Acid-Fast Bacilli in the Bone Marrow in Leprosy[1]

P. P. Banait and R. V. Junnarkar[2]

In leprosy *Mycobacterium leprae* is found throughout the body, including the reticuloendothelial system as well as the skin and nerves. Hirschberg and Biehler (3), Lowe and Dharmendra (5) and Karat (4) have demonstrated lepra bacilli in the bone marrow in lepromatous leprosy. Gass and Rishi (2) observed them in the bone marrow of "mixed" cases, but they were unable to find them in the marrow in "neural type" leprosy. The present study attempts to determine the presence of lepra bacilli in bone marrow as correlated with the type of leprosy as well as to correlate the bacillary index in bone marrow with the bacillary index in skin smears and skin biopsies.

MATERIALS AND METHODS

One hundred and fifteen cases of leprosy from the Medical College and Hospital, Nagpur, were studied between June 1967 and June 1968.

A detailed clinical history was obtained and a thorough physical examination was done in every case. Tuberculosis was excluded by clinical and radiological examination. Lepromatous cases were inpatients and were treated with DDS for three to six months while others were untreated cases. The following materials were collected for laboratory investigations: skin bacillary smear, skin biopsy and bone marrow aspirate.

All leprosy cases were classified by clinical examination and histopathologic evaluation as lepromatous, tuberculoid, or indeterminate types. The tuberculoid and indeterminate cases were untreated whereas the lepromatous were DDS treated.

To avoid contamination of bone marrow aspirate with lepra bacilli from the skin over the sternum, a well fitting stylet was used. All smears were stained with Wade's modification of the Ziehl-Neelsen stain. Skin biopsies were stained with hematoxylin-eosin and Fite-Faraco stain (1).

Bacterial indices for skin smears, skin biopsies and bone marrow were graded by Ridley's modification of Cochrane's index (6).

RESULTS

Of the 115 cases studied, 61 were lepromatous, 37 indeterminate and 17 tuberculoid leprosy (Table 1). Acid-fast bacilli were found in both the skin and bone marrow of lepromatous patients only. In the indeterminate and tuberculoid types, they were not found at both sites.

Skin biopsies showed higher bacterial concentration than the skin smears from the same area in all cases. Therefore, for comparison of bone marrow and skin bacillary content, the skin biopsy index was used.

All lepromatous cases were positive for acid-fast rods in the skin but only 48 (78%) showed leprosy bacilli in the marrow. The bacillary index was always less in the bone marrow than in the skin biopsy.

Table 2 notes that bone marrow involvement with leprosy bacilli was more common in cases of leprosy having a high skin bacillary index.

TABLE 1. *Presence of acid-fast bacilli in bone marrow in relation to type of leprosy.*

Type of leprosy	Total cases	AFB in bone marrow		% positive
		+	−	
Lepromatous	61	48	13	78
Indeterminate	37	—	37	—
Tuberculoid	17	—	17	—

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2 P. P. Banait, M.D., Reader in Pathology, Medical College, Nagpur; R. V. Junnarkar, M.D., Professor of Pathology, B.J. Medical College, Poona, India.

TABLE 2. *Relationship of bacterial index in skin biopsies and bone marrows of 61 lepromatous cases.*

Bacterial index in skin biopsy	Total cases	Bacterial index in bone marrow						No. of cases without AFB in bone marrow	Percentage of cases showing AFB in bone marrow
		1+	2+	3+	4+	5+	6+		
1+	—	—	—	—	—	—	—	—	—
2+	1	—	—	—	—	—	—	1	—
3+	6	2	—	—	—	—	—	4	33.3
4+	11	2	3	—	—	—	—	6	45.4
5+	17	—	7	6	2	—	—	2	88.2
6+	26	—	10	9	5	2	—	—	100.0
TOTAL	61	4	20	15	7	2	—	13	78

The age of the patient and duration of his disease had some effect on the presence of acid-fast bacilli in the bone marrow. Bone marrow involvement was observed more commonly in older age groups and when the disease had been long present (Table 3).

Lepra reaction was observed in 38 lepromatous cases (Table 4). Of these, 32 (84%) showed acid-fast bacilli in the bone marrow. There were 23 lepromatous patients without lepra reaction and of these 16 (69.5%) had acid-fast rods in the marrow.

DISCUSSION

Seventy-eight per cent (48) of the lepromatous cases had acid-fast bacilli in the bone marrow. These organisms were not seen in indeterminate and tuberculoid leprosy. Gass and Rishi ([2]) found lepra bacilli in bone marrow in 80% of "mixed" cases, while Lowe and Dharmendra ([5]) reported them in 50% of 32 cutaneous leprosy cases. These organisms were not seen in the marrow of the neural type of cases studied by the above workers except for one case reported by Lowe and Dharmendra. In the recent series reported by

TABLE 3. *Presence of AFB in the bone marrow in relation to age and duration of the disease in lepromatous cases.*

Age in years	Duration of disease in years										Total No. cases		Percentage of cases positive for AFB in bone-marrow
	1–4		5–8		9–12		13–16		17–20				
	+	−	+	−	+	−	+	−	+	−	+	−	
15–25	6	1	1	—	—	1	—	—	—	—	7	2	77.7
26–35	7	5	4	2	6	2	3	—	2	—	22	9	70.9
36–45	4	—	2	2	3	—	—	—	1	—	10	2	83.1
46–55	2	—	—	—	3	—	—	—	2	—	7	—	100.0
56–65	2	—	—	—	—	—	—	—	—	—	2	—	100.0
TOTAL	21 (77%)	6	7 (63%)	4	12 (80%)	3	3 (100%)	—	5 (100%)	—	48 (78%)	13	

TABLE 4. *Relation of lepra reaction to the presence of acid-fast bacilli in bone marrow in lepromatous leprosy.*

Lepra reaction	Total No. cases	AFB in bone marrow		Percentage of cases positive for AFB in bone marrow
		+	−	
Present	38	32	6	84%
Absent	23	16	7	69.5%

Karat (4) 47% of 235 lepromatous patients had acid-fast rods in the bone marrow. He also found them in five of 33 dimorphous (intermediate) and 2 of 53 indeterminate leprosy cases. All tuberculoid patients (82) in his series failed to yield *M. leprae.*

The percentage of positive bone marrows (78% of lepromatous type) in the present work was higher than reported by Karat (47%) (4). The higher percentage of positive cases might be due to the higher bacterial index found (80% cases were in groups of 5+ and 6+) than in the series published by Karat (27.6% cases were of similar groups). This study is not readily compared with the observations of Gass and Rishi (2) and Lowe and Dharmendra (5) since the leprosy classification followed by these workers was different from that currently used.

The more common bone marrow involvement with leprosy bacilli in cases of leprosy having a higher bacillary index suggests that there was a direct relationship between the incidence of acid-fast bacilli in bone marrows and the number of bacilli in the skin biopsies (4).

Morphologic abnormalities were noted in bacilli in skin and bone marrow. The bacilli were mostly situated intracellularly in the form of rods, but granular and coccoid forms were also seen.

As noted in Table 3, bone marrow involvement was more common in cases of leprosy in older age groups as well as in cases having a long clinical history. This may be explained by a lower immunologic status due to multiple nutritional deficiencies and hypoproteinemia which are more commonly seen in older age groups. The frequency of bone marrow involvement in cases of long standing duration may also be a reflection of the frequency of bacillemia.

Bone marrow involvement was also seen more commonly in cases of leprosy with reaction. This may be due to an increase of bacillemia in reactional leprosy. Karat (4) did not observe any significant relation in this respect.

SUMMARY

The present study was carried out in 115 leprosy cases. Of these 61 were lepromatous, 37 indeterminate and 17 tuberculoid. Acid-fast bacilli were found in the bone marrow of lepromatous cases (78%) only. Bone marrow involvement was more common in cases having higher bacillary indices in skin, in older age group with longer clinical history and in cases of lepra reaction.

RÉSUMÉ

L'étude ici décrite a été menée chez 115 cas de lèpre, parmi lesquels 61 lépromateux, 37indéterminés, et 17 tuberculoides. Des bacilles acido-résistants one été trouvés dans la moelle osseusse de 78 pour cent seulement des cas lépromateux. L'atteinte de la moëlle osseuse était plus fréquente chez les cas qui présentaient des indices bacillaires élevés dans la peau, de même que dans le groupe d'âge avancé avec une histoire clinique plus longue, et chez les cas souffrant de réaction lépreuse.

RESUMEN

El presente estudio se efectuó en 115 casos de pacientes con lepra. De estos, 61 eran lepromatosos, 37 indeterminados y 17 tuberculoides. Se encontraron bacilos ácido-alcohol resistentes solamente en la médula ósea de los casos lepromatosos (78%). La médula ósea estaba comprometida con mayor frecuencia en los casos que tenían índices bacilares altos en la piel, en el grupo de enfermos con más edad y cuya evolución clínica era más prolongada y en los casos de reacción leprosa.

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