Correlation of exercise right heart catheterization hemodynamics in a patient with an implantable hemodynamic monitor.

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Background

- For patients with chronic heart failure (HF), the use of implantable pulmonary artery (PA) sensors is associated with a reduction in hospitalizations (figure 1)[1].
- Previous studies have demonstrated excellent correlation between resting PA pressure sensors and invasive right heart catheterization (RHC) hemodynamics[2].
- It is not known whether implantable PA sensors correlate with invasive hemodynamics during exercise.
- We report a pilot case of an exercise RHC with simultaneous readings from a PA sensor.

Case

- A 56 year old female with a past medical history of chronic obstructive pulmonary disease (COPD), tobacco use, and diastolic heart failure with prior PA sensor implant was evaluated for several months of worsening dyspnea and exercise intolerance.
- Initial labs and physical exam were unrevealing.
- Given her profound symptoms with exercise and concomitant respiratory and cardiac disease, an exercise right heart catheterization was ordered to assess for exercise induced diastolic dysfunction.

Results

- Following PA catheter placement, the patient underwent exercise testing using a cycling ergometer (example, figure 2).
- Pressures from her PA sensor were obtained simultaneously with invasive RHC measurements both at rest and with peak exercise.
- At rest, pulmonary artery pressure by RHC and cardioMEMS 23/10 mmHg (mean 16 mmHg) and 19/10 mmHg (mean 12 mmHg) respectively (Figure 3).
- At 20 Watts (55 RPM), the patient experienced exercise-limiting dyspnea. At peak exercise, pressures recorded by RHC and cardioMEMS were 36/10 mmHg (mean 27 mmHg) and 40/6 mmHg (mean 22 mmHg) respectively (figure 3).

Figure 1: Example diagram of the CardioMems implantable PA monitor. Left panel illustrates proper placement of the implantable monitor in the distal segmental PA (illustration from Abott website).

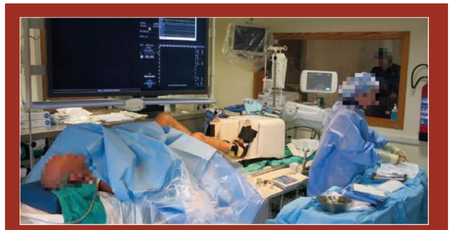

Figure 2: example of an exercise right heart catheterization. Following placement of a PA catheter under sterile conditions, the patient exercises on a supine cycle ergometer attached to the catheterization lab table while hemodynamic data is collected[3].

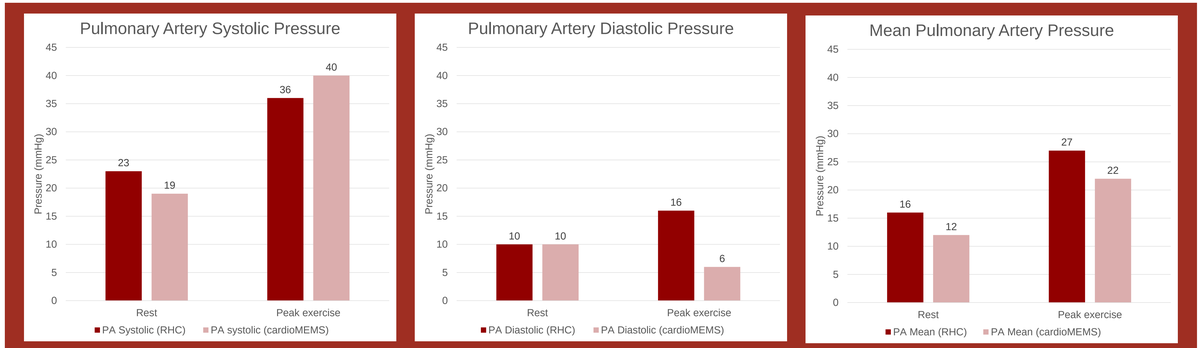

Figure 3:results of a simunltaneous RHC (dark red) and implantable PA monitor (light red) at rest and peak exercise. PA systolic pressure is represented in the left panel, PA diastolic in the middle panel, and mean PA pressure is depicted in the right panel.

Outcome

- Based on her low filling pressures with exertion, exercise induced diastolic dysfunction was ruled out.
- Ultimately, COPD was thought to be responsible for her dyspnea and she was referred back to her pulmonologist to escalate her inhaler therapy.

Discussion

- We describe a case of simultaneous hemodynamics with RHC and implantable PA monitor. Values obtained via both methods appeared comparable.
- Further evaluation with an expanded patient cohort is needed to validate this observation.
- If found to correlate, implantable PA monitors could offer a non-invasive means of assessing exercise hemodynamics. This could also potentially be expanded to treadmill exercise testing, which is more physiologic than cycling ergometer and currently not possible with RHC.
- With emerging therapies for patients with exercise induced diastolic dysfunction and pulmonary hypertension, this information could potentially be used to target future therapeutics.

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