Mycotic aneurysm of the left subclavian artery: CT findings

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ABSTRACT

Mycotic aneurysms caused by aspergillosis are rare. We report a nine-year-old girl with acute lymphoblastic leukaemia who had invasive pulmonary aspergillosis and subsequently developed a left subclavian artery aneurysm. Prior to the aneurysm, computed tomography (CT) of the chest showed a nodule with an air crescent in the left upper lobe, adhering to the mediastinum and the left subclavian artery. The left subclavian artery was ill-defined and had a small lumen, and it was embedded in the wall of the nodule. 37 days after the chest CT, the patient underwent a left thoracotomy because of massive haemoptysis, at which time a false aneurysm in the left subclavian artery was found. Plication of the aneurysm was performed. On a follow-up CT with multiplanar reconstruction six days after surgery, there were the plicated aneurysm and a small amount of pleural effusion in the upper portion of the left hemithorax, adjacent to the plication. In invasive pulmonary aspergillosis, it is important to be aware of the possibility of mycotic aneurysms, particularly in patients with pulmonary lesions adjacent to mediastinal vessels with ill-defined borders and small lumens, since the aneurysms may increase in size and rupture. CT, particularly multidetector CT, helps in visualisation of mycotic aneurysms.

Keywords: aspergillosis, computed tomography, mycotic aneurysm, subclavian artery

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INTRODUCTION

Angioinvasive pulmonary aspergillosis is a rare but potentially fatal opportunistic infection in an immunocompromised patient. The majority of cases occur in neutropenic patients undergoing chemotherapy for haematological malignancies, bone marrow and solid organ transplant recipients, and in children with primary immunodeficiency syndrome[1]. Angioinvasive pulmonary aspergillosis is not limited by anatomical barriers to the parenchyma of the lung. Aspergillus species may invade through the visceral pleura and reach the pleural space, intercostal muscles, ribs, parietal pericardium, or great vessels[2]. Direct extension to the mediastinal great vessels is rare. When it does occur, it may result in a pseudoaneurysm or occlusion[3,4]. Computed tomography (CT) findings of a child with angioinvasive pulmonary aspergillosis, both prior to and after diagnosis of a left subclavian artery mycotic aneurysm, are reported.

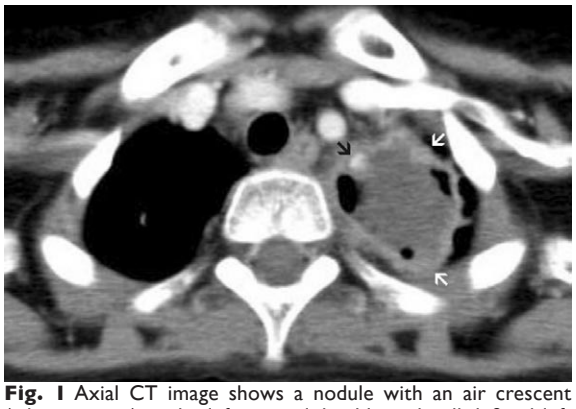

Fig. 1 Axial CT image shows a nodule with an air crescent (white arrows) in the left upper lobe. Note the ill-defined left subclavian artery (black arrow) with small lumen in nodule wall and small nodule in right upper lobe.

CASE REPORT

A nine-year-old girl was diagnosed with acute lymphoblastic leukaemia in March 2004. One month after completion of the induction and intensive courses of chemotherapy, she had prolonged febrile neutropaenia and mild haemoptysis. Her white blood cell count was 800 per cubic millimetres; her differential count was 89% neutrophils and 11% lymphocytes. Although she received a combination of antibiotics and amphotericin B, her symptoms persisted. Chest radiograph showed a left upper lobe nodule. Chest CT showed a nodule with air crescent in the left upper lobe, adhering to the

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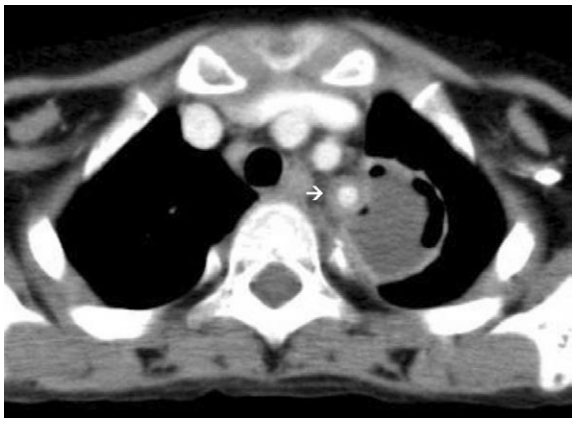

Fig. 2 Axial CT image taken at a lower level shows thickened wall of proximal portion of the left subclavian artery (arrow), which adheres to the nodule in the left upper lobe.

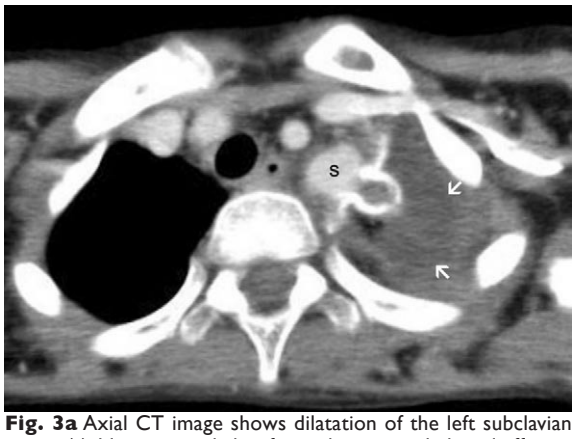

Fig. 3a Axial CT image shows dilatation of the left subclavian artery (s). Note surgical clips from plication and pleural effusion (arrows) in apex of left hemithorax.

Fig. 3b Multiplanar reformatted coronal CT image shows dilatation of the left subclavian artery (s) with irregular walls. The left vertebral artery (v) originates at superior portion of mycotic aneurysm. Note surgical clips from plication and pleural effusion (arrows) in apex of left hemithorax.

mediastinum and the left subclavian artery (Fig. 1). The left subclavian artery was ill-defined and had a small lumen, and it was embedded in the wall of the nodule. The wall of the proximal portion was thick (Fig. 2). There was wedge-shaped consolidation in the left upper lobe, and five other small nodules were seen in the lungs. A few tiny hypodense lesions were seen in the liver and spleen. Angioinvasive pulmonary aspergillosis with liver and splenic abscesses was diagnosed.

Amphotericin B was continued with an increased dosage of 1.5 mg/kg/day. Even though the patient was given a full course, her haemoptysis worsened, inducing hypovolaemic shock. She underwent a left thoracotomy 37 days after the chest CT, at which time the surgeon planned to resect the left upper lobe. However, a false aneurysm with a diameter of 3cm was found in the left subclavian artery, with a portion of the left upper lobe adhering to it. There was no leak or rupture of the false aneurysm of the left subclavian artery. Plication of the aneurysm was performed and part of the left upper lobe was resected, including the nodule with air crescent.

Pathological examination of the resected portion of the left upper lobe revealed a detached gray fungal ball (3.0x1.8x1.8cm), and an abscess surrounded by a thick fibrous wall. Pathological examination revealed that the abscess contained fungal hyphae with dichomatous branchings and ballooning that had infiltrated a fragment of lung tissue intravascularly. A necrotic fragment of lung tissue had been infiltrated intravascularly by the fungal hyphae. These findings indicated angioinvasive pulmonary aspergillosis.

CT done six days after surgery showed an aneurysm of the left subclavian artery (Fig. 3). A small amount of pleural effusion was seen in the upper portion of the left hemithorax, adjacent to the plication. The wedge-shaped consolidation in the left upper lobe and three of the nodules in the lungs had disappeared; the other two nodules in the lungs were smaller. The liver and splenic abscesses were also smaller. Amphotericin B was continued for two more months, and was then switched to itraconazole. Her chest symptoms subsequently disappeared.

DISCUSSION

Angioinvasive aspergillosis occurs almost exclusively in immunocompromised patients with severe neutropaenia. It is characterised histologically by an invasion of fungal hyphae that occlude medium-sized pulmonary arteries. This leads to the formation of necrotic haemorrhagic nodules or pleura-based, wedge-shaped haemorrhagic infarcts[5].

Characteristic CT findings are nodules surrounded by a halo of ground-glass attenuation (the "halo" sign) or pleura-based wedge-shaped areas of consolidation, corresponding to haemorrhagic infarcts. Separation of fragments of necrotic lung tissue (pulmonary sequestra) from adjacent parenchyma results in air

crescents similar to those seen in mycetomas[5]. This air-crescent sign can appear from one day to three weeks after the appearance of the initial abnormality[6]. Air crescents occur commonly in leukaemic patients with invasive pulmonary aspergillosis who are recovering from neutropaenia[7].

Air crescents may be associated with massive haemoptysis. Gefter et al found that three of 12 patients with air crescent in their study had massive haemoptysis that developed one to two days following the appearance of air crescent[7]. Saliou et al reported a 32-year-old man with a mycotic aneurysm of the left subclavian artery. This patient had been immunosuppressed by chemotherapy for leukaemia. His aneurysm was diagnosed after two episodes of haemoptysis from a fistula of lung parenchyma caused by a lung parenchyma fistulisation[8]. In our case, surgery did not reveal any fistula of lung parenchyma. The cause of massive haemoptysis was angioinvasive pulmonary aspergillosis.

Several mechanisms have been proposed to account for the development of mycotic aneurysms, namely: embolism of the vasa-vasorum, direct wall invasion, and erosion of the vessel from an adjacent lesion of the lung, either by direct extension or via the lymphatic system[8]. Cases of mycotic aneurysm caused by aspergillosis are rare in children. The cases reported include one case with mycotic aneurysm of the common carotid artery[9], two cases with mycotic aneurysm of the descending aorta[10], and one case with mycotic pseudoaneurysm of the aortic arch[11]. In the last case, the invasive pulmonary aspergillosis extended to the aortic arch, where formation of a pseudoaneurysm was demonstrated by serial CT scans.

In invasive pulmonary aspergillosis, pulmonary lesions adjacent to the mediastinum should be followed more closely. This is particularly so for those adjacent to mediastinal vessels with ill-defined borders, small lumens, and thickened walls, as in our case, because there is a higher probability of mediastinal vessel extension and potentially fatal complications[11]. It is important to be aware of this complication, since the mycotic aneurysm may increase in size substantially and rupture within days. CT, particularly multidetector CT, helps in visualisation of mycotic aneurysms.

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