Role of Percutaneous Vertebroplasty in Management of Osteoporotic Spine Fractures

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Abstract

Objective: The aim of this work is to evaluate the outcomes of Percutaneous vertebroplasty of pathological fractures secondary to osteoporotic spine fractures.

Methods: 10 patients having pathological fractures secondary to osteoporosis in the dorsal and lumbar spine were included in this study and were operated upon using Percutaneous vertebroplasty. Postoperatively, patients were evaluated and followed-up for their neurological integrity, deficits and outcome.

Results: 10 patients were operated upon. The median age of presentation in this study was 67.5 years. There was 3 males (30%) and 7 females (70%). In this study the main presentation of patients with osteoporotic fractures of the dorsal and lumbar spine was pain in all the 10 patients (100%). In this study the distribution of vertebral compression fracture for metastatic spine fractures was from the ninth dorsal vertebrae to the fifth lumbar vertebrae with 58% of the fractures in the dorsal spine and 42% in the lumbar spine. Postoperatively, in this study seven patients (70%) showed pain improvement. The complication rate for management of osteoporotic fractures of the dorsal and lumbar spine was 10% (1 patient) in the form of anaphylactic reaction.

Conclusion: Our study confirms that Percutaneous vertebroplasty of pathological fractures secondary to osteoporotic spine fractures is generally safe, effective and well-tolerated by patients. However, studies have proven that the long term follow-up did not show any difference from conservative management of the pathological fractures secondary to osteoporotic spine fractures.

Key Words: Osteoporotic spine fractures – Percutaneous vertebroplasty – Pain.

Introduction

OSTEOPOROSIS is a metabolic bone disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to increased bone fragility and a consequence increase in fracture risk [1]. Generally, osteoporosis is classified as either primary or secondary. Primary osteoporosis is further subdivided on the basis of its pathogenesis. Type I, or postmenopausal osteoporosis, is related to the abrupt decline of estrogen levels that occurs in menopausal women. Type II osteoporosis known as senile or age related osteoporosis, is due to progressive decrease of bone mineral density in both men and women that occurs with aging. Secondary osteoporosis results from any medical condition or medication that contributes to accelerated bone loss. Causes of secondary osteoporosis include endocrine and gastrointestinal disorders, bone marrow dysplasias, and disorders of calcium balance [1].

Osteoporotic vertebral compression fractures are a leading cause of disability and morbidity in the elderly. The consequence of these fractures include pain and in many cases progressive vertebral collapse with resultant spinal kyphosis. Osteoporotic vertebral compression fractures have been shown to adversely affect quality of life, physical functions, mental health and survival. These effects are related to the severity of the spinal deformity and are in part independent of pain.

Patients and Methods

This is a prospective study of 10 patients having pathological fractures in the dorsal or lumbar spine secondary to osteoporosis at Kasr El-Ainy University Hospital from 2011-2012.

The rationale of this work was to evaluate the Role of Percutaneous vertebroplasty of pathological fractures secondary to osteoporotic spine fractures. Patients of all ages and both sex were included in the study.
The study included all patients having pathological fractures in the dorsal or lumbar spine due to osteoporotic causes.

Pre-operative patient evaluation:

**History:**

Personal history included; name, age, sex, occupation, residence, marital status, and special habits of medical importance.

The presenting complaint was the most single distressing complaint to the patient, in addition to other complaints included in the patient's symptoms.

Present history included evaluation and analysis of the patient's symptomatology regarding the onset, course and duration, in addition to analysis of other neurological symptoms in focus.

Neurological symptoms included; symptoms of motor affection, sensory affection or sphincteric disturbance.

Past history included analysis of history of previous surgeries, medications received, previous irradiation and other associated medical disorders such as diabetes and hypertension.

**Examination:**

Complete general examination including: The patient's vital signs, height, weight, head, neck, chest and abdomen was performed for all patients.

A fully detailed and thorough neurological examination that included sensory examination (superficial and deep sensations), motor examination for the motor power and reflexes examination was performed for all patients.

**Investigations:**

Routine laboratory investigations including CBC, blood sugar, liver and kidney functions, PT, PC, INR, serum sodium and potassium were performed.

All patients had cardiopulmonary evaluation where chest X-ray and ECG were done for them, in addition to echocardiography and cardiological assessment for those who had history of cardiac disease and those who had ischemic changes in ECG.

Radiological investigations the diagnostic modalities that can be used to identify thoracic and lumbar fractures range from simple plain radiography to CT and MR imaging. Each imaging modality has its advantages and drawbacks. The complete evaluation of a patient with a thoracic or lumbar fracture will include a combination of various imaging techniques. It included pre-operative plain X-ray (AP, lateral views) were used as a routine screening for all patients, CT scan (without contrast) and MRI (T1 W, T2W, and T1 W with contrast if a neoplastic lesion is suspected). MR imaging is the imaging modality of choice for assessing soft tissues, including the spinal cord and was used as a complementary diagnostic modality for all patients in this study.

**Pre-operative management:**

Patients, who had evident lower limb weakness rendering them not ambulant, were closely monitored for proper hydration and were given prophylactic dose of short acting anticoagulants (fractionated low molecular-weight Heparin); 40 units/day in average weight patients and 80 units in severely obese patients and those with previous history of deep venous thrombosis. These anticoagulants were stopped 12 hours before surgery.

Patients who had history of, or turned out “on examination or by investigations”, to have medical disorders such diabetes or hypertension, were subjected to proper assessment and were given the proper corresponding medications.

All patients were given 1 gm of a third generation cephalosporin 6 hours before surgery (after performing an intra-dermal sensitivity test) and after induction of anaesthesia.

**Operative management:**

The surgical procedure and postoperative management were discussed with patient and his relative and the surgeon answered any question the patient had in mind about the operation.

All cases in our study where subjected to general anaesthesia.

Anaesthesia was given to patient while lying supine beside the operating table. During surgery we did not request Hypotensive anaesthesia.

Patients were operated on prone position on special radio-translucent table. The patient was placed on special radio-translucent frame were the injured area was clear for C-arm to take images. The frame makes the patient more stable and abdomen hang free during surgery.

Under continuous fluoroscopy, PMMA bone cement was injected manually using 1.0-mL syringes and 1 1- or 13-gauge bone biopsy needles.

**Post-operative management:**

- All patients were kept in an intermediate care unit for the first postoperative 24 hours, then they were transferred to the regular patients’ ward.
Patients were given 1 gm of third generation cephalosporin intravenously once postoperative unless infection or wound collection was noticed, where in such cases IV antibiotics were continued.

All patients were subjected to a complete and detailed postoperative neurological clinical evaluation comprising cranial nerves, motor and sensory functions.

All patients had a postoperative control X-ray.

Follow-up and outcome:

All patients were followed-up at intervals of 1 month, 3 months, 6 months and 1 year whenever possible as ten patients didn't show at their scheduled follow-up dates.

Follow-up included detailed neurological examination to evaluate the neurological deficits that the patients already had and to detect any new neurological deficits the patients developed during the follow-up period.

Follow-up also included radiological evaluation by X-ray±CTscan.

The outcome of patients was graded according to the patients' clinical and functional status in the last follow-up visit they showed up at.

Results

In this study there were ten patients presenting with osteoporotic vertebral fracture 70% of them were females and 30% were males.

In this study mean age for osteoporotic spine fractures were 67.8 years.

In this study the distribution of vertebral compression fracture was from the ninth dorsal vertebrae to the fifth lumbar vertebrae.

In this study the main presentation of patients with osteoporotic spine fractures was pain.

In this study two patients (100%) were managed by percutaneous vertebroplasty.

In this study pain was relieved immediately in 7 (70%) patients managed by percutaneous vertebroplasty.

In this study there was a single complication that occurred during vertebroplasty which was anaphylactic reaction from the bone cement material injected in the vertebral body.

Discussion

In this study there were ten patients presenting with osteoporotic vertebral fracture 70% of them were females which is close to the results obtained by Voormolen et al., [2] in which female were 82%, Huy et al., [3] in which female were 76%, Kallmes...
et al., [4] in which female were 74%, Layton et al., [5] in which female were 72% and were also close to the results by Fessl et al., [6] in which female were 73%.

In this study mean age for osteoporotic spine fractures were 67.8 which was younger than the results obtained by Voormolen et al., [2] in which mean age for presentation was 73 years old, Huy et al., [3] in which mean age for presentation was 74.6 years old, Kallmes et al., [4] in which mean age for presentation was 73.7 years old, Layton et al., [5] in which mean age for presentation was 75.8 years old and also younger than the results obtained by Fessl et al., [6] in which mean age for presentation was 74.3 years old.

In this study the distribution of vertebral compression fracture was from the ninth dorsal vertebrae to the fifth lumbar vertebrae. Which was less than the distribution results obtained by Huy et al., [3], Kallmes et al., [4], Layton et al., [5] and Fessl et al. (2005) in which distribution of vertebral compression fracture was from the fifth dorsal vertebrae to the fifth lumbar vertebrae.

In this study the main presentation of patients with osteoporotic spine fractures was pain which was consistent with the results obtained by Voormolen et al., [2], Huy et al., [3], Kallmes et al., [4], Layton et al., [5] and Fessl et al. (2005) in which the main presentation for patients with osteoporotic spine fractures was pain.

In this study ten patients (100%) were managed by vertebroplasty which was different from the study by Voormolen et al., [2] in which 50% of the patient population was managed conservatively while the other 50% of the population was managed by vertebroplasty. It was also different from the study by Huy et al., [3] in which all the patient population was subjected to vertebroplasty. And also different from Kallmes et al., [4], Layton et al., [5] and Fessl et al., [6] in which all the patient population was subjected to vertebroplasty.

In this study pain was relieved immediately in seven (70%) patients managed by vertebroplasty. While all patients subjected to vertebroplasty in the study by Voormolen et al., [2] showed improvement in pain and 60% of patients managed conservatively showed long term improvement. And in all the studies by Huy et al., [3], Kallmes et al., [4], Layton et al., [5] and Fessl et al., [6] all patients subjected to vertebroplasty showed all marked pain improvement.

In this study there was a single complication that occurred during vertebroplasty which was anaphylactic reaction from the bone cement material injected in the vertebral body. Which was different from the results obtained by Voormolen et al., [2] which showed other vertebral body fractures following vertebroplasty in (10%) of the population included in the study. And was also different from the study by Alan et al., [1] which had no complications. And the study by Kallmes et al., [4] which showed asymptomatic leakage during injection in 10% of cases. And also from the studies by Layton et al., [5] and Fessl et al., [6] which showed no complications.

**Conclusion:**

Our study confirms that Percutaneous vertebroplasty of pathological fractures secondary to osteoporotic spine fractures is generally safe, effective and well-tolerated by patients.

However, studies have proven that the long term follow-up did not show any difference from conservative management of the pathological fractures secondary to osteoporotic spine fractures.

**References**


الملخص العربي

الهدف من البحث: دراسة نجاح عمليات حقن الالعاب الفقري عن طريق الجلد في حالات عرضة للهشاشة العظام. الطريقة المتبعة في البحث: وقد كانت هذه الدراسة على عشر حالات تعاني من كسور بالفقيرات نتيجة لعشوائية العظام. وقد تم عمل حقن عن طريق الجلد في حالات التكسور الناتجة عن هشاشة العظام في الفقيرات القطنية والظهرية.

النتائج: تم عمل حقن للفقيرات القطنية والظهرية عن طريق الجلد في عشر حالات. كانت الشكوك الشائعة في كل المرضى هي الألم. المثبت من البحث: أثبتت الدراسة التي أجريت على عشر حالات أنها بوجه عام عملية آمنة ولكنها على المدى الطويل قد لا تختلف عن العلاج التحفظي.