



Effect of Wearing Brace After PVP on Recovery of Osteoporotic Vertebral Compression Fracture

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Abstract: *Objective:* The objective of this study was to explore the effect of wearing brace after percutaneous vertebro plasty (PVP) on recovery of osteoporotic vertebral compression fracture (OVCF). *Methods:* A total of 191 patients with OVCF and receiving PVP surgery in our hospital from 2020.07 to 2022.08 were reviewed. Among them, 102 patients wearing brace after surgery were the brace group, and 89 patients without brace were the control group. The Oswestry disability index (ODI), visual analogue score (VAS) and the refractured rate of adjacent vertebra after PVP were compared between the two groups before operation and 1 and 6 months after operation. *Results:* There was no significant difference in preoperative VAS and ODI between the brace group and the control group. The VAS and ODI at 1 and 6 months after operation in the brace group were significantly lower than those in the control group ($P < 0.05$). There were 15 cases (14.71%) of adjacently vertebral refracture including 12 cases (11.76%) of single-segment vertebral fracture and 3 cases (2.94%) of multiply vertebral fracture in the brace group. In the control group, there were 24 cases (26.97%) of adjacently vertebral refracture including 17 cases (19.10%) of single-segment vertebral fracture and 7 cases (7.87%) of multiply vertebral fracture. There was significant difference in the refractured rate of adjacent vertebra after PVP between the two groups ($\chi^2 = 4.397$, $P = 0.036$). *Conclusion:* Wearing brace after PVP for osteoporotic vertebral compression fracture can relieve pain and restore function of patients, and the refractured rate of adjacent vertebra after PVP is significantly lower than that of patients without brace. Therefore, wearing brace after PVP is not only important, but also necessary.

Keywords: Wearing Brace, OVCF, PVP, Vertebral Refracture

1. Introduction

Osteoporotic vertebral compression fracture (OVCF) is not only the most serious complication of osteoporosis, but also one of the most common fracture types in spinal surgery [1]. Patients with low back pain, spinal deformity and dysfunction are the main clinical manifestations, and it may even lead to disability in severe cases [2]. At present, the clinical treatment of OVCF is divided into non-operative treatment and surgical treatment. Non-operative treatment requires patients to stay in bed for a long time, which is easy to aggravate the bone mass loss and increase the risk of refracture and kyphosis [3], and even affect the lung function of the patients. With the

continuous development of minimally invasive technology, surgery is the main method for the clinical treatment of OVCF. Many reports have pointed out that percutaneous vertebro plasty (PVP) has the advantages of short operation time, less trauma and quick recovery [4]. However, at present, vertebral refracture occurs frequently after PVP [5]. It is reported [6-7] that the rate of adjacently vertebral refracture 1 year after PVP is as high as 19.59%. A large number of studies [8-9] have shown that the fracture of adjacent vertebra after PVP is related to bone mineral density, bone cement leakage, bone cement injection and other factors. However, the author found that the incidence

of adjacently vertebral refracture in patients with postoperative brace was lower, and there were no systematic studies at home and abroad to prove its correlation. Therefore, the purpose of this study is to analyze the effect of Wearing brace on the recovery of OVCF after PVP by comparing the restorative effect of wearing brace and without brace and the incidence of adjacently vertebral refracture after PVP.

2. Materials and Methods

2.1. General Information

A total of 191 patients with OVCF who were treated with PVP in our hospital from July 2020 to August 2021 were reviewed. There was no significant difference in preoperative general data between the two groups.

2.2. Inclusion Criteria and Exclusion Criteria

- (1) Inclusion criteria: bone mineral density examination showed osteoporosis; patients had obvious low back pain and limited movement; imaging data showed patients with single-segment vertebral fracture; the course of disease was less than two weeks; received

PVP surgery.

- (2) Exclusion criteria: old fracture or previous history of spinal fracture; burst fracture or pathological fracture; imaging showed that the fracture invading the spinal canal, pedicle damage and neurological symptoms; those who could not tolerate surgical treatment; those who received other surgical treatments at the same time.

2.3. Method of Wearing Brace

The method of wearing brace: The patient takes the lateral recumbent position firstly, and makes the back leaf of the brace close to the torso, and then lies flat, placing the anterior lobe of the brace in the chest and abdomen position. To make the front and back edges of the brace overlap in the axillary midline, the anterior lobe of the brace should overlaps with the midline of the torso. Finally, the patient should fasten the brace with a fixed belt, and it is better that it can put a palm between the brace and chest during deep breathing, and make sure not to affect breathing (Figure 1).

The method of removing brace: The patient takes the supine position firstly and removes it in the order opposite to the wearing procedure.

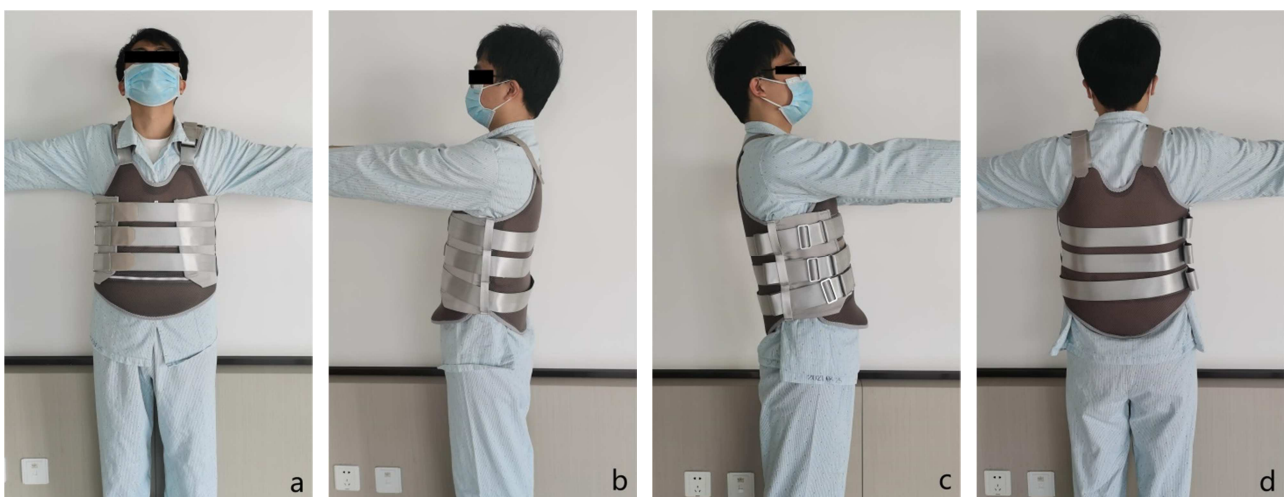


Figure 1. The demonstration of wearing bear.

2.4. Observation Index

The recovery and pain level of the patients were observed. Oswestry Disability Index (ODI) and Visual Analog scale (VAS) were used to evaluate the spinal function and pain level before and 1 month and 6 months after operation. the refractured rate of adjacent vertebra after PVP in the two groups was calculated.

2.5. Statistical Method

The data were processed by SPSS26.0. The measurement data were expressed by mean \pm standard deviation ($\bar{x} \pm s$), and the vertical sample t-test was performed between groups. The paired t-test was performed within groups, and the

counting data was expressed as percentage (%). The $P < 0.05$ indicates that the difference is statistically significant.

3. Results

3.1. Comparison of Pain VAS and ODI Between the Two Groups

There was no significant difference in preoperative VAS and ODI between the two groups ($P > 0.05$). The VAS and ODI of the two groups at 1 month and 6 months after surgery were statistically significant before surgery ($P < 0.05$). The postoperative VAS and ODI in the brace group were significantly lower than those in the control group ($P < 0.05$).

3.2. Comparison of the Refracted Rate of Adjacent Vertebra After PVP Between the Two Groups

There were 15 cases (14.71%) of adjacently vertebral refracture including 12 cases (11.76%) of single-segment vertebral fracture and 3 cases (2.94%) of multiply vertebral fracture in the brace group. In the control group, there were

24 cases (26.97%) of adjacently vertebral refracture including 17 cases (19.10%) of single-segment vertebral fracture and 7 cases (7.87%) of multiply vertebral fracture. There was significant difference in the refracted rate of adjacent vertebra between the two groups ($\chi^2 = 4.397$, $P = 0.036$).

Table 1. Comparison of VAS between the two groups.

T	n	Preoperative	Postoperative 1 month	Postoperative 1 month
The brace group	102	8.64±0.61	2.27±0.29	1.84±0.31
The control group	89	8.55±0.59	2.78±0.22	2.29±0.34
t		1.116#	13.723*	9.442*

* means $P < 0.05$, # means $P > 0.05$.

Table 2. Comparison of ODI between the two groups.

T	n	Preoperative	Postoperative 1 month	Postoperative 1 month
The brace group	102	68.50±4.64	32.90±3.16	23.11±2.89
The control group	89	67.92±3.82	39.76±4.61	32.88±4.68
t		0.336#	16.3*	17.037*

* means $P < 0.05$, # means $P > 0.05$.

4. Discussion

Osteoporotic vertebral compression fracture is a common spinal disease, which often occurs in the aged, with the highest incidence in postmenopausal women. According to statistics, about 130 million people are threatened by OVCF every year. About 1/3 women and 1/5 men have at least one osteoporotic vertebral compression fracture after the age of 50 in the world, which can lead to severe pain [10] in the chest and waist and seriously affect the quality of life of patients. In recent years, percutaneous vertebro plasty has obvious effect and advantage in the treatment of OVCF. It has been widely used in clinic and favored by patients and clinicians. However, studies have shown that PVP is easy to cause refracture of the adjacent vertebra [11], which usually occurs within 1 month after operation [12]. Some scholars [13] believe that the refracture of adjacent vertebra is related to bone mineral density, bone cement leakage [14], bone cement injection and other factors; Others have proposed that wearing brace after PVP may reduce the risk of refracture [15]. The author also found that patients without brace after PVP were more likely to have fracture and recover more slowly than patients with wearing brace. Therefore, this study conducted a retrospective study of patients after PVP in Nanjing Hospital of TCM to explore the effect of wearing after PVP brace on recovery of OVCF.

This study showed that in the brace group, there were 15 cases (14.71%) of adjacently vertebral refracture, and there were 24 cases (26.97%) of adjacently vertebral refracture in the control group. The difference of the refracted rate of adjacent vertebra between the two groups was statistically significant. It indicates that wearing brace after PVP can prevent refracture of the adjacent vertebrae. Moreover, the improvement of VAS and ODI in brace group was significantly better than that

in control group. It shows that the patients who wear brace after PVP have less pain and better functional recovery. Combined with the results of this study and clinical experience, the author analyzes that wearing brace after PVP has the following advantages. First, wearing brace early can walk in 2-3 days after operation, which is beneficial to the bone healing and the recovery of waist and back muscles, and speeds up the recovery time of patients. Second, the brace plays a certain role in protecting the patient's vertebra, preventing the patient from excessive extension and flexion of the waist during exercise, and even fracture; Third, wearing brace after PVP can protect and maintain the stability of the spine, prevent spinal deformity, and reduce the postoperative pain of the patient.

To sum up, for patients with osteoporotic vertebral compression fracture, wearing brace after PVP can effectively prevent the occurrence of vertebral refracture. It also can reduce the patient's bed rest time and reduce the patient's postoperative pain, and recover faster. In addition, the brace has the characteristics of lightweight, fit and easy to wear, and can be used repeatedly, which is worth popularizing in clinical practice.

5. Conclusion

Wearing brace can significantly improve the therapeutic effect of osteoporotic vertebral compression fracture after PVP, which is conducive to the recovery of patients.

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References

- [1] Tang B, Cui L, Chen X, Liu Y. Risk Factors for Cement Leakage in Percutaneous Vertebroplasty for Osteoporotic Vertebral Compression Fractures: An Analysis of 1456 Vertebrae Augmented by Low-Viscosity Bone Cement. *Spine (Phila Pa 1976)*. 2021 Feb 15; 46 (4): 216-222.
- [2] Long Y, Yi W, Yang D. Advances in Vertebral Augmentation Systems for Osteoporotic Vertebral Compression Fractures. *Pain Res Manag*. 2020 Dec 7; 2020: 3947368.
- [3] Andrei D, Popa I, et al. The variability of vertebral body volume and pain associated with osteoporotic vertebral fractures: conservative treatment versus percutaneous transpedicular vertebroplasty. *Int Orthop*. 2017 May; 41 (5): 963-968.
- [4] Huang S, Zhu X, Xiao D, et al. Therapeutic effect of percutaneous kyphoplasty combined with anti-osteoporosis drug on postmenopausal women with osteoporotic vertebral compression fracture and analysis of postoperative bone cement leakage risk factors: a retrospective cohort study. *J Orthop Surg Res*. 2019 Dec 18; 14 (1): 452.
- [5] Noguchi T, Yamashita K, et al. Current status and challenges of percutaneous vertebroplasty (PVP). *Jpn J Radiol*. 2022 Aug 9.
- [6] Luan HP, Deng Q, Sheng WB. Research progress on risk factors of adjacent vertebral body secondary fracture after percutaneous vertebroplasty/kyphoplasty [J]. *Journal Of Traumatic Surgery*, 2022, 24 (06): 474-478.
- [7] He B, Zhao J, et al. Effect of Surgical Timing on the Refracture Rate after Percutaneous Vertebroplasty: A Retrospective Analysis of at Least 4-Year Follow-Up. *Biomed Res Int*. 2021 Nov 27; 2021: 5503022.
- [8] Jiang RL, Yin AK, et al. Analysis of related risk factors of re-fracture after osteoporotic vertebral compression fracture operation [J]. *Journal Of Chinalical Orthopaedics*, 2022, 25 (02): 171-174.
- [9] Wang Q, Zhang J, et al. The Clinical Effect of Percutaneous Vertebroplasty in the Treatment of Osteoporosis Vertebral Compression Fracture and the Risk Factors of the Adjacent Vertebral Fracture after Operation [J]. *Progress Of Modern Biomedicine*, 2021, 21 (21): 4095-4099.
- [10] Xing RL, Zhang SC, Jiang XB, et al. Influence of spinal sagittal imbalance on therapeutic effect of percutaneous vertebroplasty for treatment of osteoporotic vertebral compression fractures [J]. *Journal Of Spinal Surgery*, 2017, 15 (2): 106-110.
- [11] Yang XQ, Zhang SF, Hu FQ, et al. Vertebroplasty for osteoporotic vertebral compression fractures: State of the art [J]. *Academic Journal of Chinese PLA Medical School*, 2017, 38 (6): 578-580.
- [12] Schulte TL, Keiler A, et al. Biomechanical comparison of vertebral augmentation with silicone and PMMA cement and two filling grades. *Eur Spine J*. 2013 Dec; 22 (12): 2695-701.
- [13] Bernardo WM, Anhesini M, Buzzini R; Brazilian Medical Association (AMB). Osteoporotic vertebral compression fracture - Treatment with kyphoplasty and vertebroplasty. *Rev Assoc Med Bras* (1992). 2018 Mar; 64 (3): 204-207.
- [14] Wang YJ. Influencing factors of refracture after percutaneous vertebroplasty in patients with osteoporotic spinal fractures [J]. *Medical Journal of Chinese People's Health*, 2022, 34 (16): 16-18.
- [15] Deng X, Wang GY. Analysis of related factors of non-operative vertebral body refracture after percutaneous kyphoplasty [J]. *The Journal of Cervicodynia and Lumbodynia*, 2017, 38 (03): 201-205.