European Respiratory Society
Annual Congress 2012

Abstract Number: 4724

Publication Number: 380

Abstract Group: 1.3. Imaging

Keyword 1: Pulmonary hypertension **Keyword 2:** Imaging **Keyword 3:** Circulation

Title: Non-invasive estimation of pulmonary artery pressure and resistance with CMR imaging: Derivation and prospective validation cohort study

Dr. Andrew 29184 Swift a.j.swift@shef.ac.uk MD [1], Dr. Smitha 29185 Rajaram docmeethu@yahoo.com MD [1], Mr. Dave 29186 Capener dave.capener@sth.nhs.uk [1], Mr. Tom 29187 Sproson mda07tws@sheffield.ac.uk [1], Dr. Allison 29188 Morton A.C.Morton@shef.ac.uk MD [2], Dr. Charlie 29189 Elliot Charlie.elliot@sth.nhs.uk MD [2], Dr. Robin 29193 Condliffe robin.condliffe@sth.nhs.uk MD [2] and Prof. Jim 29195 Wild j.m.wild@shef.ac.uk [1]. [1] Academic Unit of Radiology, University of Sheffield, United Kingdom and [2] Sheffield Pulmonary Vascular Disease Unit, Sheffield Teaching Hospitals NHS Trust, Sheffield, United Kingdom .

Body: Background The aim of this study was to develop a cardiac magnetic resonance (CMR) imaging model for non-invasive estimation of mean pulmonary arterial pressure (mPAP) and total pulmonary resistance (TPR). Methods A derivation cohort of 64 consecutive patients with known or suspected pulmonary hypertension underwent right heart catheterization (RHC) and CMR within 12hours. Cardiac volumes and function and pulmonary arterial (PA) flow were quantified. The strongest statistical model to predict mPAP from the derivation cohort was identified. Total pulmonary resistance (TPR) was estimated utilising the physiological model: TPR= pressure (CMR-derived mPAP) divided by blood flow (CMR-derived PA flow). An independent prospective validation cohort of (n= 40) tested the accuracy of the model. Results The multivariate regression CMR model gave the following equation: mPAP = 33.4 + [right ventricular end-diastolic mass index (g/cm^2) x 1.21] – [PA average velocity (cm/s) x 0.99). In the prospective validation cohort, predicted and invasively measured mPAP were strongly correlated (R^2=0.74; p<0.0001). For detection of mPAP ≥ 25mmHg the area under the receiver operator curve (ROC) was 0.91 (p<0.0001). CMR-estimated TPR correlated strongly with RHC-derived TPR (R^2=0.75; p<0.0001) in the validation cohort. CMR estimated TPR reliably identified TPR > 5WU with a high degree of accuracy, the area under the receiver operator curve (ROC) was 0.96 (p<0.0001). Conclusions A CMR Imaging derived model can accurately estimate mPAP and vascular resistance in patients with PH.