

### USING CARDIAC MAGNETIC RESONANCE TO PREDICT CLINICAL OUTCOMES IN EISENMENGER SYNDROME

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**Introduction** Eisenmenger Syndrome is defined as pulmonary hypertension with reversed or bi-directional shunting at any level between the systemic and pulmonary circulations. Retrospective studies have identified predictors of clinical outcomes including: age, function class and resting oxygen saturations. Cardiac magnetic resonance (CMR) imaging provides direct evaluation of sub-pulmonary ventricular function, morphology, stroke volume and myocardial mass, whilst allowing a non-invasive method of shunt calculation. For these reasons CMR is an attractive modality for predicting outcomes in Eisenmenger Syndrome.

**Aim** To assess whether Cardiac Magnetic Resonance (CMR) measurements of the sub-pulmonary ventricle can predict clinical outcomes in Eisenmenger Syndrome.

**Methods** 19 patients, aged 18 years or over with the diagnosis of Eisenmenger Syndrome on transthoracic echocardiography and/or catheter catheterisation were recruited between 2008 and 2011. Each patient underwent a hospital standardised CMR protocol with an ECG gated CMR (1.5 Tesla MR). Ventricular systolic and diastolic volumes, myocardial mass, ejection fraction and Qp:Qs were calculated by a single operator. Baseline demographics and predictors of clinical outcomes were recorded including: resting oxygen saturations, 6-min walk distance (6 MWD) and NYHA functional class.

Mean values are shown  $\pm$ SDs for normally distributed continuous variables. Non-parameter testing used Spearman's rank correlation.

**Results** 15 patients were female (79%). Group mean age was 34.8  $\pm$ 11 years (age range 18–52 years). 6 patients (31%) within our population had Down Syndrome. Diagnoses included; complete AVSD (n=4), VSD (n=5), PDA (n=3), secundum ASD (n=2), complex (n=5). Mean sub-pulmonary ventricular (SPV) ejection fraction was 52% $\pm$ 13, systolic volumes 44.7 ml/m<sup>2</sup> $\pm$ 26, diastolic volumes 94.9 ml/m<sup>2</sup> $\pm$ 45, stroke volume 48.6 ml/m<sup>2</sup> $\pm$ 33, myocardial mass 66.3 g/m<sup>2</sup> $\pm$ 23 and cardiac output 6.2 l/min $\pm$ 4. Mean systemic ventricular ejection fraction was 58% $\pm$ 9.2, systolic volumes 37.7 ml/m<sup>2</sup> $\pm$ 28, diastolic volumes 63.6 ml/m<sup>2</sup> $\pm$ 44, stroke volume 37.3 ml/m<sup>2</sup> $\pm$ 28, myocardial mass 51.6 g/m<sup>2</sup> $\pm$ 22 and cardiac output 4.4 L/min $\pm$ 4.

6 MWD was highly correlated with; resting saturations (R=0.61: p=0.01), functional class (R=-0.53: p=0.03), sub-pulmonary ventricular myocardial mass (R=0.82: p=0.002), sub-pulmonary

ventricular systolic volume (R=0.85: p=0.001) and sub-pulmonary ventricular diastolic volume (R=0.07: p=0.01). Resting saturations were highly correlated with: Age (R=0.56: p=0.008), functional class (R=-0.66: p=0.001).

**Conclusions** CMR derived SPV myocardial mass and volumes correlated with functional clinical outcomes within our cohort. 6 MWD increased with greater SPV myocardial mass, consistent with favourable SPV remodelling. CMR offers further knowledge into adaptations of the subpulmonary ventricle and may produce additional information to current predictors of outcomes in Eisenmenger Syndrome.