A Clinical Study of Peripheral Vascular Disease in Diabetes Mellitus With Special Reference to Ankle Brachial Pressure Index and Colour Doppler Ultrasonography

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ABSTRACT

Introduction: Diabetes mellitus is known to the human society since antiquity, possibility to the oldest text existing, the Ebers papyrus of Egypt written about 3500 yrs ago. The most appropriate term was given to the disease by Sushruta as `Madhumeha' in the 6th century AD where he made an elaborate account of it in Sushruta Samhita. Present study aimed to know the prevalence and the clinical profile of PVD in patients with DM and to conduct a comparative assessment of the Ankle Brachial Pressure Index and Color Duplex Ultrasonography in PVD patients having DM.
Material and methods: The study was undertaken for a period of one year from 1st July 2005 to 30th June 2006, in the Department of Medicine comprising of patients of diabetes admitted in all the units at Assam Medical College and Hospital, Dibrugarh
Results: The resting ankle brachial pressure index was measured with a hand held Doppler probe to measure the systolic brachial pressure and the systolic ankle pressure in both the limbs. A total of 12 cases showed abnormal ABI of which 2 cases had AB1 less than 0.5, and 8 cases had ABI values between 0.5-0.9.
Conclusion: In our observation, Ankle Brachial Pressure Index (ABI) is a simple, cheap, reliable and reproducible method with high specificity of 97% and positive predictive value of 94.1%. Routine screening of patients of diabetes with ABI may be recommended for early diagnosis and treatment of PVD.

Keywords: Peripheral Vascular Disease, Diabetes Mellitus, Ankle Brachial Pressure, Colour Doppler, Ultrasonography

INTRODUCTION

Diabetes mellitus is an important health problem that is widely prevalent all over the world *and* the prevalence has increased dramatically over the last two decades.[1,2] PVD is associated with high rates of non fatal cardiovascular ischemic events (MI, stroke and other thromboembolic phenomena), increased morbidity and mortality. It is one of the major causes of mortality among the elderly population.[3] Since diabetes itself is a risk factor for atherosclerosis, PVD is also several times more common amongst the diabetes patients compared to non-diabetes[4] It is interesting to note that foot related disorders are one of the commonest causes of hospitalization among patients with DM. Patients of PVD may be asymptomatic or present with intermittent claudication, ischemic rest pain and or gangrene. The signs and symptoms of ischemic develop when the atherosclerotic narrowing of the blood vessels exceeds 70% of the lumen (critical stenosis). In the absence of clinical symptoms and signs in the early stages of the disease, the emphasis of management in patient of PVT) lies in the early detection of the disease so as to prevent or at least reduce the rate of complications. The gold standard for diagnosis of PVD is angiography. However the use of this technique is limited

due to its invasive nature as well as the use of contrast agents which may be harmful in patients with nephropathy and DM. The noninvasive techniques like Ankle Brachial Pressure Index (ABU ABPI) and Duplex ultrasonography are coming to the forefront for early diagnosis of PVD ABI is the ratio of the peak systolic pressure in the ankle and brachial artery. It is a quick, reliable and sensitive method to detect subclinical diseasel4. ABI is inversely proportional to the degree of generalized atherosclerotic narrowing of critical vessels. If the cut off point is taken as 0.9, it is 90% sensitive and specific in detecting angiographically defined diseases.[5] However ABI is less sensitive test in diabetes in the presence *of* detectable peripheral neuropathy. Color Duplex Ultrasound (CL)U) and Color Waveform Doppler combine sonography and Doppler analysis to localize and determine the significance of a stenosis or occlusion. It detects and localizes haemodynamically significant lesions in the aortofemoral segment as effectively as angiography. It is also helpful in localizing high grade stenotic lesions from the iliac to popliteal arteries. A significant number of patients with DM present with various complications every year in Assam Medical College and Hospital, Dibrugarh, This institute has been catering medical treatment to all the districts of Upper Assam including some areas of Arunachal Pradesh, Nagaland, Manipur etc. So far as our knowledge goes, no study has been conducted in this group of the diabetic population to detect PVD as yet. Therefore it is thought appropriate to undertake a study on PVD in patients of diabetes mellitus in Assam Medical College and Hospital, Dibrugarh. The aim was to study the prevalence and the clinical profile of PVD in patients with DM and to conduct a comparative assessment of the Ankle Brachial Pressure Index and Color Duplex Ultrasonography in PVD patients having DM. The prevalence of hypertension is six times more common in diabetes mellitus than normal population

MATERIAL AND METHODS

The study was undertaken for a period of one year in the Department of Medicine comprising of patients of diabetes

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admitted in all the units at Assam Medical College and Hospital, Dibrugarh. A total number of 80 cases of diabetes mellitus were included in the present study.

Inclusion Criteria: All patients suffering from Diabetes mellitus, diagnosed on the basis of past medical history, drug treatment for diabetes (insulin or oral hypoglycemic agents), and/or criteria outlined by the World Health Organization, irrespective of severity, duration of diabetes, presence or absence of chronic complications were taken up for the study. Only Type 2 Diabetes patients were included in the study. Duration or disease, Family history, Habit of smoking, AIcohoI consumption were determined from history and available BMI was determined using by Quetelet Index (Weight in Kg./Height in meter2). Blood pressure was categorized according to JNC-7 (VII) classification. Complication of diabetes mellitus were detected by clinically or by relevant investigation e.g. Fundoscopy, Urine examination, Resting ECG, etc.

Criteria for the Diagnosis of Diabetes Mellitus: Symptoms of diabetes plus random blood glucose concentration 11.1, mmol 1 L (200 mg / dl)Or Fasting plasma glucose > 7.0 mmol 1 L (126 mg 1 dl).Two hour plasma glucose 11.1 mmol 1 L (200 mg 1 dl) during an oral glucose tolerance test. In the absence of unequivocal hyperglycemia and acute metabolic decornpensation, these criteria should be confirmed by repeat testing on a different day. Random is defined as without regard to time since the last meal. Fasting is defined as no caloric intake for at least 8 hour.

Ankle Brachial Pressure Index: Blood pressure recordings were made of posterior tibial pulses in the lower limb by inflating the cuff proximal to the ankle, and the readings were taken as the ankle pressure. The ankle-brachial index (ABI) ratio was calculated in every subject. The criterion for definition of PVD was an ABI < 0.9. The sensitivity and the specificity of the ABI were compared with the presence of atherosclerotic plaques by Colour Doppler. The positive and the negative predictive values for the test were also compared.

STATISTICAL ANALYSIS

Tables were prepared with the help of SPSS version 21. Descriptive statistics were used to generate results.

RESULTS

The present study was conducted among the patients admitted with diabetes in the various units of Department of Medicine, Assam Medical College and Hospital, Dibrugarh. A total of 80 (eighty) patients with Diabetes were evaluated in the present study for the presence of Peripheral Vascular Disease. A total of 16 cases (20%) were smokers while another 8 cases (10%) were addicted to both smoking and alcohol in the present study (total of 24 cases). 13 cases (16.75%) were addicted to alcohol. A majority or the patients (53.75%) did not give history of any history of alcoholism or smoking. 60% of the smokers in the present series had PVD with Diabetes.

Table-1 shows a total of 8 patients (30.8%) who were diabetics for more 6-11years of duration had PVD in the present study. Another 3 cases of PVD were diagnosed in those patients who were diabetics for more than 11 years duration (27.3%). None of the newly diagnosed cases had any evidence of PVD in the

present study.

Table-2 shows that the resting ankle brachial pressure index was measured with a hand held Doppler probe to measure the systolic brachial pressure and the systolic ankle pressure in both the limbs. A total of 12 cases showed abnormal ABI of which 2 cases had AB1 less than 0.5, and 8 cases had ABI values between 0.5-0.9.

Table-3 shows the results of color duplex ultrasonography (CDU) in the cases in both. the limbs. A total of 14 cases (17.5%) were found to have abnormal CDU in the form of atherosclerotic plaques in the blood vessels and calcification of the intimal wall.

DISCUSSION

Diabetes is in the top 5 of the most significant diseases in the developed world. It occurs throughout the world, but is more common (especially type 2) in the more developed countries. The greatest increase in prevalence is, however, expected to occur in Asia and Africa, where most patients will likely be found by 2030. The knowledge of the various complications of diabetes is essential to counter the gloomy forecast of a rapidly expanding diabetes epidemic. Peripheral vascular disease is common in diabetic patients and is responsible for a substantial proportion of morbidity in Diabetes. The purpose of this study was to study the clinical features of PVD in patients with DM and then to investigate the association of ABI and CDU in those patients presenting with DM in Assam Medical College, Dibrugarh, which is a Tertiary Health centre in this part of Upper Assam. To the best of our knowledge, this is the first study of PVD in patients with diabetes that has been done, from this part of India. In the present study 80 patients who presented with DM during the period of 1st July 2005 to 30th June 2006 and agreed to take part in the study were screened for the prevalence of PVD. A total of 14 patients (17.5%) were found to have PVD when Ankle Brachial Pressure Index (ABI) was used as a screening method. A noble approach has been made here to discuss the data recorded already during

Duration	Incidence		
	Number of FVDS	Number of diabetics	Percentage (%)
< 1 Yr	0	9	0
1 Yr -5 yr	3	34	8.8
6 -10 yr	8	26	30.8
> 1 L yr	3	1	27.3
Total	14	80	-

Table-1: distribution of cases of pvd with duration of diabei'es_

ABI	<0.5		> 1
Right	2	8	70
Left	1	10	69
Total	2	10	70

Table-2: Ankle brachial pressure index among the patients

CDU	Right	Left	Bilat	Total
Normal	68	66	66	66
Abnormal	12	14	11	14
Total	80	80	-	80

Table-3: Results of colour duplex ultrasound

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the period of the study. ABI < 0.9 was the cut off was used to define PVD in the present study. A total of 12 cases showed abnormal ABI of which 2 cases had ABI less than 0.5, and 8 cases had A13I values between 0.50.9. The sensitivity of ABI is 71.4% and specificity is 97%. Thus 4 patients (28.6%) would not have been diagnosed if ABI was used alone for diagnosis of PVD. Conversely, 2 of the 12 cases diagnosed to be PVD based on ABI was classified as normal by CDU. The positive predictive value of ABI was found to be 83.3% and the negative predictive value was 94.1%.Earlier studies have suggested ABI as a reliable method for diagnosis of PVD and ABI value of <0.9 has a sensitivity of *95%* compared to angiography. ABI has also been considered as a marker for increased risk of systemic vascular disease and has been shown to be a good predictor for coronary artery disease. Recent improvements in the field of imaging have introduced CDU scanning for diagnosis of PVD. The Doppler technology is very helpful for detection and grading of atherosclerotic plaques in the arteries. Premalatha G et al reported a specificity and sensitivity for ABI as 88.5% and 70.6% respectively. The positive predictive value in their study was 94.1% and- the negative predictive value was 53.4% in their series.[6] In India the prevalence of PVD among South Indian Diabetes was reported to be 6.3 compared to Caucasians (Fowler FGR et al, Mohan V et al).[7,8] A recently published study of National Urban Diabetes by Ramachandran A. et al observed the maximum number of individuals was diagnosed to **have** diabetes between the ages of 40 and 59.[9] Rao P.V et al found that the prevalence of hypertension is six times more common in diabetes mellitus than normal population.[10,11]

CONCLUSION

From the present study it can be concluded that peripheral vascular disease in Diabetes Mellitus is more commonly associated than is generally believed. Atherosclerosis of the peripheral vessels is also associated with generalized atherosclerotic changes in the coronary and vascular beds. It is also associated with significant mortality and morbidity. Hence early detection of peripheral vascular diseases should be attempted to evaluate a proper treatment guideline for patients with diabetes.

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