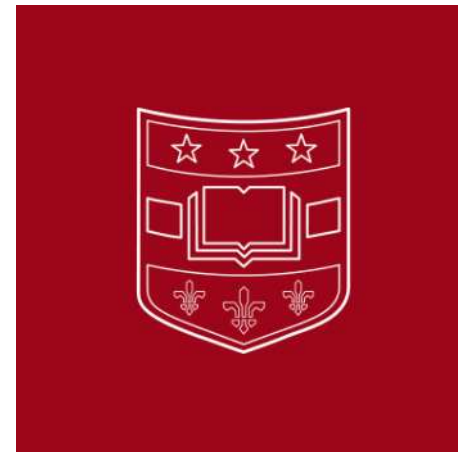


ECHOGENIC MATERIAL IN THE RIGHT HEART DURING MECHANICAL CIRCULATORY SUPPORT: WHAT AND HOW?

BRIAN TOLLY, MD

6/8/19



DISCLOSURES

- None



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Case Report

Air in the Right Ventricle During Mechanical Circulatory Support: How to Proceed?

Brian T. Tolly, MD¹, Jonathan K. Zoller, MD

Division of Cardiothoracic Anesthesia, Department of Anesthesiology, Washington University School of Medicine, St. Louis, MO

THE CASE

- **18M with NICM presents for HVAD insertion**
- **VA-ECMO (R fem in + L fem out) + R axillary Impella 5.0**
- **Already Intubated**
- **Existing R IJ Dialysis line, L IJ Multi-lumen**
- **Non-obese**
- **on CVVH**
- **No significant pulmonary comorbidity**
- **HCT 30, Plt 37**
- **4U pRBC + 2U platelets on call to the OR**

PRE-BYPASS

- **L IJ Cordis + PAC to 20 cm**
- **TEE:**
 - severely dilated LV, LVEF 5-10%, global hypokinesis, dense trabeculation vs thrombus in LV apex
 - Severe RV systolic dysfunction
 - Mild MR, No MS, Mild TR
 - AV difficult to assess with Impella
 - No PFO

BJCTEE

TIS0.2 MI 0.5

X8-2t

33Hz

11cm

xPlane

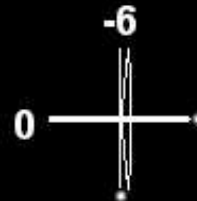
81%

81%

46dB

P Off

Gen



M4



PAT T: 37.0C
TEE T: 39.8C

85 bpm

BJCTEE

X8-2t

53Hz

7.1cm

TIS 0.2

MI 0.9

M4



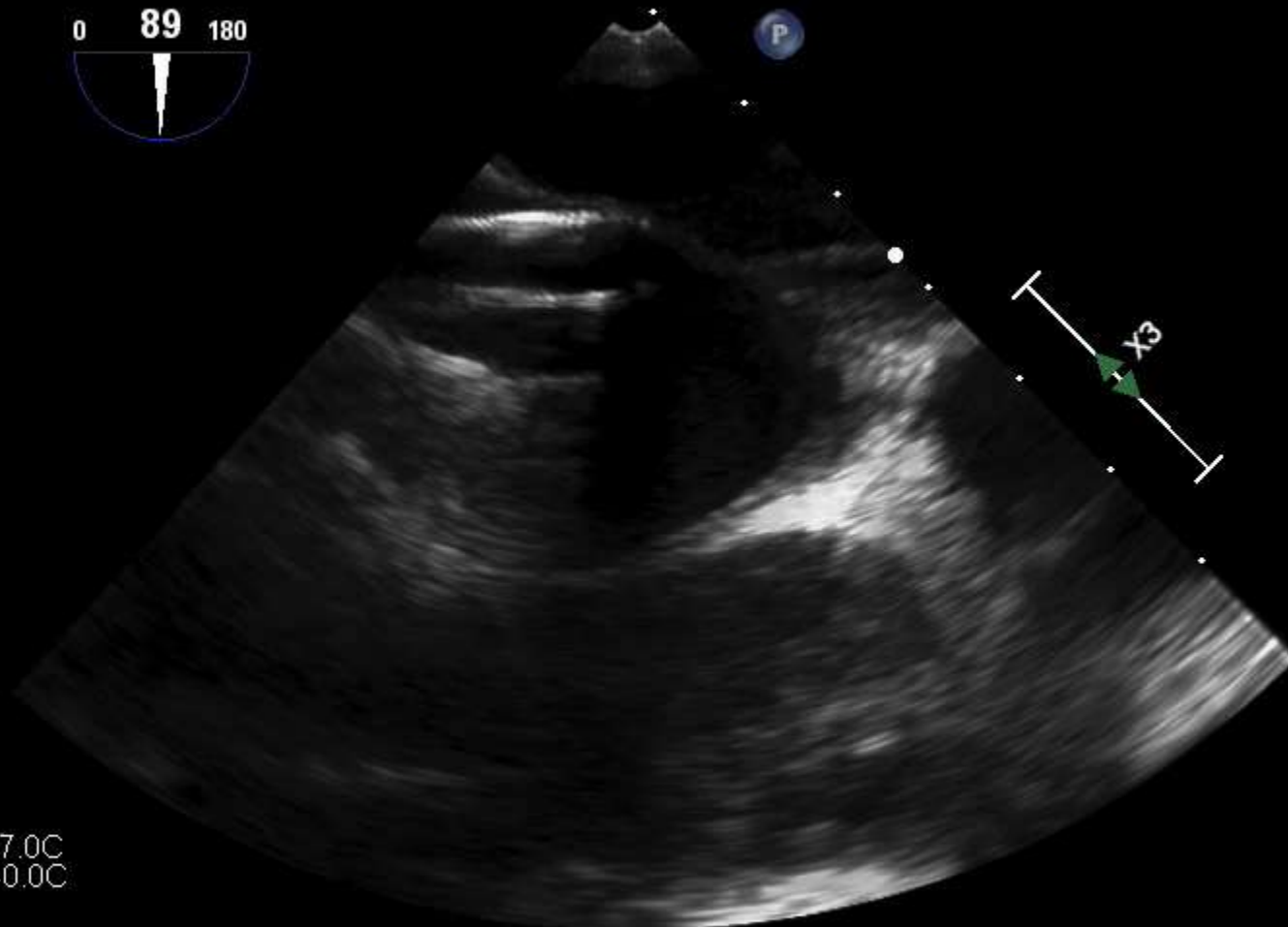
2D

60%

C 46

P Off

Gen



PAT T: 37.0C

TEE T: 40.0C

1

89 bpm

BJCTEE

TIS 0.5 MI 0.6

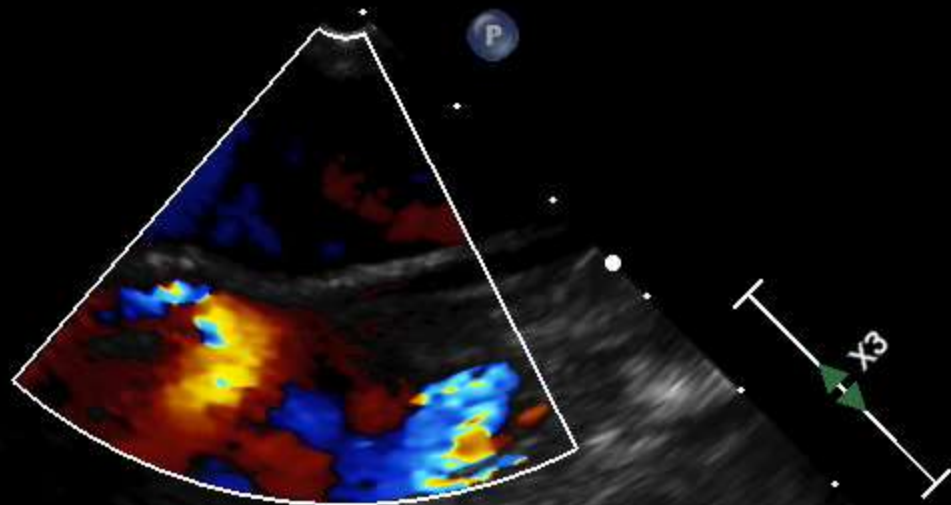
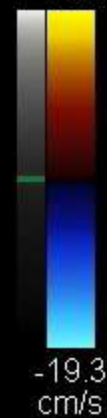
X8-2t
23Hz
7.1cm



2D
62%
C 46
P Off
Gen

CF
48%
1667Hz
WF 149Hz
3.3MHz

M4 M4
+19.3



PAT T: 37.0C
TEE T: 40.0C

88 bpm

BJCTEE

TIS0.6 MI 0.4

X8-2t

12Hz

17cm

0 115 180

2D

71%

C 46

P Off

Gen

CF

48%

5999Hz

WF 539Hz

3.3MHz

M4 M4

+69.3

-69.3

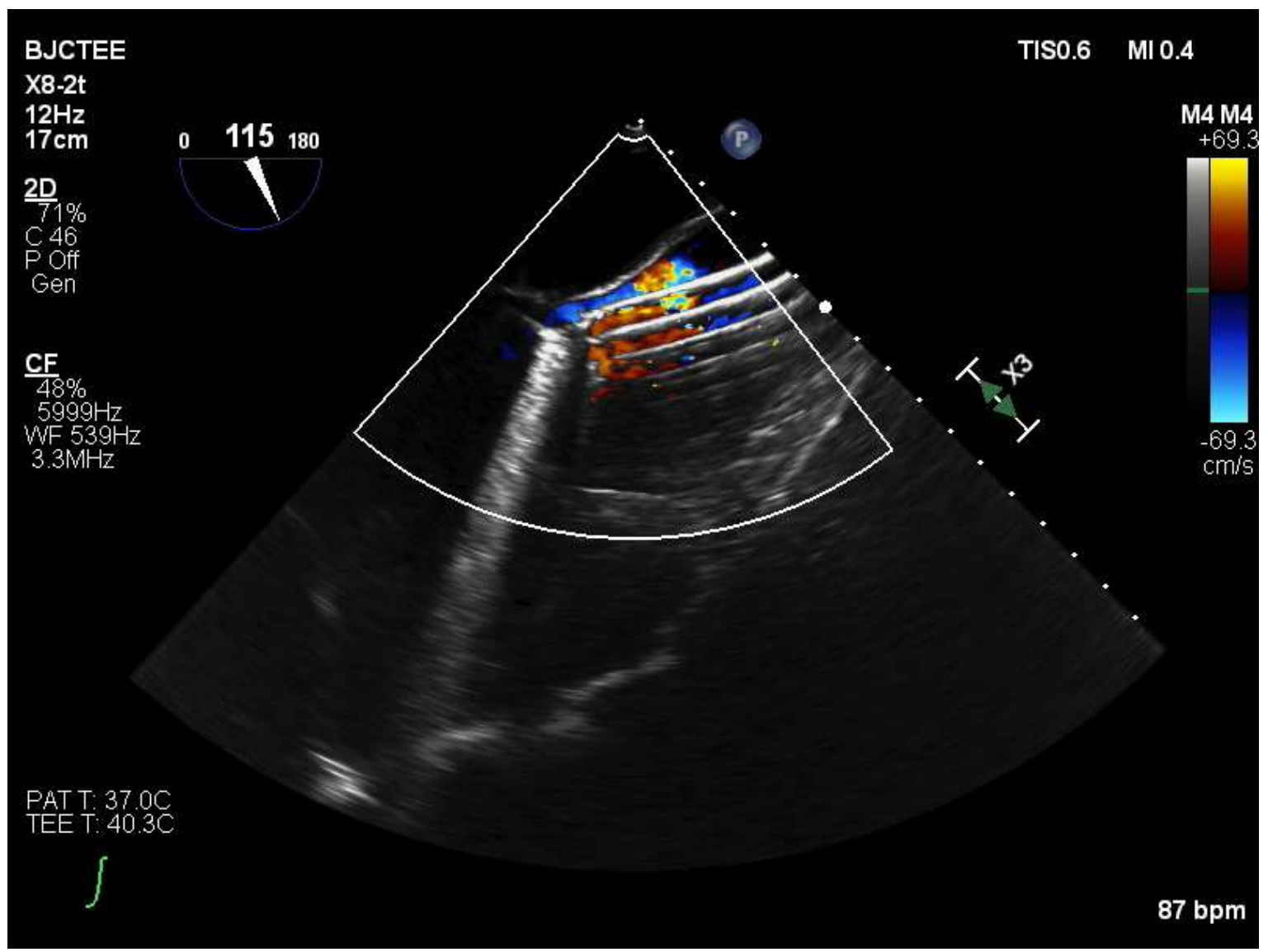
cm/s

PAT T: 37.0C

TEE T: 40.3C

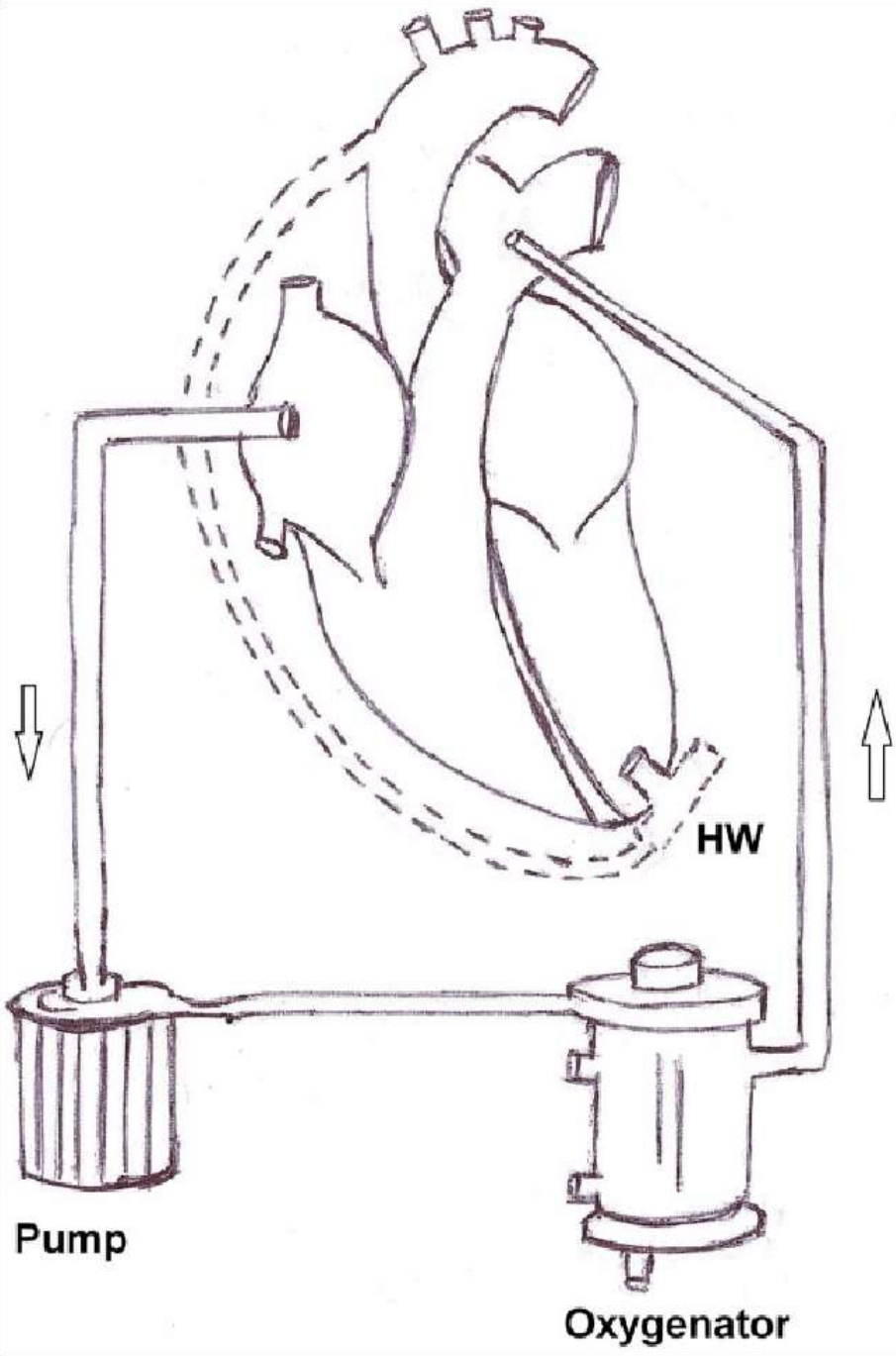
J

87 bpm



POST CPB

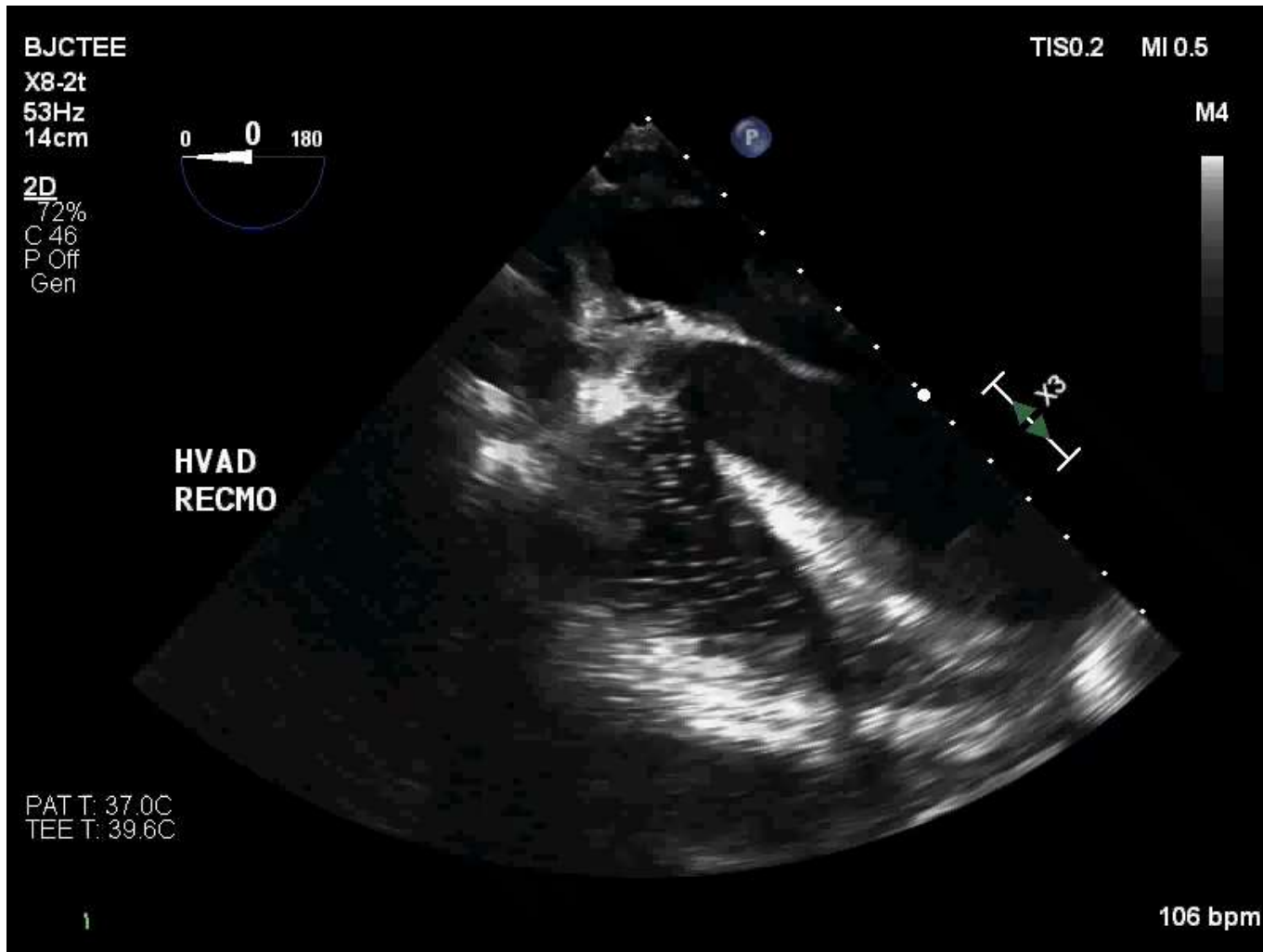
- **Successful HVAD Insertion**
- **Only off bypass for 10 seconds...**
- **R Fem CPB inflow → RVAD inflow (Centrimag + Oxygenator)**
- **Chimney dacron graft main PA → RVAD outflow**



POST CPB

- **Successful HVAD Insertion**
- **Only off bypass for 10 seconds...**
- **R Fem CPB inflow → RVAD inflow (Centrimag + Oxygenator)**
- **Chimney dacron graft main PA → RVAD outflow**
- **TEE used to assess septal positions and flow optimization**
 - 4100 RPM Centrimag: 4 LPM
 - 2580 HVAD: 3.5 LPM
- **Intermittent septal suckdown in setting of significant bleeding and hypovolemia**
- **During the post-CPB period, the following was seen...**

POST CPB



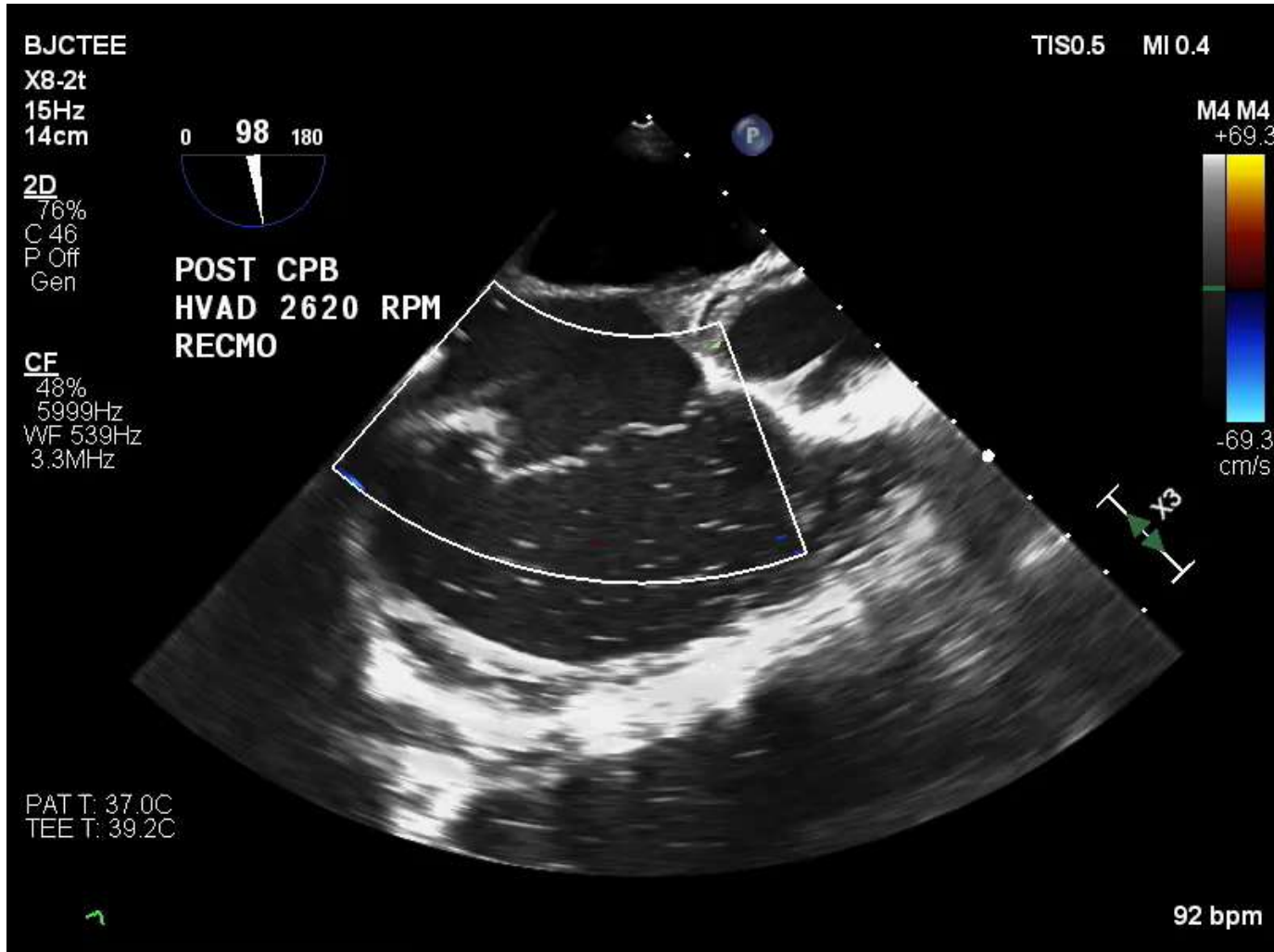
ECHOGENIC MATERIAL

- **What is it?**
 - Most likely microbubbles
 - Other differential causes:
 - Noise or Bovie Artifact
 - Thrombus
 - SEC
- **Two goals in the operating room:**
 - 1) Determine the source
 - Communicate with perfusion and surgeons
 - 2) Was this a safety risk to the patient?
 - No L sided air
 - No PFO
 - Low risk of stroke – appeared better as case progressed

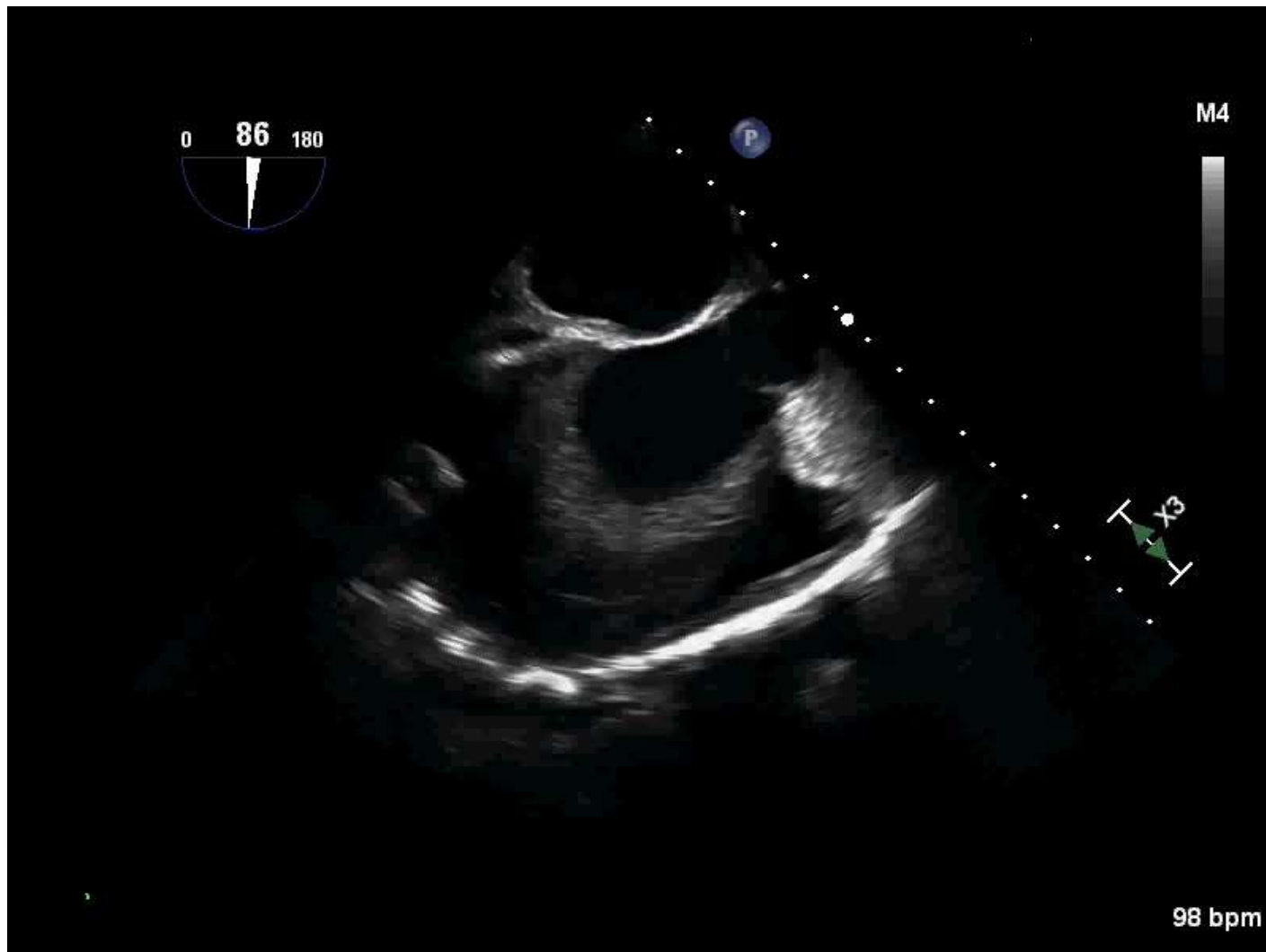
WHERE?

- **Multidisciplinary approach**
 - Perfusion: check the circuit
 - Low Flows?
 - Macroscopic air?
 - Pump alarm?
 - Surgery
 - Assess suture lines and cannula connections
 - Anesthesia
 - Check IV tubing, caps
 - Continue to monitor with TEE

THEN THIS...



THEN THIS...



SOURCES OF AIR:

- **Our hypothesis...**
 - Air in the main PA – intermittent PVI
 - Sources:
 - Chimney graft
 - Suture lines bleeding?
 - Incompletely de-aired?
 - RVAD entrainment
 - Centrifugal negative pressure on inflow side
 - CVC (loose caps & skin necrosis)
 - No bicaval view to confirm RA air
 - Cracked Cannulas
 - Cavitation
 - CVP 15
- **Prevention Strategies:**
 - Bladder reservoirs
 - Oxygenator gas pressures
 - PaO₂ <600 mmHg

POST-OPERATIVE COURSE

- **Gauze and jelly on CVC**
- **No neurologic deficit**
- **Early Post-op: Fem → IJ RVAD Inflow transition**
 - No TEE unfortunately from this time to assess air burden inside the heart
- **OHT listing at home with LVAD**

THANK YOU

References

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