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Relationship between Coronary Artery Calcium Score (CACS) and Diastolic Dysfunction in Patients with Stable Coronary Heart Disease at Adam Malik General Hospital Medan

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ABSTRACT

Introduction: Coronary artery calcium score (CACS) is a specific indicator of coronary atherosclerosis that plays a role in assessing the degree of calcification in atherosclerosis. Diastolic function is the first aspect of cardiac function to be impaired in ischemic heart disease. This study aims to determine the relationship between calcium scoring and diastolic dysfunction.
Methods: This analytical observational study with cross-sectional design evaluated the relationship between coronary artery calcium score (CACS) and left ventricular diastolic function in patients with stable CAD. Data were collected retrospectively from medical records at RSUP H. Adam Malik Medan during Nov 2023-Nov 2024. CACS was assessed using coronary CT scan, while left ventricular diastolic function was measured by echocardiography. Data analysis used chi-square test, Mann-Whitney U test, and ROC curve analysis to evaluate CACS threshold in predicting diastolic dysfunction.
Results: Among 158 analyzed samples, 113 patients had diastolic dysfunction. A calcium score ≥100 was found in 46.2% of patients, showing 1.318 times higher risk of diastolic dysfunction versus those with scores <100 ($p = 0.006$; 95% CI 1.083–1.605). ROC analysis showed CACS had moderate predictive ability for diastolic dysfunction with AUC of 0.647 ($p = 0.004$). A calcium score threshold of 45 had 65.5% sensitivity and 62.2% specificity in detecting diastolic dysfunction. Type 2 diabetes mellitus, urea, and creatinine levels were also significantly associated with diastolic dysfunction ($p < 0.05$).
Conclusion: Calcium score shows a significant relationship with diastolic dysfunction in stable CAD patients and can predict diastolic dysfunction in patients undergoing coronary CT scan.

Keywords
Coronary artery calcium score, Coronary computed tomography angiography, Diastolic dysfunction, Coronary artery disease, Echocardiography.

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INTRODUCTION

Coronary heart disease (CHD) is one of the leading causes of death in the world, the incidence of which has continued to increase over the last decade, including in Indonesia.[1] According to statistics from the World Health Organization (WHO) in 2019, CVD contributed to around 17.9 million deaths, or equivalent to 32% of total global deaths.[2] In 2021, heart disease was the second leading cause of death in Indonesia after stroke.[3] The prevalence of heart disease cases has increased by 1% over the past 5 years (2013-2018) along with unhealthy modern lifestyles and the increasing elderly population.[4] CHD diagnosed through catheterization

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or computed tomography angiography (CTA) without recent acute events is often referred to as stable coronary artery disease (CAD). Patients are considered stable if they are asymptomatic or if their symptoms are controlled by treatment or revascularization.[5-7]

The main symptom often experienced by patients with CHD is chest pain, which is the main reason patients seek medical assistance. In clinical practice, echocardiography is one of the effective imaging modalities to assess patients with chest pain.[8] One of the findings often observed in echocardiography is diastolic dysfunction, where there is an abnormality in mechanical function that occurs in the diastolic phase. This function is the first to be disrupted in ischemic heart disease. In addition, diastolic dysfunction is a predictor of mortality even in patients with normal left ventricular systolic function.[9] Along with the development of technology, atherosclerotic plaques can now be visualized noninvasively using coronary computed tomography angiography (CCTA). This examination can assess the degree of coronary atherosclerosis burden and independently predict future cardiovascular risk with the assessment of Coronary artery calcium score (CACS).[10] CAC examination is a cheap, fast, and low radiation dose test, without the need for contrast administration with a sensitivity value of 96.2% and a specificity of 62.4%.[11] CAC score is related to arterial plaque burden and previous studies have reported a relationship between CAC score and mortality.[12]

To date, evidence related to the relationship between diastolic dysfunction and CAC score in patients with stable coronary heart disease is still very limited. The identification of CAC score and diastolic dysfunction in patients with stable coronary heart disease can have clinical implications for the early detection of patients with stable coronary heart disease. Based on the description above, this study aimed to determine whether there is a relationship between calcium scoring and diastolic dysfunction in patients with stable coronary heart disease. Adam Malik General Hospital in Medan.

METHODS

The research method used in this study was observational analytic with a cross-sectional research design, namely assessing the relationship between coronary artery calcium score and left ventricular diastolic function in stable CHD patients at H. Adam Malik General Hospital in Medan. Diastolic function was obtained from echocardiography examination, while the coronary artery calcium score was assessed using coronary CT. Data were collected retrospectively from medical records of patients treated at H. Adam Malik General Hospital, Medan, from November 2023 to November 2024. The research sample was taken using the consecutive quota method, where each patient who met the inclusion criteria was sampled until a minimum of 64 patients was reached, in accordance with applicable sampling guidelines.

The inclusion criteria were as follows: patients with typical or atypical angina complaints suspected or diagnosed with stable coronary heart disease (CHD) according to the guidelines from the European Society of Cardiology (ESC), based on outpatient medical records with complete and well-documented electrocardiography (ECG), blood laboratory, echocardiography, and coronary CT-angiography (CTCA) results; patients referred for coronary CT-scan angiography; patients who underwent coronary CT-scan angiography and echocardiography; patients with normal left ventricular ejection fraction examination results; and patients aged >18 years.

The exclusion criteria included incomplete medical records, increased troponin I levels, atrial or ventricular arrhythmia, unstable hemodynamic conditions, valvular heart disease, history of percutaneous coronary intervention (PCI), history of coronary artery bypass surgery (CABG), and patients who had been diagnosis of Acute Coronary Syndrome (ACS).

Coronary artery calcium score measurement was performed using coronary CT scans performed with standard procedures using a calibrated multislice CT device, and the results were assessed based on the Agatston score, which was then categorized according to the level of vascular calcification. Left ventricular diastolic function was evaluated using two-dimensional echocardiography with spectral Doppler performed by experienced heart and blood vessel specialists. The data obtained were processed and analyzed using the latest version of the SPSS statistical software. Before analysis, a normality test of the numerical data was performed using the Kolmogorov-Smirnov test (if n > 50) or the Shapiro-Wilk test (if n < 50). Normally distributed numerical variables are presented as mean ± SD, while non-normally distributed data are presented as median with interquartile range (IQR). Categorical variables were presented as frequencies and percentages. To compare numerical variables between groups with and without diastolic dysfunction, the independent t-test was used if the data were normally distributed, and the Mann-Whitney U test was used if the data were not normally distributed. The relationship between calcium scores and the presence of diastolic dysfunction was analyzed using the chi-square test and logistic regression analysis to determine the strength of the association, as well as the ROC curve to assess the predictive ability of calcium scores against diastolic dysfunction. All analyses were performed at a significance level of 0.05.

RESULTS

In this study, 158 samples were obtained. A total of 89 (56.3%) samples were male, and 69 (43.7%) of the remaining samples were female. A total of 51 (32.3%) samples were in the normal BMI category, 67 (42.4%) samples were in the overweight BMI category, and 110 40 (25.3%) samples were in the obese BMI category. A total of 106 (67.1%) patients had a history of hypertension, whereas 52 (32.9%) did not. A total of 44 (27.8%) samples had a history of type 2 DM and 114 (72.2%) did not have a history of type 2 DM. A total of 113 (71.5%) patients had a history of dyslipidemia, and 45 (28.5%) did not.

Table 1. Basic Characteristics of Categorical Data Research Samples Parameter (n=158)

Parameter	n (%)
Gender	
Man	89 (56.3%)
Woman	69 (43.7%)
BMI (Body Mass Index) Categories	
Normal	51 (32.3%)
Overweight	67 (42.4%)
Obesity	40 (25.3%)
History of Hypertension	
Yes	106 (67.1%)
No	52 (32.9%)
History of Type 2 DM	
Yes	44 (27.8%)
No	114 (72.2%)
History of Dyslipidemia	
Yes	113 (71.5%)
No	45 (28.5%)
Smoking History	
Yes	58 (36.7%)
No	100 (63.3%)
Diastolic Dysfunction Grade	
Grade I	41 (25.9%)
Grade II	98 (62%)
Grade III	19 (12%)
Diastolic Dysfunction	
Yes	113 (71.5%)
No	45 (28.5%)
Calcium Score	
> 100	73 (46.2%)
< 100	85 (53.8%)
Medication	
Beta-blockers	126 (79.7%)
ACE-i/ARB	113 (71.5%)
Nitrate	120 (75.9%)
CCB	71 (44.9%)
Parameter, Mean ± SD / Median (min-max)	
Age (Years)	56.17 ± 11.02
IMT (kg/m²)	26.45 (19.7 – 49)

Parameter	n (%)
Calcium Score	75.5 (0 – 2013)

Table 1. Continuous

Parameter	n (%)
Echocardiography Parameters	
E/A	1.07 ± 0.37
E Velocity (m/s)	0.08 (0.04 – 9)
A Velocity (m/s)	0.75 (0.05 – 1.28)
E/e’	11.17 (4.16 – 23.53)
e’ lateral (m/s)	0.09 (0.04 – 12)
e’ Septal (m/s)	0.08 (0.03 – 1)
Fraction Ejection (%)	59 (50 – 85)
TAPSE (mm)	22 ± 4.2
LAVi (mL/m²)	25.6 (10.1 – 79.11)
Laboratory Parameters	
LDL (mg/dL)	90.35 (34 – 199)
Triglycerides (mg/dL)	155.23 ± 64.58
Ureum (mg/dL)	25 (10 – 151)
Creatinine (mg/dL)	0.99 (0.47 – 5.66)

A total of 58 (36.7%) samples had a history of smoking and 100 (63.3%) did not have a history of smoking. A total of 113 (71.5%) patients had diastolic dysfunction, and 45 (28.5%) did not have diastolic dysfunction. A total of 41 (25.9%) samples were in the grade I diastolic dysfunction category, 98 (62%) samples were in the grade II diastolic dysfunction category, and 19 (12%) samples were in the grade III diastolic dysfunction category. A total of 73 (46.2%) samples had a calcium score > 100, and 85 (53.8%) had a calcium score < 100. A total of 126 (79.7%) patients used beta-blocker therapy, 113 (71.5%) used ACE-i/ARB therapy, 120 (75.9%) used nitrate therapy, and 71 (44.9%) used CCB therapy. These basic characteristics are described in Table 1.

Numerical data on the research sample will be presented as mean with standard deviation if the data are normally distributed and median with interquartile range if the data are not normally distributed. The mean age of the sample was 56.17 ± 11.02 years old. The median and interquartile range of the sample BMI was 26.45 (19.7–49) kg / m2. The median and interquartile range of the sample calcium score was 75.5 (0 - 2013). The mean value of the echocardiographic parameter E/A of the sample was 1.07 ± 0.37. The median and interquartile range of the echocardiographic parameter E Velocity of the sample was 0.08 (0.04–9) m/s. The median and interquartile range of the echocardiographic parameter A Velocity of the sample was 0.75 (0.05–1.28) m/s. The median and interquartile range of the echocardiographic parameter E/e' of the samples were 11.17 (4.16 – 23.53) m/s. The median and interquartile range of the echocardiographic parameter e’ lateral of the sample was 0.09 (0.04 – 12)) m/s. The median and interquartile range of the echocardiographic parameter Effect Fraction of the sample was 59 (50 – 85) %. The mean value of the echocardiographic parameter TAPSE in the sample was 22 ± 4.2 mm. The median and interquartile range of the echocardiographic LAVi of the sample was 25.6 mL/m2. The median and interquartile range of the LDL sample was 90.35 (34 – 199 mg/dL). The median and interquartile range of the urea sample was 25 (10 – 151) mg/dL. The median and interquartile range of the creatinine sample was 0.99 (0.47 – 5.66) mg/dL. The mean triglyceride level in the sample was 155.23 ± 64.58 mg/dL. The complete data are listed in Table 1.

There were differences in both categorical and numerical parameters based on the presence of diastolic dysfunction. Of the 38 (33.6%) patients with type 2 DM, 33.6% experienced diastolic dysfunction, whereas the remaining 6 (13.3%) did not. A total of 75 (66.4%) patients without type 2 DM experienced diastolic dysfunction, whereas the remaining 39 (86.7%) did not. This difference was statistically significant (P = 0.01). The median and interquartile range of the high calcium score in the group with diastolic dysfunction were 115 (0 - 2103)) compared to the group without diastolic dysfunction, which was 20 (0 - 1001)). This difference was statistically significant (P = 0.004). The median and interquartile ranges of the following parameters were also higher in the group with diastolic dysfunction than in the group without diastolic dysfunction: E/e' (P = 0.012), urea (P = 0.004), and creatinine (P = 0.005). Meanwhile, echocardiographic parameters such as E Velocity (P = 0.001), e' lateral (P = 0.001), e' septal (P = 0.001), and ejection fraction (P = 0.009), showed lower median and interquartile ranges in the group with diastolic dysfunction, compared to the group without diastolic dysfunction (Table 2).

Table 2. Differences in Sample Baseline Characteristic Values Based on Diastolic Dysfunction Incidence

Parameter	Diastolic Dysfunction		p-value
	Yes (n=113)	No (n=45)	
Gender			
Man	68 (76.4%)	21 (23.6%)	0.122[a]
Woman	45 (65.2%)	24 (34.8%)	
BMI (Body Mass Index) Categories			
Normal	32 (62.7%)	19 (37.3%)	0.239[a]
Overweight	51 (76.1%)	16 (23.9%)	
Obesity	30 (75%)	10 (25%)	
History of Hypertension			
Yes	76 (71.6%)	30 (28.4%)	0.943[a]
History of Type 2 DM			
Yes	38 (86.3%)	6 (13.7%)	0.01[a]
History of Dyslipidemia			
Yes	81 (71.6%)	32 (28.4%)	0.943[a]
Smoking History			
Yes	45 (77.5%)	13 (22.5%)	0.198[a]
Age (Years)	57.57 ± 10.75	52.69 ± 11.02	0.609[c]
IMT (kg/m²)			0.177[d]
Calcium Score	115 (0 – 2103)	20 (0 – 1001)	0.004[d]
Echocardiography			
E/A	1.03 ± 0.39	1.16 ± 0.31	0.598[c]
E Velocity (m/s)	0.08 (0.04 – 0.9)	0.1 (0.07 – 0.9)	0.001[d]
A Velocity (m/s)	0.74 (0.05 – 1.28)	0.78 (0.49 – 0.97)	0.740[d]
E/e’	11.59 (5.7 – 20.26)	9.97 (4.16 – 23.5)	0.012[d]
e’ lateral (m/s)	0.08 (0.04 – 12)	0.11 (0.05 – 0.18)	0.001[d]
e’ Septal (m/s)	0.07 (0.03 – 1)	0.09 (0.05 – 0.9)	0.001[d]
Fraction Ejection (%)	58.35 (50 – 85)	60.62 (51 – 73)	0.009[d]
TAPSE (mm)	21.75 ± 4.19	22.6 ± 4.14	0.962[c]
LAVi (mL/m²)	26.97 (10.1 – 67)	23.06 (12.07 – 66.43)	0.164[d]
Laboratory			
LDL (mg/dL)	91.75 (34 – 197)	102 (46.5 – 199)	0.457[d]
Triglycerides (mg/dL)	164.93 ± 67.62	119.67 ± 34.92	0.095[c]
Ureum (mg/dL)	29 (10 – 151)	22 (12 – 150)	0.004[d]
Creatinine (mg/dL)	1.05 (0.47 – 5.66)	0.85 (0.48 – 2.08)	0.005[d]

Notes: a, Chi Square test; b, Mann-Whitney Test; c, Student T Test; d, Fisher Exact test

Multivariate analysis was used to identify factors that predicted the occurrence of diastolic dysfunction in patients with stable coronary heart disease (Table 2). The parameters measured to assess the occurrence of diastolic dysfunction in this study included sex, body mass index, history of hypertension, history of type 2 diabetes, history of dyslipidemia, history of smoking, age, calcium score, echocardiography parameters, and laboratory parameters. The variables resulting from the bivariate analysis that had a p-value <0.05 were included in the logistic regression analysis of the occurrence of diastolic dysfunction in patients with stable coronary heart disease. In the multivariate analysis, the variables of type 2 diabetes history, calcium score, and ejection fraction were statistically significant predictors (Table 3).

Table 3. Multivariate Analysis of Diastolic Dysfunction Incidence

Variables	Coefficient	p-value	OR value	95% CI	
				Min	Max
History of Type 2 DM	1.223	0.028	3.397	1.143	10.092
Calcium Score	-0.982	0.022	0.375	0.161	0.859
Fraction Ejection	-0.055	0.016	0.946	0.905	0.990
Constants	4.260				

There was a significant relationship between the calcium score and diastolic dysfunction. A total of 60 (82.1%) patients with a calcium score ≥ 100 had diastolic dysfunction, whereas the remaining 13 (17.8%) did not. A total of 53 (62.3%) patients with a calcium score <100 had diastolic dysfunction, whereas the remaining 32 (37.6%) did not. This difference was statistically significant (P = 0.006). Patients with a calcium score ≥ 100 were 1.318 times more likely to have diastolic dysfunction (95% CI 1.083– 1.605) (Table 4).

Table 4. Relationship between Calcium Score Value and Diastolic Dysfunction

Calcium Score	Diastolic Dysfunction		Total	p-value	OR	95% CI
	Yes	No				
≥ 100	60 (82.1%)	13 (17.8%)	73	0.006	1.318	1.083 – 1.605
< 100	53 (62.3%)	32 (37.6%)	85			

In this study, ROC curve analysis was also conducted to determine the cutoff value of the calcium score in patients undergoing CCTA examination to predict diastolic dysfunction. ROC curve analysis showed good ability of the calcium score, with a P value of 0.004, AUC of 0.647, and 95% CI of 0.554–0.739. A calcium score threshold value of 45 had a sensitivity of 65.5% and specificity of 62.2% for predicting diastolic dysfunction. An AUC value above 0.5 is considered to have significant predictive ability, where a value closer to 1 indicates a stronger predictor power. In the ROC curve model of this study, an AUC value of 0.647 was obtained, and it can be concluded that the calcium score has sufficient predictive ability for predicting diastolic dysfunction.

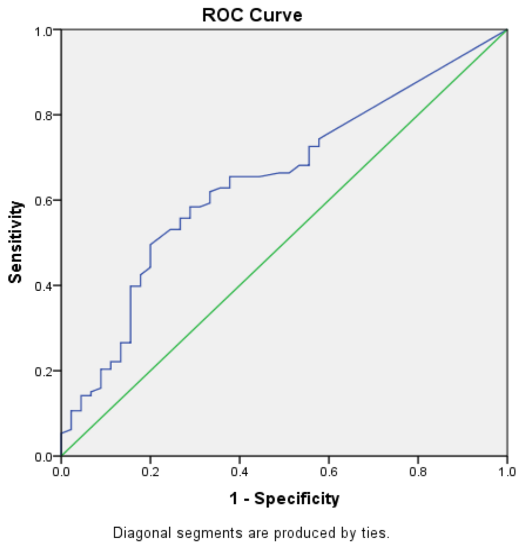

Figure 1. ROC Curve of Calcium Score for Detecting Diastolic Dysfunction

Table 5. Analysis of AUC Values, Sensitivity, Specificity of Calcium Scores

Parameter	Threshold Value	AUC	p-value	Sensitivity	Specificity	95% CI
Calcium Score	45	0.647	0.004	65.5%	62.2%	0.554 – 0.739

DISCUSSION

This study found a significant relationship between the calcium score and diastolic dysfunction. The increasing use of CCTA and calcium scores is beneficial. Evidence supports CCTA's clinical value of CCTA in CAD diagnosis, from early detection to acute assessment, plaque burden measurement, and high-risk plaque identification. This is crucial for CAD evaluation in immune-driven conditions with an increasing prevalence of cardiovascular disease. CCTA's hemodynamic indices and plaque characterization enable personalized risk assessment and guide therapy.[13] The establishment of diastolic dysfunction is important for cardiovascular disease management. Although often considered trivial, diastolic dysfunction provides a good cardiovascular prognosis. It may contribute to poor outcomes by limiting cardiac reserve, increasing dyspnea, and promoting decompensation.[14] The DIAST-CMD registry showed a significant association between cardiac diastolic dysfunction and coronary microvascular disease (CMD), both of which are linked to an increased risk of cardiovascular death. Integration of CMD into cardiac diastolic dysfunction improved risk stratification in patients without significant left ventricular systolic dysfunction.[15]

This study identified factors related to the incidence of diastolic dysfunction. Of the patients with type 2 DM, 38 (33.6%) experienced diastolic dysfunction, whereas 75 (66.4%) without type 2 DM experienced it (P = 0.01). Chaudry et al showed that among 100 patients, LVDD incidence was 41%, with Class 1 being most common. The LVDD group showed higher HbA1C levels, with HbA1C and age as strong indicators.[16] Chee et al. studied 301 Malaysian patients, of whom 83.1% had T2DM for >10 years. Patients had hypertension (77.1%), hyperlipidemia (91.0%), and obesity (72.9%). Moreover, 70.1% of the patients had left ventricular diastolic dysfunction, mostly grade 1. Age, ethnicity, insulin therapy, hypertension, and hyperlipidemia were associated with LV diastolic dysfunction.[17] Urea and creatinine levels are associated with diastolic dysfunction. In non-dialysis-dependent CKD patients, increasing E/e' (>14) remained significant after adjustment (HR = 1.09, 95% CI [1.03; 1.15], P = 0.004).[18] CKD causes hemodynamic overload, leading to structural changes that affect systolic and diastolic functions. Dilated concentric LV hypertrophy is common in ESKD, with restrictive physiology elements particularly important in CKD stages 4 and 5.[19] Echo parameters were directly related to diastolic dysfunction. E/e' was higher, whereas E Velocity, lateral e, ' septal e', and ejection fraction showed lower ranges in the dysfunction group. According to the guidelines, E/A <0.8 and E/e' <8 indicate grade 1, E/A between 0.8 and E/e' 9-12 indicate grade 2, and E/A> 2 and E/e> 12 indicate grade III dysfunction. Normal function is defined by septal e'> 8, lateral e'> 10, or LA volume <34 ml/m2.[20]

Marragianis et al. studied 114 patients, of whom 52 (45.6%) had diastolic dysfunction. Patients with diastolic dysfunction showed higher abnormal calcium scores (79.6% vs. 20%; OR 15.10, 95% CI 5.70–43.85; p<0.001). Multivariable analysis revealed diastolic dysfunction significantly associated with abnormal calcium scores (OR 13.82, 95% CI 5.57 to 37.37; p<0.001) after adjusting for Framingham Risk Score or clinical risk factors (OR 19.06, 95% CI 4.66 to 107.97; p<0.001).[[12] The study found that 60 (53.1%) patients with calcium scores ≥ 100 had diastolic dysfunction, while 6 (13.3%) did not. Of the patients with scores <100, 53 (46.9%) had diastolic dysfunction, whereas 32 (71.1%) did not (P = 0.006). Patients with scores ≥ 100 were 1.318 times more likely to have diastolic dysfunction (95% CI 1.083–1.605). The median calcium scores were higher in the diastolic dysfunction group (115 [0-2103]) versus without (20 [0-1001]), P = 0.004.

Kiel et al, 2023 also showed similar results. In a study aimed at investigating the relationship between CAC and LVDD in hypertensive patients without coronary artery disease (CAD), it was shown that of a total of 250 patients, the prevalence of LVDD was 64.8% (grade I LVDD, 48%; grade II LVDD, 16.8%), and the median CAC score was 58.2 (interquartile range [IQR] 0.7–349.8). Patients with LVDD had a significantly higher median CAC score than those without LVDD (142.8 [IQR 18.8–514.8] vs. 5.0 [IQR 0–64.4]; p<0.001). Multivariable analysis showed that the CAC score was independently associated with LVDD (OR 1.003; 95% CI [1.001–1.004]; p<0.001). Left atrial volume index and E-wave deceleration time were independently associated with high CAC (OR 1.05; 95% CI [1.01–1.09]; p = 0.008 and OR 1.008; 95% CI [1.002–1.02]; p = 0.01), respectively. Conclusion: CAC assessment is associated with LVDD in patients with hypertension.[21] Another study by Mansour et al. showed that patients with higher CAC scores were older, had more comorbidities, lower e', and were more likely to have Diastolic Dysfunction (DD). In the multivariate analysis, DD alone, age >65 years, or both were associated with an almost threefold increase in subclinical atherosclerosis. After propensity analysis, DD was still associated with an increased odds ratio (OR) for subclinical CAC (OR 3.66 [1.54-8.72], P-value 0.03) and similarly for e' < 10 cm/s. Compared with patients aged <65 years and normal diastolic function, those aged >65 years or DD had an OR of 3.49 (1.45-8.35) (P-value 0.005) for subclinical coronary atherosclerosis (CAC > 0), while those aged >65 years and DD had an OR of 9.30 (2.00-42) (P-value 0.004).[22]

Haddad et al. found associations between diastolic parameters, CAC score, age, LV mass index, and pulse pressure. Multivariate logistic regression assessed parameters influencing diastolic dysfunction in stable coronary heart disease patients. Among significant bivariate parameters (type 2 diabetes, calcium score, E velocity, E/e, ' lateral e, ' septal e', ejection fraction, urea, and creatinine), three remained significant: type 2 diabetes history, calcium score, and ejection fraction. Another study showed e', E/e', and LV mass index were independently associated with CAC after risk adjustment. E' and E/e' showed higher effects across CAC tertiles. Correlates included age, sex, race, height, weight, pulse pressure, hemoglobin A1C, and HDL cholesterol. LVDD occurred in 554 participants (26.6%).[23] ROC analysis showed calcium score's predictive ability (P=0.004, AUC 0.647, 95% CI 0.554-0.739), with threshold of 45 having 65.5% sensitivity and 62.2% specificity. Maragiannis et al. showed adding diastolic dysfunction to FRS increased abnormal CAC score identification (AUC 82.8, p<0.010) with 47% net reclassification.[12] This used pure calcium score threshold without risk modification.

CONCLUSION

A significant association exists between calcium score values and diastolic dysfunction in patients undergoing coronary computed tomography angiography (CCTA) at H. Adam Malik General Hospital Medan (P = 0.006; OR = 1.318; 95% CI 1.083–1.605), and between type 2 diabetes mellitus (DM) and diastolic dysfunction (P = 0.01). ROC analysis showed predictive capability of the calcium score (P = 0.004, AUC = 0.647, 95% CI: 0.554–0.739), with a threshold of 45 showing 65.5% sensitivity and 62.2% specificity. The coronary artery calcium score (CACS) is valuable for evaluating diastolic function and risk stratification. Future research may compare parameters of calcium scores and diastolic dysfunction with major adverse cardiovascular events (MACEs).

DECLARATIONS

None

CONSENT FOR PUBLICATION

The Authors agree to be published in the Journal of Society Medicine.

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COMPETING INTERESTS

The authors declare no conflicts of interest in this case report.

AUTHORS’ CONTRIBUTIONS

All authors contributed to the work, including data analysis, drafting, and reviewing the article. They approved the final version and were accountable for all aspects.

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