Case Report: Paederus Dermatitis in the Returning Traveler

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Abstract. Rash in the returned traveler can provide a diagnostic dilemma for clinicians, but a detailed history including epidemiologic exposures can allow prompt diagnosis of etiologies uncommon in the United States. One such disease is Paederus dermatitis, an irritant contact dermatitis related to exposure to the rove beetle characterized by bullous lesions with surrounding erythema. Although cases and outbreaks have commonly been reported throughout the world, they are rarely reported in travelers returning to the United States. Here, we describe a patient who presented to an academic medical center in Virginia after travel to Sierra Leone with clinical presentation including exposure history and histopathology consistent with Paederus dermatitis. Our patient's clinic course is described in detail including treatment. Usual treatment includes antihistamines, topical steroids, and oral antibiotics, particularly with antimicrobials with activity against *Pseudomonas* sp. In addition, this case suggests a potential role for oral steroids in the treatment of this condition but further investigation is required. This case demonstrates the importance of considering a patient's travel and exposure history, as well as having familiarity with disease processes common in other parts of the world that are rarely seen in the United States.

A 61-year-old female presented to an academic medical center in Virginia with a right lower extremity (RLE) rash after a recent trip to West Africa. She traveled to Liberia followed by Sierra Leone for 2 weeks in November to complete fieldwork for a children's outreach program. Two days after arriving in Sierra Leone, she developed multiple 2- to 3-cm blisters on her RLE. She reported finding several small insects on her shin 48 hours before this. She subsequently identified them (from example photographs) as rove beetles. In addition to vesicular lesions on her RLE, she experienced malaise but denied fevers or chills. While in Sierra Leone, she visited a physician and had laboratory work notable for a leukocytosis of 16.6×10^9 cells/L and an erythrocyte sedimentation rate (ESR) of 64 mm/hour. She was prescribed antihistamines and oral ciprofloxacin. Her initial RLE vesicles persisted, forming two large bullae. She also noted progressive confluent erythema, warmth, and tenderness to palpation surrounding the lesions. She returned to the United States and presented to our hospital 4 days after the lesions first appeared on her RLE as pictured (Figure 1A).

On arrival, her white blood cell count was 12.9×10^9 cells/L† and her ESR was elevated to 25 mm/hour.‡ She was started on IV meropenem and vancomycin. Blood cultures were obtained, which were without growth after 5 days. Fourth-generation HIV antibody/antigen testing, syphilis immunoglobulin G, Rocky Mountain spotted fever serology, *Strongyloides* antibody, and urine histoplasma and blastomycetes antigens were negative. A skin biopsy revealed intense epidermal spongiosis with serous vesicles, marked papillary dermal edema, and superficial-to-deep dermal perivascular and focally interstitial inflammatory infiltrate composed of lymphocytes and frequent eosinophils (Figure 2).

A periodic acid-Schiff stain was negative for fungal organisms and tissue bacterial, acid-fast bacilli, and fungal

cultures were all negative. Given the biopsy findings and her clinical presentation, she was diagnosed with Paederus dermatitis with surrounding cellulitis and was discharged on a 10-day course of doxycycline and levofloxacin with continued antihistamines.

At outpatient follow-up 16 days after appearance of her RLE rash, she reported resolution of surrounding erythema, warmth, and tenderness; however, the bullous lesions had ulcerated (Figure 1B). Given the persistence of the RLE lesion, she was started on topical corticosteroids. She experienced some improvement after the initiation of topical steroids but reported dramatic improvement and ultimately resolution of ulcerative lesions after receiving a short course of oral steroids given to her for right hip pain. At follow-up visit 14 weeks after initial presentation, ulcerative lesions had completely resolved with only a non-tender indentation with hypopigmentation remaining (Figure 1C).

Paederus dermatitis is an irritant contact dermatitis caused by exposure to rove beetles.^{1,2} Cases have been described in Africa, South America, and Asia,^{2–5} but there are limited descriptions of this condition in the United States. In the late 1990s, a unit of Marines was believed to have been exposed to an indigenous variant of the rove beetle and contracted Paederus dermatitis.⁶ A PubMed search for “(‘rove beetle’ AND dermatitis) OR (‘Dermatitis’ AND [‘Beetles’ OR linearis OR paederus]) OR dermatitis linearis OR Paederus dermatitis OR Whiplash dermatitis OR *latigazo*” filtered by English language produced 125 results with no other references to cases described in the United States. We believe this is likely the first reported case of Paederus dermatitis in a domestic U.S. hospital.

The causative toxin, pederin, protects the beetle against predators and resides within the beetle's hemolymph, the equivalent of blood in most invertebrates. Pederin is produced by symbiotic gram-negative organisms, including species of *Pseudomonas* closely related to *Pseudomonas aeruginosa*.² Exposure to pederin toxin occurs via direct contact with

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The material contained within has not and will not be offered elsewhere for possible publication, as long as it is under AJTMH consideration.

† Reference range 3.9–11.7 $\times 10^9$ cells/L.

‡ Reference range < 20 mm/hour.

FIGURE 1. Images of affected right lower extremity. (A) Initial presentation, (B) after 16 days, and (C) after 4 months with notable hypopigmentation with surrounding hyperpigmentation. This figure appears in color at www.ajtmh.org.

beetle secretions, usually via vigorous brushing or crushing of the beetle on the skin. Patients will subsequently develop a rash at the site of inoculation an average of 12–72 hours after initial exposure.^{2,7} The rash typically presents as linear vesicles that form over several days, which progress into bullae.⁶ The distribution is often in areas of exposed skin with most common locations involved being the face, neck, arms, and lower extremities.^{8,9} Lesions may be associated with burning, pruritus, and pain, and the surrounding skin often appears erythematous.⁸ Lesions persist for an average of 7–15 days⁷ with most patients experiencing complete resolution within 2–3 weeks.⁶ As was seen in our patient, some patients will have persistent hyper- or hypopigmented macules at the site of prior bullae, which was present for 4 months after exposure in some cases.³

The differential diagnosis for bullous lesions in a returning traveler includes phytophotodermatitis, allergic contact dermatitis, bullous impetigo, and blister beetle dermatoses including, *Paederus* dermatitis. Diagnosis of *Paederus* dermatitis is usually made based on clinical presentation and epidemiologic exposure. Our patient reported exposure to the rove beetle, a beetle endemic to the region in Sierra Leone where she traveled. Rove beetles are most active following the rainy season of an area of endemicity and, therefore, outbreaks of *Paederus* dermatitis typically occur following that period.² In Sierra Leone, the rainy season occurs between

FIGURE 2. Rove beetle—*Paederus littoralis*—a related species from Portugal. Photo courtesy of www.entomart.be. This figure appears in color at www.ajtmh.org.

May and November. As a result, the rove beetle populations peak November through December and are also more prevalent in El Niño.¹⁰ Although more than 600 species of *Paederus* exist, *Paederus sabaeus* (also known as the Nairobi fly; see Figure 2) is the most common species in Sierra Leone¹ and is thought to produce a more potent toxin which may be associated with more severe symptoms such as formation of large bullae.² A possible mimicker of *Paederus* dermatitis is another blister beetle dermatoses associated with the *Meloidae* family. *Meloidae* beetles are also found in Sierra Leone and cause blister beetle dermatitis similarly associated with a linear vesicular rash that occurs within 24 hours of contact.¹ However, symptoms from this blister beetle dermatitis are usually less severe than *Paederus* dermatitis.¹ In addition, symptoms are caused by exposure to the chemical cantharidin, which can occur within several hours of exposure, compared with 12–72 hours with pederin toxin.¹¹ Finally, the beetles have characteristically different appearances which can help distinguish between the two clinical entities.

Unlike blister beetle dermatitis from *Meloidae* beetles, *Paederus* dermatitis is characterized by a more severe clinical course. In addition to more severe skin lesions, systemic manifestations are possible. Our patient demonstrated signs of systemic inflammation as evidenced by her reported malaise, notable leukocytosis, and elevated ESR. Although atypical, there have been reports of severe cases being associated with signs of systemic inflammation including reported constitutional symptoms, neuralgias, and arthralgias.¹² Ocular manifestations, such as periorbital dermatitis and keratoconjunctivitis, have also been documented with pederin exposure to the eyes.¹³

Although not required for diagnosis, skin biopsy results may provide further support for *Paederus* dermatitis. Prior histopathological examination shows variation in appearance depending on duration lesions are present. Biopsy of early lesions typically reveals spongiosis and neutrophil exocytosis, whereas more advanced lesions showed intraepidermal vesicles, epidermal necrosis, and dermal edema with perivascular mixed inflammatory infiltrate.⁹ Our patient's biopsy suggested that she was transitioning between the early and later stages as she had spongiosis with serous vesicles, dermal edema, and mixed perivascular inflammatory infiltrates (Figure 3). Our patient's inflammatory infiltrates were predominantly eosinophils, and although eosinophils are not always present, this finding has previously been described.¹²

Although no large randomized controlled trials exist to guide therapy for *Paederus* dermatitis, the treatment of this condition per case series and animal models includes both anti-inflammatories and antimicrobials. An animal model study of guinea pigs found that prompt washing of the affected area along with antipruritics is the preferred therapy for *Paederus* dermatitis.⁶ In particular, this study compared topical fluocinolone cream with potassium permanganate solution, finding superiority of the later regimen.⁷ In addition, an observational study of 50 individuals in Sierra Leone demonstrated statistically significant reduction in symptom duration with 500 mg ciprofloxacin twice daily.² It is hypothesized that bullous lesions are associated with concurrent bacterial infections, particularly with symbiotic bacteria found in the beetle, such as *Pseudomonas* sp.⁶ Given disruption in the protective skin barrier, superinfection with bacteria frequently responsible for skin and soft tissue infections, such as *Streptococcus* sp. and

FIGURE 3. Biopsy of right lower extremity; note eosinophilic (E) and lymphocytic (L) infiltrate ($\times 100$ magnification). This figure appears in color at www.ajtmh.org.

Staphylococcus aureus, may also occur and, therefore, help guide antimicrobial therapy. Our patient's erythema had progressed while on ciprofloxacin; therefore, we opted to cover for both gram-negative organisms associated with *Paederus* dermatitis, as well as methicillin-resistant *Staphylococcus aureus* and *Streptococcus* sp. One unique feature to the case described is that our patient reported dramatic improvement after a course of oral steroids; this has not previously been described in the literature. It is possible that early use of systemic steroids may lead to earlier resolution of symptoms and potentially prevent disfigurement of the affected area, but further investigation is required.

Although rarely reported in returning travelers, *Paederus* dermatitis should be considered in patients with the appropriate epidemiologic exposure history and clinical features. Lesions typically progress from vesicular to bullous and may be associated with discomfort and surrounding cellulitis. Although data on treatment are limited, topical and potentially systemic steroids should be considered along with antimicrobial agents with coverage for gram negatives, including *Pseudomonas* sp. and possibly *Streptococcus* sp. and *Staphylococcus* sp.

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REFERENCES

1. Mullen GR, Durden LA, Mullen G, 2002. *Medical and Veterinary Entomology*. Burlington, NJ: Academic Press. ProQuest ebrary. February 24, 2017.
2. Qadir SN, Raza N, Rahman SB, 2006. *Paederus* dermatitis in Sierra Leone. *Dermatol Online J* 12: 9.
3. Mammino JJ, 2011. *Paederus* dermatitis: an outbreak on a medical mission boat in the amazon. *J Clin Aesthet Dermatol* 4: 44–46.
4. Yasri S, Wiwanitkit V, 2014. *Paederus* dermatitis. *J Coast Life Med* 2: 124.
5. Coondoo A, Nandy J, 2013. *Paederus* dermatitis: an outbreak, increasing incidence or changing seasonal pattern? *Indian J Dermatol* 58: 410.
6. Claborn DM, Polo JM, Olson PE, Earhart KC, Sherman SS, 1999. Staphylinid (rove) beetle dermatitis outbreak in the American southwest? *Mil Med* 164: 209–213.
7. Fakoorziba MR, Eghbal F, Azizi K, Moemenbellah-Fard MD, 2011. Treatment outcome of *Paederus* dermatitis due to rove beetles (Coleoptera: Staphylinidae) on guinea pigs. *Trop Biomed* 28: 418–424.
8. Uzunoglu E, Oguz ID, Kir B, Akdemir C, 2017. Clinical and epidemiological features of *Paederus* dermatitis among nut farm workers in Turkey. *Am J Trop Med Hyg* 96: 483–487.
9. Cáceres L, Suarez JA, Jackman C, Galbster A, Miranda R, Murgas I, Pascale J, Sosa N, Rodriguez-Morales AJ, 2017. Dermatitis due to *paederus colombinus*: report of an epidemic outbreak of 68 cases in the province of Darien, Panama. *Cureus* 9: e1158.
10. Van Schayk IMCJ, Agwanda RO, Githure JI, Beier JC, Knols BGJ, 2005. El Niño causes dramatic outbreak of *Paederus* dermatitis in east Africa. Low PS, ed. *Climate Change and Africa*. Cambridge, United Kingdom: Cambridge University Press, 240–249.
11. Nicholls D, Christmas T, Greig D, 1990. Oedemerid blister beetle dermatosis: a review. *J Am Acad Dermatol* 22: 815–819.
12. Borroni G, Brazzelli V, Rosso R, Pavan M, 1991. *Paederus fuscipes* dermatitis: a histopathological study. *Am J Dermatopathol* 13: 467–474.
13. Poole TR, 1998. Blister beetle periorbital dermatitis and keratoconjunctivitis in Tanzania. *Eye (Lond)* 12: 883–885.