Learning objectives

Imaging characteristics of pulmonary embolus of acrylic cement.

Avarness about complications of percutaneous vertebroplasty.

Background

Bone cement has been widely used in orthopaedic procedure and neurosurgery since 1987: PMM cement, a rapidly setting bone cement, is injected using a transpedicular or paravertebral approach, under fluoroscopic guidance [1].

Although percutaneous vertebroplasty is a relatively safe, simple, and commonly performed procedure for the management of vertebral compression fractures, it can be associated with fatal complications, such as spinal cord compression resulting in paraplegia, cerebral embolism, penetration of the right ventricle, renal artery embolism, and acute respiratory distress syndrome [2]; minor complications, reported in large series, were rare, local, and temporary and included infection, radicular pain, and spinal cord compression; moreover, most complications involved transitory worsening of pain or chest discomfort, dyspnea, and fever [3]; these symptoms may also lead to cardiovascular collapse and, rarely, to death.

The frequency of local leakage of bone cement is relatively high (about 80-90%); moreover, the rate of cement leakage into the perivertebral veins (seen in up to 24% of vertebral bodies treated) with consequent pulmonary cement embolism varies from 4.6 to 6.8% (up to 26% in radiologic studies): the risk is increased with liquid consistency of the PMM and with the treatment of some malignant lesions because of the more frequent cortical destruction of the vertebral body and higher vascularization associated with some malignant tumors; pulmonary embolism is attributable to the passage of the PMM into the perivertebral veins and from there into the azygos vein and the inferior vena cava, to end up in the pulmonary vasculature [3-7].

Patients may remain asymptomatic and develop no known long-term sequelae (when cement emboli are encountered in an asymptomatic patient, they are probably of no clinical significance and have no known long-term sequelae). However, when emboli are discovered incidentally on a conventional chest radiograph, their suggestive appearance is a high-density opacity in a tubular branching pattern, corresponding to pulmonary arterial distribution [3,8].
Some authors reported the use of a preinjection venogram to decrease the incidence of pulmonary embolism, and the injection of sclerosing agents into the vertebral body before vertebroplasty has also been suggested to close venous channels [2,7].

The treatment for symptomatic or central pulmonary cement embolism is surgical embolectomy, or, in selected cases, percutaneous removal, whereas more conservative management with anticoagulants, antibiotics, and corticosteroid is reserved for smaller or peripherally located emboli [3,9]: anticoagulation therapy reduces the risk of thrombus formation on the embolic material but cannot reduce the right ventricle afterload and cannot improve the pulmonary ventilation-perfusion ratio, which is the cause of respiratory failure.

**Imaging findings OR Procedure details**

A 69-year-old male patient was admitted to our university hospital with non traumatic vertebral scoliosis and back pain. Preoperative serum chemistries and electrocardiogram were normal.

The patient was in a prone position and percutaneous vertebroplasty was performed with a 10-gauge needle, under biplane fluoroscopic control with unilateral transpedicular approach.

Bone cement was classically prepared at 24°C by mixing 30 mL of the PMM powder with 2 g of sterile barium sulfate powder for opacification and 1 g of powdered antibiotic, before adding 10 mL of the liquid monomer; cement injection was monitored on continuous fluoroscopy in the lateral plane with intermittent evaluation in anteroposterior projection to detect early lateral venous leaks. When cement was visualized in the posterior fourth of the vertebral body or beyond the confines of the vertebral body, the procedure was terminated.

Postoperative serum chemistries, arterial blood gas, and cardiac enzymes were normal, and the postoperative course was uneventful.

Pulmonary cement embolism was detected on routine postoperative chest radiograph. Opacities in the fields of pulmonary artery was seen.

Thoracic CT revealed the characteristic appearance of cement leakage. Both pulmonary arteries confirmed a pulmonary massif embolism (hyperdense areas on pulmonary arteries) caused by cement.

The patient was treated with anticoagulants (enoxaparin 4000IU a day), antibiotics (Amoxicillin 2g a day), and corticosteroids (dexamethasone 4 mg a day) and responded favorably.
Prior to discharge on postoperative day 4, a repeat CT scan showed no substantial change in the distribution of the cement. Therefore, he was discharged home on oral warfarin for chronic anticoagulation (to reduce the risk of thrombosis on the cement remaining in the distal part of the arterial pulmonary tree), and monthly follow up was scheduled.

**Images for this section:**

![Image 1: Bilateral opacities on pulmonary arteries](image)

**Fig. 1:** Bilateral opacities on pulmonary arteries
Fig. 2: hyperdense areas were observed at unenhanced CT is compatible with cement embolism
Fig. 3: hyperdense areas were observed at unenhanced CT is compatible with cement embolism
Conclusion

This case allows us to conclude that the risk of pulmonary embolism of PMM might be underestimated. We confirm the necessity of routine chest radiograph following every vertebroplasty in order to detect pulmonary PMM embolism and thereby prevent serious delayed cardiopulmonary failures.

References


Personal Information