An Infected Abdominal Aortic Aneurysm due to Non-typhoidal *Salmonella* in an HIV-1-infected Japanese Patient

Hitoshi Ando, Rumi Minami, Soichiro Takahama and Masahiro Yamamoto

Abstract

We herein report a case study of an HIV-1-infected 64-year-old Japanese man who presented, with an abdominal aortic aneurysm due to non-typhoidal *Salmonella*. He was admitted with a 7-day history of intermittent left back pain. A culture of a blood specimen yielded gram-negative bacilli, which were identified as non-typhoidal *Salmonella*. Computed tomography showed an abdominal aortic aneurysm due to the non-typhoidal *Salmonella* infection. Since such a complication is frequently fatal, its management, especially the timing of surgery, is difficult. Further studies are needed to determine the optimal treatment strategy, however, early diagnosis and prompt careful treatment can reduce mortality.

Key words: non-typhoidal *Salmonella*, aneurysm, HIV

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Introduction

*Salmonella* species are broadly divided into two categories, typhoidal and non-typhoidal, based on their pathogenicity. Non-typhoidal *Salmonella* species are facultatively anaerobic, gram-negative bacilli that are serologically classified to approximately 2,500 serovars, which usually cause gastroenteritis. More than 95% of the cases of *Salmonella* infection are foodborne (1, 2). In recent years, the cases of non-typhoidal salmonellosis have been increasing. The first case of an infected aneurysm called mycotic aneurysm due to salmonellosis was reported in 1909 by Cathcart (2, 3).

Non-typhoidal salmonellosis typically presents with fever, diarrhea, and cramping abdominal pain. The elderly, and immunocompromised hosts, including HIV-1-infected patients have a 20 to 100-fold increased risk for developing bacteremia than the general population, and endovascular complications occur more frequently for these patients (4). Infected aneurysms remain a difficult complication to treat, and have a high mortality rate.

There have been no previous reports about a non-typhoidal *Salmonella*-infected aneurysm in an HIV-1-infected patient in Japan. The present report of an HIV-1-infected Japanese man (age 64) with an abdominal aortic aneurysm due to salmonellosis can help raise awareness of this condition and it may also assist other physicians in making an accurate diagnosis and selecting the optimal treatment.

Case Report

In August 2007, a 64-year-old heterosexual man with HIV-1 was admitted to our hospital with a 7-day history of intermittent left back pain. His past medical history included hypertension and recurrent urinary calculus. He had been diagnosed as having acquired immunodeficiency syndrome (AIDS) with *Pneumocystis* pneumonia in 1999 in our hospital after returning home from Thailand. He had been infected with the HIV-1 virus while residing there. Since he had lived in Thailand for many years, he had become estranged from his family in Japan. Although an antiretroviral regimen of atazanavir, stavudine and lamivudine had been prescribed, the patient had poor HIV control because of his...
Table 1. Laboratory Data on Admission

<table>
<thead>
<tr>
<th>&lt;Peripheral blood&gt;</th>
<th>&lt;Biochemistry&gt;</th>
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<tbody>
<tr>
<td>WBC 8900 /mm³</td>
<td>TP 9.6 g/dL</td>
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<tr>
<td>Neu 78.1 %</td>
<td>Alb 2.3 g/dL</td>
</tr>
<tr>
<td>Lym 13.0 %</td>
<td>T-bil 0.5 mg/dL</td>
</tr>
<tr>
<td>Mon 5.9 %</td>
<td>LDH 270 IU/L</td>
</tr>
<tr>
<td>Eos 1.0 %</td>
<td>AST 34 IU/L</td>
</tr>
<tr>
<td>Bas 0.3 %</td>
<td>ALT 30 IU/L</td>
</tr>
<tr>
<td>Luc 1.7 %</td>
<td>γ-GTP 291 IU/L</td>
</tr>
<tr>
<td>RBC 423×10⁶ /mm³</td>
<td>ALP 715 IU/L</td>
</tr>
<tr>
<td>Hb 13.0 g/dL</td>
<td>CK 43 IU/L</td>
</tr>
<tr>
<td>Ht 38.8 %</td>
<td>Amy 71 IU/L</td>
</tr>
<tr>
<td>Plt 25.3×10⁴ /mm³</td>
<td>BUN 39 mg/dL</td>
</tr>
<tr>
<td>&lt;Immunology&gt;</td>
<td>Cre 1.4 mg/dL</td>
</tr>
<tr>
<td>CRP 17.53 mg/dL</td>
<td>Na 133 mEq/L</td>
</tr>
<tr>
<td>CD4 count 65 /mm³</td>
<td>K 5 mEq/L</td>
</tr>
<tr>
<td>CD8 count 217 /mm³</td>
<td>24h-Cr 48.5 mL/min</td>
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<tr>
<td>CD4/8 ratio 0.3</td>
<td></td>
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<tr>
<td>HIV RNA 2.6×10⁴ copies/mL</td>
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</tbody>
</table>

Figure 1. On admission, an abdominal plain CT scan showed calcification in the hilum of left kidney. The abdominal aorta at the level of renal artery showed atherosclerotic change, although its size was 28 mm, and the surrounding soft tissues were slightly indistinct.

Figure 2. Day 7 after admission, an abdominal contrast CT scan showed a ruptured abdominal aortic aneurysm with a maximal diameter of 44 mm. It ran from a site directly under the superior mesenteric artery to 2 cm distal to the origin of the bilateral common iliac artery. In addition, the soft tissues around the abdominal aorta showed edematous changes.

poor adherence to the regimen. On examination at admission, the patient’s blood pressure was 177/133 mmHg, his pulse 100 beats per minute, and his body temperature was 36.6°C. The lungs and heart were normal. His abdomen was soft and not tender. The patient had left back pain.

Laboratory examinations revealed a normal white blood cell count of 8.9×10³ /mm³, with a CD4 cell count of 65 /mm³, HIV RNA load of 2.6×10⁴ copies/mL and elevated C-reactive protein (CRP) at 17.53 mg/dL. Urine testing could not be performed, however, other laboratory tests were undertaken (Table 1). An abdominal plain computed tomography (CT) scan displayed calcification in the hilum of left kidney (Fig. 1). The abdominal aorta at the level of renal artery showed atherosclerotic change, although its size was 28 mm, and the surrounding soft tissues were slightly indistinct. Since nephrolithiasis has been reported in patients who received unboosted atazanavir (5, 6), urinary calculus, especially nephrolithiasis was thus suspected. We therefore started the intravenous administration of fluids and electrolytes. On the second day of his hospitalization, the patient became febrile. At this time, although urinalysis was negative for red cells and white cells, he was started on intravenous ceftriaxone under suspicion of a urinary tract infection. Blood and urine specimens were obtained for culture. A culture of a blood specimen, obtained two days after the initiation of treatment with ceftriaxone, yielded gram-negative bacilli, which were identified as non-typhoidal Salmonella. The microorganisms were sensitive to ciprofloxacin, and were resistant to trimethoprim-sulfamethoxazole. A urine specimen culture did not yield microorganisms.

On the sixth day of his hospitalization, the patient’s left back pain spread to the left inguinal area, and therefore we performed an abdominal contrast CT scan (Fig. 2). The CT scan showed an irregularly formed, infra-superior mesenteric artery, which demonstrated an abdominal aortic aneurysm with a maximal diameter of 44 mm. An aneurismatic dilatation surrounded by a poorly enhanced periaortic soft tissue density was observed. The top of the aneurysm was situated at the lower side of the superior mesenteric artery and ex-
Figure 3. Day 33 after admission, a T2-weighted coronal plain magnetic resonance image of abdomen. A known aneurysm was multilobulated and it increased in size from 44 mm to 77 mm. High to low signals were observed in the surrounding soft tissues, which were indicative of the presence of old and new hematomas.

Figure 4. Day 142 after admission, an abdominal plain CT scan showed re-rupture of the aneurysm. The aneurysm increased to 98 mm in size, and the high density areas around the aneurysm also spread to the right iliopsoas muscle.

Discussion

In previous reports, approximately 5% of individuals with gastroenteritis caused by non-typhoidal Salmonella developed bacteremia (7). Fernandez Guerrero et al reported that the risk for endovascular infection in patients with bacteremia due to non-typhoidal Salmonella was 23% (2). Various endovascular complications, including aneurysm, endocarditis, pericarditis, arteriovenous fistula, mediastinitis have been reported. An infected aneurysm arising from non-typhoidal Salmonella is one of the most severe endovascular complications that can occur due to salmonellosis (2, 8).

HIV-1-infected patients have a 20 to 100-fold increased risk of salmonellosis in comparison to the general population, and as a result, they may also be more likely to develop bacteremia and endovascular complications. However, although HIV infection is a prominent risk factor for non-typhoidal salmonellosis and bacteremia, Hsu and Lin reported that immunodeficiency was a negative predictor of endovascular infection (8). Nevertheless, recurrent Salmonella bacteremia in HIV-infected patients serves as an AIDS-defining illness (9), and the rate of recurrence of bacteremia is higher in HIV-1-infected patients than in other immunocompromised patients (10, 11). Bacteremia in HIV-1-infected patients easily develops, especially when the CD4 count is below 200/mm$^3$ (11).

Bacteremia due to non-typhoidal Salmonella induces endovascular infection in 10-25% of patients older than age 50 (2, 12, 13). The risk factors for those endovascular complications include age, intravenous drug user as well as ongoing bacteremia due to non-typhoidal Salmonella (14). Non-typhoidal Salmonella is unique due to its propensity to adhere to damaged endothelium, especially atherosclerotic arterial walls (2, 13). The present patient’s history of hypertension may have resulted in atherosclerotic and necrotic changes in the arterial walls (2), thus increasing the likelihood of bacterial adherence.

The most frequent site of infected aneurysms is the ab-
dominal aorta, particularly the infrarenal segment, followed by the thoracic and suprarenal abdominal aorta (2, 15-17). The present study indicated that abdominal contrast CT is the most useful imaging strategy for early detection of infected aneurysms. The early diagnostic findings are characterized by saccular, multilobulate, periaortic soft tissue stranding and irregular peripheral enhancement of arterial walls (18). In previous reports, other arteries, including the coronary, carotid, and popliteal arteries have been involved (19-21). Regardless of the site, infected aneurysms are usually irreversible, and carry a high rate of rupture and high mortality rate. Kam et al reported that up to 53% of all infected aneurysms due to Salmonella presented with a rupture of the aneurysm (22), and Hsu and Lin reported that the mortality rate for infections caused by Salmonella is 16% to 44% (23). Boyle et al reported that such HIV-1-infected patients are at high risk of developing non-typhoidal salmonellosis with a mortality of as high as 60% (24). Insufficient information is available to determine the optimal course of treatment for patients, making surgical options controversial. However, early open surgery or surgical intervention has been reported to be successful in several cases (2, 12, 25, 26).

Antimicrobial treatment alone usually results in poor prognosis, therefore surgery may play an essential role in reducing mortality. Fernandez Guerrero et al reported that the mortality rate of patients with infected aneurysms due to Salmonella who underwent surgery ranged from 40% to 45% (2). Shiiya reported that the early mortality rate after open surgery ranged from 11% to 36% (26). Therefore, in spite of medical and surgical advances in recent years, infected aneurysms remain largely fatal.

The management of patients should consist of a combination of antimicrobial treatment and surgical debridement of surrounding necrotic tissue, together with revascularization (21). The optimal period of antimicrobial treatment before surgery is controversial, ranging from 1 week to 4 months (27, 28), with 1 week being the minimum treatment period for all but emerging cases (28). Although there were some improvements in the laboratory data for our patient as a result of the 5 weeks of antimicrobial treatment, his aneurysm had become multilobulated and had gradually grown larger (Fig. 3). At this point, safe and successful surgery became more difficult compared to the conditions at the time of diagnosis. Therefore, the optimal timing of surgery must be balanced against the need for antimicrobial treatment, the site of the aneurysm, and the changes in aneurismal form (26, 28). Our patient and his family were informed of the high mortality associated with an infected aneurysm, and the benefits and the risks of surgery were also explained. Our patient refused surgery due to a fear of the after effects of surgery, and he eventually died as a result of recurrent rupture of the infected aneurysm. Therefore, although the antimicrobial, anti-hypertensive, and pain control medications had some effect, the structural damage was too great.

Early diagnosis and prompt careful treatment can reduce mortality. Therefore, it is necessary to continue investigations into the treatment and prevention of endovascular complications, including infected aneurysms, in HIV-1-infected patients with non-typhoidal salmonellosis.

References