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# Histopathological changes in the arrector pili muscle of normal appearing skin in leprosy patients

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## ABSTRACT

**Background:** Leprosy is a chronic inflammatory disease caused by *Mycobacterium leprae*, which affects not only the peripheral nerves and skin, but also various internal viscera through hematogenous spread, especially in lepromatous cases. Histology in its own way plays a vital role, not only in classifying the established lesion, but also in confirming the clinical diagnosis. During the latent period of subclinical involvement, the apparently normal looking skin might also be undergoing some pathological changes. **Methods:** We investigated skin biopsy material taken from 60 patients with clinically diagnosed leprosy at Subharti Hospital, Subharti Medical College, Meerut, India. Hematoxylin and eosin staining and Harada's modified allochrome method for acid-fast bacilli were applied for histological investigations. **Results:** The pattern of leprosy among the patients was indeterminate in 25 cases (41.7%), tuberculoid in 14 (23.3%), borderline tuberculoid in six (10%), borderline leprosy in four (6.7%), borderline lepromatous in four (6.7%), and lepromatous leprosy in seven (11.7%). Changes were seen in the arrector pili muscle of normal appearing skin in all types of leprosy, but involvement was greater at the lepromatous end of the spectrum compared to the tuberculoid end.

**Conclusions:** Results of this study revealed definitive histological changes in the arrector pili muscle in normal appearing skin. The presence of AFB is significant as far as dissemination and transmission of the disease is concerned.

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## 1. Introduction

Leprosy is a chronic granulomatous disease caused by *Mycobacterium leprae*. The organisms are usually found in the sub-epidermal zone, inside the nerves, sweat glands, arrector pili muscle, macrophages, and around the hair follicle.<sup>1–3</sup> In most instances, it has been considered that the skin is the primary site of invasion, with secondary centripetal spread into the nerves.

Definite histological changes are seen in the normal appearing skin in all types of leprosy. However, the involvement is greater in cases at the lepromatous end of the spectrum compared to the tuberculoid end.

In this study we examined biopsy samples taken from clinically diagnosed cases of leprosy, a minimum of 10 cm away from the site of a lesion.

## 2. Materials and methods

Skin biopsies taken at least 10 cm away from the site of a lesion in patients with clinically diagnosed leprosy, attending the skin outpatient department of Chattrapati Shivaji Subharti Hospital, Subharti Medical College, Meerut, India, constituted the material for this study.

Information on patient age, sex, duration of lesion, occupation, socioeconomic status, family history, and previous treatment was collected.

Ten percent neutral formalin-fixed skin biopsies were processed for paraffin sectioning. The following staining methods were applied for histological investigations: (1) hematoxylin and eosin; (2) Harada's modified allochrome method for acid-fast bacilli (AFB).<sup>4</sup>

## 3. Results

A total of 60 patients were included in this study. The pattern of leprosy among the patients was indeterminate in 25 cases (41.7%), tuberculoid in 14 (23.3%), borderline tuberculoid in six (10%),

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**Figure 1.** Well-defined dry, rough-surfaced plaques with raised margins on the back, back of the arm, and forearm in borderline tuberculoid leprosy.

**Table 1**

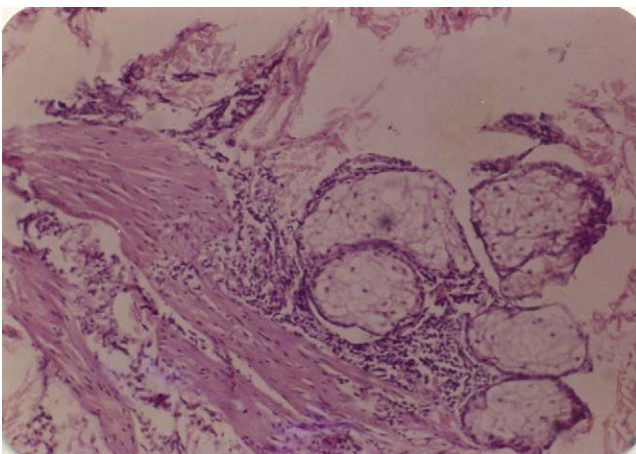
Histological features of the arrector pili muscle in the normal appearing skin of leprosy cases

	Granuloma/ FCC	Infiltration	Presence of AFB
Lepromatous leprosy (LL) <i>n</i> = 7, 11.7%	2 (28.6%)	2 (28.6%)	4 (57.1%)
Borderline lepromatous (BL) <i>n</i> = 4, 6.7%	1 (25%)	2 (50%)	1 (25%)
Borderline leprosy (BB) <i>n</i> = 4, 6.7%	-	2 (50%)	-
Borderline tuberculoid (BT) <i>n</i> = 6, 10%	2 (33.3%)	4 (66.6%)	1 (16.7%)
Tuberculoid (TT) <i>n</i> = 14, 23.3%	5 (35.7%)	10 (71.4%)	2 (14.3%)
Indeterminate (INDT) <i>n</i> = 25, 41.7%	2 (8%)	18 (72%)	1 (4%)

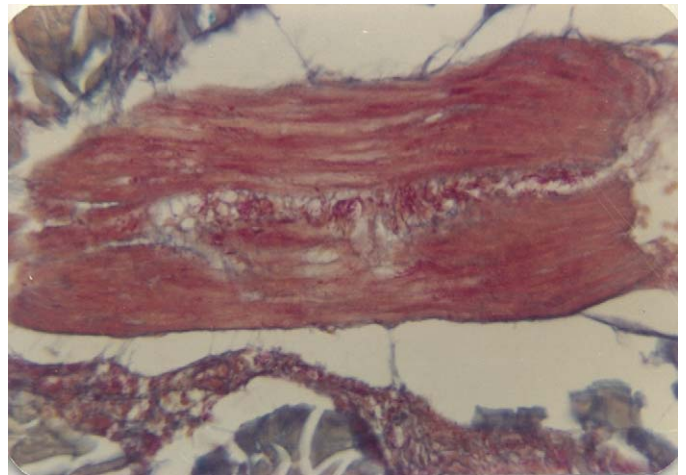
FCC, focal cell collection; AFB, acid-fast bacilli.

borderline leprosy in four (6.7%), borderline lepromatous in four (6.7%), and lepromatous leprosy in seven (11.7%). The male to female ratio was 3.2:1. The lesions were located mainly on the extremities, the back, and the face (Figure 1).

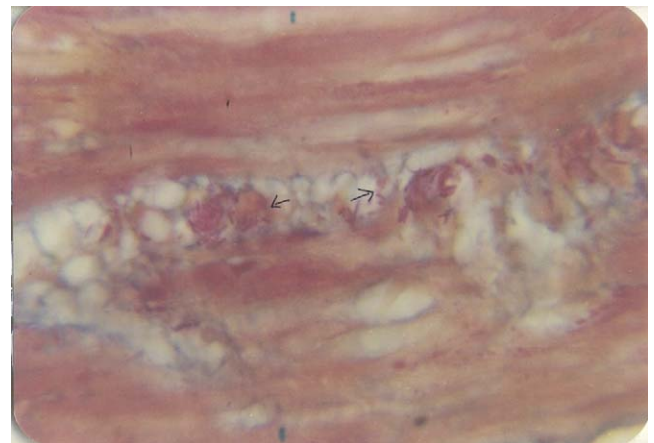
Changes were seen in the arrector pili muscle of normal appearing skin in all types of leprosy, but involvement was greater at the lepromatous end of the spectrum compared to the tuberculoid end (Table 1).



**Figure 2.** Infiltration in relation to skin appendages in a lepromatous leprosy case (H&E staining, 100 $\times$ ).



**Figure 3.** Photograph showing degenerative changes in the arrector pili muscle in the presence of acid-fast bacilli in a lepromatous leprosy lesion (modified Harada's allochrome staining, 400 $\times$ ).



**Figure 4.** Arrector pili muscle showing degenerative changes and the presence of acid-fast bacilli under oil immersion.

Infiltration of varying degree (Figure 2) was seen in almost all cases, from lepromatous to tuberculoid. Degenerative changes in the muscle along with the presence of acid-fast bacilli (Figures 3 and 4) were also seen.

#### 4. Discussion

The common form of leprosy seen in Meerut and nearby areas is of the indeterminate type. The paucibacillary form (45 cases of borderline tuberculoid, tuberculoid, and indeterminate) is more common compared to the multibacillary form (15 cases of lepromatous, borderline lepromatous, and borderline type). There was a dominance of male over female cases with a male to female ratio of 3.2:1.

Definitive histological changes were seen in the arrector pili muscle in normal appearing skin. Varying degrees of infiltration of the arrector pili muscle with histiocytes and lymphocytes were seen in multibacillary as well as in paucibacillary forms of leprosy. Ganpati et al.<sup>5</sup> noted the presence of AFB in the arrector pili muscle of skin in 32.4% of lepromatous leprosy/borderline lepromatous cases. In this study the presence of AFB was seen in the muscle from a normal appearing site in 57.1% of cases. The bacilli must have reached the muscle through blood vessels, as muscles also possess rich intramuscular capillaries.<sup>6</sup> Weddell et al.<sup>7</sup> observed

the rapid entry of bacilli into the muscle and their presence in endothelial cells of intramuscular capillaries. In this study, the presence of bacilli was noted within the intramuscular capillaries.

Muscle is one of the favorable sites, like the liver, bone marrow, and nerves, for the persistence of bacilli.<sup>8</sup> Clinically normal striated muscle has also shown the histopathological lesion and presence of bacilli in leprosy.<sup>9,10</sup> The presence of bacilli in the arrector pili muscle at the site of lesions has been reported previously.<sup>11</sup> In this study the presence of the bacilli is reported from a normal appearing site.

## 5. Conclusions

Muscle involvement exists in the normal appearing skin in all types of leprosy. Moreover the degree of the lesion increases with a decrease in immunity from the tuberculoid to the lepromatous end of the spectrum. AFB were seen in the arrector pili muscle of normal appearing sites.

The presence of AFB is significant as far as dissemination and transmission of the disease is concerned. It may be due to the phagocytic activity of keratinocytes, which engulf bacilli, and the possibility of discharge of leprosy bacilli from intact skin, even without ulceration, should be seriously considered.<sup>12</sup> The

observations in this study were confined to the light microscope level.

*Conflict of interest:* No conflict of interest to declare.

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