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Correlation of Epicardial Adipose Tissue and Pericoronary Fat Thickness Quantified by Coronary Computed Tomography Angiography with Severity of Coronary Artery Disease

K.E.El Rabbat, S.A.Mustafa, S.I.Farag, S.M.Helmy and D.M.Mahmoud
Cardiology, Dept., Faculty of Medicine, Benha Univ., Benha, Egypt
E-mail: d.awara@hotmail

Abstract

Over the previous decade, cardiovascular disease fatalities worldwide have risen by around 20 percent, with the majority of deaths happening in poor and middle-income nations (nearly 70 percent of all cardiovascular disease deaths). The purpose of this study was to examine the relationship between local EFT, PCFT, and PCFD with the existence and severity of coronary artery disease. Methods: In an imaging facility, researchers conducted this cross-sectional single-center study. Patients who were sent for MSCT coronary angiography had either known or suspected coronary artery disease and were evaluated noninvasively. Results: There was no significant difference in male and female distribution in the non-atherosclerosis group, where men were more abundant, with a P value of 0.45. Regarding the risk factors of the individuals evaluated in our research, Except for those with a family history of atherosclerosis, we found a statistically significant rise in the risk variables high blood pressure, diabetes mellitus, smoking, and hyperlipidemia in the non-atherosclerosis group. There was no statistically significant difference between individuals in terms of coronary artery disease impacted by the procedure. Prognostic imaging biomarker MSCT may help identify coronary artery disease at an early stage as well as estimate risk.

Key words: Coronary Computed Tomography Angiography, Coronary Artery Disease.

1. Introduction

About 18 million people died from cardiovascular disease in 2017, with most of those fatalities happening in low- and middle-income countries. During the previous decade, total cardiovascular disease deaths worldwide have risen by nearly 20 percent [1].

Tobacco use, dyslipidemia, diabetes, high blood pressure, obesity, inactivity, alcohol usage, psychological issues and a high-risk diet are all modifiable risk factors for coronary artery disease (CAD) [2].

It's possible that increasing smoking and cholesterol are to blame for part of the rising incidence of ischemic heart disease in certain nations, while other countries have seen an increase owing to obesity and diabetes. Preventing and treating cardiovascular risk factors is critical to reducing inequities in mortality. Cardiovascular disease prevention and mortality management face huge difficulties in light of recent worldwide increases in obesity and diabetes, as well as their long-term effects [3].

Coronary angiography is the primary diagnostic tool for severe coronary artery stenosis. A rising number of doctors are using coronary computed tomographic angiography (CCTA) to detect coronary artery disease. Accurate coronary artery calcium testing (CCTA) has become an increasingly common method for screening asymptomatic individuals to identify those at high risk of developing coronary heart disease (CHD) and cardiac events, and for the diagnosis of coronary obstruction in patients with symptoms of coronary heart disease (CAD) [4].

Risk may be better assessed in people who have no symptoms or are at intermediate risk thanks to the use of CCTA [4]. Comparatively speaking, cardiac CT has an advantage over coronary angiography in that it is a cross-sectional method that allows examination of both the artery lumen and its nearby tissue in addition to that of the vessel wall. Thus, a more accurate assessment of coronary plaque might be made [5].

2. Patients and Methods

Study design:

This cross section single center study has been carried out in a radiology center.

It included 70 patients with known or suspected coronary artery disease and were referred for MSCT coronary angiography for noninvasive evaluation of the coronary arteries.

The studied population:

- Patients with non-obstructive atherosclerotic lesion (luminal narrowing < 50% in diameter).

Selection criteria:

Inclusion criteria:

- Adult Patients suspected of CAD who were referred for coronary CT-angiography including symptomatic patients with intermediate risk for CAD and patients with uninterpretable ECG or unable to exercise on stress rest.

Exclusion criteria:

- Those who had a history of cardiac surgery.
- Patient with history of valve replacement.
- Those who had a history percutaneous coronary intervention.
- Incomplete data regarding risk factors (age, hypertension, diabetes, hyperlipidaemia etc.).
- Images of suboptimal quality.
- Patients with pacing leads.
- Patient with pericardial effusion.
- Patients with congenital heart disease and coronary artery anomalies.

- Renal insufficiency.
- Liver failure.
- Cardiomyopathy.
- Irregular heart rhythms (e.g. atrial fibrillation/flutter, frequent irregular premature ventricular contractions or premature atrial contractions, and high grade heart block).
- Known history of allergic reactions to intravenous contrast agent.
- Inability to follow breath holding instructions.
- Obese patients (body mass index >35 kg/m2).

For all patients the following were done:

1. Personal history: age, gender.
2. A complete record of medical conditions was gathered from enrolled patients including the major risk factors as the presence of diabetes mellitus (DM), hypertension (defined as systolic blood pressure >140 mm Hg or diastolic blood pressure > 90 mm Hg), smoking, hyperlipidaemia.
3. Family history of coronary heart disease.
4. CT: iCT 256-slice (radiological center)
   - Identifying the type of the lesion.
   - Identifying the severity of the lesion.

Statistical analysis of data

Data was collected throughout history, basic clinical examination, laboratory investigations and outcome measures were coded, entered and analyzed using Microsoft Excel software. The data collected was tabulated and analyzed by SPSS (statistical package for social science) version 25 (Armonk, NY: IBM Corp).

3. Results

This table shows that the mean of age in studied population was (54.74 ± 9.63) and there was no significant difference between male and female, where males were prevalent in studied population, (61.4%).

Table (1) Age and Gender among the studied patient

	Non obstructive patient		P Value
	N	%	
Age	54.74 ± 9.63		
Mean ± SD			
Sex	19	61.4%	
Male			0.45
Female	30	38.6%	
Total	70	100%	

Risk factors among the studied patients

Our study showed that there was statistically significant increase in risk factors HTN, DM, smoking, and hyperlipidemia in non-obstructive atherosclerotic patients, except for familial history

Table (2) Risk factors distribution among the studied patients.

Risk factors	Non obstructive patient		P Value
	N	%	
HTN	41	58.6%	0.005
DM	19	27.1%	0.00
Smoking	30	42.9	0.004
Hyperlipidemia	42	60.0%	0.001
Familial history	30	42	0.471

χ^2**:** Chi square test

*P-value <0.05 is significant **P- value ≤0.001 highly significant

Table (3) Coronaries affected in the studied population.
In our study population the LAD was predominantly affected.

Coronaries	Non obstructive patients	
	N	%
LAD	**55**	**78.6%**
LCX	**6**	**8.6%**
RCA	**9**	**12.9%**
Total	**70**	**100%**

4. Discussion

About 18 million people died from cardiovascular disease in 2017, with most of those fatalities happening in low- and middle-income countries. During the previous decade, total cardiovascular disease deaths worldwide have risen by nearly 20 percent (Virani et al., 2020).

Smoking, dyslipidemia, diabetes, hypertension, obesity, physical inactivity, alcohol use, psychological problems, and a high-risk diet all have a role in the development of coronary artery disease (CAD). These risk factors account for 90% of all myocardial infarctions (MIs). According to Yusuf et al.

There was no statistically significant difference between male and female sex distribution, where men predominate in the investigated population, as shown by our research (54.74 9.63). (61.4 percent).

In a research that was quite similar to ours, Demircelik et al. [6] found no significant differences in age or gender among the participants in all groups.

It was shown that the chance of acquiring coronary artery disease increases with age in both sexes, although it is more prevalent in males than in females after menopause (Aydin Ayşe and colleagues, 2015). Due to a protective impact of oestrogen in women, this gender difference may be explained (Roeters van Lennep et al., 2002).

An 80-patient research conducted by Ga et al. [7] discovered that gender had no effect, but that age groups older than 60 had a substantial impact.

As far as the study's patients' risk variables are concerned. Our research found a statistically significant rise in risk factors for hypertension, diabetes, smoking, and hyperlipidemia in the analysed group, except for the presence of a family history of the same condition. a discovery that is consistent with the well-known fact that these characteristics are among the most significant risk factors for CAD [8]. Similarly to ours, (Mustelier et al., 2011) shows that all of these risk variables have a substantial link with the development of coronary heart disease. There was also [6], (Demircelik et al., 2014) identified in a research that was done on 131 patients who were sent for noninvasive MSCT for the assessment of CAD and it was observed that greater incidence of smoking and diabetes in group III but nonsignificant link with hyperlipidemia was detected.

5. Conclusion

There was a good correlation between risk variables and the presence of plaque in the coronary arteries of the patients in the study, suggesting MSCT may be a useful imaging biomarker for detecting coronary artery disease early and assessing risk.

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