



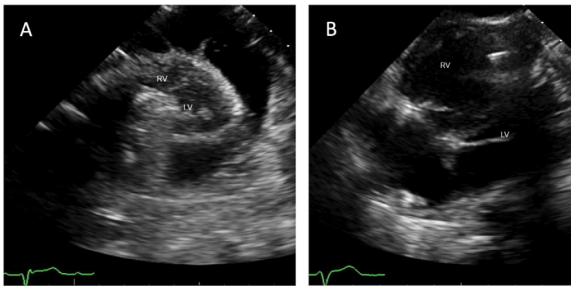
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Introduction: Cardiac tamponade results in obstructive shock due to cardiac chamber compression and impaired cardiac output. This commonly involves the RV due to its lower pressure. We report the first case of biventricular tamponade in a patient with a LVAD.

Case Report: A 30 yr old female (ht 4'7", wt 32 kg, BSA 1.13 m²) with inotrope dependent non-ischemic cardiomyopathy presented for heart transplant evaluation. Right heart catheterization on milrinone 0.375 mcg/kg/min was notable for RA 32 mmHg, PA 51/30 (37) mmHg, PCWP 34 mmHg, CI 1.2 L/min/m², PVR 1.8 Wood units. She was listed for cardiac transplant as her vessels were too small for percutaneous peripheral short term mechanical circulatory support. She decompensated needing VA-ECMO and then HeartWare LVAD implantation (speed 2300 RPM). 7 days post operatively, low flow alarms occurred with hypotension requiring escalating doses of inotropes. Echocardiography revealed a large circumferential pericardial effusion resulting in biventricular collapse (Figure A). Emergent surgical drainage was performed with 500 ml blood removal, resulting in re-expansion of both ventricles (Figure B).

Summary: To our knowledge this is the first report of biventricular cardiac tamponade, or as we have termed it, tamponade totalis. In the presence of a pericardial effusion, continuous LV unloading via a LVAD can cause the LV pressure to be lower than the pericardial pressure. Coupled with reduced RV preload from post-operative bleeding, this results in biventricular compression and tamponade. A combination of patient (size, anticoagulation, surgical approach) and pump (RPM) related factors likely lead to the development of tamponade totalis. Diagnosis of tamponade in a patient with a continuous flow LVAD is challenging due to similarities in presentation of right heart failure and atypical signs. Unique clues suggestive of tamponade in patients with a LVAD are respiratory variation of the pulsatility index waveform and pulseless paradoxus. Imaging is key to diagnosis.



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A Rare Case of COVID-19 Induced Multisystem Inflammatory Syndrome in Adult (MIS-A) Requiring Venoarterial Extracorporeal Membrane Oxygenation (VA-ECMO)

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Introduction: MIS-A is a rare COVID-19 induced condition defined by fever, new-onset severe cardiac illness, rash, encephalopathy, and elevated inflammatory markers in the setting of positive serum COVID-19 antibodies. This inflammatory cascade can cause significant biventricular dysfunction and subsequent cardiogenic shock. Patients with MIS-A can require temporary cardiac support including VA-ECMO. We present a case of a patient requiring VA-ECMO secondary to MIS-A induced heart failure and cardiogenic shock, with eventual myocardial recovery.

Case Report: 30-year-old male with type two diabetes was admitted with acute hypoxic respiratory failure, multiorgan failure, acute systolic biventricular heart failure, and COVID-19 infection four weeks prior. He was intubated and placed on vasopressors, antibiotics, and steroids for concerns for combined cardiogenic and septic shock. TTE noted global hypokinesis and 10-15% EF. EKG was sinus rhythm. He had mildly elevated troponins. Inflammatory markers including D-dimer, fibrinogen, and IL-6 were highly elevated. Despite antibiotics and supportive measures, the patient developed worsening hypoxia

and hypotension. IVIG was also initiated, with deferral of plasmapheresis. At this time, MIS-A was suspected. The patient was approved for VA-ECMO as a means for bridging to cardiac recovery. He required VA-ECMO for four days, with ability to decannulate, extubate, and wean off vasopressors. COVID-19 antibody testing was positive. Infectious workup was negative, with the patient transitioned off antibiotics and steroid regimen after completing treatment course. Inflammatory markers improved. Repeat TTE noted 44% EF with improved biventricular function. Cardiac MRI one day later, noted 61% EF without evidence of scar, myocarditis, or perimyocarditis. He was discharged home after a total of 8 days of treatment with follow-ups scheduled.

Summary: This case highlights a severe presentation of MIS-A and showcases the benefit of VA-ECMO as a bridge to myocardial recovery. VA-ECMO has been shown to improve in-hospital survival and serve as a mechanism for cardiac recovery in acutely ill patients. Long-term cardiac effects and recovery rates post COVID-19 induced MIS-A remain unknown.

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Coronavirus 2019 in a Morbidly Obese Patient: ECMO or No ECMO?

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Introduction: Coronavirus 2019 (COVID-19) can lead to Acute Respiratory Distress Syndrome (ARDS), necessitating prolonged mechanical ventilation and the use of extracorporeal membrane oxygenation (ECMO). A Body Mass Index (BMI) higher than 30 kg/m² is associated with an increased risk of developing ARDS along with greater morbidity, length of stay, and duration of mechanical ventilation in the intensive care unit. There is limited data on utilizing ECMO support in the morbidly obese population.

Case Report: A 51-year-old female with a history of chronic obstructive pulmonary disease and extreme obesity with BMI of 54 kg/m² presented with a complaint of worsening shortness of breath. She was afebrile with a temperature of 97F, tachypneic with a rate of 32, and hypoxic with oxygen saturation in the 80's. Chest x-ray showed severe bilateral interstitial airspace opacities (figure 1). Transthoracic echocardiogram showed an ejection fraction of 55-60%. She tested positive for COVID-19 and was promptly started on dexamethasone and remdesivir. Her respiratory status continued to decline and she was intubated on day 6. Despite being on 100% Fio2, her hypoxemia persisted. We proceeded to cannulate venovenous ECMO via the right internal jugular vein and right femoral vein. Over the next several days, her ARDS status continued to improve drastically along with oxygenation. On Day 13, she was successfully de-cannulated with no complications. The patient recovered well and was discharged to an acute rehabilitation facility.

Summary: ECMO has several advantages including direct pulmonary artery flow improving oxygenation and ventilation, early mobility once off the ventilator, and survival benefit. The use of veno-arterial ECMO should also be considered in the setting of severe respiratory failure accompanied by severe heart failure or right ventricular dysfunction. This case highlights the importance of considering ECMO as a feasible therapeutic option in the morbidly obese patient population with COVID-19 as it can be life-saving.

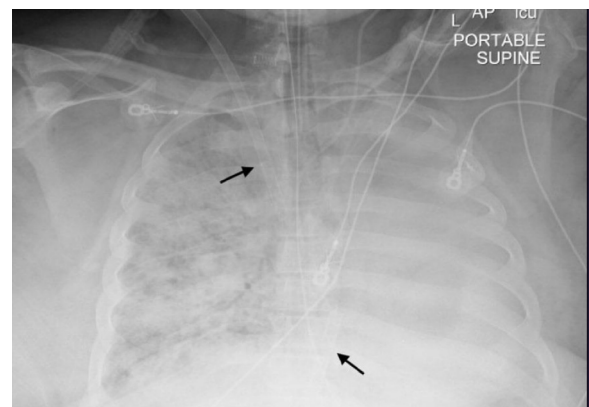


Figure 1: Chest X-ray showing severe diffuse bilateral interstitial and airspace opacities. Arrows indicate veno-venous Extra Membrane Oxygenation (ECMO) with large-bore right internal jugular vein cannula and inferior right femoral vein cannula.