

Assessment Of Nerve Conduction Parameters Of Tibial Nerve In Patients With Lumbosacral Radiculopathy - A Cross-Sectional Study In A Tertiary Care Center Of North-East India

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Abstract:

Background: Lumbosacral Radiculopathy is a syndrome complex caused by compression or irritation of nerve roots in the lower back. Nerve conduction studies (NCS) are electrodiagnostic tests to assess the functional integrity of the nerve root. Lumbosacral radiculopathy can alter the motor nerve conduction of lower limb and Nerve conduction study can be an important diagnostic test for lumbosacral radiculopathy.

Objectives: To assess the nerve conduction parameters of tibial nerve in patients with Lumbosacral radiculopathy.

Materials and Method: A hospital based cross-sectional study was carried out among fifty (50) Lumbosacral Radiculopathy patients attending Neurology OPD of AGMC & GBPH Hospital. Following standard protocol Nerve conduction study was conducted after obtaining informed consent from the participants. Data were recorded in a predesigned case study format and analysed using SPSS 21. A p-value of <0.05 was considered statistically significant.

Results: Fifty (50) Lumbosacral Radiculopathy patients participated in the study. 48% of them were female and 52% of them were male. 48% of the participant had prolonged conduction velocity of tibial nerve. Mean Right and left tibial conduction velocity was (45.02 ± 3.42) m/s and (46.31 ± 3.26) m/s respectively. Mean right and left tibial F wave latency was (45.81 ± 4.73) ms and (45.86 ± 3.81) ms respectively.

Conclusion: NCS can be valuable tool in evaluating subjects with lumbosacral radiculopathy.

Keywords: Lumbosacral radiculopathy, Nerve conduction study, Motor nerve latency, motor nerve conduction velocity, F wave.

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I. Introduction

Low back pain is the most common cause for the disability in world wide. The incidence of low back pain is between 5% to 30%, with a lifetime prevalence of 60% to 90%. One of the differentials for low back pain is lumbosacral radiculopathy. Radiculopathy is a term used to describe a pain syndrome occurring secondary to mechanical and/or inflammatory cycles compromising the nerve roots.¹

Radiculopathy is a disorder affecting the nerve roots. It is mainly due to the compression of the nerve root from a structural lesion and also secondary to an infection, tumor, or surrounding tissue inflammation². The most common symptoms of radiculopathy are numbness, tingling sensation, weakness and radiating pain which typically present unilaterally. Symptoms are based on the type of nerve root that is involved. It can be cervical radiculopathy, thoracic or lumbosacral radiculopathy. Low back pain is one of the most common presenting complain of lumbosacral radiculopathy.³

Nerve conduction studies are noninvasive, objective, and reproducible tool to assess the functional integrity of the nerve root. NCS and EMG are predominantly used for evaluation of peripheral nervous system, including motor neuron, dorsal root ganglion, root, plexus, nerve, neuromuscular junction and muscle diseases.⁴

NCS can be a useful diagnostic tool in cases of radiculopathy when combined with a thorough history and clinical examination.⁵ Motor nerve conduction studies of the common peroneal nerve and posterior tibial

nerve can be useful to assess the patient lumbosacral radiculopathy. Late responses (F-wave and H- reflex) usually provide information about the proximal nerve segment.⁶

Very few studies have been conducted to evaluate the use of nerve conduction studies in the diagnosis and assessment of patients with lumbosacral radiculopathy. There is a need for more studies to be conducted to correlate the findings of the NCS in patients with lumbosacral radiculopathy. Especially in Northeastern part of India, no such studies have been conducted in patients with lumbosacral radiculopathy. Therefore this study is taken up to assess the nerve conduction in patients with lumbosacral radiculopathy.

II. Aims & Objectives

To assess the nerve conduction parameters of tibial nerve in patients with Lumbosacral radiculopathy.

III. Materials And Method

Study type: Observational study

Study design: Hospital based Cross- sectional study

Study duration: January 2024 to November 2024

Study area / location: Department of Physiology in collaboration with Department of Neurology, Agartala Govt. Medical College (AGMC).

Study population: Fifty (50) adult patients between the age group of 30 to 70 years with Lumbosacral Radiculopathy attending Neurology OPD of AGMC & GBP Hospital.

Inclusion criteria for cases:

1. Age group of 30-70 years
2. Lumbosacral radiculopathy patients complaining of symptoms like backache, tingling sensation , numbness , difficulty in walking
3. Straight leg raising test positive
4. Co-operative & willing to participate in the study.

Exclusion criteria for cases:

1. Patients with electrolyte imbalance
2. Patients with Diabetes Mellitus, Thyroid disease
3. History of prior spinal surgery

Sampling procedure: Convenient sampling

All the lumbar radiculopathy patients attending neurology clinic who will fulfill the inclusion and exclusion criteria during the study period of study were included.

Study tools:

- Stadiometer: Bioplus; height -200cm
- Weight Machine (Mechanical EQ-BR -9201): Brand- Equinox, Weight Limit- 130kg
- 2/4 Channel portable RMS EMG.NCV.EP machine
- Case study format

Study procedure:

All the study subjects were selected consecutively during the study period following the inclusion and exclusion criteria. The data were collected from the Lumbosacral radiculopathy patients attending Neurology OPD of AGMC & GBP Hospital, Agartala two days a week within one and half year period.

All the participants were personally subjected to detailed history regarding name, age, sex, occupation, socioeconomic status, educational status, medical history and clinical features etc. These findings were recorded in a predesigned and pretested standard questionnaire. Blood sugar level, thyroid level and other laboratory findings were recorded from previous and current medical documents. Written informed consent was obtained from all the participants. Complete general physical and systemic examination was performed.

1. Age: Was recorded from birthdays to the nearest completed years.

2. Standing height: Height of the subjects was measured barefooted in centimeters to the nearest 0.1 cm.

3. Weight: Weight of the subject was recorded to the nearest 0.1kg.

4. **NCS:** The nerve conduction recordings were performed using RMS EMG.NCV.EP machine. The subjects were allowed to lie down on a couch and relax fully to ensure good recordings. The area of the skin was cleaned thoroughly with spirit to remove dirt, dead cells and grease. The cup or disc electrodes (Ag- AgCl) of 1 cm diameter filled with conducting jelly was fixed on the skin of recording area with transpore tape. These electrodes were connected to the oscilloscope through the preamplifier. After 10 min of rest and adaptation to the laboratory environment, electrodiagnostic tests were performed following the standard procedures. The recordings were performed with standard equipment settings of sensitivity 5 mV/division, sweep speed 5 ms/division, stimulus duration 0.2 ms, low frequency filter 10 Hz, high frequency filter 5 KHz by using supramaximal strength of stimuli. Motor NCS was performed for Tibial nerve. The recording electrode, the reference electrode and the ground electrode were attached. The cathode of the stimulating electrode was placed proximal to the recording electrode. The nerve was stimulated to record the muscle action potential and the following parameters were measured: Standardized distal latency in ms, amplitude of compound muscle action potential in mV (CMAP), nerve conduction velocity in m/s and F wave latencies in ms.

Data analysis: Data were analyzed using SPSS 20. Descriptive statistics and other suitable statistical tests were used as per applicability. Data were expressed in terms of mean and standard deviation. Correlation was assessed between BMI and Nerve conduction parameters. A probability value less than 0.05 were considered as significant.

IV. Results

Fifty (50) Lumbosacral Radiculopathy patients participated in the study. Demographic variables of the study participants are described in Table 1. 48% of them were female and 52% of them were male as shown in Figure 1. 48% of the participant had prolonged conduction velocity of tibial nerve as shown in Figure 2. Mean Right and left tibial conduction velocity was (45.02 ± 3.42) m/s and (46.31 ± 3.26) m/s respectively. Mean right and left tibial F wave latency was (45.81 ± 4.73) ms and (45.86 ± 3.81) m/s respectively. Nerve conduction parameters of the study participants are summarised in Table 2.

Variables	Mean	± Std. Deviation
Age (Years)	48.34	±11.5
Height (cm)	151.65	±4.29
Weight (kg)	59.38	±8.56

Table1: Demographic variables of the study participants

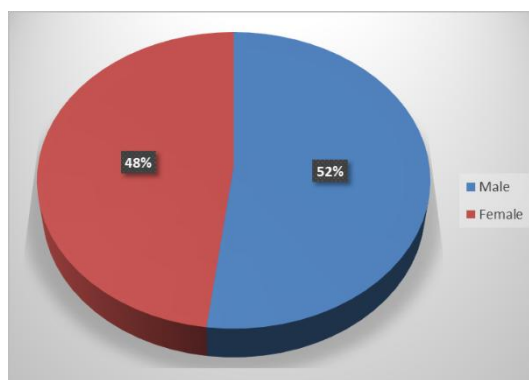


Figure1: Gender distribution among study participants

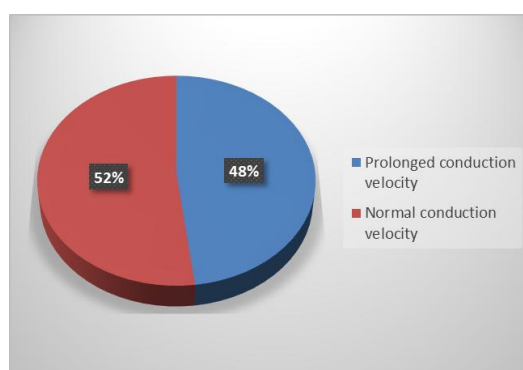


Figure2: Conduction velocity among study participants

NCS Parameters		Mean	Std. Deviation
Right Tibial	Latency (ms)	3.44	±0.78
	Amplitude (mv)	12.55	±4.7
	Conduction velocity (m/s)	45.02	±3.42
Left Tibial	Latency (ms)	3.71	±0.88
	Amplitude (mv)	12.69	±4.5
	Conduction velocity (m/s)	46.31	±3.26
F-wave	Right Tibial latency (ms)	45.81	±4.73
	Left Tibial latency (ms)	45.86	±3.81

Table2: Nerve conduction parameters of the study participants

V. Discussion

Talinga AA et al conducted one study to identify the changes in nerve conduction parameters and the potential of the study in patients with the diagnosis of Lumbar radiculopathy. They concluded in their study that NCS is helpful to detect the functional abnormalities. It also plays an important role in establishing the functional diagnosis of primary nerve damage.⁷A cross-sectional study was done on 97 clinically diagnosed Lumbar Radiculopathy patients, in which 64% of patients have positive MRI findings.Nerve conduction study was performed on common peroneal; tibialis and sural nerves and H reflex were obtained from soleus muscle of these patients.82% of the patients recording showed abnormal electrophysiological findings.⁸Another study was done to establish most common Electrophysiological predictors of lumbosacral radiculopathy among MRI diagnosed L5-S1 neural foramina compression cases by Ghugare BW et al.⁹ They concluded that EMG and NCV play important role in the evaluation of lumbosacral radiculopathy.Nisargandha MA et al conducted a study on Sciatica patient.They found gross impairment of conduction velocities and the degree of demyelination and axonal loss in the examined nerve. They concluded that NCV will be helpful for the early detection of demyelination and also for detection of nerve injuries in the patient of sciatica.¹⁰

Radiculopathy is a disorder affecting the nerve roots. It is mainly due to the compression of the nerve root from a structural lesion and also secondary to an infection, tumor, or surrounding tissue inflammation. Damage to the nerve roots and nerve fibers alter the nerve conduction through these fibers which are detected by Nerve Conduction Studies.

VI. Conclusion

Conduction of nerve impulse gets altered in patients with lumbosacral radiculopathy. NCS can be valuable tool in evaluating subjects with lumbosacral radiculopathy.

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