



Research Brief

Fractional flow reserve [FFR] guided stenting of left main coronary artery in acute coronary syndrome: A single centre experience



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ABSTRACT

The present study assesses the clinical outcomes after left main coronary stenting, using clinical evaluation, angiography, and Fractional Flow Reserve (FFR). A prospective observational study was conducted on 72 patients undergoing left main coronary artery (LMCA) stenting, transthoracic echocardiography, coronary angiography, and percutaneous coronary intervention were done and FFR was recorded. At the end of 6 months, follow up check angiography, FFR study were performed. The stent was placed from LMCA to left anterior descending artery (LAD) artery among 45.83% of patients and 9.72% had from LMCA to Left circumflex artery. The mortality rate was 8.33%. The fractional flow reserve was 0.81 on an average ranging from 0.58 to 0.90. Relatively low incidence of major cardiac event was noted among patients with single vessel disease and ostial LMCA disease.

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1. Introduction

There is scarcity of literature among Indian population on the treatment outcomes following management of left main coronary stenting.^{1,2} Very few studies have reported Fractional Flow Reserve (FFR) values following left coronary stenting and whether the FFR values differ between people who develop and do not develop major cardiovascular vents following left coronary stenting.^{3–7} Hence, the current study was conducted with an objective of assessing the incidence of major cardiovascular events following LMCA stenting for LMCA stenosis or severe ostio-proximal left anterior descending artery (LAD) or left circumflex (LCX) lesions and the FFR values during the follow up.

2. Methods

A prospective observational study was conducted on patients undergoing LMCA stenting. Patients with undergoing LMCA stenosis more than or equal to 50% and clinical symptoms or objective evidence of myocardial ischemia and who denied Coronary Artery Bypass Grafting (CABG) as revascularization procedure, patients

with significant ostio-proximal lesion of LAD or LCX were included in the study. After obtaining informed written consent, the data was collected using a structured proforma. Detailed clinical history, physical examination, transthoracic echocardiography, coronary angiography, percutaneous coronary intervention, FFR were recorded. At the end of 6 months, follow up check angiography, FFR study were performed. coGuide version V.1.0 was used for statistical analysis.⁸

3. Results

The study population included 72 individuals. The mean age of the patients was 55.38 years. There was a greater proportion of males (84.72%). The prevalence of diabetes, hypertension, in the study population was 43.06% and 38.89% respectively. Around 55.56% of the study participants reported a history of smoking and 34.72% reported tobacco chewing. Among the study participants, 36.11% presented with anterior wall myocardial infarction (MI), 26.39% presented with non-ST-segment elevation myocardial infarction (NSTEMI) and 37.5% presented with unstable angina. The average ejection fraction was 43.33. Around 72.22% of the study participants had regional wall motion abnormalities, 47.22% had single vessel disease, 31.94% had double vessel disease and 20.83% had triple vessel disease. The fractional flow reserve was 0.81 ± 0.08 as mean and standard deviation and ranging from 0.58

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to 0.90. With regards to the stenosis of LMCA, 26.39% of the study participants had 50–70% stenosis. Around 12.5% of study participants had an intermediate SYNTAX score between 23 and 32 (Table 1). The stent was located in LMCA among 44.44%. The stent was placed from LMCA to LAD artery among 45.83% and 9.72% had from LMCA to Left circumflex artery. Majority 90.28% of the study participants had been placed with a drug eluting stent and 9.72% had a bare-metal stent. With regards to antiplatelet treatment, 33.3% had been treated with Aspirin + Prasugrel antiplatelet, 20.83% had Aspirin + Clopidogrel antiplatelet, and 45.83% had Aspirin + Ticagrelor anti-platelets. Mean difference of FFR between different outcomes was statistically significant (p value < 0.05) (Table 2). The mortality rate among the study population was 8.33%. During follow up, 20.83% were symptomatic and required re-admission. Among the study population, 7 (9.72%) Follow up angiogram revealed restenosis at 6 months follow up. The Area under the curve of FFR in predicting Major adverse cardiac event (MACE) was 0.622 indicates poor prognosis with the p value of 0.14 (Statistically not significant) (Fig. 1).

4. Discussion

Among the study participants, 36.11% presented with anterior wall MI. Among the remaining, 26.39% presented with NSTEMI and 37.5% presented with unstable angina. In the study by Srinivas et al⁹ (2018), 57.14% had stable angina, 14.28% had unstable angina and 14.28% had NSTEMI.

The average ejection fraction (EF) in the present study was 43.33%. In the study by Makikallio et al⁷ (2016), the mean EF was 60% which is higher than the present study. In the study by Kim et al¹⁰ (2017), the mean EF was 48.1% which is comparable to the present study. majority, 72.22% of the study participants had regional wall motion abnormalities in the present study. In the study by Srinivas et al⁹ (2018), 21.42% had regional wall motion abnormality (RWMA). Among the study population, 47.22% had single vessel disease, 31.94% had double vessel disease and 20.83% had triple vessel disease. In the study by Kim et al¹⁰ (2017), 75.7% had single vessel disease, 21.1% had double vessel disease and 3% had triple vessel disease. With regards to the stenosis of LMCA, 26.39% of the study participants had 50%–70% stenosis, 44.44% had stenosis of 71%–90% while 29.17% had more than 90% stenosis. In

Table 2
Comparison of mean of FFR between different outcome parameters (N = 72).

Parameter	FFR (Mean± SD)	p value
Condition at follow-up		
Symptomatic (N = 15)	0.75 ± 0.11	0.002
Asymptomatic (N = 57)	0.82 ± 0.06	
Re-admission		
Yes (N = 15)	0.64 ± 0.08	0.002
No (N = 57)	0.82 ± 0.06	
Restenosis		
Yes (N = 7)	0.68 ± 0.12	<0.001
No (N = 65)	0.82 ± 0.06	
Death		
Yes (N = 6)	0.64 ± 0.08	<0.001
No (N = 66)	0.82 ± 0.06	

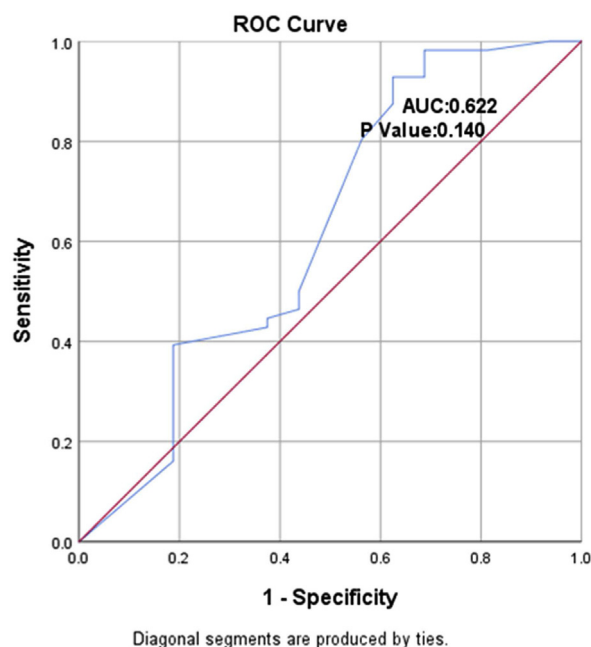


Fig. 1. Predictive validity of FFR in predicting MACE (ROC analysis) (N=72).

the study by Vyas P.M et al¹¹ (2017), 12% had 50%–70% stenosis, 38% had 71–90% stenosis and 6% had more than 90% stenosis.

The site of lesion in LMCA was ostial among 44.44% of study population, mid site stenosis among 31.94% and distal stenosis among 23.61% of the study population. In the study by Vyas P.M et al¹¹ (2017), 32% patients had ostial LMCA lesion, 16% had mid LMCA lesion, distal LMCA was diseased in 12%. In the study by Srinivas et al⁹ (2018), 0.18% had ostial involvement which was a low estimate compared to the current study.

Among 9.72% the stent was placed from LMCA to left circumflex artery. In the study by Vyas P.M et al¹¹ (2017), only LMCA stenting was done in 44% patients. Majority 90.28% of the study participants had been placed with a drug eluting stent while the remaining 9.72% had a bare-metal stent. In the study by Vyas P.M et al¹¹ (2017), drug-eluting stent (DES) was used in 70% cases while bare-metal stent was used in 30%. The Area under the curve of FFR in predicting Major adverse cardiac event (MACE) was 0.622 indicates poor prognosis with the p value of 0.14 which was not found to be statistically significant. This was similar to the study by Ahn JM et al.¹²

The mortality rate among the study population was 8.33% and statistically significant association was found with FFR (p < 0.001).

Table 1
Angiographic characteristics in study population (N = 72).

Angiographic characteristics	Summary
Location of stenting	
LMCA	32 (44.44%)
LMCA to LAD	33 (45.83%)
LMCA to LCX	7 (9.72%)
LMCA stenosis	
50%–70%	19 (26.39%)
71%–90%	32 (44.44%)
>90%	21 (29.17%)
Coronary involvement	
SVD	34 (47.22%)
DVD	23 (31.94%)
TVD	15 (20.83%)
Site of the lesion in LMCA	
Ostial	32 (44.44%)
Mid	23 (31.94%)
Distal	17 (23.61%)
SYNTAX score category	
<23	59 (81.94%)
23–32	9 (12.50%)
>33	4 (5.56%)

In the study by Makikallio et al⁷ (2016), the mortality rate was 3% which is lower than the present study. In the study by Kim et al¹⁰(2017), the total mortality rate was 1.6%. In the study by Vyas P.M et al¹¹ (2017), the mortality rate was 8%. In the study by Srinivas et al⁹ (2018), the mortality rate was 3.57% which is lower than the present study.

5. Conclusion

Relatively low incidence of major cardiac event was noted among patients with single vessel disease and ostial LMCA disease who underwent LMCA stenting. Although CABG continues to be a major mode of revascularization, LMCA stenting may be safely considered as a potential method in selected patients. Functional Flow reserve can be considered as a clinical prognosis as well as to identify flow limiting stenosis.

6. Key message

LMCA stenting is a safe and feasible alternative mode of revascularization in selected patients. FFR can be used in the management of patients with coronary artery disease.

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Declaration of competing interest

The authors declare no conflicts of interest.

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Abbreviations

Fractional Flow Reserve (FFR)

Left main coronary artery (LMCA)
 Left anterior descending artery (LAD)
 Left circumflex (LCX)
 Coronary Artery Bypass Grafting (CABG)
 Non-ST-segment elevation myocardial infarction (NSTEMI)
 Myocardial infarction (MI)
 Average ejection fraction (EF)
 Regional wall motion abnormality (RWMA)
 Drug-eluting stent (DES)
 Major Adverse Cardiac Event (MACE)

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