What's New in MCS

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Case series using the ROTAFLOW system as a temporary right ventricular assist device after HeartMate II implantation, Khani-Hanjani, *et al, ASAIO July/August 2013*

In this manuscript, the authors report on the use of a Maquet Rotaflow pump for temporary mechanical circulatory support of the right ventricle after implantation of a Heartmate II (HM2) LVAD. The Rotaflow pump is a centrifugal pump design with a single-point bearing which allows for laminar flow with low heat generation. This pump is commonly used as part of a cardiopulmonary bypass or ECMO circuit due to its reliability and low cost.

The authors report their methodology of implanting the Rotaflow pump as RVAD support during HM2 insertion, as well as their technique for weaning and explant. Overall, the authors report 91.7% survival to discharge for patients who required temporary RVAD support.

In addition, the authors briefly review five methods for evaluating the risk of right ventricular dysfunction after HM2 implantation, and suggest that the model presented by Drakos (2010) is most predictive. Futhermore, this manuscript is significant because it adds to the current body of evidence for the use of newer-generation, short-term mechanical circulatory support for the right ventricle.

Pump Flow Estimation From Pressure Head and Power Uptake for the HeartAssist5, HeartMate II, and HeartWare VADs, Pennings, *et al, ASAIO July/August 2013*

In this manuscript, Pennings *et al* use pump flow models to estimate LVAD flow using power requirements only and pressure difference across the LVAD. They report on the accuracy of each model for the HeartAssist5, HeartMate II, and HeartWare LVADs, and compare them to the flow reported by the pump controller. The methodology involved a loop filled with porcine blood and the ability to measure inlet and outlet pressures, adjust afterload, and measure flow directly.

The authors developed mathematical models for estimation of LVAD flow for each pump and apply these equations to measured flow rates for each pump under different power, speed, and pressure gradients. They conclude that the HeartWare centrifugal pump, due to it's linear power/flow relationship, provides accurate flow estimation using a model based on power only. (They did note that the controller-reported flow was lower than experimentally-measured flow). The centrifugal pumps, HeartAssist5 and HeartMate II, under-estimate LVAD flow due to a non-linear relationship between power and flow at low flow rates. Estimation of pump flow using a model based on pressure gradients was accurate for all three LVADs.

This manuscript is significant for the detailed methodology used to estimate LVAD flow rates. For centrifugal pumps (HW), estimation of flow rates from power usage is accurate throughout the clinical flow range. However, axial flow pumps (HM2 and HA5) report higher than actual flow at low flow rates, which can be critical during attempts at weaning LVAD support, or during unanticipated low-flow conditions, such as pump thrombosis. This report provides a potential alternative method for accurate flow estimation in a future generation of LVADs.

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