



THE EFFECT OF PERCUTANEOUS CORONARY INTERVENTION ON THE EJECTION FRACTION OF LEFT VENTRICLE

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Submission Date : 29-04-2019
Revision Date: 19-09-2019
Publication Date: 02-11-2019

Author's Contribution

IF: Conducted The effect of percutaneous coronary intervention on left ventricular ejection fraction in local population, audit and presented at regional audit, wrote the article. QAS: Helped in conduction, echo performing, wrote, audit and reviewed the article as a whole and consultants incharge of the audit and gave frequent advice, corrections and did the proof reading. AK: Re-arranged data and corrected article. AM: consultants incharge of the audit and gave frequent advice, corrections and did the proof reading also. QMT: Helped in Re-arranging data and corrected article. HB: Tables. AH: Tables and figures. MAR: Helped in analysis of data and typing

All authors declare no conflict of interest.

This article may be cited as: Iftikhar, Saboor QA, Khan A, Malik A, Tufail QA, Bashir H, Hilal A, Rehmaan MA. The effect of percutaneous coronary intervention on the ejection fraction of left ventricle. (J Cardiovasc Dis 2019;15(3):68 - 72)

ABSTRACT

BACKGROUND & OBJECTIVE: To see the effect of percutaneous coronary intervention (PCI) on ejection fraction (EF) of left ventricle in patients of ST segment elevation myocardial infarction.

MATERIAL & METHODS: This Quasi experimental study done at Cardiology department of Sheikh Zayed Hospital, Lahore during the period of one year from October 2015 to October 2016. 56 ST elevation myocardial infarction (STEMI) patients were included in the study who underwent PCI. There pulse and blood pressure were recorded. The information regarding myocardial infarction and peripheral vascular disease was noted. 2D Simpson's bi-plane method was used on echocardiography to determine the left ventricular ejection fraction (LVEF) before the interventional procedure and then after PCI during hospital stay. The comparison of LVEF before and after PCI was compared by using paired sample t-test. Significant p value was considered as ≤ 0.05 .

RESULTS: Before PCI, 47.61 ± 4.32 was mean LVEF while after PCI, 51.61 ± 4.31 was mean LVEF. Paired t-test was used and it was inferred that there is appreciable mean difference between LVEF before and after intervention ($p < 0.000006$).

CONCLUSION: This study demonstrated that LVEF improves after PCI in STEMI patients with reduced LVEF. Thus PCI should be offered to every patient of STEMI with reduced LVEF.

KEY WORDS: Percutaneous coronary intervention, ejection fraction, myocardial Infarction.

(J Cardiovasc Dis 2019;15(3):68 - 72)



INTRODUCTION

Left ventricular systolic function after myocardial infarction is assessed by doing echocardiography. Multiple parameters like left ventricular after load, preload and valvular abnormalities can effect the determination of Left ventricular systolic function.^{1,2}

The normal ejection fraction ranges between 50-65%.³ The prognostic value of left ventricular dysfunction after myocardial infarction has been mentioned in many previous studies. The presence of left ventricular dysfunction is linked with worse outcome during hospital stay in post MI patients.⁴

Left ventricular dysfunction is present in 10-30% of patients who undergo coronary intervention (PCI).⁵ Patients with diabetes, renal failure and those with age more than 70 usually have LV dysfunction after myocardial infarction.⁶⁻⁷ This LV dysfunction is associated with poor outcome and it can be improved with early revascularization by doing PCI.⁸⁻¹⁰ The success of PCI can be measured by using thrombolysis in myocardial infarction (TIMI) grading system. The procedural success may lead to improvement in survival rates.¹¹⁻¹³

After successful percutaneous coronary intervention, improvement in ejection fraction starts within 24 - 48 hours of PCI.¹⁴ Nozari et al conducted a study of 115 patients with mean age of (57.8±8.38) years. The mean ejection fraction during 3 stages of measurement were 40.52±6.36 in stage 1 before PCI, 41.83±7.14 in stage 2 one day after PCI and in stage 3, 44.0±7.89 from 3-6 months after PCI. Ejection fraction significantly increased during 3 stages of measurements which is statistically significant (p 0.0001).¹⁴ A study of sixty patients reported to assess the impact of ejection fraction on the outcome of PCI and the impact of PCI on EF. This study showed that patients without history of previous MI had significant improvement after interventional procedure (62.30 ± 5.52 vs. 46.63 ± 6.4%, p < 0.001).¹⁵ This study was done to see the effect of coronary intervention on the ejection fraction of left ventricle.

MATERIAL AND METHODS:

This Quasi experimental study done at Cardiology department of Sheikh Zayed Hospital, Lahore over a period of one year i.e from October 2015 - 2016. 56 ST elevation myocardial infarction (STEMI) patients were included in the study who underwent PCI. Sample size was calculated by taking confidence interval as 95%, power of test 80% with expected LVEF 40.52±6.36 and 41.83±7.14

before and after PCI. The patients undergoing PCI after STEMI (was defined as typical chest pain with raised cardiac biomarkers taken as 99th percentile of assay) regardless of gender with age between 40 -80 years with LVEF less than 55% were enrolled. The patients with previous ischemic heart disease, valvular heart disease, renal/hepatic failure, respiratory disorders like COPD and patients on inotropic support were excluded from the study. There pulse, blood pressure and risk factor profile were recorded. The information regarding myocardial infarction and peripheral vascular disease were noted. 2D Simpson's bi-plane method was used on echocardiography (on Toshiba machines, Aplio and Xario) to determine the LVEF before intervention and then after PCI prior to discharge. The LVEF was graded as fair (>45 to <55%), moderate (EF≥35 to 45%) and mild (EF>35%). The comparison of LVEF before and after PCI was compared by using paired sample t-test. Significant p-value was considered as ≤0.05.

SPSS version 22.0 was used to analyze the data. Variables like pulse, age, temperature, respiratory rate, blood pressure were expressed with Mean ± SD. Variables like gender, diabetes, hypertension, smoking, obesity, dyslipidemia and family history of CAD were expressed as frequencies and percentages. LVEF of patients before intervention was compared with LVEF of patients after PCI by using paired sample t-test.

RESULTS:

56 cases included in the study showed mean age of 60.73 ± 12.12 years ranging between 40 - 80 years. Males were 30 (53.60%) and females were 26 (46.40%). There were 11 (19.60%) patients between 40-50 age group, while 8 (14.30%), 20 (35.70%), 17 (30.40%) were between 51-60, 61-70 and 71-80 age groups respectively.

50 patients i.e, 89.30% had STEMI. Cardiac arrhythmias were present in six (10.70%) patients. Stroke and peripheral vascular disease was not reported even in a single patient.

There were 40 (71.40%) diabetics while frequency of hypertension was 40(71.40%). Smoking was reported in 36 (64.30%) patients while dyslipidemia was present in 50 (89.30%). 30 (53.60%) patients had family history of IHD and obesity.

The average pulse rate was 90.84 ± 11.71 per minute with range 70 - 110. Mean temperature was recorded as 98.6 ± 0.17 °C with range 98.4 - 99.0 °C.

Before PCI the mean LVEF was 47.61 ± 4.32 % ranging between 40 - 54 %. After PCI the

Table-1: Risk factors distribution

Risk Factors		Frequency	Percent
Diabetes Mellitus	Yes	40	71.40
	No	16	28.60
Hypertension	Yes	40	71.40
	No	16	28.60
Smoking	Yes	36	64.30
	No	20	35.70
Dyslipidemia	Yes	50	89.30
	No	6	10.70
Family history of CAD	Yes	30	53.60
	No	26	46.40
Obesity	Yes	30	53.60
	No	26	46.40

Table-2: Mean ± SD. of different variables

Statistics	Age (years)	Pulse Rate (bpm)	Respiratory Rate (pm)	Temperature (°C)
Mean	60.73	90.83	22.01	98.6
Median	62.50	91.00	21.50	98.6
Std. Deviation	12.11	11.70	4.25	0.17
Minimum	40.00	70.00	16.00	98.4
Maximum	80.00	110.00	29.00	99.0

Table-3: Mean ± S.D. of LVEF

Statistics	LVEF before PCI (%)	LVEF after PCI (%)
Mean	47.60	49.60
Median	49.00	51.00
Std. Deviation	4.31	4.31
Minimum	40.00	42.00
Maximum	54.00	56.00

Table-4: LVEF before & after PCI and its mean difference comparison

Paired Samples Statistics	N	Mean	Std. Deviation	Std. Error Mean	P-value
LVEF before PCI	56	47.60	4.31	0.57	0.000006
LVEF after PCI	56	51.60	4.38	0.58	

mean LVEF was $51.61 \pm 4.31\%$ ranging between 42 - 58%. There was noticeable mean difference between LVEF before and after PCI ($p < 0.000006$) by applying paired t-test. (Table 1,2,3 & 4)

DISCUSSION:

ST segment elevation myocardial infarction occurs due to thrombotic occlusion of coronary arteries and this leads to left ventricular systolic dysfunction. LV systolic / dysfunction is a strong predictor of morbidity and mortality. Mostly middle aged population presents with acute coronary syndrome. Mandal et al in his study showed that mostly middle aged males most commonly present with STEMI. In his study, approximately 60% were males of middle age. Similar sort of findings were present in our study.^{16,17,18}

There are many predisposing risk factors for ischemic heart disease like diabetes, hyperten-

sion, smoking, family history and dyslipidemia etc. Mahajan et al has reported hypertension to be the most common risk factor followed by diabetes and family history. In the study conducted, smoking and dyslipidemia were found to be most common predisposing risk factors. Other important risk factors noticed in the study were diabetes and family history. These findings are in contradiction to the study by Mahajan et al.¹⁹

Regarding the post MI ejection fraction, it usually declines after the acute emergency but can be improved by proper and adequate early revascularization procedures including coronary artery bypass surgery or percutaneous coronary intervention. This observation was also demonstrated in a study conducted by Seyed et al.²⁰

He also reported that LV ejection fraction improves after early and adequate revascularization by PCI and the parameters for assessment of systolic function of LV also showed significant improvement. Similar findings were recorded in the present study showing improvement in LVEF after PCI ($p < 0.000006$).

In another study by Nozari et al.²¹ it was concluded that when ejection fraction declines after MI and Echocardiographic parameters are disturbed, the LVEF improves after PCI. He recorded the LVEF after MI and after PCI. A follow up of 6 months was done in the study. Silva et al. and Buszman et al. have shown in their studies that revascularization leads to improvement of LVEF.^{22,23}

In other studies by Ioannidis et al. and Nechvatal et al. an improvement of LVEF was shown after PCI.^{24,25} Rimmelink et al. reported²⁶ an improvement in LVEF from 48 ± 1 to 52 ± 1 which was also shown by Agirbasli et al. study.²⁷

Many studies done on chronic total occlusion of coronary arteries have shown no significant improvement of LVEF when compared with medical treatment. Banerjee et al. in his study also showed similar kind of results and favored medical treatment in patients with chronic coronary artery disease.²⁸

Carluccio et al. reported improvement in LVEF and diastolic dysfunction after PCI (from 32% to 43%; $P = 0.0004$).²⁹ The discrepancy shown in above study may be due to time interval between MI and PCI. Tanaka et al. included 27 patients, almost all patients showed improvement in LVEF after PCI.³⁰ Regarding the achievement of various results in current and previous studies in one hand, and many influencing factors such as (interval between MI and PCI), LVEF before and after PCI, on the other hand it seems, further long term investi-



gation is required for obtaining more meaningful findings.

CONCLUSION:

This study demonstrated that LVEF improves after PCI in STEMI patients with reduced LVEF. Thus PCI should be offered to every patient of STEMI with reduced LVEF.

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