

Deformities and Bony Changes in Leprosy

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Abstract

India has eradicated leprosy as per WHO norms but the cases with residual deformities will persist for long. With this idea, a study was undertaken on consecutive 70 patients coming to the outpatient section of Physical Medicine and Rehabilitation Department of Safdarjang Hospital, New Delhi to study various deformities and bony changes. All the patients were leprosy cured but attending hospital for their deformities only. Specific bony changes were seen in multi-bacillary patients, while the non-specific and osteoporotic changes were seen in all types of patients. Patients appeared more willing to get the deformities treated than hiding the same from the society.

Key words: Deformities, bony changes, leprosy.

Introduction:

India has the largest number of leprosy patients in the world and has eradicated it as per WHO norms¹. National Leprosy Eradication Programme (NLEP)² has extensively covered leprosy patients across the length and breadth of our country, declaring them cured as per guidelines of multidrug therapy. But the deformities are persisting with these patients, being permanent.

These cases have visible deformities of the hands, feet and face. These deformities are clawing and loss of fingers and toes, wrist or foot drop, lagophthalmos, trophic ulcers, depressed nose, etc.

Bony changes usually occur in leprosy patients of long duration. These are divided into specific, non-specific and osteoporotic.

Specific bone changes are caused by direct invasion of the bones by *Mycobacterium leprae* causing

granulomatous lesions seen as focal areas of rarefaction on x-rays. Job *et al*³ have attributed nasal bone changes to specific infection. Nasal bone destruction is associated with destruction of septal cartilage, the alar cartilages and the perpendicular part of ethmoid and vomer bones. Boocock *et al*⁴ have documented presence of new bone formation in maxillary sinuses followed by pitting.

In the feet, these changes include honeycombing, pseudocysts, enlarged nutrient foramina and areas of bone destruction leading to concentric cortical erosion and thinning to collapse of bone. Healing is seen as periosteitis and sclerosis.

Non-specific bone changes are caused by destruction of nerve supply leading to sensory loss and disuse atrophy. Vascular changes, trauma and secondary infection also contribute to non-specific changes⁵. There are many other factors responsible for these changes. These changes may be absorptive, destructive or erosive.

In hands, distal phalanges undergo gradual atrophy due to absorption. Tuft erosion is the commonest change in the distal phalanges. Later on, the distal phalanges thin out due to rarefying osteitis, known as 'concentric bone atrophy'. Progressive shortening of the phalanges and metatarsals may be observed over years. Distal ends of metatarsals are affected giving an appearance of 'pencil' or 'sucked candy-stick' appearance⁶. It can cause carpal or tarsal bone disintegration. Eccentric absorption occurs due to infection in anaesthetic hands and feet. Osteomyelitis is seen with its varying degree of destruction in association with trophic ulcers.

Cupping of joints, sub-articular bone erosion, absorption

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of joint ends and disintegration of joint space may lead to subluxation, dislocation and contractures. Neuropathic changes in hands and feet lead to micro-fractures followed by healing.

Osteoporotic changes are thought to be due to high bacillary load and/or reaction to an active lesion in the surrounding area or due to immobilisation and disuse atrophy^{5,7,8}. Testicular atrophy and subsequent low levels of testosterone contribute to generalised osteoporosis in males⁹. Malnutrition, debility and senility may also contribute to the osteoporosis.

Motor paralytic deformities occur as a result of peripheral nerve trunk involvement. This gives rise to characteristic deformities like foot drop, claw fingers, ape thumb or facial palsy/lagophthalmos, etc. Hand functions are impaired, high stepping gait develops and the cornea is at risk of injury.

Sensory deformities develop as a result of glove and stocking anaesthesia, cutaneous/truncal nerve paralysis and anaesthetic patches. Overlying trauma and autonomic paralysis lead to hand and feet ulcers, damage/shortening of phalanges and neuropathic damage to feet leading to amputations in some cases.

Osteoporotic changes occurring due to various reasons as explained, add to the neuropathic damage. Infection from plantar ulcers is another contributory factor for downhill journey.

Incidence of bony changes in leprosy varies in different studies. Chamberlain *et al*⁹ reported bony changes in 15%, Faget and Mayoral¹⁰ in 29% and Basu,¹¹ in 91% cases.

Bandil *et al*¹² observed 12 cases out of 55 patients studied.

Materials and Methods:

Seventy leprosy patients attending Physical Medicine and Rehabilitation (PMR) department's outpatient section and from a nearby leprosy patients' colony were selected for this prospective study. Informed consent was obtained. Only patients with some deformity were included so as to obtain distribution of deformities in these patients. Very old patients were excluded who could not come to the hospital. Demographic, clinical and radiological findings were recorded.

Clinical records included- clinical typing, bacteriological status, treatment and deformity status and photographic records and tracings. The data compilation and tabulation done in scientific manner, unveiled

association of clinicoradiological features with the deformities. Seventy patients presented with – deformed upper limbs, – deformed lower limbs and – deformed faces.

Observations and Results:

This study was done on seventy consecutive patients attending outpatient section of PMR Department of Safdarjang Hospital, New Delhi and a leprosy patients' colony from adjacent area. Out of these cases 56 were males while 14 were females. Most of the patients belonged to 21 years to 60 years age group (Table 1) and belonged to South Indian States (Table 2)

Most of the patients had the disease for more than 10 years and all had taken adequate drug treatment and were in the “cured” category (Table 3), but all the patients had permanent residual deformities (Table 4).

Table 1: Age and Sex Distribution

Age Group (Years)	No of cases		Total
	Male	Female	
11-20	2	0	2 (2.85%)
21-30	13	1	14 (20%)
31-40	12	9	21 (30%)
41-50	18	1	19 (28.6%)
51-60	8	3	11 (15.71%)
61-70	3	0	3 (4.3%)
Total	56	14	70 (100%)

Table 2: Statewise Distribution

Native State	No of cases
Karnataka	55
Andhra Pradesh	1
Tamilnadu	2
Delhi	1
UP	5
Uttarakhand	1
Bihar	4
West Bengal	1
Total	70

Table 3: Duration of Illness

Duration of Illness (years)	No of cases
4-10	9
11-20	23
21-30	27
31-40	10
41-50	1
Total	70

Table 4: *Clinicoradiological Deformities*

Deformities	Face	Hands	Feet	Both	Total
Nose depression	33	–	–	–	33 (47.24%)
Leonine faces	11	–	–	–	11 (15.71%)
Tuft changes	–	24	4	12	40 (57.14%)
Absorption					
Distal phalanx	–	6	5	56	67 (95.71%)
Middle phalanx	–	6	10	50	66 (94.28%)
Proximal phalanx	–	6	12	35	53 (75.71%)
Metacarpal	–	–	–	–	–
Metatarsal	–	–	24	6	30 (42.85%)
Concentric absorption	–	7	5	49	61 (87.14%)
Eccentric absorption	–	–	11	4	15 (21.42%)
Contracted fingers, Claw fingers/toes	–	10	6	32	48 (68.57%)
Foot drop			5		5 (7.14%)
Cupping	–	2	3	–	5 (7.14%)
Arthritis	–	2	11	12	25 (35.71%)
Secondary periosteitis	–	4	10	16	30 (42.85%)
Osteomyelitis	–	–	15	22	37 (52.85%)
Carpal/tarsal disintegration	–	–	19	6	25 (35.71%)
Subluxation/dislocation	–	6	7	17	30 (42.85%)
Fracture	–	–	1	1	2 (2.85%)
Ulcer		7	21	17	45 (64.27%)
Soft tissue changes	–	3	6	15	24 (34.28%)
Osteoporosis	–	5	5	41	51 (72.85%)

Specific bony deformities (Fig 1) were seen only in multi-bacillary cases while the non-specific and osteoporotic bony changes were distributed equally among both the types of cases.

Out of 33 patients having depressed bridge of nose, only 11 showed typical lion like faces.

As most of the patients were having the disease for a long duration, the bony deformities of hands and feet were very commonly seen, including tuft changes and shortening of the phalanges. Plantar ulcers were seen in 21 patients while 7 had hand ulcers and 17 had ulcers both on the hands and feet. Thirty-eight patients had plantar ulcers despite free availability of well padded foot wear.

Clawing of the fingers and toes was the result of truncal nerve paralysis and was seen in more than 75% cases while osteoporosis was seen in 73% cases. Both these changes are indicative of long standing residual effects of the disease. As the burnt out and treated cases are added to the society after treatment of the active disease,

these problems will persist lifelong to be taken care of. Even neuropathic degenerative changes are being seen commonly in the form of carpal and tarsal disintegration, subluxation/dislocation, fractures, degenerative arthritis, cupping and absorption of phalanges because most of these patients have a long standing burnt out disease giving rise to such chronic and inevitable problems.

Plantar ulcers, osteomyelitis, reactive periosteitis and other neuropathic changes in the tarsal bones are again the result of long standing anaesthetic changes in the feet, exposed to vagaries of life in these poor patients. All the patients had some or other of these changes.

**Fig 1-** *Bony Changes in Hands and Feet*

Thus it is evident that, as the patients with lifelong residual deformities of leprosy are being added to the society, this will remain a big public health burden despite elimination of the active leprosy cases.

Discussion:

We have tabulated the results of various authors for easy comparison and discussion on our findings regarding deformities and bony changes found in our patients afflicted with leprosy (Table 5).

These studies were done in leprosy cases irrespective of their treatment status. So the profile of various bone changes and deformities is variable. But it can be observed that the later studies are showing more of non-specific, osteoporotic and overall changes suggesting inclusion of chronic cases as the leprosy was being

effectively treated the world over, more so in the western world. Our study included treated cases at a stage when the leprosy in India was on the verge of elimination. Hence, all the cases had some or other of the non-specific bone changes. Most of our patients had come from a leprosy patient's colony that had treated and burnt out disease remaining with its sequelae. None the less, our study is reflective of the status of leprosy cases after its elimination and the residual public burden of the deformities in the coming years (Table 6).

Comparison of various bone changes seen in earlier studies with that seen in our study reinforces the same changing pattern and points to the future scenario of the burden of deformities in our society. Moreover, most of our patients were included from nearby leprosy colony having long standing affection with glove and stocking anaesthesia and multiple truncal nerve damage.

Table 5: Types of Deformities

Sl. No.	Authors	Specific bone changes (%)	Non-specific bone changes (%)	Osteoporosis (%)	Overall bone changes (%)
1	Barrington ¹³ (1931)	—	—	—	13.0
2	Chamberlain <i>et al</i> ⁹ (1931)	—	—	—	15.0
3	Faget and Mayoral ¹⁰ (1944)	—	—	—	29.0
4	Patterson ¹⁴ (1955)	—	—	—	90.0
5	Patterson ⁵ (1961)	14.3	45.0	10.0	—
6	Basu ¹¹ (1961)	—	—	—	91.0
7	Yadav and Makhani ¹⁵ (1969)	10.0	80.0	—	—
8	Basu ¹⁶ (1972)	—	—	47.7	—
9	Chhabriya <i>et al</i> ⁷ (1985)	—	66.0	50.0	—
10	Thappa <i>et al</i> ¹⁷ (1999)	22.4	78.9	28.9	82.9
11	Present study	63.0	100	73	100

Table 6: Comparison of Types of Deformities

Deformity/bony changes	Patterson ⁵ (1961)	Chhabriya <i>et al</i> ⁷ (1985)	Thappa <i>et al</i> ¹⁸ (1992)	Chaudhuri <i>et al</i> ¹⁷ (1999)	Present study
Tuft erosions	27.0%	56.0%	—	13.6%	57.14%
Arthritis	24.0%	—	—	26.4%	35.71%
Secondary periosteitis	15.4%	—	—	3.6%	42.28%
Concentric absorption	14.0%	68.0%	39.5%	32.7%	87.14%
Terminal phalanx absorption	—	84.0%	59.2%	48.2%	95.71%
Middle phalanx absorption	—	72.0%	34.2%	27.2%	94.28%
Proximal phalanx absorption	—	60.0%	—	13.6%	75.71%
Soft tissue changes	—	74.0%	39.5%	44.5%	34.28%
Contractures- claw hand and claw toes	—	—	36.8%	22.7%	68.57%
Tarsal bone disintegration	1.8%	—	—	1.8%	35.71%
Eccentric absorption	—	2.0%	—	2.7%	21.42%
Osteoporosis	—	10-50%	—	38.1%	72.85%

Conclusion:

1. Though the disease of leprosy comes to the stage of eradication, the persistent deformities in the patients pose a major public health problem to deal with.
2. Reconstructive surgery needs to be taken up at a large scale to cover all the cured patients with residual deformities.
3. Cured patients with persistent sensory deficit need constant care of the hands and feet. Neuropathic changes also need continuous and lifelong care.

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