Case Report

Rocky Mountain Spotted Fever: Dermatologic Manifestation of a Life-Threatening, Systemic Disease

Urgent message: Obtaining a detailed medical history is paramount for the early detection and treatment of Rocky Mountain spotted fever. Failure to acquire adequate patient information can lead to misdiagnosis and delayed treatment of this potentially life-threatening disease.

WHITNEY CRAMER, PA-C

Many dermatologic conditions such as rashes and eczema are encountered by urgent care providers on a daily basis. Often these conditions are diagnosed as contact dermatitis or are misdiagnosed, or the patient is referred to a specialist. There are a vast number of disease processes that include dermatologic symptoms very similar to common ailments such as poison ivy, contact dermatitis, and urticaria. Distribution and characteristics of lesions as well as recent environmental exposure provide valuable insight needed for early diagnosis and treatment of more serious, potentially life-threatening diseases such as Rocky Mountain spotted fever (RMSF). When the rash presents concurrently with fever, chills, and body aches, the presence of systemic disease process must be ruled out and expansion of the differential diagnosis should be considered.

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Case Presentation

A 23-year-old man presents to the urgent care center with fever, myalgia, and sore throat that he has had for 1 week. The patient has just returned from a 2-week hike through the Appalachian Trail and is concerned, having

Whitney Cramer, PA-C, is a recent graduate of Ohio Dominican University in Columbus, Ohio, and is now working at Arlington Urgent Care in Upper Arlington, Ohio.

Figure 1. An American dog tick (*Dermacentor variabilis*).

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had no reduction or resolution of symptoms. The patient then adds that he developed a mildly pruritic rash on his ankles 3 days earlier and that it has been progressively worsening. He reports that the preceding day, the rash had spread to his wrists and palms and that he awoke that morning with a similar rash on his lower back. The patient has taken Tylenol, Mucinex DM, and Benadryl but gained only minimal relief. He reports that he has had no contact with poison ivy and has sustained no mosquito bites, tick bites, or target lesion. He also reports that he has not experienced coughing, sinus congestion, rhinorrhea, or abdominal pain.

Observation and Findings

- Evaluation of the patient showed the following:
- Temperature: 100.2°F
- Respiratory rate: 14 breaths/min
- Pulse: 92 beats/min
- Blood pressure: 124/72 mm Hg

Physical examination reveals that the patient is aware and oriented and shows no signs of distress. Findings on a dermatologic examination are significant for diffuse, erythematous macules on the ankles, wrists, and palmar aspects of both hands, as well as on the lower back. His throat is mildly erythematous, associated with shotty anterior cervical lymphadenopathy. There are no other abnormal findings on examination.

Diagnostic Studies

A rapid strep test is performed to rule out Streptococcal pharyngitis. Results are negative. Blood work is then performed because of concern for tick-borne illnesses: Lyme antibodies/Western blot reflex test, RMSF immunoglobulin G (IgG) and IgM test, complete blood cell count with differential, and a basic metabolic panel. Findings are positive for RMSF antibody IgG, elevated at 1:342 (normal range, <1:64). Findings for all other laboratory tests are within normal limits.

Diagnosis and Follow-Up

The diagnosis is RMSF. Because of a high suspicion of RMSF, the patient is prescribed doxycycline, 100 mg orally twice daily for 14 days, before leaving the urgent care center. Six days after assessment, his laboratory results are available, and the patient returns to the urgent care center for follow-up. His fever and muscle aches have decreased, but his rash is still present. He is referred to the local hospital's department of infectious diseases for follow-up and monitoring for further complications.

Discussion

Etiology

RMSF is a potentially deadly tick-borne infection caused by the bacteria *Rickettsia rickettsii*. Ticks that may carry the bacteria include the American dog tick (*Dermacentor variabilis*; **Figure 1**), Rocky Mountain wood tick *(D. andersoni*), and brown dog tick (*Rhipicephalus sanguineus*; **Figure 2**). Transmission occurs after at least 24 hours of the tick being attached to a human, with most occurrences in the spring and summer. Although cases have been reported throughout the United States, 60% of all cases occur in North Carolina, Oklahoma, Arkansas, Tennessee, and Missouri[1–3] (**Figure 3**).

Symptoms

Symptoms begin 2 to 14 days after tick bite and include

Figure 2. A brown dog tick (*Rhipicephalus sanguineus*).

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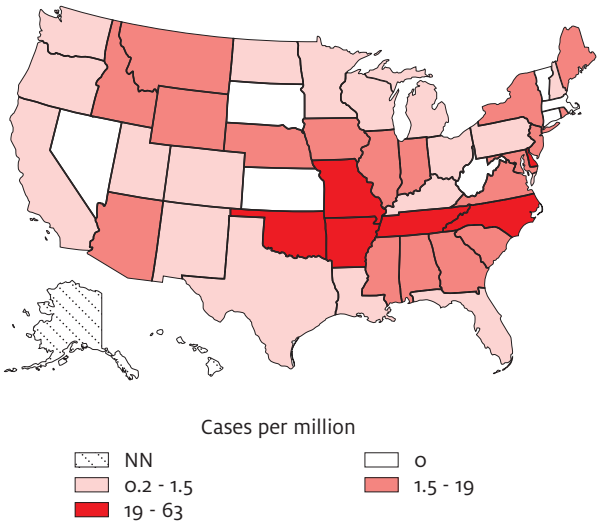
Figure 3. Annual incidence of cases of Rocky Mountain spotted fever in 2010 in the United States, by state, per million persons. NN = not notifiable [in 2010].



[From the Centers for Disease Control and Prevention. Rocky Mountain spotted fever (RMSF): statistics and epidemiology. Atlanta, GA: Centers for Disease Control and Prevention (updated 2013 September 5; cited 2015 November 17). Available from: http://www.cdc.gov/rmsf/stats/.]

fever, headache, nausea, vomiting, abdominal pain, muscle pain, and injection of the conjunctiva. Ninety percent of people with tick bites also experience some sort of rash, usually appearing 2 to 5 days after they become febrile.[1] The RMSF rash may be atypical or vary depending on the progression of the disease. The most common dermatologic manifestation is erythematous, nonpruritic macules on the wrist, forearms, and ankles that spread to the palms, soles, and trunk. Petechiae, occurring in 35% to 60% of patients with tick bites, may be seen in the same distribution, but they are not usually present until later in the disease process, indicating a more severe infection.

Additional Testing

Early detection and treatment is vital because of the potentially fatal outcomes. If the disease is left untreated, there is a 23% mortality rate.[2] The bacteria *R. rickettsii* infects endothelial cells of blood vessels. Disturbance to the vessels potentially results in myocarditis, hepatitis, acute renal failure, and damage to other vital organs.[4] Infection may not be detectable by blood work for the first few days after the appearance of symptoms, making a definitive diagnosis difficult that is based on laboratory findings at presentation. Therefore, diagnosis should be based on clinical findings. If RMSF is suspected, antibiotics should be started immediately after blood is drawn for laboratory tests. **Never delay treatment pending laboratory results.** Antibody titers to *R. rickettsii* are detectable by 7 to 10 days after onset of illness; they are undetectable in the first 7 days in 85% of patients.[2] The gold standard serologic test for RMSF is indirect immunofluorescence assay with *R. rickettsii* antigen. Blood for the first set of laboratory tests should be drawn as early in the disease as possible. In many cases, if RMSF is detected early enough, IgG immunofluorescence assay titers are either negative or low. Repeat laboratory tests should be performed 2 to 4 weeks later, when they will typically show a significant elevation in IgG antibody values. IgM antibodies are less specific and will also be elevated and remain elevated for months to years. If treatment is withheld until definitive laboratory results are reported, patients will not receive proper treatment for 2 to 4 weeks after onset of symptoms.[2]

Treatment

First-line treatment for RMSF is 100 mg of doxycycline every 12 hours for adults; for children, it is weight-based: 2.2 mg/kg twice a day for children weighing <45 kg. The standard duration of treatment is 7 to 14 days, varying with the extent of disease and manifestation of other vascular complications.[5] In more severe cases, patients must

be hospitalized for treatment and management of complications from the bacteria and the detrimental effects to the vasculature. Treatment of RMSF represents a rare situation in which tetracycline is considered the treatment of choice for children, with benefits outweighing possible side effects. Studies by both the Centers for Disease Control and Prevention and the American Academy of Pediatrics Committee on Infectious Diseases demonstrated that treating children with doxycycline at the recommended dose and duration did not produce permanent teeth discoloration. Other broad-spectrum antibiotics have shown high failure rates, with sulfa drugs actually worsening the infection.[6]

Prevention

Patients should be advised to wear long sleeves and pants when hiking in rural areas. DEET (*N,N*-diethyl-*meta*-toluamide) should be applied before they spend time outdoors, in order to repel ticks. Adults should also perform a full-body tick checks on themselves, their children, and their pets after spending time outdoors in areas known for RMSF.

Conclusion

When a patient presents with a rash in a distribution similar to that for RMSF (ankles, wrists, palms, or soles) in addition to experiencing a fever, muscle aches, or headache, the physician should suspect RMSF. Antibiotic therapy should begin immediately without waiting for laboratory results, with doxycycline being the first-line treatment. Diagnosis should be based on clinical findings and recent environmental exposure, confirmed by elevated IgG and IgM levels on an indirect immunofluorescence assay with *R. rickettsii* antigen. ■

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