PAKISTAN JOURNAL OF Cardiovascular Intervention

OPEN ACCESS

ORIGINAL ARTICLE

Short term Outcomes of left main coronary artery Percutaneous Coronary Intervention; A large tertiary care dedicated Cardiac Centre experience.

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Citation:
Ullah A, Ishaq M, Jan R, Raza A. Short term Outcomes of left main coronary artery Percutaneous Coronary Intervention A large tertiary care dedicated Cardiac Centre experience. PJCVI. 2022; 2(2): 24-30

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DOI: 10.58889/PJCVI.3.24.30

Funding:
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflicts of Interests:
The authors have declared that no competing interests exist.

Received 08/10/2022
Accepted 12/08/2022
First Published 01/12/2022

Abstract

Background: Left main coronary artery intervention is getting common throughout the world. Data in our local population are still lacking. Our aim was to study the short-term outcomes after revascularization of left main coronary artery (LMCA) at a tertiary care Centre at public sector hospital in Pakistan.

Methodology: In this descriptive study conducted at Peshawar Institute of Cardiology, we enrolled consecutive patients who underwent LMCA intervention from January 2021 till November 2021. Direct patients' interviews, reviewing charts and records were used for in-hospital outcomes and telephonic and physical follow up were used to document three months outcome. Results were expressed as means, standard deviations and percentages for different variables.

Results: Total number of patients in the study were 68. The mean age was 61 ± 11.7 years, 73.5% (50 cases) were males. Six patients (8.8%) were in cardiogenic shock and five of them were put on mechanical ventilation. Thirty-two (47.1%) patients had presentation as acute coronary syndrome (ACS) within the last seven days. Mean follow up time was 170 ± 71 days. Mortality in-hospital was 5.8%, at the mean follow up it was 8.8%.

Conclusion: Comparable short-term outcomes of left main coronary artery PCI, to national and international data can be achieved in a public sector hospital in our country where resources are scarce. Hence LMCA PCI is an acceptable alternative to CABG in suitable patients.

Keywords

Left Main Coronary Artery Disease, Percutaneous Coronary Intervention, Acute Coronary Syndrome.

Introduction

Left main coronary artery disease is reported in 3-5% of patients undergoing coronary angiography[1], others have reported it up to 10%[2]. In Pakistan, up to 10.5 % as stated by Hussain et al in 2017[3]. LMCA disease generally carries worse prognosis with high mortality as compared to other major epicardial vessel disease[4]. Coronary artery bypass graft surgery (CABG), has been the standard treatment for LMCA revascularization historically but with the advancement in percutaneous intervention techniques and equipment, percutaneous coronary intervention (PCI) is a reasonable alternative[5]. The current guidelines indicate that PCI is equally acceptable for LMCA disease with low to intermediate disease severity[6,7]. The 10 years outcome of the landmark LE MANS trial has put stenting in LMCA comparable to CABG in low to intermediate complexity anatomy[8]. Recent meta-analyses of the major trials on LMCA revascularization have concluded the same result[9,10].

The use of newer generation drug eluting stents (DES) has driven PCI comparable in terms of outcomes to CABG in LMCA revascularization[11].

In terms of percutaneous procedural options, there are a number of trials which have compared different techniques and only two trials[12,13] have shown superiority of a certain procedure only in true bifurcating lesions, although still debatable.

Data about the outcomes of left main PCI in our country is scarce. Rahman et al. (2019), reported 7.3% mortality at one year[14], while Nasir et al. (2020), reported 4.1 to 16.7% occurrence of adverse outcomes in their study with different percutaneous revascularization techniques for LMCA[15]. To the authors' knowledge this is the first study reporting outcomes of LM-PCI from a public sector hospital in our province.

The aim of this study was to evaluate in-hospital and short-term outcomes and share our experience of the LM-PCI at a public sector tertiary care hospital of the province.

Methodology

We conducted our study at Peshawar Institute of Cardiology, Peshawar, from February 2021 to November 2021. It was a cross sectional observational study. Sampling method was convenience sampling where all patients undergoing intervention of the left main coronary artery were enrolled irrespective of age and gender. An informed consent written in the national language and explained to the patient in local language was obtained. Ethical committee approval was obtained from the hospital review board. All the cases were first discussed in multidisciplinary team (MDT) meetings conducted weekly at our institute attended by the operating interventionists, cardiologists, cardiac surgeons, and anesthetists. Technique of the individual procedures were left to the discretion of the operating interventionists. Short term outcomes over a period of 3 months in terms of mortality, repeat revascularization, stroke, angina, heart failure and acute kidney injury were recorded. A predesigned proforma was used for collection of the relevant information. Patient records and telephonic or physical follow up were used to document the short-term outcomes of individual patients.

SPSS version 25 (SPSS Inc. Chicago IL, USA) was used for data analysis and results were expressed as means and standard deviation, frequencies and percentages for appropriate variables.

Results

Sixty-eight patients underwent LMCA PCI from February 2021 till November 2021. The mean age was 61 ± 11.7 years and 73.5% (50 cases) were males. Acute coronary syndrome was diagnosed in 47.1% patients at presentation, while the rest 52.9% had stable ischemic heart disease. The mean follow up was 170 ± 71 days. Four patients lost to follow up.

Native LM disease was present in 41 (60%) patients of which 6 (8.8%) patients had ostial; 5 (7.3%) had

mid-shaft lesions; 20 (30%) had distal LM disease and 4 (5.8%) had distal bifurcating disease; 6 (8.8%) had diffuse / tubular disease involving the length LMCA. Of the remaining patients 23 (33%) had provisional stenting done with stent extending from left anterior descending artery (LAD) and 4 (5.8%) from left circumflex artery (LCX). Due to the ostial involvement of LAD or LCX artery, stents were extended into the LMCA enough for appropriate proximal optimization. Thirty-one (45%) patients were turned down by the surgeon owing to their comorbidities or frailty. The most common vascular access route was the right radial artery i.e., 66% patients. PCI on vessels other than LMCA was performed in 4 (5.8%) patients in the same procedure.

Baseline characteristics are given in table 1, procedural details in table 2 and outcomes in table 3.

Mortality in our study occurred in 6 patients (8.8%). In-hospital mortality was 4 (5.8%). Out of these, 3 patients had ACS and cardiogenic shock at presentation and were on inotropic support during the procedure. Two patients (2.9%) died during the follow up period, one of which was due to covid-19 pneumonia complication 4 weeks after the procedure. Mortality among patients with distal LM disease was 12.5% (3 out of 24 patients with distal LM disease). Mean age of all the patients who died during the study period was 67 years.

Mean stent diameter used was 3.45 ± 0.35mm and mean post dilatation balloon size was 3.94 ± 0.34mm. Bifurcation stenting was done in 10 (14.7%) patients of which DK crush was the most frequently performed technique, while 85% underwent provisional stenting.

The alive patients had good dual anti-platelets (DAPs) compliance, all on clopidogrel with aspirin. Four patients lost to follow up neither could be contacted via telephone.

During the in-hospital and follow up period one patient presented with acute stent thrombosis before discharge who was treated successfully and another had probable subacute stent thrombosis who was diagnosed as acute myocardial infarction in another health care facility, but the patient succumbed to his acute condition before angiography could be done, two (3%) had recurring angina symptoms but none had relook angiography performed upon. None of the study patients had cerebrovascular accident (CVA) during the study period. Third generation drug eluting stents (DES) were used in 27 (39.7%) patients, while the rest had second generation DES stents used for their procedure. Imaging with intra vascular ultrasound (IVUS) was done in 4 (5.8%) patients.

Table 1: Baseline characteristics of Study Participants

Baseline characteristics		**N (%)**
Number of patients		68
Mean Age		61±11.7 years
Male		50(73.5)
Mean follow up (days)		170±71
Risk Factors	Diabetes	20(29.4)
	Hypertension	36(52.9)
	Dyslipidemia	4(5.8)
	Hx of CVA	7(10.2)
	CKD	1(1.47)
	Smokers	11(16.1)
	Family History	32(47)

Left Ventricular Function (EF %)	50 and above	27(39.7)
	40 to 50	24(35.3)
	Below 40	17(25)
Presentation	Acute coronary Syndrome	32(47.1)
	Stable CAD	36(52.9)
eGFR (ml/min)		90.6±8.3

*CAD (Coronary Artery Disease), CKD (Chronic Kidney Disease), eGFR (effective Glomerular Filtration Rate), Hx (History)

Table 2: Procedural details used for LMCA disease

Procedural details		**N(%)**
Native LMCA disease		41(60.29)
Lesion location in LMCA	Ostial	6(8.8)
	Mid-shaft	5(7.3)
	Distal	24(35.2)
	Tubular	6(8.8)
Access site	Radial	45(66.2)
	Femoral	20(29.4)
	Both (double stick)	2(2.9)
Vessels other than LM disease	TVCAD	31(45.6)
	DVCAD	19(28)
	SVCAD	17(25)
Procedure technique	Provisional	58(85.2)
	DK Crush	7(10.2)
	Culotte	1(1.5)
	TAP	2(2.9)
Type of Stents used DES	2nd generation	41(60.29)
	3rd generation	27(39.7)
Image used	IVUS	4(5.8)
Average No. of stents per procedure (range)		1.7(1 – 3)
Average diameter of stents in LMCA (range)		3.45±0.35 mm (2.75 – 4.0mm)
Average diameter of post dilation balloon (mm)		3.94±0.34 mm
IABP used		2(2.9)
Inotropic support		6(8.8)
Procedural complications	Dissection	none
	Perforation	none
	No reflow	3(4.4)

*DK (Double Kissing), DES (Drug Eluting Stent), DVCAD (Double Vessel Coronary Artery Disease), IABP (Intra-Aortic Balloon Pump), IVUS (Intravascular Ultrasound), LM (Left Main), LMCA (Left Main Coronary Artery), SVCAD (Single Vessel Coronary Artery Disease), TAP (T and Protrusion), TVCAD (Triple Vessel Coronary Artery Disease).

Table 3: Outcomes

Outcomes	N(%)
Deaths	6(8.8)
In-hospital	4(5.8)
Follow up period	2(2.9)
Stent thrombosis	2(2.9)
Definite	1(1.47)
Probable	1(1.47)
Angina	2(2.9)
Heart Failure	0
Acute Kidney Injury	0
Stroke	0

The majority of females, i.e., 7(16.7%) presented with acute myocardial infarction, have RBBB, while 6(12.2%) patients with RBBB were male. Similarly, 1(2.0%) single vessel disease was found in males, and 1(2.4%) was found in females. The rest of the angiographic findings were a little bit high in females as compared to males, but all of them were statistically insignificant (Table 4).

Discussion

Recent guidelines recommend CABG as the first line treatment option for LMCA disease. However, PCI to LMCA is also recognized equally acceptable in patients with low to intermediate complexity disease and in those with high surgical risk[6,7]. Most of our study population fell in the same categories.

Recent meta-analyses of the major trials of LMCA PCI showed non-inferiority of PCI to CABG except in high anatomical complexity[5,9,10].

With the advancement in stent types and the use of DAPS, PCI is increasingly becoming acceptable in LMCA disease[16]. Since the arrival of drug eluting stents (DES), the outcomes of LMCA PCI have dramatically changed as shown by different studies[11,16,17]. Almost 40% of our study population had 3rd generation stents used. As a result of the large myocardial area at risk, unprotected left main (UPLM) disease is an adverse predictor of mortality[18]. Mortality in our study was 8.8%. This figure is attributable to the fact that most of the patients were elderly, with comorbidities, some had cardiogenic shock pre-procedure and had high disease burden.

The fact that all of the patients with UPLM disease had other non-LM vessel disease in our study, hints towards the overall atherosclerotic burden of the patients. Mortality in our study among patients with distal LM disease was 12.5% (3 out of 24 patients) which is consistent with the existing literature, where CABG is the preferred strategy[19]. Ostium and mid-shaft lesions had better outcomes as shown in previous studies, comparable to CABG[11,19,20]. Mean age of all the patients who died during the study period was 67 years, all had comorbidities and multivessel disease, indicating a high-risk group per se.

Procedure type i.e., bifurcation vs single stent strategy in our study had different outcomes. Four of the total deaths in our study had bifurcation stenting done. The literature on LM-PCI, bifurcation vs single stent outcomes has persistently shown that single stent strategy is better in terms of outcomes[15,21].

The average stent diameter used in our study was 3.45 ± 0.35 mm. Stent size used can have an impact on the long-term outcomes. The mean luminal

area (MLA) after LM PCI is a predictor of long term outcomes[22] but data on MLA in our population is not available yet. The long-term outcomes of our study population who had a smaller size stent placed based on angiographic visualization needs to be followed. Moreover, IVUS is used in just 4 (5.8%) of our subjects which should have been used more liberally. Given the economic status of our local health system in public sector and newly operational hospital where we faced many logistic issues, full advantage of this modality could not be taken. A recent Indian national registry of coronary intervention has reported about 22% LM-PCI guided by IVUS in one calendar year[23] which probably reflects the same economic status as ours. In a study conducted nationally, IVUS was used in 34% patients[14] but we argue that it was conducted in a private sector hospital where the treatment cost is much higher to afford for our study population which patients from affluent economic background can afford, hence not the true representative of our local health system in the public sector.

Ours is a newly operational hospital, still in its infancy, has performed 68 LM-PCI in less than a year, a number which is proportionately greater than the studies reported nationally. Institutional PCI volume is associated with better in-hospital outcomes[24]. Our in-hospital outcomes are comparable to the local and international data. Further follow up is required to observe the long-term outcomes.

Limitations

Our study is single centered with limited sample size. Imaging is used minimum in our study owing to the economic aspect of the study population of our geographic location. Some patients had no native LM disease but had crossover PCI from LAD or LCX. Most had no angiographic follow up. Four patients lost to follow up and could not be contacted.

Conclusion

Comparable short-term outcomes of left main coronary artery PCI, to national and international data can be achieved in a public sector hospital in our country where resources are scarce. Hence LMCA PCI is an acceptable alternative to CABG. Studies with long term follow up conducted locally with larger sample size are required to further validate the results in our population.

Acknowledgment

We thank Mr. Asghar Ali, manager Cath lab, Peshawar institute of cardiology for his assistance in gathering the data.

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