

## ORIGINAL ARTICLE



# Evaluation of results of percutaneous vertebroplasty at a tertiary centre among north Indian population

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### Abstract

**Objective:** To evaluate the results of percutaneous vertebroplasty at a tertiary centre among north Indian population.

**Methods:** The study was a prospective observational study conducted in the Department of Orthopaedic Surgery, Prasad Institute of Medical Sciences, Lucknow. Patients with painful vertebral compressions involving Dorsal and Lumbar vertebrae due to osteoporosis, metastatic secondary of spine, multiple myeloma, benign conditions like hemangioma, specific traumatic spinal injuries who were admitted and treated by percutaneous vertebroplasty in the Department.

The pain was assessed by Visual Analogue Score.

**Results:** A total of 32 (12 male and 20 females) patients were included in the study. Osteoporotic cause was in more than half of patients (65.6%). Females were more affected (66.7%) than males (33.3%). Post traumatic cause was in 34.4% patients. Females were more affected (54.5%) than males (45.5%). However, there was no significant ( $p>0.05$ ) difference in causes between male and females. Pre-op VAS was  $5.94\pm 0.92$  which decreased to  $0.87\pm 1.35$  at 6 months. The decrease in VAS from pre-op to 6 month was statistically significant ( $p=0.0001$ ).

**Conclusion:** Percutaneous Vertebroplasty is a simple, effective, reliable, easy to perform and minimally invasive procedure in patients with vertebral compressions, who have excessive pain and/or surgery has great risks.

Keywords: Vertebral compressions, percutaneous vertebroplasty, Visual Analogue Score

## 1 | INTRODUCTION

The pain relief of painful malignant vertebral compression fractures (PMVCF) is one of the key elements for achieving better quality of

life in patients under palliative care. The mainstay for pain relief is pharmacological therapy such as with nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids, and if patients are not responsive to these agents or have pain upon body movement, radiother-

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apy is administered. However, despite being a non-invasive therapeutic modality, radiotherapy is less than ideal because it requires 2-4 weeks to obtain a therapeutic effect and does not achieve complete pain relief in most cases (Bates, 1992; Ben-Josef et al, 1998)<sup>1,2</sup>.

Osteoporotic vertebral compression fractures (OVCFs) are a major complication of osteoporosis and are becoming more prevalent as population aging. Back pain associated with OVCFs will limit the mobility of patients and cause several problems such as deep vein thrombosis, decubitus ulcer, and hypostatic pneumonia (Shi-Ming et al, 2015)<sup>3</sup>.

There are several verified treatments for OVCFs, including conservative treatment, open surgery, and percutaneous vertebroplasty (PVP). PVP was first introduced for treating vertebral hemangioma in 1987 (Galibert et al, 1987)<sup>4</sup>. Shortly, thereafter it has been adopted by many authors for treating symptomatic OVCFs as a minimal invasive surgery. It could provide rapid pain relief. Although PVP is effective in most patients, someone still has back pain after PVP or its effectiveness had been doubted. It is postulated that pains associated with OVCFs may arise not just from vertebral body but also from posterior elements (Bogduk et al, 2010)<sup>5</sup>.

The purpose of this study was to evaluation of results of percutaneous vertebroplasty using Visual Analogue Score (VAS) among north Indian population.

## 2 | MATERIAL AND METHODS

The study was a prospective observational study conducted in the Department of Orthopaedic Surgery, GSVM Medical College, Kanpur and Prasad Institute of Medical Sciences, Lucknow among patients

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who attended OPD and emergency. The study was approved by the Ethical Committee of the Institute and consent was taken from each participant before including in the study. Inclusion criteria for patients were painful vertebral compressions involving Dorsal and Lumbar vertebrae due to osteoporosis, metastatic secondary of spine, multiple myeloma, benign conditions like hemangioma, specific traumatic spinal injuries who were admitted (confirmed and planned by X-ray ,CT and MRI ) for percutaneous vertebroplasty in the Department. Exclusion criteria were patients age <18 years, with acute spinal trauma (within 2 weeks of injury) , trauma more than 1 year duration, neurological involvement, unstable fractures , and patients not willing for procedure were excluded from the study. There were no patient dropout from the study.

### Methods

Steps were undertaken for vertebroplasty: i. IV started, ii. Patient placed prone on fluoro table (with bolsters under sternum and pelvis) with image intensifier capabilities, iii. Part was prepared with alcohol & providine iodine and draped. iv. Local anaesthesia given at the site of pedicle marked with C- arm guidance, v. Equipment prepared, vi. A stab incision was given at the site for entry, vii. Using sterile technique and C- arm guidance, and Jamshidi needle was advanced into the vertebral body via a transpedicular approach, viii. PMMA (simplex-p) was prepared and filled in 5 ml luer-lock syringe and fitted over jamshidi needle. Under careful fluoroscopic visualization, PMMA cement was slowly injected (when it became sticky to reduce the leakage especially to spinal canal with continuous fluoroscopic monitoring during injecting the PMMA cement) into the vertebral body, diffusing throughout the intertrabecular marrow space. The procedure was usually repeated through the contralateral pedicle unless there was adequate cross-filling of the vertebral body by the initial injection. The total volume of injected cement ranged from 4 to 8 ml.

Following the procedure, patient was instructed to lie flat in the supine position for one hour to allow the cement to harden. Observation was continued for at least one to two hours at which point patient was able to stand and walk with minimal or no pain.

### Pain assessment

Visual analogue scale (VAS) was used to assess patients' pain scores the day before, within one day after, 1 week and 3 months after the procedure. VAS involves the standard pain scale from 0 to 10 (0 = no pain, 10 = intolerable, the most severe pain ever felt in a patient's life) in order to determine the level of pain objectively.

### Statistical analysis

The results are presented in frequencies, percentages and mean $\pm$ SD. The Paired t-test was used to compare changes in MRDQ score from pre-op to post 6 months. The p-value<0.05 was considered significant. All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA).

## 3 | RESULTS

A total of 32 (12 male and 20 females) patients were included in the study.

Osteoporotic cause was in more than half of patients (65.6%). Females were more affected (66.7%) than males (33.33%). Post traumatic cause was in 34.4% patients. Females were more affected (54.5%) than males (45.5%). However, there was no significant ( $p>0.05$ ) difference in causes between male and females (Table-1).

Pre-op VAS was  $5.94\pm 0.92$  which decreased to  $0.87\pm 1.35$  at 6 months. The decrease in VAS from pre-op to 6 month was statistically significant ( $p=0.0001$ ) (Table-2).

There was significant decrease in VAS from pre-op to 6 months in both Osteoporotic ( $p=0.0001$ ) and Post traumatic ( $p=0.002$ ) causes (Table-3).

There was significant decrease in VAS from pre-op to 6 months in both 2-3 weeks ( $p=0.001$ ) and >3 week-6 months duration of symptoms ( $p=0.003$ ) causes (Table-4).

## 4 | DISCUSSION

PV is a minimally invasive procedure where PMMA bone cement is injected into the vertebral body to



FIGURE 1: Postop 6 months

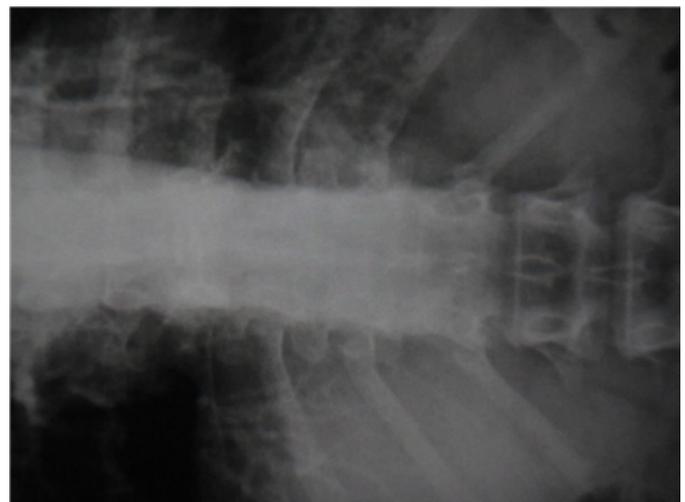


FIGURE 2: Postop 6 months

treat the pain due to a vertebral compression fracture. Cement provides structural stabilization and a pain reduction effect in the vertebral body. The main indication for PV in metastatic patients is to control local pain. It can also be used to stabilize bones having lytic metastases and high fracture risk (Anselmetti et al, 2012; Deschamps and de Baere, 2012)<sup>6,7</sup>.

In the present study, Pre-op VAS was  $5.94\pm 0.92$  which decreased to  $0.87\pm 1.35$  at 6 months. The decrease in VAS from pre-op to 6 month was statistically significant ( $p=0.0001$ ). In a study (Nas et al, 2015)<sup>8</sup>, VAS scores of 43 patients (in total 79 vertebrae) were evaluated. Median VAS scores of patients declined from 8 (4–10) before PV to 3 (0–7) within one day after the procedure, to 2 (0–9) one week after the procedure and eventually to 2 (0–9)

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**TABLE 1: Causes of vertebral fractures**

Causes	No. of Male		Female		p-value <sup>1</sup>
	No.	%	No.	%	
Osteoporotic	21	65.6	7	33.3	0.10
Post traumatic	11	34.4	5	45.5	6

**TABLE 2: Comparison of VAS from pre-op and 6 months**

Time period	VAS (Mean±SD)
Pre-op	5.94±0.92
6 months	0.87±1.35
p-value <sup>1</sup>	0.0001*

<sup>1</sup>Wilcoxon rank sum test, \*Significant

**TABLE 3: Comparison of VAS from pre-op and 6 months according to Causes of vertebral fractures**

Time period	VAS (Mean±SD)	
	Osteoporotic	Post traumatic
Pre-op	5.68±0.81	6.50±1.00
6 months	0.55±0.52	2.00±1.73
p-value <sup>1</sup>	0.0001*	0.002*

Time period	VAS (Mean±SD)	
	2-3 weeks	>3 weeks -6 months
Pre-op	5.24±0.94	6.00±0.96
6 months	0.75±0.56	1.16±1.22
p-value <sup>1</sup>	0.001*	0.003*

<sup>1</sup>Wilcoxon rank sum test, \*Significant

**TABLE 4: Comparison of VAS from pre-op and 6 months according to duration of symptoms**

Time period	VAS (Mean±SD)
Pre-op	5.94±0.92
6 months	0.87±1.35
p-value <sup>1</sup>	0.0001*

<sup>1</sup>Wilcoxon rank sum test, \*Significant

3 months after the procedure ( $p < 0.001$ ). PMMA amount applied to the vertebral body during PV varied between 1.5–9 mL (average  $\pm$  SD 4.91  $\pm$  1.61).

Mikami et al (2011)<sup>9</sup> stated that the preoperative mean VAS score was reduced from 7.3 to postoperative 1.9 with PV performed on 141 metastatic vertebrae of 69 patients. Tseng et al (2008)<sup>10</sup> showed that the preoperative mean VAS score of 8.1 decreased to 3.8 one day after and to 2.8 six months after PV.

Alvarez et al (2003)<sup>11</sup> reported that the preoperative VAS score of 9.1 decreased to 3.2 immediately after and to 2.8 three months after PV. Barragán-Campos et al (2014)<sup>12</sup> observed a significant decrease in VAS scores of patients with vertebral metastases of breast cancer.

PMMA cement prevents the collapse of vertebra by strengthening the vertebral body. PMMA causes damage to nerve endings and cytotoxic effects because of its heat releasing effect during polymeriza-



FIGURE 5:



FIGURE 4:

tion. Decrease in tumor progression or recurrence can be obtained from the antitumoral effect of the cement. In order to achieve vertebral stiffness after PV, an average of 3.5 mL volume of PMMA is sufficient (Roedel et al, 2014)<sup>13</sup>. To achieve vertebral stiffness after PV, Tseng et al (2008)<sup>10</sup> used  $5.16 \pm 1.63$  mL, Chew et al (2011)<sup>14</sup> used less than 5 mL, and Barragán-Campos et al (2014)<sup>12</sup> used  $4.7 \pm 1.55$  mL of PMMA.

One of the limitations of this study was small sample size. The studies with larger sample size are required to have more robust findings.

## 5 | CONCLUSION

PV is a simple, effective, reliable, easy to perform and minimally invasive procedure in patients with vertebral compressions, who have excessive pain and/or surgery has great risks.



FIGURE 3:

## REFERENCES

1. Galibert P, Deramond H, Rosat P, Gars L, D. Preliminary note on the treatment of vertebral angioma by percutaneous acrylic vertebroplasty. *Neurochirurgie*. 1987;33(2):166–168.
2. Nas OF, Inecikli MF, Kacar E, Buyukkaya R, Ozkaya G, Aydın O, et al. Effectiveness of percutaneous vertebroplasty in cases of vertebral metastases. *Diagnostic and Interventional Imaging*. 2015;96(11):1161–1168. Available from: <https://dx.doi.org/10.1016/j.diii.2015.05.001>. doi:10.1016/j.diii.2015.05.001.
3. Mikami Y, Numaguchi Y, Kobayashi N, Fuwa S, Hoshikawa Y, Saida Y. Therapeutic effects of percutaneous vertebroplasty for vertebral metastases. *Japanese Journal of Radiology*. 2011;29(3):202–206. Available from: <https://dx.doi.org/10.1007/s11604-010-0542-x>. doi:10.1007/s11604-010-0542-x.
4. Bogduk N, MacVicar J, Borowczyk J. The Pain of Vertebral Compression Fractures Can Arise in the Posterior Elements. *Pain Medicine*. 2010;11(11):1666–1673. Available from: <https://dx.doi.org/10.1111/j.1526-4637.2010.00963.x>. doi:10.1111/j.1526-4637.2010.00963.x.
5. Roedel B, Clarençon F, Touraine S, Cormier E, Molet-Benhamou L, Jean LL, et al. Has the percutaneous vertebroplasty a role to prevent progression or local recurrence in spinal metastases of breast cancer? *Journal of Neuroradiology*. 2015;42(4):222–228. Available from: <https://dx.doi.org/10.1016/j.neurad.2014.02.004>. doi:10.1016/j.neurad.2014.02.004.
6. Tseng YY, Lo YL, Chen LH, Lai PL, St Y. Percutaneous polymethylmethacrylate vertebroplasty in the treatment of pain induced by metastatic vertebral column tumor. *Surg Neurol*. 2008;7:78–83.
7. Barragán-Campos HM, Faou ALL, Rose M, Livartowski A, Doz M, Astagneau P, et al. Percutaneous Vertebroplasty in Vertebral Metastases from Breast Cancer: Interest in Terms of Pain Relief and Quality of Life. *Interventional Neuroradiology*. 2014;20(5):591–602. Available from: <https://dx.doi.org/10.15274/inr-2014-10084>. doi:10.15274/inr-2014-10084.
8. Anselmetti GC, Marcia S, Saba L, Muto M, Bonaldi G, Carpeggiani P, et al. Percutaneous vertebroplasty: Multi-centric results from EVEREST experience in large cohort of patients. *European Journal of Radiology*. 2012;81(12):4083–4086. Available from: <https://dx.doi.org/10.1016/j.ejrad.2012.07.005>. doi:10.1016/j.ejrad.2012.07.005.
9. Alvarez L, Prez-Higueras A, Quiones D, Calvo E, Rossi RE. Vertebroplasty in the treatment of vertebral tumors: postprocedural outcome and quality of life. *European Spine Journal*. 2003;12(4):356–360. Available from: <https://dx.doi.org/10.1007/s00586-003-0525-z>. doi:10.1007/s00586-003-0525-z.
10. Chew C, Ritchie M, O'Dwyer PJ, Edwards R. A prospective study of percutaneous vertebroplasty in patients with myeloma and spinal metastases. *Clinical Radiology*. 2011;66(12):1193–1196. Available from: <https://dx.doi.org/10.1016/j.crad.2011.08.004>. doi:10.1016/j.crad.2011.08.004.
11. Yan-Ping L, Shi-Ming G, Wen-Juan L, Mei-Ya H, Yun-Mei H, Yin-Sheng W. Percutaneous vertebroplasty and percutaneous balloon kyphoplasty for osteoporotic vertebral compression fracture A metaanalysis. *Indian Journal of Orthopaedics*. 2015;49(4):377–377. Available from: <https://dx.doi.org/10.4103/0019-5413.154892>. doi:10.4103/0019-5413.154892.
12. Deschamps F, de Baere T. Cementoplasty of bone metastases. *Diagnostic and Interventional Imaging*. 2012;93(9):685–689. Available from: <https://dx.doi.org/10.1016/j.diii.2012.06.009>. doi:10.1016/j.diii.2012.06.009.

13. D EBJM, D FSP, Aaron O Williams Pharm D MD, D ATPM. Radiotherapeutic Management of Osseous Metastases: A Survey of Current Patterns of Care. *International Journal of Radiation OncologyBiologyPhysics*. 1998;40(4):915–921. Available from: [https://dx.doi.org/10.1016/s0360-3016\(97\)00927-9](https://dx.doi.org/10.1016/s0360-3016(97)00927-9). doi:10.1016/s0360-3016(97)00927-9.
14. Bates T. A review of local radiotherapy in the treatment of bone metastases and cord compression. *Int J Radiat Oncol Biol Phys*. 1992;23:217–221.

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