

Cement Emboli Presenting as Right Atrial Mass Caused by Percutaneous Vertebroplasty

Dong Hun Kim,¹ Sung Soo Kim² and Hyun Kuk Kim²

Key Words: Cardiac surgery • Pulmonary embolism • Right atrium • Vertebroplasty

INTRODUCTION

Right atrial masses are uncommon and their etiologies include tumors, thrombi, vegetations, normal variants, and artifacts.¹ Misinterpretation of a cardiac mass may lead to an incorrect management strategy; therefore, accurate diagnosis is crucial. Clinical presentation combined with information regarding the size, shape, location, mobility, and attachment site of a cardiac mass can usually be used to differentiate masses. Herein, we present a case of cement emboli mimicking a right atrial mass and presenting pulmonary thromboemboli in a 59-year-old man who had undergone percutaneous vertebroplasty (PVP).

CASE REPORT

A 59-year-old man was referred to our emergency department with a complaint of shortness of breath and chest discomfort that had begun several weeks preceding. He had a history of hypertension, diabetes mellitus, and end-stage renal disease, secondary to diabetic nephropathy requiring renal substitution therapy since 2013. One year before the current admission, he had undergone elective percutaneous coronary intervention in the middle left anterior descending coronary artery. Twelve weeks preceding, he underwent PVP for severe

osteoporosis of the lumbar spine (L1-L3). At admission, physical examination was unremarkable; vital signs were: PR 80/min, T 36.8 °C, RR 16/min, and BP 110/80 mmHg. Heart and chest examination were normal. The rest of the physical examination was unremarkable. Electrocardiography showed a normal sinus rhythm. Laboratory workup revealed white blood cells (WBC) 10,100/μl, Hb 13.3 g/dl, platelet count 242,000/μl, erythrocyte sedimentation rate (ESR) 39 mm (N = 0-30), blood urea nitrogen (BUN) = 4.6 (N = 3-9), serum creatinine 56 μmol/l (N = 53-124), and normal liver function tests. Levels of serum tumor markers, D-dimer, creatine kinase-MB, and troponin I were normal.

Transthoracic echocardiogram (TTE) revealed normal left ventricular systolic function (ejection fraction 66%), normal left and right ventricular cavities, and normal cardiac valves. Incidentally, an apparently echogenic oscillating mass (about 35 × 5 mm) projected down from the superior portion of the right atrium with attachment to the interatrial septum (Figure 1A). Transesophageal echocardiography showed a large mass, attached to the septal wall of the right atrium near the orifice of the superior vena cava (SVC) (Figure 1B).

The morphologic shape and imaging findings suggested a calcified atrial mass. The patient underwent multidetector computed tomography (MDCT) for differential diagnostic workup of the intracardiac mass. MDCT displayed high density opacities in the right atrium and small calcified lesions scattered into both pulmonary arteries (Figure 1C, 1D, 1E). After reviewing the orthopedic medical records at the patient's local hospital, a lumbar spine X-ray revealed leakage of polymethylmethacrylate (PMMA) into the perivertebral veins, indicating rupture (Figure 2A, 2B). Given his history, the intracardiac mass strongly suggested cement emboli, a PVP com-

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¹Department of Radiology; ²Department of Cardiology, Chosun University Hospital, Donggu, Gwangju, Korea.

Corresponding author: Dr. Sung Soo Kim, Division of Cardiology, Chosun University Hospital, Donggu, Gwangju, Korea. Tel: 82-62-220-3240; Fax: 82-62-228-7174; E-mail: kholywater@gmail.com

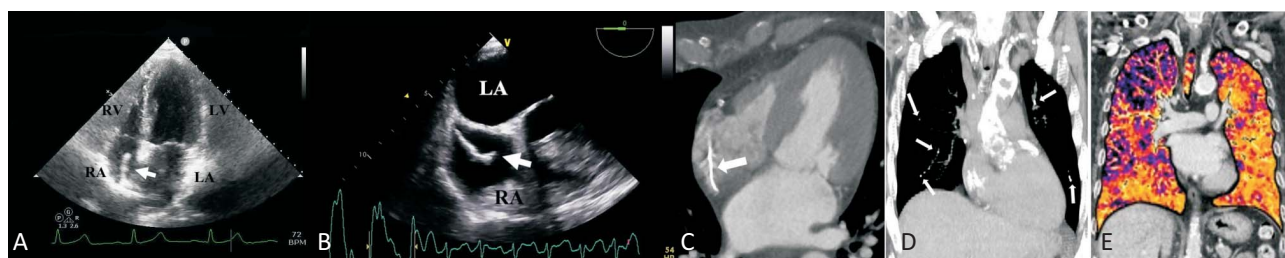


Figure 1. (A) Transthoracic echocardiogram, in four-chamber apical view, showed an hyperechogenic oscillating mass (35*5 mm sized, white arrow) projected down from the superior portion of the right atrium with attachment to the interatrial septum. (B) Transesophageal echocardiogram showed a large mass (white arrow), attached to the septal wall of the right atrium near the orifice of SVC. (C) Various scans of multidetector computed tomography. In oblique 4-chamber view, white arrow indicates linear high density lesion (cement embolus confirmed by operation). (D) Multiple tiny pulmonary thromboemboli by cement emboli (arrows) are detected in coronal maximal intensity projection image. (E) Subtraction iodine mapping image reveals multifocal decreased pulmonary perfusion (purple colored areas) by cement emboli. LA, left atrium; RA, right atrium, RV, right ventricle; SVC, superior vena cava.

plication. The cardiovascular team was consulted and recommended proceeding with a right atriotomy due to the serious risk of paradoxical embolism and cardiac perforation. The patient underwent surgery to extract the 35 × 5 mm mass from the right atrium (RA) septal wall (Figure 2C). The patient's postoperative course was unremarkable and he was discharged without need for further treatment of the lesions.

DISCUSSION

This case highlights an uncommon but serious early complication following vertebroplasty. Because patients with end-stage renal disease (ESRD) undergoing hemodialysis have risk factors that predispose them to vegetations and thrombi, it was initially suspected that this patient's mass was vegetation. However, no murmurs were heard on heart auscultation and the TTE reported a structurally normal tricuspid valve, without lesions or presence of vegetations. Nevertheless, Figure 1B shows that the mass looks pedunculated, possibly suggesting a myxoma. In most cases, myxomas arise from the fossa ovalis of the interatrial septum and protrude into the atrium; furthermore, our patient's findings strongly suggested a thrombus was present. As exhibited by our patient, MDCT may provide diagnostic evidence for cardiac tumors, due to its dynamic images, high resolution, multiple plane reconstruction, and sensitivity to calcification and fat within a mass. Thus, MDCT may aid diagnosis of lesion properties, location, and scope of invasion, for identification of pericardial and mediastinal tumors.

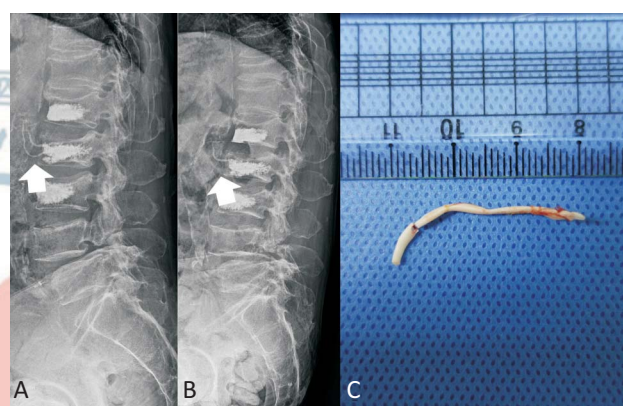


Figure 2. (A) Lumbar spine X-ray revealed leakage of polymethylmethacrylate (white arrow) into the perivertebral veins on the day of the percutaneous vertebroplasty. (B) Several days later, broken cement was shown. (C) 35 * 5 mm sized cement mass from right atrium.

In our patient, high density opacities in the right atrium and scattered small calcified lesions in both pulmonary arteries strongly suggested cement emboli from a PVP complication. Also, cardiac MRI might be used in the diagnosis of cement mass within heart and differentiating secondary cardiac masses such as foreign body by PMMA leakage, thrombus, calcification, and metastases of malignant tumors from primary cardiac masses.²

PVP is a minimally invasive procedure used extensively to treat painful diseased vertebral bodies.^{3,4} Although effective for immediate pain relief and strengthening weakened vertebral bodies, leakage of PMMA into the spinal canal or perivertebral veins can lead to devastating complications, such as cardiopulmonary embolism.⁵ Once bone cement leaks into the perivertebral system, it can drift toward the inferior vena cava (IVC)

and pulmonary vasculature and ultimately cause cardiopulmonary emboli. Choe et al. found a 4.6% rate of asymptomatic pulmonary embolism from PMMA following vertebroplasty and kyphoplasty.⁶ Clinical features of cardiopulmonary side effects of cement include precordial chest pain and tightness, dyspnea, palpitation, acute respiratory distress syndrome and cardiac arrest.⁷ The symptoms of cement embolism occur more commonly days to months after, rather than during the procedure. PMMA has a prothrombotic property and can cause endothelial injury, which can result in additional thrombosis, leading to the delayed presentation of clinical symptoms. It might be one of reasons why our patients were found after three months. Preventing additional thrombosis, an anticoagulation is indicated.

Most cases are asymptomatic, with only 1% presenting with dyspnea, which usually resolves with conservative management (i.e., oxygen therapy, anticoagulants). However, for symptomatic cases or in patients with central emboli, anticoagulant cannot dissolve the cement or release the right ventricular load; thus, surgical extraction might be considered. About 16 cases of symptomatic cardiopulmonary embolism caused by PVP and treated with surgical intervention have been reported.⁸ Three of these cases were fatal. Cement emboli are primarily associated with technical aspects of the surgery. In our case, surgical removal was considered due to the serious risk of paradoxical embolism and cardiac perforation.

This case is rare case of cement emboli mimicking a right atrial mass without pericardial effusion. Tissue characterization by echocardiography was not possible in the case presented here, although characteristics including location, attachment, shape, size, and surrounding structures provided diagnostic clues. A detailed medical history review and computed tomography (CT) imaging remain good alternative diagnostic modalities if doubt remains after echocardiography, which can contribute to accurate diagnosis in the evaluation of atrial masses. Clinicians should recognize these potentially fatal complications in symptomatic patients with a history of PVP and manage them accordingly.

LEARNING POINTS

1. Emboli caused by cement leakage may increase with

extensive application of PVP, which should be the focus of greater attention. Clinicians should recognize these potentially fatal complications in symptomatic patients with a history of PVP and manage them accordingly.

2. Tissue characterization by echocardiography was not possible in the case presented here, although characteristics including location, attachment, shape, size, and surrounding structures provided diagnostic clues. A detailed medical history review and CT imaging remain good alternative diagnostic modalities if doubt remains after echocardiography, which can contribute to accurate diagnosis in the evaluation of atrial masses.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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