



STUDY OF PREVALENCE OF MOTOR NEUROPATHY IN CHRONIC RENAL DISEASE PATIENTS

KEYWORDS

Chronic renal disease (CKD), motor nerve conduction study, neuropathy

Vinod Shende

MD,DNB (Physiology), Assistant Professor, Dept. of Physiology, Mahatma Gandhi Institute of Medical Sciences, Sevagram.

Ramji Singh

MD (Physiology), Professor and Head, Dept. of Physiology, AIIMS, Patna

Sachin Pawar

MD(Physiology), Associate Professor, Dept. of Physiology, Mahatma Gandhi Institute of Medical Sciences, Sevagram

ABSTRACT

Chronic renal disease is associated with various complications particularly in later stages. Neuropathy is one of such complication. These changes can be diagnosed by various ways; nerve conduction study is most specific amongst them all. We performed nerve conduction study on 384 chronic kidney disease patients after assessing our inclusion and exclusion criteria. Males and females of 30 yrs and above were included in the study. Written consent and IEC clearance was obtained. All patients were subjected to electrophysiological evaluation using RMS EMG EP Mark –II machine. Our results suggested that Prevalence of median, ulnar, tibial and peroneal neuropathy is 44.01% on right side and 44.53% on left side, 44.79% on right side and 48.70% on left side, 56.51% on right side and 54.95% on left side, 52.60% on right side and 52.60% on left side respectively. Thus we conclude that motor nerves of lower limb are more frequently affected than upper limb.

INTRODUCTION

A compelling change has been observed in the occurrence of disease morbidity between past and present century, Non-infectious and noncommunicable diseases has become the leading cause of mortality in present scenario (1). Chronic kidney disease (CKD) is one of the important causes of chronic disease all over the world including India. No of cases of CKD are increasing day by day with worldwide prevalence of 8 to 16 % and in India incidence rate is 229 per million population, around one lakh new patients will enter renal replacement programs per year in India (2,3,4). Over 1 million people worldwide are alive on dialysis or with a functioning graft(5). Uremia more commonly develops with chronic kidney disease (CKD), especially the later stages, but it also may occur with acute kidney injury (AKI) if loss of renal function is rapid. Various complications are associated with CKD particularly in later stages, neuropathy is one of them (6, 7). Neuropathic changes can be diagnosed by a questionnaire for the clinical symptoms and electrophysiologic examinations including vibration perception threshold, sympathetic skin response, somatosensory evoked potential study and nerve conduction study. Nonetheless, the sensitivity and specificity of these tests were changeable depending on the method used. Amongst all these electrophysiological tests nerve conduction study had the highest specificity (8, 9). The present study is carried out to study the motor neuropathy in end stage chronic renal disease patients by electrophysiological test in rural Indian population.

MATERIALS AND METHODS:

Study Design: The present crosssectional study was done on rural population of central India. Patients over and above 30 yrs of age were included in the study. Both male and female patients satisfying the inclusion and exclusion criteria were included in the study. The present study was approved by the Institutional ethics committee and written informed consent was obtained from all study participants.

Study population and sample size: Total 384 clinically diagnosed patients of end stage renal disease were included in the study. Thorough history was taken from all participants and relevant examination was documented.

Inclusion criteria: Our inclusion criterion consists of uremic (end stage renal disease) patients diagnosed by physician after minimum

clinical and supportive laboratory investigation with or without clinical evidence of neuropathy.

Exclusion criteria:

-
-
-
-
-
- Electrically sensitive patients
- Patients with a permanent pacemaker or other such implanted stimulators
- Allergy to the electrode or contact material (tape / gel)
- Subjects with reduced levels of consciousness or impaired understanding

Motor Nerves studied: Median, Ulnar, Peroneal and Tibial

Procedure and Instrument:

The study was performed on RMS EMG EP Mark-II machine in the Clinical Neurophysiology Unit, Department of Physiology. All tests were performed under constant room temperature (300C) to shortlist the errors. History and clinical examination were recorded in structured format.

Electrophysiological Evaluation:

Motor nerve conduction study:

Motor nerve conduction study involves stimulation of motor nerves at two different sites with maximal stimulus and calculation of distal motor latency, amplitude and conduction velocity. Median, Ulnar, Tibial and Peroneal nerves were tested. Setting was kept at sweep speed 5 ms/D, intensity 2 mV, frequency 2 Hz, filter between 2 Hz to 5 Hz and stimulus strength duration was 100 s(10).

RESULTS:

Table 1: Gender wise distribution of patients

Gender	No of patients	Percentage (%)
Male	250	65.10
Female	134	34.90
Total	384	100.0

Table 2: Prevalence of Motor Median Nerve

Motor Median Nerve	Right Side	Left Side	χ ² -value

Normal	210(54.69%)	213(55.47%)	0.0002 p=0.98, NS,p>0.05
Abnormal	169(44.01%)	171(44.53%)	
Total	384(100%)	384(100%)	

Table 3: Prevalence of Motor Ulnar Nerve

Motor Ulnar Nerve	Right Side	Left Side	χ^2 -value
Normal	212(55.21%)	197(51.30%)	1.17 p=0.27, NS, p>0.05
Abnormal	172(44.79%)	187(48.70%)	
Total	384(100%)	384(100%)	

Table 4: Prevalence of Motor Tibial Nerve

Motor Tibial Nerve	Right Side	Left Side	χ^2 -value
Normal	167(43.49%)	173(45.05%)	0.1 p=0.66, NS,p>0.05
Abnormal	217(56.51%)	211(54.95%)	
Total	384(100%)	384(100%)	

Table 5: Prevalence of Motor Peroneal Nerve

Motor Peroneal Nerve	Right Side	Left Side	χ^2 -value
Normal	182(47.40%)	182(47.40%)	0.00 p=1.00,NS,p>0.05
Abnormal	202(52.60%)	202(52.60%)	
Total	384(100%)	384(100%)	

Total 384 patients were enrolled for nerve conduction studies. 4 nerves (median, ulnar, tibial and peroneal) were studied bilaterally for motor nerve conduction.

Median nerve is found to be normal in 210 (54.69%) and abnormal in 169 (44.01%) on right side. Whereas it was normal in 213(55.47%) and abnormal in 171 (44.53%) patients on left side.

Ulnar nerve is found to be normal in 212 (55.21%) and abnormal in 172 (44.79%) on right side. Whereas it was normal in 197(51.30%) and abnormal in 187 (48.70%) patients on left side.

Tibial nerve is found to be normal in 167 (43.49%) and abnormal in 217 (56.51%) on right side. Whereas it was normal in 173(45.05%) and abnormal in 211 (54.95%) patients on left side.

Peroneal nerve is found to be normal in 182 (47.40%) and abnormal in 202 (52.60%) on right side. Whereas it was normal in 182(47.40%) and abnormal in 202 (52.60%) patients on left side.

DISCUSSION:

Total 384 patients were enrolled for nerve conduction studies. 4 nerves (median, ulnar, tibial and peroneal) were studied bilaterally for motor nerve conduction. If NCS is positive for neuropathy in 2 or more nerves then it is termed as polyneuropathy. And if only one nerve is affected, it is termed as mononeuropathy. Prevalence of median, ulnar, tibial and peroneal neuropathy is 44.01% on right side and 44.53% on left side, 44.79% on right side and 48.70% on left side, 56.51% on right side and 54.95% on left side, 52.60% on right side and 52.60% on left side respectively. Thus we can say that motor nerves of lower limb are more commonly affected as compared with motor nerves of upper limb^(11, 12). Earlier studies have reported prevalence rates of neuropathy from 60 to 100% depending on the choice of nerve segment, the indices measured and the number of nerves studied^(13,14).

Di Paolo B et al studied 156 subjects to evaluate the electro physiological aspects of nerve conduction in uremia. They found different populations of motor unit potentials; a decreased MNCV was found in 35% of the CLND patients, RDT patients had slowed MNCV in 42%⁽¹⁵⁾. Rachel Nardin reported his findings on 102 patients

with end-stage renal disease receiving haemodialysis. Electrophysiologically confirmed ulnar neuropathy was present in 37 (51%) of the 73 subjects with both screening and nerve conduction study⁽¹⁶⁾. Khadija Fatima and colleagues reported MNC findings in 30 end stage kidney disease patients. Group I consisted 20 patients on regular hemodialysis and in group II 10 patients with end stage renal failure waiting for hemodialysis were studied. In group I, 93% of patients and in group II, 87% of patients showed altered motor nerve conduction parameters⁽¹²⁾.

References:

- Robert Atkins. The epidemiology of chronic kidney disease. *Kidney International*, Vol. 67, Supplement 94 (2005), pp. S14–S18.
- Ruggenti P, Schieppati A, Remuzzi G. Progression, remission, regression of chronic renal diseases. *Lancet*, May 2001;357(9268):1601-8
- Jha V, Garcia G, Iseki K, Li Z, Naicker S, Plattner B, Saran R, Wang AY, Yang CW. Chronic kidney disease: global dimension and perspectives. *Lancet*, Jul 2013; 382(9888):260-72.
- Ajay K Singh, Youssef MK Farag, Bharati V Mittal, Kuyilan Karai Subramanian, Sai Ram Keithi Reddy, Vidya N Acharya, Alan F Almeida, Anil Channakeshavamurthy, H Sudarshan Ballal, Gaccione P, Rajan Issacs, Sanjiv Jasuja, Ashok L Kirpalani, Vijay Kher, Gopesh K Modi, Georgy Nainan, Jai Prakash, Devinder Singh Rana, Rajanna Sreedhara, Dilip Kumar Sinha, Shah Bharat V, Sham Sunder, Raj K Sharma, Sridevi Seetharam, Tatapudi Ravi Raju and Mohan M Rajapurkar. Epidemiology and risk factors of chronic kidney disease in India – results from the SEEK (Screening and Early Evaluation of Kidney Disease) study. *BMC Nephrology* 2013, 14:114
- Lysaght MJ. Maintenance dialysis population dynamics: Current trends and long-term implication. *J Am Soc Nephrol* 2002;13:37-40.
- Jurice D, Bilic A, Schwarz D, Orsanic D, Gabric M, Spoljaric L, Mihanovic M. Clinical Course of uremic neuropathy in long-term hemodialysis. *Coll Antropol* 2008; 32: 771-775.
- Hegstrom RM, Murray JS, Pendras JP, Burnell JM, Scribner BH. Two year's experience with periodic hemodialysis in the treatment of chronic uremia. *Trans Am Soc Artif Intern Organs* 1962; 8: 266-280.
- Bodofsky EB, Wu KD, Campellone JV, Greenberg WM, Tomaio AC. A sensitive new median-ulnar technique for diagnosing mild Carpal Tunnel Syndrome. *Electromyogr Clin Neurophysiol* 2005; 45(3):139-44.
- Do Yub Ku, Young Sook Park, Hyun Jung Chang, Sung Rok Kim, Jeoung Whan Ryu, Woo Jin Kim. Depression and Life Quality in Chronic Renal Failure Patients with Polyneuropathy on Hemodialysis. *Ann Rehabil Med* 2012; 36(5):702-707.
- Vinod Shende, Sachin Pawar, Tanushree Jiwane, A R Chaudhari, Anupama Shende. Study of Motor Nerve Conduction Parameters in Guillain Barre Syndrome Patients of Central India. *IJCMR* March 2016; 3(3):859-861.
- Arum V; Richard K S, Bruce A. Neuropathy axonal Na/K pump function and activity - depened excitability changes in end stage kidney disease. *Brain*. 2006 May(5) 992-999
- Khadija Fatima, Abdul Majid. Motor Nerve Conduction Studies in Patients with Chronic Renal failure. *Journal of Rawalpindi Medical College (JPMC)*; 2010; 14(1):11-14
- Laaksonen S, Metsarinne K, Voipio-Pulkki LM, Falck B. Neurophysiologic parameters and symptoms in chronic renal failure. *Muscle Nerve* 2002; 25: 884–90.
- Mansouri B, Adybeig B, Rayegani M, Yasami S, Behshad V. Uremic neuropathy and the analysis of electrophysiological changes. *Electromyogr Clin Neurophysiol* 2001; 41: 107–15.
- Di Paolo B, Di Marco T, Cappelli P, Spisni C, Del Rosso G, Palmieri PF, Evangelista M, Albertazzi A. Electrophysiological aspects of nervous conduction in uremia. *Clin Nephrol*. May 1988; 29(5): 253-60.
- Rachel Nardin, Kristine M. Chapman, Elizabeth M. Raynor. Prevalence of Ulnar Neuropathy in Patients Receiving Hemodialysis. *Arch Neurol*. 2005; 62(2):271-275.