

## SALMONELLA AORTITIS: A CASE REPORT

Jaffar A. Al-Tawfiq, MBBS; Ghaith Khougeer, FRCSC

Endothelial infection is a recognized complication of *Salmonella* bacteremia, especially in elderly patients with diabetes mellitus. Mycotic aneurysms usually involve the abdominal aorta and may involve the iliac arteries.<sup>1,2</sup> The clinical presentation of mycotic aneurysm secondary to *Salmonella* is classic (fever, back pain, and/or abdominal pain) but nonspecific. Such aneurysms are associated with high morbidity and mortality. We present a case of aortic mycotic aneurysm due to *Salmonella* and outline the therapeutic options.

### Case Report

A 71-year-old man known to have coronary artery disease, diabetes mellitus and hypertension, was admitted for management of *Salmonella* bacteremia. A week prior to admission, the patient had developed fever, chills and rigors, and had been treated symptomatically. Blood cultures that were taken grew *Salmonella non-typhi* group D four days later, and oral azithromycin was prescribed. The patient continued to have fever and chills, and was hence admitted for further evaluation.

On examination, his temperature was 38°C, and there was no palpable lymphadenopathy. Chest and heart examination was unremarkable and no murmur was detected. The abdomen was soft and lax with no palpable masses. Laboratory investigations revealed a WBC of  $15 \times 10^9/L$  with 60% polymorphonuclear cells, hemoglobin of 7.44 mmol/L (12 g/dL), and platelets of  $656 \times 10^9/L$ . ESR was 110 and C-reactive-protein (CRP) was 22.6. Initial blood cultures one week prior to admission and those on admission were positive for *S. nontyphi* group D. Ceftriaxone was started intravenously. The patient complained of back pain and continued to have a low-grade fever. MRI of the spine revealed spondylolithiasis at L5-S1 and a hemangioma at L1 with no herniation of the disc. A

FIGURE 1. Contrast-enhanced CT scan showing abdominal aorta with a rim of calcification (long arrow). A saccular pseudoaneurysm is seen anteriorly to the aorta and posterior to the loop of small intestine (short arrow).

bone scan was negative, however, gallium-67 scan revealed a focal area of accumulation of the radio-tracer at the region of L4-5 area. CT scan of the abdomen revealed an aneurysmal dilatation of the abdominal aorta, extending from below the origin of the renal arteries down to the iliac bifurcation. The aneurysm demonstrated an extraluminal leakage beyond the calcified wall (Figure 1).

The patient underwent successful resection and grafting of the abdominal aortic aneurysm using a straight 14 mm Gore-Tex graft. Intraoperatively, the small bowel was adherent to the site of the aortic aneurysm and was technically difficult to separate from the aneurysm, hence the native aortic tissue was left in place. Intraoperative Gram's stain of the aneurysmal wall showed many WBCs but no organisms, and the cultures subsequently were negative. A repeat CT scan one week postoperatively showed no leak from the aorta. The CRP decreased to 12.6 and ESR to 64. The patient received IV ceftriaxone for a total of 38 days, and a two-month course of oral Ciprofloxacin. On follow-up, the CRP was <0.3 and ESR was 9. At one-year follow-up, the patient was asymptomatic with negative blood cultures and good anatomic results on CT scan.

### Discussion

In 1885, Osler described mycotic aneurysm in association with septic emboli secondary to endocarditis.<sup>3</sup> In such cases, the recovered organisms are typical of those causing subacute bacterial endocarditis, which are mainly gram-positive cocci. The incidence of this form of aneurysm is becoming rare due to effective antimicrobial agents used in the treatment and prevention of endocarditis. The term "mycotic aneurysm" is being used loosely to describe other forms of bacterial aortitis. A second form of endothelial infection known as "infected aneurysm", occurs in pre-existing aneurysm. Pre-existing atherosclerotic aneurysms may become infected in the course of bacteremia.<sup>4</sup> *Salmonella* species account for 35% of all such cases.<sup>4,5</sup> *Salmonella* organisms are virulent bacteria and have a high predilection for atherosclerotic arterial walls and may invade normal endothelium.<sup>6</sup> Endothelial

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From the Divisions of Internal Medicine Services and Surgical Services, Dhahran Health Center, Saudi Aramco Medical Services Organization, Saudi Aramco, Dhahran, Saudi Arabia

Address reprint requests and correspondence to Dr. Al-Tawfiq: Room A-420, Building 61, Dhahran Health Center, Box 76, Saudi Aramco, Dhahran 31311, Saudi Arabia. E-mail: jaffar.tawfiq@aramco.com.sa.

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infection or aortitis occurs in 9%-17% of patients with *Salmonella* bacteremia,<sup>2,7</sup> however, the incidence of endovascular infection rises to 25%-35% in patients over 50 years of age.<sup>2,7</sup> Thus, it is not surprising to find that about 25% of patients with *Salmonella* aortitis have pre-existing diabetes mellitus.<sup>7,8</sup> A third form of aortitis is known as microbial aortitis. This type of endovascular infection is associated with seeding of an atherosclerotic wall in the course of bacteremia with formation of a pseudoaneurysm, which lacks normal arterial layers. These infections are usually caused by *Salmonella*, *Staphylococcus aureus* and *Escherichia coli*.<sup>4</sup> In the current case, the aneurysmal dilatation was found beyond the calcification of the wall, indicating the presence of an atherosclerotic wall prior to the infection. The other forms of aortitis are traumatic infected pseudoaneurysm and continuous aortic infection from an adjacent septic focus.<sup>4</sup> As in the present case, the clinical presentation of *Salmonella* aortitis is classic but nonspecific. Ninety percent of patients usually present with fever, back pain, and/or abdominal pain.<sup>9</sup> The presence of a pulsatile abdominal mass is found in only 42% of patients.<sup>9</sup> *Salmonella* bacteremia at the time of diagnosis is usually present in 73% of patients.<sup>9,10</sup>

The diagnosis of *Salmonella* aortitis requires a high index of suspicion and many modalities have been used for its confirmation. In this patient, gallium-67 scanning had suggested an abnormality in front of the L4-5 area. However, the results of gallium-67 scan in *Salmonella* aortitis may or may not be positive.<sup>6,11-13</sup> Bacterial aortitis cannot be ruled out based on a negative gallium scan.<sup>7</sup> CT scan with IV contrast is the preferred modality for the diagnosis of *Salmonella* aortitis. CT scan may reveal a hazy aortic wall with rupture, gas-forming inflammation around the aneurysm, retroperitoneal para-aortic fluid collection and vertebral erosion, or thrombus formation within a false lumen after aneurysmal rupture.<sup>14</sup> CT-scan may also reveal a well-enhanced para-aortic mass beyond the calcified intima of the aorta.<sup>15</sup> In addition, CT scan also demonstrates the size and the site of the aneurysm.

Medical treatment alone is associated with a high mortality rate. In one report, none of 22 patients who were treated medically survived.<sup>9</sup> In a recent review, the mortality rate was approximately 40% after combined medical and surgical intervention, compared to 96% mortality rate after medical therapy alone.<sup>10</sup> The duration of antibiotic treatment has never been studied prospectively, however, bactericidal antibiotics for at least six weeks have been recommended.<sup>7,9,10,16,17</sup> Life-long suppressive antibiotics have also been recommended.<sup>18,19</sup>

Two traditional methods of revascularization have been described in the literature. These are *in situ* grafting and extra-anatomical bypass grafting using synthetic materials. The best surgical technique in acute situations remains controversial. *In situ* homograft involves potential graft infection, while extra-anatomic bypass has inferior patency

and the necessity of a future reconstruction.<sup>20</sup> Earlier reports indicate that *in situ* grafting offers a good therapeutic outcome.<sup>21</sup> In a recent study, 10 of 12 patients who underwent *in situ* graft reconstruction had good results.<sup>7</sup> The good results with *in situ* grafting could be due to prompt diagnosis and treatment with bactericidal antibiotics.<sup>7</sup> *In situ* graft placement with extensive debridement and bactericidal antibiotics are associated with a good outcome.<sup>22,23</sup>

Some reports have suggested reserving extra-anatomical bypass grafting to infection with antimicrobial resistant *Salmonella*.<sup>17</sup> Extra-anatomic bypass outside infected tissue planes, especially with axillobifemoral grafts is considered to be associated with the least postoperative complications and the best survival rates. In one review, the survival rate in the case of extra-anatomical bypass was 71% compared to 51% in patients with *in situ* grafting.<sup>10</sup> A longer duration of preoperative antibiotic therapy has been associated with fewer adhesions and easier debridement.<sup>7</sup> Our patient had a negative intra-operative Gram's stain and had received a long course of preoperative antibiotics. However, the role of intra-operative Gram's stain in the surgical decision has not been studied systematically.

In summary, *Salmonella* aortitis should be considered in patients over 50 years of age with *Salmonella* bacteremia, fever, and back or abdominal pain. These patients should be treated aggressively with bactericidal antibiotics (e.g., a third-generation cephalosporin). In addition, these patients would require surgical debridement of the infected aneurysm and bypass grafting. The patients should also be considered for long-term antibiotic suppressive therapy. The exact duration of the treatment with antibiotics, however, is not well described in the literature.

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