

# Radiological Changes in the Hands and Feet of Leprosy Patients with Deformities

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## ABSTRACT

**Context:** Leprosy is a social disease and it is perceived in the society due to deformities. Bone changes are common in leprosy.

**Aim:** To study the radiological changes in the hands and feet in leprosy patients with deformities.

**Settings and Design:** This was an observational study done in the Department of Dermatology.

**Methods and Material:** This study was carried out for 24 months and it included 50 leprosy patients who were associated with deformities. The radiological changes were studied by taking roentgenograms (X-rays) of the hands and feet.

**Statistical Analysis Used:** The statistical analysis of the descriptive data, that included the number and percentages, was done for all the categories.

**Results:** Among 50 patients (34 males and 16 females) overall, the radiological changes were seen in 48 patients. The radiological changes found were specific, nonspecific and osteoporotic in 31, 48 and 27 patients respectively. Only 2 patients did not show any bone changes. Male patients, especially manual labourers, showed more bone changes. There was no significant difference in the bone changes among the various types of leprosy.

**Conclusions:** Though leprosy is an ancient disease, it still continues to be the most feared, due to deformities. The bone changes with deformities are preventable, since all these are not due to the disease itself. The study of the radiological changes may help the clinician in formulating methods for the management of the disease and in preventing the permanent loss of function and the occurrence of deformities and disabilities.

**Key Words:** Leprosy, Deformities, Radiological changes

## KEY MESSAGE

- Among the 50 leprosy patients who were studied, radiological changes in the form of specific, nonspecific and osteoporotic bone changes were found in 31, 48 and 27 patients respectively.
- This study may help clinicians in formulating methods of management and in preventing the permanent loss of function and the occurrence of deformities.

## INTRODUCTION

Leprosy is a chronic disease which is caused by *Mycobacterium leprae*, which is infectious in some cases, and affecting the peripheral nervous system, the skin, bones and joints and certain other tissues.

Leprosy is a disease of great antiquity [1]. It is considered to be important mainly because of its potential to cause permanent and progressive physical deformities with serious social and economical consequences [2].

Leprosy continues to be an important public problem in most parts of Asia, Africa and Latin America. It is widely prevalent in India. India alone represents 64% of the prevalence and 78% of the new case detections worldwide [3].

About 25% of the leprosy patients who are not treated at the early stages of the disease develop deformities of the hands and feet [4]. About 80% of the joint lesions are in the metatarso-phalangeal joints of the foot or in the inter-phalangeal joints of the hands and feet [5]. The frequency of the bone changes which has been recorded in different studies has varied from 15% to 95% [6].

A number of factors influence the occurrence and the progress of deformities in leprosy patients. These are related to the age, sex and occupation of the patient, the duration and type of disease, nerve involvement and environmental factors [7].

The main aim of this study was to study the radiological changes in the hands and feet in leprosy patients with deformities.

## SUBJECTS AND METHODS

50 cases of leprosy patients who attended the Department of Dermatology were selected for the study. Ethical clearance for the study protocol was obtained from the institutional ethical committee. An informed consent was obtained from all the patients.

A detailed clinical examination was carried out in all the patients and they were provisionally diagnosed as lepromatous (LL), borderline lepromatous (BL), borderline (BB), borderline tuberculoid (BT), tuberculoid (TT) and polyneurotic leprosy (PN).

The diagnosis of the type of leprosy was confirmed by the demonstration of AFB from the slit and scrape smears. The bacteriological

index (BI) and the morphological index (MI) were calculated according to Ridley's scale [8]. The histopathological examination of the skin lesions in lepromatous, borderline and tuberculoid leprosy and the nerve (sural) in neural leprosy was done.

A radiological examination for the presence of the bone changes was carried out, which included antero-posterior (AP), lateral or oblique skiagrams of both the hands and feet of the patients. The skiagrams were studied in detail for the specific and non-specific bone changes and for osteoporosis.

The statistical analysis of the descriptive data that included the number and percentages was done for all the categories.

## RESULTS

In a total of 50 patients, the overall incidence of bone changes was 96%. The radiological changes found were specific, nonspecific and osteoporotic in 62%, 96% and 54% of patients respectively. Only 4% of the patients did not show any bone changes.

The youngest patient in the present study was 12 years old and the oldest was 75 years old. The maximum number of patients

(13) who showed bone changes in this study belonged to the 40-49 years age group, whereas the least number of patients (2) belonged to the 10-19 years age group.

In this study, male patients comprised 68% and female patients, 32% of the total patients.

**Specific bone changes in the hands and feet:** In the hands, the commonest specific bone change was primary periosteitis (24%) and in the feet, the areas of bone destruction were the commonest (28%). The other changes with their frequencies are shown in [Table/Fig-1].

**Nonspecific bone changes in the hands and feet:** Nonspecific bone changes were observed in 48 patients (96%). Absorptive changes were the most common among them. The absorption of the terminal phalanges was present in 48 patients (96%). The other non specific changes with their frequencies are shown in [Table/Fig-2].

**Bone changes and the type of leprosy:** In the present study, 30 patients had BT (60%) 12 had BL (24%), 5 had PN (10%), 2 had LL (4%) and 1 had BB (2%) type of leprosy. None of the patients belonged to the TT spectrum.

Specific bone changes	Number of cases showing radiological changes			
	Hands alone	Feet alone	Hands and feet	Total
Primary periosteitis with licked candy appearance [Table/Fig-6]	12	07	02	21
Bone cyst [Table/Fig-7]	07	–	01	08
Honey combing [Table/Fig-6]	02	–	01	03
Enlargement of nutrient foramen	–	–	–	–
Thinning and irregularity of cortex	02	06	22	30
Concentric cortical erosion	01	10	14	25
Area of bone destruction	02	14	02	18
Subarticular erosion	04	05	04	13
Sclerosis (Table/Fig-8)	02	09	01	12

[Table/Fig-1]: Specific bone changes in hands and feet

Nonspecific bone changes	Number of cases showing radiological changes			
	Hands alone	Feet alone	Hands and feet	Total
Absorption of Terminal phalanges (Table/Fig-7)	02	19	27	48
Middle phalanges	02	16	12	30
Proximal phalanges	02	15	03	20
Metacarpals	02	–	–	02
Metatarsals	–	14	–	14
Soft tissue changes (Figure 9)	04	21	15	40
Concentric absorption	–	01	02	03
Contracted fingers (Figure 6) / claw hands / claw toes	10	11	08	29
Tuft erosion (Figure 7)	04	16	23	43
Arthritis	05	12	01	18
Subluxation / dislocation	05	10	–	15
Cupping of joints (Figure 8)	01	05	–	06
Fractures	–	05	01	06
Secondary periosteitis	02	07	–	09
Osteomyelitis (Figure 9)	–	10	–	10
Disintegration of tarsal bones	–	06	–	06
Eccentric absorption	01	02	1	04
Others (calcification of dorsalis pedis artery)	–	02	–	02
Osteoporosis	05	11	11	27

[Table/Fig-2]: Nonspecific bone changes in hands and feet

The bony changes with respect to the type of leprosy are shown in [Table/Fig-3].

## DISCUSSION

In all the 50 patients, the overall incidence of the bone changes was 96% in the present study whereas in the study of Choudhuri et al [9], Thappa et al [6] and Carayon [5], it was 87.3%, 82.9% and 60-80% respectively. The higher incidence of the overall bone changes in the present study may be due to the fact that the study group constituted patients who had deformities.

In the present study, 62% of the patients showed specific bone changes as against 44.5 % [9], 22.4 % [6] and 34 % [10] in other studies. Enna et al [11], noticed 3-5% specific changes in hospitalized patients and Murry and Jacobson [12] observed that 15% of the patients showed specific changes.

The percentages of various specific and non-specific changes which were encountered in the present study and by other authors are depicted in [Table/Fig-4] and [Table/Fig-5] respectively.

In the present study, 30 patients belonged to the BT type and 12 patients belonged to the BL type of leprosy. There were 5, 2 and 1 patients who belonged to the PN, LL and BB type of leprosy respectively. There were 54% patients who belonged to the paucibacillary (PB) type and 46% patients who belonged to the multibacillary (MB) type of leprosy.

In the study of Choudhuri et al [9], 89% had PB leprosy and 11% had MB leprosy. In the study of Thappa et al [6] and Chhabriya et al [10], there were more patients who belonged to the MB group of leprosy.

In a study by Schipper et al [13], tBT/TT type of leprosy was seen in 41% of the patients, the LL/BL type was seen in 47% of the patients and thPN type was seen in 12% of the patients. Similar observations were made by Thappa et al [14].

In the above mentioned studies, the commonest type of leprosy was MB, whereas in the present study the PB type was the commonest. This could be because the patients who had deformities were included and because the deformities were more common in the borderline spectrum.

Specific changes were seen in all the patients who belonged to the LL and BB types of leprosy (100%), whereas they were seen in 66.6%, 60% and 56.6% patients of the BL, PN and BT types of leprosy respectively.

In the study of Choudhuri et al [9], the LL type showed an increased incidence of bone changes (75% specific, 100% nonspecific and 75% osteoporosis) as compared to BT leprosy (45% specific, 76.5% nonspecific and 35% osteoporosis).

In the present study, the patients in the BT group showed 56.6%, 96.66% and 50% specific, nonspecific and osteoporotic changes respectively. This was almost similar to the frequency which was found in the study of Choudhuri et al [9]. However, in the present study, all the patients with the LL type showed specific (100%) and nonspecific (100%) changes.

In the study of Chhabriya et al [10], specific changes were observed with a decreased incidence (LL-37%, BT-25%, BB-25% and PN-50%), whereas the present study showed an increased incidence of specific changes among the various types of leprosy (LL-100%, BL-66.6%, BB-100%, BT-56.6% and PN-60%).

In the study of Thappa et al [6], the BT, BL and LL types showed 64.3%, 80% and 26.7% nonspecific changes and in the study of Choudhuri et al [9], the BT, BL and LL types showed 76.5%, 50% and 100% non-specific changes respectively. In the present study, a similar frequency of nonspecific changes was observed among the different types of leprosy i.e., BT (96.6%), BL (91.6%), LL (100%) and PN (100%).

In the study of Chhabriya et al [10], osteoporosis was present in 50% of all the patients and in the study of Choudhuri et al [9], it

Type of leprosy	Total no. of cases	Patients with bone changes	Specific bone changes	Nonspecific bone changes	Osteoporosis	No bone changes
TT	-	-	-	-	-	-
BT	30	29	17	29	15	1
BB	01	01	1	01	01	-
BL	12	11	08	11	07	1
LL	02	02	02	02	-	-
PN	05	05	03	5	4	-
Total	50	48	31	48	27	2

[Table/Fig-3]: Bone changes and type of leprosy

Specific bone changes	Studies			
	Present study	Choudhuri et al <sup>9</sup>	Thappa et al <sup>6</sup>	Chhabriya et al <sup>10</sup>
Primary periosteitis	42%	28.2%	1.3%	4%
Bone cyst	16%	22.7%	10.5%	22%
Honey combing	6%	-	-	6%
Enlargement of nutrient foramen	-	4.5%	5.3%	2%
Thinning and irregularity of cortex	60%	-	-	-
Concentric cortical erosion	50%	-	-	-
Area of bone destruction	36%	-	-	8%
Subarticular erosion	26%	10%	10.5%	10%
Sclerosis	24%	-	-	14%

[Table/Fig-4]: Specific bone changes in hands and feet observed in various studies

Nonspecific bone changes	Studies			
	Present study	Chouduri et al <sup>9</sup>	Thappa et al <sup>6</sup>	Chhabriya et al <sup>10</sup>
Absorption of Terminal phalanges	96%	48.2%	59.2%	84%
Middle phalanges	60%			72%
Proximal phalanges	40%			
Metacarpals	4%			
Metatarsals	28%			
Soft tissue changes	80%	44.5%	39.5%	74%
Concentric absorption	6%	32.7%	39.5%	2%
Contracted fingers / claw hands / claw toes	58%	22.7%	36.8%	38%
Tuft erosion	86%	13.6%	15.8%	56%
Arthritis	36%	26.4%	14.5%	10%
Subluxation / dislocation	30%	18.2%	10.5%	28%
Cupping of joints	12%	6.4%		
Fractures	12%	4%		
Secondary periosteitis	18%	3.6%	18%	6.6%
Osteomyelitis	20%	3.6%	14%	5.3%
Disintegration of tarsal bones	12%	1.8%		
Eccentric absorption	8%	2.7%	Nil	2%
Others (calcification of dorsalis pedis artery)	4%			
Osteoporosis	54%	38.2%	28.9%	50%
Hands only	10%	14%		
Feet only	22%	14%		
Both hands and feet	22%	11%		

[Table/Fig-5]: Nonspecific bone changes in hands and feet observed in various studies



[Table/Fig-6]: Honey combing in the heads of metacarpals, primary periosteitis with licked candy appearance and contracted fingers of the right hand



[Table/Fig-7]: Bone cysts in the middle phalanges of both thumbs and absorption of terminal phalanx with tuft erosion of the fingers

was present in 75%, 50% and 35% of the LL, BL and BT patients respectively. In the present study, osteoporosis was observed with an increased incidence among the different types of leprosy (BT-50%, BB-100%, BL-58.3% and PN-80%). However, none of the patients in LL type showed osteoporotic changes.

Thus, the various bone changes were observed in the present study, which were higher in frequency and were probably attributable to the types of leprosy and also to the study population which consisted of patients with deformities.

## CONCLUSION

Though leprosy is an ancient disease, it still continues to be the most feared due to deformities. The bone changes with deformities are preventable, since all these are not due to the disease itself. The study of the radiological changes may help clinicians in formulating methods for the management and in prevention of the permanent loss of function and the occurrence of deformities and disabilities.



[Table/Fig-8]: Sclerosis and cupping of joints of left foot



[Table/Fig-9]: Osteomyelitis with soft tissue changes

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