The Use of Extracorporeal Membrane Oxygenation (ECMO) in Thoracic Oncology Patients

The 17th Annual Midwest Thoracic and GI Oncology Conference; Pushing the Envelope in Cancer Care

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Anthony W. Castleberry, MD, MMCi
Surgical Director, Extracorporeal Life Support
Assistant Professor of Surgery
Division of Cardiothoracic Surgery, UNMC

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Disclosures

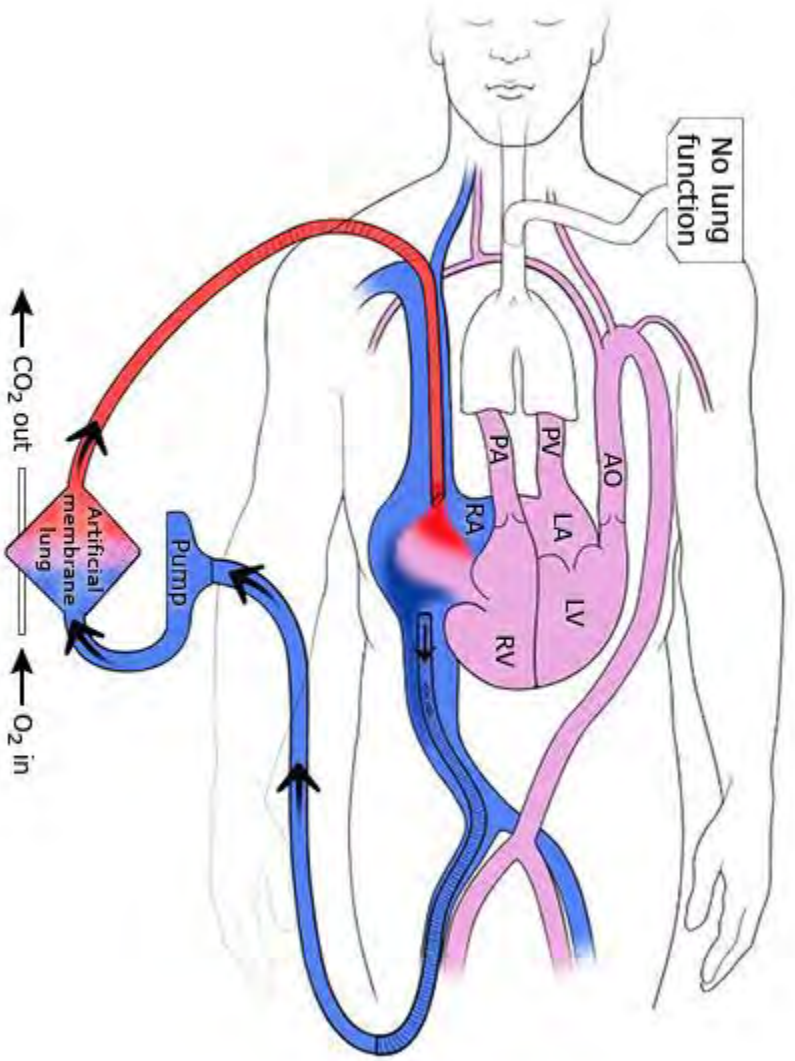
- **Consultant, Abbott Laboratories, Inc**

Objectives

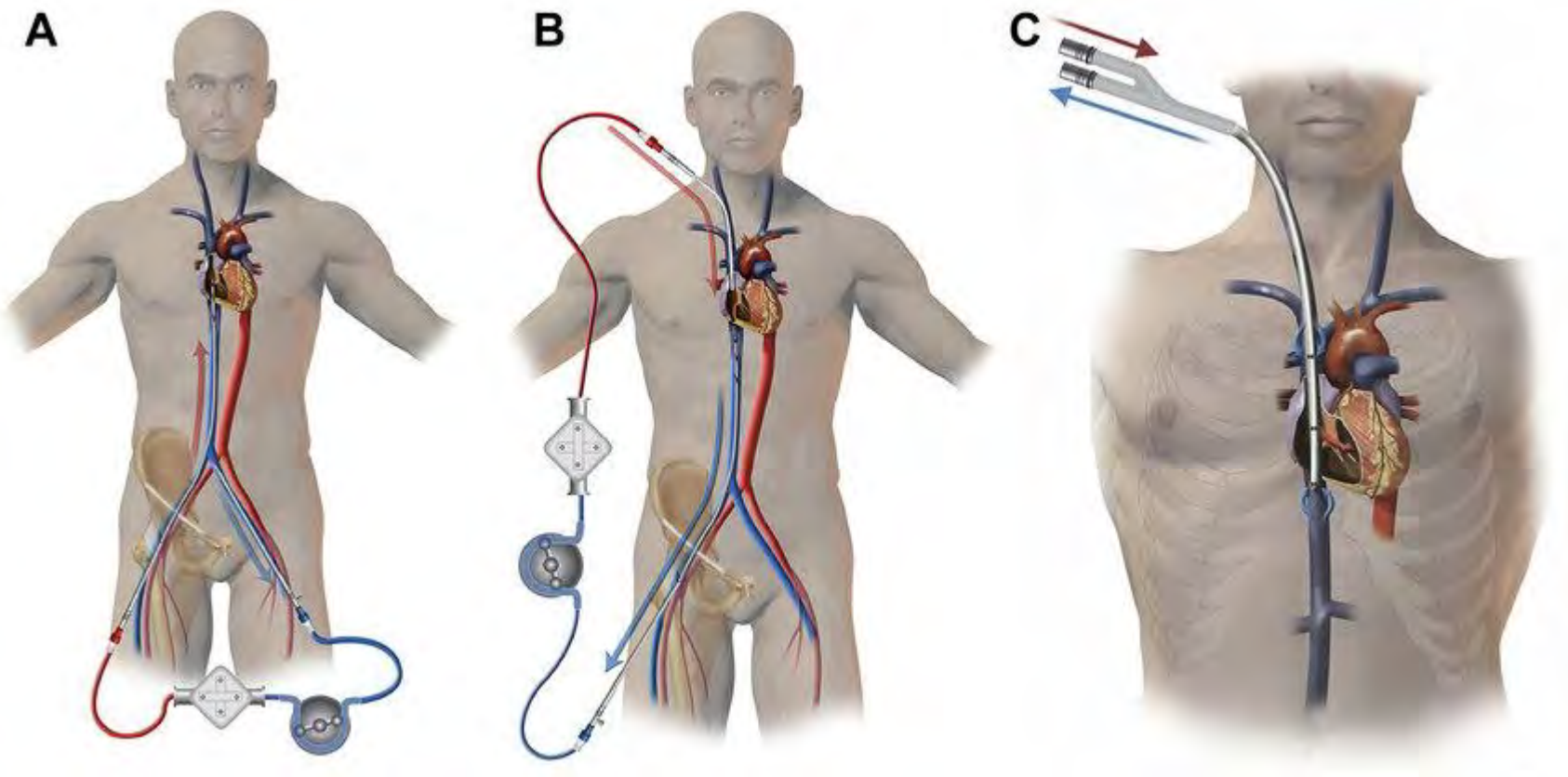
- Provide an overview of ECMO support strategies and management techniques
- Describe the role and indications for ECMO in thoracic oncology patients
- Articulate complexities specific to ECMO management in thoracic oncology
- Review the regional and national experience with ECMO and non-transplant thoracic surgery
- Discuss future directions and challenges

ECMO Support Strategies and Management Techniques

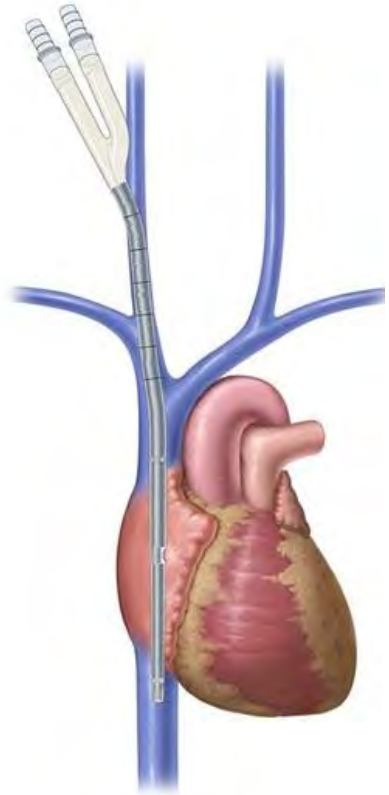
Veno-Venous (VV) ECMO

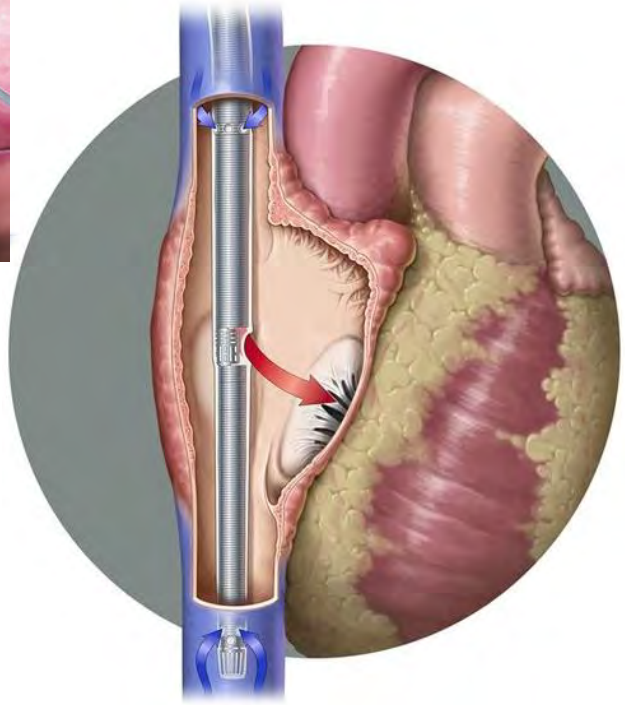


VV ECMO Configurations

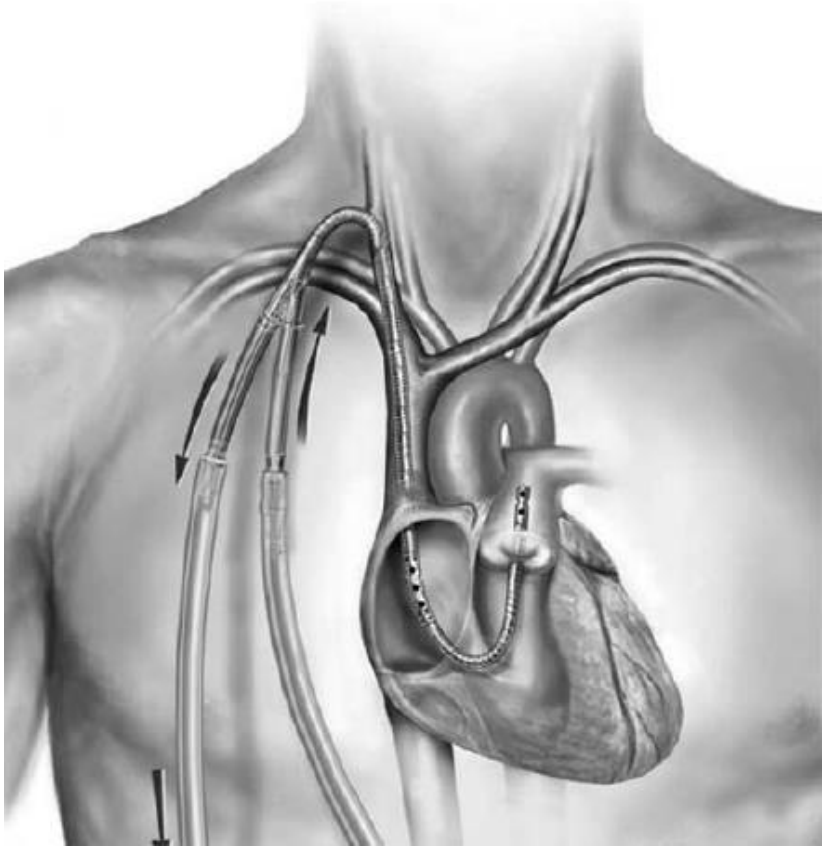


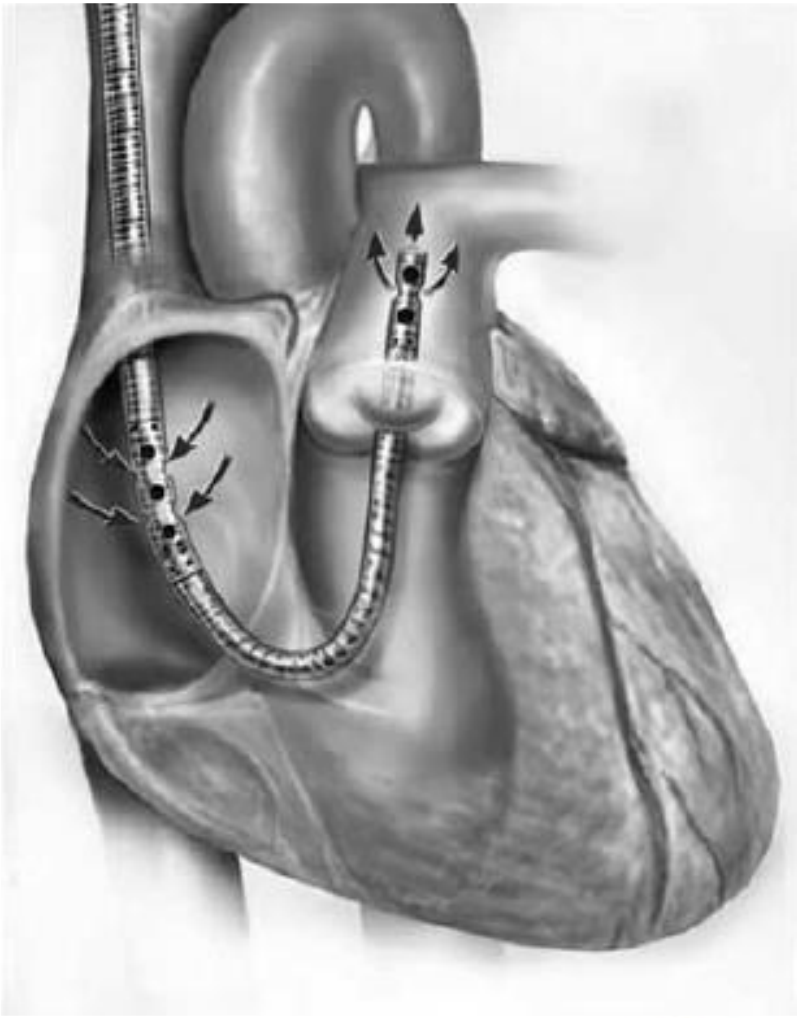
VV ECMO Configurations - Avalon





VV ECMO Configurations - ProTek





VV ECMO Configurations - ProTek

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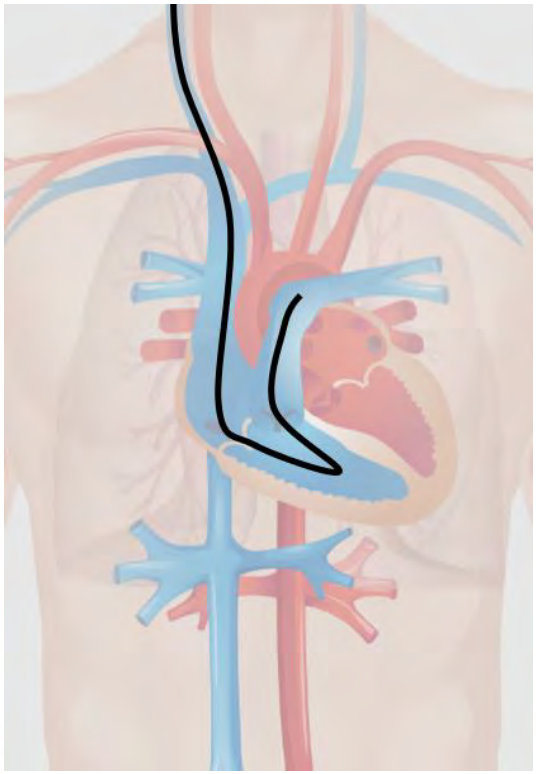

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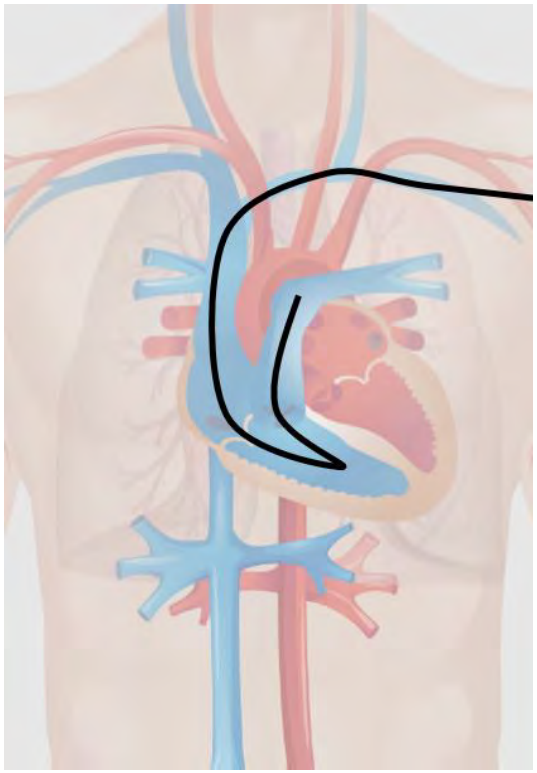

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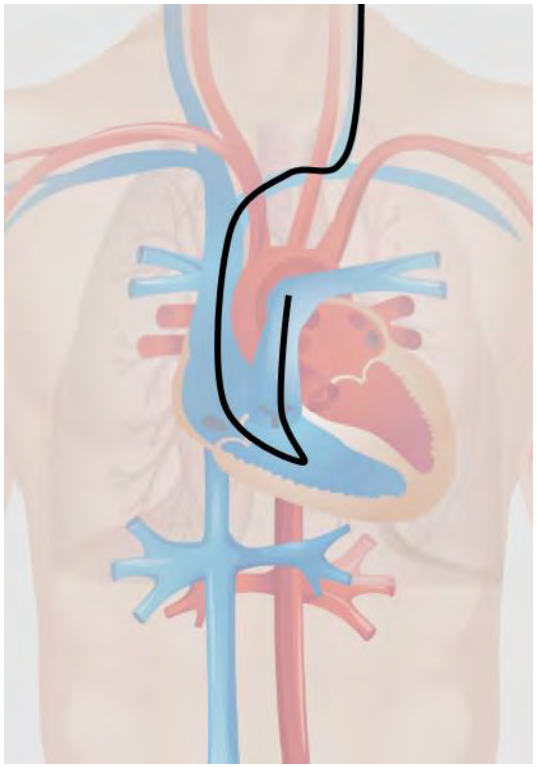
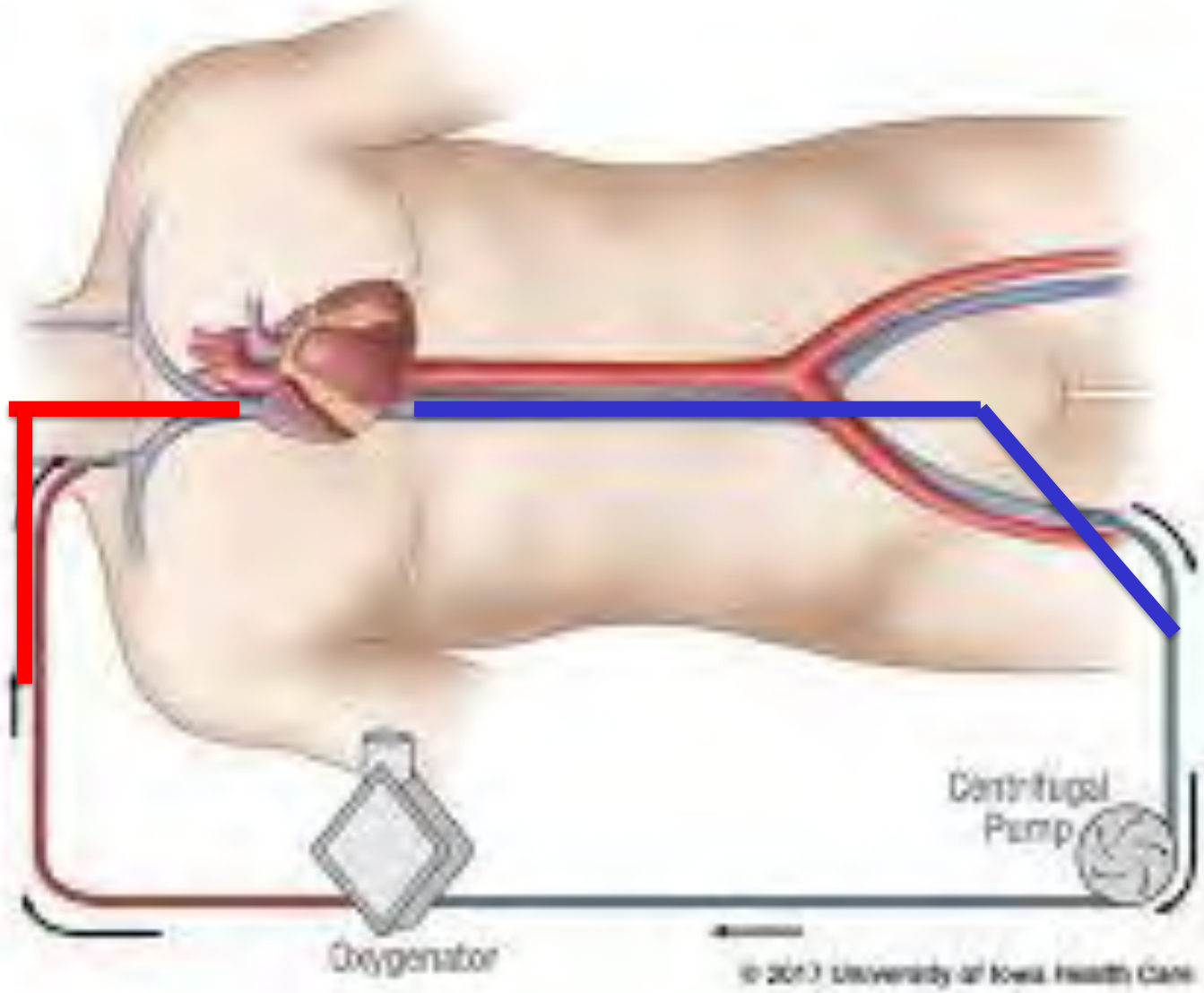


VV ECMO - Recirculation



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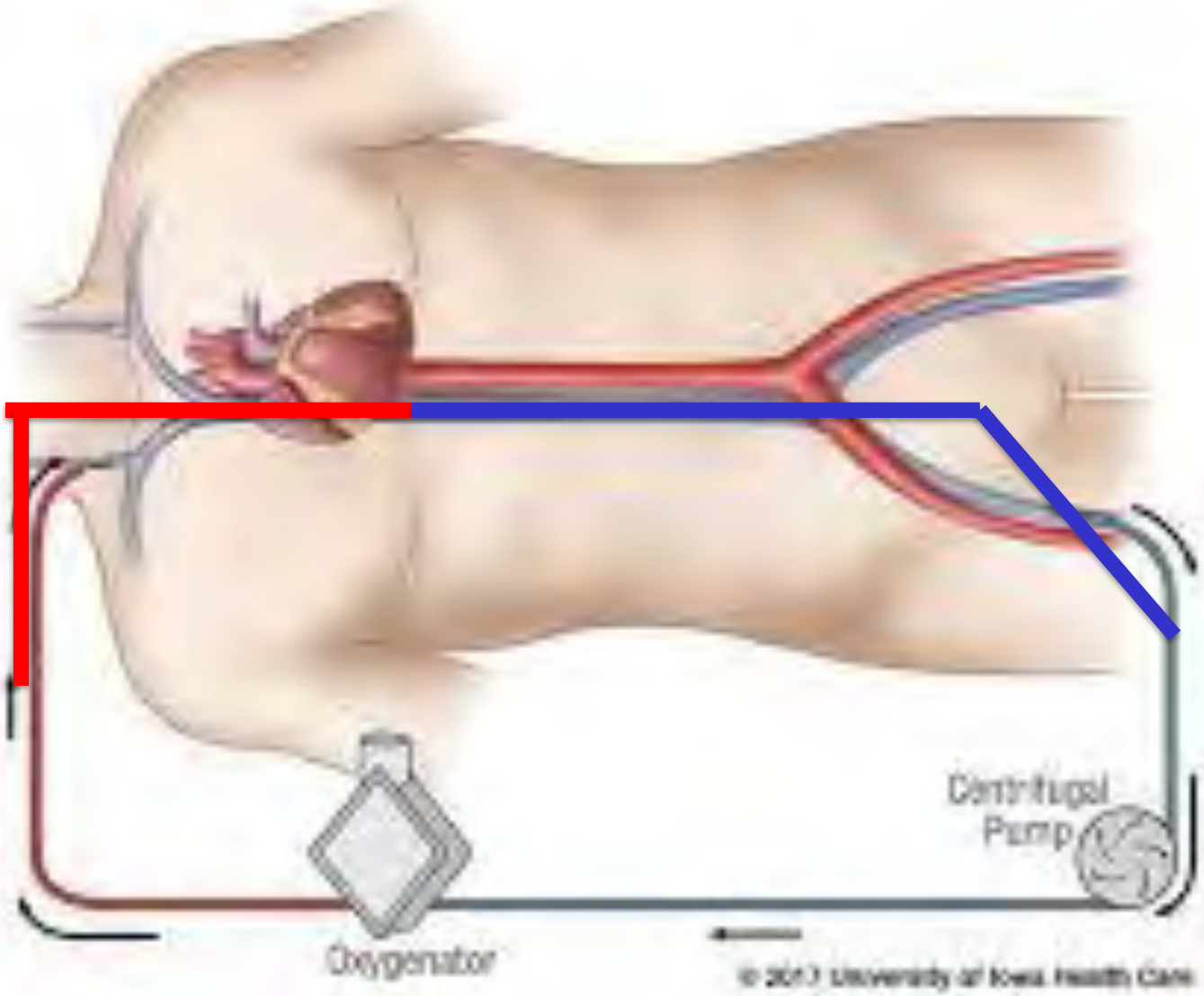

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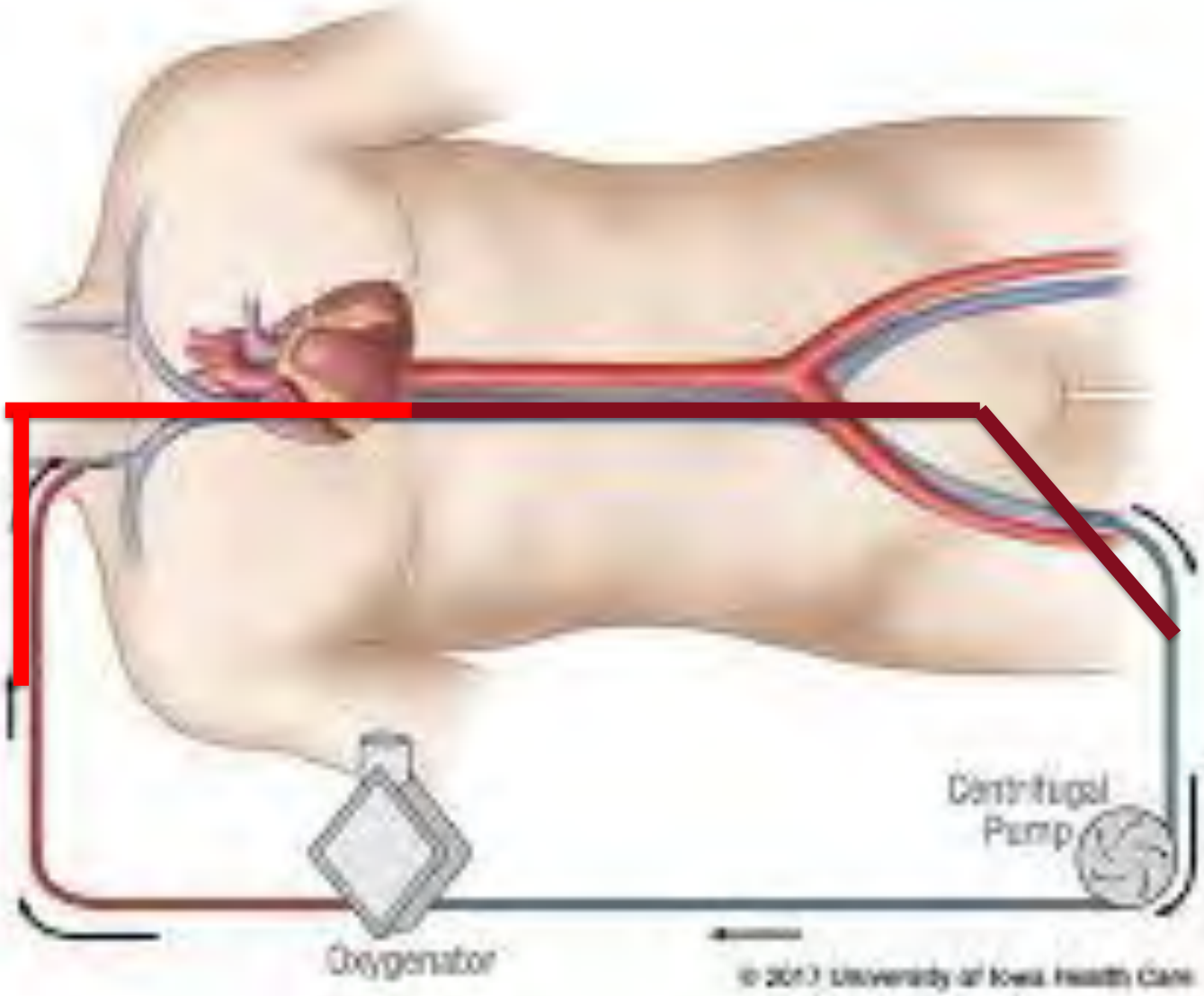

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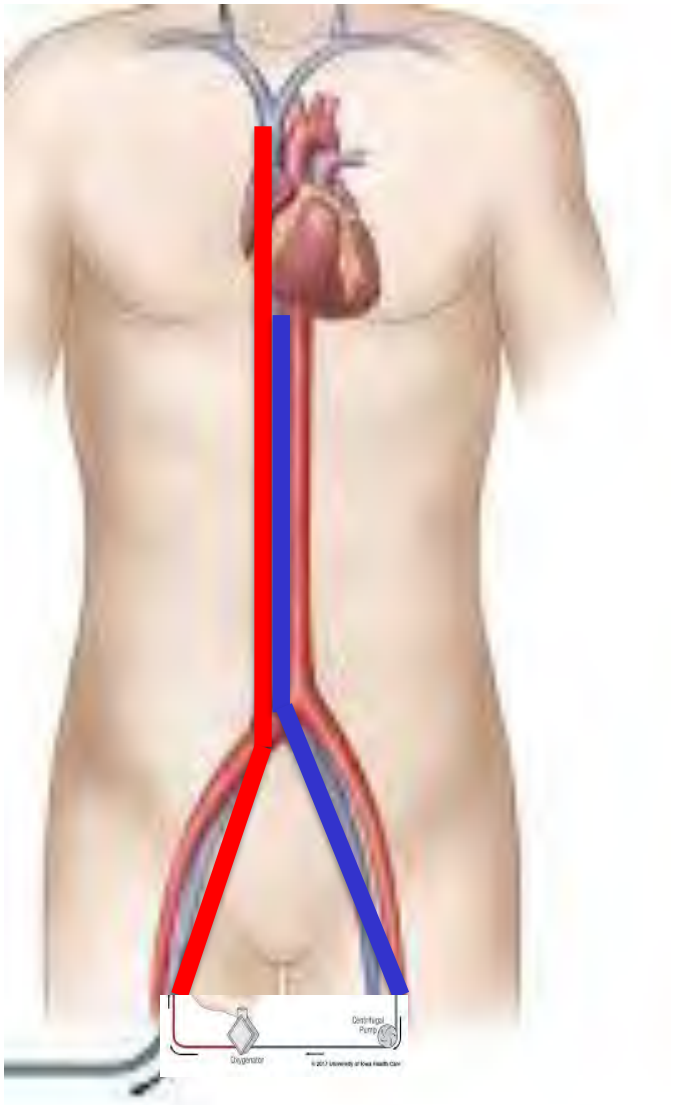
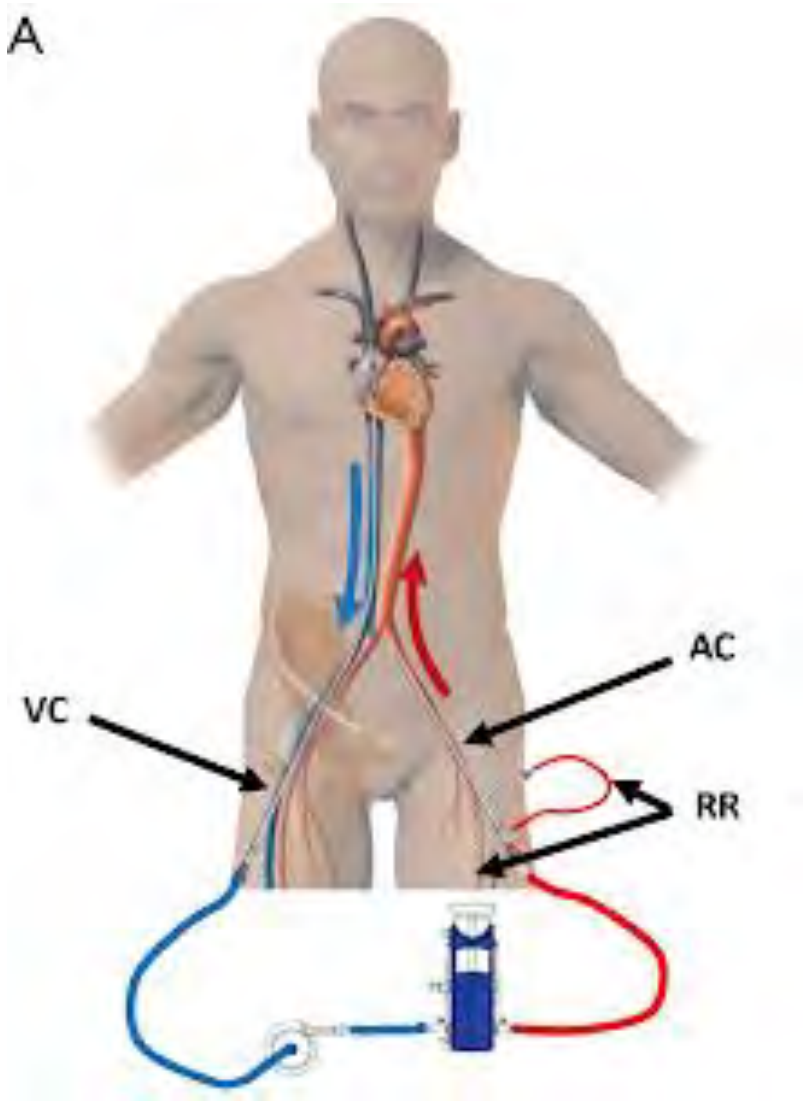
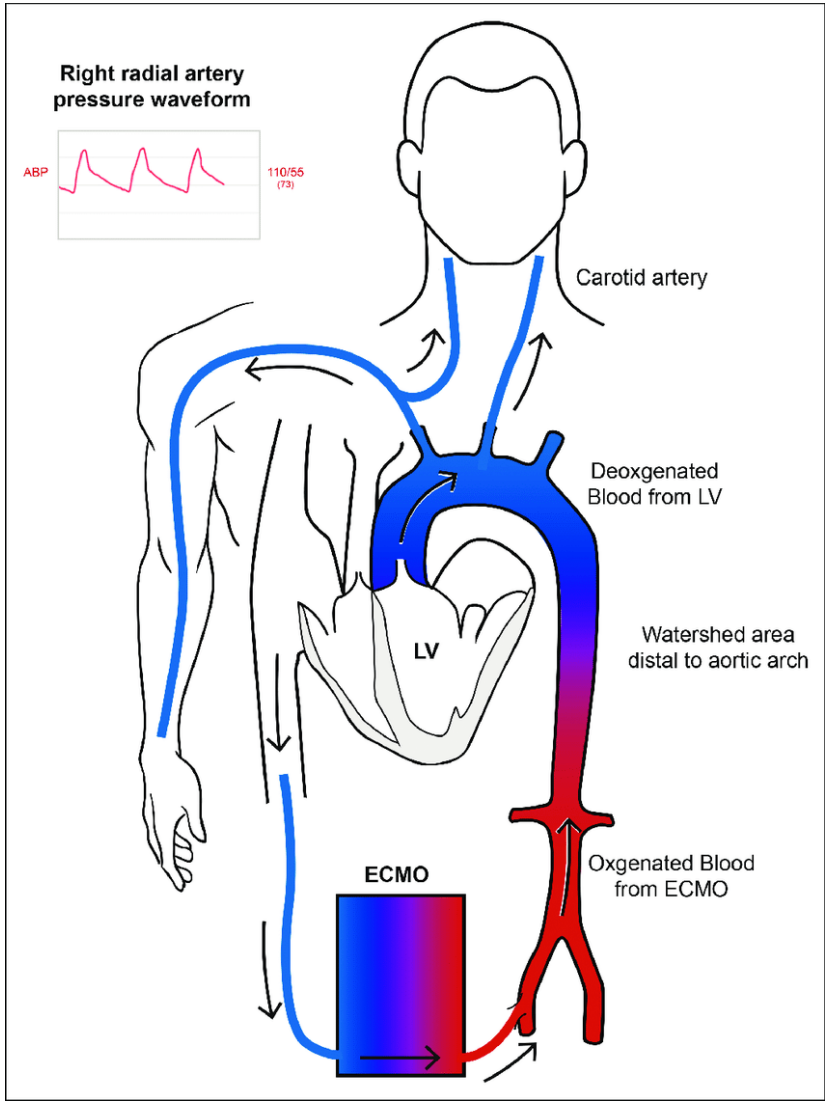


Veno-Arterial (VA) ECMO



VA-V ECMO – Harlequin Syndrome ("North-South Syndrome")



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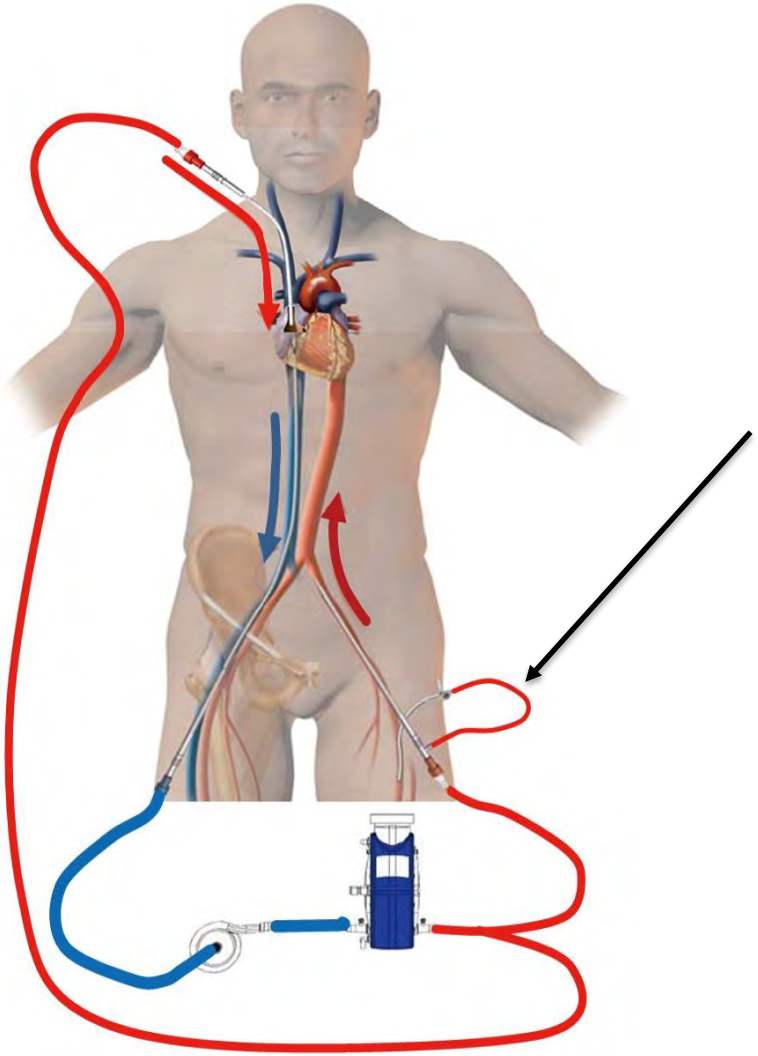
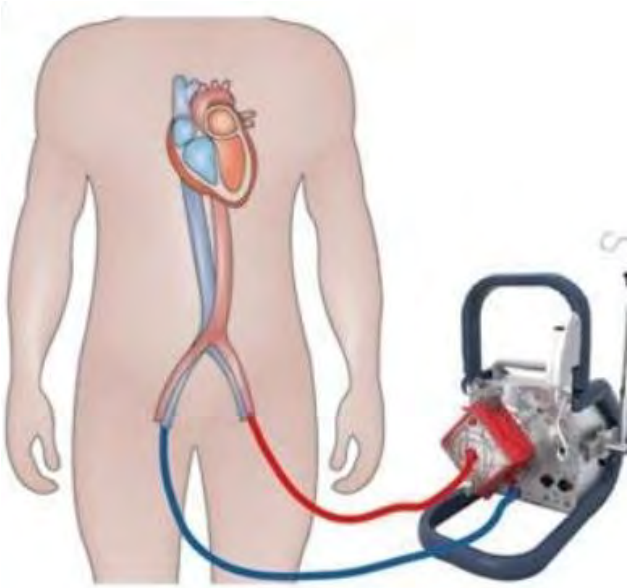
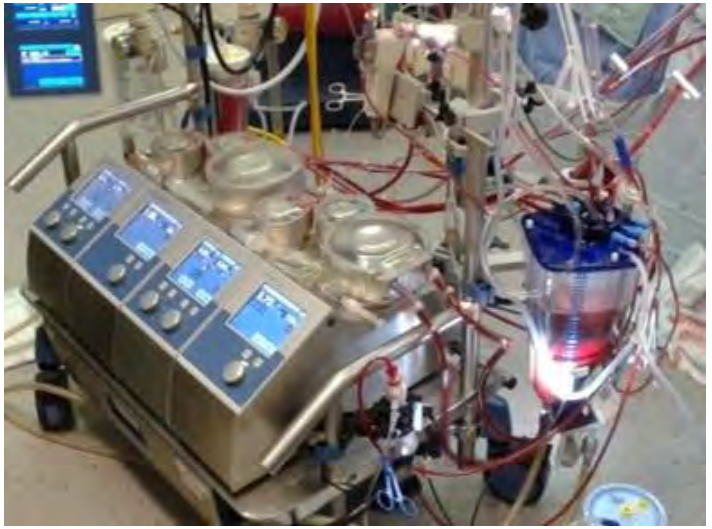


VA ECMO vs CPB



vs.



CPB = increased capabilities, reservoir, recapture blood via suction catheters, open circuit (air/blood interface)

CPB = *Full heparinization to ACT > 400*
systemic inflammatory reaction (blood/air interface), coagulopathy

Role And Indications for ECMO In Thoracic Oncology Patients

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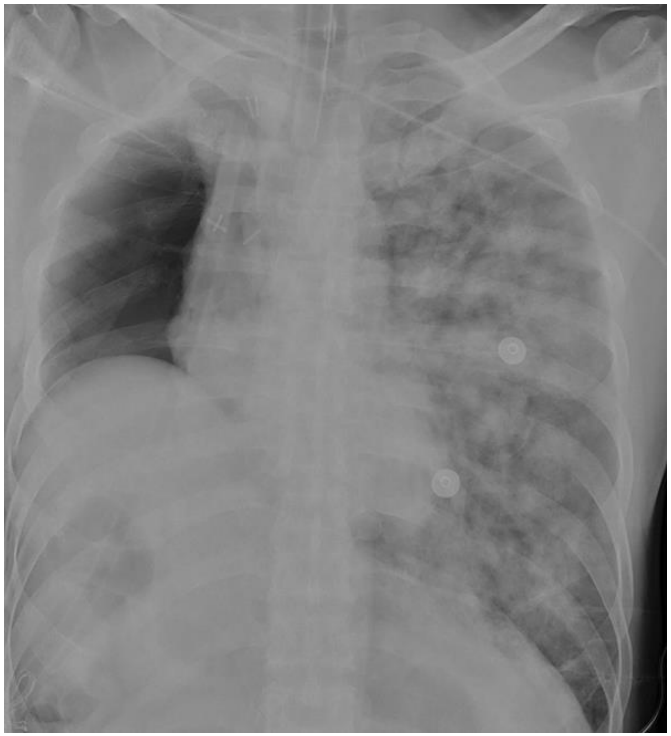
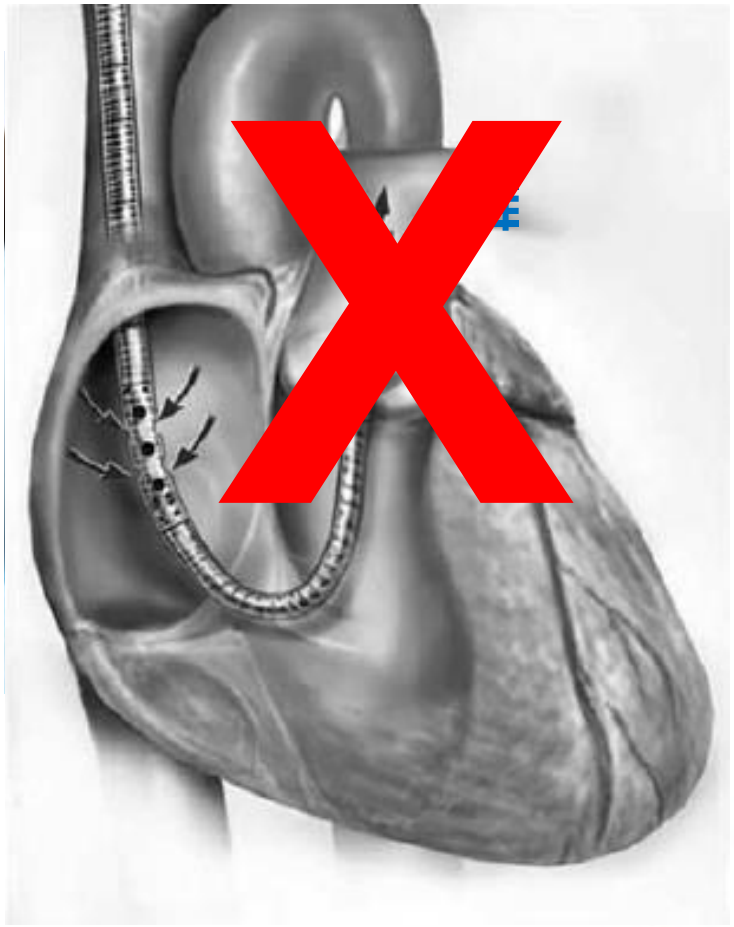
ECMO in Thoracic Surgery

Salvage/Rescue

Post-pneumonectomy ARDS

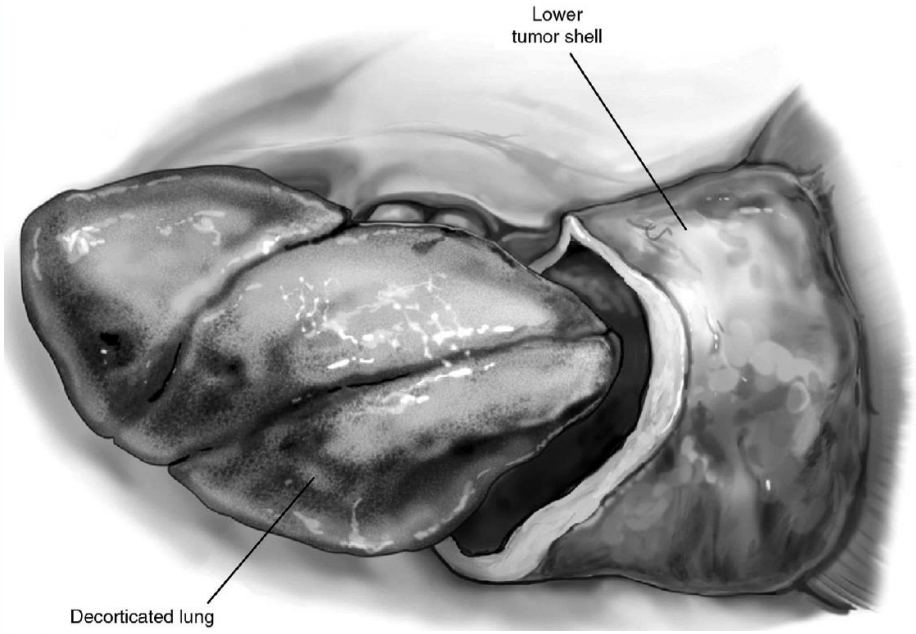


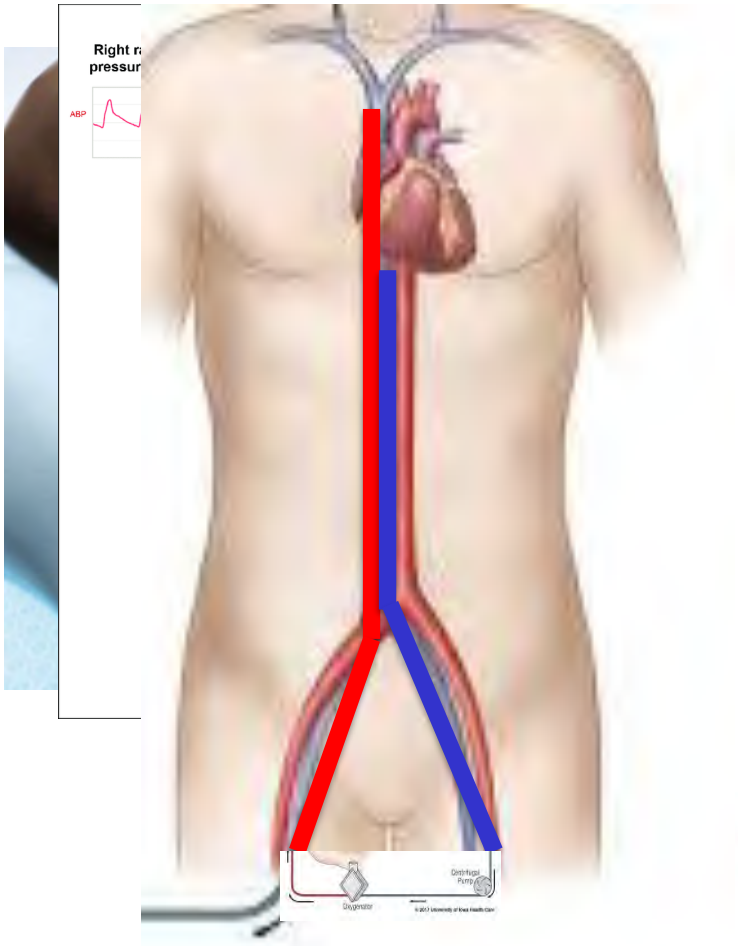


ECMO in Thoracic Surgery

Salvage/Rescue

Pleurectomy Decortication

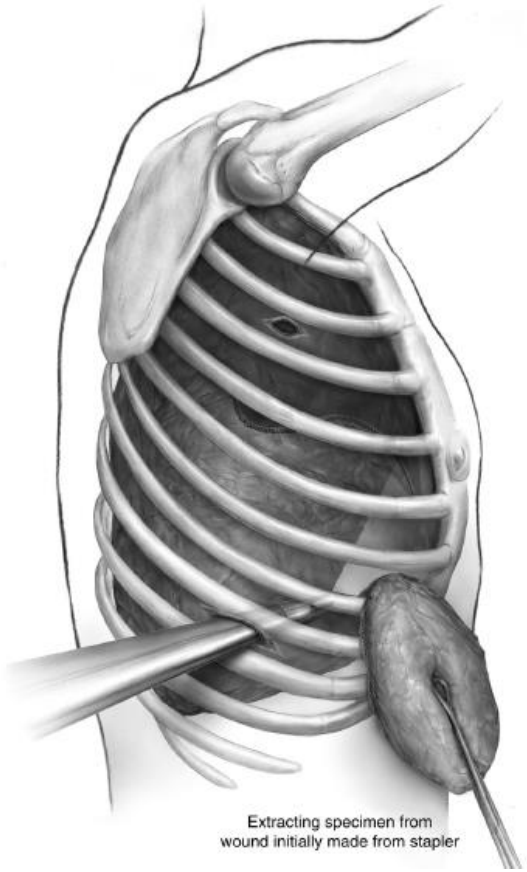


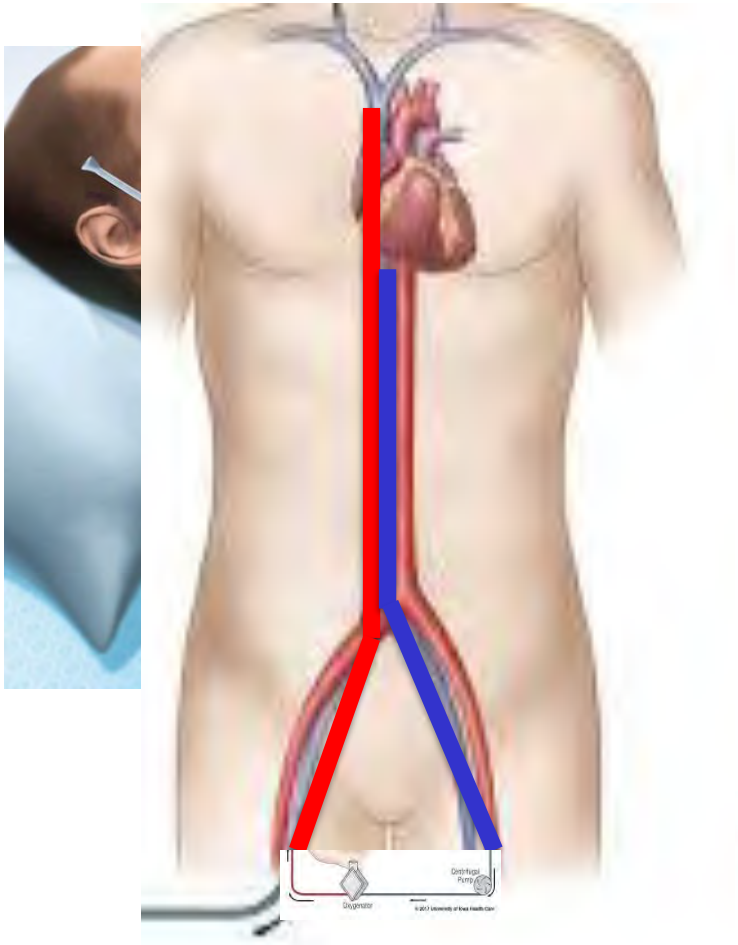


ECMO in Thoracic Surgery

Salvage/Rescue

Post-LVRS Pneumonia

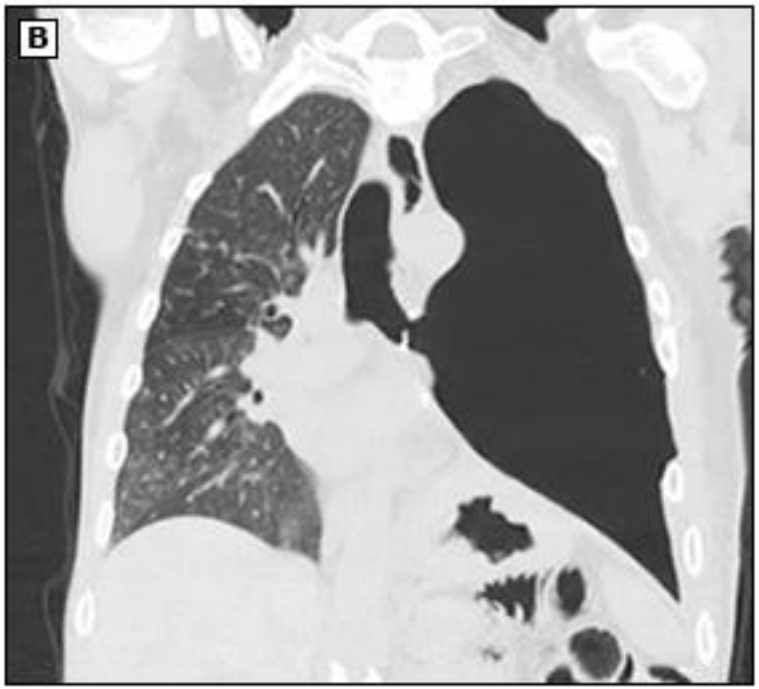


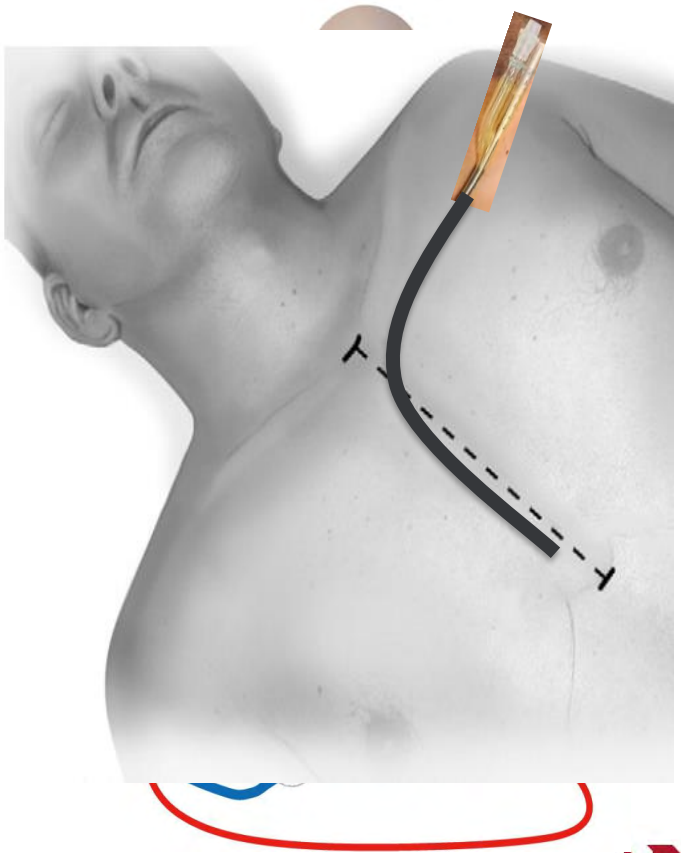


ECMO in Thoracic Surgery

Salvage/Rescue

Bronchopleural Fistula

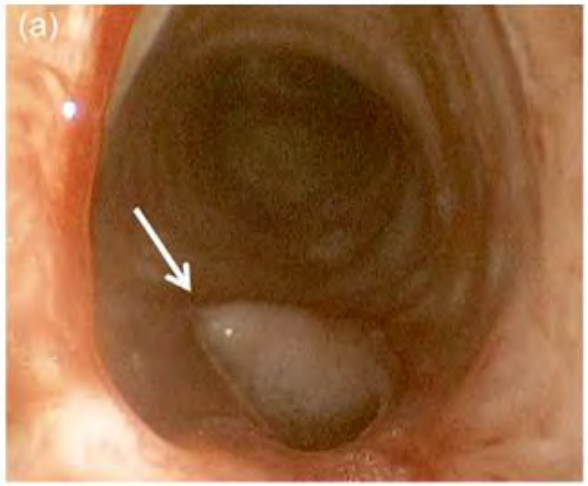


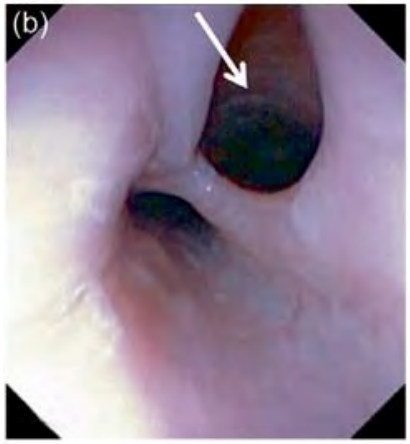


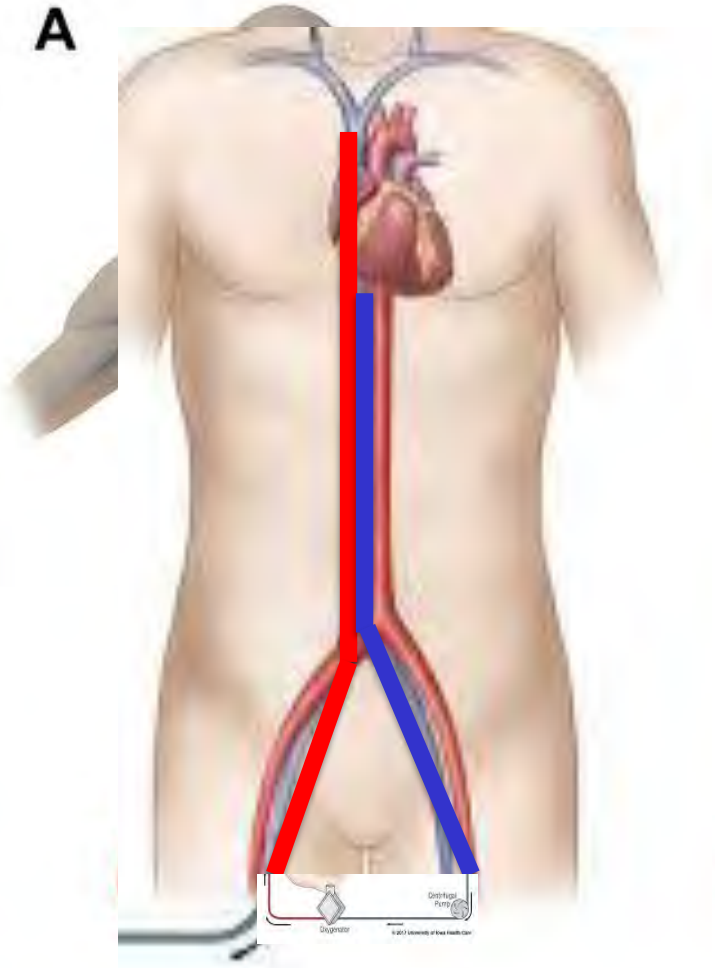
ECMO in Thoracic Surgery

Preemptive/Protective

TEF







ECMO in Thoracic Surgery
Preemptive/Protective

Airway Surgery and Complex Tracheobronchial Resections

Review Article

Extracorporeal support in airway surgery

Konrad Hoetzenecker[1], Walter Klepetko[1], Shaf Keshavjee[2], Marcelo Cypel[2]

J Thorac Dis 2017;9(7):2108-2117

- Awake cannulation
- VV ECMO vs. VA ECMO vs. CPB
- "The traditional approach of cross-table ventilation with intermittent apnea phases or jet ventilation is sufficient for most oncological airway surgery cases, but presents challenges in extended resections and complex reconstructions."
- ECMO support for endoscopic interventions (e.g. rigid bronch, tumor debridement, stent placement)

ECMO in Thoracic Surgery

Preemptive/Protective

Resection of Mediastinal Mass

A

A

B

- Risks of induction (loss of negative pressure ventilation, muscle relaxants, airway obstruction, cardiopulmonary arrest)
- More recently, pre-induction femoral VA-ECMO while maintaining spontaneous ventilation has been described

Wickiser JE, Thompson M, et al. Extracorporeal membrane oxygenation (ECMO) initiation without intubation in two children with mediastinal malignancy. Pediatr Blood Cancer. 2007 Oct 15;49(5):751-4.

Felten ML, Michel-Cherqui M, et al. Extracorporeal membrane oxygenation use for mediastinal tumor resection. Ann Thorac Surg. 2010 Mar;89(3):1012

Specific ECMO Inclusion Criteria

VV ECMO Inclusion Criteria

- P/F ratio of less than 100 despite aggressive mechanical ventilation including FiO2 of 1.0, PEEP greater than 15, neuromuscular blockade, +/- prone.
- Favorable neurologic function.
- Elevated peak airway pressures (greater than 40 mmHg) and/or plateau airway pressures (greater than 30 mmHg) despite lung protective ventilation and maximal medical therapy.
- pH of 7.2 or less with inability to correct respiratory acidosis with aggressive mechanical ventilation.
- PaCO2 of 70 or greater despite maximal medical therapy, aggressive mechanical ventilation and respiratory rate greater than or equal to 30 breaths per minute.
- Mechanical ventilation performed for 3-7 days
- May accept patients on mechanical ventilation over 7 days on a case by case basis after review and agreement by all teams.
- Known lung transplant candidate with acute decompensation.
- Age under 70 years
- BMI under 40

VA ECMO Inclusion Criteria

- Post cardiotomy patients with continued cardiogenic shock
- Acute CHF secondary to myocardial infarction
- Post CPR with ROSC after no more than 30 minutes of high quality CPR.
- Acute on chronic CHF with transplant eligibility or VAD eligibility.
- Acute CHF secondary to viral myocarditis
- Massive pulmonary embolus with cardiogenic shock
- Ventricular tachycardia refractory to medical management
- Age under 70 years
- BMI under 40

Summary

- ECMO support strategies can be a powerful resource for complex thoracic procedures
- ECMO cannulation techniques and management require and in-depth understanding of cardiopulmonary physiology with extracorporeal support
- Ambulatory strategies and device innovation hold further promise of expanding utilization of ECMO in complex non-cardiac surgery

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