Outcome Analysis of Percutaneous Vertebroplasty in Osteoporotic Compression Fractures

Suvarn Gupta[1], Tejas Sadavarte[2], Shraddha Singhania[3], Sohael Khan[4], Vasant Gawande[4]

[1]Assistant Professor, Department of Orthopaedics, Jawaharlal Nehru Medical College, Wardha, [2]Assistant Professor, [3]Senior Resident, Department of Radiodiagnosis, Datta Meghe Medical College, Nagpur, [4]Associate Professor, Department of Orthopaedics, Jawaharlal Nehru Medical College, Wardha

Abstract

Introduction: Osteoporotic compression fracture of vertebra are very commonly occurring with increasing age. Pain and deformity are most common features. Vertebral augmentation procedures like percutaneous vertebroplasty is a common surgical modality used for osteoporotic compression fractures. **Materials and Methods:** This prospective observational study was conducted on 36 patients of vertebral compression fracture that underwent percutaneous vertebroplasty in Datta Meghe Medical College in association with Jawaharlal Nehru Medical College. A thorough clinical assessment including physical, neurological, and systemic examination was carried out before taking up patients for percutaneous vertebroplasty. Bony Tenderness at fracture site was examined. **Results:** This study was conducted in 36 patients of vertebral compression fractures at our institute from January 2019 to January 2020. In our study, out of 36 patients, 24 (66.6%) were females and 18 (33.3%) were males. The mean age was 56.5 ± 6.2 SD years. D12 vertebral fracture was most commonly involved vertebra. The VAS score was used to assess pre and post procedure improvement. The mean pre-operative score 7.4 ± 1.1 SD which reduced to 2.2 ± 0.8 SD at 1 month follow-up and 2.1 ± 0.5 SD at 1 year follow up. There was significant reduction in pain score post operatively when compared with pre-operative scoring (p value < 0.01). **Conclusion:** On the basis of this study, we concluded that vertebroplasty is a safe, cost-effective, and pain relieving treatment option available for geriatric patient with osteoporotic vertebral compression fractures which are not relieved by conservative management.

Keywords: *Percutaneous Vertebroplasty, Osteoporosis, Vertebral compression fractures*

Introduction

Osteoporotic compression fracture of vertebra are very common with increasing age. Pain and deformity are most common features in this category of fractures.[1] Majority of these patients can develop chronic back pain. Increasing pain causes decrease in mobility with reduced quality of life of the patient.[2] According to American college of Rheumatology criteria for osteoporotic vertebral fractures, conservative management is given emphasis and anti-osteoporotic medications like Calcium and Vitamin D are should be given immediately[3] Traditional management includes bed rest with short course of analgesics or muscle relaxants with external bracing for four to six weeks. The pain usually decreases after conservative management within a month, however, complications due to prolonged immobilization like venous thrombo-embolism can cause increased morbidity.

Vertebral augmentation procedures like percutaneous vertebroplasty is a common surgical modality used for osteoporotic compression fractures. Percutaneous vertebroplasty consists of augmentation of vertebral body with polymethyl methacrylate (PMMA) via skin and the procedure was designed initially for treatment of osteolytic tumors like haemangiomas[4-7] and then it was used for osteoporotic compression fractures[8,9]. The

Corresponding Author:
Dr.Tejas Sadavarte
Assistant Professor, Department of Radio-Diagnosis & Interventional Radiology, Datta Meghe Medical College & Shalinitai Meghe Hospital and Research Centre. Wanadongri, Hingna, Nagpur- 441110.

basic aim of this procedure is to reduce pain. Basically, compression fracture comprises of multiple micro fractures resulting in stimulation of periosteal nerves during spinal movements. The theory behind Pain relief with this procedure is not clearly understood and these three mechanism are postulated: 1. Mechanical effect on vertebra due to injected PMMA cement, 2. Due to high temperature, nerve endings at the vertebra are damaged and 3. Cement composition destroys nerve endings. In post-mortem studies, it has been proven that PMMA causes restoration of strength and stiffness in vertebral bodies.[10] This study was undertaken to evaluate the outcome analysis of percutaneous vertebroplasty in osteoporotic wedge compression vertebral fractures.

Materials and Methods

This prospective observational study was conducted on 36 patients of vertebral compression fracture that underwent percutaneous vertebroplasty in Datta Meghe Medical College in association with Jawaharlal Nehru Medical College. Inclusion criteria was : Patients having osteoporotic vertebral compression fractures in thoraco-lumbar spine causing moderate to severe pain unresponsive to conservative therapy 2. Patients with painful vertebral hemangioma.3. Patient consenting to participate in surgery. A thorough clinical assessment including physical, neurological, and systemic examination was carried out before taking up patients for percutaneous vertebroplasty. Bony Tenderness at fracture site was examined. The pain severity was assessed by VAS (Visual analogue scoring) pre- and post-procedure and also on follow-up visits. Detailed Neurological examination with motor and sensory examination was carried out. Laboratory investigation like complete blood count (CBC), diabetes profile and coagulation profile were done routinely. Other tests according to primary disease of the patient were ordered. Radiographs of Antero-posterior and lateral view of dorsal or lumbar spine was done. Computed Tomography (CT) scan was done in selected cases with complex vertebral fractures. Magnetic Resonance imaging (MRI) was done in selected cases with complaint of radiculopathy or sensory/motor neuropathy. Percutaneous vertebroplasty was carried out under local anaesthesia (LA) with sedation, if required. With Patient in prone position and bollester kept beneath the chest and pelvis to produce the anatomical curvature of spine and under image intensifier guidance, the fractured vertebra was marked and through a minute stab incision, vertebroplasty needle (11 to 13 G) with trocar and cannula was inserted into pedicle thereby reaching the vertebral body. After confirming the position of tip of needle under image intensifier, the cannula is advanced further to a point slightly posterior to the anterior vertebral body as visualised in lateral view. The adjacent pedicle is cannulated in a same sequence. Bilateral cannulation increases the chances of safe PMMA injection. The normal saline is then pushed into the cannula until a resistance is felt to check any leakage in vertebra and to get an idea about the quantity of cement to be used. The mixture of polymethyl methacrylate (PMMA) mixed with barium in toothpaste-like consistency was prepared. The saline is then removed and bone cement was pushed. Under image intensifier guidance, the expansion of vertebra is checked. The vi filling of the body as seen on the antero-posterior views from the inner margins of the endplates along the lateral 1/3 on each side is ideal

Post-operative protocol:

Patient is kept supine for an hour after the procedure. Neurological evaluation is done. Patient is permitted to stand and walk after 4-6 hours. Intravenous antibiotics are given on first day followed by oral antibiotic for 5 days. The patient can be discharged within 48 hours after the reassessment of neurological status. Radiological evaluation with Antero-posterior and lateral radiographs of involved spine was done on the same day and follow-up was done at 3 months, 6 months and 1 year. Osteoporotic treatment like Calcium, Vitamin D, sodium alendronate etc. was started after the procedure. The VAS score and spine movements were evaluated at every follow up. All the data was collected and analysed using Microsoft Excel and SPSS 7.0 software.

Results

This study was conducted in 36 patients of vertebral compression fractures at our institute from January 2019 to December 2020. All the patients underwent percutaneous vertebroplasty and clinical follow up was done at regular intervals for 1 year. The patients were evaluated clinically and neurologically and the procedure was done under local anaesthesia and if required mild sedation was administered in some patients. In our study, out of 36 patients, 24 (66.6%) were females and

18 (33.3%) were males. The mean age was 56.5 ± 6.2 SD. All of the patients had osteoporotic compression fractures. Pre-operative radiographic findings shows osteopenia with degenerative changes and wedging of vertebral body. D12 vertebral fracture was most commonly involved vertebra.

The VAS score was used to assess pre and post procedure improvement. The mean pre-operative score 7.4 ± 1.1 SD which reduced to 2.2 ± 0.8 SD at 1 month follow-up and 2.1 ± 0.5 SD at 1 year follow up. There was significant reduction in pain score post operatively when compared with pre-operative scoring (p value < 0.01). 60% patient showed excellent to good results and 40% patients showed fair results on the basis of pain and activity score. The vertebral height improved from an average of 1.1 ± 0.3 SD mm to 5.1 ± 0.5 SD mm pre and post operatively as measured radiographically.

7 patients (19.4%) had localized swelling and tenderness at the vertebroplasty site for which analgesics and oral antibiotics were given for 5-7 days. At the end of 7th day, pain and tenderness was reduced in all the cases. One patient complained of tingling numbness in lower limbs which got relieved by conservative means at 2 week follow-up. No other complications were observed.

Post-Vertebroplasty, the patients were followed up for 1 year and the change in average pain score which was at the end of 3 months and 1 year. It can be interpreted that the pain relief after vertebroplasty can be assessed within three months of the procedure and no further variation in pain relief is there after three months.

Discussion

Majority cases of osteoporotic compression fractures are treated conservatively with bed rest, analgesic, muscle relaxant, dorso-lumbar bracing and anti-osteoporotic treatment. However, geriatric patients with comorbidities after bed rest may have complication like Deep Vein Thrombosis, thrombo-embolism, embolic phenomenon, Urinary tract infections and even bed sores.

In our study, out of 36 patients, 24 (66.6%) were females and 18 (33.3%) were males. The mean age was 56.5 ± 6.2 SD. The results were comparable with study of Singh et al [11] which reported mean age of 52.65 ± 13.1 SD with 26% males and 74 % females. According to literature, effective pain reduction was observed in 70% to 95% of patients within 24-72 hours [12-14]. In our study, 77% cases had effective pain relief within first 72 hours. After 1 year of percutaneous vertebroplasty, 93.3% of patients have pain relief which is comparable to the result of Liliang (2005) [14] and Bosch et al [15]

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Majority of studies have reported cement leakage into the spinal canal as the most serious complication but we did not find a single case of cement leakage in our study. (19.4%) had localized swelling and tenderness at the vertebroplasty site which was managed by analgesics. Similar findings were observed by Singh et al.

Hence, based on the observations of our study, we can say that percutaneous vertebroplasty is safe and economical solution for osteoporotic compression fractures which reduces the chronic pain and helps in improving the quality of life. Percutaneous Vertebroplasty can be considered as a favourable option of treatment after failure of conservative management in osteoporotic vertebral compression fractures as it results in favourable outcome.

Conclusion

On the basis of this study, we concluded that vertebroplasty is a safe, cost-effective, and pain relieving treatment option available for geriatric patient with osteoporotic vertebral compression fractures which are not relieved by conservative management. It was also found that significant pain relief is seen within 48-72 hours after procedure. Although the surgery was not free from complications but the results obtained were

satisfactory.

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Ethical Clearance: Taken from institutional ethics committee

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