

Long-term outcome of percutaneous coronary intervention for unprotected left main coronary artery disease

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Abstract

Objectives: The aim of this study is to evaluate the in-hospital, 30 day and long-term outcomes after percutaneous coronary intervention for unprotected left main coronary artery disease.

Backgrounds: Left main coronary artery (LMCA) diseases stenosis is a strong indication for coronary artery bypass grafting (CABG). With improved device technology, percutaneous coronary intervention (PCI) with drug-eluting stent (DES) stents had been recently advocated as an alternative procedure for the unprotected LMCA disease.

Methods: Between January 2003 and February 2007, all unprotected LMCA PCI procedures were retrospectively collected. Outcomes were obtained by chart record review and telephone interview.

Results: Fifty five consecutive patients with >50% diameter stenosis of LMCA undergoing PCI were analyzed. Indications for a percutaneous strategy were prohibitive surgical risks, or patient/physician preference. The procedural success rate was 98%. 41 patients (75%) received DES implantation. The majority of cases ($n=33$) were treated with a double-stent strategy. There were no in-hospital deaths. The clinical follow-up time was 867 ± 410 days (range 20–1715). 18 (29%) patients experienced major adverse cardiac events, including 3 (5%) deaths, 4 (7%) myocardial infarctions, and 12 (21.8%) target lesion revascularizations (TLR) during follow-up. Multivariate analysis revealed hyperlipidemia (Hazard ratio, HR=6.2, $p=0.024$) and bifurcation involvement (HR=4.4, $p=0.008$) were independent predictors for MACE.

Conclusions: Our results showed that PCI with stenting was an acceptable treatment option for patients with LMCA stenosis. Involvement of the LMCA bifurcation remains a predictor for unfavorable outcome.

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Keywords: Left main coronary artery disease; Percutaneous coronary intervention; Bifurcation lesions; Stents

1. Introduction

The prevalence of left main coronary artery (LMCA) disease in patients undergoing coronary angiography ranges from 2.5% to 10%. [1,2] It is widely accepted that LMCA lesion with >50% diameter stenosis is a strong indication for coronary artery bypass grafting (CABG). With improved stent technology,

percutaneous coronary intervention (PCI) has been advocated as an alternative for patients unfit or unwilling to be operated. Despite recent reports of the feasibility and favorable outcomes of unprotected LMCA intervention using drug-eluting stents (DES) [3–6], there was a paucity of large randomized controlled trial. In addition, there is no consensus on the ideal interventional strategy for different types of LMCA disease.

2. Materials and methods

Of 1,376 PCI procedures performed in our institution from January 2004 to February 2007, 55 (4.0%) consecutive

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Table 1
Baseline characteristics of the study population.

Variable	Patient (=55)
Age (years)	66.4±11.0
Men	48 (87.3%)
BMI	24.6±2.6
Smoker	25 (45.5%)
Hypertention ($\geq 140/90$ mmHg)	38 (69.1%)
Hyperlipidemia ^a	36 (65.5%)
Diabetes mellitus	22 (40.0%)
Chronic renal insufficiency ^b	8 (14.5%)
Previous MI	9 (16.4%)
Previous PCI	23 (41.8%)
Unstable angina pectoris	9 (16.4%)
Left ventricular ejection fraction (%)	59.6±10.0
Left ventricular ejection fraction <40%	2 (3.6%)
EuroSCORE ^c	3.7±2.7
EuroSCORE >6	7 (12.7%)
Stenotic vessel	
left main coronary only	2 (3.6%)
left main coronary and 1 vessel	3 (5.5%)
left main coronary and 2 vessel	18 (32.7%)
left main coronary and 3 vessel	32 (58.2%)
Right coronary artery involvement	36 (65.5%)
Location of left main	
Ostium	7 (12.7%)
Shaft	7 (12.7%)
Bifurcation	36 (65.5%)
Diffuse	5 (9%)
Reference diameter (mm)	3.5±0.4
Diameter stenosis (%)	65.6±18.2
Minimal luminal diameter (mm)	1.23±0.4
Lesion length (mm)	20.2±5.4

Data are presented as mean±S.D.

BMI, body mass index; MI, myocardial infarction; PCI, percutaneous coronary intervention.

^a Defined as total cholesterol >220 mg/dl or known statin therapy.

^b Defined as serum creatinine >140 μ mol/dl.

^c The EuroSCORE identifies a number of risk factors (including age, presence of pulmonary or renal disease, left ventricular function) that help to predict mortality from cardiac surgery. A score of 6 or more equates to an operative mortality of greater than 5%.

patients receiving unprotected LMCA intervention were identified using a prospective database. Unprotected LMCA stenosis was defined as >50% diameter stenosis without patent graft to left anterior descending artery (LAD) or left circumflex artery (LCX), nor established collaterals from right coronary artery (RCA). All LMCA lesions were judged clinically significant, defined as angina pectoris with positive stress test, or unstable angina with positive electrocardiogram (ECG) findings. The decision for PCI over other modalities is based on surgical risk, and/or patient/physician preference. Patients who underwent primary intervention for acute myocardial infarction (AMI) were not included. In-hospital and long-term outcomes were obtained by chart record note review and telephone interview approved by the hospital ethics committee.

All patients were pre-medicated with aspirin 100 mg and clopidogrel 75 mg daily for at least 7 days before the procedure, and procedural heparin was given (70–100 U/kg) to keep activated clotting time >250 s. Post-stenting regimen included aspirin and clopidogrel for at least 3 months, ac-

ording to the current Taiwanese guideline. The use of glycoprotein IIb/IIIa inhibitor, and choice between DES and bare metal stent (BMS) were left to the operator's discretion.

All PCI procedures were done with femoral approach. Different stenting techniques for LMCA bifurcation were decided according to the actual angiographic findings. Single stent "crossover" was chosen when the ostium of 1 of the LMCA branches was not narrowed. Other complex stenting techniques, including "culottes", "crush," "T", and "V", was chosen based on the actual configuration and extent of the stenosis in patients with significant narrowing (>50%) at both ostia of LMCA branches. Final kissing balloon technique (KBT) was required in all patients with LMCA bifurcation involvement. Procedural success was defined as the achievement of final diameter stenosis <20% with Thrombolysis in Myocardial Infarction (TIMI) 3 flow, without major peri-procedural complications (death, MI, or repeat revascularization during hospitalization). Follow-up angiography was done in patients with recurrent ischemia.

Q-MI was defined as a new Q wave on ECG with an increase in the creatine kinase-MB level. An increase of CK-MB more than 2 times of the normal upper limit without a new Q wave on ECG was designated non-Q-MI. Target lesion revascularisation (TLR) was defined as treatment to any new or recurrent lesion within 5 mm to the stent edges. Target vessel revascularization (TVR) was defined as treatment to any segment of the left coronary circulation. Major adverse cardiac events (MACE) were defined as death, Q- and non-Q-MI, or TLR. Death was attributed to cardiac death unless proven otherwise.

2.1. Statistical analysis

Continuous variables are presented as mean±SD and were compared by Student's t test. Categorical variables were

Table 2
Procedural findings.

Variable	Patient (=55)
Number of used stents at left main lesion	1.7±0.6
Number of total stents	2.8±1.3
Stent length (mm)	23.0±7.8
IABP support	0
Glycoprotein IIb/IIIa inhibitor use	0
IVUS guidance	1 (1.8%)
Cutting balloon angioplasty	10 (17.9%)
Stent type	
Sirolimus-eluting stent	18 (32.7%)
Paclitaxel-eluting stent	21 (38.2%)
Bare metal stent	14 (25.5%)
Sirolimus- and Paclitaxel-eluting stents	1 (1.8%)
Bare metal and Paclitaxel-eluting stents	1 (1.8%)
Direct stenting	1 (1.8%)
Bifurcation stenting technique	50 patients
Crossover	16 (32.0%)
Culotte	24 (48.0%)
Crush	6 (12.0%)
V	4 (8%)
Procedural success	54 (98.2%)

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