Left atrial decompression in chronic heart failure: why, when, and to what extent?

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Potential conflicts of interest

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☑ I have the following potential conflicts of interest to report:

Participation in a company sponsored speaker's bureau:
   Zoll Medical Corporation

Receipt of grants / research supports:
   Abiomed, Corvia Medical
LA Decompression for CHF: WHY?

Borlaug et al. Circ Journal 2013
Over a range of ePAD* (≈15–35mm Hg), baseline pressure is directly related to probability of mortality.

Zile et al. Circ. Heart Fail, 2017
LA Decompression for CHF: WHY?

Mortality decreased with relatively small reductions in ePAD

- 18% (117/662) of patients had ePAD decreased 3 mmHg or more from baseline to month 6
- 29% (193/662) of patients had ePAD increased 3 mmHg or more from baseline to month 6

Zile et al. Circ. Heart Fail. 2017

LA Decompression for CHF: WHY?

Work-Corrected PCWP Relates to Mortality

Dorfs et al. EHJ., 2014
Interatrial Shunt Device: Theoretical Considerations

(J Cardiac Fail 2014;20:212–221)
LA Decompression for CHF: WHY?

Both CVP and PCWP Increase with Exercise in HFpEF/HFmrEF

Wessler et al, in review
LA Decompression for CHF: WHY?

Exercise induced elevation of PCWP is greater than the rise of CVP, meaning the LA-RA pressure gradient increases during exercise: the gradient is the driving force.

\[ \Delta\text{PCWP} > \Delta\text{CVP} \]
Computer Simulation of Atrial Pressures With Shunt

Rest                             Exercise

Pressure (mmHg)                    Pressure (mmHg)

Pressure (mmHg)                    Pressure (mmHg)

Shunt Flow (L/min)                Shunt Flow (L/min)

Continuous L→R Flow

Qp:Qs ≈ 1.2-1.3

Kaye et al JCardFail 2014

Burkhoff et al, Submitted.
Continuous L→ R Flow

45 Days after implant
LA Decompression for CHF: WHEN?

1. Persistent symptoms despite Guideline Directed Medical Therapy
2. Significant elevation of PCWP at rest or during exercise
3. Significant gradient between RA and LA (CVP and PCWP)
LA Decompression for CHF: To What Extent?
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Peak Exercise

$\Delta$PCWP (6 Month - Baseline) (mmHg)

PCWP-CVP (Baseline, mmHg)
LA Decompression for CHF: To What Extent?

Peak Exercise

\[
\Delta(\text{PCWP-CVP}) \quad \text{(6 Month - Baseline; mmHg)}
\]

\[Qp:Qs\]
LA Decompression: Summary

• **Why:**
  • Pulmonary pressures rise significantly during exercise and this contributes to symptoms and mortality

• **When:**
  • Persistent symptoms despite GDMT
  • PCWP high and rises with exertion
  • PCWP-CVP pressure gradient

• **To What Extent:**
  • The relationship between flow and shunt diameter is relatively steep between 3 and 10 mm
    - 8 mm provides Qp:Qs ~1.2-1.3
  • The amount of shunting plateaus with LA-RA communication ~10mm
  • Reduction of pressure gradient dependent on the size of the gradient at baseline