

# Abstract 14367: Abnormal Pulmonary Flow is Associated With Impaired Right Ventricular Coupling in Patients With COPD

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## Abstract

**Introduction:** Cor Pulmonale or right ventricular (RV) dysfunction due to pulmonary disease is an expected complication of COPD resulting from increased afterload mediated by hypoxic pulmonary vasoconstriction as well as the destruction of the pulmonary vascular bed. Early detection of elevated RV afterload has been previously demonstrated by visualization of abnormal flow patterns in the proximal pulmonary arteries. Prior quantitative analysis of helicity in the pulmonary arteries of pulmonary hypertension patients has demonstrated a strong association between helicity and increased RV afterload.

**Hypothesis:** Patients with COPD will have abnormal pulmonary flow as evaluated by 4D-Flow MRI and associated with RV function and pulmonary arterial stiffness.

**Methods:** Patients with COPD (n=15) (65yrs  $\pm$  6) and controls (n=10) (58yrs  $\pm$  9) underwent 4D-Flow MRI to calculate helicity (Figure 1A). The helicity was calculated in 2 segments: 1) the main pulmonary artery (MPA) and 2) along the RV outflow tract (RVOT) - MPA axis. Main pulmonary arterial stiffness was measured using the relative area change (RAC).

**Results:** COPD patients had decreased helicity relative to healthy controls in the MPA ( $19.4 \pm 7.8$  vs  $32.8 \pm 15.9$  s<sup>-2</sup>, P=0.007) (Figure 1B). Additionally, COPD patients had reduced helicity along the RVOT-MPA axis ( $33.2 \pm 9.0$  vs  $43.5 \pm 8.3$  s<sup>-2</sup>, P=0.010). The helicity measured in the MPA was associated with RV end-systolic volume (R=0.59, P = 0.002), RVEF (R=0.631, P<0.001), RAC (R=-0.61, P=0.001). The combined helicity along the MPA-RVOT axis was associated with RVEF (R=0.74, P<0.001), RVESV (R=-0.57, P=0.004), and RAC (R=0.42, P=0.005).

**Conclusion:** Patients with COPD show quantitatively abnormal flow hemodynamics, when compared with healthy controls, as assessed by 4D-Flow MRI. A strong association between helicity along the MPA-RV outflow tract axis and RV function

suggests that 4D-Flow MRI might be a sensitive tool in evaluating RV - pulmonary arterial coupling in COPD.

