

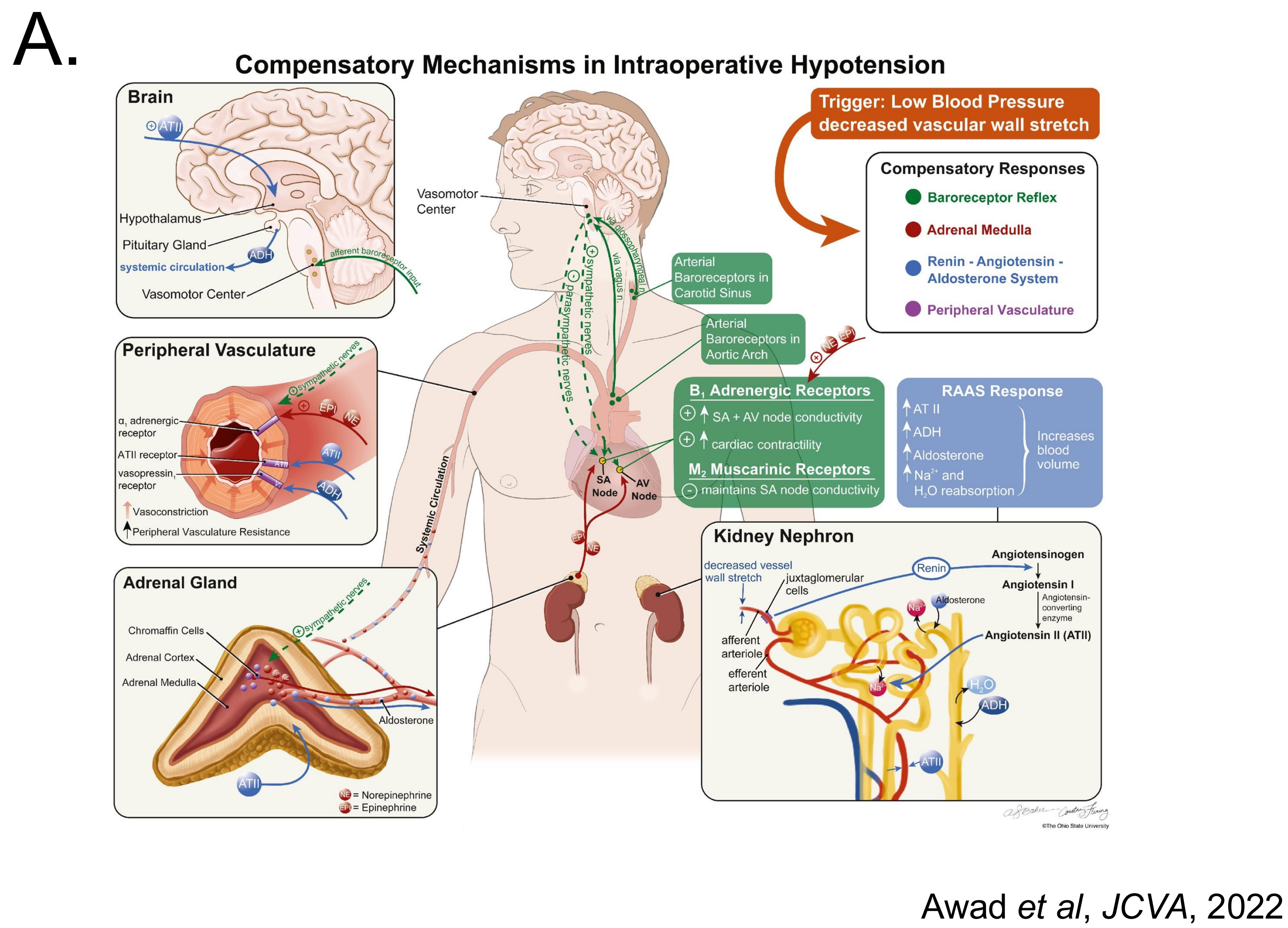
# Refractory Hypotension and Intraoperative Cardiac Arrest in a Patient with Severe Aortic Insufficiency: A Case of Physiology-Guided Crisis Management

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## Learning Objective

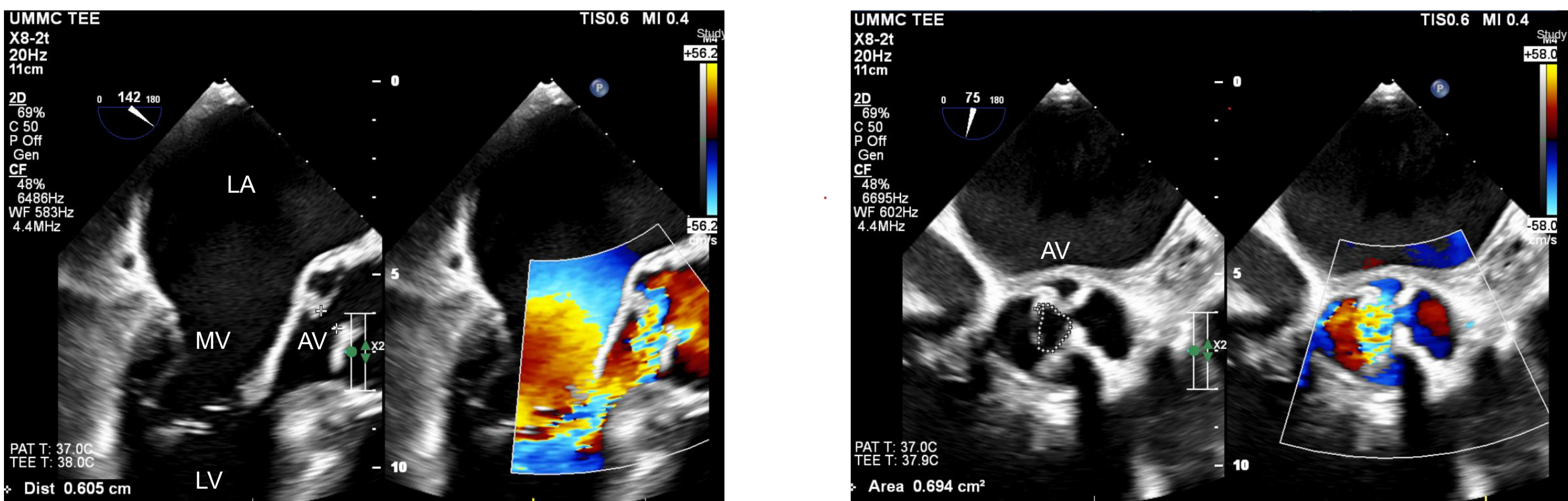
- Refractory hypotension is defined as low blood pressure that is not responsive to fluid resuscitation or vasopressor therapy.<sup>1,2</sup>
- Refractory hypotension can be caused by several underlying pathologies.<sup>1,2</sup>
- A strong foundation in physiologic reasoning is important when approaching refractory hypotension in the operating room.



## Case Description

- 52-year-old male with a history of asthma and CHF presents with several days of dyspnea on exertion and mild cough  
→ Patient was admitted 3 weeks prior with these symptoms and improved with diuresis.
- Blood pressure was 170/63 on admission and oxygen saturation was 89% on room air  
→ **LVEDP severely elevated (52mmHg)**
- Dyspnea acutely worsened overnight, leading to an emergency diagnosis of severe AI with a bicuspid aortic valve
- **Surgical plan:** CABG 3x and Aortic Valve Replacement
  - Day of surgery, patient acutely desaturated to 65% O<sub>2</sub> on room air despite steroids and albuterol. Rushed to OR. Bag mask ventilation improved O<sub>2</sub> saturation to 100%.

## B. Peri-operative Transesophageal Echocardiogram

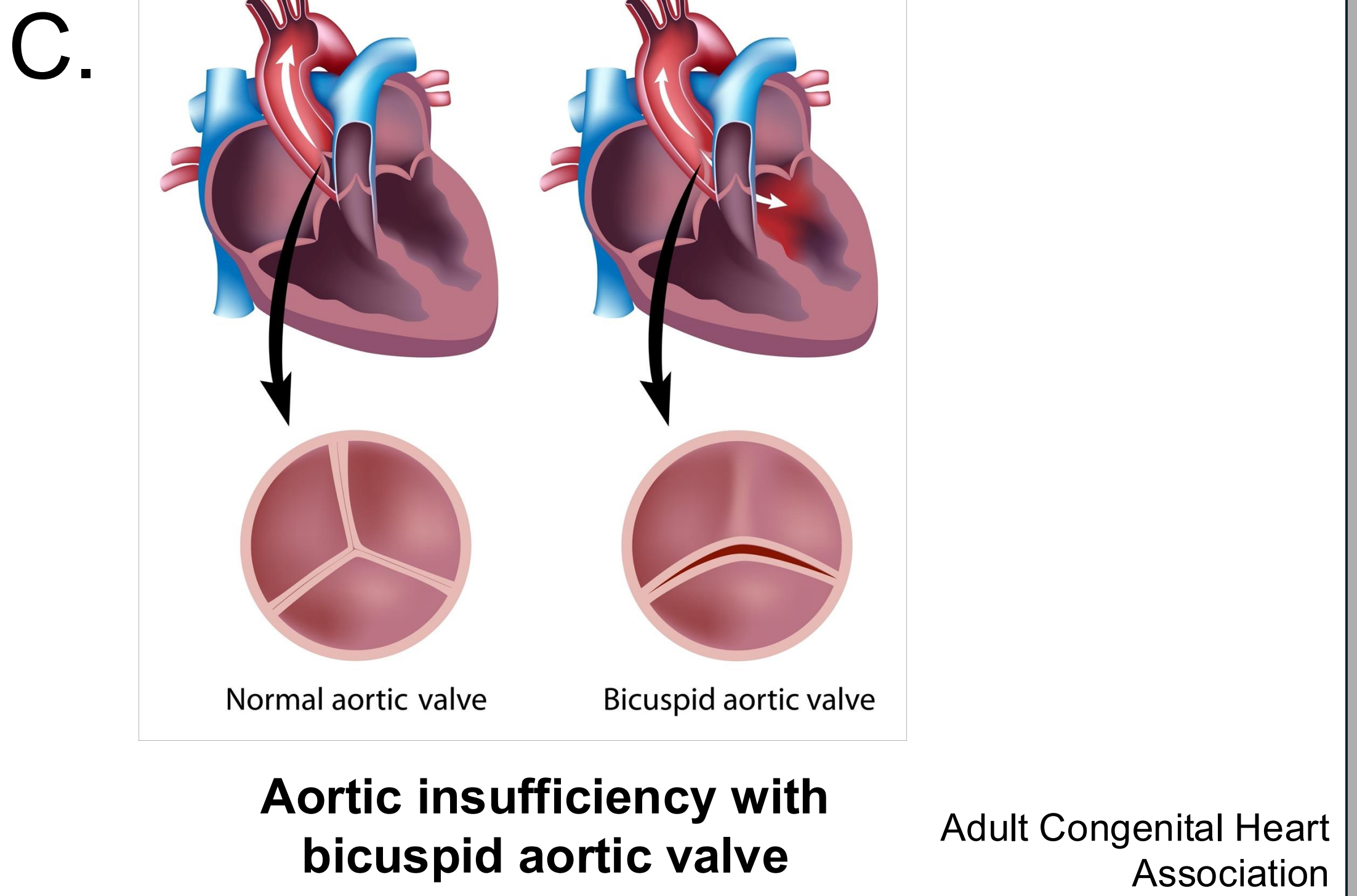


- **Induction and Intubation:** Ketamine (20mg) and Etomidate (8mg), central line (Right internal jugular vein), pre-induction arterial line (in place from CSICU, left radial), intubation uneventful,
- **Post-operative care:** extubated POD1, discharged POD20

- **Key Intraoperative events:** Performed coronary artery bypass graft (CABG) 3x and aortic valve replacement
  - 20 minutes post-induction: Patient's systolic pressure had started declining. Pressor boluses administered with minimal effect. TEE did not show pericardial effusion, and breath stacking was not present. Allowing full exhale did not improve hemodynamics.
  - 28 minutes post-induction: Arterial line flattened. CPR initiated, sternotomy made immediately after, and direct-on-heart CPR was performed.
    - Pressor doses continually administered: 4x 1mg epinephrine doses, 2g calcium, 1 ampoule HCO<sub>3</sub>.
  - 35 minutes after induction: Aorta cannulated, progressed to the bypass.

## Discussion

- **Aortic insufficiency**, although common, can have routine or complicated presentations (4.9% are complicated)<sup>3</sup>
- **Induction-related drops in SVR and bradycardia can worsen aortic regurgitation**, increasing regurgitant volume and reducing forward flow, making patients highly sensitive to abrupt anesthetic changes.
- **Maintaining preload, moderate tachycardia, and adequate afterload is essential**, as controlled induction and sympathetic tone help limit diastolic regurgitation and support hemodynamic stability.



## References

1. Stampf M, DeBlieux P. A Clinical Review of Vasopressors in Emergency Medicine. *J Emerg Med.* 2024;67(1):e31-e41.
2. Barola S, Shabbir N. Refractory Shock. In: *StatPearls [Internet]*. StatPearls Publishing; 2023. Accessed November 13, 2025.
3. Akinseye OA, Pathak A, Ibebuogu UN. Aortic Valve Regurgitation: A Comprehensive Review. *Curr Probl Cardiol.* 2018;43(8):315-334.
4. Nishimura RA, Otto CM, Bonow RO, et al. 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease. *JACC.* 2014;63(22):e57-e185.