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Outcomes After Emergency Percutaneous Coronary Intervention in Patients With Unprotected Left Main Stem Occlusion

The BCIS National Audit of Percutaneous Coronary Intervention 6-Year Experience

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ABSTRACT

OBJECTIVES This study sought to evaluate in-hospital outcomes and 3-year mortality of patients presenting with unprotected left main stem occlusion (ULMSO) treated with primary percutaneous coronary intervention (PPCI).

BACKGROUND Limited data exists about management and outcome following presentation with ULMSO.

METHODS From January 1, 2007 to December 21, 2012, 446,257 PCI cases were recorded in the British Cardiovascular Intervention Society database of all PCI cases in England and Wales. Of those, 568 were patients having emergency PCI for ST-segment elevation infarction (0.6% of all PPCI) who presented with ULMSO (TIMI [Thrombolysis In Myocardial Infarction] flow grade 0/1 and stenosis >75%), and they were compared with 1,045 emergency patients treated with nonocclusive LMS disease. Follow-up was obtained through linkage with the Office of National Statistics.

RESULTS Presentation with ULMSO, compared with nonocclusive LMS disease, was associated with a doubling in the likelihood of periprocedural shock (57.9% vs. 27.9%; $p < 0.001$) and/or intra-aortic balloon pump support (52.5% vs. 27.2%; $p < 0.001$). In-hospital (43.3% vs. 20.6%; $p < 0.001$), 1-year (52.8% vs. 32.4%; $p < 0.001$), and 3-year mortality (73.9% vs 52.3%, $p < 0.001$) rates were higher in patients with ULMSO, compared with patients presenting with a patent LMS, and were significantly influenced by the presence of cardiogenic shock. ULMSO and cardiogenic shock were independent predictors of 30-day (hazard ratio [HR]: 1.61 [95% confidence interval (CI): 1.07 to 2.41], $p = 0.02$, and HR: 5.43 [95% CI: 3.23 to 9.12], $p<0.001$, respectively) and 3-year all-cause mortality (HR: 1.52 [95% CI: 1.06 to 2.17], $p = 0.02$, and HR: 2.98 [95% CI: 1.99 to 4.49], $p < 0.001$, respectively).

CONCLUSIONS In patients undergoing PPCI for ULMSO, acute outcomes are poor and additional therapies are required to improve outcome. However, long-term outcomes for survivors of ULMSO are encouraging. (J Am Coll Cardiol Intv 2014;7:969–80) © 2014 by the American College of Cardiology Foundation.

Presentation to the cardiac catheterization lab with myocardial infarction (MI) caused by unprotected left main stem occlusion (ULMSO) is very unusual. It is assumed that when it occurs acutely, it usually results in sudden cardiac death and that many of these patients never reach medical services and die in the community (1). Because of the widespread availability of primary percutaneous

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ABBREVIATIONS AND ACRONYMS

BCIS = British Cardiovascular Intervention Society

CABG = coronary artery bypass graft

CI = confidence interval

GP = glycoprotein

HR = hazard ratio

IABP = intra-aortic balloon pump

IQR = interquartile range

LMS = left main stem

LV = left ventricle

MACCE = major adverse cardiac and cerebrovascular events

MI = myocardial infarction

PCI = percutaneous coronary intervention

PPCI = primary percutaneous coronary intervention

TIMI = Thrombolysis In Myocardial Infarction

ULMSO = unprotected left main stem occlusion

coronary intervention (PPCI) for acute MI, several small registries have investigated outcomes of patients undergoing emergency PPCI to left main stem (LMS) disease (2). However, only sporadic individual cases (3–7) and 5 small series (cumulatively n = 112) (8–12) have reported outcomes of patients suffering from occlusive or subocclusive LMS disease (8–12) from which there is limited 1-year mortality data available (total n = 100) (8,10–12).

These small studies, from several different populations, suggest that survival is poor (8–14); however, reliable contemporary information has not been collated previously, and this group has not been compared with outcomes from other emergency patients with MI. Given the paucity of data, management of this potentially catastrophic presentation poses a very significant challenge. We interrogated data from the British Cardiovascular Intervention Society's (BCIS) national PCI audit with case-based mortality tracking for 3 years following intervention. Using these data, we hoped to inform clinical decision making in the absence of existing guidelines for emergency treatment.

METHODS

DATA SOURCE. The BCIS national audit of PCI is a prospective registry of all coronary intervention preformed in all interventional cardiology units within the United Kingdom since 2005 (117 institutions in 2011) (15). A total of 113 fields of clinical, procedural, and outcome data are collected (Online Appendix) centrally at the National Institute for Cardiovascular Outcomes Research at University College London (15). All-cause mortality data of the audit cohort in England and Wales is tracked by the Office of National Statistics.

DATA QUALITY. The completeness and internal consistency of the data are assessed during submission by a set of validation rules (Online Appendix). If a major error is detected that might cause the upload to contaminate the reliability of the complete dataset, then the record is rejected for resubmission. Less serious inconsistencies are accepted, but an error log documents fatal and serious errors, allowing units to clean and correct their data locally.

STUDY POPULATION. There were 446,257 PCI records generated in England and Wales between January 1, 2007, and December 31, 2012. There were 105,216 procedures performed as an emergency (defined as treatment with primary PCI) on 102,057 patients. There were 2,125 patients identified as having undergone unprotected LMS PPCI (**Figure 1**). This included patients in whom the LMS was treated in isolation or in combination with other vessels. From the unprotected LMS PPCI cohort, information on TIMI (Thrombolysis In Myocardial Infarction) flow grade *and* lesion severity was available in 1,613 patients. There were 568 patients who presented with ULMSO (defined as pre-procedural LMS stenosis ≥75% and TIMI flow grade ≤1) and who were compared with 1,045 patients with nonocclusive pre-procedural LMS disease (defined as LMS stenosis <75% and/or TIMI flow grade ≥2). Patient groups were also divided based on the presence and absence of periprocedural cardiogenic shock.

CLINICAL ENDPOINTS AND DEFINITIONS. We report the following: 1) demographic, clinical, and procedural characteristics of patients with ULMSO; 2) 3-year all-cause mortality of the patients presenting with ULMSO stratified by the presence and absence of shock; 3) in-hospital rates of major adverse cardiac and cerebrovascular events (MACCE) defined as an accumulative composite of death, reinfarction or reintervention, in-hospital coronary artery bypass graft (CABG) and cerebrovascular events. Additionally, we aim to determine those factors that predict short- and long-term mortality.

STATISTICAL ANALYSIS. Normally distributed continuous variables (e.g., age and body mass index) are presented as mean ± SD and were analyzed using the independent samples Student *t* test. Skewed continuous variables (e.g., length of stay) are presented as median (interquartile range) and were analyzed using the Mann-Whitney *U* test. Categorical data are presented as counts and proportions of valid cases from the database, and statistical comparisons were made using the chi-square statistic. All-cause mortality rates are presented as counts and percentages and as mortality plots with the number of subjects known to be at risk at each successive time point. Group differences are assessed using the log-rank test. A landmark analysis was then performed for 30-day and 1-year survivors. A multivariable Cox proportional hazards regression model was used to estimate the independent predictors of 30-day and 3-year mortality. Sequential univariate models were performed for biologically and clinically relevant covariates (age; sex; cardiovascular risk factors; renal dysfunction; history of previous MI, PCI, or CABG; symptom to balloon time; recent lysis; left ventricular [LV] dysfunction; periprocedural cardiogenic shock;

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