,2018,26(23):3-5.*
- [9] Wan Lun, WANG Xiaolin, Yang Jinhua, et al. *Single balloon bilateral percutaneous kyphoplasty for the treatment of fresh and old thoracolumbar osteoporotic compression fractures in the elderly [J]. China clinical research,2018,31(11):1526-1529,1534.*
- [10] HUANG Haojie, ZOU Weimin, PANG Zucui, et al. *Treatment of multilevel osteoporotic compression fractures with unilateral percutaneous vertebroplasty [J]. Guangdong medical journal,2019,40(21):3055-3058.*