

CT/Body Radiology Case: 60M cardiac arrest

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RAD 4001

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Clinical History

- 60M presented to the ED after PEA arrest at home
- Rhythm converted to Vfib and patient was shocked with successful ROSC
 - Total CPR time was 30 minutes
- Pt intubated and transferred to MHH ED
- PMH of HTN, recent MVA c/b SAH/SDH, right iliac occlusion (s/p fem-fem bypass), C3-T2 fusion, dysphagia (s/p PEG placement)

Vitals

- On presentation to the ED
 - HR: 70 bpm
 - RR: 16 breaths/min
 - SpO₂: 100% (100% FiO₂)
 - BP: 72/42 mmHg
- After weaning off pressors
 - HR: 105 bpm
 - RR: 24 breaths/min
 - SpO₂: 94%
 - BP: 89/43 mmHg

Physical Exam

- General: **Intubated and sedated**
- Head: Normocephalic, atraumatic
- Eyes: **Pupils 3mm and minimally reactive bilaterally**
- Neck: 12 staples on posterior neck, well healed scar
- CV: RRR, no murmur
- Pulm: **ETT 24 cm at the teeth**, ventilated, clear lung sounds bilaterally
- Abdomen: Soft, non-tender, non-distended, **PEG tube stoma clean, intact**
- Extremities: No edema, motor sensation grossly intact, no deformity
- Skin: Warm, dry, intact

Initial Imaging

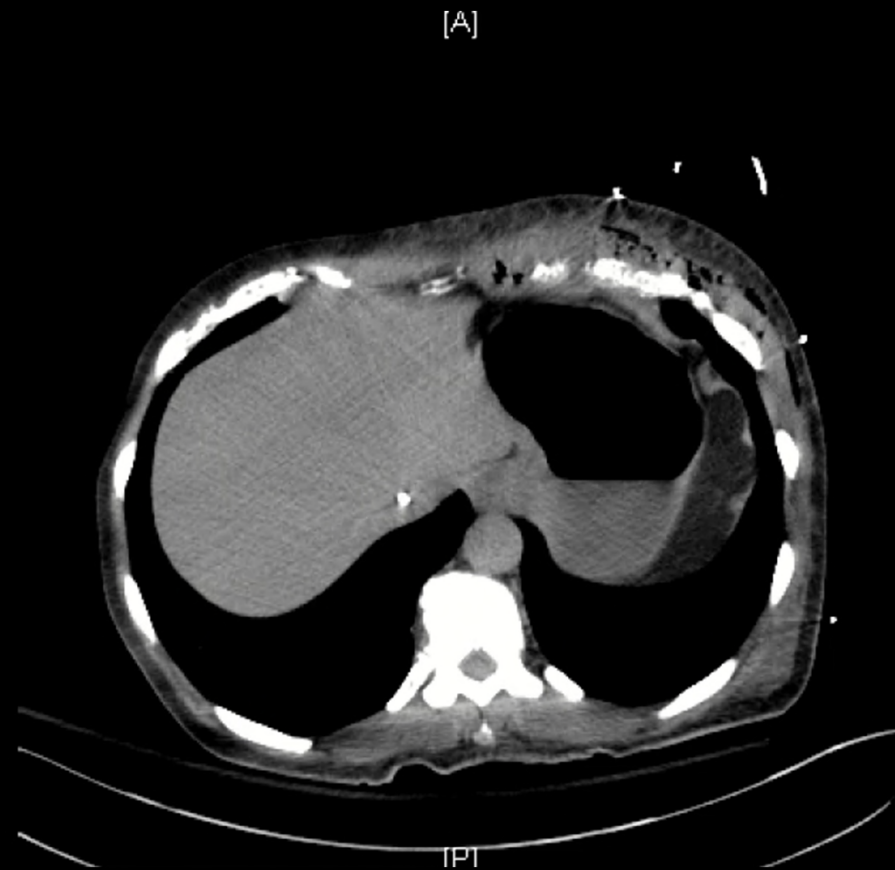
- Aimed at determining the cause of the PEA/Vfib arrest and recognizing potential sequelae
- Chest/Abdomen/Pelvis CT w/ contrast, Chest Xray, and CTA chest were ordered
- This imaging was followed by CT head w/o contrast, TTE

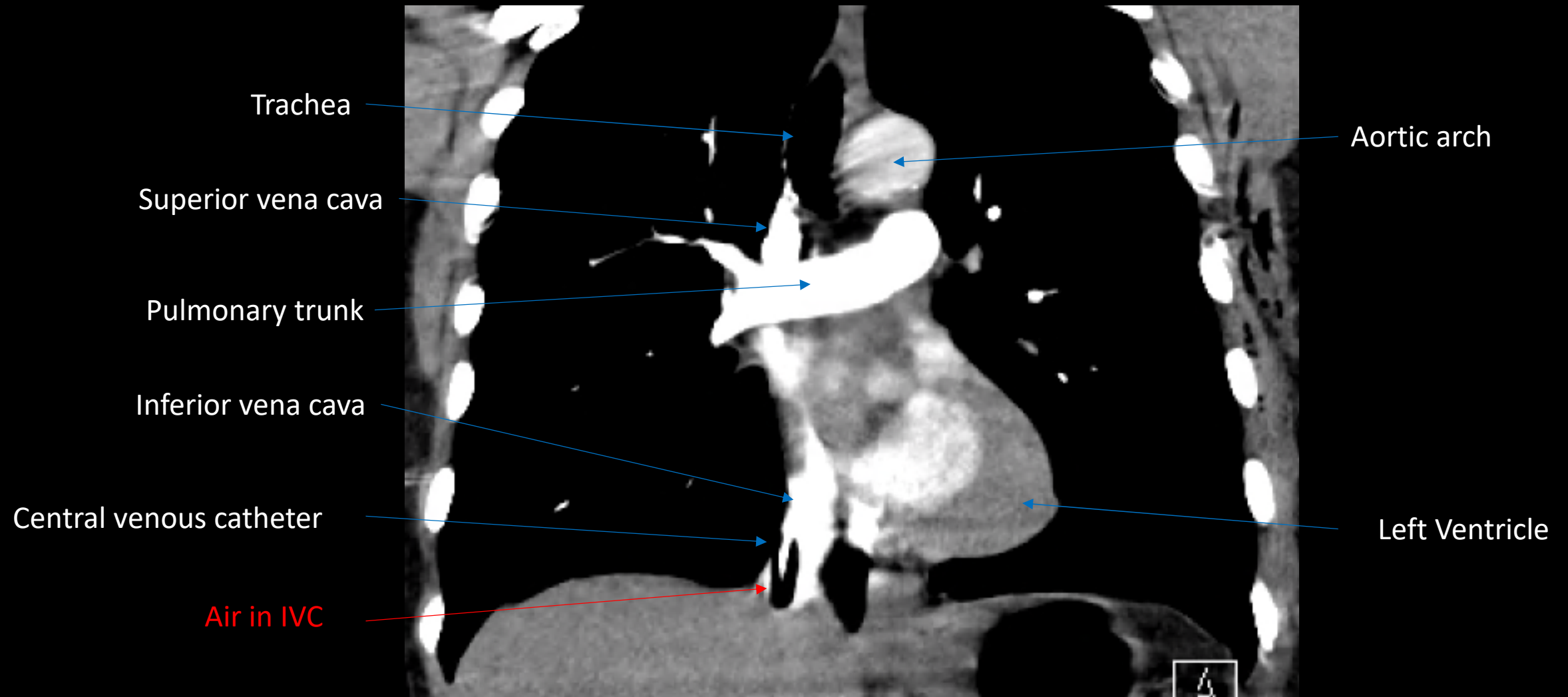
CT Chest w/ contrast

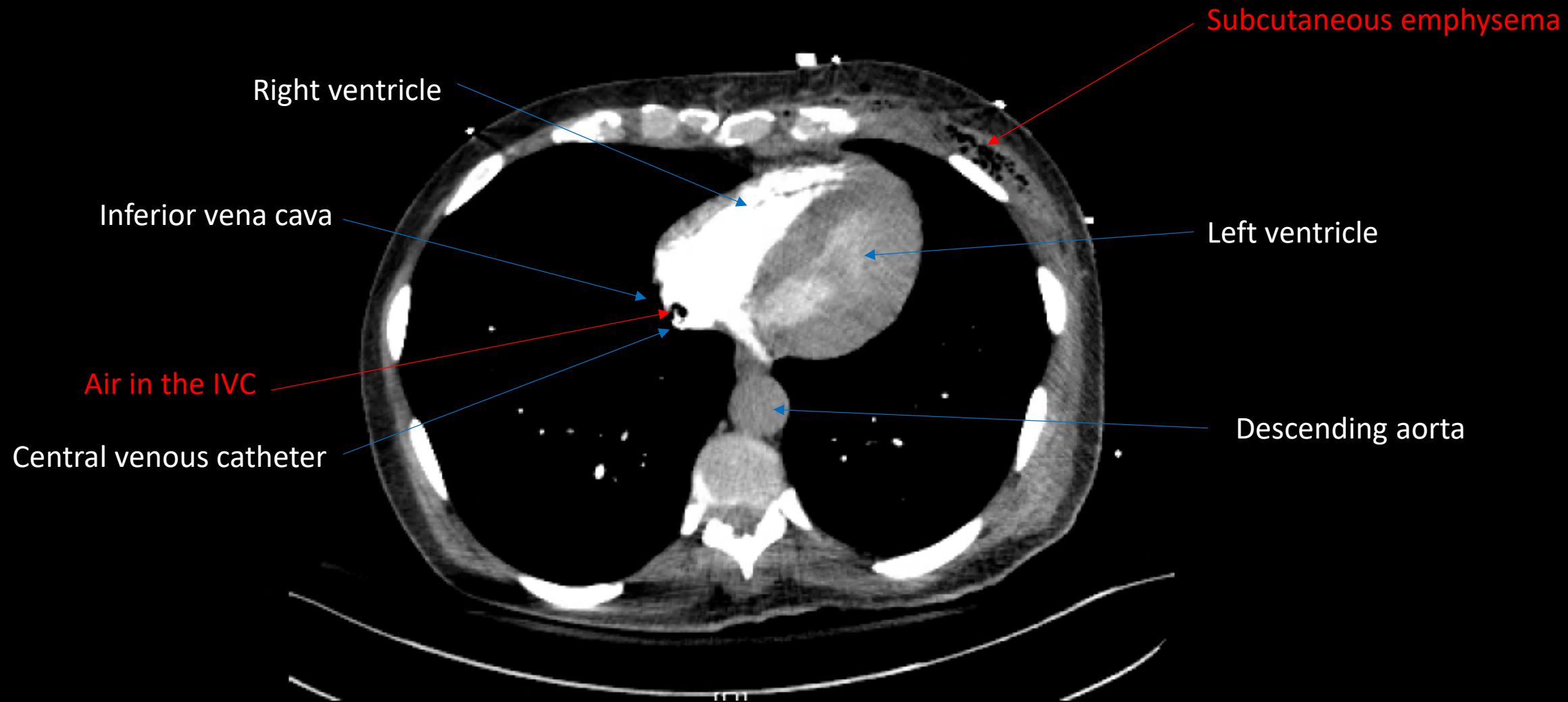
Coronal



Axial







ACR Appropriateness Criteria

| Variant 7: Major blunt trauma. Hemodynamically stable. Suspected chest trauma. Initial imaging. | | |
|--|-----------------------------------|---------------------------------|
| Procedure | Appropriateness Category | Relative Radiation Level |
| CT chest with IV contrast | Usually Appropriate | ☼☼☼ |
| CT whole body with IV contrast | Usually Appropriate | ☼☼☼☼ |
| CTA chest with IV contrast | Usually Appropriate | ☼☼☼ |
| Radiography trauma series | Usually Appropriate | ☼☼☼ |
| CT chest without IV contrast | May Be Appropriate | ☼☼☼ |
| CT whole body without IV contrast | May Be Appropriate | ☼☼☼☼ |
| US FAST scan chest abdomen pelvis | May Be Appropriate (Disagreement) | ○ |
| CT chest without and with IV contrast | Usually Not Appropriate | ☼☼☼ |
| US chest | Usually Not Appropriate | ○ |
| MRI chest without and with IV contrast | Usually Not Appropriate | ○ |
| MRI chest without IV contrast | Usually Not Appropriate | ○ |

Etiologies of Air Embolism

- Surgery
 - Particularly neurosurgical and otolaryngological procedures
 - Most commonly venous emboli
- Trauma – penetrating or blunt
- IV catheterization
 - Central venous or hemodialysis catheters
 - IV injections, particularly contrast
- Rapid ascent in scuba divers

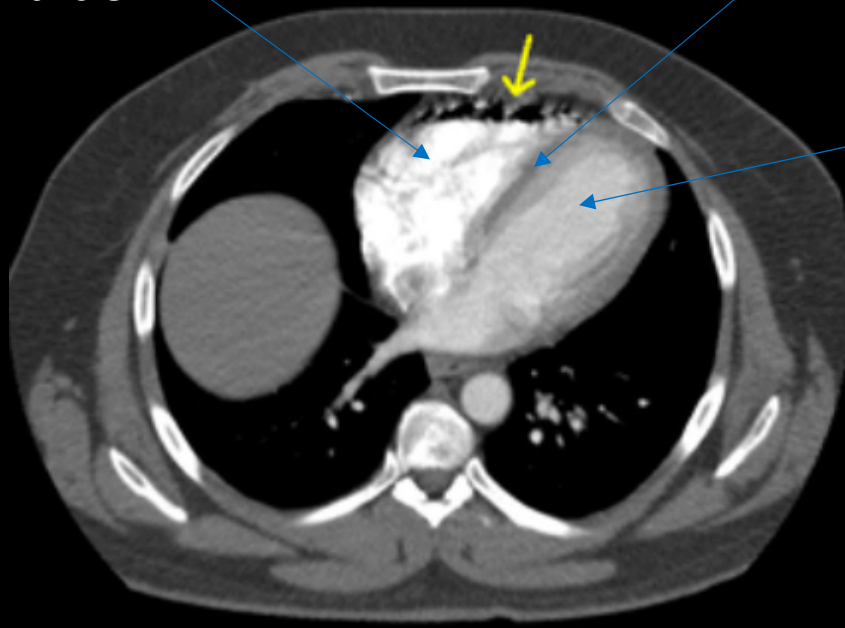
Differential Diagnosis

- Acute cardiopulmonary decompensation
- Acute neurologic decompensation
- Pulmonary embolism (of other origin)

Air embolism does not have pathognomic features that distinguish it from other forms of embolism or acute decompensation, with the exception of air on imaging

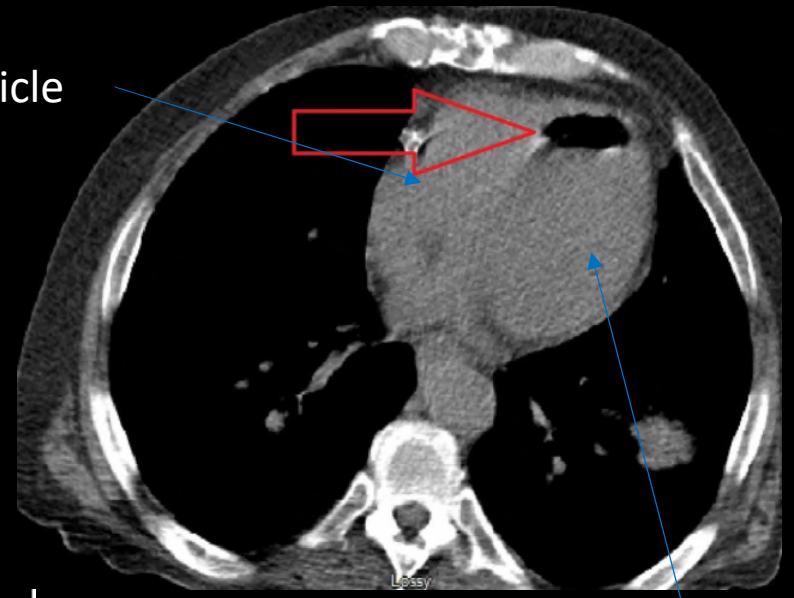
Right ventricle

Interventricular septum



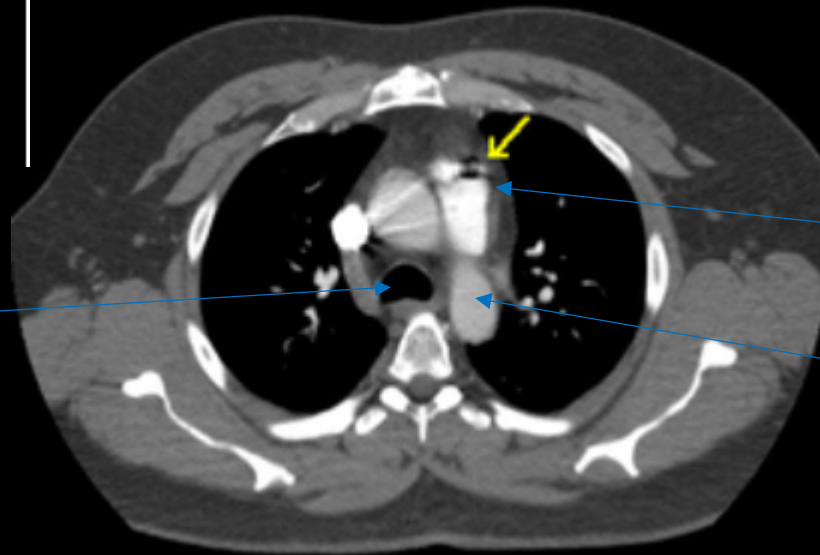
Left ventricle

Right ventricle



Left ventricle

Trachea

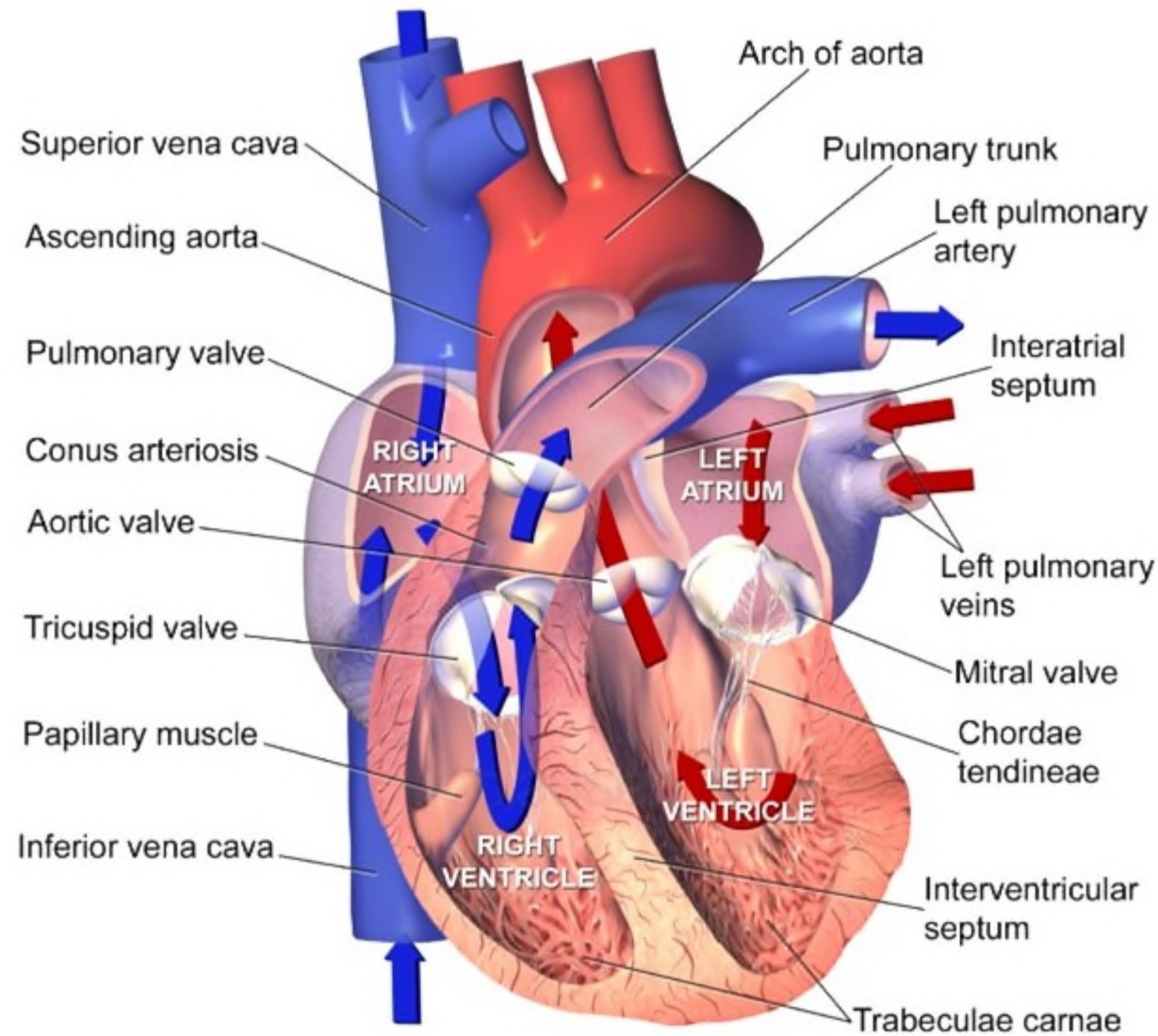


Pulmonary artery

Descending aorta

Initial Management

- Supportive therapy
 - High-flow oxygenation with 100% FiO₂
 - Mechanical ventilation (if indicated)
 - Fluids and vasopressors to maintain or achieve euvolemia
- Positioning
 - Venous embolism – left lateral decubitus (Durant's maneuver), Trendelenburg
 - Arterial embolism – supine position
- Hemodynamically unstable patients need definitive therapy



Sectional Anatomy of the Heart

Definitive Therapy

- Hyperbaric oxygen
 - Used in the setting of air embolism with cardiopulmonary decompensation or neurologic deficits
- Closed chest cardiac massage (i.e. chest compressions)
 - Similar effectiveness to positioning techniques
 - Avoided if possible due to risks
- Manual removal of air

Imaging Cost at Memorial Hermann

- Chest Xray 1View - \$762.00
- CT Chest w/ contrast - \$3936.25
- CT Pelvis/Abdomen w/ contrast - \$6534.00
- CT Head w/o contrast (x2) – \$3157.00
- Transthoracic Echocardiography – \$3773.00
- **Total Imaging Cost = \$21,319.25**
(Excluding fees for EMS, medications, medical equipment, nursing, physicians, surgical interventions, etc.)

Current status of patient

- Pt moved to CCU after stabilization and placed on hemodialysis for acute renal injury
- Cardiothoracic surgery was consulted for intervention of the ascending aortic thrombus, but pt had decreasing mental status due to anoxic brain injury
- Pt had another Vfib arrest on hospital day 3

Take Home Points – Case Summary

- Major etiologies of air embolism
 - Trauma, surgery, IV catheterization, scuba diving
- Only distinguishable by radiographic air on CT/MRI
- Initial management is 100% FiO₂ at high-flow rate, fluid resuscitation, and correct positioning (Durant's maneuver)

References

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[Faberowski LW, Black S, Mickle JP. Incidence of venous air embolism during craniectomy for craniosynostosis repair. Anesthesiology. 2000;92\(1\):20.](#)

<https://acsearch.acr.org/>

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Questions?