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Analysis of functional outcome of kyphoplasty in osteoporotic vertebral wedge compression fractures

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Abstract

Introduction: Wedge compression fractures managed by kyphoplasty VS Conservative Management.

Study design: Prospective observational study

Objective: To assess the clinico-radiological outcome in osteoporotic vertebra

Methods: Total 21 patients of osteoporotic vertebral wedge compression fracture were included in this study. Patients presented in OPD with acute or chronic backache, true anterior-posterior and true lateral X-ray of spine were taken and diagnosis of vertebral wedge compression fracture were made. Patient's vertebral wedge compression fractures classified on the basis of Denis Classification and patients managed conservatively for 4 weeks. After failure of conservative management of four weeks these patients were selected for Vertebroplasty procedure and the outcome of the procedure was measured in relation to the patients undergoing conservative management. The assessment done on the basis of post op and pre op vertebral height, pain in relation to the pain scale and various other parameters.

Results: Advantages of kyphoplasty are fast, reliable and effective pain reduction which was assessed by Visual Analog Score scores whereas conservative management fails to respond with time and has a lot of complications associated with long term use of pain medications.

Conclusion: Vertebroplasty is a good procedure in cases of wedge osteoporotic vertebral compression fractures without associated neurological complications. However, it is not a cost effective process which holds many importance's in a country like India.

Keywords: Wedge compression fracture, Vertebroplasty, vertebral height, posterior lumbar interbody fusion

Introduction

Osteoporosis is a systemic skeletal disorder characterized by decreased bone strength that predisposes to increased risk of fractures. It is defined as bone mineral density (BMD) that is 2.5 standard deviation (SD) or more below the average value for young healthy women.

These fractures occur mainly at the hip, vertebrae, and distal forearm. Osteoporosis mainly occurs in postmenopausal women and elderly men[1,2,3].

Vertebral compression fractures are most common type of fractures in osteoporotic patients[4]

Symptoms include back pain, impaired normal physical functioning, decreased lung capacity and kyphosis resulting in morbidity, disability and increased mortality. In old patients these morbidities cause decreased daily routine activities and loss of independence resulting in social isolation.[5, 6, 11]

Osteoporotic vertebral fractures may result from minor trauma and cause microfracture without compression or acute collapse. Stability of vertebral body decreases due to microfracture and compression of vertebral body can result in anterior wedging of vertebral body. One vertebral compression fracture results in four-time risk of second vertebral fracture and second fracture may cause twelve times higher chances of further vertebral fractures[6,10].

Conservative management includes complete bed rest, pain killers like NSAIDs, life style modifications, supplementary osteoporotic interventions and bracing. Approximately 30% of the patients do not respond to conventional pain medication and conservative treatment. This leads to reduced inactivity and mobility which in turn leads to further bone loss and other problems like atelectasis, pneumonia, deep vein thrombosis, pulmonary embolism etc[7]. In senior citizens, these morbidities cause loss of independence and reduced daily activities leading to social isolation and mental depression[8]. The fractured osteoporotic vertebrae may also progress to collapse and may lead to progressive burst fractures leading to kyphosis with variable degrees of cord compressions and further complications. So, the need to stabilize these fractures, besides the medical treatment and braces is mandatory[6,7, 11].

Percutaneous vertebral augmentation procedures are indicated for osteoporotic fractures but can also be done in cases of aggressive hemangioma of spine and other painful pathological fractures and are contraindicated in cases of vertebral body osteomyelitis, asymptomatic fractures, fractures with radiculopathy and patients having irreversible coagulopathy[9].

Percutaneous Vertebroplasty is performed to treat pain. It doesn't restore vertebral body height or correct spinal deformity. There is a risk of adjacent vertebral fractures associated with a high rate of cement leakage[11, 12,13].

Percutaneous balloon kyphoplasty procedure requires the introduction of the inflatable balloon tamponade. Vertebral body height restored after inflating the tamps, and cavity is created for low-pressure PMMA cement filling[12, 14].

By restoring sagittal alignment of spine, center of gravity is restored in its normal position, decreasing the risk for secondary fractures [11].

Methodology

Total 21 patients of osteoporotic vertebral wedge compression fracture were included in this study. There were 6 males and 14 females patients of age ranges from 45 years to 80 years. Patients presented in OPD with acute or chronic backache, true anterior-posterior and

true lateral X-ray of spine were taken and diagnosis of vertebral wedge compression fracture were made. Patient's vertebral wedge compression fractures classified on the basis of Denis Classification and patients managed conservatively for 4 weeks. Patients initially treated conservatively for 4 weeks and later they presented with continuous intolerable low backache, without any neurological deficit and inability to do daily activity. These patients were admitted through outpatient department. After admission a detailed history were taken , which includes name, age, sex of the patient, date and time of injury, mode of injury, initial treatments and his/her present complaints were noted. Any history suggestive of other illnesses to rule out causes for compression fractures and associated co- morbidities were noted. Then patients were examined and focus given to examination of spine like any local swelling, deformity, tenderness over the spine. Neurology were noted which included assessment of motor, sensory status, bowel and bladder status. According to neurological status, Frankels grading was done. This was done for the purpose of comparison of post-operative neurological status. In all patients, Pre-operative Visual analog score for back pain were noted for the purpose of comparison of post-operative functional outcome. Investigation of patients with Chest X-Ray, ECG, CBC, KFT, LFT, RBS and Blood Grouping required for preoperative anesthetic checkup. Radiological evaluation was done in all patients. Fresh X-ray spine anterior-posterior view & lateral view of spine were taken, if needed dynamic X- ray flexion / extension, lateral view were taken to rule out spinal instability. Specific findings were needed for integrity of anterior, middle, posterior column of spine. Level and type of fracture, kyphotic angle and anterior vertebral height were noted as it will be helpful in considering type of intervention and for further follow up. The Computer Tomography (CT) scan done and found to be accurate in assessing the nature of fracture details, like level of fracture, type of fracture, presence of posterior cortex breach, percentage of collapse, fracture involvement of superior and inferior endplate, percentage of spinal canal compromise, presence of bony fragment pressing upon the cord, any pedicle fracture and morphometry. All these factors were assessed as a part of preoperative evaluation to avoid per-operative complications. Magnetic resonance imaging (MRI) scan done in few cases to assess the age of the fracture, anterior and posterior longitudinal ligament breech and any marrow and spinal cord changes. Subsequently patient and the attendants were explained about the nature, severity, progression, prognosis of injury along with the proposed line of operative management. Kyphoplasty its advantages and complications and proper explained consent were taken. All patients accepted our proposed management and underwent kyphoplasty. Similar level of protocols were maintained for all the patients undergoing kyphoplasty with the help of PMMA cement vertebral augmentation procedure was done with the aim to restore vertebral height, functional integrity of the affected vertebral segment and pain free lifestyle based on VAS score (visual analogue score). The following were recorded on the basis of post op findings and the outcomes at 1 month, 6 months, 1 year and 2 years respectively.

Table 1: Vertebral Levels

In our study most common fractured vertebral level is D12 followed by L1.

Level	Number	Valid Percent
D11	3	14.3
D12	6	28.6
D12 L1	1	4.8
L1	5	23.8
L1 L2	1	4.8
L2	2	9.5
L2 L3	1	4.8
L3	2	9.5
Total	21	100

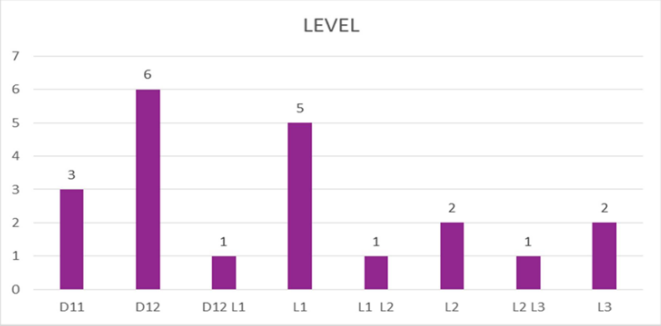

Table 2: Pre-Operative Vas Vs Postoperative Vas

In our study there is significant decrease of VAS over time from average 8.86 pre-op VAS toaverage 2.33 at 6 month of follow up.

Complication	Cases	
	No.	In %
Nil	21	96 %
Minor	1	4 %
Major	Nil	0%

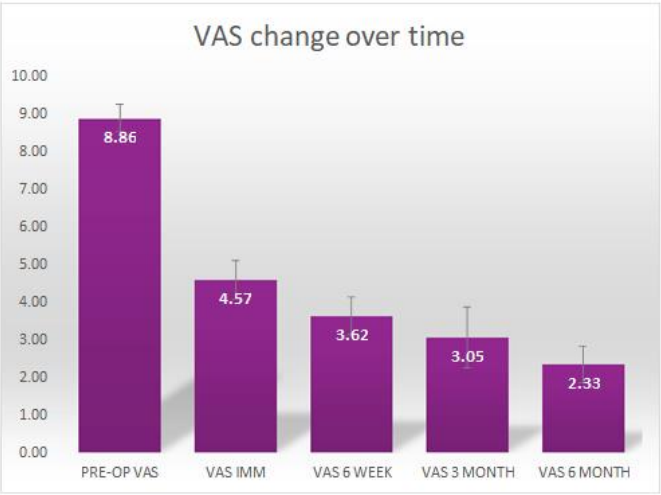

Table 3: Complications

In our study there was no major complication in all 21 patients only 1 minor complication that was asymptomatic cement extravasation noted.

Minor cement extravasations into soft tissue	1
Minor cement extravasations into spinal canal	0
Minor cement extravasations into venous channel intraoperatively	0
Dye leakage	0
Adjacent level fracture	0
Major cement embolism	0
Major paraplegia	Nil
Rib fracture	Nil

Results

In our study, 21 Patients with osteoporotic vertebral wedge compression fracture were treated with Kyphoplasty. These 21 patients were considered for the analysis. Average follow up was of 6 months with maximum follow up being 12 months and minimum follow up being 3 months. There were 21 cases with more than 6 months of follow up and 10 cases with more than 12 months of follow up.

Conclusion and Summary

Objective of this study to evaluate the role of kyphoplasty to improve functional outcome in osteoporotic vertebral compression fracture patients. In our study, Kyphoplasty shows excellent results in immediate backache relief which is maintained for longer time, improved quality of life and reduce complications and revision surgeries. So proper patient selection, correct positioning, understanding regional osseous, neural, vascular anatomy and the experience of the surgeon can improve the outcome of the procedure. In our study ,21 patients of osteoporotic compression fracture having chronic backache treated with Kyphoplasty showed marked reduction in back pain after surgery which was measured in terms of VAS

score, which was statistically significant P<0.001 and improved functional outcome which was measured in terms of daily routine activities.

Our study suggests that Kyphoplasty results and complications may be improved by following techniques.

1. Proper inclusion criteria should be followed with preoperative evaluation with CT scan of spine.
2. Transpedicular approach should be followed.
3. Avoid breaking vertebral cortex or wall of the pedicle while inserting needle.
4. Treat osteoporosis to prevent further fractures.

Complications of kyphoplasty are very low and immediate reduction of pain is significantly greater in Kyphoplasty as compared to conservative management. After thorough review of literature it's concluded that Kyphoplasty is minimally invasive vertebral augmentation procedure having benefit of severe decrease in back pain, improved mobility and quality of life, and decreased mortality and intake of NSAIDs.

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