Clinical outcomes according to ECG presentations in infarct-related cardiogenic shock in CULPRIT-SHOCK

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ABSTRACT

Background: The impact of ECG presentations of acute myocardial infarction (AMI) in cardiogenic shock is unknown.

Research question: In myocardial infarction with cardiogenic shock, is there a difference in the outcomes and effect of revascularization strategies between non-ST-segment elevation myocardial infarction (NSTE-MI) and left bundle branch block (LBBB-MI) versus STEMI?

Methods: Cardiogenic shock patients from the CULPRIT-SHOCK trial presenting with NSTE-MI or LBBB-MI were compared with STE-MI patients for 30-day and 1-year all-cause mortality. The interaction between ECG presentation and the effect of revascularization strategies on outcomes was evaluated.

Results: Of 665 cardiogenic shock patients analyzed, 55.9% presented with STE-MI, 29.3% with NSTE-MI and 14.7% with LBBB-MI. Patients differed in age (68.0 years in STE-MI, 71.0 years in NSTE-MI and 73.5 years in LBBB-MI, p=0.015), cardiovascular risk factors and angiographic severity. There was no difference in the 30-day risk of death between NSTE-MI and STE-MI (48.7 % vs. 43.0%, aOR 1.05, 95%CI, 0.66 - 1.67, p=0.85), nor between LBBB-MI and STE-MI (59.2% vs. 43.0%, aOR 1.31, 95%CI 0.73 - 2.34, p=0.36). While the univariate risk of 1-year death was higher in NSTE-MI and LBBB-MI patients compared with STE-MI, ECG presentation was not an independent risk factor of mortality after adjustment (NSTE-MI vs. STE-MI : 56.4 % vs 46.8 % aOR 1.21, 95%CI 0.76 - 1.92, p=0.42 ; LBBB-MI vs. STEMI : 69.4% vs. 46.8% : aOR : 1.59, 95%CI 0.89 – 2.84, p=0.12) . ECG presentation did not modify the effect of the revascularization strategy on 30-day and 1-year mortality (p interaction =0.91 and 0.97).

Interpretation: In patients with cardiogenic shock, NSTE-MI and LBBB-MI presentations reflect higher risk profiles than STE-MI but are not independent risk factors of mortality. ECG presentations did not modify the treatment effect, supporting culprit-lesion-only PCI as the preferred strategy across the AMI spectrum.

KEYWORDS: cardiogenic shock; STE-MI; NSTE-MI; left bundle branch block; percutaneous coronary intervention.

INTRODUCTION

Cardiogenic shock is the most frequent cause of mortality in patients admitted with acute myocardial infarction (AMI) [1,2]. This life-threatening complication occurs in 3 to 5 % of non-ST-segment myocardial infarction (NSTE-MI) patients and in 10 to 13 % of patients presenting with ST-segment elevation myocardial infarction (STE-MI) [3,4]. Emergent percutaneous coronary intervention (PCI) is the only proven strategy that improves survival [5–7]. Guidelines recommend an early invasive strategy for patients presenting with acute myocardial infarction (AMI) and hemodynamic instability, regardless of the ECG presentation [8,9].

Little is known about the profile of cardiogenic shock patients related to NSTE-MI or left bundle branch block (LBBB-MI). Because of the difficulty to quickly determine whether a LBBB is *de novo* or pre-existent, it is often considered as an equivalent of STE-MI. However, there is a considerable evolution in the appraisal of LBBB-MI patients in clinical practice and recent European Guidelines, as studies have demonstrated their specific characteristics and natural history [10–13]. Whether the 3 ECG presentations of AMI have different outcomes and are associated with a variation in the effects of treatment strategies in cardiogenic shock is unknown[14,15].

Thus, using the data of the CULPRIT-SHOCK trial, we aimed to compare the characteristics of patients admitted for cardiogenic shock with STE-MI, NSTE-MI or LBBB-MI as well as their short- and long-term outcomes and the effect of the revascularization strategy.

METHODS

Study design and population

The present post-hoc analysis included all the patients of the CULPRIT-SHOCK (Culprit Lesion Only PCI versus Multivessel PCI in Cardiogenic Shock) trial for whom the ECG presentation was collected. The investigation conforms to the principle's outlined in the Declaration of Helsinki and was approved by ethics committees involved in the CULPRIT-SHOCK trial. The design of the CULPRIT-SHOCK trial as well as the 30-day and 1-year results have previously been published [16–18]. In brief, this multicenter and open-label trial randomized patients with cardiogenic shock related to AMI and multivessel coronary artery disease to a culprit-lesion-only PCI strategy versus an immediate multivessel PCI strategy. The patients assigned to a culprit-lesion-only PCI strategy could be treated with complementary staged PCI. The primary endpoint of 30-day mortality or renal-replacement therapy occurred more often in patients treated with immediate multivessel PCI [16].

In the present post-hoc analysis, the baseline 12-lead ECG was recorded and analyzed for each patient of the trial, who was then classified as STE-MI, NSTE-MI or LBBB-MI. ST-segment elevation was defined by site investigators as a new ST-elevation ≥1 mm in ≥2 contiguous leads [19]. LBBB-MI was described as the association of a supraventricular heart rhythm, a QRS duration ≥ 120 ms, a QS or rS complex in lead V1 and a R wave in lead V6 [20]. The new or old status of the LBBB was not collected in the trial. Patients with ECG alterations other than ST-segment elevation or LBBB were considered as NSTE-MI.

Study endpoints

In the primary analysis, we compared the 30-day and 1-year all-cause death of patients admitted with cardiogenic shock related to NSTE-MI or LBBB-MI with those presenting with cardiogenic

shock related to STE-MI (reference group). The secondary outcome included the composite of all-cause death or renal replacement therapy at 30 days. Then, we assessed whether the effect of revascularization strategies on outcomes of cardiogenic shock patients was consistent across the 3 ECG presentation groups.

Statistical analysis

Continuous variables are reported as median and interquartile range [Q1-Q3] and compared using the Kruskal-Wallis test. Categorical variables are reported as numbers and percentages and compared using the Chi-square or Fisher's exact test. Kaplan-Meier curves were also used to show event rates over time with classification according to ECG presentation and compared using the log-rank test. Patients without events were censored at 30 days or 1-year.

NSTE-MI and LBBB-MI patients were respectively compared with patients presenting with STE-MI, which was the reference in this analysis. Univariate logistic regression was performed to assess the association between ECG presentation and outcomes at 30 days or 1 year, as previously published (14, 16). Multivariate logistic regression models were used to evaluate the independent association between ECG presentation and outcomes. In each model, ECG presentation was adjusted on baseline clinical and procedural characteristics (age, sex, body mass index, cardiovascular risk factors, history of MI, history of stroke, PCI, coronary artery bypass graft or peripheral artery disease, kidney dysfunction, arterial lactate level, fibrinolysis before randomization, resuscitation before randomization, femoral access, triple vessel disease, culprit lesion in the left main or left anterior descending artery, chronic total occlusion, stent in culprit lesion, mechanical circulatory support, therapeutic hypothermia, mechanical ventilation, catecholamine therapy, post-PCI Thrombolysis In Myocardial Infarction [TIMI] flow, randomization group) possibly associated with outcomes in univariate analysis ($p<0.2$) **(e-table**

1). The results are interpreted in terms of adjusted odd ratios (aOR) with their associated 95% confidence interval (CI).

The interaction between ECG presentation and revascularization strategy (randomization group) was evaluated for each outcome using logistic regression. A p-value <0.05 was considered significant. All statistical analyses were performed with SAS release 9.4 (SAS Institute Inc, Cary, NC) statistical software package.

RESULTS

Characteristics of STE-MI, NSTE-MI and LBBB-MI patients with cardiogenic shock

A description of the ECG presentation was available for 665 patients (96.9%) of the 686 cardiogenic shock patients related to AMI with multivessel coronary artery disease of the CULPRIT-SHOCK trial. There were 372 cardiogenic shock patients presenting with STE-MI (55.9%), 195 with NSTE-MI (29.3%) and 98 with LBBB-MI (14.7%). Patient characteristics were worse in patients with NSTE-MI and LBBB, as compared with those with STEMI, with regard to age (68.0 years in STE-MI, 71.0 years in NSTE-MI and 73.5 years in LBBB-MI, p=0.015), diabetes (25.1 % in STE-MI, 37.7 % in NSTE-MI and 50 % in LBBB-MI, p<0.001) and most of the cardiovascular risk factors and co-morbidities presented in **Table 1.**

Treatments and results of coronary angiograms according to ECG presentation are displayed in **Table 2**. The degree of severity of coronary artery disease also varied according to the ECG presentation, with triple vessel disease and chronic total occlusion being more frequent in LBBB-MI and NSTE-MI patients. The differences in the risk profile at admission are displayed in **Figure 1**.

Risk of short-term outcomes according to ECG presentation

The univariate and adjusted risk of 30-day all-cause death according to ECG presentation is presented in **Table 3 and figure 2.** There was no difference in the univariate and adjusted risk of mortality at 30 days between NSTE-MI and STE-MI patients (48.7% vs. 43.0%, aOR = 1.05, 95%CI [0.66 - 1.67], p=0.85)**.** Cardiogenic shock patients presenting with LBBB-MI had higher univariate risk of 30-day mortality than STE-MI, without significant difference after adjustment on confounding covariates (59.2 % vs. 43.0 %, aOR = 1.31, 95 %CI [0.73 – 2.34], p=0.36). There was no difference in the adjusted risk of all-cause death or renal-replacement therapy when NSTE-MI or LBBB were respectively compared with STE-MI**.**

Risk of long-term outcome according to ECG presentation

At 1 year, both NSTE-MI and LBBB-MI patients had a higher univariate risk of mortality compared with STE-MI **(Table 3 and figure 2**). After adjustment for confounding covariates, NSTE-MI was not associated with a different risk of mortality at 1 year as compared with STE-MI (56.4% vs. 46.8%, aOR = 1.21, 95%CI [0.76 – 1.34], p=0.42), nor was LBBB-MI (69.4% vs. 46.8%, aOR = 1.59, 95%CI [0.89 – 2.84], p=0.12).

Effect of revascularization strategy STE-MI, NSTE-MI and LBBB patients

The effect of culprit-lesion-only PCI versus immediate multivessel PCI on all-cause death or renal therapy replacement at 30 days (p interaction = 0.76), all-cause death at 30 days (p interaction = 0.91) and 1-year (p interaction =0.97) was consistent across ECG presentations **(Figure 3)**.

DISCUSSION

This post-hoc analysis of the CULPRIT-SHOCK trial analyzed the differences in risk profile and outcomes of patients admitted with STE-MI, NSTE-MI and LBBB-MI complicated by cardiogenic shock and multivessel coronary artery disease. ECG presentations reflect different

risk profiles, with an ascending proportion of co-morbidities and severity of coronary artery disease from STE-MI to NSTE-MI and LBBB-MI [21] . Because of important differences in age and vascular severity, ECG presentations are associated with different shock evolutions with LBBB-MI patients suffering of the highest rate of mortality. The adjusted risk of mortality of NSTE-MI and LBBB-MI was not different to STE-MI patients, highlighting the contribution of each respective risk profile rather than the type of ECG presentation itself. The effect of revascularization strategies is consistent across groups supporting that an immediate culprit-lesion-only PCI should be the preferred strategy irrespectively of the initial ECG presentation.

The high risk profile of NSTE-MI patients with older age, more risk factors and pre-existent heart disease than STE-MI patients was previously described in nationwide non-shock myocardial infarction registries [22,23]. These differences underlie alternative physio-pathological pathways leading to myocardial oxygen deprivation, ischemia and cardiogenic shock [14]. Whereas, in general, STE-MI results from an acute and complete thrombotic coronary occlusion, NSTE-MIs are the consequence of a more insidious and extensive atherosclerotic process involving transient unstable coronary stenosis and microcirculation dysfunction, though often with a persistent epicardial coronary blood flow[24]. As a result, the event of cardiogenic shock in NSTE-MI patients is less frequent, as compared with STEMI, and mostly results from more extensive coronary artery disease and prior MIs, in addition to more frequent and more severe co-morbidities [4].

Little is known about the characteristics of cardiogenic shock patients with AMI and LBBB. While these patients are historically considered and treated as ST-segment elevation presenters, recent findings have demonstrated that LBBB-MI patients are in fact more complex and heterogeneous, with more co-morbidities and less favorable outcomes than STE-MI presenters

[10–12]. Although anterior MI can cause a new LBBB, presuming of *de novo* or pre-existing status of the LBBB is challenging – especially in the setting of cardiogenic shock. In our population, LBBB may more likely be a pre-existent marker of established chronic ischemic heart disease with left ventricular dysfunction and remodeling. This is well illustrated by the high rate of triple-vessel disease and chronic total occlusion.

The difference in mortality rates between groups is modest at 30 days but more important at 1-year. STE-MI, NSTE-MI and LBBB-MI patients share a similar short-term high-risk period, involving hemodynamic instability or ventricular arrhythmia leading to cardiac arrest or deadly complications like cardiac rupture or acute mitral insufficiency. Beyond 30 days, STE-MI survivors have a low rate of incident death (+3.8%). In contrast, mortality kept in increasing between 30 days and 1 year in NSTE-MI (+7.7%) and LBBB-MI patients (+10.2 %). Overall, patients with LBBB-MI had worst clinical presentations at the acute phase, with more frequent resuscitation before randomization and more severe signs of shock. The very-high risk presentation of patient with LBBB-MI, on top of pre-existent co-morbidities is the major contribution of the worst short-term and long-term outcomes. This was also observed with a lower degree in patients with shock and NSTE-MI.

The effect of culprit-lesion-only PCI versus immediate multivessel PCI is consistent across each type of ECG presentation. Thus, as demonstrated by the results of the CULPRIT-SHOCK trial, an immediate culprit-lesion-only PCI strategy should be favored in patients with cardiogenic shock related to AMI and multivessel disease, irrespective of the ECG presentation. This is an important message for daily practice and revascularization decisions in these patients with multiple coronary stenoses potentially accessible to multivessel PCI. While facing the challenge of identifying the culprit lesion in NSTE-MI or LBBB-MI patients, interventional cardiologists

should still favor an immediate culprit-lesion-only PCI strategy with staged complementary revascularization to avoid harmful peri-procedural complications and worse outcomes with immediate multivessel PCI.

LIMITATIONS

We acknowledge several limitations for this substudy of the CULPRIT-SHOCK trial. First, this is a post-hoc analysis from a randomized trial and should be interpreted accordingly. Of note, our results are concordant with previous findings concerning LBBB-MI and NSTE-MI without cardiogenic shock [25]. Secondly, ECG modifications were solely evaluated by site investigators without further review or adjudication. Thus, no specific criteria such as the modified Sgarbossa criteria could be applied for LBBB. Thirdly, the LBBB status – de novo or pre-existent – was unknown and concerned a low proportion of patients.

CONCLUSIONS

In patients with AMI and cardiogenic shock, NSTE-MI and LBBB-MI presentations reflect higher risk profiles contributing to worse evolutions but are not an independent risk factor of mortality. Importantly, there is no evidence of heterogeneity in the effect of revascularization strategies between cardiogenic patients presenting with STE-MI, NSTE-MI or LBBB-MI. Our results support culprit-lesion-only PCI as the standard immediate strategy irrespectively of the ECG presentation in AMI complicated by cardiogenic shock.

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The first author (M.Zeitouni) and the senior authors (G.Montalescot and H.Thiele) designed the study, gathered, analyzed the data, and drafted the manuscript. A lead statistician (S. Rouanet) and a senior statistician (E.Vicaut) provided an independent statistical analysis, results and

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TABLES

Table 1. Presentations in STE-MI, NSTE-MI and LBBB-MI patients of the CULPRIT-SHOCK trial.

	Total (N=665)	**STE-MI (N=372)**	**NSTE-MI (N=195)**	**LBBB-MI (n=98)**	**p-value**
Age (years), median [IQR]	70.0 [60.0 - 78.0]	68.0 [58.0 - 77.0]	71.0 [63.0 - 78.0]	73.5 [63.0 - 79.0]	0.02
Female	156/664 (23.5%)	90/371 (24.3%)	39/195 (20.0%)	27/98 (27.6%)	0.31
BMI (kg/m²)					0.74
N	642	359	190	93	
Median [IQR]	26.8 [24.5 - 29.4]	26.5 [24.6 - 29.4]	27.3 [24.2 - 29.4]	26.8 [24.7 - 29.4]	
Medical history					
Current smoking	173/644 (26.9%)	109/358 (30.4%)	43/190 (22.6%)	21/96 (21.9%)	0.07
Hypertension	391/655 (59.7%)	203/367 (55.3%)	124/192 (64.6%)	64/96 (66.7%)	0.03
Hypercholesterol-emia	218/652 (33.4%)	116/365 (31.8%)	68/191 (35.6%)	34/96 (35.4%)	0.60
Diabetes mellitus	212/654 (32.4%)	92/367 (25.1%)	72/191 (37.7%)	48/96 (50.0%)	<0.01
Family history of CAD	77/637 (12.1%)	51/354 (14.4%)	18/188 (9.6%)	8/95 (8.4%)	0.13
Known renal insufficiency	42/657 (6.4%)	19/368 (5.2%)	15/194 (7.7%)	8/95 (8.4%)	0.34
Previous myocardial infarction	107/655 (16.3%)	51/366 (13.9%)	30/193 (15.5%)	26/96 (27.1%)	0.01
Previous stroke	47/658 (7.1%)	22/368 (6.0%)	15/193 (7.8%)	10/97 (10.3%)	0.31
Known peripheral artery disease	76/659 (11.5%)	38/368 (10.3%)	24/194 (12.4%)	14/97 (14.4%)	0.48
Previous PCI	121/655 (18.5%)	54/366 (14.8%)	41/193 (21.2%)	26/96 (27.1%)	0.01

Previous coronary artery bypass grafting	33/659 (5.0%)	8/369 (2.2%)	18/194 (9.3%)	7/96 (7.3%)	<0.01
Group of randomization					0.82
Culprit-lesion-only PCI	335/665 (50.4%)	185/372 (49.7%)	98/195 (50.3%)	52/98 (53.1%)	
Immediate multivessel PCI	330/665 (49.6%)	187/372 (50.3%)	97/195 (49.7%)	46/98 (46.9%)	
Presentation					
Mean blood pressure (mmHg)					0.26
N	569	322	168	79	
Median, [IQR]	75.7 [63.3 - 93.3]	73.3 [63.0 - 91.7]	78.0 [64.2 - 96.7]	73.3 [63.3 - 92.0]	
Heart rate (beats/min)					0.01
N	662	370	194	98	
Median, [IQR]	91.0 [73.0 -108.0]	89.0 [70.0 - 105.0]	97.0 [78.0 - 110.0]	91.5 [75.0 - 109.0]	
Altered mental status	444/662 (67.1%)	238/369 (64.5%)	128/195 (65.6%)	78/98 (79.6%)	0.02
Cold clammy skin and limbs	456/657 (69.4%)	258/366 (70.5%)	127/193 (65.8%)	71/98 (72.4%)	0.40
Oliguria	169/647 (26.1%)	103/359 (28.7%)	38/193 (19.7%)	28/95 (29.5%)	0.05
Arterial lactate > 2 mmol/L	430/647 (66.5%)	225/360 (62.5%)	131/193 (67.9%)	74/94 (78.7%)	0.01
pH<7.36	391/648 (60.3%)	208/361 (57.6%)	111/192 (57.8%)	72/95 (75.8%)	<0.01
Resuscitation before randomization	351/663 (52.9%)	182/370 (49.2%)	110/195 (56.4%)	59/98 (60.2%)	0.08
Atrial fibrillation	90/665 (13.5%)	39/372 (10.5%)	35/195 (17.9%)	16/98 (16.3%)	0.03
Sinus Rhythm	501/665 (75.3%)	288/372 (77.4%)	142/195 (72.8%)	71/98 (72.4%)	0.37
AV-block III	23/665 (3.5%)	17/372 (4.6%)	5/195 (2.6%)	1/98 (1.0%)	0.21
Other rhythm	75/665 (11.3%)	42/372 (11.3%)	17/195 (8.7%)	16/98 (16.3%)	0.15

Left ventricular ejection fraction (%)					<0.01
N	248	132	72	44	
Median, [IQR]	30.0 [25.0 - 40.0]	30.0 [25.0 - 44.0]	37.0 [25.0 - 41.0]	26.5 [20.0 - 32.0]	

STEMI stands for ST-segment elevation myocardial infarction, NSTEMI for non-ST segment elevation myocardial infarction, LBBB for left bundle branch block, IQR for interquartile range, BMI for body mass index, CAD for coronary artery disease, PCI for percutaneous coronary intervention

Table 2. Treatments and angiographic findings in STEMI, NSTEMI and LBBB patients of the CULPRIT-SHOCK trial.

	Total (N=665)	**STE-MI (N=372)**	**NSTE-MI (N=195)**	**LBBB-MI (n=98)**	**p-value**
Therapeutic strategies					
Mild hypothermia	217/664 (32.7%)	113/372 (30.4%)	70/194 (36.1%)	34/98 (34.7%)	0.35
Fibrinolysis <24 hr before randomization	30/663 (4.5%)	20/370 (5.4%)	5/195 (2.6%)	5/98 (5.1%)	0.28
Mechanical ventilation	536/662 (81.0%)	284/370 (76.8%)	168/195 (86.2%)	84/97 (86.6%)	<0.01
Mechanical circulatory support	185/665 (27.8%)	101/372 (27.2%)	50/195 (25.6%)	34/98 (34.7%)	0.24
Number of vessels with disease					
Triple vessel disease	423/664 (63.7%)	219/371 (59.0%)	138/195 (70.8%)	66/98 (67.3%)	0.02
Vessel related to the infarction*					
Right coronary artery	177/648 (27.3%)	108/367 (29.4%)	51/186 (27.4%)	18/95 (18.9%)	
Left main	58/648 (9.0%)	22/367 (6.0%)	25/186 (13.4%)	11/95 (11.6%)	
Left anterior descending	268/648 (41.4%)	156/367 (42.5%)	69/186 (37.1%)	43/95 (45.3%)	
Left circumflex	138/648 (21.3%)	79/367 (21.5%)	38/186 (20.4%)	21/95 (22.1%)	
Bypass graft	7/648 (1.1%)	2/367 (0.5%)	3/186 (1.6%)	2/95 (2.1%)	
At least 1 chronic total occlusion*	153/648 (23.6%)	72/367 (19.6%)	55/186 (29.6%)	26/95 (27.4%)	0.02
Number of stents in culprit lesion					0.32
No stent	35/664 (5.3%)	15/371 (4.0%)	11/195 (5.6%)	9/98 (9.2%)	
1 stent	323/664 (48.6%)	190/371 (51.2%)	92/195 (47.2%)	41/98 (41.8%)	
2 stents	182/664 (27.4%)	95/371 (25.6%)	59/195 (30.3%)	28/98 (28.6%)	
3 stents or more	124/664 (18.7%)	71/371 (19.1%)	33/195 (16.9%)	20/98 (20.4%)	
Drug eluting stent	592/629 (94.1%)	333/356 (93.5%)	175/184 (95.1%)	84/89 (94.4%)	0.76
Aspiration thrombectomy of culprit lesion	98/664 (14.8%)	72/371 (19.4%)	12/195 (6.2%)	14/98 (14.3%)	<0.01
Antithrombotic therapy administered in the catheterization laboratory					

Aspirin	491/664 (73.9%)	282/372 (75.8%)	131/194 (67.5%)	78/98 (79.6%)	0.04
Clopidogrel	125/664 (18.8%)	69/372 (18.5%)	44/194 (22.7%)	12/98 (12.2%)	0.10
Prasugrel	87/664 (13.1%)	60/372 (16.1%)	15/194 (7.7%)	12/98 (12.2%)	0.02
Ticagrelor	154/664 (23.2%)	92/372 (24.7%)	38/194 (19.6%)	24/98 (24.5%)	0.37
Glycoprotein IIb/IIIa inhibitor	144/664 (21.7%)	99/372 (26.6%)	27/194 (13.9%)	18/98 (18.4%)	<0.01
Cangrelor	18/664 (2.7%)	9/372 (2.4%)	2/194 (1.0%)	7/98 (7.1%)	0.02
Unfractionated heparin	545/664 (82.1%)	301/372 (80.9%)	162/194 (83.5%)	82/98 (83.7%)	0.68
Low-molecular-weight heparin	94/664 (14.2%)	58/372 (15.6%)	25/194 (12.9%)	11/98 (11.2%)	0.45
Bivalirudin	39/664 (5.9%)	24/372 (6.5%)	9/194 (4.6%)	6/98 (6.1%)	0.68
TIMI Flow grade before PCI*					<0.01
TIMI flow grade 0-1-2	434/644 (67.4%)	286/364 (78.6%)	95/185 (51.4%)	53/95 (55.8%)	
TIMI flow grade 3	210/644 (32.6%)	78/364 (21.4%)	90/185 (48.6%)	42/95 (44.2%)	
TIMI Flow grade after PCI*					0.01
TIMI flow grade 0-1-2	136/622 (21.9%)	91/357 (25.5%)	24/174 (13.8%)	21/91 (23.1%)	
TIMI flow grade 3	486/622 (78.1%)	266/357 (74.5%)	150/174 (86.2%)	70/91 (76.9%)	
Catecholamine therapy					
Yes	593/662 (89.6%)	325/370 (87.8%)	177/195 (90.8%)	91/97 (93.8%)	0.19
Duration in (days)					
n	589	321	177	91	
Median, [IQR]	2 [1.0 - 5.0]	2 [1.0 - 4.0]	2 [1.0 - 5.0]	2 [1.0 - 5.0]	0.27
Duration of intensive care (days)					0.04
N	622	346	186	90	
Median, [IQR]	5 [2.0 - 11.0]	4.5 [2.0 - 10.0]	6.0 [2.0 - 14.0]	7 [2.0 - 14.0]	

* Core Laboratory data.
STE-MI stands for ST-segment elevation myocardial infarction, NSTE-MI for non-ST segment elevation myocardial infarction, LBBB-MI for left bundle branch block with myocardial infarction, PCI for percutaneous coronary intervention, TIMI for Thrombolysis In Myocardial Infarction, hr for hour.

Table 3. Outcomes according to ECG presentation

Clinical Outcomes	STE-MI (N=372)	NSTE-MI (N=195)	LBBB-MI (n=98)	NSTE-MI vs. STE-MI				LBBB-MI vs. STE-MI			
				Crude OR [95% CI]	P-value	Adjusted OR* [95% CI]	p -value	Crude OR [95% CI]	p-value	Adjusted OR* [95% CI]	p -value
30-day											
All-cause death	160 (43.0%)	95 (48.7%)	58 (59.2%)	1.26 [0.89 – 1.78]	0.19	1.05 [0.66 - 1.67]	0.85	1.92 [1.22 – 3.02]	0.01	1.31 [0.73-2.34]	0.36
All-cause death or renal-replacement therapy	176 (47.3%)	99 (50.8%)	60 (61.2%)	1.15 [0.81 – 1.62]	0.43	0.84 [0.53-1.34]	0.47	1.76 [1.12 – 2.77]	0.02	1.05 [0.59-1.88]	0.86
1-year											
All-cause death	174 (46.8%)	110 (56.4%)	68 (69.4%)	1.47 [1.04 – 2.09]	0.03	1.21 [0.76 - 1.92]	0.42	2.58 [1.60 – 4.15]	<0.01	1.59 [0.89-2.84]	0.12

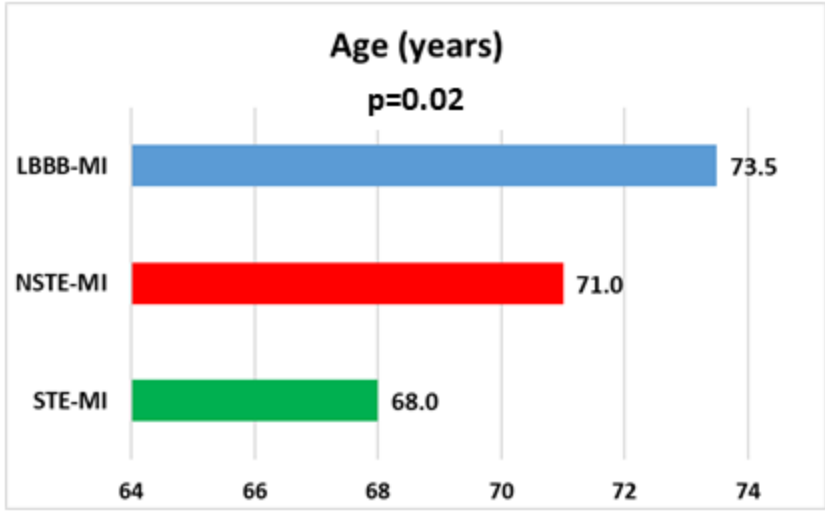
N= 575 patients were included in the multivariate model for 30-day all cause death and 30-day all cause death or renal-replacement therapy. N=592 patients were included in the multivariate model for all-cause mortality. Covariates of adjustment of both models are detailed in e-table 1. STE-MI stands for ST-segment elevation myocardial infarction, NSTE-MI for non-ST segment elevation myocardial infarction, LBBB-MI for left bundle branch block with myocardial infarction.

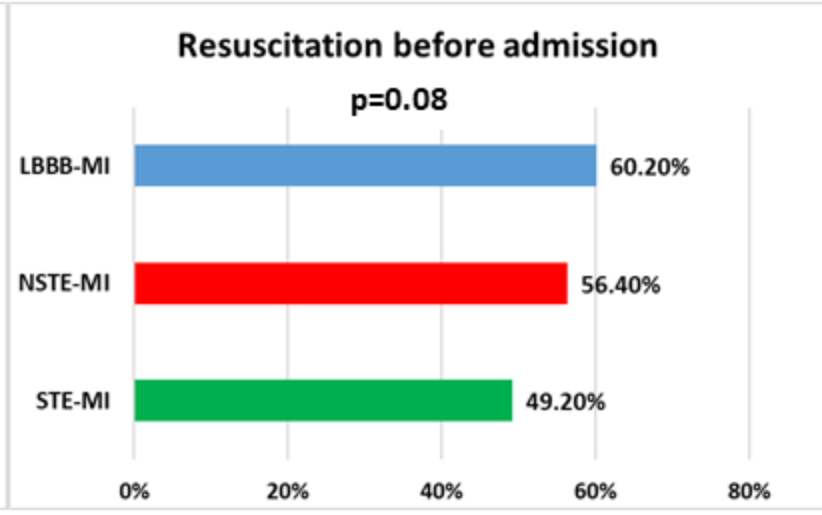
FIGURES

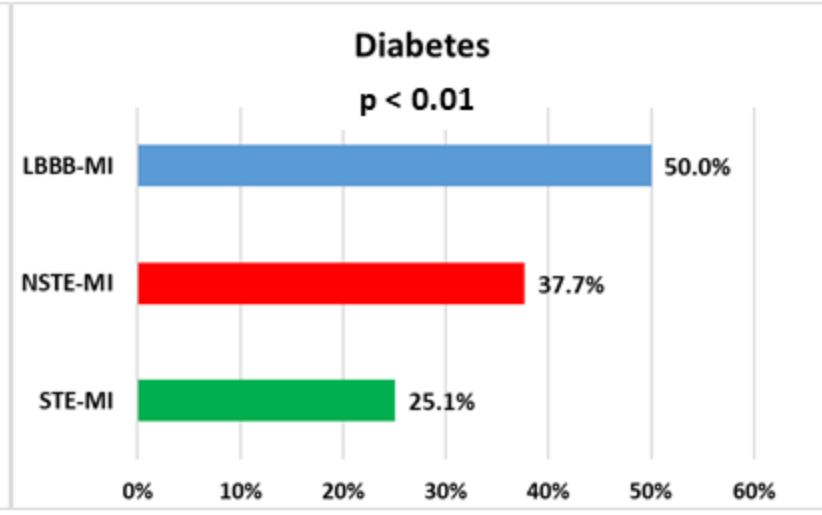
Figure 1. Risk profile of cardiogenic shock patients according to ECG presentation.

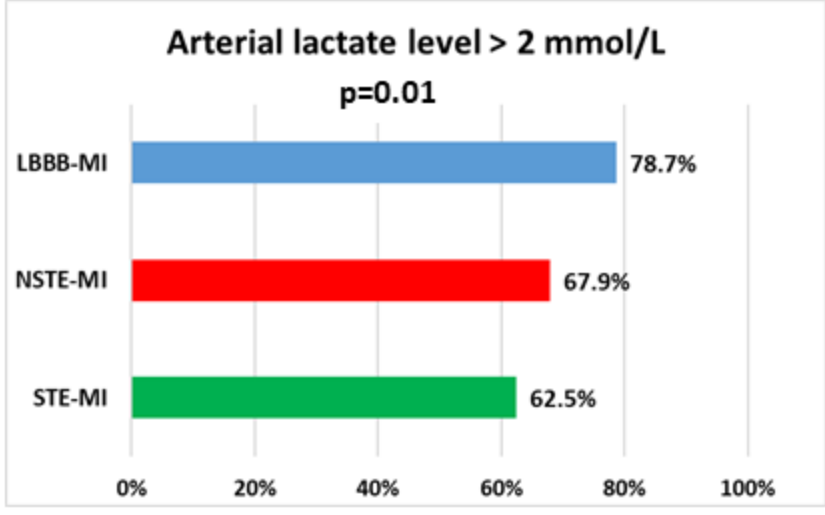
Figure 2. All-cause mortality at 30 days and 1 year according to ECG presentation. OR stands for Odds Ratio.

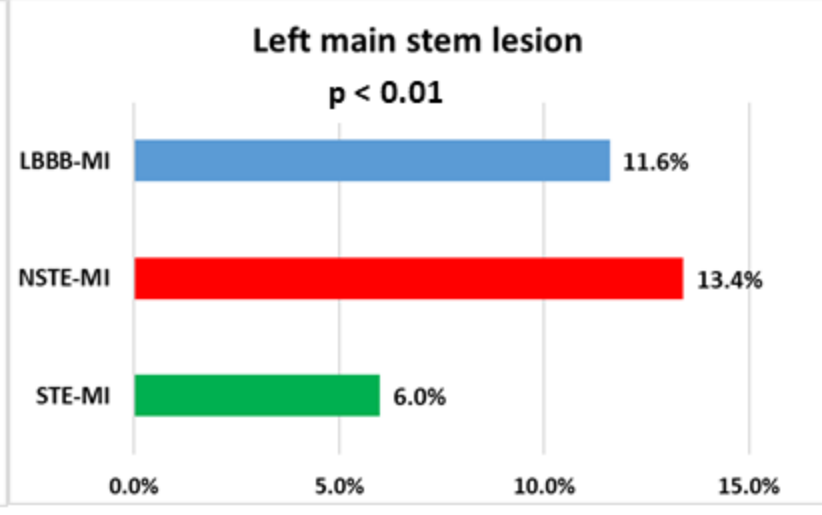
Figure 3. Effect of revascularization strategy on outcomes according to ECG presentation

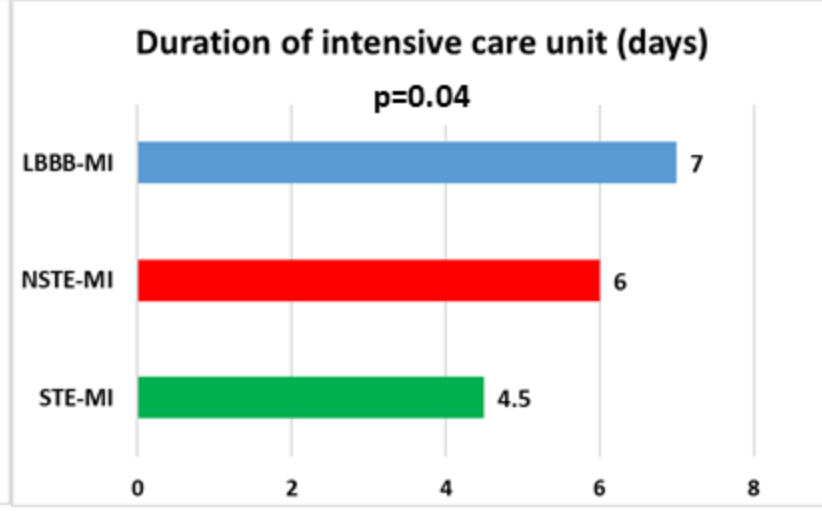

Age (years)
p=0.02
LBBB-MI
NSTE-MI
STE-MI
73.5
71.0
68.0
64
66
68
70
72
74

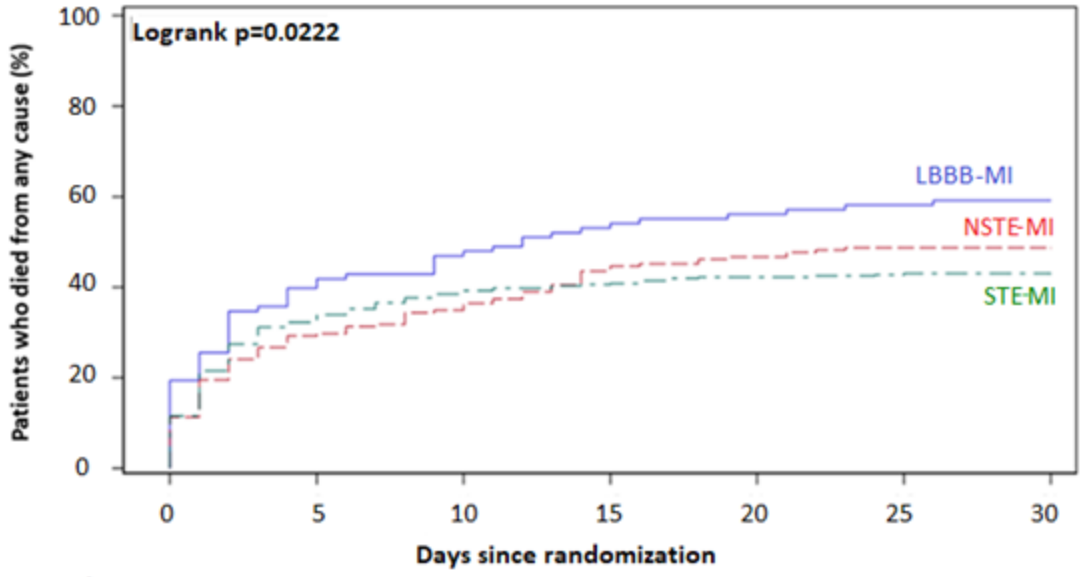

Resuscitation before admission
p=0.08
LBBB-MI
NSTE-MI
STE-MI
60.20%
56.40%
49.20%
0%
20%
40%
60%
80%


Diabetes
p < 0.01
LBBB-MI
NSTE-MI
STE-MI
50.0%
37.7%
25.1%
0%
10%
20%
30%
40%
50%
60%

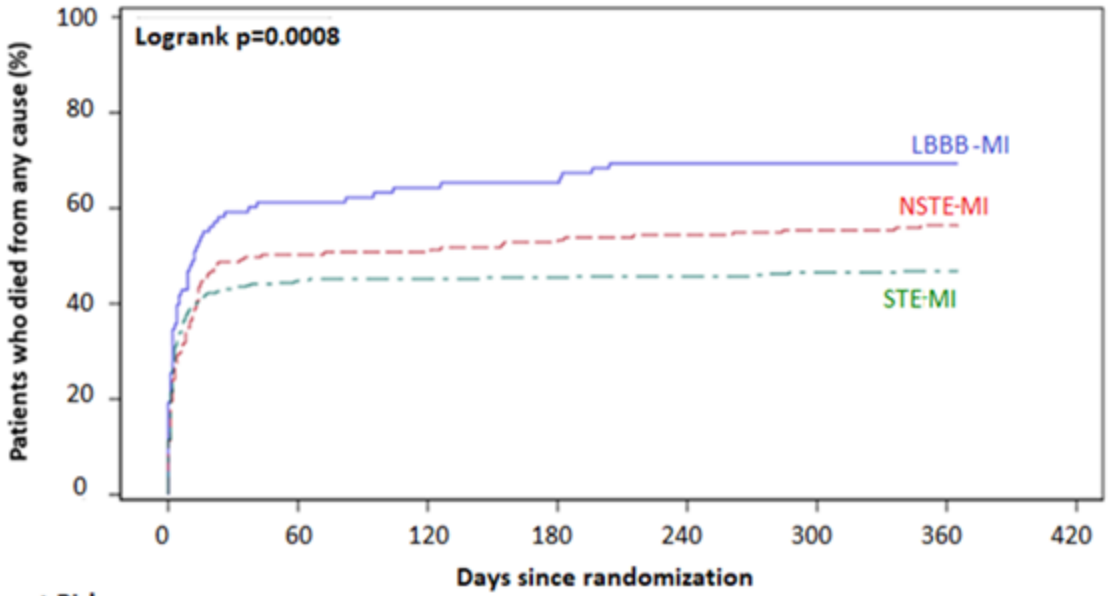

Arterial lactate level > 2 mmol/L
p=0.01
LBBB-MI
NSTE-MI
STE-MI
78.7%
67.9%
62.5%
0%
20%
40%
60%
80%
100%


Left main stem lesion
p < 0.01
LBBB-MI
NSTE-MI
STE-MI
11.6%
13.4%
6.0%
0.0%
5.0%
10.0%
15.0%


Duration of intensive care unit (days)
p=0.04
LBBB-MI
NSTE-MI
STE-MI
7
6
4.5
0
2
4
6
8

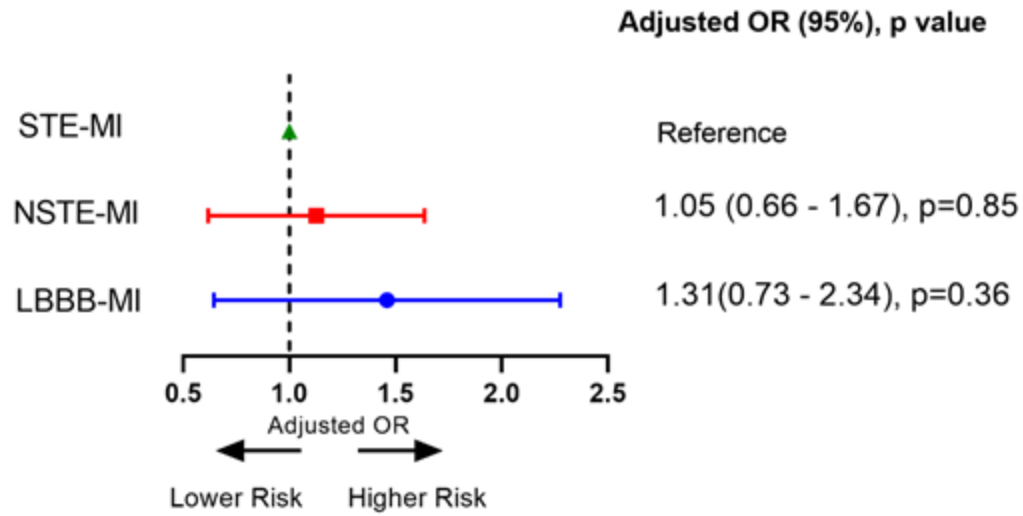


No at. Risk							
LBBB-MI	98	59	52	46	43	41	40
NSTE-MI	195	138	127	110	104	100	100
STE-MI	372	252	229	221	215	213	212

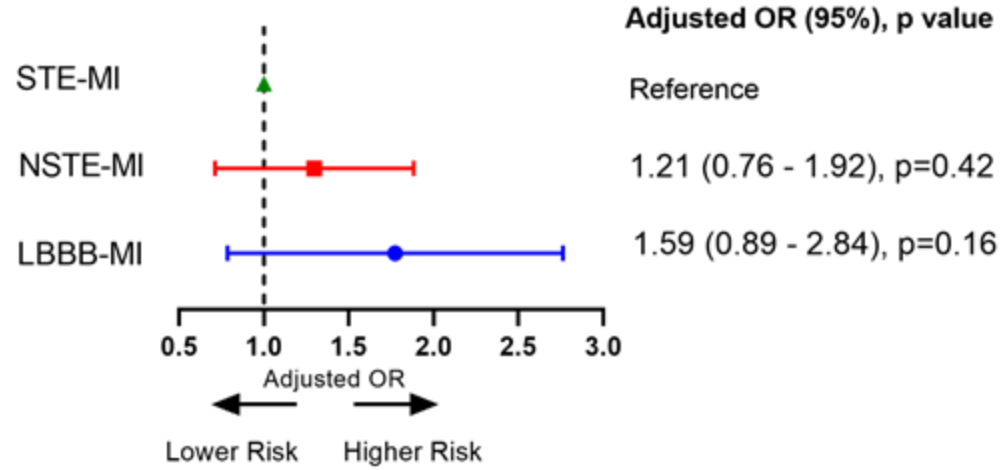


No. at Risk							
LBBB-MI	98	38	35	34	30	30	30
NSTE-MI	195	97	96	92	89	87	79

30-day all-cause mortality according to ECG presentation



1-year all-cause mortality according to ECG presentation



	Culprit-PCI-Only	Multivessel PCI	OR – 95%CI	p interaction
All-cause death or renal replacement 30-day				
STE-MI	80/185 (43.2%)	96/187 (51.3%)	0.722	
NSTE-MI	45/98 (45.9%)	54/97 (55.7%)	0.676	0.76
LBBB-MI	28/52 (53.8%)	32/46 (69.6%)	0.511	
All-cause death 30-day				
STE-MI	73/185 (39.5%)	87/187 (46.5%)	0.749	
NSTE-MI	43/98 (43.9%)	52/97 (53.6%)	0.677	0.91
LBBB-MI	28/52 (53.8%)	30/46 (65.2%)	0.622	
All-cause death 1-year				
STE-MI	79/185 (42.7%)	95/187 (50.8%)	0.722	
NSTE-MI	52/98 (53.1%)	58/97 (59.8%)	0.760	0.97
LBBB-MI	35/52 (67.3%)	33/46 (71.7%)	0.811