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ROVE BEETLE DERMATITIS – A CONCISE REVIEW

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ABSTRACT
Paederusdermatitis is a skin condition caused by some rove beetles resulting in severe and irritating painful lesions, blisters and intense itching. The distribution of this condition is seen in many parts of the world, it was first recorded by US troops. The exact pathogenesis and management is not clear. It is extremelycommon during harvesting season and in rural areas with deficit housing facilities and can be prevented through community public awareness in avoiding the muco-cutaneous exposure.Kissing ulcers, whiplash dermatitis and Nairobi eye are some of the features of this condition. The treatment part starts from the washing of exposed part, dressing with wet compress bandage with topical steroid and antibiotics.In this review article a concised epidemiological, clinical information of Paederus dermatitis with relative management is discussed.

Keywords: Rove Beetle, Blister Beetle, Paederus Dermatitis.

INTRODUCTION

Paederus dermatitis is an unusual, annoying contact dermatitis featured by sudden appearance of erythematobullous lesions on exposed areas of the body [1]. It is not due to the bite or sting of the insect, but it arises from the vesicating toxins found in the endolymph of Paederus beetles (Rove beetles). Paederus beetles belong to the class of Insecta, order of Coleoptera, family of Staphylinidae, subfamily of Paederinae, tribe of Paederini and finally, the subtribe of Paederina [2]. Out of over 622 species of Paederina (subtribe), it is recorded that about only 30 species are found to be associated with Paederus dermatitis and contain the toxin. The toxin from the beetle is called as pederin and is the most complex non-proteinaceous insect defensive secretion known. It is more potent than a Latrodectus spider venom. The synthesis of pederin is mostly related to the adult female beetles. The pederin gets released when the beetle is accidentally crushed on the skin. The toxin penetrates deeper into the skin as the action of scratching takes place. The beetles are mostly in the range of 7 to 13mm long and are not dull coloured,like most of the rove beetles. These Paederus species have an orange pronotum and orange basal segments of the abdomen, which contrast sharply with the often blue or green metallic elytra and brown or black coloration of the rest of the body [3].The Paederus species have their own nomenclatures, according to their country of origin [4]. The dermatitis acquired may be different for each individual with respect to their sex, age, race and environmental conditions. Exposed areas are severely involved with dermatitis. The affected areas show erythema, edema and a linear whiplash appearance. Appearing vesicles commonly turns into pustulates [5]. The signs appear as soon as from 24 to 48 hours of the initial contact and takes nearly a week to supress. The main complications include post inflammatory hyperpigmentation, secondary infections and extensive exfoliating, ulcerating dermatitis [6]. This SSM project describes about the paederus dermatitis, which is common in our locality.

The epidemiology, etiological agents, pathogenesis, clinical features and the management of paederus dermatitis are all reviewed in this project.

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Epidemiology

Paederus dermatitis is found in all zoogeographic regions across the world except in Antarctica but is more common in tropical and subtropical regions. Outbreaks have been reported mainly from the southern regions of Europe and Asia, and in other continents at lower latitudes. Sporadic cases are seen in any season when the insect is active, but large outbreaks occur particularly during the rainy months. An increase in the population of Paederus insects has been

NOMENCLATURE OF PAEDERUS SPECIES IN DIFFERENT COUNTRIES
West Africa : Nairobi Fly
Malaysia : SemutSemai/SemutKayap
Iran : Balaloos/Onion Fry/Dracula
Venezuela : Puri-puri/Tar-tari
Egypt : El-Rawagha/The Escaper
Brazil : Poto
Iraq : Phosphorus Insect

reported due to rains occurring as a result of the El Nino phenomenon in Peru and in East Africa especially in Kenya and Northern Tanzania in 1997-1998. A large outbreak of Paederus dermatitis in Australia that forced the evacuation of an entire Australian Aboriginal community in response to the outbreak was also reported in 1996. Banney et al. reported a large series of about 250 cases in a period of several weeks in Queensland [7].Specifically in Malaysia, the history of outbreak epidemiology started when in 1993, Mokhtar N et al reported paederus dermatitis among medical students in USM, Kelantan, Malaysia. In September 2002, an epidemic of dermatitis linearis caused by rove beetles affected thousands of high rise flat dwellers and dormitory students in Penang, Malaysia. In March 2009, the second outbreak of rove beetle dermatitis in Penang state, Malaysia. A study found that dispersal of the Paederus species occurred mainly during rice harvesting, plowing and straw burning due to destruction of habitat and non-availability of food. After an initial migration to non-harvested areas the Paederus species then spread to residential areas at dusk [8]. Another interesting fact to note down is that the nomenclatures of the Paederus species varies accordingly to different countries [4]. Table 1 lists down some of the nomenclature examples of Paederus species in different countries.

Table 1: Nomenclature of Paederus Species in Different Countries

Etiopathogenesis

Paederus beetles (Rove beetles) that causespaederus dermatitis, neither bites or stings. They cause irritation and blisters when crushed against the skin. Pederin is the effective substance/toxin released after the insect has been crushed, smeared against skin and it eventually results in a characteristically linear lesion [9]. The toxin may be transferred to the periocular region and genitals if an individual touches these areas after crushing the beetle. These toxins are restored in the hemolymph and transferred to the developmental stages through the contaminated eggs [10]. Pederin is believed to have anti-tumor, antiviral properties and it causes a release of epidermal proteases and a loss of intercellular connection, inhibiting protein synthesis, DNA synthesis, and mitosis [11]. There are expressions of CD3, CCR4, and CCR10 on cells present in the paederus dermatitis lesion and these actually could indicate that the T-lymphocytes are recruited to the site of inflammation by chemokine–chemokine receptor interactions [12]. The beetles that carries the toxin pederin, causes contraction, pyknosis and disorientation of the chromosomes,karyorrhexis, karyopyknosis and vacuolization that eventually leads to cutaneous necrosis [13].However, there is a wide variation in the pederin content of various beetles. Only females possessing the endosymbiotic bacteria can manufacture pederin and may contain up to 20 μg of pederin whereas males and females without endosymbiotic bacteria (aposymbiotic females) may possess only a very small quantity of the toxin (0.1–1.5 μg) but are not capable of biosynthesizing it [14].

Clinical Features

Usually the person/patient who had been in contact with the beetle or it's toxin does not realise it until he/she develops a rash in a few hours to two days. Paederus dermatitis clinically manifests as lesions and vesicles on an erythematous base, whereby the lesions with a linear arrangement becomes pustules [15]. They are called the 'kissing lesions'. When the blisters dry out in a week time, these vesicles and bullae

follows into a squamous stage and eventually leaves a hyperpigmented patches when they desquamate [16]. The formation of scar is quite rare and it is usually the final clinical result of severe tissue damage or a bacterial superinfection. These manifestations are accompanied by a burning sensation, stinging and pain or more rarely, by pruritus. The whole process heals spontaneously within 1-3 weeks [17]. Sometimes, patient might unknowingly spread the pederin to other parts of the body like the face,genitals and if the periorbital area is involved, conjunctivitis may develop (referred to 'Nairobi eye' in eastern Africa)(AOCD, 2019). Pain and lacrimation are nearly immediate, followed by progressively worsening erythema and edema. The clinical presentation is that of a unilateral periorbital dermatitis with or without keratoconjunctivitis. Intense conjunctivitis and keratitis can produce temporary blindness. Kissing lesions of the eyelid are not uncommon. However, in a series of 146 cases of periorbital dermatitis described by Hashish, posterior segment complications were absent and no patient developed permanent visual disability [19].

Picture 1: Erythematous lesion studded with many micropustules (Neck) [20]

Picture 2: Periorbital involvement (Spread of pederin) [21]

Investigations

Paederus dermatitis can be diagnosed based on these distinguishing features [22]

- Irritation confined to exposed areas
- Kissing lesions
- Occurrence during rainy/warm season
- Other individuals presenting with similar lesions
- Histopathology

Clinically, in a skin biopsy of a patient with paederus dermatitis, early lesion will highlight neutrophilicspongiosis, vesiculation and reticular necrosis of the epidermis. There would be high content of neutrophils in the inflammatory infiltrate (epidermis) [23]. The later biopsies will show irregular acanthosis, pallor of superficial keratinocytes, overlying parakeratosis, confluent epidermal necrosis, and suprabasalacantholysis [24]. Paederus dermatitis has many symptoms in common with other skin conditions, therefore, there is a very high chance for misdiagnosis. Differential diagnosis of this type of dermatitis include allergic contact dermatitis, blister beetle dermatitis, phytophotodermatitis, dermatitis herpetiformis, herpes simplex, herpes zoster, impetigo and arthropod bites as well as stings [25]. The two most common conditions in the differential diagnosis are blister beetle dermatitis and

phytophotodermatitis. Differences between these three conditions (including paederus dermatitis) are listed in the table below:-

Features	**Paederus Dermatitis**	**Phytophotodermatitis**	**Blister Beetle Dermatitis**
Cause	Toxin (Pederin) from rove beetles	Furocoumarins from plants of families Umbelliferae, Rutaceae and Moraceae	Cantharidin from blister beetles
Onset Of Lesion	24-72 hours after contact with toxin	12-36 hours after contact and exposure to UV light	18-24 hours after contact with toxin
Inflammation	Intense	Intense	Absent
Symptoms	Severe	Severe	Mild

Table 2: Differences Between Paederus Dermatitis, Blister Beetle Dermatitis &Phytophotodermatitis [26]

MANAGEMENT

When an individual realizes that the rove beetles had been accidentally crushed onto his/her skin, he/she should immediately wash the exposed area with a generous amount of cold water and soap. This can be followed by application of cold wet compresses, oral antihistamines (Examples: promethazine and diphenhydramine) and topical steroids (Examples :hydrocortisone, clobetasone, betamethasone) [27]. The wet compresses provides pain relief to the burning/itching by diluting the concentration of the toxin (released by the beetles). It has been reported in several studies that topical corticosteroids are effective in alleviating swelling and symptoms. They work in suppressing the histamine release and inhibiting the mast cell but eventhough the corticosteroids are an effective anti-inflammatory drugs, they do not provide immediate itch relief [28]. They require an association with antihistamines. Besides, tincture of iodine is also effective in destroying the toxin, however, it is applicable only if the reaction had not developed [29]. In cases including symptoms of headache, fever and nausea, non-steroidal anti-inflammatory medications as well as analgesics are suggested for general pain relief. Excessive itching or scratching of lesions may result in open wounds. Therefore, in severe cases antibiotics may be prescribed prophylactically to reduce the risk of secondary infection of dermal abrasions. With appropriate treatment, lesions usually resolve in a few days to a week, depending on the severity [14]. Moving on to the prevention part, there are few necessary measures that can be taken to avoid being

exposed to this type of beetles or infection. Primary prevention is by increasing public awareness on these types of dermatitis,rove beetles and their attraction to artificial lights. This is especially important during periods of known outbreaks such as the monsoon season. Any surrounding vegetation, preferably up to 50 m that may provide a haven for these beetles, must be cleared. In small areas of vegetation, deltamethrin dust may help reduce the beetle load [30]. Next, individuals can reduce their exposure to Paederus beetles by not sitting or standing directly under lights at night. In fact, sleeping near fluorescent lights even after they are switched off should also be avoided because that is the time when most of the contacts occur [31]. Rooms can be sprayed with insecticide which can also be used to spray the insects when seen.Use of mosquito nets which may or may not be treated with permethrin is useful to prevent fall of insects while sleeping. Changes such as closing doors and windows at night, removing vegetation immediately surrounding buildings, and sweeping away any dead beetles found indoors also lessen the odds of exposure [32].

CONCLUSION

Paederus dermatitis, caused by a casual contact with an insect, is actually an irritant dermatitis with unique clinical features. Paederus dermatitis cases in our country have shown a drastic increase over the years due to many factors like

increased usage of fluorescent lights and global warming. Deforestation has led to an increased contact of human beings with this otherwise innocuous insect. Proper education of the general population and increasing awareness can go a long way in curbing this disease which can sometimes cause significant morbidity .Use of preventive measures against the beetles along with prompt treatment reduces the complications and improves the quality of life for anyone who had contacted this type of dermatitis.

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