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Relationship between Left Ventricular Diastolic Function and Time to Reperfusion by Primary Percutaneous Coronary Intervention in ST Segment Elevation Myocardial Infarction Patients

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: The therapy and prognosis of acute myocardial infarction (MI) have been modified by primary percutaneous coronary intervention (PPCI). Delayed time to reperfusion in STEMI patients is risk predictor fo left ventricular diastolic dysfunction and linked to increase risk of heart failure. AMI-associated adverse remodeling, a higher possibility of heart failure, and reduced survival are all linked to echocardiographic indicators of diastolic dysfunction.

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Aims: The aim of this study was to determine the relationship between left ventricular diastolic functioning and time-to-reperfusion by PPCI for individuals with STEMI.
Patients and Methods: The current study included 50 patients admitted with STEMI & underwent primary PCI in Cardiology Department in Tanta University Hospitals.
They were divided into two groups: Group 1 early reperfusion (<6h) and group 2 delayed reperfusion (>6h).
They presented by chest pain within 24 hours and conducted echocardiography within 72-hours of PPCI.
Results: The median time-to-reperfusion, which is the time from the onset of symptoms to reperfusion at the end of PPCI, was 240 minutes (interquartile range: 120-720 minutes). LV ejection fraction and E/septal e' did not vary significantly between both groups. The current research found that those with delayed time to reprfusion were troponin (+), CKMB (+), CRP (+), high LVDd, high E/e` average, high LA volume, high LA volume index and had high grade diastolic dysfunction compared to patients with early time to reperfusion. This study showed that group II was significantly higher than group I regarding to time to reperfusion & diastolic dysfunction.
Conclusion: In PPCI-treated individuals who have STEMI, earlier increased LV diastolic pressure is linked to a longer time-to-reperfusion. We also found that creatine kinase, troponin and CRP were significantly higher in the late reperfusion group compared to early reperfusion group. Time to reperfusion and CRP were significantly associated with LVDD grade. CK, LVDs, LVDd, e´ Lateral, E/e´ Lateral, E/e´ average, LA volume index and Diastolic dysfunction grade were identified as independent predictors for LVDD.

Keywords: Primary percutaneous coronary intervention; left ventricular diastolic; ST segment; myocardial infarction.

1. INTRODUCTION

Ischemic heart diseases (IHD) are the leading cause of mortality globally, and its prevalence is rising. But throughout the last several decades, there seems to have a general decline in the death rate from ischemic heart disease in Europe [1].

IHD, with significant regional differences, is responsible for over 1.8 million fatalities annually, or 20% of the total fatalities in Europe [2].

Non-ST-elevation myocardial infarction (NSTEMI) and ST-elevation myocardial infarction (STEMI) have rising and decreasing relative occurrences, respectively [3,4].

The ST-elevation myocardial infarction (STEMI) registry in Sweden is potentially the most thorough one in all of Europe. The incidence rate of ST-elevation myocardial infarction in Sweden in 2015 was 58/100 000/year [5].

The incidence rate in other European nations varied from 43 to 144 per 100 000 per year [6].

Comparable to this, the adjusted recorded rates of incidence from the USA dropped from 133/100 000 in 1999 to 50/100 000 in 2008, while the incidence of N-STEMI stayed the same or slightly rose [7].

STEMI has a continuous trend of being more prevalent in males than in women and in younger persons compared to elderly people [5,8].

Whenever there exists proof of myocardial damage, such as a rise in cardiac troponin (I or T) values with at least one value over 99th percentile upper reference limits and necrosis, in a clinical situation that resembles myocardial ischemia, the expression acute myocardial infarction (MI) is established [9].

It is standard procedure to classify individuals who have persistent chest pain or other symptoms indicative of ischemia and ST-segment elevation in a minimum of two contiguous leads as STEMI in order to facilitate prompt treatment methods like reperfusion therapy. Contrarily, individuals who arrive without ST-segment elevation are often diagnosed with an NSTEMI, and distinct criteria have only been created for those individuals [10].

Primary PCI is the ideal reperfusion technique for those suffering from STEMI within 12 hours of the onset of symptoms, provided that it is able to be completed quickly (i.e., within 120 minutes of making a determination of STEMI), by a professional team that comprises interventional cardiologists as well as knowledgeable support personnel. In hospitals that conduct more

primary PCI procedures, there are lower rates of mortality across those receiving treatment [11].

Real-world statistics show that primary PCI in high-volume facilities is completed more quickly and has a lower fatality rate [12].

However, left ventricular (LV) unfavorable remodeling is still a fairly prevalent consequence following STEMI and is linked to a poor prognosis in these individuals [13].

Negative results are associated with diastolic dysfunction and elevated LV filling pressure after acute MI.

After an acute MI, the period prior to reperfusion is a potent prognostic indicator [14].

AMI-associated unfavorable remodeling, a higher risk of heart failure, and shorter survival are all correlated with indicators of elevated LV filling pressure on echocardiograms [14-15].

Patients who appear with dyspnea or heart failure symptoms are routinely evaluated using echocardiography to measure LV diastolic function. The guidelines for assessing diastolic function provided by the American Society of Echocardiography (ASE) and the European Association of Echocardiography (now known as the European Association of Cardiovascular Imaging [EACVI]) were thorough and included a number of 2-D and Doppler variables to grade diastolic dysfunction and determine LV filling pressures [16].

Deficient relaxation results in a decreased early mitral annulus velocity (e'), since tissue Doppler scanning of the mitral annulus velocity illustrates the alteration in LV long-axis size and volume. E' velocity is generally unaffected by preload when contrasted to other measures of diastolic function, particularly when the rate of myocardial relaxation is slowed [17,18].

The best non-invasive predictor of high LV filling pressure has been demonstrated to be the ratio of early trans-mitral flow velocity (E) to early diastolic lateral or septal mitral-annulus velocity (E/e') [14].

According to reports, a high E/e' ratio, particularly one above 15, indicates a worse prognosis after a MI [15,17].

2. PATIENTS AND METHODS

Patients' population: The cardiology department at Tanta University Hospitals identified fifty individuals who met the inclusion criterion and had primary PCI after presenting with STEMI for the 1st time.

Depending on the amount of time before reperfusion, the research patients were split into two groups:

Group I (23 patients): Those with early reperfution (≤6 hours) representing 46 % of study population.
Group II (27 patients): Those with late reperfution (> 6h &≤12h) representing 54% of study population.

Both groups were compared to each other regarding different demographic, laboratory, electrocardiographic, echocardiographic & angiographic parameters.

The study' duration: This work was performed in a six-months period, starting from March 2021 to September 2021

Inclusion criteria: Those who have had their first STEMI during 72 hours of receiving initial PCI.

Which is the term STE-ACS diagnosed According to the new criteria for diagnosing myocardial infarction In accordance with the 2017 European Society of Cardiology (ESC) guidelines, signs of myocardial ischemia includes no less than one of the following and finding a rise and/or decreases in heart biomarkers, preferably troponin, with a minimum of one value over the 99th percentile of the upper reference limit: [19]

1. Ischemia-related symptoms, such as chest pain, angina-like symptoms, and silent ischemia.
2. ECG alterations suggestive of recent ischemia (new ST-T alterations or recent LBBB.
3. The ECG develops abnormal Q-wave alterations [19,20].

Exclusion criteria:

- Patients with a history of previous IHD.
- Past history of documented LV dysfunction or past history suggestive of heart failure.
- Those with severe valvular disease.
- Those elderly more than 75 years old.
- Those with severe haemodynamic instability.
- Those with no substantial coronary lesion.
- Those with failed-reperfusion.

2.1 Statistical Analysis

The mean, standard deviation, paired t-test, un-paired student t-test, ROC-curve, logistic regression, and chi-square tests were used in the statistical presentation and analysis of the current research utilizing (IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.).

3. RESULTS

3.1 Regarding Echocardio graphic data: Table 1

LVEF: In group 1, ranging from 31-57% with mean 46.09±8.33, while in group 2, ranging from 20-51% h with mean 43.85±7.77. no satisically substantial variation was existed among the two groups with p value 0.332.

LVEDs: In group 1, ranging from 2.8-4.9cm with mean 3.51±0.37cm, while in group 2, ranging from 3.3-5.1cm h with mean 4.19±0.56 cm. Group 2 was significantly higher than group1 with p value 0.001.

LVEDd: In group 1, ranging from 3.7-5.8cm with mean 4.63±0.70 cm, while in group 2, ranging from 4-7cm with mean 5.43±.82 cm. Group 2 was significantly higher than group1 with p value 0.001.

E(cm/s): In group 1**,** ranging from 40-90 with mean 67.29±15.76, while in group 2, ranging from 34-122 with mean76.11 ±25.97. no satisically substantial variation was existed among the two groups with p value 0.162.

E/A: In group 1**,** ranging from 0.6-1.5 with mean 1.01±0.32, while in group 2, ranging from 0.5-2.2 with mean 1.16 ±0.54. no satisically substantial variation was existed among the two groups with p value 0.237.

e´septal: In group 1**,** ranging from 4.4-20 with mean 7.95±4.43, while in group 2, ranging from 2.22-22 with mean 7.91 ±5.53. no satisically substantial variation was existed among the two groups with p value 0.977.

e´lateral: In group 1**,** ranging from 6.45-14.9 with mean 9.50±2.16, while in group 2, ranging from 2.9-11 with mean 6.94 ±2.43. Group 2 was significantly higher than group1 with p value 0.001.

E/e´septal: In group 1**,** ranging from 2.74-19.4 with mean 10.25±4.93, while in group 2, ranging from 3.5-20 with mean 11.40± 5.1. no satisically sign substantial variation was existed among the two groups with p value 0.424.

E/e´lateral: In group1**,** ranging from 4.9-13.25 with mean 7.47±2.81, while in group 2, ranging from 4.7-22 with mean 11.83 ±4.58. Group 2 was significantly higher than group1 with p value 0.001.

E/e´average: In group 1**,** ranging from 4-16.3 with mean 8.85±3.77, while in group 2, ranging from 5.5-19.8 with mean 11.60 ±4.46. Group 2 was significantly higher than group1 with p value 0.024.

Left aterial volume (LA): In group 1**,** ranging from 53-74ml with mean 64.22±6.49 ml, while in group 2, ranging from 56-78 ml with mean 68.16 ±6.40 ml. Group 2 was significantly higher than group1with p value 0.036.

LA volume index (ml/m²): In group 1**,** ranged from 28-38 ml/m²with mean 32.40±2.69ml/m², while in group 2, ranged from 25-41ml/m² with mean 35.1 ±4.73ml/m². Group 2 was significantly higher than group1 with p value 0.019.

Both groups of the study were compared to diastolic dysfunction grade: regarding different demographic, laboratory, electrocardiographic, echocardiographic &angiographic parameters.

Age (P value 0.087), sex (P value 0.486), smoking (P value 0.963), DM (P value 0.340), HTN (P value 0.656), cholesterol (P value 0.234), CK (P value 0.503), troponin (P value 0.089), LVDd (P value 0.052) & e´septal (P value 0.186) were all with no statistical significance &didn´t have correlation to diastolic dysfunction grading. CRP (P value 0.008), LVDs (P value 0.018) & LVEF (P value 0.027) were significant. Time to reperfusion (P value 0.001), E (P value 0.001), E/A (Pvalue 0.001), e´ lateral (P value 0.001), E/e´ septal (P value 0.001), E/e´lateral (Pvalue 0.001), E/e´average (P value 0.001), LA volume (p value 0.001) &LA volume index (P value 0.001) were highly significant. They were all correlated with diastolic dysfunction (grade II – grade III) Table 2.

The current study revealed that there was no statistically significant variance in cholesterol levels among the two groups, whereas CKMB levels were significantly greater in the late reperfusion group when contrasted to the early reperfusion group. Additionally, we discovered

that the incidence of troponin (+) was considerably higher in the late-reperfusion group when contrasted to the early-reperfusion group. Additionally, the late-reperfusion group's CRP (+) level was substantially greater than the early-reperfusion groups (Table 3).

3.2 Logistic Regression analysis for the Parameters Predicting Diastolic Dysfunction

Logistic regression analysis were performed to investigate the possible predictors of diastolic dysfunction: The significant variables, CK (OR; 0.483, 95% CI: (0.174 – 0.861), P value = 0.031), LVDs (OR; 0.583 95% CI: (0.234 – 0.734) p value = 0.027), LVDd (OR; 0.495, 95% CI: (0.318 – 0.618), P value = 0.024), e´ Lateral (OR; 0.,508, 95% CI: (0.317 – 0.864), P value = 0.018) E/e´ Lateral (OR;2.475,95% CI:(1.217-5.854), P value =0.021), E/e´ average (OR; 0.614, 95% CI: (0.514 – 0.893), P value= 0.037), LA volume index (OR; 0.629, 95% CI: (0.495 – 0.863), P value= 0.037) & Diastolic dysfunction grade (OR; 0.634, 95% CI: (0.374 – 0.921), P value= 0.001) (Table 4).

Table 1. Comparison between the studied groups according to echocardiographic data

		Range			Mean	±	S. D	t. test	p. value
LVDs (cm)	Early	2.8	–	4.9	3.51	±	0.73	3.736	0.001*
	Late	3.3	–	5.1	4.19	±	0.56		
LVDd (cm)	Early	3.7	–	5.8	4.63	±	0.70	3.675	0.001*
	Late	4	–	7	5.43	±	0.82		
LVEF (%)	Early	31	–	57	46.09	±	8.33	0.981	0.332
	Late	20	–	51	43.85	±	7.77		
E (cm/s)	Early	40	–	90	67.29	±	15.76	1.421	0.162
	Late	34	–	122	76.11	±	25.97		
E/A	Early	0.6	–	1.5	1.01	±	0.32	1.197	0.237
	Late	0.5	–	2.2	1.16	±	0.54		
e' septal	Early	4.4	–	20	7.95	±	4.43	0.029	0.977
	Late	2.22	–	22	7.91	±	5.53		
e' lateral	Early	6.45	–	14.9	9.50	±	2.16	3.908	0.001*
	Late	2.9	–	11	6.94	±	2.43		
E/e'septal	Early	2.74	–	19.4	10.25	±	4.93	0.807	0.424
	Late	3.5	–	20	11.40	±	5.10		
E/e'lateral	Early	4.9	–	13.25	7.47	±	2.81	3.961	0.001*
	Late	4.7	–	22	11.83	±	4.58		
E/e'average	Early	4	–	16.3	8.85	±	3.77	2.331	0.024*
	Late	5.5	–	19.8	11.60	±	4.46		
LA volume (ml)	Early	53	–	74	64.22	±	6.49	2.158	0.036*
	Late	56	–	78	68.16	±	6.40		
LA volume index (ml/m^2)	Early	28	–	38	32.40	±	2.69	2.426	0.019*
	Late	25	–	41	35.10	±	4.73		

Table 2. Comparison between both groups &diastolic dysfunction grade

		Range			Mean	±	S. D	F. test	p. value
Age (years)	Normal	45	–	55	49.00	±	5.48	2.330	0.087
	I	44	–	68	57.75	±	7.73		
	II	40	–	63	52.95	±	7.80		
	III	43	–	60	53.20	±	9.31		
Cholesterol (mg\dl)	Normal	190	–	200	197.0	±	4.47	1.544	0.215
	I	160	–	240	198.50	±	22.54		
	II	160	–	240	210.00	±	23.84		
	III	170	–	220	190.00	±	27.39		

		Range			Mean	±	S. D	F. test	p. value
Time to reperfusion (hours)	Normal	2	–	2.25	2.08	±	0.12	8.413	0.001*
	I	2	–	10	3.94	±	2.72		
	II	2.5	–	12	6.80	±	3.39		
	III	8	–	9.5	8.90	±	0.82		
CKMB (Iu\l)	Normal	50	–	90	74.00	±	21.91	0.795	0.503
	I	23	–	145	78.55	±	44.47		
	II	33.8	–	180	92.28	±	54.45		
	III	90	–	120	108.00	±	16.43		
LVDs (cm)	Normal	2.8	–	3.2	3.04	±	0.22	3.710	0.018*
	I	3	–	4.9	3.87	±	0.66		
	II	3	–	5.1	3.98	±	0.79		
	III	4.2	–	4.5	4.38	±	0.16		
LVDd (cm)	Normal	4.1	–	4.5	4.26	±	0.22	2.766	0.052
	I	4	–	5.8	4.99	±	0.63		
	II	3.7	–	7	5.19	±	1.10		
	III	5.6	–	5.8	5.68	±	0.11		
LVEF (%)	Normal	51	–	52	51.60	±	0.55	3.354	0.027*
	I	31	–	57	45.75	±	8.25		
	II	20	–	49	41.35	±	8.25		
	III	48	–	50	48.80	±	1.10		
E (cm/s)	Normal	55	–	56	55.60	±	0.55	7.992	0.001*
	I	34	–	90	61.03	±	17.99		
	II	34.4	–	122	81.40	±	22.28		
	III	88	–	100	95.20	±	6.57		
E/A	Normal	1	–	1.4	1.24	±	0.22	9.787	0.001*
	I	0.5	–	1.2	0.77	±	0.26		
	II	0.8	–	1.8	1.25	±	0.33		
	III	0.7	–	2.2	1.60	±	0.82		
e' septal	Normal	7	–	7	7.00	±	0.00	1.672	0.186
	I	5.03	–	20	8.69	±	4.54		
	II	2.22	–	22	8.50	±	6.10		
	III	2.5	–	5	3.50	±	1.37		
e' lateral	Normal	10	–	10	10.00	±	0.00	10.280	0.001*
	I	4.54	–	14.9	9.68	±	2.63		
	II	2.9	–	8.3	6.66	±	1.79		
	III	4	–	7	5.80	±	1.64		
E/e'septal	Normal	7.9	–	8	7.96	±	0.05	13.153	0.001*
	I	2.74	–	16.46	8.14	±	3.77		
	II	3.5	–	19.4	12.30	±	4.49		
	III	17.6	–	20	19.04	±	1.31		
E/e'lateral	Normal	5.5	–	5.6	5.56	±	0.05	51.868	0.001*
	I	4.7	–	9.6	6.44	±	1.56		
	II	9.2	–	17.58	12.39	±	2.30		
	III	14.3	–	22	17.38	±	4.22		
E/e'average	Normal	6.7	–	6.8	6.76	±	0.05	32.686	0.001*
	I	4	–	13	7.31	±	2.55		
	II	6.4	–	16.3	12.32	±	2.92		
	III	17	–	19.8	18.12	±	1.53		
LA volume (ml)	Normal	54	–	67	61.80	±	7.12	18.468	0.001*
	I	53	–	69.3	61.90	±	5.42		
	II	64.36	–	74	69.42	±	3.33		
	III	74	–	78	76.40	±	2.19		
LA volume index (ml/m^2)	Normal	28	–	29.6	28.96	±	0.88	38.455	0.001*
	I	25	–	33.25	31.12	±	2.81		
	II	31.25	–	38	36.18	±	2.07		
	III	39.6	–	41	40.44	±	0.77		

Table 3. Comparison between both groups &diastolic dysfunction grade regarding to sex, Smoking, HTN, DM, sit of MI, CRP and Troponin

			Normal	I	II	III	X^2	P-value
Sex	Male	N	3	14	15	5	2.443	0.486
		%	60.0%	70.0%	75.0%	100.0%		
	Female	N	2	6	5	0		
		%	40.0%	30.0%	25.0%	.0%		
Smoking	No	N	2	10	9	2	0.282	0.963
		%	40.0%	50.0%	45.0%	40.0%		
	Yes	N	3	10	11	3		
		%	60.0%	50.0%	55.0%	60.0%		
HTN	No	N	3	12	14	2	1.613	0.656
		%	60.0%	60.0%	70.0%	40.0%		
	Yes	N	2	8	6	3		
		%	40.0%	40.0%	30.0%	60.0%		
DM	No	N	3	13	16	2	3.355	0.340
		%	60.0%	65.0%	80.0%	40.0%		
	Yes	N	2	7	4	3		
		%	40.0%	35.0%	20.0%	60.0%		
Site of MI	Inferior	N	5	10	2	0	37.097	0.001*
		%	100.0%	50.0%	10.0%	.0%		
	Anterior	N	0	10	18	3		
		%	.0%	50.0%	90.0%	60.0%		
	Posterior	N	0	0	0	2		
		%	.0%	.0%	.0%	40.0%		
CRP	+v	N	5	7	11	0	11.755	0.008*
		%	100.0%	35.0%	55.0%	.0%		
	-ve	N	0	13	9	5		
		%	.0%	65.0%	45.0%	100.0%		
Troponin	+v	N	5	16	20	5	6.522	0.089
		%	100.0%	80.0%	100.0%	100.0%		
	-ve	N	0	4	0	0		
		%	.0%	20.0%	.0%	.0%		

Table 4. Logistic regression analysis for the parameters predicting diastolic dysfunction

	OR (95% CI)	P value
CRP	0.674 (0.371 – 2.631)	0.138
CKMB (Iu/L)	0.483 (0.174 – 0.861)	0.031*
LVDs (cm)	0.583 (0.234 – 0.734)	0.027*
LVDd (cm)	0.495 (0.318 – 0.6/8)	0.024*
e' lateral	0.508 (0.317 – 0.864)	0.018*
E/e'lateral	2.475 (1.217 – 5.854)	0.021*
E/e'average	0.614 (0.514 – 0.893)	0.041*
LA volume (ml)	0.395 (0.137 – 1.637)	0.184
LA volume index (ml/m²)	0.629 (0.495 – 0.863)	0.037*
Troponin	0.864 (0.792 – 2.063)	0.173
Time to reperfusion (hours)	0.809 (0.447 – 0.918)	0.001*

4. DISCUSSION AND CONCLUSION

The conventional measures, such as IVS, LVEDD, and EF by M-mode echocardiography, were not significantly different between both groups (all P > 0.05), according to Chen et al. [21]. Although the p value was >0.05 compared to late-reperfusion, the WMSI appeared to be slightly greater for early-reperfusion. Only 9 individuals with an acute MI showed an appropriate diastolic filling pattern on mitral Doppler echocardiography; the remaining 80% all had aberrant filling patterns. There were 3 normal, 5 worsened relaxation, 4 pseudo-

normal, and 2 restricted filling patterns among those participating in the early-reperfusion group. Results showed 6 normal, 11 worsened relaxation, 10 pseudo-normal, and 4 restricted filling patterns in the late-reperfusion group. There was no evidence of a difference in the E velocity, A velocity, or ratio of E/A by mitral spectral pulse-wave Doppler among the groups. Though the early reperfusion group had a lower e′septal (5.52 ± 1.67 vs. 7.11 ± 2.14 cm/s, P < 0.05), the average e/ e′ was not significantly different from the late reperfusion group. The LAVI in the early-reperfusion group was 38.88 ± 11.22, which did not significantly vary from the late-reperfusion group's LAVI of 40.93 ± 12.24 (P N 0.05). Additionally, the findings showed that there was no difference in MV p between individuals who had early vs late reperfusion.

Furthermore, according to Shacham et al., [22] individuals with time to reperfusion more than 185 min had substantially greater mean mitral inflow E wave velocity, lesser septal e' velocity, greater E/septal e' ratio, greater E/lateral e' ratio, and greater E/e'average ratio compared to individuals with time to reperfusion less than 185 min. cardiac output, LVEF, or LA volume did not differ significantly across the groups.

In the current study as regard Diastolic dysfunction grade, we found that 45 patients of the study population had diastolic dysfunction, while only 5 were normal. In early group: 5 participants were normal (21.7%), 13 participants had grade I diastolic-dysfunction (56.5%) & 5 participants had grade II diastolic-dysfunction (21.7%). In late group: there was no patients who had normal function, 7 participants had grade I diastolic dysfunction (25.9%), 15 participants had grade II diastolic dysfunction (55.6%) &5 participants had grade III (18.5%). Diastolic dysfunction was highly statistically significant among both groups (P value =0.001).

According to Shacham et al.'s [22] findings, the distribution of diastolic function had been significantly various among the groups, with 43% of early-reperfusion individuals having normal diastolic functions and 12% of these individuals having grade 2 diastolic-dysfunction (pseudo-normal pattern), as opposed to only 20% normal and 32% pseudo-normal diastolic functioning, in the late time to reperfusion group, correspondingly (p < 0.001). They came to the conclusion that in STEMI patients who had received primary PCI, a longer delay to reperfusion was linked to an early elevation in LV diastolic pressure.

However, Chen et al. [21] observed that even in individuals who had acute MI who had undergone successful PCI, the majority still had LV diastolic dysfunction. It appeared that in the acute phase, those with STEMI who had early myocardial reperfusion did not have better diastolic functions than those who received late reperfusion.

In agreement with our results Prasad et al., [23] enrolled 20 patients (21%) had restrictive filling pattern (RFP) and 75 (79%) patients did not. Time from symptom-to-reperfusion in the RFP group was 413 ± 287 minutes compared to 252 ± 138 mins in the non-RFP group (p = 0.014). The studied groups were comparable in demographic data and comorbidities. The study concluded that Serious LV diastolic disorders with delayed-reperfusion following STEMI independently anticipated worse long-term results. An important pathophysiologic relationship that exists between the length of infarct size, myocardial ischemia, and prognosis is LV diastolic dysfunction.

In the current study we compared both groups as regard diastolic dysfunction grade: regarding different demographic, laboratory, electrocardiographic, echocardiographic &angiographic parameters. Age (P value 0.087), sex (P value 0.486), smoking (P value 0.963), DM (P value 0.340), HTN (P value 0.656), cholesterol (P value 0.234), CK (P value 0.503), troponin (P value 0.089), LVDd (P value 0.052) & e´ septal (P value 0.186) were all with no statistical significance &didn´t have correlation to diastolic dysfunction grading.

CRP (P value 0.008), LVDs (P value 0.018) & LVEF (P value 0.027) were significant.

Time to reperfusion (P value 0.001), E (P value 0.001), E/A (Pvalue 0.001), e´ lateral (P value 0.001), E/e´ septal (P value 0.001), E/e´ lateral (P value 0.001), E/e´ average (P value 0.001), LA volume (p value 0.001) &LA volume index (P value 0.001) were highly significant. They were all correlated with diastolic dysfunction (grade II – grade III).

In agreement with our results Shacham et al., [24] reported that patients with reperfusion time > 185 min (n = 92) had more advanced diastolic grade (p < 0.001) compared to those having early reperfusion (n = 88).

In agreement with our results, literature [25,26] showed that CRP was significantly correlated with diastolic dysfunction severity.

Logistic regression analysis for the parameters predicting diastolic dysfunction: Logistic regression analysis were performed to investigate the possible predictors of diastolic dysfunction: The significant variables were CK, LVDs, LVDd, e´ Lateral E/e´ Lateral, E/e´ average, LA volume index & Diastolic dysfunction grade.

according to Shacham et al. [22] analysis of a linear logistic regression model which took into account factors like gender, age, LVEF, hypertension, diabetes, peak creatine phosphokinase, and peak troponin as indicators of average E/e' ratios demonstrated that time to reperfusion, elevated blood pressure, and gender were the only distinct indicators of E/e' ratio.

Furthermore, according to Kane et al. [24], multivariable analysis showed that diastolic dysfunction (HR, 1.81 [95% CI, 1.01-3.48]), diabetes (HR, 1.77 [95% CI, 1.0-3.01], hypertension (HR, 2.21 [95% CI, 1.32-3.84]), and coronary artery disease (HR, 2.07 [95% CI, 1.27-3.32]) all had independent predictive abilities.

CONSENT AND ETHICAL APPROVAL

- All participants signed informed permission was acquired following a thorough explanation of the study's advantages and disadvantages.
- Tanta University's ethical committee gave the research its approval.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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