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Nail Involvement in Leprosy: A Study of 300 Patients[1]

Inderjeet Kaur, Aditi Chakrabarti, Sunil Dogra, Ranju Rai, and Bhushan Kumar[2]

ABSTRACT

Three hundred leprosy patients were recruited to study the pattern and frequency of nail changes. Nail changes, like longitudinal ridging in finger nails, transverse striations involving both finger and toe nails etc. which occurred with similar frequency in the PB and MB patients in comparison with the control group, were excluded from the analysis. Out of a total number of 150 PB patients, 84 (56%) showed nail changes. Fifty-eight (38.6%) patients showed changes in the finger nails, with an average of 3.2 involved nails per patient. Fifty-three (35.3%) patients showed changes in the toe nails, with an average of 3.0 nails per patient. The most common change observed was longitudinal melanonychia (32.4%) in the finger nails and longitudinal ridging (46.3%) in the toe nails.

In comparison, 131/150 (87.3%) MB patients showed nail changes. Finger nail changes were seen in 102 (68%) patients with an average of 5.5 nails affected per patient. Changes in toe nails were seen in 116 (77.3%) patients, with an average of 6.0 nails involved per patient. The most common nail change observed was longitudinal melanonychia in 89/523, (17%) of the total involved finger nails and subungual hyperkeratosis in 164/702, (23.4%) of the total toe nails involvement. Out of a total of 32 colony patients, 31 (96.9%) showed nail changes both in finger and toe nails with an average of 7.9 and 8.4 affected nails per patient, respectively. The most common nail change observed was rudimentary nail(s) on fingers (29%) and toes (21.1%). Among MB patients, a significantly higher number had finger nail involvement in LL group. The frequency of nail involvement for both fingers and toes was significantly greater in LL as compared to BL group of patients. The frequency of nail involvement was significantly more in patients having disease for more than 5 years and in those having trophic changes secondary to loss of sensations and impaired circulation.

RESUMÉ

Trois cent patients lépreux furent recrutés afin d'étudier la fréquence et les aspects de lésions des ongles. Les changements observés sur les ongles, qui apparaissent avec une fréquence similaire entre les patients PB et MB comparé au groupe témoin, comme les stries longitudinales sur les ongles de doigts de la main, les striations tranversales sur les ongles de main et de pied, etc., furent exclus de l'analyse. Parmi un total de 150 patients PB, 84 (56%) ont montré des lésions des ongles. Cinquante huit (38,6%) de ces patients ont montré des lésions des ongles des mains, avec une moyenne de 3,2 ongles atteints par malade. Cinquante trois (35,3%) de ces patients ont montré des lésions des ongles des pieds, avec une moyenne de 3,0 ongles atteints par patient. La lésion la plus fréquente était la mélanonychie longitudinale (32,4%) pour les ongles des mains et les irrégularités longitudinales (46,3) pour les ongles des pieds.

Par comparaison, 131/150 (87,3%) des patients MB ont montré des lésions unguéales. Les altérations des ongles des mains furent observées chez 102 (68%) malades, avec une moyennne de 5,5 ongles affectés par patient. Les lésions unguéales des pieds furent détectées chez 116 (77,3%) patients, avec une moyenne de 6,0 ongles atteints par patient. La lésion la plus commune observée était la mélanonychie chez 89/523 (17%) des ongles affectés des mains et l'hyperkératose sub-inguéale chez 164/702 (24,4%) des ongles de pied atteints. Parmi un nombre total de 32 patients relatifs entre eux, 31 (96,9%) ont montré des lésions unguéales à la fois des mains et des pieds, avec une moyenne de 7,9 et 8,4 ongles af-

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[2] I. Kaur, M.D., MNAMS; A. Chakrabarti, M.D.; S. Dogra, M.D., MNAMS; R. Rai, M.D.; B. Kumar, M.D., MNAMS, Department of Dermatology, Venereology & Leprology, Postgraduate Institute of Medical Education and Research, Chandigarh, India.

Reprint Requests: Inderjeet Kaur, M.D., Department of Dermatology, Venereology & Leprology, Postgraduate Institute of Medical Education and Research, Chandigarh-160 012, India. E-mail: kaur_inderjeet@yahoo.com

fectés, respectivement. La lésion la plus communément observée était des ongle(s) rudimentaire(s) sur les mains (29%) et les pieds (21,1%). Parmi les patients MB, un nombre significativement supérieur de malades LL avaient une atteinte des ongles des mains. La fréquence d'atteinte des ongles à la fois des mains et des pieds était significativement plus importante chez les patients LL par rapport aux patients BL. La fréquence d'atteinte des ongles était significativement plus élevée chez les patients malades depuis plus de cinq années et chez ceux ayant des altérations trophiques secondaires aux pertes de sensations et à une circulation sanguine altérée.

RESUMEN

Trescientos pacientes con lepra fueron reclutados para estudiar el patrón y la frecuencia de cambios en las uñas. Se excluyeron del análisis las alteraciones en las uñas que ocurrieron con una frecuencia similar en los pacientes PB, MB y en los controles sanos (crestas longitudinales en las uñas de las manos y estriaciones transversales en las uñas de pies y manos). De un total de 150 pacientes PB, 84 (56%) mostraron alteraciones en las uñas. Cincuenta y ocho (38.6%) pacientes mostraron cambios en las uñas de las manos, con un promedio de 3.2 uñas afectadas por paciente. Cincuenta y tres (35.3%) pacientes mostraron cambios en las uñas de los pies, con un promedio de 3.0 uñas por paciente. Los cambio más comúnmente observados fueron melanoniquia longitudinal (32.4%) en las uñas de las manos, y crestas longitudinales (46.3%) en las uñas de los pies.

En comparación, 131/150 (87.3%) pacientes MB mostraron cambios en las uñas. Los cambios en las uñas de las manos se observaron en 102 (68%) pacientes, con un promedio de 5.5 uñas afectadas por paciente. Los cambios en las uñas de los pies ocurrieron en 102 (68%) pacientes, con un promedio de 5.5. uñas afectadas por paciente. Se observaron cambios en las uñas de los pies en 116 (77.3%) pacientes, con un promedio de 6.0 uñas afectadas por paciente. Los cambios en las uñas más comúnmente observados fueron melanoniquia longitudinal en 89/523 (17%) del total de uñas de las manos, e hiperqueratosis subungal en 164/702, (23%) del total de uñas del pie afectadas. De un total de 32 pacientes de la colonia, 31 (96.9%) mostraron cambios en las uñas de los pies y de las manos, con un promedio de 7.9 y 8.4 uñas afectadas por paciente, respectivamente. El cambio mas comúnmente observado fue el de las uñas rudimentarias en las manos (29%) y los pies (21.1%). Entre los pacientes MB, la frecuencia de alteración de las uñas tanto de los pies como de las manos fue significativamente mayor en el grupo LL que en el grupo BL. La frecuencia de alteración en las uñas fue significativamente mayor en los pacientes con una enfermedad de mas de cinco años y en aquellos con cambios tróficos secundarios a la pérdida de sensibilidad y circulación afectada.

Leprosy is a chronic infectious disease affecting almost every organ of the body with wide ranging clinical manifestations. All organs and systems involved have been studied quite extensively in leprosy, but the involvement of nails has never been fully highlighted. Although the dystrophic changes and mutilation of hands and feet are considered more or less synonymous with the symptomatology of the disease, nail changes have received only a passing reference in the literature ([5, 9]).

Nail changes can be caused by neuropathy, repeated trauma, vascular deficit, infections and often more than one factor is involved. There have been only few case reports describing isolated nail changes in leprosy patients ([7, 14, 19]). In the only published study on large number of leprosy patients, the incidence of nail changes was found to be 64% ([15]). It was observed that despite wide differences in pathology, nail changes in tuberculoid and lepromatous patients were often similar and that lepromatous patients developed bilaterally symmetrical nail changes late in the course of the disease. However, there was a lack of systematic categorization and detailed description of the pattern of nail changes observed. Scanty data on the subject prompted us to study the frequency and pattern of nail changes and their correlation with the type of disease, duration of disease, deformity of hands/feet, and treatment status in patients with leprosy attending our leprosy clinic and also in patients residing in a leprosy colony, regardless of the duration of disease or treatment status.

MATERIALS AND METHODS

A total of 300 patients, 150 consecutive patients each with paucibacillary (PB) and

TABLE 1. *Frequency of nail involvement in paucibacillary (PB) and multibacillary (MB) patients.*

	PB cases (N = 150)		MB cases (N = 150)			
	BT cases (N = 150)		BL (N = 60)		LL (N = 90)	
	Hands (%)	Feet (%)	Hands (%)	Feet (%)	Hands (%)	Feet (%)
No. of patients affected	58 (38.6)	53 (35.3)	34 (56.7)	45 (75)	68 (75.5)	71 (78.9)
No. of nails affected	188 (32.4)	162 (30.5)	144 (42.4)	240 (53.3)	379 (55.7)	462 (65)
No. of affected nails/patient	3.2	3.0	4.2	5.7	5.6	6.3

multibacillary (MB) leprosy in the age group 20–50 yrs irrespective of sex, duration of disease, treatment, and reactional status attending the leprosy clinic at Postgraduate institute of Medical Education and Research, Chandigarh, India were included in the study (Table 1). One hundred age and sex matched control subjects not suffering from any disease known to affect the nails and 32 treated patients of leprosy residing in a nearby leprosy colony were also recruited in the study. Patients were diagnosed according to Ridley-Jopling classification and grouped into into PB (polar tuberculoid, TT, and borderline tuberculoid, BT) and MB (borderline, BB; borderline lepromatous, BL; polar lepromatous, LL) disease for purposes of analyses. Histopathological study of the skin lesions and slit skin smear examination were done as a routine in all patients. In addition to the routine cutaneous and neurological examination, various nail changes were noted in a predesigned proforma taking into account the number and distribution of (fingers/toes) nails involved. Peripheral vascular status of the extremities was evaluated clinically by palpating the major arterial pulsations of both upper and lower limbs. Deformities of the hands and feet were recorded according to the WHO grading (1988) ([20]). Fungal infections of the nails were ruled out by KOH examination and culture whenever indicated. X-rays of the hands and/or feet were done only in a limited number of cases. The pattern of nail changes in the study and control groups were compared using chi-square test.

The following nail changes, which occurred with similar frequency in the leprosy patients (both PB and MB patients) and the control group, were excluded from the analysis: i) longitudinal ridging and flattening—in finger nails; ii) longitudinal splitting, transverse pigmented bands, and blackish discoloration—in toe nails; iii) absence of lunula, leukonychia, transverse striations, rough nails, loss of nail fold and pitting—in both finger and toe nails. Various noted nail

TABLE 2. *Pattern of nail changes in PB patients.*

Nail changes	No. of patients			Total no. of nails involved	
	Total	Hands	Feet	Fingers (%)*	Toes (%)*
Longitudinal melanonychia	33	33	—	61 (32.4)	—
Subungual hyperkeratosis	26	6	20	23 (12.2)	42 (25.9)
Longitudinal ridging	25	—	25	—	75 (46.3)
Beau's line	16	5	11	8 (4.2)	23 (14.2)
Flattening	9	—	9		34 (18)
Onycholysis	9	6	3	7 (3.7)	6 (3.7)
Thickening of nail plate	7	7	—	9 (4.7)	—
Reddish brown discoloration	7	5	2	28 (14.9)	4 (2.4)
Thinning of nail plate	6	—	6	—	10 (6.2)
Onchomycosis	6	6	—	6 (3.1)	—
Longitudinal splitting	3	3	—	7 (3.7)	—
Chronic paronychia	3	2	1	5 (2.6)	1 (0.61)
Pterygium unguium	1	—	1	—	1 (0.61)

* Column percentage.

TABLE 3. *Pattern of nail changes in MB patients.*

Nail changes	No. of patients			Total no. of nails involved	
	Total	Hands	Feet	Fingers (%)*	Toes (%)*
Subungual hyperkeratosis	71	24	47	57 (10.1)	164 (23.4)
Logitudinal ridging	43	—	43	—	111 (15.8)
Complete shedding	41	20	21	63 (11.2)	67 (9.5)
Onychauxis	37	14	23	17 (3.0)	47 (6.7)
Longitudinal melanonychia	35	35	—	89 (15.8)	—
Rudimentary nails	32	15	17	55 (9.8)	78 (11.1)
Thickening of nail plate	29	12	17	21 (3.7)	28 (4.0)
Onycholysis	25	19	6	46 (8.2)	8 (1.1)
Beau's line	19	7	12	12 (2.1)	26 (3.7)
Thinning of nail plate	17	6	11	19 (3.4)	23 (3.3)
Excessive curvature	14	11	3	38 (6.8)	14 (2.0)
Pallor	12	6	6	49 (8.7)	62 (8.8)
Onychomycosis	8	3	5	7 (1.2)	20 (2.8)
Flattening	7	—	7	—	17 (2.4)
Onychogryphosis	7	2	5	5 (0.9)	9 (1.3)
Brachytelephalangia	7	4	3	6 (1.0)	13 (1.8)
Longitudinal splitting	5	5	—	8 (1.4)	—
Reddish brown discoloration	4	4	—	24 (4.2)	—
Brittle nail	3	—	3	—	8 (1.1)
Pterygium unguium	2	1	1	3 (0.5)	6 (0.8)
Chronic paronychia	2	2	—	2 (0.3)	—
Onychoheterotopia	1	—	1	—	1 (0.14)
Central anonychia with polynychia	1	1	—	2 (0.3)	—

*Column percentage

findings were classified based on changes in morphology and color, involving different components of the nail unit like nail plate, nail bed, nail folds viz. longitudinal melanonychia, excessive curvature of nail plate, subungual hyperkeratosis, rudimentary nails, etc. as given in Tables 2 and 3.

RESULTS

Paucibacillary patients. In the PB group, all 150 patients had BT disease. There were 106 (70.7%) males and 44 (29.3%) females. The mean age of male and female patients was 32.8 ± 2.1 and 28.1 ± 3.2 yrs, respectively. Of these, 111 patients were untreated and the rest were on regular World Health Organization (WHO) Multidrug therapy (MDT) PB regimen or had completed the treatment. The duration of the disease in these patients ranged from 1 month to 13 yrs (mean 13 ± 4.1 months). Thirty-four patients were in type I reaction. Duration of the reaction ranged from 20 days to 1 yr (mean 4.7 ± 2.9 months). Twenty-six patients had deformities of hands (grade I in 10 and grade II in 16), 10 had deformities of feet (grade I in 7 and grade II in 3) and 2 patients had deformities of both hands and feet (grade 1).

Out of these 150 PB patients, 84 (56%) showed nail changes. Fifty-eight (38.6%) patients showed changes in the finger nails, with an average of 3.2 nails per patient. Fifty-three (35.3%) patients showed changes in the toe nails, with an average of 3.0 nails per patient (Table 1). Sixty-one (40.7%) patients had involvement of both finger and toe nails. Involvement of either fingernails or toe nails alone was seen in 15 (10%) and 8 (5.3%) patients, respectively. The most common nail change observed was longitudinal melanonychia (one to three bands) in the finger nails (32.4%) (Fig. 1) and longitudinal ridging (46.3%) in the toe nails (Table 2). Various types of nail changes and their frequencies are given in Table 2. The presence of nail changes was significantly greater in those having the disease for a period of more than 5 years (55/84 vs. 23/66) ($p < 0.05$). The pattern of nail changes did not differ significantly with an increase in the duration of the disease beyond 5 years. Nail changes were not found to be more frequent in relation to lep-

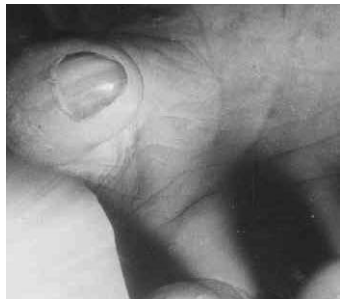

FIG. 1. Longitudinal melanonychia.

FIG. 2. Dystrophic nail.

rosy lesions on hands or feet, nor was any particular pattern found to correlate with the presence of these lesions. Nail changes such as nail dystrophy (Fig. 2), onycholysis, longitudinal ridging and brittle nails were observed to be more frequent in digits with sensorimotor deficit ($p < 0.01$). Onchomycosis confirmed by potassium hydroxide (KOH) and/or culture was present in 6 (4%) patients with or without nail changes of leprosy.

Multibacillary patients. In the MB group (BL-60, LL-90), there were 96 (64%) males and 54 (36%) females with a mean age of 34 ± 2.1 yrs and 31 ± 1.4 yrs, respectively. Duration of the disease varied from 8 months to 19 yrs (mean 3.4 ± 1.5 yrs). Eighteen patients had type 1 reaction with duration of 1 week to 9 months (mean 4.25 ± 1.2 months) and 21 patients had type 2 reaction (including recurrent episodes) with duration of 3 months to 2 yrs (mean 12.7 ± 2.1 months). Ninety-six patients had deformities of the hand (grade I in 44, grade II in 52) and 104 patients had deformities of the feet (grade I in 56, grade II in 48).

Out of a total of 150 MB patients, 131 (87.3%) showed nail changes. Finger nail changes were seen in 102 (68%) patients with an average of 5.5 nails per patient (Table 1). Toe nail changes were seen in 116 (77.3%) patients, with an average of 6.0 nails per patient. One hundred seven (71.3%) patients had changes in both finger nails as well as toe nails. Seven (4.6%) patients had changes only in the finger nails while 17 (11.3%) showed changes in the toe nails alone. The number of patients having finger nail involvement was significantly more in the LL group than BL group ($p < 0.05$). However, for toe nail involvement, this difference was not found to be statistically significant ($p > 0.1$). The frequency of nail involvement for both fingers and toes was significantly more in the LL as compared to the BL group of patients ($p < 0.05$) (Table 1). The most common nail change observed was longitudinal melanonychia (up to five bands) in the finger nails (15.8%) and subungual hyperkeratosis (23.4%) (Fig. 3) in the toe nails (Table 3). The frequency of nail changes was significantly greater in those having neurovascular deficit in the extremities ($p < 0.01$). Certain patterns, like over curvature of nails (Fig. 4), complete shedding, rudimentary nails (Fig. 5) in both fingers and toes, and blackish discoloration of the finger nails were significantly more in those having the disease for a period of greater than 5 years and those having grade II deformities of the hands and feet ($p < 0.05$). Nail changes like nail dystrophy, onycholysis, longitudinal ridging and brittle nails were observed to be more frequent in limbs with trophic changes secondary to loss of sensations and impaired circulation ($p < 0.01$). Onychomycosis confirmed by KOH and or culture was present in 8 (5.3%) patients with or without nail changes of leprosy.

Patients from leprosy colony. There were 32 patients residing in the leprosy colony. The total duration of the disease

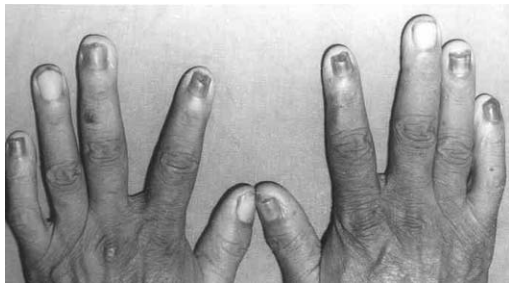

FIG. 3. Subungual hyperkeratosis.

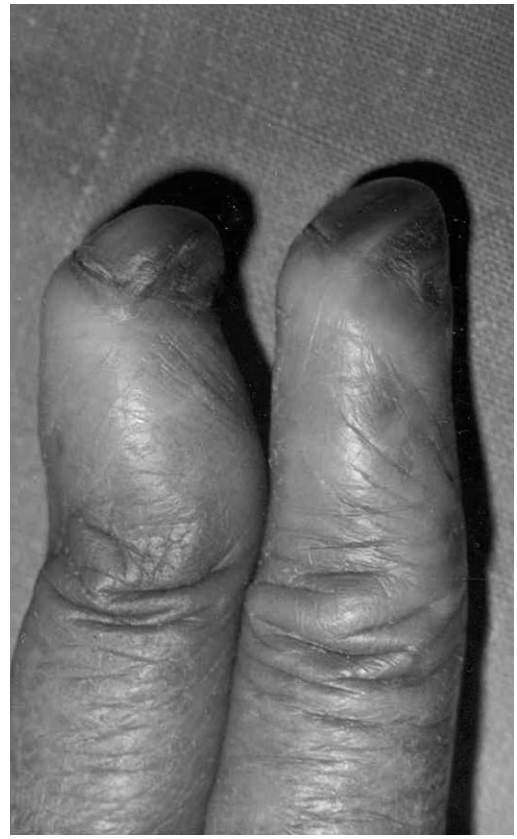

FIG. 4. Overcurvature of nails.

was more than 10 years in all of them. All of them had received adequate MDT or dapsone monotherapy and were smear negative. Thirty-one (96.9%) patients showed changes in both finger and toe nails, with involvement on an average of 7.9 finger nails per patient and an average of 8.4 toe nails per patient, respectively. The most common nail change observed was rudimentary nail(s) on fingers (29%) and toes (21.1%).

DISCUSSION

Nails are specialized keratinous cutaneous appendages that play an important role in the everyday life of humans, and have always provided the clinician major clues in the diagnosis of a number of diseases. The nail unit responds to a wide variety of insults by a limited number of reaction patterns. In literature, there is a paucity of comprehensive studies on the frequency and pattern of nail changes in leprosy patients. Bryceson and Pfaltzgraf ([5]) and Jopling ([9]) first described the nail changes in advanced lepromatous leprosy. Patki and Baran ([15]) reported nail changes in different spectrum of leprosy, but these studies lack information about the pattern of nail changes and their frequency. Nail changes in our patients were noted more frequently in the MB (87.3%) patients than in those with PB disease (56%). This could be attributed to the extensive bilateral peripheral neuropathy, trauma, infections, more severe degree of deformities and repeated type 2 reactions leading to immunologically mediated vasculopathy in the MB cases. In another published series, Patki and Baran ([15]) reported the incidence of nail changes to be 64% in their patients (PB/MB). Nail changes mostly occur as a result of nerve involvement. Like leprosy, neuropathy is a part of diabetes mellitus in which various nail changes like dystrophy, shortening, fragility, and yellowish nail discoloration have been described ([1, 12, 17]). There are reports of dystrophic changes in little finger nail following traumatic ulnar nerve damage ([13, 17]). In addition, the misuse and disuse of anesthetic and deformed hands and feet results in repeated mechanical and thermal trauma, infection, osteolysis of phalanges, and loss of nails. Trauma related changes like onycholysis, Beau's lines, longitudinal ridging and splitting were more common in MB patients in our study, probably because anaesthetic but functional limbs in MB cases are more frequently traumatized due to misuse.

The trophic changes of leprosy have always been attributed mostly to the nerve damage, but it seems that the vascular component is also important, since such dys-

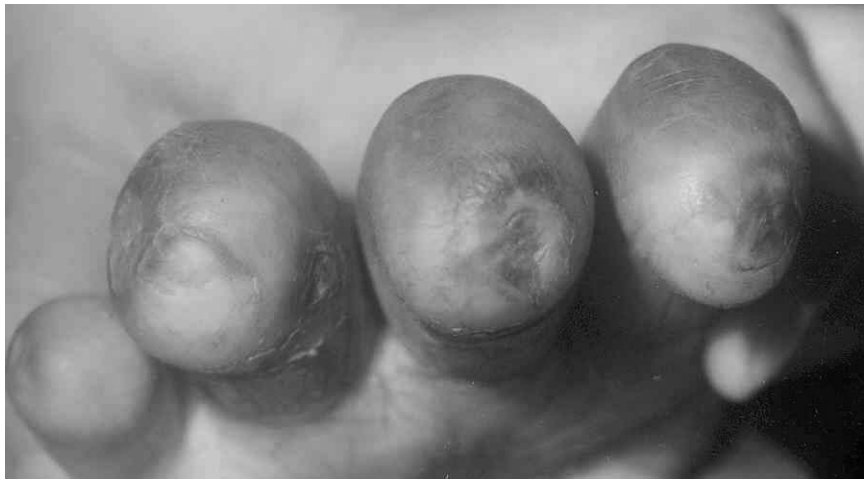

FIG. 5. Rudimentary nail–index and middle finger with anonychia–ring finger.

trophic nail changes are also seen in other diseases like scleroderma, rheumatoid arthritis etc, where vascular factors play an important role ([10, 17, 18]). The associations between neurovascular deficit and various trophic changes including fungal infections have been well documented in the literature ([1, 8]). Longitudinal ridging of the toe nails was a common change in both PB and MB patients. Similar changes have been described with peripheral vascular deficit and also as an age-related change ([17, 18]), possibly a result of age-related circulatory compromise. Other changes attributable to vascular deficit, like onycholysis, longitudinal splitting and brittle nails were seen more often in the MB patients. Beau's lines have been reported to be associated with type 2 leprosy reactions and vasculitis was thought to be a probable cause. Since only few of our patients were in reaction at the time of study, we did not try to correlate any nail change with reactional status of the patient.

Longitudinal melanonychia was a common change observed in 33/150 (22%) and 35/150 (23.3%) of our PB and MB cases, respectively, and in 21.9% patients from the leprosy colony. According to Baran ([3]), these bands arise due to stimulation of melanocytes in the nail matrix following repeated trauma. Subungual hyperkeratosis was another notable change observed more commonly in the MB as compared to the PB patients. Though the exact explanation is not known, this has been speculated to be the adverse effect of clofazimine therapy given in anti-inflammatory doses ([7]). Pallor of the nails noted by us in both PB and MB patients, though not being specific for the disease, can probably be attributed to anemia due to the anti-leprosy drugs, notably dapsone and partly due to disease itself and also vascular deficit secondary to vessels involvement. Similar observations were made earlier by Patki and Baran ([15]).

Complete shedding of the nails, brachytelephalangia, and rudimentary nails with loss of terminal phalanges were the changes found exclusively in MB patients and in patients residing in the leprosy colony. This is consistent with the hypothesis of Baran and Juhlin ([2]) which states that development of a normal nail is dependent on the underlying bone; anonychia or hyponychia may result when the underlying bone is either hypoplastic or completely absent. In leprosy it is possible that nails may be affected secondary to resorption of distal phalanges. This was probably why anonychia and rudimentary nails were more common in patients from the leprosy colony whose fingers and toes showed marked bony resorption. Brand ([4]) confirmed with follow-up radiographs over a period of 5 years that approximately 95% of resorption resulted form open wounds developing a secondary infection.

Pardo-Castello and Pardo ([13]) noted tinea unguium in 32% of their leprosy patients. Ramesh and Misra ([16]) have postulated that nails could be the source of frequent tinea corporis and tinea cruris infections in leprosy patients. We noted onychomycosis in only 4.7% of our patients. Patki and Baran ([15]) postulated that in contrast to frequent dermatophytic infections, candidal paronychia is not often observed in leprosy patients who generally have dry skin (unless altered by their occupation), which is unsuitable for growth of *Candida albicans*. We noted only 5 cases of chronic paronychia, none of which were of candidal etiology. In our bid to find out any relationship between the nail changes and anaesthetic leprosy lesions located on the corresponding hands or feet, we could not establish any such association. Diffuse leukonychia or pseudomacrolunula, which was described by Pardo Castello and Pardo ([13]) as an early change in leprosy, was not noted by us. We only observed punctate leuconychia in our patients and its incidence was no more than in controls. In our opinion, since loss of nails in leprosy is a consequence of various interacting factors like vasculopathy, neuropathy and their sequelae like trauma and infection, the term shedding which means "to cast off or throw off," should be replaced by "acquired anonychia" to describe nail dystrophy and loss. Central anonychia with polyonychia was seen in one of our MB patients from the clinic and 3 patients from the leprosy colony. This change has been characteristically described in congenital onychodysplasia of the index fingers (COIF) ([11]).

From our study it can be concluded that nail changes are common in leprosy, more so in the MB spectrum. Attributing a particular change to a single pathophysiologic mechanism would be an oversimplification. Peripheral neuropathy, trauma, and vasculopathy and secondary infections all play a role in the genesis of these nail changes. Several changes have been found in impressive numbers, but whether all are specific for the disease will remain speculative unless a clinicopathological study correlates our observations.

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