Long-Term Outcomes of Patients Sent Emergently to the Catheterization Laboratory for Possible Primary Percutaneous Coronary Intervention

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Current guidelines advocate primary percutaneous coronary intervention as the therapy of choice for ST-segment elevation myocardial infarction (STEMI) when available. Little is known about the outcomes of patients without a culprit lesion after referral for primary percutaneous coronary intervention for a presumed STEMI. Subjects were identified within a registry containing consecutive patients who underwent emergent angiography for a potential STEMI from October 2008 to July 2012. Vital status was obtained from the medical record and Social Security Death Index. Cox proportional hazards models were created to evaluate the relation between the angiographic findings and cardiovascular outcomes, including major adverse cardiovascular events (MACE) and mortality. Among 539 patients who underwent emergent angiography, 65 (12%) had no coronary artery disease (CAD), 110 (20%) had CAD without a culprit lesion, and 364 (68%) had a culprit lesion. Kaplan-Meier analysis of MACE demonstrated that patients with CAD who lack a culprit lesion had a similar rate of MACE to those with a culprit lesion ($p = 0.64$), and both groups had significantly increased risk compared with those with no CAD (hazard ratio [HR] 1.9, 95% confidence interval [CI] 1.01 to 3.41 and HR 2.0, 95% CI 1.15 to 3.54, respectively). Kaplan-Meier analysis of mortality illustrated a nonsignificant trend toward increased mortality in patients having a culprit lesion (HR 1.7, 95% CI 0.59 to 4.80) and those having CAD without a culprit lesion (HR 1.2, 95% CI 0.39 to 3.81) compared with those with no CAD. In conclusion, patients found to have CAD without a culprit lesion in emergent angiography after a presumptive STEMI diagnosis have similar long-term rates of MACE compared with those requiring emergent revascularization. **(Am J Cardiol 2013;112:1745−1749)**

Current professional society guidelines advocate restoration of coronary flow with primary percutaneous coronary intervention (pPCI) as the therapy of choice for ST-segment elevation myocardial infarction (STEMI), provided it can be done in a timely manner.[1] Previous data have suggested that 14% to 36%[2−5] of patients referred for pPCI for a presumptive STEMI do not have an evidence of an epicardial coronary artery culprit lesion on an angiogram. Despite this, the outcomes and prognosis for these patients remain ambiguous. Previous studies evaluating the importance of nonobstructive coronary artery disease (CAD) in symptomatic patients have largely been based on findings from coronary computed tomographic angiography,[6,7] and the clinical implications of these findings remain unclear. Among women who underwent nonemergent coronary angiography, previous studies have demonstrated a twofold increase in long-term cardiovascular events for those with nonobstructive CAD compared with those without any CAD.[8] However, symptomatic patients referred from the emergency department for emergent coronary angiography who lack a culprit thrombotic lesion may still have unique clinical attributes including other highly co-morbid conditions masquerading as an STEMI. The outcomes of these patients and the potential contribution of nonobstructive CAD warrant further consideration, particularly as this population may be increasing in frequency. With this in mind, we sought to evaluate the long-term outcomes of subjects referred for coronary angiography for a presumed STEMI stratified by the presence of angiographic culprit lesion and the degree of concomitant CAD.

Methods

All patients presenting to an urban trauma center (San Francisco General Hospital) or a tertiary care center

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(University of California, San Francisco) referred for emergent angiography for a presumed STEMI were enrolled in the Activate-SF registry. As previously described, this registry includes all emergency physician−initiated cardiac catheterization laboratory activations from October 2008 to July 2012.[5] The present analysis included all patients within this cohort who proceeded to emergent coronary angiography. This project has been reviewed and approved by the Institutional Review Board with a waiver of informed consent at the University of California, San Francisco.

Clinical information was collected from ambulance records and emergency department documentation recorded on presentation. Electrocardiograms from the initial presentation were de-identified and independently evaluated by 2 cardiologists (KSH and EJA) blinded to the clinical outcome. In cases of disagreement, a third blinded cardiologist adjudicated the electrocardiographic findings (JMM). Laboratory values and echocardiographic data were retrieved from the electronic medical record. All study data were collected and managed using the Research Electronic Data Capture (REDCap) reporting system hosted at the University of California, San Francisco.[9]

For every patient undergoing emergent angiography, the treating interventional cardiologist assessed the degree of CAD. A culprit lesion was defined at the time of coronary angiography as an acute thrombotic lesion in an epicardial coronary artery consistent with the clinical and electrocardiographic presentations. For the purpose of this analysis, the presence of a culprit lesion was assessed by the treating interventional cardiologist. Nonculprit CAD was defined as any stenosis of >20% in any epicardial vessel >2.0 mm in diameter, whereas no CAD was defined as normal coronary arteries or luminal irregularities of ≤20% stenosis. This definition was chosen to be inclusive of any easily identified coronary stenosis present on an angiogram and avoid the attendant difficulties of accurately determining percent diameter stenosis by visual estimation.[10]

The primary outcome measure was major adverse cardiovascular events (MACE), defined as a composite outcome of all-cause mortality, repeat hospitalization for cardiac complaints, and repeat revascularization. Mortality after the index hospitalization was ascertained through electronic medical record review and linkage with the Social Security Death Index.[11] This analysis censored living patients at the time of their last recorded health-care encounter to emphasize discrimination. The time to an event or censoring was recorded in days from the date of the index presentation.

Summary statistics were reported as means with SDs for continuous variables or medians and interquartile ranges for non-normally distributed continuous data. Analysis of variance and Kruskal-Wallis analysis of variance by ranks were used for simple comparisons of normally and non-normally distributed variables, respectively. All proportions were evaluated by chi-square or Fisher's exact tests. To evaluate the composite primary outcome and mortality alone, Kaplan-Meier analyses were performed with stratification based on the presence or absence of a culprit lesion followed by the presence or absence of CAD among those without a culprit lesion. Log-rank tests were used to assess the differences between survival functions.

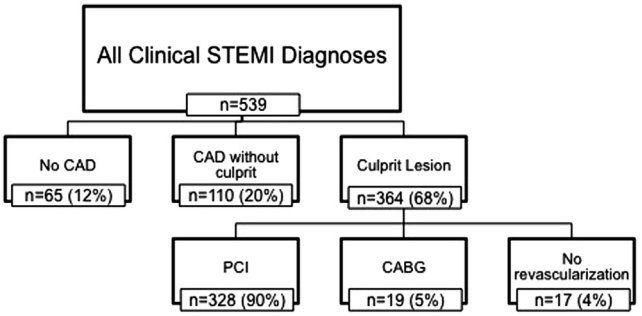

Figure 1. Flow chart of analytic cohort. CABG = coronary artery bypass grafting.

A Cox proportional hazards model was created using age, gender, and race as covariates. A test of heterogeneity was performed on the resulting proportional hazards coefficients to assess differences between the groups. All statistical analyses were performed using Stata 12 (Stata Corp., College Station, Texas). A p value <0.05 was considered statistically significant. The investigators take full responsibility for the integrity of the data and agree to the manuscript as written.

Results

Five hundred thirty-nine patients underwent emergent coronary angiography for a putative STEMI from October 2008 to July 2012. Emergent cardiac catheterization demonstrated a culprit lesion in 364 patients (68%) and no culprit lesion in 175 patients (32%). Among those without a culprit lesion, 65 patients (37%) had no CAD and 110 patients (63%) had nonobstructive CAD (Figure 1). Overall, follow-up data were available for 537 (99.6%) of the 539 patients enlisted in the cohort. The mean follow-up time for all patients was 181 days (interquartile range 11 to 229 days), and 44 patients (8%) died during the index hospitalization.

The demographic and electrocardiographic characteristics of the cohorts stratified according to their angiographic findings are listed in Tables 1 and 2, respectively. As reported in the tables, statistically significant differences between groups were found in several categories. Furthermore, patients without an angiographic evidence of CAD were at approximately 1/2 the risk of MACE (log-rank p = 0.02) compared with those with CAD, regardless of the presence of a culprit lesion on an angiogram (Figure 2). After multivariate adjustment for age, gender, and race, the hazard ratio (HR) for an event was similar (test for heterogeneity, p = 0.64) for patients with CAD with or without a culprit lesion (HR 2.0, p = 0.02, 95% CI 1.14 to 3.54 and HR 1.9, p = 0.05, 95% CI 1.01 to 3.41, respectively) compared with those without CAD.

When restricted to mortality, the Kaplan-Meier analysis illustrates a nonsignificant trend toward increased mortality in patients having a culprit lesion (HR 1.7, p = 0.34, 95% CI 0.59 to 4.80) and those having CAD without a culprit lesion (HR 1.2, p = 0.74, 95% CI 0.39 to 3.81) compared with those with no CAD (test for heterogeneity, p = 0.24; Figure 3). A breakdown of the component MACE outcomes with censoring at 1 year is provided in Figure 4, which