

Meeting abstract

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1069 Energy loss computation in the pulmonary arteries of repaired tetralogy of fallot subjects utilizing cardiac phase contrast MRI

William Gottliebson^{*1}, Ashish Das² and Rupak K Banerjee²

Address: ¹Cincinnati Childrens Hospital and Medical Center, Cincinnati, OH, USA and ²University of Cincinnati, Cincinnati, OH, USA

* Corresponding author

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Introduction

The cardiac MRI (CMR) pulmonary artery (PA) velocity-area relation (VAR) and pressure-flow relation (PFR) have been shown to change significantly in certain diseases of the PAs in which pulmonary valve function is normal. We hypothesized that the area within the PA VAR changed in concert with stroke work (an index of energy loss, represented by the integrated area of the PFR) in subjects with repaired Tetralogy of Fallot (rTOF) with residual pulmonary valve insufficiency (PI).

Methods

Concurrent catheterization (cath) and CMR data were analyzed for patients with rTOF and severe PI, and in control subjects without PI having normal as well as enlarged PAs due to a large left to right shunt. Cath data from the PAs was synchronized by ECG with concurrent MRI PA phase contrast flow (normalized to body surface area), PA cross-sectional area and PA pressure data. PA VAR and PFR curves were plotted for all subjects and the integrated areas within the curves were tabulated.

Results

In subjects with rTOF and severe PI, integrated area of VAR (0.9–1.05 cm³/s) and PFR (0.3–1.0 mmHg*cm/s) were similar and 2–3 fold greater than for the control subjects (VAR 0.1 – 0.4 cm³/s; PFR 0.09–0.1 mmHg*cm/s), signifying hysteresis and energy loss per stroke (representative examples in figures 1 and 2). Further, the negative velocity or flow in relation to pressure and area signifies regurgitant flow and inefficiency per stroke.

Conclusion

The CMR PA VAR curve characteristics mimic the changes in stroke work in subjects with rTOF and severe PI, and may be a reasonable non-invasive surrogate for assessment of PA thermodynamic and hemodynamic properties in this population.

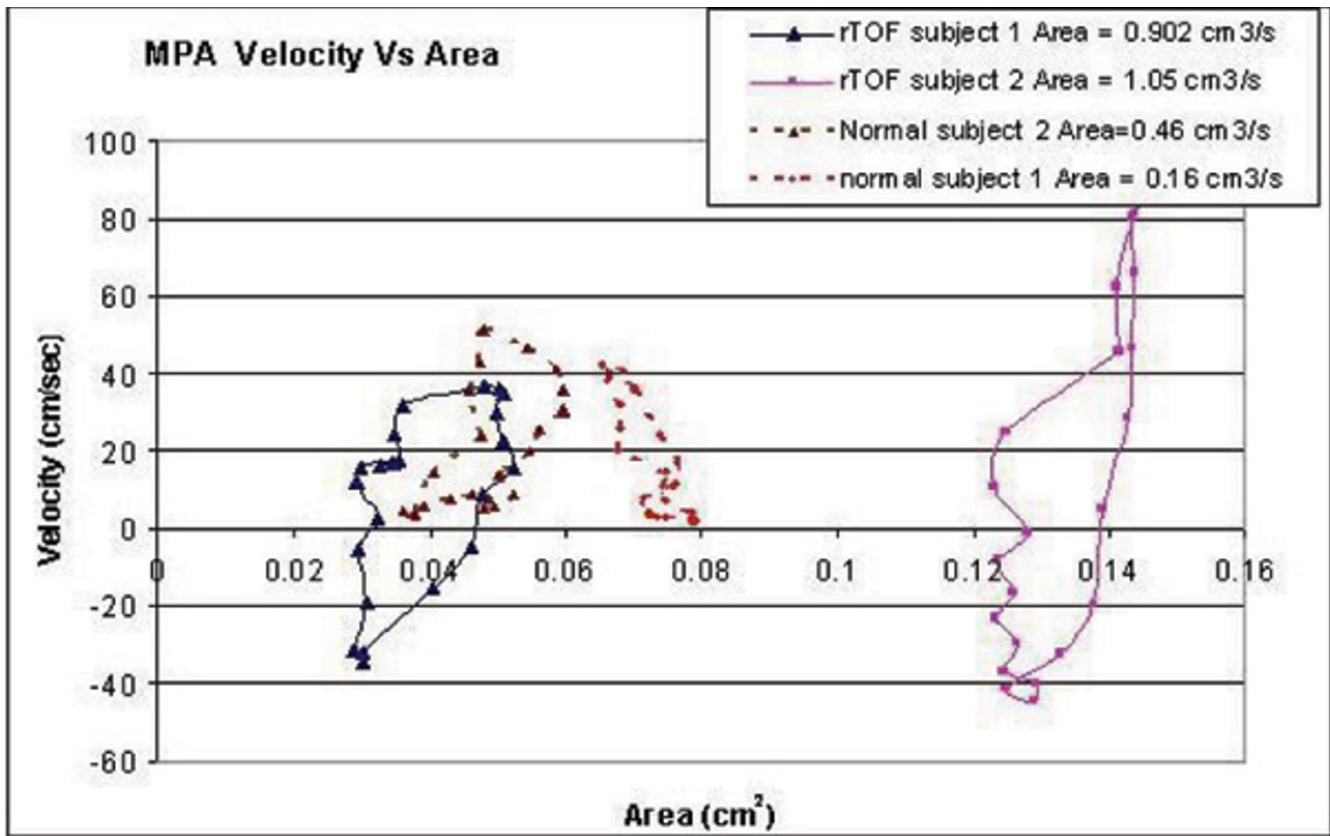


Figure 1
MPA velocity Vs area. In subjects with repaired Tetralogy of Fallot and residual pulmonary valve insufficiency, the MRI-derived pulmonary artery velocity-area relation can be used to assess energy losses in the pulmonary arteries.

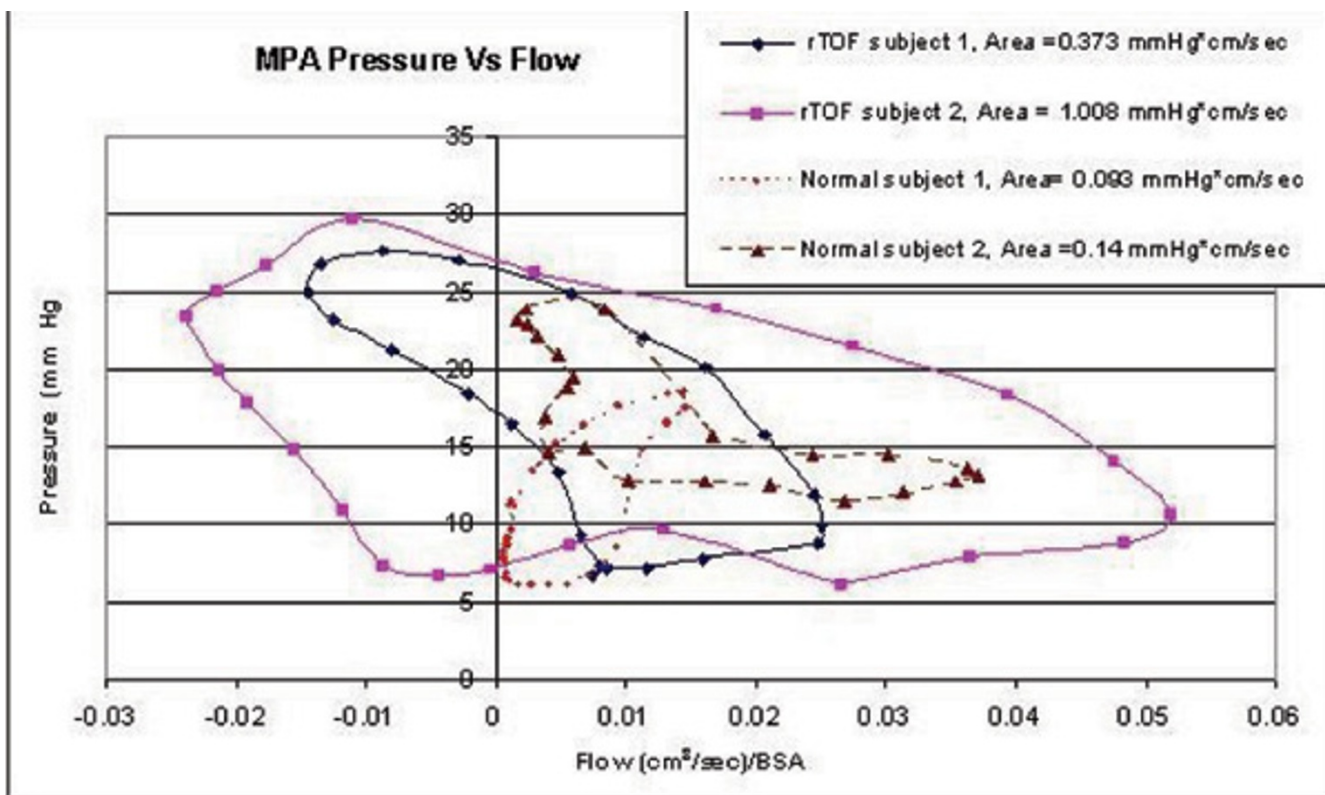


Figure 2
MPA pressure Vs flow.

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