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COMPARISON OF PRIMARY PERCUTANEOUS CORONARY INTERVENTION AND STREPTOKINASE IN ACUTE ST-SEGMENT–ELEVATION MYOCARDIAL INFARCTION

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ABSTRACT

Background: Primary percutaneous coronary intervention (PCI) is the treatment of choice in civilized countries for acute ST-segment-elevation myocardial infarction (STEMI). In developing countries, emergent PCI is still a challenge and fibrinolysis therapy Remains a viable option for reperfusion therapy .Materials and methods: This is retrospective study of 133 patients with STEMI in Tishreen University Hospital between August 2014 and August 2016. Patients were divided into two subgroups. The first subgroup underwent primary PCI whereas the other subgroup was treated with streptokinase infusion. Patients were monitored for re-hospitalization, re-infarction, mortality, cardiogenic shock, heart failure. We also recorded the time needed to apply the method of treatment .Aim of study: To compare outcomes after using streptokinase infusion or primary PCI in managing STEMI patients in our hospital .Results: 63 patients underwent PCI and 70 patients received streptokinase therapy. Delay Time to apply reperfusion therapy was shorter in the streptokinase group. Streptokinase group had higher rates of mortality of cardiac and non-cardiac causes, cardiogenic shock and re-infarction. Whereas PCI group had higher rates of re-hospitalization of cardiac causes and worsening/new-onset heart failure .Conclusion: Primary PCI might be preferred over streptokinase in the setting of acute STEMI in developing countries. Delay time should be taken into consideration.

KEYWORDS: Myocardial infarction, PCI, Fibrinolysis, Reperfusion.

INTRODUCTION

Primary percutaneous coronary intervention (PCI) is considered the reperfusion method of choice for acute ST-segment-elevation myocardial infarction (STEMI).[1] Fibrinolysis therapy Remains a viable option for reperfusion therapy due to the limited availability of Primary PCI.

In developing countries, emergent PCI is still a big challenge due to the lack of specialized centers and experienced operators.

Furthermore, primary PCI may not be optimal under some conditions such as at low-volume and less expert PCI centers, outside regular working hours or after lengthy interhospital transfer and though fibrinolysis therapy is still widely used in primary management of acute myocardial infarction.

This study aims to compare streptokinase infusion and primary PCI when used as a reperfusion therapy to manage the critical condition of acute STEMI in our hospital.

MATERIALS AND METHODS

This is a retrospective study of patients who were admitted to Tishreen University Hospital with the diagnosis of acute STEMI between August 2014 and August 2016.

All the patients received emergency primary care including dual antiplatelet loading doses, a statin loading dose and intravenous heparin.

The patients then underwent either streptokinase intravenous infusion or primary PCI and were observed during their in-hospital stay and monitored for potential adverse outcomes. The patients were also reassessed a month later after discharge to evaluate outcome.

Patients with loss of follow up data were excluded of the study and finally 133 patients were enrolled. 63 patients

underwent primary PCI and 70 patients received streptokinase therapy.

Patients were divided into two groups according to the method of treatment used and the two groups were compared regarding mortality of cardiac and non-cardiac causes, cardiogenic shock, re-infarction and new onset of heart failure signs and symptoms or worsening of known heart failure.

RESULTS

The distribution of study population according to age, sex and weight is shown in table1.

Table 1: Age, gender and weight characteristics of the study population.

			Weight (kg)			Total	P-Value
			<60	60-90	>90		
Reperfusion therapy	PCI	Count	3	26	34	63	.0288[c]
		% (of therapy group)	4.75%	41.25%	54.00%	100.00%	
	Fibrinolysis	Count	3	22	45	70	
		% (of therapy group)	4.30%	31.40%	64.30%	100.00%	
Total		Count	6	48	79	133	
		% (of study population)	4.50%	36.10%	59.40%	100.00%	
			Age (years)		Total	P-VALUE	
			<70	≥70			
Reperfusion therapy	PCI	Count	32	31	63	.000[c]	
		% (of age category)	34.40%	77.50%	47.40%		
	Fibrinolysis	Count	61	9	70		
		% (of age category)	65.60%	22.50%	52.60%		
Total		Count	93	40	133		
		% (of age category)	100.00%	100.00%	100.00%		
			Gender		Total	P-VALUE	
			Male	Female			
Reperfusion therapy	PCI	Count	51	12	63	.002[c]	
		% (of gender category)	52.00%	34.30%	47.40%		
	Fibrinolysis	Count	47	23	70		
		% (of gender category)	48.00%	65.70%	52.60%		
Total		Count	98	35	133		
		% (of gender category)	100.00%	100.00%	100.00%		

Most of the patients included in the study were heavier than 90 kg (59%) with a P-value of (0.02) and male patients were the majority.

Data obtained exhibits that most of the patient aged 70 years or more underwent fibrinolysis therapy on the contrary of patients aged less than 70 years.

Table2 shows the distribution of study population according to the presence of hypertension, diabetes mellitus and heart failure in patient history.

Table 2: Concomitant diseases of patients in the two study groups.

			Hypertension		Total	P-VALUE
			Yes	No		
Reperfusion therapy	PCI	Count	42	21	63	.0107[c]
		% (of therapy group)	66.70%	33.30%	100.00%	
	Fibrinolysis	Count	37	33	70	
		% (of therapy group)	52.90%	47.10%	100.00%	
Total		Count	79	54	133	
		% (of therapy group)	59.40%	40.60%	100.00%	
			Diabetes mellitus		Total	P-VALUE
			Yes	No		
Reperfusion therapy	PCI	Count	27	36	63	.0505[c]
		% (of therapy group)	42.90%	57.10%	100.00%	
	Fibrinolysis	Count	26	44	70	
		% (of therapy group)	37.10%	62.90%	100.00%	

Total		Count	53	80	133	
		% (of therapy group)	39.80%	60.20%	100.00%	
			Heart failure		Total	P-VALUE
			Yes	No		
Reperfusion therapy	PCI	Count	9	54	63	
		% (of therapy group)	14.3%	85.7%	100.0%	
	Fibrinolysis	Count	3	67	70	
		% (of therapy group)	4.3%	95.7%	100.0%	.045[c]
Total		Count	12	121	133	
		% (of therapy group)	9.0%	91.0%	100.0%	

PCI group had more patients with hypertension and heart failure than the PCI group.

We studied the time needed to start reperfusion therapy as expressed by door to balloon time and door to needle time and the results were shown in table 3.

Table 3: Door to balloon and door to needle time in the two study groups.

	N	**Mean**	**Std. Deviation**	**Std. Error Mean**		
door-to-balloon time	**61**	**84.0164**	**37.79131**	**4.83868**		
	Test Value = 0					
	T	Df	p-value	95% Confidence Interval of the Difference		
				Mean Difference	Lower	Upper
door-to-balloon time	17.363	60	.000	84.01639	74.3376	93.6952
	N	Mean	Std. Deviation	Std. Error Mean		
door-to-needle time	72	34.1667	24.89414	2.93380		
	Test Value = 0					
	T	Df	Sig. (2-tailed)	95% Confidence Interval of the Difference		
				Mean Difference	Lower	Upper
door-to-needle time	11.646	71	.000	34.16667	28.3168	40.0165

The mean door to balloon time was 84 minutes (with a standard deviation of 37 minutes), whereas door to needle time was 34 minutes with a standard deviation of 24 minutes.

Obtained data were analyzed for major adverse outcomes during the 30-day follow up period and the results were summarized in tables 4,5,6.

Table 4: Non- cardiac mortality and mortality of cardiac causes in the two study groups within 30 days of follow up.

			Non-cardiac mortality		**Total**	**P-VALUE**
			Yes	**No**		
Reperfusion therapy	PCI	Count	0	63	63	
		% of event category	0.0%	48.5%	47.4%	.0098[c]
	Fibrinolysis	Count	3	67	70	
		% of event category	100.0%	51.5%	52.6%	
Total		Count	3	130	133	
		% of event category	100.0%	100.0%	100.0%	
			Mortality of cardiac causes		Total	P-VALUE
			Yes	No		
Reperfusion therapy	PCI	Count	3	60	63	
		% (of therapy group)	4.8%	95.2%	100.0%	
	Fibrinolysis	Count	5	65	70	.0215[c]
		% (of therapy group)	7.1%	92.9%	100.0%	
Total		Count	8	125	133	
		% (of therapy group)	6.0%	94.0%	100.0%	

Table 5: Cardiogenic shock and new onset heart failure/ worsening known heart failure in the two study groups within 30 days of follow up.

			Cardiogenic shock		Total	P-VALUE	
			Yes	No			
Reperfusion therapy	PCI	Count	2	61	63		
		% of event category	40.0%	47.7%	47.4%	.00739[c]	
	Fibrinolysis	Count	3	67	70		
		% of event category	60.0%	52.3%	52.6%		
Total		Count	5	128	133		
		% of event category	100.0%	100.0%	100.0%		
			New onset HF/ worsening of known HF		Total	P-Value	
			Yes	No			
Reperfusion therapy	PCI	Count	23	40	63		
		% of event category	63.9%	41.2%	47.4%		
	Fibrinolysis	Count	13	57	70	.020[c]	
		% of event category	36.1%	58.8%	52.6%		
Total		Count	36	97	133		
		% of event category	100.0%	100.0%	100.0%		

Table 6: Re-infarction and re-hospitalization for cardiac causes in the two study groups within 30 days of follow up.

			Re-infarction		Total	P-VALUE
			yes	No		
Reperfusion therapy	PCI	Count	2	61	63	
		% of event category	18.2%	50.0%	47.4%	
	Fibrinolysis	Count	9	61	70	
		% of event category	81.8%	50.0%	52.6%	.043[c]
Total		Count	11	122	133	
		% of event category	100.0%	100.0%	100.0%	
			Re-hospitalization for cardiac causes		Total	
			yes	no		P-Value
Reperfusion therapy	PCI	Count	19	44	63	
		% of event category	70.4%	41.5%	47.4%	
	Fibrinolysis	Count	8	62	70	
		% of event category	29.6%	58.5%	52.6%	.007[c]
Total		Count	27	106	133	
		% of event category	100.0%	100.0%	100.0%	

As shown above, death of non-cardiac causes had occurred only in 3 patients, all in the fibrinolysis group, with a statically significant P-value. Death of cardiac causes occurred in 8 patients (5 patients in the fibrinolysis group) with a statically significant difference (P-value=002).

Cardiogenic shock within 30 days of follow up took place in 5 patients (3 in the fibrinolysis group). New onset heart failure/ decompensated known heart failure had occurred in 36 patients most of them (23 patients) were in the PCI group.

Most of the patients who suffered re-infarction were in the fibrinolysis group (9 of 11) whereas most of re-hospitalized patients were in the PCI group (19 of 27) with a statically significant P-value.

DISCUSSION

ST segment elevation myocardial infarction usually represents an acute thrombotic occlusion of an epicardial coronary artery. This condition requires prompt recognition, triage, and reperfusion. Improved outcomes require prompt restoration of normal blood flow in the infarct-related artery which is essential to myocardial salvage and mortality reduction in patients with STEMI.[2] Gains from reperfusion are greatest in the first few hours of symptom onset and rapidly decline afterwards.

Primary PCI, defined as percutaneous catheter intervention in the setting of STEMI is the preferred reperfusion strategy,[1] provided it can be performed in a timely manner in high-volume PCI centres with experienced operators, and that still represents a big challenge in developing countries.

In settings where primary PCI cannot be performed in a timely fashion, fibrinolysis should be administered as soon as possible.[1]

Our study compared primary PCI to fibrinolysis using streptokinase in a developing-country cardiology center.

As shown above, most of the patients included in the study were heavier than 90 kg (59%), which indicates the importance of obesity as a risk factor for cardiovascular diseases. Men were the majority of study population as they tend to have higher cardiovascular risk.

We noticed the primary PCI group to have more hypertensive patients than the fibrinolysis group (66.7% versus 52.9%) which might be due the high risk faced when fibrinolysis is applied to patients with uncontrolled severe hypertension.

In the same contest, most of elderly patients underwent primary PCI.

Regarding time delay to apply therapeutic strategy, we found significant difference in the benefit of fibrinolysis which took about 34 ± 23 minutes versus 84± 37 minutes for primary PCI and that consists with the logistical difficulties still facing emergent PCI in developing countries.

Death of non-cardiac causes happened in 3 patients, all of them were in the fibrinolysis group (2 patients had intracranial hemorrhage and a patient died of gastric bleeding). Death of cardiac causes also tended to happen in the fibrinolysis group and occurred in 8 patients (5 patients in the fibrinolysis group and 3 patients in the PCI group) with a statically significant difference.

Most of the cases of new onset signs and symptoms of heart failure/ worsening known heart failure happened in the PCI group (63%) and that might be due to the supine position during the procedure or to the relatively large proportion of patients with known heart failure in the PCI group as opposed to the fibrinolysis group (14.3% versus 4.3%). On the contrary, the majority of cardiogenic shock cases were reported in the fibrinolysis group (3 of 5 patients) and that might reflect a better reperfusion outcome in PCI patients.

Re-infarction was reported in 11 patients mostly in the fibrinolysis group (9 patients). Whereas most of the patients re-hospitalized within 30 days for cardiac causes were in the PCI group (19 of 27 patients).

Several studies were performed previously to compare primary PCI to fibrinolysis.

In a study performed in Turkey, Norgaz et al found no significant difference in primary endpoints (death, re-infarction and stroke) between patients received streptokinase and patients underwent primary PCI in the setting of acute isolated inferior st elevation myocardial infarction with a predicted low risk profile.[3] In this study, patients older than 80 years, diabetic patients and patients with history of MI were excluded.

In an Iranian study carried out between 2007-2012, Kristensen et al compared in-hospital morbidity and mortality and 6-month outcome between primary PCI and streptokinase injection in patients with acute myocardial infarction. Patients who underwent primary PCI had better survival rates of cardiogenic shock and less re-hospitalization within six months of follow up. On the other hand, no significant difference noted regarding re-infarction, CVA incidence or bleeding.[4]

Thao Huynh et al (2008) found less short term mortality, less stroke and re-infarction in patients of primary PCI.[5]

CONCLUSION

Primary PCI had better outcome regarding mortality, cardiogenic shock and re-infarction. Whereas fibrinolysis had less re-hospitalization rate and less worsening of heart failure signs and symptoms.

Primary PCI might be preferred over fibrinolysis in the setting of acute STEMI in developing countries with regards of appropriate timing.

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