



Original Article

Outcome of Left Anterior Descending Coronary Artery Ostial Lesions Treated with Drug-Eluting Stents

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ABSTRACT

Patients with severe Left Main Stem (LMS) stenosis have very high risk of major cardiovascular events because of the extent of myocardium suffering ischemia. Coronary artery disease of left main stem is not very common but key cause of characteristic coronary artery disease. Such stenosis is usually treated with CABG which is the gold standard treatment. **Objective:** To determine the outcome of left anterior descending coronary artery ostial lesions stenting with drug-eluting stents. **Methods:** The descriptive case series was conducted at a teaching hospital in Lahore, from 01-08-2019 to 29-07-2020. After informed consent 113 patients were included in study; both genders and diagnosed cases of LAD ostial disease, keeping in view inclusion and exclusion criteria. Then patients were admitted in cardiology wards after recording demographic data. Next day, the patients underwent angioplasty under local anesthesia. After procedural success patients were followed-up there for 3 days to assess if there was repeat myocardial infarction or mortality within hospital stay. All information obtained was recorded on a standard performa. Quantitative and qualitative data were analyzed and outcome of the procedure was recorded. **Results:** In our study 104(92.04%) patients were male and 9(7.96%) patients were females. The Drug-Eluting Stents (DES) procedural success was found in 93.81% patients, post stenting MI observed in 6.4% patients and the mortality occurred in 2.7% patients. **Conclusions:** The left anterior descending coronary artery ostial lesions stenting with DES is effective and feasible procedure with good outcome.

INTRODUCTION

Bifurcation lesions of coronary arteries treatment with Percutaneous Coronary Intervention (PCI) is practically challenging and related to excessive frequency of complications like stent thrombosis or restenosis [1]. The patients with severe Left Main Stem (LMS) and ostial LAD stenosis have high risk of main cardiovascular events, because of the extent of ischemic myocardium. The prognosis of patients with heart disease is related to the extent of myocardium at risk. LAD coronary artery often supplies a high percentage of the left ventricular myocardium, compared to circumflex or right coronary

artery. Bifurcation lesions of LAD or left main coronary artery alone pose higher risk and mortality compared to triple vessel disease. Though CABG is considered gold standard in treating ostial lesions various methods are now evolving like double stent technique, use of bioresorbable vascular scaffold and drug eluting stents that cause much reduction in risk of restenosis [2]. According to one study, ostial lesions of left main stem and LAD comprise approximately 20 % of cases requiring Percutaneous Coronary Intervention (PCI) [3]. CABG is the gold standard for treating complicated LMS stenosis, particularly when it

is coupled with multi vessel cardiac disease [4]. Percutaneous Coronary Interventions (PCI) have been shown in numerous studies to be safe and effective alternative to CABG in patients selected carefully by the Heart Group, with same death rates [5]. The results of LMS PCI have been improved constantly, to the newer PCI procedures and use of novel generation Drug-Eluting Stents (DES) [5]. Ostial LAD coronary artery lesion has been regarded as a lesion subset improper for stenting. DES acquired approval from regulatory authority of Europe and America in 2002-2003. After that a lot of clinical trials have been carried out showing efficacy of DES in reducing stent restenosis when compared to bare metal stents [6]. In one research 12-month incidence of Target Lesion Revascularization (TLR) was higher for DES but in the range of that already reported for metallic DES (between 4% and 8%), and significantly lower than that previously reported with the use of bare metal stents (in the range of 30%) [7, 8]. According to a study 118 patients with in stent restenosis were treated with drug eluting stents. After median follow up of 5.5 year Device-Oriented Composite Endpoint (DOCE) was observed 17 % at 1 year, 27 % at 2 year and 40 % at 5 years [9]. In literature, very little work has been performed regarding the outcome of DES stenting in ostial LAD artery and the available data showed controversial evidence. In a Chinese study conducted in 2023 risk of stent restenosis was shown to be 7-18 % if done without dual antiplatelet therapy or drug eluting stents [10]. However, there is no local evidence available in this regard.

Objective of this study was to determine the outcome of LAD coronary artery ostial lesions stenting with DES.

METHODS

This descriptive case series was conducted from 01-10-2019 to 30-10-2020 in the department of cardiology, Mayo Hospital, Lahore after taking consent from the Institutional review board of the hospital (Reference No CPSP/REU/CRD-2017-066-1581). Written consent was obtained from the patients after informing. Calculated sample size was 113 with 5% level of significance, 6% margin of error and taking expected percentage of repeat MI i.e-12.0% in patients who underwent ostial LAD stenting with DES. Patients of both genders, ages ranging from 35-70 years, known cases of ostial LAD disease as per operational definition were included in the study and admitted to undergo angioplasty by using DES stent. Patients who had previous history of MI, stenting, CABG, or valvular heart disease as well as the patients with co morbidity of renal disease (creatinine >1.4mg/dl or on dialysis) were excluded from the study. Demographic data (name, age, gender, BMI, duration of LAD disease, history of hypertension and smoking) was noted. Patients were admitted in Cardiology ward and next day, each patient underwent angioplasty by a single cardiologist's team with

assistance of the researcher. The procedure was performed under local anesthesia. Procedural success was labeled (as per operational definition) if no myocardial infarction or death occurred during the procedure neither any need of emergency CABG arose. After the procedure, patients were shifted to cardiology wards and were followed-up there for 3 days. Patients were evaluated if there was repeat myocardial infarction and assessed after 03 days. Mortality was labeled if it occurred within the 3 day hospital stay. All information obtained was recorded on a standard performa. SPSS version 21.0 was used to analyze data. Quantitative elements as age, duration of LAD diseases, and BMI were presented in the form of mean and Standard Deviation (SD). Qualitative data components like smoking, hypertension, procedural success, repeat myocardial infarction, mortality were calculated as frequency and percentage. Data were stratified for age, gender, hypertension (BP>160/90) diabetes mellitus (BSR>200mg/dl), smoking >5pack years, BMI and duration of LAD disease. Post-stratification, stratified groups were compared for outcome by using chi-square test. P-value≤0.05 was considered as significant.

RESULTS

In table 1, 13 patients were enrolled. Average age of the patients was between 55.72 ± 7.92 . There were 104 (92.04%) males and 9 (7.96%) females. The mean BMI of the patients was 25.078 ± 3.73 kg/m² as shown in table 1. History of smoking observed in 74 (65.5%) respondents and hypertension was found in 64 (56.6%) respondents as shown in table 1.

Table 1: Descriptive Statistics of Age, Gender and BMI

Variables	Frequency (%) / Mean \pm SD
Age	55.72 \pm 7.92
Gender	
Male	104 (92.04%)
Female	9 (7.96%)
BMI (Kg/m ²)	25.07 \pm 3.73
Smoking	
Yes	74 (65.5%)
No	39 (34.5%)
Hypertension	
Yes	64 (56.6%)
No	49 (43.4%)

The mean duration of LAD disease was 6.24 ± 2.31 years. The procedural success was found in 106 (93.81%) patients. Post stenting MI observed in 7 (6.4%) patients and the mortality occurred in 3 (2.7%) patients as depicted in table 2.

Table 2: Summary Statistics of Duration of LAD (Years), Frequency of Procedural Success, Post Stenting MI and Mortality

Duration of LAD Disease (Years)		Frequency (%)
Procedural Success	Yes	106 (93.81%)
	No	7 (6.19%)
Post Stenting MI	Yes	7 (6.2%)
	No	106 (93.8%)
Mortality (within 03 days)	Yes	3 (2.7%)
	No	110 (97.3%)
Mean ± SD		6.24 ± 2.31

There was insignificant difference in the procedural success of different groups of age, gender and BMI respectively i.e. p-value > 0.05, table 3.

Table 3: Comparison of Procedural Success between Different Groups According to Age, Gender and BMI

Variables	Category	Procedural Success N (%)		p-Value
		Yes	No	
Age	<55	56 (91.8%)	5 (8.2%)	0.45
	>55	50 (96.2%)	2 (3.8%)	
Gender	Male	97 (93.3%)	7 (6.7%)	1.00
	Female	9 (100%)	0	
BMI	<25	52 (92.9%)	4 (7.1%)	0.716
	>25	54 (94.7%)	3 (5.3%)	
Smoking	Yes	71 (95.9%)	3 (4.1%)	0.232
	No	35 (89.7%)	4 (10.3%)	
Hypertension	Yes	58 (90.6%)	6 (9.4%)	0.137
	No	48 (98%)	1 (2.0%)	
Duration of LAD Disease	<6	57 (89.1%)	7 (10.9%)	0.0018
	>6	49 (100%)	0	

Table 4 showed insignificant difference in the procedural success of different groups according to smoking and hypertension. However significant difference was seen in the procedural success of different groups according to duration of LAD disease i.e. p-value = 0.0018. The results showed statistically insignificant difference according to post stenting MI in different groups according to age, gender, BMI, smoking, hypertension and duration of LAD disease i.e. p-value was greater than 0.05.

Table 4: Comparison of Post Stenting MI in different Groups According to Age, Gender, BMI, Smoking, Hypertension and Duration of LAD Disease

Variables	Category	Post Stenting MI N (%)		p-Value
		Yes	No	
Age	<55	1 (1.7%)	58 (98.3%)	0.048
	>55	6 (11.8%)	45 (88.2%)	
Gender	Male	7 (6.9%)	94 (93.1%)	1.00
	Female	0	9 (100%)	
BMI	<25	2 (3.7%)	52 (96.3%)	0.438
	>25	5 (8.9%)	51 (91.1%)	
Smoking	Yes	3 (4.2%)	69 (95.8%)	0.232
	No	4 (10.5%)	34 (89.5%)	

Hypertension	Yes	4 (6.6%)	57 (93.4%)	1.32
	No	3 (6.1%)	46 (93.9%)	
Duration of LAD Disease	<6	5 (8.2%)	56 (91.8%)	0.458
	>6	2 (4.1%)	47 (95.9%)	

According to this study there is statistically insignificant difference found in the occurrence of mortality between different groups of age, gender, BMI, smoking, hypertension and duration of LAD i.e. p-value > 0.05, table 5.

Table 5: Comparison of mortality in Different Groups According to Age, Gender, BMI, Smoking, Hypertension and Duration of LAD Disease

Variables	Category	Mortality N (%)		p-Value
		Yes	No	
Age	<55	0	59 (100%)	0.096
	>55	3 (5.9%)	48 (94.1%)	
Gender	Male	3 (3.0%)	98 (97%)	1.20
	Female	0	9 (100%)	
BMI	<25	0	54 (100%)	0.243
	>25	3 (5.4%)	53 (94.6%)	
Smoking	Yes	1 (2.6%)	37 (97.4%)	1.51
	No	3 (4.9%)	58 (95.1%)	
Hypertension	Yes	3 (4.9%)	58 (95.1%)	0.252
	No	0	49 (100%)	
Duration of LAD	<6	2 (3.3%)	59 (96.7%)	1.00
	>6	1 (2.0%)	48 (98%)	

DISCUSSION

This present study was performed at department of Cardiology, Mayo Hospital Lahore to determine the outcome of ostial left anterior descending coronary artery lesions stenting with DES. Even though recent increasing and striking mechanical advances, isolated ostial Left Anterior Descending (LAD) lesions represent a challenge for interventional cardiologists. There is relatively lack of standardization and agreement across studies in treating lesions at bifurcations [11]. Various researches have demonstrated that drug eluting stents are more fruitful as opposed to bare metal stents in reducing the necessity for revascularization procedures [12]. Lesions in ostium solely pose difficulties in attaining appropriate positioning of stent in contrast to lesions that are not at ostium due to excessive prevalence of calcification, tumultuous blood flow and inflexibility [13, 14]. In a study published in journal of cardiovascular intervention ostial stenting was done with DES in 95 patients and 67 patients underwent crossover stenting. It concluded that Target Lesion Revascularization (TLR) was high in ostial stenting (12%) as compared with crossover stenting (3.5%) over the 2-year follow-up period. But incidence of complications and sudden cardiac death was higher with crossover stenting [15]. Dąbrowski EJ et al., carried out a meta-analysis that compared CABG, DES and medical treatment and it revealed that PCI with DES was seen with better survival. They then conducted a non-inferiority based randomized

trials that compared PCI with CABG in bifurcation lesion of coronary arteries. Three year and five year follow up revealed that PCI with DES was not inferior to CABG in terms of composite endpoints [16]. Institute of National Heart, Lung, and Blood Dynamic Registry carried out a research which compared outcomes of patients receiving bare metal stents and another group receiving drug eluting stents for lesions of ostium. This research concluded that use of drug eluting stents is not associated with any increased risk for complications like myocardial infarction, need for revascularization or death [17]. DES implantation in LM is a viable procedure, according to many registries and a current sub-group analysis from a randomized study, treatment plan that is both safe and effective. When compared to CABG, it produces similar outcomes, with the difference being significantly high frequency of target vessel intervention at follow-up following stenting [18, 19]. The DES use in ostial lesions, on the other hand, resulted in unfavorable results than in non-ostial lesions, and prior data suggested that the relatively higher rate of restenosis (14.7%) could be linked to insufficient lesion coverage [20]. A meta-analysis was carried out in 2020-21 regarding the outcome of left main stem stenting with drug eluting stents and it concluded that Single stent strategy was associated with a significantly lower risk of Target Lesion Revascularization (TLR) and Major Adverse Cardiovascular Events (MACE) compared to 2-stent strategy [21]. Another study published in interventional cardiology journal compared outcomes of stenting with drug coated balloon and double stenting design and it also concluded that use of drug coated balloon in side branch is safe and effective [22]. In our study the procedural success of DES was found in 106 (93.81%) patients, the post stenting MI observed in 7 (6.4%) patients and the mortality occurred in 3 (2.7%) patients.

CONCLUSIONS

This study concluded that stenting of ostial lesions of left anterior descending coronary artery with DESs is effective and feasible procedure with good outcome.

Authors Contribution

Conceptualization: MAA

Methodology: RMHK, AM, AUR

Formal analysis: SBK

Writing, review and editing: SBK, IS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

- [1] Sivalingam J, Mazhar MW, Chaddad RA, Fouladvand F, Cortese B. Clinical outcomes of a dedicated bifurcation stent system. *Cardiovascular Revascularization Medicine*. 2024 Feb; 59: 21-6. doi: 10.1016/j.carrev.2023.08.015.
- [2] Liang XY, Li Y, Zhang WJ, Qiao X, Yang RR, Wang ZL. Efficacy and safety of bioresorbable scaffolds in patients with coronary bifurcation lesions: A systematic review and meta-analysis. *Cardiology Journal*. 2022 Apr; 29(4): 563-73. doi: 10.5603/CJ.a2021.0040.
- [3] Ungureanu C, Natalis A, Coci M, Dumitrascu S, Noterdaeme T, Gach O et al. The impact of the bifurcation angle for the Nano-Crush two-stent coronary bifurcation technique on long-term outcomes in a real-world clinical population. *Cardiovascular Revascularization Medicine*. 2024 Jul; 64: 54-9. doi: 10.1016/j.carrev.2024.02.017.
- [4] Predescu L, Bucsa A, Croitoru M, Mereuta A, Platon P, Postu M et al. Lichiardopol L, Predescu A, Gingham C. Four-Year Outcomes of Unprotected Left Main Lesion PCI with Self-Apposing Stents versus Balloon-Expandable Stents. *Romanian Journal of Cardiology*. 2022 Mar; 32(1). doi: 10.2478/rjc-2022-0004.
- [5] Predescu L, Postu M, Zarma L, Bucsa A, Platon P, Croitoru M et al. Unprotected Left Main Bifurcation Stenting in Acute Coronary Syndromes: Two-Stent Technique versus One-Stent Technique. *Journal of Personalized Medicine*. 2023 Apr; 13(4): 670. doi: 10.3390/jpm13040670.
- [6] Abubakar M, Javed I, Rasool HF, Raza S, Basavaraju D, Abdullah RM et al. Advancements in percutaneous coronary intervention techniques: a comprehensive literature review of mixed studies and practice guidelines. *Cureus*. 2023 Jul; 15(7). doi: 10.7759/cureus.41311.
- [7] Güner A, Akman C, Çiloğlu K, Gökçe K, Uzun F, Can C et al. Long-term evaluation of revascularization strategies for Medina left main bifurcation lesions: the LM-CROSSOVER registry. *Angiology*. 2023 Nov; 00033197231213194. doi: 10.1177/00033197231213194.
- [8] Elkhateeb O, Thambi S, Beydoun H, Bishop H, Quraishi A, Kidwai B et al. Title L. Long-term outcomes following ostial left anterior descending artery intervention with or without crossover to left-main. *American Journal of Cardiovascular Disease*. 2022 Apr; 12(2): 73.
- [9] Madanchi M, Cioffi GM, Attinger-Toller A, Wolfrum M, Moccetti F, Seiler T, Vercelli L, Burkart P, Toggweiler S, Kobza R, Bossard M. Long-term outcomes after

- treatment of in-stent restenosis using the Absorb everolimus-eluting bioresorbable scaffold. *e, Heart*. 2021 Sep; 8(2): e001776. doi: 10.1136/openhrt-2021-001776.
- [10] Han Y. Chinese guidelines for percutaneous coronary intervention in patients with left main bifurcation disease. 2023 Mar; 44(9): 709-710. doi: 10.1093/eurheartj/ehac625.
- [11] Lunardi M, Louvard Y, Lefèvre T, Stankovic G, Burzotta F, Kassab GS, Lassen JF, Darremont O, Garg S, Koo BK, Holm NR. Definitions and standardized endpoints for treatment of coronary bifurcations. *Journal of the American College of Cardiology*. 2022 Jul; 80(1): 63-88. doi: 10.1016/j.jacc.2022.04.024.
- [12] Aedma SK, Naik A, Kanmanthareddy A. Coronary Bifurcation Stenting: Review of Current Techniques and Evidence. *Current Cardiology Reviews*. 2023 Jan; 19(1). doi: 10.2174/1573403X18666220406113517.
- [13] Nerlekar N, Ha FJ, Verma KP, Bennett MR, Cameron JD, Meredith IT, *et al.* Percutaneous coronary intervention using drug-eluting stents versus coronary artery bypass grafting for unprotected left main coronary artery stenosis: a meta-analysis of randomized trials. *Circulation: Cardiovascular Interventions*. 2016 Dec; 9(12): e004729. doi: 10.1161/Circinterventions.116.004729.
- [14] Ahmed M, Ali M, Abbas S, Yasir M, Riaz R, Ehsan A. Non-ST elevation myocardial infarction: correlation of red blood cell distribution width with syntax score. *Pakistan Heart Journal*. 2020 Dec; 53(3). doi: 10.47144/phj.v53i3.1909.
- [15] Yun KH, Cho JY, Lee SY, Oh SK. Optimal technique for ostial left anterior descending coronary artery lesion. *Journal of Cardiovascular Intervention*. 2022 Oct; 1(4): 151-7. doi: 10.54912/jci.2022.0014.
- [16] Dąbrowski EJ, Kożuch M, Dobrzycki S. Left Main Coronary Artery Disease—Current Management and Future Perspectives. *Journal of Clinical Medicine*. 2022 Sep; 11(19): 5745. doi: 10.3390/jcm11195745.
- [17] Vasaiwala S, Selzer F, Vlachos H, Mulukutla S, Marroquin O, Abbott DJ *et al.* Comparison of Bare-Metal Stents and Drug Eluting Stents in Ostial Coronary Lesions: Findings from the National Heart, Lung, and Blood Institute Dynamic Registry. *The American Journal of Cardiology*. 2012 Oct; 110(8): 1113-1118. doi: 10.1016/j.amjcard.2012.05.051.
- [18] D'Ascenzo F, De Filippo O, Elia E, Doronzo MP, Omede P, Montefusco A *et al.* Percutaneous vs. surgical revascularization for patients with unprotected left main stenosis: a meta-analysis of 5-year follow-up randomized controlled trials. *European Heart Journal-Quality of Care and Clinical Outcomes*. 2021 Nov; 7(5): 476-85. doi: 10.1093/ehjqcco/qcaa041.
- [19] Tam DY, Fang J, Rocha RV, Rao SV, Dzavik V, Lawton J *et al.* Real-world examination of revascularization strategies for left main coronary disease in Ontario, Canada. *Cardiovascular Interventions*. 2023 Feb; 16(3): 277-88. doi: 10.1016/j.jcin.2022.10.016
- [20] Buchanan GL and Chieffo A, Colombo A. Percutaneous Coronary Intervention in Unprotected Left Main. *Interventional Cardiology: Principles and Practice*. 2017: 168-74. *Indian Heart Journal*; 2022 Mar-Apr; 74(2): 96-104. doi: 10.1016/j.ihj.2021.12.014.
- [21] Rigatelli G, Zuin M, Nikolov P, Mileva N, Vassilev D. One-and 3-year outcomes of percutaneous bifurcation left main revascularization with modern drug-eluting stents: a systematic review and meta-analysis. *Clinical Research in Cardiology*. 2021 Jan; 110: 1-1. doi: 10.1007/s00392-020-01679-w.
- [22] Liu H, Tao H, Han X, Lu Y, Xue X, Feng R *et al.* Improved Outcomes of Combined Main Branch Stenting and Side Branch Drug-Coated Balloon versus Two-Stent Strategy in Patients with Left Main Bifurcation Lesions. *Journal of Interventional Cardiology*. 2022 Jan; 2022(1): 8250057. doi: 10.1155/2022/8250057.