A novel clinical and stress cardiac magnetic resonance score to predict long-term all-cause mortality in patients with known or suspected chronic coronary syndrome

V. Marcos Garces[1], J. Gavara[2], N. Perez[2], C. Rios-Navarro[2], E. De Dios[2], A. Gabaldon-Perez[1], H. Merenciano-Gonzalez[1], P. Racugno[1], C. Bonanad[1], J. Canoves[1], F.J. Lopez-Fornas[1], M.P. Lopez-Lereu[3], J.V. Monmeneu[3], F.J. Chorro[1], V. Bodi[1]

[1]University Hospital Clinic of Valencia, Department of Cardiology, Valencia, Spain; [2]INCLIVA Biomedical Research Institute, Valencia, Spain; [3]ERESA, Cardiovascular Magnetic Resonance Unit, Valencia, Spain

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Background: Vasodilator stress cardiac magnetic resonance (stressCMR) has shown robust diagnostic and prognostic value in patients with known or suspected chronic coronary syndrome (CCS). However, it is unknown whether integration of several prognostic stressCMR parameters, such as the ischemic burden (number of segments with first-pass stress-induced perfusion defects -PD-) and left ventricular ejection fraction (LVEF), with clinical variables can improve risk prediction in this population.

Purpose: We aim to explore the usefulness of a clinical-stressCMR score to predict the risk of all-cause mortality in patients with known or suspected CCS submitted to undergo a stressCMR.

Methods: We included 6187 patients in a large prospective multicenter registry (mean age 65.18±11.51 years, 37.3% female) which underwent stressCMR for known or suspected CCS. Several clinical and stressCMR variables were collected, such as LVEF, end-diastolic and end-systolic volume indices, ischemic burden and segments with necrosis (with late gadolinium enhancement imaging).

Results: During a mean and median follow-up of 5.85±3.82 years we registered 682 (11%) all-cause deaths. Several clinical and all stressCMR variables were associated with all-cause mortality in univariate analysis. However, the only independent predictors of all-cause mortality in multivariate analysis were age (HR 1.07 [1.06–1.08] per year, p<0.001), male sex (HR 1.36 [1.15–1.61], p<0.001), diabetes mellitus (HR 1.6 [1.37–1.87], p<0.001), LVEF (0.98 [0.97–0.98] per %, p<0.001) and ischemic burden (HR 1.04 [1.02–1.06] per segment with stress-induced PD, p=0.001). By means of the chi-square increase at each step of the stepwise multiparametric Cox regression we created a clinical-stressCMR score that included these variables (age, male sex, diabetes mellitus, LVEF and ischemic burden) kept in their continuous state if possible. This score showed a good performance to predict all-cause mortality (area under the curve = 0.716 [0.697–0.735], p<0.001). Dividing the population into quintiles according to the clinical-stressCMR score allowed for a stratification of the annualized risk of all-cause mortality (0.39%/year, 0.94%/year, 1.62%/year, 2.63%/year and 3.83%/year, respectively; log-rank 420.33 and p<0.001 for Kaplan-meier curves).

Conclusions: A novel clinical-stressCMR, which includes clinical (age, male sex, and diabetes mellitus) and stressCMR (LVEF and ischemic burden) variables, can provide robust prediction and stratification of the risk of all-cause mortality in a population of patients with know or suspected CCS.

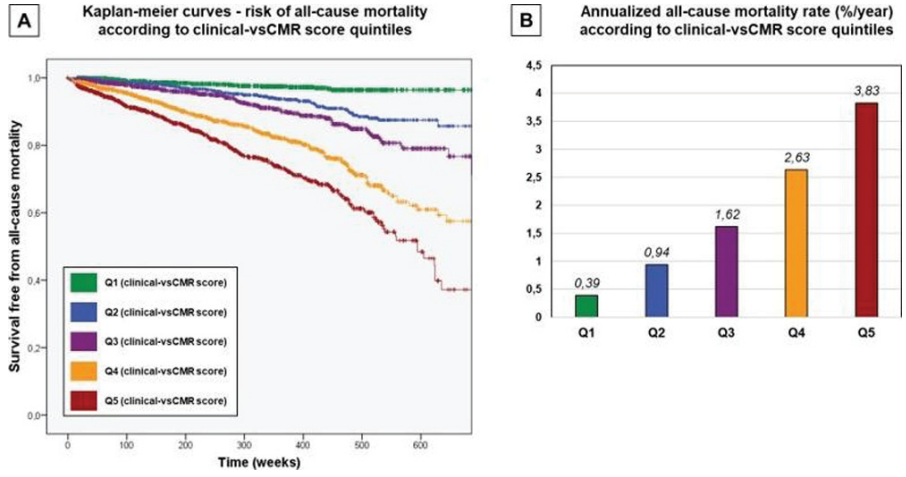

Figure 1. Clinical-stress CMR score