Section: Physiology

Original Research Article

COMPARATIVE STUDY OF MOTOR NERVE CONDUCTION CHANGES IN SYMPTOMATIC LUMBAR DISC HERNIATION PATIENTS BEFORE AND AFTER 6WEEKS OF SURGERY

Thokchom Priyalakshmi Devi[1], Yumnam Anjana[2], SP Rosemary Anal[3], Mayanglambam Sangeeta Devi[4], Umesh Takhelmayum[5], Surjit Nongthombam[6], Chingangbam Sharmila Devi[7]

[1]Senior Resident, Department of Physiology, Shija Academy of Health Sciences (SAHS), HealthVillage, Langol, Imphal West, Manipur, India.
[2]Professor, Department of Physiology, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Porompat, Imphal, Manipur, India.
[3]Assistant Professor, Department of Physiology, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Porompat, Imphal, Manipur, India.
[4]Assistant Professor, Department of Physiology, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Porompat, Imphal, Manipur, India.
[5]Assistant Professor, Department of Orthopedics, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Porompat, Imphal, Manipur, India.
[6]Assistant Professor, Department of Pharmacology, Churachandpur Medical College, Churachandpur, Manipur, India.
[7]Assistant Professor, Department of Physiology, Shija Academy of Health Sciences, Langol, Imphal West, Manipur, India.

Received : 10/07/2026
Received in revised form : 09/08/2026
Accepted : 22/08/2026

Keywords:
Lumbar Disc Herniation, Nerve Conduction Study, Tibial & Common Peroneal Nerve.

Corresponding Author:
Dr. Thokchom priyalakshmi Devi,
Email: dr.thpriyalakshmi100@gmail.com

DOI: 10.47009/jamp.2026.8.4.313

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (4); 1845-1848

ABSTRACT

Background: Lumbar disc herniation (LDH) is often leading to motor and sensory deficits in the lower limb. Nerve conduction studies (NCS) provide objective assessment to evaluate the functional impairment of peripheral nerves commonly the tibial and common peroneal nerves; hence, the present study aims to study the electrophysiological evaluation of tibial and common peroneal nerves in patients with symptomatic lumbar disc herniation. The aim is to evaluate and compare the Motor Nerve Conduction Changes in Symptomatic Lumbar Disc Herniation Patients before and after 6weeks of Surgery. **Materials and Methods:** The Observational prospective study was done in the Neurophysiology laboratory of Department of Physiology at Jawaharlal Nehru Institute of Medical Sciences (JNIMS) Manipur. The study was conducted from August 2022 to July 2024 on 30 known cases of bilaterally symptomatic lumbar disc herniation patients who were admitted for surgery in the Department of Orthopedics of JNIMS between the age group of 20 and 50 years of both sex. Age and sex matched healthy controls were recruited from among the staffs and students of JNIMS. NCS of the motor nerves- tibial and common peroneal of the lower limb were conducted. Parameters assessed were CMAP latencies, amplitudes, conduction velocities. Recording were obtained before and after surgery and compared. **Results:** Shows a statistically significant prolongation in distal latencies of right tibial and common peroneal nerves. Proximal CMAP amplitudes and motor nerve conduction velocities of both limbs for both motor nerves were also decreased before the surgery. After 6weeks following surgical intervention, motor nerve conduction parameters showed significant improvement. **Conclusion:** NCS of tibial and common peroneal nerves provide valuable information about the neurophysiological deficits associated with LDH. Surgical intervention resulted in significant improvement at 6weeks postoperatively, indicating early recovery of nerve function.

INTRODUCTION

Lumbar disc herniation is defined as displacement of disc material, soft gelatinous central portion of the disc (nucleus pulposus) or the surrounding outer ring (annulus fibrosus) beyond the intervertibral disc space. The incidence of a herniated disc is about 5 to 20 cases per 1000 adults annually and is more common in people in their 3rd to 5th decade of life, with a male to female ratio of 2:1.[1]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

The prevalence of a symptomatic herniated lumbar disc is about 1 to 3% in Finland and Italy, depending on age and sex and it is relatively common with 5 to 20 cases per 1000 adults annually.[1] In persons 25 to 55 years of age, about 95% cases of herniated disc occur at the lower lumbar spine (L4–5 level); disc herniation above this level is more common in persons older than 55 years.[1] The highest prevalence is in persons 30 to 50 years of age, with a male-to-female ratio of 2:1.[2]

The neurophysiological or electrodiagnostic studies(EdX) including Nerve conduction study (NCS) and electromyography, assess the physiological function of nerve roots or peripheral nerves and therefore, confirm the extent of the damage at the anatomical site of the injury previously determined by MRI.[3]

Nerve conduction study (NCS) is a simple, noninvasive and reliable test for evaluation of peripheral nerve function. In this technique, nerve conduction in the largest and fastest myelinated fibers are recorded and it establishes the type and degree of abnormality. The site of lesion can be identified and localized.[4]

Nerve conduction studies (NCS) is commonly used to evaluate the function of the motor and sensory nerves of the human body. The compound muscle action potential (CMAP) is an assessment of the motor nerve fibers from their origins in the anterior horn cell to their termination along muscle fibers.[5]

MATERIALS AND METHODS

Study design: It was an observational prospective study conducted to assess the role of nerve conduction study in the management and follow up of lumbar disc herniation after 6weeks of surgery.

Study Setting: The study was conducted in the Neurophysiology laboratory of the Department of Physiology, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Manipur.

Study duration: Study was carried out from August 2022 to July 2024.

Study population: Patients attending Spine Clinics, Department of Orthopedics, JNIMS diagnosed with lumbar disc herniation fulfilling the inclusion and exclusion criteria were recruited for the study.

Inclusion criteria

- Age: 20 to 50years
- Sex: both males and females
- Age and sex matched healthy controls were recruited from among the staffs and students of JNIMS.
- Patients with clinically and MRI confirmed lumbar disc herniation with or without neurological deficits who are willing to undergo surgery.

Exclusion criteria

- Low back pain caused by infections, tumour, pregnancy.
- Diabetes mellitus.
- Prior lumbar surgery at any level.
- Any local injuries/ lesion that may interfere with the recordings
- Cauda Equine Syndrome

Sampling/Methods of Recruitment

Subjects fulfilling the inclusion and exclusion criteria were recruited from Spine Clinics, Department of Orthopedics of JNIMS.

Age and sex matched healthy volunteers were recruited from among the staffs and students of JNIMS as controls.

Study tools

All subjects were tested under similar laboratory conditions. The subjects were allowed to get familiarized to the experimental and environmental conditions of the laboratory of the department of Physiology, JNIMS. The recording of Nerve Conduction Studies was done using Neuron Spectrum- 5(combo), Neurosoft, Russia**.** The Institute Ethical Committee clearance was taken from the Institutional Ethics Committee (ICE) of the Institute. Before the procedure, all the subjects have been explained the objectives and methodology of the study and an informed written consent was taken from all the participants.

TIBIAL NERVE (recorded from Abductor hallucis muscle)

- Three electrodes, an active electrode, reference electrode and a ground electrode along with a stimulator were used.
- The active electrode was placed one finger distal to the prominent part of the navicular bone along the medial surface of the foot. The reference electrode was placed on the medial side of the first metatarsophalangeal joint. The ground electrode was placed on the gastrocnemius of the same limb.
- There are two stimulation points. First stimulation point was located distally behind the medial malleolus, at the middle of the line made from the malleolus upto the Achilles tendon. Second stimulation point was placed proximally at the popliteal fossa medial to the midline at the popliteal crease.
- Latencies, amplitudes, conduction velocities were recorded.

Common Peroneal Nerve (recorded from Extensor digitorum brevis muscle)

- The active electrode was placed on a point made by a direct line from the 3rd metatarsophalangeal joint upto the most prominent part of the lateral malleolus. This line was divided into three parts, the active electrode will be kept on the border of the top and middle third. The reference electrode was set on the fifth metatarsophalangeal joint. The ground electrode was placed on the gastrocnemius of the same side of the leg.
- First stimulation point was located one finger breadth above the mid line connecting the two malleoli. Second stimulation was placed about 3-4cm distal to the proximal tip of the fibular head.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

- Latencies, amplitudes, conduction velocities were recorded.

The recording setting used for motor nerve conduction study was:

Setting	Sweep velocity (msec/division)	Sensitivity (µv/division)	Filters High/low (kHz/Hz)	Stimulator uration/rate (msec/Hz)
Motor NCS	2	5000	10kHz/2Hz	0.2msec/1Hz

RESULTS

Following observations & results are based on the present study conducted in the Department of Physiology, JNIMS, Manipur. The participants included for the study were categorized into three groups;

Group I------ control
Group II ----- symptomatic LDH patients before surgery
Group III ----- LDH patients follow up after 6 weeks of surgery
The data was analyzed using paired t- test.

Table 1: CMAP parameters of Tibial & Common Peroneal nerves in controls and symptomatic lumbar disc herniation patients (Mean ± SD)

Parameters	Tibial nerve(Right)			Common Peroneal nerve(Right)			Tibial nerve (Left)			Common Peroneal nerve(Left)		
	Group I	Group II	p value	Group I	Group II	p Value	Group I	Group II	p value	Group I	Group II	p Value
Distal latency	3.82±2.6	4.84±1.07	0.036*	3.92±1.85	11.91±18.8	0.013*	4.57±1.1	5.34±4.2	0.923	4.22±2.9	8.55±12.6	0.079
Proximal latency	11.57±11.8	12.24±2.22	0.633	10.41±1.79	13.33±20.2	0.503	11.58±1.7	14.67±16.9	0.164	10.48±2.1	13.38±15.9	0.405
Distal amplitude	3.69±2.24	3.45±4.8	0.712	2.49±1.12	1.13±2.1	0.002*	3.97±5.4	3.75±2.73	0.494	2.0±0.8	1.40±4.3	0.900
Proximal amplitude	1.90±1.30	0.47±1.1	<0.001**	1.61±1.10	0.45±1.1	<0.001**	1.67±1.5	0.33±0.7	<0.001**	1.83±1.1	0.29±0.5	<0.001**
Conduction velocity	51.1±23.0	40.86±10.62	0.002*	49.08±8.24	35.8±17.6	<0.001**	54.3±11.1	40.98±16.8	<0.001**	47.7±7.6	37.83±24	0.042*

*p<0.05; **p<0.001

[Table 1] Compares CMAP parameters of the tibial & common peroneal nerves between the controls (Group I) & symptomatic lumbar disc herniation patients (Group II)
Table shows statistically significant prolongation of distal latency of right tibial nerve (p= 0.036) & right common peroneal nerve (p= 0.013) in symptomatic patients compare to controls. Proximal amplitudes of both tibial & common peroneal nerves on right & left sides were significantly decreased in patients. Distal amplitude of the right common peroneal nerve was also significantly decreased (p= 0.002). Conduction velocities of both tibial & common peroneal nerves were significantly decreased bilaterally in symptomatic lumbar disc herniation patients.

Table 2: CMAP parameters of Tibial & Common Peroneal nerve in patients with symptomatic lumbar disc herniation before & after surgery (Mean ± SD)

Parameters	Tibial nerve(Right)			Common Peroneal nerve(Right)			Tibial nerve (Left)			Common Peroneal nerve(Left)		
	Group II	Group III	p value	Group II	Group III	p value	Group II	Group III	p value	Group II	Group III	p value
Distal latency	4.84±1.07	3.52±5.91	0.185	11.9±18.8	7.87±16.94	0.387	5.34±4.2	4.36±2.28	0.75	8.55±12.6	6.54±11.23	0.525
Proximal latency	12.2±2.22	10.3±11.15	0.651	13.3±20.2	11.29±16.94	0.675	14.67±16.9	9.05±7.67	0.111	13.38±15.9	11.71±14.21	0.682
Distal amplitude	3.45±4.8	9.63± 4.96	0.03*	1.13±2.1	5.27±16.53	0.02*	3.75±2.73	9.8±6.42	0.04*	1.40±4.3	4.18±10.66	0.03*
Proximal amplitude	0.47±1.1	13.9±26.15	0.01*	0.45±1.1	6.13±15.01	0.04*	0.33±0.7	9.3±18.20	0.01*	0.29±0.5	6.20±13.79	0.03*
Conduction velocity	40.9±10.62	49.9±25.54	0.133	35.8±17.6	38.57±23.37	0.607	40.98±16.8	46.8±26.35	0.447	37.83±24	43.51±21.32	0.407

*p<0.05; **p<0.001

ISSN (O): 2687-5365; ISSN (P): 2753-6556

[Table 2] Compares CMAP parameters of the tibial & common peroneal nerves in symptomatic lumbar disc herniation patients before surgery (Group II) and after surgery (Group III)

The finding showed statistically significant increase in distal & proximal amplitudes of right& left tibial nerve after surgery. Distal amplitudes increased significantly in both right & left tibial and common peroneal nerves after surgery. Proximal amplitudes also showed statistically significant increased bilaterally in both nerves following surgery.

DISCUSSION

Neurophysiological Studies or Electrodiagnostic Studies (EdX) including nerve conduction study and electromyography assess the physiological function of nerve roots of peripheral nerves and therefore confirm the extend of the damage at the anatomical site of the injury previously determined by MRI.

In the present study, the CMAP parameters of nerve conduction studies were evaluated in bilateral symptomatic lumbar disc herniation patients before and after 6 weeks of surgery with mean age of 45.8+10.84 years, diagnosed in the Department of Orthopaedics.

There was statistically significant prolongation of distal latencies of right tibial & common peroneal nerves which improves on follow up after 6 weeks of surgery. The distal and proximal amplitudes of both side for both motor nerves decreased significantly in the patients with lumbar disc herniation which improves significantly after 6 weeks of surgery. There was also significant decrease in conduction velocity of left tibial nerve and both sides of common peroneal nerve in patients with lumbar disc herniation as compared with controls which improved after surgical intervention. Our finding is suggestive of axonal loss and demyelination of motor nerve in most of the patient which showed improvement after surgery.

Similar findings were seen in previous study by H. Matsui et al, where they found low amplitude of CMAP and elongated latency of motor nerves.[6] In a study by S. Naffisi et al, they also concluded that the CMAP amplitude of common peroneal nerve were decreased or absent in case of radiculopathies caused by lumbar disc herniation.[7]

In contrary to our study Yousif S at al, found no significant difference in CMAP parameters of both tibial and common peroneal nerves.[8] Another study by M Toyokura et al, also showed no significant changes in nerve conduction parameters throughout the course of their study.[9]

Nerve conduction studies is a useful method for evaluation of patients with lumbar disc herniation combined with physical examination and radiological evaluation including MRI for diagnosis and predicting the prognosis of the disease process. It may be helpful in deciding the treatment modalities and for assessment of progression of patients over time or after surgery which was supported by our study.

CONCLUSION

The present study was done to determine the role of Nerve conduction studies in prognostication of symptomatic lumbar disc herniation patients.

The findings of the present study showed decreased in amplitude & nerve conduction velocity of the motor nerves in patients with lumbar disc herniation which may be due to axonal loss or demyelination. The present study revealed that the deficit encountered before surgery may improve as early as six weeks after surgery though in some it may take even longer.

Nerve Conduction Studies is an important non-invasive electrophysiological test for diagnosis and predicting the prognosis and monitoring the treatment.

REFERENCES

1. Fjeld OR, Grovle L, Helgeland J, Smastuen CM, Solberg KT, Zwart AJ et al. Complications, reoperations, readmissions, and length of hospital stay in 34639 surgical cases of lumbar disc herniation. *Bone Joint J.* 2019 Apr; 101 (4):p470-477.
2. Kim, JH, van Rijn, R.M, van Tulder, MW, et al. Diagnostic accuracy of diagnostic imaging for lumbar disc herniation in adults with low back pain or sciatica is unknown; a systematic review. Chiropr Man Therap.2018 Aug 21;26:37:p1-14.
3. Friberg S, Hirsch C. Anatomical and clinical studies on lumbar disc degeneration. ActaOrthopScand 1949;19:222–242
4. SopajAzemi E, Kola I, Kola S, Tanka M. Prevalence of Lumbar Disk Herniation in Adult Patients with Low Back Pain Based in Magnetic Resonance Imaging Diagnosis. Maced J Med Sci. 2022 Mar.18;10(B):p1720-1725
5. Lurie J, Tomkins-Lane C. Management of lumbar spinal stenosis. BMJ. 2016;352:h6234.
6. Matsui H, Kanamori M, Kawaguchi Y, Kitagawa H, Nakamura H, Tsuji H. Clinical and electrophysiologic characteristics of compressed lumbar nerve roots. Spine. 1997;vol22(18):p1-6
7. Nafissi S , Niknam S , Hosseini SS. Electrophysiological evaluation in lumbosacral radiculopathy. Iran J Neurol.2012;11(3): p 83-86.
8. Yousif S, Ahmed A, Abdelhai A, and Musa A. Nerve Conduction Studies in Patients with Lumbosacral Radiculopathy Caused by lumbar intervertebral disc herniation. AdvOrthop 2020 Nov 16:p 1-6.
9. Toyokura M, Murakami K. F-wave study in patients with lumbosacral radiculopathies. ElectromyogrClinNeurophysiol. 1997;vol.37(1):p19-26.

ISSN (O): 2687-5365; ISSN (P): 2753-6556