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General review

Tungiasis: A poorly documented tropical dermatosis

La tungose : une dermatose tropicale peu connue

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Abstract

Tungiasis is the parasitic skin disease caused by the sand flea *Tunga penetrans*, also called the jigger flea, found in most intertropical countries. The contamination occurs when walking barefoot in the sand: adult females actively burrow the foot epidermis leading to self-limited lesions responsible for itching or pain. The diagnosis is made on clinical observation and history of travelling to an endemic country. The simple treatment is surgical extraction of the flea.

Keywords: Jigger flea; *Tunga penetrans*; Tungiasis

Résumé

La tungose correspond à l'infestation cutanée par une puce chique, *Tunga penetrans*, présente dans la plupart des pays intertropicaux. L'homme se contamine en marchant pieds nus dans le sable : les femelles adultes creusent activement l'épiderme des pieds et sont à l'origine de lésions cutanées limitées responsables d'un prurit ou de douleurs. Le diagnostic repose sur l'inspection et la notion de voyage en zone d'endémie. Le traitement est simple et consiste à extraire la puce par énucléation.

Mots clés : Puce chique ; Tungose ; *Tunga penetrans*

1. Introduction

Tungiasis is a cutaneous infestation by a small hematophagous insect (*Tunga penetrans,* or jigger flea) after contact of the foot on sand or sandy soil containing gravid female fleas. The disease was first described in the XVI century, in Brazil Indians. The fleas could have been carried from Rio de Janeiro to Angola in 1872 by a ship, the *Thomas Mitchell*, which transported contaminated sand and passengers [1]. The parasite then spread to all of sub-Saharan Africa. *Tunga penetrans* may be responsible for massive infestations, sometimes complicated by bacterial superinfections in natives of low-income intertropical countries. It is a benign infection in travelers, but not well known for physicians managing cutaneous lesions on return from tropics. The objective of this review was to describe the various clinical presentations of tungiasis and to stress the benefit of an early management of the infection.

2. Epidemiology

Tungiasis is an exclusively tropical ectoparasitosis, imported from the New World. It is currently present in South and Central America, in the West-Indies (Haiti, Trinidad), in sub-Saharan Africa, and the Indian Ocean (Madagascar and the Seychelles). There are very sporadic cases in India and Pakistan (Fig. 1) [2].

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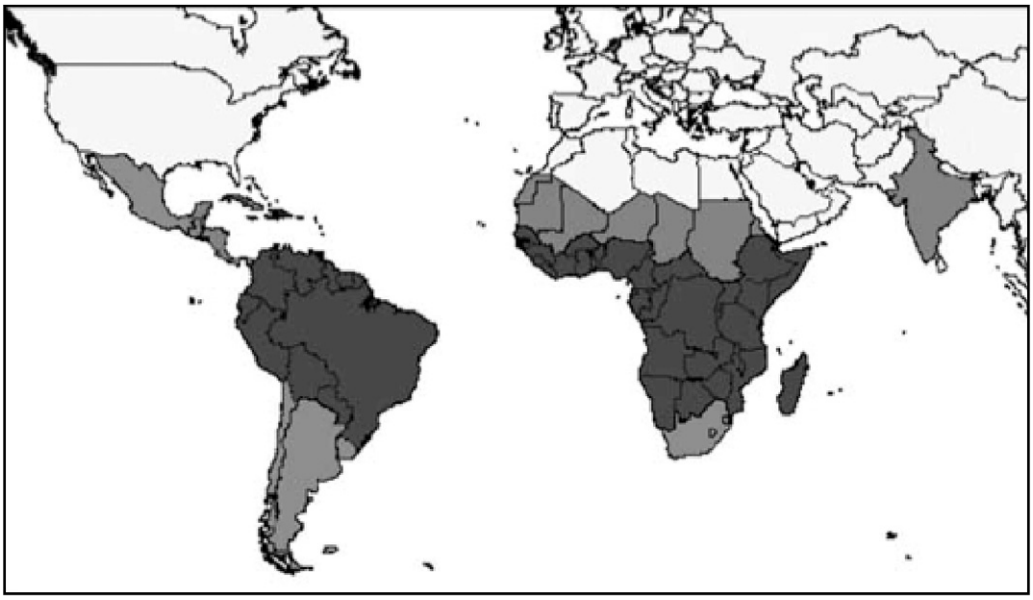

Fig. 1. Geographic distribution of tungiasis. The light gray zones correspond to countries with sporadic cases. The dark gray zones correspond to endemic countries. *Distribution géographique de la tungose. Les zones gris clair correspondent aux pays où les cas sont sporadiques. Les zones gris foncé correspondent aux pays d'endémie.*

The prevalence of tungiasis may reach more than 50% of the population in some hyperendemic zones, with often recurrent and sometimes massive parasitic infestations, responsible for superinfections and handicap. This makes it a serious healthcare issue for some low-income countries [3,4]. Poverty enhances the presence of animal reservoirs such as stray dogs and cats, pigs and rodents, and facilitates the spreading of the infectious agent [5,6]. Infections seem to be more frequent in the dry season when fruits, which fall on the sandy ground lure animals. It is a benign infection in travelers, but not well known for physicians dealing with the first-intention management of dermatoses on return from tropics, including dermatologists. Two studies, made with a ten-year interval in a specialized hospital service of Tropical Medicine, described the spectrum of dermatoses diagnosed on return from the tropics. Sixteen (6%) of the 260 patients in the first study presented with tungiasis and only seven (4%) of the 165 patients included in the second study [7,8]. These figures are probably not representative of tungiasis incidence in travelers since few of them require medical assistance and even less an infectious and tropical diseases specialist.

3. Pathogenic agent

Tunga penetrans (or *Sarcopsylla penetrans*) is a hematophagous insect, 1 mm long, and is one of the smallest fleas in the world (Fig. 2) [6]. Another species, *Tunga trimamillata*, recently described in Ecuador and Peru, can parasite humans while other species exclusively parasite wild animals [9]. Only the female flea becomes a parasite by encysting completely in the host's skin. Contamination is made by direct contact with the sandy soil on which fleas make small leaps up to 20 cm. They jump directly onto mammals (including humans) for their blood meal. The male and the non-fecundated female flea fall back to the ground and die while the gravid female digs into the epidermis with its mandibles, burrows headfirst between the epidermal *stratum corneum* and *stratum granulosum*, leaving the posterior part of its abdomen visible through an opening in the epidermal lesion. This opening allows the jigger flea to breathe, while permanently feeding on blood vessels of the dermis. The female flea becomes a whitish sphere 5 to 7 mm in diameter, due to the extreme distension of its abdomen, easily visible after the fifth day. It starts laying eggs after eight to 10 days and it goes on for three to four weeks. The eggs (ovoid, $300 \times 600\,\mu m$) are expulsed to the ground and the jigger flea dies leaving its shell in the contaminated

Fig. 2. *Tunga penetrans*.
Tunga penetrans.