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Original article

Reduction in 28 Days and 6 Months of Acute Myocardial Infarction Mortality From 1995 to 2005. Data From PRIAMHO I, II and MASCARA Registries

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ABSTRACT

Introduction and objectives: To determine whether mortality from acute myocardial infarction has reduced in Spain and the possibly related therapeutic factors.
Methods: Nine thousand, nine hundred and forty-nine patients with ST-segment elevation myocardial infarction admitted to the Coronary Care Unit were identified from PRIAMHO I, II and MASCARA registries performed in 1995, 2000 and 2005, with a 6 month follow-up.
Results: From 1995 to 2005 patients were increasingly more likely to have hypertension, hyperlipidemia and anterior infarction, but age of onset and the proportion of females did not increase. Twenty-eight-day mortality rates were 12.6%, 12.3% and 6% in 1995, 2000 and 2005 respectively, and 15.3%, 14.6% and 9.4% at 6 months (both *P*-trend <.001). Multivariate analysis was performed and the adjusted odds ratio for 28-day mortality for an infarction occuring in 2005 (compared with 1995) was 0.62 (95% confidence interval: 0.44-0.88) whereas the adjusted hazard ratio for mortality at 6 months was 0.40 (95% confidence interval: 0.24-0.67). Other variables independently associated with lower mortality at 28 days were: reperfusion therapy, and the use of anti-thrombotic treatment, beta-blockers and angiotensin-converting enzyme inhibitors. The 28-day-6-month period had an independent protective effect on the following therapies: coronary reperfusion, and prescription of antiplatelet agents, beta-blockers and lipid lowering drugs upon discharge.
Conclusions: Twenty-eight-day and six-month mortality rates fell among patients with ST-elevation myocardial infarction in Spain from 1995 to 2005. The possibly related therapeutic factors were the following: more frequent reperfusion therapy and increased use of anti-thrombotic drugs, beta-blockers, angiotensin-converting enzyme inhibitors and lipid lowering drugs.

Reducción de la mortalidad precoz y a 6 meses en pacientes con IAM en el periodo 1995-2005. Datos de los registros PRIAMHO I, II y MASCARA

Palabras clave:
Infarto agudo de miocardio
Elevación del ST
Mortalidad
Registros
Terapia de reperfusión
Unidad coronaria

RESUMEN

Introducción y objetivos: Determinar el cambio en la mortalidad a corto y medio plazo por infarto agudo de miocardio en España y los factores terapéuticos relacionados.
Métodos: Se identificó y se siguió durante 6 meses a 9.949 pacientes con infarto agudo de miocardio con elevación del ST ingresados en la unidad coronaria en los registros PRIAMHO I, II y MASCARA realizados en 1995, 2000 y 2005.
Resultados: En el periodo 1995-2005 aumentó ($p < 0{,}001$) el porcentaje de pacientes con hipertensión, hiperlipemia e infarto anterior, pero no el de mujeres ni la edad. La mortalidad a los 28 días fue del 12,6, el 12,3 y el 6% en 1995, 2000 y 2005 respectivamente y del 15,3, el 14,6 y el 9,4% a los 6 meses (ambas $p < 0{,}001$ para tendencia). Los pacientes de 2005 presentaron menos mortalidad ajustada por confusores que los de 1995, tanto a los 28 días (*odds ratio* = 0,62; intervalo de confianza del 95%, 0,44-0,88) como a los 6 meses (*hazard ratio* = 0,4; intervalo de confianza del 95%, 0,24-0,67). Otras variables asociadas con menor mortalidad a los 28 días fueron: reperfusión coronaria y uso en la unidad coronaria de antitrombóticos, bloqueadores beta e inhibidores del sistema renina-angiotensina. En el periodo

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◇ The complete list of researchers who participated in the PRIAMHO I, II and MASCARA studies can be found at: www.regicor.org/PRIAMHO-MASCARA_inv

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28 días-6 meses, la reperfusión coronaria y la prescripción al alta de antiagregantes bloqueadores beta e hipolipemiantes explicaron la menor mortalidad en 2005.
Conclusiones: La mortalidad precoz y a los 6 meses del infarto con elevación del ST disminuyó en 1995-2005. Los factores terapéuticos relacionados son: incremento de la reperfusión y mayor utilización de antitrombóticos, bloqueadores beta, inhibidores del sistema renina-angiotensina e hipolipemiantes.

Abbreviations

ACEI: angiotensin-converting enzyme inhibitor
ARB-II: angiotensin II receptor blockers
BB: betablockers
CICU: cardiac intensive care unit
GCP: guidelines on clinical practice
STEMI: ST-segment elevation acute myocardial infarction

INTRODUCTION

The health care provided to patients with acute myocardial infarction (AMI) has greatly changed during the past two decades, with the advent of new diagnostic and therapeutic procedures. As a result, mortality has decreased, as has been demonstrated in several international registries.[1–3] These advances endorsed by scientific evidence, have been incorporated by successive good practice guidelines (GPC)[4,5] implying that if the guidelines are closely followed, a lower mortality can be achieved.[6,7]

Mortality in patients with ST-segment elevation acute myocardial infarction (STEMI) very much depends on how early the ischemic myocardium is reperfused, and amongst the available options, primary angioplasty has proven to be better than fibrinolysis.[8] However, it is not as frequently used in Spain as in other western countries.[9] Furthermore, many other effective therapies recommended by guidelines could also be employed more.[1,7]

National registries enable us to monitor disease treatment changes and how they may affect mortality. In Spain, the PRIAMHO I, II and MASCARA registries collected AMI patient data for 1995, 2000 and 2005, respectively.[10–12]

The aims of this paper are: *a)* to analyze the changes in 28-day and 6-month mortality in patients with STEMI from 1995 to 2005, and *b)* to determine which therapeutic factors are associated with this variation.

METHODS

The methodology used by the PRIAMHO I, II and MASCARA registries has already been described in detail.[10–12] In summary, the PRIAMHO registries, designed by the *Sección de Cardiopatía Isquémica y Unidades Coronarias de la Sociedad Española de Cardiología* (Department of Ischaemic Heart Diseases and Coronary Care Units from the Spanish Society of Cardiology) registered all patients with and without STEMI admitted to the coronary care unit/cardiac intensive care unit (CICU) between October 1994 and September 1995 and from 15 May to 16 December 2000. Forty-seven hospitals participated in the PRIAMHO I and 81 in PRIAMHO II. All hospitals had to meet the following requirements: *a)* register at least 70% of AMI patients admitted to the hospital; *b)* register at least 75% of the AMI patients admitted to the CICU; *c)* reach a Kappa concordance index above 70% between the data registered and data obtained by an external auditor from a random sample of 15% of the patients, and *d)* perform follow-up after one year for more than 90% of the registered patients.

The MASCARA study[12] broadened the patient type analyzed to all acute coronary syndromes with and without AMI, and also included patients that were not admitted to the CICU. The recruitment period was from September 2004 to June 2005. Sixty hospitals were chosen at random in accordance with the hospital's attendance. Between 2005 and 2006 an exhaustive inclusion control was performed. The study excluded hospitals whose inclusion rate was lower than 50% that expected in accordance with the health centre's attendance rate and whose 95% confidence interval (CI) for each acute coronary syndrome type mortality rate was not within the mean range of the reference centers. As such, 18 out of the 50 centers that had completed the recruitment were excluded.

For our study, we have chosen the STEMI patient subgroup admitted to the CICU from the PRIAMHO I, II and MASCARA study. Of those patients in the CICU, those with ST-segment elevation were identified among those who met the AMI criteria. AMI diagnosis was based on the definition that existed when the study took place.[13,14] Data was recorded for: demographics, clinical history, characteristics of the acute event and complications, diagnostic and therapeutic procedures used in the CICU and drug treatment upon discharge. Follow-up was performed in an outpatient clinic or by telephone. Mortality data was collected for any cause.

Statistical Analysis

Patient characteristics are expressed as mean ± standard deviation, or frequency and percentage. For the bivariate analysis, the χ^2 test, Student's-t test or Mann-Whitney U test were used, depending on the data distribution. When analyzing evolution over three periods, the *P* value is presented for linear tendency. To analyze the relationship between period and short-term mortality (28 days) logistic regression models have been used, expressing the results as odds ratio (OR), given that most deaths occur during the first 24 h and these data are better adjusted to a binomial distribution. To analyse the relationship between the period and time to long-term mortality (28 days-6 months) Cox's regression models have been used, expressing the results as hazard ratio (HR). The HR's linearity assumption for continuous variables is calculated using a smoothing spline regression, and the proportionality assumption is calculated by testing the interaction with time. None of these tests reached a statistical significance against these assumptions. The influential cases were analyzed using the delta-beta method, in which the variation of estimations was compared following the extraction of each of the patients.

In addition to the variable 'period', with 1995 as a reference, each of the models were including more and more variables regarding demographics, clinical history, acute events and lastly, diagnosis and therapeutic procedures. Variables that showed, at least, a significant marginal relationship of $P < .15$ were included as possible confounding factors in the bivariate analysis by comparing the surviving patients with those that died after 30 days or during the 28-day-6-month period.