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Clinical Research

Comparison of Percutaneous Coronary Intervention versus Coronary Artery Bypass Grafting for Unprotected Left Main Coronary Artery Disease at National Cardiovascular Centre Harapan Kita

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Background. Despite many studies had been done comparing the outcome of Percutaneous Coronary Intervention (PCI) versus Coronary Artery Bypass Grafting (CABG) in Unprotected Left Main Coronary Artery Disease (ULMCAD), there is none such study in Indonesia.
Aim. To compare the outcome of PCI versus CABG in ULMCAD patients at National Cardiovascular Centre Harapan Kita (NCCHK) Jakarta.
Methods. A retrospective cohort study was done including 137 ULMCAD NCCHK patients who underwent PCI (n = 67) or CABG (n = 70) from July 2008 until March 2010. One-year Major Adverse Cardio Cerebrovascular Event (MACCE) outcome as defined by death, myocardial infarction (MI), stroke, and target vessel revascularization (TVR), were evaluated using Chi-square analysis, while Kaplan-Meier and Cox regression analysis were used to examine the survival curve of the mentioned intervention.
Results. One-year risk of composite MACCE (death, stroke, and TVR) (hazard ratio (HR): 1.267; 95% confidence interval (CI): 0.567 – 2.829, p = 0.564), and the risk of death (HR: 1.080; 95% CI: 0.405 – 2.878, p = 0.878) were not significantly different for patients undergoing PCI versus CABG. Proportion of stroke was significantly higher in the CABG group (8.6% vs 0.0%; p = 0.014), while proportion of TVR was significantly higher in the PCI group (13.4% vs 0.0%; p = 0.001). No MI event was documented in both groups.
Conclusion. During one-year follow up, PCI showed similar rate of composite MACCE and death, but higher TVR as compared to CABG in ULMCAD patients. Meanwhile CABG showed higher stroke rate as compare to PCI.

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Keywords: Percutaneous Coronary Intervention, Coronary Artery Bypass Grafting, Unprotected Left Main Coronary Artery Disease, One-year Major Adverse Cardio Cerebrovascular Event

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Penelitian Klinis

Perbandingan antara Intervensi Koroner Perkutan dengan Bedah Pintas Koroner pada *Unprotected Left Main Coronary Artery Disease* di Pusat Jantung Nasional Harapan Kita

Jajang Sinardja, Yoga Yuniadi, Doni Firman

Latar Belakang. Walaupun telah banyak studi dilakukan untuk membandingkan keluaran Intervensi Koroner Perkutan (IKP) dengan Bedah Pintas Koroner (BPK) pada pasien *Unprotected Left Main Coronary Artery Disease (ULMCAD)*, studi serupa belum pernah dilakukan di Indonesia.
Tujuan. Membandingkan keluaran dari IKP dengan BPK pada pasien ULMCAD di Pusat Jantung Nasional Harapan Kita (PJNHK), Jakarta.
Metode. Telah dilakukan studi kohort retrospektif terhadap 137 pasien ULMCAD di PJNHK yang menjalani IKP (n = 67) atau BPK (n = 70) dari Juli 2008 sampai Maret 2010. Keluaran Kejadian Kardio Serebrovaskular Mayor (KKSM) Satu-Tahun sebagaimana didefinisikan sebagai kematian, infark miokard, stroke, dan *target vessel revascularization (TVR),* dievaluasi menggunakan analisa Kai kuadrat, sementara Kaplan-Meier dan analisa regresi Cox digunakan untuk menilai kurva kesintasan dari kedua tindakan tersebut.
Hasil. Resiko satu tahun dari gabungan KKSM (kematian, stroke, dan *TVR*) *(hazard ratio (HR)*: 1.267; 95% interval kepercayaan (IK): 0.567 – 2.829, p = 0.564), dan resiko kematian (HR: 1.080; 95% IK: 0.405 – 2.878, p = 0.878) tidak berbeda bermakna pada pasien yang menjalani IKP dibandingkan BPK. Proporsi stroke lebih tinggi secara bermakna pada kelompok BPK (8.6% vs 0.0%; p = 0.014), sedangkan proporsi *TVR* lebih tinggi bermakna pada kelompok IKP (13.4% vs 0.0%; p = 0.001). Tidak ada kejadian infark miokard pada kedua kelompok.
Kesimpulan. Dalam satu tahun pengamatan, IKP menunjukkan angka gabungan KKSM yang sama, tetapi angka *TVR* lebih tinggi dibandingkan dengan BPK pada pasien ULMCAD. Sementara itu BPK menunjukkan angka stroke lebih tinggi dibandingkan dengan IKP.

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Kata kunci: Intervensi Koroner Perkutan, Bedah Pintas Koroner, *Unprotected Left Main Coronary Artery Disease*, Kejadian Kardio Serebrovaskular Mayor Satu-Tahun.

Coronary artery bypass grafting (CABG) is still regarded as the standard treatment for unprotected left main coronary artery disease (ULMCAD).[1] ESC guidelines on PCI stated that 'Stenting for ULMCAD should only be considered in the absence of other revascularization options.'[2] This might be true in the era of angioplasty (POBA) or bare metal stents (BMS),[3-4] but with the emerging of drug-eluting stents (DES) era, with the promise of vastly reduced rate of restenosis, the possibility of improved late outcomes

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in this challenging patient group had raised consideration that PCI might have a greater role in treating ULMCAD patients.[5-6] Bunch of available data support continued use and study of PCI, especially using DES, in ULMCAD patients with suitable anatomy who are either at high risk for CABG or are strongly adverse to surgery.[7-16] Though, some of those studies were done in Asia, most were done in Mongoloid population, and very limited data available for non-Mongoloid Asian population.[7,12,16]

At National Cardiovascular Centre Harapan Kita (NCCHK), Jakarta, CABG was also the standard treatment for ULMCAD, but yet the proportion of ULMCAD patients who didn't undergo CABG were quite high, due to patient's preference or high risk profile for CABG. In such cases, PCI was frequently considered as an alternative treatment.

This study aimed to compare the outcome of PCI versus CABG in ULMCAD patients at NCCHK, since there was no such study had been done in Indonesia. The end points of the study were Major Adverse Cardiac Cerebrovascular Event (MACCE) which were defined as death, myocardial infarction (MI), stroke and target vessel revascularization (TVR).

Methods

Study population. This was a retrospective cohort study including 137 ULMCAD patients who underwent revascularization procedure, either PCI (n = 67) or CABG (n = 70) between July 2008 and March 2010 at NCCHK, Jakarta, Indonesia. Left main coronary artery (LMCA) disease was defined as 50% or more of stenosis either at ostial/mid and or distal/bifurcation of LMCA, and was considered unprotected if there were no patent grafts either to the left anterior ascending (LAD) or left circumflex (LCX) coronary arteries.[17] Patients with previous CABG history, and who underwent concomittant valvular surgery were excluded from this study.

Data were collected from medical record and or by phone. Data including clinical and angiographical data. To evaluate severity of vessels disease we used SYNTAX scoring, as had been described elsewhere.[18] All patients were followed up until one year after revascularization procedure. The end points of the study were MACCE which were defined by death, MI, stroke, or TVR. Death was defined as death from any cause. MI was defined as documented event of hospitalization due to diagnosis of ST elevation MI (STEMI). Stroke was considered if there was any neurological deficits after the revascularization procedure, which confirmed by a neurologist. TVR was defined as any repeat revascularization procedure in any segment of left coronary arteries, either LM, LAD or LCX.[16]

Patients underwent PCI, instead of CABG, because of either the patient's or physician's preference or the high risk associated with CABG. All procedures were done with standard interventional techniques under operator's discretion.

Statistical analysis. Data were expressed as means ± SD. Baseline characteristics of different patient categories were compared using Student *t* tests or Mann-Whitney for continuous variables and Chi-squared tests for categorical variables.

Event-free survival curves were estimated by the Kaplan-Meier method and compared using the log-rank test. The Cox proportional hazards regression model was used to determine which variables were related significantly to MACCE. Each variable was first tested in univariate analysis and then retested after adjustments for possible confounders. Variables with p values < 0.2 in the univariate Cox regression analysis were used in the multivariate Cox regression analysis. Differences were considered statistically significant at the two-sided $p < 0.05$ level. All statistical analyses were performed using SPSS statistical software, version 17.0 (Chicago, Illinois).

Results

Patient characteristics. The baseline characteristics of the study patients are shown in Table 1. Of 137 patients included in this study from July 2008 until March 2010, most were men (89.8%) with mean age of 60 years old. Sixty seven patients were treated with PCI, while 70 patients were treated with CABG.

The CABG patients showed a higher clinical and angiographical risk profile as compared to the PCI patients, as were indicated by significantly higher diabetes (52.9% vs. 32.8%; p = 0.018), extent of vessel disease (p = 0.001), involvement of right coronary artery (RCA) (p < 0.001), and higher SYNTAX score (37.9 vs. 30.6; p < 0.001). However, patients who had previous PCI were higher in the PCI group than the CABG group (26.9% vs. 12.9%; p = 0,039).

Table 1. Baseline Characteristics

Variable	Overall Patients (n = 137)	PCI (n = 67)	CABG (n = 70)	p Value
Age	60 ± 8	59.8 ± 7.8	61.1 ± 8.1	0.419
Male	123 (89.8%)	61 (91.0%)	62 (88.6%)	0.633
Medical history:				
Diabetes mellitus	59 (43.1%)	22 (32.8%)	37 (52.9%)	0.018*
Hipertension	111 (81.0%)	44 (82.1%)	56 (80.0%)	0.755
Dyslipidemia	98 (71.5%)	43 (64.2%)	55 (78.6%)	0.062
Current smoker	77 (56.2%)	36 (53.7%)	41 (58.6%)	0.568
Previous coronary intervention	27 (19.7%)	18 (26.9%)	9 (12.9%)	0.039*
Previous myocardial infarction	68 (49.6%)	29 (43.3%)	39 (55.7%)	0.146
Previous congestive heart failure	27 (19.7%)	10 (14.9%)	17 (24.3%)	0.169
Cerebrovascular disease	10 (7.3%)	4 (6.0%)	6 (8.6%)	0.745
Chronic kidney disease	48 (35.0%)	24 (35.8%)	24 (34.3%)	0.851
Ejection fraction ≤ 35%	19 (14.2%)	9 (14.1%)	10 (14.3%)	0.970
Atrial fibrillation rhythm	8 (5.8%)	5 (7.5%)	3 (4.3%)	0.487
Clinical indication:				
Silent ischemia	1 (0.7%)	1 (1.5%)	0 (0.0%)	0.333
Chronic stable angina	103 (75.2%)	47 (70.1%)	56 (80.0%)	
Unstable angina	9 (6.6%)	5 (7.5%)	4 (5.7%)	
NSTEMI	16 (11.7%)	11 (16.4%)	5 (7.1%)	
STEMI	8 (5.8%)	3 (4.5%)	5 (7.1%)	
Involved location				
Ostial / Mid	20 (14.6%)	9 (13.4%)	11 (15.7%)	0.705
Distal / Bifurcation	117 (85.4%)	58 (86.6%)	59 (84.3%)	
Extent of disease				
LM only	2 (1.5%)	2 (3.0%)	0 (0.0%)	0.001*
LM plus single vessel disease	17 (12.4%)	12 (17.9%)	5 (7.1%)	
LM plus double vessel disease	33 (24.1%)	23 (34.3%)	10 (14.3%)	
LM plus triple vessel disease	85 (62.0%)	30 (44.8%)	55 (78.6%)	
Right coronary artery disease	97 (70.8%)	35 (52.2%)	62 (88.6%)	<0.001*
SYNTAX score	34.4 ± 8.0	30.6 ± 9.3	37.9 ± 10.0	<0.001*

Note: Continues data were described using mean ± SD or median (min-max) when appropriate. As for categorical data, the data were described using percentage. Significancies for continues data were analyzed using Student T-test analysis or Mann-Whitney analysis and considered significant if $p < 0.05$. Categorical data were compared using the Chi-square analysis and considered significant if $p < 0.05$.

Among 67 PCI treated patients, 46 patients (68.6%) received DES, 16 patients (23.9%) received BMS, and only 5 patients (7.5%) received balloon angioplasty. We tried to compare one-year MACCE outcome between BMS vs CABG, DES vs CABG, and overall PCI vs CABG. The results were shown in table 2. No MI was documented either in the PCI, or in the CABG group. Composite MACCE were composed of death, stroke and TVR.

In the BMS vs. CABG the composite MACCE were significantly higher in the BMS group (43.8% vs 15.7%; p = 0.035). Both BMS and DES showed higher TVR rates as compare to CABG (18.8% vs 0.0%; p = 0.005, and 13.0% vs 0.0%; p = 0.003, respectively).

There were no significant differences of composite MACCE and death between overall PCI and CABG group (19.4% vs 15.7%; p = 0.570, and 11.9% vs 11.4%; p = 0.926, respectively). However, there were significant differences in proportion of stroke and TVR, in which proportion of stroke was significantly higher in the CABG group (8.6% vs 0.0%; p = 0.014), while proportion of TVR was significantly higher in the PCI group (13.4% vs 0.0%; p = 0.001).

After adjusment of baseline covariates, the one-year risk of composite MACCE and death were similar in the 2 groups of treatment, either using BMS, DES, or

Table 2. MACCE Outcome Comparison

Outcome	BMS vs CABG (n=86)			DES vs CABG (n=116)			PCI vs CABG (n=137)		
	BMS (n=16)	CABG (n=70)	p Value	DES (n=46)	CABG (n=70)	p value	PCI (n = 67)	CABG (n=70)	p Value
Composite MACCE	7 (43.8%)	11 (15.7%)	0.035*	6 (13.0%)	11 (15.7%)	0.691	13 (19.4%)	11 (15.7%)	0.570
Death	5 (31.3%)	8 (11.4%)	0.06	3 (6.5%)	8 (11.4%)	0.522	8 (11.9%)	8 (11.4%)	0.926
Stroke	0 (0.0%)	6 (8.6%)	0.588	0 (0.0%)	6 (8.6%)	0.08	0 (0.0%)	6 (8.6%)	0.014*
TVR	3 (18.8%)	0 (0.0%)	0.005*	6 (13.0%)	0 (0.0%)	0.003*	9 (13.4%)	0 (0.0%)	0.001*

overall PCI, as can be seen in table 3. However, there was a trend toward higher rate of composite MACCE and death in the BMS group than the CABG group. By contrast when comparing DES vs CABG, there was a trend toward lower rate of composite MACCE and death in the DES group than the CABG group. The risks of stroke and TVR could not be computed by multivariate analysis since there was no stroke event in the PCI group, and no TVR event in the CABG group.

Some patient's baseline characteristics showed significant proportion differences in relation with MACCE outcome. They were age (59.5±7.4 vs 65.0±9.1; p = 0.003), previous myocardial infarction (MI) history (43.4% vs 79.2%; p = 0.001), previous congestive heart failure (CHF) history (15.0% vs 41.7%; p = 0.008), cerebrovascular disease (CVD) (4.4% vs 20.8%, p = 0.015), chronic kidney disease (CKD) (30.1% vs 58.3%; p = 0.008), and ejection fraction (EF) less than 35% (9.1% vs 37.5%, p = 0.001). (Table 4)

However, in multivariate Cox Regression analysis, after adjustment with age and sex, there was no any variable which significantly predicted the one-year MACCE outcome. (Table 5)

Using Kaplan Meier analysis (figure 1), the univariate survival curve for composite MACCE outcome and death did not differ significantly (p log rank =

Table 3. HRs for Clinical Outcomes After PCI as Compared With After CABG

Outcome	Unadjusted		Adjusted	
	HR* (95% CI)	p Value	HR* (95% CI)	P Value
PCI vs. CABG (n=137)				
Composite MACCE	1.229 (0.551 – 2.744)	0.614	1.267 (0.567 – 2.829)	0.564
Death	1.041 (0.391 – 2.775)	0.935	1.080 (0.405 – 2.878)	0.878
Stroke	0.016 (0.00 – 11.295)	0.216	NA	NA
TVR	68.22 (0.32 – 14543.3)	0.123	NA	NA
BMS vs. CABG (n=86)				
Composite MACCE	2.998 (1.161 – 7.742)	0.023*	2.433 (0.934 – 6.342)	0.069
Death	2.904 (0.949 – 8.884)	0.062	2.439 (0.794 – 7.498)	0.120
Stroke	0.037 (0.000 – 375.9)	0.484	NA	NA
TVR	NA	NA	NA	NA
DES vs. CABG (n=116)				
Composite MACCE	0.811 (0.300 – 2.192)	0.679	0.887 (0.328 – 2.403)	0.814
Death	0.560 (0.149 – 2.110)	0.391	0.608 (0.160 – 2.306)	0.465
Stroke	0.021 (0.000 – 18.20)	0.264	NA	NA
TVR	103.9 (0.116 – 93503)	0.181	NA	NA

*Hazard ratios (HRs) are for the PCI group, as compared with CABG group.

Table 4. Patient's Characteristics Based on MACCE Outcome

Variable	MACCE (-) (n = 113)	MACCE (+) (n = 24)	p Value
Age	59.5 ± 7.4	65.0 ± 9.1	0.003*
Male	99 (87.6%)	24 (100%)	0.129
Medical history:			
Diabetes mellitus	51 (45.1%)	8 (33.3%)	0.289
Hipertension	93 (82.3%)	18 (75.0%)	0.400
Dyslipidemia	81 (71.7%)	17 (70.8%)	0.933
Current smoker	60 (53.1%)	17 (70.8%)	0.112
Previous coronary intervention	21 (18.6%)	6 (25.0%)	0.572
Previous myocardial infarction	49 (43.4%)	19 (79.2%)	0.001*
Previous congestive heart failure	17 (15.0%)	10 (41.7%)	0.008*
Cerebrovascular disease	5 (4.4%)	5 (20.8%)	0.015*
Chronic kidney disease	34 (30.1%)	14 (58.3%)	0.008*
Ejection fraction ≤35%	10 (9.1%)	9 (37.5%)	0.001*
Atrial fibrillation rhythm	5 (4.4%)	3 (12.5%)	0.145
Clinical indication:			
Silent ischemia	1 (0.9%)	0 (0.0%)	0.832
Chronic stable angina	86 (76.1%)	17 (70.8%)	
Unstable angina	8 (7.1%)	1 (4.2%)	
NSTEMI	12 (10.6%)	4 (16.7%)	
STEMI	6 (5.3%)	2 (8.3%)	
Involved location			
Ostial / Mid	15 (13.3%)	5 (20.8%)	0.347
Distal / Bifurcation	98 (86.7%)	19 (79.2%)	
Extent of disease			
LM only	2 (1.8%)	0 (0.0%)	0.820
LM plus single vessel disease	15 (13.3%)	2 (8.3%)	
LM plus double vessel disease	27 (23.9%)	6 (25.0%)	
LM plus triple vessel disease	69 (61.1%)	16 (66.7%)	
Right coronary artery disease	79 (69.9%)	18 (75.0%)	0.619
SYNTAX score	33.6 ± 10.2	37.8 ± 10.2	0.064

Table 5. Multivariate Analysis of Factors Associated with MACCE Outcome

Variables	Unadjusted HR		Adjusted HR	
	HR (95% C.I.)	p Value	HR (95% C.I.)	p Value
Current smoker	1.766 (0.691 – 4.518)	0.235	1.473 (0.567 – 3.826)	0.427
Previous myocardial infarction	2.951 (1.014 – 8.588)*	0.047*	2.796 (0.970 – 8.055)	0.057
Previous congestive heart failure	1.272 (0.342 – 4.722)	0.720	1.134 (0.314 – 4.089)	0.848
Ejection fraction ≤35%	1.911 (0.509 – 7.175)	0.338	2.102 (0.565 – 7.827)	0.268
Cerebrovascular disease	2.438 (0.843 – 7.047)	0.100	1.996 (0.680 – 5.863)	0.209
Chronic kidney disease	2.183 (0.910 – 5.236)	0.080	1.683 (0.653 – 4.336)	0.281
Atrial fibrillation rhythm	4.026 (1.043 – 15.547)*	0.043*	2.551 (0.624 – 10.424)	0.192
SYNTAX score	1.019 (0.976 – 1.063)	0.394	1.022 (0.980 – 1.067)	0.311

Variables included in multivariate analysis were variables with $p < 0.2$ in univariate analysis. Adjusted HR: variables were adjusted with age and sex. The analysis were conducted using Cox Regression analysis with level of significance $p < 0.05$ (mark with *).

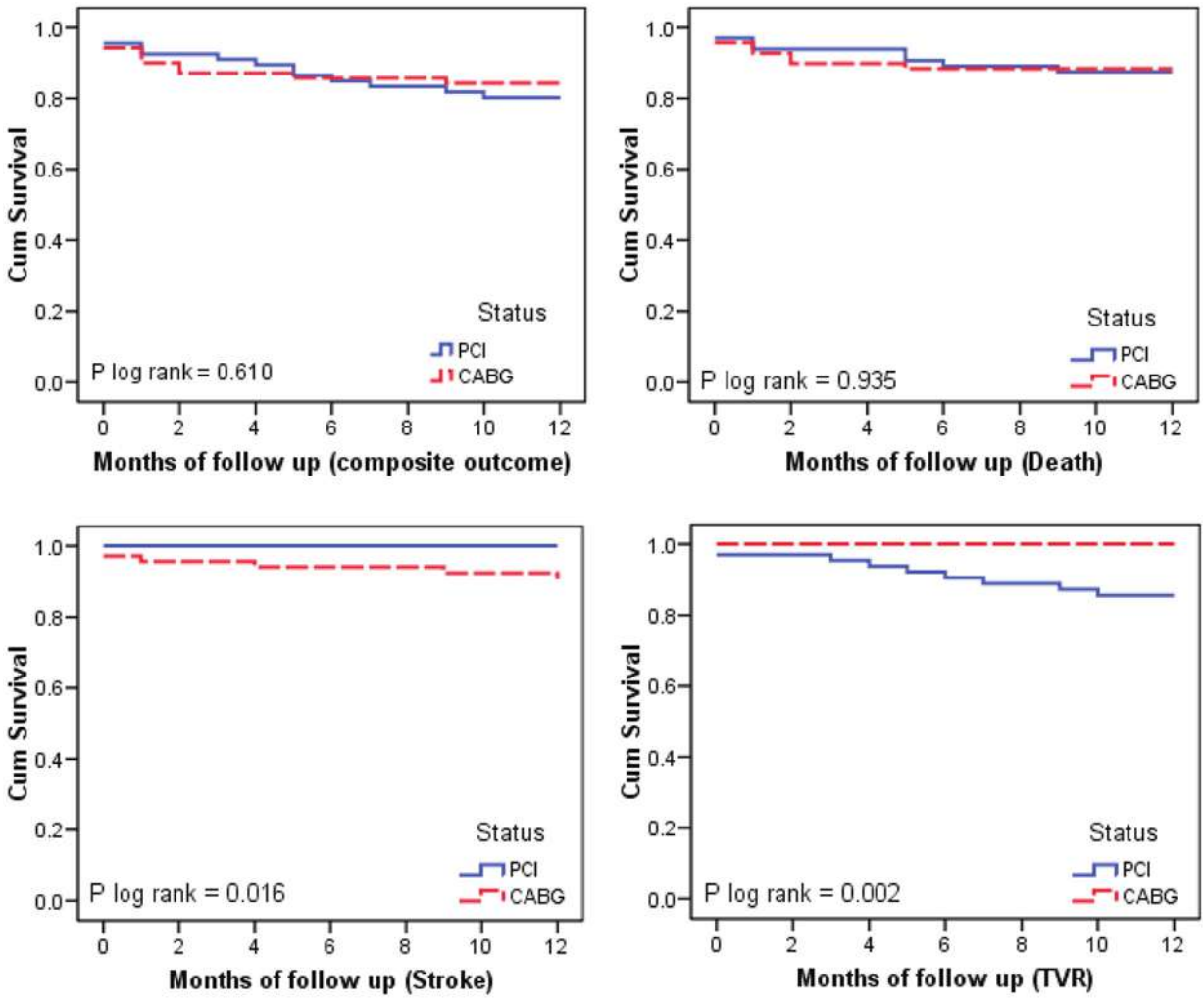

Figure 1. Kaplan-Meier Curves for Outcome in the Overall Patients Underwent PCI or CABG

0.610 and p log rank = 0.935, respectively) between the two groups of treatment. PCI patients showed a significantly better stroke-free survival curve as compared to CABG patients (p log rank=0.016). Whilst the opposite result was shown for TVR, in which CABG patients showed a significantly better TVR-free survival curve as compared to PCI patients (p log rank=0.002).

Discussion

In this study, there were no significant differences in the one-year risk of composite MACCE and death between the PCI group and the CABG group of ULMCAD patients at NCCHK. However, the rate of TVR was significantly higher in the PCI group, either using BMS or DES, than in the CABG group. By contrast, the rate of stroke was significantly higher in the CABG group than in the PCI group. The Kaplan-Meier survival curve showed consistent results, in which the composite MACCE and death-free survival curve were similar for both group, whereas stroke-free survival curve was better in the PCI group, and TVR-free survival curve was better in the CABG group.

Some previous studies had shown similar results. The MAIN-COMPARE Registry indicated that safety outcomes (death or composite of death, MI, or stroke) were comparable between PCI and CABG group, whereas PCI was related to a significantly higher rate

of TVR, either in BMS or DES group.[16] The left main subset of SYNTAX (Synergy between PCI with Taxus and Cardiac Surgery) trial also reported same results, in which PCI was comparable with CABG in terms of overall MACCE, and overall safety outcomes (death, cerebrovascular accident, and MI). The SYNTAX investigators also reported a higher rate of TVR in the PCI group, and a higher rate of cerebrovascular accident in the CABG group.[19]

In our study with 137 patients, the one-year MACCE outcome are as follow: death 11.7%, MI 0.0%, stroke 4.4%, and TVR 6.6%. The MAIN-COMPARE Registry, which so far the largest and longest study comparing PCI and CABG in ULMCAD, with 2.240 patients, showed 5-year MACCE outcome as follow: death 14.6%, MI 1.0%, stroke 1.8%, and TVR 9.7%.[16] Though our study result could not be simply compared to the MAIN-COMPARE study, due to different follow up period and study population size, the outcome of the revascularization procedure for ULMCAD patients in our centre is seemingly to be quite equal with other centres, except for a bit higher rate of stroke.

Lee et al, in comparison of CABG with PCI with DES for ULMCAD, indicated MI and diabetes as predictors of MACCE outcome.[8] The DELFT (Drug Eluting stent for LeFT main) Registry reported that age was predictor for cardiac death, while diabetes was predictor for MACE and TVR, and EF < 50% was predictor of TVR.[13] In our study, patients who experienced MACCE in one-year follow up were older in age, and showed higher proportion of previous MI, CHF, CVD, CKD, or EF $\leq$ 35%. However, after multivariate analysis, none of these variables significantly predicted one-year MACCE outcome in this study.

Capodanno et al reported the usefulness of SYNTAX score to select patients with ULMCAD to be treated with CABG. The study concluded that a SYNTAX score threshold of 34 may usefully identify a cohort of patients with ULMCAD who benefit most from surgical revascularization in terms of mortality.[20] In our study, the SYNTAX score was significantly higher in CABG patients than in PCI patients (37.9 vs 30.6).This may be translated that ULMCAD patients with lower SYNTAX score may undergo PCI with no difference in risk of MACCE and death as compare to CABG.

The CABG group in this study showed a higher clinical and angiographic risk profile, which was indicated by higher proportion of diabetic patients, more severe coronary artery disease, involvement of RCA, and higher SYNTAX score. This data was not surprising, since in diabetic patients, especially those with more severe CAD (thus, higher SYNTAX score), cardiologist tend to send the patients to surgeon, as recommended by the guidelines.[1] However, these factors did not reach statistical significancy as risk predictors of MACCE after multivariate analysis. Nevertheless, it will be wise to consider these variables when selecting ULMCAD patients for PCI. In terms of clinical practice, PCI could be considered as an effective and safe treatment for selected ULMCAD patients with lower SYNTAX score, non-diabetic, less severe coronary artery disease, and RCA disease-free.

The only higher proportion of clinical factor in the PCI group was previous PCI (p = 0.039). The PCI group also had a higher proportion of TVR as compared to the CABG group. We noticed that the most important cause of repeated PCI in our study is in-stent restenosis (ISR). Mandip Singh et al reported that ISR at baseline was one of the clinical factors that was associated with increased risk of TVR in 11.484 patients underwent PCI in PRESTO trial.[21] Considering these data, PCI might be more effective (in term of less TVR event) in selected patients with de novo ULMCAD lession. Until we have a better solution to treat ISR (especially DES-ISR) with percutaneous intervention, it might be better to consider CABG rather than PCI for a revascularization procedure.

This study only analyzed the clinical variables as risk factors for the overall MACCE events, but not with each component of MACCE (death, stroke, MI, or TVR) separately, due to lack of sample size. It might be that with a bigger sample size, some variables will show significant association as risk factors of death, stroke, MI or TVR. Sotiris C. Stamou et al reported that recent myocardial infarction, diabetes, and atrial fibrillation (AF) was associated with higher risk of stroke in post CABG patients.[22] In our study, CABG patients had higher proportion of diabetes (p = 0.018), whereas previous myocardial infarction and AF were significantly associated with higher risk of overall MACCE in unadjusted multivariate analysis (HR: 2.951; 95% CI: 1.014–8.588, p = 0.047, and HR: 4.026; 95% CI: 1.043–15.547, p = 0.043, respectively). Stroke proportion was higher in the CABG group. We couldn't conclude that diabetes, previous MI or AF were risk factors of stroke after CABG in this study, but with a bigger sample size, these factors might show significant relationship as risk factors of stroke after CABG.

In subgroup analysis the BMS group showed a trend toward higher rate of MACCE outcome than the CABG group, whereas the DES group showed a trend toward lower rate of MACCE outcome than the CABG group. Again, these results was in line with other previous studies which reported that DES displayed a better result than BMS in ULMCAD.[7-16] In light of this result, we consider using DES, instead of BMS in treating ULMCAD. In the future, with more experiences, and with the improvement of PCI techniques and stent technology, hopefully TVR rate can also be lessen, so PCI could be a more excellent treatment choice for ULMCAD patients.

Study limitation. This was a retrospective study with it's inherent limitations, so despite appropriate statistical adjustments, unknown confounders might have affected the results. Lack of TVR event in the CABG group, and stroke event in the PCI group had hampered the multivariate analysis calculation. A longer follow up period, and bigger sample size, may give a better study results.

Conclusion

In this retrospective cohort study, we found that PCI showed similar safety with CABG in treating ULMCAD, as there were no differences in one-year composite MACCE and death outcome between the two groups. However TVR rate were higher in PCI treated patients, whereas stroke rate were higher among CABG patients.

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