Observation: Multiple Pruritic Papules From Lone Star Tick Larvae Bites

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Background: Ticks are the second most common vectors of human infectious diseases in the world. In addition to their role as vectors, ticks and their larvae can also produce primary skin manifestations. Infestation by the larvae of ticks is not commonly recognized, with only 3 cases reported in the literature. The presence of multiple lesions and partially burrowed 6-legged tick larvae can present a diagnostic challenge for clinicians.

Observation: We describe a 51-year-old healthy woman who presented to our clinic with multiple erythematous papules and partially burrowed organisms 5 days after exposure to a wooded area in southern Kentucky. She was treated with permethrin cream and the lesions resolved over the following 3 weeks without sequelae. The organism was later identified as the larva of Amblyomma species, the lone star tick.

Conclusions: Multiple pruritic papules can pose a diagnostic challenge. The patient described herein had an unusually large number of pruritic papules as well as tick larvae present on her skin. Recognition of lone star tick larvae as a cause of multiple bites may be helpful in similar cases.

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Report of a Case

A 51-year-old white woman presented with multiple, diffuse, intensely pruritic papules and papulovesicles. Five days prior to her presentation, the patient was boating on a lake in southern Kentucky. On 2 occasions, she had disrobed in a wooded area near the lake, leaving her clothes on the ground for several minutes before redressing. One day after the second time she undressed, the patient noted the onset of an erythematous pruritic rash that progressed with additional lesions over the next few days.

She visited several physicians in the following days who variously diagnosed infestations with "no-see-ums" (for which she was prescribed cetirizine hydrochloride [Zyrtec; Pfizer US, New York, NY] and a 5-day course of prednisone), bedbugs, and finally pubic lice (for which she was given a prescription of 5% permethrin cream). Despite numerous showers and scrubs, the rash progressed, and the patient began to note the presence of tiny dark "bugs" attached to her skin in the centers of many of the papules.

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She presented to our dermatology clinic for further recommendations before using the permethrin cream. In the clinic, we found hundreds of red, blanching papules and papulovesicles on her trunk and extremities, especially in areas that had been under her clothing. On close inspection, we found dark, 1-mm organisms in the center of many of the papules. Under magnification, these were determined to be bugs of unknown type whose heads were partially burrowed under the skin (Figure 2). Several of the organisms were removed with forceps and visualized in mineral oil under the microscope; they were rotund, 6-legged organisms (Figure 3).

The patient was instructed to complete a single overnight application of 5% permethrin cream and try to scrub off the organisms the next morning. The initial diagnosis was infestation by chigger mites, but because of the unusual nature of the presentation, including the large size and number of organisms and the fact that the organisms were still attached and burrowed, this diagnosis was questioned.

Sample organisms were sent for definitive identification to the C. Wayne Ellett Plant and Pest Diagnostic Center of Ohio State University, Columbus, and found to be the larvae of *Amblyomma* species, most likely *A. americanum*, the lone star tick. The patient’s pruritus began to resolve approximately 2 days after application of the permethrin cream, and the erythematous papules gradually resolved over the next 3 weeks. She has not had any further complications.

**COMMENT**

Ticks are obligate blood-sucking arthropods that parasitize every class of vertebrate in almost every region of the world. They are currently considered to be second only to mosquitoes as vectors of human infectious diseases in the world.\(^1\)

The life cycle of most hard ticks requires 2 years for completion and includes the egg, the 6-legged larva or “seed tick,” the 8-legged immature nymph, and the 8-legged reproductively mature adult. All stages except the egg require a blood meal for morphogenesis. 6,7 The larvae emerge from eggs deposited on the ground and then crawl up grasses and other low vegetation where they can easily attach to passing animals or humans. 2 The tick clings to hair or clothing, waits until the host is at rest, moves to an appropriate exposed area of the host’s body, and then bites.

It appears that this patient must have undressed near a nest of newly hatched tick larvae that were attracted to her clothing and attached themselves before transferring to her skin when she redressed. Ticks inject an anesthetic similar to lidocaine, which usually makes their bites painless. A tick may spend up to 24 hours on the host before biting and then feed for 2 hours to 7 days before dropping off. 8 After completion of a blood meal at 1 site, the larva typically drops to the ground where it molts to become a nymph. 3 The larval and nymphal stages are so small they often are not seen until they have fully engorged with blood. This may account for the patient not noticing the ticks until the fourth or fifth day of her infestation.

For most tick-borne diseases, it appears that the tick must remain attached for 24 to 48 hours before disease transmission occurs. 9 Among the 13 genera of *Ixodidae*, 3 are known to transmit disease to humans in the United States: *Amblyomma*, *Dermacentor*, and *Ixodes*. 7 All stages of *Amblyomma* except the egg are capable of transmitting disease. 2,3

*Amblyomma americanum* is the most common species of *Amblyomma* found in the United States. It is named...
the lone star tick due to the prominent white dot on the back of the adult female and is abundant in the south central and southeastern United States. *A. americanum* and *Amblyomma cajennense* ticks will feed on small or large mammals during any stage of their life cycle and are commonly found on white-tailed deer. They are known to transmit several human diseases including chlamidiosis (*Ehrlichia chaffensis*) in the mid-Atlantic, south central, southeastern, and western (California) states; tularemia (*Francisella tularensis*) in the southeastern and south central states; and, less commonly, Rocky Mountain spotted fever (*Rickettsia rickettsii*) and Q fever (*Coxiella burnetii*). *A. americanum* is a rare cause of tick paralysis. In the past several years, *A. americanum* has been shown to be the vector for an erythema migrans–like rash illness termed “southern tick-associated rash illness” (STARI) caused by *Borrelia lonestari*.

Ticks can also cause problems in the host without transmitting infection. Uncomplicated bites can be painful and leave a red puncture wound that takes 1 to 2 weeks to heal. Rarely, bites cause a delayed hypersensitivity reaction, with fever, pruritus, and urticaria. A granuloma can develop if a tick is removed improperly. Other reports describe prurigo lesions, skin hemorrhages, purpuric urticaria, diffuse dermatitis (papules, vesicles, and bullae), necrotic ulcers, and patchy alopecia. The severity of the skin reaction to tick feeding may depend on several variables, including duration of feeding, size of the mouthparts, type of tick secretions (eg, saliva or cement), changes in secretion during feeding, previous exposure of the host to the tick or related species, and allergic reactions of the host.

Only 3 other cases of primary infestation by *A. americanum* larvae have been reported. Two cases were in children and presented as asymptomatic clusters of small *Amblyomma* larvae on the neck, back, and scrotum. The third case was an adult woman who presented with multiple pruritic erythematous macules and plaques on the trunk and thighs with burrowed pinhead-sized organisms, similar to our case.

When patients present with attached ticks, removal may be difficult. Most authors recommend removal with blunt forceps (tweezers). The tick should be grasped close to the skin and steady pressure applied, pulling the tick straight out perpendicular to the skin. A twisting motion can cause the head to separate from the body and potentially remain in the bite wound. The area should be immediately cleansed with a disinfectant, according to some authors. Punch or shave biopsy is an alternative approach. After the tick is isolated, some authors recommend storing the arthropod at −20°C in the event that the patient develops a disease. Suffocating ticks with agents such as petrolatum, sun tan oil, or fingernail polish may take several hours to cause the tick to withdraw, allowing more time for possible pathogen transmission. Burning the tick with a match or other hot devices should be avoided because this might cause the tick to regurgitate thus increasing the risk of transmitting disease. Several commercial tick removal tools are available to consumers. These include Tick Nipper (Sawyer Products, Tampa, Fla), Pro-Tick Remedy (SCS Ltd, Lake Ariel, Pa), and Tickled Off (Tickled Off Inc, Dover, NH). In a study comparing these 3 tools with tweezers, it was found that all of these tools were more effective than tweezers in removing nymph-stage ticks.

There are no data to indicate that prophylactic treatment with antibiotics after a tick bite reduces the risk of disease transmission in all cases. A recent randomized trial showed that a single 200-mg dose of doxycycline administered within 72 hours after a recognized *Ixodes scapularis* bite had an efficacy of 87% in preventing erythema migrans. The number needed to treat to prevent 1 case of erythema migrans was 36 among people with any *I. scapularis* bite and 12 among people with bites from engorged nymphal *I. scapularis*. The possible effects of prophylactic treatment on other infections transmitted by deer ticks and on strains of *Borrelia* in Europe and Asia, as well as its use to prevent Lyme disease in children, have not been evaluated. Because of the low cost, safety, simplicity, and efficacy, some authors argue that a single dose of doxycycline is recommended for adults who live in areas where Lyme disease is endemic and who seek treatment for a bite from an engorged *I. scapularis*. These same authors state that bites from *Dermacentor variabilis* and *A. americanum* do not require prophylactic treatment. Testing for the presence of antibodies against tick-borne bacteria at presentation and at 3 to 6 weeks and treating if there is clinical or serologic evidence of infection is not recommended because of the low sensitivity, low positive predictive value, and the cost of the tests. Clinicians must observe and treat only if a disease occurs.

Tick bites are best prevented by avoiding tick-infested areas. When this is not possible, tick bites may be prevented by wearing long pants that are tucked into boots. In addition, the application of a topical DEET (N,N-diethyl-m-toluamide) repellent to exposed skin and treatment of clothing with permethrin can prevent tick bites. This system is currently used by the US Army and numerous armies throughout the world to protect their soldiers. It produces nearly 100% protection. When used alone, DEET provides greater than 90% protection for up to 2.7 hours against *A. americanum*. The optimal concentration of DEET to use for maximum protection is 15% to 33%. Its efficacy plateaus at a concentration of 30%, which is the maximum concentration currently recommended for infants and children. Treating clothing with permethrin can be accomplished through a pressurized spray formulation (Duranon; Sawyer Products/Clouston, Tampa, Fla), Sawyers [Sawyer Products], Repel Permanone [Spectrum Brands, St Louis, Mo]) or via impregnation. It can be used in any age group and remains effective for several weeks and through several weekly washings. When used alone, permethrin-treated clothing kills or disables 79% to 100% of *A. americanum* ticks for up to several hours.

In conclusion, ticks are the second most common vector of human infectious disease in the world. In addition to their role as a disease vector, ticks can also produce primary skin disorders. The 6-legged larvae can also bite, which may make a correct diagnosis difficult if the clinician is not aware of the development of ticks from this 6-legged organism to the adult with 8 legs. The patient described in this report was a diagnostic challenge.
because of the unusually large number of bites and larvae present on her skin and the vesicular reaction that ensued. Recognition of lone star tick larvae as a cause of pruritic papules may be helpful in similar cases.

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REFERENCES