COMPARISON OF NERVE CONDUCTION STUDIES ON AFFECTED AND NON-AFFECTED SIDE IN THE PATIENTS OF SCIATICA

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Abstracts:

Background: Sciatic neuropathy is the one of the most common neuropathies of the lower extremities. Low-back pain (LBP) is a major health problem around the world and a major cause of medical expenses, absenteeism and disability. Although LBP is usually a self-limiting and benign condition that tends to improve spontaneously over time, a large variety of therapeutic interventions is available for treatment. Sciatica can result when the nerve roots in the lower spine are irritated or compressed. The aim of the study was to observe the effect of nerve conduction velocity in sciatica subjects. **Method and materials:** In this study we involved the participants either sexes; aged >21 years; treatment for LBP; in the acute, sub-acute or chronic phases, with sciatica. Patients were selected on the basis of routine clinical examination and complaint with pain during walking. The selected Patients initially send for Nerve conduction investigation in the department of Physiology. Nerve conduction study was done on RMS EMG EP Mark-II. The sites of stimulation for Sciatic nerves were ankle and at or below popliteal fossa and recording site were motor point of Extensor digitorum brevis and Abductor Hallucis respectively. Reference electrode was placed 4 cm distally over 4^{th} metatarsophalangeal joint. Ground electrode was placed between stimulating and recording electrodes. Recording surface disc electrode was placed below lateral malleolus of ankle for sural nerve. **Result:** The mean value of latency was 3.152 $\pm$ 0. 255 in normal side and it was 2.876 $\pm$ 0.4002 on the affected side which was significantly decreased. Motor nerve conduction Velocity in the normal side was 51.27 $\pm$ 3.98 and the Motor nerve conduction Velocity of sciatic patient was 47.34 $\pm$ 5.659 on the affected side decreased significantly. **Conclusion:** In this study we concluded that, this will be helpful for the early detection of demyelination as well as it may be helpful for the detection of nerve injuries in the patient of sciatica.

Key Words: NCV: Nerve conduction velocity, LBP: Low back pain, DML: distal motor latency.

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Introduction:

Sciatica is a clinical condition characterized by severe pain started from the low back region and radiating down along the course of the leg. This is common entity encountered in clinical practice. Most often this is due to lumbar disc prolapse. It can be due to lifting heavy weights or injury to the vertebral column and different disease of vertebral column. The most important symptom of sciatica is lumbosacral radicular leg pain that follows a dermatomal pattern radiating below the knee and into the foot and toes.[1]

The lifetime prevalence of low back pain is reported to be more than 70% in industrialized countries (1-year prevalence, 15% to 45%; adult incidence, 5% per year) with varying degrees of symptom severity.[2] The prevalence of low back pain during school age approaches that seen in adults,[3,4] increases from childhood to adolescence,[5] and peaks between ages 35 and 55 years.[6]

Few studies specifically examine sciatica, but some low back pain studies include data on sciatica prevalence, risk factors, and natural history. Low back-related leg pain, or sciatica, is one of the most common variations of low back pain.[7] Sciatica is known by a range of terms in the literature, such as lumbosacral radicular syndrome, radiculopathy, nerve root pain, and nerve root entrapment or irritation. Controversy exists in clinical and re-search circles about the use of sciatica as a term.[6,7] Although definitions of sciatica used in epidemiological surveys vary, sciatic pain is generally defined as pain radiating to the leg,

normally below the knee and into the foot and toes. As with low back pain, sciatica is a symptom rather than a specific diagnosis, but lumbar disk herniation and lumbar canal or foraminal stenosis are typical pathologies that may cause sciatic pain.

Patients with sciatica usually have a more persistent and severe type of pain than patients with low back pain, have a less favourable outcome, consume more health resources, and have more prolonged disability and absence from work.[6,8,9]

Sciatic neuropathy is the one of the most common neuropathies of the lower extremities, second only to common fibular (peroneal) neuropathy. One of the most common presentations of sciatic neuropathy is foot drop. Because ankle dorsiflexion weakness, with or without lower extremity sensory impairment, may also be associated with several other clinical syndromes, a careful evaluation is necessary before confirming a diagnosis of sciatic neuropathy. Electrodiagnostic testing is of great value in confirming the diagnosis of suspected sciatic neuropathy and assessing the potential for recovery of nerve function.[10]

Patients with sciatica usually have a more persistent and severe type of pain than patients with low back pain, have a less favourable outcome, consume more health resources, and have more prolonged disability and absence from work.[11,12,13]

Electrodiagnostic testing is helpful in localizing the site of injury and the severity of the lesion. Electrodiagnostic studies are also useful for assessing both recovery and prognosis. Standard nerve conduction studies for evaluation of the sciatic nerve include testing. [14]

Nerve conduction study is an important test used to test the functioning of nerves, especially the ability of conduction of electrical stimulus. NCV studies can acknowledge the degree of demyelination and axonal loss in the segments of nerve examined. Demyelination of a nerve results in prolongation of conduction time (decreased conduction velocity), whereas axonal loss generally leads to the loss of nerve fiber.[15]

Sciatic pain is complex mechanism, which clinician and researcher are continually working to better understand this complex phenomenon and give proper diagnosis for better treatment. To determine the conduction velocity of deep-seated nerves and those supplying big muscles have been introduced; however, they have not met with wide acceptance. The purpose of this study is therefore to establish for the determination of motor nerve conduction velocity of deep-seated nerve find out the affected and non-affected sciatic nerve, which was useful these diagnostic values for the line of treatment in sciatic patients

Material and Methods:

This study has been carried out in the Department of Physiology MGM Medical College Hospital, Aurangabad. While working in the OPD and IPD of physiotherapy, Medicine Department & orthopaedic department many patients have been found suffering from Sciatica. The patients were referred to Nerve conduction study in the Neurophysiology laboratory in Physiology Department from MGM Hospital. The patients were subjected to detailed History, physical examination, and clinical examination in the department of Physiology.

MGM- ECRHS Approval Letter – *MGM* - ECRHS/2015 /07.

Study Design –Comparative.

Sample Size – 50

Period of Study –two year

Study Population –OPD / IPD Patients LBP willing for investigation.

Study Area- M. G.M. Medical College Hospital & Department of Physiology.

Inclusion criteria:

- Reproductive age group 21 to 60 years
- Patients having signs and symptoms of Sciatica like Tingling sensation, numbness, difficulty in walking.
- Back ache
- SLR (straight Legs Rising) test Positive

Exclusion Criteria

- Patient not giving regular follow up
- Those requiring emergency surgical intervention
- Fracture in pelvic
- Systemic disorder T.B. ,
- Psychological disorders.

DATA ANALYSIS:

All result was expected as mean $\pm$ SD data were compared using the paired student's t- test. The difference were considered to be significant when $P < 0.05$. Statistical analysis was carried out by

using **SPSS** (statistical Package for social science) for windows statistical software version 16.

Result: The present study was carried out in the department of Physiology at Mahatma Gandhi Medical College Hospital to analyze the Nerve conduction study in the Patients' of Sciatica.

Table:1 Study variables in comparison between Non-Affected (Control groups) and Affected side

Paired Samples Test

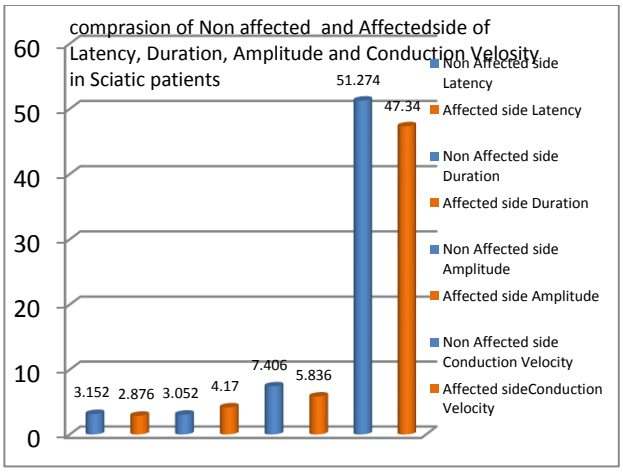
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Non Affected Side Latency - Affected Side Latency	.27600	.46448	.06569	.14400	.40800	4.202	49	.000
Pair 2	Non Affected Side Duration - Affected Side Duration	-1.11800	.71305	.10084	-1.32065	-.91535	-11.087	49	.000
Pair 3	Non Affected Side Amplitude - Affected Side Amplitude	1.57000	1.24560	.17616	1.21600	1.92400	8.913	49	.000
Pair 4	Non Affected Side Conduction Velocity - Affected Side Conduction Velocity	3.93400	7.31790	1.03491	1.85428	6.01372	3.801	49	.000

Graph- 1: Bland and Altman plot

Table No1: shows different variables of NCV nonaffected and affected side in the sciatica patients

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Non Affected Side Latency	3.1520	50	.25574	.03617
	Affected Side Latency	2.8760	50	.40029	.05661
Pair 2	Non Affected Side Duration	3.0520	50	.24348	.03443
	Affected Side Duration	4.1700	50	.67348	.09524
Pair 3	Non Affected Side Amplitude	7.4060	50	.95006	.13436
	Affected Side Amplitude	5.8360	50	.83879	.11862
Pair 4	Non Affected Side Conduction Velocity	51.2740	50	3.98901	.56413
	Affected Side Conduction Velocity	47.3400	50	5.65905	.80031



Discussion: Nerve conduction study is an important test used to test the functioning of nerves, especially the ability of conduction of electrical stimulus. NCV studies can acknowledge the degree of demyelination and axonal loss in the segments of nerve examined. Demyelination of a nerve results in prolongation of conduction time (decreased conduction velocity), whereas axonal loss generally leads to the loss of nerve fiber and muscle potential amplitude. The evaluation of electrophysiological study of nerve conduction is assessed by four criteria, i.e., latency, amplitude, Duration and velocity of the evoked response. [16]

In our study, Table 1 shows mean value of latency was significantly decreased in the patients of sciatica as compared to the non-affected side.

Similar finding was found in the Nerve conduction assessment revealed gross impairment of conduction velocities, latencies, and amplitude in all the patients consistent with the clinical findings of Hansen's disease [17]

In this study Table No 1 shows MNAP durations was longer in Sciatic patients as compared to the Normal side of the nerves, but it was statistically significant. It may be due to process of neuronal loss on affected side that may lead to main structural changes reported to appear with Sciatic nerve such as changes in the fiber membrane.

Similar finding was observed in the other studies that, fiber loss in peripheral nerves, affecting predominantly the thick myelinated fibers; changes in intermodal length and diameter with demyelinating remyelinating processes [18, 19]

In our study, the mean value of CMAP Amplitude of sciatic patient decreased on the affected side as compared with the CMAP Amplitude of normal side which was statistically significant.

Findings on motor nerve conduction studies most commonly include reduced fibular compound muscle action potential (CMAP) amplitudes often with normal tibial CMAP amplitude. Given the depth and size of the sciatic nerve proximally. In sensory nerve conduction studies, reduced superficial fibular and sural sensory nerve action potential amplitudes are seen in most cases Similar abnormalities are found in different age populations. [20, 21]

In support of our study, Buschbacher in his study, showed decrease in CMAP amplitude of the tibial nerve innervating the abductor hallucis in older age group as compared to the younger individuals.[22] Also, Huang in his study found that the subjects with older age had smaller amplitudes compared to the younger age group.[23]

Hennessey et al also found similar decrease in CMAP amplitude of the median nerve in older age group.[24] Similarly, Buschbacher in his study of peroneal nerve motor conduction to the extensor digitorum brevis found decrease in CMAP amplitude in older age group as compared to the younger individuals.[25] Also, in our study smaller CMAP amplitude was significantly related to advancing age.

In our study on Sciatic nerve conduction in affected side found that conduction velocity significantly decreases. NCV studies can acknowledge the degree of demyelination and axonal loss in the segments of nerve examined. Demyelination of a nerve results in prolongation of conduction time.

Similar finding was observed in Saeed et al in their study on sural nerve conduction in healthy subjects found that conduction velocity decreases with advancing age. [26] Asymptomatic neuropathy is common in obese patients independent of glucose control, and impaired distal nerve function. [27]

Conclusion:

Nerve conduction study is an important test used to test the functioning of nerves, especially the ability of conduction of electrical stimulus. NCV studies can acknowledge the degree of demyelination and axonal loss in the segments of nerve examined. Demyelination of a nerve results in prolongation of conduction time.

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