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ORIGINAL ARTICLE

Short-Term outcomes of percutaneous coronary intervention versus coronary artery bypass grafting in patients with significant left main coronary artery disease.

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ABSTRACT… Objective: To evaluate the short-term results of coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) in patients with severe left main coronary artery disease (LMCAD). **Study Design:** Prospective Cohort study. **Setting:** Department of Cardiology and in association with the Department of Cardiothoracic Surgery, Punjab Institute of Cardiology (PIC), Lahore. **Period:** 2nd October, 2025 to 2nd March, 2026. **Methods:** Three hundred patients having considerable LMCAD of either sex were enrolled in this study. After informed consent, patients were equally allocated into two groups: 1) PCI and 2) CABG. The short-term Major Adverse Cardiovascular and Cerebrovascular Events (MACCEs) were assessed at 3-month follow-up in both groups. Chi-square test was used to compare the outcome variables of both groups. A p-value of ≤0.05 was considered significant. **Results:** The mean age of the study population was 62.11 ± 12.92 years, with 81.7% being male. Both groups were comparable in terms of demographic and co-morbid conditions, with statistically insignificant differences. PCI groups experienced more MACCEs overall, but it was statistically non-significant (32% PCI vs 22% CABG; p >0.05). Mortality was also found to be lower in the CABG group (14.7% vs 10%; p-value=0.219). **Conclusion:** This study concluded that in patients with LMCAD, there were statistically insignificant differences in the occurrence of short-term MACCEs.

Key words: Coronary Bypass Grafting, Left Main Disease, LMS Disease, Major Adverse Cardiac Events, Percutaneous Angioplasty.

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INTRODUCTION

Left main coronary artery disease (LMCAD), a luminal narrowing of the left main coronary artery, has a prevalence of almost 6% in individuals undergoing coronary intervention.[1] LMCAD is considered a high-risk lesion because of the jeopardy of most of the myocardium (nearly 70%).[2] It has significant morbidity and mortality, unless protected by collaterals or an open graft.[1] Conventionally, due to better survival and morbidity, the preferred course of treatment for LMCAD was coronary artery bypass grafting (CABG). Chaitman et al. (1981) reported a cumulative survival rate of CABG, better (91%) than that of medically treated patients (69%) in patients having left main disease.[3] PCI was the alternate approach for carefully chosen patients, those having unstable hemodynamics, or those who were having considerable surgical risk.[4]

Due to the improvement in device, drug, and PCI techniques, PCI has emerged as a substitute for CABG in many patients having LMCAD over the past few decades.[5] Since the advent of drug-eluting stents (DES), Several studies have reported controversial outcomes due to varying durations of follow-up.[6-8] The ideal treatment of LMCAD is still controversial. The guidelines for selecting the mode of revascularization for unprotected LMCA disease rely on many factors, including complex anatomy determined by SYNTAX score, the individual risk factors, and the patient's preference.[9,10] Several trials have been done to show outcomes in this aspect. EXCEL and PRECOMBAT trials demonstrated similar results for patients receiving PCI and CABG, with non-severe complexity.[11-14] Optimal treatment of LMCAD is still an ongoing debate due to controversial data.

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Several international studies have provided insight into this, but there is a paucity in the local data. As there are few to no local studies that have been done to compare the short-term MACCEs in significant LMCAD patients undergoing PCI vs CABG.

METHODS

Following the authorization of the institutional ethical review committee (Ref. RTPGME-Research-398; dated 02-06-2025) and final approval of synopsis from the CPSP (CPSP/REU/CRD-2023-070-3099; dated 01-10-2025), a prospective, cohort study was conducted at the Cardiology Department in collaboration with Cardiothoracic Surgery Department of Punjab Institute of Cardiology, Lahore for 5 months (2nd October, 2025 to 2nd March, 2026). After obtaining informed consent, a total of 300 patients were recruited. Sample size was calculated by using the WHO calculator, where MACE% of 37.5% for PCI and 24.2% for CABG, respectively.[15] The study included patients aged 25 to 80 years, who presented with acute coronary syndrome, having >50% stenosis of the left main disease (on coronary angiogram), having a SYNTAX score of 10 to 28, and who were hemodynamically stable. Patients who had undergone CABG, acute endocarditis, valvular heart disease (as per history and medical records), severe LV dysfunction (LVEF<30%), and those with a history of chronic kidney/liver/pulmonary disease were excluded.

After enrollment, the baseline demographic characteristics and risk factors like diabetes, hypertension, obesity, and smoking status were recorded. In order to resolve the ethical consideration, a discussion was conducted by the Heart team, comprising a consultant cardiologist, a cardiac surgeon, and the patient on CABG or PCI, as per American Heart Association (AHA) guidelines. The patients were then allocated into two equal groups: 1) PCI group, 2) CABG group. The procedure was done by the consultant with at least 5 years of experience in the related procedure. Post-procedure, all patients were carefully observed. They were discharged according to the satisfaction of the treating consultant, considering the guideline-directed medical therapy, including dual antiplatelets and statins. Patients were followed up at intervals till 3 months after the procedure, and were monitored for major adverse cardiac and cerebrovascular events (MACCEs), which included MI, CVA, Revascularization, demise, and 30-day readmission.

Statistical analysis was done using SPSS version 26. After normality assessment and descriptive statistics, both groups were compared first for baseline characteristics, and then for the MACCEs. Chi-square was used for the qualitative data comparison, and Student's t-test for quantitative data. Data stratification was used to overcome confounders and effect modifiers. Significance was defined as $p \leq 0.05$.

RESULTS

Normality of the data showed a normally distributed data. The mean age was 62.11 ± 12.92 years, comprising 53.0% of >60 years. Males were in the majority (81.7%). Regarding risk factors, diabetes, hypertension, dyslipidemia, and smoking were reported in 33.3%, 49%, 34%, and 42.7% of the patients, respectively. 28.04 ± 4.24 was the mean SYNTAX score. Both groups were comparable for baseline characteristics ($p > 0.05$) (Table-I).

MACCE occurred more in the PCI group, but statistically non-significant (32% vs 22%; p> 0.05). Similarly, deaths occurred more in PCI (14.7% vs 10%; p>0.05). However, MI (10.7% 11.3%), revascularization (13.3% vs 18.7%), and stroke (6.7% vs 8.7%) were observed more in the CABG group patients ($p > 0.05$). (Table-II).

TABLE-III compares the baseline clinical features with the mortality (n = 37). A significant relationship between age and mortality was found, with more patients who died being aged >60 years (70.3%) than survivors (50.6%) ($p = 0.025$). Clinical outcomes, including MACCE, MI, revascularization, and stroke, had statistically non-significant differences between the two groups. ($p > 0.05$). (Table III).

DISCUSSION

This study compared the short-term results of PCI and CABG in patients with LMCAD. This prospective cohort study helps in the ongoing debate about the ideal strategy for LMCAD. Our study revealed a higher prevalence of LMCAD in males (81.7%), which is consistent with another

study showing the same gender imbalance.[16-18] This shows the male predominance in CAD. Our study further strengthens the old studies in showing that LMCAD is more common in the sixty-year age group.[16,19,20]

After 3 months, the death rates were 14.7% versus 10% in the angioplasty group versus the surgery group, which is statistically insignificant. The study's findings are consistent with prior research that found no difference in mortality between the two groups after 30 days and 6 months.[16,19] However, in the EXCEL trial, the mortality was considerably lower in the PCI group (4.9% vs 7.9%)[13,20], but it was also statistically nonsignificant, consistent with our study. It is worth noting that the EXCEL trial involved patients of all SYNTAX scores, whereas our study included patients with intermediate scores.[13]

In our study, MACCE occurred in 32% of the participants undergoing PCI versus 22% in the other group, which corresponds with an old study that showed 22.2% vs 17.2% in the PCI vs CABG cohort.[15]

TABLE-I

Baseline Demographics of PCI and CABG Groups (N = 300)

Characteristic	Category	PCI	CABG	P-Value
Age (years)	Mean±S.D	60.99±12.86	63.23±12.93	0.134
	≤60 years	73 (48.7)	68 (45.3)	0.563
	>60 years	77 (51.3)	82 (54.7)	
Sex	Male	121 (80.7)	124 (82.7)	0.654
	Female	29 (19.3)	26 (17.3)	
Smoking	Yes	62 (41.3)	66 (44.0)	0.641
	No	88 (58.7)	84 (56.0)	
Diabetes mellitus	Yes	55 (36.7)	45 (30.0)	0.221
	No	95 (63.3)	105 (70.0)	
Hypertension	Yes	77 (51.3)	70 (46.7)	0.419
	No	73 (48.7)	80 (53.3)	
Dyslipidemia	Yes	52 (34.7)	50 (33.3)	0.807
	No	98 (65.3)	100 (66.7)	
Syntax Score	Mean±S.D	27.98±4.31	28.11±4.17	0.796

Data presented as mean ± SD or frequency (%).

Overall, 27% (n=81) of the patients had MACCEs, which included Mortality 12.3% and MI 11%.

TABLE-II

Clinical outcomes in PCI and CABG groups (N = 300)

Characteristic	Category	PCI	CABG	P-Value
MACCE	Yes	48 (32.0)	33 (22.0)	0.051
	No	102 (68.0)	117 (78.0)	
MI	Yes	16 (10.7)	17 (11.3)	0.854
	No	134 (89.3)	133 (88.7)	
Revascularization	Yes	20 (13.3)	28 (18.7)	0.208
	No	130 (86.7)	122 (81.3)	
Stroke	Yes	10 (6.7)	13 (8.7)	0.515
	No	140 (93.3)	137 (91.3)	
Mortality	Yes	22 (14.7)	15 (10.0)	0.219
	No	128 (85.3)	135 (90.0)	

Data presented as mean ± SD or frequency (%).

TABLE-III

Factors associated with mortality (N = 300)

Characteristic	Category	Mortality		P-Value
		Died (n=37)	Alive (n=263)	
Age (years)	≤60 years	11 (29.7)	130 (49.4)	0.025
	>60 years	26 (70.3)	133 (50.6)	
Sex	Male	31 (83.8)	214 (81.4)	0.722
	Female	6 (16.2)	49 (18.6)	
Smoking	Yes	15 (40.5)	113 (43.0)	0.780
	No	22 (59.5)	150 (57.0)	
Diabetes mellitus	Yes	11 (29.7)	89 (33.8)	0.619
	No	26 (70.3)	174 (66.2)	
Hypertension	Yes	22 (59.5)	125 (47.5)	0.174
	No	15 (40.5)	138 (52.5)	
Dyslipidemia	Yes	14 (37.8)	88 (33.5)	0.599
	No	23 (62.2)	175 (66.5)	
Syntax Score	Mean±S.D	27.89±4.33	28.06±4.23	0.817
MACCE	Yes	11 (29.7)	70 (26.6)	0.690
	No	26 (70.3)	193 (73.4)	
MI	Yes	4 (10.8)	29 (11.0)	0.969
	No	33 (89.2)	234 (89.0)	
Revascularization	Yes	7 (18.9)	41 (15.6)	0.605
	No	30 (81.1)	222 (84.4)	
Stroke	Yes	4 (10.8)	19 (7.2)	0.443
	No	33 (89.2)	244 (92.8)	

Data presented as mean ± SD or frequency (%).

Stroke, MI, and revascularization were not statistically significant in both groups, which is again in line with the old studies.[15,21] Patients of 60 years of age or older had higher mortality, as per our study. The fact that patients older than 60 years also had other co-morbidities and complex cardiac anatomy, which can lead to early demise. Old age and hypertension were linked to mortality, but the relationship was not statistically significant.[14,15]

Although our study shows that PCI and CABG have both favorable outcomes as far as short-term MACCE is considered, which is in line with old studies.[13,14,15,20,21] More multicenter studies are suggested as our study has certain limitations, such as a small sample size, being conducted at a single center, and the absence of long-term follow-up.

CONCLUSION

Both PCI and CABG can be undertaken for patients with LMCAD with intermediate SYNTAX score, as both show equivalent outcomes in terms of MACCE. The incidence of MACCE was not found to be statistically significant in both groups. These findings show that both revascularization techniques can be used in this situation. However, in order to further clarify the situation, a multi-center study is required with a follow-up of longer duration.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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1	**Muhammad Zia ur Rehman:** Concept, data collection, writing.
2	**Bilal S. Mohydin:** concept, critically manuscript review.
3	**Ali Bin Tariq:** Data collection, writing, data interpretation.
4	**Muhammad Anjum Rana:** Critically review.
5	**Fahim Ahmad Danish:** Data interpretation.
6	**Muhammad Tahir Mohyuddin:** Critical revisions.