Madura Foot or Philoctetes Foot?

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Madura foot or mycetoma (i.e., a fungal tumor due to the tumor-like mass it forms) is a chronic granulomatous disease characterized by localized infection of cutaneous and subcutaneous tissues from fungus or bacteria (actinomycetes/nocardia). This chronic, slowly progressive but destructive disease can potentially extend into the underlying bone, causing osteomyelitis. The characteristic clinical presentation includes a triad of tumor-like swelling (hence named mycetoma), with draining sinuses and often with discharge of macroscopic grains in different colors.

The microorganisms are primarily saprophytic agents that are found in the soil and on plant matter. Healthy persons become inoculated with these agents as a result of the traumatic embedding of thorns, splinters or other plant matter. Thus, it most commonly involves the foot but can involve the hands, back or shoulders. In endemic countries it is most commonly seen in farmers or individuals of lower socioeconomic status who walk barefoot [1].

The disease is caused either by fungus (eumycetoma or mycotic mycetoma) or filamentous bacteria (actinomycetoma). One of the unique features of this infection is the discharge of macroscopic grains (colonies of infecting organisms) in different colors that may help in establishing the diagnosis. Black granules indicate a fungal etiology (eumycetoma), while white-to-yellow granules can be discharged by either eumycetoma or a bacterial infection (actinomycetoma).

The disease distribution occurs mainly in developing countries, in tropical and subtropical regions, an area known as the Madura/Mycetoma Belt [Figure 1]. The highest number of reported cases are in

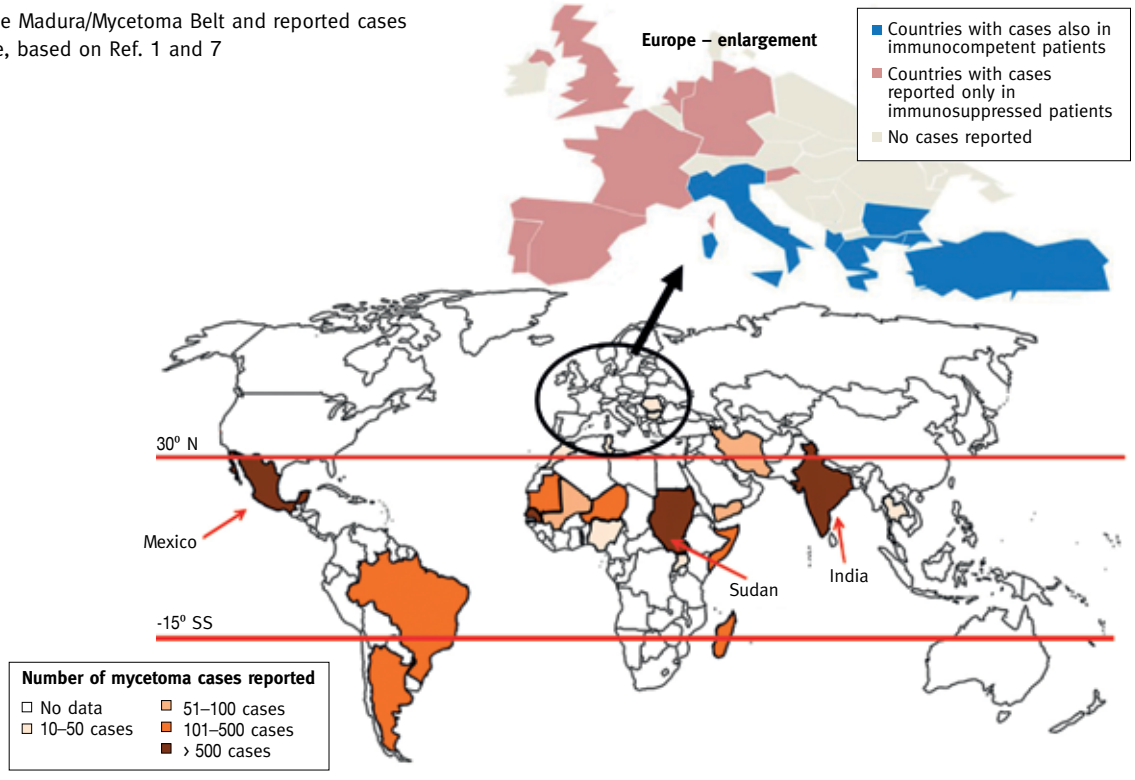

Figure 1. The Madura/Mycetoma Belt and reported cases from Europe, based on Ref. 1 and 7

India, Sudan and Mexico [1]. In Western countries, including Israel, reported cases occur mainly among immigrants from endemic countries, as reported in this issue of *IMAJ* [2]. The two patients described here were infected in Sudan, a region highly endemic for the disease.

The first modern description of Madura foot was made by Gill in 1842 in Madurai, a holy city in southern India (hence the disease name Maduramycosis). The fungal etiology of the disease was established in 1860 by Carter [3]. For the British who ruled India at that time this was a new disease. The pathology, however, had already been described in ancient writings from India (around the fourth to fifth centuries AD) and was named Padavalmika, which translates literally as "foot anthill" [3].

Figure 2. Philoctetes on the Island of Lemnos. Painted by Guillaume Guillon-Lethière, 1798

Source: https://commons.wikimedia.org/wiki/File:Guillaume_Guillon-Lethiere,_Philoctetes_on_the_Island_of_Lemnos.jpg

CLASSICAL HISTORY

Since the pathogens of the disease are ubiquitous and found in soil and decayed vegetable matter, it is probable that the disease existed in other parts of the world as well. This is also suggested by the play *Philoctetes,* written by the ancient Greek tragedian Sophocles in the fifth century BC. Against the background of the Trojan War, the hero Philoctetes suffers a persistent festering wound. This malady is most likely related to mycetoma. The hero Philoctetes, who held the key to victory in the Trojan War, was kept away from the field of battle for ten years due to a chronic disease of his foot. He had been leading seven ships to Troy, but when they stopped along the way he was bitten by a snake, resulting in a wound that would not heal, a painful and foul-smelling wound that caused his people to abandon him alone on the island of Lemnos. The signs and symptoms described by Sophocles in his play are well characterized. It appears that this description came from his experience rather than from his imagination, subsequently challenging modern-day diagnosticians as well as inspiring artists and painters throughout centuries [Figure 2]. As written in the play: "His foot diseased and eaten away with running ulcers" (line 6), "Some rags are drying in the sun full of the oozing matter from a sore" (lines 38-39), " it is nine years now that I have spent dying, with hunger and pain feeding my insatiable disease" (lines 312-314).

Johnson [4] offers several hypotheses to explain Philoctetes' chronic illness. Grassi et al. [5] favored the diagnosis of gout, based on the intense and episodic pain in the foot. However, purulent exudate from the heel does not concur with a diagnosis of gout. In addition, the presence of constant pain does not fit this diagnosis.

Others support the diagnosis of infectious disease such as chromoblastomycosis; however, as mentioned by Johnson, this infection, most commonly seen in the foot, is almost always found in tropical climates, while the region of the island of Lemnos has a temperate climate. In addition, chromoblastomycosis is a fungal infection of the skin that spreads slowly and in 10 years would not have remained localized to the heel [4]. Johnson himself believed it was chronic osteomyelitis, which he claims was initiated by a superficial wound such as a snake bite and could account for all these signs and symptoms [4].

We prefer the diagnosis of mycetoma, as was also suggested by Bryceson [6]: "The fungus could have been inoculated through a wound from a snake bite, which was the initial event, followed by inflammation." Based on our experience, the chronic pain that the hero suffered (which according to Johnson refutes this diagnosis) may in fact belong to the Madura foot symptomatology, which sometimes even leads to incapacitation

In addition, another characteristic of the disease, somehow ignored by the others, is the discharge of black flux of blood and matter, which may describe the discharge of black granules as seen in eumycetoma. As Sophocles writes "The sweat is soaking all his body over, and a black flux of blood and matter has broken out of his foot" (lines 823-825). Thus, a chronic fungal infection such as Madurella mycetomatis, which is the most prevalent causative agent of mycetoma worldwide [1], could be the diagnosis in the Greek hero's case.

Treatment is not that easy, even in modern medicine, and involves prolonged antifungal medication and often amputation. Thus, the need for the help of Asclepius continues to be relevant even now. As Sophocles declares in his play: "You will never know relief (from the disease)….. until you come of your own will to Troy, and meet among us the Asclepiadas who will relieve your sickness" (lines 1330-1335).

THE RELEVANCE TODAY

What does Madura foot or philoctetes foot mean for us today? Apart from the

historical debate regarding the question as to where the disease was first described: whether it occurred in our region, the Mediterranean, or in the Far East, in India, its importance lies in our alertness to its possible presence. The hypothesis that Philoctetes foot was the first description led us to think about this diagnosis outside of the tropical countries and outside the classical "Madura Belt" [Figure 1]. In their article in the current issue of *IMAJ*, Brunfman and co-authors [2] state correctly that mycetoma infection is extremely rare in Israel and in Western countries, but that physicians should be acquainted with this disease due to the high influx of migrants from these regions. Early recognition, before the lesion progresses and the infection causes an advanced and disabling disease, may alleviate the patient's suffering. It should be remembered that Philoctetes acquired his disease outside of the "Madura Belt," which reminds us that the disease exists and is endemic even outside this geographic region. As was recently reviewed, autochtonous cases even in immunocompetent patients were recorded in Europe, including the Balkans and more relevant to Philoctetes' journey, in Greece and Turkey [Figure 1] [7]. Thus, despite the name "Madura foot," one should be alert to this disease in developed countries as well.

Bryceson [6] states: "Philoctetes' case illustrates nicely the need to take a careful travel history, and to pay attention to all the patient's complaints" [6], but Sophocles through his hero Philoctetes reminds us that the disease might exist in our backyard, without having to travel to a classic endemic region.

Note:
The Sophocles citations are from *Greek Tragedies*, Vol. 3, by David Grene (Editor, Translator), Published by University of Chicago Press, 1992.

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