

Case Report

Presence of *Mycobacterium leprae* in epidermal cells of lepromatous skin and its significance

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ABSTRACT

A 49-year-old man with lepromatous leprosy treated with dapsone monotherapy for 12 years (1967 to 1979) reported in the hospital in 2003, with relapsed disease. A slit skin smear showed a bacteriological index of 4+. Biopsies from skin lesions before and after anti-leprosy therapy showed features of lepromatous leprosy. Both biopsies showed unusual features of bacillary clumps in epidermal cells demonstrating clearly that dissemination of *M. leprae* can take place even through unbroken skin. The presence of lepra bacilli in clumps in the epidermis is an indicator that the skin is a potential route of transmission of the disease.

Key Words: *M. leprae*, Epidermis, Transmission

INTRODUCTION

Leprosy is a chronic granulomatous disease caused by *M. leprae*. Usually the organisms are found in the subepidermal zone, inside the nerves, sweat glands, sweat ducts, arrector pili muscle, macrophages and around the hair follicle.^{[1]-[3]} Sometimes, in patients with a high bacteriological index (BI \geq 4+) the bacilli may be seen throughout the dermis, even scattered in dermal collagen. However, reports of *M. leprae* in epidermal cells are not common. Such a finding bears great significance for the dissemination of the organism and the route of transmission of the disease.

CASE REPORT

A 49-year-old man reported in the outpatient department of the hospital complaining of multiple patches over both arms and legs since 6 months. He had a history of leprosy when he was 12 years old and

had received dapsone monotherapy for 12 years. On examination, he had multiple, hypopigmented, dry, ichthyotic patches of varying sizes, from 4 x 6 cm to 30 x 20 cm, over both arms and legs. There was sensory loss and loss of sweating over the patches. The ulnar, lateral popliteal and posterior tibial nerves were enlarged bilaterally. There was mild infiltration of the face and ear lobes. Although he had no obvious deformities of the extremities, depressed nasal bridge and madarosis were present.

Routine blood, urine, and stool examinations were normal. The skin smear was done and the bacterial index was 4.5. A clinical diagnosis of lepromatous leprosy (LL) was made and a lesion in the left arm was biopsied. The sample was stained with both Hematoxylin and Eosin (H&E) stain and a modified Fite-Faraco stain for acid-fast bacilli (AFB).^[6] The epidermis showed no significant affection. In the dermis there were small focal collections of macrophages and a few

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lymphocytes, mainly around skin adnexal structures, occupying less than 25% of the tissue. A few small fibrosed nerves were seen in the dermis. Sections stained for AFB showed bacilli, including several solidly staining bacilli, inside macrophages and nerves to a load of 4+. In the epidermis there were bacilli in clumps and also singly inside keratinocytes. A diagnosis of lepromatous leprosy was made.

The patient was given multibacillary multidrug therapy (MB-MDT) for one year.^[4] Skin smears were repeated and The BI was 4+. A biopsy was repeated from a lesion on left buttock. In the dermis, there were small focal collections of foamy macrophage and a few lymphocytes around the blood vessels and skin adnexal structures, occupying less than 20% of the dermis. Sections stained for AFB showed a number of granular and beaded bacilli in clumps within the macrophages [Figure 1], smooth muscle cells and around the hair follicles. Again, clumps of granular and beaded bacilli were found within basal cells [Figure 2] and several keratinocytes.

DISCUSSION

The H & E stained sections from both biopsies of this patient showed a very similar picture, with focal collections of foamy macrophages and scanty lymphocytes around the neurovascular bundles and skin adnexal structures confirming the diagnosis of LL. Modified Faraco-Fite staining^[5] for AFB showed a number of granular beaded bacilli inside macrophages, nerves, smooth muscle cells, and especially within epidermal cells. The finding of AFB within epidermal cells in both biopsies is extremely interesting and unusual. Sato wrote that leprosy bacilli invade epidermal cells.^[6] Harada very clearly showed leprosy bacilli in the epidermis by his specially modified allochrome staining method.^[7] Electron microscopic studies have clearly demonstrated the presence of *M. leprae* in epidermal cells.^{[8],[9]} Hosokawa observed acid-fast bacilli in the epidermis, cutaneous appendages and endothelial cells of capillaries from non-ulcerating skin lesions of multibacillary patients.^[10] In his study, 10.9% of the specimens stained for AFB demonstrated bacilli, more so in lepromatous leprosy patients compared to borderline lepromatous cases. It is possible to find

bacilli as artifacts in the epidermis. In some instances, AFB attached to the microtome knife can be transferred to other areas of the sections. In such instances, during examination of the slide under the oil immersion objective, bacilli and epidermis are seen one above the other in adjacent layers. These are known as "floaters". But in the present case, it can be clearly recognized that the bacilli were arranged inside vacuoles in the cytoplasm of keratinocytes [Figure 2] and therefore they were not floaters.

The presence of leprosy bacilli in the epidermal cells is significant as far as the dissemination and transmission

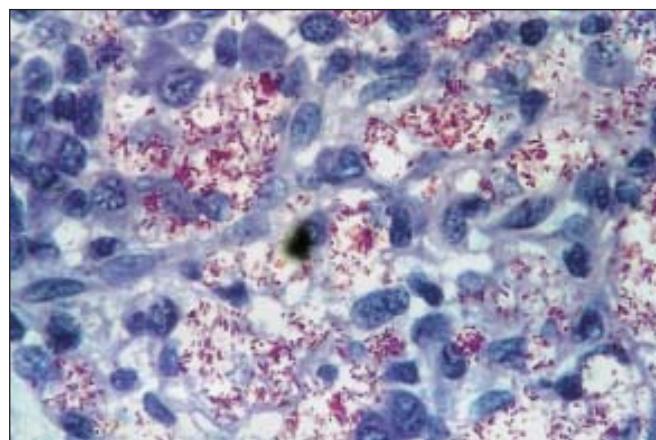


Figure 1: Clumps of acid-fast bacilli (a few solid staining and many fragmented and granular) inside macrophages, (Modified Fite x 1200)

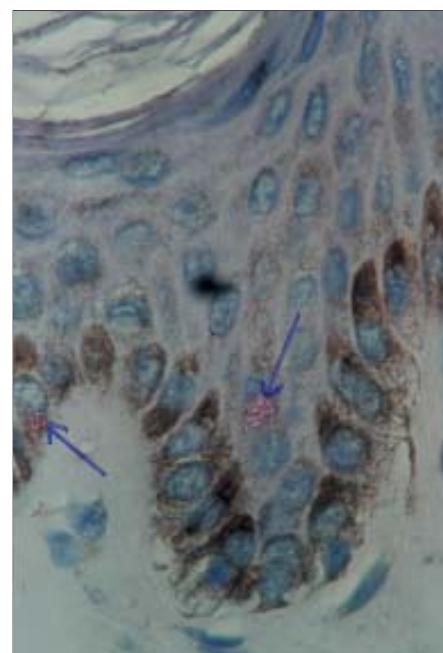


Figure 2: Clumps of *M. leprae* in a basal cell and in a keratinocyte. (Modified Fite x 1200)

of the disease is concerned. It may be due to the phagocytic activity of keratinocytes, which engulf bacilli from the subepidermal zone. Hence, the possibility of discharge of leprosy bacilli from intact skin, even without ulceration, should be seriously considered.^[11] Also, there is a possibility of *M. leprae* entering through the intact epidermis, especially when the keratin layer is removed.^{[12],[13]} It is possible that the presence of *M. leprae* in epidermal cells is not reported more often because they are not ordinarily looked for in routine work. The presence of *M. leprae* in epidermal cells proves beyond any reasonable doubt that *M. leprae* are shed in large numbers through even intact skin, and therefore transmission of leprosy through skin and from skin to skin contact should be seriously considered.

REFERENCES

1. Kotteswran G, Chacko CJ, Job CK. Skin adnexa in leprosy and their role in the dissemination of *M. leprae*. Lepr India 1980;52:475-81.
2. Job CK. An outline of pathology of leprosy. Int J Lepr 1965;33:533-41.
3. Ridley DS. Skin biopsy in leprosy. Basle: Ciba Geigy; 1984. p. 14-42.
4. WHO expert committee on leprosy, WHO technical report series, No. 874, 1998.
5. Job CK, Chacko CJ. A modification of Fite's stain for demonstration of *M. Leprae* in tissue sections. Indian J Lepr 1986;58:17-8.
6. Klingmuller V. Die Lepra, Berlin: Julius Springer, 1930.
7. Harada K. A modified allochrome procedure for demonstrating mycobacteria in tissue sections. Int J Lepr 1977;45:49-51.
8. Young HS, Wook C, Hae-Yong C, Yung-Ma H. *Mycobacterium leprae* in the epidermis: Ultrastructural study. Int J Lepr 1995;63:101-4.
9. Okada S, Komura J, Nishiura M. *Mycobacterium leprae* found in epidermal cells by electron microscopy. Int J Lepr 1978;46:30-4.
10. Hosokawa A. A clinical and bacteriological examination of *M leprae* in the epidermis and cutaneous appendages of patients with multibacillary leprosy. J Dermatol 1999;26:479-88.
11. Job CK, Jayakumar J, Aschhoff M. Large number of *Mycobacterium leprae* is discharged from the intact skin of lepromatous leprosy. Int J Lepr other Mycobacterial disease 1999;67:164-7.
12. Job CK, Chehl SK, McCormick T, Hastings RC. Can *Mycobacterium leprae* enter the body through unbroken epithelium? Int J Lepr 1985;55:772-5.
13. Leiker JL. On the mode of transmission of *Mycobacterium leprae*. Lepr Rev 1977;48:9-16.