

Invasive pulmonary mucormycosis with vascular involvement

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Abstract

An immunocompromised woman developed progressive respiratory symptoms followed by signs of embolism in the pulmonary artery and great vessels. MRI of the chest was able to demonstrate the lung cavitation, as well as demonstrating vascular invasion, suggesting a diagnosis of mucormycosis, an opportunistic fungal infection.

Keywords

Magnetic resonance; angiography; mucormycosis.

Case report

A 37-year-old female was admitted with neutropenic sepsis following chemotherapy for acute myeloid leukaemia. Broad-spectrum antibiotics were commenced. Five days after admission her renal function suddenly deteriorated (creatinine, 323 $\mu\text{mol/l}$; urea, 11.3 $\mu\text{mol/l}$) in spite of normal gentamicin and vancomycin levels. She continued on intravenous azlocillin alone but remained pyrexial and developed a productive cough, wheeze and left-sided pleuritic chest pain. Chest radiographs showed rapidly progressive consolidation of the left lung despite the addition of further broad-spectrum antibiotics. Bronchoscopy was unremarkable and endobronchial washings revealed only a lightly cellular specimen containing bronchial epithelial cells, mature squames, a small number of neutrophils and alveolar macrophages with no growth. A helical CT scan of her chest, performed without the use of intravenous iodinated contrast in view of her poor renal function and bronchospasm, showed extensive consolidation and cavitation of her left upper lobe (Fig. 1).

A fungal infection was suspected because of her immunocompromised state and the progression of her lung cavitation despite the use of broad-spectrum antibiotics. Amphotericin was added to her drug regimen, but the following day her condition deteriorated when she developed a right hemiparesis and painful left arm. Radial and ulnar pulses were absent and a CT scan of the head demonstrated a recent cerebral infarct in the left middle cerebral artery territory. Embolic disease was suspected, and MRI of her thorax was performed to assess the great vessels as a source of her emboli and to visualize the lung and left pulmonary artery.

Axial T1W images were obtained through the pulmonary arteries and an angled sagittal enhanced flow study with gadolinium optimized for the left pulmonary artery. The axial images showed a left

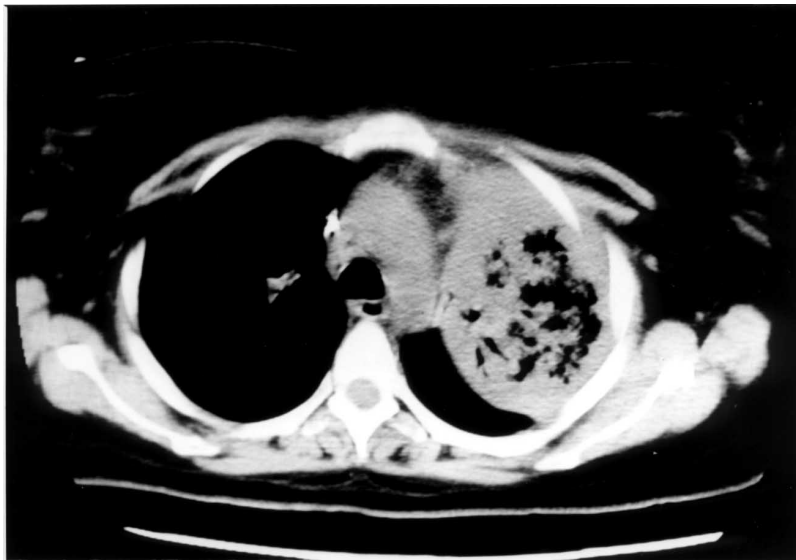


Fig. 1. Axial unenhanced CT at the level of the aortic arch demonstrates extensive cavitation and consolidation of the left upper lobe.



Fig. 2. Angled sagittal gadolinium-enhanced flow study through the mediastinal vessels demonstrates the left upper lobe mass infiltrating the left main pulmonary artery (arrow). Note is made of the abrupt occlusion of the left subclavian artery.

upper lobe mass with extension into the left main pulmonary artery. This was confirmed on the flow study (Fig. 2), which demonstrated the aortic arch, great vessels and the left subclavian artery.

At operation, fungus and clot were seen in the left upper lobe extending into the left main pulmonary artery. Histology of the resected upper lobe showed extensive necrosis of lung tissue with fungi in the alveoli and vascular occlusion by invasion of the vessel wall. The fungal mycelia were aseptate with irregular diameters characteristic of mucormycosis. The patient made an uneventful postoperative recovery.

Diagnosis

Invasive pulmonary mucormycosis with vascular involvement.

Clinical evidence

Mucormycosis is a rare, opportunistic infection caused by fungi belonging to the class Zygomycetes, genus *Mucor*. The clinical manifestations have traditionally been divided into six separate syndromes: rhinocerebral, pulmonary, cutaneous, gastrointestinal, central nervous system and disseminated disease. Patients with diabetic ketoacidosis often develop rhinocerebral mucormycosis, whereas those with haematological malignancies, usually in association with severe neutropenia, develop pulmonary or disseminated disease.^[1,2] Pulmonary involvement can develop as a result of inhalation of airborne fungal spores or from haematogenous spread, and presents with rapidly progressive cough, fever and pleuritic chest pain with a high mortality rate.^[3]

In the largest review of pulmonary mucormycosis, the most common radiographic finding was a focal infiltrate or consolidation seen in 58%.^[4] Other reported radiological manifestations include cavitation, the air crescent sign, bronchopleural fistula pulmonary artery pseudoaneurysm and the CT halo sign. The halo sign has been shown to represent round pulmonary infarcts with surrounding haemorrhage and oedema, best seen with thin-section CT. Mucormycosis is among the few pulmonary infections that may cross pleural surfaces.

Histologically, a characteristic feature of mucormycosis is tissue invasion by aseptate broad (5–50 μm) hyphae and a propensity for invasion of blood vessels.^[3]

The imaging of vascular invasion in this patient presented some difficulties. Arch aortography, even without selective cannulation of the great vessels, is an invasive procedure with a small but definite risk of stroke. Helical CT has been used to image the pulmonary^[5] and central vessels but requires intravenous contrast medium, which is relatively contraindicated in a sick patient with bronchospasm and poor renal function. More recently, magnetic resonance imaging has demonstrated potential as an alternative in the diagnosis of pulmonary emboli,^[6] and for imaging the aorta and great vessels.^[7,8] Direct invasion was shown by using an angled sagittal gadolinium-enhanced flow study optimized for the left pulmonary artery. Contrast flow sequences were employed in this patient as non-contrast techniques are more prone to motion artefact in the chest as a result of longer acquisition times. Gadolinium is not known to have significant nephrotoxicity at the doses employed in routine imaging.^[9] Contrast-enhanced magnetic resonance angiography has the potential for imaging the pulmonary vasculature in addition to its use for demonstrating embolic disease. There are no previously documented reports of the MRI appearances of pulmonary mucormycosis.

Lessons

Pulmonary mucormycosis should be considered in neutropenic patients with cough, pleuritic chest pain or haemoptysis resistant to standard antibiotics. It may cross pleural surfaces and invade vascular structures. MRI may elegantly provide useful diagnostic information.

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