

Effectiveness of Delayed in Comparison with Early Primary Percutaneous Coronary Intervention in Patients with Acute Myocardial Infarction

Mazin Z Al-Shibani* FIBMS-Med., D.M, M.Sc.I.C.

*Dept. of Medicine, College of Medicine, Al-Qadisiya University-Iraq

الملخص

خلفية الموضوع: يعتبر أحتشاء العضلة القلبية من الأسباب المنتشرة عالميا والمؤدية الى الموت، وان نسبة الوفاة بدأت بالنقصان وبوضوح خلال الثلاثين سنة الماضية مع وجود وحدة الأنعاش التاجية، ومحللات الخثرة، وإعادة الأرواء اعتمادا على القسطرة والتي تشمل التداخل التاجي الأولي ووجود مقلات الدهون. تعتبر إعادة فتح الأوعية الدموية ذات أهمية حادة في إدارة المرضى المصابين بأحتشاء العضلة القلبية الحاد.

الغاية: لتحديد الفائدة من التداخل التاجي الأولي المتأخر عن طريق الجلد مقارنة مع المبكر في المرضى المصابين بأحتشاء العضلة القلبية الحاد (المقطع ST المرتفع).

الطرق: هذه دراسة أستباقية تشمل 82 مريض مصابين بأحتشاء العضلة القلبية المقطع ST المرتفع اللذين تم اختيارهم من بين المرضى الداخليين الى وحدة العناية التاجية في مركز شهيد المحراب في بابل-العراق خلال الفترة من تشرين الأول 2013 لغاية تشرين الأول 2014 وقد تم تقسيم المرضى الى مجموعتين اعتمادا على وقت التداخل التاجي الذي تم، المجموعة الأولى تشمل المرضى اللذين تم إجراء التداخل التاجي الأولي لهم عن طريق الجلد في أقل من 12 ساعة من بداية أحتشاء العضلة القلبية والمجموعة الثانية تشمل المرضى اللذين أجري لهم التداخل التاجي الأولي عن طريق الجلد من 12 الى 48 ساعة من بداية الأعراض. تم مقارنة نسبة جزء الطرد، البعد الأنبساطي الأخير للبطين الأيسر والصنف الوظيفي للمرضى عند الحضور وبعد شهرين وبعد ستة أشهر.

النتائج: أن معدل جزء الطرد في المجموعة الأولى هو 55%، 59%، و 60% عند الحضور، وبعد شهرين وبعد ستة أشهر على التتابع. يشير التحليل الأحصائي الى وجود تحسن واضح في جزء الطرد مع P-value أقل من 0.05. وأن معدل جزء الطرد في المجموعة الثانية هو 48%، 50%، و 50% عند الحضور وبعد شهرين وبعد ستة أشهر على التوالي مع تحسن غير واضح في جزء الطرد، P-value أكبر من 0.05. وأن معدل البعد الأنبساطي الأخير مقسوما على طول المريض في المجموعة الأولى هو 3.02 سم/م، 3.20 سم/م، و 3.25 سم/م عند الحضور وبعد شهرين وبعد ستة أشهر على التوالي وفي المجموعة الثانية هو 2.94 سم/م، 3.09 سم/م، و 3.19 سم/م عند الحضور وبعد شهرين وبعد ستة أشهر على التوالي. يبين التحليل الأحصائي أختلاف واضح بين المجموعتين بخصوص البعد الأنبساطي الأخير للبطين الأيسر عن الحضور وبعد شهرين، P-value أقل من 0.05 بينما لا يوجد أختلاف واضح بعد ستة أشهر، P-value أكبر من 0.05. يوجد تحسن واضح في المجموعة الثانية في جزء الطرد في المجاميع الثانوية (عند الحضور، وبعد ستة أشهر) بين 30% و 39%، P-value أقل من 0.05. يوجد تحسن واضح في الصنف الوظيفي في المجموعة الثانية بعد ستة أشهر، P-value أقل من 0.05.

الأستنتاجات: من الممكن أن يؤدي التداخل التاجي المتأخر عن طريق الجلد في حالة أحتشاء العضلة القلبية الحاد المقطع ST المرتفع الى تحسن في الصنف الوظيفي، وحجم البطين الأيسر وكذلك جزء الطرد. وأن التداخل التاجي المبكر عن طريق الجلد يؤدي الى تحسن أكثر في جزء الطرد الخاص بالبطين الأيسر، والحجم وإعادة الترميم والصنف الوظيفي.

Abstract

Background: Acute myocardial infarction is world wide leading cause of death and the incidence of mortality have declined dramatically over the last 30 years, with the advent of the coronary care unit, fibrinolytic therapy, catheter-based reperfusion including primary percutaneous coronary intervention, and statin therapy. Early revascularization is critically important in the management of patients presenting with acute myocardial infarction.

Aim: To assess the benefit of delayed in comparison with early primary percutaneous coronary intervention in patients with acute ST elevation myocardial infarction.

Methods: This prospective study included 82 patients with acute ST elevation myocardial infarction they were selected from those who had admitted to the coronary care unit of Shaheed Al-Mehrap cardiac center in Babylon-Iraq during a period between November 2013 and November 2014, they divided in to two groups according to the time of intervention that done, first group include patients underwent primary percutaneous coronary intervention within less than 12 hours from the onset of acute myocardial infarction and second group include patients underwent primary percutaneous coronary intervention between 12 and 48 hours from the onset. Ejection fraction, left ventricle end diastolic dimension, and functional class compared at presentation, after 2 and 6 months.

Results: The mean ejection fraction in first group were 55%, 59% and 60% at presentation, after 2 and 6 months respectively with statistical analysis that shows significant improvement in ejection fractions with P-value < 0.05. The mean ejection fraction in second group were 48%, 50% and 50% at presentation and after 2 and 6 months respectively with no significant improvement in the ejection fraction, P-value > 0.05% . The mean left ventricular end diastolic dimension divided by patient`s height in first group were 3.02 cm/m, 3.20 cm/m and 3.25 cm/m at presentation and after 2 and 6 months respectively and in second group were 2.94 cm/m, 3.09 and 3.19 at presentation, and after 2 and 6 months respectively. The statistical analysis shows significant difference between both groups regarding mean left ventricular end diastolic dimension at presentation and after 2 months, P-value < 0.05, while there is no significant difference after 6 months, P-value > 0.05. In the second group, there is significant improvement in the ejection fraction of subgroup (at presentation and after 6 months) between 30 and 39%, P-value < 0.05. There is significant improvement in functional class of second group after 6 months, P-value < 0.05.

Conclusions: In case of ST-elevation myocardial infarction, delayed primary percutaneous coronary intervention may improve functional class, left ventricular size and even ejection fraction. Primary percutaneous coronary intervention, indicate more improvement in left ventricular ejection fraction, size and remodeling, and functional class

Introduction:

Acute myocardial infarction (AMI) redefine as the detection of a rise and/or fall in cardiac troponin with at least one value above the 99th percentile of the upper reference limit (URL), together with evidence of ischemia. Ischemia was defined as any symptom of ischemia, electrocardiographic changes suggestive of new ischemia, development of pathologic Q waves on electrocardiogram (ECG), or imaging evidence of infarction. Included in the definition were sudden cardiac death

(SCD) with evidence of myocardial ischemia (new ST elevation, left bundle branch block [LBBB], or coronary thrombus) and biomarker elevation > 3 X URL for post percutaneous coronary intervention (PCI) patients or > 5 X URL for post-coronary artery bypass grafting (post-CABG) patients. Documented stent thrombosis was recognized in this new definition as well. Established MI was defined as any one criterion that satisfies the following: development of new pathologic Q waves on serial ECGs, imaging evidence of MI, or pathologic findings of healed or healing MI ⁽¹⁾.

The restoration of blood flow to ischemic myocardium has been established as the preeminent objective for treatment of patients with AMI ⁽²⁾. Primary PCI has evolved through continued innovation of the method and dissemination to an expanding proportion of patients ⁽³⁾. Patients with ST-segment elevation myocardial infarction (STEMI) who present early and less than 12 hours achieve greater myocardial salvage from PCI than those presenting more than 12 hours after symptom onset. Even so, late presenters still achieve substantial reductions in final infarct size (FIS) from intervention ⁽⁴⁾. Timely reperfusion therapy is recommended for patients with STEMI, and door-to-balloon delay has been proposed as a performance measure in triaging patients for PCI ⁽⁵⁾.

Patient and methods:

This prospective study enrolled 82 patients with acute STEMI they were selected from those who had admitted to the coronary care unit of Shaheed Al-Mehrap cardiac center in Babylon-Iraq during a period between November 2013 and November 2014, they divided in to two groups according to the time of intervention when done to them, first group include patients underwent PCI within less than 12 hours from the onset of symptoms of AMI and second group include patients underwent PCI between 12 and 48 hours from the onset of symptoms. Detailed history and thorough physical examination with measuring the height in meter had been performed for each patient included in this study. Investigations done for each patient in form of ECG, cardiac troponin, chest X-ray, blood urea, serum creatinine, and complete blood picture.

Echocardiography done by same operator to all patients at time of presentation, using 2D echocardiography to

assess the size, shape, and contractility of left ventricle (LV), other cardiac chambers and all cardiac valves, M-mode used to measure the ejection fraction (EF) and left ventricular end diastolic dimension (LVEDD) after correction by using height of the patients ⁽⁶⁾, coronary angiography done according to the recent guidelines of American College of Cardiology and American Heart Association (ACC/AHA). Echocardiography redone after 2 and 6 months and we compare EF and LVEDD, between the two groups at presentation, 2 and 6 months.

LVEF is measured by echocardiography depending on LV dimension equation $LVEF = (LVEDD^2 - LVESD^2) / LVEDD^2$ ⁽⁷⁾.

Percutaneous coronary angioplasty done to all culprit arteries, and stenting done to most culprit one by using drug eluting stents (DES). Patients who candidate for CABG has been excluded. The collected data had been tabulated in term of frequency distribution tables that show frequency, mean and standard deviation of different parameters of STEMI.

Statistical analysis had been done using student's t-test. P-value less than 0.05 had statistical significance.

Results:

This study had enrolled 82 patients with STEMI, they divided in to two groups according to the time of intervention had been done to them, first group, those patients who underwent intervention within less than 12 hours from the onset of MI (44 patients, 36% had DM, 50% had HT, 56% are smokers, functional classes with NYHA I and II are 56%, NYHA III and IV are 44%) and second group, those patients who underwent PCI between 12 and 48 hours from the onset (38 patients, 28% had DM, 47% had HT, 60% are smokers, functional classes with NYHA I and II are 50%,

NYHA III and IV are 50%), as shown in table 1.

Table 1: Distribution of the patients according to the base line parameter.

Character		First group	Second group
Total No.		44 (53 %)	38 (47%)
DM		16 (36%)	11 (28%)
HT		22 (50%)	18 (47%)
Smoking		25 (56%)	23 (60%)
Functional class	NYHA I, II	25 (56%)	19 (50%)
	NYHA III, IV	19 (44 %)	19 (50%)

Age of the patients in first group had range between 31-77 years, mean 53 y and ages of second group range between 33 and 70 years mean 53 years, there is no significant difference between the two groups (P-value > 0.05) as shown in table 2.

Table 2: Distribution of the patients according to the age

Age by year	First group		Second group		P-value
	No.	%	No.	%	
30 -39	3	6	4	10	> 1.2
40-49	7	15	5	13	
50- 59	18	40	20	54	
60- 69	12	28	5	13	
≥ 70	4	9	4	10	
Total	44	100	38	100	
	Mean ± SD range		Mean ± SD range		
	52.7±9.5 (31-77)		53.07±8.7 (33-70)		

75% patients of first group were male and 25% were female, while 73% patients of second group were male and 27% were female. Statistical analysis shows that the male is more predominant in both groups as shown in table 3.

Table 3: Distribution of the patients according to the gender

Gender	First group		Second group	
	No.	%	No.	%
Male	33	75	28	73
Female	11	25	10	27
Total	44	100	38	100
P-value	< 0.05		< 0.05	

The mean EF in first group were 55%, 59 % and 60% at presentation, after 2 months and after 6 months respectively, with statistical analysis that shows significant improvement in EF between presentation and 2 & 6 months, P-value < 0.05, and the mean EF in second group were

48%, 50% and 50% at presentation and after 2 & 6 months respectively, the mean EF were statistically not significant, as shown in table 4.

Table 4: Distribution of EF of both groups in different times.

EF	First group	Second group
At presentation	55% (33-68)	48% (30-66)
After 2 months	59% (33-70)	50% (30-67)
After 6 months	60% (33-72)	50% (30-66)
P-value	< 0.05	> 0.05

The mean LVEDD/height in first group were 3.02 cm/m, 3.20 cm/m and 3.25 cm/m at presentation, after 2 and 6 months respectively while the mean LVEDD/height in second group were 2.94 cm/m, 3.09 and 3.19 at presentation, after 2 and 6 months. The statistical analysis shows significant difference in the LVEDD between first and second group at presentation and after 2 months (P-value < 0.05), while there is no significant difference after 6 months (P-value > 0.05) as shown in table 5.

Table 5: Distribution of LVEDD/height of patients in different time

LVEDD/height (cm/m)	First group	Second group	P-value
At presentation	3.02	2.94	< 0.05
After 2 months	3.20	3.09	< 0.05
After 6 months	3.25	3.19	0.08

By comparing the EF of second group, the statistical analysis show that there is significant improvement in subgroup with EF between 30% and 39% at presentation and after 6 months (P value < 0.05), while the other subgroups shows no significant difference as shown in table 6.

Table 6: Distribution of patients in second group according to EF at presentation and after 6 months.

EF %	At presentation	After 6 months	P-value
30-39	8	5	< 0.05
40-49	12	15	> 0.05
50-59	12	11	> 0.05
60-69	5	5	> 0.05
≥70	1	2	> 0.05

When comparing the NYHA functional class of second group, the statistical analysis show significant improvement in functional class after 6 months as shown in table 7.

Table 7: Distribution of patients in second group according to NYHA functional class at presentation and at 6months.

Functional class	At presentation	After 6 months	P-value
NYHA I & II	19 (50%)	28 (73%)	< 0.05

NYHA III & IV	19 (50%)	10 (27%)	> 0.05
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Discussion:

As primary PCI is of clear benefit specially in the first 12 hours of onset of STEMI and even more beneficial than thrombolytic therapy regarding mortality, functional class and left ventricular function⁽⁸⁾, these results had stimulate many of research workers to study the benefit of delayed PCI to patients with STEMI who present in a time when delayed PCI indicated to them within more than 12 hours.

This study revealed that EF improve after 2 and 6 months in patients who underwent primary PCI within 12 hours of STEMI while in patients who underwent delayed PCI within 12-48 hours show no improvements and these results resemble the results of Caitlin E Cox et al study but the difference is follow up in Caitlin study which was persist for one year⁽⁴⁾ but by studying the EF of second group with delayed PCI in our study there is significant improvement of EF in subgroup between 30-39% at six months. The explanation for this discrepancy may be due to complexity of risk factors in our patients and poor compliance with treatment, and duration of follow up.

In studying the LVEDD/height of the patients, we found that there is significant difference between the two groups at presentation and at 2 months but there is no significant difference between the two groups at 6 months which mean that there is significant improvement in left ventricular size and remodeling in patient with STEMI who underwent delayed PCI between 12-48 hours and this may be the cause of significant improvement in functional class in the second group after 2 and 6 months, these results are similar to results of Liao

Wei et al study^(4, 9). This agreement may explained by delicate measuring of LVEDD with correction by using patient's height and echocardiography that done by single operator hand avoiding inter-variability.

Conclusion:

1. Delayed PCI in patients with STEMI may improve functional class, left ventricular size and EF.
2. In patients with STEMI, the early PCI, the more improvement in LVEF, size and remodeling, and functional class.

Recommendation:

To clarify the results of this study and confirm these conclusions, larger studies are recommended to include larger number of patients and continue for longer duration.

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