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Prognostic Value of Geriatric Conditions Beyond Age After Acute Coronary Syndrome

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Abstract

The aim of the present study was to investigate the prognostic value of geriatric conditions beyond age after acute coronary syndrome. This was a prospective cohort design including 342 patients (from October 1, 2010, to February 1, 2012) hospitalized for acute coronary syndrome, older than 65 years, in whom 5 geriatric conditions were evaluated at discharge: frailty (Fried and Green scales), comorbidity (Charlson and simple comorbidity indexes), cognitive impairment (Pfeiffer test), physical disability (Barthel index), and instrumental disability (Lawton-Brody scale). The primary end point was all-cause mortality. The median follow-up for the entire population was 4.7 years (range, 3-2178 days). A total of 156 patients (46%) died. Among the geriatric conditions, frailty (Green score, per point; hazard ratio, 1.11; 95% CI, 1.02-1.20; $P=.01$) and comorbidity (Charlson index, per point; hazard ratio, 1.18; 95% CI, 1.0-1.40; $P=.05$) were the independent predictors. The introduction of age in a basic model using well-established prognostic clinical variables resulted in an increase in discrimination accuracy (C-statistic$=.716$-$.744$; $P=.05$), though the addition of frailty and comorbidity provided a nonsignificant further increase (C-statistic$=.759$; $P=.36$). Likewise, the addition of age to the clinical model led to a significant risk reclassification (continuous net reclassification improvement, 0.46; 95% CI, 0.21-0.67; and integrated discrimination improvement, 0.04; 95% CI, 0.01-0.09). However, the addition of frailty and comorbidity provided a further significant risk reclassification in comparison to the clinical model with age (continuous net reclassification improvement, 0.40; 95% CI, 0.16-0.65; and integrated discrimination improvement, 0.04; 95% CI, 0.01-0.10). In conclusion, frailty and comorbidity are mortality predictors that significantly reclassify risk beyond age after acute coronary syndrome.

E lderly patients with acute coronary syndrome can experience a wide spectrum of geriatric conditions that aggravate their prognosis. Older age is universally considered as a risk factor, but geriatric conditions are not usually evaluated. It is probable that cardiologists are not familiar with some of the cumbersome tools required to measure geriatric conditions.

A number of studies have reported the close association of frailty[1-7] and comorbidity[8-12] with outcomes after acute coronary syndrome. Nevertheless, the long-term prognostic effect of geriatric factors beyond age has not been completely elucidated.

The present study involves a series of patients hospitalized for acute coronary syndrome, in whom a wide spectrum of geriatric conditions were measured. The goals were to investigate which geriatric conditions had the highest prognostic effect and the relevance of their prognostic information beyond that of age at long-term follow-up.

PATIENTS AND METHODS

This was a prospective cohort design including 342 consecutive patients (from October 1, 2010, to February 1, 2012), survivors of acute coronary syndrome, from the Cardiology Department of the University Clinic Hospital in Valencia, Spain. A detailed description of the study design has been explained elsewhere.[4] In brief, inclusion criteria were admission for

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acute coronary syndrome (either ST-segment elevation or non–ST-segment elevation acute coronary syndrome), older than 65 years, and signed written consent for the evaluation of geriatric conditions upon hospital discharge. Exclusion criteria were a previous diagnosis of heart disease other than ischemic heart disease and coronary surgery during hospitalization, because the consequences of the surgical procedure would confound the assessment of geriatric conditions at discharge. A total of 29 patients were excluded because of planned coronary surgery before discharge. In addition, 51 patients fulfilling inclusion criteria refused to participate. The study was reviewed and approved by the Clinical Research Ethics Committee by the University Hospital Clinic in Valencia. A considerable amount of data was collected from clinical assessment (coronary risk factors, admission heart rate and blood pressure, and Killip class), electrocardiograms (ST-segment deviation), routine blood tests (troponin levels, admission hemoglobin level, and glomerular filtration rate), and echocardiograms (left ventricular ejection fraction at discharge) (Supplemental Table 1, available online at http://www.mayoclinicproceedings. org).

Geriatric Conditions

On the day of hospital discharge, 5 geriatric conditions were evaluated[4]: (1) frailty, using the Fried and Green scores, through the evaluation of the unintentional weight loss (or serum albumin level in the case of the Green score), physical activity, walk time, grip strength, and exhaustion; (2) physical disability using the Barthel index; (3) instrumental disability using the Lawton-Brody scale; (4) cognitive impairment using the Pfeiffer questionnaire; and (5) comorbidity condition using Charlson and simple comorbidity indexes. Geriatric conditions were assessed by 2 nurses trained for this purpose using predefined standard instruments. All patients were able to complete all geriatric assessments.

Outcomes

The primary end point was all-cause mortality. The follow-up period was considered to start at discharge. Patients were followed until September 1, 2016. All but 4 patients completed the follow-up. The median follow-up for the entire patient population was 4.7 years (range, 3-2178 days). Secondary end points were cardiac mortality (death attributed to a cardiac cause or of unknown origin), acute myocardial infarction (readmission by angina or other equivalent symptoms along with troponin elevation), readmission for acute heart failure, readmission for stroke, readmission for bleeding episode, and readmission for any other reason. Information on the end points was collected from the hospital files or outpatient department. In patients who did not return to the hospital or the outpatient department, the information was obtained by establishing contact with the patient, his or her general physician, or the regional mortality registry.

Statistical Analyses

Continuous variables were expressed as mean $\pm$ SD and categorical variables as the absolute values and their percentages. The univariate association between each geriatric condition and outcomes was tested using C-statistic. For the bivariate comparison between the C-statistics among geriatric markers, the method proposed by Kang et al[13] was used (z-score test). To select those geriatric conditions related to mortality, a Cox regression analysis was performed introducing all geriatric conditions. Hazard ratios (HRs) with 95% CIs were calculated for each geriatric condition. Because frailty (Green score) and comorbidity (Charlson index) were independent predictors, all further analyses were focused on these items.

Next, to test the incremental prognostic information added by the Green score and the Charlson index, a full clinical model was built using a multivariate Cox regression analysis including all clinical covariates deemed to be of well-established prognostic value, regardless of their P value, excluding those variables that are also items in the Charlson index (diabetes, previous ischemic heart disease, previous stroke, and peripheral artery disease). The clinical variables tested were sex, smoking, hypertension, dyslipidemia, previous antiplatelet treatment, admission systolic blood pressure and heart rate, Killip class, ST-segment deviation in the initial electrocardiogram, troponin elevation, left ventricular ejection fraction at discharge, admission hemoglobin level, and admission glomerular filtration rate. The