

Right Ventricular Strain and Short-Term Prognosis in Patients with First Acute Anterior STEMI without Evidence of RV Infarction

Hany H. Ebaid , Mahmoud A. Abdallah, Ahmed A. Mohammed,
Karim H. Ali

Abstract:

Background: Myocardial infarction (MI) remains a leading cause of death worldwide. Right ventricular (RV) dysfunction, though often overlooked, is strongly associated with higher mortality and cardiogenic shock. While left ventricular (LV) function has been a traditional prognostic factor, its value is reduced with modern revascularization. RV strain may provide additional prognostic insight, even without evident RV infarction. **Aim:** To assess the prognostic role of RV strain imaging in patients with first acute anterior ST-elevation myocardial infarction (STEMI) without RV infarction. **Methods:** This prospective, single-center study included 200 consecutive patients admitted with first acute anterior STEMI to Benha University Hospital from September 2023 to August 2024. Patients were classified as “complicated” (major adverse cardiovascular events [MACE]) or “non-complicated.” All underwent clinical evaluation, electrocardiography, echocardiography, and speckle tracking echocardiography. **Results:** Mean age was 62 ± 7 years; 59% were male. Comorbidities included diabetes (51%), hypertension (59%), dyslipidemia (33%), and smoking (43.3%). Compared to the non-complicated group, MACE patients showed higher RVMPI (0.50 ± 0.03 vs. 0.44 ± 0.05 , $P < 0.001$), lower TAPSE (15.24 ± 1.13 vs. 17.18 ± 0.49 mm, $P < 0.001$), and reduced FAC ($34.7 \pm 1.6\%$ vs. $39.2 \pm 1.4\%$, $P < 0.001$). RV free wall strain ($19.1 \pm 2.2\%$ vs. $20.5 \pm 0.6\%$) and RV global longitudinal strain ($16.1 \pm 2.1\%$ vs. $17.4 \pm 0.3\%$) were also significantly lower ($P < 0.001$). **Conclusion:** In anterior STEMI without RV infarction, impaired RV strain—particularly RVGLS and free wall strain—independently predicts MACE, highlighting its value for prognosis and management. **Keywords:** Right Ventricular Strain; First Acute Anterior STEMI; RV Infarction.

Cardiovascular Department,
Faculty of Medicine Benha
University, Egypt.

Corresponding to:
Dr. Mahmoud A. Abdallah.
Cardiovascular Department,
Faculty of Medicine Benha
University, Egypt.
Email:
m.abdullah60616@fmed.bu.edu.eg

Received:

Accepted:

Introduction

RV dysfunction is acknowledged as a critical factor in the prognosis, mortality, and incidence of cardiogenic shock in AMI patients, despite the fact that MI remains a significant cause of mortality on a global scale. RV dysfunction has frequently been disregarded, despite the fact that studies have demonstrated its correlation with an elevated mortality risk, despite its importance. RV involvement is a significant independent predictor of outcomes, even in cases where LV function is comparatively preserved. Consequently, it is imperative to consider RV function in the prognosis of AMI⁽¹⁾

The utility of a diverse array of echocardiographic parameters, including right ventricular myocardial performance index (RIMP), fractional area change (FAC), the tricuspid annular plane systolic excursion (TAPSE), fractional area change (FAC), tissue Doppler imaging of the lateral tricuspid annulus (S'), and more recently RV free wall global longitudinal strain (RV-GLS), in the evaluation of RV systolic function has been consistently demonstrated in a number of studies⁽²⁾

However, there is no study that evaluates the right ventricular function of patients with anterior myocardial infarction⁽³⁾

Patients and Methods

The Cardiology Department at Benha University Hospital admitted 200 consecutive patients with their first acute anterior STEMI from September 2023 to August 2024 for this observational, prospective, single-center study.

On the basis of the presence of significant adverse cardiovascular events, the subjects of the study were divided into two groups: the

"complicated" group and the "non-complicated" group.

Inclusion Criteria:

- Patients aged ≥ 18 years of both sexes, presenting with an initial acute anterior STEMI who do not exhibit evidence of RV infarction. A new ST-segment elevation of at least 1 mm in two or more contiguous anterior leads (V1–V6, aVL, and I) and the presence of ischemic chest pain for a duration exceeding 30 minutes were the criteria for anterior STEMI⁽⁴⁾.

Exclusion Criteria:

- Patients with RV infarction (both clinically and ECG evidence of RV infarction (ST-elevation in V3R, V4R).
- Individuals who have previously been diagnosed with ischemic heart disease.
- Cardiogenic shock, bundle branch block, severe acute pulmonary congestion, or any other interventricular conduction delay.chronic renal failure,Liver cell failure
- Patients with RV dysfunction due to other causes like pulmonary embolism or COPD.
- Poor echogenic window.

The history of all patients was obtained, which included their age, Sex, history of diabetes mellitus, hypertension, and dyslipidemia.

A comprehensive clinical evaluation was conducted, which encompassed the following: diastolic and systolic blood pressure,heart rate, signs of heart failure, and KILIP classification.

A CBC, serum creatinine, and troponin were obtained from blood samples.

In order to detect cardiac rhythm abnormalities and ST-segment elevation in the anterior leads, all patients underwent a twelve-lead electrocardiogram.

The first contact was followed by comprehensive transthoracic

echocardiographic examinations using a Philips Epic 7C machine with the 5.5 X transducer S5-1 probe and simultaneous ECG signal, and after 6 months. In the left lateral decubitus position, patients were examined. Every echocardiographic examination was acquired and documented offline. In both the apical two chamber and apical four chamber views, the left ventricular ejection fraction (LVEF) was calculated using the end-diastolic and end-systolic volumes of the ventricle. This methodology was derived from Simpson's research. The ejection fraction, or a specific percentage of the end-diastolic volume, is discharged with each pulse. This value is obtained by dividing the stroke volume (SV) by the end-diastolic volume. Stroke volume is calculated by subtracting the end-diastolic volume from the end-systolic volume⁽⁵⁾.

The apical 4-chamber image was employed to calculate the fractional area change (FAC). The end-diastolic area is divided by the end-systolic area, and the resulting value is multiplied by 100. This value is referred to as FAC⁽⁶⁾.

From end-diastole to end-systole, the term "tricuspid annular plane systolic excursion" (TAPSE) refers to the entire excursion of the tricuspid annulus. Typically, M-mode imaging is implemented to quantify it at the lateral annulus⁽⁷⁾.

The maximal tricuspid regurgitation (TR) velocity of a patient is used to determine their PASP. The following formula can be used to analyze TR peak velocity using continuous wave (CW) Doppler: the inflow view of the parasternal long axis (PLAX), parasternal short axis (PSAX), and the apical 4-chamber (A4C) view. One method of calculating RVsP:= PASP = PASP = $4(\text{peak TR velocity})^2 + \text{RAP}$ ⁽⁸⁾.

Speckle-tracking analysis was employed to measure the global wall strain and unconstrained wall strain of the RV in a four-chamber view, with LV-specific software. We manually traced the endocardial boundary of the RV (about 10-16 points) throughout a single frame during the strain analysis, which was completed offline. To exclude the pericardium and include the whole myocardial wall, the region of interest (ROI) was changed. At the start of each cardiac cycle, the QRS complex served as the reference point. The speckle displacement from one frame to the next divided by the time gap is the myocardial velocity. In order to determine RVGLS in the three segments of the RV free wall—basal, mid, and apical—the mean value of the three segments was computed. A lower number shows that the RV systolic function is improving, and a negative strain value means that the tissue is shortening. Parts were removed if the monitoring was not accurate enough. In 85% of the segments, strain analysis was achievable⁽⁹⁾.

Patients were managed either through percutaneous coronary intervention (PCI), or streptokinase (SK) therapy. Clinical outcomes were observed and recorded. Outcome variables included heart failure, stroke, rehospitalization, and mortality.

Statistical Analysis

□ Continuous variables were expressed as mean $\pm$ SD and compared using the Student's t-test or Mann-Whitney U test as appropriate.

□ Categorical variables were presented as frequencies and percentages and analyzed using the Chi-square test or Fisher's exact test.

□ Multivariate logistic regression was performed to identify independent predictors of adverse cardiovascular events.

□ All statistical analyses were performed using **SPSS software, version 26.0 (IBM Corp., Armonk, NY, USA).**

Results

The mean age of the 200 participants in the investigation was 62 ± 7 years. The sample consisted of 118 males (59%) and 82 females (41%). 84 (43.3%) of the participants were smokers, and 102 (51%) of the participants had diabetes mellitus

□ A p-value <0.05 was considered statistically significant.

Approval code: MD 1-8-2023 (DM). The mean body mass index (BMI) was 25 ± 2 and 118 individuals (59%) were diagnosed with hypertension. Furthermore, dyslipidemia was observed in 66 participants (33%) **(Table 1).**

Table 1: Demographic characteristics and Echocardiography of the studied patients.

General characteristics		
Age (years)	Mean ±SD	62 ±7
Sex		
Males	n (%)	118 (59)
Females	n (%)	82 (41)
DM	n (%)	102 (51)
Smoking	n (%)	84 (43.3)
Hypertension	n (%)	118 (59)
BMI		25 ±2
RVMPI		0.46 ±0.05
PASP		32 ±3
TAPSE		16.7 ±1.1
FAC		38.1 ±2.5
LVIDD		5.14 ±0.83
LVISD		3.78 ±0.87
EF		38 ±4
RV-free wall strain		-20.2 ±1.3
RVGLS		-17 ±1.2

*SD: Standard deviation; DM: Diabetes mellitus; BMI: Body mass index; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; HR: Heart rate; RVMPI: Right ventricular myocardial performance index; PASP: Pulmonary artery systolic pressure; TAPSE: Tricuspid annular plane systolic excursion; FAC: Fractional area change; LVIDD: Left ventricular internal diameter in diastole; LVISD: Left ventricular internal diameter in systole; EF: Ejection fraction; RVGLS: Right ventricular global longitudinal strain.

The study participants' echocardiographic measurements revealed the following mean values: a fractional area change (FAC) of 38.1 ± 2.5%, a tricuspid annular plane systolic excursion (TAPSE) of 16.7 ± 1.1 mm, a right ventricular myocardial performance index (RVMPI) of 0.46 ± 0.05 and a pulmonary artery systolic pressure (PASP) of 32 ± 3 mmHg.

The internal diameter of the left ventricle was 5.14 ± 0.83 cm during diastole (LVIDD) and 3.78 ± 0.87 cm during systole (LVISD). Ejection of approximately 38% of the material occurred. The right ventricular free wall strain was -20.2 ± 1.3%, and the right ventricular global longitudinal strain (RVGLS) was -17 ± 1.2% **(Table 1)**

The treatment modalities among the study participants were predominantly percutaneous coronary intervention (PCI), utilized in 166 individuals

(83%), while streptokinase (SK) therapy was administered to 34 participants (17%). **Table 2**

Table 2: Management strategies for the studied patients

	n (%)
SK	34 (17)
PCI	166 (83)

*SK: Streptokinase; PCI: Percutaneous coronary intervention

Table 3: Outcome of the studied patients

	n (%)
Heart failure	22 (11)
Stroke	6 (3)
Re-hospitalization	18 (9)
Mortality	4 (2)
MACE	50 (25)

*MACE: Major adverse cardiac events

The study's outcomes revealed that 22 participants (11%) experienced heart failure (HF), and 6 participants (3%) suffered a stroke. Rehospitalization occurred in 18 participants (9%), and there were 4 deaths (2%). Major adverse cardiovascular events (MACE) were reported in 50 participants (25%).

Table 3

The mean age of participants who experienced MACE was higher (66 ± 7 years) than that of those who did not (61 ± 7 years, $P < 0.001$). Smoking

was more prevalent among individuals with MACE (60%) than those without (37.5%, $P = 0.006$). Furthermore, hypertension was more prevalent in the MACE group (72%), as opposed to the non-MACE group (54.7%) ($P = 0.031$).

Table 4

Insignificant variables included sex ($P = 0.135$), diabetes mellitus (DM) ($P = 0.142$), body mass index (BMI) ($P = 0.332$), and dyslipidemia ($P = 0.602$).

Table 4

Table 4: Demographic and general characteristics according to MACE

		MACE		P-value
		Yes (n = 50)	No (n = 150)	
Age (years)	Mean $\pm$ SD	66 $\pm$ 7	61 $\pm$ 7	<0.001*
Sex				
Males	n (%)	34 (68)	84 (56)	0.135
Females	n (%)	16 (32)	66 (44)	
DM	n (%)	30 (60)	72 (48)	0.142
Smoking	n (%)	30 (60)	54 (37.5)	0.006*
Hypertension	n (%)	36 (72)	82 (54.7)	0.031*
BMI	Mean $\pm$ SD	26 $\pm$ 2	25 $\pm$ 2	0.332
Dyslipidemia	n (%)	18 (36)	48 (32)	0.602

*Significant P-value; MACE: Major adverse cardiac events; SD: Standard deviation; DM: Diabetes mellitus; HTN: Hypertension; BMI: Body mass index

Compared to the non-MACE group (0.44 ± 0.05 , $P < 0.001$), the MACE group demonstrated a higher right ventricular myocardial performance index (RVMPI) (0.5 ± 0.03). In comparison to the non-MACE group, the MACE group demonstrated a reduced tricuspid annular plane systolic excursion (TAPSE) of 15.24 ± 1.13 mm (17.18 ± 0.49 mm, $P < 0.001$). The fractional area change (FAC) of participants who experienced MACE was considerably lower than that of those who did not ($39.2 \pm 1.4\%$, $P < 0.001$). The ejection fraction (EF) in the MACE group was significantly higher ($40 \pm 4\%$) than in the non-MACE group ($38 \pm 4\%$, $P <$

0.001). The MACE group demonstrated a lower right ventricular free wall strain ($19.1 \pm 2.2\%$) ($20.5 \pm 0.6\%$, $P < 0.001$) in comparison to the non-MACE group. Furthermore, the MACE group demonstrated a reduced right ventricular global longitudinal strain (RVGLS) ($16.1 \pm 2.1\%$) than the non-MACE group ($17.4 \pm 0.3\%$, $P < 0.001$) (**Table 5**)

There were no statistically significant alterations in LVIDD ($P = 0.495$), LVISD ($P = 0.971$), or pulmonary artery systolic pressure (PASP). Nevertheless, there were no significant differences in LVISD ($P = 0.971$) or pulmonary artery systolic pressure (PASP) **Table 5**

Table 5: Echocardiography parameters according to MACE

		MACE		P-value
		Yes (n = 50)	No (n = 150)	
RVMPI	Mean $\pm$ SD	0.5 ± 0.03	0.44 ± 0.05	<0.001*
PASP	Mean $\pm$ SD	32 ± 3	32 ± 3	0.476
TAPSE	Mean $\pm$ SD	15.24 ± 1.13	17.18 ± 0.49	<0.001*
FAC	Mean $\pm$ SD	34.7 ± 1.6	39.2 ± 1.4	<0.001*
LVIDD	Mean $\pm$ SD	5.2 ± 0.64	5.12 ± 0.89	0.495
LVISD	Mean $\pm$ SD	3.78 ± 0.71	3.78 ± 0.92	0.971
EF	Mean $\pm$ SD	40 ± 4	38 ± 4	<0.001*
RV-free wall strain	Mean $\pm$ SD	-19.1 ± 2.2	-20.5 ± 0.6	<0.001*
RVGLS	Mean $\pm$ SD	-16.1 ± 2.1	-17.4 ± 0.3	<0.001*

*Significant P-value; RVMPI: Right ventricular myocardial performance index; PASP: Pulmonary artery systolic pressure; TAPSE: Tricuspid annular plane systolic excursion; FAC: Fractional area change; LVIDD: Left ventricular internal diameter in diastole; LVISD: Left ventricular internal diameter in systole; EF: Ejection fraction; RVGLS: Right ventricular global longitudinal strain

Statistical analysis and data administration were conducted using SPSS version 28 (IBM, Armonk, New York, United States). In order to determine whether quantitative data was normally distributed, we implemented direct data visualization tools and the Kolmogorov-Smirnov test. Quantitative data was described using medians and ranges, which are equivalent to mean and standard deviations, in accordance with the normality concept. The categorical data was summarized using percentages and figures. Comparing the groups under study was done using the Mann-Whitney U test for non-normally distributed quantitative

variables and the independent t-test for regularly distributed ones. Both Fisher's exact test and the chi-square test were used by the researchers when comparing the categories. MACE was predicted using multivariate logistic regression analysis. The 95% confidence intervals were employed to ascertain the odds ratios. The statistical experiments were consistently conducted with two categories in mind. The results were deemed significant when the P values were less than 0.05⁽¹⁰⁾

Case presentation

Male patient 58 years old, diabetic but not hypertensive or smoker presented with

typical retrosternal chest pain radiated to back and associated with autonomic manifestation.

Physical examination revealed regular pulse of 100 bpm, and blood pressure 100/60 mmHg. On auscultation there is no detectable murmur or additional heart sound.

ECG: revealed sinus rhythm with ST elevation in leads V1 to V6 and AvL.

LV Echocardiography:

EF: 47.0 %, **LVEDD:** 51ml, **LVEDS:** 39ml.

Laboratory data:

Troponin: 4.7 ng/ml

Patient diagnosed as anterior STEMI & fibrinolytic therapy was given.

RV Echocardiography:

RV free wall strain -17.5%, RV global wall strain -12.5%, FAC19.4%, TAPSE 1.5 cm (figure 1)

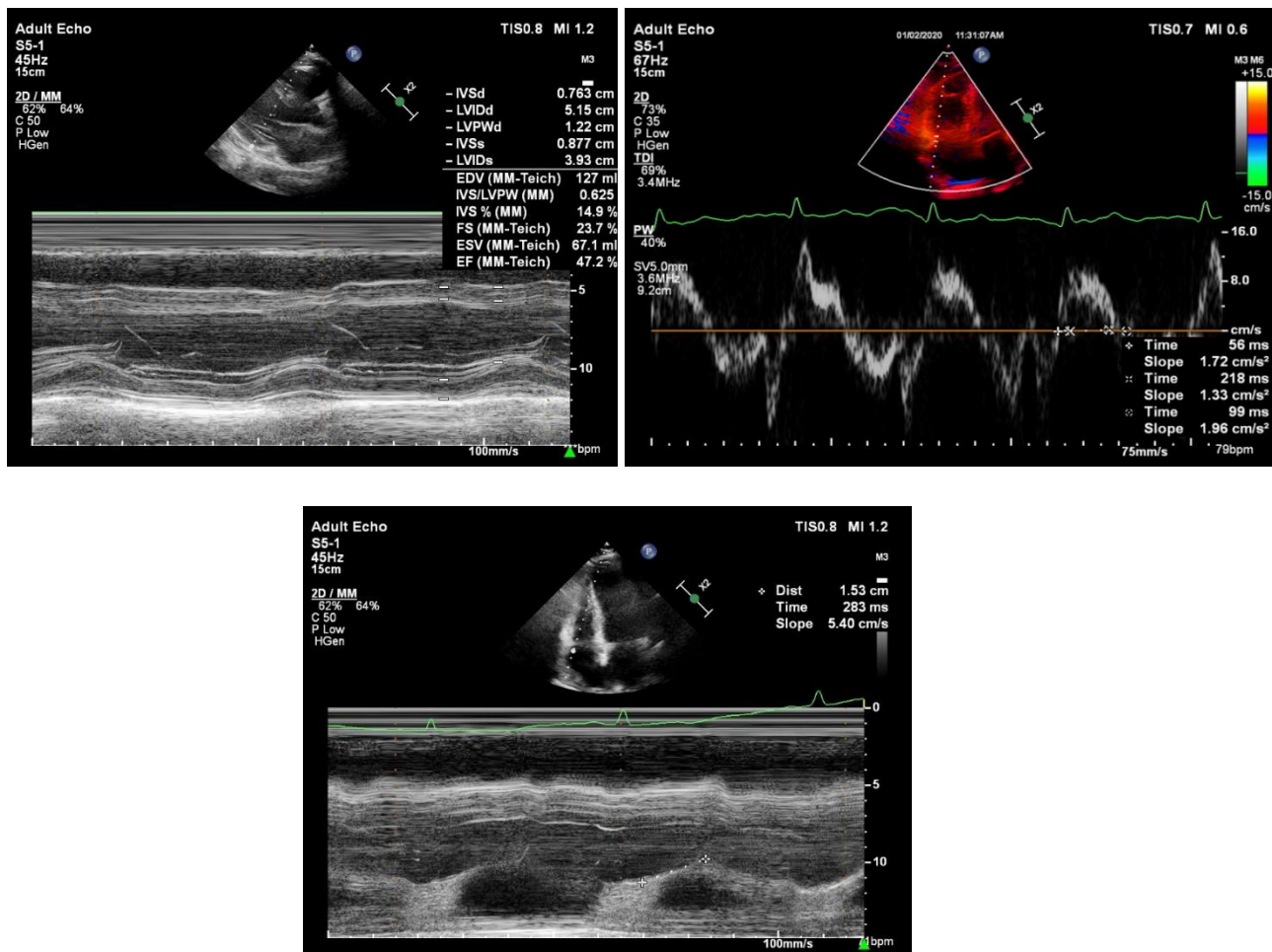


Figure 1: Echocardiographic Assessment of Right Ventricular Function in a Case of First Acute Anterior STEMI without RV Infarction

Discussion

Patients presenting with first-ever acute anterior STEMI who do not show signs of RV infarction were the subjects of this study, which sought to determine the

predictive utility of right ventricular stress imaging.

In this prospective observational study, 200 patients hospitalized to Benha University Hospital with their first acute anterior STEMI were included. Included patients were those who were 18 years of

age or older and did not show signs of RV infarction; patients who had a history of IHD or other diseases impacting RV function were not. Data collection involved clinical and echocardiographic assessments, including TAPSE and RVGLS. Patients received either PCI or streptokinase therapy, with outcomes such as heart failure and MACE monitored.

Our study found that participants who experienced MACE were older, with a mean age of 66 ± 7 years compared to 61 ± 7 years in the non-MACE group ($P < 0.001$). This aligns with prior studies, including those by Peacock et al.⁽¹⁶⁾ and Lang et al.⁽¹³⁾, which highlighted age as a key determinant of poor outcomes in MI patients. Age-related changes, such as decreased cardiovascular reserve and increased arterial stiffness due to atherosclerosis, may explain the heightened vulnerability of older individuals to complications following MI as mentioned in Kalkan et al.⁽¹¹⁾.

Smoking prevalence was also higher among those with MACE (60% vs. 37.5%, $P = 0.006$). This observation is consistent with findings from studies like Baghel et al.⁽³⁾, which emphasized smoking as a modifiable risk factor strongly associated with adverse outcomes in MI. Chronic exposure to tobacco compounds leads to endothelial dysfunction, oxidative stress, and increased thrombus formation, predisposing patients to worse cardiac outcomes like Borges et al.⁽⁴⁾.

Hypertension was more frequent in the MACE group (72% vs. 54.7%, $P = 0.031$), which supports prior evidence from Keskin et al.⁽¹²⁾, showing that hypertension exacerbates myocardial stress and contributes to poor prognosis in MI patients Keskin et al.⁽¹²⁾. Conversely, other variables such as diabetes mellitus (DM), body mass index (BMI), sex, and dyslipidemia were not significantly associated with MACE in our cohort. This differs from the findings of Lang et al.⁽¹³⁾, who identified DM and dyslipidemia as significant predictors in their study. The

discrepancy could be due to differences in sample size, population characteristics, or treatment protocols, as reported by Lang et al.⁽¹³⁾.

The present study found that patients with MACE exhibited higher RVMPI and lower TAPSE, FAC, RV-free wall strain, and RVGLS, suggesting compromised RV function. Elevated RVMPI reflects impaired global RV performance, while reduced TAPSE and FAC point to diminished systolic function, which may result in an elevated risk of adverse events and inadequate cardiac output. Despite the fact that the MACE group exhibited a marginally higher EF, this likely reflects a compensatory mechanism rather than improved function, as reduced RV strain parameters indicate subclinical RV dysfunction, as reported by Lee et al.⁽¹⁴⁾.

Confirming our study, Lee et al.⁽¹⁴⁾ The early effects of RV dysfunction in patients with anterior versus inferior STEMI were compared using tissue Doppler and speckle tracking echocardiography. Subjects of their investigation comprised one hundred patients who underwent primary percutaneous coronary intervention (PCI). Two categories of patients were identified: those who had undergone anterior STEMI. Their results were in agreement with ours, as they found that anterior STEMI patients exhibited reduced TAPSE, RV strain, and elevated RVMPI, which indicated that their RV function was worse. Both studies emphasize the prognostic importance of RV dysfunction in anterior STEMI, despite the absence of overt RV infarction on ECG, as reported in Pavlicek et al.⁽¹⁵⁾.

Our results demonstrate that RV-free wall strain and RVGLS are significant predictors of MACE following myocardial infarction. ROC analysis identified optimal cutoffs for RV-free wall strain ($\leq -19.5\%$) and RVGLS ($\leq -16.9\%$), with AUCs of 0.715 and 0.733, respectively, reflecting robust predictive capability ($P < 0.001$). Both strain metrics showed high specificity (93.3% and 88%, respectively)

and strong negative predictive values, indicating their utility in ruling out MACE in lower-risk patients.

Furthermore, multivariate logistic regression revealed that a one-unit increase in RV-free wall strain reduced the risk of MACE by 51.8%, while an equivalent increase in RVGLS reduced the risk by 59.3% (both $P < 0.001$), independent of other clinical factors such as age, sex, smoking, hypertension, and BMI. Age emerged as an independent risk factor, with each additional year increasing MACE risk by approximately 12% ($P < 0.001$). Consistently, as reported in Pavlicek et al. ⁽¹⁵⁾.

The RVGLS of patients with anterior STEMI was significantly worse than that of those with inferior STEMI ($14.52 \pm 5.23\%$ vs. $17.41 \pm 5.06\%$, $P < 0.001$). A baseline model was established using the GRACE risk score to illustrate the improvement in in-hospital mortality prediction achieved by RV GLS. The LVEF was subsequently incorporated. The integration of RV GLS significantly improved the predictive value of the model. The results of transthoracic echocardiography conducted within 24 hours after revascularization indicated that patients who encountered their first ACS had the strongest correlation between in-hospital mortality and RV GLS. This index exceeded all other RV function indices Keskin et al. ⁽¹²⁾.

According to our results, Antoni et al. ⁽¹⁶⁾. RV function was assessed in a study to determine its predictive significance in patients who had primary percutaneous coronary intervention (PCI) for acute myocardial infarction (MI). Their univariate analysis revealed that RV strain, RVFAC, and tricuspid annular plane systolic excursion all predicted a poorer prognosis. Following multivariate analysis, the composite end point could be predicted only by RV FAC (hazard ratio, 0.96; 95% CI, 0.92 to 0.99) and RV strain (hazard ratio, 1.08; 95% CI, 1.03 to 1.13). In addition, RV strain served to enhance

clinical data, infarct features, left ventricular function, and RVFAC. According to the RV function, the result was much worse than expected.

Likewise, Peacock et al. ⁽¹⁷⁾ Assessment of RV function in AMI patients was given top priority, with a focus on IWMI and AWTMI (anterior wall myocardial infarction) cases that did not entail RV infarction. They evaluated 160 patients using 2D, 3D echocardiography, and TDI within 72 hours of admission. The study found significantly lower TAPSE scores in AWTMI patients (16.78 ± 2.87 mm) compared to IWMI patients (18.41 ± 2.67 mm, $p = 0.001$), indicating more pronounced RV dysfunction in AWTMI cases. Similarly, the FAC was lower in AWTMI ($37.45 \pm 4.98\%$) than IWMI ($41.10 \pm 4.45\%$, $p = 0.003$). Furthermore, 23.91% of AWTMI patients experienced MACE within one month, with 20.95% of these patients having RV dysfunction ($p < 0.001$) Peacock et al. ⁽¹⁷⁾.

While TAPSE, RVFAC, and RV strain do have a strong relationship, they do assess different components of RV function. When assessing the contractility of RVs, RVFAC is the most used measure. Bear in mind that RVFAC measurement relies on prior experience and often has poor repeatability. Consequently, RVFAC may not be a reliable measure of contractility. TAPSE is a second frequently used metric to assess RV function. The longitudinal systolic excursion of the lateral tricuspid valve annulus is quantified. However, the contractility of the RV may not be accurately represented.

Active myocardial deformation can be quantified in an angle-independent manner using a novel technique known as strain. It has been shown in prior research that strain can be employed to identify clinically relevant but subtle reductions in ventricular function. As a result, we hypothesized that this could also be relevant to the subtle modifications in RV function that occur following an acute myocardial infarction Radwan et al. ⁽¹⁸⁾

The current study's findings support the idea that RV function should be routinely evaluated as part of the follow-up process for patients with AMI. Research has shown that measuring RV strain early after an AMI is more useful for risk classification of patients than using RVFAC and TAPSE. This has the ability to help find patients who are more likely to have negative outcomes.

Conclusion

In patients with their first acute anterior STEMI without RV infarction, the present study concluded that right ventricular strain, specifically RVGLS and RV-free wall strain, is a critical prognostic factor. A higher risk of MACE, including HF and increased mortality, was associated with lower RVGLS and RV-free wall strain values. These findings highlight the critical role of RV strain assessment in improving prognosis and guiding clinical management in this patient population

Recommendation

Right ventricular strain parameters, such as RVGLS and RV-free wall strain, should be integrated into routine echocardiographic evaluations for patients with acute anterior STEMI to improve risk stratification.

“The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.”

References

1. El-Sayed Hammad, M., Sami Abd El-Samea, M. , Mostfa, et al. ECHOCARDIOGRAPHIC ASSESSMENT OF RIGHT VENTRICULAR FUNCTION AFTER SUCCESSFUL REVASCULARIZATION FOR ACUTE ANTERIOR MYOCARDIAL INFARCTION WITHOUT RIGHT VENTRICULAR INFARCTION. *Al-Azhar Medical Journal*,2021; 50, 2845-2856..
2. Deshpande ,A. & Birnbaum, Y. ST-segment elevation: Distinguishing ST elevation myocardial infarction from ST elevation secondary to nonischemic etiologies. *World J Cardiol*,2014; 6, 1067-79.
3. Baghel, P. K., Tripathi, S. K., Vahab, A. A.,et al. Assessment of Right Ventricular Function in Patients With Acute Myocardial Infarction. *Cureus*, 2022;14, e22399.
4. Borges, A. C., Knebel, F., Eddicks, S., et al. Right ventricular function assessed by two-dimensional strain and tissue Doppler echocardiography in patients with pulmonary arterial hypertension and effect of vasodilator therapy. *Am J Cardiol*,2016; 9.4-530 ,^
5. Guazzi, M., Bandera, F., Pelissero, G., et al. Tricuspid annular plane systolic excursion and pulmonary arterial systolic pressure relationship in heart failure: an index of right ventricular contractile function and prognosis. *Am J Physiol Heart Circ Physiol*,2013; 305, H1373-81.
6. Chang, W. T., Shih, J. Y., Feng, Y. H., et al. The Early Predictive Value of Right Ventricular Strain in Epirubicin-Induced Cardiotoxicity in Patients with Breast Cancer. *Acta Cardiol Sin*,2016; 32, 550-559.
7. Aher, M., Bansal, S., Isser, H.,et al. ASSESSMENT OF RIGHT VENTRICULAR FUNCTION IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION. *Journal of the American College of Cardiology*,2018; 71, A42-A42.
8. El Amrawy, A. M., Zaghloul, S. A. E., El Sharkawy, et al., Prognostic value of right ventricular diastolic dysfunction in patients with inferior ST-elevated myocardial infarction. *The Egyptian Heart Journal*,2023; 75, 31.
9. Anastasiou, V., Kamperidis, V., Daios, S., et al. Right ventricular global longitudinal strain and short-term prognosis in patients with first acute coronary syndrome. *European Heart Journal - Cardiovascular Imaging*, 2023;24.
10. Fabiani, I., Pugliese, N. R., Santini, V., et al. Speckle-tracking imaging, principles and clinical applications: a review for clinical cardiologists. *Echocardiography in Heart Failure and Cardiac Electrophysiology*,2021, 12, 85-114.
11. Kalkan, K., Aksakal, E., Gulcu, O, et al. Assessment of right ventricular dysfunction in patients with mitral stenosis: A speckle tracking study. *Journal of Clinical Ultrasound*,2020; 48, 269-274.
12. Keskin, M., Uzun, A. O., Hayiroglu, et al. The association of right ventricular dysfunction with in-hospital and 1-year

- outcomes in anterior myocardial infarction. *Int J Cardiovasc Imaging*,2019; 35, 77-85.
13. Lang, R. M., Badano, L. P., Mor-Avi, V, 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. *Eur Heart J Cardiovasc Imaging*, 2015;16, 233-70.
 14. Lee, J. H. & Park, J. H. Strain Analysis of the Right Ventricle Using Two-dimensional Echocardiography. *J Cardiovasc Imaging*,2018; 26, 111-124.
 15. Pavlicek, M., Wahl, A., Rutz, T., et al. Right ventricular systolic function assessment: rank of echocardiographic methods vs. cardiac magnetic resonance imaging. *Eur J Echocardiogr*,2011; 12, 871-80.
 16. Antoni ML, Scherptong RWC, Atary JZ, Boersma E, Holman ER, van der Wall EE, et al. Prognostic value of right ventricular function in patients after acute myocardial infarction treated with primary percutaneous coronary intervention. *Circ Cardiovasc Imaging*. 2010 May;3(3):264–271.
 17. Peacock, J., & Peacock, P. Oxford Handbook of Medical Statistics (2nd ed.), 2020. Oxford University Press.
 18. Radwan, H. I., Alhoseeny, A. M. A., Ghoniem, S. M., et al., Early right ventricular dysfunction after primary percutaneous coronary intervention in anterior versus isolated inferior myocardial infarction assessed by tissue Doppler imaging and speckle tracking echocardiography. *Heart Fail Rev*,2023; 28, 407-417.

To cite this article: Hany H. Ebaid , Mahmoud A. Abdallah, Ahmed A. Mohammed, Karim H. Ali. Right Ventricular Strain and Short-Term Prognosis in Patients with First Acute Anterior STEMI without Evidence of RV Infarction. *BMFJ* XXX, DOI: 10.21608/bmfj.2025.413801.2615.