



## CLINICAL CORRELATION BETWEEN NERVE CONDUCTION STUDIES AND NEUROSONOGRAPHY IN PERIPHERAL NEUROPATHIES

### Neurology

**Dr. Archana  
Bethala\***

Department of Neurology, QQDC 2nd floor, Osmania General Hospital, Afzalgunj, Hyderabad 500012 \*Corresponding Author

### ABSTRACT

**BACKGROUND** - Peripheral neuropathies are the most common neuromuscular disorder seen by neurologists. Nerve ultrasonography is a recently emerging tool for visualizing the structure, architecture and vascularity of peripheral nerves.

**OBJECTIVES** - To study the Clinical correlation between Nerve conduction studies and Neurosonography in peripheral neuropathies.

**METHODOLOGY** - All patients with peripheral neuropathy were included in the study from February 2016 to January 2018.

**RESULTS** - The most common aetiologies for peripheral neuropathy were diabetes and leprosy. Nerve ultrasound showed corresponding changes in the above conditions.

**CONCLUSION** - Nerve ultrasound is useful in peripheral neuropathy and can complement other diagnostic investigations.

### KEYWORDS

nerve ultrasound, carpal tunnel syndrome (CTS), leprosy neuritis

### INTRODUCTION

Peripheral neuropathies are the most common neuromuscular disorder seen by neurologists. The overall prevalence of peripheral neuropathies varied from 5 to 2400 per 10,000 population in various community studies in India<sup>1</sup>. They are distressing and disabling to the patients and deprive them of functional independence. Nerve conduction studies are complementary to clinical examination in determining the extent of nerve injury<sup>2</sup>. To determine the aetiology of peripheral neuropathy wide variety of investigations are to be done, which might remain inconclusive at times.

Nerve ultrasonography is a recently emerging tool for visualizing the structure, architecture and vascularity of peripheral nerves<sup>3</sup>. Various etiologies of peripheral neuropathies show varied appearances on nerve ultrasonography. Nerve ultrasonography is increasingly used in the diagnosis of entrapment neuropathies, leprosy neuropathy and nerve tumors. Several studies are done to determine the utility of nerve ultrasonography in the diagnosis of peripheral nerve lesions, in an attempt to avoid invasive procedures like nerve biopsy or expensive investigations like magnetic resonance imaging of peripheral nerves<sup>4</sup>. The present study is projected at determining the utility of nerve ultrasonography in peripheral neuropathies and its correlation to nerve conduction studies in various peripheral nerve lesions.

### PATIENTS & METHODS

All the patients with peripheral nerve lesions attending the neurology department are included in the study. The study period was from February 2016 to January 2018. Demographic details, presenting neurological symptoms and details of the systemic disease (if any), were noted. Further, patients were examined and subjected to nerve conduction studies and nerve ultrasound and advised other investigations if necessary, details of which were noted on follow up.

### RESULTS

In the present study on 44 patients with peripheral neuropathies, the age of the patients ranged from 10 years to 65 years. 73% of the patients were over 30 years of age. 57% were males and 43% were females. Among the 44 patients, 70% of them presented with both motor weakness and sensory symptoms, 14% had isolated motor symptoms and 16% had isolated sensory symptoms. Etiologically, diabetes and leprosy accounted for majority (32% each) (TABLE 1). Nerve conduction studies revealed mononeuropathy in 68% of the patients, polyneuropathy in 27% and normal studies in 5% of cases. Among the 5 patients with carpal tunnel syndrome, 2 patients had distorted nerve architecture on ultrasonography. Among the 14 patients with leprosy neuritis, ulnar nerve was involved in 79%, common peroneal nerve was involved in 14% and median nerve in 7%. Nerve ultrasound in leprosy neuritis revealed increased cross sectional area in 26%, distorted architecture in 28% and abnormal vascularity in 16%.

**TABLE 1**

Etiology of peripheral neuropathy	Number of patients	Percentage
Carpal tunnel syndrome	5	11%

Diabetic neuropathy	14	32%
Entrapment neuropathy at elbow	2	4%
Leprosy neuropathy	14	32%
Nerve tumour	2	5%
Traumatic neuropathy	3	7%
Undetermined etiology	4	9%

### DISCUSSION

Peripheral nerve disorders are caused by lesion of either single or multiple peripheral nerves. Early diagnosis and treatment of the cause of peripheral neuropathies reduces the morbidity and improves the quality of life of the patient. Clinical presentation of these lesions includes weakness, wasting, sensory loss, paresthesias, sensory ataxia, pain and features of autonomic dysfunction like orthostasis, reduced or absent sweating, urinary incontinence and constipation.

In the present study, 44 patients were included with various causes of peripheral neuropathies. The mean age of the patient population is  $41.36 \pm 15.73$  years, whereas according to Kalliopi Pitarokouli and colleagues the mean age was  $69.07 \pm 12.17$ <sup>5</sup>. Of the 44 patients, 57% were males and 43% were females. In the present study, diabetic neuropathy and leprosy neuropathy are the most common causes of symptoms. 32% of the patients were affected with diabetic neuropathy. The most common presentation in this group was symmetrical paresthesias and sensory loss with weakness. In a study from Sri Lanka, the prevalence of diabetic peripheral neuropathy was 48.1% and most common symptom among newly diagnosed subjects were burning, aching pain or tenderness of feet, followed by numbness of feet, prickling sensation of feet and unsteadiness in walking<sup>6</sup>. 85.7% of the patients had involvement of lower limb nerves. 14% of the patients had carpal tunnel syndrome. On nerve ultrasound, mean cross sectional areas of the nerves in diabetic patients were significantly larger, similar to the mean cross sectional areas of the respective nerves in other studies<sup>7,8</sup>.

All patients with leprosy neuritis had mononeuropathy. Ulnar nerve is the most common nerve involved followed by common peroneal nerve. Increased cross sectional area was seen in 26%, distorted architecture of the fascicles of the nerve was seen in 28% and abnormal vascularity was seen in 16% of patients with leprosy neuropathy. These findings were consistent with previous study by Jain et al<sup>9</sup>. The mean cross sectional area of ulnar nerve at the elbow in leprosy neuropathy was  $19.65 \pm 7.26$  mm<sup>2</sup>. In a study by S. Gupta et al<sup>10</sup>, mean cross sectional area of the ulnar nerve was  $12.52 \pm 1.67$  mm<sup>2</sup>, which is much lower than that found in our study. This may be due to variation of site of examination and variable severity of the disease.

Other etiologies included nerve entrapment, trauma, tumors and undetermined. 15.9% of patients had nerve entrapment – 11.3% had carpal tunnel syndrome (CTS) and 4.5% had ulnar nerve entrapment at elbow. In CTS patients, the mean cross sectional area of median nerve was  $9.28 \pm 2.62$  mm<sup>2</sup>, which is less than mean cross sectional area in other studies<sup>11</sup>. This might be due to different study conditions and

measurement techniques, along with factors such as age, weight and gender. Three patients had traumatic neuropathy, two had neurapraxia and one had partial nerve injury, secondary to intramuscular injection, who showed increased cross section area and distorted architecture, consistent with previous studies<sup>2</sup>. In the present study, 2 patients had nerve tumours on ultrasonography – one with median neuropathy and another with sciatic neuropathy.

Thus, nerve ultrasound is a useful modality in the evaluation of almost all the pathologies of the peripheral nerves and permits the direct assessment of pathologic changes in nerve structures. Given its increasing availability, lesser cost and ability to perform rapid non-invasive testing, ultrasound imaging will soon qualify as another bedside technique that extends the reach of the neurological examination.

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