Case report - Vascular thoracic

Coxiella burnetii infection of an aortic graft: surgical view and a word of caution

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Abstract

A 30-year-old-man presented with an aortic graft infection. Polymerase chain reaction study identified the infectious organism as Coxiella burnetii, a strictly intracellular pathogen that causes Q fever in humans. The patient was successfully treated by removal of the infected graft, implantation of homograft aortic tube, and specific antibiotic therapy. He is doing well after 6 months, with no evidence of recurrent homograft infection on transthoracic echocardiography.

C. burnetii vascular graft infections may be underdiagnosed because of lack of recognition. We suggest that serologic tests for C. burnetii be routinely performed in the presence of unexplained febrile illness or pain in patients with a history of underlying vascular disease.

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1. Introduction

Q fever is caused by Coxiella burnetii, a small, obligate intracellular, Gram-negative bacterium related to the Rickettsiaceae family. Q fever occurs worldwide [1], but the incidence is probably underestimated [2] because of the insidiousness of the infection and lack of clinician awareness. It is easily detectable with a simple, low-cost, and reliable serologic examination with immunofluorescence. We recently successfully treated a patient with C. burnetii infection of an aortic graft.

2. Case report

A 30-year-old-man underwent surgery for aortic coarctation in June 1994 involving the interposition of a Gortex tube; there were no complications. In January 2003, the patient was admitted for investigation because of high fever. During the previous year he had had several episodes of fever, which resolved without medical help.

On physical examination, rectal temperature was 39.7 °C, blood pressure 110/46 mmHg, and heart rate 120 beats/min. Femoral pulses were present with a bruit on the left side, and distal pulses were perceptible. Neurological examination revealed no abnormalities.

Laboratory tests showed a white blood cell count of 8500/mm³ and creatinine of 1.9 mg/dl. Chest X-ray was normal. Findings on transthoracic echocardiography (TTE) ruled out the diagnosis of cardiac endocarditis. An infection of the aortic graft was suspected by the presence of large vegetations on the graft on transesophageal echocardiography (TEE) (Fig. 1a). Blood cultures were sterile. Serologic examination revealed chronic Q fever (IgG anti-phase I titer 6400, and IgA anti-phase I titer 6400; IgM was negative).

Specific antibiotic therapy with doxycycline 200 mg/day and ofloxacin 400 mg/day was started. After 1 week, the fever decreased, but TEE still showed large vegetations in the prosthetic tube. Because of the possible presence of a Q fever-resistant infection and the risk of peripheral septic embolization, the patient was referred for surgery.

The prosthetic graft was resected through a left posterolateral thoracotomy using a femorofemoral partial bypass with permissive mild hypothermia (33 °C). The graft was adhered to the lung, but after careful dissection, it was...
possible to control the aorta proximally and distally to the graft. After resection of the graft, we noted a few large vegetations also in the lumen of the tube. Owing to the suspicion of a resistant pathogen, the prosthetic graft was replaced by a valveless cryopreserved (−160 °C liquid nitrogen storage) homograft. On analysis, *C. burnetii* was detected in the aortic specimen (Fig. 1b) by polymerase chain reaction and was isolated in Vero cell culture. After surgery, the antibiotic therapy was changed to doxycycline and hydroxychloroquine. The patient was discharged after 6 weeks with a recommendation to continue antibiotic treatment with serologic monitoring of Q fever and follow-up evaluation for drug-related adverse events. At 10 months, the patient is doing well. He is still taking antibiotics. No evidence of recurrent infection of the homograft tube on follow-up TEE was noted.

### 3. Discussion

Q fever, caused by *C. burnetii*, is characterized by its clinical polymorphism. It may be subclinical, acute, or chronic. *C. burnetii* is an extremely infectious bacterium, and a single inhaled organism can cause infection. The reservoir of *C. burnetii* is wide; cattle, goats and sheep are frequently involved [3]. However, 20–40% of affected patients have no evident contact with animals and acquire the infection via inhalation of bacteria surviving in nature. Endocarditis is the main manifestation of chronic Q fever, occurring in 60–70% of all cases [1]. Infection of vascular graft or aneurysm has also been reported [1,2].

Chronic Q fever is associated with high levels of specific antibodies to *C. burnetii* phase I, whereas acute Q fever is characterized by a predominance of antibodies to *C. burnetii* phase II [4,5]. Most cases of chronic Q fever are diagnosed by detection of specific antibodies, with the microimmunofluorescence test being the reference technique [4,6]. The diagnosis may also be achieved by isolation of *C. burnetii* from blood and tissue specimens via cell cultures—which must be performed in security laboratories because this bacterium is a high-level biohazard [2]—or by demonstration of *C. burnetii* DNA infection in tissue specimens using PCR-based methods [2]. The diagnosis of *C. burnetii* infection of a vascular graft is usually based on serology. Although life-threatening, *C. burnetii* vascular infection is seldom recognized and its incidence is probably underestimated [2], like for other complications of chronic Q fever, the number of diagnosed cases is highly dependent on the interest of local physicians and the presence of specialized laboratories [2].

In our patient, *C. burnetii* caused infection of a Gortex aortic graft. The most common organisms involved in the aortic graft infections are *Staphylococcus epidermidis*, *Staphylococcus aureus*, and Gram-negative enteric organisms [2,3]; in 5% of cases, cultures of the removed infected graft are negative [3]. The organism responsible here was identified by both isolates from the graft and the strong serologic response. The presence of high-level IgG and IgA antibodies against phases I and II of the organism indicated chronic *C. burnetii* infection.

Our survey of the literature revealed only four cases of *C. burnetii* infection of a vascular graft (Table 1). The most common epidemiological features were male predominance, mean age (±SD) 65.2 ± 2.8 years, presence of an underlying aortic abnormality, and a history of environmental exposure. None of the patients presented with specific signs or symptoms, which is one of the reasons the disease is infrequently diagnosed. Fever, also noted in our patient, was the most frequent symptom (80% of patients) followed by weight loss and pain. Treatment in all cases consisted of removal of the infected foreign material and administration of antibiotics. In our patient, we used a valveless aortic homograft to replace the infected Gortex graft. Several papers suggest that homografts are advantageous for the treatment of complex endocarditis [8,9], because they are less prone to recurrent endocarditis. Since Q fever is a chronic infection caused by a particularly resistant bacterium because of intracellular development,
we thought a homograft would reduce the chances of reinfection. Antibiotic therapy was also prescribed according to the Q fever endocarditis regimen [10], namely, a combination of doxycycline (200 mg/day) and hydroxychloroquine (200 mg £ 3/day). Treatment should not be prescribed for shorter than 1.5 years or longer than 4 years [10]. A stable low titer of anti-phase I antibodies has to be maintained before therapy is stopped (IgG, 800; IgA, 50) [10].

Chronic C. burnetii vascular infection is a life-threatening disease with a long evolution, serious complications, and a generally poor prognosis. Therefore, accurate, early diagnosis is necessary. Because the culprit microorganism remains unidentified in many vascular graft infections, we suggest that the etiologic search be extended to C. burnetii. Furthermore, the first episode of Q fever remains asymptomatic in many cases, C. burnetii persists in the infected host. An underlying vascular disease being an essential risk factor, we recommend that clinicians consider the diagnosis of Q fever and perform systematic serological testing for C. burnetii in all patients with a vascular graft and unexplained fever, abdominal pain, or weight loss.

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Table 1
Epidemiological and clinical features of patients with Coxiella burnetii infection of a vascular graft: available reports

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Sex/age (year)</th>
<th>Habitat</th>
<th>Vascular abnormality</th>
<th>Fever</th>
<th>Vascular symptoms</th>
<th>General symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>Fournier et al. [2]</td>
<td>M/68</td>
<td>Rural</td>
<td>Dacron aortobifemoral bypass</td>
<td>Yes</td>
<td>None</td>
<td>Weight loss hepatosplenomegaly</td>
</tr>
</tbody>
</table>

NA: not available.

References