Tungiasis Outbreak in Travelers From Madagascar

Sorya Belaz, Eugénie Gay, Florence Robert-Gangneux, Jean-Claude Beaucournu, Claude Guiguen

BRIEF COMMUNICATION

Tungiasis outbreak in travelers from Madagascar

Sorya Belaz [1,2], Eugénie Gay [2], Florence Robert-Gangneux [1,2], Jean-Claude Beaucournu [1], and Claude Guiguen [1,2]

[1] Laboratoire de Parasitologie et Zoologie appliquée, Faculté de Médecine, et Institut de Parasitologie de l'Ouest, Rennes, France

[2] Laboratoire de Parasitologie, Mycologie et Immunologie parasitaire, Centre Hospitalier Régional Universitaire, Rennes, France.

Running title: Tungiasis outbreak in travelers from Madagascar

Corresponding author:

Sorya Belaz,

Laboratoire de Parasitologie et Zoologie appliquée, Faculté de Médecine, et Institut de Parasitologie de l'Ouest

2 avenue du Professeur Léon Bernard

F-35043 Rennes cedex, France

E-Mail: sorya.belaz@univ-rennes1.fr

Abstract

Seven patients from a group of 16 travellers were diagnosed at our institution with one or more sand fleas on toes, 1 day to 3 weeks after coming back from Madagascar. A questionnaire was sent to the whole group to collect clinical and epidemiological information, 9/13 (69%) had received pre-travel medical advices, but none were aware of sand flea, thus prevention measures were rarely applied. 5/7(71%) wore open sandals all over the trip. Overall 10 sand fleas were extracted.

Tungiasis is an endemic neglected disease in numerous tropical countries[1], due to the penetration into the epidermis of a female sand flea laying its eggs. Although it is widespread in local population, it is rarely reported in travellers. A survey of 165 travellers coming back from tropics with dermatoses reported only 7 cases during 6 months of following up travellers[2]. Another study by Lederman et *al*. reported 31 diagnoses of tungiasis among 4742 dermatologic disorders diagnosed during a 10-year survey in worldwide travellers (in GeoSentinel database)[3]. We report here a serie of 7 tungiasis cases from a group of 16 French travellers coming back from Madagascar. Such grouped cases have been rarely described in travellers, so we investigated contamination factors in the whole group, and we recall the epidemiology of this ectoparasitose and prevention measures.

Case report

Sixteen travellers went backpacking for 14 days (3 nights in tents on the sand) along the Pangalanes Channel (provinces of Antananarivo, Toamasina and Fianaranlsoa, on the East Coast of Madagascar), from November 10th to November 24th, 2012. Their average age was 61, with an equal number of men and women (Table 1). We've been referred the first patient by his general practitioner one month after he returned home. He was complaining from two "painful masses" under his fifth toe (Figure 1) which had appeared as soon as he came back. Once he was diagnosed in our ward with tungiasis, he got in touch with his travelling companions: four of them came at our consultation to have medical advice. One female patient had noticed a warty lesion on her big toe that appeared as soon as she came back from Madagascar, and decided to treat herself with cryotherapy (considered as self-exploration in

table 1). After being alerted by her past travelling companion, she came to our ward for advice. Cryotherapy had indeed killed the flea, but the patient rather preferred the parasite to be extracted. After further examination, another subungual flea was found on her 5th toe. The three other patients who came to our ward reported painful toes 3 weeks after their return. All were diagnosed with tungiasis. Two patients with painless lesions did not wish to receive any medical treatment, and extracted the flea on their own. The pain depended on each patient since it's just after being contacted by the first patient that they came for advice. Each patient was examined in order to find other lesions. Fleas were extracted surgically, as described by Pradinaud et *al*.[1]. Overall, 10/12 fleas were extracted and identified by binocular examination as *Tunga penetrans*. The outcome was unremarkable, except for two patients who suffered from local infectious complication after extraction (one medical extraction in our ward and one self-extraction with cryotherapy), which was resolved within 7 days under daily antiseptic wash (Hibiscrub®). At the same time, we systematically checked the anti-*Tetanus* vaccination status of each patient.

A questionnaire was sent to all 16 travellers to investigate the occurrence of similar clinical signs in other person of the group and get information on prevention measures. Thirteen people filled the questionnaire (response rate 81%). The attack rate was 53.8% (7/13). It appeared that they walked rarely barefoot, except when swimming in Pangalanes Channel and when crossing rivers. Infected patients were more likely to wear open sandals (5/7, 71%) than healthy travellers (3/6, 50%) (Table 1). After clinical examination or from the questionnaire answers, it appeared that three patients (43%) had a single lesion (3rd, 5th toe and foot sole respectively); three patients (43%) had 2 lesions (1st and 5th toe for one patient, both 5th toes for two patients) and one patient (14%) had 3 lesions (5th toes) (Table 1). The mean number of fleas per patient was 1.7. Lesions were mainly observed on toes (11/12 fleas, 92%), and 41%

(5/12) of lesions were subungual. Clinical signs are described in Table 1. The mean time between end of travel and onset of symptoms (itch or pain) was 15 days.

Discussion

Tungiasis is caused by the burrowing into the patient's epidermis of a female *Tunga penetrans* (Siphonaptera) which only measures from 0.8 to 1 mm. In South America species diagnosis is necessary because other species than *T. penetrans*[4] can be found. Lesions are mainly located on feet, especially on toes (with a common subungual localization), and rarely reach the malleoli, probably because of the fleas' poor jumping ability. Most lesions observed in our patients were located on toes (11/12 fleas, 92%) and mainly on the 5th toe (9/12 fleas, 75%). This localization on the 5th toe is not typical, as Veraldi et *al*. [5] series of tungiasis, found this localization in only 1/19 travellers(1/25 fleas) but can be explained by the fact this toe often sticks out of flip-flops and sandals, as all patients with 5th toe lesion(s) did wear open sandals (data not shown).

Due to feeding and egg production, the flea's abdomen extends. This phenomenon leads to a whitish lesion, which measures from 5 to 7 mm, and is centered by a dark cutaneous roll corresponding to the insect's excrements (Figure 1). Females shed about thousands eggs over a 3- to 4-weeks period, after which they die. Eggs are visible to naked eyes[6]; and although none of our patients saw them, we did see them when we extracted the fleas. Egg laying starts within 8 to 10 days. Clinically, early pruritus (described by 5/7, 71% of our patients) is quickly followed by an inflammatory pain (also described by 5/7, 71% of our patients) (Table 1). These typical lesions do not have any classic differential diagnoses, but can be often unknown outside endemic areas, and can remain undiagnosed in travellers.

In our series, the free interval before the onset of symptoms seems longer (average 15 days, median 21 days) than usually described in other series. Caumes et *al.* [7] described a median interval of only 12 days. In another series of 9 cases in travellers back from Ethiopia, Grupper et *al.* [8] described an interval between contamination and the observation of visible lesion of 7 to 12 days. This longer interval observed in our series can be explained by the fact that most patients did not notice the lesion before the onset of symptoms.

T. penetrans was exclusively present in Central and South America, as well as in the Caribbean, until it was imported to Sub-Saharan Africa, apparently in the eighteenth century[6]. Tungiasis has not yet been established in Europe and USA, despite so many occasional records[9]. Since then, it spread across the region (especially during the nineteenth century) and finally reached Madagascar. From 1950 to 1960, indoor spraying campaigns targeting malaria vectors in Madagascar probably had an impact on reducing the importance of this parasite in the island. However, local populations still remain highly exposed to sand fleas, especially in districts with hog farms, since pigs are hosts for *T. penetrans* as well[10]. Two of the coastal zones along the Pangalanes Channel (visited by our travellers) are among the most infested areas with *T. penetrans*. The active period of the parasite peaks during the dry season[11], which lasts in Madagascar from May to November. Our patients were there in November at the end of the high risk season, which can explain the high attack rate.

Travellers usually have fewer sand fleas compared to local population, probably due to a shorter duration of exposure. Complications usually remain local, and mainly occur when patients manipulate their own lesions, as described by Veraldi et *al.*[5]. In our series, 2/4 (50%) patients who manipulated their lesions developed superinfection.

The pre-travel consultation allows to inform travellers about sand fleas (especially in case of travel in endemic areas during dry season). Nine patients (69%) benefited from a pre-travel medical advice but none of them have had advice about sand fleas (Table 1). The knowledge

of the disease enables a quick treatment, and helps avoiding complications. Personal prevention among travellers is achieved through wearing closed shoes but seems rather utopic in tropical zones. It also relies on frequent applications of diethyltoluamine-based skin repellents on feet, a prophylaxis which may be easier to follow, even in wet and warm areas. In the present report, most contaminated patients wore open shoes (5/7, 71%) and none used repellent on their feet (0/7, 0%) (Table 1). Some healthy travellers wore closed shoes (3/6, 50%) and one used repellent on his feet (1/6, 17%), but the comparison between infected and non-infected patients did not reveal statistically significant results, probably due to a lack of power.

Whether tungiasis is not an important burden in the whole population of travellers[2,3], it must be taken into consideration for backpackers who are particularly at risk in endemic areas. This report describes a large outbreak of tungiasis in travellers. Although Grupper et *al*. already described a similar outbreak (9 cases), we medically examined more patients (5/7 patients) and the interest of our study is that most travellers of the group (13/16), whether infected or not, responded to a questionnaire, so that hypotheses on contamination can be discussed. This report shows the importance of pre-travel medical consultation as an opportunity to inform travellers and provide prophylaxis counseling for stays in countries at risk.

Declaration of Interests

The authors state they have no conflicts of interest to declare.

References

1 Pradinaud R, Strobel M. La tungose ou puce chique. Concours méd 1985:3514-3516.

2 Ansart S, Perez L, Jaureguiberry S, et al. Spectrum of dermatoses in 165 travelers returning from the tropics with skin diseases. Am J Trop Med Hyg 2007; 76:184-186.

3 Lederman ER, Weld LH, Elyazar IR, et al. Dermatologic conditions of the ill returned traveler: An analysis from the geosentinel surveillance network. Int J Infect Dis 2008; 12:593-602.

4 Linardi PM, De Avelar DM, Filho EJ. Establishment of tunga trimamillata (siphonaptera: Tungidae) in brazil. Parasitol Res 2013; 112:3239-3242.

5 Veraldi S, Valsecchi M. Imported tungiasis: A report of 19 cases and review of the literature. Int J Dermatol 2007; 46:1061-1066.

6 Degeilh B, Beaucournu J. Chap 5 : Tungose. In: Chabasse D, Caumes E. Parasitoses et mycoses courantes de la peau et des phanères. Guides medi/Bio: France: Elsevier, 2003:55-63.

7 Caumes E, Carriere J, Guermonprez G, et al. Dermatoses associated with travel to tropical countries: A prospective study of the diagnosis and management of 269 patients presenting to a tropical disease unit. Clin Infect Dis 1995; 20:542-548.

8 Grupper M, Potasman I. Outbreak of tungiasis following a trip to ethiopia. Travel Med Infect Dis 2012; 10:220-223.

9 Linardi PM, Beaucournu JC, de Avelar DM, Belaz S. Notes on the genus tunga (siphonaptera: Tungidae) ii--neosomes, morphology, classification, and other taxonomic notes. Parasite 2014; 21:68-85.

10 Ratovonjato J, Randriambelosoa J, Robert V. Tunga penetrans (insecta, siphonaptera, tungidae) à madagascar: Une nuisance négligée. Revue Méd. Vét. 2008; 159:551-556.

11 Heukelbach J, Wilcke T, Harms G, Feldmeier H. Seasonal variation of tungiasis in an endemic community. Am J Trop Med Hyg 2005; 72:145-149.

Table 1: Demographic and clinical characteristics of the 13/16 responding travellers

	Travellers with sand flea(s) (N=7)	**Travellers without sand flea (N=6)**	**All (N=13)**
Mean age, y [min-max]	60.6 [55-67]	62.6 [60-65]	61.3 [55-67]
Sex, M/F	4/3	3/3	7/6
Pre travel advises, n/N (%)	4/7 (57%)	5/6 (83%)	9/13 (69%)
Advises on sand fleas	None	None	None
Use of skin repellent on feet, n/N (%)	None [a]	1/6 (17%)	1/13 (8%)
Walking barefoot, n/N (%)	7/7 (100%)	6/6 (100%)	13/13 (100%)
Wearing open sandals, n/N (%)	5/7 (71%)	3/6 (50%)	8/13 (62%)
Visiting hog farm	None	None	None
Contact with stray dogs	None	None	None
Skin lesions, n/N (%)			
1 lesion	3/7 (43%)	na	na
2 lesions	3/7 (43%)	na	na
3 lesions	1/7 (14%)	na	na
Clinical signs, n/N (%)			
Itch	5/7 (71%)	na	na
Pain	5/7 (71%)	na	na
Super infection	2/7 (29%)	na	na
Mean time return-lesions, days [min-max]	15 [0-21]	na	na
Self-exploration, n/N (%)	4/7 (57%)	na	na
Medical exploration, n/N (%)	5/7 (71%)	na	na

ns: non-significant, na: not applicable

[a] 4 travellers with sand fleas used repellent but not on feet

Figure 1: Single lesion of the right fifth toe. Typical 'mistletoe' centered lesion with a black ring