

**Correlation between Peri-Coronary Epicardial
Adipose Tissue Volume, Cardiac Calcification and
the Severity of Coronary Artery Disease by Multi
Slice Computed Tomography**

Thesis

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By

Tarek Ramzy El Mawardy

*M.B, B.Ch & M.Sc Cardiology
National Research Center*

Under Supervision of

Prof. Dr. Adel El Etriby

*Professor of Cardiology
Faculty of Medicine - Ain Shams University*

Dr. Ashraf El Sherbiny

*Professor of Internal Medicine
National Research Center*

Dr. Ramy Remon

*Assistant Professor of Cardiology
Faculty of Medicine - Ain Shams University*

Dr. Ahmed Mamdouh

*Lecturer of Cardiology
Faculty of Medicine - Ain Shams University*

*Faculty of Medicine
Ain-Shams University*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

لسبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدق الله العظيم

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List of Abbreviations

Abb.	Full term
AHA	<i>American Heart Association</i>
AS	<i>Aortic stenosis</i>
AT	<i>Adipose tissue</i>
AUC	<i>Area under curve</i>
AV	<i>Aortic valve</i>
AVC	<i>Aortic valve calcification</i>
AVS	<i>Aortic valve sclerosis</i>
BMI	<i>Body mass index</i>
BMP	<i>Bone morphogenic protein</i>
CABG	<i>Coronary artery bypass grafting</i>
CACS	<i>Coronary artery calcium score</i>
CAD	<i>Coronary artery disease</i>
CCS	<i>Coronary calcium score</i>
CHD	<i>Coronary heart disease</i>
CI	<i>Confidence interval</i>
CRP	<i>C-Reactive protein</i>
CT	<i>Computed tomography</i>
DBP	<i>Diastolic blood pressure</i>
EAT	<i>Epicardial adipose tissue</i>
EBCT	<i>Electron beam computed tomography</i>
ECG	<i>Electrocardiogram</i>
FFA	<i>Free fatty acid</i>
HDL	<i>High density lipoprotein</i>
HS	<i>Highly significant</i>
HU	<i>Hounsfield unit</i>
IL-6	<i>Interleukin-6</i>
IQR	<i>Inter-quartile range</i>
IVUS	<i>Intra vascular ultra sound</i>
JNK	<i>Jun N-terminal kinase</i>

List of Abbreviations (Cont...)

Abb.	Full term
KV	<i>Kilo volt</i>
LA	<i>Left atrium</i>
LAD	<i>Left anterior descending</i>
LCX	<i>Left circumflex artery</i>
LDL	<i>Low density lipoprotein</i>
LM	<i>Left main coronary artery</i>
LV	<i>left ventricle</i>
M RNA	<i>Messenger riboneucleotide acid</i>
MA	<i>Milli ampere</i>
MCP-1	<i>Monocyte chemoattractant protein-1</i>
MDCT	<i>Multidetector computed tomography</i>
MESA	<i>Multi-Ethnic Study of Atherosclerosis</i>
MRI	<i>Magnetic resonance imaging</i>
MSCT	<i>Multi Slice computed tomography</i>
NF	<i>Nuclear factor</i>
NPV	<i>Negative predictive value</i>
NS	<i>None significant</i>
NSTEMI	<i>Non ST elevation myocardial infarction</i>
OR	<i>Odds ratio</i>
P Value	<i>Probability value</i>
PAF	<i>Plasminogen activator factor</i>
PET	<i>Positron emission tomography</i>
PPV	<i>Positive predictive value</i>
RA	<i>Right atrium</i>
RCA	<i>Right coronary artery</i>
ROC	<i>Receiver operating characteristic curve</i>
RV	<i>right ventricle</i>
S	<i>Significant</i>
SBP	<i>Systolic blood pressure</i>

List of Abbreviations (Cont...)

Abb.	Full term
<i>SD</i>	<i>Standard deviation</i>
<i>SE</i>	<i>Standard error</i>
<i>SPECT</i>	<i>Single photon emission computed tomography</i>
<i>SPSS</i>	<i>Statistical Package For Social Science</i>
<i>TAVI</i>	<i>Transcatheter aortic valve Implantation</i>
<i>TNF-α</i>	<i>Tumor necrosis factor-α</i>
<i>UCP1</i>	<i>uncoupled protein 1</i>
<i>VAT</i>	<i>Visceral adipose tissue</i>
<i>VEGF</i>	<i>Vascular endothelial growth factor</i>

Abstract

Background: Epicardial adipose tissue (EAT) is a complex endocrine organ that plays an important role in the development of unfavorable metabolic and cardiovascular risk profile. EAT may express a variety of inflammatory mediators which may contribute to the pathogenesis of coronary artery disease (CAD). Aortic and mitral valve calcification may reflect generalized atherosclerosis in the elderly and may be a marker of high prevalence and severity of CAD. There is a direct correlation (extent, severity and the future CV events) between the coronary artery calcium and the CAD.

Aim of the study: To correlate peri-coronary epicardial adipose tissue and coronary artery calcification and valvular (aortic and mitral) calcification with the severity of the coronary artery disease.

Methods: The study recruited 200 patients with suspected coronary artery disease. The amount of EAT surrounding the left main and the three main coronary arteries was quantified in axial cuts with the most distinct layer of EAT. The amount of calcium in the aortic and mitral valve and the coronaries were quantified with multi-detector computed tomography MDCT using dedicated software for measuring calcium score that is based on Agatston score. Coronary artery disease severity was assessed in terms of number of vessels affected and the severity of coronary stenosis by multi-planner reformation technique.

Results: Based on the finding of the MDCT and according to the presence of calcification in the aortic or the mitral valves, and the significance of the coronary artery disease, patients were classified into two groups, **group (I):** 115 patients with normal coronaries or with non significant lesions in their coronaries, and **group (II):** 85 patients with significant coronary artery disease. The Mean \pm SD (in millimeters) of EAT for the entire study cohort in various coronary artery locations were as follows: LM EAT 9.82 ± 2.67 , proximal LAD EAT 10.06 ± 2.80 , mid LAD EAT 9.15 ± 2.41 , distal LAD EAT 6.46 ± 1.87 , proximal LCX EAT 8.10 ± 1.90 , distal LCX EAT 6.83 ± 1.79 , proximal RCA EAT 10.23 ± 2.42 , mid RCA EAT 9.26 ± 2.72 , distal RCA EAT 7.25 ± 2.58 . Statistically highly significant difference were observed between the two groups with regards to LM EAT, proximal, mid and distal LAD EAT, proximal and distal LCX EAT, proximal, mid and distal RCA EAT (8.38 ± 2.18 Vs 11.77 ± 1.94 P: 0.000, 8.49 ± 2.21 Vs 12.18 ± 2.00 , 7.93 ± 1.77 Vs 10.81 ± 2.16 , 5.45 ± 1.26 Vs 7.82 ± 1.68 P: 0.000, 7.08 ± 1.34 Vs 9.46 ± 1.67 , 6.05 ± 1.50 Vs 7.89 ± 1.61 P: 0.000, 9.01 ± 1.94 Vs 11.88 ± 1.99 , 8.07 ± 2.32 Vs 10.86 ± 2.39 , 6.31 ± 2.26 Vs 8.51 ± 2.45 P: 0.000; respectively). Statistically highly significant difference were observed between the two groups with regards calcium score and the severity of CAD in the three major vessels (LAD, LCX and RCA) and the total calcium score in all vessels (35 (16 – 85.5) Vs 179.5 (59.5 – 243) P: 0.000, 20.5 (7 – 50.5) Vs 56 (33 – 95) P: 0.000, 31 (9 – 54) Vs 97 (54 – 199) P: 0.000, 12 (0 – 84) Vs 286 (106 – 511) P: 0.000; respectively) while calcium score in the LM was not statistically significant with the severity of CAD (4 (3 – 26) Vs 12 (9 – 16) P: 0.360). As regards aortic valve calcification there was statistically highly significant difference between the two groups; P value 0.000, while mitral valve calcification was found to be not statistically significant between the two groups P: 0.272.

Conclusion: The present study demonstrated a significant correlation between the peri-coronary epicardial adipose tissue, coronary calcification and aortic valve calcification and the severity of the coronary artery disease.

Keywords: Epicardial adipose tissue; coronary calcification; valvular calcification; CAD.

AIM OF THE WORK

- 1- To correlate peri-coronary epicardial adipose tissue volume and the severity of coronary artery disease by MSCT.
- 2- To correlate the coronary calcium score (number of vessels affected, degree of calcium), mitral anular calcification, aortic valve calcification and the severity of the coronary artery disease by MSCT.