What's New in MCS

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Van-Khue Ton, MD, PhD
Advanced Heart Failure, Ventricular Assist Device, Heart Transplant
University of Maryland School of Medicine
Baltimore, MD, USA
Tonkhue@gmail.com

Reviews:

The July 2017 issues of Circulation, Journal of Heart and Lung Transplantation and European Journal of Heart Failure continue to highlight right ventricular (RV) failure as a vexing complication of left ventricular assist device (LVAD) implantation. Meanwhile, 2-year results of the Risk Assessment and Comparative Effectiveness of Left Ventricular Assist Device and Medical Management in Ambulatory Heart Failure Patients (ROADMAP) trial, published in JACC – Heart Failure, provided important risk-benefit information that clinicians can use to aide decision-making on timing of LVAD implant. Finally, the National Heart, Lung, and Blood Institute (NHLBI) held a Working Group of experts to discuss strategies aimed at advancing the field of myocardial recovery with LVAD support – these strategies were summarized in the Journal of Thoracic and Cardiovascular Surgery. Of note, a study published in Journal of the American College of Cardiology (JACC) put doubt in the prospect of myocardial recovery by examining persistence of fibrosis in myocardial tissues after LVAD explantation.

RV failure after LVAD implantation – reviews and meta-analysis

RV dysfunction is a major cause of morbidity and mortality in patients with LVAD implant. Despite the development of numerous risk scores and calculations, our ability to predict RV failure remains poor. Houston BA and colleagues, in a review, deftly summarized the possible mechanisms of RV failure in the presence of LVAD.[1] They suggested that impaired RV contractility before, during, and after LVAD implantation, may be the main cause of RV dysfunction. In fact, if RV contractility is compromised intra-operatively, or ongoing post-operatively, no risk score, derived from pre-operative conditions, would be able to accurately predict post-operative RV failure.

Bellavia D and colleagues performed a meta-analysis of RV failure risk factors from 36 observational studies of 4428 patients.[2] RV failure prevalence post LVAD implant was 35%, though the authors employed a more liberal set of criteria for RV failure by including persistent RV stroke work index (RVSWI) < 4 g/m^2, in addition to need for inotrope > 14 days, need for inhaled NO > 48 hours, and need for mechanical RV support. This meta-analysis included studies with a small number of pulsatile LVADs. Regardless, the findings were not too surprising. Pre-operative predictors of post-operative RV failure included: mechanical ventilation, continuous renal replacement therapy, high CVP, low RVSWI, and moderate-severe RV dysfunction by echocardiogram.

A noteworthy review of acute mechanical RV support devices such as the Protek Duo cannula and Impella RP came from Kapur NK and colleagues.[3]

The ROADMAP trial – Is early LVAD implant the road less traveled?

The initial 1-year results of ROADMAP were published in 2015. The study showed that LVAD implantation in non-inotrope-dependent patients had similar intention-to-treat survival to optimal

medical therapy (OMM), at the expense of adverse events. The 2-year results were published in JACC – Heart Failure in July 2017, again showing no difference in intention-to-treat survival.[4] Of those on OMM, 22% crossed over and received LVAD implant, about half of whom became inotrope-dependent at the time of LVAD surgery. Perhaps the most important take-home message from ROADMAP is that there is no mortality "penalty" for delaying LVAD implant while patients are on OMM, provided that they are followed closely, and referred in a timely manner for LVAD. In patients with INTERMACS profiles > 3 (*i.e.* non-inotrope-dependent), LVAD implant may be considered early if their quality of life is poor, though this decision must be carefully weighed against the frequent hospitalizations and adverse events as shown in ROADMAP.

Is myocardial recovery the unicorn of LVAD kingdom?

Myocardial recovery has been somewhat of a "holy grail" in the field of congestive heart failure (CHF). Much research effort is spent investigating the structural, genetic and molecular bases of myocardial recovery in the context of neurohormonal blockade, stem cell therapy, and medical devices. The rate of myocardial recovery in LVAD-supported patients appears highly variable, from ~ 1% to as high as 70%, depending on patient populations and CHF etiologies. Farris SD and colleagues from University of Washington showed that, in a contemporary cohort of patients with continuous-flow LVAD, despite robust myocardial unloading, myocardial fibrosis and capillary density remain unchanged.[5] This is consistent with prior studies showing persistent CHF-specific molecular and genetic signatures despite LVAD support. Perhaps complete myocardial recovery is more of a myth than reality? No one knows, as much research is still needed to shed light on the molecular basis of myocardial recovery.

See the specific recommendations for research questions proposed by the Myocardial Recovery Working Group to the NHLBI in order to address the knowledge gap in understanding myocardial recovery.[6]

There are no MCS-related papers in July issues of the rest of the journals.

References:

1. Houston BA, Shah KB, Mehra MR, Tedford RJ. A new "twist" on right heart failure with left ventricular assist systems. J Heart Lung Transplant 2017;36:701-7.

2. Bellavia D, Iacovoni A, Scardulla C, et al. Prediction of right ventricular failure after ventricular assist device implant: systematic review and meta-analysis of observational studies. European journal of heart failure 2017;19:926-46.

3. Kapur NK, Esposito ML, Bader Y, et al. Mechanical Circulatory Support Devices for Acute Right Ventricular Failure. Circulation 2017;136:314-26.

4. Starling RC, Estep JD, Horstmanshof DA, et al. Risk Assessment and Comparative Effectiveness of Left Ventricular Assist Device and Medical Management in Ambulatory Heart Failure Patients: The ROADMAP Study 2-Year Results. JACC Heart Fail 2017;5:518-27.

5. Farris SD, Don C, Helterline D, et al. Cell-Specific Pathways Supporting Persistent Fibrosis in Heart Failure. J Am Coll Cardiol 2017;70:344-54.

6. Drakos SG, Pagani FD, Lundberg MS, Baldwin TJ. Advancing the science of myocardial recovery with mechanical circulatory support: A Working Group of the National, Heart, Lung, and Blood Institute. J Thorac Cardiovasc Surg 2017;154:165-70.