What's New in MCS

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Reviews:

JOURNAL OF CARDIAC FAILURE

Sintek MA, Gdowski M, Lindman BR, *et al.* **Intra-Aortic Balloon Counterpulsation in Patients with Chronic Heart Failure and Cardiogenic Shock: Clinical Response and Predictors of Stabilization**. *J Card Fail*. 2015;21(11):868-876.
http://www.ncbi.nlm.nih.gov/pubmed/26164215

Cardiogenic shock is a clinical problem with an increasing number of solutions. While more choices are sometimes better, it is not always clear which choice is best for a given patient. As additional percutaneous options become more widespread, the routine use of IABP as first line mechanical circulatory support (MCS) is under increasing scrutiny. The IABP-SHOCK II trial added significantly to the controversy by concluding that there is no benefit to the routine use of IABP in myocardial infarction with cardiogenic shock. Some heart failure specialists may be ready to throw in the towel for IABP.

In this single center review, Sintek *et al.* attempt to add clarity to the decision process. They reviewed all patients that received an IABP prior to LVAD at Barnes Jewish Hospital from 1998 to 2013. Of the 54 patients included in the study, 31 patients were deemed to have stabilized with IABP and 23 decompensated. While it is impossible to control for selection bias in a retrospective review, the baseline characteristics of the study group indicate a sick group of patients. The average patient was on a single inotrope before IABP, the average ejection fraction was 17%, and the average LV end-diastolic dimension was between 6.8 and 7.1 cm. Criteria for decompensation were stringent and included any of the following: 1. any additional MCS device, 2. any increase in vasopressor or inotrope requirement, 3. initiation of renal replacement therapy, 4. initiation of mechanical ventilation, 5. worsening ventricular arrhythmia, 6. persistently severe or worsening metabolic acidosis. In short, if there was any significant clinical worsening, then the patients fell into the decompensated category.

Segregating responders and non-responders to IABP, and examining a wide range of hemodynamic variables, allowed the authors to identify a few parameters associated with IABP success. These included RV cardiac power index (mean PA pressure x cardiac index/451), LV cardiac power index (mean arterial pressure x cardiac index/451), pulmonary arterial systolic pressure, RV stroke work index. Receiver operator curves were constructed for each variable and cut-points were established. If either RV or LV power indices were above the ROC cutpoint (RV = 0.13 W/m^2 and LV = 0.33 W/m^2), there was an 82% positive predictive value for stabilization. The authors hypothesize that LV and RV power index may reflect contractile reserve, an advantage that we realize by using the IABP to further reduce afterload.

Why is it important to determine if a patient will be an IABP responder? In this group, responders spent much less time intubated after LVAD (4 days *vs*. 20 days) and much less time in the ICU after LVAD (8

days *vs*. 25 days). In short, if we can identify the right patient, the IABP remains an invaluable member of the team.

JOURNAL OF THORACIC AND CARDIOVASCULAR SURGERY

Rajagopal K, Saha P, Mohammed I, *et al.* **Effects of Small Platform Catheter-based Left Ventricular Assist Device Support on Regional Myocardial Signal Transduction**. *J Thorac Cardiovasc Surg*. 2015;150(5):1332-1341.
http://www.ncbi.nlm.nih.gov/pubmed/26395041

This study is a follow-up to a previously published study by the Bartley Griffith group at the University of Maryland. In the study, the authors treated myocardial infarction in pigs with an Impella 5.0 device for 2 weeks. During this time, the Impella flow was set at about 2 lpm, or roughly half of the animals' total cardiac output. Animals were allowed to recover for an additional 10 weeks before sacrifice and tissue analysis. From the original cohort of animals, tissue from 3 control animals, 3 infarct animals, and 3 Infarct + Impella animals, was available for analysis of RNA and protein. Pathway analysis was performed with protein level corroboration, and animal results were correlated with strain data available from the earlier study.

Clinically, at 12 weeks, there was a significant reduction in diastolic strain in the LVAD treated group in the area adjacent to the infarct, but not in areas remote to the infarct. Not surprisingly, transcripts of heart failure associated genes like NPPA were also greater in territories adjacent the infarct if untreated with LVAD. The main finding of the study is that although LVAD support was largely associated with beneficial effects, there were some potentially negative effects as well. For example, there was less β-arrestin mediated signaling in the LVAD group, something that is normally believed to be cardioprotective. These findings have important implications for the development of coordinated medical and mechanical support strategies.

ASAIO JOURNAL

Boehme, AK, Pamboukian SV, Geroge JF, *et al.* **Predictors of Thromboembolic Events in Patients with Ventricular Assist Device**. *ASAIO J*. 2015;61(6):640-647.
http://www.ncbi.nlm.nih.gov/pubmed/26418204

With the controversy surrounding the REVIVE-IT trial, there is renewed emphasis on understanding and study of thrombosis in the LVAD population. In this article, the team at the University of Alabama reviewed their population and identified 23 out of 115 patients that had a primary thromboembolic event. Detailed examination of patient characteristics demonstrated that elevated LDH on the day of implant, increased LDH within the first month of implant, and eGFR <30 were all associated with increased risk of thromboembolism. Percent of time in target range INR (PTTR) >60% was protective against embolic events. Importantly, the $CHADS_2$ and CHA_2DS_2-VASC scores that are commonly used to estimate thrombosis risk in atrial fibrillation patients were not predictive. This study re-iterates caution in patients with poor renal function and adds to the growing evidence supporting tight INR control in the outpatient LVAD population.

Davis J, Sanford D, Schilling J, *et al.* **Systematic Review of Outcomes After Noncardiac Surgery in Patients with Implanted Left Ventricular Assist Devices**. *ASAIO J*. 2015;21(11):648-651.
http://www.ncbi.nlm.nih.gov/pubmed/26418202

Yost GL, Joseph CR, Tatooles AJ, Bhat G. **Neutrophil-to-Lymphocyte Ratio Predicts Outcomes in Patients Implanted with Left Ventricular Assist Devices**. *ASAIO J*. 2015;21(11): 664-669.

http://www.ncbi.nlm.nih.gov/pubmed/26181711

Brunet J, Valette X, Ivascau C, et *al.* **Extracorporeal Life Support for Refractory Cardiac Arrest or Shock: A 10-Year Study**. *ASAIO J*. 2015;21(11):676-681.
http://www.ncbi.nlm.nih.gov/pubmed/26366684

Shein SL, Maul TM, Li H, Kurland G. Surfactant **Administration During Pediatric Extracorporeal Membrane Oxygenation**. *ASAIO J*. 2015;21(11):682-687.
http://www.ncbi.nlm.nih.gov/pubmed/26181713

Miller JR, Epstein DJ, Henn MC, *et al.* **Early Biventricular Assist Device Use in Children: A Single-Center Review of 31 Patients**. *ASAIO J*. 2015;21(11): 688-694.
http://www.ncbi.nlm.nih.gov/pubmed/26186261

CIRCULATION HEART FAILURE
No MCS articles in November

EUROPEAN JOURNAL OF HEART FAILURE
No MCS articles in November

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
No MCS articles in November