Cardiac magnetic resonance for prophylactic implantable-cardioverter defibrillator therapy international registry in patients with ischemic cardiomyopathy

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Background: Sudden cardiac death (SCD) in patients with ischemic cardiomyopathy (ICM) remains a leading cause of death. Current guidelines provide a class I recommendation for implantable cardioverter-defibrillator (ICD) implantation in ICM patients with transthoracic echocardiographic (TTE) left ventricular ejection fraction (LVEF) ≤35%, and NYHA functional class II or III. The current paradigm is suboptimal in identifying patients who are likely to benefit. In fact, only a relatively small proportion of ICD recipients for SCD primary prevention receive appropriate device therapy and instead there is a not negligible percentage of patients who experienced SCD event despite not fulfilling criteria for implantation.

Purpose: The DERIVATE-ICM registry sought to evaluate the additional prognostic value for the indication of ICD implantation using cardiac magnetic resonance (CMR) as compared to standard of care based on TTE in a large cohort of ICM patients.

Methods: We enrolled 861 ICM patients (86% male, mean age 65±11 years) with chronic heart failure and TTE-LVEF<50%. Major adverse arrhythmic cardiac events (MAACE), defined as the combination of SCD, aborted SCD event, and sustained ventricular tachycardia, were the primary endpoint. Independent predictors were used to calculate a CMR risk score for each patient. Risk levels were defined as low (quantile 1 [Q1]), medium (Q2 and Q3) and high (Q4).

Results: During a median follow-up of 1054 days, MAACE occurred in 88 (10.2%). Left ventricular end-diastolic volume index (HR:1.007, 95% CI:1.000-1.011, p=0.05), CMR-LVEF (HR:0.972, 95%CI: 0.945-0.999, p=0.045) and late gadolinium enhancement (LGE) mass (HR:1.010, 95%CI: 1.002–1.018, p=0.015) were independent predictors of MAACE. Based on the multivariate analysis, CMR weighted risk score was developed according to the following equation [0.005 * EDV/BSA (mL/m²) – 0.029 * LVEF (%) + 0.010 * LGE ischemic mass (g)]. A multiparametric CMR weighted predictive derived score effectively identifies subjects at high risk for MAACE as compared to TTE-LVEF cut-off of 35% with a Continuous NRI: 31.7% (95%CI: 8.6%-54.8%, p=0.007) (Figure 1, Figure 2).

Conclusions: In this large multicenter registry, a multi-parametric CMR predictive model provides additional prognostic stratification for MAACE predictions in a large cohort of ICM patients as compared to standard of care. This model identifies a large number of patients with TTE-LVEF<35% at low risk of SCD event and on the other side it identifies a subset of patients who are at high risk of MAACE despite TTE-LVEF≥35% (i.e. the population currently not fulfilling the guideline-based criteria for ICD implantation). Further randomized trials to test a CMR guided strategy for ICD implantation versus standard of care are now needed.

Kaplan-Meier curves
Event rate redistribution