

Association of nerve conduction study variables with laboratory studies in patients with type 2 DM



Min A Seok¹, *Jun Hwan Choi¹, So Young Lee¹, Hyun Jung Lee¹, Su Jong Lee¹, Ji Min Han¹, So Yeon Yoo²

¹Department of Rehabilitation Medicine, Jeju National University Hospital, College of Jeju School of Medicine
²Department of Internal Medicine-Endocrine, Jeju National University Hospital, College of Jeju School of Medicine

*Corresponding author : Jun Hwan Choi (miraerohj0728@gmail.com)

Background and aim

Diabetic peripheral neuropathy (DPN) is the most common and disabling complication association with type 2 diabetes mellitus (T2DM). Nerve conduction studies (NCS) are considered to be gold standard for the diagnosis of DPN. Although the exact cause of DPN remain still unknown, previous studies have shown that glycemic control, DM duration, age, male, and height are associated with abnormalities of NCS. The purpose of this study was to investigate the association between laboratory studies and NCS variables in patients with T2DM.

Methods

Patients in T2DM with symptoms of neuropathy were retrospectively enrolled by review of the medical record of T2DM patients who visited department of endocrinology for management of hyperglycemia and evaluation of complication. Demographic data, clinical laboratory data and NCS results were collected for analysis. DPN was diagnosis based on abnormal NCS results and patients were divided into two groups: normal and abnormal NCS results. NCS was underwent with motor and sensory NCS, F-wave latency, Hoffman reflex on bilateral lower extremities and unilateral upper extremity.

Results

The final analysis included 400 patients (173 male and 227 female) with mean age of 58.7 ± 14.8 and mean duration of diabetes of 11.5 ± 8.3 years. The NCSs revealed abnormal values in 57 % (N=228) of the subjects. Abnormal NCS group had significantly higher in the age, DM duration, fasting plasma glucose (FPG), glycosylated hemoglobin (HbA1C), apolipoprotein B, Urine Albumin-Creatine ratio (UACR) and lower in the estimated glomerular filtration ratio (eGFR), High density lipoprotein-cholesterol (HDL-C), apolipoprotein A1. The bilateral H-reflex and tibial F-wave latencies were negatively correlated with HDL-C and vitamin B12. The bilateral sural sensory nerve latencies were positively correlated with FPG, TC, LDL-C, UACR and negatively correlated with HDL-C, vitamin B12. According to the severity of the NCS results, the higher the severity, the lower the HDL-C, eGFR and the higher, DM duration, Cr, Low density lipoprotein (LDL), UACR.

Table 1. Demographic and disease-related characteristics of the subjects (N=400)

Variables	Normal NCS (n=172)	Abnormal NCS (n=228)	p-value
Age (years)	54.5 ± 14.3	61.9 ± 14.4	<0.001*
Sex, males/females	81 / 91 (47.1) / (52.9)	92 / 136 (40.4) / (59.6)	0.186
Height (cm)	161.0 ± 15.1	164.0 ± 18.7	0.091
Weight (kg)	67.0 ± 13.8	69.0 ± 13.4	0.144
DM duration (years)	8.6 ± 6.6	13.6 ± 9.0	<0.001*
FPG (mg/dL)	172.9 ± 83.9	193.8 ± 112.1	0.035*
HbA1c (%)	8.37 ± 2.3	9.13 ± 2.7	0.003*
TC (mg/dL)	164.9 ± 44.7	156.4 ± 67.9	0.155
TG (mg/dL)	148.1 ± 141.7	158.1 ± 232.2	0.619
HDL-C (mg/dL)	50.4 ± 19.9	43.9 ± 16.6	<0.001*
Apo A1 (mg/dL)	63.7 ± 69.8	40.2 ± 63.3	0.001*
LDL-C (mg/dL)	83.8 ± 38.7	88.4 ± 34.3	0.216
Apo B (mg/dL)	31.5 ± 50.5	49.9 ± 57.9	0.001*
eGFR	95.8 ± 69.7	79.6 ± 30.5	0.009*
UACR	62.5 ± 171.3	299.0 ± 828.8	<0.001*
Vitamin B12	752.1 ± 380.7	732.2 ± 358.3	0.637

Table 2. Correlation between NCS and laboratory studies

Variables	Correlation coefficients (r) H-reflex latency	Correlation coefficients (r) Tibial F-wave latency	Correlation coefficients (r) Sural latency
FPG (mg/dL)	0.114/0.137	0.087/0.135*	0.169**/0.174**
HbA1c (%)	0.098/0.084	0.003/-0.043	0.076/0.009
TC (mg/dL)	-0.086/-0.035	-0.024/-0.057	0.136**/0.124*
TG (mg/dL)	0.082/0.081	-0.003/0.074	0.016/-0.001
HDL-C (mg/dL)	-0.161**/-0.196**	-0.302**/-0.204**	-0.103**/-0.139*
Apo A1 (mg/dL)	-0.084/-0.042	0.032/0.081	0.060/-0.016
LDL-C (mg/dL)	-0.014/0.012	-0.020/-0.033	0.123**/0.110*
Apo B (mg/dL)	-0.040/-0.026	0.032/0.002	0.023/-0.033
eGFR	-0.060/0.007	0.006/-0.061	-0.080/0.282
UACR	0.108/0.166	-0.005/0.210	0.189**/0.224**
Vitamin B12	-0.214**/-0.241**	-0.105**/-0.105*	-0.177**/-0.109*

Abbreviations: NCS, nerve conduction study; DM, diabetes mellitus; FPG, fasting plasma glucose; HbA1c, glycosylated hemoglobin; TC, total cholesterol; TG, triglyceride; HDL-C, high density lipoprotein-cholesterol; Apo, apolipoprotein; LDL-C, low density lipoprotein-cholesterol; eGFR, estimated glomerular filtration rate; UACR, urine albumin-creatinine ratio; dimensions-
 * <0.05, ** <0.01

Conclusions

The present study demonstrated that glycemic control alone is not sufficient to prevent the progression and worsening of DPN. And in people with concomitant microvascular complications, additional cardiometabolic risk factors should be reduced to prevent DPN. And vitamin B12 levels could be useful to detect early change in DPN as well as cardiometabolic risk factors.