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Original Research Article

Real World Experience of Unprotected Left Main Coronary Artery Angioplasty: A Single Centre Experience from Western Rajasthan

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Conflict of interest: Nil

Abstract

Background: For several decades Coronary artery bypass grafting (CABG) was accepted as the first line management option for unprotected left main coronary artery (ULMCA) disease while techniques for the percutaneous management of coronary atherosclerosis were in the early stages of development.

Objectives: To assess the demographic, angiographic and procedural characteristics in patients subjected to angioplasty of unprotected left main coronary stenosis, and to compare the characteristics in patients suffering with major adverse clinical event (MACE) with non-MACE patients.

Materials & Methods: Total 50 patients were selected based on inclusion and exclusion criteria. After surgical intervention, patients were followed up during stay in hospital; and after getting discharge at time intervals of 1st, 6th months, and 1 year. After 1 year of treatment, coronary angiogram was done for all patients. The data was collected and subjected to statistical analysis using SPSS version 20.0.

Results: All characteristics were observed and compared for both MACE and Non-MACE group patients. Statistically significant relation was found for all parameters in operative, angiographic and procedural characteristics except presentation and Left ventricular ejection fraction. ($p<0.05$).

Conclusion: In MACE group, incidence of co-morbidities, high Syntax score, and left ventricular dysfunction with EF≤45%, were common. The study advocated ULMCA PCI technique for cases having low Syntax score, without co-morbidities and LV dysfunction.

Keywords: Unprotected Left Main Coronary Artery, Major Adverse Clinical Event (MACE), Syntax, Coronary Artery Bypass Grafting.

Introduction

Since 1960s, the obstructive unprotected left main coronary artery (ULMCA) condition has been identified as a high-risk disease, affecting major part of myocardium being supplied by this system [1]. This is considered as a life threatening condition, with a prevalence rate of 3 to 10% of the patients subjected to coronary angiogram [2]. When subjected to medical treatment, this disease shows a high level of 1-year mortality with 21% death rate and 30–40% death rate in 3-year mortality [3,4].

Advent of coronary artery bypass grafting (CABG) has made it clear that surgical treatment of such patients had a mortality benefit significantly over therapeutic treatment strategy alone. Since many years, for ULMCA disease, CABG is referred as the first line of treatment whereas methods for the percutaneous treatment of coronary atherosclerosis were in the early developmental stages [5,6]. The left main coronary artery (LMCA) stenosis presence reflects an anatomic subset, that still require a bypass surgery for obtaining revascularization as compared to percutaneous coronary intervention (PCI) [4].

Emergency coronary artery bypass grafting is proved to be an efficient method, but it is time-consuming approach that causes the chances of widespread, irreversible myocardial damage. In the unprotected left main coronary artery, percutaneous coronary intervention can lead to initial revascularization and stabilization rapidly, even in cases of high-risk patients, but procedural outcomes are still being investigated, since the recent discovery of drug-eluting stents [7].

According to newer guidelines, coronary artery bypass graft (CABG) is a preferred revascularization strategy for ULM disease, mainly when there is involvement of distal bifurcation with a presence of diffuse multi vessel coronary disease. It has been found that age and clinical profile can increase the surgical risk dramatically. But the promising results have been observed in elective patients having ULM coronary disease being managed with percutaneous coronary intervention (PCI) and drug-eluting stents (DES) [8].

Angioplasty alone is contraindicated in managing the left main disease because various earlier studies on balloon angioplasty for LMCA disease have indicated a poor, acute and long-term survival rates. The practicability of stenting in case of LMCA disease has been discussed in recent studies, although limited data was found.

Thus the present study was conducted to assess the demographic, angiographic and procedural characteristics in patients subjected to angioplasty of unprotected left main coronary stenosis, and to compare the characteristics in patients suffering with major adverse clinical event (MACE) with non-MACE patients.

Materials & Methods

This study was conducted in the Department of cardiology of a tertiary care teaching hospital of Rajasthan Patients having de novo ULMCA stenosis and treated by a group of interventional cardiologists were included in the study. Patients who were having ST-elevation myocardial infarction (STEMI) were excluded from the study.

All included patients were explained about the treatment procedure and a written informed consent was obtained for surgery as well as for data collection at follow-up visits. The study was approved by institutional ethical committee.

Before PCI, patients who were suffering with unstable angina or NSTE-ACS were stabilised medically. For all patients SYNTAX score was calculated. All patients were preloaded with clopidogrel (600 mg) and for next 12 months, they were given daily dosage of 150 mg of aspirin. 75

mg aspirin was then continued indefinitely. The procedures were done through transfemoral or transradial route. During the procedure, intraprocedural unfractionated heparin was administered. In case of distal disease, coronary angioplasty and implantation of stent using bifurcation strategy was done based on operator's discretion, with the basic aim of covering the diseased segment completely.

The choice of atherectomy devices, IVUS guidance, prophylactic intra-aortic balloon pump (IABP), Enhanced Stent Visualisation (ESV) system and periprocedural glycoprotein IIb/IIIa inhibitors was also at the discretion of operator.

Patients were followed up during stay in hospital; and after getting discharge at time intervals of 1st, 6th months, 1 year and then yearly by visit to clinic or telephonically contact. After 1 year of treatment, coronary angiogram was done for all patients. Characteristics like presentation, co-morbidities, route and habit of smoking were assessed. Mean LV ejection fraction, Syntax score and follow-up time was evaluated. All patients were assessed for angiographic characteristics. Overall characteristics were observed and compared for both MACE (major adverse cardiac events) and non-MACE patients.

The data was collected and subjected to statistical analysis using SPSS version 20.0. Categorical variables are recorded as frequencies and percentages, and comparison was done using chi-square testing at a level of significance being $p<0.05$.

Results

Total 50 patients were assessed with mean age being 56.34±10.23 years, out of which 84% were males and 16% were females. Out of 50, 14% were MACE and 86% were non-MACE patients. Mean left ventricular ejection fraction was 46.60±10.85 and Syntax score was 18.26±5.89. (Table 1).

Table 1: Overall characteristics of all patients (N=50)

Parameters	Mean±SD
Age (years)	56.34±10.23
Left ventricular ejection fraction (%)	46.60±10.85
Syntax score	18.26±5.89
Follow-up time (months)	21.04±11.80
Major adverse cardiac events (MACE)	7 (14%)
Non-MACE	43 (86%)

Except presentation statistically significant difference was observed between MACE and non-MACE group for all parameters ($p<0.05$). (Table 2)

Table 2: Overall Characteristics in both MACE and Non-MACE groups

Parameters		MACE (N=7)		Non-MACE (N=43)		p-value
		Frequency	Percentage	Frequency	Percentage	
Age	**<60**	5	71.43	24	55.81	0.033*
	≥60	2	28.57	19	44.19	
Gender	**Female**	0	0	8	18.6	0.051*
	Male	7	100	35	81.4	
Presentation	**Acute coronary syndrome**	4	57.1	25	58.1	0.093
	Angina	3	42.9	18	41.9	
Co-morbidities	**Diabetes mellitus-2**	2	28.57	3	7.0	0.004*

	Hypertension	2	28.57	23	53.5	
	Nil	4	57.14	14	32.6	
Route	**Right femoral approach**	4	57.1	36	83.7	0.033*
	Right radial approach	3	42.9	7	16.3	
Smoking	**No**	5	71.43	27	62.79	0.047*
	Yes	2	28.57	16	37.21	

***significant**

Angiographic and procedural characteristics were also compared for both MACE and Non-MACE patients. Statistically significant relation was observed for all parameters except left ventricular ejection fraction ($p<0.05$). (Table 3 and 4)

Table 3: Angiographic characteristics in both MACE and Non-MACE groups

Parameters		**MACE (N=7)**		**Non-MACE (N=43)**		
		Frequency	**%**	**Frequency**	**%**	**p-value**
Coronary angiography (CAG)	DVD	1	14.3	4	9.3	0.034*
	LM	0	0	5	11.6	
	LM+DVD	4	57.1	14	32.6	
	LM+LAD	1	14.3	0	0	
	LM+LAD+LCX	0	0	1	2.3	
	LM+SVD	1	14.3	15	34.9	
	LM+TVD	0	0	1	2.3	
	SVD	0	0	1	2.3	
	TVD	0	0	2	4.7	
Revascularization	Complete	7	100	37	86.0	0.041*
	Incomplete	00	0	6	14.0	
Bifurcation	Minicrush	1	14.3	4	9.3	0.052*
	no	5	71.4	34	79.1	
	TAP	1	14.3	5	11.6	
Left Main Lesion	Distal	6	85.7	27	62.8	0.005*
	Ostial	1	14.3	16	37.21	
Medina	0,1,0	0	0	3	7.0	0.046*
	0,1,1	0	0	2	4.7	
	1,0,0	0	0	1	2.3	
	1,1,0	4	57.14	16	37.2	
	1,1,1	2	28.6	8	18.6	
Syntax score	0-22	5	71.43	28	65.12	0.044*
	23-32	2	28.57	15	34.88	
	>33	0	0	0	0	
Left ventricular ejection fraction	<45%	2	28.57	12	27.91	1.071
	≥45%	5	71.43	31	72.09	

***significant**

Table 4: Procedural characteristics in both MACE and Non-MACE groups

Parameters		MACE (N=7)		Non-MACE (N=43)		
		Frequency	Percentage	Frequency	Percentage	p-value
Total stents	1	2	28.6	22	51.2	0.002*
	2	3	42.9	12	27.9	
	3	2	28.6	8	18.6	
	4	0	0	1	2.3	
Strategy	2-stent	2	28.57	5	11.6	0.021*
	Provisional	5	71.43	38	88.4	

***significant**

Discussion

In patients suffering with ULM disease, CABG is referred as the standard treatment but PCI is considered as appropriate treatment technically by specialist with an increased percentage of immediate angiographic success [9]. The present study was conducted to assess the ULMCA PCI patients in the present scenario.

The mean age of patients was 56.34±10.23 years. It was observed that mean follow up time was 21.04±11.80 months. Mean LV ejection fraction was 46.60±10.85 and mean Syntax score was 18.26±5.89. 14% patients were reported with MACE. Similar results were observed in a study by Ray *et al* [2]. It has been advocated that patients having a higher Syntax score had higher MACE.

In present study, 66% had distal left main involvement, with Medina classification 1.1.0 and 1.1.1 being the most common disease patterns. These findings were in accordance with study by Ray *et al* [2] and Serruys *et al* [10]. In MACE group, most of the patients were younger in age, and with more incidence of hypertension.

More patients were with distal LM, complete revascularisation, higher Syntax score in MACE groups and were mainly managed with two stents with provisional strategy. Palmerini *et al* [11] has advocated that distal LMCA bifurcation being managed with multiple stents was found to have worse outcome.

The methods used for 2-stent strategy are simultaneous kissing stenting (SKS) and Double kissing crush (DKC). None of these methods are better than the other in relation to MACE. In our study, simultaneous kissing stenting was done mainly in patients having Medina 0,1,1 lesion with less than 5 mm proximal overlap.

No restenosis was observed in this group. Various authors revealed that if stenting is done by experienced doctors, any technique either single- or two-stent use for bifurcation give a feasible long-term result as compared to CABG [12].

It has been observed that low EF is an independent determinant of mortality in cases of LMCA PCI [13]. LV EF is included as the main risk factor having high prognosis value [14]. In present study, population with MACE had mainly left ventricular EF ≤45%.

Limitations of the Study

The study was conducted with limited sample size, thus further studies should be conducted with larger sample size. We haven't looked at the risk scores of the study population. The study was conducted in a single centre, so results of study can't be generalised to whole Indian population.

Conclusion

The study observed that in MACE cases, co-morbidities like diabetes and hypertension; high Syntax score, and left ventricular dysfunction with EF ≤45%, were common. It is required to evaluate the enhanced stent visualisation and intravascular ultrasound (IVUS) in clinical outcome.

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