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LETTER TO THE EDITORS

Pulmonary and intracardiac cement embolism after a percutaneous vertebroplasty

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Sirs:

A 68-year-old woman was admitted to our hospital complaining of dyspnoea and chest pain. She had neither prior cardiac history nor any other relevant medical history except from osteoporosis and Parkinson disease.

She underwent percutaneous vertebroplasty for fusion of L1-S1 and fracture of L3, 2 months ago in another institution. Arthrodesis L1-S1 and laminectomy of L3 was successfully performed and she was discharged home 2 weeks later.

She referred having started with chest pain and dyspnoea 2 weeks ago. On examination, she was haemodynamically stable, her blood pressure was 112/70 mmHg and her heart rate 75 bpm. Her room air oxygen saturation was 95 %. Cardiopulmonary auscultation was normal. ECG showed no relevant findings and the chest radiography only highlighted lumbar arthrodesis.

A transthoracic echocardiography was performed as a first approach, followed by a transesophageal echocardiogram (Fig. 1). We found a normal ventricular ejection function of both ventricles and surprisingly we discovered a calcium density foreign body in the right atrium located in the septum, next to the the fossa ovalis. An exhaustive clinical history and physical examination were performed to rule out the possibility of a paradoxical embolism. Afterwards, a chest computed tomographic (CT) scan (Fig. 2) was performed, which confirmed the existence of several fragments of blade material, one of them, with a linear morphology, was crossing the atrial septum, located mostly in the left atrium. There were two other fragments, one located in the left lower lobe artery, at about 3.5 cm of the origin of the left main artery and the other in a subsegmental branch of the left basal segments. In this clinical context, these fragments were compatible with vertebroplasty cement fragments, which protruded into the left atrium and into the pulmonary branches.

Given these findings, we decided to perform surgery. Under general anesthesia through a median sternotomy and normothermic cardiopulmonary bypass, opening of the right atrium was performed, with removal of the foreign body and closure of the oval foramen. We also carried out longitudinal opening of the left pulmonary artery from the bifurcation to the beginning of the lobar arteries, extracting the foreign body from the left lower lobe artery (Fig. 3). The patient did well and could be discharged 10 days after the surgery.

Percutaneous vertebral minimally invasive procedures are becoming the standard treatment for osteoporotic vertebral fractures and osteolytic vertebral tumors (metastasis, myeloma and hemangioma) [1]. These techniques include vertebroplasty, kyphoplasty and skyphoplasty. In all of them, an injection of polymethylmethacrylate into the vertebral body is performed under fluoroscopy or computed tomographic scan guidance. In the kyphoplasty, an inflatable balloon is used to create a cavity in the vertebral body that will be filled with the cement, and a plastic tube is used in the skyphoplasty. Percutaneous vertebroplasty was the first procedure described and has been shown to improve symptoms and quality of life of patients with vertebral compression fractures [2]. The procedure requires the

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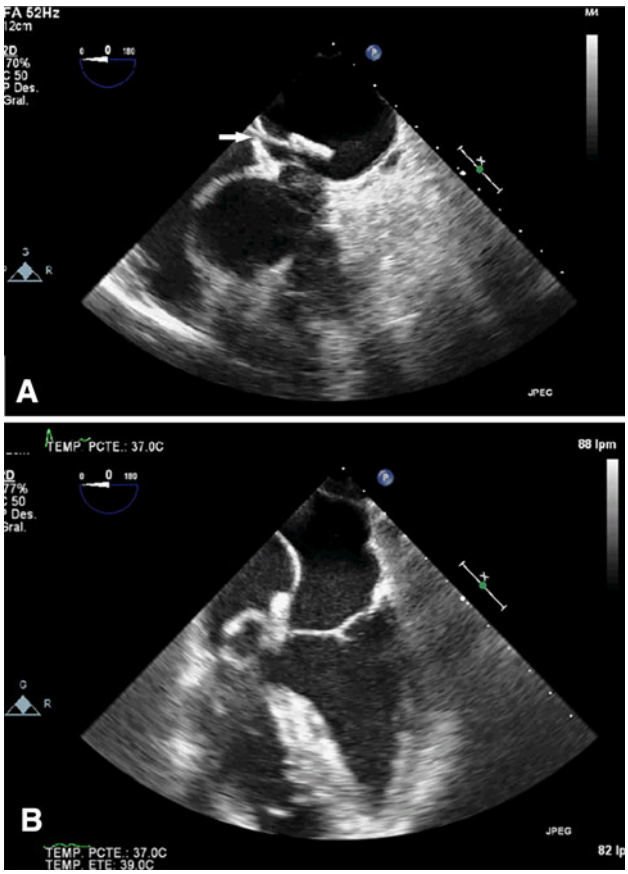

Fig. 1 **a** Transesophageal echocardiogram demostrated a calcium density foreign body (*arrows*) in the right atrium located in the septum at the fossa ovalis. **b** Five chamber view showing *left* and *right* non dilated ventricles and normal systolic function

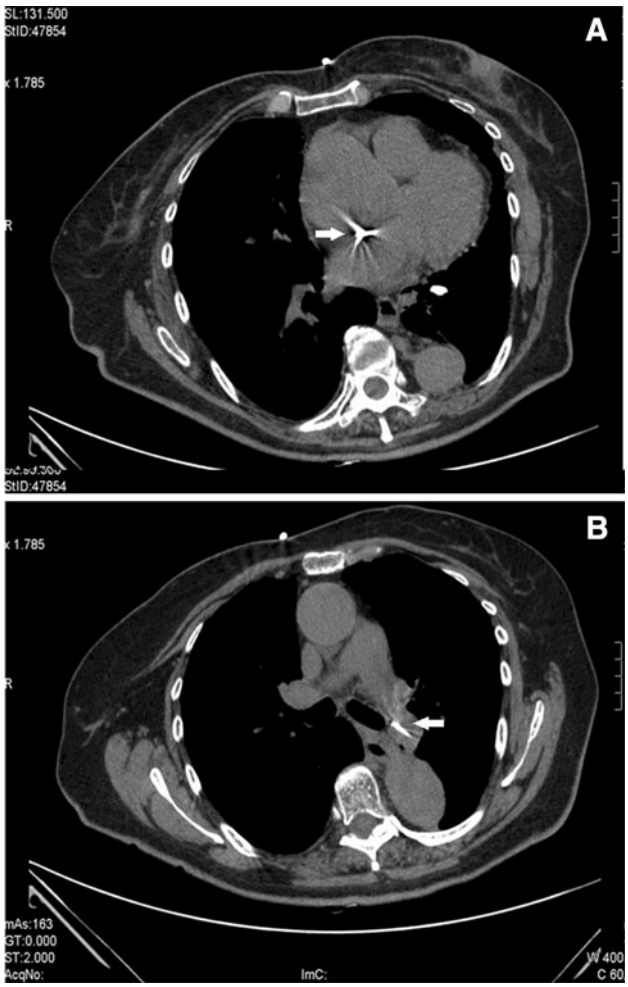

Fig. 2 Chest CT scan. **a** Axial CT scan confirming the existence of several fragments of radiodense deposits (*arrows*) crossing the atrial septum. **b** Deposits in the *left* main pulmonary artery

injection of acrylic cement into a partially collapsed vertebral body. This provides mechanical stability of the vertebral body resulting in rapid pain relief and restoring vertebral body height. Despite these procedure was initially designed to treat vertebral hemangioma [2], now it is used for other entities. Due to the increasing aging of the population and the growing prevalence of osteoporosis, the implementation of this intervention is becoming more common.

Although this procedure is relatively safe, easy and commonly performed today, it can be associated with devastating complications. The complication rate of percutaneous vertebroplasty ranges between 1 and 10 % [3]. The most common are infection, bleeding and nerve damage. Also, there is a risk of leakage of cement into the spinal canal or venous system and this results in local manifestations (spinal canal stenosis, cord or nerve compression) that can be associated with neurological deficit, requiring in some cases surgical removal [4]. Moreover, there have been described systemic complications like pulmonary embolism and paradoxical cerebral cement embolization through a patent foramen ovale [5]. The rate of pulmonary cement embolism after vertebroplasty is unknown, because this rare complication in the vast majorities of patients remains asymptomatic and chest imaging after procedure is not routinely performed. Despite this limitation, the reported incidence is above 7 % (ranges from 3.5 to 23 %) [2]. There are many factors that have been associated with more risk of embolization. The amount of cement injected, the position of the needle, the approach and the insufficient polymerization of the cement should be taken into account. It is technically recommended that the cement should have an appropriate viscosity and not more than 4–6 ml amount of cement ought to be injected [5] and with not too much pressure [2]. Finally, the injection should be performed with endoscopic monitoring for early detection of embolization. Comparing the two most used techniques, kyphoplasty is known to have less risk of cement leakage than vertebroplasty. We also know that multi-level percutaneous vertebroplasty has

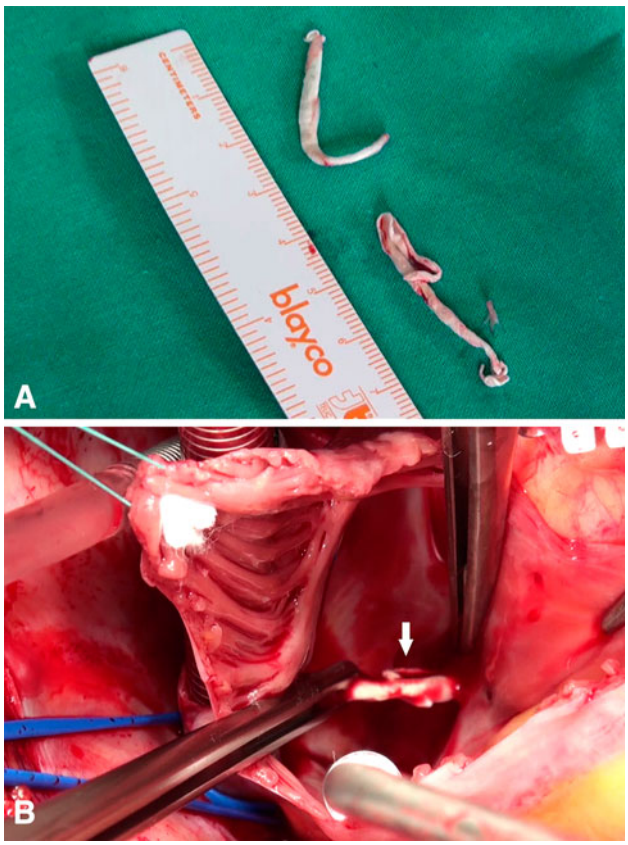

Fig. 3 **a** Linear cement fragments that were removed from the *left* main pulmonary artery and from the fossa ovalis. **b** Intraoperative photograph depicting the material (*arrows*) that was retrieved from the fossa ovalis

a higher risk of pulmonary embolism, so we must be especially careful.

The clinical manifestations include dyspnoea, cough, chest pain, hemoptysis but embolisms can be completely asymptomatic.

Several cases of pulmonary embolism have been reported in the literature [2, 4], finding more rare occurrence of intracardiac complications (tricuspid regurgitation, cardiac tamponade, left atrial migration) [6, 7]. In our case, there was an additional risk of embolization in the systemic territory, arising from the coexistence of a patent foramen ovale that allowed passage to the left chambers. In fact, as noted previously, the cement fragment was in higher proportion in the left atrium.

Supportive treatment should include bed rest, oxygen and hemodynamic monitoring. Initial treatment includes anticoagulation in most cases. Successful surgical embolectomy has been reported by many authors in the literature [8]. Others [9], however, describe cases of pulmonary embolism and cardiac tamponade after percutaneous vertebroplasty that required open heart surgery. Performing an invasive approach depends on the symptomatology, on the location of the material and on hemodynamic stability of the patient.

We report the case of a 68-year-old woman who developed pulmonary and intracardiac embolisms after percutaneous vertebroplasty, as we could demonstrate by chest CT and echocardiography.

Although percutaneous vertebroplasty is considered a safe and effective therapeutic procedure, occasionally it can cause serious complications, as in this case. Cement embolism into the venous system must be diagnosed promptly, and the need for cardiac surgery assessed, according to clinical stability and localization of the cement fragments.

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