

STATE-OF-THE-ART PAPER

A Systematic Review and Meta-Analysis on Primary Percutaneous Coronary Intervention of an Unprotected Left Main Coronary Artery Culprit Lesion in the Setting of Acute Myocardial Infarction

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Objectives This study sought to evaluate 30-day all-cause mortality of patients treated with primary percutaneous coronary intervention (PCI) presenting with an acute myocardial infarction (AMI) due to an unprotected left main coronary artery (ULMCA) culprit lesion. In addition, an average estimated mortality rate was extrapolated from the available data.

Background There are limited data available on clinical outcome after primary PCI in patients presenting with AMI with unprotected left main as the infarct-related coronary artery.

Methods Medical literature databases were searched to identify cohort studies reporting on primary PCI for unprotected left main-related AMI. A total of 13 retrospective studies meeting all pre-specified criteria were included in the meta-analysis. No randomized trials were available. The primary endpoint for the meta-analysis was 30-day all-cause mortality.

Results This meta-analysis comprises a total of 977 patients, of which 252 (26%) presented in cardiogenic shock. Thirty-day all-cause mortality was evaluated using a forest plot analysis and showed higher event rates in patients presenting with cardiogenic shock among all subgroups. The average estimated 30-day all-cause mortality was 15% in patients presenting without signs of cardiogenic shock and 55% in patients presenting with cardiogenic shock (relative risk: 3.74, 95% confidence interval [CI]: 2.95 to 4.76, $p < 0.001$).

Conclusions In this large meta-analysis of patients treated with primary PCI for AMI due to an ULMCA culprit lesion, the 30-day all-cause mortality in patients presenting with shock is much higher than in patients not presenting with shock. The estimated all-cause mortality data may serve as a benchmark for future reference. (J Am Coll Cardiol Intv 2013;6:317–24) © 2013 by the American College of Cardiology Foundation

A significant involvement of the left main coronary artery occurs in 4% to 7% of patients presenting with an acute myocardial infarction (AMI) (1,2).

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These critically ill patients frequently present with cardiogenic shock or cardiac arrest and are at high risk for in-hospital major cardiac adverse events (3,4). In nonurgent patients, coronary artery bypass grafting (CABG) has been the standard treatment for significant unprotected left main coronary artery (ULMCA) stenosis and is recommended as first choice of treatment by the American College of Cardiology/American Heart Association (5) and European Society of Cardiology (6) guidelines. In

selected patients, however, several studies have reported increasingly good immediate and 1-year outcomes of ULMCA stenting comparable to the outcomes reported after CABG (7–11). Long-term follow-up of the SYNTAX (SYnergy Between PCI With TAXUS and Cardiac Surgery) trial showed that overall major adverse cardiac and cerebrovascular event rates were not significantly different between the percutaneous coronary intervention (PCI) group compared with the CABG group in the pre-specified left main coronary artery subgroup at 3 years (12). Although more PCI patients required reintervention, less stroke was observed compared with CABG-treated patients.

In patients presenting with AMI, primary PCI is considered the optimal reperfusion strategy (13). Whether PCI is the preferred therapy for significant involvement of ULMCA is still subject to debate. At present, the American Heart Association and American College of Cardiology guidelines are less clear about the optimal standard of care for patients presenting with an AMI due to a ULMCA culprit lesion (14). However, it is generally accepted to perform PCI in high-risk patients, such as patients in cardiogenic shock or cardiac arrest where CABG is associated with too high a mortality risk. Currently, there are only limited data on immediate percutaneous treatment for patients with an AMI due to a ULMCA culprit lesion. Especially for those complicated by cardiogenic shock, the left main shock syndrome, only small cohorts have been described.

We therefore performed a systematic review on the currently available literature and a meta-analysis on the treatment

of PCI for an AMI due to a ULMCA culprit lesion. Patients were categorized according to initial clinical presentation of AMI with or without cardiogenic shock. Our second goal was to calculate an average mortality rate for this patient category from the available data, which may serve as a benchmark for future studies in this very high-risk patient group.

Methods

Inclusion criteria for the meta-analyses. To date, there are no randomized trials concerning primary PCI for left main coronary artery AMI. We therefore only included outcome data from cohort studies describing:

1. patients undergoing primary PCI for an AMI due to a ULMCA culprit lesion;
2. patients with reported 30-day all-cause mortality and;
3. a clear description of whether patients presented with or without cardiogenic shock and/or pre-procedure cardiac arrest with successful cardiopulmonary resuscitation.

Cardiogenic shock or pre-procedure cardiac arrest with successful cardiopulmonary resuscitation hereinafter is referred to as cardiogenic shock. All studies required that either in-hospital or 30-day mortality was available for at least 90% of the patients. In-hospital or 30-day mortality hereinafter is referred to as 30-day all-cause mortality.

Data source. We performed a MEDLINE (PubMed) literature search up to August 2011 for cohort studies describing the 30-day outcomes after primary PCI for unprotected left main AMI. Searches included the key words and corresponding Medical Subject Headings (MeSH) for unprotected left main coronary artery disease and AMI. All potentially relevant articles were independently reviewed by 2 investigators (M.M.V. and M.A.B.) to establish eligibility for the meta-analysis. In case of disagreement, this was resolved in consultation with a third reviewer (J.P.S.H.). Citations were screened at title/abstract level and retrieved as full reports. Non-English articles, case reports, and elective or non-urgent interventions were excluded.

The flow chart of the search strategy and selection of studies is depicted in Figure 1. We identified 21 nonrandomized cohort studies for inclusion in our meta-analysis. Eight studies were excluded because 30-day outcomes were only reported for the total study population and did not discriminate between patients with and without cardiogenic shock. One study was excluded because all patients with left main coronary AMI were treated with CABG. Finally, we included the results from a comparative cohort study of primary PCI for an AMI due to a ULMCA culprit lesion from our own research group (the Academic Medical Center [AMC] cohort). Therefore, a total of 13 cohort studies were included in our meta-analysis of primary PCI for an AMI due to a ULMCA culprit lesion (Table 1).

Data extraction and definitions. Pre-specified patient characteristics, the outcome, and the completeness of the follow-up data were independently extracted by 2 investigators (M.M.V. and M.A.B.). Data were grouped for cardiogenic shock at presentation and primary PCI. PCI treatment was clustered between balloon angioplasty (BA) and/or bare-metal stent (BMS), BMS and/or drug-eluting stent (DES), or DES alone.

Unprotected left main was considered to be angiographically documented stenosis >50% located in the left main coronary artery with no patent graft to the left anterior descending or circumflex coronary artery (15). AMI was defined as clinical and/or electrocardiographic signs of an

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