Hypoxia after LVAD Implantation

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Disclosures

I have no relevant relationships with commercial interests to disclose.

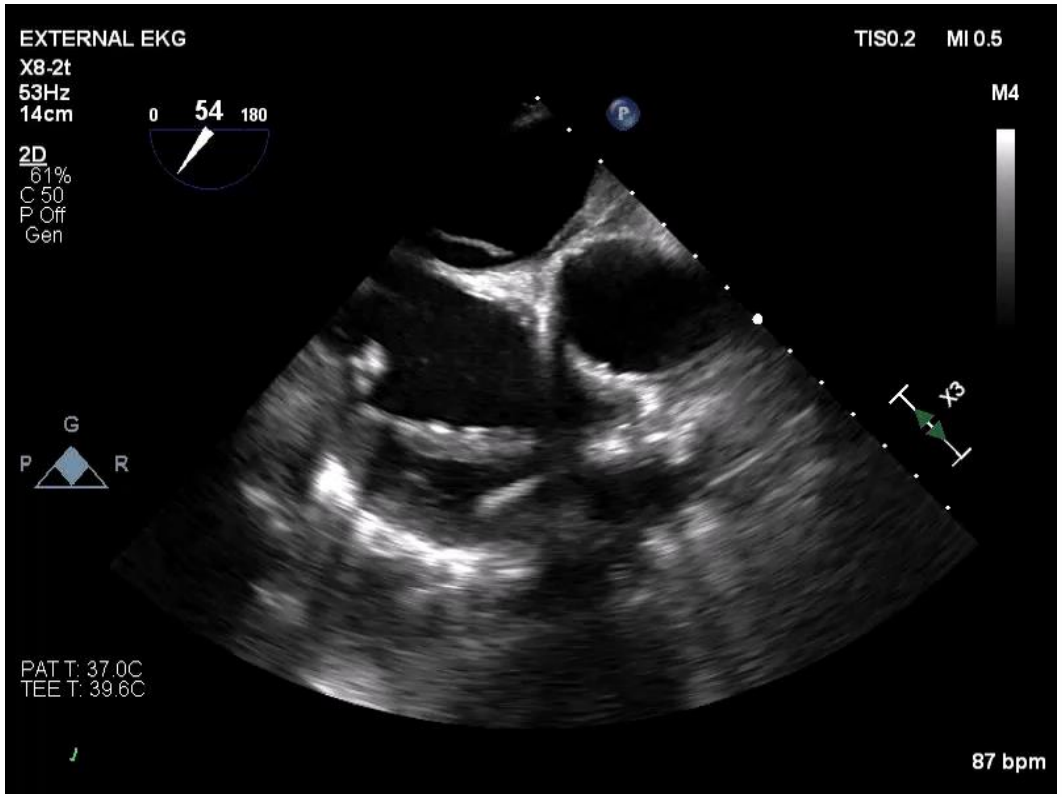
Patient History

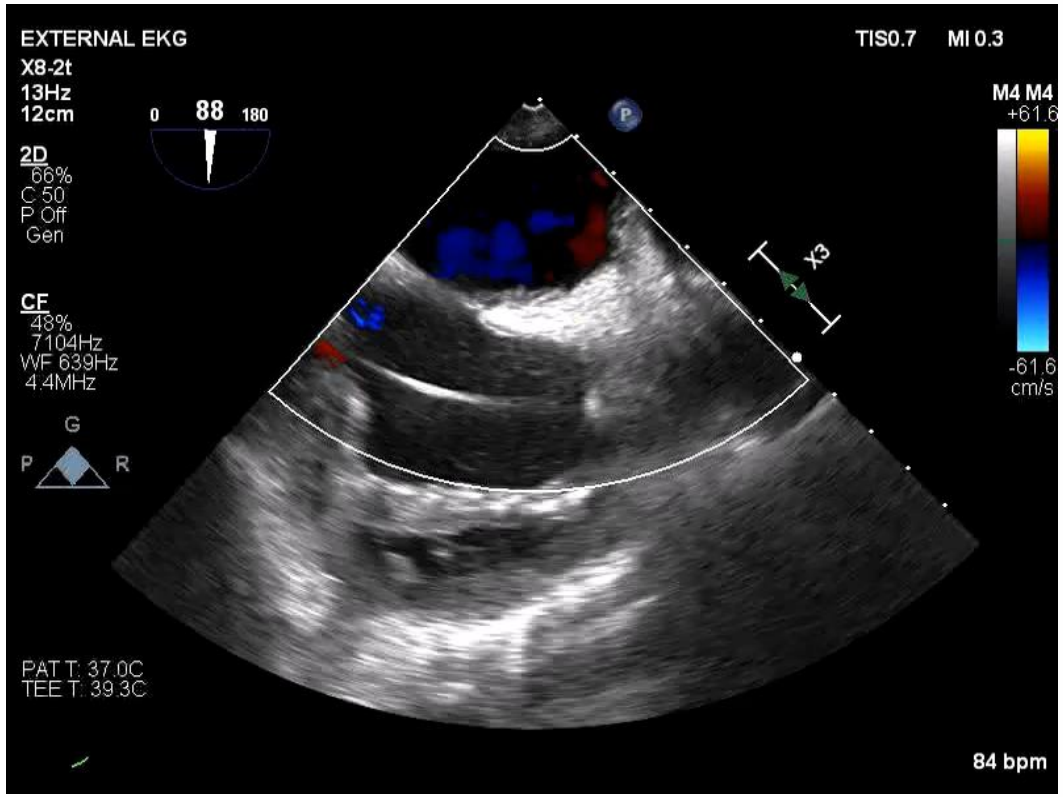
- 68 year old gentleman with end stage heart failure secondary to an ischemic cardiomyopathy on home milrinone therapy who presented for planned LVAD implantation
- He has long-standing paroxysmal atrial fibrillation, type II diabetes mellitus, and chronic kidney disease with a baseline Cr of 1.5.

Evaluation

- The patient electively proceeded to the operating room for a HeartMate 3. He underwent a successful placement of the LVAD and was uneventfully weaned off cardiopulmonary bypass with TEE monitoring.
- He was transferred to the surgical ICU for further monitoring
- Shortly following transfer, the patient developed progressive hypoxemia requiring escalating ventilator support
- A repeat TEE was performed that demonstrated a significant right to left shunt through a PFO which was not identified at the time of LVAD implantation

Transesophageal Echocardiogram





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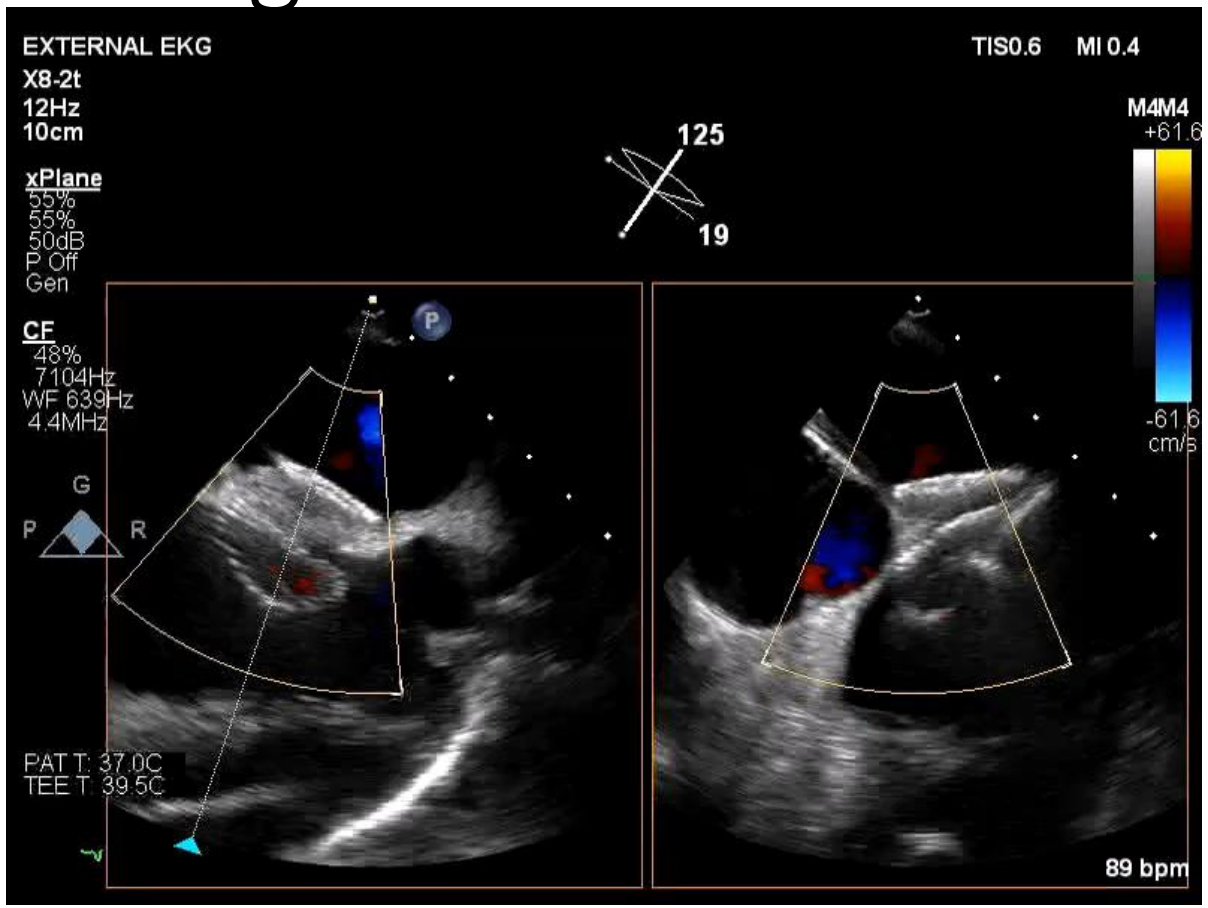
Treatment

- An urgent heart team discussion was held with cardiothoracic surgery, heart failure cardiology, and interventional cardiology.
- Rather than a repeat surgical approach, the decision was made to percutaneously close the PFO.
- Initially a 35mm Amplatzer PFO occluder was placed, but there was significant Aortic hugging
- The device was removed and a 25mm Amplatzer PFO occlude was inserted successfully

Transesophageal Echocardiogram

- First 35mm Amplatzer PFO Occluder with Aortic hugging



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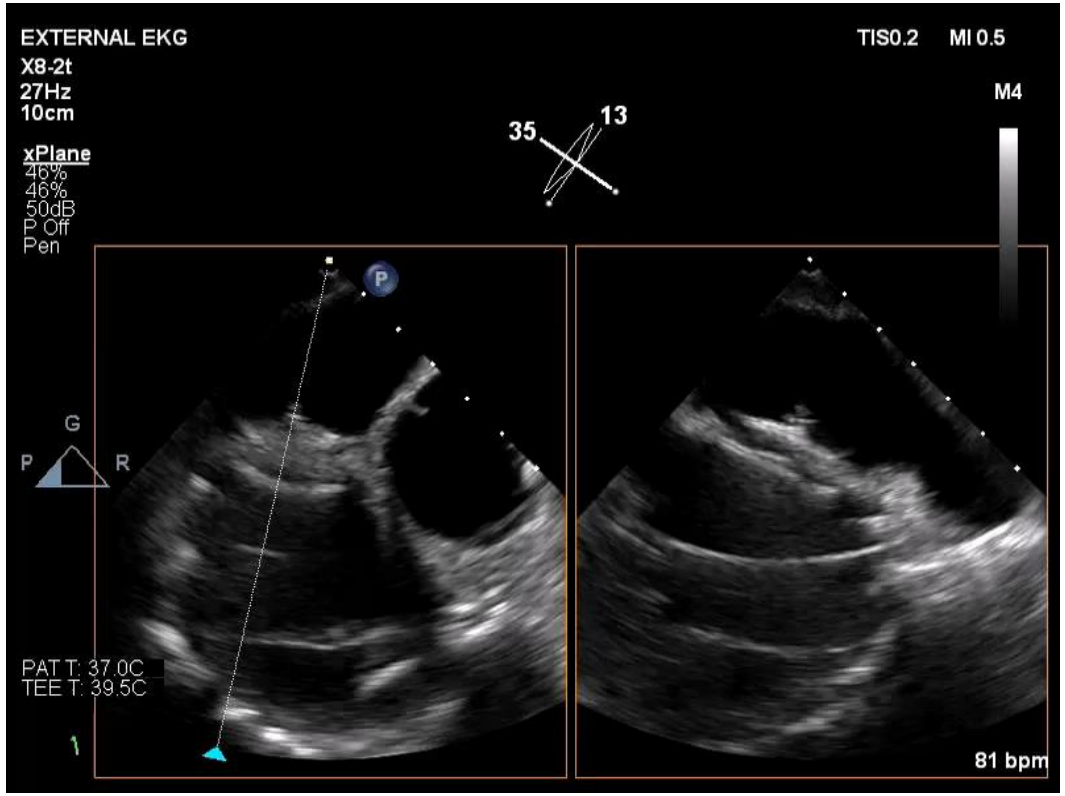
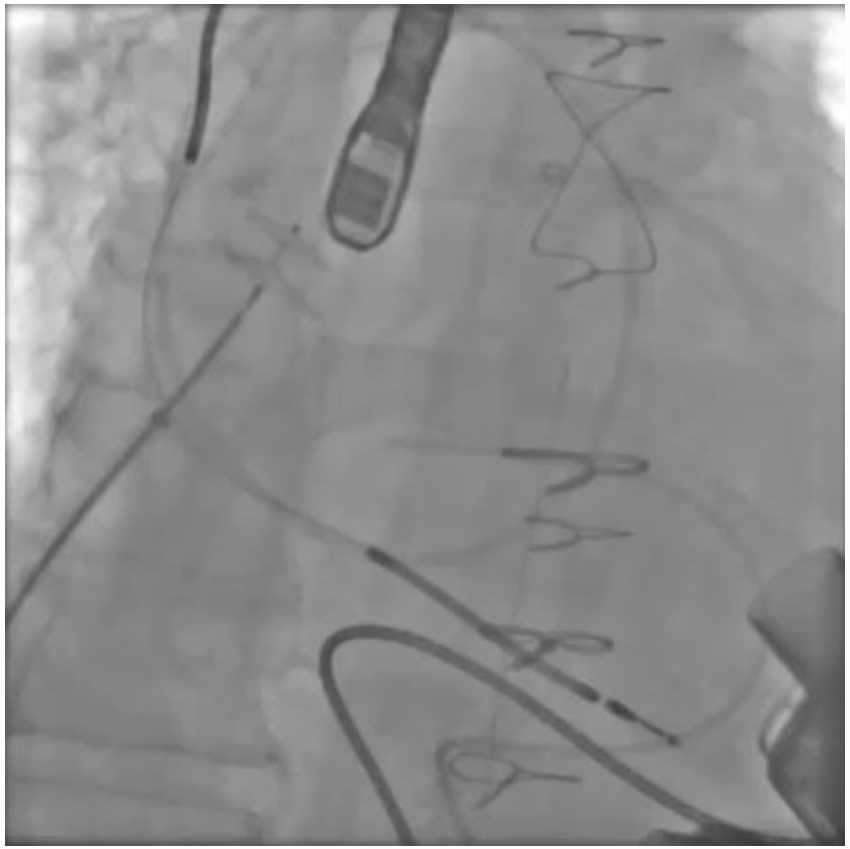
Transesophageal Echocardiogram

- Second device deployed
- 25mm Amplatzer PFO Occluder well seated



Fluoroscopic Positioning



Hospital Course and Follow-Up

- The patient's hypoxemia rapidly improved after device implantation.
- He was extubated the following day and wean from inotropic support over the subsequent three days.
- The patient was discharged to a rehab facility on post-operative day 6 and has done well in follow up with improved heart failure symptoms.

Question

- What is the accuracy of identifying a PFO using standard TEE methods?
  a. 75%
  b. 85%
  c. 95%
  d. 100%

Correct Answer

- B. 85%
- Traditional bubble studies indicate accuracy of 85-90%.
- Methods to improve specificity:
  - Agitated saline injection from the leg
  - Intrathoracic pressure augmentation while mechanically ventilated
  - Manual compression of the pulmonary artery at the time of bubble study prior to LVAD implantation, which markedly increases right sided pressures

Conclusions and Learning Points

- Careful pre-procedural screening or intra-operative TEE should be performed prior to LVAD insertion to rule out PFO
- Typically, PFOs are over sewn at the time of LVAD implantation to prevent this phenomenon of increased right to left shunting.
- PFO closure can be performed successfully and eliminate a large right to left shunt.

Reference

- Majd RE, Kavarana MN, Bouvette M, Dowling RD. Improved technique to diagnose a patent foramen ovale during left ventricular assist device insertion. Ann Thorac Surg. 2006 Nov;82(5):1917-8. doi: 10.1016/j.athoracsur.2005.09.030. PMID: 17062283.
- Loyalka P, Idelchik GM, Kar B. Percutaneous left ventricular assist device complicated by a patent foramen ovale: importance of identification and management. Catheter Cardiovasc Interv. 2007 Sep;70(3):383-6. doi: 10.1002/ccd.21185. PMID: 17563095.
- Kapur NK, Conte JV, Resar JR. Percutaneous closure of patent foramen ovale for refractory hypoxemia after HeartMate II left ventricular assist device placement. J Invasive Cardiol. 2007 Sep;19(9):E268-70. PMID: 17827518.