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High resolution Ultrasonography of nerves. A new screening tool in suspected cases of Pure Neuritic Leprosy

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ABSTRACT

OBJECTIVES: To assess high resolution Ultrasound examination of peripheral nerves by analyzing and comparing with Ultrasound guided Fine Needle Aspiration Cytology & nerve conduction studies in suspected cases of Pure Neuritic Leprosy.

MATERIAL&METHODS: From Jan 2005 to June 2015, 1172 suspected cases of Pure Neuritic Leprosy were screened by High Resolution Ultrasonography. All the cases underwent Nerve conduction studies. USG guided FNAC was done on all Ultrasonographically hypoechoic nerves.

RESULTS: 71%cases showed diffuse hypoechogenicity of nerves. 89% hypoechoic nerves showed Neuritis & 37.5% showed AFB in USG guided FNAC evaluation. The nerve conduction studies showed 100%positive tracing in all hypoechoic nerves.

CONCLUSION: High Resolution Ultasonography of nerves proves an effective new screening tool in picking Pure Neuritic Leprosy cases. Thus a new step forward in elimination of Leprosy.

KEYWORDS : High resolution Ultrasound examination of nerves, Pure Neuritic Leprosy (PNL), Ultrasound guided fine needle aspiration cytology (FNAC), nerve conduction studies

INTRODUCTION:

Ultrasound examination of nerves is being done since last two decades. The high resolution image quality is further delineating & defining the nerves effectively. Attempts were made in the past to highlight the abnormal features like thickening, decreased echogenicity of nerves & entrapment of nerves. Normal volunteers were also evaluated for echogenicity & thickness. Some studies have also done comparison of ultrasound and NCV studies of ulnar nerves at elbow. No significant references are available on evaluation of USG of nerves in cases of clinically suspected Pure Neuritic Leprosy in large volume.

There is growing concern regarding the efforts put up by (WHO) and global alliance for elimination of leprosy (GAEL).

Also there is growing concept of evidence based medicine to promote newer, less costly, acceptable and valid tools in the quest for better medical practices. Our study aims to screen the clinically suspected Pure Neuritic Leprosy cases by performing High Resolution ultrasonography of nerves & simultaneously comparing the abnormal Ultrasound features with Fine Needle Aspiration Cytology & Nerve Conduction Studies.

MATERIAL & METHODS:

This study was done in a span of 10 years from 2005 Jan to Jan 2015. All Clinically suspected 1172 cases of Pure Neuritic Leprosy were referred to USG Dept. for High Resolution Ultrasonography Scan. All the cases were excluded to have any significant risk factors & other common causes of Neuritis like Diabetes, and vasculitis. The patients were from the hills & foothills of Darjeeling, Sikkim, Bihar & bordering areas of Nepal, Bangladesh & Bhutan. Suspected peripheral nerves in extremities were scanned by High Resolution Ultrasonography using a 12 MHz probe.

Only ulnar nerves & lateral popliteal nerves were scanned according to the limbs involved.

USG was done in prone position with both hands in internal rotation & extension at elbow for ulnar nerves. Lateral popliteal nerves were screened in popliteal fossa in extension. Image (1) shown below

USG criterias noted were thickness of nerves, echogenicity, nodularity, intra and peri-neural collections. Entrapment of nerves and SOLs were ruled out & not included in this study. Simultaneously the socioeconomic and literacy data of patients was also noted.

The nerves on High Resolution Ultrasonography were mentioned as hypoechoic when they showed more hypoechoic echotexture in comparison with adjacent muscles Image 2, 3. Shown below .The nerves were mentioned as normal when the echogenicity of nerves was less than a tendon & more than a muscle. All the nerves were subjected to Nerve Conduction Studies. Only the hypoechoic nerves were subjected to Ultrasound guided Fine Needle Aspiration Cytology Image 4. Shown below

The data was tabulated and reviewed.

IMAGE 1 Usg of lateral politeal nerve

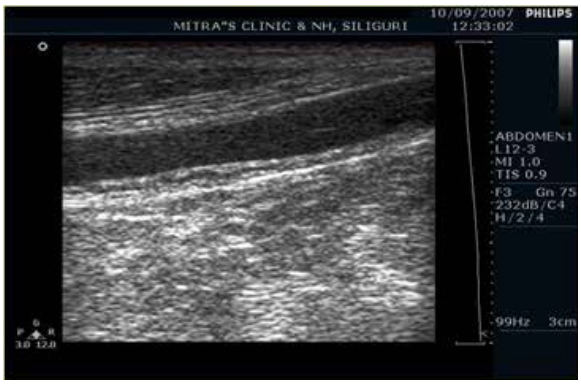

IMAGE 2. HYPOECHOIC NERVE

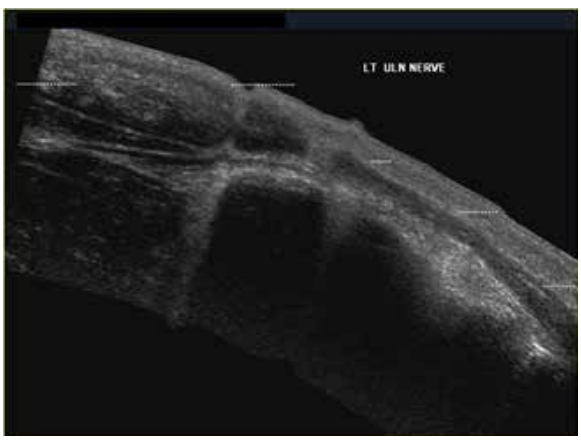

IMAGE 3. HYPOECHOIC NODULAR

IMAGE 4.Usg guided fine needle aspiration

RESULTS:

High Resolution Ultrasonography of nerves was done in 1172 cases. Out of which independently 245 cases of ulnar nerves & 759 cases of popliteal nerves & combinedly 168 cases of both ulnar & popliteal nerves were evaluated Table(1. As Table (2) suggests, 71% (832) cases showed diffusely hypoechoic echotexture of nerves Image(2,3) & 29% (340) cases showed normal echotexture.). 29 % (241) hypoechoic nerves showed nodularity along the long segment Image(3) & 7% (58) showed nerve abscess.). Highest numbers fell in 41-50 years of age group.76 % (632) were from non BPL (Below poverty line) group. Male preponderance was noted.

The average maximum thickness of nerves was more in hypoechoic nerves as against normal nerves – Table (3. The nerve conduction studies done in all hypoechoic nerves showed 100% (832) positive tracing , 38% (129) positive tracing was also seen in normal echogenic nerves

Table 4 . Of all the hypoechoic nerves subjected to USG guided FNAC, 89% (741) showed features of Neuritis & 37.5% (312) showed presence of AFB in modified ZN stain. Table 5 None of the USG guided FNAC cases presented with any complication.

Table no. 1

Total cases Jan 2005 to June 2015	1172
Ulnar nerves	245
Lateral popliteal nerves	759
Both	168

Table no 2

Hypoechoic nerves	832-----71%
Normal echogenic nerves	340----29%
Hypoechoic nodular nerves	241 ---29%
Hypoechoic nerves with abscess	58---7%

Table no 3 --- Average thickness in mm Hypoechoic nerves Normal nerves

Right Ulnar nerve	2.76	2.34
Left Ulnar nerve	2.91	2.20
Right lateral popliteal nerve	2.56	1.76
Left lateral popliteal nerve	2.46	1.73

Table no 4

Hypoechoic nerves…….100% positive NCV studies -- 832

Normal echogenic nerves…… 38% positive NCV studies -- 129

Table no 5

Hypoechoic nerves 832
FNAC Positive in 741case ---89%
Negative in 104 cases ---12.5%

Hypoechoic nerves	positive NCV studies – 832...100%
Normal nerves	positive NCV studies – 129…38%

AFB visualised in… 312 cases 37.5%

DISCUSSION

Development of new hardware & software in medical imaging like high resolution Ultrasonography is attempting at imaging of many smaller structures like skin, nail bed, nerves etc. Solbiati et al presented with first paper on High Resolution Ultasonography of recurrent laryngeal nerve (1). Forage et al gave more detailed imaging of peripheral nerves in extremities (2). Last two decades showed increased emphasis on High Resolution Ultasonography of nerves (3), (4). Simultaneous comparison of High Resolution Ultrasonography with electro physiological studies & Histopathological studies was also tried (5), (6). One article suggests USG guided FNAC may be substituted for open nerve Biopsy (7). Pathological changes in the nerves can be demonstrated by nerve enlargement & increased hypoechogenicity (8). High Resolution Ultrasonography can pickup many types of nerve patterns (10). High Resolution Ultrasonography can also be incorporated as a bedside tool for Neuro muscle Ultrasound examination (9).

Pure Neuritic Leprosy is extreme type of Leprosy, having good prognosis if picked up early on clinical screening, properly diagnosed & treated effectively. Pure Neuritic Leprosy contributes 4-8% share of all leprosy cases. It is a common cause of neuropathy predominantly affecting peripheral nerves in extremities. Developing countries contribute major share in the world scenario. The diagnosis is often a challenge as the skin lesion may not be present or may occur later in the course (12). Pure Neuritic Leprosy presents with thickened & tender nerves with sensory & motor symptoms in the respective dermatome. In the recent years FNAC of suspected nerves showed good pickup rate (11). In our study of 1172 clinically suspected cases of Pure Neuritic Leprosy 71% showed positive features on High Resolution Ultrasonography of which 89% were positive on Histopathological evaluation (USG guided FNAC done) establishing a good corelation.

As the WHO 2000 programme of global elimination of leprosy failed, more concerns were raised.

WHO 2005 programme did suggest various steps, which still showed

critical lacunae (13). Though the data published by WHO in successive years show reducing prevalence rates there is more to do in the field as the clinical screening of Pure Neuritic Leprosy cases may show wider inter-observer reliability (14,15). The cases of Pure Neuritic Leprosy are to be highly suspected in doubtful neuropathies & there is a need for acute awareness (16,17). Our study showed the presence of Pure Neuritic Leprosy more in non-BPL category and it may explain more people are out of the surveys conducted by health agencies. Practically there is problem to convince the patient who has pure neuritic leprosy in absence of skin lesions. There is also growing concept of evidence based medicine which thus necessitates to have a more methodical approach & more tools to screen & diagnose Pure Neuritic Leprosy. High Resolution Ultrasonography is a relatively cheap & widely available technology and where the clinical screening and surveillance may fail it also shows and confirms the extra features of involved nerves like nodularity, abscesses ,long segment involvement, and multiple nerve involvement.

Our study showed a good correlation of High Resolution Ultrasonography & Fine Needle Aspiration Cytology in clinically suspected Pure Neuritic Leprosy. Thus High Resolution Ultrasonography of nerves should be used as a screening tool in the field by clinicians, trained observers & health personnel for precisely picking & also monitoring new & old cases of PNL.

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