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# A COMPARATIVE STUDY OF EPICARDIAL FAT THICKNESS AND SEVERITY OF CORONARY HEART DISEASE IN A TERTIARY CARE CENTER

**Cardiology**

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## ABSTRACT

**Background:** This study aimed to investigate the predictive value of Epicardial Adipose tissue (EAT) in determining the extent and severity of coronary artery disease (CAD) **Patients and Methods:** This study is prospectively designed and includes 110 patients with CAD. The study cohort was subdivided into two groups according to Synergy Between Percutaneous Coronary Intervention with Taxus and cardiac surgery score (SS) as low (< 22) and intermediate-high (≥22). Complete blood counts, serum CRP, and serum albumin were obtained at admission. The EATvalues of all patients were calculated. Then, we evaluated the relationship of EAT with the CAD extent and severity. **Results:** EAT were moderately correlated with SS , but PLR showed weak correlation with SS. According to multivariate analysis models, EAT, and SS were found to be independent predictors of CAD severity (P < 0.05. A CAR more than 17 and EATof more than 0.16 predicted an intermediate-high SS. **Conclusion:** Novel inflammatory marker EAT can be used as a reliable marker in prediction of CAD severity in patients with CAD .

## KEYWORDS

Epicardial Adipose tissue ( EAT) Syntax Score (SS) Coronary Artery Disease (CAD)

## INTRODUCTION

Internal organs are restricted by adipose tissue. Adipose tissue in heart can be divided into extra and intrapericardial Fat, particularly around subepicardial coronary vessels. This Fat constitute around 20% of hearts weight. They are predominantly found in the Atrioventricular Groove where the coronary arteries runs. Epicardial fat is necessary for adequate cardiac function because it has an essential role in preserving the equivalence of body energy and metabolic process, but in other hand, it has important impact on heart muscle function because of secretion of adipokines and pre-inflammatory cytokines. It seems that increased thickness of epicardial fat increases the risk of developing of metabolic syndrome which itself causes coronary artery disease (CAD). This is likely several cytokines which play a role in the formation of vascular plaques and protein related to atherosclerosis are be expressed by epicardial adipose tissue.6 It seems that regional body adipose tissue is better and stronger marker of cardiovascular disease than total body adiposity. So, fat deposited around the heart and coronary arteries, can lead us to stratify the risk of cardiovascular disease particularly CAD and its severity. Epicardial fat thicknesses (efts) can be quantified by echocardiography as a reliable imaging marker and less expensive modality than MRI or CT.8 Some studies showed the relationship between EFT and severity of CAD with conflicting results. Therefore, the purpose of current study is to evaluate the association between EFT, evaluated by transthoracic echocardiography, and severity of CAD and find the related factors.

## METHODS

### Study Population

110 consecutive CAD patients who underwent coronary angiography were taken and EFT was evaluated by 2D Echocardiography. The severity of CAD was defined in two ways: (1) SYNTAX score, (2) number of vessels with significant lesion. Both the ECHO parameters and Coronary Angiogram Parameters were analysed.

### Echocardiography

Transthoracic echocardiography for measuring EFT was, using standard techniques, with subjects in the left lateral decubitus position. We measured EFT on the free wall of right ventricle along the midline of the ultrasound beam, perpendicular to the aortic annulus from the parasternal long-axis view at end-diastole for 3 cardiac cycles on the 2-dimensional echocardiography. Epicardial fat was measured in standard parasternal long axis (PlAX) and parasternal short axis (PSAX) view from 3 cardiac cycles at the end of systole and diastole

### Angiographic Analysis

Coronary angiograms were examined by two cardiologists. The severity of coronary stenosis was evaluated with the anatomical SYNTAX score. The study population was divided into two groups as per the CAD severity by using SS: low (< 22) and intermediate-high (≥22).

### Statistical Analysis

All statistical analyses were performed using the SPSS Software. Continuous variables were expressed as means ± SD or, in the case of a nonnormal distribution, as median 25th to 75th percentiles (IQR). Categorical variables were shown as percentages and numbers, and the $\chi 2$ test was used to compare groups. The Kolmogorov-Smirnov test was performed to assess whether the variables were normally distributed. The Student t test or the Mann-Whitney U test was performed to compare continuous variables between groups based on whether they were normally distributed or not. The Pearson coefficient was used to describe the degree of correlation of parameters among each other and with the SS. The Lin statistic (concordance correlation coefficient; CCC) was used to analyze the inter-operator agreement for image analysis.

## RESULTS

In the study population of 110 , 47 % of the patients in our study belong t50-60 yrs of age. Among those 76% were male and 24% were female. In our study population 41% had diabetes 29.7% had hypertension , and 22% were smoker as shown in table and 5% of patients consumes alcohol.83 % of patients in our study are ACS patients and remaining are SIHD patients. Majority of the patients were KILLIP class 2 while presentation. On analysing the severity of the disease 41 % of the population has triple vessel disease. And 36% had single vessel disease.

The median SYNTAX SCORE of the study population was 26, the 25 percentile was 18 and the 75 percentile was 28. The median Ejection fraction of the study population was 45 and the 25 percentile was 35 and the 75 percentile was 55. The median EFT of the study population was 5.5 and the 25 percentile was 4 and the 75 percentile was 6.80.

On corelating the Epicardial Adipose Tissue with the CAD , KILLIP Class and Number of vessel disease, all the three parameters were positively correlating with significant r Value and this corelation is also statistically significant with a p value

**Table 1 – Baseline Characteristics & Eat .**

| | | EAT | | | P value |
|---|---|---|---|---|---|
| | | Median | Percentile 25 | Percentile 75 | |
| Age group | <40 | 5.00 | 3.00 | 6.20 | 0.061 |
| | 41-50 | 4.25 | 2.90 | 6.00 | |
| | 51-60 | 5.95 | 4.00 | 7.00 | |
| | 61-70 | 6.05 | 4.50 | 7.00 | |
| | >71 | 4.65 | 4.20 | 5.50 | |
| SEX | F | 5.50 | 4.00 | 7.00 | 0.727 |
| | M | 5.50 | 4.00 | 6.80 | |

| | | | | | |
|---|---|---|---|---|---|
| ACS | NO | 6.05 | 5.50 | 7.00 | 0.104 |
| | YES | 5.00 | 4.00 | 6.80 | |
| DM | NO | 5.00 | 4.00 | 6.90 | 0.827 |
| | YES | 5.60 | 4.00 | 6.50 | |
| HTN | NO | 5.50 | 4.00 | 6.80 | 0.522 |
| | YES | 5.25 | 3.05 | 6.75 | |
| SMOKER | NO | 5.80 | 4.00 | 7.00 | 0.037 |
| | YES | 4.85 | 3.55 | 5.75 | |
| ALCOHOLIC | NO | 5.50 | 4.00 | 6.80 | 0.114 |
| | YES | 3.00 | 2.20 | 6.00 | |
| CAD | AWMI | 5.00 | 4.00 | 6.50 | 0.278 |
| | IWMI | 5.25 | 3.50 | 6.40 | |
| | NSTEMI | 5.05 | 2.90 | 7.55 | |
| | USA | 4.90 | 4.00 | 6.80 | |
| | EA | 6.10 | 5.50 | 7.00 | |
| | IPWMI | 7.50 | 7.50 | 7.50 | |
| | IWMI+RV MI | 4.50 | 3.00 | 6.00 | |
| KILLIP | 1 | 4.00 | 3.00 | 5.80 | <0.0001 |
| | 2 | 5.50 | 5.00 | 7.00 | |
| | 3 | 6.80 | 6.20 | 7.10 | |
| | 4 | 7.05 | 6.80 | 8.00 | |
| CAG- NUMBER OF DISEASED VESSEL | 0 | 2.75 | 2.50 | 3.00 | <0.0001 |
| | 1 | 4.00 | 3.00 | 4.30 | |
| | 2 | 5.50 | 5.00 | 6.20 | |
| | 3 | 7.00 | 6.00 | 7.10 | |
| SYNTAX | <22 | 38 | 38.0% | | |
| | >23 | 62 | 62.0% | | |

**Table 2:**

| | r value | p value |
|---|---|---|
| SYNTAX | .854** | <0.0001 |
| EF | -.760** | <0.0001 |
| CAG- NUMBER OF DISEASED VESSEL | .793** | <0.0001 |
| KILLIP | .580** | <0.0001 |

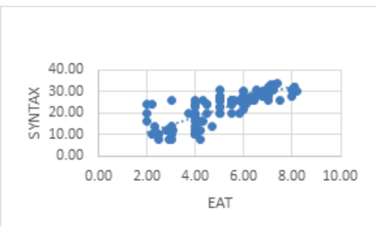



**Figure 1:**

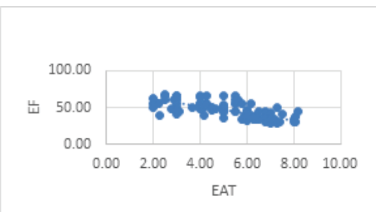
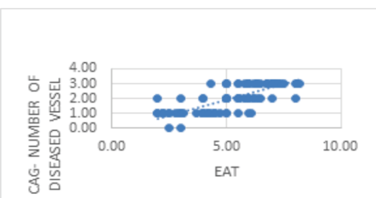



**Figure 2:**

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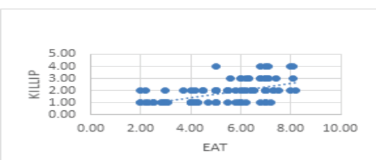


**Figure 4 :**

## DISCUSSION

The relationship between echocardiographic EFT and CAD has also been reported in several studies like our study.8,12-14 The present study was intended to show association between echocardiographic EFT and severity of CAD in patients with CAD

In recent years, the visceral AT surrounding the heart and coronary arteries, known as epicardial adipose tissue (EAT), has become the subject of increasing scientific investigation, with emerging evidence that it may be associated with the development of obstructive coronary disease and even acute coronary syndromes.

There are a lot of studies about the epicardial fat thickness and atherosclerotic diseases of CAD; but, there are few studied in the subgroup of patients with diabetes mellitus. In a recent study on 123 patients with CAD, echocardiographic epicardial fat thickness was significantly correlated with the presence and severity of angiographically detected CAD. They used Gensini scoring system for measurement of the severity of CAD. In another study on 110 patients, epicardial fat thickness in men and women was not statistically different and coronary artery lesions measured by Gensini score showed linear association with severity of CAD, and epicardial fat thickens.

Nakazato et al. measured epicardial fat volume by CT scan instead of echocardiography, and found that epicardial fat valium was independently and linearly associated with existence of CAD and its severity.

The location of lipid accumulation around the heart may be important in increasing the probability of coronary stenosis. In a study on 157 patients with diabetes mellitus type II and without CAD history, left atrioventricular groove epicardial adipose volume was an independent predictor of CAD.

Cystatin C, a 13-kD endogenous cysteine proteinase inhibitor, is ubiquitously expressed, mainly in the brain, testis, lung, spleen, and adipose tissue. Recently, a strong association between epicardial fat and cystatin C in patients with diabetes type II is founded. This means that epicardial fat accumulation play an essential role in cystatin C secretion, that contributing to atherosclerosis risk in these patients.

There is a decreased expression of peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC1α) and uncoupling protein 1 (UCP1) mRNA in epicardial fat tissue of patients with CAD and diabetes mellitus type II that may be caused by a loss of brown-like fat features. There is a higher prevalence of CAD in patients with decreased expression of PGC1α in epicardial adipose tissue.

Besides, its effect on coronary artery pericardial fat is related to other cardiac conditions such as heart failure calcification of coronary arteries, coronary artery spasm, etc.

Ng et al. found that in with patients mellitus, epicardial fat is independently associated with impaired myocardial systolic function despite preserved 3 dimensional (3D) left ventricular ejection fraction and absence of obstructive CADs. They measured epicardial fat using 3D echocardiography.

Coronary artery calcium score is associated with epicardial fat thickness, too. A cohort study showed that progression of coronary artery calcification was correlated with epicardial fat thickness, and this score also had significant correlation with systemic inflammation markers.27

A 5-year CT scan follow-up study by Hwang et al. showed that greater amount of epicardial fat at baseline CT scan independently predicted the development of non-calcium coronary plaque in asymptomatic individuals.28 The development of coronary artery calcification may be mediated by epicardial fat volume via the activation of local inflammatory cytokines.

Epicardial fat is related to the presence of coronary artery calcification but not to aortic valve or ascending aorta calcification. These findings support a local paracrine effect of epicardial fat in mediating coronary atherosclerosis.29

Epicardial fat volume also correlated with atherosclerotic plaque vulnerability. There was an association between epicardial fat volume and development of coronary atherosclerosis and the most dangerous types of plaques in Ito et al

## CONCLUSION

Our study showed that EAT shows strong association with SS and may be a potential available, easily measurable parameter for analysing the coronary atherosclerosis severity. It may be a part of cardiovascular examination to identify individuals with acute coronary syndrome at high risk for advanced CAD who may need a aggressive management approach and more periodic clinical follow-up. However, to evaluate the predictive value EAT,mainly its prognostic value CAD patients , large-scale studies are still required

## REFERENCES

1. Çakmak EÖ, Bayam E, Çelik M, Kahyaoğlu M, Eren K, Imanov E, et al. Uric Acid-to-Albumin Ratio: A Novel Marker for the Extent of Coronary Artery Disease in Patients with Non-ST-Elevated Myocardial Infarction. Pulse. 2021 Jun;8(3–4):99–107.
2. Ruggiero C, Cherubini A, Ble A, Bos AJG, Maggio M, Dixit VD, et al. Uric acid and inflammatory markers. Eur Heart J. 2006 May 1;27(10):1174–81.
3. Kelesoglu S, Yilmaz Y, Elcık D. Relationship Between C-Reactive Protein to Albumin Ratio and Coronary Collateral Circulation in Patients With Stable Coronary Artery Disease. Angiology. 2021 Oct;72(9):829–35.
4. Head SJ, Farooq V, Serruys PW, Kappetein AP. The SYNTAX score and its clinical implications. Heart. 2014 Jan 15;100(2):169–77.
5. Schillinger M, Exner M, Mlekusch W, Amighi J, Sabeti S, Schlager O, et al. Serum albumin predicts cardiac adverse events in patients with advanced atherosclerosis – interrelation with traditional cardiovascular risk factors. Thromb Haemost. 2004; 91(03):610–8.
6. Çağdaş M, Rencüzoğullari I, Karakoyun S, Karabağ Y, Yesin M, Artaç I, et al. Assessment of Relationship Between C-Reactive Protein to Albumin Ratio and Coronary Artery Disease Severity in Patients With Acute Coronary Syndrome. Angiology. 2019 Apr 1;70(4):361–8.
7. Yalcinkaya D, Karacali K, Ilhan BC, Yarlioglues M. Relation Between Serum Uric Acid to Albumin Ratio and Severity of Chronic Coronary Artery Disease. Angiology. 2023 Mar 13;00033197231161902.