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RESEARCH ARTICLE

THROMBOLYSIS IN ST- ELEVATION MYOCARDIAL INFARCTION PATIENTS: CLINICAL PREDICTORS OF REPERFUSION AND ANGIOGRAPHIC OUTCOMES

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ST Elevation Myocardial Infarction, Thrombolysis, Percutaneous Coronary Intervention

Abstract

Background: Thrombolysis is an alternative strategy for reperfusion in the management of ST- Elevation Myocardial Infarction (STEMI) patients, when percutaneous coronary intervention (PCI) cannot be performed. However, using clinical markers of reperfusion, thrombolysis is not always successful for all patients and immediate angiographic rescue PCI is indicated.

Aim of the Work: The goal of this clinical study was to determine the angiographic efficacy of thrombolysis in STEMI patients. Besides its correlation in successful or failed thrombolysis (FT) based on clinical criteria of reperfusion.

Material/Methods: The study population included patients with acute STEMI within 12 hours of onset chest pain, who were admitted to The Cardiac Intensive Care Unit of cardiology department, at University Hospital Center Mohammed VI of Marrakech Morocco, receiving thrombolysis with Tenecteplase, during the period from January 2021 to January 2023. Repeated Electrocardiogram (EKG) at baseline, 90 minutes after Thrombolysis to define FT and PCI were performed for all patients.

Results: 121 patients with a mean age of 56 years were recruited in the study. Successful thrombolysis was present in 60% of patients (n = 73) in Group I, while 40% of patients (n = 48) had FT in Group II. There was no significant difference between patients in both groups regarding gender, risk factors for coronary artery disease like dyslipidemia, diabetes mellitus, obesity, smoking, and myocardial infarction territory on the EKG. However, hypertension, delayed presentation after six hours of onset chest pain, and severe alteration of the systolic ejection fraction were mostly present in Group II. The TIMI III flow rates represent 76% (n = 93) of the patients in the study, with higher rates in both groups, at 80% versus 70% for groups I and II, respectively.

Conclusion: The study confirmed that unsuccessful thrombolysis does not mean always unsuccessful restoring of epicardial coronary flow. As a result, our current results clearly demonstrate the benefits of fibrinolysis for STEMI patients when resources are limited for primary PCI. However, Additional clinical studies are also needed to investigate the recovery of microvascular and tissular perfusion to improve myocardial function and long-term clinical outcomes.

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Introduction:-

The strategies for reperfusion using fibrinolysis or percutaneous coronary intervention (PCI) in the earliest phase of acute myocardial infarction treatment are intended to speedily restore and preserve tissue perfusion. Limited resources, accessibility, and lack of transportation to hospitals capable of performing PCI have made fibrinolysis the most common reperfusion strategy.

ST-segment elevation reduction of more than 50%, when examining the lead with the most evidence of myocardial injury, is predictive of coronary artery patency after treatment with thrombolytics for acute myocardial infarction. Infarct-related artery rescue PCI is indicated as a second-line solution in case of failure of fibrinolytic therapy.

The goal of this clinical study was to determine the correlation between successful or unsuccessful thrombolysis and angiographic outcomes.

Materials and Methods:-**Patient population, inclusion and exclusion criteria**

The inclusion criteria in this study were patients admitted with acute STEMI presenting up to 12h from the onset of symptoms, underwent a thrombolysis and a percutaneous coronary intervention (PCI) during the period from January 2021 to January 2023. Exclusion criteria were as follows: Patients presenting with STEMI but having contraindications to thrombolysis, refusing consent for reperfusion therapies, STEMI patients with delayed presentation after 12 hours.

Study design

This clinical study included patients with STEMI up to 12 h after symptom onset, who were admitted to the cardiac intensive care unit of the cardiology department of the Mohammed VI University Hospital Center in Marrakech, Morocco, during the period from January 2021 to January 2023.

Full history taking

Patient background included name, age, gender, previous medication history and hospitalizations, with particular focus on ischemic heart disease risk factors and comorbidities.

Detailed clinical examination

A detailed cardiac and general clinical examination was performed on all patients. The pain relief after thrombolysis was evaluated using a visual analog scale.

Electrocardiographic examination

Electrocardiography machine was used to record standard 12-lead ECGs. They were recorded at a paper speed of 25 mm/s and a gain of 10 mm/mv.

Twelve-lead electrocardiography was performed directly before and 90 minutes after the administration of thrombolytic agent. ~~In both ECG studies.~~ On every ECG, we analyzed the sum of elevations of ST segments in all leads to calculate the 90-minute ST resolution percentage (resolution of ST segment elevation by >50% in the index lead showing greatest degree of elevation on presentation) and development of reperfusion arrhythmias.

Reperfusion of acute STEMI

Reperfusion of acute STEMI was realized in all patients using thrombolytic therapy.

Results:-

121 patients were included in the study with 84% males. Average age of study population was 56 years. Successful thrombolysis was present in 60% (n=73) patients (Group I) while 40% (n=48) patients have unsuccessful thrombolysis (Group II). Age and gender did not vary significantly between patients in the two groups. In addition, among both groups, we found that risk factors for coronary heart disease such as dyslipidemia, diabetes mellitus and smoking were not significantly different. However, high blood pressure was identified as a significant difference

between the two groups. The Mean duration of angina was more than six hours for most of the patients in the study. This delay was too long in patients with failed thrombolysis. (Table 1)

Table 1:- Baseline clinical data for 121 patients treated with first-line fibrinolytics as primary treatment for acute STEMI.

	Overall (n=121)	Successful thrombolysis 60% (n=73)	Unsuccessful thrombolysis 40% (n=48)
Mean age	56(28 -81)(years)	56(31-77)year	56(28-81year)
AGE			
<30ans	2%(2 case)	(0)	4%(2)
30-45ans	18%(22)	24%(18)	8%(4)
46-60ans	44%(53)	38%(28)	52%(25)
61-75ans	29%(36)	31%(23)	27%(13)
>75ans	6%(8)	6%(4)	8%(4)
Angina durationa			
▪ UP to 3H	17%	21%	14%
▪ <3H-6H	23%	36%	11 %
▪ <6H-12H	59%	42.5%	75%
Mean angina duration (hours)	6.6h	6h	8.2h
Male Gender			
Femme	17%	21%	6 %
Homme	84%	79%	94%
Smoking	64%	61%	65%
Hypertension	20%	14%	30%
Diabetes	39%	41%	36%
Dyslipidemia	59%	55.5%	68%
Prior acute coronary syndrome	6.8%	5.7%	8.5%
Family history	1%	2%	0%
Killip class			
I	87%	88%	83%
II	8%	6%	13%
III	1%	0%	2%
IV	4%	6%	2%
COMPLICATIONS	15%	14%	10%

aAngina duration- The interval time between onset of symptoms and emergency department admission.

The frequent myocardial infarction territory present were antero-lateral, inferior and anterior respectively with non-significant difference among patients of group I and II.

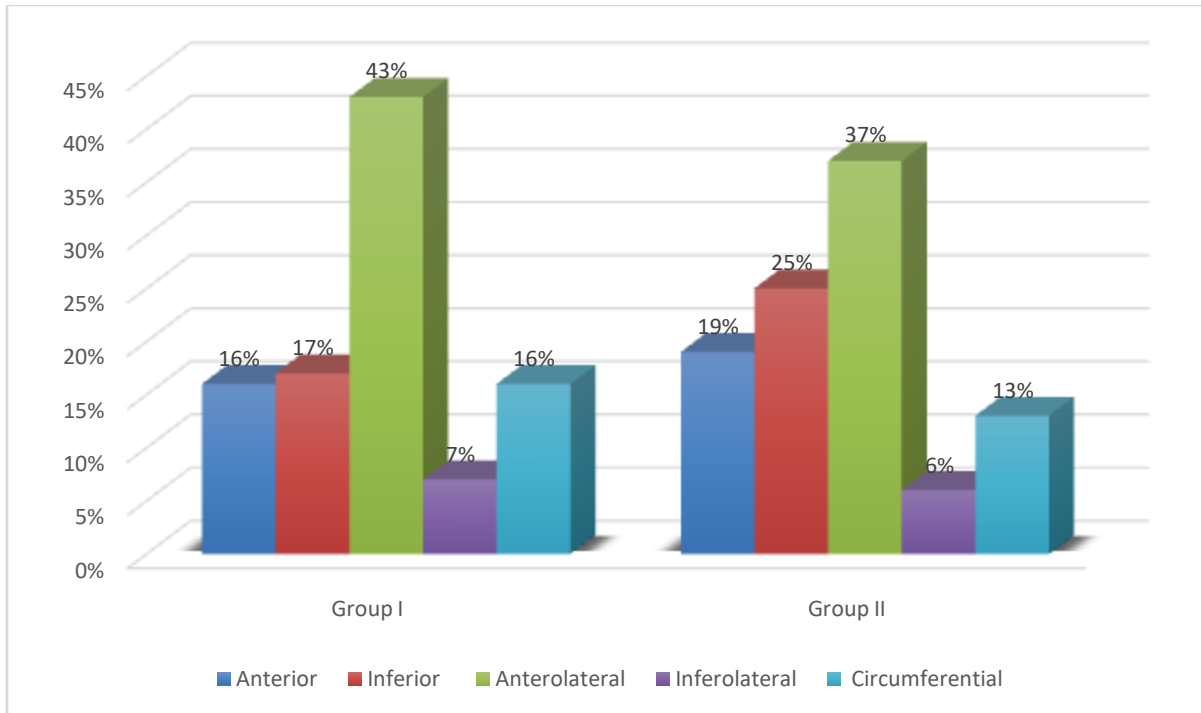


Figure 1:- Comparison of the percentage of MI Territory in the study groups.

In terms of echocardiographic parameters, there was a considerable difference between the two study groups in terms of left ventricular ejection. Mildly reduced ejection fraction (HFmrEF) was present in one-half of Group I patients, while it is was present in one-third of Group II patients.

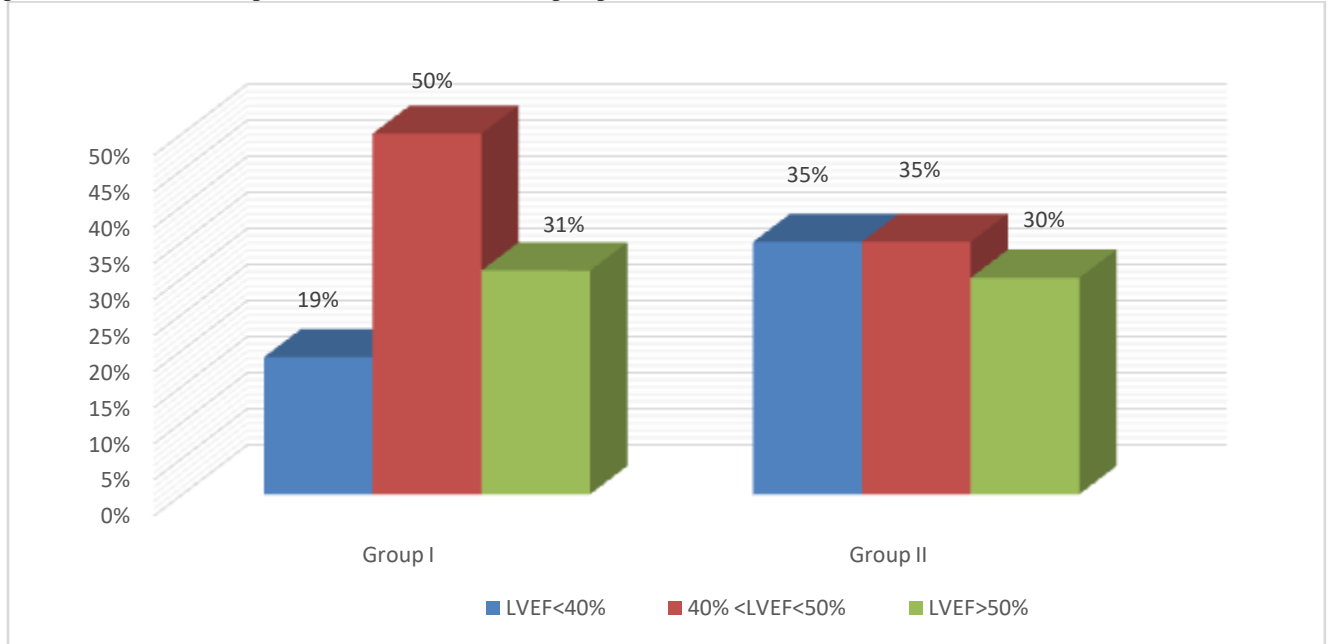


Figure 2:- Comparative assessment of LVEF levels in the study groups.

The TIMI III flow rates represents 76% (n=93) of the patients of the study with higher rates in both group of the study with 80% (n=59) versus 70% (n=34) for group I and group II respectively.

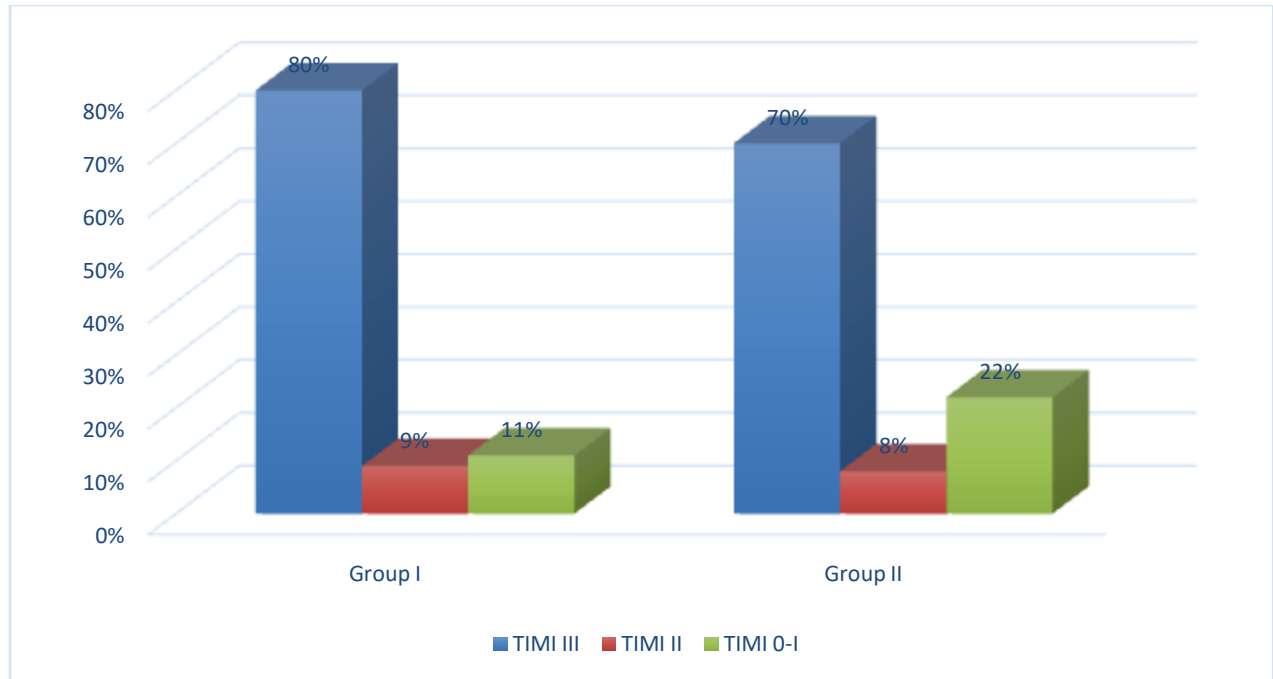


Figure 3:- TIMI flow grade of patients with ST-segment elevation myocardial infarction receiving fibrinolytic therapy as primary treatment.

The profile of lesions on coronary angiography was similar in the groups of the study, with a predominance of mono or bi-truncular lesions, while tri-truncular obstructive coronary artery were present more in-patient with successful thrombolysis. According to this, percutaneous coronary intervention was the most frequent revascularisation strategy performed to our patients.

Table 2:- Angiographic outcomes of patients with STEMI who received fibrinolytics as primary treatment for both study groups.

Variables	Successful thrombolysis 60% (n=73)	Unsuccessful thrombolysis 40% (n=48)
Extent of coronary artery disease		
non obstructive coronary artery	13%	12%
Mono- or bi troncular	70%	84%
Tri troncular	17%	4%
Revascularization strategy		
PCI	70%	74%
CABG	14%	10%
OMT	16%	16%

CABG: coronary artery bypass grafting; OMT: optimal medical management; PCI: percutaneous coronary intervention

Discussion:-

The mean age of patients in the failed thrombolysis group was 56 years with male predominance comparable to the study of laghla et al. (1).

The time from onset of symptoms to reperfusion therapy is the crucial factor in providing the best possible outcomes in STEMI(2). The mean time from symptom onset to first medical contact was six hours for the successful thrombolysis group, while it was eight hours for those within the failed thrombolysis group.

A number of clinical factors predisposing to thrombolysis failure have been elucidated, but the mechanisms are unclear. Patients whose thrombolysis fails are generally older, non-smokers, as well as more likely to have had prior infarction and to have a longer delay in lytic treatment.(3) These factors, except the factor of non-smoking, were present in the group of failed thrombolysis.

Furthermore, in a study by Rao and colleagues, (4) the long time from symptom to needle was a significant predictor of thrombolysis failure, as were advanced age, diabetics and dyslipidemias. A non-significant difference existed between the two groups in our study in terms of coronary heart disease risk factors such as dyslipidemia, diabetes mellitus and smoking.

In the group of patients with unsuccessful thrombolysis, the frequency of grade 0-I, II, and III TIMI flows was 22%, 8% and 70% respectively. The TIMI-III flow were reported in a higher proportion of thrombolysed patients and considerably more than previous studies, such as in the GUSTO study, TIMI III flow in the infarct-related artery was 54 %.(5)

In our study, 12% of Group II patients had non-obstructive coronary disease, while the percentages of mono- or bi-truncular and tritruncular patients were 84% and 4% respectively, in line with the study by Ashish et al(6).

In the current study, the most of patients underwent rescue PCI in both groups, whereas 16% of patient who needs only optimal medical management.

Conclusion:-

The study supported that failed thrombolysis does not automatically mean failure to restore epicardial coronary flow. As a consequence, our findings to date strongly support the utility of fibrinolysis for STEMI patients when resources are limited for primary PCI. Nevertheless, many clinical efforts should focus on public awareness of the early symptoms, on promoting earlier hospitalisation, and on minimising delayed treatment. Additional clinical studies are also needed to investigate the recovery of microvascular and tissular perfusion to improve myocardial function and long-term clinical outcomes.

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