Research Article

The Role Of Emergency PCI In The Management Of Acute STEMI The Local Experience In Al-Nassiriya Heart Center

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Abstract

Background: Primary PCI is an emergent percutaneous catheter intervention in the setting of STEMI,without previous fibrinolytic treatment .It is the prefered strategy in patients with STEMI.
Aim: To evaluate the immediate and intermediate procedural and clinical outcome in a local experience.
Methods: This is a descriptive cross sectional study carried out in a tertiary cardiac center for 301 patirnts with acute myocardial infarction. Fifty patients(16.6%) were followed up prospectively for one month up to one year in the outpatient clinic.
Results: primary PCI was done in 294 patients (97.6%) and rescue PCI was done in 7 patients (2.4%). Ischemic time is ranging from one hour to twenty four hours (mean 5.02±3.27) . Procedural success rate was 100%. Mortality rate was 5.3% mostly because of cardiogenic shock.
Conclusion: Primary PCI should be the standered of care for patients with STEMI.

Key words: Primary PCI; immediate; long term; outcome

INTRODUCTION

Primary percutaneous coronary intervention (PCI) is an emergent percutaneous catheter intervention in the setting of ST-segment elevation myocardial infarction (STEMI) ,without previous fibrinolytic treatment .It is the prefered strategy in patients with STEMI.(1) It has become the predominant reperfusion strategy for STEMI throughout western healthcare systems.(2) Recent estimates in the United States suggest that primary PCI is used in 85% of all STEMI cases that undergo reperfusion, with thrombolytic agents used in only 9% and the combination of thrombolytic agents with PCI in 6%.(3) This dramatic switch from thrombolytic therapy to primary PCI was the result of several studies conducted in the early 1990s that demonstrated the superiority of primary PCI at reducing stroke and reinfarction as well as an absolute reduction in mortality by 2%.(4)

PATIENTS AND METHODS

Three hundred and one patients with acute STEMI were included in this study. All the patients were admitted to Al-Nassiriya Heart Center from the period between 1st. of February 2014 and 31th.of January 2015. Primary PCI was done for 294 patients(97.6%) . The patients were rushed into the catheterization laboratory for a timely intervention.The patients were loaded with 600 mg clopidogril (Plavix) and aspirin 300 mg as soon as possible provided that no contraindication existed. Diagnostic coronary angiography was done immediately and if the coronary anatomy was suitable for intervention, PCI was done by standard technique.

Statistical analysis

Statistical package for social sciences version 18 (SPSSv.18) and Chi-square test were used to analyze the results .The statistical analysis applied at level of significance $\alpha = 0.05$ ($P \leq 0.05$).

RESULTS

Among the 301 patients who were included in this study, 235(78%) were male and 66 (21%) were female. The mean age was 57.6±12.35 SD.Most of the patients were smokers (57.1%) and only 54 patients(17.9%) has previous history of ischemic heart disease.Hypertension and diabetes were found in 46.5% and 31.9% of the patients respectively.

Geographic distribution**:** One hundred sixty two patients(53.8%) involved in this study were inhabitant in locality less than 20Km from the heart center; 110 patients (36.5%) were living in areas 20 to 60 km from the center; whereas only 29 patients (9.6%) were coming from area more than a distance of 60 Km.

Ischemic time is ranging from one hour to twenty four hours (mean 5.02±3.27). 279 patients (92.6%) were presented to the hospital within less than 12 hours from the onset of chest pain,while only 22 patients(7.3%) presented within more than 12 hours.

Primary PCI was done in 294 patients (97.1%),while only 7 patients (2.36%) had thrombolytic therapy beforehand and underwent rescue PCI because of persistent ischemia.

Procedure approach: The majority of patients (90%) underwent the primary PCI via femoral approach, radial approach was done for 29 patients (9.7%) and only one patient (0.3%) underwent primary PCI via ulnar approach.

Predilatation of the lesion was needed in 74 patients (24.6%) ,while in 227 patients(75.4%) direct stenting was performed. TIMI III flow was achieved in 64(86.5%) of patients, TIMI II flow was achieved in 7 patients (9.5%) while TIMI I flow was achieved in only 3 (4.1%) of the patients with predilatation. There is no significant relationship between predilatation and direct stenting group in the resultant TIMI flow.(table 1).

Table (1): The relationship between pre-dilatation and TIMI flow

TIMI flow	Pre-dilatation/& stenting No.(%)	Direct stenting No.(%)	P Value	Total no.
0	0 (0%)	8 (3.5%)	0.10	
I	3 (4.1%)	1 (0.4%)	0.076	
II	7 (9.5%)	11 (4.8%)	0.145	
III	64 (86.5%)	207 (91.2%)	0.240	
Total	74	227		301

*Post-dilatati*on after deployment of the stents was needed in 114 patients (37.8%),while in 187 patients(62.2%),post-dilatation was not needed.TIMI III flow was achieved in 93% of patients who needed post-dilatation and TIMI I flow was found in only 1% of patients despite post-dilatation. There was no significant difference between the resultant TIMI flow among patients who needed post-dilatation of the stent and those who did not need it. (table 2).

Table (2): The relationship between post-dilatation and TIMI flow

TIMI flow	Post-dilatation No.(%)	Without post-dilatation No.(%)	P Value	Total no.
0	1(0.9%)	7(3.7%)	0.23	
I	1(0.9%)	3(1.6%)	0.59	
II	6(5.3%)	12(6.4%)	0.68	
III	106(93%)	165(88.2%)	0.18	
Total	114	187		301

Death rate among patients from locality less than 20Km was 4.9% and 10.3% from locality more than 60Km. There was no significant relationship between locality distance and death rate. (table 3).

Table (3): The relationship between locality distance and death rate

Locality distance (Km)	Life No(%)	Death No(%)	P Value	Total
<20Km	154(95.1)	8 (4.9%)	0.753	162
20-60Km	105(95.5)	5 (4.5%)	0.651	110
>60Km	26(89.7)	3 (10.3%)	0.204	29
total	285(94.7)	16 (5.3%)		301

Aspiration thrombectomy was performed in 12 patients (4.0%).

Multivessel PCI was done in only 4 (1.3%) of the patients included in this study . Two vessels primary PCI was done in two patients (0.6%) and another two patients (0.6%) primary PCI was done for one vessel and ad hoc PCI was done for nonculprit vessel since there was no hemodynamic stability after primary PCI.

Complications

Local complication: Only 7 patients (2.3%) has had local complications In form of small hematomas which did not necessitate any specific treatment.

Perforation of coronary artery occurred in one patient only (0.3%) because of guide wire which was sealed during the procedure. It was Ellis Type 2 perforation.

Temporary pacemaker was needed in 13 patients (4.3%) during the procedure and shortly after, because of development of complete heart block.

Recatheterization was done for 21 patients (7.0%) ,eight of them underwent coronary recatheterization during the hospital stay (i.e. 3-7 days), of those eight patients only two patients had acute stent thrombosis. Of the thirteen patients who underwent late catheterization (more than one month) , three were found to have late stent thrombosis. one patient had malapposition of the stent.

Stroke: During hospitalization only three patients (1%) developed acute stroke documented by computerized tomography of the brain; all were found to be ischemic strokes.

Acute renal failure occurred in five patients (1.6%), in whom one patient required hemodialysis

Death: Twenty patients (6.6%) died, three of them died during the procedure and seven patients died in the same day after the procedure, while four patients died after 24 hours from the procedure and two patients died after 48 hours .The patient data and cause of in-hospital death are shown in table 4. Another four patients died after a period of three months, two in hospital because of decompensated heart failure, and two at home.

Table (4):Analysis of in-hospital mortality

Case No.	Age (year)	Gender	Risk factors	Number Of vessels	Cause Of death	Ischemic site	Culprit vessel
1	74	male	DM,HT,IHD	2	Severe LV dysfunction	inferior	RCA
2	49	male	HT,IHD,SMOCKING	3	Ventricular fibrillation	Infero-lateral	LCX
3	51	male	DM,HT	3	Ventricular fibrillation	Antero-lateral	LAD
4	64	female	IHD	1	Cardiogenic shock	Antero-septal	LAD
5	82	male	HT,IHD	3	Cardiogenic shock	Antero-septal	LAD
6	80	female	HT,IHD	3	Cardiogenic shock	Inferior	RCA
7	72	male	DM,HT,SMOCKING	2	Cardiogenic shock	Antero-septal	LAD
8	86	female	HT	2	Cardiogenic shock	Antero-septal	LAD
9	42	Female	DM.HT	1	Thrombus shift to LMS	Antero-septal	LAD
10	67	male	DM,HT,SMOCKING	3	Moderate LV dysfunction.	Inferior	LCX
11	63	female	DM,HT,IHD	1	Cardiogenic shock, severe MR.	Inferior	OM
12	73	female	HT	2	Arrhythmia (VF)	Inferior	RCA
13	67	female	DM,HT	3	Cardiogenic shock	Antero-septal	LAD
14	66	male	DM,HT,SMOCKING	3	Cardiogenic shock, severe MR.	Inferior	LCX
15	66	male	DM,IHD,SMOCKING	1	Cardiogenic shock	Antero-septal	LAD
16	78	male	HT	3	Cardiogenic shock	Inferior	RCA

Follow up: Follow-up for one month and up to one year in some patients was performed in 50 patients(16.6%) by doing physical examination, ECG and echocardiography study.In 40 patients (80%) the ECG showed ST and T wave changes; in 37 patients (74%) Q wave was present. In 29 patients (58%) echocardiography study revealed presence of echocardiographic changes in the infarcted area in form of regional wall motion abnormalities and aneurysms. Ejection fraction (EF) was 30%-40% in five patients(10%) and from 40% to 50% in 13 patients (26%) and more than 50% in 32 patients (64%).

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DISCUSSION

We found that (53.8%) of patients involved in this study were inhabitant in locality less than 20 Km from the heart center, while (9.6%) were coming from area more than a distance of 60 Km.In one registry the median distance from the non-PCI hospital to the primary PCI center was 31.9 miles.[5]

Ischemic time in this study ranged from one hour to twenty four hours (mean: 5.02±3.27). 92.6% arrived in the center within less than 12 hours from the onset of chest pain. Accordingly, a small proportion of patients with acute myocardial infarction underwent primary PCI within the recommended time according to the well established guidelines (90-120 minutes).[3] Although this finding is comparable to that of Jeronimo Sousa et al,[6] who found that median total ischemic time was 4 h 30 min (<120 min in 4% of patients), ischemic duration in our patients remains unacceptably high.This is not realated only to the distance from the primary PCI center, but also to the poor logistic infrastructure in our case , interestingly rescue PCI is a valid solution for this problem.

Rescue PCI was associated with significantly lower risk of long-term adverse outcomes for patients with STEMI who failed fibrinolytic therapy. However, rescue PCI is substantially underused in clinical practice [7].In this study only 2.36% had undergone rescue PCI. In Ko DT et al study,[7] rescue PCI was done in 34.7%.

Femoral approach was used in 90% of cases while radial approach was used in only 9.7% of cases included in this study, these figures reflected the operators experience in both access sites, however the radial approach was associated with significantly lower incidence of major bleeding and access site complications and superior net clinical benefit.[8] In Bernat I et al,[8] study femoral approach was used in 51% and radial approach was used in 49% of patients included in the study .

In this study, Direct stenting strategy was done in 75.4% of patients while 24.6% of patients stenting after balloon predilatation was needed. There was no significant relationship between predilatation and direct stenting group in the resultant TIMI flow.This finding was comparable to Kim Byung Ok et alstudy,[9] who found that final TIMI grade 3 flow was (93.1% vs 82.1 %, p=0.25) in direct stenting vs predilatation baloon, he also concluded that direct stenting without predilatation is not inferior to predilatation balloon during primary PCI in improving myocardial perfusion and has a tendency of better clinical outcome. When anatomically and technically feasible, direct stenting technique may be considered. However, predilatation with a large size balloon is to be discouraged in primary PCI, since this may lead to thrombus dislodgement to distal sites or other vessels. Predilatation should if necessary, be done using a low profile balloon, just to clear the view for stent deployment.[9]

In this study we found that there was no significant differences between the resultant TIMI flow among patients who needed post dilatation of the stent and those who who did not need it. Biswas S et al,[10] concluded in his study that Stent postdilatation does not seem to have any detrimental effects on patients' final angiographic results and long-term clinical outcomes, in the setting of STEMI. Again, in this context, stent optimization should not be vigorous, and non-compliant balloons should be used, with avoidance of oversizing.[10]

In this study ,there is no significant relationship between death rate and the distance transport for primary angioplasty. Widimský P et al,[11] found in his study that long distance transport from a community hospital to a tertiary PCI centre in the acute phase of AMI is safe. This strategy markedly decreases mortality in patients presenting >3 hours after symptom onset. For patients presenting within <3 hours of symptoms, thrombolysis results are similar results to long distance transport for PCI .

In this study aspiration thrombectomy was used in only 4.0% of the cases due to hardware non-availability.The ACC/AHA/SCAI guidelines have been updated so that routine thrombectomy during primary PCI for STEMI has been given a class III indication and selective or bailout thrombectomy has been given a class IIb indication due to lack of data.[12]

Multivessel PCI was done in only 1.3% of the patients included in this study. Patients with ST-segment

elevation myocardial infarction (STEMI) and multivessel coronary artery disease who undergo primary percutaneous coronary intervention (PCI) are most commonly treated with PCI to the culprit lesion only. Whether a strategy of complete revascularization in these patients is superior is unknown.[13] In Bainey KR et al,[13] study , multivessel PCI was done in 17% of the cases included in the study.

Local hematomas occurred in 2.3% of the patients in this study. In other studies the incidence of femoral vascular complications after PCI is reported to be around 2-6%, generally Mild bruises and small haematomas are common and do not require specific investigation or treatment.[14]

Coronary perforation during Primary PCI is an unanticipated complication. Prompt recognition and management is mandatory to prevent mortality. In this study coronary perforation was very rare (0.3%) This result was comparable with Kinnaird T et al,[15] study in which the incidence of coronary perforation during PCI was 0.33%.

Temporary pacemaker was needed in 4.3% of the patients in this study, during the procedure or shortely after because of the development of complete heart block. In one study, 6.3% of acute myoccardial infarction patients develop a third- degree AV block. In 86.3% of these patients , the block occurred before or during PCI and , in 94.5% of the patients, resolution of the block occurred in the catheterization laboratory.[16]

Stent thrombosis after primary percutaneous coronary intervention is relatively frequent and continues to increase out to 5 years.[17] Optimizing adjunct pharmacology including early antithrombin therapy, preloading with a potent antiplatelet therapy may further reduce stent thrombosis in ST-segment elevation myocardial infarction.[18] In our study acute stent thrombosis occurs in only two patients (0.6%) while late stent thrombosis ocuured in only three patients (1%). In Dangas GD et al,[18] acute stent thrombosis occurred in 0.9%, and late stent thrombosis occurred in 1.0%.

Ischemic stroke occurred in only three patients [1%] during hospitalization. In APEX-AMI trial,[19] Stroke is an infrequent complication in the setting of ST-segment elevation myocardial infarction treated with primary PCI, it occurred in 69 primary patients with PCI (1.3%). A third of strokes were ischemic (n=23; 33%), 12% (n=8) were hemorrhagic, and the remaining 55% (n=38) were of uncertain type. The median (25th, 75th percentile) time of stroke occurrence was 6 days. Overall, 43% of strokes occurred within 48 hours of PCI, and all hemorrhagic strokes occurred within 48 hours.[19]

Contrast-induced nephropathy was defined as a rise in creatinine >0.5 mg/dl. or a 25% relative rise within 48 h after contrast exposure.[20] In this study contrast induced nephropathy occured in 1.6%. Marenzi G et al,[21] found in his study that Contrast-induced nephropathy frequently complicates primary PCI (19% of the cases), even in patients with normal renal function.It is associated with higher in-hospital complication rate and mortality.Thus, preventive strategies are needed, particularly in high-risk patients.[21]

Mortality rate during hospitalization was 5.3 % among the patients included in this study, in the majority of patients , in- hospital death was due to cardiogenic shock, while after one month the mortality rate was 1.3%.These figures were comparable to Pedersen F et al,[22] study who found that main causes of death within the first 30 days were cardiogenic shock and anoxic brain injury after cardiac arrest. Age, culprit vessel size and flow, and the presence of heart failure and diabetes were independent predictors of mortality. After 30 days, the annual cardiac mortality rate was <1.5%. Causes of death beyond 30 days were noncardiac in 65% of cases.[22]. Halkin A et al,[23] concluded in his study that In AMI patients treated with primary PCI, seven risk factors namely ; age >65 years, Killip class 2/3, baseline left ventricular ejection fraction <40%, anemia, renal insufficiency, triple-vessel disease, and post-procedural Thrombolysis In Myocardial Infarction flow grade (TIMI folw grade) readily available at the time of intervention accurately predict short- and long-term mortality. Of note, measurement of baseline left ventricular function is the single most powerful predictor of survival and should be incorporated into risk score models.[23] Navarese EP et al,[24] found in his study that the reduction of mortality of STEMI patients treated at high-volume primary PCI centers is time-dependent and affected by risk profile. The greatest benefit was observed in high-risk patients presenting within 90 min from symptoms onset.[24]

A unique feature of this study is its inclusion of long term follow up data for 50 (16.6%) of the patients who underwent primary PCI. The ejection fraction exceeded 40% in 90% of the patients and was > 50% in 2/3rd of the patients. Since the left ventricular function is the most important determinant of quality of life and survival,[25] it can be seen that primary PCI has a crucial role in improving the prognosis of patients with STEMI.

Conclusion: Primary PCI should be the standered of care for patients with STEMI due its demonstated safety and efficacy.

Recommendation: Utmost attention should be paid to minimize the duration of ischemia in patients with STEMI, and radial approach should be encouraged, since it has been demonstrated to be safer than femoral approach.

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