

Outcomes of Left Main Percutaneous Coronary Intervention

SALEEM ULLAH¹, SAMIULLAH², MUHAMMAD ABBAS KHAN³, JAVED KHURSHED SHAIKH⁴, GULZAR ALI BURIRO⁵, SYED NADEEM HASSAN RIZVI⁶

¹MBBS, FCPS Cardiology Fellowship in Interventional Cardiology National Institute of Cardiovascular Disease, Karachi.

²MBBS, FCPS CARDIOLOGY, Fellowship in Interventional Cardiology National Institute of Cardiovascular Disease, Karachi.

³MBBS, FCPS Cardiology Fellow Interventional Cardiology, Hayatabad Medical Complex Peshawar

⁴MBBS, FCPS (General Cardiology), MSPH Assistant professor Department of Cardiology, National Institute of Cardiovascular Disease, Karachi.

⁵MBBS, FCPS (Cardiology) Post Fellow (Interventional cardiology) Assistant Professor Department of Cardiology, National Institute of Cardiovascular Disease, Karachi

⁶MBBS, DIP, CARD, MRCP, FRCP, FACC, FAIC (Supervisor), Professor Interventional Cardiology NICVD Karachi

Corresponding author: Saleem Ullah, Email: Drsaleem.kmc@gmail.com, Cell: 0344-8884600

ABSTRACT

Objective: The objective of this research is to assess the efficacy of left main coronary artery (LMCA) revascularization and to document the outcomes for patients who underwent this procedure.

Methodology: The National Institute of Cardiovascular Diseases (NICVD) in Karachi conducted a cross-sectional study from January 2018 to December 2019 and discovered that participants had a decreased risk of developing heart disease. All patients aged 18 and above who received percutaneous LMCA revascularization at the study location were considered for inclusion. We evaluated patient outcomes in the hospital by charting and doing telephonic follow-ups for one year. Regarding quantitative variables, the results were expressed as means and standard deviations, and concerning qualitative variables, as percentages.

Results: The study center treated 95 patients with LM PCI during the study period. 68 (71.5%) of the people who had LM PCI had unprotected LM. LM PCI was most commonly performed on 44 patients (46.3%) presenting with unstable angina. Ninety-one (95.7%) patients required PCI due to native LM illness, while four patients (4.2%) underwent LM PCI as a rescue treatment. There were 41.7 ± 26.9 months of follow-up on average. Participants were followed up on average for 41.7 ± 26.9 months, and they were admitted to the hospital on average for 4.45 ± 3.2 days. The death rate in the hospital was 12.6%, and this was followed by the mortality rate at 1 year and a mean follow-up of 7.5% and 6.7%, respectively.

Conclusion: Hemodynamically unstable patients, or those who cannot have bypass surgery for various reasons, have a successful therapy option in Pakistan: LM percutaneous coronary intervention. It may be necessary for the future to conduct prospective studies to evaluate whether PCI can be used to treat LM lesions when compared with existing treatments.

Keywords: Percutaneous coronary, Intervention Coronary artery disease, Intravascular ultrasound, Left main coronary artery.

INTRODUCTION

The left main (LM) is stenotic in approximately 3–5% of coronary angiographies.¹ In patients with a critical LM lesion, stenosis of greater than 50% threatens at least 75% of the myocardium, resulting in significant mortality.² According to numerous research, coronary artery bypass grafting is the primary therapy for left main stenosis (CABG).^{3–6} It has been examined several times since the invention of percutaneous coronary intervention (PCI) whether PCI is equivalent to bypass surgery for treating left main interventions. Early attempts in LM PCI employed bare-metal stents and plain old balloon angioplasty (POBA), but they had disastrous outcomes.^{7,8} Recent data have been given to the scientific community supporting the use of drug-eluting stents (DES) for revascularization of the LM artery in patients with severe LM disease, and studies reveal that this approach provides revascularization with similar long-term outcomes to CABG.^{9–12} However, information on the clinical results of left main PCI is scarce in Pakistan. The purpose of this study is to address this knowledge gap by sharing the results of our LM-PCI procedures at the National Institute of Cardiovascular Diseases (NICVD) in Karachi.

This study sought to regulate whether LM PCI results in improved mortality, both in-hospital and post-discharge. The secondary aim of the research was to track long-term outcomes for patients who had received LM PCI, such as the occurrence of angina, myocardial infarction, repeat revascularization, stroke, and heart failure.

MATERIAL AND METHODS

The National Institute of Cardiovascular Diseases (NICVD) Karachi conducted this cross-sectional study from January 2018 to December 2019 after receiving approval from the hospital's Ethics Review Committee. Revascularization of the LMCA was performed on all adult patients aged >18 years old. We identified patients with percutaneous left main coronary artery revascularization from cardiology cauterization laboratory records who had undergone LMCA revascularization. Information relevant to the goals of the

study was gathered using a prefabricated form. After getting informed permission, we gathered data on the specifics of the procedure, mortality, and morbidity from the patient's notes or by calling them afterward.

Statistical Analysis: The data were analyzed with SPSS version 20.0, and the results were provided as means, standard deviations, and percentages for quantitative variables, and frequency and percentages for qualitative variables.

RESULTS

The study center treated 95 patients with LM PCI during the study period. Unprotected LM was found in 68 (71.5%) patients suffering from LM PCI. LM PCI was most commonly performed on 44 patients (46.3%) presenting with unstable angina. Ninety-one (95.7%) of the patients had LM illness that required PCI, and four (4.2%) of the patients received LM PCI as a last-resort measure. There were 41.7 ± 26.9 months of follow-up on average.

Before PCI, all patients underwent CABG surgery by a cardiothoracic surgeon. Twenty-two patients (23.1%) were deemed unfit for CABG due to hemodynamic instability, coexisting comorbidities, extreme aging, or extreme risks associated with the surgery. Patients or their families opted for LM PCI over CABG in 73 cases (76.8%). A majority of 89 patients (93.6%) underwent LM PCI via the femoral route. The distal LM PCI in 75 patients (78.9%) was performed along with the PCI in 77 patients (81.0%) who also needed PCI in other vessels. **Table I** gives the baseline characteristics of patients, and **Table II** gives the procedural details of PCI.

At the time of death, 29.4% of patients had died, with a mean death time of 21.13 ± 25.8 months. The death of every victim was presumed to be caused by cardiovascular disease because no autopsy was performed.

There was a 12.6% in-hospital mortality rate and a mean hospital stay of 4.45 ± 3.2 days. Among the patients, all had undefended LM PCI. The mean age was 68.6 ± 12.5 years. Intubation, inotropic support, counterpulsation therapy, and intra-aortic balloon pumping were required for 10 patients who were in cardiogenic shock and not suitable for CABG due to

hemodynamic instability. A refractory cardiogenic shock was the most common reason for in-hospital mortality (6 patients). Sepsis and GI bleeding were also significant causes. Death rates at one year are 6.3% (6 patients) for the 83 patients discharged from the hospital. Distal LM stenting, which is similar to bifurcation stenting, presents a special problem. In this research, PCI to the distal LM was performed on 75 patients (78.9%). 22 people died as a result of distal LM PCI at the average follow-up (23.1 %). Individuals receiving distal LM PCI had an in-hospital death rate of 10 patients (10.5 %). Target lesion revascularization was necessary for 5 patients (5.2%) receiving distal LM PCI, but not in any patients undertaking PCI to the LM ostium or shaft. IVUS was performed on 33 patients (34.7%) undergoing LM PCI; 8 (8.4%) mortalities were discovered during follow-up. Twenty-one (22.1%) of the patients who underwent IVUS at the time of LM PCI was still alive at follow-up, although four cases were not found. Eleven patients (11.5%) had MI at the mean follow-up following the index surgery, four patients (4.2%) needed repeat target lesion revascularization, and eight patients (8.4%) experienced congestive heart failure. No patients experienced a stroke. All patients who were still alive after a median follow-up time of 3 months or more adhered to their treatment plans, which included both aspirin and clopidogrel. Among the 10 patients with MI, 10 (10.5%) underwent distal LM PCI, 4 (4.2%) underwent distal LM bifurcation stenting, and 6 (6.3%) underwent left main to LAD crossover. Following angiograms, 4 patients with in-stent restenosis (ISR) in the left main stent were identified (4.2 %). All patients with ISR underwent distal LM stenting, two of whom underwent LM-LAD crossover surgery and two of whom underwent bifurcation stenting. The average diameter of the DES implanted in each patient who developed ISR was 3.14 ± 0.56 mm, and the average balloon size used for post-dilatation was 4.0 ± 0.50 mm.

Table 1: Demographic details of the Left main – Percutaneous coronary intervention patients (n=95)

Demographic details of the patients	N (%)
No of cases	95
Age in years	67.05 \pm 11.6
Male	65 (68.4%)
Female	30 (31.5%)
Unprotected Left main	68 (72.1%)
Risk factors	
HTN	87 (91.5%)
Dyslipidemia	46 (48.4%)
DM	58 (61.0%)
Smoking	31 (32.6%)
Chronic kidney disease	15 (15.7%)
On Hemodialysis	7 (7.3%)
dysfunction Dysfunction	46 (48.4%)
Presentation	
ST elevation myocardial infarction	18 (18.9%)
Non ST elevation myocardial infarction.	33 (34.7%)
Angina	44 (46.3%)
Cardiogenic shock	18 (18.9%)
Intubated patients	17 (17.8%)
Cardiac arrest	9 (9.4%)

Table 2: Procedure details of LM-PCI (n=95)

Procedure details	N (%)
Emergent Percutaneous coronary intervention	24 (25.2%)
Percutaneous coronary intervention of other vessels along with Left main	77 (81.0%)
Type of stent in Left main	
Drug-eluting stents	78 (82.1%)
Bare metal stents	15 (15.7%)
Covered stent	1 (1.0%)
Drug eluting balloon	1 (1.0%)
Complications during Percutaneous coronary intervention	
Dissection	17 (17.8%)
No reflow	3 (3.1%)
Distal Left main Percutaneous coronary intervention	75 (78.9%)

Ostial Left main Percutaneous coronary intervention	20 (21.0%)
Percutaneous coronary intervention Technique	
Left main to Left anterior descending artery crossover	46 (48.4%)
Simultaneous kissing stenting	9 (9.4%)
CULOTTE	4 (4.2%)
Left main to Left circumflex artery crossover	9 (9.4%)
Left main Stenting only	25 (26.3%)
Intravascular ultrasound	33 (34.7%)
IABP placement	22 (23.1%)
Temporary pacemaker placed	15 (15.7%)
Inotropic support	22 (22.1%)

DISCUSSION

It is recommended that CABG is the treatment of choice for critical left main disease. As a class I recommendation, CABG is also the treatment of choice for LM illness, based on the published literature. Patients who do not qualify for surgical revascularization because of left main disease¹³ or who refuse CABG are not left out of the recommendations' consideration of LM PCI as a therapeutic option.

Recent studies show no differences in the management of left main disease between PCI and CABG.¹⁰⁻¹⁵ DES of a newer generation and dual antiplatelet therapies have been credited primarily for this accomplishment of PCI to LM. There has been significant progress in LM stenting using drug-eluting stents, as numerous registries about LM stenting with DES have demonstrated positive outcomes.

There was a 29.4% mortality rate at mean follow-up in the present study. At our center, most of the patients who underwent LM PCI were elderly (mean age 65 ± 13.6 years), in cardiogenic shock (18.9%), and deemed ineligible for CABG (23.1%). PCI through the left main unprotected (UPLM PCI) is usually used in emergencies when an invasive procedure is not an option. Thus, adverse clinical presentations also influence outcomes, rather than procedures themselves. In previous studies, unprotected LM (UPLM) was found to be an important predictor of mortality.¹⁶⁻¹⁸ The mortality rate for UPLM patients was 23.1% in this study. This high MACE rate can be explained by the fact that 81.0% of patients undergoing UPLM PCI also had significant disease affecting vessels other than the LM. There is an inherent heavy burden of atherosclerosis in this group which causes a high incidence of adverse events.

It was found that 22 patients (23.1%) died following distal LM PCI, and 4.2% of repeat angiogram patients had ISR. In this study, PCI of lesions including the shaft or ostium of the LM had better outcomes than PCI of other lesions.^{19,20} In addition, studies have reported that MACE and repeat revascularization for distal LM lesions are significantly linked to PCI.²¹ The significant death rate of PCI patients with distal LMS could be related to the distal LM's complicated architecture. Diffuse illness in the left main system might necessitate the placement of smaller stents. This gap appears to be attributable to subjective judgment on the part of the operators, given there are no population-based benchmarks for minimal surface area (MSA) and minimal luminal diameter. A modest final MSA determined by IVUS after LM-PCI was highly related to unfavorable outcomes, according to EXCEL's analysis of the trial's long-term follow-up.²² This study's main limitation is its retrospective design. Because not all patients were eligible for angiographic follow-up, it was impossible to estimate the real rate of restenosis. The data regarding fourteen patients could not be retrieved because they were lost to follow-up.

CONCLUSION

Patients with hemodynamic instability who need immediate revascularization are the primary candidates for percutaneous coronary intervention (PCI) of the left major coronary artery. Although CABG is the standard of care for treating LM lesions, percutaneous coronary intervention (PCI) of the left main coronary

artery is an alternative for patients who need urgent revascularization. LM lesions are situated anatomically in the left main, and PCI in the left main can be complex, which raises the possibility of restenosis. Planned and elective PCI of LM lesions can produce superior results with IVUS guidance, leading to a lower risk of restenosis and MACE. PCI for LM lesions in elective settings needs to be evaluated in more prospective studies.

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