

## Original Research Article

# The role of motor nerve conduction: in cervical radiculopathy patients

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## ABSTRACT

**Background:** Cervical radiculopathy is the clinical description of when a nerve root in the cervical spine becomes inflamed or damaged, resulting in a change in neurological function. Neurological deficits, such as numbness, altered reflexes, or weakness, may radiate from the neck into the shoulder, arm, hand, or fingers. Patient also complains of tingling, numbness or loss of sensation along with the nerve root dermatome. It is a substantial cause of disability and morbidity, and its cost-effective evaluation and treatment are crucial so there is a definite need to establish a cost effective, reliable, and accurate means for establishing the diagnosis of cervical radiculopathy. Electrodiagnostic tests are the closest to fulfil these criteria out of which nerve conduction tests are one of the electrodiagnostic test.

**Methods:** In this study motor nerve conduction of ulnar and median nerve done in 30 clinically proven cervical radiculopathy patients

**Results:** There are significant decrease in the conduction velocity of both nerve (median nerve (51.60±7.5), Ulnar nerve (50.60±5.6)) and significantly increased in the mean latency of both nerve (median nerve (6.02±2.4), ulnar nerve (5.8±1.8)).

**Conclusions:** Authors concluded that MNC is the specific test for the diagnosis of cervical radiculopathy. At least the MNC of both nerves included in diagnostic criteria of cervical radiculopathy.

**Keywords:** Cervical radiculopathy, Median nerve, Motor nerve conduction, Ulnar nerve

## INTRODUCTION

Neck pain is a widespread modality that affects a large majority of the population. Its prevalence is greatest amongst middle-aged people.<sup>1</sup> The reported annual incidence rate of CR is 107.3 per 100,000 for men and 63.5 per 100,000 for women, with a peak at 50 to 54 years of age.<sup>2</sup> Approximately 66% of individuals experiencing neck pain and related symptoms at some stage in their lives.<sup>3</sup> Neck pain is also the second most frequent musculoskeletal complaint presenting to primary healthcare practitioners and most people with neck pain do not experience a complete resolution of symptoms.<sup>4,5</sup>

Although there is a large prevalence of neck pain, neck pain is difficult to diagnose and therefore, to treat.<sup>6</sup> Degenerative joint diseases are the most common cause of neck pain. It is characterized by a series of degenerative changes comprising intradiscal tears with subsequent disc space loss, osteophytic growths and spur formation, ligamentous hypertrophy and capsular thickening.<sup>7</sup> Cervical spine degenerative joint disease occurs mostly in 4th and 5th decades and is associated with the natural aging process.<sup>8</sup>

Cervical Radiculopathy (CR) is a neurologic condition characterised by dysfunction of a cervical spinal nerve,

the roots of the nerve, or both.<sup>2</sup> It is a clinical diagnosis based on a sclerotomal distribution of motor and/or sensory changes or complaints. Any process that causes impingement of exiting cervical nerve roots can lead to a radicular disorder. Impingement may be brought about by acute pathologic changes or by degenerative changes consistent with cervical spondylosis. Retropulsed disk material, zygoapophyseal joint hypertrophy, neurocentral joint hypertrophy, and other soft-tissue abnormalities all may cause compression of an existing nerve root.<sup>9</sup> Cervical radiculopathy can be a debilitating disease that can cause patients significant impairment. The toll on this population can be significant both economically, from lost work and wages, and psychologically, from prolonged pain and impaired social functioning.<sup>10</sup> The goal for clinicians should be the rapid diagnosis and treatment of this condition so to facilitate the return of the patient to their normal state of health.<sup>11</sup>

Electrodiagnostic tests are more in timeline for better and effective diagnosis of cervical radiculopathy to fulfil the above criteria. The role of nerve conduction study to rule out any other neurological process present with the cervical nerve root involvement. Nerve conduction studies are also important for patients who may have symptoms of more generalized peripheral neuropathy.

## METHODS

Electrophysiological study was carried out in department of Physiology using an RMS EMG MK II model electromyography machine for determination of nerve conduction velocity. The study include 30 clinically and radiologically confirmed patients, between 35 to 55 years of age of either sex suffering from cervical radiculopathy excluding the Patients of neck pain with other causes e.g.: non compressive cause- demyelination, infection, tumor infiltration, traumatic and nerve root infarction. Detailed history, general physical and neurological examination was carried out. Patient with neck pain having radiation to the ipsilateral or bilateral side of the limb was clinical neurologically evaluated, including both motor as well as sensory system examination as per particular myotomal or dermatomal involvement by noting the signs such as Position of the head and neck contours, Paraspinal cervical muscle spasm, Restriction in neck movements and carrying out the Upper limb tension test, Spurling test or the foraminal compression test and Lhermitte test. Patient underwent for radiological examination. Anteroposterior view of chest X-ray and MRI of cervical spine was done to rule out the other causes of neck pain and to confirm the diagnosis of cervical radiculopathy. All the disc involvement patients are come in the category of MRI positive. Electrophysiological study was carried out to record the motor nerve conduction of Median and Ulnar nerve. Filter setting for motor nerve conduction study was 5 kHz to 10 kHz and sweep speed 2-5 ms/division. Patient was made to lie down comfortably in supine position and the procedure was

explained to him/ her in own language, to allay apprehension.

For Median nerve stimulation Active electrode was placed over the abductor pollicis brevis and reference electrode was placed over the proximal phalanx of the thumb. Ground electrode was placed over the dorsum of the hand. Stimulation was done as:

- S1- at the wrist between the Palmaris longus and flexor carpi radialis.
- S2- at the elbow crease, medial to the biceps tendon and brachial artery.
- S3- at the axilla.

For Ulnar nerve stimulation: Active electrode was placed over the mid portion of abductor digiti minima and reference electrode was placed over the proximal phalanx of the little finger. Ground electrode was placed over the dorsum of the hand. Stimulation was done as:

- S1- at the palmer aspect of wrist just radial to the flexor carpi ulnar is tendon
- S2- at the elbow
- S3 -at the axilla

Latency, Amplitude and Conduction velocity Calculated automatically by the machine. The normal value for median nerve are Latency (3.5-5), Amplitude (7.5-12) and Conduction velocity (55-62), for Ulnar nerve Latency (3.5-5), Amplitude (5.5-15) and Conduction velocity (55-63).

Statistical analysis All the data are computed in the MS Excel sheet. Categorical data were presented as number (n) or in percentage (%). Normally distributed data were presented as means and standard deviation. For comparing two variables paired t test was used and for comparing two groups containing quantitative variables, independent sample t-test was used. Pearson's correlation was used for measuring correlation coefficient between two quantitative variables. All tests were performed at a 5% level significance; thus a difference was significant if the value was less than 0.05 (p value < 0.05).

## RESULTS

In a group of 30 patients there were 22 (73.3%) females and 8 (26.6%) males (female: male 2.77:1). The mean age was 47.5±7.07 (range is 35-45 years). 25 patients had complained of unilateral pain and 5 bilateral pains.

Motor nerve conduction study of median nerve carried out in all 30 study subjects. In the affected side the mean latency was (6.02±2.4) significantly increased (p=0.003), amplitude was within normal limits (9.9±6.2) but significant reduction (<0.0001) was observed in conduction velocity (51.90±7.5) as compare to control group. In the non-affected side the mean latency (4.48±0.5), amplitude (9.09±1.3) and conduction velocity

were within normal limit as compare to control group. When authors compare non affected side with the

affected side no significant relationship was observed in conduction velocity, latency and amplitude. (Table 1)

**Table 1: MNC study of median nerve.**

	Control group (Mean±SD) (N=30)	Study group (n=30)			
		Affected side		Non Affected side	
		Mean±SD	p-value	Mean±SD	p-value
Latency (ms)	3.6±0.79	6.02±2.4	0.003	4.1±0.4	0.082
Amplitude (mV)	9.11±1.4	9.9±2.6	0.133	9.09±1.3	0.941
Conduction velocity (m/s)	58.4±2.2	51.9±7.5	<0.0001	57.07±3.1	0.065

**Table 2: MNC study of ulnar Nerve.**

	Control group (Mean±SD) (n=30)	Study group (n=30)			
		Affected side		Non affected side	
		Mean±SD	p-value	Mean±SD	p-value
Latency (ms)	4.2±0.3	5.8±1.8	0.001	4.5±0.7	0.095
Amplitude (mV)	8.2±2.9	9.47±3.8	0.195	8.1±1.3	0.688
Conduction velocity (m/s)	58.76±2.1	50.60±5.6	0.0001	57.7±2.3	0.087

Motor nerve conduction study of ulnar nerve carried out in all 30 study subjects. In the affected side the mean latency was (5.8±1.8) significantly increased (p=0.001), the amplitude was not significantly increased but significant reduction (0.0001) was observed in conduction velocity (50.60±5.6) when compared with control group. In the non-affected side the mean latency (4.5±0.7), amplitude (8.1±1.3) and conduction velocity were within normal limits as compare to normal values. When non affected side compare with affected side no significant relationship was observed in conduction velocity, latency and amplitude. (Table 2).

## DISCUSSION

Cervical radiculopathy is a clinical syndrome which manifested by the spinal nerve compression at the level of neck, presented with the upper extremity pain and sensorimotor deficit in the affected area.

In our study median nerve CV (51.60±7.5) was significantly (p<0.001) reduced and mean latency (6.02±2.4) was significantly increased. Ulnar motor nerve CV (50.60±5.6) was significantly reduced and latency (5.8±1.8) was significantly increased.

The study shows concluded that ulnar nerve involved in 3.7% in symptomatic, 2.5% in asymptomatic patients, median nerve involvement in 27.5% in symptomatic, 12.5% in asymptomatic patients out of 80 patients of CR.12 whereas in our study ulnar nerve involved in 80% in symptomatic, 30% in asymptomatic, median nerve involvement in 63.3% in symptomatic, 33.33% in asymptomatic.

The study shows reported that among various motor nerve conduction parameters Compound muscle action potential (CMAP) was found to be more sensitive with high positive predicative value in diagnosing cervical radiculopathy. Conduction velocity was found to have greater specificity and Distal motor latency (DML) had least negative predictive value and also said that the CMAP of MNC was more sensitive as compared to distal motor latency and conduction velocity.<sup>13</sup>

Compound-muscle action potentials show a decrease in amplitude proportional to muscle atrophy In this study authors concluded that CV and latency was changed, due to the compression causes hypoxia which affects the myelination and conduction of impulses and authors have to include the motor nerve conduction of the ulnar and median nerve in the diagnostic criteria of the cervical radiculopathy as motor nerve conduction show significant changes in conduction velocity and latency.

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