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Original article

Impact of Previous Vascular Burden on In-hospital and Long-term Mortality in Patients With ST-segment Elevation Myocardial Infarction

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ABSTRACT

Introduction and objectives: Patients with a current acute coronary syndrome and previous ischemic heart disease, peripheral arterial disease, and/or cerebrovascular disease are reported to have a poorer outcome than those without these previous conditions. It is uncertain whether this association with outcome is observed at long-term follow-up.

Methods: Prospective observational study, including 4247 patients with ST-segment elevation myocardial infarction. Detailed clinical data and information on previous ischemic heart disease, peripheral arterial disease, and cerebrovascular disease («vascular burden») were recorded. Multivariate models were performed for in-hospital and long-term (median, 7.2 years) all-cause mortality.

Results: One vascular territory was affected in 1131 (26.6%) patients and $\geq$ 2 territories in 221 (5.2%). The total in-hospital mortality rate was 12.3% and the long-term incidence density was 3.5 deaths per 100 patient-years. A background of previous ischemic heart disease (odds ratio = 0.83; P = .35), peripheral arterial disease (odds ratio = 1.30; P = .34), or cerebrovascular disease (stroke) (odds ratio = 1.15; P = .59) was not independently predictive of in-hospital death. In an adjusted model, previous cerebrovascular disease and previous peripheral arterial disease were both predictors of mortality at long-term follow-up (hazard ratio = 1.57; $P < .001$; and hazard ratio = 1.34; P = .001; respectively). Patients with $\geq$ 2 diseased vascular territories showed higher long-term mortality (hazard ratio = 2.35; $P < .001$), but not higher in-hospital mortality (odds ratio = 1.07; P = .844).

Conclusions: In patients with a diagnosis of ST-segment elevation acute myocardial infarction, the previous vascular burden determines greater long-term mortality. Considered individually, previous cerebrovascular disease and peripheral arterial disease were predictors of mortality at long-term after hospital discharge.

Importancia de la carga vascular previa en la mortalidad intrahospitalaria y a largo plazo de pacientes con infarto de miocardio y segmento ST elevado

Palabras clave:
Infarto de miocardio
Enfermedad arterial periférica
Accidente cerebrovascular

RESUMEN

Introducción y objetivos: El paciente con síndrome coronario agudo con antecedentes de cardiopatía isquémica, arteriopatía periférica y/o accidente cerebrovascular previos muestra un peor pronóstico. Sin embargo, la relación existente entre dichos antecedentes y el pronóstico a largo plazo no ha sido aclarada del todo.

Métodos: Estudio prospectivo de 4.247 pacientes con infarto agudo de miocardio y segmento ST elevado. Se obtuvo información clínica detallada que incluye los antecedentes de cardiopatía isquémica, arteriopatía periférica y accidente cerebrovascular. Estudiamos la mortalidad intrahospitalaria y a largo plazo (mediana, 7,2 años) mediante modelos ajustados.

Resultados: Se observó que 1.131 (26,6%) pacientes tenían un territorio enfermo y 221 (5,2%), $\geq$ 2 territorios. La mortalidad hospitalaria total fue del 12,3% y la densidad de incidencia de mortalidad a largo plazo fue de 3,5/100 pacientes-año. Los antecedentes de cardiopatía isquémica (*odds ratio* = 0,83; p = 0,35), arteriopatía periférica (*odds ratio* = 1,30; p = 0,34) y accidente cerebrovascular (*odds ratio* = 1,15; p = 0,59) no fueron predictores independientes de mortalidad hospitalaria. En un modelo ajustado, los dos últimos fueron predictores de mortalidad a largo plazo (*hazard ratio* = 1,57; p < 0,001; y *hazard ratio* = 1,34; p = 0,001, respectivamente). La afección de $\geq$ 2 territorios vasculares fue predictora

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de mortalidad a largo plazo (*hazard ratio* = 2,35; p < 0,001), aunque no de mortalidad intrahospitalaria (*odds ratio* = 1,07; p = 0,844).

Conclusiones: En el infarto de miocardio con segmento ST elevado, la carga vascular previa condiciona mayor mortalidad a largo plazo. Individualmente, la arteriopatía periférica y el accidente cerebrovascular previos son predictores de muerte tras el alta.

Abbreviations

CVD: cerebrovascular disease
IHD: ischemic heart disease
PAD: peripheral arterial disease
STEAMI: ST-segment elevation acute myocardial infarction

INTRODUCTION

Atherosclerosis is a chronic, progressive systemic arterial disease that can affect the coronary arteries as acute myocardial infarction or angina, the arteries of the lower extremities as peripheral arterial disease (PAD), and the cerebral vasculature as cerebrovascular disease (CVD), mainly stroke.[1] Thus, the concept of *polyvascular disease* has emerged to refer to patients with > 1 affected vascular territory (the so-called "previous vascular burden") because of the existing etiologic nexus.[2] The importance of polyvascular disease resides in reported evidence that atherosclerotic involvement of ≥ 1 vascular territories leads to underuse of medications with proven benefits[3–8] and fewer coronary revascularization treatments,[3,4,7,9,10] which has an adverse impact on the clinical course during hospitalization[3,6–9,11] and at follow-up.[4,7,8,11–13] These observations have been investigated for each of the 3 territories separately,[4,6,7,10–12] and for concomitant involvement of 2 territories, mainly CVD and PAD.[8] However, few studies have assessed the impact of previous involvement of all 3 territories mentioned—ischemic heart disease (IHD), PAD, and/or CVD—on in-hospital management and mortality,[3,9] and, to our knowledge, there is no published information on the long-term status following hospital discharge.

A recent study in Spain[8] investigated the adverse prognostic value of previous PAD and/or CVD for in-hospital and 6-month mortality in a heterogeneous population of patients with acute coronary syndrome (ACS). The population ranged from patients with a very low risk status, diagnosed by stress testing or simply by their history of IHD, to those at high or very high risk (high-risk ST-segment elevation or non–ST-segment elevation ACS). Nonetheless, it is unknown whether the prognostic performance of a history of PAD and/or CVD is similar in the different types of ACS according to the risk stratum. The long-term (> 1 year) impact is also uncertain.

The aim of this study is to evaluate the prognostic importance of the previous vascular burden during hospitalization and at long-term following discharge in hospitalized patients with a diagnosis of persistent ST-segment elevation acute myocardial infarction (STEAMI).

METHODS

Enrollment

Between January 1998 and January 2008, we enrolled all patients consecutively hospitalized with a diagnosis of STEAMI in the coronary units of 2 university hospitals in the Region of Murcia: *Hospital Universitario Virgen de la Arrixaca* (El Palmar) and *Hospital Universitario de Santa Lucía* (Cartagena). The patients were included in a prospective, longitudinal, observational study. Patients who experienced an acute myocardial infarction during a coronary revascularization procedure were excluded.

Diagnosis of STEAMI was based on the presence of typical chest pain of ≥ 30 min duration and/or elevated myocardial necrosis markers, together with a presumably new ST segment elevation in ≥ 2 precordial leads: > 0.2 mm in V_1, V_2 or V_3, and > 0.1 mm in the lateral (aVL, I) or inferior (II, III, and aVF) leads. Patients with a presumably new left bundle branch block were also included.

The study was approved by the ethics committee of each participating center, and patients gave written consent to be included in the registry.

Variables. Definitions

Complete demographic information was collected for each patient. Previous IHD was established from documented previous diagnosis of angina or myocardial infarction, or on surgical or percutaneous coronary revascularization. Previous PAD was defined as a documented history of peripheral arterial disease, claudication, amputation due to arterial failure, aortoiliac occlusive disease, surgical or percutaneous peripheral arterial revascularization, or positive results on noninvasive testing. Previous CVD (stroke) was established with a documented history of sudden-onset loss of neurologic function that persisted in time. The previous vascular burden was defined as the "number" of diseased vascular territories, basically previous IHD, CVD, or PAD. Severe or major bleeding complications were defined as cerebral and retroperitoneal hemorrhage, and bleeding at any other site resulting in hemodynamic deterioration and/or the need for transfusion of whole blood or blood products.

After hospital discharge, patients underwent lengthy follow-up (median, 7.2 years) by telephone contact, medical record review, outpatient visits, and review of death registries. In-hospital deaths were excluded from this analysis. Follow-up information was obtained for 98% of the study participants.

Statistical Analysis

Contingency tables and the chi-square test or Fisher exact test, as appropriate, were used to determine relationships between dichotomous variables. Qualitative variables were compared using analysis of variance or the Kruskal-Wallis test, as appropriate. Factors associated with in-hospital death were analyzed by binary multivariate regression analysis. Odds ratios (ORs) were calculated with their respective 95% confidence intervals (95%CIs). The survival analysis following discharge was performed using Kaplan-Meier graphs, and between-group comparisons were done with the Mantel-Haenszel test. Cox regression was carried out, estimating the hazard ratio (HR) and 95%CI as a measure of associations. Variables with a non-Gaussian distribution were transformed by $\log_{10}$. The following variables were chosen as confounders for the multivariate models: *a)* variables in the study that showed an association with either the variable of interest (all-cause death) or the number of affected vascular territories,