

## Case report of leprosy diagnosis in the emergency department: A potential challenge in non-endemic areas

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### Abstract

**Background:** Per the World Health Organization (WHO) definition of prevalence lower than 1 case per 10,000 persons, leprosy has been eliminated as a public health threat. However, it's not clear how many unreported cases exist in the less-developed world; leprosy is likely more common than currently reported. Current estimates are that 220,000+ new cases are diagnosed worldwide each year.

**Case Presentation:** We encountered a 29-year-old, Indian male who presented to the Emergency Department (ED) with non-tender skin eruptions, left for earm numbness and low-grade fever for two weeks. Physical examination revealed decrease in sensation of the left arm, left hand and dozens of non-tender nodular skin lesions of varying diameter. Patient was treated with a multi-drug regimen and underwent various blood, imaging tests and a skin biopsy.

**Conclusion:** The fact that leprosy may be more common in some parts of the world than indicated by available data stands in contradistinction to the rarity with which the disease is seen in highly developed countries. ED physicians in countries such as Qatar have never seen leprosy and with globalization of economies and labor forces, it is likely that leprosy may increase in incidence in developed-countries. Literature reveals that leprosy tends to be frequently misdiagnosed or mismanaged when presenting in countries with low incidence. The ED physician is thus well-advised to consider a patient's geographic origin and consider leprosy as a potential cause for skin lesions and findings such as described in this case – the main barrier to diagnosing leprosy in non-endemic areas is not considering it.

### Keywords

emergency medicine; leprosy; qatar; emergency department

### Abbreviations

WHO: World Health Organization; ED: Emergency department; HGH: Hamad general hospital; MDT: Multi-drug therapy; CDC: Centre for disease control; BCG: Bacillus calmette Guerin; USA: United States of America; PCR: Polymerase chain reaction.

## Case Presentation

### History

A 29-year-old male presented to the Emergency Department (ED) at Hamad General Hospital (HGH) in Doha, Qatar. He had a chief complaint of non-tenderskin eruptions all over the body, accompanied by left forearm numbness and low-grade fever. He had been ill for two weeks.

The patient had arrived in Qatar a month prior to presentation, to begin work in this country. He had no known exposures to illness or hazardous chemicals, and reported knowing no one with similar complaints. The patient was cooperative with the history, but his native language was an Indian dialect and there was a communication barrier preventing optimal history.

Review of systems was positive only for the previously mentioned entities. He reported no exacerbating or relieving factors for his symptoms. He had no ophthalmologic complaints and had no itching or mucous membrane symptoms. The left arm numbness and loss of sensation was diffuse in the involved upper extremity and not associated with weakness.

The patient had first noted the arm numbness when he accidentally (in a welding incident) sustained minor burns to the forearm that he did not feel, but which he thought should have been painful. The remaining review of systems was negative.

Social history was notable for limited in-country support for the patient, who entered Qatar without family in order to join the local construction workforce. When he perceived he was ill he tried to travel home to India, but was denied boarding at the airport due to elevated temperature. At that point he was sent to the HGH ED for further evaluation.

There was no pertinent previous history, no immune compromise, and no prior surgery. The patient was not taking any chronic medications and had no known allergies.

### Physical examination

The physical examination revealed a non-distressed male with vital signs: Heart rate 84 bpm, respirations 20, room-air pulse oximetry 99%, blood pressure 121/77, and oral temperature 38.5 C. The eye, ear, nose, and throat assessment revealed baseline visual acuity and normal mucous membranes; there was no sign of intravascular volume depletion. The neck was supple without adenopathy. Auscultation of the chest revealed normal lung and cardiac sounds. The abdomen was soft and non-tender without organomegaly or peritoneal irritation. The patient was appropriate and cooperative with a neurological examination that revealed only subjective decrease in sensation in the left arm and left hand (in the ulnar distribution).

The skin examination revealed dozens of non-tender nodular lesions of varying diameter 1-4 cm. The primary anatomical location of lesions was on the face and trunk, with some extremity lesions as well. The appearance of the lesions is shown in Figures 1-4.

### Initial impression and work-up

Based on the initial presentation and physical examination, the differential diagnosis included a breadth of infectious and non-infectious entities. Dermatologic problems (*e.g.* erythema nodosum) and

other non-infectious conditions (*e.g.* neurofibromatosis) were included in the early listing of alternative diagnoses, but the evaluating physician had previously seen cases of leprosy (Hansen's disease) and felt this presentation was highly suggestive of lepromatous disease.

The ED physician instituted droplet isolation measures (moving the patient to the ED's isolation unit) and began therapy with antipyretics (paracetamol 1 g IV), intravenous fluids (Ringer's lactate 1.5 L over 3 hours) to supplement oral intake, and broad-spectrum antibiotics for coverage of alternative possible diagnoses (2 g ceftriaxone IV). The Qatari Ministry of Public Health was later notified of the patient's suspected diagnosis.

The initial work-up proceeded with general metabolic, sepsis, and hematologic testing. Selected pertinent results are shown in Table 1. The ED lab results were notable for leukocytosis and signs of systemic inflammation with elevated lactate. An initial chest X-ray (Figure 4) was unremarkable.

Based on the initial results, further suspicion of leprosy prompted consultation with the HGH Department of Medicine's Division of Infectious Diseases (ID). The ID consultant saw the patient in the ED isolation unit and agreed with the presumptive diagnosis of erythema nodosum leprosum (lepromatous leprosy), ordering a punch biopsy for histological evaluation.

### Hospital course

The patient was admitted to the HGH for performance of the punch biopsy and to institute presumptive therapy for multibacillary leprosy. The leprosy therapy was the WHO multi-drug therapy (MDT) approach (see Discussion section). Treatment commenced on day one with combination of three antimicrobials: rifampicin (600 mg), clofazimine (300 mg), and dapson (100 mg, administered after negative test results for glucose-6-phosphate dehydrogenase deficiency). After the preceding therapy was given on day one, daily therapy continued with clofazimine (50 mg) and dapson (100 mg) with the plan to repeat the cycle (day one therapy followed by daily therapy) monthly for a year. The patient's treatment regimen also included prednisolone 60 mg daily.

The patient defervesced by hospital day two. He was never tachycardic, hypotensive, or hypoxemic during the hospitalization.

Two days post-admission, the patient underwent punch biopsy of a left-arm lesion. He was continued on antimicrobials and was afebrile with stable vital signs and minimal complaints. The day after the punch biopsy, the patient had been afebrile for two days and he was discharged from the hospital on MDT with biopsy results pending and ID clinic follow-up arranged.

Trends in selected laboratory tests are shown in Table 2. Anti-nuclear antibody assay was negative, as were serologic tests for hepatitis and human immunodeficiency virus. Lactate levels normalized by hospital day 1 to 1.6 mmol/L and were not rechecked afterward. Aerobic and anaerobic blood cultures were reported as no growth at five days post-admission.

The day after his discharge, the patient left the country and has been lost to follow-up. His biopsy results returned the next day. The punch biopsy results showed dermal epithelioid granulomatous inflammation with periadnexal, perivascular, and perineural distribution. Focal necrosis was noted as well. The special stain for *M. leprae* was negative. However, the hospital laboratory's histological diagnosis was "granulomatous inflammation fully in keeping with tuberculoid leprosy."

The final clinical diagnosis was leprosy, caused by the bacillus *M. leprae*. Attempts to contact the patient by telephone failed and there is no information on his current status.

## Discussion

### Leprosy etiology, disease classification, and epidemiology

Leprosy is caused by the intracellular acid-fast bacterium *M. leprae* (and less frequently, by the newly described species *M. lepromatosis*) [1,2]. The disease is classically divided into paucibacillary tuberculoid leprosy or multibacillary lepromatous leprosy, but there are wide variations (*e.g.* leprosy limited to nerve involvement) and overlaps in classification systems [3,4]. While the type of leprosy in terms of organ involvement and bacillary load is important from ID and public health perspectives, for the initial ED work-up and therapy the precise categorization of leprosy subtype is not critical.

Leprosy is a tropical disease. Among the areas with historical or current problems with leprosy are India (and neighboring Nepal), Brazil, Indonesia and nearby areas (*e.g.* Singapore, Malaysia, the Philippines), the Americas (tropical regions in particular) and central Africa [5-12].

In terms of the WHO definition of prevalence lower than 1 case per 10,000 persons, leprosy has been officially eliminated as a public health threat. However, it is not clear how many unreported cases exist in the less-developed world; leprosy is likely far more common than currently reported and current estimates are that 220,000+ new cases are diagnosed worldwide each year [8,13]. Experts have noted that the disease remains endemic (if not rising) in many areas of the world, and due to its causing significant disability leprosy remains a threat particularly in vulnerable populations such as children [14-16]. Information on the WHO program on leprosy is available at

[www.who.int/mediacentre/factsheets/fs101/en/](http://www.who.int/mediacentre/factsheets/fs101/en/) and information on leprosy transmission is outlined at the USA's Centers for Disease Control (CDC) website [www.cdc.gov/leprosy/transmission](http://www.cdc.gov/leprosy/transmission).

The contribution of the immune system susceptibility to leprosy is not fully characterized, but there are data suggesting genetic factors' contributions [14,17]. It also seems likely that immunocompromise such as that seen in transplant recipients, could increase risk of leprosy [18,19].

### Clinical manifestations and natural history of disease

Leprosy is most notorious for its skin lesions. However, the disease commonly affects peripheral nerves, upper respiratory mucosa, and the eyes (including causing blindness) [5,20-24].

Facial lesions can have devastating cosmetic effect. Ulcerative changes and even loss of body parts (*e.g.* fingers, nose) due to inflammation, immunecompromise, and secondary infection can occur [24]. The pattern of erythematous nodular lesions seen in our case is not inconsistent with the face, trunk, and extremity distribution of such lesions often reported in lepromatous leprosy [18].

The indolent nature of leprosy infection is such that ongoing nerve involvement causes significant neuropathy over years of disease. Risk of nerve damage is increased due to diagnostic delays [5].

The chronic course of leprosy may be marked by intermittent skin-lesion flares called acute leprosy (or lepra) reactions [25,26]. These lepra reactions are clinically overt and may be the primary reason for patient presentation with previously undiagnosed disease.

*M. leprae* multiplies very slowly. The disease is characterized by an incubation period averaging 5 years. In some cases, symptoms may occur within a year of contracting the disease but patients may not develop the characteristic skin findings until 20 years after exposure. In one representative pediatric series from Brazil, nearly 3/4<sup>th</sup> of cases had no symptoms until at least a year after exposure [5].

### Prevention: Historical and current

Although most leprosy cases arise from human transmission, leprosy is not highly contagious and there has long been disagreement as to precise transmission risks and mechanisms. [24, 27-29]. Nasal or mouth droplet transmission seems the most frequent mechanism, but the causative mycobacteria have also been cultured from skin surfaces [30,31]. the major risks to those with long-term exposure (*e.g.* family members caring for patients) [32].

If there are known exposures, chemoprophylaxis (*e.g.* with MDT drugs) can be used since there is no highly effective vaccine[13,33]. A single dose of the Bacillus Calmette-Guerin (BCG) immunization is reported to reduce risk of leprosy contraction by half [13.]

The disconcerting appearance of lepers has combined fears of transmission to translate into a historical “preventive” approach of isolating those with the disease. Over centuries, lepers have been stigmatized, discriminated against, and occasionally banished [17,34,35]. In many countries leper colonies were established in remote or non-populated regions [36]. In the United States of America (USA), for instance, the most notable colony was established in the Hawaiian Islands over a century ago, and operated until the middle of the 20<sup>th</sup> century [37,38]. A second leper colony was established by the U.S. Public Health Service in the semi-tropical state of Louisiana in the USA's South; this establishment for 75 years after its doors opened in 1922 [39,40].

### Diagnosis

Once the disease is considered, punch biopsy and histologic examination should be executed as histopathological examination of the skin lesion is the gold-standard for diagnosis, especially when presentations may be atypical [25,41]. On histopathology, leprosy should be considered any time there are perineural lymphocytes with a pattern of granulomatous infiltrate; the next step is to obtain a Fite acid-fast stain (as was done in our case) although there is evidence that fluorescent histochemical methods may improve diagnostic accuracy [40,41] The *M. leprae* organism is less acid-fast than the bacillus of *M. tuberculosis* due to differences in mycolic acid carbon-chain lengths, but the stain is usually helpful.

Although there are a variety of reported serological and molecular-probe methods for diagnosing leprosy, the precise identification of the organism can be rendered difficult by the inability to grow it *in vitro* [32]. A recent report of a nasal polymerase chain reaction (PCR) swab for detection of *M. leprae* shows promise for making the diagnosis in symptomatic and asymptomatic cases [32]. An advanced form of quantitative PCR (qPCR) has been found to have nearly 85% sensitivity and 100% specificity in diagnosing leprosy, regardless of the form or stage of clinical disease [43].

### Treatment

The two main issues with treating leprosy are delays in diagnosis and imperfect therapeutic success even after diagnosis is made. Treatment delays are especially problematic due to the indolent

disease course and these delays are associated with increased tissue damage [5].

The disease is at least partially curable by the MDT antimicrobial approach used in our case. Unfortunately, recurrence rates can approach 50%, particularly in immunocompromised patients, even after treatment has been deemed a success [19]. The antimicrobials used for leprosy are dosed differently in the long-term treatment, depending on disease characteristics, but the initial regimen is as used in our case. The MDT approach used in our patient (clofazamine, rifampin, dapsone) is that which was promulgated by the WHO (when it passed a resolution in 1991 to eliminate leprosy as a public health problem)[8,19].

Clofazamine can cause harmless skin discoloration in newborns (when given to pregnant patients)[44]. The drug also rarely causes enteropathy when administered in high doses [45].

The anti-leprosy drugs rifampin and clofazamine also have activity against other acid-fast bacilli, notably *M. tuberculosis* which may be theoretically useful given historical reports of co-infection with the two mycobacteria [26,46,47]. The third drug in MDT, dapsone, has both bactericidal and bacteriostatic activity against *M. leprae* and is a long-standing foundation of anti-leprosy therapy even though problems such as hypersensitivity and hemolysis must be considered [48,49].

Quinolones may have some role in treatment of leprosy, although a DNA gyrase mutation in *M. leprae* is well-known to mediate resistance to this class of antimicrobials [50].

Pregnancy is a risk factor for exacerbation of leprosy. The standard MDT regimen is reported safe and effective for pregnant patients and their newborns [44].

Therapy additional to antimicrobials includes steroids. Steroids appear useful for acute lepra reactions and are very commonly used in leprosy [26,26]. Steroids' therapeutic goals are to control symptoms and to reduce recurrences and long-term deformity [12,26,51]. Steroids are particularly useful, although not invariably effective, in treating erythema nodosum leprosum (as seen in our patient) [52]. Cochrane Review identifies some potential benefit from steroid use in treating nerve damage in leprosy [53].

Immunotherapy with a *Mycobacterium w* (Mw) vaccine (a heat-killed suspension derived from a nonpathogenic, cultivable, atypical mycobacterium named *M.indicuspranii*) may provide additional benefit to MDT in terms of preventing disease worsening or recurrence [54,55].

In most countries, leprosy is a reportable disease. ED physicians or others who suspect or confirm the diagnosis, should correspond with their area public health authorities.

## Conclusion

The fact that leprosy may be more common in some parts of the world than indicated by available data stands in contradistinction to the rarity with which the disease is seen in highly developed countries. Many ED physicians in countries such as ours (Qatar) have never seen leprosy, and with globalization of economies and labor forces it is likely that leprosy – like other “third-world diseases” – could be seen with increasing frequency in developed-country Eds.

Unfortunately, the literature from developed-country clinics reveals that leprosy (like other non-endemic diseases) tends to be frequently misdiagnosed or otherwise mismanaged when presenting to

healthcare in countries in which the disease is not commonly seen [20,42,56,57]. The ED physician is thus well-advised to consider a patient's geographic origin, and to think of leprosy as a potential cause for skin lesions and findings such as those described in this case – the main barrier to diagnosing leprosy in non-endemic areas is not considering it [57].

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**Consent for Publication:** The nature of the case report was explained to the patient and informed consent was appropriately taken for photographs of the patient's clinical findings.

## Figures



**Figure 1:** Pale nodular lesions on the forehead (each lesion 2 cm diameter) and cheeks



**Figure 2:** lesions on the patient's back showing confluence and plaque-like appearance



**Figure 3:** Pectoral lesions (each lesion's diameter 1.5-2 cm) showing erythematous nodule appearance



**Figure 4:** Chest X-ray

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