

CASE REPORT

Tungiasis: a highly neglected disease among neglected diseases. Case series from Nduta refugee camp (Tanzania)

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Abstract

Tungiasis is a highly prevalent yet neglected disease of populations affected by extreme poverty. It causes great discomfort and pain, leads to social stigmatization and, when left untreated, can cause serious complications. Although natural repellents have been shown to be effective, too little is being done in terms of systematic prevention and treatment. In addition, self-treatment (usually extraction of fleas with non-sterile sharp instruments) comports high risks of infection, notably with viral hepatitis and human immunodeficiency virus. In this article, we report seven severe cases of tungiasis in children living in a refugee camp in Tanzania, all of whom were treated with surgical extraction of the fleas because the topical treatment (dimethicone) was not available. Refugee camps—particularly in sub-Saharan Africa where tungiasis is endemic—should be considered high-risk areas for the condition. Aid organizations should engage in active case searching, and health promotion should be systematically carried out.

INTRODUCTION

Tungiasis is a parasitic skin disease caused by the sand flea *Tunga penetrans*. It is confined to resource-limited communities and has a high transmission rate due to poor housing and hygiene conditions, social neglect and inadequate health care. It is endemic to 88 countries worldwide and has reached epidemic proportions in sub-Saharan Africa, South America and the Caribbean [1]. One of the highest prevalence rates has been reported for northern Tanzania [2]. In endemic communities, there is a maximum prevalence in children between 5 and 14 years, followed by disabled and elderly people. Transmission is mostly seasonal, especially during the dry season.

Human beings acquire the infection by walking barefoot such that the fleas are usually found in the toes or under toenails, but penetration can occur in any part of the body. Lesions can be found at ectopic sites as far as the hands, elbows, neck, anus and genitals.

If left untreated, complications can occur, including secondary infections due to bacterial infections, such as *Staphylococcus aureus* or enterobacteria; anaerobic agents, such as *Peptostreptococcus spp* and *Clostridium spp*; lymphangitis; tetanus; and gangrene. Auto-amputation of digits or other extensive soft tissue debridement is also a possibility. Associated pain due to inflammation can be severe, especially when walking. Death from tetanus associated with tungiasis has been reported [3].

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Figure 1: Skin lesions in patients: feet toes.



Figure 2: Skin lesions in patients: foot with embedded fleas and zones of necrosis.

Many patients seek to extract the fleas with non-sterile sharp instruments, further exposing themselves to viral hepatitis and human immunodeficiency virus infection. Finally, social stigmatization—since the disease is known to be that of the ‘poor’—is an additional burden for patients.

Patient information

The Burundi refugee situation in Tanzania began in spring 2015, with a significant number of persons of concern arriving in Tanzania. New arrivals were relocated to Nyarugusu camp, which was already hosting 65 000 persons, mainly persons from Democratic Republic of Congo. Since it quickly reached full capacity, the Nduta camp (Kibondo district) was opened in October 2015. Two years later, the camp was hosting a population of 120 043 refugees, among whom 55% were children under 17 years. Médecins Sans Frontières (MSF) is the only health provider in Nduta offering primary and secondary care. The MSF project runs six health posts in the camp in addition to a hospital. A total of 7 pediatric patients aged 3–12 years presented with tungiasis at the MSF hospital between August and September 2017; all of them shared the following risk



Figure 3: Foot after surgical extraction.

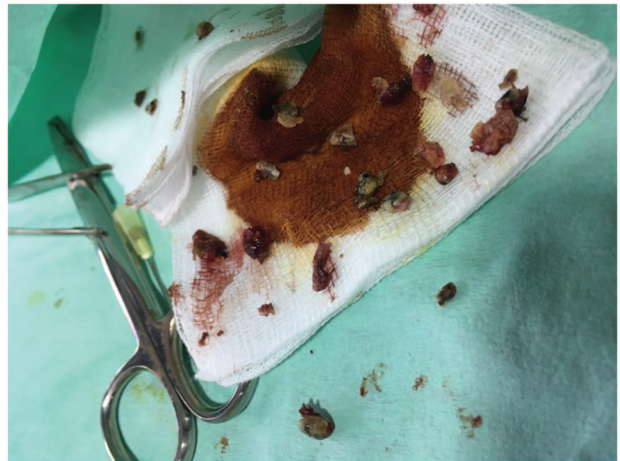


Figure 4: Eggs after surgical removal.

factors: poor hygiene (water shortage), poor housing conditions, uncemented floors and no mattresses to sleep on.

Diagnostic assessment

The diagnosis was purely clinical. The patients presented characteristic lesions: whitish nodules with a central black point sometimes covered by a black crust, zones of necrosis and pain (Figs 1 and 2). Patients had a high parasitic load (>100 lesions). As the lesions in our patients were very specific and typical, other differential diagnosis could easily be excluded, such as scabies, pyodermitis, abscesses, myiasis, foreign body reaction, plantar wart and cutaneous larva migrans.

Therapeutic intervention

All the patients were treated with surgical extraction under ketamine anesthesia (Figs 3 and 4), topic Vaseline, sterile gauze and paracetamol to manage pain. For Patients 1 and 2, we applied also silver sulfadiazine topical cream. Patients 1 and 3 were treated for the malnutrition, and Patient 3 was also treated with amoxiclav for the abscess. They had all received the tetanus vaccine. After surgical extraction, all the patients improved, they

Table 1: Clinical and epidemiological features of the patients

Patient	Gender	Age	Onset of symptoms	Affected body parts	Comorbidity	Days in-hospital stay
1	M	3 years	7 months	Feet, hands, scrotum, buttocks	Severe acute malnutrition	30 (need of caretaker)
2	M	12 years	7 months	Feet, hands		30 (need of caretaker)
3	M	7 years	1 year	Feet, hands, inguinal area	Severe acute malnutrition/Inguinal abscess	7 (treatment of malnutrition and the abscess)
4	M	8 years	4 months	Feet, hands, elbow, buttocks		3
5	M	5 years	4 months	Feet, hands		3
6	M	3 years	4 months	Feet, hands		3
7	M	8 years	1 year	Feet, hands		3

recovered function (normal walking) and the wounds healed quickly.

Following these cases, health promoters searched actively for other patients, but the rainy season in October would have naturally reduced infection acquisition.

DISCUSSION

The topical application of a mixture of two-component dimethicone with low viscosity is currently the best option for treating tungiasis [4]. However, dimethicone is not available in all endemic areas, probably due to the elevated cost. In resource-limited settings such as ours, treatment is usually limited to the surgical extraction of the whole flea and its eggs. Metrifonate, thiabendazole and ivermectin have all been tested as topical applications, but none have proved to be sufficiently effective [5]. Although oral ivermectin is effective against a wide range of ectoparasites, it did not show superior efficacy against placebo in a randomized controlled trial [4].

Epidermal parasitic skin conditions belong to the group of neglected diseases affecting the poorest populations, with tungiasis considered to be particularly neglected [6]. With tens of millions of people estimated to be suffering from the condition, there is an urgent need for research to evaluate and develop promising preventive interventions [7].

This report is one of the very few to look at tungiasis specifically in a refugee camp setting, whereas these are high-risk areas given poor housing and hygiene conditions. In 2005, Swaminathan *et al.* [8] reported four children with tungiasis in Australia, all of them were recently arrived from Central-East Africa and had cutaneous lesions on their feet—mainly on the toes, nail beds and interdigital spaces as our patients.

Measures such as closed shoes, bed mats, natural repellents and regular feet washing can keep the fleas at bay; however, the cost can be high and difficult to carry out in the camp.

In Nduta, most of the refugees wear open shoes or go barefoot; they have poor hygiene habits due to shortage of water in the camp. Because of the small size of the shelters, they do not have beds or mattresses to sleep on. We led a campaign on prevention measures and warning against non-sterile sharp instruments for flea removal.

In terms of prevention, the regular application of a repellent based on coconut oil effectively prevents *T. penetrans* from penetrating into the skin. Protection has been shown to vary between 86% and 100% in studies conducted respectively in Brazil and Madagascar [9, 10].

Tungiasis may cause severe disease and deformation in high-risk individuals and needs to be considered a major public health problem in endemic areas. Urgent action is needed to reduce the

severe morbidity caused by this parasitic disease in poor African communities, and aid organizations should be particularly vigilant in refugee camp settings.

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CONFLICT OF INTEREST STATEMENT

None declared.

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ETHICAL APPROVAL

This research fulfilled the exemption criteria set by the MSF Ethics Review Board for *a posteriori* analyses of routinely collected clinical data and thus did not require MSF ERB review. It was conducted with permission from Micaela Serafini, Medical Director, Operational Centre, Geneva Médecins Sans Frontières.

CONSENT

Informed patient consent for the photographs was obtained verbally from their parents.

GUARANTOR

Sandra Montserrat Nájera Villagrana.

REFERENCES

1. Feldmeier H, Heukelbach J, Ugbomoiko US, Sentongo E, Mbabazi P, von Samson-Himmelstjerna G, *et al.* Tungiasis—a neglected disease with many challenges for global public health. *PLoS Negl Trop Dis* 2014;**8**:e3133.
2. Girma M, Astatkie A, Asnake S. Prevalence and risk factors for tungiasis among children of Wensho district, southern Ethiopia. *BMC Infect Dis* 2018;**18**:456.

3. Heukelbach J, Eisele M, Jackson A, Feldmeier H. Topical treatment of tungiasis: a randomized, controlled trial. *Ann Trop Med Parasitol* 2003;**97**:743–9.
4. Thielecke M, Nordin P, Ngomi N, Feldmeier H. Treatment of tungiasis with dimethicone: a proof-of-principle study in rural Kenya. *PLoS Negl Trop Dis* 2014; **8**:e3058.
5. Feldmeier H, Sentongo E, Krantz I. Tungiasis (sand flea disease): a parasitic disease with particular challenges for public health. *Eur J Clin Microbiol Infect Dis* 2013; **32**:19–26.
6. Wiese S, Elson L, Feldmeier H. Tungiasis-related life quality impairment in children living in rural Kenya. *PLoS Negl Trop Dis* 2018;**12**.
7. Sweileh WM. Global output of research on epidermal parasitic skin diseases from 1967 to 2017. *Infect Dis Poverty* 2018;**7**:74.
8. Swaminathan A, Gosbell IB, Zwar NA, Douglas MW. Tungiasis in recently arrived African refugees. *Med J Aust* 2005;**183**:51–1.
9. Hotez PJ, Bottazzi ME, Franco-Paredes C, Ault SK, Periago MR. The neglected tropical diseases of Latin America and the Caribbean: a review of disease burden and distribution and a roadmap for control and elimination. *PLoS Negl Trop Dis* 2008;**2**:e300.
10. Elson L, Wright K, Swift J, Feldmeier H. Control of tungiasis in absence of a roadmap: grassroots and global approaches. *Trop Med Infect Dis* 2017;**2**:33.