A Tale of Two Ticks: A case of *Babesia microti* and *Rickettsia ricketsii* co-infection

Guinn Dunn, Linda Lewis PA, Ryan Murphy MD, Santosh Reddy MD
Department of Internal Medicine, University of Utah, Salt Lake City

Learning Objective

To consider more than one pathogen in tickborne disease and initiate appropriate treatment.

Case Information

Patient Presentation:

- Previously healthy and active 83-year-old man from CT
- Five days of worsening chills and fatigue
- Tick removal six days prior
- Received two doses of prophylactic doxycycline
- No localizing symptoms
- No recent illness, foreign travel, fresh water exposure, or history of blood transfusion
- Past medical history: paroxysmal atrial fibrillation

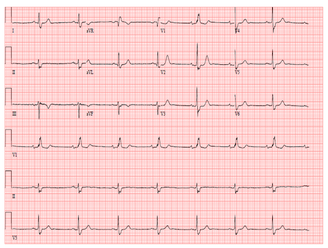
Initial Evaluation

Physical Exam

- Temperature 38.8 ˚C
- Tachypnea
- Mild Hypoxia
- Bradycardia
- No rash

Normal CXR

EKG



Labs

- WBC 6.04
- Hgb 12.3 (L)
- Platelets 65 (L)
- MCV 94.4
- Bilirubin 3.1 (H)
- Haptoglobin <10 (L)
- LDH 600 (H)
- AST 46 (H), ALT 29
- Sodium 131 (L)
- Creatine Kinase 219 (H)

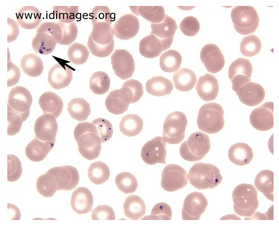
Differential Diagnosis

- Tickborne illness should be considered in any patient with fever, malaise, and recent history of tick exposure
- Potential diagnoses include Lyme disease, babesiosis, ehrlichiosis, anaplasmosis, and Rocky Mountain spotted fever

Clinical Features of Babesiosis and RMSF

BABESIOSIS

- Gradual onset malaise, fatigue
- Fever, chills, sweats
- Headache, myalgias, arthralgias
- Hemolytic anemia
- Thrombocytopenia
- Elevated liver enzymes
- Identification of parasite on blood smear



ROCKY MOUNTAIN SPOTTED FEVER

- Fever
- Malaise
- Headache, myalgias, arthralgias
- Thrombocytopenia
- Hyponatremia
- Non-blanching maculopapular rash that frequently involves the palms and soles

Further Evaluation

- Peripheral blood smear with no abnormalities
- Direct Coombs negative
- Negative testing for Ehrlichia, Anaplasma, and Lyme disease by PCR
- Negative *Borrelia burgdorferi* serologies
- Transthoracic echocardiogram showed no abnormalities

- *Babesia microti* detected by PCR
- *Rickettsia ricketsii* serology showed low-positive IgM

Hospital Course

- Admitted and empirically treated with doxycycline for severe sepsis secondary to tickborne illness.
- Remained febrile with only minor clinical improvement overnight.
- Atovaquone and azithromycin were added to cover suspected babesiosis on Hospital Day 2.
- The patient slowly improved over four days.
- Discharged in stable condition with plans to continue doxycycline, atovaquone, and azithromycin for a total treatment duration of 10 days.
- Repeat *R. ricketsii* serologies taken three weeks after presentation were negative.

Discussion

- The majority of tickborne diseases begin with vague symptoms.
- Diagnosis is initially guided by location and early lab findings.

- For this patient, hemolytic anemia, thrombocytopenia, and elevated liver enzymes were most consistent with babesiosis.[1,2]
- Peripheral blood smear lacked identification of Babesia, but as few as 1% of erythrocytes may be parasitized in the early stages of infection[1]
- Treatment was initiated prior to PCR confirmation, which eventually verified *B. microti* infection

- RMSF was initially considered an unlikely diagnosis.
- This patient had no skin findings, but rash in RMSF takes several days to develop. Up to 12% of patients never develop rash.[3]
- *R. ricketsii* IgM was low-positive. This alone is insufficient to confirm RMSF.[4]

- Infectious Disease was consulted. They agreed that the patient's presentation of severe sepsis with slow clinical improvement warranted treatment with continued doxycycline, especially considering that very early therapy (as this patient had received in Connecticut) is known to diminish antibody response.[4]

- The patient's *R. ricketsii* titers were negative three weeks after presentation. This could be secondary to diminished antibody response or a false positive initial test.

- While co-infection with *B. mircroti* and *B. borgderfori* is well described,[5,6] to our knowledge, co-infection with *B. microti* and *R. ricketsii* has not yet been reported.

- We hypothesize that severe Babesiosis may suppress RMSF serologies.

References

(1) Vannier et al. N Engl J Med, 2012. (2) Wormser et al. Clin Infect Dis, 2006 (3) Helmick et al. J Infect Dis, 1984. (4) Biggs et al. MMWR Recomm Rep, 2016. (5) Swanson et al. Clin Microbiol Rev, 2006. (6) Steiner et al. FE, Pinger RR, Vann CN, et al. J Med Entomol, 2008. Images: (1) Babesia seen on Giemsa staining of the peripheral blood smear (thin smear). Partners' Infectious Disease Images. (2) https://www.cdc.gov/rmsf/symptoms/index.html.

HEALTH
UNIVERSITY OF UTAH

Division of General Internal Medicine