

## Case Report

# Surgical retrieval pulmonary and inferior vena cava embolism caused by cement leakage after percutaneous vertebroplasty: case report and literature review

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**Abstract:** Osteoporotic vertebral fracture is becoming increasingly risk factor of the aging population. Percutaneous vertebroplasty is a widely used treatment for the vertebral fracture. However this procedure may carry complication about cement leakage. Here we report a case of a 66-year-old woman who had developed the inferior vena cava and pulmonary embolism after PVP with bone cement leakage. This patient subsequently underwent a combination surgery to remove the embolus. This case discussed the therapeutic methods to treat pulmonary cement embolism.

**Keywords:** Osteoporotic vertebral fracture, percutaneous vertebroplasty, pulmonary cement embolism

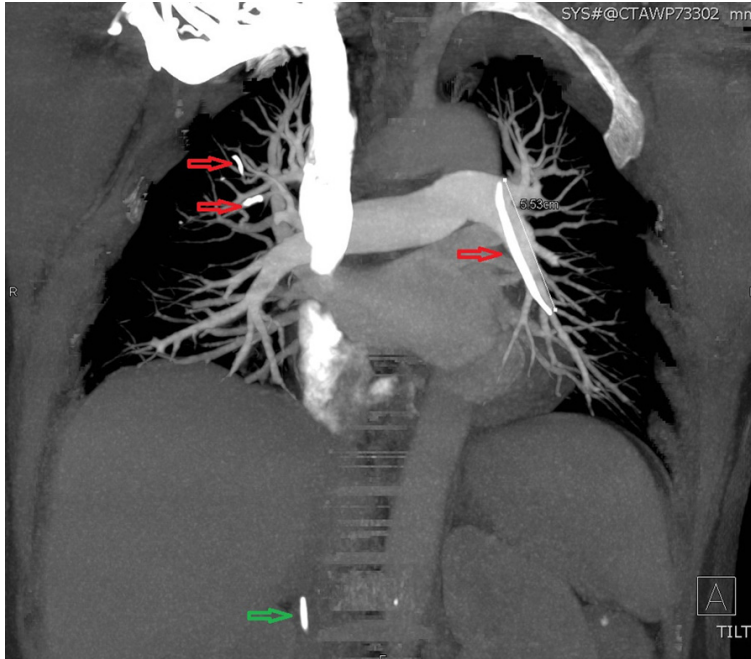
## Introduction

Percutaneous vertebroplasty (PVP) is a therapy, minimally invasive interventional radiological procedure which is used in treatment for osteolytic lesions caused by bone metastases, aggressive haemangioma, multiple myeloma and osteoporotic compression fractures [1]. However, this procedure may carry complications about cement leakage, which into the spinal canal, paravertebral tissue or the perivertebral venous system. Pulmonary embolism (PE) may occur when the cement draft from the perivertebral venous system towards the right heart and pulmonary circulation [2]. We report a pulmonary and inferior vena cava (IVC) embolism by cement leakage after PVP.

## Case report

A 66-year-old lady came to emergency department with chest pain and shortness of breath about two weeks. She had no record history but experienced a vertebral fracture (L2) and undergone PVP procedure about eighteen days before. First physical examination showed stable vital signs and nothing special. The regular ECG, CK, CK-MB, cardiac troponin I, amylase and arterial blood gas was normal, but D-dimer elevated significantly. At last, PE and IVC embolism

was diagnosed by computer tomography of chest and abdomen (**Figure 1**). Surgery was need beyond the obvious symptoms, the risk of continued thrombosis and further migration, and cement embolism maybe. Moreover, the largest pulmonary artery emboli was 5.53 cm long of multiple-location embolism, the option of the percutaneous retrieval seems too difficult. So, the patient underwent open surgery for retrieval the emboli, which operation is cooperate with cardiac surgery and vascular surgery. This surgery was performed by general anesthesia. Vascular surgery was performed a midline laparotomy to retrieval the IVC cement emboli at first, then cardiac surgery performed a midline sternotomy to took out the pulmonary artery cement emboli (**Figure 2**). Computer tomography of chest and abdomen was performed after the surgery, the IVC and left pulmonary artery emboli were retrieved successfully, but the right pulmonary artery emboli were failed to take out because of it was too difficult to find out (**Figure 3**). The patient discharged after one week intensive care and ten days uneventful recovery. At a follow-up of 3 months after surgery, the patient remained free of symptoms and no special change of the right PE.



**Figure 1.** Computer tomography of chest and abdomen revealed multiple-location radioopaque densities, which were identified in the both sides of pulmonary artery branch vessels (red arrow) and IVC (green arrow).



**Figure 2.** The cement emboli in the IVC, and the red things are the venous thrombus (left); the cement emboli in the left pulmonary artery (right).

## Discussion

PVP is the commonest of the minimally invasive imaging-guided procedures, which are popular treatment protocols for the management of vertebral osteoporotic fractures and osteolytic vertebral tumors [1]. PVP performed by injec-

ting polymethylmethacrylate (PMMA) cement into the vertebral body under high pressure [3]. Despite clinical trials have proven this PVP to be an efficient and relatively safe procedure, it is not immune to complications. Among these complications, cement leakage has been particular concerned. Cement leakage has been reported at rates of up to 73% of vertebral bodies treated, with venous leaks in up to 24% of cases [4]. Once the cement leak into the perivertebral venous system, where it can drifts toward the IVC and pulmonary vasculature, may eventually resulted in pulmonary cement embolism (PCE). Several studies have report incidence rates of PCE ranging from 2.1% to 26%. And these studies have also reported cement leakage into the IVC was the only risk factor lead to PCE [5, 6].

We are used to consider PCE as the most fatal complication of PVP, because it has a thrombogenic potential leading to pulmonary artery occlusion which can result in respiratory failure, even death. There is an interesting phenomenon that PCE usually detected incidentally, and less than 1% of patients have presented with clinical symptom [7]. And this phenomenon explains why the clinical importance of PCE is controversial. There have been few cases report that fatal PCE result in patient dead [8, 9]. The treatment of the patient with PCE is controversial too.

There is no established treatment protocol for PCE, and the recommended treatment strategy is to reduce the risk of thrombus formation, which can result in pulmonary embolism, pulmonary infarction and respiratory failure. Many case reports have been described successful non-operative treatment for the PCE patients with cardiovascular and



**Figure 3.** Computer tomography of chest and abdomen after surgery revealed the IVC and left pulmonary artery embolus have been completely removed. There was no change to the right pulmonary artery emboli (red arrow).

pulmonary complications in using anti-coagulations such as heparin and low-molecular-weight heparin only [10, 11]. Surgery intervention is a necessary complements of the conservative treatment, for those symptomatic patients with central embolism, especially caused by large emboli. Percutaneous retrieval is a relatively attractive option but also carries a high risk of right ventricular or vascular damage and break the cement material sometimes [12]. Because of the high risk and addition trauma, open surgery is usually considered unacceptable [9, 13]. But it is still necessary to achieve large pieces of cement completely remove [14]. Thus, some authors have suggested treatment criteria based on the severity of the symptoms and location and size of the pulmonary embolism [7, 15]. In our case, the obvious symptoms, the risk of continued thrombosis and further migration, and cement embolism maybe. Beside the size of the cement embolus is too difficult to percutaneous retrieval. We finally choose a combination surgery. And fortunately, the patient was recovery uneventfully. Now available evident confirm that if the cement fragment is estimated not pliable enough to allow catheter-based retrieval or if it is too large to extract through the IVC, open surgery should be performed [12, 14].

#### Disclosure of conflict of interest

None.

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