**Correlation between Left Ventricular Speckle Tracking and Coronary Angiography in Patients with Suspected Coronary Artery Disease**

**Abstract**

**Background:** Background: To examine the value of speckle tracking echocardiography to detect the presence, extent and severity of coronary artery affection in patients with suspected coronary artery disease.. **This study aimed to** examine the value of speckle tracking echocardiography to detect the presence, extent and severity of coronary artery affection in patients with suspected CAD. **Methods:** This cross-sectional study enrolled 200 candidates with suspected coronary artery disease. Patients were subjected to speckle tracking echocardiography and coronary angiography. Global longitudinal peak systolic strain were assessed and were correlated to the results of coronary angiography for each patient. **Results**: ROC analysis was done for GLPSS in predicting single-vessel affection. It revealed a significant AUC of 0.713, with a 95% confidence interval ranging from 0.555-0.871 (P = 0.013). The best cutoff was ≤- 18, at which sensitivity and specificity were 83% and 53.8%, respectively. ROC analysis was done for GLPSS in predicting multi-vessel affection. It revealed a significant AUC of 0.908 (P < 0.001). The best cutoff was ≤ - 11, at which sensitivity and specificity were 87.7% and 89.6%, respectively. **Conclusion:**Two-dimensional speckle tracking echocardiography has good sensitivity and specificity to predict the presence, extent and severity of CAD.

**Keywords:** ; Global Longitudinal Strain; Coronary artery Disease , stable angina, Coronary angiography

**Introduction**

The diagnosis and assessment of coronary artery disease involves clinical evaluation, identifying risk factors for atherosclerosis, and specific cardiac investigations such as different stress testing modalities and coronary imaging (1)*.*

non-invasive identification of patients with CAD is clinical challenge; more than half of the patients had normal or non-obstructive CAD on coronary angiography (2).

The diagnosis of CAD using echocardiography depends on the detection of left ventricle (LV) abnormal wall motion and the assessment of LV ejection fraction (EF). However, there are no abnormal LV wall motions at rest in CAD patients without a history of myocardial infarction (3).

strain can be used in assessing myocardial contraction myocardial viability either at rest or with stress (4).

2D-STE is more accurate than conventional 2D echocardiography in evaluating the regional and global myocardial function and assessing infarct size, viability of the infarcted myocardium, and mild changes of myocardial ischemia (5).

Speckle tracking echocardiography is a semi-automated modality, so it provides good intra-observer and inter-observer reproducibility (6).

 “strain” and “strain rate” imaging; require a single cardiac cycle for further offline processing and interpretation (7).

Longitudinal strain provides a good quantitative myocardial deformation assessment of each LV segment allowing early detection of systolic dysfunction in patients with preserved LV ejection fraction (8).

The use of STE longitudinal strain can detect, and risk stratify CAD with good accuracy and reproducibility. Strain and SR are homogeneously distributed across the myocardium, so mild changes in either measure suggest myocardial dysfunction. Although strain imaging has a potential role in the diagnosis and management of virtually any myocardial disease, its greatest role is in the detection of ischemic heart disease (9).

Measurements of myocardial strain and strain rate are newer indices that have the potential to overcome these limitations. Strain and Strain rate represent the magnitude and rate, respectively, of the myocardial deformation.(10)

**Aim of the work**

This study aims to detect the validity of left ventricular speckle tracking in patients with suspected coronary artery disease and correlates these findings with coronary angiographic results.

**Patients and methods**

This single center, cross sectional study enrolled 200 consecutive patients with suspected coronary artery disease from January 2021 to Novembre 2022 at cardiology department, Benha university. All patients signed an informed consent, and the study was approved by the local ethics committee.

**Inclusion criteria were** patients with typical angina pain, Patients with significant ECG changes, Patients with positive non- invasive imaging (resting echo, stress ECG, stress echo) and age more than 18 years old.

**Exclusion criteria were** serum creatinine>2 mg/dL, Poor echocardiographic window, Rhythm other than sinus rhythm, Significant valvular heart disease, Hypertrophic or idiopathic restrictive cardiomyopathy, Patients with previous cardiac surgery, Prior history of PCI, Patients with history of chronic obstructive lung disease, pulmonary hypertension or recent pulmonary embolism,

**All patients were subjected to c**omplete demographic data including age, gender, and cardiovascular risk factors. Systolic and diastolic blood pressure, Heart rate, resting 12-lead ECG, Ischemic changes, Associated arrhythmias and conduction defects. Conventional Trans-thoracic echocardiography was done by A complete conventional echocardiographic examination was performed for all patients using PHILIPS Affiniti 50, USA apparatus . LV ejection fraction left ventricular end-diastolic volume and left ventricular end-systolic volume were assessed using modified Simpsons method.

All patients were examined to detect wall motions abnormalities by regional wall motion score index, using 17 segments model by American Society of Echocardiography, Each segment was evaluated by semi-quantitative scoring system (1= normo-kinetic, 2 = hypokinetic, 3 = akinetic, 4= dyskinetic) and global wall motion score index will be calculated as the average of regional score.

2D Speckle-Tracking Strain Analysis was performed by by Three consecutive cardiac cycles with breath hold at high frame rates (>70 frames/sec) were obtained in the apical four, apical two-chamber and apical 3 chambers views. Semi-automated method was used in which 3 points were identified (basal septal, basal lateral and apical). (11,12)

Coronary angiography was performed for all patients within one week of speckle tracking echo by an expert cardiologist blinded to echocardiographic results according to the Judkins technique. Significant stenosis defined as stenosis ≥ 50% for the left main and ≥70% for the right coronary, left anterior descending and circumflex arteries. Multivessel CAD defined as significant stenosis in two or more vessels. severity coronary artery disease will be assessed by Calculation of the Gensini score which was initiated by giving a severity score to each coronary stenosis as follows: 1 point for ≤25% narrowing, 2 points for 26 to 50% narrowing, 4 points for 51 to 75% narrowing, 8 points for 76 to 90% narrowing, 16 points for 91 to 99% narrowing, and 32 points for total occlusion. Thereafter, each lesion score is multiplied by a factor that takes into account the importance of the lesion's position in the coronary circulation (5 for the left main coronary artery, 2.5 for the proximal segment of the left anterior descending coronary artery, 2.5 for the proximal segment of the circumflex artery, 1.5 for the mid-segment of the left anterior descending coronary artery, 1.0 for the right coronary artery, the distal segment of the left anterior descending coronary artery, the posterolateral artery, and the obtuse marginal artery, and 00.5 for other segments). (13)

**Statistical analysis**

Data management and statistical analysis were done using SPSS version 28 (IBM, Armonk, New York, United States). Quantitative data were summarized as means and standard deviations. Categorical data were summarized as numbers and percentages. Quantitative data were compared according to coronary affection using one-way ANOVA. Pairwise analyses were done in case of a significant overall effect. All pairwise analyses were adjusted for multiple comparisons. Correlation analyses were done using Pearson’s correlation. ROC analysis was done for GLPSS to predict single-vessel and multi-vessel disease. Areas Under Curve (AUC) with 95% confidence intervals, best cutoff points, and diagnostic indices were calculated. Multinominal logistic regression analysis was done to predict coronary affection. The odds ratios with 95% confidence intervals were calculated. All statistical tests were two-sided. P values less than 0.05 were considered significant.

**Results**

Patients’ general characteristics, Echo and coronary angiography findings of the studied patients were shown in **Table 1**.

A significant association was reported between diabetes and coronary affection (P = 0.024); Diabetes was higher in those with multi-vessel affection (66.7%) compared to those with single-vessel affection (52.8%) or normal coronaries (30.8%). Additionally, hypertension showed a significant association with coronary affection (P = 0.004);. Dyslipidemia showed a similar association with coronary affection (P < 0.001). No significant differences were reported regarding age (P = 0.778), gender (P = 0.781), BMI (P = 0.474), family history (P = 0.336), and smoking (P = 0.622). **Table 2**

**Regarding the clinical parameters according to coronary affection:** EF significantly differed between levels of coronary affection (P < 0.001). It was significantly higher in those with normal coronaries (53 ±4) than in those with single (49 ±4) or multiple vessel disease (41 ±6). Additionally, it was significantly higher in those with single-vessel disease than in those with multi-vessel disease. RWMSI showed a significant difference between the levels of coronary affection (P < 0.001). It was significantly lower in those with normal coronaries (1.3 ±0.3) than in those with single (1.5 ±0.3) or multiple vessel disease (2.1 ±0.3). Additionally, it was significantly lower in those with single-vessel disease than in those with multi-vessel disease. ESV revealed a significant difference according to coronary affection (P < 0.001). It was significantly lower in those with normal coronaries (61.3 ±8.3) than in those with single (68 ±8.3) or multiple vessel disease (87.4 ±12.6). Additionally, it was significantly lower in those with single-vessel disease than in those with multi-vessel disease.

EDV significantly differed between coronary affection levels (P < 0.001). It was significantly higher in those with multi-vessel disease (147 ±7) than in those with single-vessel disease (130 ±9) or normal coronaries (125 ±9). GLPSS showed an overall significant difference between the levels of coronary affection (P < 0.001). It was significantly higher in those with normal coronaries (-17 ±3) than in those with single (-15 ±3) or multiple vessel disease (-9 ±4). Additionally, it was significantly higher in those with single-vessel disease than in those with multi-vessel disease. Gensini score significantly differed between levels of coronary affection (P < 0.001). It was significantly lower in those with normal coronaries (55 ±7) than in those with single (63 ±3) or multiple vessel disease (76 ±10). Additionally, it was significantly lower in those with single-vessel disease than in those with multi-vessel disease. **Table 3**

GLPSS revealed a significant positive correlation with EF (r = 0.965, P < 0.001). In contrast, it revealed significant negative correlations with RWMSI (r = -0.953, P < 0.001), ESV (r = -0.947, P < 0.001), EDV (r = -0.761, P < 0.001), and Gensini score (r = -0.936, P < 0.001). **Table 4**

ROC analysis was done for GLPSS in predicting single-vessel affection. It revealed a significant AUC of 0.713, with a 95% confidence interval ranging from 0.555-0.871 (P = 0.013). The best cutoff was ≤- 18, at which sensitivity and specificity were 83% and 53.8%, respectively. **Figure 1**

ROC analysis was done for GLPSS in predicting multi-vessel affection. It revealed a significant AUC of 0.908 (P < 0.001). The best cutoff was ≤ - 11, at which sensitivity and specificity were 87.7% and 89.6%, respectively. **Figure 2**

Multinominal logistic regression analysis was done to predict coronary affection (single and multi-vessel). The model was built clinically, including GLPSS and all factors that might contribute to coronary affection. GLPSS was an independent predictor for single coronary affection (OR = 0.8, 95% CI = 0.647 – 0.989, P = 0.04) and multi-vessel affection (OR = 0.487, 95% CI = 0.376 - 0.632, P < 0.001), controlling for age, gender, BMI, diabetes, hypertension, dyslipidemia, family history, and smoking. **Table 5**

**Discussion**

. In this study, we investigated the global longitudinal peak

systolic strain (GLPSS) value through speckle tracking echocardiography (STE) to predict the presence and severity of coronary artery disease in stable coronary ARTERY DISEASE patients. There was a negative correlation between the GLPSS value and the severity of coronary artery disease.

Of the total 200 patients in the present study, More than half of the patients (53%) had single-vessel affection. More than one-third (40.5%) had multi-vessel affection, while only 6.5% had normal coronaries. This might be due to the questionnaire followed at our institute had more sensitivity, than specificity which gives us a strong control group. The mean age of the studied patients was 62 ±11 years, which was NEARLY similar to the mean age population 60 ± 12 reported by Montgomery et al 5 We found a significantly higher number of patients with advanced age, male gender, BMI, diabetes and smoking in the CAD group in comparison to the non-CAD group which is consistent with previously reported studies.(5,14,15)

In this study  GLPSS was significantly higher in those with normal coronaries (-17 ±3) than in those with single (-15 ±3) or multiple vessel disease (-9 ±4). Additionally, while in a study by Gaibazzi et al 16found -22 ± 1.5 (SVD), -19.4 ± 2.4 (DVD) and -18 ± 2.3(TVD) in CAD patients and Radwan et al17 reported GLPSS value of -15.13 ± 0.64 (SVD), -12.25 ± 0.9 (DVD) and -9.1 ± 1.94 (TVD), which supports our study trend of inverse correlation between GLPSS value and severity of coronary artery disease.

In single vessel affection this study found cutoff was ≤- 18, at which sensitivity and specificity were 83% and 53.8%, respectively. In multivessel affection this study found cutoff was ≤- 18, at which sensitivity and specificity were 83% and 53.8%, respectively

Moustafa et al14 found cutoff value of GLPSS for SVD, DVD, TVD, high syntax score (> 16) -18.44 (sensitivity 90%,specificity 95.1%); -17.35(sensitivity 90%,specificity 88.9%%); -15.33(sensitivity 63%,specificity 72%); -13.75(sensitivity 80%,specificity 91%) respectively which supports the present study cutoff value for SVD is > -20 with sensitivity of 79.69 % and 70.27% specificity, DVD (-18%) with sensitivity of 77.70% and specificity of 86.49%, TVD (> -16%) with sensitivity of 81.82% and 98.20% specificity and high syntax (> 22) > -16 with sensitivity 76.7% and specificity 83.33. This might be because of inter vendor and inter observer variability.

Abdelrazek et al15 found GLPSS cut-off value for high syntax score (≥ 22) was -16.5 (sensitivity 93%, specificity 91%), which is similar to the present study GLPSS cut-off -16 with sensitivity of 81.82% and 98.20% specificity for syntax score ≥ 22.

The SYNTAX score is used to grade lesion complexity for coronary revascularization. Most studies have reported longitudinal strain correlates with the presence and severity of CAD, but limited data has shown the correlation between GLPSS and Syntax score.

Study by Tanaka et al 18 reported a moderate correlation between SYNTAX scores and the extent of stress-induced myocardial ischemia as measured on myocardial SPECT (r = 0.647, *P* < 0.0001) in patients without prior myocardial infarction. These significant correlations were predominantly based on patients with a low SYNTAX score (r = 0.580, *P* < 0.0001), whereas such a correlation found insignificant for patients with an intermediate-high SYNTAX score (r = –0.033). Dogdus M et al19 defined severe coronary artery disease by Gensini score ≥ 20 and he reported the cut-off value of GLS for severe CAD was -10 (sensitivity 88.9%, specificity 92.9). In our study, we found inverse correlation between GLPSS and syntax score (r = 0.534, *P* < 0.000), indicating more severe the CAD more severely affected GLPSS.

In prediction of coronary affection the GLPSS was an independent predictor for single coronary affection (OR = 0.8, 95% CI = 0.647 – 0.989, P = 0.04) and multi-vessel affection (OR = 0.487, 95% CI = 0.376 - 0.632, P < 0.001) , in agreement with moustafa et al 14 The cutoff value of segmental LPSS for detection of diseased LAD artery was\_18.3 with 90% sensitivity and 91.1% specificity .The cutoff value of segmental LPSS for detection of diseased LCX artery was\_19.3138 with 95% sensitivity and 80% specificity and .The cutoff value of segmental LPSS for detection of diseased RCA artery was\_18.085 with 72.9% sensitivity and 78.8% specificity.

Limitation

It is undeniable that the number of patients enrolled in our study was relatively small and not randomized. For the comparison of value of GLPSS with presence and severity of disease we used coronary angiography technique only. Gensini score was not assessed by Intra Vascular Ultrasound (IVUS). Radial, transverse, circumferential strain and synchrony analysis were not achieved in the present study.

**Conclusion**

2D STE has good sensitivity and specificity to predict the presence, extent and severity of CAD in patients with suspected stable angina pectoris.

**Sources of funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Author contribution**

Authors contributed equally in the study**.**

**Conflicts of interest**

No conflicts of interest

**References**

1. Bösner S, Haasenritter J, Becker A, Karatolios K, Vaucher P, Gencer B, et al. Ruling out coronary artery disease in primary care: development and validation of a simple prediction rule. Cmaj. 2010;182:1295-300.

2. Patel MR, Peterson ED, Dai D, Brennan JM, Redberg RF, Anderson HV, et al. Low diagnostic yield of elective coronary angiography. N Engl J Med. 2010;362:886-95.

3. Elhendy A, van Domburg RT, Bax JJ, Roelandt JR. Significance of resting wall motion abnormalities in 2-dimensional echocardiography in patients without previous myocardial infarction referred for pharmacologic stress testing. J Am Soc Echocardiogr. 2000;13:1-8.

4. Bansal M, Jeffriess L, Leano R, Mundy J, Marwick TH. Assessment of myocardial viability at dobutamine echocardiography by deformation analysis using tissue velocity and speckle-tracking. JACC Cardiovasc Imaging. 2010;3:121-31.

5. Montgomery DE, Puthumana JJ, Fox JM, Ogunyankin KO. Global longitudinal strain aids the detection of non-obstructive coronary artery disease in the resting echocardiogram. Eur Heart J Cardiovasc Imaging. 2012;13:579-87.

6. Park CM, March K, Williams S, Kukadia S, Ghosh AK, Jones S, et al. Feasibility and reproducibility of left ventricular rotation by speckle tracking echocardiography in elderly individuals and the impact of different software. PLoS One. 2013;8:e75098.

7. Khosravani-Rudpishi M, Akhavan-Khaleghi N, Hosseinsabet A. Two-dimensional speckle-tracking echocardiographic evaluation of the longitudinal deformation of the left ventricular myocardium in patients with severe coronary artery tortuosity. J Clin Ultrasound. 2018;46:467-74..

8. D'Hooge J, Barbosa D, Gao H, Claus P, Prater D, Hamilton J, et al. Two-dimensional speckle tracking echocardiography: standardization efforts based on synthetic ultrasound data. Eur Heart J Cardiovasc Imaging. 2016;17:693-701.

9. Rumbinaitė E, Žaliaduonytė-Pekšienė D, Vieželis M, Čeponienė I, Lapinskas T, Žvirblytė R, et al. Dobutamine-stress echocardiography speckle-tracking imaging in the assessment of hemodynamic significance of coronary artery stenosis in patients with moderate and high probability of coronary artery disease. Medicina (Kaunas). 2016;52:331-9.

10. Hoit BD. Strain and strain rate echocardiography and coronary artery disease. Circ Cardiovasc Imaging. 2011;4:179-90.

11. Biering-Sørensen T, Hoffmann S, Mogelvang R, Zeeberg Iversen A, Galatius S, Fritz-Hansen T, et al. Myocardial strain analysis by 2-dimensional speckle tracking echocardiography improves diagnostics of coronary artery stenosis in stable angina pectoris. Circ Cardiovasc Imaging. 2014;7:58-65.

12. Lang RM, Badano LP, Mor-Avi V, Afilalo J, Armstrong A, Ernande L, et al. Recommendations for cardiac chamber quantification by echocardiography in adults: an update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. J Am Soc Echocardiogr. 2015;28:1-39.e14.

13. Sinning C, Lillpopp L, Appelbaum S, Ojeda F, Zeller T, Schnabel R, et al. Angiographic score assessment improves cardiovascular risk prediction: the clinical value of SYNTAX and Gensini application. Clin Res Cardiol. 2013;102:495-503.

14. Moustafa S, Elrabat K, Swailem F, Galal A. The correlation between speckle tracking echocardiography and coronary artery disease in patients with suspected stable angina pectoris. Indian Heart J. 2018;70:379-86.

15. Abdelrazek G, Yassin A, Elkhashab K. Correlation between global longitudinal strain and SYNTAX score in coronary artery disease evaluation. Egypt Heart J. 2020;72:22.

16. Gaibazzi N, Pigazzani F, Reverberi C, Porter TR. Rest global longitudinal 2D strain to detect coronary artery disease in patients undergoing stress echocardiography: a comparison with wall-motion and coronary flow reserve responses. Echo Res Pract. 2014;1:61-70.

17. Radwan H, Hussein E. Value of global longitudinal strain by two dimensional speckle tracking echocardiography in predicting coronary artery disease severity. Egypt Heart J. 2017;69:95-101.

18. Tanaka H, Chikamori T, Hida S, Igarashi Y, Shiba C, Usui Y, et al. Relationship of SYNTAX score to myocardial ischemia as assessed on myocardial perfusion imaging. **Circ J**. 2013;77(11):2772-7. doi: 10.1253/circj.cj-13-0099.

19. Dogdus M, Simsek E, Cinar CS. 3D-speckle tracking echocardiography for assessment of coronary artery disease severity in stable angina pectoris. **Echocardiography**. 2019;36(2):320-7. doi: 10.1111/echo.14214.

**Table 1: General characteristics, Echo and coronary angiography findings of the studied patients**

|  |  |
| --- | --- |
|  |  |
| **Age (years)** | 62 ±11 |
| **Gender** |  |
| Males | 126 (63) |
| Females | 74 (37) |
| **BMI** | 35 ±3 |
| **Diabetes mellitus** | 114 (57) |
| **Hypertension** | 129 (64.5) |
| **Dyslipidemia** | 126 (63) |
| **Family history** | 87 (43.5) |
| **Smoking** | 95 (47.5) |
| **Echo and coronary angiography findings** |  |
| **EF (%)** | 46 ±7 |
| **RWMSI** | 1.8 ±0.4 |
| **ESV (ml)** | 75.4 ±14.4 |
| **EDV (ml)** | 136 ±12 |
| **Coronary affection** |  |
| Normal | 13 (6.5) |
| Single vessel affection | 106 (53) |
| Multi-vessel affection | 81 (40.5) |
| **LAD affection** | 151 (75.5) |
| **RCA affection** | 111 (55.5) |
| **LCX affection** | 42 (21.0) |
| **GLPSS** | -13 ±4 |
| **Gensini score** | 68 ±10 |

Data are presented as mean ±SD or number (percentage)

**Table 2: General characteristics according to levels of coronary affection**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Normal****(n = 13)** | **Single vessel****(n = 106)** | **Multivessel****(n = 81)** | **P-value** |
| **Age (years)** | 63 ±11 | 62 ±11 | 61 ±10 | 0.778 |
| **Gender** |  |  |  |  |
| Males | 9 (69.2) | 68 (64.2) | 49 (60.5) | 0.781 |
| Females | 4 (30.8) | 38 (35.8) | 32 (39.5) |  |
| **BMI** | 36 ±4 | 35 ±3 | 35 ±3 | 0.474 |
| **DM** | 4 (30.8) | 56 (52.8) | 54 (66.7) | **0.024** |
| **HTN** | 6 (46.2) | 60 (56.6) | 63 (77.8) | **0.004** |
| **Dyslipidemia** | 8 (61.5) | 53 (50) | 65 (80.2) | **<0.001** |
| **Family history** | 6 (46.2) | 41 (38.7) | 40 (49.4) | 0.336 |
| **Smoking** | 7 (53.8) | 47 (44.3) | 41 (50.6) | 0.622 |

Data are presented as mean ±SD or number (percentage); Significant P-values are marked in bold.

**Table 3: Clinical parameters according to levels of coronary affection**

|  |  |  |
| --- | --- | --- |
|  | **Coronary affection** |  |
|  | **Normal** | **Single vessel** | **Multivessel** | **P-value** |
| **EF** | 53 ±4 a | 49 ±4 b | 41 ±6 c | **<0.001** |
| **RWMSI** | 1.3 ±0.3 a | 1.5 ±0.3 b | 2.1 ±0.3 c | **<0.001** |
| **ESV (ml)** | 61.3 ±8.3 a | 68 ±8.3 b | 87.4 ±12.6 c | **<0.001** |
| **EDV (ml)** | 125 ±9 a | 130 ±9 a | 147 ±7 b | **<0.001** |
| **GLPSS** | -17 ±3 a | -15 ±3 b | -9 ±4 c | **<0.001** |
| **GENSINI score** | 55 ±7 a | 63 ±4 b | 76 ±10 c | **<0.001** |

Data are presented as mean ±SD or number (percentage); EF: Ejection fraction; RWMSI: Regional wall motion score index; ESV: End systolic volume; EDV: End diastolic volume; GLPSS: Global longitudinal peak systolic strain; Different small letters between any pair indicate statistical significance; Significant P-values are marked in bold.

**Table 4: Correlation between GLPSS and other parameters**

|  |  |
| --- | --- |
|  | **GLPSS** |
|  | **r** | **P** |
| **Age (years)** | 0.048 | 0.497 |
| **BMI** | 0.016 | 0.819 |
| **EF** | .965 | **<.001** |
| **RWMSI** | -.953 | **<.001** |
| **ESV ml** | -.947 | **<.001** |
| **EDV ml** | -.761 | **<.001** |
| **GENSINI score** | -.936 | **<.001** |

r: Correlation coefficient; EF: Ejection fraction; RWMSI: Regional wall motion score index; ESV: End systolic volume; EDV: End diastolic volume; GLPSS: Global longitudinal peak systolic strain Significant P-values are marked in bold.

**Table 5: Multivariate logistic regression analysis to predict coronary affection.**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **OR (95% CI)** | **P-value** |
| **Single vessel** | Age (years) | 0.987 (0.932 - 1.045) | 0.649 |
|  | Gender | 1.141 (0.305 - 4.264) | 0.844 |
|  | BMI | 0.911 (0.76 - 1.091) | 0.312 |
|  | DM | 2.45 (0.637 - 9.426) | 0.193 |
|  | HTN | 1.581 (0.401 - 6.231) | 0.513 |
|  | Dyslipidemia | 0.522 (0.138 - 1.976) | 0.339 |
|  | Family history | 0.965 (0.23 - 4.046) | 0.962 |
|  | Smoking | 0.826 (0.217 - 3.149) | 0.779 |
|  | GLPSS | 0.8 (0.647 - 0.989) | **0.040** |
|  |  |  |  |
| **Multi-vessel** | Age (years) | 0.986 (0.92 - 1.056) | 0.677 |
|  | Gender | 1.278 (0.278 - 5.869) | 0.752 |
|  | BMI | 0.954 (0.767 - 1.186) | 0.669 |
|  | DM | 3.954 (0.806 - 19.402) | 0.09 |
|  | HTN | 1.94 (0.392 - 9.608) | 0.417 |
|  | Dyslipidemia | 1.169 (0.249 - 5.49) | 0.843 |
|  | Family history | 1.333 (0.256 - 6.944) | 0.733 |
|  | Smoking | 1.416 (0.305 - 6.581) | 0.657 |
|  | GLPSS | 0.487 (0.376 - 0.632) | **<.001** |

OR: Odds ratio; 95% CI: 95% Confidence interval; Significant P-values are marked in bold.



**Figure 1: ROC analysis of GLPSS to predict single coronary affection.**



**Figure 2: ROC analysis of GLPSS to predict multi-vessel coronary affection.**