



ORIGINAL RESEARCH PAPER

Physiology

ELECTROMYOGRAPHY : IN CERVICAL RADICULOPATHY PATIENTS

KEY WORDS: Cervical Radiculopathy, Electromyography, Deltoid, Biceps, Abductor Pollicis Brevis, Triceps, Paracervical Muscle.

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ABSTRACT

The unique and peculiar position and functions of the cervical spine and its intervertebral discs in the human body make it prone to degenerative changes and other functional disorders that is cervical radiculopathy. It is 2nd most common cause of morbidity. Electrodiagnostic studies play a important role in the diagnosis of cervical radiculopathy, in which the major role played by the Electromyography. In this study EMG of paracervical, Triceps, Biceps, Deltoid and Abductor pollicis brevis muscle done in 30 clinically proven cervical radiculopathy patients and results shows that In paraspinal cervical muscle EMG, 80% patients had spontaneous activity and decreased recruitment seen in 28 patients, In triceps muscle EMG, 70% patients had spontaneous activity and decreased recruitment seen in 27(90%) patients, In APB muscle EMG, 50% patients had spontaneous activity and decreased recruitment seen in 20(66.6%) patients, In deltoid muscle EMG, 40% patients had spontaneous activity and decreased recruitment seen in 20(66.6%) patients, In biceps muscle EMG, 33.3% patients had spontaneous activity and decreased recruitment seen in 18 patients in affected side. On EMG, abnormality seen in increasing order of paracervical> triceps>APB>deltoid>biceps. We concluded that EMG of muscle is important diagnostic tool for diagnosis of cervical radiculopathy.

INTRODUCTION

The cervical spine has the most spinal mobility with as much as 600 movements per hour in a normal individual, thus its high susceptibility to degenerative changes.^{1,2} Cervical spondylosis is a degenerative process of the spine with a gradual onset which alone or in combination with other factors may result in narrowing of the central spinal and root canals.^{3,4} It is a very common cause of spinal cord dysfunctions with progressing age and Degenerative disc disease and its sequelae are main causes of neck pain. Patients with cervical radiculopathy complain of pain in the neck and in a radicular distribution in the upper extremity. Pain is often accompanied by numbness, tingling, and weakness.^{5,6}

Diagnostic criteria for cervical radiculopathy are not well defined, and there are no universally accepted criteria for its diagnosis. Imaging with CT myelogram or MRI scans can usually identify the presence of a structural lesion entrapping the nerve roots. However, it is important to note that radiculopathy and polyradiculopathy may both occur without a structural lesion seen on MRI or CT myelogram.⁷

EDX examination of paraspinal and limb muscles has been utilized for over 50 years, and cervical radiculopathy is among the most common referral diagnoses to the EDX laboratory. Needle EMG is widely regarded as the technique of choice in the diagnostic evaluation of cervical radiculopathy. The sensitivity of needle EMG in confirming a diagnosis of cervical radiculopathy and the accuracy of needle EMG in localizing the level of spinal root lesion.^{8,9,10}

MATERIAL AND METHODS:

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 electromyogram of paracervical spinal muscle, Triceps, Biceps, Deltoid, Abductor Pollicis Brevis with the Concentric needle electrode of 24-26 gauge, bevelled tip exposed to give an oval recording area of 125x580 μm² was used. We check the insertional activity, spontaneous activity and voluntary activity as recruitment of MUP (%) and peak to peak amplitude (μV). The criteria for taken the abnormal EMG include presence of spontaneous activity or recruitment of MUP was less than 90%, peak to peak amplitude was also reduced.

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. 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).

RESULT AND DISCUSSION:

A total of 35 clinical and MRI examinations of the cervical spine were carried out during the period, out of which 30 were included in this study. There were 22 (73.3%) females and 8 (26.6%) males (female:male 2.77:1).

Electromyography of paracervical spinal muscle was abnormal in 28(93.3%) patients of CR out of which 80% of patients had positive spontaneous activity and 93.3% had decreased recruitment of MUP in affected side whereas in the non affected side 12 patients (40 %) had spontaneous activity and had less than 50% of recruitment of MUPs. 11(37.7%) patients had 50-90% and 7 (20.6%) patients had more than 90% recruitment of MUP. (Table I)

EMG of Triceps was abnormal in 27 (90%) patients of CR put of which 70% of patients had positive spontaneous activity and 27 had decreased recruitment of MUP in affected side. In non affected side spontaneous activity was observed in 11(36.6%) patients, 10 (33.3%) had less than 50% recruitment

of MUP, 8 (20.6%) had recruitment of MUP from 50-90% and 12 had more than 90%. (Table II)

In current study EMG of APB muscle was abnormal in 20(66.6%) patients of CR out of which 50% of patients had positive spontaneous activity and 66.6% had decreased recruitment of MUP in affected side. In the non affected side spontaneous activity was not observed but 5(16.6%) patients of CR had decreased recruitment of MUP ranges from 75-85%. (Table III)

Electromyography of Biceps was abnormal in 18 (60%) patients and out of which 10(33.3%) of patients had positive spontaneous activity and all patients had decreased recruitment of MUP in affected side in present study. In non affected side no spontaneous activity was observed whereas decreased recruitment of MUP (50-90%) was observed in 4 (13.3%) patients, 26 patients had more than 90% recruitment of MUP in non affected side. (Table IV)

Electromyography of Deltoid was abnormal in 20 (66.6%) of patients and out of which 12(40%) of patients had positive spontaneous activity and decreased recruitment of MUP was observed in all patients in present study. No spontaneous activity was observed in non affected side whereas decreased recruitment of MUPs (50-90%) was observed in 5 (16.6%) patients, 25 patients had more than 90% recruitment of MUP in non affected side. (Table V)

TABLE – 1 EMG study of Para cervical spinal muscle in study subjects

mean±SD	Symptomatic side	Asymptomatic side
Recruitment of MUP (%)	40.16±25.8	54.5±22.8
Peak to peak amplitude (µV)	357.5±272.6	609.26±406.07

TABLE – II EMG study of Triceps muscle in study subjects

mean±SD	Symptomatic side	Asymptomatic side
Recruitment of MUP (%)	43.96±23.6	69.83±27.3
Peak to peak amplitude (µV)	626.16±755.9	2265.3±1642.4

TABLE – III EMG study of APB muscle in study subjects

mean±SD	Symptomatic side	Asymptomatic side
Recruitment of MUP (%)	75.66±17.7	94.5±7.3
Peak to peak amplitude (µV)	1722.43±1087	3600.7±1348.9

TABLE – IV EMG study of Biceps muscle in study subjects

mean±SD	Symptomatic side	Asymptomatic side
Recruitment of MUP (%)	81.66±17.5	94.83±9.5
Peak to peak amplitude (µV)	1921.06±979	3227.4±924.4

TABLE – V EMG study of Deltoid muscle in study subjects

mean±SD	Symptomatic side	Asymptomatic side
Recruitment of MUP (%)	80±14.62	93.83±9.6
Peak to peak amplitude (µV)	1432.2±752.7	1943.3±580.32

According to the previous studies Dillingham et al revealed that testing 6 muscles including the cervical PSPs achieved a sensitivity of 94% to 98% for the presence of radiculopathy. If

PSPs were not tested, testing of 8 limb muscles to achieve a sensitivity of 92% to 95%. Paraspinal muscle was one of the screening muscle.¹¹

Czyrny et al and Date et al concluded that significant changes were found in the EMG of PSPs and Limb muscles, more at PSPs.^{12,13} Rashad et al concluded that 50 % of patients of CR had abnormal EMG findings in paraspinal cervical muscle.¹⁴ Some author concluded that EMG sensitivity test was higher in paraspinal cervical muscles and most prominent abnormalities were signs of denervation. The percentage of abnormalities of paraspinal cervical muscle was highly significant than limb muscles. They concluded that abnormalities in PSPs EMG and motor end potentials (MEPs) examinations are sensitive in localizing that the lesion whether after or proximal to the roots.¹⁵

The present study demonstrated the useful characteristics of electromyography. EMG abnormality was observed in increasing order paracervical> triceps> APB> deltoid> biceps. These results indicate that especially in the cervical spine, a significant percentage of patients with radiculopathy were missed if examinations of paraspinal cervical muscles as well as the limb muscles were not part of EDX evaluation of CR patients.

CONCLUSION:

We concluded that Emg of the PSPs muscles shows significant changes in the affected as well as non affected side. Positive results seen with the limb muscle. needle EMG examination confirms a clinical diagnosis of cervical radiculopathy with a high degree of specificity. So EMG must be a diagnostic tool for the cervical radiculopathy diagnosis.

REFERENCES:

- Mustapha Z, Okedayo M, Ibrahim K, Abba Ali A, Ahmadu MS, Abubakar A, Yusuf M (2014). Cervical Spine MRI Findings in Patients Presenting With Neck Pain and Radiculopathy. *Int. Res. J. Basic Clin. Stud.* 2(2):20-26
- Brazier MAB, Watkins AL, Michelson JJ: Electromyography in differential diagnosis of ruptured cervical disc. *Arch Neurol Psychiat* 1946;56: 651-658
- Eisen A: Electrodiagnosis of radiculopathies, in A. J. Aminoff (eds): *Neurologic Clinics: Symposium on Electrodiagnosis*. Philadelphia, W. B. Saunders, 1985, vol 3, pp. 495-510.
- Kimura J: *Electrodiagnosis in diseases of nerve and muscle*. Philadelphia, F.A. Davis, 1989.
- Shea PA, Woods WW, Werden DH: Electromyography in diagnosis of nerve root compression syndrome. *Arch Neurol Psychiat* 1950;64:93-104.
- So YT, Olney RK, Aminoff MJ: A comparison of thermography and electromyography in the diagnosis of cervical radiculopathy. *Muscle Nerve* 1990; 13: 1032-1036
- Streib E, Daube JR: Electromyography of paraspinal muscles. *Neurology* 1975; 386. Abstract only.
- Negrin P, Lelli S, Fardin P: Contribution of electromyography to the diagnosis, treatment and prognosis of cervical disc disease: a study of 114 patients. *Electromyogr Clin Neurophysiol* 1991;31:173-179
- American Association of Electrodiagnostic Medicine: Practice parameter for needle electromyographic evaluation of patients with suspected cervical radiculopathy. *Muscle Nerve*. 1999;22:S209-21.
- Czyrny JJ, Lawrence J: The importance of paraspinal muscle EMG in cervical and lumbrosacral radiculopathy: review of 100 cases. *Electromyogr Clin Neurophysiol*. 1996;36:503-8.
- Dillingham TR, Lauder TD, Andary M, Kumar S, Pezzin LE, Stephens RT, et al. Identification of cervical radiculopathies: optimizing the electromyographer screen. *Am J Phys Med Rehabil*. 2001;80:84-91.
- Gilad R, Dabby M, Boaz M, Sadeh M. Cervical paraspinal electromyography: normal values in 100 control subjects. *J Clin Neurophysiol*. 2006;23:573-6.
- Date ES, Kim B, Yoon JS, Park BK. Cervical paraspinal spontaneous activity in asymptomatic subjects. *Muscle Nerve* 2006;34:361-4.
- Rashad HM, Salem SS, El-khuly HS, Rabah AM. EMG and MEPs to the paraspinal muscles in cervical spondylosis. *M.sc.2002*. Cairo university, Egypt.
- Miller MA, Pardo R, Yaworski R. Clinical utility of reflex studies in assessing cervical radiculopathy. *Muscle Nerve*. 1999;22(8):1075-9.