

## Smear Site Selection with Particular Reference to the Fingers. A Study in 244 Long-Treated Lepromatous Patients<sup>1</sup>

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The success of leprosy control is, to a growing extent, in jeopardy because of the increasing numbers of lepromatous patients in whom the disease relapses. In a substantial percentage of those patients the relapse is brought about by the development of dapsone resistance in their bacilli. Contacts infected with those bacilli will develop primary dapsone resistant leprosy. Early diagnosis of relapse is therefore of primary importance, and this can be achieved by regular examination of lepromatous patients. The examination should include skin smears from sites most likely to contain bacilli.

Ridley, *et al.* (<sup>3</sup>), in a small series of long-treated lepromatous patients, found the fingers to be the skin site at which bacilli were most frequently detected and where the highest bacterial load and highest number of solidly staining bacilli could be found. A similar study from India (<sup>1</sup>) supported these findings and further suggested that more solids can be found in the terminal phalanx as compared to the middle phalanx. Jopling, *et al.* (<sup>2</sup>) demonstrated in two patients that the presence of solid bacilli in the finger preceded the reappearance of solids in other skin sites and occurred before the relapse became clinically apparent.

Following a discussion with Dr. W. Jopling in October 1979, it was decided to include finger smears in our examination of long-treated lepromatous patients. In many leprosy control projects the number of smears taken for routine monitoring are very limited (usually only two), and it is important that the sites chosen are those most likely to be productive. The following

study, therefore, is an attempt to analyze data from multiple smear sites in a large number of long-treated lepromatous patients.

### MATERIALS AND METHODS

**Patients.** The study was undertaken at a special clinic established at the ALERT hospital for the assessment and follow-up of relapsed leprosy patients. Between January and July 1980 all lepromatous patients on treatment for at least 5 years and having positive skin smears were included in the study. Eighty percent of the patients were in fact treated for more than 10 years. Data were included only from the first smears in those patients that were examined more than once during this period. The patients studied were divided into two groups:

- I. One hundred and seventy patients in whom the disease seemed quiescent.
- II. Seventy-four patients who presented with one or more active leprosy lesions. In half of them the lesions had been present for less than 3 months.

**Examination.** The assessment of the patients included slit-skin smears from six sites which were recorded on their clinical drawings. In group I smears were taken from one earlobe (site 1), one finger (site 2) and from one site just proximal to each elbow and knee (sites 3, 4, 5, 6). In group II smears were taken from one earlobe (site 1), one finger (site 2), and from active lesions with preference for new nodules or, in the absence of a sufficient number of active lesions, from sites just proximal to the elbows and the knees (sites 3, 4, 5, 6).

In the first 66 patients of group I and the first 32 patients of group II the finger smears were taken from the dorsum of the proximal phalanx of the middle finger while in the remaining patients it was taken from the distal phalanx of the fourth finger. The

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TABLE 1. Mean BI at various skin sites in 170 clinically quiescent patients (group I) and 74 clinically active patients (group II).

|          | Ear | Finger | Site 3 | Site 4 | Site 5 | Site 6 |
|----------|-----|--------|--------|--------|--------|--------|
| Group I  | 1.6 | 1.4    | 1.4    | 1.3    | 1.3    | 1.3    |
| Group II | 3.0 | 3.0    | 4.1    | 4.0    | 4.0    | 4.0    |

smears were taken by a health worker experienced in smear taking and were stained by a modification of the Ziehl-Neelsen method. The slides were covered with carbol fuchsin, heated until visible vapor was formed, allowed to stand for 15 minutes, then rinsed in tap water and decolorized in 10% acetic acid for 60 seconds, washed in tap water and counter stained with methylene blue for one minute. Microscopic examination of all smears was performed by the same clinician. The Bacterial Index (BI) was recorded for each site according to Ridley's scale (6) and the Morphological Index (MI) as the percentage of uniform staining bacilli without any clear defect in morphology.

### RESULTS

There was no significant difference in the relative concentration of either the total number of bacilli or the number of solid forms at the proximal phalanx of the middle finger as compared to the distal phalanx of the fourth finger in either group I or II. Therefore, in subsequent comparisons, no distinction is made between patients having the finger smear taken from the proximal phalanx of the middle finger and those in whom the distal phalanx of the fourth finger was chosen.

The mean values of the BI at the six sites

are given in Table 1. In group I the mean BI was slightly higher in the earlobe than at the other sites. In group II, on the other hand, the mean BIs at the sites on the body showed to be one full point higher (indicating 10× as many bacilli) than at either the ear or the finger.

Table 2 shows that in both group I and group II no significant differences were found among sites 3, 4, 5, and 6 when comparing the productivity at each of these sites with the productivity at the earlobe and finger. Site 6, with the lowest score in most aspects, was chosen as a representative site on the body for comparison with the ear and finger.

The results, summarized in Table 3, show that the earlobe was the most productive in group I, whereas in group II the site on the body was far more productive than the ear and finger, showing the highest number of bacilli and solid forms. This site was also most frequently the sole site for solid forms.

### DISCUSSION

From Table 3 it can be seen that the earlobe was the most informative site in long-treated lepromatous patients without any apparent active lesions. Little additional information was gained from the finger, either from the proximal phalanx, or from the distal phalanx. Also in the group of patients with one or more active looking lesions, the finger smear did not have any advantage over either the earlobe or sites 3, 4, 5, and 6 on the extremities or body. On the other hand, much valuable information was gained from sites 3, 4, 5, and 6, yielding relatively the highest total number of bacilli and their solid forms and being most frequently the only sites showing solids.

The experience in this hospital is that the

TABLE 2. Percentage of patients showing at sites 3, 4, 5, and 6 a value higher than at earlobe and finger.

|                           | Group I (quiescent) |        |        |        | Group II (active) |        |        |        |
|---------------------------|---------------------|--------|--------|--------|-------------------|--------|--------|--------|
|                           | Site 3              | Site 4 | Site 5 | Site 6 | Site 3            | Site 4 | Site 5 | Site 6 |
| Highest BI                | 15.9                | 16.4   | 15.9   | 17.6   | 47.3              | 41.9   | 43.2   | 43.2   |
| Sole site showing bacilli | 5.9                 | 6.5    | 6.5    | 5.9    | 0                 | 2.7    | 2.7    | 2.7    |
| Highest MI                | 4.7                 | 3.5    | 3.5    | 3.5    | 36.5              | 36.5   | 31.1   | 25.7   |
| Sole site showing solids  | 4.1                 | 2.4    | 3.5    | 2.9    | 20.3              | 16.2   | 16.2   | 12.2   |

TABLE 3. Percentage of patients showing the highest value at site 6, finger and earlobe.

|                           | Group I (quiescent) |        |        | Group II (active) |        |        |
|---------------------------|---------------------|--------|--------|-------------------|--------|--------|
|                           | Ear                 | Finger | Site 6 | Ear               | Finger | Site 6 |
| Highest BI                | 28.2                | 18.8   | 17.6   | 14.9              | 12.2   | 43.2   |
| Sole site showing bacilli | 8.2                 | 6.5    | 5.9    | 1.4               | 0      | 2.7    |
| Highest MI                | 6.5                 | 1.2    | 3.5    | 9.5               | 13.5   | 25.7   |
| Sole site showing solids  | 6.5                 | 0.6    | 2.9    | 1.4               | 5.4    | 12.2   |

finger, apart from giving little additional information, has certain disadvantages as a site for smear taking. Many patients object to this site because it causes more pain, bleeds more, and the resulting wound is easily visible. One also wonders whether in a farming community a wound in the finger might not more often lead to infection.

Technically the slit-skin smear from the distal phalanx is more difficult than from the proximal phalanx because the skin at that site cannot be pinched and the material obtained tends to contain more blood. However, the proximal phalanx did not produce any better results. Difficulties in the technique are therefore not likely to be the explanation for differences between our results and the previous reports.

Ridley, *et al.* (<sup>5</sup>) found in a series of 30 long-treated lepromatous patients that bacilli were most frequently detected in the fingers and that this skin site produced the highest total number of bacilli and also of solid-staining forms. If coolness of the site plays an important role, climatic differences between England and Ethiopia might explain the difference in productivity of smears from the fingers. A study comparing the yield of different skin sites including the finger, in a greater number of patients and in climatic conditions similar to England and supplemented with thermographic studies, might perhaps clarify this point.

Hiramilini, *et al.* (<sup>1</sup>), working in tropical India, studied 41 lepromatous patients who were treated for periods ranging from 6 months to 20 years. The authors do not report how many were long-treated or in what proportion of patients the disease was quiescent. In their group the maximal BI and MI of four smears from the fingers and the maximal BI and MI of four smears from the toes were compared to the BI and MI from each of the routine sites and found signifi-

cantly higher. One would doubt, however, whether the maximal BI and MI at four fingers or toes may be validly compared with the BI and MI at each of the other sites from which only one smear was taken. This could find support in the authors' statement that "No statistical significant difference was observed between the average or maximal BI and MI at fingers or toes as compared to the same at routine sites."

Jopling, *et al.* (<sup>2</sup>) showed that the presence of solids in fingers preceded a clinical relapse and reappearance of solid forms in other skin sites in two patients treated for respectively 3 and 15 years.

Jopling, reviewing these three papers in an Editorial (<sup>3</sup>), suggests that "no more than four smears are necessary: one from each earlobe and one from the terminal phalanx of each middle finger." The three case reports, however, demonstrated that smears taken from fingers do not necessarily show an increase of bacilli or their solid forms before a relapse becomes clinically apparent and these three cases are no exceptions.

I suggest that in selection of standard sites for smears from long-treated lepromatous cases at least one earlobe and one site on the limbs or trunk are included, with a preference for active lesions. Further research should be conducted to evaluate finger smears in other groups of patients, particularly in untreated lepromatous and non-lepromatous patients (<sup>4</sup>).

## SUMMARY

Positive slit-skin smears were studied from 244 long-treated lepromatous patients. In clinically active patients (74) the finger was found to be less productive than the earlobe and four other sites, both in respect to total numbers of bacilli and their solid forms. In clinically quiescent patients (170)

the earlobe proved to be the most informative site.

### RESUMEN

Se estudiaron preparaciones positivas de linfa cutánea de 244 pacientes con lepra lepromatosa con muchos años de tratamiento. Se encontró que en los pacientes clínicamente activos (74), el dedo fue menos productivo que el lóbulo de la oreja y que otros cuatro sitios, tanto en número total de bacilos como en el número de formas sólidas. En los pacientes en remisión clínica (170), el lóbulo de la oreja resultó ser el sitio más informativo.

### RÉSUMÉ

Chez 244 malades lépromateux traités pour une longue période, on a étudié des frottis cutanés positifs prélevés à la curette (split-skin) malades cliniquement actifs, au nombre de 74, on a observé que le doigt livrait moins de bacilles en nombre absolu, et une proportion moindre de forme solide, que le lobe de l'oreille et les 4 autres sites de prélèvement qui ont été étudiés. Chez des malades cliniquement quiescents, 170 au total, le lobe de l'oreille s'est révélé l'endroit de prélèvement livrant le maximum d'information.

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