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Acute Circulatory Collapse and Advanced Therapies in Patients with COVID-19 Infection

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Introduction: In the current COVID era, ICU-level patients typically develop respiratory failure and acute respiratory distress syndrome (ARDS). While less frequent, the management of concomitant acute circulatory collapse has its own challenges and nuances. Early identification of acute circulatory collapse requires appropriate imaging and precise diagnosis of cardiogenic shock. Escalation to mechanical circulatory support such as intra-aortic balloon pump (IABP), Impella and extracorporeal membrane oxygenation (ECMO) have been useful in patients with circulatory collapse from COVID.

Case Report: 42-year-old obese female presented with COVID bronchopneumonia 6 days after a positive outpatient COVID swab. In the ED, she was given 3L of fluid bolus for severe sepsis and developed flash pulmonary edema requiring emergent intubation. She also developed hemodynamic collapse, requiring inotrope and pressor support and a TTE demonstrated severely depressed left ventricular ejection fraction (LVEF) of < 10%. Peripheral VA ECMO was placed, and the patient was transferred to our tertiary care center for further management of fulminant COVID-myocarditis with cardiogenic shock. Patient did not have any significant obstructive coronary artery disease on catheterization. An Impella CP was placed for hemodynamic support. She was started on a high-dose steroid, one dose of tocilizumab for severe LV dysfunction, two rounds of IVIG, and CRRT for volume removal. On Day 11 she had improved hemodynamics and there were signs of LV recovery, after which she was decannulated. Impella support was continued until there was complete recovery. Patient was extubated on Day 17 and continues to recover at a long-term acute care facility.

Summary: Acute circulatory collapse in COVID-19 infection is a serious complication with high morbidity and mortality. Early recognition of depressed LV function and cardiogenic shock by echocardiography, cardiac MRI, and/or Swan-Ganz catheter assessment is critical. ICU management of hemodynamic function, fluid status, and blood pressure management remains standardized, but prompt medical management with inotropes and mechanical support maximizes patient outcomes. IABP, Impella, and ECMO all play a key role in managing acute circulatory collapse.

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From 13% to 60%: A Rare Case of Multisystem Inflammatory Syndrome in Adults 4 Weeks Following COVID-19 Infection

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Introduction: Multisystem inflammatory syndrome in adults (MIS-A) is a rare but serious entity implicated with COVID-19 infection. Improved diagnosis and treatment of MIS-A may mitigate morbidity and mortality attributed to COVID-19 infection.

Case Report: Our patient is a 24-year-old male with no known past medical history except for COVID-19 infection diagnosed 4 weeks prior. He presented with a 5-day history of intractable nausea, vomiting, and abdominal pain. He was febrile. COVID-19 test was negative. The patient became hypotensive, tachycardic and was aggressively resuscitated (5L crystalloid) with no improvement. He was transferred to ICU, intubated for worsening acute hypoxic respiratory failure, and started on vasopressors. TTE showed EF of 13% with severe global LV hypokinesis and RV enlargement with severe global hypokinesis. He underwent urgent coronary angiogram which showed normal coronaries. His clinical course was consistent with the working definition of MIS-A as specified by the CDC. As the patient was in cardiogenic shock with severe biventricular dysfunction, left femoral Impella CP and right femoral Impella RP were placed. Given his severe hemodynamic compromise leading to persistent shock and multiorgan failure, he was eventually placed on venoarterial ECMO. The patient was being treated with methylprednisolone, IVIg and anakinra. Over the following days, he continued to improve, and his vasopressors were weaned off. His Impella CP was successfully removed with stable LV pulsatility on arterial line. His LV function improved on TTE and the patient was decannulated 5 days after initiation of VA ECMO. TEE done 6 days after initial echocardiogram showed LVEF of 60% and normal RV systolic function. The patient was extubated and continued to improve clinically.

Summary: MIS-A is a serious hyperinflammatory condition that presents with multiorgan dysfunction approximately 4 weeks after onset of COVID-19 infection. Aggressive supportive care in the ICU, utilization of advanced heart failure devices, and immunomodulatory therapeutics should be utilized during management. More studies are needed to elaborate on treatment modalities and clinical predictors.

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Pseudomonas aeruginosa LVAD Driveline Infection Acquired from the Bathroom at Home

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Introduction: Driveline infections in patients with a left ventricular assist device (LVAD) are feared due to significant morbidity and mortality. There might be great potential in preventive measures at home.

Case Report: A 54-year old patient showed a deep LVAD (HeartMate III) driveline infection by *Pseudomonas aeruginosa* shortly after his first shower at home. Despite 6 weeks of antibiotics (piperacillin/tazobactam, followed by ceftazidime and ciprofloxacin), surgical intervention was needed due to ongoing inflammation.

To find the source of infection, culture swabs were taken from the patient's home bathroom (Figure 1). *P. aeruginosa* was found in the shower drain, wall-mounted shower jet (**B**) and non-slip shower mat (**D**). Typing by Multiple Locus Variable-Numbers Tandem Repeat Analysis to detect genetic congruence, revealed all bathroom strains to be highly similar to the exit site *P. aeruginosa*.

P. aeruginosa thrives in moist environments. Contaminated drains and sinks are known to cause nosocomial infections. Our patient was probably infected at home by upward transmission as both the mat and shower drain tested *P. aeruginosa* positive. The wall mounted shower jet was positive, but not used. Airborne transmission was not investigated. Preventing driveline infections is important to reduce hospital re-admissions, repeated surgery and costs. We suggest instructions to prevent *Pseudomonas* infection (Table 1) and increase awareness on infection risks at home. These measures might also be protective for other water-borne pathogens.

Summary: Consider the patient's home bathroom as potential source of *P. aeruginosa* LVAD driveline infections.

Table 1:

General	- Make sure that the hands are rinsed, disinfected with 70% alcohol and properly dried before handling the LVAD - If possible, let a caregiver clean and dress the LVAD exit site - Keep the driveline exit site as dry as possible - Keep all cleaning attributes at a separate dry space - Wash all non-disposable cleaning textile at 60° degrees Celsius immediately after use
Sink	- Prevent splashing of water, preferably by installing a covering drain top - Dry the sink and its surroundings after using, from outwards to inwards. Avoid contact of the drying towel with the drain - In case a rubber plug is used to close the sink, dry after each use. Clean the plug in the washing machine or dishwasher once a week, preferably at 60° degrees Celsius or higher
Shower	- Be aware that bacteria can easily grow in and around the drain - Dry the shower cabin after use, as it is more difficult for water-borne pathogens to grow in a dry environment - Thoroughly clean the shower once a week. All cleaning products should be washed at 60° degrees Celsius immediately after use - Consider the shower floor and sink as potentially contaminated. Avoid contact, including by towels and other cleaning attributes - Dry the LVAD attributes after exposure to water with disposable wipes or towels. If a non-disposable towel is used, use only clean and unused ones - The use of a non-slip shower mat is highly discouraged, as bacteria can easily attach and grow on the material. The use of non-slip footwear such as slippers is preferred. Clean the footwear in the washing machine or dishwasher once a week, preferably at 60° degrees Celsius or higher