Am. J. Trop. Med. Hyg., 00(00), 2022, pp. 1–2
doi:10.4269/ajtmh.21-1215

Case Report: Gnathostomiasis Acquired in Costa Rica in a Returning Traveler to the United Kingdom

Anjaneya Bapat,[1]* Beatrice Nickel,[2,3] Timothy J. P. Bray,[4,5] Maaz Abbasi,[4] and Neil R. H. Stone[1]

[1]*Hospital for Tropical Diseases, University College London Hospitals NHS Foundation Trust, London, United Kingdom;* [2]*Swiss Tropical and Public Health Institute, Basel, Switzerland;* [3]*University of Basel, Basel, Switzerland;* [4]*Imaging Department, University College London Hospitals NHS Foundation Trust, London, United Kingdom;* [5]*Centre for Medical Imaging, University College London, London, United Kingdom*

Abstract. Gnathostomiasis, caused by infection with nematode parasites in the genus *Gnathostoma*, is endemic in tropical and temperate zones, and is classically associated with East and Southeast Asia and, more recently, Latin America and Africa. We report a case of gnathostomiasis acquired in Costa Rica, which has not previously been considered an endemic country. The patient had eosinophilia with migratory myalgia, and the diagnosis was made after serological testing. Full resolution of symptoms and eosinophilia followed treatment with ivermectin and albendazole. The diagnosis can be challenging to make because of variability in presentation, lack of access to diagnostics, and emerging knowledge of endemic areas. Increased awareness of this disease among clinicians is vital for faster diagnosis and better outcomes in afflicted patients.

INTRODUCTION

Gnathostomiasis is a parasitic infection caused by nematodes of the genus *Gnathostoma*. The disease has historically been associated with East and Southeast Asia.[1] In recent years, Latin America, particularly Mexico, has been recognized as an area of endemicity for the parasite, and there are increasingly case reports of disease from African countries not previously thought of as endemic.[2–5] Infection is acquired by ingesting raw or undercooked food infected with the third-stage larvae of the nematode. Typically, they are found in freshwater fish or another second-intermediate host such as frogs, chickens, or snakes.[6]

The cutaneous manifestation of gnathostomiasis is the most common form of the disease and is classically characterized by eosinophilia, intermittent migratory swelling, travel to an endemic region, and a history of consumption of raw food. If the larvae penetrate the viscera, then the consequences can be more severe. In the central nervous system, the larvae can cause hemorrhagic eosinophilic meningitis, which has a high mortality rate. Both albendazole and ivermectin are well-recognized, effective therapies, in some cases only after repeated treatment. We describe a case of gnathostomiasis after travel to Costa Rica.

CASE REPORT

A 22-year-old woman attended the Hospital for Tropical Diseases (HTD) outpatient service in London. She reported a 6-month history of fluctuating muscle pain, worst in the right calf but present in several muscle groups in the upper and lower limbs. She had recently returned from an 8-month trip to Costa Rica and Mexico. She had first traveled to Costa Rica for 6 months as a tourist and to volunteer in an animal sanctuary, and then to Mexico for 2 months as a tourist. She reported eating chicken, beef, and pork throughout her trip, but no seafood or freshwater fish. The onset of her symptoms occurred 3 months after starting her trip, while she was in southern Costa Rica on the Osa peninsula. She developed fevers, headaches, and nausea that resolved within 72 hours. A week after this febrile illness, her migratory muscle pain began, which persisted for the next 6 months.

At the HTD, she was found to have an eosinophil count of 2.05×10^9 eosinophils/L. A magnetic resonance image of her right leg showed a small signal abnormality between the medial and lateral heads of the right gastrocnemius muscle (Figure 1). Her serum was sent to the Diagnostic Center of the Swiss Tropical and Public Health Institute (Swiss TPH) Basel, Switzerland, for *Gnathostoma* serology. The performed screening immunoblot with an antigen of *Gnathostoma spinigerum* was positive. The antigen for the immunoblot was prepared from *Gnathostoma* third-stage larvae. Antigen preparation and immunoblotting was performed according to published protocols.[7,8]

The patient's eosinophilia resolved after a course of ivermectin (200 μg/kg orally for 2 days), but some symptoms persisted, necessitating retreatment with albendazole (400 mg twice a day orally for 21 days). After this second treatment, the patient was completely free of symptoms.

DISCUSSION

Gnathostomiasis is a rare but well-recognized diagnosis to make in travelers returning from Asia or Latin America to western Europe. The gold standard of diagnosis is retrieval of the worm itself or demonstrating the presence of *Gnathostoma* spp. larvae in tissue biopsies, but this is often not feasible because the larvae migrate and move in the tissue. Therefore, in most cases, diagnosis relies on a compatible clinical syndrome with travel history and serological testing for specific antibodies against *Gnathostoma* spp., which is offered only by a few specialized laboratories, such as the Diagnostic Center of Swiss TPH, Basel, Switzerland, and the Hospital for Tropical Diseases, Mahidol University, Bangkok, Thailand.

Notably, this case was acquired in Costa Rica. Although Central America, and Mexico in particular, are regions known to be endemic for *Gnathostoma binucleatum*, there are no reported cases from Costa Rica in the literature.[2] This may reflect underreporting and lack of access to diagnostics.

*Address correspondence to Anjaneya Bapat, Centre for Immunobiology, Blizard Institute, Barts and The London School of Medicine and Dentistry, London, E1 2AD, UK. E-mail: anjaneya.bapat@nhs.net

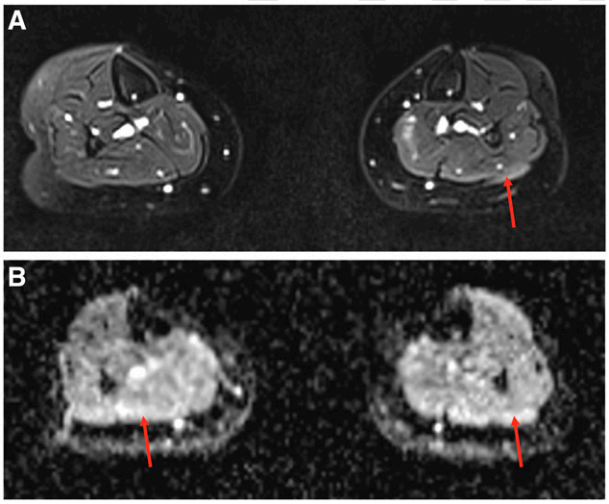

FIGURE 1. Magnetic resonance imaging signal abnormalities in lower limb muscles. (**A**) Short inversion time inversion recovery images and (**B**) apparent diffusion coefficient maps are shown. There are subtle areas of (**A**) hyperintensity and (**B**) increased diffusivity in the gastrocnemius muscles, closely related to the overlying fascia and indicative of inflammation, in both lower limbs (arrows).

A previous case series of gnathostomiasis at the HTD described 16 cases over a 12-month period, with none acquired in Central America and most having been acquired in Asia.[9]

Also of interest is the dietary history as reported by the patient. She was confident that she had not knowingly eaten any freshwater fish for the entirety of her trip because of her personal disinclination. She did report eating chicken, beef, and pork, but no other meat. The diagnosis of gnathostomiasis is most often associated with a history of consumption of raw or undercooked freshwater fish; however, ingestion of other undercooked second-intermediate hosts such as chickens or frogs can transmit gnathostomiasis the same way and should be included in the diagnostic assessment. Any animal that eats the infected first-intermediate host (or any intermediate paratenic host) can be a source of infection. This includes and is not limited to fish, eels, frogs, birds, and other reptiles.[3]

The primary challenge to diagnosis, in addition to the often long and intermittent history of unspecific symptoms with migratory swelling, is the lack of widespread availability of serological testing. Up to now, no commercial diagnostic test for gnathostomiasis is available, and only specialized laboratories offer this serology.

The Diagnostic Center of Swiss TPH routinely performs an in-house immunoblot with antigen from the most widely distributed species in Asia, *Gnathostoma spinigerum*, as a first screening test. If there is a travel history to Latin America and the immunoblot with *G. spinigerum* antigen is negative, then a second immunoblot with antigen from *G. binucleatum*, the New World *Gnathostoma* sp., is performed. Crude antigen for the immunoblots is prepared from third-stage larvae of the corresponding *Gnathostoma* sp. isolated from infected freshwater fish. Antigen preparation and immunoblotting are performed according to published protocols.[7,8]

Although the serum of the reported case of gnathostomiasis acquired in Costa Rica was positive on the first immunoblot with antigen from *G. spinigerum*, it has been reported that some serum samples from patients who acquired a *Gnathostoma* infection in the Americas did not show reactivity on *G. spinigerum*, but only on *G. binucleatum*, antigen.[10] The *Gnathostoma* immunoblot is reported to be 99% sensitive and 94% specific; however, cross-reactivity with other tissue helminths cannot be excluded completely.

In conclusion, gnathostomiasis can be a challenging diagnosis to make for several reasons. Regions of endemicity are probably underreported, overreliance on dietary histories may not be helpful, and symptoms can fluctuate over a period of many months to years, making a differential diagnosis quite tricky. Because management is generally very straightforward, increased awareness of this infection is vital to its recognition, and will lead to faster diagnosis and better outcomes for patients, for whom symptoms can be quite debilitating.

Received November 22, 2021. Accepted for publication December 2, 2021.

Published online February 7, 2022.

Financial support: Payment of publication fees was supported by the Hospital for Tropical Diseases Charitable Fund. T. J. P. B. is supported by an National Institute for Health Research Clinical Lectureship (CL-2019-18-001).

Authors' addresses: Anjaneya Bapat and Neil R. H. Stone, Hospital for Tropical Diseases, University College London Hospitals NHS Foundation Trust, London, UK, E-mails: anjaneya.bapat@nhs.net and XXXXX. Beatrice Nickel, Swiss Tropical and Public Health Institute, Basel, Switzerland, and University of Basel, Basel, Switzerland, E-mail: XXXXX. Timothy J. P. Bray, Imaging Department, University College London Hospitals NHS Foundation Trust, London, UK, and Centre for Medical Imaging, University College London, London, UK, E-mail: XXXXX. Maaz Abbasi, Imaging Department, University College London Hospitals NHS Foundation Trust, London, UK, E-mail: XXXXX.

REFERENCES

1. Nawa Y, 1991. Historical review and current status of gnathostomiasis in Asia. *Southeast Asian J Trop Med Public Health.*
2. Nawa Y et al., 2015. *Gnathostoma*. Biology of Foodborne Parasites, 420–441. CRC Press.
3. Herman JS, Chiodini PL, 2009. Gnathostomiasis: another emerging imported disease. *Clin Microbiol Rev* ■■■*:* 484–492.
4. Herman JS et al., 2009. Gnathostomiasis acquired by British tourists in Botswana. *Emerg Infect Dis 15:* 594–597.
5. Itani O et al., 2021. Gnathostomiasis in a traveller returning from Madagascar. *J Travel Med 28*.
6. Centers for Disease Control and Prevention, 2020. *Gnathostomiasis FAQs.* Available at: https://www.cdc.gov/parasites/gnathostoma/faqs.html. Accessed January 19, 2022.
7. Nopparatana C et al., 1991. Purification of *Gnathostoma spinigerum* specific antigen and immunodiagnosis of human gnathostomiasis. *Int J Parasitol 21:* 677–687.
8. Tapchaisri P et al., 1991. Specific antigen of *Gnathostoma spinigerum* for immunodiagnosis diagnosis of human gnathostomiasis. *Int J Parasitol 21:* 315–319.
9. Moore DAJ et al., 2003. Gnathostomiasis: an emerging imported disease. *Emerg Infect Dis 9:* 647–650.
10. Neumayr A et al., 2016. Cross-reactivity pattern of Asian and American human gnathostomiasis in Western blot assays using crude antigens prepared from *Gnathostoma spinigerum* and *Gnathostoma binucleatum* third-stage larvae. *Am J Trop Med Hyg 95:* 413–416.