ABSTRACTS FOR ORAL PRESENTATION, SESSION 2, HRC 2014

Ventricular tachycardia & sudden death

COMBINING A NOVEL ELECTRICAL RESTITUTION BASED BIOMARKER WITH HEART RATE VARIABILITY ANALYSIS IMPROVES PREDICTION OF SUDDEN CARDIAC DEATH RISK

S.P. Trethewey[1], W.B. Nicolson[2], G.P. McCann[2], M.I. Smith[1], A.J. Sandilands[3], P.J. Stafford[3], F.S. Schlindwein[4], N.J. Samani[5], and G.A. Ng[2]

[1]University of Leicester, Leicester; [2]Department of Cardiovascular Sciences, University of Leicester, Leicester; [3]Department of Cardiology, Glenfield Hospital, Leicester; [4]Department of Engineering, University of Leicester, Leicester; and [5]NIHR Biomedical Research Unit, Glenfield Hospital, Leicester

Introduction: Sudden cardiac death (SCD) remains a significant cause of mortality worldwide. Current SCD risk markers have substantial limitations. Peak Electrical Restitution Slope (PERS) is a promising new SCD risk marker. PERS uses the surface 12-lead ECG to measure peak restitution gradient, a property of myocardium known to play a role in ventricular arrhythmogenesis. By combining PERS with heart rate variability (HRV) analysis, we sought to improve SCD risk prediction in patients with ischaemic cardiomyopathy (ICM).

Methods: Blinded, prospective, observational study of 44 ICM patients (>18 years of age) undergoing risk stratification for an implantable cardioverter defibrillator. Patients underwent programmed ventricular stimulation for determination of PERS. Surface ECG surrogates for action potential duration (QRS-onset to T-peak) and diastolic interval (T-peak to QRS-onset) were used to measure peak restitution gradient. Patients underwent 24-hour ambulatory ECG monitoring to determine time-domain HRV (standard deviation of normal to normal RR intervals [SDNN]). A pre-defined SDNN cut off (100ms) was combined with an optimal PERS cut-off (1.21) to determine if combining these risk markers could improve SCD risk stratification.

Results: During median follow up of 22 months, 11 patients experienced ventricular arrhythmia (VA)/SCD. PERS was significantly higher in patients experiencing VA/SCD than those not (mean $\pm$ SEM:1.73 $\pm$ 0.27 vs 1.07 $\pm$ 0.08, p = 0.002). PERS was independent of age, gender, left ventricular ejection fraction, QRS duration and SDNN in prediction of endpoint (Cox model, p = 0.002). Patients with low SDNN (<100ms) experienced a non-significantly higher rate of VA/SCD than those with high SDNN (33% vs 19%, p = 0.24). Patients with PERS $\geq$ 1.21 and SDNN < 100ms had a hazard ratio for VA/SCD 17.4 times that of patients negative for both (Cox model, p = 0.01). Kaplan Meier analysis (Figure 1) showed significant separation in rates of VA/SCD in patients stratified by PERS and SDNN (log-rank, p = 0.002).

Conclusions: Combining PERS with SDNN identifies patients at particularly high risk of ventricular arrhythmia/SCD. A combined PERS + SDNN risk marker may improve SCD risk stratification in patients with ischaemic cardiomyopathy.

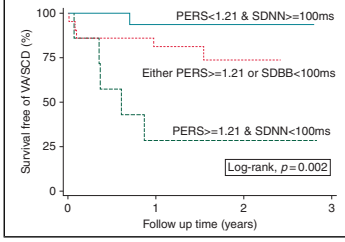

Figure 1 Kaplan-Meier curves illustrating rates of VA/SCD in patients stratified using PERS and SDNN.