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Original article

Coronary Artery Dominance and Long-term Prognosis in Patients With ST-segment Elevation Myocardial Infarction Treated With Primary Angioplasty

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ABSTRACT

Introduction and objectives: The long-term prognostic significance of coronary artery dominance pattern in patients with ST-segment elevation myocardial infarction is poorly characterized. We investigated the prognosis of such patients according to whether they had right dominance, left dominance, or codominance.

Methods: This was a retrospective study of 767 patients, who were admitted to hospital between 2007 and 2012 with ST-segment elevation myocardial infarction and treated with primary percutaneous coronary intervention. We determined the effect of the coronary dominance pattern on all-cause mortality and readmission for infarction, adjusting for mortality as a competing event.

Results: A total of 80.9% of patients had right coronary dominance, and 8.6% had left coronary dominance. Over 40.8 months' [interquartile range, 21.9-58.3 months] follow-up, 118 (15.4%) deaths were recorded, of which 39 (5.1%) were in hospital. Mortality for right dominance, left dominance, and codominance was 7.1%, 36.4%, and 13.8% ($P < .001$), respectively. Cause of death was cardiovascular in 7.1%, 21.2%, and 2.4%. On Cox multivariate analysis, left dominance was significantly associated with mortality (hazard ratio = 1.76; $P = .02$). Taking "coronary dominance" into account in prediction of risk of death improved the discrimination and calibration capacity of GRACE (Global Registry of Acute Coronary Events) scoring. At follow-up, 9.3% (71 patients) had reinfarction. On multivariate analysis, left dominance was an independent predictor of reinfarction (subhazard ratio = 2.06; $P = .01$).

Conclusions: In ST-segment elevation myocardial infarction treated with primary percutaneous coronary intervention, left coronary artery dominance confers a higher risk of death and reinfarction than right coronary artery dominance, and should be included in prognostic stratification.

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Dominancia coronaria y pronóstico a largo plazo de los pacientes con infarto de miocardio con elevación del segmento ST tratado con angioplastia primaria

Palabras clave:
Infarto agudo de miocardio
Dominancia coronaria
Pronóstico
Mortalidad

RESUMEN

Introducción y objetivos: El significado pronóstico a largo plazo del patrón de dominancia coronaria en pacientes con infarto de miocardio con elevación del segmento ST está mal caracterizado. Se investigó el pronóstico de esos pacientes según tuvieran dominancia derecha, izquierda o codominancia.

Métodos: Estudio retrospectivo de 767 pacientes, ingresados entre 2007 y 2012 por infarto de miocardio con elevación del segmento ST y tratados con intervencionismo coronario percutáneo primario. Se determinó el impacto del patrón de dominancia coronaria, en la mortalidad por cualquier causa y los reingresos por infarto ajustando por mortalidad como evento competitivo.

Resultados: La dominancia coronaria fue derecha en el 80,9% e izquierda en el 8,6%. Durante 40,8 [intervalo intercuartílico, 21,9-58,3] meses de seguimiento, se registraron 118 (15,4%) muertes, 39 (5,1%) de ellas, intrahospitalarias. La mortalidad fue del 7,1, el 36,4 y el 13,8% ($p < 0,001$) en dominancia derecha, izquierda y codominancia, respectivamente. La causa de muerte fue cardiovascular en el 7,1, el 21,2 y el 2,4%. En el análisis multivariable de Cox, la dominancia izquierda se asoció significativamente

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con la mortalidad (*hazard ratio* = 1,76; p = 0,02). Considerar «dominancia coronaria» en la predicción de riesgo de muerte mejoró la capacidad de discriminación y calibración de la puntuación GRACE *(Global Registry of Acute Coronary Events)*. El 9,3% (71 pacientes) presentó reinfarto durante el seguimiento. En el análisis multivariable, la dominancia izquierda fue predictora independiente de reinfarto (*sub-hazard ratio* = 2,06; p = 0,01).

Conclusiones: En el infarto con elevación del segmento ST tratado con intervencionismo coronario percutáneo primario, la dominancia izquierda confiere mayor riesgo de muerte y reinfarto que la dominancia derecha, y debería tenerse en cuenta en la estratificación pronóstica.

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Abbreviations

ACS: acute coronary syndrome
AMI: acute myocardial infarction
CD: coronary dominance
PCI: percutaneous coronary intervention
STEMI: ST-segment elevation myocardial infarction

INTRODUCTION

Left coronary dominance (CD) and codominance are generally described as a variant of normal anatomy, with a left CD prevalence of around 7% to 10% in the general population.[1,2] Patients with left CD have a nondominant right coronary artery that supplies blood only to the right ventricle and right atrium, whilst the left ventricle is completely supplied by the left coronary tree. Therefore, in the case of coronary occlusion, patients with left CD have a larger area of myocardium at risk than patients with right CD, which could negatively affect their prognosis.

There are few clinical studies on the prognostic relevance of CD pattern in patients with acute coronary syndrome (ACS). Furthermore, in the setting of acute myocardial infarction (AMI) with ST-segment elevation (STEMI), the importance of CD pattern in long-term prognosis remains poorly characterized, with conflicting data on its prognostic significance.[3,4]

The aim of our study was to evaluate the relationship between CD pattern, mortality, and readmission for a new AMI (reAMI), adjusting for mortality as a competing event.

METHODS

Study Population

This was a retrospective cohort study based on the CardioCHUS registry; a registry that included all consecutive patients admitted with ACS to the Cardiology Service of the *Complejo Hospitalario Universitario de Santiago de Compostela (Santiago de Compostela* University Hospital Complex) from December 2003 to September 2012 (N = 5532). Our substudy of the CardioCHUS registry ran from July 2007 to September 2012, a period that we consider to represent current management of acute STEMI. It included consecutive patients who had a primary diagnosis of acute STEMI, had available data on CD pattern, and were treated with primary percutaneous coronary intervention (PCI). The initial population of this substudy was composed of 1084 patients with a primary diagnosis of acute STEMI, of whom 769 had primary PCI as their initial treatment. In 2 patients, CD pattern could not be determined, so those patients were excluded. Thus, the final study population consisted of 767 patients.

Definition of Study Variables

Acute STEMI was defined as presence of symptoms along with ST-segment elevation $\geq$ 1 mm in at least 2 contiguous leads or new or presumed new left bundle branch block, and raised cardiac troponin I (except in cases of early death before laboratory measurement).

Coronary lesions detected on invasive coronary angiography were considered significant if stenosis was $\geq$ 70% on visual assessment as judged by the responsible cardiologist. This percentage is equivalent to a 50% stenosis on a quantitative analysis method.[5] Lesions of the left main coronary artery were considered significant if they were $\geq$ 50%.

Coronary dominance was defined as the coronary artery giving rise to the posterior descending artery and the posterolateral branches. Coronary dominance was classified as right, left, or codominant. The information on CD was obtained by reviewing coronary angiography reports.

Failed PCI was defined as final TIMI (Thrombolysis In Myocardial Infarction) flow $<$ III or residual stenosis $>$ 30%. Left ventricular ejection fraction was quantified during inpatient stay, using echocardiography according to the Simpson method. The study conformed to the principles of the Declaration of Helsinki.

Aims and Follow-up

The aim of this study was to investigate the prognostic effect of CD type on long-term total mortality and cause of death, as well as (nonfatal) reAMI adjusted for mortality as a competing event, in patients with acute STEMI treated with primary PCI.

After discharge, patients were followed up in a specialized ischemic heart disease outpatient clinic and by their general practitioner. Structured follow-up was carried out using the electronic history (IANUS program, unique to the Spanish autonomous community of Galicia), reviewing all medical visits and hospital records and using telephone contact in some cases.

For classification of cause of death, we used the same classification of cause of death as that previously used by our group.[6] Death of cardiovascular origin (cardiac and noncardiac vascular) was defined as that due to sudden death, refractory heart failure, ACS, acute aortic syndrome, pulmonary, systemic, or cerebral thromboembolism, or renal vascular disease (renal failure in the absence of glomerulonephropathy or other parenchymal abnormalities). The remaining causes of death available were considered noncardiovascular.

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