

Proximal Nailfold Capillary Patterns in Multibacillary Leprosy Patients: A Case Series Study

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Due to disabilities and disfigurement caused by leprosy it has been a feared illness since antiquity. Leprosy remains the most common infection that leads to disability. Skin and peripheral nerves are the main targets of leprosy. Nailfold capillaroscopy (NFC) is a non-invasive imaging technique that is used for assessment of proximal nailfold capillaries. The objective of the study is to observe the different nailfold capillaroscopic patterns in patients with multibacillary leprosy. A total of 10 multibacillary leprosy patients were enrolled for nailfold capillaroscopic examination using a Foto-Finder video dermoscope. Among these 10 cases, 5 (50%) were borderline lepromatous (BL) leprosy, 2 (20%) were lepromatous leprosy (LL) with type 2 lepra reaction and 3 (30%) lepromatous leprosy (LL) with trophic ulcers. The age of the patients ranged from 20 to 70 years. Most common nailfold capillaroscopic findings seen in this study were avascular areas, meandering vessels and dilated vessels. Invasion of microvasculature and molecular adhesions by *Mycobacterium leprae* could be responsible for morphological changes observed in these cases. Diagnostic / prognostic value of these findings needs to be established by data captured in well characterized comparable leprosy cases in different settings. These capillaroscopic findings are to be studied in the context of clinical, histopathological and bacteriological findings, then to be analysed with reference to vascular and neurological involvement.

Keywords: Multibacillary Leprosy, Nailfold Capillaroscopy, Video Dermoscopy, Meandering Vessels, Avascular Areas.

Introduction

Leprosy is a chronic infectious granulomatous disease caused by *Mycobacterium leprae* and *Mycobacterium lepromatosis* (Han et al 2021), both causative agents reported from India (Ahuja et al 2018). Though manageable and its numbers vastly reduced after multi-drug treatment (MDT), this disease is prevalent in numerous regions worldwide. The spectrum of the disease's involvement depends on the host's immune system and its resistance to the bacillus

(Penna et al 2005). Skin and peripheral nervous system are the most involved organs and may lead to permanent sequelae. The bacilli usually resides in the colder regions of human body like forehead, nasal mucosa, ear lobes and human nail bed (Kato & Nakandakari 1998). Nailfold capillaroscopy (NFC) is the evaluation of nailfold microvascular network. It is an inexpensive, safe, non-invasive and easily performed examination. NFC is performed by using Foto-Finder video dermoscope (Grover et al 2022). Lima et al

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(2016) and an earlier study from our institution showed that nailfold capillaroscopy can be additional useful tool to study the changes in leprosy. In this case series we have attempted to enlarge our experience of use of this technique in multi-bacillary leprosy cases. Multibacillary leprosy patients were chosen for the study due to social stigma, lack of awareness, patients tend to neglect early lesions and approach health care centers at advanced stages (Jindal et al 2009).

Patients and Methods

This is a case series study conducted in Department of Dermatology, Venereology and Leprology at SNMC and HSK hospital, Bagalkot (India). This study was conducted from May 2022 to November 2022 for a period of 7 months. Informed written consents were taken from all the patients. Ten consecutive multibacillary leprosy cases, aged 20-70 years, attending Dermatology OPD during this period were included in the study. Patients presenting with multiple hypo-pigmented patches, loss of sensation, nerve thickening and presence of acid-fast bacilli (WHO 2018, NLEP 2013) were included in the study. Patients with diabetes, hypertension, autoimmune disorders, connective tissue disorders, pregnant and lactating females were excluded from the study.

A complete history of the disease duration and prior treatment was obtained.

Skin lesions as well as cutaneous and peripheral nerves were examined. Slit skin smears were taken for acid fast bacilli.

Both clinical and nailfold capillaroscopic images were taken using a Foto-Finder video dermoscope (Medicam 1000s, Foto-Finder Systems GmbH, Bad Birnbach, Germany) in polarized mode at 20x magnification. The patients were made to sit comfortably at room temperature for 15 minutes. The patients were also informed to avoid consumption of caffeine and smoking 4 hours before examination. They were all made to

sit and place their respective hands on the table at heart level to undergo nailfold capillaroscopic examination.

These nailfold capillaroscopic images were captured, interpreted and assessed statistically. Various morphological alterations of capillary loops were assessed and recorded. The abnormal capillary morphology seen in more than 2 fingers were considered significant for the study.

Results

Among 10 cases studied in these case series, 6 (60%) were male and 4 (40%) were females. The age-group ranged between 20 years to 70 years. Among the 10 subjects, 2 (20%) were skilled workers, 4 (40%) were daily wage workers and 4 (40%) were homemakers (Table 1).

Among these 10 multibacillary leprosy cases, 5 (50%) were borderline lepromatous leprosy, 2 (20%) cases lepromatous leprosy with type 2 lepra reaction and 3 (30%) lepromatous leprosy with trophic ulcers.

Clinical findings:

Clinical findings observed in these patients are summarized in Table 2.

Among 5 borderline lepromatous leprosy patients, 1 patient was presented with multiple erythematous plaques with loss of sensation and bilateral ulnar nerve enlargement. One patient presented with multiple hypo-pigmented patches with right sided ulnar nerve and common peroneal nerve enlargement. One patient presented with multiple plaques (inverted saucer), trophic ulcer over plantar aspect of left foot and dorsal aspect of left middle finger with left ulnar, radial and posterior tibial nerve enlargement. Two patients presented with multiple hypo-pigmented patches with satellite lesions and bilateral ulnar, right sided radial and posterior tibial nerve enlargement.

Among 2 lepromatous leprosy patients with type 2 lepra reaction, 1 patient presented with

Table 1 : Socio-demography of study subjects.

Characteristic	Number	Percentage
Age (Mean±SD)	44±14.1	
21-40 yrs	4	40%
41-60 yrs	4	40%
> 60 yrs	2	20%
Gender		
Male	6	60%
Female	4	40%
Occupation		
Home makers	4	40%
Unskilled	4	40%
Skilled	2	20%

Table 2: Clinical findings among leprosy patients included in the study.

Clinical presentation	Borderline lepromatous leprosy (5)	Lepromatous leprosy patient with type 2 lepra reaction (2)	Lepromatous leprosy patients with trophic ulcers (3)
Patch	3(60)	-	2(66.7)
Nodule	-	2(100)	1(33.3)
Plaque	2(40)	-	-
Trophic ulcer	1(20)	1(50)	3(100)
Nerves affected			
Bilateral Ulnar	2(40)	2(100)	3(100)
Unilateral Ulnar	2(40)	-	-
Common peroneal	1(20)	-	3(100)
Radial Unilateral	2(40)	-	-
Bilateral Radial	-	1(50)	-
Bilateral Median	-	2(100)	-
Posterior Tibial	2(40)	1(50)	-
Others	-	1(50)	-

multiple nodules over the ear lobes, face, extremities, bilateral ulnar, median nerve enlargement with bacillary index 6+. One patient presented with multiple nodules, ulcers present over dorsal surface of middle right and left finger.

The same patient also presented with madarosis, ear infiltration, saddle nose (depressed nasal bridge) and bilateral ulnar, median radial, right side greater auricular, lateral popliteal and posterior tibial nerve enlargement.



Fig. 1 : Nailfold capillaroscopy (NFC) changes of BL patient showing avascular area (black circle), capillary dropout (green circle), meandering capillaries (red arrow), dilated capillaries (yellow arrow) and neoangiogenesis (pink arrow).

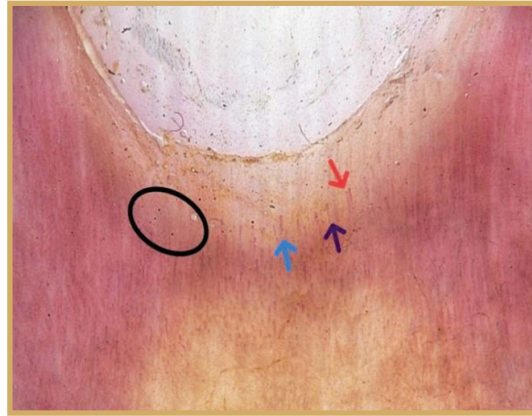


Fig. 2 : Nailfold capillaroscopy (NFC) changes in a BL patient showing avascular area (black circle), meandering capillaries (red arrow), tortuous capillaries (blue arrow) and bizarre capillaries (purple arrow).

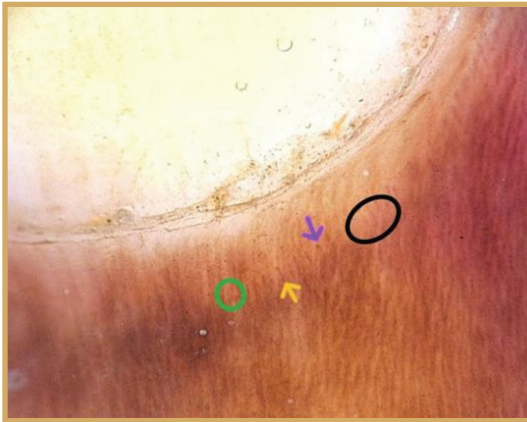


Fig. 3 : Nailfold capillaroscopy (NFC) changes of BL patient showing avascular area (black circle), capillary dropouts (green circle), bizarre capillaries (purple arrow) and dilated capillaries (yellow arrow).

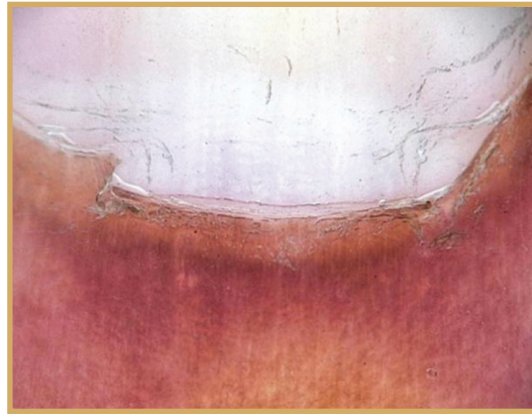


Fig. 4 : Nailfold capillaroscopy (NFC) changes of LL patient with type 2 reaction were not appreciated due to the Indian skin type and colour.

Among the 3 lepromatous leprosy patients with trophic ulcers, 2 patients presented with multiple hypo-pigmented patches with trophic ulcer over the right foot and the other had trophic ulcers over both hands. One patient presented

with multiple nodules over the face, extremities with trophic ulcers over left hand and right foot. On examination, bilateral ulnar and common peroneal nerve enlargement was found in both patients.

All patients showed glove and stocking type of sensory loss.

Nailfold capillaroscopy findings:

Among the 5 (50%) borderline lepromatous leprosy patients, 1 patient showed dilated vessels, meandering vessel, capillary dropout, neoangiogenesis and avascular area (Fig. 1). One patient showed tortuous vessels, meandering vessels, avascular area and bizarre vessel (Fig. 2). One patient showed bizarre vessel, avascular area, capillary dropout and dilated vessel (Fig. 3). One patient showed avascular area, tortuous vessel, meandering vessel. One patient showed bizarre vessel, dilated vessel, avascular area and neoangiogenesis.

Among the 2 (20%) lepromatous leprosy patient with type 2 lepra reaction, 1 patient showed bizarre vessel, dilated vessels, meandering vessels and avascular area. One patient nailfold capillaries were not appreciated due to the Indian skin type and color (Fig. 4).

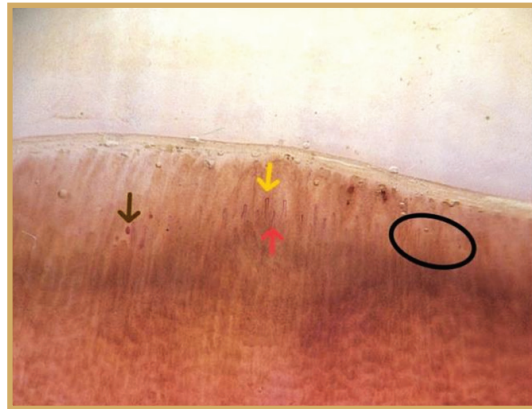


Fig. 5 : Nailfold capillaroscopy (NFC) changes in a LL patient with trophic ulcer showing avascular area (black circle), micro haemorrhage (pink arrow), dilated capillaries (purple arrow) and meandering capillaries (blue arrow).

Among the 3 (30%) lepromatous leprosy patients with trophic ulcers, 1 patient showed micro-hemorrhage, dilated vessels, meandering vessels

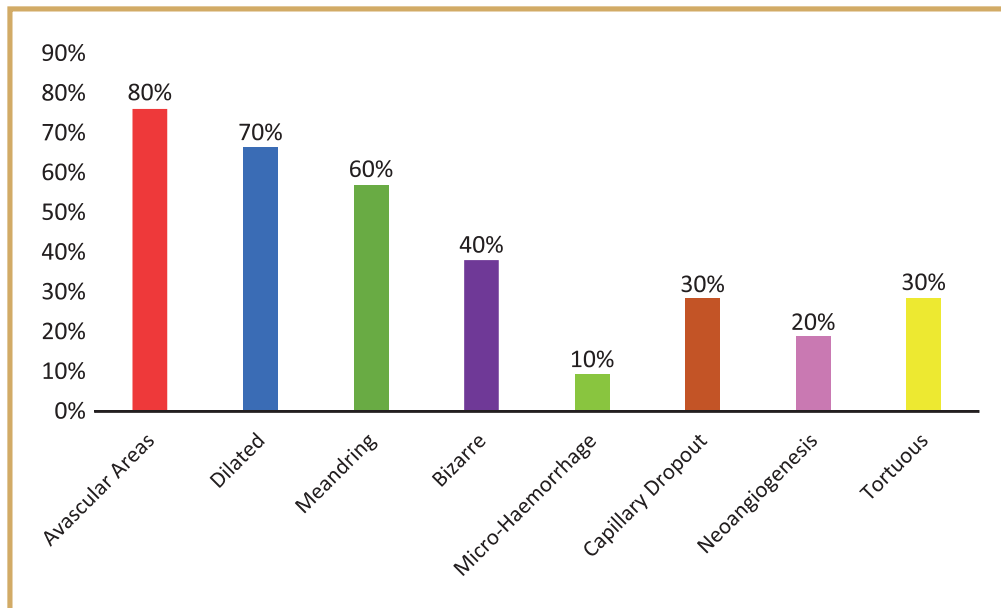


Fig. 6 : NFC changes observed in 10 participants of study.

and avascular areas (Fig. 5). One patient nailfold capillaries were not appreciated due to the Indian skin type and color. One patient showed dilated vessels, avascular area, meandering vessel and tortuous vessel.

Overall, among the 10 multibacillary leprosy cases, 8 (80%) cases showed avascular areas, 6 (60%) cases showed meandering vessels, 7 (70%) cases showed dilated vessels, 4 (40%) cases showed bizarre vessels, 3 (30%) case showed tortuous vessel, 3 (30%) case showed capillary dropout, 2 (20%) cases showed neoangiogenesis and 1 (10%) case showed micro-hemorrhage (Fig. 6).

Discussion

Nailfold capillaroscopy (NFC) is the evaluation of nailfold microvascular network. It is an inexpensive, safe, non-invasive and easily performed examination. NC (nailfold capillaroscopy) is performed by using Foto-Finder video dermoscopy (Grover et al 2022).

According to the study done by Sudhakar et al (2022) 40 % were multibacillary leprosy cases in which the nailfold capillaroscopic changes seen were avascular areas, meandering vessels, bizarre vessels, tortuous vessels, micro-hemorrhages, capillary dropouts and neo-angiogenesis. The most frequent changes that were seen were avascular areas, meandering vessels, bizarre vessels. The present extended study (case series) in multi-bacillary cases shows similar trends.

According to the study done by de Lima et al (2016), which includes 30% of patients with Virchow's leprosy and 20% of patients with dimorphic leprosy, the common nailfold capillary changes seen were ectatic capillaries, micro-hemorrhages and corkscrew capillaries.

According to a study, the early site of accumulation of *Mycobacterium leprae* is in the epineurium. *Mycobacterium leprae* is usually present in 40% of epineurial blood vessels, 75% in

lymphatics and 25% in intraneural vessels. Due to endoneurial infection, there is epineurial vessels colonization of *M. leprae* bacteremia which also enhances risk of mild inflammation and ischemia (Scollard et al 1999). It has been reported that *M. leprae* interacts primarily with endothelial cells of vaso-nervorum which later invade the endoneurium (Scollard et al 1999). Another theory suggests that endothelial cells express specific adhesion molecules like addressin which helps in adhesion interactions between *M. leprae* or *M. leprae*-parasitized macrophages and endothelial cells of vasa nervorum, may be one of the specific mechanisms involved in the localization of *M. leprae* to peripheral nerve. The adhesion molecules on the endothelium of the endo-neural capillaries appear due to microtraumas that require repair. Consequently, macrophages carrying bacilli move through the vessel wall into the endoneurium by diapedesis. Injury to the peripheral nerve causes hypoesthesia or anesthesia patches and paralysis. It is hypothesized that this neuropathic change leads to ischemic changes like trophic ulcers. So far, such changes have not been correlated with capillaroscopy findings.

In our study, the most common nailfold capillary changes seen in multibacillary leprosy patients were avascular areas, meandering vessels and dilated vessels which were reported earlier from our department (Sudhakar Rao et al 2022) and also by others (De Lima et al 2016). Invasion of microvasculature and molecular adhesions by *M. leprae* may lead to morphological changes which were observed during nailfold capillaroscopic examination. Hence, larger studies with larger sample size are further required. It would be of interest to study these changes in age matched, duration matched and cases with comparable vascular, neurological involvement with due attention to histopathology and bacteriological assessments.

References

1. Ahuja M, Lavania M, Singh I et al (2018). Detection of *Mycobacterium lepromatosis* in patients with leprosy from India. *Infec Drug Resist.* **11**: 1677-1683.
2. Grover C, Jakhar D, Mishra A et al (2022). Nailfold capillaroscopy for the dermatologists. *Indian J Dermatol Venereol Leprol.* **88(3)**: 300-312.
3. Han XY, Sizer KC, Velarde-Felix JS et al (2012). The leprosy agents *Mycobacterium lepromatosis* and *Mycobacterium leprae* in Mexico. *Int J Dermatol.* **51(8)**: 952-959.
4. Jindal N, Shanker V, Tegta GR et al (2009). Clinico-epidemiological trends of leprosy in Himachal Pradesh: a five year study. *Indian J Lepr.* **81(4)**: 173-179.
5. Kato LE, Nakandakari S (1998). Alteracoes ungueais especificas da hanseniase. *Hansen Int.* **23**: 59-63.
6. Lima AS, dal Pizzol VI, Fritsch S et al (2016). Nailfold capillaroscopy in leprosy. *An Bras Dermatol.* **91(5)**: 686-687.
7. National Leprosy Eradication Programme - NLEP (2013). Training Manual for Medical Officer. Central Leprosy Division, Directorate General of Health Services, Ministry of Health and Family Welfare (GoI), Nirman Bhawan New Delhi.
8. Penna GO, Pinheiro AM, Nogueira LS et al (2008). Clinical and epidemiological study of leprosy cases in the University Hospital of Brasilia: 20 years - 1985 to 2005. *Revista da Sociedade Brasileira de Medicina Tropical.* **41(6)**: 575-580.
9. Scollard DM, McCormick G, Allen JL (1999). Localization of *Mycobacterium leprae* to endothelial cells of epineurial and perineurial blood vessels and lymphatics. *Am J Pathol.* **154(5)**: 1611-1620.
10. Sudhakar Rao KM, Smitha SV, Aruna MS et al (2022). Video-dermoscopic assessment of capillaroscopic pattern in Hansen's disease. *Indian J Lepr.* **94**: 153-161.
11. World Health Organization (2018). Guidelines for the diagnosis, treatment and prevention of leprosy. WHO Regional Office for South-East Asia, New Delhi.

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