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Cardiology

CAROTID INTIMA – MEDIA THICKNESS AS PREDICTOR OF SEVERITY OF CAD IN STABLE ISCHEMIC HEART DISEASE PATIENTS

Dr. K. Vinoth	MD, Cardiology Department, Government Kilpauk medical College & Hospital/Tamilnadu Dr.M.G.R Medical University, India
Prof. Dr .M. A. Arumugam	MD, DM, Professor & H.O.D Cardiology Department, Government Kilpauk medical College & Hospital/Tamilnadu Dr.M.G.R Medical University , India

ABSTRACT

Background: Cardiovascular-related deaths are the leading cause of death both in India and worldwide. Advanced stage of involvement is often present in atherosclerotic disease at the time of onset of clinical findings. Many significant changes occur in the arterial wall, including endothelial dysfunction and an increase in intima-media thickness, before the onset of clinical findings, and these changes can be useful in the early diagnosis of atherosclerosis. In the current study, we aimed to investigate the relationship between carotid intima-media thickness (CIMT) and coronary artery disease (CAD) in patients evaluated by coronary angiography for suspected CAD. **Materials and methods:** In this Prospective Observational study including 200 patients admitted with stable ischemic heart disease over the period of 6 months. After coronary angiography, patients were divided into two groups according to the results: group 1 (78 patients) without a noncritical coronary lesion, and group 2 (122 patients) having at least one lesion more than 50% within the main branches of the coronary arteries. All of the patients underwent B mode carotid ultrasound examination for measurement of the CIMT by our Radiology department blinded to the angiographic data. **Results:** The mean CIMT was 0.80 ± 0.18 mm in Group 1, while it was 1.52 ± 0.30 mm in Group 2 (p = 0.001). The mean CIMT in patients with single vessel disease, multi-vessel disease, and leftmain coronary artery disease were significantly higher compared to Group 1 (1.32 ± 0.25 mm, p =0.02; 1.55 ± 0.34 mm, p = 0.001; and 1.78 ± 0.32 mm, p = 0.0001, respectively). Logistic regression analysis identified CIMT (OR 4.3, p < 0.001) as the most important factors for predicting CAD. **Conclusion:** The findings of this study show that increase in CIMT is associated with the presence and extent of CAD and help to classify substantial proportion of intermediate CV risk Patients. Hence Carotid Doppler ultrasonography can be utilized as a valuable screening tool due to its several advantages, including ease of application, reproducibility, low cost and strong correlation with atherosclerosis.

KEYWORDS :

I. INTRODUCTION

Cardiovascular-related deaths are the leading cause of death both in India and worldwide. Advanced stage of involvement is often present in atherosclerotic disease at the time of onset of clinical findings. There is no clear investigational modalities in to detect disease in early stage of disease. Many significant changes occur in the arterial wall, including endothelial dysfunction and an increase in intima-media thickness, before the onset of clinical findings, and these changes can be useful in the early diagnosis of atherosclerosis. After the first report of intima-media thickness measurement by Pignoli et al., rapid progress has been noted in ultrasonographic imaging methods and carotid intima-media thickness (CIMT) has begun to be used as an inexpensive,reliable, and reproducible method in the diagnosis of atherosclerosis.

II. MATERIALS AND METHODS

This prospective observational study was carried out on stable ischemic heart disease patients of Department of Cardiology at Government Kilpauk Medical College and Hospital, Chennai, Tamilnadu from January 2023 to June 2023. A total 200 adult subjects (both male and females) were included for this study.

Study Design: Prospective observational study

Study Location: This was a tertiary care teaching hospital based study done in Department of Cardiology at Government Kilpauk Medical College and Hospital, Chennai, Tamilnadu .

Study Duration: January 2023 to June 2023.

Sample size: 200 patients.

Sample size calculation: study subjects are chosen based on convience sampling

Subjects & selection method:

The study population was drawn from stable ischemic heart disease patients came to cardiology outpatient clinic, Government kilpauk medical college and hospital period from January 2023 to June 2023. All patients undergone coronary angiography and Carotid intima-media thickness (CIMT) measurements. Relationship between coronary angiography features and CIMT was analysed in this study.

Inclusion criteria:
1. stable angina pectoris
2. Ishemia on exercise stress test

Exclusion criteria:
1. previous myocardial infarction
2. previous PCI (stemi & nstemi)
2. coronary artery bypass graft surgery
3. stroke

Procedure and methodology

After written informed consent was obtained, a well-designed questionnaire was used to collect the data of the recruited patients. The questionnaire included socio-demographic characteristics such as age, gender, risk factors with Comorbidities, and smoking were included.

Angiographic findings like without significant coronary disease (group1) and with significant coronary artery disease (gropu2). Those with significant CAD are subgrouped as single vessel, double vessel, triple vessel and left main disease.

All study subjects undergone carotid intima-media thickness (CIMT) measurement by B mode carotid ultrasound. CIMT was measured in right and left common carotid artery 1cm proximal to carotid bifurcation and average value of both taken.

Relationship between CAD severity and CIMT was done and

interpretated.

Statiscal analysis
All of the statistical analyses were performed using SPSS19.0 (SPSS Inc., Chicago, USA). ODDS ratio was used to measure relationship of CIMT with CAD and other risk factors. The level $P < 0.05$ was considered as the cutoff value or significance.

III. RESULTS
The mean CIMT was 0.80 ± 0.18 mm in Group 1, while it was 1.52 ± 0.30 mm in Group 2 (p = 0.001). The mean CIMT in patients with single vessel disease, multi-vessel disease, and left main coronary artery disease were significantly higher compared to Group 1 (1.32 ± 0.25 mm, p = 0.02; 1.55 ± 0.34 mm, p = 0.001; and 1.78 ± 0.33 mm, p = 0.0001, respectively). Logistic regression analysis identified CIMT (OR 4.3, p < 0.001) as the most important factors for predicting CAD.

Table No.1

CHARACTERSTICS	GROUP- I	GROUP- II	P Value
AGE	57+_9	61+_10	NS
GENDER	22 (28%)	44 (36%)	NS
BMI Mean + SD	23	25	NS
SMOKING	21 (26%)	57 (46%)	NS
HYPERTENSION	28 (36%)	60(49%)	0.01
DIABETES	8 (10%)	38 (31%)	0.01
HYPERLIPIDEMIA	14 (18%)	50 (41%)	0.01

Among Table No.1 shown the demographic characteristics of both groups are presented. Mean age in group 1 and group 2 was 57 years and 61 years, respectively. The mean BMI in group 1 and group 2 was 23 and 25, respectively. There were significantly more hypertensive, diabetic, hyperlipidemic patients in Group 2 (p < 0.05).There were no significant differences between the twogroups in terms of age, gender and smoking.

Table No.2 Coronary Angiographic Features Of Study Subjects

Angio graphic findings	No.of Person
1. Without CAD (group 1)	78
2. With CAD (group 2)	122
2a. Single vessel disease	38
2b. Double vessel disease	42
2c. Triple vessel disease	34
2d. Left main disease	8

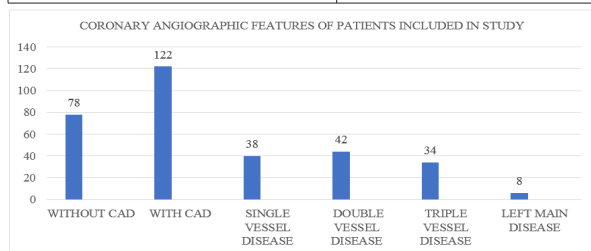CORONARY ANGIOGRAPHIC FEATURES OF PATIENTS INCLUDED IN STUDY

Table No.2 shown, Among 200 study subjects, 78 are without significant coronary artery disease and 122 are found to be significant coronary artery disease. Among CAD groups single vessel disease, double vessel disease, triple vessel disease and left main disease were 38, 42, 34 and 8, respectively. Those with double and triple vessel disease groups combined and called as multivessel disease group.

Table No.3 Coronary Angiography And Cimt Correlation

	CIMT in GROUP 2	CIMT in GROUP1	P Value
SINGLE VESSEL DISEASE	1.32 ± 0.25 mm	0.80 ± 0.18	0.02
MULTIVESSEL DISEASE	1.55 ± 0.34 mm	0.80 ± 0.18	0.001
LEFT MAIN DISEASE	1.78 ± 0.32 mm	0.80 ± 0.18	0.0001

Table No.3 shown, The mean CIMT was 0.80 ± 0.18 mm in Group 1, and 1.52 ± 0.30 mm in Group 2 (p = 0.001). The mean CIMT was statistically significantly higher in the groups with single vessel disease, multi-vessel disease, and left main coronary artery disease compared to Group 1 (1.32 ± 0.25 mmp = 0.02; 1.55 ± 0.34 mm, p = 0.001; and 1.78 ± 0.32 mm, p= 0.0001, respectively).

Table No.4

VARIABLES	P- VALUE	ODDS RATIO
CIMT > 1.0	0.0001	4.2
HYPERTENSION	0.039	2.5
DIABETES	0.043	1.6
HYPERLIPIDEMIA	0.591	1.592

Table no.4 shown, A logistic regression model was created using variables that were significantly associated with CAD on univariate analysis, CIMT (>1.0 mm), hypertension, diabetes, and hyperlipidemia. Backward stepwise analysis on this model identified CIMT (OR 4.3, p < 0.001) and hypertension (OR 2.4,p = 0.04) as the most important factors for predicting CAD. Diabetes (OR 1.6 , p= 0.04) and Hyperlipidemia (OR 1.592 ,p= 0.591) are other factors associated with CAD.

IV. DISCUSSION
Interventional and non-interventional methods to detect atherosclerosis are widely used in clinical practice. CIMT measurement has been recommended by the American Heart Association as the most useful method to identify atherosclerosis. CIMT can be measured by B-mode ultrasonography. There are several prospective epidemiologic studies including the Atherosclerosis Risk in Communities(ARIC) Study and the Cardiovascular Health Study (CHS), which have supported a direct correlation of CIMT with myocardial infarction and stroke risk in patients without cardiovascular disease history. The ARIC Study was conducted in 15,792 individuals between 5 and 65 years of age in 4 different regions of the USA between 1987 and 1989. The baseline CIMT was measured and measurements were repeated at 4-7 year intervals by carotid B mode ultrasonography in this study. An increase in CIMT was correlated with an increased risk for CAD. The CHS was initiated in 1988, and the relationship of CIMT with risk of myocardial infarction and stroke was investigated in 4,476 subjects ≤65 years of age. At the end of approximately 6 years of follow-up, CIMT measurements were correlated with cardiovascular events.

Paroiartérielle et Risque Cardiovasculaire in Asia Africa/ Middle East and Latin America (PARC-AALA) is another important large-scale study, in which 79 centers from countries in Asia, Africa, the Middle East, and Latin America participated, and the distribution of CIMT according to different ethnic groups and its association with the Framingham cardiovascular score was investigated. Multi-linear regression analysis revealed that an increased Framingham cardiovascular score was associated with CIMT, and carotid plaque independent of geographic differences.

In the Rotterdam study, Bots et al. [15] followed 7,983patients >55 years of age for a mean period of 4.6 years,and reported 194 incident myocardial infarctions within this period. CIMT was significantly higher in the myocardial infarction group compared to the other group. Study by Ugur Coskun et al showed CIMT was higher inpatients with significant CAD than in patients with non-critical coronary lesions. Regression analysis revealed that thickening of the mean intima-media complex more than1.0 was predictive of significant CAD in our patients. There was incremental significant increase in CIMT

with the number coronary vessel involved.

The present study showed CIMT was higher in patients with significant CAD than in patients with non-significant coronary lesions. CIMT screening can help to reclassify a substantial proportion of intermediate cardiovascular risk patients into a lower or high risk category. Regression analysis revealed that CIMT more than 1.0 was predictive of significant CAD in our patients. There was incremental significant increase in CIMT with the number coronary vessel involved.In accordance with the literature, We found that CIMT was significantly higher in the presence of CAD. CIMT was increased as the number of involved vessels increased and the highest CIMT values were noted in patients with left main coronary involvement.

V. CONCLUSIONS

The findings of this study show that increase in CIMT is associated with the presence and extent of CAD and help to classify substantial proportion of intermediate CV risk Patients. Also CIMT is positively correlated with the number of vessels involved in CAD. Hence Carotid Doppler ultrasonography can be utilized as a valuable screening tool due to its several advantages, including ease of application, reproducibility, low cost and strong correlation with atherosclerosis.

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