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# Comparative Study between Safety and Efficacy of Pharmacoinvasive Strategy and Primary Percutaneous Coronary Angioplasty in Patients Presenting by Acute ST Segment Elevation Myocardial Infarction

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## Abstract

*Background:* Ischemic heart disease is considered the most common cause of death worldwide. Reperfusion treatment in acute myocardial infarction aims at early and sustained reperfusion of the myocardium at risk. Traditionally reperfusion can be obtained by thrombolysis or by primary Percutaneous Coronary Intervention (pPCI).

*Aim of Study:* Study and assess the safety and efficacy of a Pharmacoinvasive (PI) strategy compared with (pPCI) strategy in ST Segment Elevation Myocardial Infarction (STEMI) management.

*Patients and Methods:* Comparing clinical results regarding mortality, Major Adverse Cardiac Events (MACE) and Left Ventricular (LV) systolic function by echocardiography during hospital admission and 30 days follow-up, in 200 patients presenting with STEMI.

*Results:* During hospital admission, the composite of death/Congestive Heart Failure (CHF) in patients treated with PI strategy versus the group managed by pPCI occurred in 4% versus 7% ($p$=0.352); 9% versus 13% ($p$=0.366) respectively. No cases of re-infarction recorded during hospital admission.

After 30-days follow-up, the composite of death/congestive heart failure/re-infarction in PI and pPCI arms occurred in 3% versus 3% ($p$=0.635); 8% versus 3% ($p$=0.211); 0% versus 3% ($p$=0.139) respectively.

*Conclusion:* In daily clinical practice pharmacoinvasive, strategy is considered safe alternative to primary PCI. Especially considering logistical issues and delay in the initiation of management of STEMI.

***Key Words:*** *Primary percutaneous coronary intervention – Pharmacoinvasive – ST segment elevation acute myocardial infarction – Major adverse cardiac events.*

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## Introduction

**REPERFUSION** of infarct-related artery using fibrinolytics and pPCI in STEMI patients is considered the cornerstone in management of STEMI to reduce myocardial damage and infarct size. pPCI has been found superior to thrombolytic therapy if done within specified time [1]. However, logistical issues as lack of pPCI capable centers, financial problems, health care coverage and difficult transportation limit the efficacy of pPCI. Therefore, pharmacoinvasive technique has yielded growing interest towards its application in STEMI management in which early fibrinolytic therapy followed by coronary angiography with a window to PCI [2].

*Aim of the work:*

This work aimed to study and assess the safety and efficacy of a PI strategy compared with a pPCI strategy in STEMI management.

## Patients and Methods

This study was carried out on 200 patients who were diagnosed with first time STEMI at the Cardiology Department at Tanta University Hospital, in a period of six months starting from June 2017. The diagnosis of STEMI was made according to recent 2017 European Society of cardiology guidelines [1]. The onset of chest pain to First Medical Contact (FMC) did not exceed 12hrs. They were divided into two groups. Group 1 comprised of 100 patients who had pPCI as a reperfusion strategy, group II comprised of 100 patients who had Pharmacoinvasive Technique (PI) as a reperfusion strategy in which patients received streptokinase IV infusion followed by coronary angiography, either immediately after failed thrombolytic, or

within 3-24hrs after successful thrombolysis. Successful thrombolysis was assessed by chest pain relief, decrease in ST segment elevation by >50% compared to the initial electrocardiogram (ECG), appearance of reperfusion arrhythmia and shooting of cardiac enzymes. Reperfusion success in coronary angiography is measured by the Thrombolysis in Myocardial Infarction (TIMI) blood flow grade; reperfusion was considered successful (TIMI 3) or abnormal (TIMI 0-1-2) according to the TIMI blood flow grade [3]. Then pPCI was done with or without stenting.

Exclusion criteria included patients with history of myocardial infarction or Coronary Artery Bypass Graft (CABG), patients presenting with cardiogenic shock, electrical instability and patients with known contraindication to either forms of treatment.

The study compared between the two groups during hospitalization according to the clinical outcomes (mortality, Major Adverse Cardiac Events (MACE) as heart failure symptoms, re-infarction, bleeding complication), angiographic findings (base line TIMI flow score and final TIMI score, single or multi-vessel disease) and angiographic complications as dissection and no-reflow, occurrence of contrast induced nephropathy and cerebrovascular events. Follow-up after 30 days was done to assess clinical outcomes regarding mortality, re-infarction and CHF. Left Ventricular (LV) systolic function assessment by echocardiography was done during admission and after 30 days follow-up using Ejection Fraction (EF).

*Duration of the study:* This study was done in a period of six months starting from June 2017.

*Statistical methods:*

Data were analysed using IBM SPSS software package Version 20.0. (Armonk, NY: IBM Corp). Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Significance of the obtained results was judged at the 5% level. The used tests were Chi-square test ($\chi^2$), Fisher's Exact or Monte Carlo correction, Student *t*-test, Mann Whitney test and Kruskal Wallis test.

## Results

*Patient demographics:* The median age in group I was 60 years and 57 years in group II with statistical significant difference ($p$=0.004). Group I included 74 males (74%) while group II 81 males (81%) with no statistical significant difference ($p$ =0.236).

*Prevalence of risk factors:* Twenty-six patients (26%) of group I and 64 patients (64%) of group II were diabetics with statistical significant difference ($p$<0.001). Regarding hypertension, forty two patients (42%) of group I and 45 patients (45%) in group II were hypertensive with no statistical significant difference ($p$=0.669). Regarding dyslipidemia, forty patients (40%) of group I and 58 patients (58%) of group II were diagnosed with dyslipidemia, there was statistically significant difference between the two groups ($p$=0.011). Regarding smoking, there were 57 smokers in group I (57%) and 59 smokers in group II (59%) with no statistical significant difference ($p$=1.000), (Table 1).

Table (1): Comparison between the two studied groups according to risk factors.

| Risk factors | Group I | | Group II | | $\chi^2$ | $p$ |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| Diabetes mellitus | 26 | 26.0 | 64 | 64 | 29.172 | <0.001 |
| Hypertension | 42 | 42.0 | 45 | 45.0 | 0.183 | 0.669 |
| Smoking | 57 | 57.0 | 59 | 59.0 | 0.082 | 0.774 |
| Previous PCI | 4 | 4.0 | 3 | 3.0 | 0.148 | FE $p$=1.000 |
| Dyslipidaemia | 40 | 40.0 | 58 | 58.0 | 6.483 | 0.011 |

*Clinical presentation:*

According to time from onset of symptoms to First Medical Contact (FMC), the symptoms duration of the study population ranged between 30 minutes and 12 hours with median 5.5hrs and 4hrs in group I and II respectively ($p$=0.132), (Table 2).

Most cases presented by anterior STEMI, 69 patients (69%) of group I and 60 patients (60%) of group II. Sixty-six patients were diagnosed by inferior STEMI, 28 patients (28%) of group I and 37 patients (37%) of group II. Six patients were diagnosed by lateral STEMI, 3 patients (3%) of both group I and group II, (Table 2).

In group I, 69 patients presented with Killip class I (69%), 27 patients presented with Killip class II (27%) and 4 patients presented with Killip class III (4.0%), while in group II, 87 patients presented with Killip class I (87%), 10 patients presented with Killip class II (10%) and 3 patients presented with Killip class III (3%) with statistical significance ($p$=0.004), (Table 2).

Regarding the Systolic Blood Pressure (SBP), in group I, SBP ranged between 100.0 and 180.0 mmHg with a mean of 127.4±19.0. In group II, it

ranged between 100.0 and 150.0mmHg with a mean of 135.0±12.10 ($p$=0.001). The Diastolic Blood Pressure (DBP) of the study population, in group I, DBP ranged between 60.0 and 110.0mmHg with a mean of 76.70±11.01. In group II, it ranged between 60.0 and 100.0mmHg with a mean of 74.80±10.10 ($p$=0.205), (Table 2).

The pulse of the study population ranged between 40 and 120 beats per minute (bpm). In group I, the pulse ranged between 40.0 and 120.0bpm with a mean of 82.40±17.41. In group II, it ranged between 50.0 and 100.0bpm with a mean of 77.55 ± 11.67 ($p$=0.022). According to the presenting rhythm, in group I, 96 patients presented with sinus rhythm (96%), two patients presented by atrial fibrillation and two patients by complete heart block (4.0%). In group II, 95 patients presented with sinus rhythm (95%), 2 patients by atrial fibrillation and 3 by complete heart block (5.0%). ($p$=1.000), (Table 2).

Table (2): Clinical characteristics of the studied groups.

| | Group I | | Group II | | Test of sig. | $p$ |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| *Time from onset of symptoms to FMC (hours):* | | | | | | |
| • Min.-Max. | 0.50-12.0 | | 1.0-12.0 | | U= | 0.132 |
| • Mean ± SD. | 5.97±4.05 | | 4.63±2.54 | | 4390.0 | |
| • Median | 5.50 | | 4.0 | | | |
| *Pulse (beat/min.):* | | | | | | |
| • Min.-Max. | 40.0-120.0 | | 50.0-100.0 | | *t*= | 0.022 |
| • Mean ± SD. | 82.40±17.41 | | 77.55±11.67 | | 2.3 14 | |
| • Median | 80.0 | | 77.50 | | | |
| *Killip class:* | | | | | | |
| • 1 | 69 | 69.0 | 87 | 87.0 | $\chi^2$= | MC$p$= |
| • 2 | 27 | 27.0 | 10 | 10.0 | 10.158 | 0.004 |
| • 3 | 4 | 4.0 | 3 | 3.0 | | |
| *Systolic blood pressure (mmHg):* | | | | | | |
| • Min.-Max. | 100.0-180.0 | | 100.0-150.0 | | *t*= | 0.001 |
| • Mean ± SD. | 127.4±19.0 | | 135.0±12.10 | | 3.374 | |
| • Median | 125.0 | | 140.0 | | | |
| *Diastolic blood pressure (mmHg):* | | | | | | |
| • Min.-Max. | 60.0-110.0 | | 60.0-100.0 | | *t*= | 0.205 |
| • Mean ± SD. | 76.70±11.01 | | 74.80±10.10 | | 1.271 | |
| • Median | 70.0 | | 70.0 | | | |
| *Location of infarction:* | | | | | | |
| • Anterior STEMI | 69 | 69.0 | 60 | 60.0 | $\chi^2$= | MC$p$= |
| • Inferior STEMI | 28 | 28.0 | 37 | 37.0 | 1.947 | 0.414 |
| • Lateral STEMI | 3 | 3.0 | 3 | 3.0 | | |

*Door to reperfusion method:*

For group I, door to balloon time ranged from 15 to 120 minutes, with a mean duration of 61.15 ± 20.07 minutes. For group II, time to IV bolus of thrombolytic ranged from 5 to 20 minutes, with a mean duration of 14.22±3.51 minutes, and time from the end of thrombolytic therapy to PCI ranged from 2 to 120 minutes, with a mean duration of 18.51±16.25 minutes.

*Angiographic finding:* There was no statistical significant difference regarding PCI access ( $p$= 0.269) and number of diseased vessel ($p$=1.000). In group I, the Infarcted Related Artery (IRA) was the left anterior descending coronary artery (LAD) in 74 patients (74%), the left circumflex coronary artery (LCX) in 11 patients (11%) and the Right Coronary Artery (RCA) in 15 patients (15%). In group II, the IRA was the LAD in 65 patients (65%), the LCX in 10 patients (10%) and the RCA in 25 patients (25%). There was no statistically significant difference between the two groups ( $p$= 0.209).

Percutaneous Coronary Intervention (PCI) was done to all patients using balloons or stents or both. According to type of intervention, balloons were used in 71 patients of group I (71%) and in 58 patients of group II (58%). There was no statistically significant difference between the two groups ($p$-value=0.055).

Stents were used in 180 patients. In group I Bare Metal Stents (BMS) were used in 25 patients (25%) and Drug Eluting Stents (DES) in 60 patients (60%). In group II, BMS were used in 7 patients (7%) and DES in 88 patients (88%). There was statistically significant difference between the two groups ($p$-value <0.001).

Baseline TIMI flow, in group I, 91 patients (91%) had TIMI flow <3, and 9 patients had TIMI III flow (9%). While in group II 50 patients had TIMI flow <3 (50%), and 50 patients had TIMI III flow (50%) with statistical significant difference ($p$<0.001). While final TIMI flow showed no statistical significant difference, final TIMI III was achieved in 90 patients (90%) in group I and 95 patients (95%) in group II ($p$=0.179), (Table 3).

Table (3): Comparison between the two studied groups according to TIMI flow score (base line and final).

| | Group I | | Group II | | Test of sig. | $p$ |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| **TIMI:** | | | | | | |
| *Baseline:* | | | | | | |
| <3 | 91 | 91.0 | 50 | 50.0 | $\chi^2$= | <0.001 |
| 3 | 9 | 9.0 | 50 | 50.0 | 40.414 | |
| *Final:* | | | | | | |
| <3 | 10 | 10.0 | 5 | 5.0 | $\chi^2$= | 0.179 |
| 3 | 90 | 90.0 | 95 | 95.0 | 1.802 | |

*Major adverse cardiac events:* During hospital admission, mortality occurred in 4 patients (4%) in group I versus 7 patients (7%) in group II, with no statistical significant difference. ($p$=0.352); congestive heart failure 9% versus 13% ($p$=0.366) respectively. No cases of re-infarction were recorded during hospital admission. Bleeding complications were more significant in group II than group I, 19 patients (19%) in group II versus 6 patients (6%) of group I ($p$=0.005), (Table 4).

Table (4): Major adverse cardiac events during hospital stay in the study population.

| Complications | Group I (n=100) | | Group II (n=100) | | $\chi^2$ | FE$p$ |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| In hospital mortality | 4 | 4.0 | 7 | 7.0 | 0.866 | 0.352 |
| Re-infarction | 0 | 0.0 | 0 | 0.0 | | |
| Bleeding complication | 6 | 6.0 | 19 | 19.0 | 7.726 | 0.005 |
| CHF | 9 | 9.0 | 13 | 13.0 | 0.817 | 0.366 |

After 30-days follow up, mortality occurred in 3 patients (3%) of both group I and group II ($p$= 0.635), congestive heart failure occurred in 8 patients (8%) in group I versus 3 patients (3%) in group II ($p$=0.211). Reinfarction occurred only in 3 patients (3%) of group II and did not occur in group I patients ($p$=0.139), (Table 5).

Table (5): Major adverse cardiac events during 30-days follow-up in the study population.

| Complications | Group I | | Group II | | $\chi^2$ | FE$p$ |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| 30 days follow-up mortality | 3 | 3.0 | 3 | 3.0 | 0.934 | 0. 635 |
| 30 days re-infarction | 0 | 0.0 | 3 | 3.0 | 3.603 | 0.139 |
| 30 days CHF | 8 | 8.0 | 3 | 3.0 | 3.113 | 0.211 |

*Echocardiographicfindings:* The assessment of LV systolic function shows median Ejection Fraction (EF) 50% and 45% in group I and group II respectively ($p$=0.682), while after 30-days follow-up median EF was 50% in both groups ($p$= 0.488) with no statistical significant difference.

## Discussion

Reperfusion treatment in acute myocardial infarction aims at early and sustained reperfusion of the myocardium at risk. Traditionally, reperfusion can be obtained by thrombolysis or by pPCI.4 Although pPCI is the preferred reperfusion method for STEMI, it remains difficult to implement in many areas, and fibrinolytic therapy is still widely used. In the past 10 years, evidence has been brought that fibrinolytic treatment should not be used as stand-alone therapy, but rather as part of a pharmaco-invasive strategy, with the patients brought to PCI-capable facilities after fibrinolysis, to perform semi-urgent coronary angiography and secondary PCI, when necessary [я].

In daily clinical practice, thrombolytic therapy is still used to manage STEMI due to logistical issues and lack of pPCI capable centres in developing countries. The Cardiology Department in Tanta University Hospital (TUH) is a primary PCI capable centre; however, thrombolytic therapy is still being used for reasons as financial issues, insurance coverage, reimbursement. In addition, many cases receive thrombolytic therapy in other centres before being transported to TUH. Based on this pharmacoinvasive protocol is being used for many cases.

In this study, the ratio of males to females was 3.5:1 and the age of the study population ranged between 35 and 86 years. Men are 3 to 5 times more likely to have coronary heart disease than women. However, the risk for women increases after menopause, by about 5 to 10 years following menopause, the risk of coronary heart disease for women increases to the same rate as men. Many women before menopause seem to be partly protected from coronary heart disease and stroke by natural oestrogen **[6]**. This came in agreement with a study conducted by Vaidya et al., in which the ratio of males to females having MI was 5:1 in the study population. Also, this came in agreement with the American Heart Association (AHA) statistical annual updated report by Mozaffarian et al., who found that STEMI is more prevalent in men than women **[7,8]**. Also, this agrees with the study conducted by Blondeau et al., in which about 70% of the STEMI cases were males **[9]**.

In this study 90 patients were diabetics (45%), and 87 were hypertensive (43.5%), while 116 were active smokers (58%). This came in agreement with a study conducted by Chow et al., smoking has a strong pro-thrombotic effect, and smoking cessation is potentially the most cost effective of all secondary prevention measures **[10]**. In the 2018 AHA statistical update about heart disease and stroke by Benjamin et al., stated that tobacco use remains the leading cause of preventable death in the United States and globally. It was estimated to account for 7.2 million deaths worldwide in 2015 **[11]**. The beneficial effect of smoking cessation in patients with CAD, including a majority suffering an MI, has been shown in a meta-analysis conducted by Critchley et al., 20 observational studies, including 12603 patients reporting a 36% reduction of mortality in quitters **[12]**.

In this study, the majority of cases presented by anterior STEMI and patients presenting by Killip class I represented majority of their study population. This came in agreement by the STREAM trial in which the majority of cases presented by anterior STEMI and patients presenting by Killip class I represented majority of their study population **[13]**.

Both study groups were compared regarding baseline TIMI flow in coronary angiography. In group II, treated with fibrinolytic agents 50% of cases achieved TIMI III flow. While 50 patients achieved either TIMI flow 0, 1 or 2 (50%) of which urgent angiography and PCI was required in 19 patients who didn't meet criteria of successful reperfusion by thrombolytic therapy (19%). The remainder cases underwent timely arranged coronary angiography and PCI within 24 hours. But as would be expected in group I, only 10 cases achieved baseline TIMI III flow (10%), and the remainder patients of the study group achieved either TIMI 0, 1 or 2 (90%), ($p$<0.001).

After PCI, patency rates were high in the two study groups with final TIMI III achieved in 90% and 95% of patients in group I and II respectively. Of those undergoing PCI, stenting was required in 85 cases of group I (85%) and 95 cases of group II (95%) while no stenting required for 15 cases of group I (15%) and 5 cases of group II (5%). ( $p$ <0.179).

This came in concordance with the STREAM trial, in the group treated by fibrinolysis most patients presented by base line TIMI III 58.5%, while in the group treated by primary PCI most patients achieved baseline TIMI 0 (59.3%). But the final TIMI III flow was achieved similarly in the group treated by pharmacoinvasive technique and group treated by primary PCI 91% and 92% respectively **[13]**.

Also, in the FAST-MI trial initial TIMI flow for group treated by primary PCI in 18% of patients, and 37% of patients treated by fibrinolysis, while the final TIMI flow was 89% in group treated by primary PCI and 84% in patients treated by fibrinolysis **[5]**.

*Regarding in-hospital MACE:* 4 cases of group I, died during admission (4%) compared to 7 cases (7%) of group II, ($p$=0.352), and regarding angiographic complication there were no significant difference in both groups.

Bleeding complication occurred more in the pharmacoinvasive arm compared with primary PCI arm with 19 patients suffered from different types of bleeding complication (19%) compared to 6 patients of group I (6%).

*Regarding major adverse outcome during 30 days follow-up:*

During follow-up visit, there were similarities in both groups regarding all-cause mortality 3 patients of group I and 3 of group II died during one month follow-up, ($p$=0.635). Also, MACE (congestive heart failure and re-infarction) $p$=0.211 and $p$=0.139 respectively.

Regarding MACE results, this came in agreement with the STREAM trial, which compared outcomes in patients treated with Pharmacoinvasive therapy or primary PCI presenting within 3h after symptom onset, unable to undergo Primary PCI within 1hr. The primary end point was a composite of death, shock, congestive heart failure, or reinfarction up to 30 days, the primary end point occurred in (12.4%) in the fibrinolysis group and in (14.3%) in the primary PCI group. More intracranial haemorrhages occurred in the fibrinolysis group than in the primary PCI group, before adjusting the protocol to half dose Tenecteplase instead of full dose. The bleeding complication incidence were equal in both arms **[13]**.

Also, Larson et al., conducted a prospective registry data from a large regional STEMI system (the Minneapolis Heart Institute Foundation), involving 2624 consecutive STEMI patients and 31 referring non-PCI hospitals demonstrated the safety and efficacy of a pharmacoinvasive reperfusion strategy in rural patients who had expected delays to PCI owing to long-distance transfers. STEMI patients who were transferred from hospitals more than 60 miles from the PCI hospital received fibrinolytic therapy were transferred for immediate PCI. There were no differences in 30-day mortality (5.5% vs. 5.6%; $p$=0.94), stroke (1.1% vs. 1.3%; $p$=0.66), major bleeding (1.5% vs. 1.8%; $p$=0.65), or reinfarction/ischemia (1.2% vs. 2.5%; $p$=0.088) in patients receiving a pharmacoinvasive strategy compared with patients presenting directly to the PCI center for primary PCI, despite a 93 minute longer door to balloon time **[2]**.

In the FAST-MI trial, they assessed 5-year mortality in STEMI patients from the French registry of acute ST-elevation or non-ST elevation Myocardial Infarction (FAST-MI) in 2005 according to use and type of reperfusion therapy. Of 1492 STEMI patients with first call <12 hours from onset, 447 (30%) received fibrinolysis (66% prehospital; 97% with subsequent angiography, 84%

with subsequent PCI), 583 (39%) had pPCI and 462 (31%) received no reperfusion. There was a numerical excess of reinfarction, stroke, and ventricular fibrillation with the fibrinolytic-based strategy, and an excess of cardiogenic shock with primary PCI. However, none of the in-hospital complications differed significantly for the two reperfusion strategies. In the FAST-MI trial major bleeding complication occurred more with the primary PCI arm with no statistical difference ($p$ =0.29) [14].

While in 5-year follow-up, five-year survival was high in patients who had received reperfusion therapy with either primary PCI, or a pharmacoinvasive approach, with approximately two-thirds of the patients receiving fibrinolytic treatment in the pre-hospital setting. As expected, patients who did not get reperfusion therapy had a much higher mortality. When comparing the two reperfusion strategies, the results achieved with the pharmacoinvasive approach were at least as good as those with an intended primary PCI strategy [14].

The Comparison of Angioplasty and Prehospital Thrombolysis in Acute Myocardial Infarction (CAPTIM) trial, has suggested that prehospital fibrinolytic therapy with the patients brought to PCI-capable centers and with one third undergoing rescue angioplasty, could do at least as well as primary PCI up to 5 years after the initial episode. Also a pooled analysis of the CAPTIM and Which Early ST-Elevation Myocardial Infarction Therapy (WEST) trials found a reduction in one-year mortality with fibrinolysis in patients seen early [15].

*Limitations of the study:*

Small size of study population, which was due to many factors as not all patients were willing to the idea of follow-up after one month, also a lot of cases came with late presentation after the accepted window of thrombolytic therapy.

Others refused doing PCI at our center due to logistic or cultural issues as well as our study included only patients with first attack of myocardial infarctions.

In addition, most patients who receive thrombolytic therapy with signs of successful reperfusion undergo coronary angiography later after discharging due to financial reasons and red tape.

Another limitation was the short period assigned for follow-up which didn't allow the appearance of results for mortality, re-infarction & rehospitalization. The chosen period was one month only to prevent fallacies in the results because mostly after one month the patients underwent elective PCI for other coronary lesions, so this may affect the results.

Also, the use of M-mode, Simpson's method might not be of the same accuracy in assessment the global & regional LV systolic function as the newest techniques such as speckle tracking & strain and strain rate.

*Conclusion:*

In this study, we highlighted the importance of total ischemic time and importance of patient and system related delays in influencing outcomes of STEMI. Therefore, in daily clinical practice, pharmacoinvasive strategy is considered safe alternative to pPCI. Especially considering logistical issues and delay in the initiation of management. Prehospital fibrinolysis should probably be considered in remote areas where transport time to a hospital is unacceptably long. Proper training of Emergency Medical Service (EMS) personnel can be facilitated by wireless transmission of 12-lead ECGs to an offsite cardiologist. Standardized inter-hospital transfer protocols should be established to allow for routine post-fibrinolysis coronary angiography (and PCI when appropriate) within the recommended time frame, as well as urgent rescue PCI for patients with failed thrombolysis.

More efforts should be targeted to ensure wide scale availability of newer generations of thrombolytic therapy to reduce the bleeding risk associated with streptokinase, for further improvement of the outcomes of pharmacoinvasive strategy.

Finally, while system-related delays have been the focus of numerous studies, which have resulted in remarkable improvements in emergency medical services response, transfer times, door-to-needle and/or door-to-device times; the ultimate objective in patients with acute STEMI is reducing the total ischemic time which also includes the time delay to FMC. The latter has received significantly less attention, which in part is related to difficulties in accurate measurement, given its susceptibility to recall bias and the fact that symptoms may be vague or intermittent in a considerable number of STEMI patients. This delay is almost certainly longer in less developed regions/countries where emergency services and public awareness/education programs are not well established.

Further research and efforts aiming at effective reduction of patient-related delays (in addition to system-related delays) are urgently needed and carry the potential of driving significant improve-

ments in the short and long-term outcomes of patients with acute STEMI.

## References


1- IBANEZ B., JAMES S., AGEWALL S., ANTUNES M.J., BUCCIARELLI-DUCCI C., BUENO H., et al.: 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. Eur. Heart J., 39 (2): 119-77, 2018.

2- LARSON D.M., McKAVANAGH P., HENRY T.D. and CANTOR W.J.: Reperfusion Options for ST Elevation Myocardial Infarction Patients with Expected Delays to Percutaneous Coronary Intervention. Vol. 5, Interventional Cardiology Clinics, p. 439-50, 2016.

3- APPLEBY M.A., ANGEJA B.G., DAUTERMAN K. and GIBSON C.M.: Angiographic assessment of myocardial perfusion: TIMI myocardial perfusion (TMP) grading system. Heart [Internet], 86: 485-6. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1729964/pdf/v086p00485.pdf, 2001.

4- MEGA J.L. and MORROW D.A.: 52-ST-Elevation Myocardial Infarction: Management. In: Braunwald's Heart Disease, 10/e. Eleventh E. Elsevier Inc., p. 1095-154, 2015.

5- HANSSEN M., COTTIN Y., KHALIFE K., HAMMER L., GOLDSTEIN P., PUYMIRAT E., et al.: French Registry on Acute ST-elevation and non ST-elevation Myocardial Infarction 2010. FAST-MI 2010. Heart, 98 (9): 699-705, 2012.

6- COTRAN R., KUMAR V., ROBBINS S., ABBAS A.K., ASTER J.C. and ASTER J.C.: Robbins and Cotran pathologic basis of disease. Philadelphia, PA: Saunders, Ipswich, MA. 1-1368 p, 2015.

7- VAIDYA C.V. and MAJMUDAR D.K.: A Comparative Study of Clinical Profile of Acute ST Elevation Myocardial Infarction in Young and Old Patients from Gandhinagar, Gujarat, 4 (October): 34-42, 2014.

8- MOZAFFARIAN D., BENJAMIN E.J., GO A.S., ARNETT D.K., BLAHA M.J., CUSHMAN M., et al.: Heart Disease and Stroke Statistics--2015 Update: A Report From the American Heart Association. Vol. 131, Circulation, 29-322, 2014.

9- BLONDEAU M., BS C., CHONG A., DICK A. and FROESCHL M.P.V.: Safety and Ef fi cacy of a Pharmacoinvasive Strategy in ST-Segment Elevation Myocardial Infarction, 9 (19), 2017.

10- CHOW C.K., JOLLY S., RAO-MELACINI P., FOX K.A.A., ANAND S.S. and YUSUF S.: Association of diet, exercise, and smoking modification with risk of early cardiovascular events after acute coronary syndromes. Circulation, 121 (6): 750-8, 2010.

11- BENJAMIN E.J., VIRANI S.S., CALLAWAY C.W., CHAMBERLAIN A.M., CHANG A.R., CHENG S., CHIUVE S.E., CUSHMAN M., DELLING F.N., DEO R., et al.: Hear Dis stroke Stat Updat A Rep from Am. Hear Assoc. Circ., 137: e67-492, 2018.

12- CRITCHLEY J.A. and CAPEWELL S.: Mortality Risk Reduction Associated with Smoking Cessation in Patients with Coronary Heart Disease: A Systematic Review. Vol. 290, Journal of the American Medical Association, p. 86-97, 2003.

13- ARMSTRONG P.W., GERSHLICK A.H., GOLDSTEIN P., WILCOX R., DANAYS T., LAMBERT Y., et al.: Fibrinolysis or primary PCI in ST-segment elevation myocardial infarction. N. Engl. J. Med., 368 (15): 1379-87, 2013.

14- DANCHIN N., PUYMIRAT E., STEG P.G., GOLDSTEIN P., SCHIELE F., BELLE L., et al.: Five-Year survival in patients with ST-Segment-elevation myocardial infarction according to modalities of reperfusion therapy: The French registry on acute ST-elevation and non-ST-Elevation myocardial infarction (FAST-MI) 2005 cohort. Circulation, 129 (16): 1629-36, 2014.

15- BONNEFOY E., STEG P.G., BOUTITIE F., DUBIEN P.Y., LAPOSTOLLE F., RONCALLI J., et al.: Comparison of primary angioplasty and pre-hospital fibrinolysis in acute myocardial infarction (CAPTIM) trial: A 5-year follow-up. Eur. Heart J., 30 (13): 1598-606, 2009.

# دراسة مقارنة بين سلامة وكفاءة القسطرة ما بعد العقار المذيب للجلطة والقسطرة القلبية الآولية لمرضى الإحتشاء الحاد فى عضلة القلب ذو إرتفاع مقطع ST


أجريت الدراسة على ٢٠٠ مريضا تم تشخيصهم بالإحتشاء الحاد فى عضلة القلب ذو إرتفاع قطعة س ت، وتم تقسيم المرضى إلى مجموعتين.

- المجموعة الآولى: تشمل ١٠٠ مريض يعانون من إحتشاء عضلة القلب الحاد وقد تلقوا العلاج عن طريق إجراء القسطرة التداخلية العلاجية الآولية العاجلة للشرايين التاجية.
- المجموعة الثانية: تشمل ١٠٠ مريض يعانون من إحتشاء عضلة القلب الحاد وقد تلقوا العلاج عن طريق العقار المذيبة للجلطة ثم إجراء قسطرة قلبية علاجية.

تجرى الدراسة على مرضى الإحتشاء الحاد بعضلة القلب ذو إرتفاع مقطع س ت وقد بدآت آعراض الإصابة بالإحتشاء فى مدة لا تزيد عن ١٢ ساعة.

نتائج الدراسة: آظهرت الدراسة آن نتائج المجموعة الآولى مشابهة لنتائج المجموعة الثانية من حيث الوضع الإكلينيكى للمرضى، وبالنسبة لنتائج المجموعتين فيما يتعلق بمعدل الوفاة ومعدل حدوث المضاعفات الكبرى لمرضى القلب والآوعية الدموية آظهرت الدراسة آن معدل حدوث مضاعفات إحتشاء عضلة القلب مشابهة فى المجموعتين مع زيادة فى معدل حدوث النزيف الحاد فى مرضى المجموعة الثانية نتيجة إستخدام العقار المذيب للجلطة.

عند إجراء المتابعة بعد شهر آظهرت الدراسة آن نتائج المجموعة الآولى والثانية متقاربة فيما يتعلق بمعدلات الوفاة ومعدل حدوث المضاعفات ضعف عضلة القلب.

وآيضا عند قياس كفاءة عضلة القلب وتقييم كفاءة البطين الآيسر الإنقباضية عن طريق الموجات الصوتية ومقارنتها بمثيلها فى المرحلة الحادة آظهرت النتائج تحسن طفيف لكفاءة عضلة القلب لمرضى المجموعة الثانية تم ملاحظتها عند إجراء المتابعة بعد شهر.

النتائج السابقة آظهرت آن العقار المذيب للجلطة ثم إجراء القسطرة القلبية العلاجية لحالات إحتشاء عضلة القلب لا يقل كفاءة عن إجراء القسطرة التداخلية العلاجية الآولية العاجلة للشرايين التاجية إذا ما تم إجراءها فى الفترة الزمنية المحددة.