

The hyperdense lumen sign: the tale of the elusive pulmonary embolism

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DESCRIPTION

A 55-year-old man with a history of chronic obstructive pulmonary disease (COPD) presented to the emergency department with 2 weeks of progressively worsening dyspnoea. The admitting service interpreted the initial chest radiograph as demonstrating a right lower lobe infiltrate. The patient was admitted for acute COPD exacerbation secondary to right lower lobe pneumonia and was started on antibiotics. An unenhanced chest CT was obtained, which demonstrated hyperdensities within the bilateral pulmonary arteries concerning for pulmonary embolism (PE; figure 1A, B). A chest CT angiography (CTA) was subsequently ordered and confirmed a saddle embolus with multiple bilateral pulmonary emboli (figures 1C and 2) and right heart strain. The patient's antibiotics were subsequently discontinued and anticoagulation was initiated.

We present a case of the hyperdense lumen sign, a rare finding that has previously been reported to correlate with the presence of acute PE on unenhanced CT with a specificity of 99%.¹ The hyperdense appearance of acute thrombus is caused by increased concentration of haemoglobin due to decreased water content and varies based on the patient's haematocrit level and the age of the clot.² However, this finding is rarely observed on unenhanced CT examinations, even when PE is present. There are more well-recognised indirect signs of acute PE, which are neither sensitive nor specific, including pulmonary arterial dilation, pleural effusion, regional oligoemia, subpleural pulmonary consolidations and/or airspace opacities.¹ In our case, the patient had a dilated main pulmonary artery (figure 2), suggestive of pulmonary

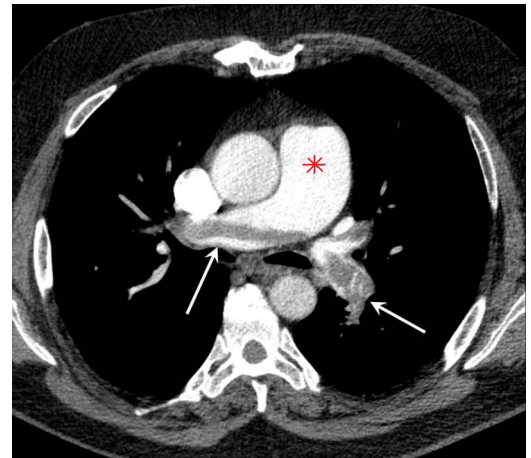


Figure 2 A single axial image from an enhanced CT angiography of the chest demonstrates hypodense filling defects within the bilateral pulmonary arteries (arrows), consistent with acute pulmonary embolism. The main pulmonary artery (asterisk) is dilated.

hypertension and evidence of right heart strain with cor pulmonale confirmed on echocardiogram.

Often, chest CTA is the study of choice for the diagnosis of PE.³ However, in situations where PE is not the working clinical diagnosis or the patient is unable to receive intravenous contrast, awareness of the presence of the hyperdense lumen sign on unenhanced CT may contribute to early detection of an acute PE. This was a particularly important finding in our case given the extent of the patient's emboli and associated right heart strain, an indicator of increased mortality risk, leading to the early diagnosis of a potentially fatal condition.



Figure 1 (A) A single axial image from an unenhanced CT of the chest demonstrates hyperdense material present within the bilateral pulmonary arteries (arrows). (B) A single axial image from an unenhanced CT of the chest utilising a narrower window width allows better visualisation of the hyperdense material (arrows). (C) A single axial image from an enhanced CT angiography of the chest demonstrates hypodense filling defects within the bilateral pulmonary arteries (arrows), confirming the findings on the unenhanced CT.



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Learning points

- ▶ The hyperdense lumen sign, a rare occurrence, may serve as an indicator of acute pulmonary embolism on unenhanced CT.
- ▶ Acute pulmonary embolism is often a diagnostic challenge for clinicians and awareness of the hyperdense lumen sign may contribute to early diagnosis and appropriate patient management.
- ▶ Confirmatory testing with a contrast enhanced chest CT angiography or a V/Q scan is still recommended if a hyperdense lumen sign is identified.³

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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