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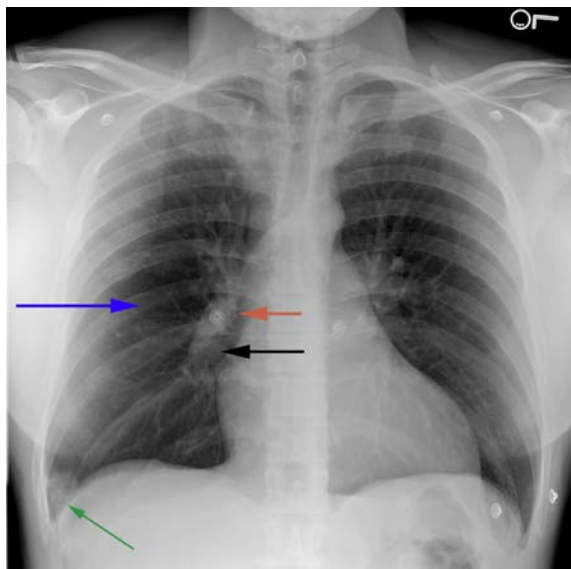
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Figure 1. Posterior-anterior chest radiograph demonstrating right lower lobe, peripheral, wedge-shaped, airspace opacity concerning for Hampton's hump (green arrow) and right middle lobe increased lucency (blue arrow), implying regional oligemia (Westermarck sign). Additionally, there is dilatation of the right pulmonary artery (orange arrow) with abrupt cutoff (black arrow), concerning for Fleischner and knuckle signs, respectively.

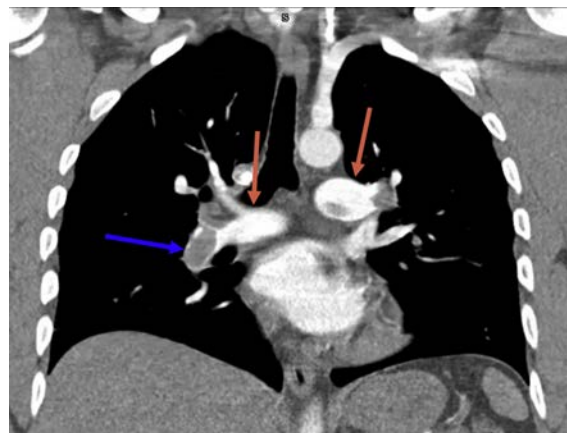


Figure 2. Coronal CT angiography demonstrating dilated pulmonary arteries (Fleischner sign; orange arrows) with abrupt vessel cutoff of the right lower lobe pulmonary artery (knuckle sign; blue arrow), corresponding to findings in Figure 1.



Figure 3. Axial CT angiography of the chest at the level of the pulmonary artery bifurcation, demonstrating a saddle thromboembolism (orange arrow).

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An otherwise healthy 35-year-old active duty military infantryman presented to the emergency department, complaining of intermittent dyspnea over one-week duration, which was worsened by exertion. He recalled some unusual left leg cramping three weeks before and reported an uncomplicated tooth extraction one week before, but denied any invasive surgeries.

Chest radiographs were obtained, followed by computed tomographic (CT) angiogram of the chest.

For the diagnosis and teaching points, see page 202.

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DIAGNOSIS:

Pulmonary embolism. Pulmonary embolism can occur without a known cause or as a result of numerous prothrombotic conditions.¹ Delayed morbidity may occur by recurrent pulmonary embolism (8% in first year) or chronic pulmonary hypertension (4% at 2 years).²

This case demonstrates multiple rare but specific radiographic findings of pulmonary embolism. These include the Westermark, knuckle, and Fleischner signs, in addition to Hampton's hump. The Westermark sign is shown in the right middle and inferior lung fields as a region of relative hyperlucency resulting from oligemia distal to the clot (Figure 1). The knuckle sign is an abrupt cutoff of the pulmonary artery, as shown by the black arrow in Figure 1 and confirmed by the blue arrow in Figure 2. The Fleischner sign refers to an enlarged central pulmonary artery proximal to the clot (Figures 1 and 2). The classic Hampton's hump is well demonstrated at the right costophrenic angle (Figure 1).^{3,4}

The CT angiogram demonstrated a saddle pulmonary embolism (Figure 3) with significant clot burden and evidence of right-sided heart strain, which was corroborated by bedside echocardiography and an elevated troponin level. The patient received immediate anticoagulation and a single dose of alteplase, resulting in significant clinical improvement during the subsequent 24 hours.

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the US government.

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