Hemoptysis From a Ruptured Mycotic Aneurysm Caused by Salmonella

Yu-Chung Kung[1,2], Wen-Yeh Hsieh[3*], Sen Sun[4], Yu-Chen Chen[5]

[1]Division of Chest Medicine, Department of Internal Medicine, Mackay Memorial Hospital, [2]Mackay Medicine, Nursing and Management College, Taipei, [3]Division of Chest Medicine, Department of Internal Medicine, Mackay Memorial Hospital, Hsinchu Branch, Hsinchu, and Departments of [4]Cardiovascular Surgery and [5]Pathology, Mackay Memorial Hospital, Taipei, Taiwan.

SUMMARY

Although an uncommon cause of hemoptysis, fistulas between the aorta and the airway (especially the left bronchopulmonary tree) are frequently associated with infected aneurysms of the thoracic aorta and are fatal if not diagnosed and surgically treated. We report a case of mycotic aneurysm in a 74-year-old man who presented with hemoptysis. This patient complained of blood-tinged sputum and chest pain initially, and the chest X-ray showed an aortic aneurysm. The chest computed tomography scan revealed the aneurysm ruptured into the lung parenchyma. Urgent graft replacement was performed successfully after diagnosis. Tissue culture yielded non-typhoidal *Salmonella*. [International Journal of Gerontology 2009; 3(2): 133–136]

Key Words: endovascular graft repair, hemoptysis, mycotic aneurysm, ruptured aortic aneurysm, *Salmonella* infections

Introduction

Hemoptysis is defined as expectoration of blood originating from the lower respiratory tract, and includes the full range of bloody sputum, from blood streaks to frank blood. Sometimes, hemoptysis can be fatal if a massive amount causes unstable hemodynamics or asphyxia[1]. Bronchitis, bronchogenic carcinoma, and bronchiectasis are the most common causes of hemoptysis[2].

Mycotic aneurysm is a localized irreversible arterial dilatation resulting from destruction of the vessel wall by infection. The majority of mycotic aneurysms are caused by bacteria. Thrombosis and rupture are possible complications. A mycotic aneurysm complicated with hemoptysis has been reported, and it required surgical intervention[3].

Correspondence to: Dr Wen-Yu Hsieh, Department of Internal Medicine, Mackay Memorial Hospital, 92, Chung-Shan North Road, Taipei, Taiwan.
E-mail: a4040@ms7.mmh.org.tw
Accepted: March 12, 2009

We describe a patient with a ruptured mycotic aneurysm with hemoptysis who was successfully treated by surgical repair. We then discuss the various aspects of hemoptysis and mycotic aneurysm.

Case Report

A 74-year-old man had a 40 pack-year smoking history and had stopped smoking for 7 years. He also had a history of chronic obstructive pulmonary disease with cor pulmonale, hypertension, and uncontrolled diabetes mellitus for 1 year. He experienced frequent chest tightness and pain without cough or dyspnea 1 month prior to admission. He presented to our emergency department because of dull chest pain for minutes and cough with blood-streaked secretions occurring twice. The daily amount of fresh blood was less than 50 mL. The patient denied epistaxis, oral bleeding, hematemesis, fever, dyspnea or weight loss. Hemogram analysis showed hemoglobin 15.1 g/dL, white blood cell count 9,500/μL without left shift, and normal cardiac enzymes and electrocardiography.

On admission, his temperature was 37°C, pulse rate 98/minute, respiratory rate 20/minute and blood pressure 146/98 mmHg. Physical examination revealed minimal crackles in the left hemithorax and a slight systolic murmur. Otherwise, he had no heart murmur, skin lesion or palpable lymphadenopathy. Routine laboratory examinations, including complete blood count, coagulant function, blood urea nitrogen and creatinine, and liver biochemical tests were all within normal limits. The electrocardiography showed normal sinus rhythm without evidence of myocardial infarction or premature beat. The chest X-ray revealed a soft tissue mass in the left upper lung adjacent to the aortic knob (Figure 1). The ultrasonography of the heart showed moderate tricuspid regurgitation with moderate to severe pulmonary hypertension, with no vegetation detected. On day 3 of admission, computed tomography (CT) of the chest demonstrated a dilated descending aortic aneurysm with mural thrombi, and the surface of the aorta was uneven (Figure 2A). Bronchoscopy was not performed in case of aortic aneurysm rupture. The patient did not receive antibiotics, because there was no sign of infection and no microbes were found in the blood culture. There was less blood in the sputum after antitussives and tranexamic acid (Transamin; Daiichi Sankyo, Tokyo, Japan) were given in the following days. The chest CT was repeated on day 10 because of increased tearing-like chest pain and increasingly bloody sputum. It revealed an increased size of aortic aneurysm with rupture into the lung (Figure 2B).

A cardiovascular surgeon was consulted for emergency surgical repair of the aortic aneurysm. The operative finding was a proximal descending aortic aneurysm with rupture into the left upper lung. The aorta was repaired by resection of all infected tissue and use of extra-anatomic bypass grafting. The microscopic examination demonstrated an aorta with atherosclerosis and thrombus formation compatible with an aneurysm (Figure 3). The microbiological culture grew group D *Salmonella* from the aneurysmal site, and an appropriate antibiotic (ciprofloxacin) was prescribed for his infection. The chest pain and hemoptysis subsided after surgical repair of the mycotic aneurysm.

Unfortunately, systemic infection with methicillin-resistant *Staphylococcus aureus* occurred in the lung and bloodstream. Despite prompt antibiotic treatment,

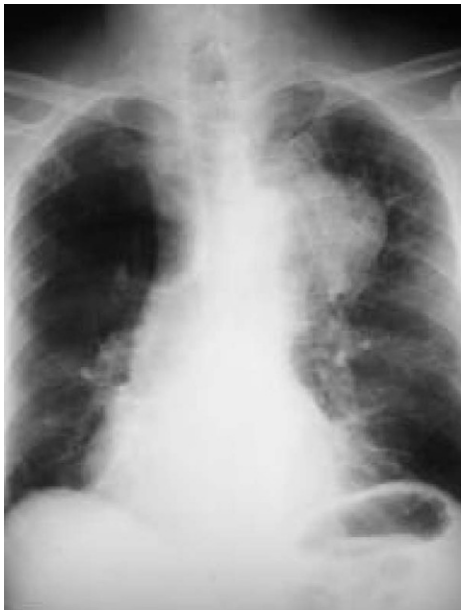

Figure 1. Chest X-ray showing a soft tissue mass in the left upper lung adjacent to the aortic knob.

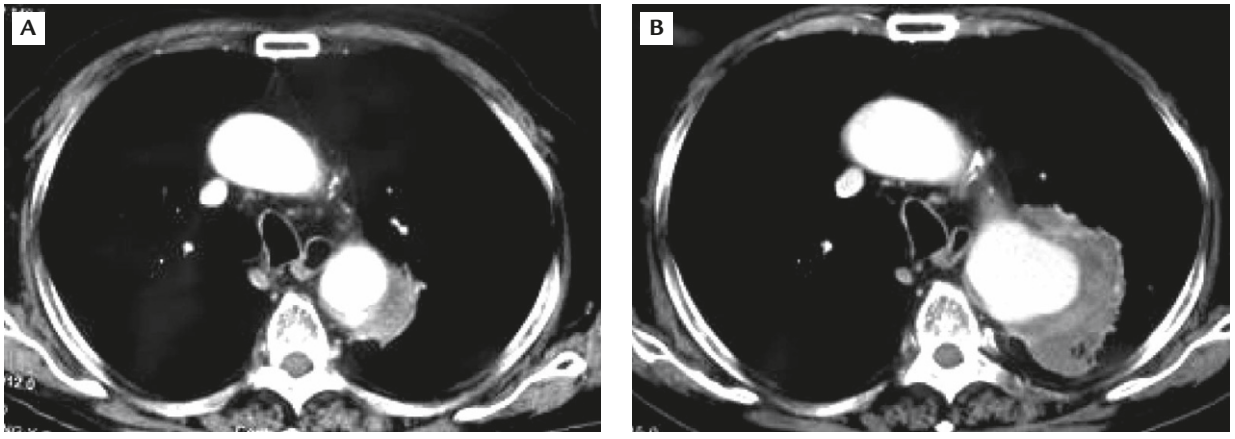

Figure 2. Computed tomography of the chest demonstrating: (A) dilated descending aorta with calcification and mural thrombi on day 3 of admission, and (B) enlarged aneurysm ruptured into the lung 1 week later.

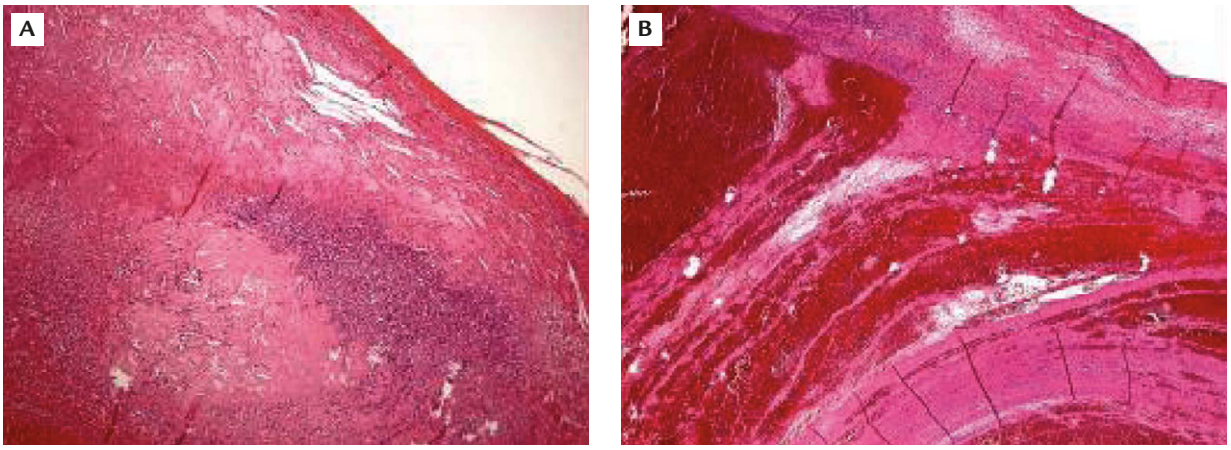

Figure 3. (A) Aorta with atherosclerosis (hematoxylin and eosin, 40×). (B) Aorta with thrombus (hematoxylin and eosin, 20×), compatible with an aneurysm.

the patient developed multiorgan failure and finally died 3 weeks after surgery.

Discussion

The confusing term "mycotic aneurysm" is commonly used to denote infected aneurysms in general, not just fungal infections. The aneurysm is secondary to a microbial aortitis, in which virulent bacteria infect the aorta and destroy the aortic wall. The pathogenesis of endovascular infection can thus be divided into three steps[4]. Common risk factors for mycotic aneurysms are arterial trauma, local or concurrent infection (such as bacterial endocarditis), immunodeficiency, and older age. The clinical manifestations are dependent upon the site of the aneurysm. *Salmonella* infection used to be the most common cause. In the current era, *Staphylococcus* is the most common infection because of intravenous drug use. In some series, *Staphylococcus aureus* was the most common pathogen, responsible for 28–71% of cases, and *Salmonella* was the second most common pathogen, accounting for 15–24%[5].

The Gram-negative, facultatively anaerobic bacilli, nontyphoidal *Salmonella,* are the most common cause of gastroenteritis, bacteremia, and subsequent focal infection[6]. Most patients present with fever, diarrhea and cramping abdominal pain, and have a mild, self-limited course without complications. However, it may be complicated in infants, the elderly and immunocompromised patients, sometimes even causing death. Bacteremia occurs in less than 5% of patients with gastrointestinal tract salmonellosis, and is more likely to occur in immunocompromised patients.

A mycotic aneurysm caused by *Salmonella* can infect a previously normal arterial wall or atherosclerotic aortic plaque to produce necrosis of the arterial wall and the rapid formation of a mycotic pseudoaneurysm, or secondary infection of a preexisting aneurysm. In 1909, Cathcart reported the first case of a *Salmonella*-infected mycotic aneurysm with typhoid fever.

Mycotic aneurysms may be solitary or multiple, and can occur anywhere in the body. Fernandez Guerrero et al.[7] described 11 cases of mycotic aneurysm caused by *Salmonella* infection which occurred on a major segment of the aorta, mainly the abdominal aorta (77%), followed by the thoracic aorta. Most presented with a subacute clinical manifestation with fever and chills. The patient may have chest pain, and abdominal or back pain if aortitis developed. Hemoptysis results from the erosion of the infected aneurysm into the lung parenchyma. Bronchoscopy for this particular lesion is not very helpful, because it cannot diagnose the condition.

The diagnosis of a mycotic aneurysm is usually suspected on imaging studies and confirmed by culturing an organism from the blood. In two different studies, blood cultures were positive in 85%[8] and 50%[9] of cases of mycotic aneurysm. Organisms can be isolated from aneurysmal tissue in up to 76% of patients[9]. Contrast-enhanced CT is considered the best diagnostic method for mycotic aneurysms. Diagnostic features on the CT scan include a periaortic soft tissue density, an irregular aortic wall with rim enhancement, an eccentric thickened wall without calcium, and gas in the aneurysmal sac[10].

Endovascular stent graft repair has provided a viable, less invasive alternative in the management of

aortic diseases. Lin et al.[11] reported successful surgical treatment of a *Salmonella* mycotic aneurysm. The surgical techniques included aortic or arterial ligation, wide debridement of the necrotic tissue and aortic wall, irrigation, and repair with a Dacron graft. Hsu et al.[12] reported that timely surgical management and prolonged postoperative antibiotic treatment can provide an improved outcome. Third-generation cephalosporins and new quinolones have been documented to be most effective against *Salmonella* species, and often require 4–6 weeks of treatment.

In conclusion, endovascular infection is a feared complication of nontyphoidal *Salmonella* bacteremia, and the prognosis is poor if intervention is not timely. If clinical manifestations are fever, chest pain and hemoptysis, and blood culture yields nontyphoidal *Salmonella*, a mycotic aneurysm should be considered as a differential diagnosis. This is of particular importance in those who have atherosclerosis or impaired immunity. Successful treatment depends on early diagnosis, prompt antibiotic therapy, and surgical intervention.

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