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Visual Case Discussion

Unexpected radiological findings post vertebroplasty: Cement pulmonary embolism

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Discussion

A 74-year-old female presented with cough, fever and lethargy. She had history of COPD with a 25-pack year smoking history. She was hemodyncamically stable with normal oxygen saturation at room air. As part of the routine work up for her presentation she had a chest x-ray which showed linear dense opacities seen in the distribution of bilateral lower lobe pulmonary arteries that warranted further investigation (Fig. 1). She subsequently had a non-contrast chest CT scan to investigate those findings. CT scan confirmed the presence of calcium-density foreign body scattered throughout the pulmonary arteries bilaterally (Fig. 2). There was also evidence of multilevel vertebroplasty in the lumbar spine. On further history patient reported that she had undergone multilevel percutaneous vertebroplasty (with polymethyl methacrylate) for osteoporotic vertebral compression fractures 1 year ago. Immediately post-procedure she developed a transient hypoxemia that was managed conservatively with oxygen supplementation. However, this quickly resolved, and she was discharged the next day. The findings on both the X-ray and CT images were consistent with cement pulmonary embolism as a complication of vertebroplasty.

Non-thrombotic pulmonary embolism is defined as the embolization of non-thrombotic material to the pulmonary vasculature. This non-thrombotic material can include a wide range of biologic and nonbiologic materials which includes foreign material, like cement.

Percutaneous vertebroplasy involves the injection of orthopedic cement into a fractured vertebral body to stabilize the fracture and reduce pain. A complication of this procedure involves the leakage of cement into the perivertebral venous plexus, which then enters the right heart via the venous system. The cement particles can then lodge in the pulmonary arteries, where it can cause cement pulmonary embolism. Some notable risk factors for cement leakage include degree of bone compromise, number of vertebrae treated per session and operator techniques.[1] This complication can occur in upto 26.9% of vertebroplasties, but this is largely under-recognized as majority of these cases remain asymptomatic and do not require any specific treatment.[2] In most cases, the cement emboli are incidentally identified on follow-up images. However there have been reported cases of life-threatening respiratory failure associated with cement pulmonary embolism.[3] Such cases are managed with supportive care, including providing ventilatory support, when clini-

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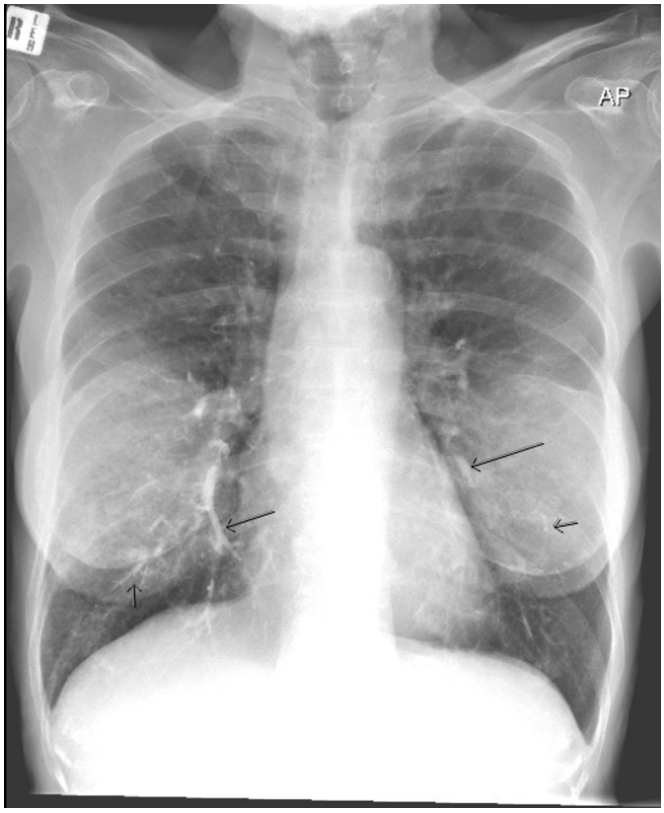

Fig. 1. CXR demonstrated multiple high-density branching linear opacities (arrow) in the expected location of pulmonary arteries.

cally indicated.

Given the widespread use of percutaneous vertebroplasty, cement pulmonary embolism is an important differential to keep in mind for patients who present with acute respiratory symptoms following vertebroplasty.

Questions

1 Which of the following are recognized clinical presentation for cement pulmonary embolism, except:
   a) Asymptomatic
   b) Rash, altered conscious state and dyspnea
   c) Respiratory failure
   d) Chest pain
2 All of the following are all accepted treatment modality for cement pulmonary embolism except:
   a) supplemental oxygen
   b) short-term anticoagulation
   c) thrombolysis
   d) observation

Answers

1 Answer: (b). Embolization of bone marrow fat can occur during vertebroplasty. Fat embolism is characterized by hypoxemia, neurologic abnormalities, and a petechial rash. it is also related to traumatic fracture of marrow-containing long bones or orthopedic procedures.
2 Answer: (c). An asymptomatic patient with cement pulmonary embolism can simply be observed. However in symptomatic patients, the mainstream therapy is to provide supportive care. The exact role of anticoagulation is uncertain. However short-term anticoagulation

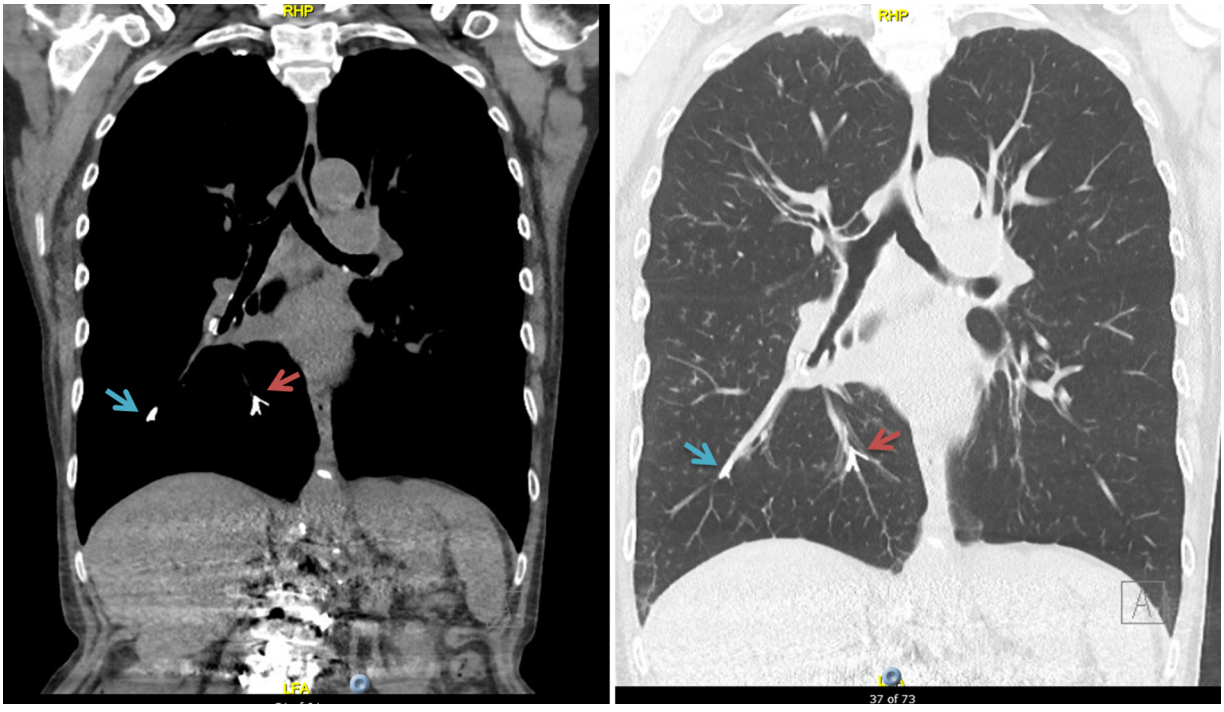

Fig. 2. CT scan demonstrated branching hyperdensity scattered throughout the pulmonary arteries bilaterally with the largest within the right lower lobe pulmonary artery extending into its segmental branches (arrows).

is administered in selective patients to reduce the risk of thrombus formation on the cement embolus until the foreign material is usually endothelialized, which then limits the danger of progression of the occlusion.

Declaration of Competing Interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.visj.2019.100681.

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