Abstract: 2378

Blunted stress myocardial oxygenation and not myocardial perfusion reserve is associated with arrhythmic risk in hypertrophic cardiomyopathy.

Authors:
B Raman¹, K Chan¹, M Mahmood¹, R Ariga¹, S Sivalokanathan¹, TD Karamitsos², J Selvanayagam³, AT Hess¹, EM Tunnicliffe¹, H Watkins¹, S Neubauer¹, ¹University of Oxford, Division of Cardiovascular Medicine, Radcliffe Department of Medicine - Oxford - United Kingdom of Great Britain & Northern Ireland, ²Aristotle University of Thessaloniki, First Department of Cardiology - Thessaloniki - Greece, ³Flinders Medical Centre and Flinders University - Adelaide - Australia,

Topic(s):
Hypertrophic Cardiomyopathy

Citation:

Funding Acknowledgements:
National Institute for Health Research Oxford Biomedical Centre and British Heart Foundation.

Background
In hypertrophic cardiomyopathy (HCM), myocardial ischaemia is believed to play a role in fatal life-threatening ventricular arrhythmias and caused by microvascular dysfunction manifesting as impaired myocardial perfusion. However, previous studies suggest that myocardial oxygenation during vasodilator stress may also be blunted when perfusion is normal, due to increased metabolic demands conferred by energy-costly sarcomeric mutations, left ventricular hypertrophy and outflow obstruction. Whether or not impaired myocardial perfusion reserve or blunted stress oxygenation on cardiac magnetic resonance (CMR) predict the risk of ventricular arrhythmia in HCM is unknown.

Purpose
We sought to investigate if impaired myocardial perfusion reserve or stress oxygenation is associated with an increased risk of ventricular arrhythmia in HCM.

Methods
103 genotyped HCM patients (mean age 47±15 years) and 32 age- and sex-matched healthy controls underwent adenosine stress blood oxygen level dependent (BOLD) imaging, first pass perfusion and late gadolinium imaging (LGE) on CMR to assess stress oxygenation (BOLD ?SI), myocardial perfusion reserve index (MPRI), and fibrosis respectively. All HCM patients were monitored for ventricular tachycardia (=3 beats, =120 beats per minute) on a 24-hour Holter.

Results
As expected, MPRI was significantly reduced in HCM (1.5±0.4 vs 2.0±0.3, p<0.0001) compared to controls. Stress oxygenation response was blunted in HCM versus controls (9.1±4.1% vs 17.0±1.6%, p<0.0001, Figure 1B). Twenty-six (25%) patients developed ventricular tachycardia on Holter monitoring. On univariate analysis, only stress oxygenation and not MPRI associated with ventricular tachycardia. The prevalence of ventricular tachycardia in HCM increased with decreasing quartiles of stress oxygenation (Figure 1D). HCM patients in the lowest quartile of oxygenation (BOLD ?SI <6.5%) were at a three-fold risk of ventricular tachycardia (OR 3.04, 95% confidence interval 1.02-9.05, p=0.04) on multivariable analysis (after adjusting for sudden cardiac death risk factors and LGE mass) compared to other patients. Sarcomeric mutation status was an independent determinant of stress oxygenation on multivariable analysis. Stress oxygenation was impaired in phenotype-negative sarcomeric mutation carriers (Sarc+P-, n=16) despite normal perfusion (Figure 1C, E). Sarcomeric HCM (Sarc+HCM) had more severe impairment in stress oxygenation than genotype negative HCM (G-HCM) and controls (Figure 1E).
Conclusion
In HCM, blunted stress-induced oxygenation is associated with an increased risk of ventricular arrhythmia and may represent a novel biomarker of arrhythmic risk. Sarcomeric mutation status is an important determinant of stress oxygenation response.