

Decoding Nerve Abscesses in Leprosy: Clinical, Ultrasonographic, and Histopathologic Correlates

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Received: 15.01.2025

Revised: 15.05.2025

Accepted: 09.06.2025

Leprosy has been labelled as a great imitator since time immemorial because of its wide range of clinical manifestations. Here we report two cases of borderline tuberculoid leprosy presenting with nerve abscess. Their diagnosis was made by clinical examination and with the aid of fine needle aspiration cytology, histopathology and by radiology (high -resolution ultra-sonography). High resolution ultrasound can be a useful approach to diagnose nerve abscess and to determine whether the nerve is hypoechoic or hyperechoic with its fibrillary architecture. Present case series highlights the importance of nerve conduction assessment and high-resolution ultrasonography in the management of such cases.

Keywords : Ulnar Nerve Abscess, Median Nerve Abscess, Nerve abscess of Dorsal Common Digital Nerve, Borderline Tuberculoid Leprosy, High Resolution Ultrasonography.

Introduction

Leprosy is a chronic granulomatous infection generally caused by *Mycobacterium leprae* complex which comprises of *M. leprae* and *M. lepromatosis*, primarily affecting the skin and peripheral nerves. Although India has achieved the goal of eliminating leprosy as a designated public health problem which is defined as prevalence <1 case per 10,000 at the national level, leprosy still persists in certain high endemic districts (NLEP 2013). It is a complex spectrum disease with a wide range of neural and cutaneous manifestations. In some, the disease involves only one peripheral nerve (a mononeuritis) or causes a single or multiple

hypo anaesthetic patches. In others, nerve abscess is an infrequently reported complication. It is commonly seen in borderline tuberculoid type which could be attributed to the stronger cell-mediated immune response resulting in the development of epithelioid granulomas and perineural fibrosis (Mittal et al 2022). The most commonly involved nerve is ulnar nerve followed by lateral popliteal, median and posterior tibial nerve (Bhagat et al 1980). This case series illustrates the importance of imaging techniques in the diagnosis of nerve abscess, making a prompt medical management at an earlier stage helping in regaining of nerve function.

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Case series:**Case 1: Median nerve abscess and Ulnar nerve abscess:**

A 14-year-old male was referred to the Department of Dermatology, Veneorology and Leprosy in our hospital for evaluation of progressive right ulnar palsy with sensorimotor symptoms. He complained of swelling and pain around the inner aspect of the right elbow joint for 6 months, along with progressive hand weakness and occasional numbness. Dermatological examination revealed solitary scaly erythematous infiltrated plaque over right medial side of eyebrow measuring around 4x5 cm and other erythematous patch over right lower lip measuring around 5x2 cm (Fig.1, black arrows). Both the lesions were associated with hypo anaesthesia. On physical examination, two nodular swellings were seen which were soft and fluctuant with an approximate size of



Fig. 1 : Scaly erythematous infiltrated plaque over right medial side of eyebrow measuring around 4x5 cm and other erythematous patch over right lower lip measuring around 5x2 cm (Black arrows).

2x2 cm each (Fig. 2) and the right ulnar nerve was markedly thickened and tender, extending proximally till the tender swelling on the medial aspect of the right upper arm, suggestive of ulnar nerve abscess. Motor examination of the left hand revealed partial claw hand deformity (Fig. 3; black arrow) and the patient was unable to flex metacarpophalangeal joints and extend interphalangeal joints of the fourth and fifth fingers of the right hand. There was flattening of hypothenar eminence, guttering of interosseous spaces and shiny coppery appearance (Fig. 3; yellow arrow, red arrow) along with failure of adduction and abduction of the fourth and fifth fingers of the right hand. Sensory examination



Fig. 2 : Two nodular swellings, soft and fluctuant with an approximate size of 2*2 cm in the course of the ulnar nerve.

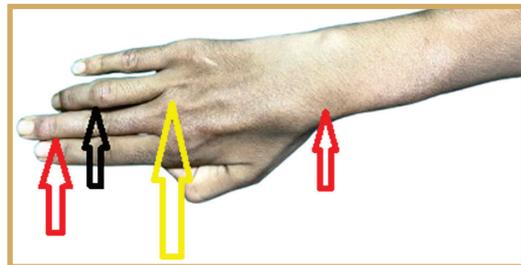


Fig. 3 : Black arrow: partial claw hand deformity, Yellow arrow: guttering of interosseous spaces, Red arrow: coppery shiny appearance of right hand.

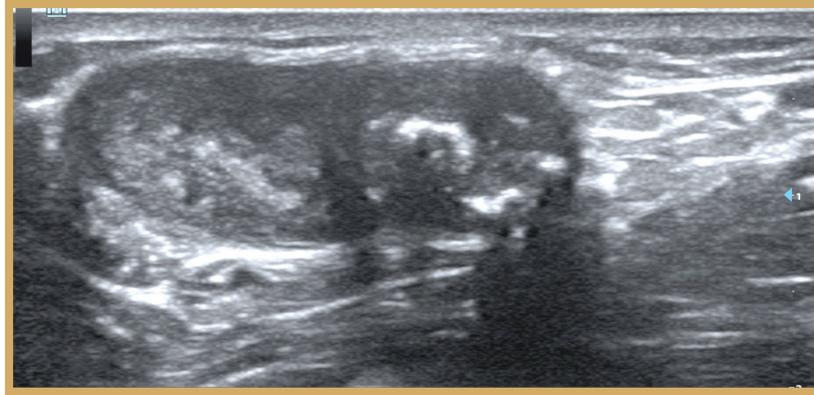


Fig. 4 : Ultrasound shows a thick-walled collection/abscess measuring 2×1.2 cm with internal echoes and liquefied component which is seen in close approximation and communicating with the ulnar nerve.

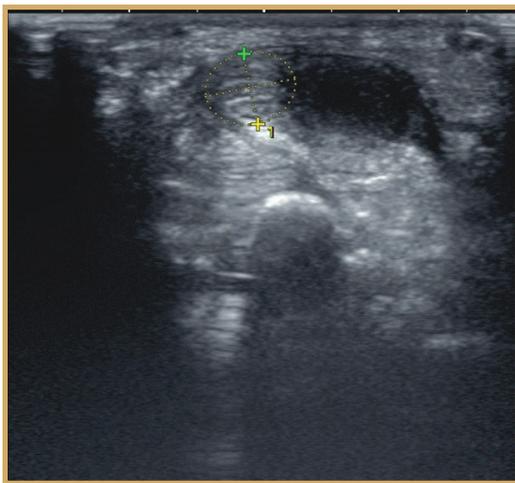


Fig. 5 : An eccentric intrasubstance anechoic area (blue arrow) is noted which is suggestive of abscess formation in close proximity and communicating with median nerve as well as loss of its fascicular architecture was seen on ultrasound.

revealed the near-complete absence of touch, pain, and temperature sensations over the ulnar distribution of the right hand. Along with the right ulnar nerve, the median nerve was also found to be involved as it was tender on palpation.

High-resolution ultrasonography using a linear probe at 12 MHz revealed diffuse heterogeneous hypoechoic thickening of right ulnar nerve with loss of normal fascicular architecture. The cross-sectional area of the nerve was 13 mm² and colour doppler scan showed hypervascularity indicating inflammation. Also, a thick-walled collection/abscess measuring 2×1.2 cm with internal echoes and liquefied component was seen in close approximation and communicating with the ulnar nerve, a few centimetres proximal to the elbow joint (Fig. 4). The ultrasonography was also done for other peripheral nerves of both upper limbs, and we found collection in close proximity of the median nerve measuring around 3×2 cm contrary to clinical findings (no visible swelling at flexor retinaculum) (Fig. 5). Nerve conduction studies showed sensory motor axonal neuropathy of ulnar nerve. Slit skin smear from the ear lobule and the plaque over right eyebrows was negative. Based on the clinical (IAL 1982) and imaging findings, a diagnosis of leprosy was made. Further, ultrasound guided fine needle aspiration was done from abscess, and it was analysed with ZN stain and revealed fragmented

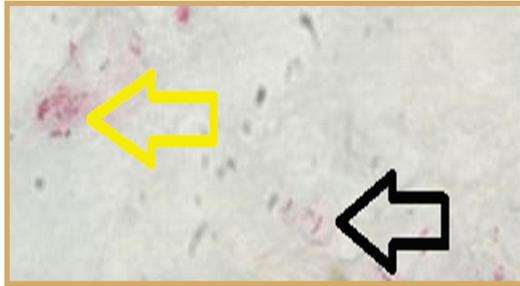


Fig. 6 : Ziehl Neelsen stain of the aspirate obtained from abscess showing acid fast bacilli (solid: black arrow, fragmented : yellow arrow).

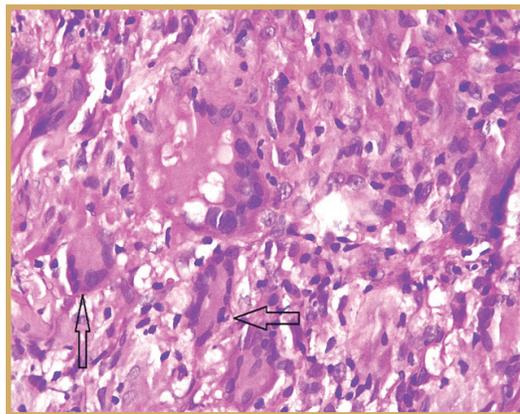


Fig. 7 : Hematoxylin and eosin-stained section of plaque on right eyebrow showing presence of dermal epithelioid cell granulomas with multiple Langhans Giant cells (black arrows) (H and E, 400×)

acid-fast bacilli (Fig. 6). Histopathology of biopsy specimen taken from plaque over right eyebrows revealed epithelioid cells and langhans cells (Fig. 7). With these findings, a diagnosis of borderline tuberculoid leprosy (Ridley & Jopling 1966) with ulnar nerve abscess, median nerve abscess and grade 2 deformity of right hand was made (Brandsma & van Brakel 2003). As per WHO criteria followed by NLEP (2013) patient was classified as multibacillary (MB) type. The patient



Fig. 8 : At 6th week follow up of patient with MB-MDT, only one swelling seen. (Note: Acneiform eruptions secondary to oral corticosteroids)

was started on WHO multibacillary multi-drug therapy (MB-MDT, Adult) constituting rifampicin (600 mg/month), clofazimine (300 mg/month and 50 mg daily) and dapsone (100 mg daily) for 12 months, and since it was the acute and first episode of nerve abscess, instead of going with surgical decompression, medical decompression was chosen and prednisolone 1mg/kg for management of nerve abscess and ulnar neuritis was started. The patient was also advised supportive and rehabilitative physiotherapy. The dose of corticosteroid was gradually tapered by 5mg/week, and patient was followed up at 6th week and there was resolution in one of the abscesses (Fig. 8) and there was improvement in sensations but no improvement in motor functions. Due to financial restraints, a repeat nerve conduction study and high-resolution ultrasound was not done. Patient is currently on follow up.



Fig. 9 : Orange arrow: Erythematous plaque over middle of dorsum of right side extending to right middle finger; Black arrow: Nodular swelling (soft, fusiform, tender).

Case 2: Nerve abscess of Dorsal Common Digital Nerve (Branch of ulnar nerve)

A female presented to the Department of Dermatology, Venereology and Leprosy with tender nodular swelling with insidious onset on right dorsum of hand on medial side with an erythematous plaque over the dorsum of right hand for 1 year (Fig. 9; Orange arrow). On examination plaque was erythematous and measured 5x6 cm was associated with hypo anaesthesia and absent temperature sensation. The swelling was soft, fusiform, tender, and subcutaneous with the normal overlying skin, with no fixity to the surroundings and lack of local signs of inflammation (Fig. 9; Black arrow). Further examination revealed that the swelling was a part of a local thickened nerve with no mobility along the long axis of the nerve and restricted mobility in the perpendicular axis. The motor examination was found to be normal. Clinically the right ulnar nerve was grossly thickened, and an ultrasound of the nodular swelling was done to rule out whether

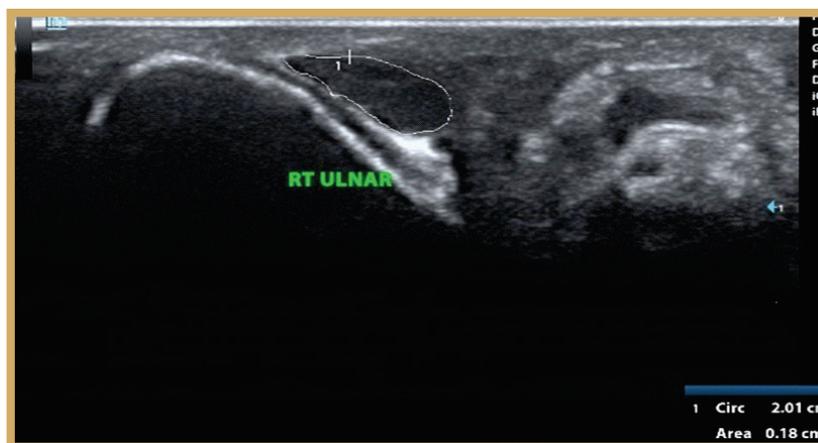


Fig. 10 : Cross sectional area of right ulnar nerve was 18 mm² on high resolution ultrasound.

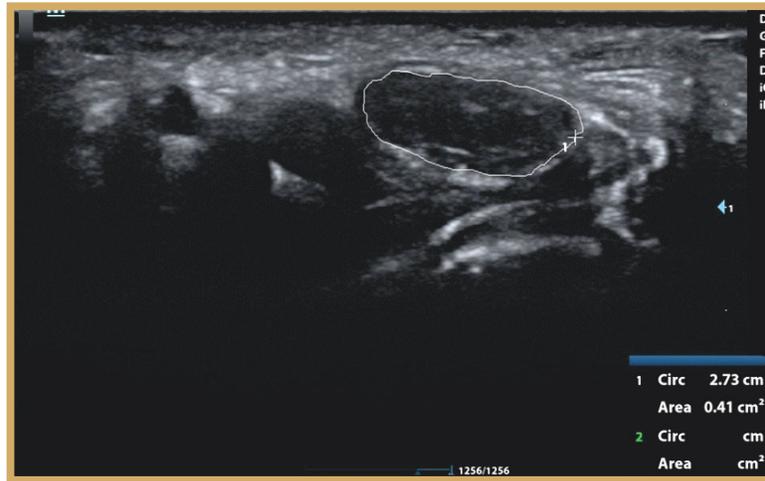


Fig. 11 : An eccentric intrasubstance anechoic area (encircled) is noted by ultrasound which is suggestive of abscess formation in dorsal common digital nerve which is the branch of the ulnar nerve.

was it an isolated swelling originating other than the nerve or was enlargement of the feeding nerve i.e., the ulnar nerve of the right upper limb. High-resolution ultrasonography using a linear probe at 12 MHz revealed diffuse heterogeneous hypoechoic thickening of the right ulnar nerve involving the cubital tunnel area and region proximal to the tunnel for a length of approximately 5-7 cm with loss of normal fascicular architecture. The maximum cross-sectional area of the nerve was 20 mm² (Fig. 10). Colour Doppler scan showed intraneural hypervascularity. Also, a thick-walled collection/abscess measuring 0.41cm² with internal echoes and liquefied component was seen in the dorsal digital branch of the ulnar nerve of the right ring finger (Fig. 11). Nerve conduction study showed decreased sensory and motor conduction velocities of ulnar nerve. Histopathology from the plaque on hand showed epithelioid cells and lymphocytic infiltrate. Slit skin smear was found to be negative. Subsequently ultrasound guided fine needle aspiration was done from abscess, and it was analysed with ZN stain and

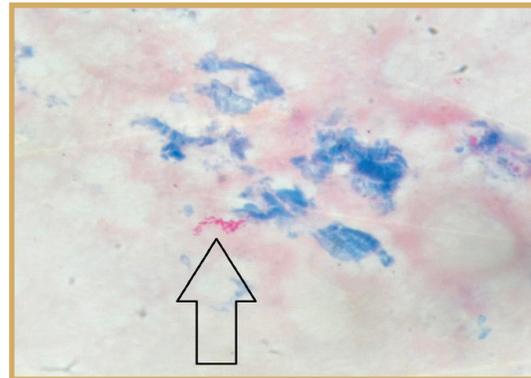


Fig. 12 : Ziehl Neelsen stain of the aspirate obtained from abscess showing acid fast bacilli.

revealed acid-fast bacilli (Fig. 12). The patient was subsequently diagnosed with borderline tuberculoid leprosy (Ridley & Jopling 1966) and was started on MDT-MB for adult as per WHO criteria followed by NLEP (2013). The patient was started on 0.5mg/kg and was followed up at 6th week. There was a less decrease in size of swelling (Fig. 13). The dose was increased to 1mg/kg and then was gradually tapered with



Fig. 13 : Moderate decrease in circumference and size of swelling after MDT-MB (Adult) and steroid therapy.

5mg every week. There was no tenderness and sensory symptoms improved at next follow up.

Discussion

Nerve abscesses are not frequently encountered in outpatient department of dermatology. In India, nerve abscesses develop in approximately 1.3% of patients with leprosy (Sen et al 2013) and some of these abscesses may calcify (Lichtman et al 1979). Most commonly affected age group is young children and teenagers which can be attributed to the extension of multi drug therapy programme without adequate infrastructure to detect and treat neuritis (Salafia & Chauhan 1996). Ulnar nerve is the most common nerve to develop nerve abscess.

Nerve abscesses can be seen across the whole spectrum of poles of leprosy but is most commonly seen in tuberculoid and borderline tuberculoid pole because of the presence of established cell mediated immunity which mounts an immune response against leprae bacilli. This causes destruction of perineurium and schwann cells

with the formation of epithelioid cells (Ebenezer & Scollard 2021). In severe cases, in inflammatory changes and liquefaction of granuloma lead to caseous necrosis which on coalescing forms nerve abscess (Rai et al 2013). Conversely, abscesses in lepromatous leprosy may result from antigen-antibody interactions, such as those occurring during an erythema nodosum leprosum (ENL) reaction, progression of a lepromatous lesion, or necrosis within a lepromatous granuloma (Krishnan et al 2024). High resolution ultrasound is an emerging modality which can diagnose abscess and highlights its internal structure whether the nerve is hypoechoic or hyperechoic with its fibrillary architecture and presence of any thickening of nerve. Fine needle aspiration cytology has also been useful in diagnosing the nerve abscesses secondary to leprosy where the aspirated material sent for cytology for noting the cellularity and acid-fast bacilli which was done in both of our cases and histopathology (Kiran & Menon 2013). The importance of diagnosing nerve abscess at an earlier stage is because it can cause nerve function impairment due to compression caused by it on the nerve, its timely appropriate management can prevent an irreversible damage to nerve.

The present case series especially highlights the importance of nerve conduction study and high-resolution ultrasound. As in case report 1, patient did not have any apparent swelling over wrist, but HRUS was able to diagnose the underlying abscess of median nerve which was clinically causing tenderness to the patient. In case report 2, patient did not give any motor abnormalities on examination (card test, book test and little finger adduction test was normal) but NCV was able to detect subclinical motor changes in form of decreased conduction velocity. Previous studies have also demonstrated the usefulness of NCS in evaluating and monitoring nerve involvement and

nerve abscesses in leprosy (Chaudhary et al 2023, Kar et al 2013). This case series also highlights the involvement of distal digital branches of commonly involved nerve i.e. ulnar nerve and its HRUS imaging. In both of the cases steroids were started in tapering doses and response was being noted in form of gradual reduction in swelling and improvement in sensory findings, so instead of surgical decompression both the patients were kept on medical treatment. There were certain limitations as well. The follow up HRUS and NCV in both the cases were not done and HRUS findings were not supported by Magnetic resonance imaging due to financial restraints. Nerve biopsy was not done since it is an invasive procedure and is associated with morbidity if damage to nerve happens. Our study reinforces the approach of using imaging to confirm nerve abscess in leprosy (Sen et al 2013, Mittal et al 2022, Krishnan et al 2024).

Conclusion

In summary, nerve abscess as an initial presentation of leprosy is rare, and accurate diagnosis requires a high degree of clinical suspicion. Clinical examination supported by nerve conduction velocity assessment, high-resolution ultrasonography, FNAC for cytology and bacteriology as well as histopathology can help in appropriate management of such cases.

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How to cite this article : Kabra N, Sinha R, Sinha N et al (2025). Decoding Nerve Abscesses in Leprosy: Clinical, Ultrasonographic, and Histopathologic Correlates. *Indian J Lepr.* **97**: 413-421.