

## Association of Carotid Intima Media Thickness with the Severity of Coronary Artery Disease

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### ABSTRACT:

#### BACKGROUND:

Nevertheless, of a number of prevention schemes, coronary artery illness continues to exist as the leading cause of death worldwide disease. Within this context, Intima media thickness is believed to have a key role in the atherosclerosis initiation. The development of ultrasound machines, advances in echocardiographic devices with great determination transducers facilitate total study of carotid –intima media thickness (C-IMT).

#### OBJECTIVE:

To investigate the relationship of Carotid Intima Media Thickness with the severity of coronary vessels illness.

#### PATIENTS AND METHODS:

Through the sections of a cross sectional multicenter diagnostic accuracy survey assessing C-IMT in a total of one hundred thirty two patients preselected to undergo coronary angiography. For this purpose, patients' demographic data and the disease- associated risk factors were evaluated. Two dimensional transthoracic echocardiographic measurements were done. Furthermore, C-IMT measurements were obtained as it specified by the American society of echocardiography (ASE). Consequences of the study sample as all were revised according to angiographic findings.

#### RESULTS:

In the present study, a total of 132 patients, of them 72 patients were included in the CAD group while 60 patients with no CAD served as control. The most important risk factors for CAD are modifiable, while family history of CAD ( a non- modifiable risk factor) was not significant (P value=0.348). There was direct and significant correlation between C-IMT and severity of CAD. ROC analysis for validity of C-IMT to discriminate between multiple vessels disease and no vessel involvement is excellent (AUC= 0.961, cut point > 1.04mm, sensitivity=92.9%. specificity=86.7%). C-IMT is fair to discriminate between single vessel disease and no vessel involvement (AUC=0.738, cut point > 0.84mm, sensitivity 100%), so if correlated with age, C-IMT above 0.84 is utilized as can be used as a detached theme to guessing of CAD.

#### CONCLUSION:

C-IMT is simple, inexpensive and reproducible parameter that is utilized to be showing aid to the presence and severity of CAD particularly earlier indications showing in great danger for sick people.

**KEYWORDS:** Carotid Intima- Media Thickness, Coronary Artery Disease, Echocardiography.

### INTRODUCTION:

#### Carotid Intima Media Thickness (CIMT) and Atherosclerosis

Pignoli and others (1986), stated that ultrasound picturing to evaluate IMT of carotid supply routes.<sup>[1]</sup> Salonen (1991) stated that the in vivo utilizing of ultrasound picturing for the assessment of atherosclerotic alternates within the carotid supply routes. picturing of Ultrasound

gives data on IMT, the nearness and sort of plaque, calcification and divider breadth. Those data empower evaluation of presymptomatic injuries, atherosclerotic burden, and diminishes passing and inabilities from cardiovascular illness (CVD).<sup>[2]</sup> CIMT of the common carotid course (CCA) has way better reproducibility than inner carotid course (ICA) or carotid bifurcation due to its ease of get to and vicinity to the surface and runs generally parallel to the skin.<sup>[2]</sup> The major advantage of CIMT estimation is that it is totally non-invasive and can be rehashed as regularly as necessary.<sup>[3]</sup>

The improvement of Doppler ultrasound technologies, progressed working computer

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program, and tall determination transducers encourages total investigation of the (IMT) within the fringe vessels—in other words, the carotid and femoral supply routes. Thickening of the intima-media is commonly perceived as the starting arrange within the development of atherosclerosis. Hence, early location of CAD may perhaps demonstrate to be instrumental in presenting successful treatment and may contribute to lessening mortality, for illustration, through plaque stabilization and more forceful control of atherosclerotic hazard variables.<sup>[3, 4]</sup>

Measurement of the carotid artery intimal plus medial thickness has been shown to stratify cardiovascular (usually myocardial infarction) risk.<sup>[5]</sup> The threshold of greater than 1 mm or less than 1 mm of IMT has variable prediction of risk. Measurement of the far wall is preferred over use of the near wall.<sup>[6]</sup>

Atherosclerosis may be an unremitting situation which tightens courses by building fat-filled bulges within the blood vessel dividers. These bulges are called atherosclerotic plaques. In a few individuals, the plaques in the long run break open and the substance cause blood clots. If these clots are cleared into the circulatory system, they can hold up within the littler supply routes downstream and totally square blood stream past that point. In case the blood supply remains blocked for a half hour or more, the muscle of the heart cells will start to die.<sup>[7]</sup>

It is assessed that in case all shapes of major CVD were dispensed with, life hope would rise by nearly 7 a long time.<sup>[8]</sup> On the other hand, atherosclerosis is a known predisposing factor for CVD, which in turn contains a long asymptomatic idle time .thus providing a chance to interventions.<sup>[7]</sup>

### Coronary arteriography

Cardiac catheterization (coronary angiography or angiogram) was the foremost authoritative

strategy and in fact the ‘gold standard’ for determination of greatest cardiac cases.<sup>[9]</sup>

It decides the nearness, area and seriousness of coronary course illness. In any case, its great cost, risk of death (almost 0.1%), and morbidity (1%–5%) constrain its utilizing as a schedule screening as well.<sup>[10]</sup>

### AIM OF THE STUDY:

Investigating the correlation of C-IMT with the severity of coronary artery illness.

### PATIENTS AND METHODS:

Through sections of multicenter diagnostic accuracy survey carried out at Ibn Al-Nafis Cardiovascular Hospital, Ibn Al- Bitar Cardiology Center and Ghazi Al-Hariri Hospital –Iraqi Center for Cardiology during the period between October 2016 and May 2017, assessing C-IMT. **Inclusion criteria:** sick people who underwent diagnostic coronary angiography. Patient with minimal atherosclerotic lesion < 50% in coronary vessels or no lesion served as control. Patients with coronary artery stenosis of 70% or more in one or more coronary arteries (LAD, CX or RCA) or 50% or more in left main stem were served as a case of CAD<sup>[11]</sup>.

**exclusion criteria:** Those with Poor window, history of prior revascularization whether by stent or coronary artery bypass graft and those with lack of written informed consent.

A total of one hundred thirty two (132) patients preselected to undergo coronary angiography are comprised in the survey.

History regarding demographic data and risk factors was taken.

Ejection fraction measured by M-mode method from parasternal long axis view.

C-IMT was measured according to that recommended by the American society of echocardiography (ASE)<sup>[12]</sup>.

Then, consequences of the whole study sample were revised according to angiographic findings, 72 patients were included in the CAD group while 60 patients with no CAD served as control.

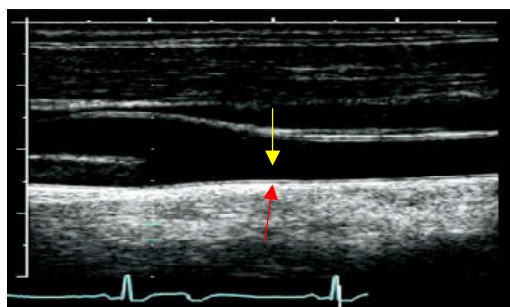


Figure 1: Genuine longitudinal flat at the same time illustrating Twofold lines on the close and distant dividers of the common carotid supply route.<sup>[13]</sup>

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### Statistical Analysis:

SPSS 20.0.0, Minitab 17.1.0, Med Clac 14.8.1 computer program bundle utilized to form the measurable examination, P esteem considered to be noteworthy in the event that less than 0.05

### RESULTS:

Age, height, weight, BMI and sex have no great difference among control and CAD clusters as illustrated in table (1). All risk factors (except the history of premature family CAD) were significantly more prevalent in patients with CAD compared to control as illustrated in table (2). EF: There is not so much reduction in ejection fraction in patients with no vessel involvement and those with one and /or two vessels involvement. But there was significant reduction in ejection fraction among patients with three vessel disease as illustrated in table (3).

C-IMT: there was significant difference in the C-IMT between each group, as number of vessels involvement increases the patients will be in high quartile (Q4) regarding Carotid Intima Media Thickness(C-IMT), e.g. three vessels 100% versus 2 vessels 67.7% in quartile four as illustrated in table (4). As vessels involved increase, the mean C-IMT was increased too, as illustrated in table (3) C-IMT was fair (since AUC between 0.7 – 0.79) to discriminate single vessels disease with optimum cut point >0.84 offering more sensitivity and negative predictive value (less false negative). As illustrated in table-5. C-IMT had excellent (since AUC between 0.9 – 0.99) to discriminate multiple vessels disease from no vessels involvement with optimal cut point of >1.04 as illustrate in table 6.

**Table 1: Demographic data.**

Variables	Control	CAD	P value
Age (years)	57.0 ± 10.9	60.0 ± 10.1	0.140
Height (m)	1.7 ± 0.1	1.7 ± 0.1	0.181
Weight (kg)	76.2 ± 9.8	78.2 ± 12.6	0.327
BMI (kg/m <sup>2</sup> )	27.4 ± 3.0	28.6 ± 4.4	0.070
Sex			0.266
Female (44)	23 (38.3%)	21 (29.2%)	
Male(88)	37 (61.7%)	51 (70.8%)	
BMI groups			0.446
Normal(30)	15 (25.0%)	15 (20.8%)	
Over weight(64)	31 (51.7%)	33 (45.8%)	
Obese (38)	14 (23.3%)	24 (33.3%)	

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**Table 2: Distribution of risk factors according to studied group**

Risk factors	Total (n=132)	Control(n=60)	CAD(n=72)	P value
Hypertension	Negative (47)	28 (46.7%)	19 (26.4%)	0.015
	Positive (85)	32 (53.3%)	53 (73.6%)	
DM	Negative (94)	51 (85.0%)	43 (59.7%)	0.001
	Positive (38)	9 (15.0%)	29 (40.3%)	
Smoking	Negative (90)	48 (80.0%)	42 (58.3%)	0.008
	Positive (42)	12 (20.0%)	30 (41.7%)	
Alcoholic	Negative (126)	60 (100.0%)	66 (91.7%)	0.032
	Positive (6)	0 (0.0%)	6 (8.3%)	
Family History of Premature CAD	Negative (110)	52 (86.7%)	58 (80.6%)	0.348
	Positive (22)	8 (13.3%)	14 (19.4%)	
Dyslipidemia	Negative (110)	55 (91.7%)	55 (76.4%)	0.019
	Positive (22)	5 (8.3%)	17 (23.6%)	

**Table 3: Distribution of coronary angiogram finding according to LVEF & C-IMT**

Parameters	Number of coronary arteries involved				P value
	0 (control)	1	2	3	
LVEF %	65.61 ± 3.80	67.87 ± 2.16	63.65 ± 3.21	52.27 ± 6.33	<0.001
C-IMT(mm)	0.87 ± 0.16	1.00 ± 0.09	1.15 ± 0.07	1.35 ± 0.11	<0.001

**Table 4: Distribution of mean intima-media thickness (IMT) in patients with and without CAD .**

	Number	Q1	Q2	Q3	Q4
		IMT <0.87	0.87 ≤ IMT < 1.00	1.0 ≤ IMT <1.13	IMT ≥ 1.13
No CAD	60	30 (50.0%)	17 (28.3%)	12 (20.0%)	1 (1.7%)
Single vessel	30	3 (10.0%)	15 (50.0%)	12 (40.0%)	0 (0.0%)
Two vessels	31	0 (0.0%)	0 (0.0%)	10 (32.3%)	21 (67.7%)
Three vessels	11	0 (0.0%)	0 (0.0%)	0 (0.0%)	11 (100.0%)

**Table 5: ROC analysis of the validity of C-IMT in the discrimination between single vessels CAD and no vessel involvement**

	AUC	P value	Cut point	Sensitivity	Specificity	PPV	NPV
C-IMT	0.961	<0.001	>1.04	92.9%	86.7%	83.0%	94.5%

**Table 6: ROC analysis of the validity of C-IMT in the discrimination between multiple vessels CAD and no vessel involvement.**

	AUC	P value	Cut point	Sensitivity	Specificity	PPV	NPV
C-IMT	0.738	<0.001	>0.84	100%	48.0%	49.2%	100%

**DISCUSSION :**

The present study demonstrated that risk factors like hypertension, diabetes mellitus, smoking, alcohol drinking and dyslipidemia were significantly higher among patients with CAD compared to non- CAD group. Actually, each one of these risk factors is proven to accelerate atherosclerosis of arteries.<sup>[14,15,16]</sup> Also, our findings are consistent with Kulkarni who has indicated that diabetes, hypertension, obesity, hyperlipidemia and smoking are strong predictors of CAD.<sup>[17]</sup> In our study we found that positive family history of premature CAD, a non-modifiable risk factor was not significant for CAD (P value =0.348). Thus, the most important risk factors for CAD among our patients are amenable to medical and lifestyle interventions. this finding was partially consistent with Kulkarni who demonstrated that whereas positive family history of untimely CAD does not show up to affect common illness hazard, it does altogether increment early onset of CAD (P value= 0.03).<sup>[17]</sup> Within the Framingham Heart Ponder, a Family history of untimely heart malady was related with an abundance chance for an antagonistic cardiovascular outcome.<sup>[18]</sup> i.e. appearance of CAD is due to an interaction of a few unfavorable hereditary and natural variables. In later a long time, there has been tremendous progress in sequencing the human genome, in conjunction with propels in atomic and populace hereditary qualities that will clear the way for recognizable proof of qualities and their potential part in expression of fundamental atherosclerosis.<sup>[19]</sup> The show think about appeared that carotid course IMT was higher in patients with angiographically affirmed CAD than in patients with typical usual IMT reductions as the code of complicated coronary vessels rises.

Our perceptions are reliable with a few considerations. Crouse et al found a solid affiliation between coronary supply route status, confirmed by coronary angiography, and cruel total IMT in carotid courses.<sup>[20]</sup> Moreover, in our think about cruel total IMT expanded with progressing CAD. In the present study, the cut point in the case patients was 0.84mm which is similar to that reported by Adams et al ( intima-media thickness of 0.83±0.20 mm)<sup>[9]</sup> Kablak- ziembicka et al appeared that there was an increment in CIMT as the CAD advanced and patients with CIMT esteem of 1.15 mm had 94% higher chance of CAD.<sup>[10]</sup> which agrees to our findings in that C-IMT of > 1.04mm have a sensitivity of 92.9% to discriminate patients with multiple vessels disease from no vessel

involvement. Limitations of the study The confinements are inalienable within the think about plan, which enlisted subjects experiencing coronary angiography for a suspected clinical determination of CAD. In addition, being a multicenter study, echocardiographic measurements were not done by a single Echocardiographer.

**CONCLUSION:**

CIMT is a non-invasive parameter, easily evaluated, inexpensive and reproducible. It can be considered as a predictive factor for CAD especially before symptoms appearance in high-risk patients. Also, it is an independent predictor of CAD. It has good correlation with the severity of coronary atherosclerosis

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