Case 6307

Pulmonary thromboembolism complicated by paradoxical embolism secondary to a patent foramen ovale
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Patient: 60 years, female

Clinical History:

An elderly woman presented with clinical features of pulmonary embolism and acute left upper limb ischemia. CT pulmonary angiogram with multiplanar reconstruction confirmed bilateral pulmonary embolism causing right ventricular strain. Furthermore, a patent foramen ovale with paradoxical systemic embolus within intrathoracic arteries was demonstrated in one single examination.

Imaging Findings:

An elderly woman presented to Accident and Emergency department with 3 weeks history of increasing shortness of breath. The lungs were clear on examination although she was hypoxic on air. The initial CXR was unremarkable. Subsequently, she developed symptoms and signs of acute left upper limb ischemia with diminished left radial pulse and reduced perfusion. An urgent echocardiogram showed right ventricular dysfunction and signs of pulmonary hypertension. The interatrial septum was floppy suggesting the possibility of interatrial shunt. An urgent CT pulmonary angiogram revealed large thrombi in both distal main pulmonary arteries with further smaller emboli in several lobar and segmental branches. The right ventricle was dilated with bowing of the interventricular septum to the left indicating right ventricular strain. In addition, the right atrium was distended with a defect in interatrial septum, with suggestion of non opacified blood from the left atrium ejecting into the opacified right atrium at this site. Furthermore, a moderate sized linear serpigenous thrombus was present in the aortic arch causing occlusion of the left subclavian artery despite suboptimal contrast opacification of the aorta. In view of the above findings, the patient was thrombolysed. Post treatment MR angiogram demonstrated resolution of thrombi in the aortic arch although a small residual thrombus was present at the proximal left subclavian artery. The patient's arm remained ischaemic and thrombectomy retrieved further thrombus from the brachial artery. Unfortunately, as a consequence of thrombolytic therapy she developed delayed brain parenchymal haemorrhage in right temporo-occipital lobe.

Discussion:

Paradoxical emboli to systemic circulation is a well recognised phenomenon. The source for these emboli commonly originates in the deep venous system and travels from right to left heart usually via a patent foramen ovale but also via atrial or ventricular septal defect (1). Clinically suspicion arises if there is a temporal relationship of clinical onset of pulmonary embolism/deep venous thrombosis and systemic embolism. In a study by Kasper W et al, patients with haemodynamically significant pulmonary embolism showed 39% incidence of patent foramen ovale (PFO) by contrast echocardiography and this group exhibited symptoms of systemic embolism (2). It is conceivable that the acute rise in right sided pressure caused by massive pulmonary thromboembolism could promote underlying predisposition to intracardiac shunting (3). Good quality CT pulmonary angiogram can not only detect systemic
thromboembolism within intrathoracic arteries but can also identify shunts across the atrial or ventricular septum as demonstrated in our case. Paradoxical systemic embolus via a patent foramen ovale was shown in this case with massive pulmonary embolism causing right ventricular strain. Thus, CT pulmonary angiogram with multiplanar reconstruction allowed us to make a confident diagnosis in a single examination. The potential catastrophic adverse effect of systemic thrombolysis such as intracranial haemorrhage has also been highlighted in this case.

**Differential Diagnosis List:** Pulmonary thromboembolism complicated by patent foramen ovale and paradoxical embolism.

**Final Diagnosis:** Pulmonary thromboembolism complicated by patent foramen ovale and paradoxical embolism.

**References:**

Oliver, TB, Reid, JH
Thoracic aortic dissection that wasn\'t: CT demonstration of probable paradoxical embolus secondary to unsuspected pulmonary embolus
Br J Radiol 1997 70: 840-842. (PMID: [9486051](pmid:9486051))


Figure 1

Description: Thrombus in the left distal main pulmonary artery. **Origin:**

Description: Thrombi in right distal main and left lower lobe pulmonary arteries. **Origin:**
Description: Thrombi in both distal main pulmonary arteries. Origin:

Description: Dilatation of the right ventricle with bowing of the interventricular septum as a result of considerable ventricular strain. Origin:
**Description:** Patent foramen ovale with non opacified blood jet from the left atrium into the opacified right atrium. **Origin:**

**Description:** Serpigenous embolus in the aortic arch. **Origin:**
Description: Paradoxical embolus occluding the left subclavian artery origin. Origin:
Figure 2

a

Description: Coronal image showing thrombus in the right distal pulmonary artery.Origin:

b

Description: Oblique coronal image showing thrombus in the left distal main pulmonary artery.Origin:
Description: Oblique sagittal image showing serpigenous embolus in the aortic arch occluding left subclavian artery origin. Origin:
Description: Key diagnostic oblique sagittal image which shows embolus in the left main pulmonary artery, patent foramen ovale and paradoxical aortic arch embolus with occlusion of left subclavian artery origin. Origin:
Description: Coronal MIP image shows clearance of aortic embolus although there is a small residual embolus at the proximal left subclavian artery. Origin:
Figure 4

Description: Acute right temporo-occipital parenchymal haemorrhage secondary to systemic thrombolysis. Origin: