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Original Article

Vertebroplasty: pros and cons in treating vertebral compression fractures

Neurosurgery

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ABSTRACT

Background: Vertebroplasty is a minimally invasive procedure for the treatment of vertebral compression fractures.

Objective: To assess the advantages and disadvantages of vertebroplasty.

Methodology: this study is an interventional prospective study includes 20 patients who treated with vertebroplasty in Al-Azhar University hospitals and Mansoura new general hospital, during 2018 and 2019.

Results: In our study vertebroplasty was effective in reducing pain in most of patients within a short period of time. Preoperative visual analog scale (VAS) ranged from 7 to 9 and the mean was 8.4± 0.699 and Postoperative VAS ranged from 1 to 7 and the mean was 2.3±1.88. The height restoration ranges from 0.5% to 28% of the relative vertebral body height & by a mean of 5.14% (SD±8.14%). The local kyphotic angle improved by a mean of 2.21° (SD±1.5). We had no anesthetic complications and 50% of our cases was done under local anesthetics and the other were under general anesthesia. We had no cases of spinal infection. Vertebroplasty cement leakage: the incidence was 30% (6 cases). Intradiscal cement leakage was 5% (1 case). Prevertebral cement leakage was 10% (4 case). Their ware no vascular cement leakage. The incidence of canal and foraminal cement leakage was 5% (1 case) which required decompressive laminectomy and foramenotomy.

Conclusion: Vertebroplasty was found to be beneficial in treating painful vertebral collapse by lowering pain, raising vertebral body height, and correcting local vertebral kyphosis in a short amount of time. And, with careful patient selection, it might be done under local anesthetics. The incidence of symptomatic complications after vertebroplasty is rare such as: cement leakage which can lead to permanent neurological deficits or vascular and pulmonary embolism, adjacent level vertebral fracture and infection. To get the greatest outcomes and avoid complications, adequate patient selection, pre-procedural evaluation, and proper technique should be used.

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INTRODUCTION

Osteoporotic vertebral compression fractures (VCFs) had minimal therapeutic options prior to the discovery of percutaneous vertebroplasty (PV), such as bed rest, analgesics, and bracing. PV is an approved treatment for osteoporotic VCFs because it provides rapid and long-lasting pain alleviation. Similarly, when patients with metastatic lesions live longer, there is a greater desire to improve their quality of life as they near the end of their disease. PV relieves pain and augments vertebral bodies damaged by osteolytic lesions in situations of spinal metastases, offering some palliation and allowing the patient to resume his daily weight-bearing activities [1] .

For decades, vertebroplasty was done as an open procedure to augment pedicle screws and fill voids created by tumor removal. PV vertebral augmentation is achieved by injecting polymethyl-methacrylate (PMMA) cement into a vertebral body through a percutaneously inserted cannula to increase structural stability. As a result, percutaneous vertebroplasty achieves the benefits of surgical vertebroplasty without the associated morbidity [2].

In 1984, Galibert and Deramond in France conducted the first vertebroplasty on a 54-year-old lady who had been suffering from significant cervical pain for several years due

to a big C2 vertebral hemangioma (VH), and the patient enjoyed total pain relief. The procedure's results were so good that it was repeated on six more individuals [3].

The major steps of the operation were established based on the knowledge gained from these patients and other experimental work done on fresh cadaveric vertebral bodies. In the thoracic and lumbar spines, large-bore (10–13 gauge) needles are used, while in the cervical spine, smaller-bore (13–15 gauge) needles are used. For enhanced fluoroscopic vision of the cement dispersion during injection, an opacification agent was added to the PMMA cement. In the thoracic spine, a posterolateral technique was initially employed, but after cement leakage along the needle's track caused intercostal radiculopathy, a transpedicular needle approach was created. As a result, the probability of cement leaking posteriorly along the needle route was reduced.

The success of the initial percutaneous vertebroplasty cases inspired researchers to use a modified technique (18-gauge needles) to inject PMMA into the weakened vertebral bodies of seven patients: four with osteoporotic vertebral compression fractures (VCFs), two with VHs, and one with spinal metastasis. These seven initial patients reported good (one patient) to excellent (six patients) pain relief [4]**.** The European experience initially concentrated on treating tumor-related pain, whereas the American experience has primarily focused on treating painful osteoporotic VCFs [5]. In the last few years, substantial progress has been observed by numerous companies by producing devices and materials to aid in the performance of PVP [6]. The aim of this study is to assess the advantages and disadvantages of vertebroplasty in patients with vertebral compression fractures.

PATIENTS AND METHODS

This study is an interventional prospective study include 20 patients who treated with vertebroplasty in Al-Azhar University hospitals and Mansoura new general hospital, during 2018 and 2019.

Methods of preoperative assessment: All patients were subjected to both clinical and radiological examination on admission to the hospital as follows:

Personal History: Including age, sex, type of work, personal habits of medical importance (smoking & alcoholism).

Present History: Including main complaint, type of injury and duration of pain.

Evaluation of Pain:
Visual Analogue scale (**VAS**): was used to evaluate preoperative, postoperative, and long-term pain follow-up. In this test, each patient was asked to rate his pain on a horizontal 10 cm line (rating 0-10), with zero representing no pain and ten representing the most severe pain. The patient's mark is measured and a number between 0 and 10 is assigned.
The preoperative VAS values were compared to the postoperative VAS values to assess pain improvement before and after surgery. Between 0 and 10 is a conceivable outcome. Reduced readings suggest that pain levels have improved after surgery. With the same value, pain was the same before and after surgery. Increased VAS values indicate a worsening of postoperative pain sensations. The VAS was also used to evaluate the patient's pain condition at long-term follow-up with the situation after surgery.

Medication: Including type, dosage & duration and Bracing used and for how long.

Past history: Previous back surgeries, osteoporotic fractures, medical disease (diseases causing osteoporosis and cancers).

General examination: Includes: Systemic examination searching for associated injury, skin cautery marks indicating pain, deformity, local examination: includes - Scars for previous back surgeries and site of pain. - Local tenderness over spinous process.
Neurological examination (motor, sensory & reflexes).

Radiological assessment: All patients prior to vertebroplasty had standard antero-posterior and lateral x-rays, magnetic resonance imaging (MRI): which can shows marrow edema in STIR image (short T1 inversion recovery=Fat suppression) that indicates an unhealed fracture and it is also required in all of our osteoporotic patients and when a CT scan was required, it was used to identify potential sources of PMMA leakage, such as bone defects in the vertebral body's posterior wall.

The degree of spinal height restoration and improvement in kyphotic deformity were assessed using pre and postoperative radiographs. From lateral projection radiographs, the anterior and middle heights of fractured and normal vertebral bodies were measured. The percentages of estimated pre-traumatic vertebral height were used to determine the degree of compression fracture. The mean of the measurements from the nearest un-fractured vertebra below the fracture site was used to compute the height of a pre-traumatic vertebra. (McKiernan et al proposed method for calculating the height restoration ratio).

The Cobb's method was used to compute the kyphotic angle from the lateral radiographs, with measurements made from the superior endplate of the vertebra one level above the treated vertebra to the inferior endplate of the vertebra one level below the treated vertebra.

Laboratory investigations: Complete blood picture, bleeding and coagulation time and prothrombin time and activity.

A white blood-cell count, measurement of the erythrocyte sedimentation rate, and serum protein electrophoresis help to rule out an underlying infectious or malignant etiology.

Patient selection criteria: Patients with vertebral collapse resulting from osteoporotic compression fracture, traumatic compression fracture or malignancy were selected for this study if the pain was severe, debilitating and cannot be relieved by medical therapy for at least 2 months.

Patient exclusion criteria: Osteoporotic vertebral fracture that is completely healed or is clearly responding to conservative management, presence of untreated coagulopathy, presence of discitis/osteomyelitis or sepsis (active infection), significant compromise of the spinal canal by retro pulsed fragment or tumors invading the epidural space, all patients suffering from Neurological manifestations, unstable fracture involving the posterior elements and absence of a defined level of collapse.

Vertebroplasty technique

Vertebroplasty was performed under complete aseptic technique with the patient placed In prone position with thoraco-pelvic supports. In all of our patients we used the transpedicular approach under C-arm fluoroscopic guidance for cement injection. Fluoroscopic AP view used to identify the targeted vertebral pedicle(Scottie dog). Once the needle tip is decked in the bone , it could be advanced into the pedicle and the vertebral body. Lateral fluoroscopic view is used to identify the tip of the needle within the vertebral body when reaching the anterior one third of the vertebral body. We inject about 2_3cc of cement under continuous fluoroscopic view , any cement leakage outside the vertebral body is an indication to stop injection .We used bipedicular approach in 12 patient and unipedicular approach in 8 patients.

Immediate postoperative care: The patients are maintained recumbent for 1 to 2 hours and monitored for any clinical changes with early ambulation the 2nd day of the procedure and all patients are discharged the second day of the procedure from the hospital.

Post-operative radiological assessment: Check X-ray was done before discharge to determine bone cement leakage or adjacent level fracture and to measure the local kyphotic angle and the vertebral height postoperatively

Post-operative clinical assessment: Neurological examination (for early complications) and evaluation of pain; Pain level were determined after the patient could walk before discharge from the hospital. The same visual analogue scale was applied to compare with that prior to the procedure.

All patients advised for schedule visits at one, three and six months postoperatively for radiological and clinical assessment.

Statistical analysis

All data were expressed as mean± standard deviation (SD). Measurement data including VAS score, vertebral height of the fractured vertebral body, and local kyphotic angle before and immediate after vertebroplasty were compared using a paired students t-test and independent samples t-test. Pearson correlation coefficient were calculated to assess the relationship between the decreased values of VAS ,the restoration of vertebral height and the improvement of local kyphotic angle .$p<0.05$ indicated statistical significance.

RESULTS

The study included 20 patients (12 females and 8 males) with vertebral collapse (32 vertebral bodies affected) who underwent vertebroplasty. Their Age ranges from 35 to 81 years (average 58.7 years). Osteoporotic vertebral collapse found in 7 cases, 12 cases with traumatic vertebral collapse and 1 case of vertebral hemangioma.12 patients (60%) underwent bipedicular vertebroplasty and 8 patients (40%) were unipedicular. 50% of patients had general anesthesia and 50% of patients had local anesthesia (table 1).

In this study the preoperative VAS score ranges from 7 to 9 and the mean was 8.4(SD ± 0.699), postoperative VAS ranged between 1to 7 and the mean was 2.3(SD±1.88) (table 2). In our study mean VAS score after bipedicular vertebroplasty was2.5 (SD±2.25) and post unipedicular VAS score was 2 (SD±1.41).

The preoperative vertebral height of the fractured vertebral bodies ranges from 42% to 95 % and the mean was 67.26 (SD±16.57). The postoperative vertebral height ranged from 44.1%to 98.1 % the mean was 72.4 (SD±15.24) (table 3). Postoperatively, the height restoration ranges from 0.5 percent to 28 percent of the relative vertebral body height, with a mean of 5.14 (SD±8.14).

The preoperative local kyphotic angle ranges from 2° to 29° and the mean was 14.52±8.5°. Postoperative local kyphotic angle ranged from 0.8º to 26.8º the mean was 12.31º (SD±8.04) (table 4). In our study two patients with severe spinal osteoporosis and multiple spinal osteoporotic fractures underwent compound spinal fixation with vertebroplasty with no fixation failures.

The cement leakages were classified in to 5 types; 1), intradiscal (1case) 2), vascular (no cases) 3). perivertebral (4 cases) 4). canal (1case), and 5). foraminal (1case). We had no cases of spinal infection after vertebroplasty in this study. In this study, we had no patients with adjacent level fracture. Left lower limb radicular pain was found in one case who had intracanalicular and intraforaminal cement leakage and

the patient required spinal decompression and foramenotomy at the level of cement leakage.

In this study, we had no patients with allergic reaction to the cement used.

Table (1): Patient Demographic Characteristics

Patients characteristics	n (%)
Number of patients (n =20)	
Age /year: Mean age (Range)	58.7 (35-81)
Sex: Male/ Female	8 / 12
Number of vertebrae (n = 32)	
Approach (n =20)	
Unipedicular	8 (40%)
Bipedicular	12 (60%)
Etiology (n =20)	
Traumatic	12 (60%)
Osteoprotic	7 (35%)
Hemangioma	1 (5%)
Anesthesia (n =20)	
Local	10 (50%)
General	10 (50%)

Table (2): Comparison of visual analogue score in studied patients

	Preoperative Mean ± SD	Post-operative Mean ± SD	Stat. test	
			t	P-value
Visual analog scale	8.4± 0.699	2.3 ±1.88	10.41	0.001*

* Significant p value

Table (3): Comparison of RVH in studied patients

	Preoperative Mean ± SD	Postoperative Mean ± SD	Stat. test	
			t	P-value
Relative vertebral height	67.26±16.57	72.4±15.24	2.20	0.077

Table (4): Comparison of kyphotic angle in studied patients

	Preoperative Mean ± SD	Postoperative Mean ± SD	Stat. test	
			t	P-value
Kyphotic angle*	14.52±8.5	12.31±8.04	4.52	0.001*

* Significant p value

Case (1)

Male patient 71 years old, fall down 6 months ago, past history of L4_ L5 fixation 4 years ago, complaining of sever agonizing back pain, MRI lumbosacral spine shows L1 vertebral fracture (figure 1) , he is neurologically intact (sensation, sphincteric and motor power) and preoperative VAS was 8.

Figure (1): MRI lumbosacral spine shows L1 fracture

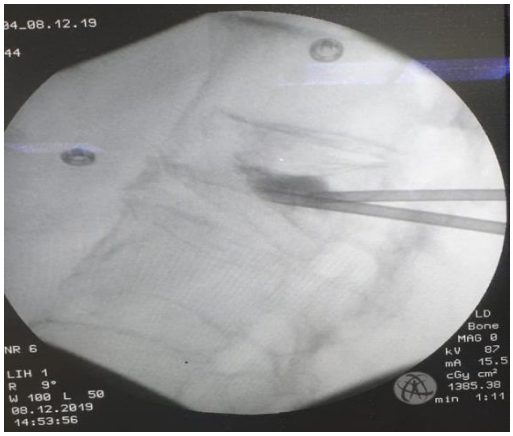

Figure (2): Intra-operative fluoroscopy shows bi-pedicular cement injection

Intraoperative fluoroscopy shows bi-pedicular cement injection. Post-operative no clinical complications and Post-operative VAS was 1.

Case (2)

Female patient 70 years old, fall down 3months ago, complaining of sever back pain over L2,MRI shows L2 fracture with bone marrow edema (figure (3), no past history of any medical disease, he is neurologically intact (sensation, sphincteric and motor power) and preoperative VAS was 8.

Figure (3): Lumbar MRI shows L2 fracture with bone marrow edema

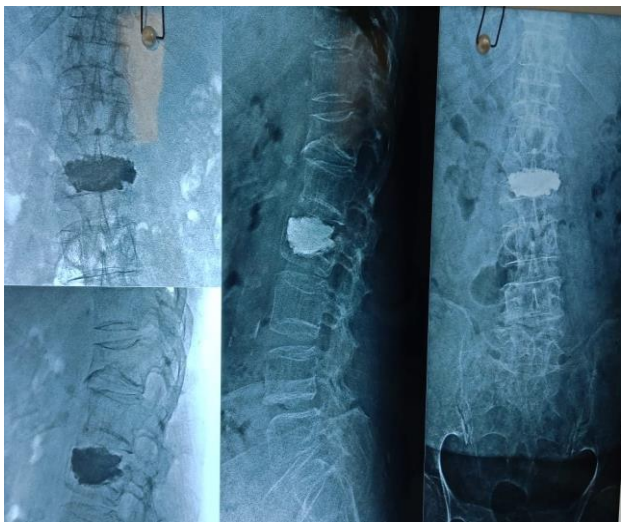

Figure (4): Post-operative plain x-ray showing cement injected at L2

Post-operative X-ray shows cement injection at L2 with no clinical complications. Post-operative VAS was 1.

DISCUSSION

The study was carried out on 20 patients with vertebral collapse who had vertebroplasty (12 females and 8 males). With a spectrum of ages ranging from 35 to 81years (average 58.7 years). Our osteoporotic patients are younger (mean age 67.6 years) than those described in prior studies by Anand et al [7]. (Mean age 73.8), Juerg et al. [8] (mean age 70.4), and Eric et al. [9] (mean age 72). Many hormonal, inherited, medical, and lifestyle factors can influence this discrepancy.

Twelve patients (60%) had bipedicular vertebroplasty, while 8 patients (40%) had unipedicular vertebroplasty. The mean VAS score after bipedicular vertebroplasty was 2.5 (SD2.25), whereas the mean VAS score after unipedicular vertebroplasty was 2 (SD1.41). The bipedicular approach provides a better vertebral filling and alternative way if the unilateral approach fails owing to cement leakage, the unipedicular approach has the benefits of a shorter operation time, less fluoroscopy exposure, and a reduced rate of cement leakage. Sun et al. [10] compared the safety and efficiency of unilateral percutaneous vertebroplasty for the treatment of osteoporotic vertebral compression fractures to bilateral therapy in a meta-analysis of 14 studies and observed no significant difference in VAS score (MD 0.12), Except Zhang LG study[11], which demonstrated a statistical difference between unilateral and bilateral PVP (MD 0.41), All of the patients received transpedicular vertebroplasty. The transpedicular approach reduces the possibility of cement leaking into the paravertebral tissue while avoiding spinal segmental nerve damage.

Vertebroplasty is a minimally invasive procedure for the treatment of painful spinal compression fractures without the morbidity associated with traditional open surgeries. Reducing pain: In most of our patients, vertebroplasty was helpful in lowering pain and enhancing their sense of well-being in a fairly short period of time, according to our findings. The VAS treatment results were taken into consideration. Preoperative VAS in our study ranged from 7 to 9 and the mean was 8.4± 0.699, while postoperative VAS ranged from 1 to 7 and the mean was 2.3±1.88. When these varied values were compared to preoperative VAS, the improvement was determined to be statistically significant. Except for one patient who experienced intracanalicular and Lt foraminal cement leakage and required spinal cord decompression, all patients reported immediate post vertebroplasty pain alleviation. The first night after the injections, the pain was slightly reduced, but by the second day, they had much improvement. This improvement was maintained and continued over the whole follow-up period. Our findings are consistent with those of Filippiadis et al. [12], who showed that pain reduction after vertebroplasty was 90% for acute and 80–100% for chronic osteoporotic VCFs, 60–85% for malignant cases, and 80–100% for aggressive hemangiomas. In addition, these results agree with Clark et al. [13], who found that about 95% of patients experienced significant pain relief. VAS pain was lower in the vertebroplasty group than in the control group at 14 days but not at 6 months follow up, and the vertebroplasty group used less analgesics over the 6 month follow up. According to Klazen et al. [14], vertebroplasty provided better pain relief than conservative treatment; the difference in mean VAS score between baseline and one month was –5.2 after vertebroplasty and –2.7 after conservative treatment, and the difference between baseline and one year was –5.7 after vertebroplasty and –3.7 after conservative treatment. The difference in mean VAS score reduction from baseline across groups was 2.6 at 1 month and 2.0 at 1 year follow up. Another multicenter study comparing vertebroplasty to a sham operation (use a placebo effect) was published by Buchbinder et al [15]. And the primary result showed that there was no difference in pain relief, disability, or quality of life between vertebroplasty and a sham treatment. We are concerned about these findings because pain improvement was significant in our study, which is consistent with most studies reporting pain improvement after VP. Furthermore, the thermogenic effect of cement or the cement-mediated stabilisation of microfractures cannot be ignored to the extent that there is no difference. Pain relief in painful vertebral hemangiomas was attributed by Nambiar et al. [16] to the PMMA cement filling the osseous defect and acting as a platform to anchor the vertebral body. It has been proposed that the exothermic process of PMMA cement polymerization (44 to 113 degrees) contributes to pain alleviation. The process of heat necrosis can produce thrombosis of the hemangioma, as well as ablation of perivertebral nerve terminals. Injections of PMMA cement can also produce compression, resulting in ischemia and tumour necrosis. Pain relief after vertebroplasty improves the patients' quality of life and social activities, as well as avoiding the issues associated with prolonged bed rest, the use of analgesics and other medications, degradation in bone density and musculoskeletal system function, and dementia progression in elderly patients. Back pain that persists might lead to psychological issues as mentioned by Rapan et al. [17]

In contrast to kyphoplasty, vertebroplasty does not try to restore spinal height. Despite this, after vertebroplasty, the vertebral body height increased to various degrees in all of our patients. Postoperatively, the height restoration ranges from 0.5 percent to 28 percent of the relative vertebral body height, with a mean of 5.14 percent (SD±8.14 percent). Our results goes with Cho et al. [18] who find that the mean restoration rate of anterior body height was 5.0% (±9.9%) from 34.99% to 19.69% after vertebroplasty. Hu et al. [19] also found that mean vertebral height restoration after vertebroplasty was (1.9 mm).Also Hiwatashi et al. [20] reported that vertebral

height was restored immediately after treatment by (1.2 mm).

The amount of cement injected and its pressure, which lifted the vertebral end-plate and led to partial height restoration, was determined to be a probable explanation for these VH changes, since there was a positive link detected between VH improvement and the amount of cement injected.

The local kyphotic angle improvement (the angle decreased) postoperatively by a mean of 2.21° (SD±1.5). Cho et al. [18] in their study find that the mean improvement of kyphotic angle was 3.26º HU et al. [19] also found that kyphotic angle improvement after vertebroplasty was7.51º. Hiwatashi et al. [20] reported that wedge angle was restored immediately after treatment by a mean of 2.8°. Vertebral height restoration and improvement of local kyphotic angle share in decreasing pain by decreasing stress on vertebrae and back muscle Dong et al.[21]

We had no anesthetic complications in this study and 50% of our cases was done under local anesthetics and the other half were under general anesthesia. As VP is a minimal invasive procedure and it takes short time duration compared to open surgery and most of VP candidate are elderly patient with multiple comorbidities. These comorbidities, including cardiac disease, pulmonary compromise, poor nutritional status, narcotic dependency and limited mobility require careful pre-operative medical assessment and optimization. Cardiovascular and pulmonary disease may especially impair the ability to lie in a prone position for a long time during general anesthesia. In a review of 91 vertebroplasty and kyphoplasty cases Caglı et al. [22] Performed vertebroplasty under local anesthesia to avoid the potential complications of general anesthesia with no medical complications reported. Emre et al. [23] also performed Vertebroplasty under local anesthesia in the treatment of 62 patients (68 vertebrae in total) with osteoporotic vertebral fractures between 2011 and 2013 with no post-operative complications reported.

Intradiscal, vascular, prevertebral, canal, and foraminal cement leakage are the most common kinds of vertebroplasty cement leakage, with the majority of cases being asymptomatic. The ones that caused symptoms were mainly caused by neurological compression. In our study, cement leakage incidence was 30% (6 cases). Intradiscal cement leakage was 5% (1 case). Prevertebral cement leakage was 10% (4 case). Their ware no vascular cement leakage. The incidence of canal and foraminal cement leakage was 5% (1 case) which was a female patient with traumatic L3 fracture treated with bipedicular vertebroplasty, postoperative patient complained of left thigh pain CT lumbar spine showed intracanalicular and foraminal cement leakage and the patient required decompressive laminectomy and Lt foramenotomy. We differ from Saracen et al. [24] who found that leakage occurred in 50% of osteoporotic fractures, 34% of neoplastic fractures, and 16% of traumatic fractures in their analysis of 616 patients having vertebroplasty. In 23 individuals, there was intradiscal leakage, and 9 patients had intracanal leakage. After developing lower extremities monoparesis, one patient with multiple myeloma underwent decompressive laminectomy. The remaining 8 patients did not benefit from the operation right away, but a 30-day evaluation found that 6 of them had significant pain alleviation and only 2 had no pain relief. A pulmonary embolism was found in two individuals, and the area of embolism in both patients was minor, with no clinical signs of pulmonary embolism. Also Elnoamany. [25] Who reported 11 cases of asymptomatic cement leakage in 123 patients treated with vertebroplasty. Which could be attributed to fracture severity grade, bone cement viscosity and presence of intravertebral cleft or cortical disruption which found to be a strong risk factors for cement leakage as reported by Nieuwenhuijse et al. [26]

The severity of complications caused by cement extravasations is determined by the site of the extravasation. Cement leaking in the epidural space can compress nerve roots and/or the spinal cord, resulting in a variety of neurologic problems ranging from radiculopathy to paraplegia. Intraoperative hypotension, cardiac problems, and pulmonary emboli can all be caused by cement leakage into the venous system as reported by Makary et al. [27]

Because the neurological consequences of cement leakage were minimal, leakage of PMMA cement into the spinal canal and neural foramen was generally well tolerated. However, it can cause major neurological problems, including paraplegia. In one case, intracanalicular and intraforaminal leaking caused the patient Lt Lower limb radicular pain, necessitating a decompressive laminectomy and Lt foramenotomy at the level of cement leakage. Saracen et al. [24] reported 9 cases of spinal canal cement leakage, one case only had monoparesis and sensory affection and required spinal decompression, with the patient experiencing significant pain alleviation 1 month later. In their study, Sidhu et al. [28] revealed that in 21 cases of patients with neurological deficits after cement extravasation, 18 patients reported neurological status deterioration immediately after the procedure, and two patients reported symptom presentation at 1 and 3 days after the procedure. In 18 cases, surgery was utilized to remove PMMA, while in the remaining three individuals, observation was used. Surgical intervention was found to be clinically beneficial even when performed 4 months after the beginning of symptoms in one study. Five of the 18 patients who had the PMMA surgically removed experienced only minor changes in neurological status both immediately after surgery and at long-term follow-up. For cement removal, two patients had numerous

decompression surgeries. After steroid treatment, two of the three patients who were treated conservatively showed no neurological improvement and one patient showed neurological recovery.

No patients with adjacent level fractures were found in the present study, which could be due to a lack of exact follow-up. Because of health-related concerns, geographic distance, or inconvenience, some patients may be unable to engage in a proper follow-up evaluation. Zhang et al. [29] observed no significant difference between total new fractures (P = 0.55) and adjacent level fractures (p = 0.5) in their meta-analysis study comparing and evaluating the incidence of a new vertebral fracture after vertebral augmentation and conservative treatment. For the treatment of pre-existing spinal fractures. While Takahara et al. [30] reported new vertebral fractures in 14 of 61 osteoporotic female patients (23.0%) during the first month of follow-up, which they attributed to the patients' advanced age and lower lumbar and hip BMD scores. Ma et al. [31] found that three strong-evidence risk factors for new VCFs after PVP, including lower BMD, intradiscal cement leakage, and vertebral height restoration, as well as cement injection, contribute to changes in spine biomechanics and weight-bearing effects, as well as increased adjacent and nonadjacent vertebral stress. According to Trout et al. [32], new vertebral fractures occurred in 86 (19.9%) of 432 patients. Seventy-seven (41.4%) of them were in close proximity to the vertebroplasty level. They also found that adjacent-level fractures were more common near the thoracolumbar junction, whereas nonadjacent fractures were most common in the midthoracic area of the spine, and that adjacent-level fractures occurred much sooner than non-adjacent level fractures. To date, it is not determined yet whether new compression fractures are merely the result of osteoporosis progressing naturally or as a result of bone cement injections increasing vertebral body stiffness. [33]

Compound spinal fixation with vertebroplasty in sever osteoporotic patients: In our study. We had no fixation failures, such as loosened or broken pedicle screws, or nearby vertebral body fractures or vertebral re-fracture, during the follow-up period on two patients with severe spinal osteoporosis and multiple spinal osteoporotic fractures who treated with posterior transpedicular screw fixation and verteproplasty. Gu et al.[34] stated that in patients without neurological deficits, minimally invasive pedicle screw fixation combined with percutaneous vertebroplasty is more effective than vertebroplasty in treating burst vertebral fractures because it reduces Cobb angle and increases central and anterior vertebral body height, preventing secondary VCF. According to Xu et al. [35] Long segment fixation and vertebroplasty are more effective than percutaneous kyphoplasty in restoring vertebral body height and correcting kyphosis in treating severe osteoporotic thoracolumbar compression fractures.

We had no cases of spinal infection after vertebroplasty in this study. Although it is rare, it has been published in a few case reports. In their study, Liao et al. [36] discovered that eighteen individuals developed infectious spondylitis after VP (0.32 percent, 18/5749). There were two males and sixteen females in the group. At VP, the median age was 73.4 years. Nine of the patients had tuberculosis, whereas the other nine were pyogenic. The time between VP and revision surgery was somewhere between 7 and 1140 days (mean 123.2 days). Anterior combined with posterior surgery was the most prevalent kind of revision surgery. Prior to revision surgery, seven patients had neurological deficits. With a mortality rate of 16.7%, three patients died within six months of revision surgery. WBC and CRP levels in the pyogenic group were considerably higher after revision surgery. Five people in the pyogenic group had a UTI and bacteremia, while five people in the TB group had a history of lung TB. Abdelrahman et al. [37] reported 4cases of spinal infection after vertebroplasty between January 1997 and June 2012 out of 1,307 cases underwent percutaneous vertebroplasty or kyphoplasty.

Finally most of published papers do not specifically determine infection rate but most of the published cases had multiple comorbidities or immunosuppression allowing low-virulence organisms to multiply and grow at the operative site. [37]

CONCLUSION

Vertebroplasty was found to be beneficial in treating painful vertebral collapse by lowering pain, raising vertebral body height, and correcting local vertebral kyphosis in a short amount of time. And, with careful patient selection, it might be done under local anaesthetics. The incidence of symptomatic complications after vertebroplasty is rare such as: cement leakage which can lead to permanent neurological deficits or vascular and pulmonary embolism, adjacent level vertebral fracture and infection. To get the greatest outcomes and avoid complications, adequate patient selection, pre-procedural evaluation, and proper technique should be used.

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الملخص العربي

الحقن الإسمنتي الإصلاحي لفقرات العمود الفقري: الإيجابيات والسلبيات

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ملخص البحث

الخلفية: الحقن الإسمنتي الإصلاحي لفقرات العمود الفقري هو إجراء محدود التدخل لعلاج كسور العمود الفقري الانضغاطية..

الهدف: تقييم مزايا وعيوب الحقن الإسمنتي الإصلاحي لفقرات العمود الفقري.

الطرق: هذه الدراسة تشمل 20 مريضاً عولجوا من كسور الفقرات الانضغاطية عن طريق الحقن الإسمنتي الإصلاحي لفقرات العمود الفقري في مستشفيات جامعة الأزهر ومستشفى المنصورة العام الجديد خلال عامان (2018، 2019)

النتائج: في دراستنا، كان الحقن الإسمنتي الإصلاحي لفقرات العمود الفقري فعالاً في تقليل الألم لدى معظم المرضى خلال فترة زمنية قصيرة حيث تراوح المقياس التناظري المرئي قبل الجراحة من 7 إلى 9 وكان المتوسط 8.4 وتراوحت القيمة بعد الجراحة من 1 إلى 7 وكان المتوسط 2.3. تم تحسين ارتفاع جسم الفقرة النسبي من 0.5٪ إلى 28٪ وبمتوسط 5.14٪، كما تم تحسين الزاوية الحدبة المحلية بمتوسط 2.21 درجة ولم يكن لدينا أي مضاعفات جراء التخدير وتم إجراء 50٪ من حالاتنا تحت التخدير الموضعي والأخرى كانت تحت التخدير العام. لم يكن لدينا أي حالات عدوى في العمود الفقري. تسرب الإسمنت من العمود الفقري: كانت نسبة الإصابة 30٪ (6 حالات). كان التسرب داخل الغضروف المجاور للفقرة 5٪ (حالة واحدة). بلغت نسبة تسرب الإسمنت بجوار الفقرة 10٪ (4 حالات). ولا يوجد تسرب إسمنتي داخل الأوعية الدموية و كانت نسبة حدوث تسرب إسمنتي داخل القناة العصبية 5٪ (حالة واحدة) مما تطلب التدخل الجراحي لتوسيع القناة العصبية .

الاستنتاجات: وجد أن الحقن الإسمنتي الإصلاحي لفقرات العمود الفقري مفيد في علاج الانهيار الفقري المؤلم عن طريق تخفيف الألم ، ورفع ارتفاع الجسم الفقري ، وتصحيح تحدب العمود الفقري الموضعي في فترة زمنية قصيرة. وباختيار المريض بعناية ، يمكن إجراؤه تحت التخدير الموضعي. من النادر حدوث مضاعفات عرضية بعد الحقن الإسمنتي مثل: تسرب الإسمنت الذي يمكن أن يؤدي إلى عجز عصبي دائم أو انسداد الأوعية الدموية والرئتين، وكسر العمود الفقري المجاور والعدوى للحصول على أفضل النتائج وتجنب المضاعفات، يجب الاختيار المناسب للمريض، والتقييم الجيد قبل اجراء الحقن الإسمنتي واستخدام التقنية المناسبة لذلك.

الكلمات المفتاحية: الحقن الإسمنتي الإصلاحي، ارتفاع الفقرات، التسريب الاسمنتي

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