CASE REPORT

Tungiasis: a case report and review of the literature

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ABSTRACT

Tungiasis is a cutaneous parasitic infection caused by the sand flea Tunga penetrans. This infection is endemic to Central and South America, the Caribbean, and sub-Saharan Africa.1-8 Tungiasis is prevalent in rural Central and South America, the Caribbean, and sub-Saharan Africa.1-8 The preferred habitats of T. penetrans are warm, dry environments with sandy soil and dust.4,6 In humans, tungiasis most commonly affects the feet and legs, especially the toes and subungual and periungual areas.1-3,5,6,8 The disease can be easily diagnosed on the basis of its characteristic clinical features and a travel history to endemic areas.1-3,5,6,8 We report a case of imported tungiasis and discuss its clinical features, diagnosis, histopathology, and treatment.

Introduction

Tungiasis is an invasion of the human skin by gravid female flea Tunga penetrans (also known as chigoe flea, sand flea, chigo, chica, jigger, pico, pique, and chique).1-8 Tungiasis is prevalent in rural Central and South America, the Caribbean, and sub-Saharan Africa.1-8 The preferred habitats of T. penetrans are warm, dry environments with sandy soil and dust.4,6 In humans, tungiasis most commonly affects the feet and legs, especially the toes and subungual and periungual areas.1-3,5,6,8 The disease can be easily diagnosed on the basis of its characteristic clinical features and a travel history to endemic areas.1-3,5,6,8 We report a case of imported tungiasis and discuss its clinical features, diagnosis, histopathology, and treatment.

Case report

The patient was a 60-year-old Chinese man from Brazil, who presented with two skin lesions on his left foot. The first lesion was an asymptomatic blackish nodule that had developed on the distal aspect of the left sole 1 month before his visit to our institute. The second lesion was a skin-colored papule that had developed on the medial aspect of the left heel 1 week before the visit. The patient was in good health and did not show constitutional symptoms. He had no history of trauma or contact with plants and animals. No other family member had the condition. A review of the patient’s history revealed a significant finding of the patient’s habitual barefoot wandering on the beaches of Rio de Janeiro. Physical examination revealed a dark-blue to black nodule (diameter, 0.5 cm) on the distal aspect of the left sole (Figure 1A) and a pale-yellow, dome-shaped papule (diameter, 0.3 cm) with a central black punctum on the medial aspect of the left heel (Figure 1B). Lymphadenopathy was not observed in his left inguinal area. We performed complete surgical resection of the two lesions. Hematoxylin and eosin staining of both lesions showed the presence of T. penetrans in the stratum corneum and infiltration of eosinophils, neutrophils, and lymphoplasma cells in the surrounding area. Biopsy of the first lesion showed collapsed carcass and degenerated ovaries (Figure 2A). The insect isolated from the second lesion had a thick outer cuticle and a prominent hypodermal layer; the insect’s head lay within the dermis, and its external orifice was in the corneal layer (Figures 2B and 2C). The insect cavity showed striated muscles and numerous internal organs, including the digestive tract, ring-form tracheae, and ovaries full of eggs at various stages of development (Figure 2D). Tooth-like spines were not visible in both sections. The signs and symptoms shown by the patient were consistent with those of tungiasis. After excision, no new lesions were detected during follow-up.

Discussion

Tungiasis is a cutaneous infestation caused by gravid female fleas that belong to the genus Tungia.1-8 Of the 10 known species of Tunga, T. penetrans and Tunga trimamillata are the only species that infect humans.1 Tunga penetrans is also known as sand flea, jigger flea, chigger, or chigoe in English; chique in French; sandfloh in German; and bicho de pé in Portuguese.1-4,6 Infection with T. penetrans first emerged in Central and South America in 1623 and...
later spread to Africa, Madagascar, and Asia.\textsuperscript{1,3,8} In the 21st century, infection with \textit{T. trimamillata} first emerged in Ecuador and Peru.\textsuperscript{1} Recently, infection with \textit{T. penetrans} has been largely prevalent in Latin America and sub-Saharan Africa.\textsuperscript{1–8} Most cases of tungiasis have been reported in people living in urban slums and areas with tropical or subtropical climate and loose, dry, or sandy soils, and in traditional fishing and rural communities.\textsuperscript{1,4} The high prevalence rates in these areas can be attributed to three sociocultural factors: the practice of walking barefoot or wearing only sandals, lack of personal and soil hygiene, and sharing space closely with domestic animals.\textsuperscript{1,2,4,6} Occasionally, cases of tungiasis imported to industrialized countries have been reported in tourists, missionaries, nongovernmental organization volunteers, or workers returning from endemic zones.\textsuperscript{1,3,6,8}

The insect’s life cycle lasts about 1 month and begins when the eggs expelled by the gravid female fall onto the ground. Larvae

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\caption{Skin lesions of tungiasis. (A) Dark-blue to blackish nodule (diameter, 0.5 cm) with a slight central depression on the distal aspect of the left sole. (B) Pale-yellow papule (diameter, 0.3 cm) with a black punctum on the medial aspect of the left heel.}
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\begin{figure}[h]
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\includegraphics[width=\textwidth]{figure2.png}
\caption{Skin biopsy of the two lesions. (A) Vertical section of the lesion showed in Figure 1A revealed collapsed carcass and degenerated ovaries (hematoxylin and eosin [H&E] staining; scanning view). (B) Vertical section of the lesion in Figure 1B showing the long axis of the flea. The flea was present within a pseudocavity in the stratum corneum, with its head and mouth (solid arrow) lying in the dermis. The flea had a thick cuticle (open arrow) and prominent hypodermal layer (solid arrowhead) (H&E; scanning view). (C) Vertical section of the lesion showed in Figure 1B revealed striated muscles (solid arrow) and external orifice of the insect (open arrow) in the keratin layer (H&E; scanning view). (D) Close view of Figure 2C shows internal organs within the insect cavity, including digestive tubes (solid arrows), tracheal rings (open arrows), and enlarged ovaries (solid arrowheads) containing eggs at various stages of development (H&E, 40×).}
\end{figure}
hatch from the eggs under suitable environments with loose and dry soil. The larvae pupate after burrowing into the soil. Adults hatch from the pupae, and both males and females feed on their warm-blooded host. Males die after fecundation, and only the mated females burrow into the epidermis of the host. The female parasite penetrates the epidermis, thrusts its head into the superficial dermis, and punctures blood vessels for nourishment. The parasite orients its posterior aspect toward the surface, with its external orifice in the keratin layer to aid breathing and to serve as a passage for the expulsion of eggs and excretion. After the growth of the ovaries, female fleas may grow up to 1 cm in size and may contain many fertilized eggs. The females expel about 100 eggs over a 2-week period and die, and are sloughed from the host’s skin.

Early symptoms of infestation are usually mild and, therefore, go unnoticed. itching intensifies and swelling develops as the female flea increases in volume. The affected individual also develops soreness or pain, which limits walking ability. The parasite preferentially infects the peri- and subungual folds of the toes, interdigital spaces, soles, and heels. Infection at other sites, including the hands, genitals, groin, face, elbows, wrists, breasts, back, thighs, knees, and legs, has also been reported in a few cases. Tungiasis is characterized by the development of single or multiple, white, gray, or yellowish papular or nodular lesions with brown-black-colored opening at the center and peripheral reddening. Affected individuals may also develop crusty, plantar wart-like, bullous, pustular, or ulcerative lesions. In cases of tungiasis, bacterial superinfections are the most common complications, and were observed in 29% of the patients in one study. Furthermore, the lesions can develop into septic ulcers or abscesses and may cause cellulitis, gangrene, phleagmon, thrombophlebitis, lymphangitis, or autoamputation of toes. The risk of tetanus should also be considered in affected individuals.

Generally, tungiasis is diagnosed on the basis of the typical morphology and location of the affected site and a history of inhabiting or visiting an endemic area. Tungiasis can be confirmed by microscopic analysis after the extirpation of the parasite from the nodule. Dermoscopy is also helpful for the diagnosis of tungiasis, especially for health workers in nonendemic countries, who may have difficulty in identifying the parasite because of the rarity of tungiasis cases in these areas. Under a handheld dermoscope, the parasites appear as pigmented, light brown to black rings with central pores. Clinical differential diagnosis of tungiasis includes warts, mycotic lesions, bacterial infections, foreign-body granulomas, subungual exostosis, early melanoma, tick bite, or furuncular myiasis. Histopathological examination showed hyperkeratosis, parakeratosis, and acanthosis. The body of the flea is surrounded by a pseudocystic cavity within the epidermis, whereas the head lies in the dermis. The flea has a thick cuticle with prominent hypodermic cells, branched tracheal rings, distended digestive tracts, and enlarged ovaries containing numerous eggs at various stages of development. In some cases, perilesional neutrophils, lymphocytes, and eosinophils have also been reported to be found. Histopathologic differential diagnoses include myiasis, scabies, infection with human flea, and tick bite. Larvae that cause myiasis and scabies mites have characteristic spines. Unlike the round head of T. penetrans, the human flea Pulex irritans has an angular head. The entire tick has been reported to be embedded in the skin in only a few cases.

The simplest therapy for tungiasis in uncomplicated cases is extraction of the parasite using a sterile needle. Extraction becomes difficult when the flea becomes engorged, and surgical excision is required in such cases. The patient should be treated with antibiotics if secondary infection is suspected. Topical antibiotics may be sufficient in most cases. Tetanus prophylaxis is indicated for travelers who have not received tetanus vaccine before travel. No standard drug therapy is available for tungiasis. In a randomized trial, metrifonate, thiabendazole, and topical ivermectin were reported to significantly reduce the number of lesions. Oral ivermectin has been reported to be effective in tungiasis treatment. Tungiasis can also heal spontaneously after the female parasite dies.

Infection can be prevented by wearing protective clothing, closed footwear, and socks. In addition, measures, such as spraying the ground with insecticides and sweeping floors, are necessary for the prevention of tungiasis. Our patient hailed from Brazil, which is an endemic area, and had a history of walking barefoot on the beach; he presented with a characteristic papule and nodule with a central black point on the sole. Microscopic examination confirmed the diagnosis of tungiasis. Excisional biopsy wounds healed well without complication, and no new lesion was detected before the patient’s return to Brazil.

Tungiasis is a significant problem in endemic areas. Although Taiwan is not an endemic area, travelers visiting endemic areas may import tungiasis into the country. Dermatologists should be aware of this condition, and tungiasis lesions should be promptly managed to reduce morbidity.

References