

## Case Report

# Salmonella-related mycotic aneurysm: a rare but fatal condition

Aarsha Sadar\*, Arun Raj C. N., Legha R., Jayaprakash R.

Department of General Medicine, Travancore Medical College, Kollam, Kerala, India

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**\*Correspondence:**

Dr. Aarsha Sadar,

E-mail: arshsadar@gmail.com

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### ABSTRACT

Salmonella species commonly causes gastrointestinal infection in humans. Occasionally they lead to serious complications such as mycotic aneurysms which are rare but potentially fatal. Mortality is high without timely intervention. The clinical presentation is variable and early diagnosis requires a high degree of clinical alertness. Here, we reported a case of mycotic aneurysm secondary to *Salmonella enteritidis* infection. The case highlights the need to evaluate all elderly patients with non-typhoid *Salmonella bacteremia* for possible endovascular infections.

**Keywords:** Salmonella, Mycotic aneurysm, Aortitis, Bacteremia

## INTRODUCTION

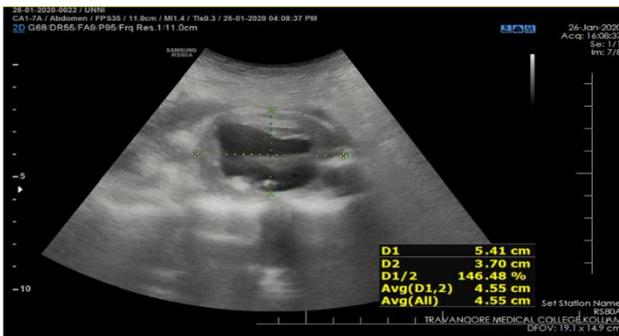
A mycotic (or infective) aneurysm refers to the localised, irreversible vascular dilation due to weakening and destruction of the arterial wall by infective organisms.<sup>1</sup> Mycotic aneurysms are rare, but severe with fatal outcomes. 0.7 to 3% of aortic aneurysms are infectious in origin.<sup>2</sup> The common pathogens causing mycotic aneurysms in Western countries are *Staphylococcus aureus* (28%), *Salmonella spp* (15%) and *Pseudomonas aeruginosa* (10%), while most Asian countries consistently report salmonella as the most common pathogen.<sup>3</sup> The general clinical picture of mycotic aneurysm is one of delayed diagnosis and high mortality. We reported a case of a 60 year old man who developed mycotic aneurysm of infrarenal abdominal aorta secondary to *S. enteritidis* infection, resulting in rupture and death of the patient. This case report attempted to emphasise on the aggressive nature of Salmonella species, the rapidity with which a mycotic aneurysm can develop resulting in life-threatening complications like rupture of the aneurysm and the need for active intervention and close follow up.

## CASE REPORT

A 60-year-old man, with history of type 2 diabetes mellitus, diabetic peripheral neuropathy, peripheral occlusive vascular disease, dyslipidemia and coronary artery disease, presented with complaints of recurrence of high-grade fever with chills for 1 day. Patient was admitted 13 days back with a similar history of fever. Investigations showed leucopenia and mild thrombocytopenia with hyponatremia then. Blood cultures yielded no growth. USG abdomen showed grade 1 fatty liver. A diagnosis of a viral illness was made then. The patient improved symptomatically with supportive treatment and was discharged after 4 days.

During the present admission, the patient was febrile and disoriented. Palpable pulsations were present in the infraumbilical region which were absent during his previous admission. Other peripheral pulses were palpable except bilateral dorsalis pedis and posterior tibial artery pulsations (which were absent in the previous admission also, owing to his peripheral occlusive vascular disease). Examination of other systems was unremarkable. He was admitted to the ICU. Preliminary investigations showed normal blood counts and

hyponatremia. Chest X-ray showed normal lung parenchyma. An ultrasonography of abdomen revealed an infrarenal aortic aneurysm of diameter 5.4 cm, which was a new finding compared to abdominal ultrasonography taken 13 days ago (Figure 1). The patient was treated with sodium correction and empirical antibiotics after taking samples for blood and urine culture. Cardiothoracic and vascular surgery team was alerted regarding the possibility of a mycotic aneurysm and aneurysm repair surgery was planned. Patient had high fever for the initial 24 hours after which the fever spikes decreased and his sensorium improved. On the next day, the patient developed right lower abdominal pain associated with multiple episodes of passage of semi-solid stools, irritability and sudden hypotension. Clinical examination showed mild abdominal tenderness, abdominal pulsations, bilateral palpable femoral pulsations with absent dorsalis pedis and posterior tibial artery pulsations. An impending rupture of the aortic aneurysm was suspected and patient was started on intravenous fluids and inotropic support. Bedside ultrasonography of abdomen revealed infrarenal aortic aneurysm with a dissection flap, false lumen and blood collection around the aorta which was increasing in size. A CT angiogram could not be taken due to the grave condition of the patient. The patient's general condition deteriorated over the next one hour and he expired. No postmortem examination was performed. Blood cultures posthumously showed growth of *S. enteritidis*.



**Figure 1: Infrarenal aorta showing thick walled, lobulated sacular aneurysm (maximum diameter 5.4 cm) with mild amount of retroperitoneal periaortic fluid.**

## DISCUSSION

The patient was a classic case of *S. enteritidis*-induced mycotic aneurysm. The patient was an elderly man with risk factors like diabetes mellitus, peripheral occlusive vascular disease, dyslipidemia and coronary artery disease with advanced atherosclerosis. In this patient's case, abdominal ultrasound taken on day 2 of the illness revealed no aortic aneurysm but showed an infrarenal aortic aneurysm of significant size (5.4 cm) when repeated on day 13, signifying the rapidity with which salmonella can cause endovascular infections. The aneurysm ruptured within a few hours of detection, even

before any active intervention could be done. His initial blood cultures were sterile though the subsequent ones grew *S. enteritidis*.

Salmonella are gram-negative, rod-shaped bacteria, belonging to the *Enterobacteriaceae* family that are common in warm-blooded animals and can cause disease in humans. Non-typhoidal salmonella are food-borne pathogens that commonly cause mild gastroenteritis, which is usually self-limiting. Transient bacteremia may occur in 2 to 8% of these patients. However, they can cause invasive infection, especially in debilitated, older patients. Non-typhoidal salmonella had a predilection for invading damaged endothelium of the heart and arteries leading to a spectrum of manifestations including mediastinitis, pericarditis, endocarditis, aortitis, mycotic aneurysms and infection of cardiac devices. The most common sites for infective aortitis include the infrarenal abdominal aorta, followed by the thoracic and suprarenal abdominal aorta.<sup>4</sup> Mycotic aneurysms of the aortic arch are rare. The abdominal aorta was the most common site of vascular infection by salmonella. However, peripheral and visceral arteries may also be affected.

About 0.5-1.3% of aneurysms were of bacterial origin. The main risk factors were older age (over 65 years), male gender and presence of co-morbidities such as hypertension, diabetes mellitus, immunodeficiency, chronic kidney disease, liver cirrhosis, smoking and advanced atherosclerosis.<sup>5</sup> Most cases of bacterial aortitis were present in older individuals with a pre-existing aortic pathology such as atherosclerotic plaque or aneurysmal sac. A study in Taiwan reported solid organ malignancy, age and extraintestinal infection as independent predictors for in-hospital death due to non-typhoidal *S. bacteremia*.<sup>6</sup> A study in Malaysia of 55 cases of non-typhoidal *S. bacteremia* found serogroup D to be the most common cause and to demonstrated the highest degree of blood invasiveness.

Salmonella had a strong affinity for large blood vessels. They easily adhered to the damaged vessel wall, playing a major role in the pathogenesis of mycotic aneurysms. It was reported that the most important pathophysiological mechanism of mycotic aneurysm was necrosis and rupture of the atherosclerotic vascular wall, which caused the adhesion of bacteria.<sup>7</sup>

In addition, bacterial embolus could also attach to the branches of vessels or small nourishing vessels through hematogenous route and invaded the arterial wall, causing damage to the structure and gradually developing into an aneurysm. Iatrogenic factors such as surgery or endovascular procedures, might cause vascular endothelial damage, providing an opportunity for the bacteria in circulation to strand in these areas and invade the arterial wall. In a minority of cases with a true aneurysm, the bacteria spread through blood circulation, get stranded and caused infection of the aneurysm wall.

Mycotic aneurysms were rare, but severe and develop rapidly. The common presentations included fever, unremitting sepsis, relapsing bacteremia, diarrhea for 2 days to a month prior to the diagnosis of the aneurysm, back or chest pain and/or shock with rupture. Localized symptoms may be due to pressure effects from aneurysms, an extension of the infection or impending aneurysmal rupture. However, only 53% of patients with infected aortic aneurysms had a palpable abdominal mass, about 30% have back pain and blood cultures were negative in about 30% of patients. Rare presentations included pelvic and psoas abscesses, vertebral osteomyelitis, endobronchial masses, hemoptysis and gastrointestinal bleeding due to aortobronchial or aortoduodenal fistula formation.<sup>8</sup> Failure to anticipate these unusual complications of non-typhoidal *S. bacteremia* can lead to catastrophic consequences. Aortic rupture often followed unless it was recognized early and treated promptly. In 1948, the first case of a fatal rupture of salmonella-induced abdominal aortic aneurysm was reported in a 69-year-old man by Dehlinger. The incidence of mycotic aneurysm rupture was greater than that of the arteriosclerotic aneurysm and had a higher mortality rate. Early diagnosis and appropriate treatment (antibiotics with adequate dosage and duration and surgical treatment) improved survival.

The diagnosis was based on the classic features of fever, back or chest pain, pulsatile mass and positive blood cultures. The best diagnostic imaging techniques were computed tomography (CT) and ultrasonography (US) for the detection of mycotic aneurysms.<sup>9</sup> Investigations usually showed an increased white blood cell count with neutrophilia and elevated inflammatory markers such as C-reactive protein or erythrocyte sedimentation rate. Most patients had at least one blood culture positive for *Salmonella* species. However, blood cultures had poor sensitivity and specificity in the diagnosis of mycotic aneurysms.

If targeted antibiotic therapy was given before an aneurysm forms, mortality may be reduced to 25%. In *Salmonella* infections, the antibiotics of choice include third-generation cephalosporins or new-generation fluoroquinolones. It was important to note that fluoroquinolone-resistant *Salmonella* infections may be increasing. If an aneurysmal rupture occurred, mortality can be as high as 65%. With medical treatment alone, mortality may reach 100%. Therefore, treatment should involve targeted antibiotic therapy along with surgical replacement of the infected aorta.<sup>5</sup> Previously, conventional open surgery, with resection of the infectious aneurysm, extensive local debridement and revascularization was regarded as the gold standard. However, there had recently been a shift towards endovascular aneurysm repair (EVAR) as an alternative, but persistent infection requiring prolonged antibiotic therapy remained a problem with EVAR.<sup>10</sup> Despite aggressive treatment, mortality remained high and in many cases, diagnosis was only made at autopsy.

## CONCLUSION

This case report describes the importance of diagnosis and treatment of *Salmonella*-induced mycotic aneurysm. This patient developed a *Salmonella*-induced aortic aneurysm that was not surgically treated and resulted in immediate aneurysmal rupture and death of the patient. Had surgical intervention taken place promptly when the aneurysm was discovered, perhaps the outcome would have been favorable. India is a well-known endemic country for enteric fever and gastroenteritis. However, the ability of non-typhoidal *Salmonella* to cause invasive infections is often neglected. It is important to consider the diagnosis of a mycotic aneurysm in patients with cardiovascular or atherosclerotic risk factors presenting with fever with chills or back pain and with a history of sporadic diarrhea. However, the diagnosis of a mycotic aneurysm should not be excluded based on negative blood cultures. Though mycotic aneurysms secondary to *Salmonella* infection have a fulminant course, they can be successfully treated with open surgery and antibiotics, which may have to be administered lifelong due to the risk of potentially fatal graft infection.

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