Implantable Cardioverter-Defibrillator Infection Due to *Brucella melitensis*: Case Report and Review of Brucellosis of Cardiac Devices

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We report a case of implantable cardioverter-defibrillator infection due to *Brucella melitensis* and review 5 previously reported cases of *Brucella* infection of cardiac devices. Device removal, followed by antibiotic therapy for 6 weeks, is probably required for cure. Although rare, reports of *Brucella* infection of prosthetic implants and devices have increased in the past decade. Brucellosis should be considered in the differential diagnosis of cardiac device infection in patients residing in or traveling to areas of endemcity.

Brucellosis is a zoonotic infection, presenting with fever and malaise and sometimes complicated by granulomatous hepatitis, sacroiliitis, spondylitis, and epididymoorchitis. *Brucella melitensis* is the most pathogenic of the brucellar species for humans. It is acquired from consumption of unpasteurized goat milk or cheese or contact with live goats and sheep or their carcasses [1]. Rates of brucellosis are especially high in the Middle East, central Asia, the Balkans, southern Italy, Greece, Spain, Mexico, and Peru [2].

Infection of a prosthetic device or implant is a rare complication of brucellosis. We report a case of implantable cardioverter-defibrillator (ICD) infection with *Brucella melitensis* and summarize 5 previously reported cases of cardiac device brucellar infection.

**Case report.** A 66-year-old man presented with a 2-week history of redness and pain at the site of an ICD that was placed 26 months earlier because of nonischemic cardiomyopathy. His past medical history also included diabetes mellitus, chronic obstructive pulmonary disease, and hyperlipidemia. Aside from mild malaise, he felt well and was afebrile. Physical examination was notable for mild erythema and tenderness of the ICD site; there was no evidence of hepatosplenomegaly or sacroiliitis during examination or imaging studies. The patient was a native of Albania who had lived in suburban Boston for the previous 20 years. He last traveled to Italy and Albania 3 months after ICD implantation. During this visit, he consumed goat meat, but he denied consumption of unpasteurized goat cheese or milk.

The patient underwent debridement of the ICD pocket and replacement of the generator. The pocket appeared edematous, but no frank pus or tissue necrosis was noted. Cultures of a superficial specimen and tissue from the pocket unexpectedly grew presumptive *Brucella* species, subsequently confirmed as *B. melitensis* at the Centers for Disease Control and Prevention (Atlanta, GA). Culture of blood obtained before and after replacement of the generator yielded negative results. The patient was initially treated with intravenous gentamicin and oral ciprofloxacin and doxycycline (rifampin was avoided in view of extensive drug interactions with the patient’s cardiovascular medications). He subsequently underwent complete extraction of the ICD device and leads. Samples taken from the device at the time of explantation again yielded *B. melitensis* on culture. A new ICD was placed on the opposite side 1 week after extraction. The patient completed a 6-week course of oral ciprofloxacin and doxycycline therapy without sequelae.

**Discussion.** To the best of our knowledge, *Brucella* infection of an ICD has not been previously reported, although there have been 5 previous reports of brucellar pacemaker infection [3–7], which are summarized in table 1. Cardiac device infection with *Brucella* presented a mean of 3.5 years after device insertion. Three of 6 patients had significant systemic symptoms and fever; the other 3 had relatively mild local symptoms referable to the device site. Device removal followed by treatment with standard regimens for brucellosis resulted in good clinical outcomes in all cases except for 1, in which the patient died of postoperative duodenal perforation. Removal of cardiac devices infected with *Brucella* is probably required for cure. In 2 cases, patients treated for systemic brucellosis experienced relapse because an infected pacemaker served as nidus for recurrence [4, 7]. In another patient, a pacemaker was the source of multiple symptomatic relapses of brucellosis, despite a paucity of local symptoms [5]. The standard regimen for treatment of brucellosis is 6 weeks of oral doxycycline, combined with...
Table 1. Clinical characteristics of patients with pacemaker infection due to *Brucella melitensis*.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Patient 1</th>
<th>Patient 2</th>
<th>Patient 3</th>
<th>Patient 4</th>
<th>Patient 5</th>
<th>Patient 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>65</td>
<td>63</td>
<td>71</td>
<td>68</td>
<td>70</td>
<td>66</td>
</tr>
<tr>
<td>Sex</td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>Location</td>
<td>French Pyrenees</td>
<td>Spain</td>
<td>Spain</td>
<td>Turkey</td>
<td>Italy</td>
<td>Boston, MA</td>
</tr>
<tr>
<td>Time from device placement to symptoms, years</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>7a</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Systemic <em>Brucella</em> infection</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><em>Brucella</em> bacteremia</td>
<td>NA</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Local redness, pain at pacemaker site</td>
<td>Fever, local redness, discharge at pacemaker site</td>
<td>Fever, sacroiliitis; no local symptoms at pacemaker site</td>
<td>Local pain, swelling at pacemaker site</td>
<td>Malaise; pain, swelling around pacemaker pocket</td>
<td>Mild malaise, local pain, redness, swelling at ICD site</td>
</tr>
<tr>
<td>Device removed</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Clinical cure after device removal</td>
<td>Yes</td>
<td>Yes</td>
<td>Died of postoperative complications (gastrointestinal bleeding)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Antibiotics received</td>
<td>NA</td>
<td>Doxycycline, rifampin, streptomycin</td>
<td>NA</td>
<td>Rifampin, doxycycline</td>
<td>Rifampin, minocycline, ciprofloxacin</td>
<td>Doxycycline, ciprofloxacin</td>
</tr>
<tr>
<td>Culture results</td>
<td><em>B. melitensis</em> biotype 2</td>
<td><em>B. melitensis</em></td>
<td><em>B. melitensis</em></td>
<td><em>B. melitensis</em> biotype 1</td>
<td><em>B. melitensis</em></td>
<td><em>B. melitensis</em></td>
</tr>
</tbody>
</table>

**NOTE.** ICD, implantable cardioverter-defibrillator; NA, not available.

* Revised 1 year before symptoms.
* Present case.
either oral rifampin for 6 weeks or parenteral streptomycin for 2 weeks [1].

Our patient resided in an urban region of the United States and vigorously denied recent exposure to goats, sheep, and unpasteurized dairy products. He last traveled to a region in which *Brucella melitensis* is endemic almost 2 years before the onset of symptoms, just 3 months after the original ICD was inserted. This suggests that his ICD may have been seeded during an episode of transient bacteremia, with organisms lying dormant there until his symptoms developed. The absence of systemic symptoms in 2 previously described patients with brucellar pacemaker infection [3, 6] and in most reported patients with *Brucella* infection of prosthetic joints [8–10] suggests that seeding of devices and prostheses during transient, asymptomatic episodes of brucellar bacteremia is possible.

In recent years, there has been an increase in reports of brucellar infection of prosthetic materials, including prosthetic joints [8–10], prosthetic heart valves [11, 12], a ventricular septal defect patch [13], and breast implants [14]. These reports presumably largely reflect increased access to advanced medical care in regions where brucellosis is endemic. Although *Brucella* species are known primarily as intracellular pathogens, they also avidly bind extracellular matrix proteins, including collagen, laminin, and especially fibronectin and vitronectin [15]. Prosthetic materials implanted into humans become coated with these matrix proteins [16], thus explaining the ability of *B. melitensis* to infect devices and prostheses, even relatively long periods of time after insertion.

Two microbiology laboratory technicians received successful postexposure prophylaxis for brucellosis. Awareness of the possibility of infection of implanted devices with *B. melitensis* in patients residing in or traveling to areas of endemicity may be helpful in early laboratory recognition of this virulent pathogen, thus limiting occupational exposures.

**Acknowledgments**

*Potential conflicts of interest.* All authors: no conflicts.

**References**