

Bone Cement Pulmonary Embolism after Percutaneous Vertebroplasty

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Abstract

Percutaneous vertebroplasty (PVP) is a common procedure for treatment of painful vertebral fractures. Although PVP is considered minimally invasive, complications may occur during the procedure. Bone cement pulmonary embolism (CPE) is a severe and potentially life-threatening complication following vertebroplasty (VP). CPE commonly occurs after performing VP, but hemodynamically it has little clinical impact. Treatment strategies of CPE is still unclear.

Keywords: Cement leakage; Complication; Pulmonary embolism; Vertebroplasty

Case Report

A 36-year-old woman was admitted to outpatient clinic for chest pain. The pain was originating from low back and spreading to right and left lower chest. There was no dyspnea, tachypnea or tachycardia. Vital signs, routine blood work, arterial blood gas analysis and cardiac enzymes were normal. Patient did not use any drugs other than analgesic (Naproxen sodium). She hasn't got any comorbid disease but she was quite overweight. Chest pain started three days after PVP performed for traumatic vertebral compression fracture. She was discharged two days after the procedure without any complication and symptom. We detected five centimeter-length linear foreign body in the right lower lobe in chest X-ray. In thorax Computerized Tomography (CT) we saw that the foreign body was in the right lower pulmonary artery (Figures 1 and 2). Thorax CT revealed the characteristic appearance of cement leakage at the level of the VP (Figure 3). The presence of cement embolism in the segmental and sub segmental pulmonary arteries of the right lower and middle lobe was also confirmed by CT. Because the patient was asymptomatic for pulmonary embolism, we didn't start anticoagulation. The patient's chest pain was attributed to soft tissue cement leakage at the level of vertebroplasty. There hasn't been any further cement material embolization during three years follow up.

Materials and Methods

We collected data from PubMed database, with the queries: "complication of vertebroplasty", "bone cement pulmonary embolism." Only asymptomatic pulmonary cement embolism cases which occurred after vertebroplasty were selected for this review.

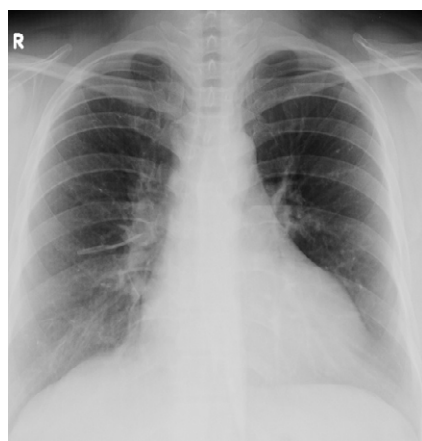


Figure 1: Foreign body was in the right lower pulmonary artery.

Results

There were seven series consisting of a total number of 951 VP cases, of which 72 (8%) developed asymptomatic PCE. Three of the series were retrospective, four of them were prospective. The numbers of case reports were sixteen. Anticoagulation treatment was used in two cases (2.5%), surgical embolectomy was used in three cases (3.5%). Patients received conservative treatment for the pulmonary embolism after surgery in all of these cases. Six publications didn't discuss their treatment method (25 patients/28%). Eleven publications didn't begin any treatment besides clinical observation (58 patients/66%) (Table 1).

13 patients (15%) were diagnosed during the surgery of vertebroplasty, 47 patients (54%) post-op in seven days, 23 patients (26%) two months and over and 4 (5%) unknown.

From our brief literature review, it seems to be unclear which therapeutic strategy to be used for asymptomatic bone cement pulmonary embolism. Treatments varies from clinical follow up to anticoagulation.

When we examined the publications in detail, we realized that at the case of Seo et al. [1]. Physicians was performed embolectomy because

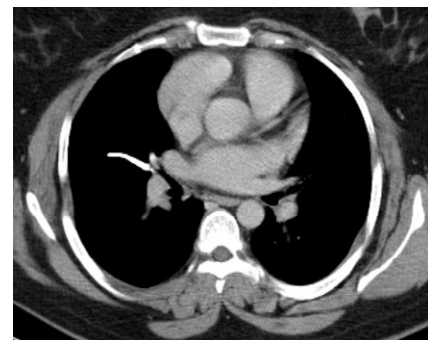


Figure 2: Foreign body was in the right lower pulmonary artery (Enlarged image).

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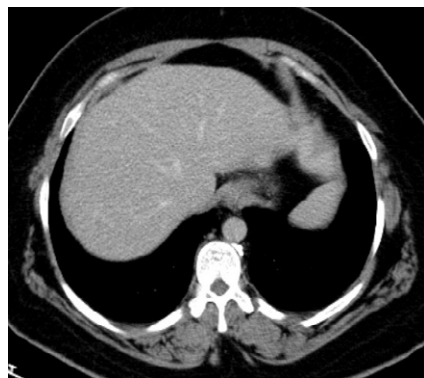


Figure 3: Thorax CT revealed the characteristic appearance of cement leakage at the level of the VP.

Authors	Patient number /Asymptomatic PCE patients	Time between VP and diagnosis	Treatment
Grados et al. [6]	40/1	48 months	Not reported
Bernhard et al. [7]		1 6 months	Not reported
Pleser et al. [8]		1 During VP	AKG
Seo et al. [1]		1 24 months	Embolectomy
Baumann et al. [3]		1 Post-op	Embolectomy
MacTaggart et al. [11]		1 2 months	Clinical observation
Du Hwan Choe et al. [12]	64/3	3 months	Clinical observation
Quesada et al. [13]		1 1 day	Not reported
Abdul-Jalil et al. [14]		1 1 year	Clinical observation
Serra et al. [15]	175/3	Not reported	Not reported
Schneider and Plit [16]		1 2 days	Not reported
Yeo et al. [17]	75/18	Post-op	Not reported
Venmans et al. [18]	299/11	During VP	Clinical observation
Venmans et al. [19]	54/14	21 months	Clinical observation
Fornell-Perez et al. [20]		1 Post-op	Clinical observation
Nesnidal et al. [21]		1 2 days	Clinical observation
Dash and Brinster. [2]		1 Not reported	Embolectomy
Luetmer et al. [23]	244/22	Post-op	Clinical observation
Tourtier et al. [24]		1 Post-op	Clinical observation
Walter et al. [25]		1 During VP	Clinical observation
Girolamo et al. [26]		1 Post-op	AKG
Lee et al. [27]		1 3 years	Clinical observation
	87		

Table 1: Case reports and series of patients with asymptomatic pulmonary embolism after percutaneous vertebroplasty. Data was collected from PubMed database, with the queries: "complication of vertebroplasty", "bone cement pulmonary embolism". VP: Vertebroplasty; PCE: Pulmonary Cement Embolism; AKG: Anticoagulant

of Chest CT showed catheter-like highly-dense 14-cm-length material within inferior vena cava (IVC) and focal thrombosis around the tip of the lesion in the right atrium. They considered the cement in the IVC to be the source of pulmonary thromboembolism or infarction. Therefore, an operation was performed to remove the foreign body in the IVC. In the case of Dash et al. [2] embolectomy was performed because of right atrial-inferior vena caval thrombus. In the case of Bauman et al. [3] CT of the abdomen was taken at post-op fifth day and showed that the cement fragment became detached from the vertebra and a smaller fragment had broken off. They performed thrombectomy to intrahepatic portion of the IVC because of the potential complications.

Discussion

Cement leaks into the external vertebral venous plexuses have frequently been reported. There is also a potential risk of cement migration into the inferior vena cava and pulmonary embolism [4]. The frequency of local leakage of bone cement is relatively high (about 80-90%), moreover, the rate of cement leakage into the perivertebral veins (seen in up to 24% of vertebral bodies treated) with consequent pulmonary cement embolism varies from 4.6 to 6.8% (up to 26% in radiologic studies) [5,6].

It is assumed that in many cases, many embolisms remain undetected. In the majority of those cases, cement leakage does not cause any problems and is usually detected during routine radiological work up. Those types of cement leakages after PVP seem to be harmless and require no further therapy [7,9,10,22]. Nevertheless, pulmonary cement embolisation leading to death can be the after effect of uncontrolled leakage.

Conclusion

Due to potential hazards of radiation exposure, Chest X-ray is not a routine work-up after VP. That may be the reason why a significant portion of PCE patients are still diagnosed incidentally and there is no clear diagnostic or treatment standard for PCE. Chest X-ray should be taken after VP for recognition of pulmonary leakage. We suggest routine Chest X-ray evaluation after the procedure and CT scan, especially in the cases where cement leakage is detected during the procedure. Thereby serious cardiopulmonary complications due to delayed or missed diagnoses can be prevented.

The results show that there is no clear diagnostic or treatment standard for asymptomatic PCE. In cases of asymptomatic patients with peripheral PCE we recommend no treatment besides clinical follow-up; in cases of asymptomatic central PCE, however, we recommend to proceed routine treatment of pulmonary embolism as in the guidelines. In cases with large sized peripheral emboly in systemic circulation or intracardiac emboly, we recommend surgical resection because of potential cardiopulmonary complications.

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