Case 10939

Pulmonary polymethyl methacrylate (PMMA) - cement embolism
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Section: Chest imaging
Area of Interest: Thorax Thoracic wall
Procedure: Education
Imaging Technique: CT
Special Focus: Pathology Case Type: Clinical Cases
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Patient: 80 years, female

Clinical History:
An 85-year-old female patient, with a background history of vertebroplasty for compression fractures, presented with a subacute history of shortness of breath. She was investigated with a CT scan of the chest.

Imaging Findings:
Axial post contrast bone windowed CT image at the level of the right pulmonary artery (Fig. 1 - arrow) demonstrates peripheralised radiodense intravascular material representing an embolised polymethyl methacrylate (PMMA) cement fragment. Note that this is as dense as the undiluted contrast jet within the superior vena cava. An axial CT image further below at the level of right ventricle (Fig. 2 - arrow) demonstrates a similarly dense intracardiac embolic fragment within the right ventricle abutting the interventricular septum. This image and an image more inferiorly at the level of T12 (Fig. 3 - arrow) show radiodense migrated PMMA material within the paravertebral veins. A cast of paravertebral migrated PMMA cement material within the paravertebral veins extends from vertebroplasty material within T10 to L2 and is confirmed on sagittal images (Fig. 4a-d).

Discussion:
Background
Vertebroplasty is a commonly performed procedure for symptomatic relief and strengthening of diseased bone resulting from various pathological processes such as compression fractures. It is usually performed by administration of a hard setting acrylic cement (poly-methyl methacrylate or PMMA). A complication that can uncommonly occur is extravertebral extrusion and venous migration, which can in turn result in distal embolisation. The incidence of PMMA pulmonary embolism is estimated at around 5-23% [1-3].

Clinical perspective
While most patients with PMMA-cement emboli are asymptomatic, a small proportion can have symptoms [2, 4]. In many instances, leakage is related to injection of poly-methyl-methacrylate (PMMA) which is at an extremely liquid state or by applying excessive pressure during injection [5]. Other predisposing factors include close needle positioning with respect to basivertebral veins and overfilling of vertebral bodies [6]. PMMA-cement hardens through time and can be typically seen as a cast of radiodense material extending into paravertebral veins from a vertebral body. Reported management options vary greatly ranging from conservative strategies (i.e. observation) to anticoagulation to embolectomy.

Imaging perspective
Due to extreme hyperattenuation of PMMA, the diagnosis of PMMA emboli can be made on a non contrast CT scan.
Post (IV) contrast scans may give more detailed information, although reviewing on bony window settings is essential as PMMA can be easily masked by intravenous contrast on soft tissue window settings. The administration of contrast helps assessment of the rest of the vascular system. In an event of PMMA emboli to the lungs, CT scans typically show extremely dense intraluminal material within the pulmonary arterial system. Recognition and reporting of intracardiac embolic fragments is important. There are published reports of cardiac perforation from intracardiac PMMA fragments [7-8] although this fortunately did not occur in our case. Sagittal and coronal review of vertebral levels aid direct visualisation of a typical cast of extravertebral extension of migrated PMMA.

Outcome
The peripheral location of embolic pulmonary arterial PMMA-cement as well as the duration of symptoms in our case suggested that the embolic event may not have been acute. Due to minimal and resolving symptoms, other comorbidities and a relatively low embolic burden, a conservative strategy was adopted in our case with no further adverse outcome.

Teaching points
This case highlights the importance of recognising intracardiac and pulmonary PMMA-cement emboli as potential complications associated with vertebroplasty. The case also emphasises the value of reviewing intrathoracic images in bony window settings in this clinical context.

Differential Diagnosis List: Pulmonary polymethyl methacrylate (PMMA) - cement embolism, Contrast within the pulmonary artery, Calcification associated with the pulmonary artery

Final Diagnosis: Pulmonary polymethyl methacrylate (PMMA) - cement embolism

 References:
Description: Axial post contrast CT image windowed on bone settings demonstrate a radio-opaque peripheralised density within the right lower pulmonary artery (arrow) representing an embolised PMMA cement fragment. Origin: SKG
**Description:** Axial post contrast CT image on bone window settings demonstrates a similarly radiodense linear density within the right ventricle abutting the interventricular septum (arrow) representing a further embolic intracardiac PMMA fragment. **Origin:** SKG
**Figure 3**

Description: Axial bone windowed post contrast CT image at the level of the T12 vertebra demonstrates migrated radiodense PMMA-cement within the right paravertebral vein (arrowed). **Origin:** SKG
Description: Sagittal post contrast CT images demonstrate vertebroplasty material from T10 to L2 levels with evidence of migration of similarly dense vertebroplasty cement - PMMA material into the paravertebral veins. Origin: SKG
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