

Predictive Factors for Vertebroplasty in Osteoporotic Vertebral Compression Fractures

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ABSTRACT

Objective: To identify predictive factors for performing percutaneous vertebroplasty (PVP) after osteoporotic vertebral compression fractures (OVCFs).

Methods: A retrospective review of medical record of patients who presented with OVCF between April 2007 and March 2010 was conducted. Specific data collected in each group such as gender, age, and radiographic parameters were analyzed by statistical methods.

Results: Fifty six patients (28 vertebroplasty, 28 conservative treatment) were enrolled. Severity of collapsed osteoporotic fracture more than 40% showed significant association with vertebroplasty ($p=0.002$). Other factors such as gender, age, fracture age, mechanism of trauma, and kyphotic angle had no statically significant association with vertebroplasty.

Conclusion: Our findings suggested that osteoporotic patients who had severe vertebral fracture collapse more than 40% significantly underwent percutaneous vertebroplasty. Because of small sample size, further prospective systematic multicenter trials intended to investigate other risk factors are needed.

Keywords: Vertebral compression fracture, vertebroplasty, predictive factor, osteoporosis

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INTRODUCTION

The osteoporotic vertebral compression fractures (OVCFs) are common morbidity in elderly patients which may eventually cause problems and lower the quality of life. The prevalence was reported about 81-153 per 100,000 persons.¹ These conditions can be treated with conservative treatment, operative treatment and minimally invasive intervention such as percutaneous vertebroplasty (PVP) or kyphoplasty. However, conservative treatments can result in many side-effects including prolonged pain

and disability. Furthermore, operative treatment including vertebral instrumentation or fusion under general anesthesia may cause several serious complications. Percutaneous vertebroplasty is one of the treatments of choice for OVCFs patients and results in immediate pain relief and rapid rehabilitation with few complications.²⁻⁵ The most common indication for PVP is intractable pain due to failure of conservative treatment.⁶ The definition and period of treatment to justify failure of conservative care have not been well defined. Even if most of the cases are improved with conservative means, some cases which will benefit from PVP, so have to be suffered for a trial and failed conservative treatment. It will be more beneficial for the patients if the chance of failed conservative treatment and the chance to

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have PVP can be predicted so the treatment can be given earlier. However, there has been no report which indicated the factors that may predict chance of PVP after failure of conservative treatment. The purpose of the present study was to investigate predictive factors for performing PVP after OVCFs.

MATERIALS AND METHODS

This is a retrospective study that reviewed medical records of 56 OVCFs patients who were admitted at Siriraj Hospital between April 2007 and March 2010. The inclusion criteria were symptomatic osteoporotic vertebral compression fracture patients who had clinical symptoms at the corresponding level after failed initial conservative treatment. The exclusion criteria were neurological deficit and the presence of pathologic fractures such as metastasis, multiple myeloma and infection. All patients underwent initial conservative treatment including bed rest, life style modification, braces and appropriate analgesics. The indication of vertebroplasty was painful osteoporotic vertebral compression fracture which failed conservative treatment. Criteria of conservative treatment failure was refractory severe back pain over fractured vertebra which was not relieved after conservative therapies for 4-6 weeks. All failed-conservative patients were suggested for vertebroplasty. The patients who refused vertebroplasty were admitted for further conservative treatment. Twenty eight patients were treated with PVP and 28 patients were treated with conservative treatment.

Vertebroplasty was performed percutaneously under local anesthesia. The vital signs were continually monitored during the procedure. The patient was placed in a prone position. The upper chest and pelvis were supported by pillows. Local anesthetic agent was injected after sterile skin preparation was performed. Then, an 11-gauge vertebroplasty needle was inserted percutaneously through the pedicle of the affected vertebra. The level of vertebra and proper position of needle placement were checked by using image intensifier. Polymethyl methacrylate (PMMA) cement was continually injected through the needle using

a 5-mL plastic syringe and stopped when cement filled the adequate area of the collapsed vertebral body and then the needle was removed.

The patient's demographic data including gender, age, mechanism of injury, baseline activity, number of fractures, location, morphology, degrees of collapse and kyphotic angle were recorded. Co-morbidity including diabetes, hypertension, ischemic heart disease, and chronic renal disease were recorded. Pain and functionality were evaluated by using visual analog scale (VAS) and ambulatory status, respectively. The locations of involvement were divided into 4 levels including thoracic (T4-T9), thoracolumbar (T10- L2), lumbar (L3-L5) and multi-location. The SPSS version 15.0 (SPSS Inc., Chicago, IL, USA) was used for all statistically analysis, and *p*-values of <0.05 were determined to be statistically significant. Each factor comparison was performed using the Chi-square test or Fisher's exact test except age which was performed using the Student's *t*-test. The risk factors were analyzed using the logistic regression test. The odds ratios (OR) were used to measure strength of association.

The present study was approved by the Ethic Committee of the Faculty of Medicine Siriraj Hospital (reference number COA Si.155/2013).

RESULTS

Fifty six patients admitted for osteoporotic vertebral compression fracture between April 1, 2007 and March 31, 2010 who were managed with PVP (28 cases) or conservative treatment (28 cases) were enrolled in this study. Most of the cases were females (85.71%). The differences in baseline activity were not statistically significant, but the PVP group had number of outdoor ambulation without gait aids (92.9%) slightly more than the conservative group (82.1%) (Table 1).

The common location of fracture in both groups was thoracolumbar region. Most of the cases were single level fracture. The wedge-shaped fracture in the PVP group and conservative group were 75% and 67.9%, respectively (*p*=0.768). The number of cases that had local kyphotic angles more than 20 degrees were found 53.3% and 75.0%, respectively (*p*=0.09). Statisti-

TABLE 1. Demographical data and comparison of the predictive factor between PVP and conservative group.

	Vertebroplasty (N=28)	Conservative group (N=28)	Odd ratio (95 %CI)	p-value
Gender				
Female	25 (89.3%)	23 (82.1 %)	1.81 (0.40 - 8.44)	0.705
Mean age (S.D.)	73.93 (6.03)	70.54 (10.05)	0.133	
Comorbidity	24 (85.7%)	16 (57.1%)	4.50 (1.23 – 16.45)	0.018
History of previous fracture	0	5 (17.9%)	0.45 (0.33 – 0.61)	0.051
Baseline of activity level				
Outdoor ambulatory without gait aids	26 (92.9%)	23 (82.1%)	2.83 (0.50 – 15.99)	0.422
Outdoor ambulatory with gait aids	2 (7.1%)	5 (17.9%)		
Number of fracture				
1 site	23 (82.1%)	20 (71.4%)	0.54 (0.15 – 1.93)	0.528
≥ 2 sites	5 (17.9%)	8 (28.6%)		
Location of fracture				
Thoracic	5 (17.9%)	0		
TL junction	16 (57.1%)	17 (60.7%)		
Lumbar	3 (10.7%)	5 (17.9%)		
Multi location	4 (14.3%)	6 (21.4%)		
Fracture morphology				
Wedge	21 (75.0%)	19 (67.9%)	1.42 (0.44 – 4.56)	0.768
Biconcave	7 (25.0%)	9 (32.1%)		
Fracture collapse				
>40%	26 (92.9%)	15 (53.6%)	11.27 (2.23 – 56.86)	0.002
Kyphotic angle				
>20 degrees	15 (53.6%)	21 (75.0%)	0.39 (0.12 – 1.19)	0.094

cally significant differences in number of severe fracture collapses (>40%) cases were observed between the PVP group (92.9%) and conservative treatment group (53.6%) (p=0.002). No perioperative complications of vertebroplasty was reported such as neural tissue compression, infection or embolism. The back pain was improved in all patients.

Using logistic regression, the two groups were not statistically significantly different with regard to gender, age, fracture morphology, number of fractures, location of fracture, mechanism of trauma and kyphotic angle (p>0.05).

DISCUSSION

Vertebroplasty demonstrated a rapid significant pain relief, decreasing use of analgesics,

increasing mobility and improved the quality of life. Pain relief after PVP is not only immediate, but also is sustained for at least a year when compared with the conservative treatment.⁷⁻¹⁵ This intervention leads to early mobilization and avoidance of conservative therapy complication including immobilization syndrome.¹⁶ Liu et al, reported that pain relief in the PVP group was greater than that of the conservative group at 3, 6, and 12 months.¹⁷ However, several studies have reported no beneficial effect of vertebroplasty compared with a sham procedure.¹⁸ The better results after PVP can be expected in patients with American Society of Anesthesiologists class 1, the vertebral body height loss is less than 70% and when the level managed is confirmed by magnetic resonance imaging.¹⁹ More severe focal back pain, high uptake bone scan, and the lower mean

T-score were related to the better pain relief following PVP.²⁰ There has been no previous study which demonstrated the factors which predict the chance of vertebroplasty in OVCFs. This study found that patients who presented with OVCFS collapse >40% had higher chance to undergo PVP. Another interesting finding from the present study was the kyphotic angle, which was lower in the PVP group than the conservative group. However, this factor is insignificant as an independent risk factor while the other factors failed to show statistical significance.

The present study had few limitations. Since the study design was a retrospective study, there has been selection bias due to non-randomization. The surgery was performed by many surgeons, which resulted in various preferences and thresholds of intervention. Finally, this study was conducted in only a single center and has small number of enrolled cases. Further prospective systematic multicenter trials intended to investigate other risk factors are needed.

CONCLUSION

The findings from the present study imply that OVCF patients with severe collapse (>40%) are more likely to be treated by using PVP. However, the presented data fail to demonstrate statistically significant correlation between chance of PVP and other factors including demographic data and degrees of kyphosis. Since the sample size was small, further prospective systematic multicenter trials intended to investigate other risk factors are needed.

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