



Coronary Artery Bypass Graft Surgery and Percutaneous Coronary Interventions in Patients With Unprotected Left Main Coronary Artery Disease

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ABSTRACT

OBJECTIVES This study sought to investigate long-term clinical outcomes following coronary artery bypass graft (CABG) and percutaneous coronary intervention (PCI) in patients with unprotected left main disease (ULMD).

BACKGROUND PCI has been increasingly used as an alternative mode of revascularization for ULMD. However, there are limited data comparing clinical outcomes between CABG surgery and PCI.

METHODS Between 2004 and 2010, 4,046 consecutive patients with ULMD were treated with either CABG surgery (n = 2,604) or PCI (n = 1,442) with drug-eluting stents. The primary outcome was 3-year all-cause mortality and the secondary outcome was the composite of death, nonfatal myocardial infarction, or nonfatal stroke.

RESULTS The unadjusted 3-year all-cause mortality was higher in the PCI group as compared with the CABG group (3.8% vs. 2.5%; log-rank p = 0.03), although there was no significant difference in the composite outcome (7.5% vs. 9.4%; log-rank p = 0.07). After adjustment for differences in baseline risk factors, PCI was associated with significantly higher risk of all-cause mortality (hazard ratio [HR]: 1.71; 95% confidence interval [CI]: 1.32 to 2.21; p < 0.001) but similar risk of the composite outcome (HR: 0.94; 95% CI: 0.82 to 1.09; p = 0.43). These differences were not statistically significant among patients with low or intermediate SYNTAX (Synergy Between PCI With Taxus and Cardiac Surgery) score (≤ 32) or diabetes; however, PCI was associated with an increased risk among those with high SYNTAX score (>32), with HRs of 3.10 (95% CI: 1.84 to 5.22; p < 0.001) for all-cause mortality and 1.82 (95% CI: 1.36 to 2.45; p < 0.001) for the composite outcome. CABG was associated with lower risk of repeat revascularization but higher risk of stroke in each clinically relevant subgroup.

CONCLUSIONS In this single-center observational study among patients with ULMD, CABG was associated with improved long-term outcomes, especially in patients with more complex disease. (J Am Coll Cardiol Intv 2016;9:1102-11)
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Unprotected left main disease (ULMD) occurs in 5% to 7% of patients undergoing coronary angiography and its 3-year mortality without revascularization is 50% (1). Coronary artery bypass graft (CABG) surgery has been recommended as the standard treatment for patients with ULMD (2). However, with advances in interventional cardiology, percutaneous coronary intervention (PCI) has been increasingly used for ULMD, and outcomes of ULMD PCI have significantly improved over time (3-6).

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Recent randomized clinical trials including the SYNTAX (Synergy Between PCI With Taxus and Cardiac Surgery) trial have shown that PCI is a feasible and safe approach, and might be considered as an alternative to CABG in patients with anatomic low-risk and clinical high-risk conditions (8). However, results of registry data demonstrated an advantage of CABG over PCI in the incidence of composite cardiac and cerebrovascular events, driven by the higher incidence of target-vessel revascularization with PCI (8-12). Furthermore, there is limited evidence regarding long-term outcomes for patients with ULMD who underwent CABG or PCI.

The present study was conducted in a large cohort undergoing coronary revascularization to investigate long-term clinical outcomes following CABG and PCI, and to explore the potential benefits of different risk-stratification schemes in treatment selection for ULMD.

METHODS

DESIGN AND DATA SOURCE. Prospective coronary revascularization registry database collecting information on all patients of Fuwai Hospital (Beijing, China) undergoing CABG or PCI was used to assess the association between revascularization strategies and post-operative adverse outcomes. This study was designed by the principal investigators (Z.Z. and B.X.), and the protocol was approved by the institutional review board at Fuwai Hospital. The data collected included a range of variables such as demographics, patient history, pre-operative medications, pre-operative risk factors, intraoperative data, and in-hospital, 30-day, and long-term conditions. The efforts made to ensure the accuracy and completeness of the data are described in the [Online Appendix](#). Variables in the registry were defined according to the Society of Thoracic Surgeons database and the 2013 American College of Cardiology Foundation/American Heart Association key data definitions for coronary artery disease (13).

STUDY COHORTS. The study included 4,046 consecutive patients with angiographically confirmed ULMD and treated with PCI or CABG from January 2004 to December 2010 ([Online Figure 1](#)). ULMD is defined as left main artery luminal narrowing of more than 50% without patent bypass grafts to its branches (14). Patients were excluded if they were younger than 18 years of age, or had prior CABG, concomitant valvular, or aortic surgery, ST-segment elevation myocardial infarction (MI) within 1 week, or cardiogenic shock. The SYNTAX score algorithm was not available at the beginning of the study period. A retrospective review of a baseline angiogram for calculation of the SYNTAX score in the standard fashion by using the web-based score calculator (www.syntaxscore.com) (15,16) at an angiographic core lab was available in 2,752 patients (68.0% of the total study population).

The decision to perform CABG or PCI was made by cardiologists and surgeons, taking into account the available clinical and anatomic factors as well as patient's preference ([Online Table 1](#)). Patients underwent CABG or PCI, because of either the risk associated with each revascularization procedure or the patient's or physician's preference ([Online Figure 2](#)). An anesthetic protocol was followed, and surgical revascularization was performed using standard bypass techniques ([Online Appendix](#)) (17). CABG procedures were performed with cardiopulmonary bypass or off-pump, at the surgeon's discretion. Whenever possible, complete revascularization using arterial grafts was recommended. Antiplatelet therapy consisting of aspirin 100 mg/day was continued indefinitely post-operatively (17).

For the PCI group, consecutive patients with ULMD who underwent drug-eluting stents implantation were included. All patients undergoing PCI were prescribed aspirin plus clopidogrel (loading dose, 300 or 600 mg) before the coronary intervention (18). Lesions in the ostium or body of the ULM usually received a single stent and post-dilation with kissing balloon angioplasty was always used to finish the procedure when treating distal ULM bifurcation with 2-stent technique (16). Use of intravascular ultrasound, adjunctive devices, or glycoprotein IIb/IIIa inhibitors was at the operator's discretion ([Online Appendix](#)). The use of dual antiplatelet therapy with aspirin and clopidogrel was recommended for at least 12 months after stent implantation (18).

Other pharmacological treatments including angiotensin-converting enzyme inhibitors, beta-blockers, and statins, were recommended on the basis of current practice in both treatment groups (17-19).

ABBREVIATIONS AND ACRONYMS

CABG = coronary artery bypass graft

CI = confidence interval

HR = hazard ratio

MI = myocardial infarction

PCI = percutaneous coronary intervention

ULMD = unprotected left main disease

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