International Journal of Science and Healthcare Research
Vol.3; Issue: 2; April-June 2018
Website: www.ijshr.com
Original Research Article *ISSN: 2455-7587*

Nerve Conduction Study of Median Nerve in Type 2 Diabetes Mellitus

[1]Mrs. Dil Maya Limbu, [1]Dr. Priza Subedi, [2]Dr. Bishnu Hari Poudel, [3]Dr. Dilip Thakur, [3]Dr. Robin Maskey

[1]Assistant Professor, [2]Professor, [3]Additional Professor, Basic and Clinical Physiology,
B.P. Koirala Institute of Health Sciences, Dharan, Nepal
[3]Additional Professor, Department of Internal Medicine,
B.P. Koirala Institute of Health Sciences, Dharan, Nepal

Corresponding Author: Mrs. Dil Maya Limbu

ABSTRACT

Background: The prevalence of chronic disease diabetes mellitus is rapidly rising all over the globe. The number of diabetic mellitus patients with diabetic neuropathy is increasing as estimated as 45% of patients develop diabetic polyneuropathy.

Objectives: To evaluate latency, amplitude and NCV of median nerve in type 2 DM.

Methods: The study was done in 60 (M=35, F= 25) consenting diabetic patients. Anthropometric variables were recorded. Motor and sensory nerve conduction parameters of bilateral median nerves were recorded using standard technique. Values obtained were compared with normal values. Independent t test was applied to compare the anthropometric and nerve conduction variables between male and female diabetic subjects.

Results: Anthropometric variables were comparable between diabetic male and females. Also, most of the nerve conduction variables were comparable between diabetic males and females. However, these values were less as compared to given standard values. [14] Distal amplitude of left median motor nerve was significantly higher in males (p=0.04) while onset latency of left median sensory nerve is significantly prolonged as compared to females (p=0.008).

Conclusion: Median nerves are affected in type 2 diabetes suggesting of diabetic neuropathy.

Key words: type 2 diabetes, nerve conduction study

INTRODUCTION

Diabetes mellitus (DM) is one of the chronic diseases all over the world. The prevalence of diabetes is rapidly rising all over the globe at an alarming rate. [1] It is estimated 45% of patients with DM develop diabetic polyneuropathy. [2] Diabetes can be treated and its consequences can be avoided or delayed with diet, physical activity, medication, regular screening and treatment for complication. [3] Neuropathy is one of the commonest long term complications. 15 % of patients have both symptoms and signs of neuropathy but nearly 50% have either neuropathic symptoms or slowing of nerve conduction velocity, before patient develops any sign. [4] Nerve conduction studies (NCS) are considered to be the most sensitive reliable noninvasive and objectives means of investigations of diabetic polyneuropathy. It helps in evaluating the type and degree of abnormalities of the peripheral nerves. Slowing of conduction velocity is suggestive of peripheral nerve demyelination.

Diabetic sensorimotor polyneuropathy is the most common clinical sub type seen in clinical practice. [5,6] Sensory nerves are affected earlier than motor nerves. Most common nerve affected in upper limb is median nerve while in the lower limb is sural nerve. Nerve conduction abnormalities exist in the subclinical stages of neuropathy [7,8] that can be detected in early asymptomatic stage by various electrodiagnostic test. Because peripheral nerve have the capacity to regenerate, therefore, early diagnosis and timely therapeutic intervention will reduce the

morbidity and mortality in diabetes mellitus [9] It has been shown by Zahed Ali et al that median nerve has the highest electrodiagnostic abnormalities in diabetic patients with early neuropathy.

It has been shown by various studies that upper limb sensory nerve conduction studies are more sensitive in detecting than lower limb nerve conduction studies. [10] As electrodiagnostic abnormalities are most commonly found in the median nerve (59%) as compared to ulnar nerve (28%), peritoneal nerve (28%) and sural nerve (8%) [11] Many previous studies [10,12] have also found that NCS alteration of median nerve suggestive of neuropathy in diabetics. Thus our objective was to study the nerve conduction parameters of median nerve in type 2 diabetes mellitus. It has been shown that following diagnosis of DM, slowing of median NCV usually progresses at a steady rate by approximately 1m/s/yr and that there is positive correlation between the level of impairment and duration of DM. [13] Thus the present study was aimed to study of median nerve in type 2 diabetes mellitus.

MATERIALS AND METHODS

Type of study: Comparative Cross sectional study

Inclusion criteria:

Clinically diagnosed diabetic mellitus patients both male and female of age 40-60 yrs.

Referred from Diabetic clinic, Department of Internal medicine, BPKIHS

Exclusion criteria:

Type I diabetic patients

Diabetic patients with hypertension, history of smoking or alcohol intake

Age more than 60 yrs

Sample size: N= 60

Sample size was calculated by a power sample size formula. A total of 60 diabetic patients were taken and 35 were male and 25 were female in group. Informed written consent was taken prior to the study. Ethical clearance was taken prior to study from Institutional Ethical Review Board (IERB) BP Koirala Institute of Health Sciences, Dharan, Nepal.

Duration of study: Jan 2o16 – Dec 2016

Recording procedure: Anthropometric data were first recorded. Motor and sensory nerve conduction parameters of bilateral median nerves were recorded in Neurophysiology Lab at BPKIHS, Dharan using standard techniques. [14,15] Proximal and distal amplitude of CMAP (compound motor action potential), proximal & distal latencies & conduction velocities of bilateral median nerves were recorded. Minimum F wave latency of bilateral median nerves was also recorded.

Statistical Methods: The data were entered into MS Excel and descriptive analyzing was done for anthropomentric & nerve conduction variables. Unpaired t test was used to compare the anthropometric & nerve conduction variables between male and female diabetic patients.

Recording data were analyzed by using SPSS 17.

RESULTS

There were no statistically significant in all anthropometric variables between male and female diabetic group. Most of the nerve conduction variables were comparable between male & female diabetic groups. Onset latencies, SNAP (sensory nerve action potential) amplitude and conduction velocity of bilateral median sensory nerves were recorded. However, the values were less as compared to given standard values. [14] However, distal amplitude of left median nerve was higher in diabetic males as compared to females. (p= 0.005) and onset latency of left median sensory nerve was significantly prolonged in males (p=0.008) as compared to females. (as shown in table 5)

Table 1: Comparison of anthropometric variables between male and female diabetic variables

Variables	Diabetic male (mean± SD)	Diabetic female (Mean ± SD)	P value
Age (in years)	52.23±11.59	50.80±13.10	0.574
Height (in cm)	162.33±7.31	160.83± 6.36	0.128
Weight(kg)	59.0±14.17	64.33±5.50	0.757

Table 2: Comparison of right median Motor nerve NCS variables between diabetic male and diabetic female

Variables	diabetic male (Mean ±SD) (Male- 35)	Diabetic female (Mean ± SD) (Female- 25)	P value
DSONALT	3.07±0.21	2.78±0.23	0.972
PRONLAT	7.05±0.21	7.35±1.41	0.107
DSAMP	2.72±1.55	2.35±3.12	0.080
PRAMP	3.82±3.20	2.72±1.97	0.412
MNCV	59.73±4.67	44.10±22.33	0.192
FWMIN	24.33±1.53	19.60±8.65	0.213

Abbreviations:

DSONLAT: Distal onset latency
PRAMP: proximal wave amplitude
PRONLAT: Proximal onset latency
MNCV: motor nerve conduction velocity
DSAMP: distal wave amplitude
FW MIN: F wave minimum latency

Table 3: Comparison of left median Motor nerve NCS variables between diabetic male and diabetic female

Variables	diabetic male (Mean ±SD) (Male- 35)	Diabetic female (Mean ± SD) (F-25)	P value
DSONALT	2.13±0.82	3.57±1.20	0.344
PRONLAT	8.5±3.04	11.47±9.38	0.253
DSAMP	3.11±1.21	2.81±1.22	0.043*
PRAMP	3±3.00	2.14±2.75	0.613
MNCV	44±6.56	45.900±24.33	0.243
FWMIN	21.67±2.89	23.20±3.42	0.746

Table 4: Comparison of right median sensory NCS variable between male and female diabetic group

Variables	Diabetic male (Mean ±SD) (Male- 35)	Diabetic female (Mean ±SD) (Female- 25)	P value
ONLAT	4.82±0.36	3.63±3.80	0.215
AMP	14.05±7.57	9.50± 5.85	0.679
SNCV	49.00±15.22	50.51±15.22	0.939

Abbreviations:

AMP: amplitude
ONLAT: onset latency
SNCV: sensory nerve conduction velocity

Table 5: Comparison of left median sensory NCS variable between male and female diabetic group

Variables	Diabetic male (Mean ±SD) (Male- 35)	Diabetic female (Mean ±SD) (Female- 25)	P value
ONLAT	6.07±8.25	2.08± 0.52	0.008*
AMP	16.85±4.78	16.65±7.40	0.346
SNCV	37.13±9.89	43.47±11.78	0.633

DISCUSSION

Most of the previous literatures suggest on early involvement of median nerve in diabetic neuropathy. [8,10-12]

Hrishikesh Bagchi et al in 2014 showed that significant reduction in both NCV and amplitude with increasing values of duration of diabetes. The commonest abnormality in diabetics is reduction of amplitude of motor or sensory nerve action potential because of axonopathy [16] Hennessey & Others (1994) observed that women, in comparison to men have significantly larger distal amplitudes for median nerve. [17] Similar study was done by Lawrence et al in 1993 [18] observed that sensory amplitude of Lt. median nerves were larger in women. Our study is contrary to this study in which male larger distal amplitudes for median nerves than female diabetic groups have.

Distal amplitude of median motor nerve is higher in male than female and NCV of motor nerve in median nerve is higher in male than female which are opposed by Gakhar et al which showed that distal amplitude of median nerve in female is higher than males. Onset latency of motor of median nerves in both right and left side were comparable which is contrary to study done by Gakhar et al in 2014. [19]

A study done by Zahed Ali et al in which Conduction velocities were decreased in both male and females in left median sensory which is statistically significant and our study showed that there is significant difference in onset latency of left median sensory in male and female diabetic group, which is different statistically. Our study showed that male patients had significantly longer latencies and female demonstrate faster conduction velocity. The similar result has been shown by Gakhar et al. [19] Thus, our results showed that males have larger distal amplitudes of Left Median motor nerve as compared to females. However, onset latency is prolonged of left median sensory nerve as compared to females.

CONCLUSION

Median nerves are affected in type 2 diabetic mellitus patients.

ACKNOWLEDGEMENT

I would like to acknowledge for providing the fund to conduct the study and all the subjects who participated in the study.

REFERENCES

1. Huizinga MM, Rothman RL. Addressing the diabetes pandemic: A comprehensive approach, Indian J Med Res 2006; 124:481-484.
2. J Kimura: Long and short of nerve conduction measures: reproducibility for sequential assessments Neuro (Neurosurg Psychiatry 2001;71:427.430 e
3. Global report on. Diabetes. World Health Organization Geneva 2016
4. Ogawa K; Sasaki H; Yamasaki H, Okamoto K, Matsuno S, Sono T, Doi T, Arimoto K, Furuta H, Nishi M, Nakao T, Nanjo K. Peripheral nerve functions may deteriorate parallel to the progression of microangiopathy in diabetic patients. Nutr Metab Cardiovasc Dis 2006; 16: 313-321.
5. Ellenberg, M. Diabetic neuropathy. In: Ellenberg M, Rifkin H, eds. Diabetes mellitus: theory and practice. New York: McGraw-Hill, 1982-777-801.
6. Stambolius E, Voumvourakis K, Andrikopoulou A, Koutisis G, Tentolouris N, Kodonius A, Tsivgoulis G. Association between asymptomatic median neuropathy and diabetic polyneuropathy in patients with diabetes mellitus. Journal of The Neurological Sciences 2009.278(1):41-43.
7. Zahed Ali, Maliha Hakim, Monirul Islam, Nirmalendu Bikash Bhowmik, Shamsun Nahar, AKM Anwar Ullah, Anisul Haque. Role of electrodiagnostic tests in early detection of diabetic neuropathy . Bangladesh Journal oo Neuroscience 2008;24:1.
8. Buschbacher RM. Median nerve F-wave latencies recorded from the abductor pollicis brevis. *Am J Phys Med Rehabil*.1999 Nov-Dec:78 (6- Suppl): S32-7
9. Gakhar, M. Verma, S.K. and Lehri, A. A comparision of Nerve conduct velocities in Male and Female of 20 to 30 years of age group. Journal of exercise science and physiotherapy. Vol.10. No. I: 16-20.2014
10. Rota E; Quadri R; Fanti E; Isoardo G; Poglio F; Tavella A; Paolasso I; Ciaramitaro P, Bergamasco B; Cocito D.- Electrophysiological findings of peripheral neuropathy in newly diagnosed type 2 diabetes mellitus . J Peripher Nerv Syst. 10 (4): 348-353, Dec, 2005.
11. El-Salem K, Ammari F, Khader Y, Dhaimat O. Elevated glycosylagted hemoglobin is associated with subclinical neuropathy asymptomatic patients: A prospective study. J Clin Neurophysiol 2009 ; 26 (1):
12. Kimura J; Yamada T; Stevland N.P. – Distal slowing of motor nerve conduction velocity in diabetic polyneuropathy. J Neurol Sci. 42 (2): 291- 302, July 1979.
13. Ward JD, Barness CG, Fisher DJ, Jessop JD, Baker RWR. Improvement in nerve conduction following treatment in newly diagnosed diabetes. Lancet 1971; 1 :428- 430.
14. Preston DC, Shapiro BE. BE. Basic nerve conduction studies. In:"Electromyography and Neuromuscular disorders". Boston: Bu erworth-Heinermann; 1998.p. 26-56.
15. Zahed Ali; Maliha Hakim, Monirul Islam; Nirmalendu Bikash Bhowmik; Shamsun Hahr; AKM Answer Ullah; Anisul Haqaue. Role of electrodiagnositic tests in early detection of diabetic neuropahy. Bangladesh Journal 00 Neuroscience 2008; 24-1.
16. Bagchi H, Biswas A, Mukhopadhyay AK, A study of somatic nerve functions in Diabetic and Normal persons. *Indian Medical Gazette*.2014 Oct: 365-368.
17. Hennessey, W.J., Falco, F.J.E., Goldberg, G., Braddom, R.L. 1994. Gender and arm length: influence on nerve conduction parameters in the upper limb. *Arch. Phys. Med. Rehabil.*, 75: 265–269.
18. Lawrence D. G. Motor nerve conduction velocity in Diabetes. Arch Neurol 19 61; 5 (5):483- 489 November 1971. doi: 10.1001/areneur. 1901.0045017002/003
19. Gakhar, M. Verma, S.K. and Lehri, A. A comparision of Nerve conduct velocities in Male and Female of 20 to 30 years of age group. Journal of exercise science and physiotherapy. Vol.10. No. I: 16-20.2014

How to cite this article: Limbu DM, Subedi P, Poudel BH et al. Nerve conduction study of median nerve in type 2 diabetes mellitus . International Journal of Science & Healthcare Research. 2018; 3(2): 40-43.

******