ORIGINAL ARTICLE

A STUDY ON CORRELATION OF CAROTID INTIMA AND MEDIA THICKNESS WITH STRESS ECG AND 2D ECHO IN TYPE 2 DIABETES MELLITUS PATIENTS IN TERTIARY CARE HOSPITAL OF PUNE CITY

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ABSTRACT

Background: The atherosclerotic process in diabetes mellitus causes intimal thickening and luminal narrowing. The present study was conducted with an objective to study correlation of Carotid Intima and Media Thickness with Stress ECG and 2D Echo in type 2 DM.

Methodology: This cross-sectional study was conducted on cases of asymptomatic type 2 DM. A detailed history was taken and clinical examination consisting of all diabetic manifestations including carotid bruit and other peripheral vascular disease was noted. All patients were subjected to necessary laboratory investigations, stress ECG and 2D Echo.

Results: Among the 50 DM cases, there was no significant correlation found between CIMT and Age (P value>0.05). There was significant correlation found between CIMT (group ≤0.9 - ≥0.7) with sex and duration of DM with p value <0.05. There was significant correlation found between CIMT (group ≤0.9 - ≥0.7) with BMI, Waist Circumference, Waist to Height Ratio with p value <0.05. There was no significant correlation found between CIMT and 2D Echo findings at p value >0.05.

Conclusion: We concluded from this study that CIMT could be positively correlated with sex, duration of DM, BMI, Waist Circumference, WHR, BSL, and HbA1c. However, CIMT could not be correlated with age, urine protein, diabetic retinopathy, and 2D Echo findings.

Keywords: Type 2 Diabetes Mellitus, carotid intima and media thickness, 2D Echo

INTRODUCTION

Diabetes Mellitus (DM) is characterized by chronic hyperglycemia with disturbances of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action, or both.[1] In etiologic classification-it's mainly divided in type 1 DM and type 2 DM. Type 2 DM is most common form of diabetes. Most patients with type 2 DM are obese when they develop DM and obesity aggravates insulin resistance. The risk of Type 2 DM increases with age, obesity, hypertension, dyslipidemia and physical inactivity. Dyslipidemia is responsible for atherosclerosis which causes macro vascular complications and micro vascular vasculopathy.[2]

Atherosclerosis involves several processes starting in the artery wall and ultimately leading to impaired blood flow to the cardiac muscle, brain, peripheral organs, causing ischemia, or infarction. The athero-sclerotic process causes intimal thickening and luminal narrowing. The rupture of the overlying intima or endothelial erosion leads to exposure of the atherosclerotic lesion contents to platelets and initiates thrombosis.[1]

Some non invasive tools have been shown to be clinically useful to obtain measures of arterial function and morphology, including measurement of Carotid Intima and Media Thickness (CIMT), stiffness, pulse wave velocity and arterial compliance. However, there are very limited studies reporting CIMT and stiffness measurement in Indians who differ from the western population in cardiovascular risk profile, morbidity, and mortality.[3] The present study was conducted with an objective to study correlation of Carotid Intima and Media Thickness with Stress ECG and 2D Echo in type 2 DM.

METHODOLOGY

The present study is the cross-sectional study conducted on cases of asymptomatic type 2 DM cases admitted to Medicine section (OPD and Wards) of Dr.D.Y.Patil Medical College, Hospital and Research Centre, Pimpri, Pune. The study was conducted from period of August 2013 to September 2015. The diagnosis of type 2 DM was established in patients ≥40 years of age by fasting plasma sugar >126mg/dl or random/postprandial plasma sugar >200mg/dl or HbA1c >6.5 in cases having symptoms of polyuria and polydipsia. A pre-designed semi-structure questionnaire was utilized for data collection. A detailed history was taken and clinical examination consisting of all diabetic manifestations including carotid bruit and other peripheral vascular disease clinically was noted. All patients were subjected to necessary laboratory and radiological investigations. The cases with Type 1 DM, Hypertension, Dyslipidemia, Cardiomyopathy, Pericardial diseases, Existing Ischemic Heart Disease, Rheumatic Heart Disease, Large and medium vessel vasculitis, both primary and secondary, known smokers and/or tobacco chewers, known ECG abnormalities like conduction disturbances, Pre Excitation syndrome, Patients already on statins and anti platelets drugs are excluded from the study. Institute Ethics committee clearance was obtained before starting the study. Written informed consent was taken from all patients involved in the study.

RESULTS

There were 50 cases of type 2 Diabetes mellitus included in the present study. Relationship between age, gender and duration of diabetes with CIMT is shown in Table 1. There was no significant correlation found between CIMT and Age with P value>0.05. There was significant correlation found between CIMT (group ≤0.9 - ≥0.7) with sex and duration of DM with p value <0.05.

Table 1: Age, gender and duration of diabetes distribution among study participants

Variable	CIMT ≤0.9-≥0.7	CIMT<0.7	Total	P value
Age (Yrs)				
40 – 49	11	8	19	>0.05
50 – 59	6	5	11	
60 – 69	10	6	16	
>69	3	1	4	
Sex				
Male	21	8	29	<0.05
Female	9	12	21	
Duration of DM				
<1	5	5	10	<0.001
1 – 5	6	13	19	
≥ 6	19	2	21	
Total	**30**	**20**	**50**	

Table 2: Distribution of cases according to physical parameters

Parameter	CIMT ≤0.9-≥0.7 (n=30) Mean±±SD	CIMT<0.7 (n=20) Mean±SD	p-Value
Body Mass Index	29.13±4.67	26.58±3.15	<0.05
Waist Circumference	90.27±7.48	83.95±7.99	<0.01
Hip Circumference	99.83±4.078	100.95±3.953	>0.05
Waist to Hip Ratio	0.91±0.081	0.83±0.083	<0.005

Table 3: Laboratory profile of the cases

Parameter	CIMT≤0.9 – ≥0.7 (n=30) Mean±SD	CIMT<0.7 (n=20) Mean±SD	p-Value
BSL-fasting	181.37±33.303	159.90±20.807	<0.05
BSL-PP	307.80±73.104	257.60±37.867	<0.01
HbA1c	8.29±1.116	7.24±0.537	<0.005

Table 4: Urinary protein level of the cases

Urine protein	CIMT ≤0.9 - ≥0.7	CIMT<0.7	Total
1+	20	10	30
2+	3	0	3
3+	1	0	1
Normal	6	10	16

P value >0.05

Table 5: Association between diabetic retinopathy and CIMT

Retinopathy	CIMT ≤0.9-≥0.7	CIMT <0.7	Total
Proliferative Diabetic Retinopathy	2	0	2
Non-proliferative Diabetic Retinopathy	23	11	34
Normal	5	9	14
Total	30	20	50

P value >0.05

Table 6: Association between 2D ECHO and CIMT

2D ECHO finding	CIMT ≤0.9-≥0.7	CIMT <0.7	P-Value
Mild Conc LVH	2 (6.67)	4 (20)	>0.05
AVS	3 (10)	1 (5)	>0.05
MAC	2 (6.67)	1 (5)	>0.05
Diastolic dysfunction	1 (3.33)	0	>0.05
RWMA	0	0	
Normal	24	16	

There was significant correlation between CIMT (group ≤0.9 - ≥0.7) with BMI, Waist Circumference, Waist to Height Ratio with p value <0.05 (Table 2)

There was significant correlation found between CIMT (group ≤0.9 - ≥0.7) with BSL-fasting, BSL-PP and HbA1c at p value <0.05 (Table 3). There was no significant correlation found between CIMT (group ≤0.9 - ≥0.7) with Urinary protein secretion at p value

<0.05 (Table 4). There was no significant correlation found between CIMT (group ≤0.9 - ≥0.7) with diabetic retinopathy at p value <0.05 (Table 3)

There was no significant correlation between CIMT and 2D Echo findings at p value >0.05 (Table 6)

DISCUSSION

In our study, we observed cases with duration of diabetes grouped as duration <1 yr, 1-5 years, and 6 years and above, with mean duration of 4.68 years. There was significant correlation between CIMT and duration of diabetes, with p value of 0.001. Robin et al[4]observed that the CIMT increased with the duration of diabetes with a significant p value of 0.02. Similar results were obtained in a Chennai based study and Mohan Rema et al[5]who observed increase in CIMT with increasing duration of diabetes.

There was significant correlation observed between CIMT and BMI with p value <0.05. But no significant correlation was observed between Body Mass Index and carotid CIMT in similar studies by R Gayathri[6] and Tanmay Jyoti Sau[7]. The CIMT was found to be higher among those with central obesity as assessed by the waist circumference and waist-hip ratio with a significant P value of <0.01 and <0.005 respectively. R Gayathri et al[6] observed waist hip ratio to be an independent determinant of CIMT. Frouse et al[8] also demonstrated positive correlation between WHR and carotid wall thickening.

There was significant correlation found between CIMT and BSL-F and BSL-PP with p value <0.05 and <0.01 respectively.R Gayathri et al[6] observed significant correlation between BSL-F and CIMT. Thomas R Einarson et al[9], demonstrated significant correlation between BSL-PP and CIMT.However, Bernd Kowall et al[10] did not find any correlation between BSL and CIMT. There was significant correlation found between CIMT and HbA1c with p value <0.05.Similar observations were found in a studies conducted by Matsumoto et al[11] and R Gayathri.[6]

There was no correlation found between CIMT and 2D Echo findings with p value >0.05.Adler et al[12] showed significant association between the presence and severity of MAC and aortic atheroma.Luca Sgorbini[13] found significant correlation between CIMT and MAC values.A similar study[14] showed a strong association between aortic valve sclerosis and systemic endothelial dysfunction which was evaluated by ultrasonography of the brachial artery.

CONCLUSION

We concluded from this study that CIMT could be positively correlated with sex, duration of DM, BMI, Waist Circumference, WHR, BSL, and HbA1c. However, CIMT could not be correlated with age, urine protein, diabetic retinopathy, and 2D Echo findings. A large population study is recommended to find out the prevalence of asymptomatic Coronary artery disease amongst type 2 DM with CIMT >0.9mm.

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