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ORIGINAL INVESTIGATIONS

Temporal Trends in Mechanical Complications of Acute Myocardial Infarction in the Elderly

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ABSTRACT

BACKGROUND Reperfusion therapy led to an important decline in mortality after ST-segment elevation myocardial infarction (STEMI). Because the rate of cardiogenic shock has not changed dramatically, the authors speculated that a reduction in the incidence or fatality rate of mechanical complications (MCs), the second cause of death in these patients, could explain this decrease.

OBJECTIVES This study sought to assess time trends in the incidence, management, and fatality rates of MC, and its influence on short-term mortality in old patients with STEMI.

METHODS Trends in the incidence and outcomes of MC between 1988 and 2008 were analyzed by Mantel-Haenszel linear association test in 1,393 consecutive patients ≥75 years of age with first STEMI.

RESULTS Overall in-hospital mortality decreased from 34.3% to 13.4% (relative risk reduction, 61%; $p < 0.001$). Although the absolute mortality due to MC decreased from 9.6% to 3.3% ($p < 0.001$), the proportion of deaths due to MC among all deaths did not change (28.1% to 24.5%; $p = 0.53$). The incidence of MC decreased from 11.1% to 4.3% (relative risk reduction 61%) with no change in their hospital fatality rate over time (from 87.1% to 82.4%; $p = 0.66$). The proportion of patients undergoing surgical repair decreased from 45.2% to 17.6% ($p = 0.04$), with no differences in post-operative survival (from 28.6% to 33.3%; $p = 0.74$).

CONCLUSIONS Although the incidence of MC has decreased substantially since the initiation of reperfusion therapy in elderly STEMI patients, this reduction was proportional to other causes of death and was not accompanied by an improvement in fatality rates, with or without surgery. MCs are less frequent but remain catastrophic complications of STEMI in these patients. (J Am Coll Cardiol 2018;72:959–66) © 2018 by the American College of Cardiology Foundation.

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ABBREVIATIONS AND ACRONYMS

AMI = acute myocardial infarction

CVD = cardiovascular disease

FWR = free-wall rupture

MC = mechanical complication

PMR = papillary muscle rupture

PPCI = primary percutaneous coronary intervention

STEMI = ST-segment elevation myocardial infarction

VSR = ventricular septal rupture

Short-term fatality rates after acute myocardial infarction (AMI) have decreased importantly in the last decades (1-3), particularly in the oldest patients, who constitute the majority of early AMI deaths (4,5), particularly those 75 years of age or older, who account for 25% of all AMI deaths (6). This improvement has been mostly driven by the increase in the use of reperfusion therapy, particularly primary percutaneous coronary intervention (PPCI) (7). The main mechanism for early death after AMI in elderly patients is cardiogenic shock, causing roughly one-half of initial deaths, followed by mechanical complications (MCs), accounting for approximately one-third of early deaths (8). Given that the incidence and fatality rate of cardiogenic shock has not varied significantly in the last decades (9-11), we speculate that either a decrease in the incidence or in the fatality rate of MCs might explain an important part of the improvement in short-term prognosis in older patients with AMI, particularly in those with ST-segment elevation myocardial infarction (STEMI). We, therefore, designed this study to assess the time trends in the incidence, management, and fatality rates of MCs, and their influence on short-term mortality in older patients with STEMI.

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METHODS

PATIENTS AND DATA ABSTRACTION. The population consisted of all patients ≥75 years of age admitted to the Coronary Care Unit of Hospital General Universitario Gregorio Marañón in Madrid, Spain, with a definitive diagnosis of first STEMI between October 1, 1988, and December 31, 2008. We abstracted variables related to baseline characteristics, infarction features, diagnostic procedures, treatment, and hospital course as previously described (7). Data were obtained directly from clinical records.

DEFINITIONS. MC was defined as any spontaneous rupture of the myocardium following AMI. This comprises 3 types, according to the area where the myocardial rupture happens: free-wall rupture (FWR), ventricular septal rupture (VSR), and papillary muscle rupture (PMR). Confirmed FWR was defined as the occurrence of electromechanical dissociation or severe and sudden hemodynamic compromise associated with at least 1 of the following: 1) pericardial effusion (>1 cm) with intrapericardial echoes and criteria of cardiac tamponade by 2-dimensional echocardiography; 2) hemopericardium by pericardiocentesis; or 3) anatomic confirmation (surgical or post-mortem). Suspected FWR included cases of death due to electromechanical dissociation after a course free of signs of pump failure but in whom none of the confirmation tests was available. VSR was diagnosed by Doppler echocardiography, step-up in oxymetric analysis >5% from right atrium to right ventricle, ventriculography, surgical closure of the ruptured site, or necropsy. PMR was diagnosed by transthoracic or transesophageal Doppler echocardiography, or by anatomic confirmation (surgery or necropsy). The causes of early death after AMI were classified as: shock or pump failure, MCs (any kind of cardiac rupture or electromechanical dissociation without prior evidence of left ventricular systolic dysfunction or heart failure), and other causes (7). Admission delay was defined as the time from symptoms onset to emergency room arrival.

STATISTICAL ANALYSIS. Continuous variables were assessed for normal distribution using the 1-sample Kolmogorov-Smirnov test and were expressed as mean ± SD or, if they do not fulfill this condition, as median and interquartile range. Categorical variables were expressed as frequencies and percentages. The prevalence of suspected FWR was calculated, but not considered for the rest of analysis.

For time-trend analyses, patients were divided into 4 consecutive 5-year periods according to year of admission: 1988 to 1993, 1994 to 1998, 1999 to 2003, and 2004 to 2008. Differences were assessed with the Mantel-Haenszel chi-square test of linear association for categorical variables. Analysis of variance and Kruskal-Wallis tests were used to compare means and medians. A logistic regression analysis for mortality was performed to assess the time trend in risk-adjusted mortality including age, risk factors, prior cardiovascular disease (CVD), delay to admission, and time period as covariates. A 2-tailed probability value of <0.05 was considered statistically significant for all these tests. Statistical analyses were performed with SPSS software version 21 (IBM, Armonk, New York).

RESULTS

A total of 1,393 patients were enrolled. They were split into four 5-year time period groups, which consisted of 280 (20.1%), 363 (26.0%), 356 (25.5%), and 394 (28.3%) patients, respectively. Baseline characteristics, infarction features, reperfusion therapy, mortality rates, and their temporal trends are shown in Table 1. The mean age of the patients was 80.7 ± 4.7 years, and 51% were women. The majority (84%) presented with at least 1 cardiovascular risk factor, and 33.9% had had prior CVD. Most patients (64.7%)