COMPARISON OF EFFECT OF PRIMARY PERCUTANEOUS CORONARY INTERVENTION WITH STREPTOKINASE IN ACUTE ST ELEVATION MYOCARDIAL INFARCTION (STEMI) ON LEFT VENTRICULAR FUNCTION AFTER 3 MONTHS

Saleha Abbas, Abdul Hameed Siddiqui, Ammar Cheema, Ayesha Abbas, Sadaf Khan, Anum Fatima Janjua, Farhan Tuyyab

Armed Forces Institute of Cardiology/National Institute of Heart Disease (AFIC/NIHD)/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To assess the left ventricular function three months after the primary percutaneous coronary intervention versus Streptokinase in ST elevation myocardial infarction.

Study Design: Prospective comparative study.

Place and Duration of Study: Cardiac Catheterization Lab, in-patients and out patients departments of Armed Forces Institute of Cardiology and National Institute of Heart Diseases, Rawalpindi from Jun 2018 to Jun 2019.

Methodology: Patients included in the study were with first acute MI treated with primary PCI/SK, having systolic blood pressure >90 mmhg, pre-infarction EF >40% and with no previous history of coronary artery bypass grafting or angioplasty. All patients undergoing primary percutaneous coronary intervention/Streptokinase injection were assessed for left ventricular function at day one by transthoracic echocardiography and then three months later by transthoracic echocardiography. Two-dimensional echocardiography was being performed immediately after primary percutaneous coronary intervention on day one and at three months follow-up.

Results: There were 80 patients recruited in the study. Mean age of the patients was 55.5 ± 11.6 years with range 36-81 years. Sixty nine (86.3%) patients were male while 11 (13.48%) were female patients. Most common comorbid was smoking 37 (46.3%) followed by diabetes mellitus 25 (31.3%). Most common culprit artery was left anterior descending 38 (47.5%) followed by left circumflex 15 (18.8%) and then right coronary artery 14 (17.5%). Independent sample t-test was applied to find out the statistical significance between two groups (Streptokinase group vs PPCI group). Ejection fraction of the patients was checked at the time of discharge and after three months follow-up and result showed the statistical significance with *p*-value <0.05.

Conclusion: Based on this comparative analysis of improvement of left ventricular function between streptokinase and primary percutaneous coronary intervention, we concluded that after three months satisfactory ejection fraction is seen in patients treated with primary percutaneous coronary intervention as compared to patients treated with streptokinase.

Keywords: Hyperlipidemia, Primary percutaneous coronary intervention, Streptokinase, ST elevation myocardial infarction.

INTRODUCTION

Since 1979, AMI is diagnosed solely on the presence of unequivocal ECG changes (defined as development of abnormal, persistent Q or QS waves and evolving injury current) lasting longer than 1 day and/or unequivocal biomarker changes (initial rise and subsequent fall of the serum level)[1]. Different methods have been devised to salvage the myocardium including fibrinolysis or PCI with insertion of stent. At present, the preferred reperfusion treatment for patients with acute myocardial infarction (AMI) is early pr-mary angioplasty with the placement of a drug-elutingstent in the infarct-related coronary artery[2]. Early restoration of perfusion after myocardial infarction (MI) reduces mortality, limits infarct size, and preserves left ventricular (LV) function[3]. The primary objective of reperfusion therapy is not only to restore epicardial vessel patency but also to re-perfuse tissue in order to maintainmyocyte integrity and function and thus LV function[3].

Correspondence: Dr Saleha Abbas, Department of Cardiology, AFIC/NIHD Rawalpindi Pakistan

Myocardial necrosis following myocardial infarction (MI) leads to LV dilatation followed by LV systolic dysfunction as a result of remodeling. Cardiac remodeling is generally accepted as a determinant of the clinical course of heart failure[4]. The process of ventricular enlargement can be influenced by three interdependent factors: infarct size, infarct healing and ventricular wall stresses[5]. A useful way to prevent or minimize the increase in ventricular size after infarction and the consequent adverse effect on prognosis is to limit the initial insult. Acute reperfusion therapy has been consistently shown to result in a reduction in ventricular volume. The reestablishment of blood flow to the infarcted region, even beyond the time frame for myocyte salvage, has beneficial effects in limiting ventricular enlarge-ment[4,5].

Over the past decade the efficacy of thrombolytic therapy and coronary angioplasty in restoring patency to the infarct-related coronary artery and preserving left ventricular function has been studied extensively[2-9]. Although "rescue" angioplasty may be advantageous in infarct-related arteries that fail to reperfuse after thrombolytic therapy[10], in general there is no additional benefit of routine angioplasty after thrombolytic therapy[7,8]. Immediate coronary angioplasty without previous thrombolytic therapy avoids the potentially adverse effects of myocardial and intraplaque hemorrhage that can occur after thrombolysis, also it helps to restore the patency of thrombus laden artery more effectively than streptokinase and is therefore advocated by some authors as the preferred treatment of acute myocardial infarction[9,15]. However Antithrombotic therapy in conjunction with primary percutaneous coronary intervention reduces the risk of recurrent ischemic events and death in patients with ST-segment elevation myocardial infarction (STEMI) at the expense of an increase in iatrogenic bleeding complications[11,12,13]. A study published in NEJM (N Engl J Med 1987; 317: 850–5.) concludes that administration of intravenous streptokinase (1.5 million units) to patients with a first myocardial infarction results in improved left ventricular function and short-term survival.

Except for a small randomized study comparing intracoronary streptokinase treatment with immediate angioplasty[17], comparisons of the two approaches are lacking. For this reason we intend to carry out a prospective comparative study to compare immediate angioplasty with intravenous streptokinase treatment in patients with acute myocardial infarction in improving left ventricular function.

METHODOLOGY

It was a prospective comparative study carried out at inpatient departments of Armed Forces Institute of Cardiology & National Institute of Heart Diseases, Rawalpindi from June 2018 to 2019. Patients included in the study were with first acute MI treated with primary PCI/SK, having systolic blood pressure >90 mmhg, pre-infarction EF >40% and with no previous history of CABG or angioplasty. While excluded patients were those having cardiogenic shock, previous MI, previous coronary artery bypass grafting, prior LV ejection fraction <40%, TIMI grade 1 or 2 flow at time of initialangiography or those with unsuccessful PCI. Patients were recruited through consecutive sampling. Study was conducted after the permission from Ethical review committee. Sample size was calculated using online openEpi software. All patients undergoing primary PCI were assessed for left ventricular function at day one by transthoracic echocardiography and then three months later by transthoracic echocardiography and myocardial perfusion imaging. A written informed consent was taken from all patients before the procedure. Primary PCI was performed within 6 hours after the onset of symptoms via 6F sheath according to standard clinical practice with provisional stent implantation. Coronary angiography was performed at the end of PCI for off-line flow analyses. Two-dimensional echocardiography was performed immediately after primary PCI with a commercially available imaging system (Philips SONOS 2500, 2.0/2.5 MHz transducer). Echocardiographic evaluation of the LV function was repeated at day one and at three months follow-up. All data was collected prospectively. Data collection tool

was developed regarding patient demographics, co-morbids, previous medical history and laboratory findings. Quantitate variables were analyzed using mean ± SD while qualitative variables were analyzed using frequency and percentages.

RESULTS

There were 80 patients recruited in the study. Mean age of the patients was 55.5 ± 11.6 years with range 36-81 years. Sixty nine (86.3%) patients were male while 11 (13.48%) were female patients. Most common co-morbid was smoking 37 (46.3%) followed by diabetes mellitus 25 (31.3%). Mean weight of the patients was 82.07 ± 10.7 kg with range 70-110 kg which showed most of the patients were over-weight/obese. Most common culprit artery was LAD 38 (47.5%) followed by LCX 15 (18.8%). Descriptive summary was shown in table-I.

Table-I: Clinical characteristics of the population.

Parameters	n (%)
Diabetes Mellitus	25 (31.3)
Current Smokers	37 (46.3)
Hyperlipidemia	24 (30.0)
Culprit Artery	
LAD	38 (47.5)
LCX	15 (18.8)
RCA	14 (17.5)
LMS	1 (1.3)
Angiography was not possible, SK was given	12 (15.0)
Type of Myocardial Infarction	
Anterior wall MI	49 (61.3)
Inferior wall MI	22 (27.5)
Lateral wall MI	9 (11.3)
Patients were given SK (within 12 hours)	41 (51.2)
Patients PPCI performed (within 12 hours)	39 (48.7)

Table-II: Showing independent sample t-test between two groups.

Parameters	Streptokinase Group (n=41)	PPCI Group (n=39)	*p*-value
Ejection Fraction at the time of discharge	39.15 ± 10.3 Mean ± SD	45.13 ± 8.8 Mean ± SD	0.007
Ejection Fraction after 3 months	40.76 ± 13.3 Mean ± SD	51.13 ± 12.6 Mean ± SD	0.001

Angiography was done among 68 (85.0%) patients. Independent sample t-test was applied to find out the statistical significance between two groups (Streptokinase group vs PPCI group). Ejection fraction of the patients was checked at the time of discharge and after three months follow-up and result showed the statistical significance with *p*-value <0.005.

DISCUSSION

Evolution of left ventricular function after ST elevation myocardial infarction treated with primary percutaneous coronary intervention is influenced by guideline based preventive strategies to retard LV remodeling and reduce subsequent coronary events. The prevalence of severe left ventricular dysfunction after STEMI has reduced significantly with the use of primary PCI. The prevalence of severe LV systolic dysfunction after STEMI in large series of patients treated with primary PCI is around 20%. Improvement in STEMI patients after primary PCI is also influenced by the presence of multivessel disease and the use of complete revascularization versus PCI of only the infarct related artery. The peak troponin level is an adequate reflector of infarct size as assessed with imaging techniques such as single-photon emission tomography and late gadolinium.

In addition, baseline LVEF is also an important determinant of the improvement of LV systolic function at follow-up. LVEF is strongly associated with myocardial infarct size: a low LVEF reflects larger damage that may not recover at follow-up.

In our study, streptokinase group (51.2%) was adopted as frequently as primary PCI (48.8%) to treat patients presenting with acute STEMI. Both groups showed no significant association with regard to the patient's age group, sex, diabetes, active smoking or location of the myocardial infarctions. Out of 80 patients angiography was performed in 68 (85.0%) patients.

Even though our study revealed that the ejection fraction on discharge was marginally low in both groups which is significantly raised in primary PCI group than in patients treated with

streptokinase at follow up, thereby proving that PCI is the preferred treatment option compared to thrombolysis by streptokinase.

In an observational study with 63 patients who underwent rescue PCI, though the ejection fraction was unsatisfactory on discharge, in-hospital mortality was below 3%. The RESCUE study revealed that rescue PCI, even though it does not increase resting ejection fraction (EF), there was evidence of improvement in exercise EF as well as prevention of death or severe heart failure. In our study, EF on followup showed an increase in patients treated with primary PCI than those treated with primary PCI.

Our results compared with those of other studies show conflicting results. The study also showed that there was a significant difference between the discharge ejection fraction (47% vs. 53%; p=0.014) but the composite endpoint of death, repeat PCI, repeated MI, and CABG occurred in the rescue group at 26.7% and in the primary PCI group at 35% (p=0.36).

CONCLUSION

Based on this comparative analysis of improvement of left ventricular function between streptokinase and primary PCI, we concluded that after three months satisfactory ejection fraction is seen in patients treated with primary PCI as compared to patients treated with streptokinase.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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