ORIGINAL RESEARCH PAPER

Volume-7 | Issue-4 | April-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A STUDY TO FIND THE NEUROPHYSIOLOGICAL CHANGES IN HEALTHY AND TYPE II DIABETES MELLITUS SUBJECTS

Physiology

Vipin Kumar Sharma* PhD Research Scholar Department of Physiology, National Institute of Medical Sciences and Research, Hospital, NIMS University, Jaipur-303121 (Rajasthan) India. *Corresponding Author

Usha Gupta Professor and Head, Department of Physiology, National Institute of Medical Sciences and Research, Hospital, NIMS University, Jaipur-303121 (Rajasthan) India

ABSTRACT

Diabetes mellitus (DM) is characterized by hyperglycemia with disturbance of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action or both. Type II Diabetes mellitus (TIIDM) is the most common presentation of the disease accounting for almost 90% of all diabetes cases worldwide. Diabetic neuropathy is the common complication of diabetes and is due to high blood sugar, chemical changes that occur in the nerves The present study was performed on 30 TIIDM subjects who recruited from OPD of the Department of Medicine, National Institute of Medical Sciences and research, Hospital, Jaipur and equal number of control subjects are included for the study. Nerve conduction study is a medical diagnostic test, commonly used to evaluate the ability of electrical conduction, of motor and sensory nerves. This study signifies that the sensory nerves are more susceptible for changes in conduction velocity than the motor nerve conduction velocity.

KEYWORDS

Diabetes Mellitus, Type II Diabetes Mellitus, Nerve Conduction Study, Nerve Conduction Velocity.

INTRODUCTION

Diabetes mellitus is a heterogeneous chronic metabolic disorder, which leads to abnormally elevated blood glucose level with disturbance of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action or both[1]. Classification of diabetes mellitus is based on its etiology and clinical presentation. Type II Diabetes mellitus is the most common presentation of the disease accounting for almost 90% of all diabetes cases worldwide[2]. Chronic complications of Type II Diabetes mellitus are divided into microvascular and macrovascular[3]. Diabetic neuropathy is the common complication of diabetes and is due to high blood sugar, chemical changes that occur in the nerves[4]. Type II Diabetes mellitus is frequently asymptomatic and the associated complications of diabetes like neuropathy may be the first clinical indication of the disease[5]. A high prevalence (29.2%) of diabetic peripheral neuropathy among north_Indian type II diabetes mellitus patients[6]. In the presence of moderate to severe disease, conventional nerve conduction studies (NCS) are generally reliable diagnostic methods for diabetic neuropathy[7].

MATERIAL METHOD

The study was done in the Department of Physiology in collaboration with the Department of Medicine of National Institute of Medical Sciences and research, Hospital, Jaipur. The total 60 subjects were selected for study. Out of these 30 subjects were diagnosed TIIDM patients attending department of medicine and rest 30 were healthy who served as control. Medicaid System's EMG/NCV equipment with Neurostim software was used for nerve conduction velocity.

Inclusion criteria:

Control:-

- Willingness (Informed consent)
- Normal healthy aged 30-45 years.

Case:-

- Willingness (informed consent)
- Only Diagnosed cases of male and female type II Diabetic aged 30-45 suffering from more than 2yrs.
- The diagnosis of diabetes is made on the basis of (Revised American Diabetic Association criteria)[8].
- Fasting glucose >126mg/dl and 2hr postprandial plasma glucose >200mg/dl.

Exclusion criteria:

- No previous history of any systemic condition related to peripheral neuropathy (Hypertension, Alcoholic neuropathy, Renal failure)
- Any neuromuscular disorders such as myopathy, familial polyneuropathy or chronic polyneuropathy.
- Neuropathies associated with exogenous toxic agents, metals or drugs.
- Skin lesions or swelling that would interfere with Nerve Conduction Study (NCS).
- Trauma in the course of nerve to be examined.

Statistical analysis

The statistical analysis was done using Statistical Package for Social Sciences version 17.0 (SPSS) software. Unpaired t–test applied for the obtained data and p value <0.05 is taken as significant.

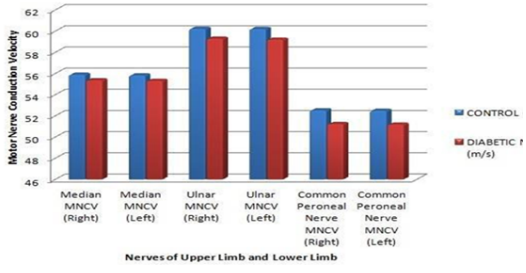
RESULT

In this study, there was bilateral decrease in motor nerve conduction velocity of upper (Median and Ulnar nerves) and lower limb (Common Peroneal nerve) in TIIDM subjects when compared with control subjects but (p value > 0.05) motor nerve conduction velocity of upper was statistically non-significant.

Table 1 Comparison of Motor Nerve Conduction Velocity (MNCV) of various nerves between controls and TIIDM subjects

PARAMETER	CONTROL (n=30) M±SD (m/s)	TIIDM (n=30) M±SD (m/s)	P Value
Median MNCV (Right)	56.79 ± 3.21	55.26 ± 3.29	>0.05
Median MNCV (Left)	55.92 ± 3.19	55.21 ± 3.31	>0.05
Ulner MNCV (Right)	61.23 ± 4.10	50.09 ± 4.05	>0.05
Ulner MNCV (Left)	60.21 ± 4.08	59.20 ± 4.06	>0.05
Common Peroneal Nerve MNCV (Right) (Left)	52.32 ± 4.46	51.05 ± 4.53	>0.05
Common Peroneal Nerve MNCV (Left)	51.49 ± 3.13	50.18 ± 3.40	>0.05

Data was presented as Mean ± Standard Deviation. Analysis was done by unpaired 't'- test. 'P' < 0.05 significant.



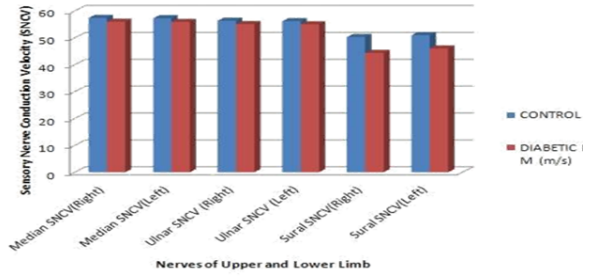
Graph 1 Comparison of Motor Nerve Conduction Velocity (MNCV) of various nerves between controls and TIIDM subjects

A bilateral decrease was observed in the sensory nerve conduction velocity of upper limb (Median and Ulnar nerves) in TIIDM subjects as compared to the control subjects but (p value > 0.05) sensory nerve conduction velocity of upper limb was statistically non-significant. However, (p value < 0.05) significant bilateral decrease in the sensory nerve conduction velocity of upper limb was observed in the lower limb (Sural nerve) in TIIDM subjects.

Table 2 Comparison of Sensory Nerve Conduction Velocity (MNCV) of various nerves between controls and TIIDM subjects

PARAMETER	CONTROL (n=30) M±SD (m/s)	TIIDM (n=30) M±SD (m/s)	P Value
Median SNCV (Right)	56.44 ± 5.67	55.04 ± 5.50	>0.05
Median SNCV (Left)	57.31 ± 6.42	55.67 ± 6.29	>0.05
Ulner SNCV (Right)	57.41 ± 7.14	56.10 ± 7.10	>0.05
Ulner SNCV (Left)	56.21 ± 7.13	55.02 ± 6.98	>0.05
Sural Nerve SNCV (Right)	50.31 ± 4.46	43.22 ± 6.93	<0.05
Sural Nerve SNCV (Left)	51.00 ± 6.32	46.08 ± 5.22	<0.05

Data was presented as Mean ± Standard Deviation. Analysis was done by unpaired 't'- test. 'P' < 0.05 significant.



Graph 2 Comparison of Sensory Nerve Conduction Velocity (MNCV) of various nerves between controls and TIIDM subjects

DISCUSSION

- In the TIIDM subjects hyperglycemia leads to increased intracellular glucose and cellular toxicity in endothelial cells of capillaries associated with nerves. The increased sugar level in the blood causes decreased formation of neurotropin like nerve growth factor and contributes nerve dysfunction[9].
- Mankar et al. conducted a study which shown the definite decrease in nerve conduction velocities of both the sensory and motor components, axonal and demyelinating type in TIIDM subjects[10]. Simillar In present study, there was bilateral decrease in MNCV of upper (Median and Ulnar nerves) and lower limb (Common Peroneal nerve) in TIIDM subjects when compared with control subjects but this decrease in MNCV was statistically non-significant.
- Decrease in sensory nerve conduction velocity in this study is consistent with the study done by Tupkovic E et al. which showed that sensory nerve conduction velocity was higher in control group as compared to diabetics whereas in motor nerve conduction velocity there was no significant difference in conduction velocity of diabetics and control groups[11]. But, in contrast to the present study Cerriza M et al., observed no deterioration of sensory nerve dysfunction in Type II diabetic patients[12].
- In this study more deterioration of nerve conduction velocity are found in nerves of lower limb as compared to nerves of upper limb. Kulkarni et al. also observed that nerves of lower limbs are more susceptible to diabetes assault as compared to upper limb suggesting that long nerves are commonly affected[13]. Mulder et al and Halar at al reported that lower limb nerves are more prone to diabetic neuropathy than the nerves of upper limb[14,15].

Conclusion

There was non-significant bilateral decrease in MNCV of upper (Median and Ulnar nerves) and lower limb (Common Peroneal nerve) in TIIDM subjects when compared with control subjects.A significant bilateral decrease in the SNCV was observed in the lower limb (Sural nerve) in TIIDM subjects but there was non-significant bilateral decrease in the SNCV of upper limb (Median and Ulnar nerves) in TIIDM subjects as compared to the control subjects.This study signifies that the sensory nerve are more susceptible for changes in conduction velocity than the motor nerve conduction velocity.

REFERENCES

1. International Diabetes Federation. International Diabetes Federation Atlas. 5th ed. Brussels, Belgium: International Diabetes Federation; 2011.
2. Mungrue K, Roper LA, Chung T. Assessment of Weight Loss in the Management of Patients with Type 2 Diabetes Mellitus in Primary Care in Trinidad. J Diabetes Metab. 2011; 2: 120
3. Coelho R, Amorim I, Prata J. Coping Styles and Quality of Life in Patients With Non-Insulin-Dependent Diabetes Mellitus. Psychosomatics. 2003; 44: 312–318.
4. Heltianu C, Guja C. Role of Nitric Oxide Synthase Family in Diabetic Neuropathy. J Diabetes Metab.2011; S5:002.
5. Bennet PH, Kahn CR, Weir GC ed. Joslin's Diabetes Mellitus, 13th Ed. Baltimore, Waverly International. 1994; 194-195.
6. Bansal D, Gudala K, Muthyala H, Esam HP, Ramya NR, Bhansali A Prevalence and risk factors of development of peripheral diabetic neuropathy in type 2 diabetes mellitus in a tertiary care setting. J Diabetes Invest 2014; 5: 714–721.
7. Rutkove SB, Kothari MJ, Raynor EM, Levy ML, Fadic R, Nardin RA. Sural/radial amplitude ratio in the diagnosis of mild axonal polyneuropathy. Muscle Nerve. 1997; 20: 1236-41.
8. American Diabetes Association, Diagnosis and Classification of Diabetes Mellitus. Diabetes Care Jan 2010; 33(1): 62-69.
9. P. Reed Larsen, M. Henry, Shlomo Melmed, S. Kenneth. Williams — Textbook of endocrinology. 10th Ed.2003; Saunders an Imprint of Elsevier. Philadelphia, Pennsylvania 19106:1427-1483 and1513-1554.
10. Mankar K, Bhagya V, Bondade SY. A Comparative Peripheral Nerve Conduction Study in Type-2 Diabetics with Symptoms of Polyneuropathy with Age and Sex Matched Normal Subjects. Journal of Dental and Medical Sciences .2016 July; 15(7):75-82.
11. Tupkovic E, Pavijesevic S,Nisc M, Salihovic S. Electroneurography of right median nerve and ulnar nerves in diabetic patients with and without retinopathy. Bosn J Basic Med Sci 2007; 7(3):231-4 .
12. Cerizza M, Minciotti G, Meregalli S, Garosi V, Crosti P, Frattola L. Central nervous system involvement in elderly patients with non-insulin-dependent diabetes mellitus. Acta Diabetol Lat. 1990; 27(4):343–48.
13. Kulkarni AL, Gokhale VS, Vohra KV, Choudary N. Clinical and nerve conduction study correlation in patients of diabetic neuropathy. J Assoc Physicians India. 2014 Jan; 62(1):24-7.
14. Mulder DW, Lambert EH, Bastron JA, Spraggue RG. The neuropathies associated with diabetes mellitus.Neurology 1960; 10:212-234.
15. Halar EM, Graf RJ, Haltar JB, Brozovick FV, Soine BT. Diabetic neuropathy:a clinical, laboratory and electrodiagnostic study. ArchPhys Med Rehabil 1982; 63:298-303.