Journal of Health and Rehabilitation Research 2791-156X JHRR

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Original Article

Expanded Single-Center Study: Combined Outcomes of Initial and Additional Cohorts in Left Main Coronary Artery Percutaneous Coronary Intervention

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Conflict of Interest: None.

*Khan MI., et al. (2023). 3(2): **DOI**: https://doi.org/10.61919/jhrr.v3i2.289*

ABSTRACT

Background: Coronary artery disease remains a leading cause of morbidity and mortality worldwide. Percutaneous coronary intervention (PCI), particularly on the left main coronary artery (LMCA), has emerged as a significant treatment option. Understanding the long-term outcomes of such interventions is crucial for optimizing patient care and guiding clinical decisions.

Objective: To evaluate the three-year clinical outcomes of PCI procedures performed specifically on the LMCA.

Methods: This study, conducted at the Peshawar Institute of Cardiology from April to September 2023, received ethical committee approval. Participants were identified through a review of medical records for individuals who underwent LMCA PCI. Data were collected via a pre-designed questionnaire and analyzed using SPSS version 26.

Results: The study included 75 patients, with an average age of 61.49±10.41 years, comprising 57 males (76.0%) and 18 females (24.0%). During the hospital stay, complications included thrombectomy in 1 patient (1.3%), 2 deaths (2.7%), 1 case of bleeding (1.3%), and 1 cardiac arrest successfully reverted (1.3%). Post-discharge, 2 additional deaths (2.7%) occurred within one month, and 1 patient (1.3%) experienced angina after three months. The three-year follow-up revealed a mortality rate of 6 patients (8.0%).

Conclusion: The study concludes that complications following LMCA PCI were relatively infrequent. However, it emphasizes the need for continued research to further elucidate the long-term outcomes of this procedure.

Keywords: Angina, Coronary Artery Disease, Left Main Coronary Artery, Mortality, Percutaneous Coronary Intervention, Thrombectomy, Vascular Complications

INTRODUCTION

Percutaneous Coronary Intervention (PCI), also known as coronary angioplasty or coronary stenting, is a widely utilized medical procedure to treat coronary artery disease (CAD) (1). Recognized as a common and effective method, PCI restores blood flow to the heart muscle and alleviates symptoms associated with CAD (2). The use of drug-eluting stents in PCI has been established as a viable therapeutic option for individuals diagnosed with left main coronary artery disease, as evidenced by multiple studies (3-6). The left main coronary artery, supplying blood to a substantial portion of the heart, is of significant importance (7). Historically, left main disease has been regarded as high-risk, with coronary artery bypass grafting (CABG) often being the preferred treatment (8).

Left main coronary artery disease (LMCAD) is identified in up to 10% of individuals undergoing coronary angiography. This condition is linked to a reduced lifespan and significant disability (9). Unprotected left main coronary artery disease (ULMCAD) is hemodynamically characterized by the presence of ≥50% stenosis in the left main coronary artery without patent bypass grafts to its branches (10, 11). Representing a more complex form of coronary artery disease, ULMCAD is associated with poorer treatment outcomes compared to lesions in other parts of the coronary tree. Addressing ULMCAD requires invasive therapeutic approaches for revascularization to prevent major adverse cardiac and cerebrovascular events (MACCE) (12, 13). Approximately 3-5% of all coronary angiograms reveal visualized stenosis in the left main (LM), and a stenosis exceeding 50% in the LM is associated with significant mortality, as a critical LM lesion jeopardizes at least 75% of the myocardium (14, 15). This study was conducted to evaluate the long-term clinical outcomes of left main PCI in a specialized healthcare setting, aiming to provide valuable insights into the effectiveness, safety, and durability of this intervention and potentially inform clinical practice and decision-making in the field of

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interventional cardiology. The focus is on investigating the three-year clinical outcomes associated with PCI procedures specifically performed on the left main coronary artery.

MATERIALS AND METHODS

The study was designed as a longitudinal observational cohort and conducted at the Peshawar Institute of Cardiology, Pakistan, over a period of six months, from April to September 2023. The primary aim was to observe the outcomes in patients diagnosed with significant left main coronary artery disease (LMCAD), confirmed through coronary angiography. The study enrolled patients between the ages of 18 to 80 years who had undergone left main percutaneous coronary intervention (PCI) as either a primary or staged intervention. Additionally, the study focused on women presenting with a range of clinical symptoms indicative of stroke, such as sudden onset of weakness, numbness, or difficulty speaking, and those with diverse vascular etiologies contributing to stroke.

The exclusion criteria were stringent to ensure the safety and appropriateness of the interventions. Patients with contraindications for PCI, such as severe allergies to contrast media, coagulation disorders, or other medical conditions making PCI unsafe, were excluded. Also excluded were patients with left main lesions deemed unsuitable for PCI due to factors like the length or calcification of lesions, or lesions requiring coronary artery bypass grafting (CABG). Patients with a history of CABG, severe comorbidities like end-stage renal disease and advanced liver disease, and pregnant women were not considered for this study.

Following ethical approval from the hospital's ethical committee, the study was initiated. A total of 75 patients were enrolled and underwent a comprehensive physical and clinical examination. The participants were identified through medical records of the hospital as individuals who had previously undergone PCI of the left main coronary artery (LMCA). Data collection was conducted using a pre-designed questionnaire. For data analysis, SPSS version 26 was employed.

The study's methodology was designed to ensure a thorough and humane approach to understanding the complexities of LMCAD and the impacts of PCI. The use of a structured, yet empathetic approach to patient inclusion and data collection reflects the study's commitment to producing high-quality, medically relevant research while maintaining respect and care for the participants.

RESULTS

In this study, a total of 75 patients were enrolled, with a mean age of 61.49±10.41 years. The cohort comprised 57 males (76.0%) and 18 females (24.0%). Regarding comorbidities, 27 patients (36.0%) were suffering from hypertension (HTN), 7 (9.3%) from diabetes mellitus (DM), 1 (1.3%) from both HTN and DM, 11 (14.7%) from HTN and hyperlipidemia, 1 (1.3%) from HTN, DM, and hypercholesterolemia, and 2 (2.7%) from DM and hypercholesterolemia. Additionally, 7 patients (9.3%) had a history of cerebrovascular accident (CVA), 33 (44%) had a family history of coronary heart disease, and 11 (14.7%) were smokers.

Detailed information about the left ventricular ejection fraction, disease location in the left main stem (LMS), clinical setting, vascular access, and types of stents used are provided in Table 2. The follow-up outcomes, also mentioned in Table 2, indicated that 1 patient (1.3%) underwent thrombectomy. During the hospital stay, 2 patients (2.7%) died, 1 (1.3%) suffered from bleeding, and 1 (1.3%) experienced cardiac arrest but was successfully revived. One month after the procedure, an additional 2 patients (2.7%) died. Three months post-procedure, 1 patient (1.3%) suffered from angina. After a three-year follow-up, the study noted a mortality rate of 6 patients (8.0%).

Table 1 Mean age of all enrolled Patient (n=75)

Variables	Mean±SD
Age (Years)	61.49±10.41
Creatinine	1.06±0.28

Table 2 Characteristics of all the enrolled patients (n=75)

Gender	Frequency	Percentage
Male	57	76.0
Female	18	24.0
Comorbidities		
HTN	27	36.0

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Gender	Frequency	Percentage
DM	7	9.3
Hyperlipidemia	1	1.3
HTN and DM	11	14.7
HTN, DM and Hypercholesterolemia	1	1.3
DM and Hypercholesterolemia	2	2.7
Prior CVA	7	9.3
Family History	33	44.0
Smoker	11	14.7
LV ejection fraction		
50 and above%	31	41.3
40% and above	26	34.7
below 40%	18	24.0
Disease location in LMS		
Osteal LMS	5	6.7
Midshaft LMS	5	6.7
Distal LMS	25	33.3
Distal Bifurcating	2	2.7
Tubular	6	8.0
Other Vessels		
SVCAD	20	26.7
DVCAD	22	29.3
TVCAD	33	44.0
Clinical Setting		
Stable Ischemic Heart Disease	39	52.0
Acute coronary syndrome	36	48.0
Vascular access		
Right Radial	46	65.3
Right Radial and Right Femoral	1	1.3
Right Femoral	25	33.3
Image or Physiology used		
IVUS	3	4.0
Stent 1 type		
Promus Premier	29	38.7
Xience prime	28	37.3
Resolute Onyx	3	4.0
Resolute Integrity	15	20.0
Stent 1 diameter (Mean±SD)	3.4200±0.36	
Stent 1 Length (Mean±SD)	30.34±6.8	
Stent 2 type		
Promus Premier	28	37.3
Xience prime	31	41.3
Resolute Integrity	16	21.3
Stent 2 diameter (Mean±SD)	2.8333±0.37	
Stent 2 Length (Mean±SD)	27.54±6.94	

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Table 3 Follow up study of the enrolled patients (n=75)

	Frequency	Percentage
Thrombectomy	1	1.3
In hospital complication		
Death of the patient	2	2.7
Bleeding	1	1.3
Arrest on table, reverted	1	1.3
Complications over the next 1 months		
Death of the patient	2	2.7
Complications over the next 3 months		
Angina	1	1.3
Complications over the next 6 months		
None	100.0	100.0%
Complications over the next 3 years		
Death of the patient	6	8.0

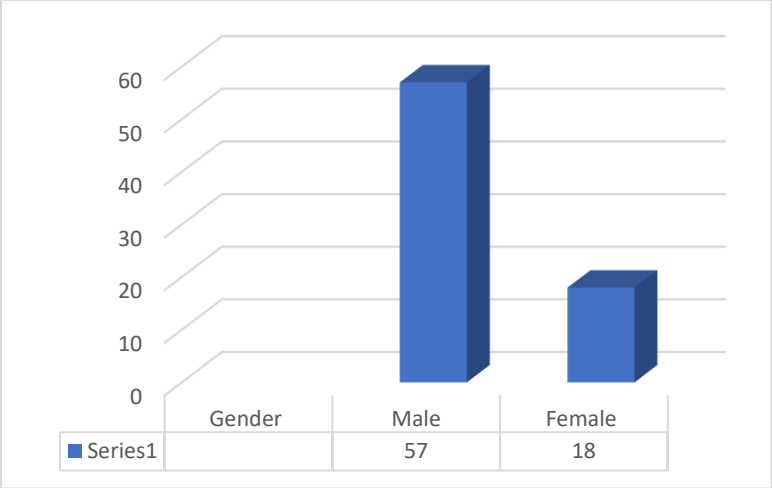

Figure 1 Graph showing gender distribution

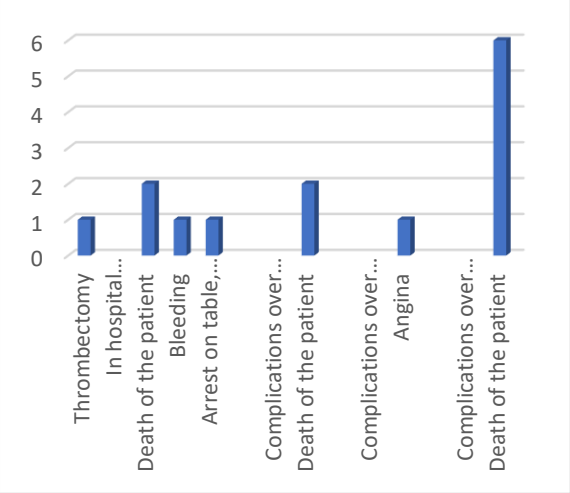

Figure 2 Bar graph showing distribution of patient's outcomes during follow up

DISCUSSION

CABG is considered the preferred treatment for critical left main disease (16). Nevertheless, the guidelines acknowledge LM PCI as an alternative therapeutic approach for left main disease in situations where patients are deemed unsuitable for surgical revascularization or choose to decline CABG. The choice between CABG and PCI for left main disease is influenced by various factors, including the patient's overall health, the extent and location of coronary artery disease, and individual clinical characteristics.

In the present study, 10 patients (13.3%) died during follow-up. Of these, 2 patients (2.7%) died in the hospital, 2 (2.7%) within the next month, and 6 during the 3-year follow-up. This mortality rate might be attributed to the higher prevalence of elderly patients, with a mean age of 61.49±10.41 years, undergoing left main percutaneous coronary intervention (LM PCI) at our center. Contrasting with our findings, Muhammad Nasir Rahman et al. reported a 29% mortality rate, while G.W. Stone et al. noted a 10.0% mortality rate during follow-up (16). Six randomized trials demonstrated that PCI using drug-eluting stents had more favorable outcomes than coronary artery bypass grafting (CABG) at the one-year mark, particularly with a lower incidence of periprocedural adverse events and quicker recovery (4, 5, 17).

In our study, most patients were male (76.0%), with the remainder being female. Several risk factors contributed to fatal outcomes, including hyperlipidemia, hypertension (HTN), diabetes mellitus (DM), hypercholesterolemia, prior cerebrovascular accident (CVA),

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family history, and smoking. These risk factors are known to lead to worse outcomes. Interestingly, about 40.0% of patients had a family history of coronary heart disease, which could have influenced the high occurrence of adverse events.

During the follow-up, only 1 patient (1.3%) required thrombectomy, a procedure used to remove blood clots from vessels (16). Thrombectomy and PCI are integral in cardiovascular care, particularly for addressing blockages in coronary and cerebral arteries. In this study, only 1 patient (1.3%) experienced significant bleeding post-PCI, a recognized complication of the procedure (18, 19). Another critical observation was that only a small number (1.3%) of patients experienced a cardiac arrest during the procedure, which was successfully reverted (20). After six months, no complications were noted in our enrolled patients, with complications being confined to the hospital stay and during the first and third months of follow-up.

CONCLUSION

The study's findings suggest that complications following percutaneous coronary intervention (PCI) on the left main coronary artery were relatively infrequent. Nonetheless, to gain a deeper understanding of the clinical outcomes of PCI in this specific context, additional research is warranted. Future studies could provide more comprehensive insights and potentially enhance treatment strategies for patients with left main coronary artery disease.

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