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ELECTROPHYSIOLOGICAL STUDY OF SUPERFICIAL PERONEAL NERVE IN TYPE 2 DIABETES MELLITUS PATIENTS.

Physiology

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ABSTRACT

Background: Complications of Diabetes Mellitus can be divided into vascular and nonvascular complications. The vascular complications are subdivided into microvascular and macrovascular.1. It is estimated that 35% to 45% of Type 2 diabetics have diabetic polyneuropathy (DPN)2.

Material & Method: The study was conducted in 40 patients with clinically undetectable Peripheral Neuropathy of Type 2 DM and 40 age matched controls.

Results: Significant ($p<0.05$) increase of Distal latency and decrease in Conduction Velocity and Amplitude was seen in Superficial Peroneal Nerve in both lower limb of clinically undetectable peripheral neuropathy group as compared to controls which is an axonal type.

Summary-All electrophysiological variables of Superficial Peroneal nerve were affected negatively in all diabetic subjects under study. Nerve conduction studies can be utilised to analyse asymptomatic neuropathy in diabetics at an early stage..

KEYWORDS

Superficial Peroneal nerve, Type 2 Diabetes Mellitus, Diabetic neuropathy, Nerve conduction study.

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorders characterized by a chronic hyperglycemic resulting from defects in insulin secretion, insulin action or both. Diabetes mellitus has been divided into type 1 and type 2. Type 1 diabetes is the result of near-total insulin deficiency. Type 2 DM is a group of disorders characterized by insulin resistance, impaired insulin secretion, or increased glucose production[3]. Disease process in Diabetes may progresses to the diabetic foot, that arises from the infection and ulceration of the foot, leading to amputation [4]. Diabetic Neuropathy incidence in a study from South India showed that 19.1% type II diabetic patients had peripheral neuropathy[5]. Amanda J et al. reported neuropathy in 20% type 2 DM patients with poor glycemic control.[6] The diagnosis of diabetic peripheral neuropathy is mainly based on the symptoms and signs.[7] But sometimes symptoms may not develop at all. Therefore the need for doing nerve conduction studies (NCS) is important[8] . The early detection can help in controlling crippling illness like peripheral neuropathy.[9]

METHODOLOGY

This case control study was Conducted in the Department of Physiology in collaboration with the Department of Medicine of Gandhi Medical College, Bhopal. The neurophysiological and biochemical investigations were done in the Department of Physiology.

40 Type 2 DM patients with clinically undetectable Peripheral Neuropathy and 40 non diabetic age matched controls were selected on the basis of inclusion and exclusion criteria. Michigan (MNSI)[10] questionnaire and Michigan examination were used for screening the cases and controls for ruling out peripheral neuropathy. The selected study and control group were as follows-

STUDY GROUP:

Cases of Type 2 diabetes mellitus on the basis ADA criteria 2015 in the age group 30-60 years with no known other endocrinal and metabolic disorders and with no history of treatment with any neurotoxic drugs were selected.

CONTROL GROUP

Forty age and gender matched healthy non diabetic volunteers in the age between 30-60 years with no reported history of any endocrinal, metabolic, renal, cardiovascular or neuropathic disorder were taken as controls.

Equipment:

The recording equipment used was **RMS EMG EP MAK II.** The subjects reported to the Physiology Department in loose comfortable clothes and with no lotion or oil smeared on the skin of limbs. Present and past illness, family ,personal and drug history was taken. Complete clinical examination was done and fasting, post prandial glucose and HbA1C were estimated.Nerve conduction parameters recorded were: Distal latency (DL), Nerve Conduction Velocity (NCV), and Sensory nerve action potential (SNAP) Amplitude

STATISTICAL ANALYSIS

The data collected was analysed by using SPSS 16.0 . All parameters were expressed as mean ± SD. The significance of difference between parameters recorded was calculated using unpaired Student's t-test for comparison between cases and control. P value of less than 0.05 was considered statistically significant.

Table 1: Characteristic Features of Study Population

S. No.	Variables	Controls N=40	Clinically Undetectable Peripheral Neuropathy Group N=40
1	Age (years)	43.82±8.37	39.6±9.1
2	BMI (Kg/m2)	24.14±1.91	24.21±2.99
3	Pulse (bpm)	78.45±3.84	77.3±3.14
4	SBP (mm Hg)	124.6±7.18	123.55±7.77
5	DBP (mm Hg)	77.8±7.57	76.7±6.8
6	Duration of Diabetes Mellitus(years)	-	2.37±1.57
7	FPG (mg/dl)	83.4±7.26	148.07±29.46
8	PPPG(mg/dl)	123.32±8.79	253.65±41.71
9	HbA1C (%)	-	5.76±0.39

RESULT

The mean age of clinically undetectable peripheral neuropathy group and control group recorded were 43.82±8.37 years and 39.6±9.1 years respectively (age range 30-60 years).The body mass index was in normal range for both study population. The mean values of cardiorespiratory parameters recorded were in normal range in the study population. Analysis of electrophysiological parameters showed significant ($p<0.05$) increase of Distal latency and decrease in Conduction Velocity and Amplitude in Superficial Peroneal Nerve in both lower limb of clinically undetectable peripheral neuropathy group as compared to control group. An axonal type of peripheral neuropathy was more common (Right Superficial Peroneal nerve 57.5%, Left Superficial Peroneal nerve 52.5%).

Table 2: Comparison of Superficial Peroneal Nerve Conduction Study Parameters of cases and controls.

Nerve	Electrophysiological variables	Control group(n=40)		Clinically undetectable Peripheral Neuropathy group(n=40)		p
		Right I	Left II	Right III	Left IV	
Superficial Peroneal	Distal latency (msec)	2.11± 1.01	2.09± 0.81	3.37± 1.08	3.15± 0.76	<0.0001 * <0.0001
	SNAP (μV)	13.17±10.32	16.32±11.96	4.95± 3.83	4.00± 3.36	<0.0001 * <0.0001
	SNCV (m/s)	57.94±20.58	54.04±10.39	44.62±11.75	44.6± 8.76	<0.0001 * <0.0001

***statistically significant**

Figure 1:Comparison of mean distal latency (DL) of cases and controls

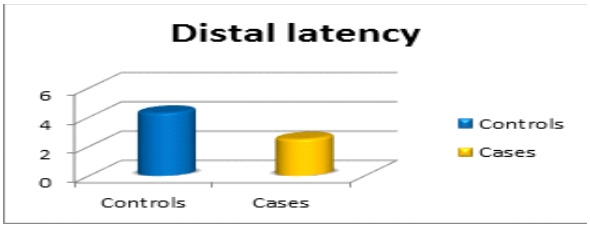


Figure 2: Comparison of mean amplitude (SNAP) of cases and controls

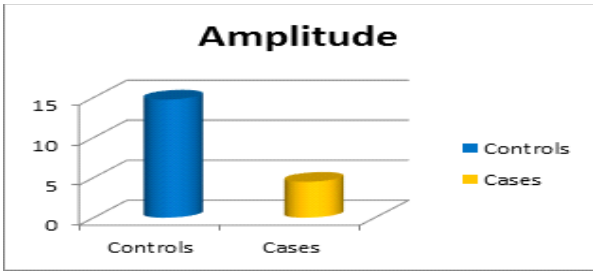
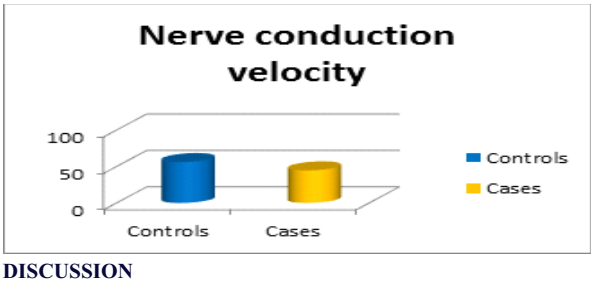


Figure 3: Comparison of mean nerve conduction velocity (CV) of cases and controls



DISCUSSION

In developing countries like India Diabetic neuropathy is the commonest of all neuropathies. Asymptomatic neuropathy has been defined as the presence of the nerve lesions associated with diabetes mellitus in the absence of abnormal clinical signs and symptoms [11]. Diabetes causes DPN by neuronal apoptosis and inhibiting nerve regeneration, which leads to deterioration in tactile sensitivity, vibration sense, lower-limb proprioception, and kinesthesia[12]. Pro-inflammatory cytokines including IL-6 and TNF-α are thought to contribute to nerve cell damage[13].Niazi et al (2001) evaluated diabetic polyneuropathy by doing electrodiagnostic study on 41 patients in 2001 in Pakistan and suggested that these studies are capable of diagnosing diabetic neuropathy even before clinical symptoms develop[14] .Our study is in conformity with the study of Liu MS et al (2005) who studied clinical and neurophysiological features in 700 T2DM patients in China and reported that subclinical Diabetic Peripheral neuropathy can be detected by electrophysiological studies[15]. Studies conducted by Al – Shamma YMH et al (2011) and Balaji R et al (2015) found that sensory nerves are affected more than motor nerves and lower limbs are affected more than upper limbs[16,17].Kakrani et al (2014) performed nerve conduction study on 50 patients of diabetic neuropathy out of which 100% had involvement of lower limb and also suggested that nerve conduction studies detect neuropathy changes even before signs develop.[3]Asad A et al, (2009) reported that axonal neuropathy is the commonest type of neuropathy as reported by the present study[8].

CONCLUSION

The present study has confirmed the existence of predominantly Axonal sensory peripheral neuropathy in Superficial Peroneal nerve of both lower limbs in clinically undetectable Peripheral neuropathy patients. Early initiation of preventive measures and effective therapeutic interventions can be helpful in reducing or delaying morbidity caused by Diabetic neuropathy. Since Nerve Conduction Study is able to diagnose Diabetic neuropathy early in the course before sign and symptoms appear, it is advised to perform atleast one annual neurological examination and nerve conduction studies to detect onset of peripheral neuropathy and adopt relevant measure to prevent morbidity.

Conflict of Interest: None

REFERENCE

1. Perkins BA, Bril V. Diagnosis and management of diabetic neuropathy. Curr Diab Rep 2002;2:495–500.
2. Ogawa K, Sasaki H, Yamasaki H, et al. Peripheral nerve functions may deteriorate parallel to the progression of microangiopathy in diabetic patients. Nutr Metab Cardiovasc Dis. 2006;16:313-321.
3. Kakrani AL, Gokhale VS, Vohra KV, Chaudhary N. Clinical and Nerve Conduction Study Correlation in Patients of Diabetic Neuropathy Journal of the association of physicians of India. 2014 JANUARY;62:24-27.
4. Partanen J, Niskanen L, Lehtinen J, Mervaala E, Siitonen O, Uusitupa M. Natural history of peripheral neuropathy in patients with non-insulin-dependent diabetes mellitus. N Engl J Med 1995; 333: 89-94.
5. Ashok S, Ramu M, Deepa R. et al Prevalence of neuropathy in type 2 diabetes patients attending diabetes center in South India. J Assoc Physicians India. 2002 Apr;50:546-550.
6. Adler AI, Boyko EJ, Ahroni JH, Stensel V, Forsberg RC, Smith DG. Risk Factors for Diabetic Peripheral Sensory Neuropathy Results of the Seattle Prospective Diabetic Foot Study. DIABETES CARE. 1997July;20: 7.
7. Watanabe T, Ito H, Morita A, Uno Y, Nishimura T, Kawase H, et al. Sonographic Evaluation of the Median Nerve in Diabetic Patients Comparison With Nerve Conduction Studies. J Ultrasound Med. 2009;28:727–734.
8. Asad A, Hameed MA, Khan UA, Butt MU, Ahmed N, Nadeem A .Comparison of nerve conduction studies with diabetic neuropathy symptom score and diabetic neuropathy examination score in type-2 diabetics. The Journal of the Pakistan Medical Association. 2009;59(9):594-598.
9. Dobretsov M, Romanovsky D, Stimers JR. Early diabetic neuropathy: triggers and mechanisms. World J Gastroenterol. 2007;13:175-191
10. Feldman EL, Stevens MJ, Thomas PK, Brown MB, Canal N, Greene DA. A Practical Two-Step Quantitative Clinical and Electrophysiological Assessment for the Diagnosis and Staging of Diabetic Neuropathy . DIABETES CARE. 1994 NOVEMBER ;17(11):1282-85.
11. Dyck PJ, Karnes JL, Daube J, O'brien P, Service FJ. Clinical and neuropathological criteria for the diagnosis and staging of diabetic polyneuropathy. Brain. 1985;108: 861-80.
12. Bansal V, Kalita J, Misra UK .Diabetic neuropathy. Postgrad Med J. 2006;82: 95-100.
13. Chen YW, Hsieh PL, Chen YC, Hung CH, Cheng JT . Physical exercise induces excess hsp72 expression and delays the development of hyperalgesia and allodynia in painful diabetic neuropathy rats. Anesth Analg.2013; 116: 482-490.
14. Niazi PHK, Ahmad K, Hussain A, Butt AW, Alam A. Electrodiagnostic Evaluation of Diabetic Polyneuropathy. Pak Armed Forces Med J 2001; 51: 75-7.
15. Liu MS, Hu BL, Cui LY, Tang XF, Du H, Li BH. Clinical and neurophysiological features of 700 patients with diabetic peripheral neuropathy. Zhonghua Nei Ke Za Zhi .2005; 44:173-6.
16. Al – Shamma YMH, Khudhair SA, Al - Aridie MAK. Prevalence of Peripheral Neuropathy in Type 2 Diabetic Patients. Kufa Med Journal. 2011; 14(2):51-64.
17. Balaji R, Mayilanandhi K, Sarah Subashini, Rajasekaran D. NERVE CONDUCTION PROFILE IN TYPE II DIABETICS. Journal of Evolution of Medical and Dental Sciences2015 March;4(20):3412-3417.