Salmonella: A Rare Cause of Fatal Emphysematous Aortitis – A Case Report

Chih-Ying Ou, Han-Yu Chang

In rare cases, Salmonella infection may be associated with extra-intestinal manifestations. Of these, an endovascular invasion of Salmonella to the thoracic aorta, manifesting as non-aneurysmal aortitis, is seldom seen. Nonetheless, it poses a risk of rupture and mortality equal to the aneurysmal form. We describe the case of an 86-year-old man who had a medical history of hypertension and prostate cancer under treatment with hormone therapy, and who presented with Salmonella bacteremia and a rare combination of infectious thoracic aortitis and left-side empyema. When pneumomediastinum and loculated pleural effusion are encountered on chest radiography, the possible origins of the air should include thoracic organ invasion by gas-forming bacteria. The characteristic chest radiographic abnormalities presented in our case can aid clinicians in the differential diagnosis, including aortitis and esophageal rupture. Emergency chest CT is the best diagnostic modality for identifying these abnormalities clearly, and led to a quicker diagnosis of the rare combination of Salmonella aortitis and empyema in our case. (Thorac Med 2009; 24: 181-185)

Key words: emphysematous, aortitis, Salmonella

Introduction

The etiologies of acute mediastinitis include perforation of a thoracic organ and direct extension of infection from elsewhere. Infectious thoracic aortitis, which is defined as inflammation of the thoracic aortic wall by an infection, is seldom diagnosed as the cause of acute mediastinitis. Salmonellae, together with Streptococcus and Staphylococcus, are among the most commonly detected bacteria to seed the aorta, with Salmonellae being the most common [1]. Salmonellae have a predilection for diseased arterial walls, especially atherosclerotic arterial walls. Aneurysm formation, enlargement of an existing aneurysm, and simple vascular inflammation are 3 characteristically vascular manifestations [2]. Vascular infection due to Salmonellae usually involves the thoracic and abdominal aorta. In such cases, the abdominal aorta is particularly involved [3], but a higher mortality is associated with thoracic aortic involvement [4]. Involvement of the thoracic aorta in Salmonellae bacteremia is an extremely rare
complication [5-6], especially in the form of non-aneurysmal aortitis, as in our patient.

Computed tomography (CT) with contrast medium is the diagnostic modality of choice because it detects changes in the aortic arterial wall and peri-aortic tissue, including aneurysm, fluid, gas, and blood components. Nonetheless, few cases of non-aneurysmal bacterial aortitis have been reported, with most past reports describing mycotic aneurysms of the aorta. In 1990, Michael et al. reported 2 cases of non-aneurysmal bacterial aortitis with subsequent rupture documented on CT; they concluded that the diagnosis of acute aortic infection on CT, even in the absence of aneurysmal dilatation, heralds a high risk of impending rupture [7]. Furthermore, a previous report of aortic infection due to Salmonella described complications such as pneumonia, aortobronchial fistula, thoracic or lumbar osteomyelitis, and psoas muscle or pelvic abscess [8]. Empyema caused by Salmonella has been reported only once before (in 1991) as a complication of simultaneous aortitis [9]. The coincidence of fatal thoracic aortitis and left-side empyema caused by Salmonella is very rare in clinical practice.

Case Report

An 86-year-old man with a history of hypertension and prostate cancer under treatment with hormone therapy presented to the emergency room (ER) because of progressively droopy consciousness and poor appetite at home. About 2 weeks earlier, the patient complained of nonspecific tenderness in the anterior chest wall that improved after taking an analgesic agent. He had no fever or other associated symptom such as cough, abdominal pain, or back pain. On arrival in the ER, his temperature was 37.4°C, pulse rate was 133 beats/minute, and respiratory rate was 22 breaths/minute. His blood pressure was 102/76 mmHg. Neurological and physical examinations revealed nothing remarkable, except crackles heard in the left lower lung field. A complete blood count showed leukocytosis with a left shift (10,400 WBC/μl, 67% segmented neutrophils, 32% bands). He had no anemia. Biochemistry showed acute renal insufficiency with pre-renal azotemia (99 mg/dl blood urea nitrogen, 2.9 mg/dl creatinine) and elevated C-reactive protein (276 mg/L). All other tests were non-contributory. His arterial blood gases in room air showed a pH of 7.454, PCO2 of 27.2 mmHg, PO2 of 51 mmHg, and HCO3- of 19.1 mmol/L, which was compatible with hypoxemia and respiratory alkalosis. An emergency chest radiograph (Figure 1) revealed air within the mediastinum and left-side loculated pleural effusion. Thoracentesis was performed and empyema was diagnosed due to apparent frank pus. Several episodes of hypotension were evident, and improved after a normal saline challenge. Empiric antibiotic

Fig. 1. Chest radiograph obtained in the emergency room. Note the presence of air within the mediastinum and left-side loculated pleural effusion.
with Ceftriaxone was prescribed and emergency non-contrast CT of the chest (Figure 2) was arranged. The emphysematous change along the thoracic aorta and the neighboring loculated pleural effusion suggested infectious aortitis as the primary source of infection. Blood and pleural effusion were submitted for culture, and Salmonella enteritidis group B was identified 2 days later. Surgical intervention was suggested by the cardiovascular surgeon, but the family refused due to the patient’s advanced age. Unfortunately, the patient experienced a sudden hemodynamic collapse resulting in the performance of emergent cardiac pulmonary cerebral resuscitation (CPCR). The patient expired due to failed resuscitation the next day.

**Discussion**

Most patients with aortitis caused by *Salmonella* have preexisting atherosclerotic disease and the most common predisposing factor for *Salmonella* aortitis is diabetes mellitus, which could serve as a marker of preexisting atherosclerotic disease of the aorta [8]. Although there was no medical history of diabetes mellitus in our patient, obvious calcification on the arterial wall, as seen on chest CT, indicated evidence of underlying atherosclerosis in this patient. In addition to the risk factors mentioned above, endovascular infection may also complicate patients older than 50 [10], as with our patient. Other underlying diseases include hypertension, which was also noted in our case.

In general, the symptoms and signs of *Salmonella* vascular infections are often nonspecific. Prolonged fever, back or abdominal pain, and relapsing bacteremia are the clinical hints of a vascular infection. The results of laboratory tests are also of little help, except for positive blood cultures. Nearly all of the reported cases of *Salmonella* aortitis have resulted in aneurysm formation or, more rarely, enlargement of a preexisting aneurysm [2]. Widening of the mediastinum on a chest radiograph is suggestive of an aneurysm, but it is usually nonspecific. CT plays a pivotal role in detecting aortic aneurysm. In our patient with non-aneurysmal aortitis, loss of contiguous intimal calcification and the gas surrounding the aorta on CT (Figure 2) were diagnostic. Nonetheless, the characteristic feature on the chest CT in our case, emphysematous formation along the descending aorta, was of great educational value and a clue for differentiating aortitis from esophageal rupture, despite the latter being more frequently encountered in our clinical practice.

In a comprehensive review of the literature, the overall mortality due to *Salmonella* aortitis was found to be 53%, but mortality was 95% among patients treated medically and only 41% when patients were treated surgically [2]. The
earlier the diagnosis of *Salmonella* aortitis was made, the less subsequent morbidity and mortality there were. Depending on its location, infectious aortitis with or without aneurysm often progresses undiagnosed, resulting in recurrent bacteremia from an unidentified source; eventually, the aorta ruptures, and leading to cardiovascular collapse.

Surgical intervention is the treatment of choice and can greatly increase survival. Because involvement of the thoracic aorta produces a more complex surgical challenge and surgeons have little experience with this type of intervention, an early diagnosis is even more important, so as to reduce life-threatening complications.

In conclusion, when we encounter pneumomediastinum and loculated pleural effusion on chest radiography, the possible origins of the air usually are the respiratory or gastrointestinal tract, and may be the result of inflammation, trauma, or iatrogenic procedures. Although most patients with *Salmonella* aortitis present without distinctive clinical symptoms, obtaining a comprehensive history, including recent trauma or iatrogenic procedures, the presence of significant abnormal radiographic findings, and a high index of suspicion will help to manage the mediastinitis with greater confidence. In our patient, the isolation of *Salmonella enteritidis group* B from the blood cultures and pleural effusion samples, coupled with radiographic evidence of gas surrounding the thoracic aorta and loculated pleural effusion, highlighted the rare combination of *Salmonella* aortitis and empyema.

**References**

造成致命縦膈腔炎的罕見原因—病例報告

歐芷瑩 張漢煜

一般沙門氏桿菌很少會造成胃腸道以外的症狀。其中，沙門氏桿菌侵犯到胸腔主動脈並且以非動脈瘤表現的主動脈炎更是罕見。然而，它和以動脈瘤表現的主動脈炎有同樣高的破裂和死亡的機率。我們報告一位86歲有髒血壓病史和接受賀爾蒙治療的攝護腺癌男性，被發現合併了感染性的胸腔主動脈炎，左側膿胸還有沙門氏桿菌菌血症。臨床上，當胸部X光片發現縦膈腔氣腫和多處肋膜積水時，我們要把會侵犯到胸腔器官的產氣細菌當作可能造成氣腫的來源。典型的胸部X光異常可以幫助我們在鑑別診斷上需要將主動脈炎和食道破裂納入考慮，緊急的胸部電腦斷層是區分這些病灶的最好工具並且進一步快速診斷罕見合併沙門氏桿菌感染的主動脈炎和膿胸。(胸腔醫學 2009; 24: 181-185)

關鍵詞：產氣的，主動脈炎，沙門氏桿菌