HISTOPATHOLOGY OF SKIN LESIONS IN LEPROSY

JAYALAKSHMI MBBS*

Summary
A review of skin biopsies performed at the University Hospital, Kuala Lumpur over a 10 year period (1968 to 1978) revealed 76 cases of leprosy. The lesions have been classified as tuberculoid, borderline tuberculoid, borderline, borderline lepromatous and lepromatous leprosy. Their histological appearances and relationship to nerve involvement are discussed.

INTRODUCTION
Histopathological examination of skin or nerve biopsies or the demonstration of lepra bacilli in skin smears are the only laboratory means of confirming a diagnosis of leprosy. The histological features are particularly useful in the early stages when there is a sparsity of bacilli in skin smears. The histological changes in the skin in leprosy are protean, and it is essential for a histopathologist dealing with skin biopsies from leprosy patients to be aware of these diverse manifestations.

A review of 1,710 consecutive skin biopsies performed at the University Hospital, Kuala Lumpur between January 1968, and December 1978, revealed 76 cases of leprosy. The findings are presented in this paper.

MATERIALS AND METHODS
The skin biopsies were fixed in 4% formaldehyde, embedded in paraffin and stained with hematoxylin and eosin. In addition, sections from the 76 cases of leprosy were stained by the Fite-Farraco method for acid fast bacilli. The lesions were classified on the basis of histopathological features into tuberculoid (TT), borderline tuberculoid (BT), borderline (BB), borderline lepromatous (BL) and lepromatous leprosy (LL).

RESULTS
The distribution of patients into the five classes of leprosy according to age, sex and race is given in Tables I and II. No cases of borderline leprosy (BB) were found.

**TABLE I**
DISTRIBUTION OF 76 LEPROSY CASES ACCORDING TO AGE, GROUP AND TYPE OF LESION

<table>
<thead>
<tr>
<th>Age group in years</th>
<th>Type of leprosy</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TT</td>
<td>BT</td>
<td>BL</td>
</tr>
<tr>
<td>0–9</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10–19</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>20–29</td>
<td>9</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>30–39</td>
<td>1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>40–49</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>50–59</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>60–69</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>70–79</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>80–89</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>19</td>
<td>29</td>
<td>9</td>
</tr>
</tbody>
</table>

*Medical Officer, Department of Pathology, University Hospital, Kuala Lumpur (Address for reprint requests).
TABLE II
DISTRIBUTION OF 76 LEPROSY CASES ACCORDING TO SEX AND RACE

<table>
<thead>
<tr>
<th>Type of leprosy</th>
<th>Male</th>
<th>Female</th>
<th>Malay</th>
<th>Indian</th>
<th>Chinese</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT</td>
<td>12</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>BT</td>
<td>23</td>
<td>6</td>
<td>3</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>BL</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>LL</td>
<td>15</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>TOTAL</td>
<td>56</td>
<td>20</td>
<td>12</td>
<td>17</td>
<td>47</td>
</tr>
</tbody>
</table>

TUBERCULOID LEPROSY (TT)
19 patients had tuberculoid leprosy. The diagnostic skin lesion was the presence of epitheloid cell granulomas with numerous lymphocytes and a few Langhans-type giant cells (Fig. 1). Granulomas were observed both in the papillary and reticular dermis in 13 cases. They were found to be predominantly present around dermal appendages in 4 cases and around nerve bundles in 2 cases. Perivascular infiltration by lymphocytes was present in all cases. Infiltration of the nerve bundles by lymphocytes and epitheloid cells was seen in 6 cases. There was moderate swelling of nerve bundles in 1 case. Occasional foci of caseation necrosis were present in 3 cases (Fig. 2). Nerves were not recognised in 12 cases. Erosion of the epidermis by the granulomas and lymphocytes was seen in 2 and 10 cases respectively (Fig. 3). The index for acid fast bacilli (using the 6+ bacterial index scale) was 1+ in the affected nerve bundles in 1 case and 0 in 18 cases.

BORDERLINE TUBERCULOID LEPROSY (BT)
This represents the largest group comprising approximately 38% of the total number of cases (29 biopsies). The characteristic lesion is the epitheloid cell granuloma with moderate numbers of lymphocytes. Langhans giant cells were seen in 16 cases. There was a clear subepidermal zone in 23 cases. In the remaining cases, focal erosion of the basal layer of the epidermis by lymphocytes was seen. The changes observed in the dermal nerves included perineural lymphocytic and mononuclear infiltration (2 cases), infiltration into the margins of nerves by lymphocytes (6 cases) and interstitial infiltration by lymphocytes and epitheloid cells, partially replacing the nerve twigs (7 cases). In 14 cases, nerve fibres were not identified. Perivascular lymphocytic infiltration was seen in all cases. The granulomas were seen around sweat glands, hair follicles and arrectores pilorum muscles. The index for AFB was 1+ in 3 cases and 2%+ in 2 cases.

BORDERLINE LEPROMATOUS LEPROSY (BL)
There were 9 cases of borderline lepromatous leprosy. The granulomas in this group consisted of foamy macrophages with:

(a) numerous lymphocytes densely packed over the whole granuloma in 3 cases and one segment of the granuloma in 6 cases and

(b) an occasional clump of epitheloid cells in 3 cases.

The granulomas were massive in the papillary and reticular dermis in 3 cases. In the reticular dermis they were seen around the dermal appendages. The dermal nerve twigs were surrounded and infiltrated by lymphocytes and a few histiocytes in 2 and 7 cases respectively. The subepidermal zone was clear in all cases. The index for AFB was 4 to 5+.

LEPROMATOUS LEPROSY
Biopsies from 19 patients showed features of lepromatous leprosy including 3 cases of erythema nodosum leprosum. Macrophage granulomas with scanty lymphocytes and small vesicles were seen. Numerous lepra cells containing bacilli in large clumps were seen in most cases
Figure 1: Tuberculoid leprosy (TT). Epitheloid cell granuloma with lymphocytes and a Langhans giant cell. H & E x 160.

Figure 2: Tuberculoid leprosy. Caseation nectosis in a granuloma H & E x 160.
Figure 3: Tuberculoid leprosy. Erosion of the epidermis by lymphocytes H & E x 160.

(Fig. 4). The granulomas were massive in the papillary dermis in all cases (Fig. 5). They were also present in the reticular dermis in 5 cases and around dermal appendages in the other cases. Foamy macrophages and lymphocytes were seen to have infiltrated between the nerve fibres in 12 cases. Moderate thickening and proliferation of perineurium was present in 4 cases. The subepidermal zone was clear in all cases and there was atrophy of the epidermis in 10 cases (Fig. 6). The index for AFB was 5 to 6+

**DISCUSSION**

Tuberculoid leprosy including borderline tuberculoid leprosy appears to be more common (63%) than borderline lepromatous and lepromatous leprosy. The incidence of leprosy is highest in the 20–29 year age group.

While there is involvement of nerves in all forms of leprosy, tuberculoid leprosy (TT) is characterised by early nerve involvement with sensory and sympathetic neural dysfunction. In this study partial infiltration and replacement of nerve bundles by tuberculoid granulomas was seen in 6 out of 19 cases of TT. Nerve fibres were not identified in 12 cases. It is not possible to be certain whether this is due to total destruction of nerve fibres or due to their absence in the biopsy. The index for AFB was similar to that of other reports.

**BT** was the most common type of leprosy seen. It is not generally appreciated that BT is the commonest type of leprosy to be encountered world-wide and failure to appreciate this fact is due to failure to recognise the clinical and histological features. According to Ridley over half the cases of leprosy orig-
Figure 4: Lepromatous leprosy (LL). Lepra cells and bacilli. Fite stain x 400.

Figure 5: Lepromatous leprosy. Massive granulomas in the papillary dermis. H & E x 63.
Figure 6: Lepromatous leprosy. Atrophic epidermis with a clear subepidermal zone. H & E x 160.

Figure 7: Erythema nodosum leprosum. Infiltration of a lepromatous granuloma by lymphocytes and polymorphs. H& E x 160.
SKIN PATHOLOGY IN LEPROSY

inates in BT. 79% of BT cases showed a clear subepidermal zone, while the remainder showed focal erosion of the basal layer of the epidermis by lymphocytes. A useful feature that distinguishes BT from TT is that in the former, a clear subepidermal zone is present, although it might be narrow, whereas in the latter there is extensive erosion of the epidermis.

The changes observed in LL in this study correspond to previous descriptions. The nerve changes include proliferation of the perineurium and infiltration between the nerve fibres by macrophages and a few lymphocytes. There were 3 cases of erythema nodosum lepromatous (ENL), a well known complication of lepromatous leprosy. The presence of polymorphs is a characteristic feature of early lesions of ENL, while lymphocytes predominate in older lesions. Moderate to marked oedema of the walls of blood vessels, endothelial swelling and angiitis may also be seen. The lepra bacilli are typically granular and fragmented.

ACKNOWLEDGEMENTS
I wish to express my gratitude to Prof. K. Prathap for his encouragement and the staff of the Department of Pathology, University of Malaya for their assistance.

REFERENCES