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Role of Early Pharmacoinvasive Strategy in Management of Patients with Acute ST Elevation Myocardial Infarction

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ABSTRACT

Background: Myocardial reperfusion with rapid recanalization of infarct-related artery is the key to success in the management of ST-elevation myocardial infarction (STEMI). Timely reperfusion is crucial for minimization of infarct size and thereby for preservation of left ventricular function and reduction in mortality in STEMI patients.

Objective: The aim of this study was to determine the effectiveness of early routine percutaneous coronary intervention (PCI) post-fibrinolysis for ST-elevation myocardial infarction (STEMI) in relation to baseline risk status (assessed by GRACE score).

Patients and methods: Our study was conducted on 120 patients presented with ST-elevation myocardial infarction who presented within 12 hours after the onset of symptoms to our hospital and were eligible for firbrinolytic therapy.

Results: In general pharmaco-invasive strategy was associated with reduction of death, reinfarction, revascularization and composite MACE at 1 & 6 months follow up. In the subgroup analysis of the high risk patients who underwent routine early PCI, the reduction in improvement was associated with using BMS. Moreover, patients treated with BMS showed higher rate of revascularization than those treated with conservative strategy. The patients treated with DES showed reduction in re-infarction, revascularization and composite MACE within 6 months. The using of BMS versus DES in the non-high risk group didn't show significant difference on 6 months follow up.

Conclusion: The baseline risk stratification will add advantage in choosing the strategy of reperfusion and even the type of stent used during PCI.

Keywords: PCI, STEMI, GRACE, MACE.

INTRODUCTION

Prompt reperfusion is the key aspect of the optimal management of ST-elevation myocardial infarction (STEMI). Although, primary percutaneous coronary intervention (PCI) is the preferred approach if performed in experienced centers in a timely manner [(1)], it is not always feasible for the majority of STEMI patients who present to hospitals without on-site PCI facilities [(2)]. The current treatment paradigm recognizes that delays to primary PCI can substantially diminish its efficacy [(3)]. Accordingly, at present, immediate fibrinolysis remains the treatment of choice for many STEMI patients in developed countries [(2)].

Recent research has focused on improving the management of STEMI patients after fibrinolysis [(4)]. Several randomized controlled trials have shown that early routine PCI in conjunction with potent antithrombotic treatment to counteract the platelet activation and prothrombotic state induced by fibrinolysis (pharmacoinvasive strategy) is superior to a conservative approach guided by documented ischaemia or need for rescue PCI [(5)]. However, treatment outcomes in relation to baseline risk status have not been examined.

In this study, we have tried to explore any differential treatment effects of a pharmacoinvasive strategy compared to the standard treatment in STEMI patients stratified by the Global Registry of Acute Coronary Events (GRACE) risk score, which is a validated powerful predictor of in-hospital mortality [(6)]. We hypothesized that risk scores can potentially guide the selective use of the pharmacoinvasive strategy in the optimal management of STEMI.

AIM OF THE WORK

The aim of this study was to determine the effectiveness of early routine percutaneous coronary intervention (PCI) post-fibrinolysis for ST-elevation myocardial infarction (STEMI) in relation to baseline risk status (assessed by GRACE score).

PATIENTS AND METHODS

The patients were selected from Al-Azhar University Hospitals the period from October 2013 to October 2015.

Selected 120 patients presented with STEMI were included in this study, they were divided according protocol of management into two groups:

- **Group I**: Included 60 patients treated with standard conservative treatment (early transfer only for failed reperfusion, otherwise catheterization > 24 hours if indicated). The group was subdivided into high risk and non-high risk subgroups according to GRACE score:
  - **Group I a**: Included 30 patients with GRACE score < 155
  - **Group I b**: Included 30 patients with GRACE score ≥ 155
- **Group II**: Included 60 patients treated with pharmacoinvasive strategy (transfer for routine early PCI within 3- 24 hours after the start of fibrinolytic therapy). The group was subdivided into high risk and non-high risk subgroups according to GRACE score:
  - **Group II a**: Included 30 patients with GRACE score < 155

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- **Group II b**: Included 30 patients with GRACE 6-score ≥ 155

Inclusion criteria:

- Patients with ST-segment elevation myocardial infarction who presented within 12 hours after the onset of symptoms to our hospital and were eligible for firbrinolytic therapy.

Exclusion criteria

- Cardiogenic shock
- PCI within the previous month
- Previous coronary-artery bypass surgery
- The availability of primary PCI with an anticipated door to- balloon time of less than 90 minutes.

Ethical approval and written informed consent:

An approval for the study was obtained from Al-Azhar University Academic and Ethical Committee. Every patient signed an informed written consent for acceptance of the operation.

METHODS

All patients received, aspirin 300 mg orally, clopidogrel 300 mg , thrombolytic therapy and enoxaparin 30 mg intravenously followed by a subcutaneous dose of 1 mg/kg repeated every 12 h up to hospital discharge or revascularization for a maximum of 7 days [(7)].

All patients were subjected to the following:

1- ***History taking*** : with emphasis on the following
   A) Age & sex
   B) Presence of risk factors for CAD
2- ***Clinical assessment :***
Including pulse and blood pressure measurement, cardiac examination and routine general examination to exclude valvular heart disease.
3- ***Twelve (12) lead ECG*** :
Sometimes additional leads were carried out e.g.V3R&V4R for right ventricular infarction and V7&V8&V9 for posterior infarction)
4- **Laboratory assessment** (serum creatinine ,{ Troponin I on presentation and 6 hours later } , cholesterol and triglyceride level).
5- **Echocardiography:**
Echocardiography was done on day 2 or 3 [(7)] to assess LV function by 2D, RWMA after fibrinloysis and after 42 days. A Philips E55 phased array system equipped and Vivid T8 phased array system equipped were used with transducer 1- 5 MHz.

All the patients were examined in the left lateral decubitus position. Echocardiographic images were acquired from the standard views (parasternal long-axis, parasternal short axis at level of the great vessels, apical four–chambers, apical five–chambers and apical two-chambers). Recordings and calculations of different cardiac chambers and ejection fractions were made according to the recommendations of the American Society of Echocardiography [(8)].

Coronary angiography and PCI if indicated:

Patients assigned to the early invasive strategy were transferred to the cardiac catheterization lab 3-24 hours after start of thrombolytic therapy. The radial or femoral routes were used according to the operator's preference and experience. Coronary angiograms of the infarct-related vessel was performed. At least two orthogonal projections of the coronary segment scheduled for coronary intervention are filmed before the intervention. The same projections are repeated after the intervention. The angiograms were recorded in such a way that they are suitable for quantitative analysis: the catheter tip, filled with contrast must be clearly visible in each filmed view, preferably near the center of the screen. At least 1 film after treatment must include the myocardial territory of contrast distribution to allow estimation of TIMI frame count. Vessel overlapping at the lesion site or projections with excessive foreshortening was avoided

- PCI of culprit lesion at time of catheterization if ≥ 50% stenosis [(9)].
- GP IIb/IIIa inhibitors and type of stent were left to operator's decision.

7- ***End points***

- Primary endpoint: 30-day composite of death, reinfarction, recurrent ischemia, CHF.
- Secondary endpoint: death / reinfarction at 6 months.

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- Independent-samples t-test of significance was used when comparing between two means.
- Chi-square (x^2) test of significance was used in order to compare proportions between two qualitative parameters.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. The p-value was considered significant as the following:
- Probability (P-value)
- P-value <0.05 was considered significant.
- P-value <0.001 was considered as highly significant.
- P-value >0.05 was considered insignificant.

RESULTS

Comparison between the two groups as regards patient´s demographic characteristics and cardiac risk factors: As shown in table (1), there was no statistically significant difference between groups I and II as regards age, BMI, gender, smoking, hypertension, diabetes, family history of coronary artery disease and presence of previous MI (**P-value > 0.05)** .

Table (1): Demographic data and risk factors in the two main groups

	Group I (n = 60)			Group II (n = 60)			
	Mean	**STD**	**Range**	**Mean**	**STD**	**Range**	**P-Value**
Age	58.7	7.3	45-73	59.7	7.7	42-75	0.4
BMI	26.2	3.8	19-35	26	3.6	19-33	0.8
	Number	**Percentage**		**Number**	**Percentage**		
Gender (males)	40	66.7 %		42	70 %		0.7
Smokers	29	48.3%		30	50%		0.86
Hypertensive patients	26	43.3 %		25	41.7 %		0.85
Diabetic	19	31.7 %		17	28.3 %		0.69
Dyslipidemic	25	41.7 %		18	30%		0.18
Family history of CAD	21	35%		16	26.7		0.3
Previous MI	13	21.7 %		10	16.7		0.49

Comparison between subgroups Ib and IIb concerning patient´s clinical parameters, lab results, grace score, time from onset of chest pain to thrombolysis and ECG localization of infarction: As shown in table (2), there was no statistically significant difference between groups I and II as regards heart rate, systolic blood pressure at presentation, peak troponin level, serum creatinine, cholesterol, triglyceride level, grace score, pain to thrombolysis time, presence of cardiac arrest, type of infarction and Killip classification (**P-value > 0.05).**

Table (2): Comparison between subgroup Ib and IIb as regard patient´s clinical parameters, lab results, grace score, time from onset of chest pain to thrombolysis and ECG localization of infarction

	Subgroup I b (n = 30)			Subgroup II b (n = 30)			
	Mean	**STD**	**Range**	**Mean**	**STD**	**Range**	**P-Value**
Heart rate	100.2	8.9	78-120	100.9	9.8	78-124	0.77
Systolic BP	116.2	23.9	85-180	118.8	26.8	80-180	0.69
Troponin	5.9	3.4	1.9 -14	5.97	3.5	1.3-14	0.975
Creatinine level	1.29	0.3	0.7-1.8	1.33	0.42	0.7-2.3	0.697
Cholesterol	210	43.4	156-310	197.5	42.2	154-310	0.26
Triglyceride	167	41.7	112-313	165.4	40.6	112-302	0.88
Grace score	181.6	21.3	157 -242	178.4	20.9	155-226	0.56
Pain to thrombolysis time (hours)	6.07	2.2	2-11	6.1	2.3	2-11	0.9
	Number	**Percentage**		**Number**	**Percentage**		
Infarction location							
Anterior	19	63.3%		19	63.3		1
Non-Anterior	11	36.7%		11	46.7		
Cardiac arrest	2	6.7 %		3	10%		0.64
Killip Class							
I	10	33.3%		15	50%		0.26
II	14	46.7%		10	33.3%		
III	6	20%		5	16.7%		

Comparison between the two groups as regard echocardiographic parameters that was done 2-3 days after presentation: As shown in table (3), there was no statistically significant difference between groups I and II as regards EF, WMSI and grade of diastolic dysfunction (**P-value > 0.05).**

Table (3): Echocardiographic parameters 2-3 days after presentation in group I and II

	Group I (n = 60)			Group II (n = 60)			
	Mean	STD	Range	Mean	STD	Range	P-Value
WMSI	1.59	0.31	1-2.4	1.58	0.31	1-2.3	0.882
EF	47%	7.1	28-64	47.2%	7	30-62	0.876
	Number	Percentage		Number	Percentage		
Diastolic dysfunction							0.519
I	46	76.7%		42	70%		
II	14	23.3%		17	28.3%		
III	0	0%		1	1.7%		

Coronaryangiography in Group I: Table (4) summerized the coronaryangiographic findings for patients underwent coronary angiography in group I

Table (4): Coronary angiographic findings in group I

		Group I		Subgroup I a		Subgroup I b		P-Value
		Number	Percentage	Number	Percentage	Number	Percentage	
Patients indicated for coronary angiography		23	38.3	8	26.7	15	50	0.065
Culprit arteryin patient with CA	• LAD	16	69.6	5	62.5	11	73.3	0.576
	• LCX	2	8.7	1	12.5	1	6.7	
	• RCA	5	21.7	2	25	3	20	
TIMI flow	• 0	1	4.3	0	0	1	6.7	0.397
	• I	2	8.7	0	0	2	13.3	
	• II	10	43.5	4	50	6	40	
	• III	10	43.5	4	50	6	40	
Other lesion		14	61	5	62.5	9	60	0.756
Stent type	• BMS	9	39.1	4	50	5	33.3	0.328
	• DES	10	43.5	4	50	6	40	
	• Non	4	17.4	0	0	4	26.7	
GPIIb/IIIa inhibitor		5	21.7	0	0	5	33.3	0.06

Coronary angiography in Group II

Time from start of thrombolytic therapy to coronary angiography: As shown in table (5) the mean time from start of thrombolytic therapy to coronary angio of group II was 11.33 ± 5.21 hours, whereas it was 11 ± 5.02 hours in subgroup IIa and 11.67 ± 5.47 hours in subgroup IIb. There was no statistically significant difference between the two subgroups as regards time to coronary angiography **(P-value 0.62).**

Table (5): Time from start of thrombolytic therapy to coronary angiography in group II patients

Group	**Time to coronary angiography (in hours)**			**P-value (significance)**
	Mean	**Range**	**SD**	
Group II	***11.33***	2-23	***5.21***	
Subgroup IIa	***11***	**2-23**	**5.02**	0.62
Subgroup IIb	***11.67***	**4-22**	**5.47**	

TIMI flow before intervention and PCI to non-culprit lesion: As shown in table (6) there was statistically significant difference between subgroup IIa and subgroup IIb as regards TIMI flow before intervention and PCI to non-culprit artery **(P-value 0.035 & 0.018).**

Other data:

As shown in table (6) there was no statistically significant difference between subgroup IIa and subgroup IIb as regards culprit artery, presence of other lesion, stent type and glycoprotein IIb/IIIa inhibitors usage.

Table (6): Coronary angiographic finding and PCI procedure in group II, IIa and IIb patients

		Group II		Subgroup II a		Subgroup II b		P-Value
		Number	Percentage	Number	Percentage	Number	Percentage	
Culprit artery	• LAD	35	58.3	16	53.3	19	63.3	0.676
	• LCX	10	16.7	4	13.3	6	20	
	• RCA	15	25	10	33.4	5	16.7	
TIMI flow	• 0	2	3.3	0	0	2	6.7	0.035
	• I	6	10	2	6.7	4	13.3	
	• II	7	11.7	2	6.7	5	16.7	
	• III	45	75	26	86.7	19	63.3	
	Other lesion	44	73.3	23	76.7	21	70	0.12
Stent type	• BMS	18	30	8	26.7	10	33.3	
	• DES	39	65	19	63.3	20	66.7	
	• Nointervention	3	5	3	10	0	0	
GPIIb/IIIa inhibitor		22	36.7	11	36.7	11	36.7	1
PCI to non-culprit		6	10	6	20	0	0	0.018

Echocardiography sex weeks after MI: There was highly statistically significant difference between WMSI 2-3 days and 6 weeks after onset of MI within each group and subgroups **(P-Value < 0.001).**

Table (7): WMSI 6 weeks after MI

	Mean	STD	Range
Group I (n = 60)	1.35	0.25	2-Jan
• **Subgroup Ia**	1.21	0.18	1-1.6
• **Subgroup Ib**	1.48	0.24	2-Jan
Group II (n = 60)	1.37	0.26	2-Jan
• **Subgroup IIa**	1.24	0.21	1-1.87
• **Subgroup IIb**	1.49	0.25	2-Jan

Comparison between different groups as regard MACE: Table (8) summarizes percentage of death, reinfarction, revascularization, heart failure and composite MACE within each group.

Table (8): MACE within 1 and 6 months in each group

		Group I	Subgroup Ia	Subgroup Ib	Group II	Subgroup IIa	Subgroup IIb
At 30 days	MACE	14 (23.3%)	6 (20%)	8 (26.7%)	7 (11.7%)	1 (3.3%)	6 (20%)
	Death	3 (5 %)	1 (3.3)	2 (6.7%)	1 (1.7%)	0 (0%)	1 (3.3%)
	Reinfarction	4 (6.7%)	2(6.7%)	2(6.7%)	0 (0%)	0 (0%)	0 (0%)
	Revascularization	4 (6.7%)	3 (10%)	1 (3.3%)	2 (3.3%)	0 (0%)	2 (6.7%)
	Heart failure	4 (6.7%)	0 (0%)	4 (13.3%)	4 (6.7%)	1 (3.3)	3 (10%)
At 6 months	MACE	23 (38.3%)	9 (30%)	14 (46.7%)	12 (20%)	2 (6.7%)	10 (33.3%)
	Death	4 (6.7%)	1 (3.3%)	3 (10%)	2 (3.3%)	0 (0%)	2 (6.7%)
	Reinfarction	6 (10)	2 (6.7%)	4 (13.3%)	0 (0%)	0 (0%)	0 (0%)
	Revascularization	11 (18.3)	6 (20%)	5 (16.7%)	6 (10%)	1 (3.3%)	5 (16.7%)
	Heart failure	5 (8.3%)	0 (0%)	5 (16.7%)	5 (8.3%)	1 (3.3%)	4 (13.3%)

Comparison between patients treated by BMS and patients with DES in subgroup IIa as regard MACE within 1 & 6 months: There was no statistically significant difference between the 2 groups as regard death , reinfarction , heart failure , revascularization and overall MACE within 1 month, as well as death , reinfarction , heart failure , revascularization within 6 months **(P-Value > 0.5).** Whereas, there was statistically significant difference between the two groups as regards overall MACE within 6 months **(P-value 0.03).**

Table (9): Comparison between patients treated by BMS Vs patients with DES in subgroup II b as regard MACE

		Group IIb treated with BMS Number = 10	Subgroup IIb treated with DES , number = 20	P-Value
At 30 days	• MACE	4 (40%)	2 (10%)	0.057
	• Death	1 (10 %)	0 (0%)	0.68
	• Reinfarction	0 (0%)	0 (0%)	1
	• Revascularization	2 (20%)	0 (0%)	0.04
	• Heart failure	1 (10%)	2 (10%)	1
At 6 monthes	• MACE	7 (70%)	3 (15%)	0.003
	• Death	1 (10%)	1 (5%)	0.611
	• Reinfarction	0 (0)	0 (0%)	1
	• Revascularization	5 (50%)	0 (0%)	0.001
	• Heart failure	2 (20%)	2 (10%)	0.5

Comparison between patient who developed MACE within 6 months and who didn't develop it as regards EF, pain to thrombolysis time and serum troponin I level:

Table (10): Comparison between patients who developed MACE within 6 months and who didn't develop it as regard EF, pain to thrombolysis time and serum troponin I level

	Patient developed MACE (N= 35)		**[ACE free patients (N = 85)**		
	Mean	**STD**	**Mean**	**STD**	**P-Value**
EF	43.3	8.2	48.7	5.8	0.001
Pain to thrombolysis	6.23	2.7	4.7	2.4	0.004
Troponin I	5.9	3.7	4.7	2.8	0.047

There was high statistically significant difference between the 2 groups as regards EF **(P-value 0.001).** Besides, there was highly statistically significant difference between the 2 groups as regards pain to thrombolysis time (**P-value 0.004).** Also, there was statistically significant difference between the 2 groups as regards pain to thrombolysis time (**P-value 0.047).**

DISCUSSION

The logistic difficulties of implementing primary PCI in routine practice coupled with evidence of benefit of prehospital fibrinolysis (especially if administered early after the onset of symptoms) and the overarching importance of time to reperfusion regardless of strategy used serve as the foundation for developing a unified approach to manage patients with STEMI [(10)]. However, treatment outcomes in relation to baseline risk status have not been adequately assessed. For this purpose we compared the strategy of transfer for early PCI after fibrinolysis with a standard strategy of ischemic guided PCI after successful reperfusion with thrombolytic therapy among 120 patients presenting with ST elevation myocardial infarction who could not undergo timely primary PCI in relation to baseline risk status.

Baseline risk status was assessed using the Grace score which is a validated powerful predictor of in-hospital mortality. The primary and secondary end points, a composite of death, reinfarction, revascuarization, congestive heart failure and death at 30 days and six months after onset MI.

In our study, the pharmacoinvasive strategy was associated with a significantly lower rate of re-MI at 30 days in STEMI patients and lower rate of re-MI and composite MACE (death, heart failure, revascularization and re-infarction) at 6 months as regard whole patients. The pharmaco-invasive strategy was associated with a reduction in recurrent ischemia and revascularization at 30 and at 6 months compared to a conservative strategy. However, the reduction did not reach statistical significance. These findings come in agreement with CARESS-in-AMI trial [(11)].

CARESS-in-AMI trial was an open label, prospective, multicentre trial which randomized 600 patients aged < 75 years with one or more high-risk features in hospitals who were treated with half-dose reteplase, abciximab, heparin and aspirin. They were randomly assigned to immediate transfer to the nearest interventional center for PCI, or for management in the local hospital with transfer only in case of persistent ST-segment elevation or clinical deterioration. Rescue PCI was done in 91 patients (30.3%) in the standard care/rescue PCI group. The primary outcome occurred in 13 patients (4.4%) in the immediate PCI group compared to 32 (10.7%) in the standard care/rescue PCI group (hazard ratio 0.40; 95% CI 0.21–0.76, p=0.004). There were no significant differences in major bleedings or strokes in immediate PCI group versus standard care/rescue group concluding that immediate transfer for PCI improves outcome in high-risk patients with STEMI treated at a non-interventional center with half-dose reteplase and abciximab [(11)].

The strategy of PCI performed a few hours after fibrinolysis (which was evaluated in our trial) should be distinguished from the strategy of PCI performed immediately after fibrinolysis, an approach that has been termed facilitated PCI [(12)]. Clinical trials of facilitated PCI have shown increased rates of bleeding and no clinical benefit with that strategy as compared to primary PCI alone [(13)].

Although, the reasons for these disappointing findings remain speculative, it is possible that the time between fibrinolysis and PCI (median, 90 to 104 minutes) was too short in these trials, with the result that persistent fibrinolytic activity led to increased bleeding complications.

The lack of adequate antiplatelet therapy in these trials may have also conferred a predisposition to thrombotic complications. Fibrinolysis is followed by increased platelet activation and aggregation. Stent implantation early after fibrinolysis without adequate antiplatelet therapy may be associated with increased rates of acute stent thrombosis [(14)].

In our study, the rate of bleeding was low and did not differ between the pharmacoinvasive and the conservative group that may be due to usage of radial access in many cases and limitation of usage of glycoprotein IIb/IIIa inhibitors.

Importantly, the treatment effect varied substantially according to baseline risk, the pharmacoinvasive strategy was associated with a significantly lower rate of death/revascularization at 30 days and 6 months in STEMI patients with low-intermediate GRACE risk scores. Whereas high-risk patients undergoing routine early PCI showed no significant reduction in death, re-MI, heart failure and recurrent ischemia with at 30 days. On 6 months follow up of these patients, there was significant reduction in reinfarction only.

The difference in outcome in relation to baseline risk was reported by **Yan *et al.*** [(14)], who performed post hoc subgroup analysis of Trial of Routine Angioplasty and Stenting after Fibrinolysis to Enhance Reperfusion in Acute Myocardial Infarction (TRANSFER-AMI) and stratified 1059 STEMI patients receiving tenecteplase into low-intermediate risk group versus high-risk groups, based on the GRACE risk score for in-hospital mortality. There was a significant interaction between treatment assignment and risk status for the composite endpoint of death/re-MI at 30 days.

Compared to the standard treatment, pharmacoinvasive therapy (early routine PCI) was associated with a lower rate of death/re-MI at 30 days in the low-intermediate risk stratum (8.1 vs. 2.9%, P = 0.001), while a higher rate of death/re-MI occurred in the high-risk group (13.8 vs. 27.8%, P = 0.025) [(14)]. The role of validated risk scores in guiding management decisions in STEMI is less clear, **Thune *et al.*** [(15)] reported a significant interaction (P = 0.008) between risk status and benefit of primary PCI over fibrinolytic therapy in the DANAMI-2 trial. Primary PCI significantly reduced causes of mortality at 3 years in the high-risk group, but not in the low-risk group. These data imply that the relative efficacy of various types of reperfusion therapy may differ according to baseline risk.

Our findings extended the previous work and suggested that risk scores may also guide the best strategy to achieve and maintain myocardial re-perfusion after administration of fibrinolytic therapy. Because the benefit of a routine early PCI strategy may vary with respect to baseline risk stratification. Our data support the notion that risk scores may play a pivotal role in the effective triage of STEMI patients.

The precise pathogenetic mechanisms underlying the discrepant treatment effects across the risk groups are not evident in this study and remain to be elucidated. Post-intervention usage of medical therapies alone did not seem to account for the differences in outcome. One of the explanation is that PCI may paradoxically compromise the patency of the infarct-related artery by causing dissection, abrupt closure, distal embolization, or the no-reflow phenomenon.

The comparison of biolimus eluted from an Erodible Stent Coating with Bare-Metal Stents in acute ST-elevation myocardial infarction (COMFORTABLE AMI) trial. On examining patients assigned to either BMS or to biolimus-eluting stents with a biodegradable polymer, reported that the latter showed a lower risk of the composite primary endpoint of cardiac death, target vessel myocardial infarction and target-lesion revascularization (4.3% vs. 8.7%; HR 0.49; 95% CI 0.30–0.80; P = 0.004) as well as a lower risk of target-vessel myocardial infarction (0.5% vs. 2.7%; HR 0.20; 95% CI 0.06–0.69; P = 0.01) and a trend towards a lower risk of definite stent thrombosis (0.9% vs. 2.1%; HR 0.42; 95% CI 0.15–1.19; P = 0.10) **[17].** Moreover, using BMS versus ischemic guided PCI was associated with higher rate of revascularization within 6 months. Whereas, using DES in high risk patients was associated with significant reduction in composite MACE within 6 months and non-statistically significant reduction in death, re-infarction and heart failure.

There was statistically significant difference between WMSI 2-3 days and 6 weeks after MI that comes in agreement with **Touchstone *et al.* [17],** who demonstrated that there might be two levels of benefit achieved with successful reperfusion therapy related to the transmural extent of infarction. There was statistically significant difference between patient with and without MACE as regard time delay to thrombolytic therapy that comes in agreement with **Dudek *et al.*[18],** who reported that longer door-to-reperfusion time in patients with STEMI is associated with a worse long-term clinical outcome regardless of the type of reperfusion strategy used. Also, there was statistically significant difference between patient with and without MACE at 6 months as regard serum troponin I level that comes in agreement with previous studies, which showed that patients presenting with clinical evidence of ischemia and higher troponins have worse outcomes **[19].** The MISSION trial showed that peak troponin T levels are a good estimate of infarct size and an independent predictor for left ventricular function at 3 months, and major adverse cardiac events at 1 year **[20].** Results were maintained throughout 2 years of follow-up and a pooled analysis of both trials confirmed a lower risk of stent thrombosis and re-infarction with DES than with BMS **[21].**

CONCLUSION

From this study we concluded the following:

1. Validated risk scores may enhance tailoring of pharmacoinvasive treatment for appropriate patients
2. The main benefits of pharmacoinvasive PCI strategy were achieved in the non-high risk patients
3. For high risk patients, PCI with DES was superior to BMS
4. Time to thrombolysis alone had a strong predictor value for successful reperfusion.

RECOMMENDATIONS

We recommend the following:

1. Using validated risk score for targeting the treatment strategy in patients presenting with STEMI.
2. Further studies for assessment of efficacy of using BMS in high risk patients.
3. Further study for assessment of outcome of pharmacoinvasive therapy for patients presented with cardiogenic shock.
4. Larger study to assess effect of time delay within the first 24 to catheterization lab on the outcome.

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