

Original Research Article

Autonomic dysfunction in cardiovascular system of type 2 diabetic mellitus – A bedside evaluation

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Abstract

Introduction: In 20 to 40% of all diabetes mellitus patients some abnormalities of autonomic function is present. Diabetic autonomic neuropathy can involve both sympathetic and parasympathetic nervous system. Parasympathetic abnormalities appear earlier and sympathetic innervations may remain intact even in presence of severe Parasympathetic damage.

The aim of the study: To determine the various aspect of autonomic neuropathy in the diabetic population using series of standardized test, to interpret the different type of presentation of autonomic neuropathy in diabetes mellitus.

Materials and methods: Sixty patients with mean age of 57.7% who had non-insulin dependent diabetes mellitus, varying from one year to fifteen years duration with normal 12 lead electrocardiograph were selected for the study. With standard autonomic function test procedures for both sympathetic and parasympathetic were done with suitable inclusion criteria.

Results: Peripheral neuropathy was observed in 40% (24/60) of patients. In 46.6% (28/60) patients Pupillary changes were observed. In patients with peripheral neuropathy, 95.8% (23/24) had Pupillary changes. Postural hypotension was observed in 36.7% (22/60). The results of various tests of autonomic function are as follows. While interpreting the results all borderline cases were considered as normal. The rise of heart rate less than ten was observed in 40% of study group with mean of 6.94. Among the patients, 36.7% (22/60) had fallen in blood pressure of more than 30 millimeter of mercury.

Conclusion: Newer drugs have to be tried for comforting many diabetics with clinical autonomic neuropathy afflicted with this condition in that at least the quality of life of with diabetic neuropathy will improve.

Key words

Autonomic Nerve Dysfunction, Diabetes Mellitus, Diabetic neuropathy, Cardiovascular Risk.

Introduction

Diabetes mellitus is defined as a group of common metabolic disorders that share the phenotype of hyperglycemia. The factors contributing to hyperglycemia include reduced insulin secretion, insulin resistance, decreased glucose utilization and increased glucose production. Diabetes mellitus is caused by the complex interaction of genetics, environmental factors, and lifestyle choices. The disease has a particular predilection for microvascular complications and tendency for macrovascular complication. Hence diabetes is a metabolic cum vascular disease [1]. Autonomic nervous system involvement in diabetes mellitus was described by Rundles in 1945. The study of autonomic nervous system involvement in diabetes mellitus is of special interest because this appears to have increased mortality. About 50% of patients with autonomic dysfunction of five years duration die of sudden cardiorespiratory arrest. In 20 to 40% of all diabetes mellitus patients, some abnormalities of autonomic function are present [2]. Diabetic autonomic neuropathy can involve both sympathetic and parasympathetic nervous system. Parasympathetic abnormalities appear earlier and sympathetic innervations may remain intact even in presence of severe Parasympathetic damage. Abnormalities in bowel and bladder function and impotence have been ascribed to the involvement of autonomic nervous system in diabetes mellitus [3]. The integrity of the autonomic nervous system can be assessed with several simple tests which are based on cardiovascular reflexes. These tests are dependent on the response of heart rate and blood pressure to a variety of stimuli [4].

Materials and methods

Sixty patients with mean age of 57.7% who had noninsulin dependent diabetes mellitus, varying from one year to fifteen years duration with normal 12 lead electrocardiograph were selected for the study. Clinical signs of cardiac failure

electrocardiograph abnormalities of ischemia arrhythmias were excluded from the study. Those patients who had hypertension congestive cardiac failure ischemic heart disease chronic obstructive pulmonary disease and disease which are known to cause autoimmune dysfunction rheumatoid arthritis leprosy, Gullian-Barre syndrome etc. were excluded from the study. The diabetic control of the patient was achieved with diet, oral anti-diabetic agents. The control group consisted of 10 non-diabetic individuals 6 males and 4 females with mean age of 50.1 % who fulfilled all the criteria and in addition had no family history of diabetes mellitus and no symptoms of autonomic dysfunction. A detailed history physical examination and routine investigations were observed and recorded from all patients as set forth in the pro forma. For parasympathetic system: Heart rate variation to deep breathing, Postural variation of heart rate, Valsalva test. For sympathetic system: Postural variation of blood pressure, Hand grip test.

Results

Patients with duration of diabetes less than five years 4% (1/24) had a sweating abnormality. Patients with duration of diabetes in-between five to ten years 44.8% (13/29) had a sweating abnormality. Patients with duration of diabetes more than ten years 57.1% (4/7) had a sweating abnormality. Nocturnal diarrhea and constipation were observed in 25% (15/60). Correlating with age, 5% (1/19) of patients with age less than 50 had nocturnal diarrhea and constipation. In the age group 50 to 60 nocturnal diarrhea and constipation was found in 27.6% (8/29) Peripheral neuropathy was observed in 40% (24/60) of patients. In 46.6% (28/60) patients Pupillary changes were observed. In patients with peripheral neuropathy, 95.8% (23/24) had Pupillary changes. Postural hypotension was observed in 36.7% (22/60). The results of various tests of autonomic function are as follows. While interpreting the results all borderline cases were

considered as normal. In the study, the mean fall of blood pressure on standing was - 20.86 millimeter of mercury as compared to 9.8 millimeters of mercury in control group. Among the patients, 36.7% (22/60) had fallen in blood pressure of more than 30 millimeter of mercury. Further 26.7% (26/60) of the patient in the study group had borderline fall between 11 and 29 millimeter of mercury. The mean rise in diastolic blood pressure in the study group was 8.14 as compared to 16.4 in control group. Among the patients, 46.7% (28/60) had the rise of blood pressure less than 10 millimeters of mercury. Further 23.3% (14/60) had borderline rise in blood pressure between 10 and 16 millimeter of mercury.

Discussion

Polyneuropathy is predominantly sensory. Clinical features are hyperesthesia, paresthesia, dysesthesia, numbness, tingling sensation, burning that begins in feet and spreads proximally, bilateral glove and stocking loss of sensation, diminished vibration sense, absent ankle jerk, abnormal position sense and ulceration over the ball of the foot [5]. The Autonomic nervous system is an efferent system that innervates vascular and visceral smooth muscle, exocrine and endocrine glands, parenchymal cells throughout the various organ systems in the body [6]. The distribution of blood flow and maintenance of tissue perfusion, regulation of volume and composition of the extracellular fluid, the expenditure of metabolic energy and supply of substrate and the activity of visceral smooth muscle glands. Standing up results in pooling of blood independent part of the body due to effects of gravity [7]. Sympathetic hypotension rare form of orthostatic hypotension of neurogenic origin associated with marked tachycardia when the patient stands [8]. The sympathetic nervous system seems to react normally to postural changes, but there is the impaired response of the effector organ to norepinephrine causing a drop in blood pressure despite the increased pulse rate. Other neurological disorder may also be responsible for

impotence with retention of libido. A disease affecting the spinal cord or with local involvement of parasympathetic plexus prevents the reflex or erection.[9] Some of these are tabes dorsalis, syringomyelia, multiple sclerosis, spinal cord tumors, Pernicious anemia, and myelitis. Vascular disorders such as thrombosis of aortic bifurcation or arteriosclerosis may cause impotence. The equivalent of erectile failure in women is the absence of vaginal lubrication during intercourse. A distinct entity clitoral neuropathy has been reported [10]. This is usually mistaken for candidal vaginitis since it produces paresthesias over genitalia. Adequate control of diabetes and prompt treatment of candidal vaginitis relieves dyspareunia and orgasmic dysfunction [11]. A study of the involvement of autonomic nervous system in 60 patients of noninsulin dependent diabetes mellitus (with age less than fifty 19 patients, 29 patients with age group 50 to 60, and 12 patients with age more than 60) and 10 non-diabetic individuals control reveals the following. In 55% of the patients at least one symptoms of autonomic dysfunction was observed. Good glycemic control will improve gastric function and autonomic neuropathy. Smaller, more frequent meals, fiber-rich, easier to digest, low in fat, will minimize symptoms of gastroparesis [12].

Conclusion

The exact prevalence of autonomic neuropathy in diabetes is precisely not known, however tests of autonomic function have shown impairment in roughly 40 to 50% of diabetic patients. Subclinical autonomic nerve damage occurs more widely in diabetes and may go unnoticed. It is assuming greater importance because of the implications for morbidity and mortality. Symptomatic autonomic neuropathy carries a worse prognosis than any other complication of diabetes. Prevention of autonomic damage with newer drugs, particularly in its earlier stage will reduce the mortality and morbidity significantly. Newer drugs have to be tried for comforting many diabetics with clinical autonomic

neuropathy afflicted with this condition in that at least the quality of life of with diabetic neuropathy will improve.

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