Septal Angle on MRI predicts Combined Pre and Post Capillary Pulmonary Hypertension

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Purpose:
Patients with left heart disease commonly develop pulmonary hypertension (PH) due to backward transmission of high left ventricular filling pressures. Some patients subsequently develop pre-capillary vascular remodelling. This combined pre and post capillary pulmonary hypertension (Cpc-PH) is defined as:

- Mean pulmonary artery pressure (mPAP) ≥ 25mmHg
- Pulmonary arterial wedge pressure (PAWP) >15 mmHg
- Diastolic pulmonary gradient (DPG) of ≥ 7

Patients with Cpc-PH have a worse outcome and targeted pulmonary vascular therapies may be useful.

The aim of this study was to assess the role of MRI septal angle in Cpc-PH.

Materials and Methods:
Incident suspected PH patients who underwent MRI at a pulmonary hypertension referral centre from April 2012 to October 2015 were assessed. Patients with PAWP >15mmHg, with right heart catheter and MRI on the same day were included.

2437 patients underwent MRI, 1272 were incident and 227 patients had PAWP >15mmHg. 163 had MRI and right heart catheter on the same day. Average age was 70 (sd 11), 64% were female.

The diagnostic accuracy of septal angle to identify Cpc-PH was assessed.

Results:
Interventricular septal angle correlated strongly with DPG (r=0.735, p <0.0001). ROC analysis showed it was predictive of Cpc-PH (defined by DPG ≥7): area under the curve was 0.90 (p <0.0001). Analysis of the ROC data showed 160˚ septal angle as a threshold predicted a DPG of ≥7mmHg, with 74% sensitivity and 90% specificity (p <0.0001).

Interventricular septal angle predicted outcome with univariate hazard ratio 1.017 (95% CI 1.007-1.028, p = 0.001). Dichotomised by median value (149˚) the hazard ratio was 3.245 (95% CI 1.720-6.119, p <0.0001) and log-rank chi-square was 14.74.

Conclusion:
Interventricular septal angle on MRI can non-invasively predict the presence of an elevated diastolic pressure gradient in patients with left heart disease.

The interventricular septal angle can predict left heart disease patients with a poor outcome and in the future, may offer the potential to identify patients for targeted therapy.

Future work
Improve the identification of left heart disease with dynamic parameters on MRI
Assess the role of cardiac MRI in the prediction of outcome in pulmonary hypertension due to left heart disease
Assess the role of potential treatment in Cpc-PH