Change in Left Ventricular End Diastolic Pressure (LVEDP) as apredictor of Adverse Effect in Patients undergoing Primary PCI

Osama Amin Abd- Elhamid, Akram Abdelbary, Ahmed Battah, Tarek Elgohary
Critical Care Department, Faculty of Medicine, Cairo University.
*Corresponding Author: Osama Amin Abd- Elhamid , E-mail: osamaamin130@yahoo.com

ABSTRACT

Background: in acute myocardial infarction (MI), decreasing compliance of the left ventricle is directly associated with prognosis. **Patients and Methods:** 30 patients presented with acute ST segment elevation MI Who underwent primary PCI within 12 hours of presentation. All patients were subjected to full history taking, physical examination, serial ECG, cardiac enzymes and measurement of LVEDP just before and after Primary PCI using end hole catheter. **Results:** post revascularization left ventricular end diastolic pressure (LVEDP) decreased. There is significant correlation between LVEDP change and left ventricular dysfunction (p value:0.014). Significant correlation between LVEDP and mortality are present. **Conclusion:** change in LVEDP measured just pre and post primary PCI are significantly correlated with adverse clinical outcome in patients with acute STEMI.

Keywords: LVEDP, STEMI, Primary PCI.

INTRODUCTION

The aim of reperfusion therapy for many years has focused on achieving epicardial artery patency at the site of the occlusive thrombus[1]. It is now possible, through advances in interventional techniques and adjunctive pharmacological treatment, to achieve TIMI (Thrombosis In Myocardial Infarction) grade 3 epicardial flow (normal) in 95% of patients[2]. The myocardial blush grade (MBG) has been devised for the visual assessment of myocardial reperfusion after primary percutaneous coronary intervention (PCI), and this score is an independent predictor for adverse outcome[3]. Despite this achievement, mortality, although declining, still remains high. This is possibly because despite restoration of TIMI grade 3 flow, 40% of patients do not achieve microvascular flow, which should be the goal of reperfusion therapy [4, 5]. Successful rescue PCI within 3–24 hours of the onset of chest pain has been associated with improved LV systolic function at a mean follow-up period of 22 months [6]. In this study, baseline and repeated Echocardiography were used to assess LV systolic function. Other studies of primary PCI have also reported improved LV systolic function compared to thrombolysis [7]. In acute myocardial infarction (MI), decreasing compliance of the left ventricle is directly associated with prognosis. In patients with ST segment elevation MI (STEMI), left ventricular filling pressure increase[8]. Early improvement of perfusion after MI will improve left ventricle function and decrease the infarction area, thus decreasing mortality[9].The efficacy of reperfusion treatment may be shown indirectly with electrocardiography (ECG), by regression of ST elevation, but there is a need for methods to demonstrate left ventricle and microvascular function improvement [10]. Primary percutaneous coronary intervention (PCI) is regarded as the best reperfusion model in STEMI. PCI may be used to show hemodynamic changes in the left ventricle or to measure left ventricle end-diastolic pressure (LVEDP) for evaluation of reperfusion efficacy and success.

PATIENTS AND METHODS

30 patients were prospectively enrolled in our study presented with their first STEMI event and were undergone primary PCI within the first 24 hours of presentation. **The study was approved by the Ethics Board of Cairo University.** We excluded patients with previous ischemic events, cardiogenic shock, severe valvular heart disease and patients with refractory ventricular arrhythmias. All patients were subjected to full history taking regarding risk factors for ischemic heart disease as diabetes mellitus, hypertension, hyperlipidemia, any history of other diseases or regular medications. Serial ECG was recorded, cardiac enzymes were measured, other biochemical parameters were also measured as serum creatinine, electrolytes, CBC and coagulation profile. **Primary PCI procedure:** the procedure was performed according to standard practice, un-fractionated heparin 70U/kg was used for procedural anticoagulation, both direct stenting protocol and pre-dilatation were included, invasive LVEDP measurement in the catheterization lab, on table, after performing the coronary angiography just before and after the primary PCI using an end-hole catheter in the shown technique.

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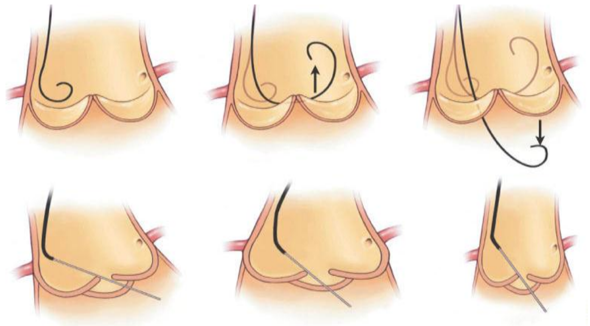

Figure 1: Technique for retrograde crossing of an aortic valve using a pigtail catheter. Top row, Technique for crossing a normal aortic valve. Bottom row, Use of a straight guide wire and pigtail catheter in combination.

Angiographic data: Angiographic data were collected including lesion location, reference vessel diameter, and severity of the culprit lesion, presence of thrombus and the presence of multi-vessel involvement. Angiographic assessment of coronary reperfusion was assessed using TIMI flow grade. ***Echocardiography:*** All patients underwent echocardiographic examination. Each patient was examined in the left lateral position according to the recommendations of the American Society of Echocardiography (ASE). The study was conducted using an ATL HDI 5000 colored echocardiographic machine using a 3.5 MHz transducer to assess LV systolic function. **Clinical Follow up:** chet pain resolution, serial ECG, serial cardiac enzymes, major Adverse Cardiovascular End points (MACE) including: life threatening arrhythmias, cardiogenic shock, reinfarction, CVS and Mortality. **Statistical analysis:** Numerical data were analyzed as mean +SD. Categorical data were analyzed as percentages .Paired comparisons were done to compare pre and post PCI recordings. Statistical analysis was done using SPSS 17.0 edition.

RESULTS

Demographic data of this study included 22 male and 8 female.

Table (1): Distribution of the studied cases as regards clinical risk factors:

Risk factors	No.	%
Non diabetic	9	31%
Diabetic	20	69%
HTN	7	24%
FH	8	28%
Smoking	23	79%
Non-smoker	6	21%

The time of presentation was varying from 2 to 14 hours, (5.9±2.7 hours). The data shows that 24 patients of this study presented with Killip class I and 8 of them with Killip class II.

Table (2): Distribution of the studied cases as regards Culprit vessel:

Culprit vessel	Frequency	Percentage
LAD	13	45%
LCX	4	14%
RCA	11	38%
MVD	1	3%

LVEDP data of the present study:

Table (3): LVEDP data of the present study:

	Mean	SD	Minimum	Maximum
LVEDP pre PCI	19.1	11.6	4	50
LVEDP post PCI	13.8	9.2	1	45
LVEDP change	-5.1	8.0	-32	13

The minimum LVEDP measured pre-PCI was 4mmHg and the maximum was 50mmHg with mean value of 19.1 and standard deviation of 11.6. Meanwhile, the minimum LVEDP measured post-PCI was 1mmHg and the maximum was 45mmHg with mean value of 13.8 and standard deviation of 9.2. **The LVEDP was tabulated according to the difference between LVEDP after and before dilatation (post-PCI minus pre-PCI LVEDP)**. So, negative value of the LVEDP change means that LVEDP has decreased, while LVEDP in positive value means that LVEDP had increased. The LVEDP change recorded showed decrease in LVEDP up to 32mmHg and increase up to 13mmHg. **LVEDP change and ST segment resolution:** Results of our study showed that patients whose ST segment resolution achieved had an LVEDP change (decrease) of -3.33± 3.26, while those with no ST segment resolution had an LVEDP change (increase) of 2.25± 2.88. Revealing that there was a statistically significant positive correlation between LVEDP change and ST-segment elevation resolution **(p value: 0.002). LVEDP change and LV dysfunction:** The present study results showed that the patients who had LV dysfunction had an LVEDP change (increased) of 3.5± 0.7, while those with no LV dysfunction had an LVEDP change (decrease) of -3.1± 3.51. So there was a statistically significant positive correlation between LVEDP change and LV dysfunction **(p value: 0.014).**

DISCUSSION

The aim of this study is to assess acute change in LVEDP in patients with acute STEMI after primary PCI as an indicator for diastolic function improvement after revascularization and comparing it with other clinical data (Chest pain, ST segment resolution, peaking of cardiac enzymes, mortality and ECHO cardiographic assessment of left ventricular function). Our study detected rapid improvement in diastolic function and decrease in LVEDP significantly after successful reperfusion **(p value: 0.001)** with no statistically significant difference between patients with either anterior or inferior STEMI **(p value: 0.51).** Regarding clinical outcome in our study, 23 patients had ST segment resolution (77%), 28 patients had chest pain resolution (93 %) and 26 (86%) patients their LV function normal while 4(14%) patients had impaired LV function. The mortality rate of our study was 10% (3 patients), 2 patients (6.7%) included in our study had recurrent ischemia. **Few studies were found to assess the acute change in LVEDP as an indicator of successful reperfusion.** Our study was compatible with the following studies: **Engin** [(11)]carried out investigations on 29 patients with acute STEMI and concludedthat a significant decreaseoccurredin LVEDP after successful reperfusion with primary PCI ($p<0.05$),withno statistically significant difference found between patients with anterior or inferior STEMI ($p=0.657$). It seems that our findings and conclusions derived through our studies are compatible with the previous results. Also**Maurice** [(12)]investigated 15 patients with acute anterior STEMI undergoing primary PCI and concludedthatOnline PV loop assessment during primary PCI showed that coronary reperfusion caused an immediate improvement in diastolic function by increasing LV compliance and in systolic function by increasing apical contractility in STEMI patients which are compatible with our study. Our results regarding acute change in LVEDP agreed with those of **Amr** [(13)] who conducted 30 patients with acute anterior STEMI with significant decrease in LVEDP after Primary PCI. Our study showed that acute change in LVEDP was not an independent predictor of in-hospital outcome and this may be explained by: exclusion of high risk patients, either systolic or diastolic indexes reflected instantaneous measurements, and could vary across the ACS period. Therefore a single measurement might not reflect the best prognostic index, there were no reports on the diastolic function previous to the index ACS admission, nor there a noninvasive echocardiographic assessment of the mitral inflow.

CONCLUSION

Change in LVEDP measured just pre and post primary PCI are significantly correlated with adverse clinical outcome in patients with acute STEMI.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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