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Distal left main stenting versus coronary artery bypass graft in intermediate syntax score

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Abstract

Background: Percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) stands as effective treatment choices for coronary revascularization among selected cases developing stable coronary artery disease as well as ischemia. This work was aimed at comparing the MACE outcomes (total deaths, myocardial infarction (MI), coronary revascularization, stroke, as well as hospitalization) between cases developing intermediate syntax score who underwent distal left main coronary artery stenting and others who underwent coronary artery bypass graft with a six-month follow-up period.

Methods: The cohort study included 100 cases, with an age range falling between eighteen and seventy-five years, both genders, developing de novo lesions, stenosis equal to or above 50% of left main coronary artery, having stable/unstable angina or atypical chest pain and, in asymptomatic cases, they had positive evidence of myocardial ischemia. Participants underwent an equal categorization into two groups: group A: Left main coronary artery stenting and group B: CABG.

Results: Syntax score was significantly reduced within PCI group as opposed to CABG group ($p=0.001$). Stents number exhibited significantly greater measurements within CABG group as opposed to PCI group ($p=0.001$). HbA1c exhibited significantly greater values within PCI group as opposed to CABG group ($p=0.017$). Coronary angiography findings exhibited significant variances among PCI and CABG groups ($p<0.001$). Outcome as well as complications at discharge and after 6 months were insignificantly different between the two groups. Cardiac events at discharge and within a six-month period exhibited insignificant variance among both groups.

Conclusions: Syntax score exhibited a significant reduction within PCI group in comparison to CABG group. In cases developing intermediate SYNTAX II score, no significant variance was documented among the PCI and CABG with respect to outcome and complications at discharge or after 6 months which including MACE, MI, stroke, heart failure, revascularization and death.

Keywords: Percutaneous coronary intervention, coronary artery bypass grafting, coronary artery disease, syntax score

Introduction

Among selected individuals who develop stable coronary artery disease (CAD) or ischemia, percutaneous coronary intervention (PCI) as well as coronary artery bypass grafting (CABG) remain effective and viable options for coronary revascularization. Single or double-vessel CAD of lesser complexity is often managed with PCI, which has a greater degree of acceptability in comparison to CABG. Conversely, complex three-vessel disease is most effectively managed employing CABG, exhibiting a higher acceptance level^[1,2].

The CAD severity cannot be solely determined by the number of affected coronary arteries. The PCI's technical feasibility along with the prognosis are influenced by many crucial aspects, involving the lesion locations as well as their effect on blood flow, the extent of stenosis, the classifications of lesions, as well as the vessel's diameter and calcification. A novel angiographic SYNTAX score was developed to evaluate this concept^[3].

By Incorporating the American Heart Association (AHA) classification modified for the Arterial Revascularization Therapy Study (ARTS), the Leaman score, the American College of Cardiology (ACC)/AHA lesions classification system, the total occlusion classification system, as well as the Duke and ICPS classification systems for bifurcation lesions, along

with employing prior angiographic scores that evaluate the complexity of lesions, the SYNTAX score was introduced by experienced consultants [4].

The SYNTAX score measures the complexity of a lesion, which is determined by the characteristics of the coronary tree, the precise locations as well as specifics.

An essential characteristic of the SYNTAX score is its lesion-based nature, integrating all lesions to assess the degree of myocardial risk as well as the technical efficacy and success rates following treatment of each lesion. The score consists of three general questions, and each lesion requires responses to eight questions in order to get its individual score. These scores combine to provide the total SYNTAX score for each case [5].

This work was aimed at comparing the MACE outcomes (total deaths, myocardial infarction (MI), coronary revascularization, stroke, as well as hospitalization) between cases developing intermediate syntax score who underwent distal left main coronary artery stenting and others who underwent coronary artery bypass graft with a six-month follow-up period.

Patients and Methods

The cohort study included 100 cases, with an age range falling between eighteen and seventy-five years, both genders, developing de novo (previously untreated) lesions, stenosis equal to or above 50% of left main coronary artery, having stable/unstable angina or atypical chest pain and, in asymptomatic cases, they had positive myocardial ischemia evidence. We commenced our research after getting approved by the Ethical Committee Benha University Hospitals, Qalyubiya, Egypt. Our team got a signed informed consent from participants.

We excluded those who develop acute MI (≤ 24 h), cardiogenic shock, high-risk factors for bleeding, involving dysfunction of blood coagulation or prior major hemorrhage (like intracranial, or gastrointestinal) along with all concerns about the prolonged possible compliance with double antiplatelet therapy (DAPT), hepatic and renal failure or malignancies, severe mitral or valve disease, requiring surgical procedures within the next six months, prior lesion treatment (previous PCI or CABG), or those requiring concomitant cardiac surgical procedure.

Participants underwent an equal categorization into two groups: group A (PCI): Left main coronary artery stenting while group B: CABG.

Our team took a comprehensive medical history from all participants, followed by physical as well as cardiovascular assessments. Lab testing was also conducted [complete blood picture (CBC), kidney and liver function test, coagulation profile, lipid profile, creatinine kinase, creatinine kinase MB isoenzyme along with glycated hemoglobin (HbA1c)]. Additionally, radiological investigations were also conducted [electrocardiography (ECG), CABG as well as PCI].

Coronary artery bypass grafting

Was conducted based on the surgeon's decision and in accordance with local clinical standards. The vessel bypassing was conducted either via another arterial conduit or the saphenous vein in the configuration considered suitable by the surgeon. Among participants under the age of 70, arterial revascularisation was highly advised. Participants had the surgical procedure with or without

extra-corporeal circulation. Within on-pump procedures, the specific cardioplegia type was determined subjectively by the surgeon. Standardization of anesthesia techniques was absent.

Percutaneous coronary intervention

When dealing with more than one stent per lesion. Administering a kissing balloon was recommended after stent insertion within cases developing bifurcation lesions. Bilateral coronary angiography with simultaneously injections of both the left and right coronary arteries was advised for lesions exhibiting complete occlusion. Pre-procedural administration of a loading dosage of clopidogrel was required and sustained for a six-month period at least following surgery. 6-month assessment of major adverse cardiac and cerebrovascular events (MACCE). Quality of life at 6 months was an additional predetermined secondary outcome measure.

Clinical follow-up

A clinical office visit was used for clinical follow-up 6 months after the procedure. Echocardiography or stress ECG was obtained for all patients 6 months after the procedure. An independent cardiologist blinded to the study oversaw assessing all events.

SYNTAX score

The diagnostic angiograms along with electrocardiograms were evaluated by personnel at an autonomous core laboratory who were not informed of the therapy assignments. Scoring of diagnostic angiograms was performed employing the SYNTAX scoring system [6]. The SYNTAX score stands as a comprehensive anatomical evaluation that arose from several pre-existing classifications. Briefly, any lesion that produces at least 50% luminal obstruction, measuring 1.5 mm or more is classified based on the modified AHA coronary tree segment classification. It is then evaluated individually based on factors such as bifurcations or trifurcations, aortic ostial localisation, chronic occlusion, vessel tortuosity, length, calcification, while thrombus formation. Ultimately, the sum of the scores for all lesions is employed to derive the comprehensive SYNTAX Score for the case. Therefore, higher SYNTAX Scores suggest complex coronary disease..

Statistical analysis

We conducted statistical analysis employing SPSS v26 (IBM Inc., Chicago, IL, USA). Quantitative variables were illustrated as mean as well as standard deviation (SD) while a comparison was carried out among groups with unpaired Student's t-test. Qualitative variables were showcased as frequency as well as percentage (%). Then, analysis was carried out employing the Chi-square or Fisher's exact test when appropriate. A two-tailed P value of below 0.05 was deemed statistically significant.

Results

Males and smoking exhibited significantly greater values within CABG group as opposed to PCI group ($p < 0.001$) while age, DM, HTN, dyslipidaemia, Hb as well as creatinine levels exhibited insignificant variance among both groups. HbA1c exhibited significantly greater values within PCI group in comparison to CABG group ($p = 0.017$). Table 1.

Table 1: Demographic characteristics, comorbidities, risk factors and laboratory data among both groups

		PCI group (n=50)	CABG group (n=50)	Test	P
Age (years)		58.40±5.01	56.90±6.44	$Z_{MWU}=1.157$	0.247
Sex	Male	27 (54.0%)	45 (90.0%)	$X^2=0.125$	<0.001*
	Female	23 (46.0%)	5 (10.0%)		
Comorbidities and risk factors					
DM		33 (66.0%)	38 (76.0%)	1.214	0.271
HTN		36 (72.0%)	32 (64.0%)	0.735	0.391
Dyslipidemia		38 (76.0%)	45 (90.0%)	3.473	0.062
Smoking		18 (36.0%)	30 (60.0%)	5.769	0.016*
Laboratory data	Hb (g/dl)	12.65±1.24	12.61±1.19	$T=0.165$	0.870
	HbA1C (%)	7.91±1.97	7.63±1.53	$Z_{MWU}=2.388$	0.017*
	Creatinine (mg/dl)	1.11±0.26	1.29±0.37	$Z_{MWU}=0.938$	0.348

Data are presented as mean ± SD or frequency (%). *Significant p value <0.05. PCI: Percutaneous coronary intervention, CABG: Coronary artery bypass grafting, DM: Diabetes mellitus, HTN: Hypertension, Hb: Hemoglobin, HbA1C: glycated hemoglobin, X^2 : Chi- square test, Z_{MWU} : Mann-Whitney U test.

EF exhibited insignificant variance among PCI and CABG groups. Syntax score was significantly reduced within PCI group as opposed to CABG group (p=0.001). Stents number

exhibited significantly greater values within CABG group in comparison to PCI group (p=0.001). Table 2.

Table 2: Comparison of EF, syntax score and stents number among both groups

		PCI group (n=50)	CABG group (n=50)	Test	P
EF (%)		58.94±7.37	60.78±7.96	$t=1.199$	0.233
Syntax score		20.88±1.71	22.60±2.58	$Z_{MWU}=3.459$	0.001*
Number of stents	One	6 (12.0%)	0 (0.0%)	$X^2=17.37$	0.001*
	Two	17 (34.0%)	5 (10.0%)		
	Three	20 (40.0%)	36 (72.0%)		
	Four	7 (14.0%)	9 (18.0%)		
Number of stents		2.56±0.88	3.08±0.53	$Z_{MWU}=3.287$	0.001*

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

*Significant p value <0.05. PCI: Percutaneous coronary intervention, CABG: Coronary artery bypass grafting, EF: Ejection fraction, X^2 : Chi- square test, Z_{MWU} : Mann-Whitney U test.

Coronary angiography findings showed significant variances among PCI and CABG groups (p<0.001). Table 3

Table 3: Coronary angiography findings among both groups

		PCI group (n=50)	CABG group (n=50)	X^2	P
Coronary angiography	Distal LM	50 (100.0%)	50 (100.0%)	47.18	<0.001*
	Mid RCA	15 (30.0%)	19 (38.0%)		
	Mid LCX	6 (12.0%)	18 (36.0%)		
	Mid LAD	4 (8.0%)	18 (36.0%)		
	Ostial LAD	20 (40.0%)	5 (10.0%)		
	Ostial LCX	2 (4.0%)	1 (2.0%)		
	Ostial OM	2 (4.0%)	21 (42.0%)		
	Ostial PDA	0 (0.0%)	6 (12.0%)		
	Ostial RCA	3 (6.0%)	12 (24.0%)		
	Ostial Proximal LAD	4 (8.0%)	1 (2.0%)		
	Ostial to Mid LAD	6 (12.0%)	5 (10.0%)		
	Proximal to Mid LAD	2 (4.0%)	5 (10.0%)		
	Proximal OM	4 (8.0%)	1 (2.0%)		
	Proximal RCA	3 (6.0%)	2 (4.0%)		
	Proximal LCX	2 (4.0%)	12 (24.0%)		
	Proximal PDA	2 (4.0%)	1 (2.0%)		
Proximal LAD	13 (26.0%)	6 (12.0%)			

Data are presented as frequency (%). *Significant p value <0.05. PCI: Percutaneous coronary intervention, CABG: Coronary artery bypass grafting, X^2 : Chi- square test, LM: Left main, RCA: Right coronary artery, LCX: Left circumflex coronary artery, OM: obtuse marginal, PDA: Patent ductus arteriosus, RCA: Right coronary artery, LAD: Left anterior descending coronary artery.

Outcome and complications at discharge and within a six-month period exhibited insignificant variance among both groups. Table 4

Table 4: Comparison of outcome and complications at discharge and after 6 months among both groups

	PCI group (n=50)	CABG group (n=50)	X ²	P
Outcome and complications at discharge				
MACE	11 (22.0%)	12 (24.0%)	0.056	0.812
MI	0 (0.0%)	0 (0.0%)	--	--
Stroke	2 (4.0%)	3 (6.0%)	0.211	>0.999 ^{FET}
HF	6 (12.0%)	4 (8.0%)	0.444	0.505
Revascularization	2 (4.0%)	0 (0.0%)	2.041	0.495 ^{FET}
Death	0 (0.0%)	1 (2.0%)	1.010	>0.999 ^{FET}
After 6 months				
	PCI group (n=50)	CABG group (n=49)	X ²	P
MACE	8 (16.0%)	6 (12.2%)	0.287	0.592
MI	0 (0.0%)	1 (2.0%)	1.031	0.495 ^{FET}
Stroke	1 (2.0%)	1 (2.0%)	0.00	>0.999 ^{FET}
HF	2 (4.0%)	1 (2.0%)	0.323	>0.999 ^{FET}
Revascularization	0 (0.0%)	3 (6.1%)	2.970	0.242 ^{FET}
Death	0 (0.0%)	0 (0.0%)	--	--

Data are presented as frequency (%). PCI: Percutaneous coronary intervention, CABG: Coronary artery bypass grafting, X²: Chi- square test, FET: Fischer exact test, MACE: Major adverse cardiovascular events, MI: Myocardial infarction, HF: Heart failure.

Cardiac events at discharge and within a six-month period exhibited insignificant variance among both groups. Table 5

Table 5: Comparison of cardiac events at discharge and within a six-month period among both groups

	PCI group (N=50)	CABG group (N=50)	X ²	P
Cardiac events at discharge				
Absent	45 (90.0%)	46 (92.0%)	1.678	>0.999 ^{MC}
Pulmonary edema	2 (4.0%)	1 (2.0%)		
VT	2 (4.0%)	1 (2.0%)		
AF	0 (0.0%)	1 (2.0%)		
Congested heart	1 (2.0%)	1 (2.0%)		
After 6 months				
	PCI group (N=50)	CABG group (N=49)	X ²	P
Absent	45 (90.0%)	49 (100.0%)	5.095	0.234 ^{MC}
Hypertensive urgency	2 (4.0%)	0 (0.0%)		
AF	1 (2.0%)	0 (0.0%)		
Congested heart	1 (2.0%)	0 (0.0%)		

Data are presented as frequency (%). PCI: Percutaneous coronary intervention, CABG: Coronary artery bypass grafting, X²: Chi- square test, MC: Monte-Carlo correction, VT: Ventricular tachycardia, AF: Atrial fibrillation.

Discussion

Left main coronary artery (LMCA) disease stands as a condition, causing high morbidity. It could be linked to a poor prognosis if not revascularized [7, 8].

Our research demonstrated that the mean EF within the PCI group indicated 58.94±7.37% while in CABG group, the mean EF was 60.78±7.96%. No significant variance was documented among PCI and CABG groups regarding EF. Our findings supported TRĂȘCĂ *et al.* [9] did not address significant variance among both patient groups regarding left-ventricular ejection fraction. Additionally, our results are consistent with Hassan *et al.* [10] addressed no significant variance among both patient groups as regard preoperative ejection fraction.

In contrast to our results about laboratory data, Persson *et al.* [11] addressed significant variances among both groups as regards Hb and creatinine levels. Unlike the present study also, Daoulah *et al.* [12] also stated significant variance among both groups as regards creatinine levels.

In our study we revealed that the Syntax score in PCI group ranged from 18 to 24 while in CABG group, the Syntax score ranged from 18 to 27. Syntax score exhibited a significant reduction within PCI group in comparison to CABG group. Similarly, TRĂȘCĂ *et al.* [9] addressed significant variance among PCI and CABG groups as regards SYNTAX scores. As well, our results are consistent

with Hassan *et al.* [10] addressed significant variance among PCI and CABG groups as regards SYNTAX scores.

Regarding coronary angiography findings among the two studied groups, we found highly significant variance among PCI and CABG groups as regards coronary angiography findings. In disagreement with the present study, Warisawa *et al.* [13] addressed no significant variance among both groups as regards coronary angiography findings.

Our research addressed significant variance among PCI and CABG groups as regards stents number since it exhibited significantly greater values in CABG group as opposed to PCI group (p=0.001). In disagreement with the present study, Hassan *et al.* [10] did not address significant variations among the groups as regard the total procedures number.

Regarding outcome as well as complications at discharge and within a six-month period among the two studied groups, we revealed no significant variances among both groups regarding MACE, MI, stroke, heart failure, revascularization as well as mortality. Supporting our research, Head *et al.* [4] revealed no statistically significant variance among both groups as regards MACCE, death, stroke, MI and revascularization. Additionally, our findings supported Etman *et al.* [14] addressing no significant variances among both groups as regards the occurrence of all-cause mortality, MI, target vessel revascularization, stroke or major as well as fatal bleeding.

Our study about cardiac events at discharge and after 6 months, we found that in PCI group, two cases had pulmonary edema, two cases reported ventricular tachycardia, and one case exhibited congested heart. No significant variance was observed among both groups regarding cardiac events at discharge. Our results are consistent with, Etman *et al.* [14] addressed no significant variance among both groups as regards cardiac events at discharge. Also, our results in consistent with Athappan *et al.* [15] addressed no significant variance as regards combined MACE among both groups.

Limitations involved a relatively modest sample size. We conducted a single-center research. The participants had a relatively short follow-up period. Therefore, we suggest that future investigations should be carried either utilizing meticulously planned RCTs or extensive, comparative observational research. Collect a representative sample of cases who have comparable age, gender, as well as condition severity.

Conclusions

Syntax score exhibited a significant reduction within PCI group in comparison to CABG group. In cases developing intermediate SYNTAX II score, no significant variance was documented among the PCI and CABG with respect to outcome and complications at discharge or after 6 months which including MACE, MI, stroke, heart failure, revascularization and death.

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Conflict of Interest: Nil.

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