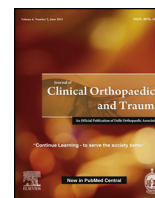




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Original Study

Clinical outcomes of percutaneous vertebroplasty for selective single segment dorsolumbar vertebral compression fractures

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ABSTRACT

Overview of literature: Elderly patients sustaining a trivial fall may develop vertebral compression fractures if they are predisposed to any factor that leads to decreased bone mineral density. Such patients suffer with severe pain and disability during the early healing stages. Percutaneous Vertebroplasty is mainly done to provide immediate pain relief and also believed to offer stability to the compressed vertebra by preventing further collapse.

Methods: Selected patients [n=20; Age=57.9±7.9 years] with osteoporotic vertebral compression fracture of a single dorsolumbar vertebra were treated with percutaneous vertebroplasty after 2–3 weeks of conservative trail. Their Pain score was noted using numeric rating scale (NRS) before and after the procedure. Functional outcomes were analysed using Roland Morris Disability Questionnaire (RMDQ) score.

Results: NRS pain score before procedure was 8.3±0.6. RMDQ score before procedure was 21.6±0.5. Third post procedural day NRS pain score was 4.7±1.2 (p<0.0001), denoting significant decrease in pain. Functional outcome analysis using RMDQ score showed an average of 87±6.1 percent improvement (p<0.0001), by 6 weeks following procedure. Considering pre-injury status all patients were in their best possible functional state by 6 weeks.

Conclusions: Percutaneous Vertebroplasty serves its purpose adequately and economically. Under controlled circumstances, it offers immediate pain relief and stability, leading to early recovery in selective patients. Yet, underlying poor bone mineral density status needs to be treated.

Study design: Observational Case Series (Level 4).

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1. Introduction

Axial loading due to a fall from height, particularly in a patient with poor bone mineral density, has high potential to produce vertebral compression fractures, even if the impact was trivial.¹ These fractures can cause severe pain, especially on loading, and does not allow patients to carry on with daily activities. This leads to decreased mobility and restricted activity resulting in more bone density loss predisposing to further kyphosis.^{1,2} Percutaneous vertebroplasty involves injecting radiopaque bone cement into the fractured vertebra by inserting a needle from the posterior

aspect that passes through the pedicle into the vertebral body.² The thermal reaction produced by the cement on setting, blocks the nerve endings that supply the fractured vertebra and thus provides immediate pain relief.³ The cement by itself offers stability by preventing further compression of the fractured vertebra on loading. We intend to analyse the clinical outcomes following percutaneous vertebroplasty for selective single segment dorsolumbar vertebral compression fractures in old age.

2. Patients and methods

Forty-two elderly patients (35 females and 7 males), having sustained an axial loading trivial fall, who presented with severe pain in the back leading to restricted activity were shortlisted over a period of time. Standard anteroposterior and lateral view radiographs that were initially taken showed one or more dorsolumbar vertebral compression fracture. Those patients with multiple level compression fractures, burst fractures with

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displaced bone fragments, fractures with involvement of posterior elements and those with neurologic complications were excluded. Only 26 patients with single level dorsolumbar vertebral compression fracture showing wedge or biconcave deformity with intense pain adjacent to the fracture level were selected for a trial of conservative management. All patients had less than 50% decrease in anterior vertebral height and less than 25° kyphotic angle of the affected vertebra. Pain was graded using numeric rating scale,⁴ and all patients had a pain score of more than 7.

These patients were subject to conservative management in the form of bed rest and analgesics for 2–3 weeks. A thoraco-lumbar brace was provided to all patients to be worn during sitting and standing. Those who tolerated conservative management well with gradual decrease in the pain score to ≤ 5 were excluded. Remaining patients showing no symptomatic improvement for more than 2 weeks with pain score of more than 7 were selected for the procedure. A sample containing 20 female patients with a mean age of 57.9 years having compression fracture of a single vertebra centred in the thoracolumbar junction between D11–L2 was obtained. Their functional status was noted using Roland Morris Disability Questionnaire (RMDQ) score before the procedure and all were found to have a score of more than 21.5 Bone mineral density of all the patients was 2.5 standard deviations less than that of the young adult mean which significantly denotes osteoporosis.

Percutaneous Vertebroplasty was planned in the third week after a failed conservative trial for 2 weeks. Appropriate informed consent was obtained from the patient prior to the procedure. We preferred general anaesthesia for most of our cases except for a couple of patients in whom we performed the procedure under local anaesthesia. Patients were made to lie down prone on the radiolucent operating table and C-arm was positioned appropriately. Fractured vertebra was identified in both anteroposterior and lateral view images. C-Arm was positioned for an anteroposterior view to visualize the pedicles of the affected vertebra. With AP view as initial reference, a disposable 11-gauge Jamshidi type trephine vertebroplasty needle was inserted percutaneously from the back and directed to a point on the lateral border of the pedicle which corresponds to the centre of the pedicle in lateral view (Fig. 1). Once position and direction was confirmed, the needle was hammered and advanced.

Care was taken that as long as the needle crosses the pedicle in a lateral view, it should not have crossed the medial border of the pedicle in an anteroposterior view (Fig. 2). Once the needle was placed in the desired point inside the vertebral body, similar procedure was done to place another needle through the opposite pedicle (Fig. 2). Hence 2 needles were placed in each vertebra, one through each pedicle. After confirmation of needle position, Kyphon[®] high viscosity radiopaque vertebroplasty cement [Medtronic, Minneapolis, MN, USA], which takes a longer time to set, was injected through one of the needles when another needle remains closed with a stylet. The cement was injected alternatively in both the needles to achieve symmetrical spread (Fig. 3). We were comfortable using 3 ml syringes to inject cement into the needle. Once adequate even spread was noted, needles were removed. At least 4–6 ml of cement was injected into the affected vertebra in all our cases.

A couple of our patients had cement leakage into the disc space when final pressure was given to inject the cement. Once cement leakage was considered dawning, no further pressure was given to inject more cement. We did not encounter instances of cement leakage into the spinal canal. Those patients in whom the same procedure was done under local anaesthesia also tolerated the procedure well. Analgesics and antibiotics were given only on the day of procedure. Post procedural X-ray was done on the next day of procedure (Fig. 4). All patients were allowed to weight bear from the next day of the procedure and everyone tolerated well. We advised our patients not to carry on with strenuous activities until 4 weeks after the procedure, this was done to provide adequate healing conditions for the surrounding structures. Pre and post procedural pain was analysed using numeric rating scale. Functional assessment was done before the procedure using Roland Morris Disability Questionnaire during the conservative trial and after the procedure at 6th week follow up. Percentage of improvement in function when compared to pre-procedural status is calculated. Ultimate time taken to return to normal activity is noted.

Results were tabulated and statistical analysis were carried out using Graph Pad Prism 5 [GraphPad Software Inc., San Diego CA]. Analysis were done using Student's T test for all continuous variables. Probability values of less than 0.05 were considered statistically significant. This study was reviewed by the appropriate ethical committee and was performed in accordance with the

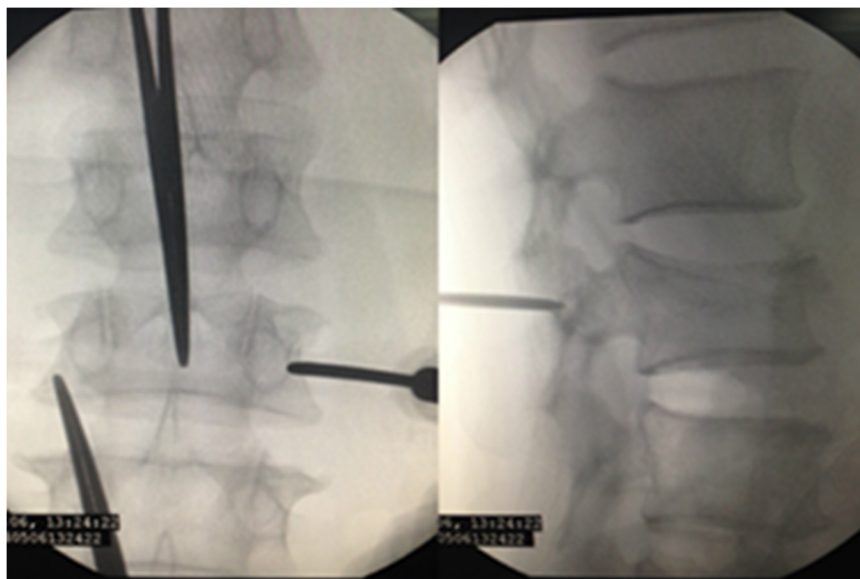


Fig. 1. Placement of needle over the bone before hammering into the pedicle as seen in both AP and lateral views.

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