Septic Shock Due to Babesiosis

Michael J. Dacey, Howard Martinez, Thomas Raimondo, Christopher Brown, and John Brady
Intensive Care Unit, Kent County Hospital, Warwick, Rhode Island

We present the case of a 69-year-old man with an unremarkable past medical history and an intact spleen who developed shock and renal failure due to babesiosis. Despite hemodynamic parameters showing severe distributive shock with hyperdynamic cardiac function, the patient recovered fully after treatment with quinine sulfate and clindamycin.

Babesiosis is an infection by Plasmodium-like protozoans that parasitize the erythrocytes of both animals and humans. In the United States, most disease in humans is caused by the rodent strain Babesia microti and is transmitted via a tick vector (Ixodes scapularis). Babesiosis has been reported in New England, New York, Missouri, Minnesota, Maryland, Virginia, Georgia, and the Pacific Northwest. The majority of cases in humans are believed to be asymptomatic or to produce only mild symptoms. However, babesiosis can be life-threatening in patients who have compromised immune systems, especially in individuals who have undergone splenectomy. We report the first case of septic shock due to infection with B. microti in a patient with an intact immune system.

**Case report.** A 69-year-old man presented to the emergency department in profound shock. His family reported that, for the previous 7 days, he had been complaining of malaise and fatigue. He had seen his primary care physician, who had noted hypotension that responded to treatment with iv fluids on 2 separate occasions. His family took him to the emergency department when they found him unresponsive.

His past medical history was unremarkable and he was not taking any medications, nor did he have any medication allergies. He had no surgical history and had never received a blood transfusion. He had lived in Rhode Island his entire life and had not left the state in >2 years. He had been stationed in Seoul, South Korea, during the Korean War, but he recalled having no illness during that time. He lives adjacent to a large area of woodlands, and he routinely took long walks; however, he did not remember sustaining any tick bites.

Findings of a physical examination were consistent with profound shock. The patient’s temperature was 40°C and his blood pressure was 90/35 mm Hg while receiving 15 μg/kg/min of iv dopamine (a high dose). His pulse rate was 130 beats/min in sinus rhythm, and oxygen saturation was 98% when breathing room air. The patient had rigors so severe that placement of arterial and central venous catheters had to be delayed. Findings of a neurological examination were normal, and there were no oral lesions or adenopathy. The lungs were clear to auscultation, and there were no murmurs on cardiac examination. The patient’s abdomen was not tender, and the liver and spleen were of normal size. The appearance of the skin was unremarkable, although the extremities were cold and poorly perfused. Results of laboratory tests were as follows: WBC count, 12 × 10^9 cells/L; platelet count, 110 × 10^9cells/L; hematocrit, 0.34; blood urea nitrogen level, 165 mg/dL; serum creatinine level, 6.5 mg/dL; prothrombin time, 60 s; adjusted partial thromboplastin time, 38 s; international normalized ratio, 8.5; total bilirubin level, 4.1 mg/dL; and lactate dehydrogenase level, 250 U/L.

A blood sample obtained at admission tested negative for antibody to HIV. Blood samples obtained on the last day of hospitalization subsequently tested negative for antinuclear antibody and rheumatoid factor. Four sets of blood samples for culture were obtained during febrile episodes in the first 48 h; none showed any growth after 7 days. Findings of chest radiography appeared completely normal throughout his hospital stay. Arterial blood gas levels were consistent with severe metabolic acidosis with attempted respiratory compensation. The anion gap was 27.

The patient was transferred to the intensive care unit, where he had a Swan-Ganz pulmonary artery catheter placed. Initial hemodynamic parameters while he was receiving high-dose dopamine were as follows: cardiac index, 4.5 L/min/m² (normal range, 2.5–3.0 L/min/m²); pulmonary capillary wedge pressure, 16 mm Hg (normal range, 5–15 mm Hg); and systemic vascular resistance, 450 (dyne/s)/cm² (normal range, 900–1200 [dyne/sec]/cm²). These results were consistent with distributive shock. An echocardiogram showed normal systolic function and unremarkable valves. Cardiac isoenzyme levels were negative for myocardial infarction.

Broad-spectrum antibiotics were administered: piperacillin-tazobactam (3.375 g iv q8h), ciprofloxacin (400 mg iv q.d.)
and vancomycin (1 g iv initially and subsequent doses based on serum levels). Twelve hours after the initiation of therapy the patient still required a high dosage of vasopressors, still had persistent fever (temperature ≤40°C), and continued to have severe rigors. An infectious diseases specialist was consulted, and a peripheral blood smear showed substantial amounts of intraerythrocytic ring forms, a finding consistent with either B. microti or plasmodium infection. The initial parasitemia was estimated at 8%. Results of an indirect immunofluorescence antibody assay for reactivity to B. microti eventually became positive at a ratio of >1:2048. Serologic tests for both Borrelia burgdorferi and Ehrlichia had negative results.

Treatment was initiated with quinine sulfate (650 mg t.i.d. orally) and clindamycin (600 mg q8h iv). During the following 24 h, the patient’s requirement for vasopressors quickly decreased by 50%, and, after 36 h, his blood pressure was normal, even when he was no longer receiving any vasoactive medications. Renal function returned to normal after 7 days, and the patient did not require dialysis. The parasite load decreased to 3% after 72 h of therapy, and, by the time of discharge 7 days later, no parasites were seen on a blood smear. The patient was seen at a follow-up examination 2 weeks later, at which time he felt well, had no fever, and had physical examination findings that were completely normal.

Discussion. We report a case of septic shock and acute renal failure due to babesiosis in an immunocompetent older patient with an intact spleen. The hemodynamic parameters indicated distributive shock with hyperdynamic cardiac function. Such findings are very similar to those recorded during shock caused by falciparum malaria; they are characterized by low systemic vascular resistance, an elevated cardiac index, and diminished oxygen consumption at the tissue level [1, 2]. The cause of the profound decrease in vascular resistance in patients with malaria is a matter of much investigation and debate. Cytokines probably play a major role. Septic shock in patients with malaria has been associated with elevated levels of TNF–α, IL-1, IL-6, IL-10, and an elevated ratio of IL-6 to IL-10 [3]. It has been demonstrated that elevated levels of IL-1 and TNF–α in adults with malaria induces expression of phospholipase-A2 [4]. This enzyme catalyzes the hydrolysis of membrane phospholipids and plays an important role in the cellular production of mediators of the inflammatory response to various stimuli [5]. These same mechanisms may play a role in shock induced by babesiosis.

Investigations in dogs have clearly shown that acute infection with B. microti can induce hypotension and septic shock; some reports suggest that the severity of the shock is proportional to the parasite burden [6, 7]. However, in humans, host factors would seem crucial to the development of symptomatic disease, because most serious infections occur in patients who are immunocompromised, asplenic, or >65 years of age [8, 9].

It has been known for some time that B. microti can cause life-threatening disease, including acute respiratory distress syndrome [10]. We report the first case of overwhelming septic shock without respiratory involvement due to babesiosis in an immunocompetent patient with an intact spleen. Given the expanding geographic area in which babesiosis is occurring, it should be added to the differential diagnosis of patients with septic shock.

ACKNOWLEDGMENT

We are indebted to Jennifer Thompson, M.D., for her suggestions and review of the manuscript.

References