A 36-year-old woman presented for urgent temporary total artificial heart (SynCardia TAH-t) placement. Her past history included three prior sternotomies, most recently for mechanical aortic valve replacement with aortic root replacement and single vein graft to left anterior descending artery. Her recent history included an ejection fraction of 20% on home milrinone, recent arrest from ventricular fibrillation, paroxysmal atrial fibrillation, chronic kidney disease, and congestive hepatopathy requiring paracentesis. Worsening heart failure was refractory to aggressive inotropic and intra-aortic balloon pump support, so she was transferred to our institution for mechanical support.

Her intraoperative course was notable for long cardiopulmonary bypass time (5 hours, 19 minutes) and coagulopathy. Following separation from cardiopulmonary bypass and protamine administration, fresh frozen plasma, platelets, and cryoprecipitate were transfused. Arterial blood gas showed a PaO2 of 364 on 100% FiO2. Subsequent blood gas revealed worsening hypoxia with PaO2 66, ventilator pressures increased, and edema fluid was noted in the endotracheal tube.

To improve oxygenation different ventilator strategies were attempted; bronchoscopy confirmed endotracheal tube position and was remarkable only for moderate serous fluid; nitric oxide was initiated and furosemide was administered. The TAH-t device was manipulated to increase left sided suction, and transesophageal echocardiography revealed no left atrial compression. Given only marginal improvement, extracorporeal membrane oxygenation (ECMO) was initiated. Veno-venous (V-V) and veno-arterial (V-A) configurations were discussed, with right femoral to right internal jugular V-V configuration selected to prevent thrombus formation by allowing full flows through the TAH-t. Oxygenation improved dramatically and the patient was transferred to the intensive care unit.

The following day, the patient returned to the operating room for evacuation of fluid causing decreased device flows. At that time, pulmonary artery pressures were directly measured and elevated despite low left atrial pressures. The ECMO configuration was revised to pulmonary artery to left atrium (PA-LA), thus bypassing the patient’s severely injured lungs. Days later, severe lung injury progressed to multi-organ failure and subsequent massive hemorrhagic stroke prompting withdrawal of care.

Discussion:
The patient’s new-onset respiratory failure appeared to be independent from perturbations in TAH-t flow, suggesting a non-cardiogenic etiology such as reperfusion injury after long CPB time, or transfusion-associated acute lung injury.

Use of ECMO has been well documented in isolated respiratory failure (typically V-V), or cardiogenic shock with or without respiratory failure (typically V-A). Only one case report to date has described ECMO use with the TAH-t, a V-A configuration with full heparinization. In this patient due to high concern for device thrombus formation and significant coagulopathy, V-V ECMO and PA-LA ECMO were selected in attempt to provide oxygenation in the setting of severe acute lung injury, without reduction in TAH-t device flow or the risk of anticoagulation.