Assessment of Carotid Intimal Thickness in Type 2 Diabetes Mellitus Patients by high resolution USG machine

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ABSTRACT

The aim of this study is to evaluate carotid intimal thickness in patients of type 2 diabetes mellitus by high-frequency ultrasonography machine. One hundred patients of type 2 diabetes mellitus were taken. The intimal-medial thickness (IMT) of carotid artery was observed by high-frequency ultrasound. Out of the total subjects included in the study 60% had IMT values in range of 0.5-1.0mm; 24% had 1.1-1.5mm; 12% had between 1.6-2.0mm and 4% had in between 2.1-2.5mm. This study shows a positive correlation of IMT with female sex. Although studies shows that male diabetics have greater mean IMT (1, 2). This error may due to increased number of female subjects included in the study. Our study showed that BMI had no correlation with IMT. Duration of diabetes has a definite correlation with CIMT (3). The relationship between CIMT and duration of diabetes have been illustrated well in other studies also (4, 5). The mean IMT of those patients who took OHA was 1.23+0.30. The mean IMT of patients who took Insulin was 1.41+0.20 The mean IMT of subjects who took OHA+ Insulin was 1.68+0.14.Thus showing a definite correlation between type of treatment taken with IMT. The mean IMT of subjects who smoked in the study was 1.47±0.07.and alcoholic subjects was1.18±0.05. Thus showing a positive correlation of IMT with habit of smoking. Mean IMT of 0.94+0.56 had Fasting LDL levels less than 100. Mean IMT of 1.48+0.52 had Fasting LDL levels in range of 100-130. Mean IMT of 1.62+0.34 had Fasting LDL levels in range of 130 thus showing fasting LDL level were correlated with IMT.

1. Introduction

Diabetes mellitus is associated with vascular abnormalities in human subjects, and atherosclerosis is regarded as the leading cause of morbidity and mortality in diabetic patients (8). Several biochemical parameters including soluble vascular cell adhesion molecule1, sialic acid, C-reactive protein, and fibrinogen have been proved to be significantly associated with atherosclerosis (9). And those parameters were believed to indicate endothelial dysfunction and chronic inflammation which support a hypothesis that it increases generalized vascular damage which may promote atherosclerosis (10). But the underlying mechanism is still unclear. High-frequency B-mode ultrasonography is a noninvasive method of detecting carotid artery wall and provides measurement of intima-media thickness (IMT). The IMT is significantly higher in diabetic patients than that in non diabetic patients (11). And the increased IMT can predict future events of silent brain infarction and coronary heart disease in the patients of type 2 diabetes mellitus (12, 13). Carotid artery plaque is another marker of systemic subclinical atherosclerosis. But the previous reports showed the inconsistent associations among IMT, plaque, risk factors, and clinical disease (14). In addition, the reported results of the relationship between smoking, alcohol, insulin, oral hypoglycemic agents and carotid IMT is also different. Therefore, in this study we sought to clarify the relationship between different parameters and markers of carotid atherosclerosis including IMT and plaque in type 2 diabetic patients.

2. Materials and Methods

2.1. Participants

This study included 100 patients of type 2 diabetes mellitus in the Department of Medicine in IPD, OPD and in emergency in Rohilkhand Medical College and Hospital, Bareilly (UP), India. Type 2 diabetes mellitus was diagnosed according to the 1999 World Health Organization criteria. The Ethics Committee of the Medical College and Hospital approved the study. All patients gave their informed consent to participate in the study.

2.2. Carotid Artery Ultrasonography

Carotid artery ultrasonography was performed and were examined in the supine position with the head turned 45° contra lateral to the side of scanning. B-mode images were obtained in longitudinal section. IMT was defined as the distance between the lumen-intima and the media-adventitia ultrasound interfaces. The IMT on the far wall of the bilateral common carotid artery was about 10 mm proximal to the bifurcation of the carotid artery was measured manually as previously described (15). Three measurements on both sides were performed for each patient and the mean value was obtained for analysis. A high degree of reproducibility was shown in paired CIMT measurements in the same arteries and an intra class correlation coefficient was 0.93. The presence of plaque was defined as an area of focal wall thickening >50% greater than surrounding wall thickness confirmed by marking and comparing plaque thickness with the thickness of the surrounding wall during scanning by electronic calipers. Furthermore, the plaques were classified into three types: calcified plaques (hyperechogenic), dense plaques (less hyperechogenic than calcified lesions), and soft plaques (isoechogenic in comparison with blood), based on their echogenic properties according to the criteria established by Johnson et al (16).

2.3. Laboratory Parameters

The following laboratory parameters were obtained: total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL), high density lipoprotein (HDL), hemoglobin A1c (HbA1c), fasting plasma glucose (FBG). Serum concentrations of TC, TG, LDL, HDL, and FBG were measured by enzymatic method. HbA1C was measured by high performance liquid chromatography. Body mass index (BMI) was calculated as weight in kilograms divided by height in meter squared. All the measurements were performed very carefully.

2.4. Statistical Analysis

Statistical analysis was done by estimating the prevalence rate of diastolic dysfunction and co-relating with the demographic variables like age and sex and its application to clinical practice. All data were analyzed by using statistical package for social sciences (SPSS) version 17.3 for windows. Chi-square, and Analysis of variance (ANOVA) test was used to find the significance of proportion of diastolic dysfunction and carotid intima media thickness in the diabetic patients. Correlation analysis including

Pearson's for continuous and Spearman's for discrete variables and multiple linear stepwise regression analysis was used to show the influences of variables on IMT.

3. Results

The present study was done in Rohilkhand Medical College and Hospital Bareilly; with the inclusion of subjects from OPD/IPD and having no symptoms of Diabetes. The age of the patients varied from a minimum of 35 years to a maximum of 75 years. The mean age of the patients was 53.05±10.72. Among the total of 100 patients 40% were males and 60% were females. In the study group 22 % were smokers and 18% were alcoholic. In the study group duration of diabetes was found in < 5 years in 56%, 5-10 years in 42% & only 2% were >10 years. In the group 80% patients were on OHA, 13% patients were on Insulin and 7% patients were on both OHA and insulin. Most of the patient were having BMI in range 20-25kg/m^2 is 37% & 26-30 kg/m^2 is 39%. Only 8% patient have BMI 20kg/m^2 & 16% BMI was >30kg/m^2. 71% patients have Serum Cholesterol ≤ 200 & 29% was > 200. Serum HDL ≤ 40 in 43% patients & > 40 in 57%. 38 patients i.e. (38%) have serum LDL <100, 49% have 100-130 & 13% have > 130, 29% patients were having FBS in 101-150 range, 27% was in 151-200 range.. In 30% of patients PPBS were in 201-250 range, 17% were in 151-200 range, 16% were in 251-300 range,15% were in 301-400 range & 13 % patients were in 101-150 range.

4. Discussion

Our study has its limitations i.e, the study population is small and some type 2 diabetic patients have already been treated for diabetes and hyperlipidemia which may lead to inaccuracy of the results. This study shows a positive correlation of IMT with female sex. Although studies shows that male diabetics have greater mean IMT. This error may due to increased number of female subjects included in the study. Our study showed BMI had no correlation with IMT. Duration of diabetes has a definite correlation with CIMT. The study shows a definite correlation between type of treatment taken with IMT. It shows a positive correlation of IMT with habit of smoking. This shows that fasting LDL level were correlated with IMT and fasting TG level were correlated with IMT.

5. Conclusion

This study describes the sonographic evaluation of the intima-media thickness and the relationship between the intima-media thickness and certain physical and biochemical parameters were evaluated. It was seen that the mean intima-media thickness of the diabetic group was significantly high. It was seen that as the duration of Type-2 Diabetes Mellitus increased, there was a corresponding increase in the intima-media thickness. The study showed a significantly higher Intima-media thickness among individuals who smoke and who consume alcohol. Diabetic patients who were being treated with insulin had a significantly higher Intima-media thickness compared to those treated with diet control /oral hypoglycaemic agents. Our data showed that there is a significant association between different aggravating factors and IMT which is regarded as the early sign of carotid atherosclerosis in type 2 diabetic patients. It helps us not only to detect early atherosclerosis but to prevent further development of diabetic nephropathy and cardiovascular events by applying more intensive therapy. However, larger and further studies are needed to confirm our results.

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