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STATE-OF-THE-ART PAPER

Unprotected Left Main Coronary Disease and ST-Segment Elevation Myocardial Infarction

A Contemporary Review and Argument for Percutaneous Coronary Intervention

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Acute occlusion involving the unprotected left main coronary artery (ULMCA) is a clinically catastrophic event, often leading to abrupt and severe circulatory failure, lethal arrhythmias, and sudden cardiac death. Although coronary artery bypass grafting (CABG) is the standard of care for ULMCA disease in patients with stable ischemic heart disease, uncertainty surrounds the optimal revascularization strategy for patients with ST-elevation myocardial infarction (MI) and ULMCA occlusion who survive to hospitalization, and treatment guidelines in this setting are vague. Percutaneous coronary intervention (PCI) is technically feasible in most patients, has the advantage of providing more rapid reperfusion compared with CABG with acceptable short- and long-term outcomes, and is associated with a lower risk of stroke. PCI of the ULMCA should be considered as a viable alternative to CABG for selected patients with MI, including those with ULMCA occlusion and less than Thrombolysis In Myocardial Infarction flow grade 3, cardiogenic shock, persistent ventricular arrhythmias, and significant comorbidities. The higher risk of target vessel revascularization associated with ULMCA PCI compared with CABG is an acceptable tradeoff given the primary need for rapid reperfusion to enhance survival. (J Am Coll Cardiol Intv 2010;3:791–5) © 2010 by the American College of Cardiology Foundation

Although the previous version of the guidelines stated that the standard of care for patients with significant unprotected left main coronary artery (ULMCA) disease is coronary artery bypass grafting (CABG), the 2009 American College of Cardiology (ACC)/American Heart Association (AHA) focused guidelines for percutaneous coronary intervention (PCI) state that ULMCA stenting may be considered in patients with anatomic conditions that are associated with a low risk of procedural complications and clinical conditions that predict an increased risk of adverse surgical outcomes (class IIb) (1,2). Acute occlusion involving the ULMCA, which accounts for 0.8% of patients who undergo primary PCI (3), is a clinically catastrophic event, often leading to abrupt and severe circulatory failure, lethal arrhythmias, and sudden cardiac death. Patients with ULMCA disease with ST-segment elevation myocardial infarction (STEMI) who survive to hospitalization are typically critically ill, may suffer from cardiogenic shock, and have high mortality rates, and both the acuity of the event and critical condition of the patient may preclude the opportunity for emergency CABG (4).

Uncertainty surrounds the optimal revascularization strategy for STEMI patients and ULMCA

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disease, and treatment guidelines in this setting are vague. The 2004 revised ACC/AHA STEMI guidelines indicate that PCI is class Ia indication in cardiogenic shock and a class Ia indication for CABG if there is suitable coronary anatomy, but again do not provide specific treatment recommendations for ULMCA disease (5). Considering the clinical dilemma that ULMCA disease presents in the setting of STEMI, there is a need to better understand the evidence base regarding ULMCA revascularization strategies and to establish treatment recommendations. The present report critically evaluates the current evidence to elucidate the role of primary PCI for ULMCA occlusion, supporting PCI as superior to medical therapy alone and as a suitable alternative to surgical revascularization in selected cases.

Procedural, In-Hospital, and Long-Term Outcomes With PCI for STEMI Due to ULMCA Occlusion

Abbreviations and Acronyms

ACC = American College of Cardiology

AHA = American Heart Association

CABG = coronary artery bypass grafting

DES = drug-eluting stent(s)

MI = myocardial infarction

PCI = percutaneous coronary intervention

STEMI = ST-segment elevation myocardial infarction

ULMCA = unprotected left main coronary artery

As with less complex lesions and clinical settings, procedural success has improved considerably when percutaneous revascularization with stenting (compared with angioplasty alone) is performed for ULMCA disease in STEMI. Although data on long-term follow-up are limited in this indication, patients who survive to discharge following ULMCA PCI have a favorable prognosis. In a retrospective multicenter international registry, angiographic success was achieved in all 23 patients, with no deaths after the first month in patients with STEMI who underwent ULMCA PCI with drug-eluting stents (DES) (6). Although the in-hospital mortality rate was 44% in 18 patients (cardiogenic shock present in 78%) who underwent primary PCI, Lee et al. (7) reported no subsequent death or MI during a follow-up period of 39 ± 22 months. In another study of 16 patients (cardiogenic shock present in 69%) who underwent ULMCA PCI with DES for STEMI, despite an in-hospital mortality rate of 44%, there were no subsequent deaths at a mean follow-up of 215 days (8). Prasad et al. (9) reported an in-hospital mortality rate of 35% among 28 patients who underwent primary PCI for ULMCA occlusion, yet there was only 1 death at a follow-up of 26 ± 12 months.

Comparisons of Outcomes With PCI Versus CABG for STEMI Due to ULMCA Occlusion

Nonrandomized and randomized data examining ULMCA PCI in nonemergency cases compared with CABG have not demonstrated significant differences in the outcomes of death or MI (10–12). This has led to increasing interest surrounding the role of PCI in more acute situations involving ULMCA disease, in which patients are often too critically ill and hemodynamically unstable to undergo CABG.

Studies evaluating surgical revascularization of ULMCA occlusion in patients with acute MI are limited but indicate high clinical risk for such patients. In a study of 13 patients with acute MI due to ULMCA occlusion, the in-hospital mortality rate after emergency CABG was 46% (13).

Limitations to the Current Evidence Comparing Revascularization Strategies in ULMCA Disease and MI

Among existing studies reporting outcomes in MI related to ULMCA disease, 3 themes have emerged regarding treatment strategies: 1) clinical outcome is improved with any revascularization compared with medical therapy alone (14–16); 2) among revascularization patients, a treatment bias favoring performance of PCI rather than CABG in higher clinical risk patients prohibits direct comparison between the 2 revascularization modalities; and 3) despite differences in patient groups and decisions for treatment, ULMCA PCI in STEMI is associated with similar survival rates compared with CABG (16).

Aside from the small sample size of individual trials, which limits any definite conclusion, the observational, nonrandomized design of these trials enables significant confounding and imbalance in factors like patient variability (e.g., age, illness severity, cardiogenic shock, and coronary anatomy), different primary end points, and various periods of follow-up between treatment groups that are only partially accounted for through multivariable and propensity score adjustments. Subjective assessment of each patient by a physician and a nonobjective means of deciding the appropriate intervention are oftentimes very difficult. Patients undergoing emergency PCI are often more unstable than ones undergoing CABG because their higher risk precludes surgical revascularization. Further, lack of application of the intention-to-treat principle challenges comparisons between PCI and CABG; specifically, patients considered for CABG who do not survive to surgery or are later deemed ineligible are not represented in CABG-related outcomes. Conversely, if the very same patients underwent PCI and subsequently died, they nonetheless would be considered PCI-related deaths despite the fact that death would have occurred no matter what revascularization strategy was chosen.