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### Small Vessel, large problems: An unusual cause of heart failure in an elderly female.

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## Introduction

- A patent ductus arteriosus (PDA) is a congenital heart defect where a fetal vessel fails to close and remains patent into adulthood.
- This case describes an elderly female who was found to systolic heart failure caused by a patent ductus arteriosus.
- Once discovered, closure of this vessel is generally recommended.

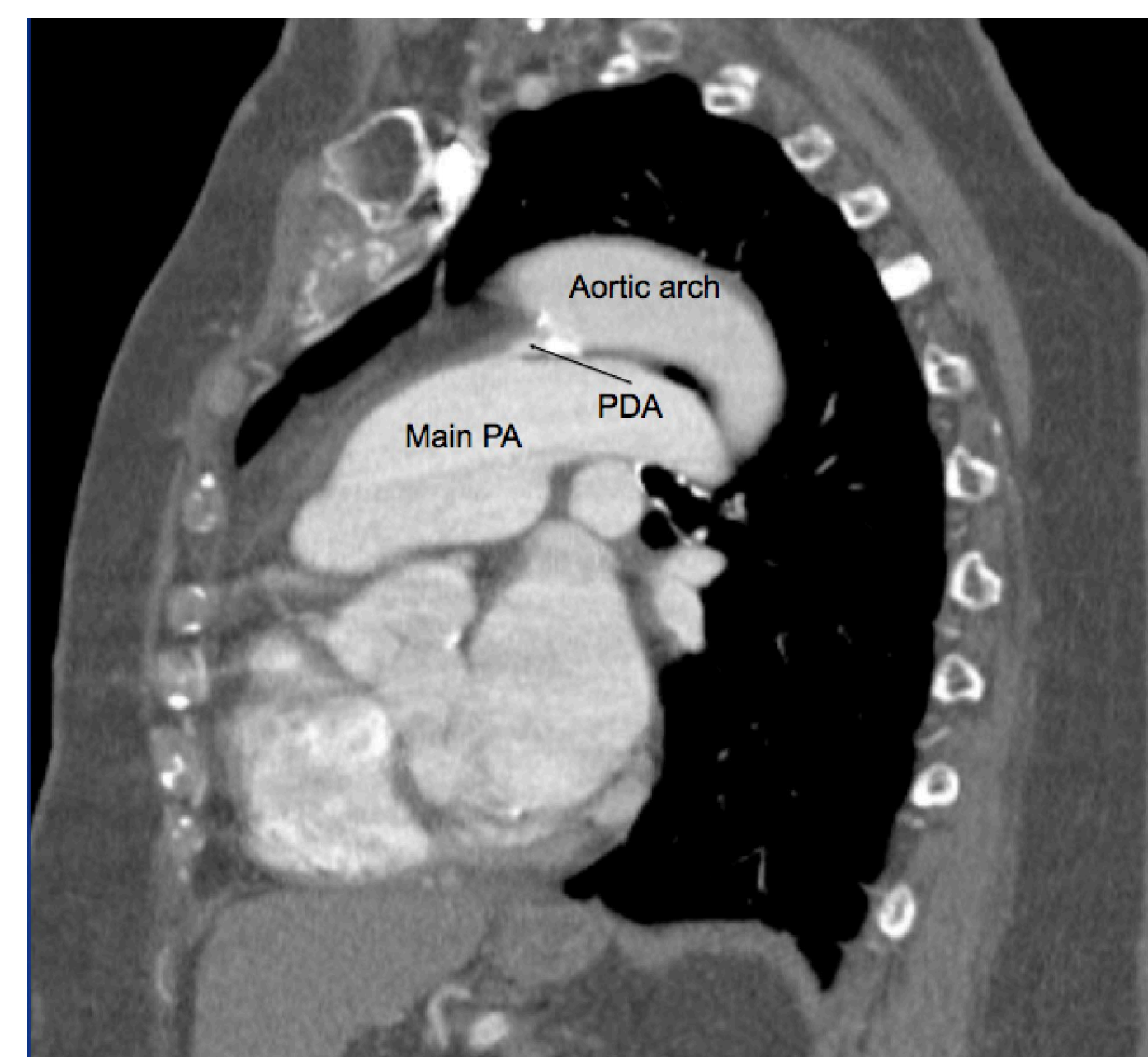
## Case Presentation

An 82 y.o. F with a PMH of pulmonary hypertension, paroxysmal atrial fibrillation, and HFrEF presents to cardiology clinic after recent hospitalization for acute HFrEF exacerbation.

- Hospitalized in 3/2021 for acute on chronic HFrEF.
- Initial exam was notable for LE edema and 2/6 holosystolic murmur and a wide pulse pressure (168/72).
- Underwent 3 kg diuresis with Lasix.
- Echocardiogram was notable for EF of 35% and RVSP of 53.
- Coronary angiogram w/ no evidence of coronary artery disease.
- The patient started on Entresto, spironolactone, and torsemide, and was discharged home.

### Cardiology clinic follow-up:

- Follow up echocardiogram in 6/2021 notable for LVEF of 40%, RVSP of 44 mmHg and turbulent flow in the main pulmonary artery during systole and diastole concerning for possible PDA.
- Patient later recalls being told about a congenital heart abnormality earlier in her life that was unable to be repaired.
- A subsequent CTA chest 7/2021 confirmed the presence of a small patent ductus arteriosus.
- The patient was referred to interventional cardiology for possible catheter-directed closure of her PDA.



**Figure 1:** (Right) CT angio of the chest showing a small patent ductus arteriosus.

## Patent ductus arteriosus in adults

### Anatomy:

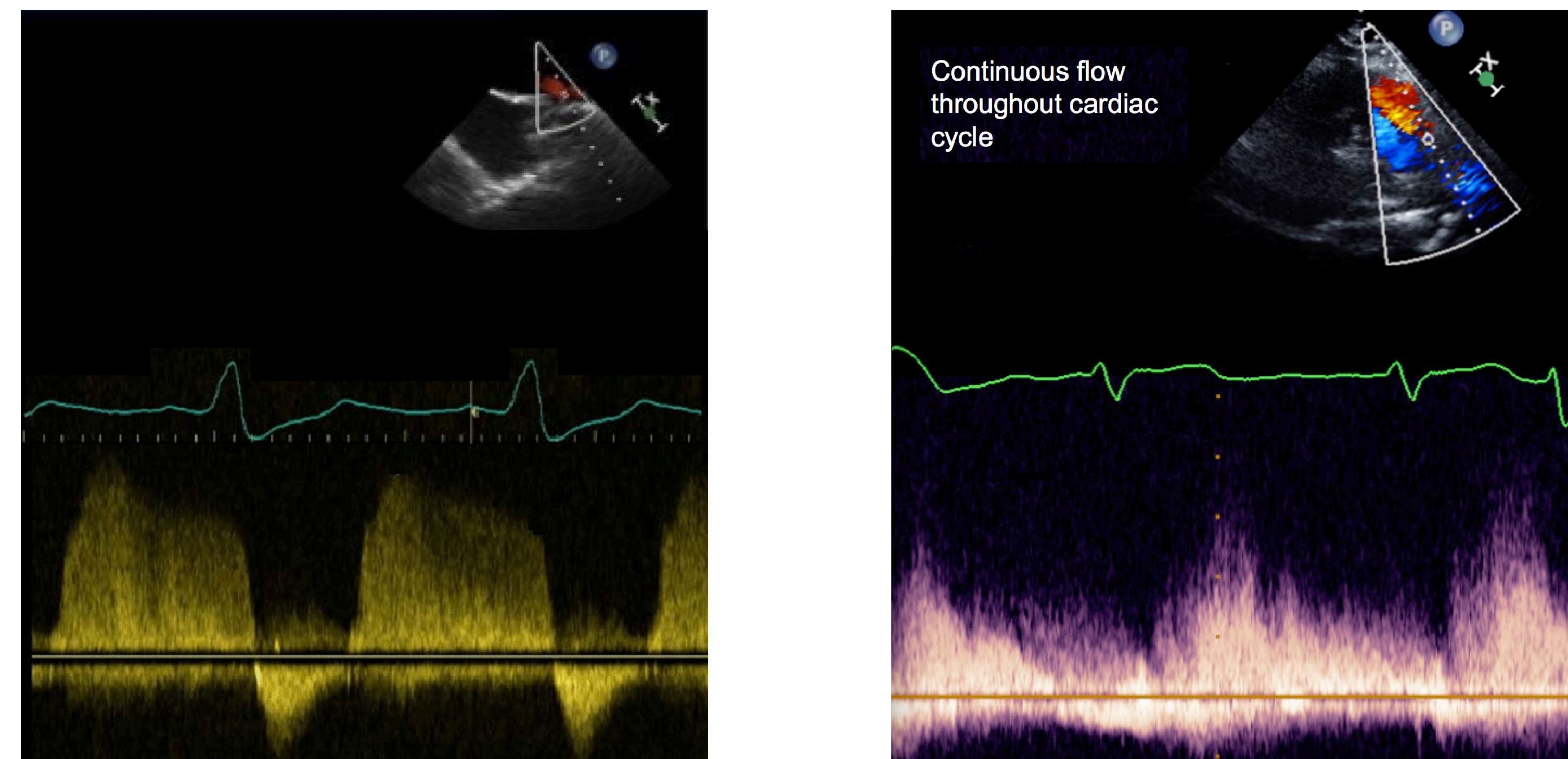
- The ductus arteriosus is a fetal vessel connecting the pulmonary artery to the aortic arch.
- In utero this vessel allows oxygenated blood to bypass the non-functional fetal lungs. Closure of the ductus begins at birth and is complete within the first few weeks of life.
- When the ductus fails to close it is referred to as a patent ductus arteriosus.

### Epidemiology:

- Incidence is 1 in 2000 of full term births, more common in premature births.
- PDAs are usually identified and treated during childhood.
- Due to the increased survival rate of premature births the frequency of PDA is increasing.

### Morbidity and mortality:

- The mortality of untreated PDA in adults is ~ 1.8% per year.
- Small PDAs (ductal diameter of 1.5 – 2.5 mm) are generally closed because of the risk of bacterial endocarditis/endarteritis.
- Large PDAs are closed to prevent irreversible pulmonary hypertension and decrease risk of congestive heart failure.
- Endocarditis prophylaxis is not recommended for unrepaired PDAs.



**Figures 2 & 3:** (Above) Continuous wave doppler of pulmonary artery flow from left parasternal window. Right image shows normal flow. Left image is from our patient with PDA showing continuous PA flow.

## Diagnosis and when to suspect PDA

### Physical exam:

- Continuous murmur heard at LUSB and/or diastolic rumble.
- Wide pulse pressure *due to flow into the pulmonary circulation.*

### Transthoracic echocardiogram (TTE):

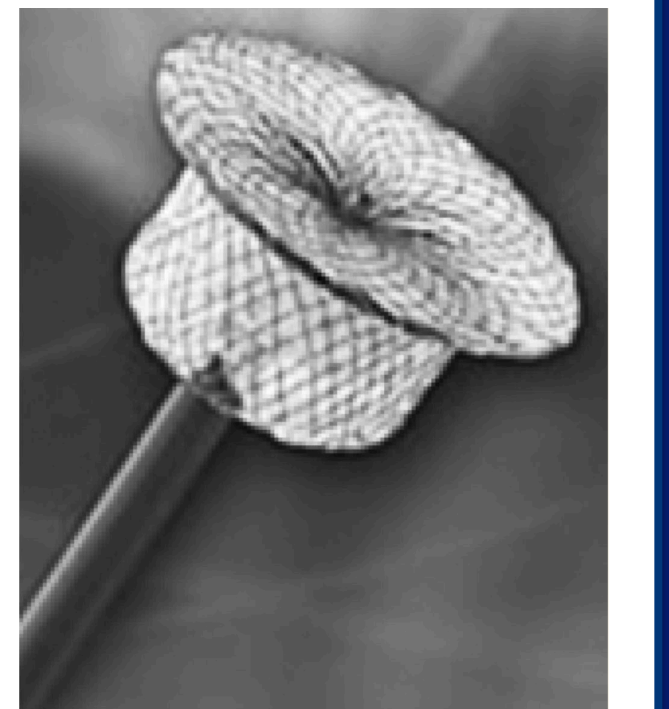
- Can show the presence of a PDA and is commonly used to confirm the diagnosis.
- Can illustrate complications PDA including pulmonary hypertension, left atrial and ventricular enlargement.
- Doppler imaging can estimate the degree of shunting and identify extremely small PDAs.

### Additional testing:

- CT angio and MR imaging are typically not required for diagnosis but are useful to define the anatomy and size of the PDA.
- Right cardiac catheterization can quantify degree of shunting (Qp:Qs), with a level of >1.8 indicative of significant shunting.

## Treatment options

- Catheter directed closure with coils or closure devices are typically preferred over surgery.
- For large PDAs or for those with difficult anatomy surgical closure is preferred.
- Endocarditis prophylaxis is required for the first 6 months following closure.



## Learning Points

- A patent ductus arteriosus (PDA) in an adult is a rare clinical finding that is becoming increasingly common. It is typically incidentally discovered on physical exam or echocardiogram.
- A PDA in an adult is a concerning finding and is associated with heart failure, pulmonary hypertension, and increased risk for endocarditis/endarteritis.
- Once a PDA is identified repair is typically recommended. Repair is accomplished via a catheter-directed or surgical approach.

## References

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3. Cassidy, H & Blackshear, J. Incidental Discovery of a Patent Ductus Arteriosus in Adult. *JABFM*. 2009;22(2):214-218