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Case report

Cardiac perforation and tricuspid regurgitation as a complication of percutaneous vertebroplasty

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Abstract

Percutaneous vertebroplasty is a minimally invasive technique that is used to treat vertebral fractures, tumors and osteolytic vertebral metastases. However, cement leakage to the venous system is a potential source of serious complications after percutaneous vertebroplasty. We report a 65-year-old female patient who demonstrated cardiac perforation, pulmonary cement embolism, and tricuspid regurgitation, and these were all caused by venous leakage of polymethylmethacrylate as a complication of the procedure.

Keywords: Foreign bodies; Ventricle right; Rupture; Pulmonary embolism; Vertebroplasty

1. Introduction

Vertebroplasty consists of the percutaneous injection of polymethylmethacrylate (PMMA) into the collapsed vertebrae in order to obtain pain relief and mechanical stability of the vertebral body [1—4]. The risk of cement entry into the venous system and the spinal canal is the potent major hazard of this technique [1,4].

We report here on the case of a patient with cardiac perforation, pulmonary embolism and tricuspid regurgitation that were caused by migrated PMMA, who underwent percutaneous vertebroplasty.

2. Case

A 65-year-old woman presented with chest pain and tightness that she had suffered with for the previous 5 days. She had received percutaneous vertebroplasty twice to other levels of the first, second and fourth lumbar spine at 10 days and 2 months ago, respectively, to treat her lower back pain. After the percutaneous vertebroplasty, she was discharged without any respiratory or chest discomfort. The pain had developed 5 days after the second vertebroplasty when she had toppled to the ground. A chest radiograph obtained on admission showed multiple high-density tubular opacities along the course of the pulmonary vessels and linear-shaped high-density material in the heart shadow. The transthoracic echocardiogram revealed a large amount of hemopericardium with cardiac tamponade and two echogenic linear materials in the right ventricle with one that had penetrated the right ventricle. The materials were in the blood stream of the right ventricle and there was severe tricuspid regurgitation. Chest CT showed radio-opaque linear materials in the right ventricle had perforated the right ventricular free wall and this was the cause of hemopericardium (Fig. 1). And also, the CT showed the linear remnant cement from the inferior vena cava (IVC) to the first lumbar vertebral body. We speculated that it developed when the percutaneous vertebroplasty needle was wrongly positioned in the IVC and injected cement directly into the IVC when the procedure was performed at first lumbar vertebra.

After pericardiocentesis, an emergency operation was performed. When the pericardium was opened, we found a needle-like white material perforating the right ventricular free wall. The whole epicardium was covered with fibrin material. When the right atrium was opened, an 8 cm sized linear-shape cement material was sticking in the right ventricular wall (Fig. 2). Another 4 cm sized linear cement material had perforated the anterior free wall of the right ventricle and was caught in the chordae of the anterior leaflet. This material reached to the septal papillary muscle of the tricuspid valve, where it had eroded and partially ruptured the papillary muscle. The cement materials in the right ventricle were removed through the tricuspid valve. The perforation site of the right ventricle was confirmed using a metal probe and sutured. We made neochordae at the

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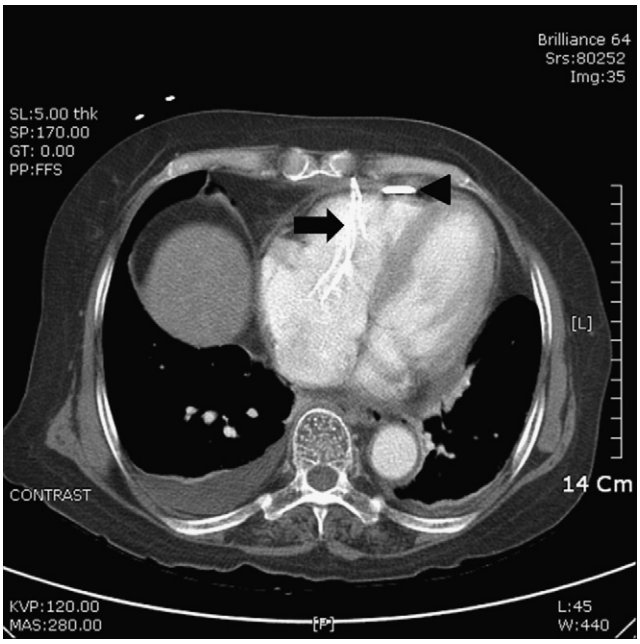

Fig. 1. Axial maximum-intensity-projection image shows that the linear high-density materials in the right ventricle have perforated the free wall (arrow), and note the pericardial drain catheter (arrow head).

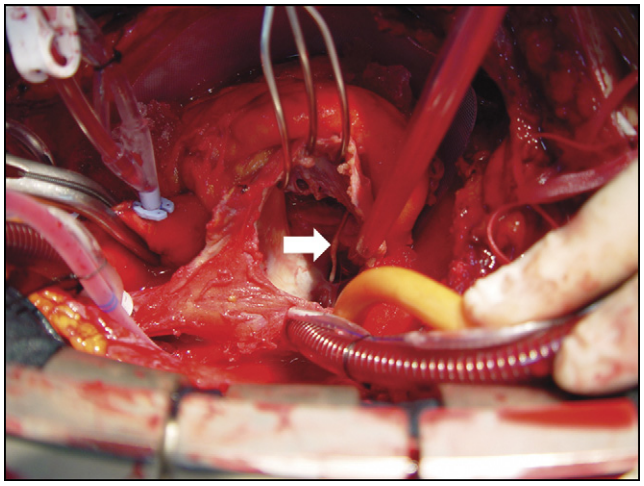

Fig. 2. A string-like piece of cement is sticking into the right ventricular wall, and this was seen through the tricuspid valve (arrow).

septal leaflet with 6-0 ePTFE nonabsorbable monofilament (Goretex® suture, W.L. Gore & Associates Inc., Flagstaff, Arizona, USA) and performed tricuspid annuloplasty (bicuspidization). The postoperative transthoracic echocardiogram revealed mild tricuspid regurgitation. The patient recovered without any complications and discharged after the surgery.

3. Discussion

Percutaneous vertebroplasty is a minimally invasive technique to relieve pain and stabilize a vertebral body that has been mechanically compromised by compression fractures, tumors, or bone metastases [1—4]. The technique was first described by Galibert in 1987 and it has since become a standard treatment for the above indications [5]. Although percutaneous vertebroplasty is an efficient treatment, cement leakage can occur frequently (38—73%) and this is the main cause of complications [2,5]. Especially, cement entry into the venous system represents the major hazard of this technique [1,4].

PMMA entry into the perivertebral venous system can cause several different complications. Most patients with minor venous leaks, and even those with pulmonary emboli that are detected by chest radiographs, have remained asymptomatic [1,3]. However, some lethal consequences have been reported such as fatal pulmonary embolism [2,6], paradoxical cerebral embolism [3], penetration of the right ventricle [4], renal artery embolism [7], and acute respiratory distress syndrome [8]. Our experience demonstrated that cardiac perforation, pulmonary embolism and tricuspid regurgitation can occur as serious complications of venous leakage of bone cement. We presumed that the PMMA stayed in the right ventricle after the procedure since it could not go into the pulmonary artery because of the material's long and stiff nature. Then, it had penetrated the right ventricular wall after the patient had toppled down, because chest pain occurred immediately after the falling episode. In this case, we could not reattach the ruptured papillary muscle because the tissue was severely friable. After resecting the ruptured papillary muscle and chordae, we made a neochordae between the septal leaflet and the remnant papillary muscle. Although mild tricuspid regurgitation was noted on the follow-up echocardiogram after the operation, we achieved a satisfactory result to treat the tricuspid valve regurgitation with creating neochordae.

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