

Linear Neutrophilic Dermatitis: A Seasonal Outbreak of *Paederus* Dermatitis in Upper Egypt

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Practice Points

- Seasonal outbreaks of dermatitis can occur in certain geographic locations due to accidental exposure to various insects.
- Irritant dermatitis caused by exposure to insects such as the *Paederus* beetle can resolve easily after topical application of moderate-potency steroids.

In this retrospective study, we investigated a mysterious acute linear eruption that was reported yearly in 300 Egyptian patients, with peaks in June and September, without a clear diagnosis. The lesions evolved suddenly in all patients and presented as an erythematous linear eruption with a grayish center and vesicles and/or pustules located in the middle of the plaques. Only areas that were not covered by clothing were affected. Microscopic examination of skin biopsies revealed striking neutrophilic spongiotic lacunae within a degenerated epidermis and moderate dermal infiltrate. After excluding other possible differential diagnoses associated with linear lesions, the Paederus beetle was concluded to be the initiator of this irritant dermatitis reaction. An outbreak of acute linear neutrophilic dermatitis may develop due to exposure to the Paederus beetle with no sex or age predilections.

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A wide spectrum of potential diagnoses should be considered with the development of linear lesions on the skin, including Köbner phenomenon, developmental lesions, blood or lymph vessel-related lesions, nerve-related lesions, and lesions induced by contact with exogenous agents.¹ We evaluated patients in Upper Egypt who presented with acute, erythematous, linear lesions over 6 years without a clear diagnosis. This unexplained outbreak was coined *herpes linearis* by many local physicians because of its clinical resemblance to herpetic viral infections with a vesicular eruption on erythematous skin in a characteristic linear pattern. We sought to determine the cause of this previously unexplained condition with a retrospective study.

Methods

This retrospective study included 300 patients who presented to dermatology clinics in Minia, a province in Upper Egypt, over 6 years (January 2003 to December 2008) with a sudden eruption of unexplained linear lesions. Personal data and complete medical history were collected for each patient from 4 clinics. Patients provided informed consent. Clinical photographs of the lesions were taken along with a biopsy in accepted patients (30 patients)(ie, patients who accepted and did not refuse the biopsy surgery). The biopsy specimen from a relatively new, evolving vesicle at the center of the lesion was stained with hematoxylin and eosin and examined

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using light microscopy. In patients who underwent biopsies, the eruption had developed in 1 to 3 days.

Reassurance was informed to the sometimes panicked patients due to facial disfigurement and treatment with moderate-potency topical steroids and antibiotic cream was initiated, as contact insult was believed to be the main cause of the eruption. Patients were advised to avoid sun exposure. At 1-week follow-up, clinical photography was repeated and a shift to treatment with sunscreens and mild bleaching creams was initiated. Repeat clinical photography and evaluation was conducted again at follow-up 2 weeks later.

Results

The patients ranged in age from 10 to 66 years, with a mean (standard deviation) of 31.9 (13.30) years. Fifty-two percent of patients were female (156/300) and 48% were male (144/300). Lesions were acute in all patients and were discovered suddenly, either when waking up in the morning or following a burning sensation throughout the day. On presentation, linear lesions were erythematous and slightly edematous with a grayish center in a whiplash distribution. Vesicles and sometimes pustules were present toward the center of the plaques.

Lesions appeared on areas that were not covered by clothing, such as the face (102/300 [34%]), neck (138/300 [46%]), upper and lower limbs (24/300 [8%] and 6/300 [2%], respectively), and sometimes the trunk (30/300 [10%])(Figures 1 and 2). Fitzpatrick skin types ranged from III to V, which is common in this geographic region. Forty-two percent (126/300) of patients resided in rural areas, while 58% (174/300) resided in urban areas. The lesions typically appeared from April to October, excluding the winter months from November to March, with greatest incidence in June (60/300 [20%]) and September (114/300 [38%])(Figure 3).

Examination of histopathologic samples revealed closed, spongiotic, intraepidermal lacunae studded with a moderate amount of neutrophils; degeneration of keratinocytes was a notable finding (Figure 4). Density of the upper and mid dermal infiltrate was moderate to severe in a perivascular pattern with lymphocytic and neutrophilic cells and occasionally eosinophils. In older lesions (patient delayed visit for a biopsy by a few days), hyperkeratosis and parakeratosis were detected in a moderately acanthotic epidermis with regressing lacunae (Figure 5).

All patients denied exposure to plants or outdoor activities, except for the daily routine of those patients residing in rural areas. Topical application of or exposure to perfumes or pomades also was denied in all cases. On clinical evaluation, all other possible



Figure 1. An acute, erythematous, slightly edematous lesion with a grayish center on the neck. Vesicles and pustules appear toward the center of the plaque.



Figure 2. A linear facial lesion with a grayish center in a whiplash distribution.

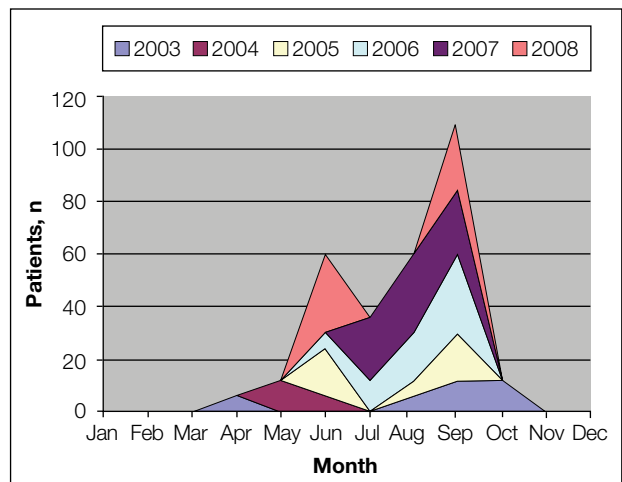


Figure 3. The number of patients presenting with linear eruptions from 2003 to 2008 (N=300). Outbreaks peaked in June and September.

differential diagnoses associated with linear lesions were excluded.

Some patients had observed and caught a small black insect in the surrounding area, which was

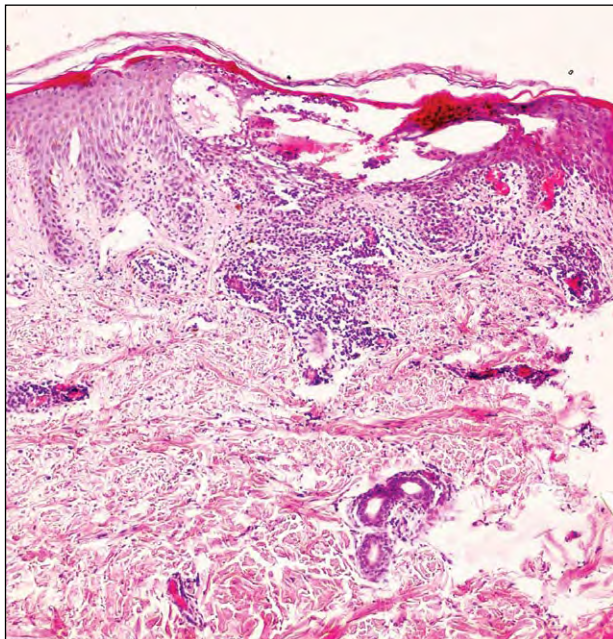


Figure 4. Histopathologic examination revealed closed intraepidermal lacunae within a spongiotic epidermis studded with a moderate amount of neutrophils (H&E, original magnification $\times 200$).

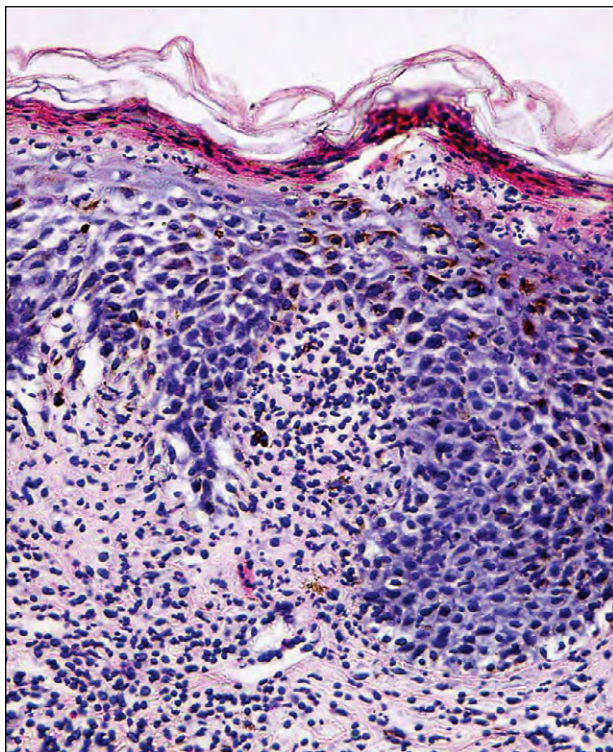


Figure 5. An older lesion (patient delayed visit for a biopsy by a few days) demonstrated hyperkeratosis and parakeratosis in a moderately acanthotic epidermis on histopathology. Neutrophils were abundant in the dermal papillae, resembling dermatitis herpetiformis (H&E, original magnification $\times 100$).



Figure 6. *Paederus alfieri* Koch (rove beetle).

examined and classified as a *Paederus* beetle (Figure 6). All patients denied voluntarily crushing the insect.

After 1 week of treatment, clinical inflammatory signs disappeared in all patients, leaving a slightly scaly, hyperpigmented, linear lesion. Pigmentation gradually resolved within a few weeks with the use of bleaching agents and sunscreens.

Comment

The development of linear lesions in all patients was suggestive of a contact element as the initiator of the disease. Phytophotodermatitis and plant contact dermatitis were the initial suspected diagnoses in all cases due to the affected areas and similarities in clinical presentation; however, many patients resided in urban areas and denied exposure to plants preceding the development of the lesions.

Other differential diagnoses included herpes simplex virus and herpes zoster due to the existence of vesicles grouped on erythematous skin, but the biopsy specimens did not show the characteristic ballooning degeneration of keratinocytes and other diagnostic clinical and/or pathological criteria to confirm either condition.

The seasonal nature of the outbreaks was suggestive of a natural insult with the possibility of insects. The *Paederus* beetles collected by some patients led to speculation of irritant contact dermatitis, especially based on reports of this condition in several other countries, including Nigeria,² Guinea,³ Turkey,⁴ Peru,⁵ and India.^{6,7} When asked, the majority of our patients could not confirm that they noticed the insect or felt its sting. None of them could correlate the eruption with exposure to or contact with the insect, and only 6% of patients could

not exclude or deny the possibility after noticing the peculiar and unusual small black insect.

The *Paederus* beetle (rove beetle) generally measures 0.5×4 to 0.5×7 mm and belongs to the genus *Paederus*, family Staphylinidae, order Coleoptera, and class Insecta, which includes more than 622 species worldwide.⁸ The insect has a black head, lower abdomen, and elytra (the structure covering the wings and first 3 abdominal segments), with a red thorax and upper abdomen.⁹ *Paederus* beetles are tropical insects that live in moist habitats, feed on debris, and increase and breed related to sugarcane fields and waste disposal areas.⁶ Although these insects can fly, they prefer to move on land and are extremely agile. The *Paederus* beetle has a characteristic habit of curling up its abdomen when it runs or is disturbed, which is quite distinctive and allows for immediate identification. Eggs are individually laid on a moist surface and typically develop from larvae to adults in 3 to 19 days.⁸ The insect's small size can explain why contact went unnoticed by the patients in this study, especially when the lesions were discovered in the morning.

In Egypt, the rove beetle, *Paederus alfieri* Koch, was reported as an active predator of several insects and pests, attacking a wide variety of cultivated plants such as maize, cotton, clover, and wheat.^{10,11} *Paederus* beetles are nocturnal and are attracted to incandescent and fluorescent light; as a result, they often inadvertently come into contact with humans.⁸ The night activity of the insect also may explain the discovery of lesions on waking up in the morning without recalling contact with the insect.

Lesions develop from the release of the vesicant pederin, which blocks mitosis at levels as low as 1 ng/mL by inhibiting protein and DNA synthesis without affecting RNA synthesis; acantholysis is probably caused by the release of epidermal proteases.⁸ Because the culprit is a beetle, no biting or stinging is suspected. Crushing the insect on the skin previously has been reported as essential for the irritants to act.^{4,7} This crushing was denied by all of our patients, and no remnants of the insects were detected on the surface of the skin. We speculate that insect crushing was not known because it happened while the patients were asleep or inadvertently occurred during the usual act of repelling insects, which then initiated the release of the irritant substance. Amazingly, this inflammatory reaction was artificially induced in patients with vitiligo by crushing the insects against the vitiliginous skin surface as an alternative treatment.¹²

The striking presence of neutrophils in the pathology of early lesions is a characteristic finding during initiation of the irritant dermatitis reaction.¹³

This finding clarified the nature of the eruption in our study, which we concluded as being irritant contact dermatitis toward the pederin released when crushing the insect. When neutrophils are abundant in the dermal papillae, pathology may resemble dermatitis herpetiformis (Figure 5); when neutrophils are within the spongiotic epidermis, pathology may resemble other diseases with neutrophilic spongiosis (Figure 4). Yet these other conditions can be excluded based on the clinical presentation.

A rash consisting of erythematous patches with numerous pustules arranged in a linear pattern previously has been reported in the literature as dermatitis artefacta among soldiers.¹⁴ A group of patients included in our study were military service soldiers based in a suburb near fields; due to the seasonal nature of the outbreak, we provided a diagnosis of *Paederus* dermatitis in these patients. Dermatitis artefacta is a common skin problem in barracks and should always be excluded, but reassessing the previous diagnosis also is possible.

In our study, the outbreak peaked in June and September each year; prior reports have noted 1 yearly peak in May and June.²⁻⁷ It was discovered that peasants in nearby countryside areas would stop irrigation and dry their fields completely together in June after harvesting wheat crops to prepare for the next cultivation cycle; this practice also was repeated in September after harvesting maize crops. After losing their moist environment, the insects leave the fields in search of other moist areas, possibly in urban areas, subsequently coming into contact with humans.

If patients notice the insect on their skin, they should not crush it or harshly remove it; instead they should gently move it onto a sheet of paper to be discarded before it releases its toxin.⁷ In locations where the *Paederus* beetle commonly is found, the use of window screens also should be encouraged, at least in the peak periods of outbreak of the disease.

Treatment with topical steroids was successful in resolving inflammatory reactions within 1 week of initiation, but subsequent hyperpigmentation was reported, which was expected in patients with Fitzpatrick skin types IV and V due to their ability to hyperpigment after any inflammation, and evolving hyperpigmentation was less notable in patients with more fair skin (eg, Fitzpatrick skin type III). Reports of hyperpigmentation were most frequent among patients with Fitzpatrick skin type IV, as hyperpigmentation was more apparent in these patients compared to patients with darker skin types. In all cases, bleaching agents and sunscreens effectively eliminated the disfigurement.

Although our study was limited to patients inhabiting one province in Upper Egypt, other outbreaks have been reported by dermatologists in southern Egypt as well as on the Egyptian delta (oral communication with several dermatologists, 2008). This outbreak of linear eruptions in patients in Egypt might be related to the normal infrequency of this tropical insect in Egypt's temperate environment year-round. Based on data collected by NASA (National Aeronautics and Space Administration), it is possible that tropical conditions resulting from global warming may have natural consequences in Egypt, such as the appearance and/or abundance of new insects with unique biologic effects.^{15,16} There are similar risks in other temperate and subtropical nations worldwide; therefore, physicians and other health care professionals should be aware of the possibility of tropical illnesses that may be new to a geographic area.

Conclusion

A seasonal outbreak of acute linear neutrophilic dermatitis on exposed skin with no sex or age predilection may develop due to contact with the tropical *Paederus* beetle. In our patients, the eruption peaked twice a year, predominantly in June and September. The effects of global warming on the Egyptian environment may be related to this outbreak of disease in Upper Egypt.

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