Fever and Cardiac Arrest in a Patient With a Left Ventricular Assist Device

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A 68-year-old avid deer hunter with ischemic cardiomyopathy underwent left ventricular assist device (LVAD) implantation for destination therapy two years ago. He was living an active lifestyle, tracking deer and fishing in a Midwestern forest in November. His wife removed an engorged tick on his thorax. A few days later, he experienced fever, confusion, and ataxia and was hospitalized with septic shock and ventricular fibrillation. The LVAD site had no signs of trauma, drainage, warmth, or tenderness. A peripheral blood smear revealed intraleukocytic anaplasma microcolony inclusions. After completing 14 days of doxycycline, he recovered. Typical non-device-associated infections in LVAD recipients include pneumonia, urinary tract infection, or *Clostridium difficile* colitis. Human granulocytic anaplasmosis (HGA) is a very atypical non-LVAD infection, and the incidence of tickborne illnesses in LVAD recipients is unknown.

Keywords. *Anaplasma*; fever; left ventricular assist device.

A 68-year-old avid deer hunter with ischemic cardiomyopathy underwent left ventricular assist device (LVAD) implantation for destination therapy 2 years ago. Recently, he experienced several days of fever, malaise, anorexia, ataxia, and confusion. Just 2 weeks prior, he was living an active lifestyle, tracking deer and fishing in a Midwestern forest in November. His wife removed an engorged tick on his thorax. He presented in septic shock and ventricular fibrillation. The LVAD site had no signs of trauma, drainage, warmth, or tenderness. Evaluation revealed a white blood cell count of 6.3×10^9/L with 96% polymorphonuclear leukocytes and 1% lymphocytes, platelets 23×10^9/L, creatinine 3.1 mg/dL, aspartate aminotransferase 216 U/L, and total bilirubin 1.4 mg/dL. He was empirically treated with vancomycin, ceftriaxone, ampicillin, doxycycline, and metronidazole. Blood cultures were negative, but a peripheral blood smear (Figures 1 and 2) revealed intraleukocytic anaplasma microcolony inclusions (morulae), with 30% parasitemia. Polymerase chain reaction on peripheral blood was positive for *Anaplasma phagocytophilum* and negative for *Borrelia burgdorferi* and *Babesia microti*.

He completed 14 days of doxycycline. His home warfarin therapy was adjusted for drug interactions. His hospital course was complicated by acute kidney injury, disseminated intravascular coagulation, aspiration pneumonia, and recurrent ventricular fibrillation necessitating implantable cardioverter defibrillator placement. However, he recovered and was dismissed on hospital day 31. He continues to do well 3 years later.

Human granulocytic anaplasmosis is a tick-borne infection that should be suspected when patients from endemic regions present with fever (85%), leukopenia, and thrombocytopenia (83%) [1]. The bacterium *A phagocytophilum* is transmitted by the *Ixodes scapularis* tick, which also transmits *B burgdorferi* and *B microti*. Human granulocytic anaplasmosis can be fatal; therefore, clinical suspicion necessitates empiric doxycycline until diagnostic confirmation [2].

Left ventricular assist device recipients typically present with poor functional capacity and device-associated infections

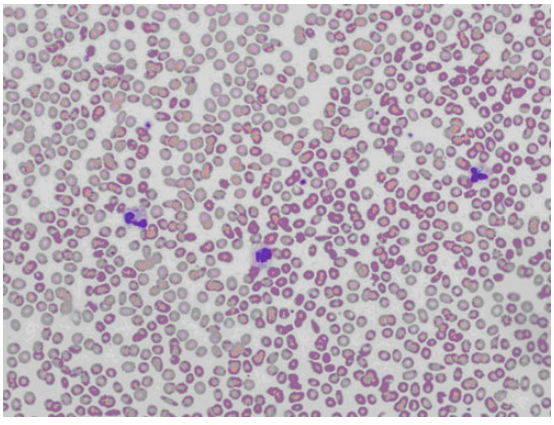

Figure 1. Peripheral blood smear (Wright-Giemsa stain, 10× original magnification).

Received 11 December 2014; accepted 27 February 2015.

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Open Forum Infectious Diseases

DOI: 10.1093/ofid/ofv033

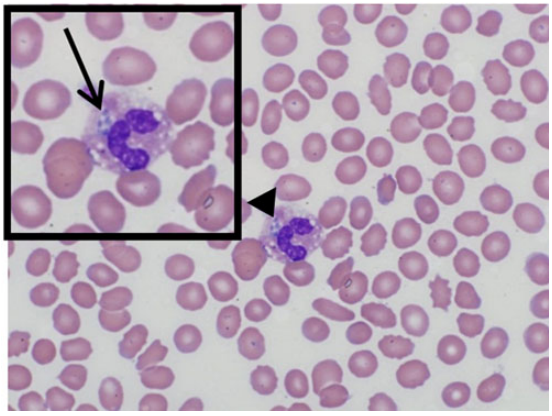

Figure 2. Peripheral blood smear (Wright-Giemsa stain, 40× original magnification) demonstrating intracytoplasmic anaplasma microcolony inclusions (morulae) within leukocytes (arrowhead and inset).

involving the pump, cannula, pocket, driveline, or bloodstream [3]. However, in the destination therapy era, patients are living longer and can present with nondevice infections [4, 5]. The 2009 HeartMate II destination therapy trial demonstrated a 49% rate of non-LVAD infections [6]. In a 2010 study on 81 LVAD recipients, non-LVAD infections included pneumonia (8.6%), urinary tract infection (12.3%), and *Clostridium difficile* colitis (8.6%) [7]. Catheter-related bloodstream infections due to coagulase-negative staphylococci (40%) and *Staphylococcus aureus* (20%) are also common [8]. Our patient was infected with *A phagocytophilum*, which is a very atypical non-LVAD associated infection. The epidemiology of tick-borne illnesses in LVAD recipients is unknown.

Acknowledgments

We thank Dr. Kaaren Reichard for providing peripheral blood smear images.

Potential conflicts of interest. All authors: No reported conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest.

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