

Case Report

Pulmonary cement embolization after vertebroplasty, an uncommon presentation of pulmonary embolism: A case report and literature review

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ABSTRACT

Pulmonary Cement Embolization (PCE) is a rare complication of vertebroplasty surgery. There is no clear guideline for management of this entity. There is no definite protocol for anticoagulation in PCE. This is a case report of our patient who was diagnosed to have Pulmonary Cement Embolization, which was quite significant involving both lungs. She was successfully managed without long term anticoagulation.

KEY WORDS: Anticoagulation, pulmonary cement embolization, vertebroplasty

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INTRODUCTION

Percutaneous vertebroplasty is a well-known treatment modality for painful vertebral compression fractures caused by osteoporosis. The procedure involve injection of Poly Methyl Meth Acrylate (PMMA, bone cement), into the desired vertebral body. Pulmonary embolism with bone cement after vertebroplasty surgery, is not very rare, and can occur in upto 26% of patients undergoing this procedure.^[1] Bone cement being a foreign body would in reality lead to mechanical occlusion of pulmonary vasculature. Whether it is a nidus of clot formation and propagation, is not well known.^[2]

CASE REPORT

This was a case report of a 48 year old lady who presented with history of severe pain on the right side of her chest. She had been discharged ten days earlier,

after a vertebroplasty surgery for a wedge compression osteoporotic fracture of superior half of L2 vertebral body. She denied history of breathlessness, chest pain, cough, fever or hemoptysis at the time of discharge from hospital 10 days back. There was no history of trauma to chest after surgery. Her pre-operative investigations were reviewed which were normal.

Her general examination showed pulse rate of 120 beats per minute, respiratory rate of 20 per minute, Room air oxygen saturation (Sao₂) of 98% and right upper limb blood pressure of 124/80 mm Hg. Her respiratory system examination showed reduced breath sound in the right lower chest with scattered crepitation in both lung fields. Other system examinations were normal.

Her chest X-ray PA view [Figure 1] showed linear branching opacities in all zones of both lungs. This was not seen on the pre-operative chest x ray [Figure 2]. Her blood gas analysis was normal. Two dimensional Trans thoracic echocardiography was done and it showed normal cardiac chambers with estimated pulmonary artery systolic pressure of 25 mmHg. A possibility of Cement embolization in pulmonary vasculature was considered. She was started on intravenous analgesics, Inj. Tramadol 50 mg three times a day, followed by Diclofenac Transdermal patch for chest pain. She was hemodynamically stable and had normal oxygenation throughout her stay.

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In view of persistence of chest pain, CT Pulmonary Angiogram (CTPA) along with non-contrast CT cuts was obtained. CTPA showed no focal filling defects in Main pulmonary trunk, right, left and segmental pulmonary arteries but it showed branching vascular linear radio densities in proximal and distal sub segmental pulmonary arterial branches bilaterally [Figure 3], consistent with Cement embolization. These branching radio opaque densities could also be seen in non-contrast CT image [Figure 4], consistent with radio opaque bone cement. Lung windows [Figure 5] revealed peripheral wedge shaped consolidation in right lower lobe lateral basal segment with internal branching radio densities, possibly pulmonary infarct. Trans esophageal echocardiography ruled out a source of embolization from the cardiac valves or chambers. Figure 6 shows X-ray of lateral view of spine showing bone cement.

Patient was started on broad spectrum antibiotics and therapeutic anticoagulation, Inj enoxaparin 60 mg subcutaneously twice daily. Oral vitamin K antagonists were not initiated as the patient refused and the family

had concern of the risk of hemorrhage. Hence she received 3 days of parental anticoagulation prior to discharge. She was discharged with analgesics and oral antibiotics. On her first follow up after 2 weeks, her chest pain had completely subsided. We did not offer her anticoagulation as she was completely symptom free.

DISCUSSION

Injection of bone cement (PMMA) into vertebral column for osteoporosis is mainly by two main methods - Vertebroplasty and Kyphoplasty. The incidence of embolization is higher with vertebroplasty. The main benefit is to reduce pain and vertebral body collapse in osteoporosis of vertebra. The most common symptoms of pulmonary cement embolization are chest pain and breathlessness, and rarely it can present as Acute respiratory distress syndrome.^[3] These symptoms rarely occur immediately after the procedure. More commonly the symptoms occur later, sometimes weeks or months after the procedure.^[4] The majority of patients with pulmonary cement embolization are asymptomatic.^[5] At least six

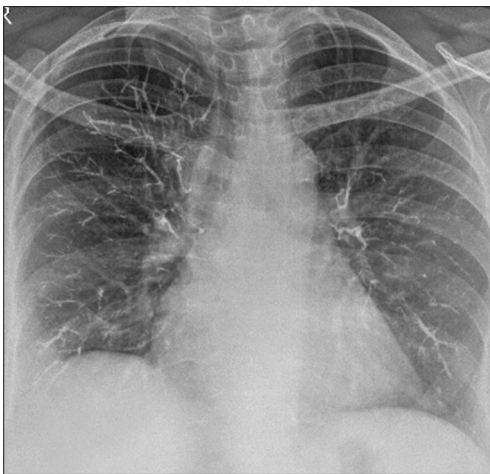


Figure 1: Chest X-ray PA view showing linear branching opacities in all zones of both lungs with right lower zone haziness

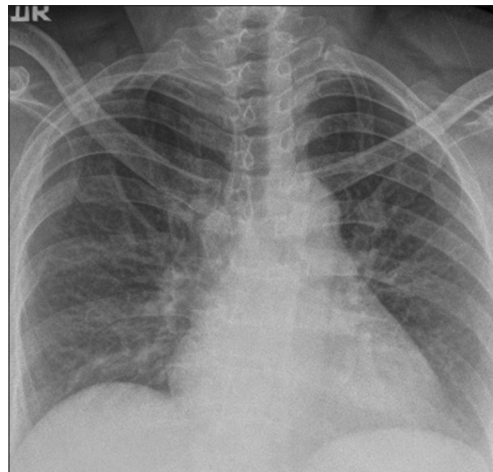


Figure 2: Normal Chest X-ray: Done before surgery

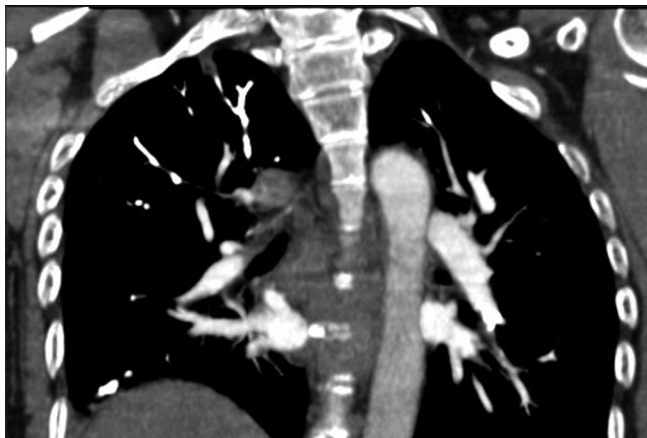


Figure 3: CTPA showing bilateral linear radio opaque material in Pulmonary arterial branches peripherally

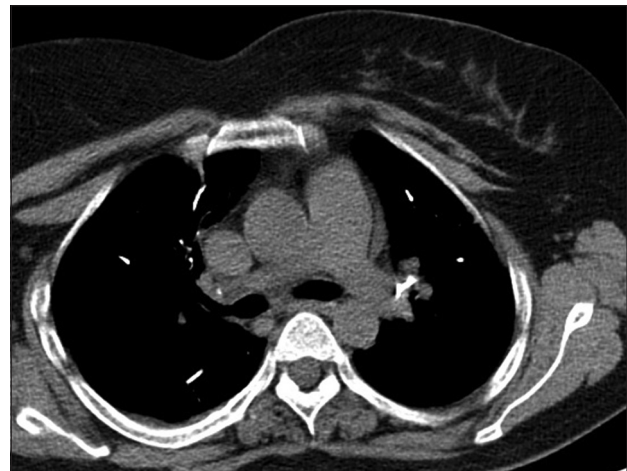


Figure 4: Non contrast phase of CTPA: Showing bilateral linear opacities in pulmonary arteries suggestive of bone cement embolization

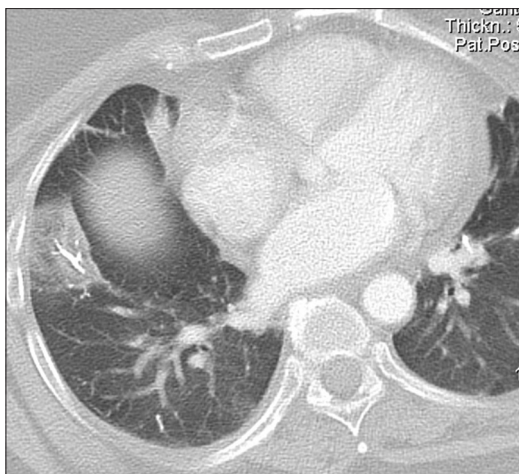


Figure 5: Lung window of CTPA: Showing right lower lobe peripheral wedge shape shadow with branching linear opacity. Suggestive of pulmonary infarct with an embolized vessel

deaths have been reported in literature due to pulmonary cement embolization after vertebroplasty procedure.^[3,6-10]

The pathophysiology of pulmonary cement embolization involve accidental extravasation of bone cement into the valveless vertebral venous plexus, from where cement enters thoracic venous system.^[11] Once injected PMMA rapidly polymerizes, and this further halts further extravasation into vertebral venous plexus. An early injection in the liquid phase may result in bone cement extravasation into the venous system, as well as its distant migration to the lungs.^[12] A previous *in vitro* study has shown that PMMA does not cause platelet aggregation or propagation of clot.^[13] There is scarcity of evidence whether bone cement (PMMA) is prothrombotic *in vivo*,^[14] by causing endothelial injury and clot propagation.

Treatment of pulmonary cement embolization depends on patient's symptoms. Asymptomatic patients only require initial monitoring and follow up. The various treatment options depending on amount of cement embolized and patient's severity of symptoms are - anticoagulation, percutaneous removal, cardiopulmonary bypass and surgical removal, corticosteroids and antibiotics.^[15] Krueger *et al.* have suggested a treatment algorithm for pulmonary cement embolism.^[16] For large central cement pulmonary emboli, surgical embolectomy seems to be definitive treatment. However the role of anticoagulation in patients with peripheral symptomatic or asymptomatic pulmonary embolism is not clear. Long term follow up studies are scarce and the recommendations to anticoagulate are not clear i.e., when, how long etc. Other non-thrombotic emboli are currently not anticoagulated e.g. Fat and Amniotic fluid emboli.

Our patient had atypical presentation. Chest X-ray was not done after surgery and prior to her discharge from hospital, because she had no symptoms. She subsequently developed Chest pain. We hypothesize that the reasons

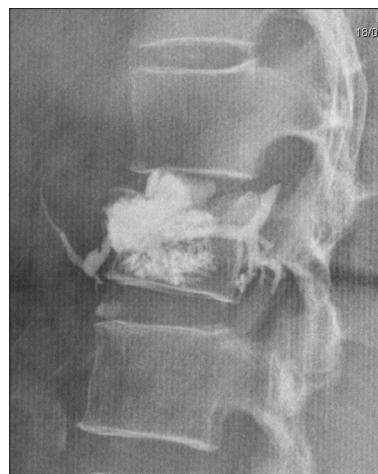


Figure 6: X-ray of Lumbar vertebra (Lateral view) after vertebroplasty showing bone cement in L2 vertebral body. Note the vertebral vein traversing through it

of chest pain in this patient could be - 1. Parietal pleural irritation due to pulmonary infarction, 2. Intercostal ischemia due to an embolization of a branch of intercostal artery, 3. Hypersensitivity reaction due to bone cement lodged in pulmonary arteries.

CONCLUSION

In conclusion, it is our contention that as bone cement embolism is mechanical occlusion of pulmonary arteries and not a vascular clot, anticoagulation would depend on the treating pulmonologist's clinical judgement. By this case report we want to create awareness that all patients undergoing vertebroplasty procedure should have routine chest x ray after the procedure, prior to discharge from hospital (our patient did not have one!).

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