Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Introduction: Perioperative anticoagulation in patients with heparin-induced thrombocytopenia (HIT) requiring cardiopulmonary bypass (CPB) presents a clinical challenge due to high risk of intravascular thrombosis. Alternative anticoagulants have been used but carry their own risks. We report the successful use of Cangrelor, a P2Y12 platelet receptor antagonist, with heparin during left ventricular assist device (LVAD) implantation.
Case Report: A 25-year-old female with dilated cardiomyopathy due to dermatomyositis and Turner's syndrome and left ventricular thrombus on apixaban, was admitted to our institution with worsening dyspnea. She had a left lower lobe segmental and subsegmental pulmonary embolus and was started on heparin infusion. Over a few days, her platelet count decreased from 278K to 8K and she developed a subclavian and internal jugular deep vein thrombosis. Given concern for HIT, she was switched to bivalirudin. Severe HIT was confirmed with an optical density of 2.8. She progressed into cardiogenic shock requiring inotrope and mechanical support. Given her hemodynamic deterioration, we proceeded with HeartMate II LVAD implant after thorough evaluation. In consultation with hematology, we utilized cangrelor and heparin to minimize platelet aggregation and thrombosis during CPB. Cangrelor has a favorable pharmacokinetic profile for use with heparin in HIT patients given its fast-onset, short half-life, and high-affinity causing aggregation. Intraoperatively, platelet reactivity units (PRUs) were measured to assess Cangrelor's activity and ensure P2Y12 antiplatelet effect with the appropriate scale. A cangrelor bolus and infusion were given before heparinization; PRU reduced from 326 to 103 (less than 208 indicates presence of antiplatelet effect). Systemic heparinization was then safely achieved with Cangrelor infusion being discontinued 10 minutes prior to heparin reversal with protamine. She was started on bivalirudin postoperatively and eventually transitioned to coumadin.
Summary: This case represents a novel approach of using cangrelor with heparin intraoperatively for a patient with confirmed HIT requiring urgent LVAD implantation. Cangrelor use with heparin offers a safe and effective option in surgeries requiring CPB while minimizing hematologic complications of thrombosis and bleeding.

(1309)

Less Invasive HeartMate 3 Left Ventricular Assist Device Implantation under Deep Hypothermic Circulatory Arrest for Severely Calcified Aorta

R. Rengarajan,[1] D. Enter,[2] D. Meyer,[2] A. Rafael,[2] and C. Guerrero.[1] [1]Cardiology, Baylor University Medical Center, Dallas, TX; and the [2]Cardiac Surgery, Baylor University Medical Center, Dallas, TX.

Introduction: Left ventricular assist devices (LVADs) such as the HeartMate 3 (HM3) are becoming more frequently implanted in those with end-stage heart failure. We present one such patient with prior sternotomies and severely calcified ascending aorta in whom we planned a less invasive LVAD implantation via redo hemi-sternotomy and left thoracotomy with short-term deep hypothermic circulatory arrest (DHCA) to avoid cross-clamping of the aorta.
Case Report: A 70 year old male with history of two prior cardiac surgeries and heart failure presented in cardiogenic shock requiring temporary mechanical support with Impella CP. He continued to require increasing doses of inotropes and pressors; therefore, he was approved for high risk LVAD placement. A preoperative 4D CT scan revealed severely calcified ascending aorta with only a small area of focal sparing.
First, a left anterior thoracotomy in the fifth intercostal space and redo upper hemi-sternotomy was performed. The LVAD outflow graft was positioned through the thoracotomy and brought up to the ascending aorta via the right pleural space, which was opened from the hemi-sternotomy. After initiation of cardiopulmonary bypass, the patient was cooled to 28˚C with selective antegrade cerebral perfusion via the right axillary artery and systemic perfusion was temporarily arrested. DHCA was achieved. The LVAD outflow graft was then anastomosed to the aorta after which circulation was restarted and the patient rewarmed. The HM3 LVAD was then implanted in the LV apex and the rest of the operation was completed successfully.
Summary: Placing an LVAD via thoracotomy has theoretical advantages over a median sternotomy. Surgical trauma is minimized leading to less postoperative bleeding, improved maintenance of the chest stability, earlier recovery, and less cost. Additionally, there might be a reduction in post-operative right heart failure since the pericardium remains intact. Data from the LATERAL study and ELEVATE registry support the safety of this approach. While data support the safety of DHCA in other aortic arch procedures, there are only two case reports of DHCA for LVAD implantation. Our unique case validates the safety of LVAD implantation via thoracotomy and highlights the use of preoperative CT as well as DHCA in placement of an LVAD in a patient with severely calcified ascending aorta.

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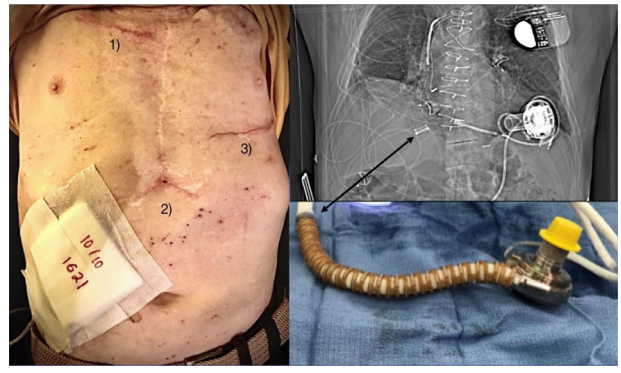
Three-Field LVAD Implantation Completely Avoids Dissection of the Heart in Patients with Previous Sternotomy

A.J. Sbrocchi,[1] B.A. Houston,[2] R.J. Tedford,[2] and L. Lozonschi.[3] [1]Department of Surgery, Division of Cardiothoracic Surgery, Medical University of South Carolina, Charleston, SC; [2]Department of Medicine, Division of Cardiology, Medical University of South Carolina, Charleston, SC; and the [3]Department of Surgery, Division of Cardiothoracic Surgery, University of South Florida, Tampa, FL.

Introduction: Less invasive techniques to implant a left ventricular assist device (LVAD) reduce perioperative complications, length of stay, right heart failure, and perhaps even mortality. In this case series we describe a novel three-field implant technique (3FIT) for LVAD for patients with previous sternotomies. This technique employs a left thoracotomy, a subxiphoid incision, and a right thoracotomy or upper ministernotomy. The outflow graft is tunneled from the left thoracotomy to the subxiphoid area and then subsequently to the aorta through the right pleural space. To avoid any possible compression of the outflow graft in the subxiphoid area, an additional bend relief is easily spliced with the original one (Figure).
Case Report: Five patients (4 with previous CABG and one with 3 prior sternotomies) underwent LVAD implantation via the 3FIT. The mean age was 55.4 ± 16.2 years and Heartmate II Risk Score (HMRS) was2.51 + 0.5 (high risk HMRS is > 2.48). Mean pre-operative eGFR was 46+ 14 mL/min. Mean right atrial pressure was 11 + 5 mmHg and pulmonary artery pulsatility index was 3.3+ 2.8. Mean cardiopulmonary bypass time was 142 + 38 minutes. Post-operatively, the mean time to extubation was 10.4 ± 7.5 hours, mean ICU length of stay was 8.6 ± 5.7 days, and mean length of stay was 20.8 ± 4.7 days. No patients had severe or severe-acute right heart failure (RHF) by INTERMACS criteria, and no patients required long term renal replacement therapy. One patient died 16 months post-operatively of chronic heart failure.
Summary: The 3FIT completely avoids dissection and mobilization of either ventricle in patients with prior sternotomies. This is particularly important in patients with poor RV function and patent coronary grafts. Coronary angiography to assess bypass grafts preoperatively is not necessary, especially if renal function is compromised. None of our patients had significant RHF or required long-term dialysis in this high risk group of patients with prior sternotomies.



(1311)

The First Reported Case of COVID-19 Myocarditis Managed with Biventricular Impella Support

J. Ruiz,[1] F. Kandah,[1] M. Ganji,[1] and R. Goswami.[2] [1]Cardiology, University of Florida-COM Jacksonville, Jacksonville, FL; and the [2]Cardiology, Mayo Clinic Hospital, Jacksonville, FL.

Introduction: SARS-CoV-2, responsible for COVID-19, is a pandemic that has taken the world by storm. We present the only contemporary reported case of COVID-19 myocarditis leading to recovery with utilization of biventricular impella for temporary mechanical circulatory support. No cases have been reported regarding utilization of Bi-V impella as therapy for management of SARS-CoV-2..

Case Report: We present a 35 year old-woman with history of systemic sclerosis who was found to have 5 days of generalized malaise associated with fevers and cough. On arrival she was found tachycardic at 112 bpm and febrile 101.8 F. She tested positive for COVID-19 via nasal CPR. Cardiac enzymes were found elevated on admission with troponin T elevated at 0.28. On day two of hospitalization patient had spontaneous PEA arrest secondary to hypoxemia. Transthoracic echocardiogram(TTE) revealed EF <10% and RV impairment which compare to prior which had normal ejection fraction. Labs showed elevated lactic acidosis of 10. Invasive hemodynamics assessment RA 21 mmHg, PA 32/23(mean 26 mmHg) and PCWP 18 mmHg. Calculated PAPi 0.76, CO 2.1 L/min and CI of 1.2 L/min/m^2. Decision was made to place right and left sided ventricular impellas for mechanical circulatory support. She was started on IVIG for COVID-19 myocarditis along with remdesivir and solumedrol. After two weeks of continuous temporary mechanical circulatory support (TMCS), patient hemodynamics improved and she was able to be weaned from her need for TMCS. Repeat echocardiogram demonstrated recovery and remodeling with an LVEF of 60% and no significant valvular disease. She was discharge home at day 23 with no neurological deficit.

Summary: The use of biventricular continuous microaxial flow devices during acute COVID-19 myocarditis is key to allow ventricular rest and optimal offloading without the increased risk of surgically placed TMCS such as Centrimag or VA or VV ECMO. With recent emergency use by the FDA, its wide adaptation remains sparse. Our case demonstrates a unique approach to management of COVID-19 myocarditis. It is the only reported case in the literature utilizing biventricular Impella devices for circulatory support without the concurrent use of ECMO. Due to the success in this patient, this promising approach warrants continued investigation in the management of COVID myocarditis and cardiogenic shock.

(1312)

Heart Mate II Deactivation Using a Left Atrial Appendage Occluder in the Outflow Cannula

A.B. Pereira,[1] D.S. Belfort,[2] B. Biselli,[1] P.H. Melo,[1] M.S. Ávila,[1] R.L. Hames,[1] S.I. Rizk,[1] B.S. Rangel,[1] V.B. Batista,[1] A.A. Abizaid,[1] R. Kalil Filho,[1] P.M. Fernandes,[1] F.S. Brito Junior,[1] and S.M. Ferreira.[1] [1]Cardiology, Hospital Sirio Libanes, Sao Paulo, Brazil; and the [2]Cardiology, Incor - Instituto do Coração do Hospital das Clínicas da FMUSP, Sao Paulo, Brazil.

Introduction: Reverse cardiac remodeling may occur in some LVAD recipients. Although considered the standard therapy, surgical device explantation with repeat sternotomy might be undesirable or very high risk. On the other hand, there are few data reporting minimally invasive percutaneous LVAD deactivation. We describe a case of a man with LVAD malfunction due to driveline fracture and LV function recovery who had a Heart Mate II deactivated with a percutaneous technique using a left atrial appendage occluder (LAAO) positioned inside the outflow cannula.

Case Report: A 48 yo male patient with previous diagnosis of dilated cardiomyopathy and HMII implanted in 2017 as bridge to transplant was admitted due to device malfunction and alarm triggering after coughing crisis. On admission, the pump was off probably due to driveline fracture, although the patient was asymptomatic and hemodynamically stable. An echocardiogram showed cardiac remodeling and ejection fraction improved from 29% to 69%. The heart team proposed to keep the pump off and to perform a minimally invasive outflow cannula occlusion. A cardiac CT was performed and according to the measured land zone, the LAAO device Lambre (Lifetech Scientific Corp., Shenzhen, China) 1824 mm was selected. Through a 5F sheath in the left common femoral artery, a pig-tail catheter was used to obtain an aortography. Through an 8F sheath in the right femoral artery, a 5F pig-tail catheter was placed inside the outflow cannula, then an Amplatz Super-Stiff (Boston Scientific, Marbourough, MA, US) 0.035''inch wire was advanced to the distal aspect of the graft. Using an over-the-wire technique, a 9F Lambre delivery sheath was positioned, and the Lambre 1824 mm device was released, occluding the outflow cannula from the anastomosis. A new aortography showed decreased flow to the graft. After the procedure, the patient was maintained on anticoagulation and persisted asymptomatic. Echocardiogram one week later showed no flow in the outflow graft. LV ejection fraction remained 60%. He is now in hospital discharge planning.

Summary: To the best of our knowledge this the first report of LVAD deactivation with the fully recapturable Lambre LAAO device. We propose that the use of a LAA occlude to obstruct HM II outflow cannula is feasible and safe.

(1313)

Cardiac Tamponade from Biodebris Accumulation in Long Term HVAD Support

D. Gumber,[1] B. Medalion,[2] M.C. Kontos,[1] C.R. Trankle,[1] Z.M. Gertz,[1] K.B. Shah,[1] and I. Tchoukina.[1] [1]Cardiology, Virginia Commonwealth University Pauley Heart Center, Richmond, VA; and the [2]Cardiology, Virginia Commonwealth University Cardiothoracic Surgery, Richmond, VA.

Introduction: As patients live longer on mechanical circulatory support (MCS), it is crucial to recognize long term device complications. We present a case of an unusual late complication after an HVAD implantation.

Case Report: A 51 year old female implanted with HVAD 6.5 years ago as a bridge to transplant presented with hypotension and UTI. She received IV fluids and antibiotics, and antihypertensive medications were held with clinical improvement. Surveillance RHC showed high filling pressures (RA 25 mmHg, Wedge 38 mmHg) and low cardiac index (1.8 mL/kg/m2). After diuresis, she developed acute hypotension, low flows and a pulsatility waveform consistent with suction for which device speed was decreased. Despite volume resuscitation she had PEA arrest requiring CPR and inotrope support. An echocardiogram showed near complete compression of the RA and RV by a fluid collection adjacent to the outflow tract. An emergent CT showed a $5.2 \times 8.4 \times 9.7$ cm fluid collection around the outflow graft, extending from the proximal conduit to the aortic anastomosis. There was mass effect causing effacement of the IVC-RA junction and compression of SVC consistent with tamponade. The outflow graft was patent without signs of compression. Due to concern for bleeding from the graft, the patient was taken to surgery. Intraoperatively, there was a large amount of gelatinous material within the Gore-Tex wrapping of the conduit and no bleeding. The biodebris was evacuated with immediate relief of cardiac compression. Gore-Tex membranes were removed, and the chest was closed. The patient recovered and is doing well.

Summary: We present the first case of biodebris within Gore-Tex outflow graft wrapping causing cardiac tamponade. Gore-Tex wrapping of MCS devices is used to facilitate future explanting but may cause accumulation of biodebris over time. The phenomenon was previously described with HeartMate devices owing to the design of the bend relief resulting in outflow graft compression, but is unusual for HVAD devices, and has not been reported to cause tamponade.