

COMPLICATION OF PERCUTANEOUS VERTEBROPLASTY IN OSTEOPOROTIC VERTEBRAL BODY FRACTURES AND CEMENT LEAKAGEMa Mingling^{1,2}, Wang Yongxiang^{1,3}, Sun Hao^{1,3} and Mohamed Suleiman Mohamed^{1,3*}¹Department of Orthopedics Surgery, Northern Jiangsu People's Hospital, Yangzhou, 225001, Jiangsu, China.²Graduate School of Dalian Medical University, Dalian 116044, Liaoning, China.³Clinical Medical College, Yangzhou University, Yangzhou, 225001, Jiangsu, China.***Corresponding Author: Mohamed Suleiman Mohamed**

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ABSTRACT

Percutaneous vertebroplasty (PV) is one of the alternative method treatments for vertebral fractures, that reported significant complications such as, pain, radiculopathy, spinal cord compression, pulmonary embolism, infection and rib fractures. Vertebroplasty is a Prestigious procedure that participate in vertebral compression fractures and usually performed by patient's who are suffering from back pain, are more eligible to this surgery. Most these procedures must have complications that caused by needle insertion and normally cement leakage that occurs in paravertebral soft tissue and veins that may affect epidural space but the local complications are 60% of leakage around soft tissues. The most common complication of bone cement leakage appears, including veins, paravertebral soft tissue in the intervertebral disk and infections. There are also small systemic complications that may cause serious disease such as: fat embolism, PMMA (Methyl methacrylate) pulmonary embolism, cardiac problems and these may lead to irreversible paralysis.

KEYWORDS: Vertebral augmentation, Percutaneous vertebroplasty, multiple myeloma, vertebral body compression, cement pulmonary embolism, vertebral hemangioma, polymethylmethacrylates and spinal osteoporosis, benign compression fractures.

BACKGROUND

Percutaneous vertebroplasty is the management of the patients who have the vertebral body compression fracture caused by pathological changes and related with these diseases of multiple etiologies including hemangioma, multiple myeloma, osteolytic metastases, and primary osteoporosis. technically this management was originally developed by German radiologist whose named was Deramond and Galibert, also a French radiologist and neurosurgeon, in 1987. They practiced percutaneous transpedicular approach to introduce polymethylmethacrylate (PMMA) cement into the vertebral body.^[1]

The complication of procedure has been increased and associated with elevation of pain and it may has a bit low blood pressure(transient hypotension) and other issues such as infection, and cement leakage in paravertebral veins and causing heart problems.^[2]

The patients who are suffering from the neoplastic vertebral compression fractures are increasing and in our population, it is the most problematic health care.

This procedure is the best management of the vertebral hemangiomas to relieve pain. - the most complication of bone cement leakage appears including veins, paravertebral soft tissue in the intervertebral disk and infections. There are also small systemic complications that may cause serious disease such as :fat embolism,PMMA pulmonary embolism and cardiac problems.^[3]

Multiple myeloma (MM): 90% of the patients who are suffering from lytic bone disease are increasing by causing the filtration overgrowth of plasma cells in the bone marrow and can crowd out normal blood forming cells, leading to low blood counts, These lesions in the spine are common and when severe, can lead to one or more vertebral compressional fractures.^[4]

After treatment of vertebroplasty been done successfully, the patient may develop serious complication caused by infection.^[5] As many diseases are affecting vertebral body, the best way to treat the patients are by using percutaneous injection of an acrylic cement, polymethylmethacrylate (PMMA), and by the guidance of CT, it helps to relief pain and mechanical stabilization to protect the vertebral body to collapse.^[6]

The most obvious complications confirmed after surgery including spinal cord compression, nerve root compression, local infection venous embolism and pulmonary embolism.^[7]

Management of vertebroplasty procedure

Vertebroplasty: is a procedure which indicates percutaneous injection of polymethylmethacrylate (PMMA) in the vertebrae, to relief the pain. Galibert *et al* was the first person to discover in 1987 since then the method become more useful to treat cervical vertebra affected by hemangioma.

This procedure has been used and practiced for more than 10 years. Mainly, it is for the patients with hemangiomas and metastatic disease of vertebrae but now it is more famous during operative managements for vertebral compression fractures.

A new procedure kyphoplasty: this new procedure that attempts to restore vertebral body height by using of balloons inflate existing to bone cement injection.^[8]

Vertebra compression fracture (VCF): is a type of fracture that collapse one or more spinal vertebrae caused by loss of bone mass.

Vertebra augmentation procedure (VAP): its one of the promising procedure that have been used to treat vertebral compression fractures.^[9]

Distribution of Epidemiology History

Vertebral body compression fractures are usually seen in elderly patients and is a high risk of osteoporosis. Cancer in this age group is a major contributing factor.

Vertebral compression fractures: after women reached postmenopausal, elderly women are more susceptible than men to get osteoporosis. every year 1.5 million Americans were diagnosed especially aging people in vertebral compression fractures and the number of patients are increasing.

Vertebral compression fracture caused by osteoporosis are predicted to multiple myeloma; 14% with breast cancer; 6% with prostate cancer; and 8% with lung cancer.^[10]

The technique of percutaneous vertebroplasty with polymethylmethacrylate (PMMA): in 1987 was the first year Galibert and others were found that augmentation procedure can be used to treat the patients with vertebral hemangioma to relieve back pain.^[11]

Vertebroplasty was first introduced at the University Hospital of Amiens, France, in 1984, when it was used to augment the post-resection defect of a benign spinal tumor. Since then, it has become an increasingly recommended therapeutic intervention due to its high efficacy and safety^[12]. Same year these two scientists

called Deramond and Galibert were started to inject PMMA into C2 vertebra to treat hemangioma and procedure has been done successfully.^[13]

Complication

Needle Access Complications: the preparation of this procedure should be applied under with local anaesthesia or general anaesthesia.^[13]

Needle manipulation may result in complications from direct injury to artery, nerve and muscular tendon.^[14]

Procedural complication: performing of needle placement that seen during antecedent venography causing a cerebrospinal fluid leak and in the period of post procedural headache the patient developed left sided pain and the patient has no other evidence.^[15]

The three main classification of vertebroplasty

There are three main complications in which occurs vertebroplasty are mild, moderate and severe.

Mild complications

- 1) Temporary pain after the procedure and
- 2) Cement leakage in the intervertebral disc space and into paravertebral soft tissues.

Moderate complications included

- 1) Infection caused by insertion of the needle and
- 2) Cement leak into the epidural space

Severe complications

- 1) Leak into the paravertebral veins
- 2) Leading to pulmonary embolism, cerebral embolism or cardiac perforation. severe complications lastly attack to heart and cement leakage releases radicular pain.^[16,17]

Technical incidents and complication

All complications are matching each other technical incidents are part of them and needle.^[17,18]

- Venous leakage
- Soft tissue
- Dismal leakage
- Epidural venous leakage
- Arterial leakage

Complications

Radicular pain
Pulmonary embolism.

Inaccurate needle placement: inserting needle should be accurate if not there will be a damage to the nerve root.

Infections: is too less and its treatable by using of anti-inflammatory drugs.

Bleeding: if there is a bleeding the patients may receive anticoagulation drugs.^[19,20]

Surgical Procedure

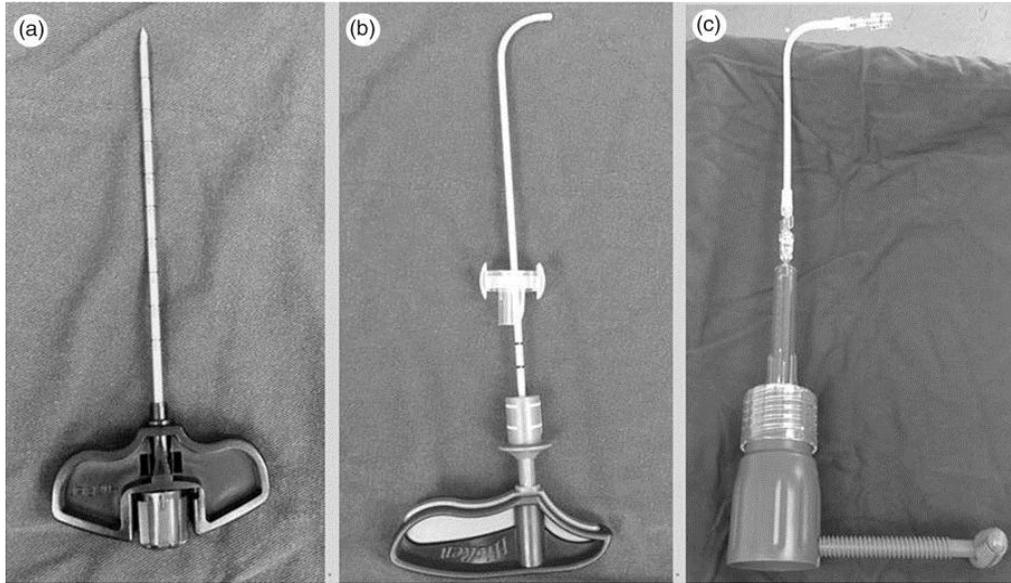
To describe all the surgical procedures are similar and patients were arranged well to perform the surgery, patient were in prone position on a radiolucent operation table.

Patients were given local anesthesia includes lidocaine, rivercane and rape vaccine and presented procedure

underwent fluoroscopy guided by unilateral pedicular.

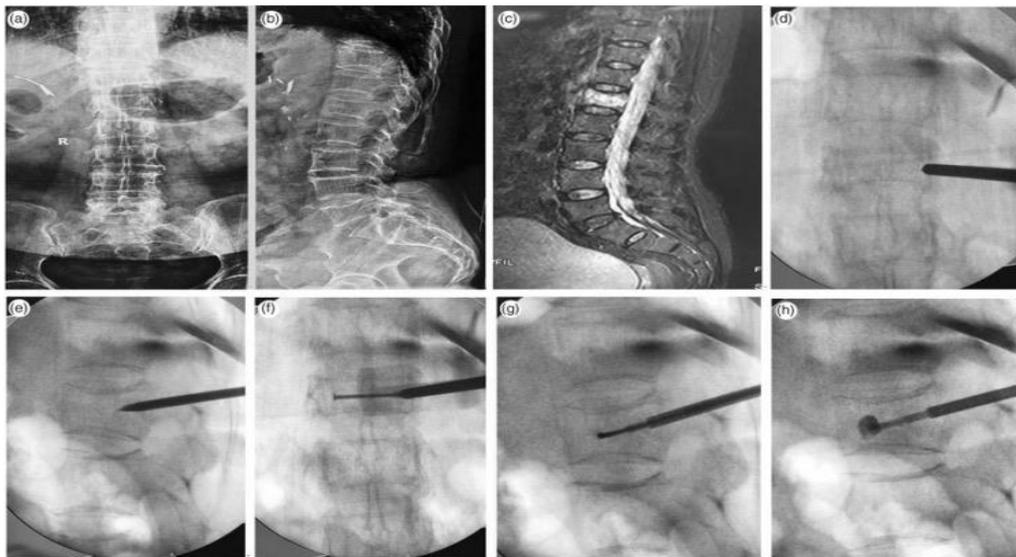
The location of the needle was in the anterior 3/4 of the vertebral body under guided fluoroscopy.

the cannula was inserted through the vein the amount of 3-5minutes as PMMP.^[21,22,23,24]



Representative images of surgical instruments using in percutaneous curved vertebroplasty, showing:
 (a) Puncture trocar

(b) Bending-angle injector
 (c) Cement screw injector.



Types of procedures

There are three types of procedures are includes: vertebral augmentation, vertebroplasty and kyphoplasty

Vertebra augmentation procedures (VAP): are a techniques in which have been used to treat vertebral body compression fractures.

Percutaneous vertebroplasty (PVP): is an outpatient management procedure for stabilizing compression fractures in the spine, normally bone cement is injected into back bones vertebrae often because of osteoporosis.

Percutaneous kyphoplasty (PKP): is a procedure used to treat vertebral compression fractures, and restore

vertebral body height by inflating balloons prior to bone cement injection.^[28,29,30,31]

MATERIALS AND METHODS

studying population

1,100 percutaneous vertebroplasty patients were discussed and participated in 616 patients with vertebral fracture and treatment, only this criteria were available.

All these patients were investigated after admission 468 (76%) women, and 148 men (24%), 24 to 94-year old, mean age 68 years.

All patients had experienced in severe pain and they were hospitalized, also MR or CT were confirmed within first 2 weeks.

616 patients were noticed in severe pain that increased within from 2 to 6 weeks before augmentation being performed.

There are 137 fractures that caused by malignant disease, and from 1100 procedures, 794 treated osteoporotic. Before surgery all patients were in prone position and vertebroplasty been presented with 11 gauge needle that under monitored by fluoroscopy and unilateral transpedicular.^[25]

These cases were identified on the departmental register, which recorded every percutaneous vertebroplasty case that was undertaken in an electronic prospective manner and there were 552 patients treated between February 1999 and October 2005.

Each case was reviewed by a consultant radiologist on the radiology imaging picture archiving and communication system along with the formal vertebroplasty reported cases were 552 patients underwent 673 deliberately to treat 1000 spinal compression fractures.

There were other 63% of treatments sessions (425/673) related with the treatment of a single level ,compared with other 27 percent (180/673) linked with 2 levels,9 percent (58/673) that involved 3 levels, and 1 percent (9/673) linked 4 levels.

According to the single case that linked the treatment of 5 level ,but there were no cases in that treatment of more than 5 fractures were presented in a single session.

Basically our study average age of patients based on 74 years (SD, 10.8 years) with a range of 28 –96 years. _As our data is showing that the number of females are more than males 69% (379/552) were women, whereas 31 percent (173/552) were men. however, vertebroplasty procedures have been discussed and presented by neuroradiologists with the other expertise in spinal interventions.

The needle injection was planned to terminate due to the disk space and epidural extravasation if was encountered. However, whether there is inadequate filling of the contralateral hemivertebra was reported and then a second needle must be placed into the contralateral side.

A preprocedure consultation usually presented by a neuroradiologist who has enough experience and normally this consultation included physical examination with fluoroscopic confirmation of correlating pain.

Vertebroplasty nurses and neuroradiologists were trained to conduct a modified Roland-Morris Disability Questionnaire of the preprocedure consultation, patient mobility, pain medication usage, visual analog pain scale which scored (0 –10).^[26]

Due to the vertebroplasty painful compression fracture we have been participated in 37 patients (16 men and 21 women): age range, 45–93 years; mean age, 78 years.

However, The causes of these fractures were osteoporosis 30 patients, metastases three patients, multiple myeloma two patients, and lymphoma and myelodysplasia one patient each.

Basically the total of 85 vertebral bodies were received treatment in these 37 patients, and physician has confirmed that most of the fractured vertebrae located around thoracolumbar junction.

Vertebroplasty Technique have been presented through a bipedicular by using that 13 gauge bone biopsy needles were placed into the anterior third of the vertebral body.

However, the procedures were participated underwent biplane fluoroscopic control by using of moderate conscious sedation and local anesthesia has been designated for outpatients.

When two needles were inserted through in the vertebral body, the liquid and powder which contains in polymethylmethacrylates that were mixed with 12g of barium sulfate and 1.2 g of tobramycin and 2-3hours after procedure patients condition were stable and patients were discharged from the hospital.

To avoid any injury during the preoperative surgery were guided under MRI by using of pre contrast sagittal T1 weighted 600/14/1, fat suppressed T2 weighted (4000/105/2),and sagittal fat-suppressed T1-weighted (600/14/1) image and CT were performed by using about thickness of 1.25 mm with 0.6-mm.^[27]

CONCLUSION

Percutaneous vertebroplasty is a treatment of vertebral compression fracture in which a medical grade cement is injected through a needle into a painful fractured vertebral body. This stabilizes the fracture, allowing most patients to discontinue.

The risks of PVP are generally low when performed carefully, but complications may be severe and the major risk is placing PMMA in the wrong place, such as in veins with pulmonary embolization.

Vertebroplasty and kyphoplasty complications both procedures have risk includes spinal cord compression, nerve root compression, venous embolism, and pulmonary embolism including cardiovascular collapse.

Although kyphoplasty has increased risk of level fractures.

All procedures are promising to treat the patients who are suffering from the vertebral body compression fracture caused by osteoporosis.

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