

# The role of vertebroplasty in cases of wedge compression fracture of spine

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## Abstract

**Background:** This was a prospective observational study of osteoporotic fractures of vertebral bodies carried out in randomised 50 cases, between September 2016 to September 2018. Two groups were formed group C and group V. Group C- treated with conservative management and Group V- treated with Vertebroplasty. PMMA (Polymethylmethacrylate) was injected in the body of the fractured vertebra under fluoroscopic control and the results were observed postoperatively, 1 month, 3 months and 1 year; the results were compared with that of group C. Analysis was done by VAS (Visual Analogue Score) and RMD (Rolland Morris disability) score. The mean VAS score among both groups showed significant statistical difference post-operatively, at 1 month and 3 month with lower score among patients with Vertebroplasty group. The mean VAS score among both groups again at 6 month and 1 year showed no significant statistical difference. The mean RMD score among both groups showed significant statistical difference post-operatively, at 1 month and 3 month with lower score among patients with Vertebroplasty group. The mean RMD score among both groups again at 6 month and 1 year showed no significant statistical difference.

**Key Words:** Vertebral compression fracture (VCF), Polymethylmethacrylate (PMMA), Roll and Morris Disability score (RMD), Visual analogue score (VAS), Vertebroplasty

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## INTRODUCTION

Percutaneous vertebroplasty is an established method for the treatment of osteoporotic vertebral compression fracture. It is a minimally invasive surgical procedure used for the treatment of vertebral fractures. Acrylic cement has been used for decades for augmentation of weakened or partially destroyed bones. Most commonly used acrylic is Polymethylmethacrylate (PMMA).<sup>1</sup> Vertebroplasty is a radiologically guided therapeutic procedure that consists

of injection of PMMA into a vertebral lesion to relieve pain and structurally reinforce the vertebra.<sup>2</sup> This technique was processed in France in 1985 by Deramond *et al.*, for treatment of symptomatic or aggressive vertebral angiomas.<sup>2</sup> Subsequently, vertebroplasty has been used in treatment of pain due to vertebral malignant tumours and vertebral osteoporotic compression. Jensen *et al.*, safely treated 45 osteoporotic vertebral fracture in 29 patients with percutaneous vertebroplasty and noted that 90 % of patients described pain relief within 24 hours after treatment.<sup>3</sup> Percutaneous vertebroplasty in osteoporotic vertebral compression fracture is highly effective for pain relief and improvement of patient mobility across a wide range of fracture ages. It also helps in decreasing the requirement of analgesics.<sup>4</sup> The incidence of fractures in the body of vertebra was around 30-50% in women and 20-30 % in men<sup>5</sup>. The most common cause is osteoporosis<sup>6</sup>. It can be isolated / multiple osteoporotic fractures. Since the incidence rate of this fracture increases with age, it is also likely that the fracture prevalence rate will increase in the near future due to the increasing proportion of elderly in

most populations.<sup>7</sup> Once a vertebral compression fracture occurs, it can be a risk factor for future fractures, including non-spinal fragility fractures.<sup>8</sup> The occurrence of a vertebral fracture has also been found to be associated with an increased mortality.<sup>9</sup> The structural changes that occur in osteoporotic bone increase the susceptibility to low energy fractures. Thus, osteoporotic compression fractures generally occur during normal, daily activities. While osteoporosis affects the entire skeleton, most osteoporotic fractures occur in the vertebrae.<sup>10</sup> Vertebral compression fracture (VCF) patients present clinically with a collapsed anterior vertebral body, which produces the kyphosis (humpback) seen in osteoporotic patients. The thoraco-lumbar region of the spine has the highest prevalence of vertebral compression fractures.<sup>11</sup> Hence, the aim of the present study was to compare the conservative management and percutaneous vertebroplasty in cases of osteoporotic vertebral compression fracture.

### MATERIAL AND METHODS

The present study was a prospective observational study undertaken to compare the conservative management and percutaneous vertebroplasty in cases of osteoporotic vertebral compression fracture in a tertiary care centre.

The study was conducted amongst 50 cases that fulfil inclusion and exclusion criteria of study in Department of Orthopaedics at Bharati Hospital, Pune, Maharashtra from September 2016 to September 2018. A total sample size of 50 patients referred to the department OPD with osteoporotic vertebral compression fracture was included. Patients aged less than 40 years, with neurological involvement, compression fractures secondary to bone tumours and failed conservative trial were excluded from study. Vertebroplasty involve injection of bone cement, generally polymethylmethacrylate, into the collapsed vertebral body. The procedure may use a unipedicular, bipedicular or transpedicular approach to position a needle into the fractured vertebral body. The transpedicular procedure of injecting bone cement into a fractured vertebral body. The viscous cement is injected with the use of fluoroscopy to guide the surgeon and indicate when an appropriate cement volume has been injected. The vertebroplasty procedure involves injecting the cement directly into the fractured vertebral body.<sup>12</sup> The patients were divided into two groups by random method. Group C treated with conservative management and group V treated with Vertebroplasty. The patients were examined and investigated with conventional x-rays, CT, and MRI. The results of the study was compared with Visual Analogue Score (VAS) and Rolland Morris Disability Score (RMD)

#### Inclusion Criteria:

1. Denis type 1 fracture of dorso lumbar vertebrae.

2. Age- less than 40 years.
3. Osteoporotic vertebra.

#### Exclusion Criteria:

1. Neurological involvement.
2. Compression fractures secondary to bone tumours.
3. Failed conservative trial
4. No relief of pain

**Data analysis:** Data was entered in MS Excel sheet and analysed by using percentage and proportions whenever necessary. The chi-square test was applied and the statistical tests were considered significant for  $p < 0.05$ . Ethical approval taken from Institution ethical committee.

### RESULTS

**Table 1:** Comparison of VAS scores among two groups

VAS Score	Group C	Group V	P-value
Preoperative	7.41 ± 0.91	7.63 ± 0.82	>0.05
Postoperative	5.91 ± 1.41	4.76 ± 1.21	<0.05*
1 month	4.19 ± 2.11	3.11 ± 1.82	<0.05*
3 month	3.79 ± 2.21	2.83 ± 1.63	<0.05*
6 month	3.63 ± 1.91	2.67 ± 1.21	>0.05
1 year	3.16 ± 1.63	2.31 ± 1.41	>0.05

( $P < 0.05$  statistically significant)

It was observed from **Table 1** that the majority of patients had compression fracture at level L1 (32%) followed by level T12 (30%) There was no statistical significant difference seen among both groups with respect to diagnosis. ( $P > 0.05$ ) The comparison of mean VAS score among control group showed that mean VAS score preoperative was more compared to postoperative score at 1 year with statistical significant difference (7.41 vs 3.16) Similarly, mean VAS score preoperative was more compared to postoperative score at 1 year with statistical significant difference (7.63 vs 2.31). The comparison of mean VAS score among two groups showed that mean VAS score preoperative among both groups showed no statistical significant difference (7.41 vs 7.63) The mean VAS score among both groups showed significant statistical difference post-operatively, at 1 month and 3 month with lower score among patients with Vertebroplasty group ( $P < 0.05$ ) The mean VAS score among both groups again at 6 month and 1 year showed no significant statistical difference. ( $P > 0.05$ )

**Table 2:** Comparison of RMD scores among two groups

VAS Score	Group C	Group V	P-value
Preoperative	17.22 ± 2.39	16.19 ± 2.12	>0.05
Postoperative	15.23 ± 3.51	14.21 ± 3.34	<0.05*
1 month	10.23 ± 3.89	7.19 ± 4.11	<0.05*
3 month	8.18 ± 4.18	6.79 ± 4.23	<0.05*
6 month	7.73 ± 4.12	6.18 ± 5.10	>0.05
1 year	7.59 ± 5.23	5.12 ± 4.22	>0.05

( $P < 0.05$  statistically significant)

It was seen from **Table 2** that the mean RMD score among both groups showed significant statistical difference post-operatively, at 1 month and 3 month with lower score among patients with Vertebroplasty group. ( $P < 0.05$ ) The mean RMD score among both groups again at 6 month and 1 year showed no significant statistical difference. ( $P > 0.05$ )

## DISCUSSION

The comparison of mean VAS score among two groups showed that mean VAS score preoperative among both groups showed no statistical significant difference (7.41 vs 7.63) The mean VAS score among both groups showed significant statistical difference post-operatively, at 1 month and 3 month with lower score among patients with Vertebroplasty group ( $P < 0.05$ ). The mean VAS score among both groups again at 6 month and 1 year showed no significant statistical difference. ( $P > 0.05$ ) The mean RMD score among both groups showed significant statistical difference post-operatively, at 1 month and 3 month with lower score among patients with Vertebroplasty group ( $P < 0.05$ ). The mean RMD score among both groups again at 6 month and 1 year showed no significant statistical difference. In a study by Kallmes D.F *et al.*<sup>13</sup> on randomized controlled trial of Vertebroplasty for osteoporotic spine fractures observed that both groups (conservative and vertebroplasty) showed immediate improvement in disability and pain after the intervention. Hao-Kuang Wang *et al.*<sup>14</sup> studied the clinical outcomes following percutaneous vertebroplasty (PV) with conservative therapy for acute osteoporotic vertebral compression fractures. It was observed that both PV and conservative therapy provided pain reduction ( $P < 0.001$ ), improvements in physical functioning ( $P < 0.001$ ), and decreased medication ( $P < 0.001$ ). The reductions in visual analogue pain scores were more significant in the vertebroplasty group at 1 ( $P < 0.001$ ) and 4 weeks ( $P < 0.001$ ) but not at 12 months. Diamond *et al.*<sup>15</sup> found prompt pain reduction and improvement in physical functioning at 24 hours after PV, as compared with patients in a conservative group. However, the benefits of PV were not evident at 6 weeks or at 6 months. Both groups, after 6 weeks, had similar improvements in pain reduction and physical functioning. The results suggest that the pain and disability of osteoporotic vertebral compression fractures appear to be treated more effectively by percutaneous vertebroplasty than by conservative therapy alone. Vertebroplasty appears to be safe and well tolerated by patients. The drawbacks of present study included the small number of small number of sample size, and the relatively short period of observation. Carefully designed and well-executed long-term clinical trials are needed to verify that percutaneous vertebroplasty is effective and

superior to conservative therapy for managing osteoporotic vertebral fractures.

## CONCLUSION

The present study was a prospective observational study undertaken to compare the conservative management and percutaneous vertebroplasty in cases of osteoporotic vertebral compression fracture. The results suggest that the pain and disability of osteoporotic vertebral compression fractures appear to be treated more effectively by percutaneous vertebroplasty than by conservative therapy alone. Vertebroplasty appears to be safe and well tolerated by patients. Carefully designed and well-executed long-term clinical trials are needed to verify that percutaneous vertebroplasty is more effective and superior to conservative therapy for managing osteoporotic vertebral fractures.

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