Short Communication

Primary Percutaneous Coronary Intervention (PPCI) in acute myocardial infarction complicated with cardiogenic shock in a newly emerging cardiac center in Nepal

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Abstract

BACKGROUND: Acute myocardial infarction (AMI) is complicated by cardiogenic shock in 7~10% of patients. Mortality rate is exceedingly high and reaches 70-80% in those treated conservatively. Large thrombolytic trials demonstrate 60% mortality with most effective thrombolytic agent.

METHODS: In between September 2005 to August 2008 total PCI in Shahid Gangalal National Heart Center (SGNHC) in Nepal was 452. Among them primary PCI (PPCI) in AMI with cardiogenic shock was done in only 16 patients (3.5%).

RESULTS: This study showed in-hospital mortality of 50% (n = 8). Of 50% (n = 8) alive patients with cardiogenic shock who underwent PPCI, 6 patients are in routine follow-up over 12 months and 2 were doing well in subsequent 6 months but not in follow up after that.

CONCLUSION: Primary PCI in AMI complicated by cardiogenic shock has lower mortality and improved outcome. High cost, high in-hospital mortality and lack of trained personnel are major limitations.

KEY WORDS: Primary percutaneous coronary intervention, acute myocardial infarction, cardiogenic shock, SGNHC (Shahid Gangalal National Heart Center).

Cardiogenic shock is the commonest cause of death in the patients with acute myocardial infarction (AMI) who reach hospital alive. Cardiogenic shock in AMI occurs when 40% or more of left ventricle is destroyed. It occurs within hours of onset of infarction due to massive ischaemia and infarction. A relatively small infarction superimposed on extensive previous damage may precipitate cardiogenic shock. Acute myocardial infarction is complicated by cardiogenic shock in 7-10% of patients. Mortality rate is exceedingly high and reaches 70-80% in those treated conservatively.[1,2] Large thrombolytic trials demonstrate 60% mortality with most effective thrombolytic agent. Comparison of 30 day mortality in cardiogenic shock with AMI between Reteplase or Alteplase, 64% of patients treated with Reteplase and 58% treated with Alteplase died within 30 days (p = 0.59).[3,4]

A growing trend has been to use more aggressive therapeutic interventions early in patients who have cardiogenic shock as a result of acute myocardial infarction. The recent guidelines of the European Society and American College of Cardiology (ACC) and the American Heart Association (AHA) recommend early mechanical revascularization for cardiogenic shock for patients younger than 75 years with ST-elevation AMI or left bundle-branch block.[5,6]

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Invasive strategy in developing country like Nepal is not only costly but also technically demanding. No study has been done till date with aggressive invasive strategy in poor developing countries like Nepal and hence its usefulness, justification and feasibility is not known. The purpose of this study was to evaluate the in-hospital mortality rate in a cohort of unselected consecutive patients with AMI complicated by cardiogenic shock treated with PPCI in SGNHC, the only national heart Center which offers this facility in Nepal.

Methods

A consecutive of 16 patients who presented to SGNHC with acute ST elevation MI complicated by cardiogenic shock were studied. Among them, 3 patients presented with concomitant RV infarction. Those patients who presented with ST elevation MI with cardiogenic shock with mechanical complications such as papillary muscle rupture, ventricular septal defect and free wall rupture in echocardiography were not considered for PPCI due to surgical indication. We do not have exact data of the whole incidence of cardiogenic shock in ST elevation MI. However, it is estimated to be approximately 5~7%. Diagnosis of acute ST elevation with cardiogenic shock was defined as evidence of hypoperfusion (cold clammy skin, cerebral obtundation), systolic blood pressure < 90 mm Hg, pulse > 100bpm and evidence of acute STEMI or new onset LBBB (ischaemic chest pain and ST elevation in ECG).

This is a retrospective study between September 2005 to August 2008. A total of 452 patients underwent PCI in SGNHC in this period. Among them PPCI in AMI with cardiogenic shock was done in only 16 patients (3.5%).

Results

Clinical characteristics of the patients included in this study are shown in Table 1. The interval between AMI to Cardiogenic shock to PPCI was 6~30 hours. The age range was between 21-77 yrs. (mean 48.5 ± 16.52 yrs.). There were 12 male and 4 female patients. The risk factors

distribution showed diabetes in 4, smoking in 7, hypertension in 4 and strong family history in 2 patients. The baseline left ventricular ejection fraction (LVEF) by echocardiography was 30-41% (35.57 ± 3.92). The culprit vessels were 7 right coronary arteries (RCA), 6 left anterior descending arteries (LAD), 2 left circumflex (LCX) and 1 left main vessel (LM). Thrombolysis in myocardial infarction (TIMI) flow among 16 patients showed pre procedure TIMI flow 0 in 14 patients and TIMI flow 1 in 2 patients. Post procedural TIMI flow 3 was achieved in 13 patients, TIMI flow 2 in 1 patient and TIMI flow 0 in 2 patients. Due to financial constraints intraaortic balloon pump (IABP) could only be used in 7 patients.

Table 1. Patient characteristics

Characteristics	n = 16
Mean age (years)	48.5 ± 16.5
Sex (men)	12 (75%)
Anterior MI	7 (44%)
Non anterior MI	9 (56%)
Diabetes mellitus	4 (25%)
Hypertension	4 (25%)
Smoking (current)	7 (44%)
Hyperlipidemia	3 (19%)
IABP used	7 (44%)
LVEF	35.6 ± 3.9%

From 16 patients with acute ST elevation MI complicated by cardiogenic shock, who underwent PPCI, 8 patients died in-hospital and 8 survived and were discharged. Out of 8 deaths, culprit vessel could not be opened in 2 patients, but non-culprit vessel was successfully dilated and stented. One died due to pre existing renal failure and 5 patients died despite opening culprit vessel due to ongoing ischaemia and remaining vessels had diffuse disease, hence, PPCI was not attempted. Out of 8 survived patients, 6 patients were in routine follow-up over 12 months and 2 were in regular follow-up for subsequent 6 months.

Discussion

Meta analysis of 23 large randomized trial have shown that primary PCI is superior to

thrombolysis for immediate treatment of STEMI due to more effective restoration of coronary patency, less recurrent myocardial ischaemia , less coronary reocclusion , improved residual LV function and better clinical outcome including stroke.[7-10]

In this study with 16 patients, the mortality showed to be 50%. The causes of mortality were pre-existing renal failure, TIMI flow 0/1 and delayed procedural time.

Landmark Shock trial showed that early revascularization is better than medical management in AMI with cardiogenic shock. Thirty day survival was 54% and one year survival was 50%. Thirty day survival after successful PCI was 65% and after unsuccessful PCI was 20%. Mortality was related to TIMI flow. Mortality with TIMI grade flow showed TIMI 3 flow: mortality 38%, TIMI 2 flow: mortality 55% and TIMI 1 or 0 flow: mortality 100%. The independent predictors of mortality in shock trial was increasing age, lower systolic blood pressure, increasing time of randomization, lower post PCI TIMI flow 0/1, and multivessel PCI.[11]

In a prospective randomized trial in Germany between 1994 to 2001, 1333 patients in 80 centers were entered into ALKK PCI registry and 14.2% of the patients with AMI presented with cardiogenic shock. The in-hospital mortality was 46.1%. Predictors of in-hospital mortality was post procedural TIMI flow, advanced age (75 years or more) and time-interval between symptom-onset and start of PCI.[12]

In a retrospective study between 1994-2004 in France, the in-hospital mortality was reported to be 43% among 175 patients presenting with AMI and cardiogenic shock. Independent risk factors for increased mortality were absence of TIMI 3 flow, smoking and need of mechanical ventilation. The independent predictors of impaired long term outcome were LVEF < 0.3 and triple vessel disease.[13]

In a REO-SHOCK trial, 30 day mortality was 42.5%. The national registry of myocardial infarction reported in-hospital mortality of 47.9% in 775 US hospitals from January 1995 to May 2004.[14] Patients randomized to aortic counterpulsation had significantly less reocclusion of the infarct-related artery during follow-up were compared with control patients (8% versus 21%, p < 0.03). In addition, there was a significantly lower event rate in patients assigned to aortic counterpulsation in terms of a composite clinical end point (death, stroke, reinfarction, need for emergency revascularization with angioplasty or bypass surgery, or recurrent ischemia: 13% versus 24%, p < 0.04).[15] In a prospective observational study from January 1995 to May 2004 in 775 hospitals in the United states, of 293,633 patients with ST-elevation myocardial infarction, cardiogenic shock was present in 25,311 (8.6%) and there was an increase in PPCI rate from 27.4% to 54.5%. The in-hospital mortality in 1995 was 60.3% which was reduced to 47.9% in 2004.[16]

The in-hospital mortality of AMI complicated by cardiogenic shock in this study is high (50%). However, it is lower compared to historical thrombolytic therapy in AMI with cardiogenic shock. The present study shows that invasive strategy can be an alternative mode to thrombolytic therapy despite high mortality.

Study Limitation

This is the only National Heart Center in Nepal offering PCI services, and since it is in the initial phase, the total number of routine PCI and primary PCI in cardiogenic shock is small. Also, this is a retrospective study of a single center with small number of highly selective patients and there is no direct control group to compare the results with thrombolytic therapy. So, the number of patients admitted with AMI in this hospital is small and a very small number of these patients are complicated by cardiogenic shock. Moreover, due to financial constraints, IABP was used only in few patients, which could have limited the outcomes.

Conclusion

In-hospital mortality in patients with acute myocardial infarction complicated by cardiogenic shock remains high, even with early interventional therapy. Every effort should be made to reduce the incidence of cardiogenic shock. Primary PCI in AMI complicated by

cardiogenic shock has lower mortality and improved outcome. Major limitations include high cost, high in-hospital mortality and lack of trained personnel.

Conflict of Interest
Authors have no conflicts of interest.

Authors' Contributions
AM designed the study, collected data and prepared the manuscript.

ShRR, LD, YB, RM, YRL, DS, MB provided assistance in designing the study and preparing the manuscript.

All authors have read and approved the content of the manuscript.

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