Simultaneous cardiac and lung perforation by bone cement after percutaneous kyphoplasty

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Case report

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Abstract

Background: Intracardiac cement embolisms(ICE) have been poorly reported in the literature. When the presence of intracardiac cement embolisms is identified, the cardiorespiratory complications related to ICE may be delayed and opinions also differ regarding whether the clinical consequences of this specific complication of percutaneous vertebroplasty (PV) is benign or malignant.

Case presentation: A 63-year-old female patient was referred to our institution with chest discomfort and dyspnea. She had undergone PV in the lumbar vertebra one year ago. Radiologic investigations revealed the foreign material in the RA, perforating the RA wall and penetrating right pleura. We performed the removal surgically of the cement fragments after a median sternotomy with under heart-lung machine.

Conclusions: when the presence of ICE is identified, the cardiorespiratory complications related to ICE may be delayed and a symptomatic and migrating bone cement must be considered surgical retrieval for the prevention of the progression into a constrictive pericarditis as well as symptom relief. This is the first report describing simultaneous cardiac and lung perforation and the longest interval period case (one year after PV) treated surgically caused by bone cement.

Background

Percutaneous vertebroplasty (PV) is a safe, increasingly common, and minimally invasive procedure for the treatment of vertebral fractures [1–3]. Although a low incidence of intracardiac cement embolism(ICE) occurs after PV, opinions differ as to whether the clinical consequences of these specific PV complication is benign or malignant and it also is associated with life-threatening complications due to cement leakage, including cardiac perforation and pulmonary embolism[2,3]. We present a unique presentation of atypical pneumothorax with cardiac perforation by bone cement after PV.

Case Presentation

A 63-year-old female patient was referred to our institution with chest discomfort and dyspnea. She had undergone Percutaneous vertebroplasty (PV) in the lumbar vertebra 1 year prior and had been admitted for right pneumothorax 5 months earlier (Fig. 1A). Radiologic evaluations revealed a bone cement in the right atrium (RA) (Fig. 1B, C). Echocardiography showed a hyperechogenic rod-like structure in the RA and septal bouncing, but no dysfunction of the cardiac wall motion. Coronary angiography did not show evidence of obstructive coronary disease. We planned a surgical approach rather than endovascular retrieval of the cement fragments. After a median sternotomy, we encountered a tight pericardial adhesion through the entire pericardial space, indicating a previous existence of hemopericardium due to perforation of the RA. After pericardial adhesiolysis, a white-colored, spear-shaped foreign body penetrating the RA was found to also penetrate the right middle lobe through the pericardium and pleura (Fig. 2A, B and Video 1). After initiating cardiopulmonary bypass and opening the RA, the foreign body entangled in the tricuspid valve septal leaflet was removed from the RA cavity (Fig. 2C). Another foreign

body penetrating the right middle lobe was retrieved easily with wedge resection of the right middle lobe (Fig. 2D). The postoperative course was uneventful. At last follow-up (3 years after PV), the patient had no cardiopulmonary symptoms and no further migration of bone cement in the left pulmonary artery branch.

Discussion And Conclusions

PV has become increasingly common for the treatment of vertebral compression fractures in the last three decades [1 ~ 3]. Pulmonary bone cement embolisms during PV procedures have been extensively reported. Their incidence ranges from 2.1 to 26%; most of them are asymptomatic and have no clinical consequence [2 ~ 4]. Even though all pulmonary cement embolisms first pass through the heart cavities, some cement fragments may stay inside the heart. ICE have been poorly reported in the literature. Opinions also differ regarding whether the clinical consequences of this specific complication of PV is benign or malignant. The incidence of ICE during PV is low (3.9%) [4], and most patients with ICEs (93%) are asymptomatic. However, in a systematic review of the literature, Hatzantonis et al [5] found that ICE-related clinical manifestations vary from asymptomatic (5.5%) and mild symptoms, such as chest pain, syncope, or moderate dyspnea (72%), to life-threatening conditions, such as acute respiratory distress or cardiac tamponade (22.2%). In our case, the patient was initially misdiagnosed as simple pneumothorax because we overlooked the radio-plaque opacity located only in the RA. Our patient presented with signs and symptoms of recurrent pneumothorax and pericarditis caused by the migrated and protruding RA fragment after the first right pneumothorax 5 months earlier. We think that a simultaneous RA and lung perforation occurred when the hardened cement fragment in the RA, anchored to the tricuspid valve annulus, was fractured and pushed upward through the pericardium and pleura due to pericardial adhesion during cardiac systole.

To date, no consensus exists in the literature regarding the best management of ICE. The choice of treatment for ICE depends on the location of the cement and the symptom severity. Current treatment options are conservative management with symptomatic treatment, oral anticoagulation for 3 to 6 months until the bone cement endothelializes and stops being thrombogenic, percutaneous retrieval (especially for RA leakage), or open-heart surgery [4, 5]. In our review of the literature, severe symptomatic patients tended to have more ICEs in the right ventricle and multiple fragments were more frequently detected. In addition, more patients have undergone open cardiac surgery or percutaneous retrieval than there have been asymptomatic patients [3 ~ 5]. Our patient had a similar tendency except the localization in the RA.

To the best of our knowledge, this report is the first to describe simultaneous cardiac and lung perforation by bone cement in the RA after PV. In addition, this case has the longest interval (1 year after PV) for surgical treatment.

In conclusion, ICE-related cardiorespiratory complications may be delayed and surgical retrieval must be considered to prevent progression to chronic constrictive pericarditis in symptomatic ICE.

Abbreviations

PV

Percutaneous vertebroplasty

ICE

Intracardiac cement embolism

RA

Right atrium

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Consent for publication of this case report in its entirety was obtained from the patient.

Availability of data and materials

Data Availability Guidance for Authors and Editors.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

KHK is the corresponding author. KHK conceived of the study and participated in its design and coordination. SJK and KHK both contributed to drafting the manuscript. Both authors have read and approved the final manuscript.

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Not applicable

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Figures

Figure 1

Preoperative radiological investigations. A, Chest X-ray showing radio-plaque opacity in the right atrium 7 months after percutaneous vertebroplasty (red arrow). B, X-ray showing a foreign body migrated more upwardly than 5 months ago, and another in the left pulmonary artery (black arrow). C and D, Computed tomography angiogram showing a long linear, fractured foreign material in the right atrium (arrow).

Figure 2

Intraoperative findings. A, A white, spear-shaped foreign body penetrating the right atrium and pericardium and right pleura (arrow). B, The foreign body entangled in the tricuspid valve septal leaflet (arrow). C, Penetration into the right middle lobe, with a 1.5 mm coronary dilator passing (arrow). D, Inverted L-shaped bone cement retrieved .

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