CASE FOR DIAGNOSIS

Fever and haemoptysis in an injecting drug user

L.K.K. Tan*, D.J. Powrie[#], R. Rowland[†], I. Cropley[†] and M. Lipman⁺

CASE REPORT

A 46-yr-old injecting drug user was admitted with a history of repeated haemoptysis, pleuritic chest pain and fevers. He had a neutrophilia and elevated C-reactive protein. A pulmonary embolus was diagnosed by computed tomography (CT) pulmonary angiography and he was treated with low molecular weight heparin. He received *i.v.* antibiotics (flucloxacillin, amoxicillin, gentamicin and metronidazole) for polymicrobial bacteraemia (methicillin-sensitive *Staphylococcus aureus*, Enterococcus, viridans type Streptococcus) caused by a right groin abscess, which was subsequently incised and drained, and was associated with iliofemoral thrombosis. No valvular vegetation was seen on transthoracic or subsequent transoesophageal echocardiogram.

The patient had a fluctuating clinical course, requiring respiratory support with supplemental oxygen and noninvasive ventilation. He had a persistent neutrophil leukocytosis and greatly elevated C-reactive protein at $>100 \text{ mg}\cdot\text{L}^{-1}$. Clinically, there was evidence of bilateral pleural effusions, which cultured Enterococcus on aspiration. Attempted thoracocentesis was unsuccessful with minimal fluid drained. An ultrasound scan of the chest revealed loculated pleural effusions. He continued to cough blood and 17 days after admission had an episode of massive haemoptysis requiring a blood transfusion. At this point the anticoagulation was discontinued given the risk of further massive haemoptysis.

A repeat CT of the chest was performed to clarify the cause of the continuing haemoptysis (fig. 1). Despite halting the anticoagulation, further fresh haemoptysis occurred a few days later and he was referred to a cardiothoracic surgeon with a view to surgical intervention. Due to his poor respiratory and nutritional status, it was felt that he was high risk for surgery and was therefore referred for radiologically guided intervention (fig. 2).

FIGURE 1. Computed tomography scan of the thorax after an episode of massive haemoptysis.

FIGURE 2. Pulmonary angiography of the left pulmonary artery a) confirming the cause of massive haemoptysis and b) post-radiologically guided intervention

BEFORE TURNING THE PAGE, INTERPRET THE COMPUTED TOMOGRAPHY OF THE THORAX AND PULMONARY ANGIOGRAPHY IMAGES AND SUGGEST A DIAGNOSIS.

*Dept of HIV Medicine, Chelsea and Westminster Hospital, Depts of [†]Infectious and Tropical Diseases and ⁺Thoracic Medicine, Royal Free Hospital, London, and [#]Dept of Thoracic Medicine, Southend University Hospital NHS Foundation Trust, Essex, UK.

CORRESPONDENCE: L.K.K. Tan, Dept of HIV Medicine, Thomas Macaulay Ward, Chelsea and Westminster Hospital, 369 Fulham Palace Road, London SW10 9NH, UK. Fax: 44 2087468537. E-mail: lionel.tan@nhs.net

STATEMENT OF INTEREST: None declared.

COMPUTED TOMOGRAPHY

The CT scan of the thorax (fig. 1) demonstrates large bilateral loculated pleural effusions and a 3.5-cm bi-lobed aneurysmal dilatation of a branch of the left pulmonary artery with surrounding consolidation (arrow). This had developed at the site of the previously documented pulmonary embolus.

PULMONARY ANGIOGRAPHY

Pulmonary angiography (fig. 2a) confirmed the presence of the aneurysmal dilatation of a branch of the left pulmonary artery (arrow). The patient subsequently underwent coil embolisation to this dilated segment (fig. 2b) under radiological guidance.

Diagnosis: Mycotic pulmonary artery pseudoaneurysm caused by a septic pulmonary embolus originating from an infected thrombus related to the groin abscess.

CLINICAL COURSE

The site of the pseudoaneurysm in the left lower lobe would have required a lobectomy; the surgeons felt that the patient's clinical condition precluded this. He was thus referred for radiologically guided coil embolisation, which was successful and haemoptysis did not recur. However, the patient's clinical condition deteriorated and he died of respiratory failure 1 week later.

DISCUSSION

Mycotic aneurysms and pseudoaneurysms are a rare but recognised consequence of injecting drug use and can occur within the pulmonary circulation. First used by OSLER [1] in 1885, when he described the formation of an aneurysm secondary to bacterial endocarditis, the term "mycotic aneurysm" is in a sense a misnomer. At the time, "mycotic" meant any microbe and not just fungus. However, this term continues to be applied to any aneurysm of infectious aetiology [2]. An aneurysm occurs when there is dilatation of the vessel wall. This is in contrast to a pseudoaneurysm when destruction of the two inner layers of the vessel wall with preservation of the tunica adventitia, or sometimes complete destruction of the entire wall of the vessel, occurs. Haemorrhage is usually contained by tamponade from surrounding structures; however, once a pseudoaneurysm lacks a wall it is liable to rupture as the surrounding thrombus lyses.

Mycotic aneurysms and pseudoaneurysms are thought to arise by one of the following mechanisms: 1) septic microemboli to the vasa vasorum; 2) a neighbouring infected focus; 3) haematogenous seeding; or 4) trauma with direct contamination [2]. They may occur within the pulmonary circulation in conjunction with infective endocarditis or in association with pneumonia where they may present as an endobronchial mass with potentially fatal consequences [3]. Organisms differ depending on the mechanism of formation; *S. aureus* is commonly implicated in relation to septic microemboli associated with infective endocarditis [2, 4]. However, other bacteria, including *Actinomyces* and *Mycobacterium tuberculosis* and fungi, have also been implicated in the pathogenesis of mycotic pulmonary artery aneurysms [5–7].

An arterial mycotic pseudoaneurysm is a rare occurrence amongst injecting drug users; in one study from an urban hospital in the USA, only 11 (0.14%) out of 7,795 patient visits for complications of injecting drug use had mycotic pseudoaneurysms, with none of these being pulmonary [8].

Mycotic pulmonary artery pseudoaneurysms have been described in conjunction with endocarditis in injecting drug users [4]; however, the current patient had no evidence of valvular vegetations on either transthoracic or transoesophageal echocardiogram. Instead, the present authors believe that septic microemboli to a branch of the left pulmonary artery, originating from a groin abscess, led to invasion of the vessel wall and subsequent dilatation, destruction and pseudoaneurysm formation. In addition, neighbouring pulmonary infection and haematogenous spread may have also contributed.

The optimum management of these cases is not defined. As the wall tension (T) in an aneurysm is related to the intravascular pressure (P), radius of the aneurysm (r) and thickness (d) of the wall, by Laplace's relationship:

$$T = Pr/2d \quad (1)$$

these structures are potentially unstable and may rupture. Previous cases have been treated conservatively [9]. Other options include surgery [10] and, depending on the site of the aneurysm, radiological embolisation [11, 12]. In this case, life-threatening haemoptysis occurred presumably due to rupture of the pseudoaneurysm and treatment was considered mandatory. Due to the site of the pseudoaneurysm in the left lower lobe, surgical intervention would have involved a lobectomy, which the patient was clearly unable to tolerate and coil embolisation was therefore performed.

The decision to transfer the patient for coil embolisation was partly driven by the dilemma regarding the use of anti-coagulation. The presence of residual thrombus in the patient's iliofemoral veins provided a risk of further embolism to the pulmonary vasculature. However, if anticoagulated, he was also at continuing risk of life-threatening haemoptysis due to dispersal of the thrombus surrounding the pseudoaneurysm, which was acting as a tamponade. The patient's clinical condition and bacteraemia precluded the insertion of a temporary inferior vena cava filter. After the episode of massive haemoptysis, it was decided that, on balance, anti-coagulation should be halted whilst a definitive procedure was performed to repair the pseudoaneurysm and hence prevent any further bleeding.

Mortality from mycotic pulmonary pseudoaneurysms is high, and has been estimated at just over 50% [4]. Thus, it is important to recognise the development of mycotic pulmonary pseudoaneurysms in injecting drug users who present with haemoptysis and signs of infection. Several of the significant thrombo-embolic and infective complications associated with injecting drug use are illustrated within the present single case.

ACKNOWLEDGEMENTS

We would like to thank J. Jackson, (Hammersmith Hospitals, NHS Trust, London, UK) for permission to use his images.

REFERENCES

- 1 Osler W. Gulstonian lectures on malignant endocarditis. *BMJ* 1885; 1: 467–470, 522–526, 577–579.
- 2 Fowler VG, Scheld WM, Bayer AS. Endocarditis and intravascular infections. In: Mandell GL, Bennett JE, Dolin R, eds. Principles and Practice of Infectious Diseases. London, Churchill Livingstone, 2004; pp. 1005–1022.

- 3 Dransfield MT, Johnson JE. A mycotic pulmonary artery aneurysm presenting as an endobronchial mass. *Chest* 2003; 124: 1610–1612.
- 4 Benveniste O, Brunell F, Bedos JP, *et al.* Ruptured mycotic pulmonary artery aneurysms: an unusual complication of right-sided endocarditis. *Scand J Infect Dis* 1998; 6: 626–629.
- 5 Lertsapcharoen P, Chottivittayatarakorn P, Benjacholamas V. Mycotic aneurysms of the pulmonary arteries. *Heart* 2002; 88: 524.
- 6 Kim HS, Oh YW, Noh HJ, Lee KY, Kang EY, Lee SY. Mycotic pulmonary artery aneurysm as an unusual complication of thoracic actinomycosis. *Korean J Radiol* 2004; 5: 68–71.
- 7 Greillier L, Barlesi F, Fraticelli A, *et al.* Fatal pulmonary haemorrhage from a mycotic pulmonary artery aneurysm. *Int J Tuberc Lung Dis* 2005; 9: 702–703.
- 8 Tsao JW, Marder SR, Goldstone J, Bloom AI. Presentation, diagnosis, and management of arterial mycotic pseudoaneurysms in injecting drug users. *Ann Vasc Surg* 2002; 16: 652–662.
- 9 McLean L, Sharma S, Maycher B. Mycotic pulmonary arterial aneurysm in an intravenous drug user. *Can Respir J* 1998; 5: 307–311.
- 10 Mody GN, Lau CL, Bhalla S, *et al.* Mycotic pulmonary artery pseudoaneurysm. *J Thorac Imaging* 2005; 20: 310–312.
- 11 Deshmukh H, Rathod K, Garg A, Sheth R. Ruptured mycotic pulmonary artery pseudoaneurysm in an infant: transcatheter embolization and CT assessment. *Cardiovasc Intervent Radiol* 2003; 26: 485–487.
- 12 Ghaye B, Trotteur G, Dondelinger RF. Multiple pulmonary artery pseudoaneurysms: intrasaccular embolization. *Eur Radiol* 1997; 7: 176–179.