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Original Article

Limitation of Marginal Arteries Flow and its Impact on Clinical Prognosis in Patients with Acute Inferior ST-Elevation Myocardial Infarction treated with primary Percutaneous Coronary Intervention

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ABSTRACT

Background: Importance of marginal arteries revascularization is still unclear, few studies discussed the relationship between limitation of marginal arteries branches flow and clinical outcome of the patients with acute inferior ST-elevation myocardial infarction (STEMI) with culprit lesion in right coronary artery (RCA) or left circumflex (LCX).
Aim: To evaluate impact of marginal arteries flow on clinical outcome of patients with acute inferior STEMI treated with Primary Percutaneous Coronary Intervention (PPCI).
Methods: This study was carried out in Cardiology Department, Zagazig University on 170 patients represented by first time acute inferior wall myocardial infarction and treated with primary PCI. Patients were divided into group I: Final thrombolysis in myocardial infarction (TIMI) III Flow in (RCA) and right marginal arteries (RMAs).or Final TIMI III Flow in (LCX) and left marginal arteries (LMAs) and group II: Final TIMI III in RCA and TIMI =<2 in RMAs (subgroup A) or Final TIMI III in LCX and TIMI =<2 in LMAs (subgroup B).
Results: There was significant lower mean value of Tricuspid annular plane systolic excursion(TAPSE), tricuspid annular systolic velocity(TASV) in subgroup A compared to subgroup B and significant higher rate of mitral regurgitation in subgroup B compared to subgroup A.
Conclusion: Flow limitation RMAs of RCA during Primary PCI in Inferior MI was associated with greater rates of right ventricular (RV) dysfunction and higher rates of heart block compared to Flow limitation in LMAs of LCX. Flow limitation in LMAs of LCX during PPCI in acute inferior MI was associated with greater rates of mitral regurgitation compared to Flow limitation in RMAs of RCA.
Keywords: Marginal Arteries, ST-Elevation Myocardial Infarction, primary Percutaneous Coronary Intervention.

INTRODUCTION

One-third of all deaths in the globe among those over 35 are attributable to acute coronary syndrome (ACS), which is a collection of disorders that includes non-ST elevation myocardial infarction, unstable angina, and STEMI **[1].**

STEMI is linked to a high rate of morbidity and death. Most occurrences of STEMI are caused by a complete thrombotic blockage that develops from an atherosclerotic plaque in an epicardial coronary artery. The initial electrocardiogram (ECG) may exhibit non-specific changes or be normal, but it may also show ischemia changes such as ST depression, T-wave abnormalities, or temporary STEMI **[2].**

Reduced perfusion to that area of the myocardium due to a coronary artery obstruction causes inferior wall myocardial infarction (MI). In the event that therapy is delayed, myocardial ischemia and infarction ensue. The RCA supplies the inferior myocardium in the majority of patients. The posterior descending coronary artery is supplied by the LCX in approximately 6–10% of the population due to left dominance. The inferior wall is involved in about 40% of MIs **[3].**

Less than 10% of MIs to the inferior wall result in death. Nonetheless, a number of exacerbating variables that raise mortality, such as hypotension, bradycardia heart block, cardiogenic shock, and right ventricular infarction **[4,5].**

The longest branch of the RCA on the anterior side of the heart, the acute marginal artery reaches towards the cardiac apex. The artery's name refers to its location along the anteroinferior border of the heart, which is known as the "acute margin" or "margo acutus" in Latin. In coronary angiography, the acute marginal artery is used to indicate the bottom edge of the heart **[6].**

An observed phenomenon during acute inferior STEMI is acute marginal artery (AMA) flow limitation after PCI to the RCA. Unknown are the clinical ramifications of this. RV dysfunction was observed to be more common and to have worse clinical outcomes when there was acute marginal artery flow limiting during PCI to the RCA **[7].**

LCX, one of the major arteries delivering blood to the heart, gives rise to the left marginal artery, also known as the left marginal branch or obtuse marginal artery. From the left main coronary artery, the LCX branches off to deliver blood to different parts of the heart muscle as it travels around the left side of the heart **[8].**

METHODS

After protocol approval by our Local Ethics Committee (IRB#101018-22/8-2023), this study was performed at cardiology department, Faculty of Medicine, Zagazig University in the duration from October 2023 to March 2024. We 170 patients admitted to cardiac care unit (C.C.U) by first time acute inferior wall myocardial infarction and treated with primary PCI and have no item of exclusion criteria. All patients provided written informed consent to participate in the study. Study protocol conformed to the ethical guidelines of the Declaration of Helsinki (1975) for studies involving humans.

We divided the patients into 2 groups then subdivide group II into 2 subgroups, based on the coronary angiographic data: **group I**: patients with acute inferior STEMI with: final TIMI III Flow in RCA and Acute marginal arteries and final TIMI III Flow in LCX and left marginal arteries and **group II**: patients with acute inferior STEMI with: final TIMI III in RCA and TIMI < or = TIMI II in right marginal arteries and final TIMI III in LCX and TIMI < or = TIMI II in left marginal arteries then divided **group II** into 2 subgroups : **subgroup A** patients with acute inferior STEMI with: final TIMI III in RCA and TIMI score < or = TIMI II in right marginal arteries and **subgroup B** patients with acute inferior STEMI with: final TIMI III in LCX and TIMI score < or = TIMI II in left marginal arteries.

Patients with inferior wall MI with age =or > 18 years (confirmed by ECG, Cardiac enzymes; especially troponin and Creatine phosphokinase-MB (CK-MB) ratio), indicated for invasive coronary angiography study with presentation within the first 48 hours from the onset of pain and treated with primary PCI were included in the study.

Patients not indicated for invasive coronary angiography, patients with baseline hemoglobin (HB)<7g/dl, patients with contraindications to contrast such as renal insufficiency and allergy, patients with congenital heart disease, patients with previous PCI and patients with final TIMI flow less than III in RCA or LCX were excluded from the study.

Every patient underwent a comprehensive history taking, a clinical examination that focused on the pulse and rhythm to rule out arrhythmia, and a measurement of their blood pressure (both systolic and diastolic) and auscultation to exclude valvular affection, laboratory tests including **c**omplete blood picture, heart biomarkers, liver function tests, fasting lipid profile, kidney function tests (blood urea and serum creatinine), and cardiac biomarkers. Moreover, all supine patients underwent a twelve-lead ECG at a paper speed of 25 mm/s, a filter range of 0.16–100 Hz, and a height of 10 mm/mV. An ECG was obtained upon admission, and it was reviewed based on the patient's condition.

Echocardiography

Transthoracic echocardiography (TTE) was done within 24 hours of arrival to C.C.U, utilizing the commercially available Vivid 7 machine, which has a multi-frequency transducer with a frequency of 2.5 MHz. Within 24 hours of entering the C.C.U, all patients underwent an M-mode, 2-dimensional, and Doppler echocardiographic evaluation to assess left and right ventricular function as well as measure mitral annular velocities. Two-dimensional echocardiography was subsequently used to detect thrombus. According to the patient was assessed in the left semi-lateral position as recommended by the American Society of Echocardiography. The long, short, apical 4, apical 5, and apical 2 chamber views of the left parasternum were employed **[9].**

The following measure were stressed upon and selected for analysis:

Ejection fraction (EF %) was calculated from the formula: EF= (end diastolic volume (EDV)-end systolic volume (ESV)*100)/EDV.

Normally it is 50-70%. Wall motion abnormalities in the form of segmental hypokinesis, akinesia or dyskinesis were searched for utilizing two-dimensional echocardiography in left parasternal long axis view, short axis view, apical 4chamber and apical 2 chamber views.

Also, mitral valve regurgitation severity and mechanical complication were assessed. Right side of the heart was assessed by RV systolic function along the long axis is reflected by the easily measured TAPSE, which has been demonstrated to be strongly correlated with the RV ejection fraction. RV systolic function can be well-indicated by tricuspid annular systolic velocity (TASV), which is also readily measured using tissue Doppler imaging analysis **[10].**

Coronary angiography and PCI:

A catheter will be run through the blood vessels to the heart after being put into an artery in the neck, arm, or groin during a coronary angiography. A coronary angiography may reveal clogged or constricted heart blood arteries. PCI, also termed angioplasty with stent, is a non-surgical technique that involves inserting a tiny device called a stent through a catheter, which is a thin, flexible tube, to widen restricted cardiac blood arteries **[11].**

Thrombolysis in Transient Ischemic Heart Attack (TIMI) Blood "flow" limitations in the AMA were evaluated using the Flow Grading System: intravenous (IV) tissue plasminogen activator (tPA) and IV streptokinase in phase 1 were used to measure "recanalization of the fully blocked artery ninety minutes following the initiation of the medication infusion" **[12].** To guarantee a consistent and uniform approach to documenting epicardial perfusion on coronary artery angiography, TIMI Coronary Grade Flow was developed. Total blockage was indicated by TIMI grade flow of 0, and normal epicardial perfusion was indicated by TIMI grade flow of 3. Grade 0 (no perfusion): Past the point of blockage, there is no antegrade flow. Grade 1 (penetration without perfusion): During the cine-angiographic filming phase, the contrast material "hangs up" after passing past the location of obstruction and does not completely opacify the coronary bed distal to the obstruction. Grade 2 (partial perfusion): The coronary bed distal to the occlusion is opacified by the contrast material as it passes over it. The rate of entry of the contrast material into the vessel distal to the obstruction or the rate of clearance from the distal bed is noticeably slower than comparable areas not perfused by the previously occluded vessel, such as the opposite coronary artery or the coronary bed proximal to the obstruction. Grade 3 (complete perfusion): Contrast material is removed from the affected bed in the same vessel or artery as soon as it is from an unaffected bed. Just as quickly as antegrade flow into the bed proximally to the blockage, antegrade flow into the bed distal to the obstruction happens.

Statistical analysis:

Utilizing SPSS for data management 2015 release from IBM Corp. Version 23.0 of IBM SPSS Statistics for Windows. IBM Corp., Armonk, NY: Univariate and multivariate logestic regression, chi-square testing, mann-whitney u test, fisher exact test, and t-test were employed.

RESULTS

There was statistically no -significant difference between group I and group II regarding age, smoking habit, distribution percent of hypertensive or diabetes mellitus, (p>0.05), while there was significant higher percent males in group I compared to group II, (p=0.003) (Table 1).

There was significant higher high density lipoprotein (HDL) in group I compared to group II, (p=0.005). Otherwise there was no-significant difference between group I and group II, regarding other laboratory parameters, (p>0.05) (Table 2).

There was significant lower mean value of TAPSE, TASV in group II compared to group I, (p=0.003),(p=0.027) respectively, and there was significant higher mitral regurgitation in group II compared to group I (p=0.039) . Otherwise there was no-significant difference between group I and group II, regarding Echocardiography data, (p>0.05) (Table 3).

There was statistically no -significant difference between group I and group II regarding in hospital outcome (p>0.05). Except Heart block significantly more common in group II compared to group I , (p=0.006) (Table 4).

There was significant lower mean value of TAPSE, TASV in subgroup A compared to subgroup B, (p=0.001),(p=0.001) respectively, and there was significant higher rate of mitral regurgitation in subgroup B compared to subgroup A (p=0.014), Otherwise there was no-significant difference between subgroup A and subgroup B, regarding Echocardiography data, (p>0.05) (Table 5).

There was statistically no -significant difference between Subgroup A and Subgroup B regarding in hospital outcome (p>0.05). Except Heart block significantly more common in Subgroup A compared to Subgroup B , (p=0.015) (Table 6).Univariate analysis defined the independent predictors for Limitation of Marginal coronary Arteries Flow in Patients with Acute Myocardial Infarction at Lower ST-Elevation: females, decrease HDL value are significant predictors for Limitation of Marginal coronary Arteries Flow. (p<0.05). Multivariate analysis defined the independent predictors for Limitation of Marginal coronary Arteries Flow Females had a lower HDL value in patients with acute inferior STEMI (p<0.05) (Table 7).

Table (1): *Patients' characters of studied groups*

Variables		Group I n.106	Group II n.64	value
Age (years)	Mean ±SD	64.69±9.29	65.53±8.9	0.561
	Range	50-81	53-80	
Sex	males	72(67.9)	29(45.3)	**0.004***
	Females	34(32.1)	35(54.7)	
Smoking		47(44.3)	21(32.8)	0.14
Hypertension		39(36.8)	32(50.0)	0.091
Diabetes mellitus		53(50.0)	38(59.3)	0.24

t :student't (t), χ 2 Chisquare test ,*P value ≥ 0.05: no significant, *P value < 0.05: significant*

Table (2): Comparing between Group I and group II regarding laboratory data

Variables		Group I n.106	Group II n.64	p-value
WBCs (*10^9/L)	Mean ±SD	8.6±2.97	9.04±2.95	0.350
	Range	4.2-14	5.4-15	
HB (g/dl)	Mean ±SD	13.1±1.52	13.15±1.25	0.854
	Range	10.3-16	11.3-15	
PLT (*10^9/L)	Mean ±SD	235.36±53.03	247.14±78.17	0.255
	Range	130-355	166-379	
blood urea (mg/dl)	Mean ±SD	21.37±12.76	18.27±7.25	0.078
	Median(Range)	17.1(8-71)	11.4-36.7	
serum creatinine (mg/dl)	Mean ±SD	1.19±0.58	1.07±0.28	0.073
	Median(Range)	1.0(0.73-3.7)	(0.6-1.6)	
AST (U/L)	Mean ±SD	114.23±140.66	89.38±66.58	0.187
	Median(Range)	55.9(15-621)	54.3(26-222)	
ALT (U/L)	Mean ±SD	41.53±29.63	38.44±27.70	0.501
	Median(Range)	30(14-126)	28(14-109)	
HDL (mg/dl)	Mean ±SD	40.62±7.47	35.18±4.34	**0.001***
	Range	24.4-66	28-44.3	

WBC: white blood cell, HB: *hemoglobin* PLT = platelet, AST = aspartate aminotransferase, ALT = alanine aminotransferase, , HDL-C = high-density lipoprotein cholesterol, t:student't(t), u:Mannwhitney u test, *P value ≥ 0.05: no significant , *P value <0.05: significant*

Table (3): Comparing between Group I and group II regarding Echocardiography data

Variables		Group I n.106	Group II n.64	p-value
Left atrium size (mm)	Mean ±SD	38.03±4.11	39.10±2.94	0.079
	Range	30-50	32-42	
left ventricle (LV) end-diastolic LVEDD (mm)	Mean ±SD	49.66±6.04	52.44±6.88	0.094
	Range	38-60	36-60	
end systolic dimensions LVESD (mm)	Mean ±SD	35.52±5.64	36.73±6.01	0.186
	Range	25-46	25-45	
LV ejection fraction (LVEF) (%)	Mean ±SD	50.12±8.40	49.66±6.61	0.706
	Range	39-68	38-60	
TAPSE (mm)	Mean ±SD	18.29±2.79	16.92±2.93	**0.003***
	Range	13-23	12-22	
TASV (cm/s)	Mean ±SD	14.13±2.17	13.38±2.1	**0.027***
	Range	10-17	10-16	
degree of mitral regurgitation	Moderate or more	27(25.5)	26(40.63)	**0.039***

TAPSE: Tricuspid Annular Plane Systolic Excursion, TASV: *tricuspid annulus* systolic velocities, PASP: *pulmonary* artery systolic pressure, t :student't (t), U:Mann whitney test,c: χ 2 Chi square test ,P value ≥ 0.05: no significant , *P value < 0.05: significant

Table (4): Comparing between Group I and Group II regarding in hospital outcome
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Outcome	Group1(n.106)		Group II(n.64)		fp-value
	No.	%	No.	%	
Death	2	1.9	3	4.7	0.295
Cardiogenic shock	12	11.3	13	20.3	0.109
Atrial arrhythmia	5	3.9	0	.0	0.078
Ventricular arrhythmia	8	7.5	8	12.5	0.284
Heart block	4	3.8	9	14.0	0.014*
Left ventricular failure	12	11.3	16	25	0.06

F :Fisher exact test , ***P value ≥ 0.05: no significant , P value < 0.05: significant***

Table (5): Comparing between Subgroup A and Subgroup B regarding echocardiography data

Variables		Group II		P -value
		Subgroup A n.41	Subgroup B n.23	
Left atrium size (mm)	Mean ±SD	38.80±3.31	39.78±1.73	0.245
	Range	32-42	37-42	
left ventricle (LV) end-diastolic LVEDD (mm)	Mean ±SD	53.22±8.28	51.04±2.75	0.228
	Range	36-60	48-55	
end systolic dimensions LVESD (mm)	Mean ±SD	37.49±7.02	35.39±3.33	0.183
	Range	25-45	28-39	

LV ejection fraction (LVEF) (%)	Mean ±SD	48.76±6.53	51.26±6.61	0.147
	Range	38-60	40-58	
TAPSE (mm)	Mean ±SD	15.5±2.61	19.33±1.94	**0.001***
	Range	12-19	17-22	
TASV (cm/s)	Mean ±SD	12.33±1.97	15.11±1.05	**0.001***
	Range	10-15	14-16	
degree of mitral regurgitation	MODERATE or MORE	12(29.3)	14(60.89)	**0.014***

TAPSE: Tricuspid Annular Plane Systolic Excursion, TASV: *tricuspid annulus* systolic velocities , PASP: *pulmonary* artery systolic pressure **, t :student't (t), U:Mann whitney test,c: χ 2 Chisquare test** ***,P value ≥ 0.05: no significant , *P value < 0.05: significant***

Table (6): Comparing between Subgroup A and Subgroup B regarding hospital outcome

outcome	**Studied group II**				**p-value**
	Subgroup A (n.41)		**Subgroup B 2(n.23)**		
	No.	**%**	**No.**	**%**	
Death	3	0.07	0	.0	0.184
Cardiogenic shock	10	24.4	3	13	0.279
Ventricular arrhythmia	3	0.07 3	5	21.7	0.063
Heart block	9	21.9	0	0.0	**0.015***
Left ventricular failure	11	26.8	5	21.7	0.395

F :Fisher exact test , ***P value ≥ 0.05: no significant***

Table (7): Univariate and multivariate logistic regression for predictors Limitation of Marginal coronary Arteries Flow in Patients with Acute Inferior ST-Elevation Myocardial Infarction

predictors	**B**	**S.E.**	**Sig.**	**Exp(B)**	**95% C.I.for EXP(B)**	
					Lower	Upper
Univariate Logistic regression						
Females	1.636	0.571	0.004	5.133	1.68	15.7
HDL	-0.141	0.052	0.006	0.868	0.784	0.961
Multivariate Logistic regression						
Females	3.061	0.890	0.001	21.36	3.73	122.25
HDL	-0.162	0.063	0.010	0.850	0.75	0.96

HDL: High-density Lipoprotein, Exp(B): odds ratio (OR), C.I: confidence level. (P<0.05): significant

DISCUSSION

The current study revealed that the limitation to blood flow in the RMAs (TIMI flow ≤3) was seen in 64(37.6%) of cases underwent PPCI for STEMI, which was nearly similar to that the reported by **Ravindran et al. [7]** who revealed that in 37% of instances, there was a restriction to blood flow in the acute marginal artery (AMA) (TIMI flow <3)..

Regarding patients' characteristics, the current investigation found that there was an age difference between groups I and II that was not statistically significant, smoking habit, distribution percent of hypertensive or diabetes mellitus, p>0.05, while there was significant higher percentage of males in group I compared to group II, p=0.003.

To the best of our knowledge only one study by **Ravindran et al. [7]** assessed the impact of the limitation in blood flow of the acute marginal artery on the outcome of PPCI, infortinatly the study was present as abstract and not assessed the association between patients chrecteristics and restriction in the acute marginal artery's blood flow.

The current study was supported by **Marinsek et al. [13]** showed that females more likely to develop suboptimal coronary blood flow (TIMI <III) than males (18.6% vs. 12.5% respectively) post PPCI for STEMI, but without statistical significance.

Also, our results were further supported by **[14]** who revealed that there was significant association between inadequate coronary blood flow following first angioplasty in those experiencing acute anterior STEMI and female sex, however no association between suboptimal flow and DM or hypertension but contrasting with our findings, they discovered a strong correlation between suboptimal coronary blood flow and older age.

As well, **Shah et al. [15]** revealed that there was no association between slow/no-reflow and DM, hypertension or smoking, but in contrast the study revealed that older patient age was significantly associated with slow/no-reflow and sex have no association with slow/no-reflow post PPCI among 153 patients with STEMI. This contrast may be due to difference in sample size or inclusion criteria.

Regarding laboratory data, the current study showed that there was significant higher HDL in group I compared to group II, p=0. 005. Otherwise, there was no-significant difference between group I and group II, regarding other laboratory parameters, p>0.05.

However, in contrast to the current study several studies **Elakabawi et al. [14]** found no significant association between HDL and suboptimal coronary blood flow post primary PCI, while, **Tamrakar et al**. **[16]** revealed that patients with dyslipidemia had poor TIMI flow grade during primary PCI.

Also, in disagreement with the current study **Ravindran et al. [7]** enrolled 547 STEMI patients underwent PPCI and revealed that Peak troponin I was higher in patients with acute marginal artery flow limitation (46,640 vs. 30,066 ng/L, $p < 0.05$). The contrast to the current study may be due to differences in sample size.

Moreover, **Elakabawi et al. [14]** found substantial correlation between decreased Hb and enhanced coronary blood flow poor Creatinine, other laboratory data have no impact on coronary blood flow.

Regarding echocardiography data, the current study revealed that there was significant lower mean value of TAPSE, TASV in group II compared to group I, (p=0.003),(p=0.027) respectively, and there was significant higher mitral regurgitation in group II compared to group I (p=0.039) . Otherwise there was no significant difference between group I and group II, regarding other Echocardiography data.

In agreement with the current study **Ravindran et al. [7]** showed that Echocardiography revealed a higher rate of RV impairment in patients with acute marginal artery flow limitation (20.4% vs. 8.5%, $p < 0.001$).

Also,**Elakabawi et al. [14]** found significant association between suboptimal coronary blood flow and impaired ejection fraction post PPCI.

Similar results were reported by **Yurdam et al. [17]** as they revealed that patients with TIMI flow ≤ 2 post PPCI were more likely to have lower ejection fraction.

Regarding outcome, the present study showed that there was statistically no -significant difference between group I and group II regarding in hospital outcome p>0.05. Except Heart block significantly more common in group II compared to group I, p=0.006. There was a tendency to better outcome in group I compared to group II but without statistical significance.

In subgroup analysis of patients with acute marginal artery flow limitation (group II), group II were divided into two subgroups: subgroup A: included 41 patients with final TIMI III Flow in RCA and TIMI < or = TIMI II in right marginal arteries. Subgroup B: included 23 patients with final TIMI III Flow in LCX and TIMI < or = TIMI II in left marginal arteries.

Regarding baseline data, the current study revealed that there was statistically no -significant difference between Subgroup A and Subgroup B regarding age, sex, smoking habit, distribution percent of hypertensive or diabetes mellitus, p>0.05.

Regarding echocardiography data, the current study revealed that there was significant lower mean value of TAPSE, TASV in subgroup A compared to subgroup B, (p=0.001),(p=0.001) respectively . And there was significant higher mitral regurgitation in subgroup B compared to subgroup A (p=0.014) Otherwise there was no-significant difference between subgroup A and subgroup B, regarding Echocardiography data, (p>0.05).

A significantly diminished RV systolic function may be indicated by a decline in TAPSE or TASV, so our results showed that the flow limitation in left marginal arteries was associated with better RV systolic function compared to those with flow limitation in right marginal arteries, but this primary result need to be confirmed with larger studies.

Regarding outcome, the current study revealed that there was statistically no -significant difference between Subgroup A and Subgroup B regarding in hospital outcome (p>0.05). Except Heart block significantly more common in Subgroup A compared to Subgroup B, (p=0.015). There was no-significant difference between Subgroup A and Subgroup B, regarding duration of ICCU stay per days, (p>0.05).

To the best of our knowledge this is the first study compared the outcome of patients flow limitation in right and left marginal arteries,

Univariate and multivariate analysis were performed to find the independent predictors for limitation of marginal coronary arteries flow in patients with acute Inferior STEMI, females, decrease HDL value are significant predictors for limitation of marginal coronary arteries flow. p<0.05 in both univariate and multivariate analysis.

To the best of our knowledge, this is the first study to evaluate the factors associated with limited marginal coronary artery flow in acute inferior STEMI patients.

The above results may be supported by **Marinsek et al**. **[13]** who revealed that women were more likely to have poorer outcome compared to men post PPCI for STEMI. Moreover, the study revealed that females have higher tendency to develop suboptimal coronary blood flow (TIMI <III) than males (18.6% vs. 12.5% respectively) post PPCI for STEMI, but without statistical significance.

Rao et al. [18] in a meta-analysis stated that following STEMI, women die at a higher rate than men do. Women do, however, typically have greater rates of diabetes, hypertension, and high cholesterol, as well as being older and having more co-morbidities. This meta-analysis showed that the increased 1-year mortality rate in women was no longer significant when these covariates were considered (RR 0.90; 95% CI [0.69–1.17]; p=0.42).

Another meta-analysis by **Pancholy et al. [19]** of 68,536 patients (27% female, n=18,555), mortality was higher in women both in hospital (RR 1.93; 95% CI [1.75–2.14]; p<0.001) and at 1 year (RR 1.58; 95% CI [1.36–1.84]; p<0.001).

Moreover, **Zhang et al. [20]** suggested that an increased LDL/HDL ratio and reduced HDL were independent risk factors for PCI-assisted long-term coronary revascularization in STEMI patients.

Also, **Ji et al. [21]** revealed revealed among STEMI patients, low HDL was substantially linked to an increased risk of in-hospital death.

As well, **El Amrawy et al. [22]** concluded a substantially increased risk of in-hospital and one-year mortality for STEMI patients was linked to a low HDL level.

CONCLUSION

Flow limitation in right marginal arteries of RCA or left marginal arteries of LCX during primary PCI in acute inferior MI was associated with higher rates of right ventricular (RV) dysfunction and higher rates of heart block and higher rates of mitral regurgitation. Flow limitation in right marginal arteries of RCA during Primary PCI in Inferior MI was associated with greater rates of RV dysfunction and higher rates of heart block compared to Flow limitation in left marginal arteries of LCX. Flow limitation in left marginal arteries of LCX during Primary PCI in acute inferior MI was associated with greater rates of mitral regurgitation compared to Flow limitation in right marginal arteries of RCA.

Declaration of interest
The authors report no conflicts of interest. The authors along are responsible for the content and writing of the paper.
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REFERENCES

1. Reda A, Bendary A, Elbahry A, Farag E, Mostafa T, Khamis H, et al. Prevalence of atherosclerosis risk factors in Egyptian patients with acute coronary syndrome: final data of the nationwide cross-sectional ‘CardioRisk’project. East Afr. J. Public Health, 2020; 11(2).
2. Gilutz H, Shindel S, Shoham-Vardi I. Adherence to NSTEMI guidelines in the emergency department: regression to reality. Crit. Pathw., 2019; 18(1), 40-46.
3. Aydin F, Yildirim OT, Dagtekin E, Aydin AH, Aksit E. Acute inferior myocardial infarction caused by lightning strike. PREHOSP DISASTER MED., 2018; 33(6), 658-659.
4. Lévy S. Bundle branch blocks and/or hemiblocks complicating acute myocardial ischemia or infarction. J. Interv. Card. Electrophysiol., 2018; 52, 287-292.
5. Bouhuijzen L, Stoel M. Inferior acute myocardial infarction with anterior ST-segment elevations. Neth Heart J., 2018; 26(10), 515-516.

6. Chia BL, Yip J, Poh KK. Acute inferior myocardial infarction: the dilemma between anatomic-pathological classification and electrocardiographic diagnosis. Singap. Med. J., 2019; 60(8), 385.
7. Ravindran J, Allahwalla U, Hansen P, Rassmussen H, Nelson G, Hoo S, et al. Limitation in Blood Flow of the Acute Marginal Artery During an Inferior ST-Elevation Myocardial Infarction is Associated With Poorer Clinical Prognosis. Heart Lung Circ., 2018; 27, S493.
8. Kulkarni JP. Variant anatomy of coronary arteries. Indian Heart J., 2013; 1(2), 46-51.
9. 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. Eur. Heart J. Cardiovasc. Imaging, 2015; 16(3), 233-271.
10. Park JH, Kim JH, Lee JH, Choi SW, Jeong JO, Seong IW. Evaluation of right ventricular systolic function by the analysis of tricuspid annular motion in patients with acute pulmonary embolism. Cardiovasc. Ultrasound, 2012; 20(4), 181.
11. Tabrizi AT, Moghaddasi H, Rabiei R, Sharif-Kashani B, Nazemi E. Development of a catheterization and percutaneous coronary intervention registry with a data management approach: a systematic review. Perspect. health inf. manag., 2019; 16(Winter).
12. Sarkar A, Grigg W, Lee J. TIMI grade flow In: StatPearls. Treasure Island (FL). In: StatPearls Publishing, 2021.
13. Marinsek M, Šuran D, Sinkovic A. Factors of Hospital Mortality in Men and Women with ST-Elevation Myocardial Infarction–An Observational, Retrospective, Single Centre Study. Int. J. Gen. Med., 2023; 5955-5968.
14. Elakabawi K, Huang X, Shah SA, Ullah H, Mintz GS, Yuan Z, et al. Predictors of suboptimal coronary blood flow after primary angioplasty and its implications on short-term outcomes in patients with acute anterior STEMI. BMC Cardiovasc. Disord., 2020; 20, 1-12.
15. Shah M, Mohsin M, Satti KN, Shah MU. PREDICTORS AND IN-HOSPITAL MORTALITY OF SLOW FLOW/NO-REFLOW AFTER PERCUTANEOUS CORONARY INTERVENTION IN PATIENTS WITH ST-ELEVATION MYOCARDIAL INFARCTION.
16. Tamrakar R, Rajbhandari R, KC SS. TIMI (Thrombolysis in Myocardial Infraction) flow grade in ST Elevation Myocardial Infarction after Primary Percutaneous Intervention. Europasian j. med. sci., 2021; 3(1), 60-65.
17. Yurdam FS, Kiş M. The Relationship Between TIMI Flow and MAPH Score in Patients Undergoing Primary Percutaneous Coronary Intervention for STEMI. Int. Heart J., 2023; 64(5), 791-797.
18. Rao U, Buchanan GL, Hoye A. Outcomes after percutaneous coronary intervention in women: are there differences when compared with men? Interv. Cardiol. Rev., 2019; 14(2), 70.
19. Pancholy SB, Shantha GPS, Patel T, Cheskin LJ. Sex differences in short-term and long-term all-cause mortality among patients with ST-segment elevation myocardial infarction treated by primary percutaneous intervention: a meta-analysis. JAMA Intern. Med., 2014; 174(11), 1822-1830.
20. Zhang R, Fan Y, Xue Y, Feng Y, Dong C, Wang Y, et al. The LDL/HDL ratio predicts long-term risk of coronary revascularization in ST-segment elevation myocardial infarction patients undergoing percutaneous coronary intervention: a cohort study. Braz. J. Med. Biol., 2022; 55, e11850.
21. Ji MS, Jeong MH, Ahn YK, Kim YJ, Chae SC, Hong TJ, et al. Impact of low level of high-density lipoprotein-cholesterol sampled in overnight fasting state on the clinical outcomes in patients with acute myocardial infarction (difference between ST-segment and non-ST-segment-elevation myocardial infarction). J. Cardiol., 2015; 65(1), 63-70.
22. El Amrawy AM, Almaghraby A, Abdelnabi MH. The prognostic impact of HDL-C level in patients presenting with ST-elevation myocardial infarction. Br. J. Cardiol., 2023; 30(1).

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