How could interatrial shunting be beneficial in heart failure and pulmonary hypertension?

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Mechanisms of Exercise Intolerance in Heart Failure With Preserved Ejection Fraction

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PCWP rises quickly and profoundly in HFpEF and may be the mechanism underlying effort intolerance.

Figure 2. Filling pressures and pulmonary artery (PA) pressures during exercise in early heart failure with preserved ejection fraction (HFpEF). (A) Despite normal resting pulmonary capillary wedge pressures (PCWP), patients with early-stage HFpEF develop a dramatic elevation in PCWP with even 1 min of low level (20 Watts) exercise, that rapidly returns to baseline values with cessation of exercise. (B) This increase in PCWP is secondary to exercise-induced elevation in LV end-diastolic pressure (LVEDP) in HFpEF and is coupled with secondary, passive elevation in PA pressures (C), causing exercise-induced PA hypertension. (Adapted with permission from Borlaug et al.69)
CVP versus PCWP in HFpEF

Rest

Peak Exercise

PCWP and CVP increase during exercise in HFpEF
CVP versus PCWP in HFpEF

LA-RA Pressure gradient increases during exercise
What is the Cause of the Profound Increase of PCWP and CVP?

1. LV Diastolic Dysfunction?
2. RV or LA Dysfunction?
3. Autonomic-mediated vasoconstriction?
   - Veno constriction
   - Volume shift from peripheral to central compartment
   - Arterial constriction
   - Hypertension
4. Pericardial Constraints?
Hypothesis

Interatrial shunt can reduce PCWP at a given workload
REST

LA

RA

EXERCISE

Pressure (mmHg)

Pressure (mmHg)

Pressure (mmHg)

Pressure (mmHg)

Shunt Flow (L/min)

Shunt Flow (L/min)

No Shunt

With Shunt

1 Sec
IASD® PCWP-CVP Difference at Peak Exercise
Baseline vs. 6 Months

Majority of points below line of identity indicating there is a significant reduction in the pressure gradient between LA and RA
BASELINE (PCWP-CVP) correlates with Reduction of PCWP-CVP during EXERCISE but NOT at REST

Hemodynamics at REST

Hemodynamics during Exercise

Control

IASD
Atrial Septostomy in PAH?
Atrial Septostomy for Pulmonary Hypertension

Impact of ASD size on R→L Shunting on Pressures and O2 Saturations
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