

## Background

- Myocarditis is defined as inflammation of cardiac muscle and has many possible etiologies.
- Viruses are the most common cause of acute myocarditis and account for 50 – 70% of all cases in North America.<sup>1</sup>
- Influenza A has been implicated in acute myocarditis in 0.4 – 13% of hospitalized adults<sup>1</sup>. Up to 84% of these patients experience congestive heart failure while mortality can be as high as 23%.<sup>1</sup>
- Here we describe a case report of an otherwise healthy 38-year-old female who experienced fulminant myocarditis complicated by right atrial (RA), right ventricle (RV), and left ventricle (LV) thrombi requiring mechanical circulatory support, systemic anticoagulation, and negative inotropy.

## Case Description

- A 38-year-old female with no significant medical history presented to emergency department after a syncopal episode.
- She reported chest tightness and fatigue for 5 days and tested positive for Influenza A at an urgent care center.
- In the ED, she became acutely hypotensive and was diagnosed with cardiogenic shock.

## References

1. Sellers SA, Hagan RS, Hayden FG, Fischer WA 2nd. The hidden burden of influenza: A review of the extra-pulmonary complications of influenza infection. *Influenza Other Respir Viruses*. 2017 Sep;11(5):372-393. doi: 10.1111/irv.12470. PMID: 28745014; PMCID: PMC5596521.

2. Baral N, Adhikari P, Adhikari G, Karki S. Influenza Myocarditis: A Literature Review. *Cureus*. 2020 Dec 10;12(12):e12007. doi: 10.7759/cureus.12007. PMID: 33437555; PMCID: PMC7793451

3. Antoniak S, Boltzen U, Riad A, Kallwellis-Opapa A, Rohde M, Dörner A, Tschöpe C, Noutsias M, Pauschinger M, Schultheiss HP, Rauch U. Viral myocarditis and coagulopathy: increased tissue factor expression and plasma thrombogenicity. *J Mol Cell Cardiol*. 2008 Jul;45(1):118-26. doi: 10.1016/j.jmcc.2008.03.013. Epub 2008 Mar 29. PMID: 18495150.

## Intervention & Outcomes

- Impella insertion was attempted but failed due to inadequate right axillary artery size, leading to venous-arterial extracorporeal membrane oxygenation (V- A ECMO) cannulation.
- A left ventricular ejection fraction (LVEF) of 5% was noted on echocardiogram with development of thrombi through the RA, RV (Figure 1 and 2), including a mobile LV thrombus (Figure 3).
- Suction thrombectomy was unsuccessful, leading to Biventricular assist device (BiVAD) insertion to offload the ventricles and to act as a bridge for recovery or transplant.
- Therapeutic anticoagulation was initiated for treatment of the intracardiac clot burden. Beta blockade and calcium channel blockers were initiated for negative inotropy in presence of a mobile LV thrombus.
- Endomyocardial biopsy (EMB) showed lymphocytic clusters without evidence of myocarditis.
- Ultimately, the patient's cardiac function improved and intracardiac thrombi were treated with anticoagulation. She was decannulated and discharged to a rehabilitation facility.

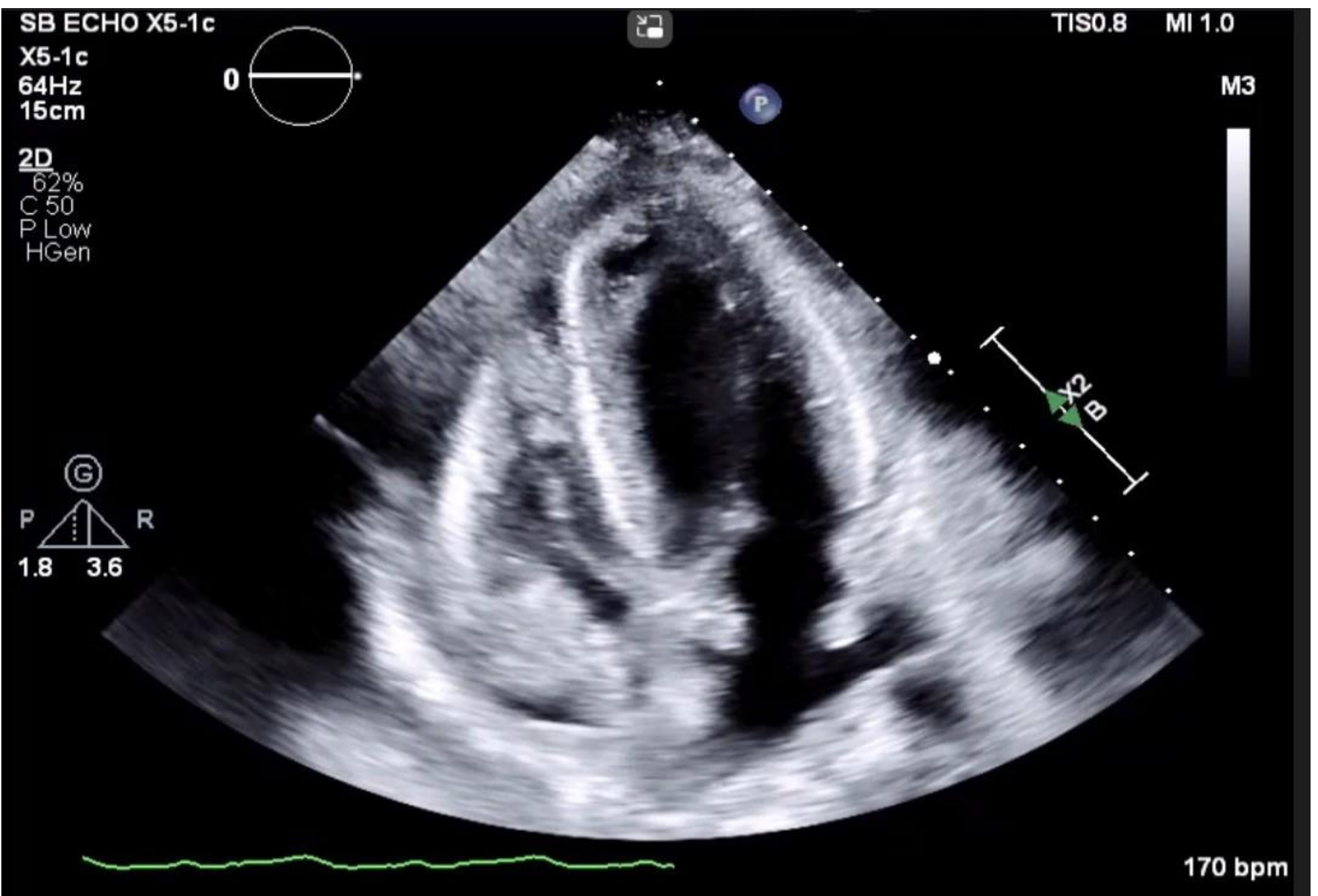


**Figure 1:** Apical four chamber showing right-sided thrombi

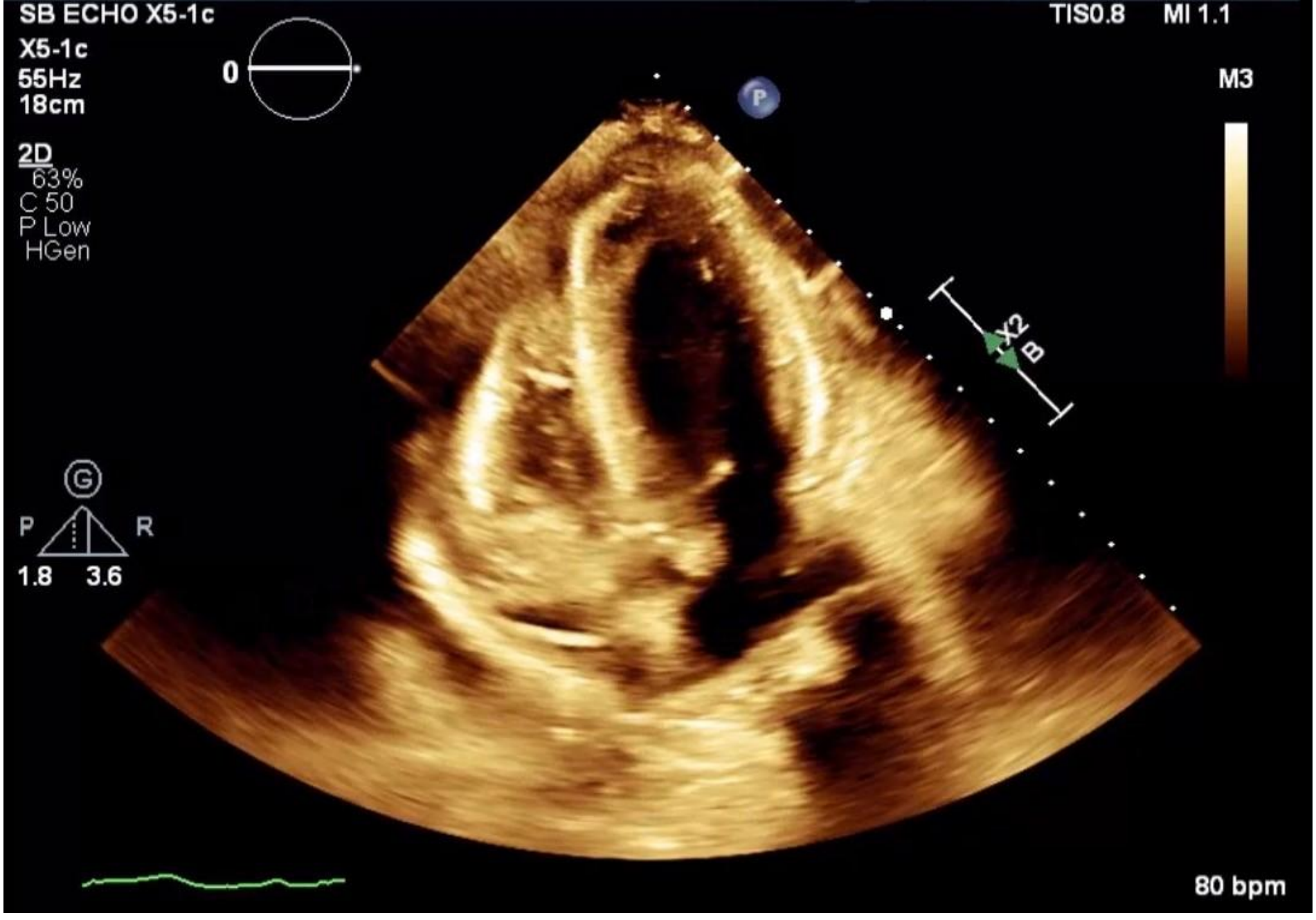


**Figure 2:** Apical 4 chamber showing right-sided thrombi atrium thrombi

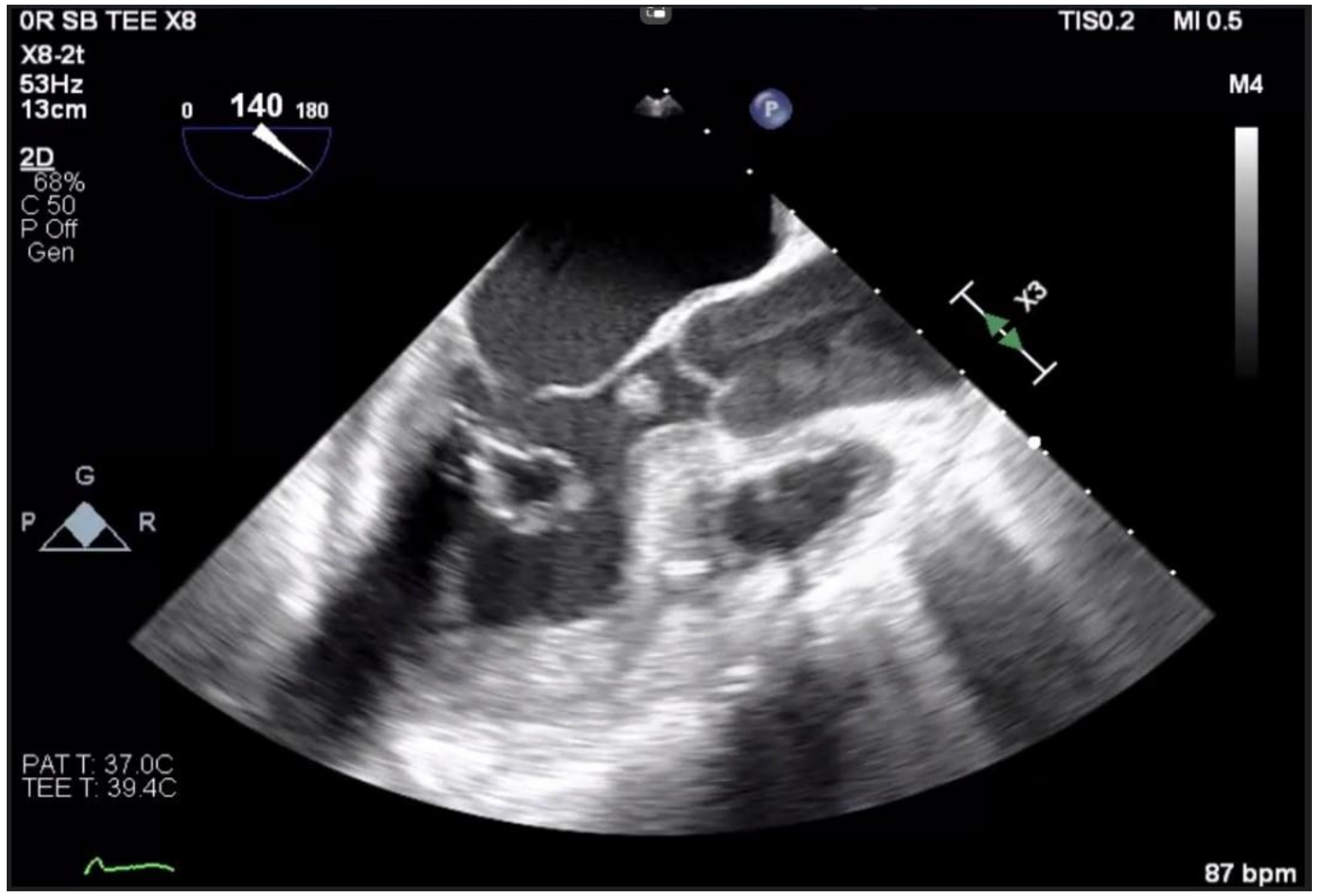


**Figure 3:** Mid-esophageal long axis showing left ventricle thrombi

## Discussion

- This otherwise healthy patient displayed fulminant cardiac failure requiring mechanical circulatory support in the setting of recent Influenza A infection despite a negative EMB.
- Although, it is understood EMB has variable sensitivity due to chances of biopsy site missing involved myocardium.<sup>2</sup>
- Intracardiac thrombi throughout the RA, RV, and LV were likely due to myocardial injury, inflammation, and blood stasis.<sup>3</sup>
- To reduce the risk of intracardiac thrombi embolization, the pillars of our treatment plan consisted of therapeutic anticoagulation and pulsatility suppression.
- Follow up echocardiograms verified the resolution of thrombi at which point the patient's return of innate cardiac function was supported.