

What's New in MCS

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Reviews:

The Journal for Heart and Lung Transplantation

Short-term mechanical circulatory support for recovery from acute right ventricular failure: Clinical outcomes

Cheung AW, White CW, Davis MK, et al. The Journal of Heart and Lung Transplantation. Volume 33, Issue 8, Pages 794–799, August 2014

Acute right ventricular failure refractory to optimal medical management is both a well known and feared clinical diagnosis due to its grave prognosis.

This study included a retrospective cohort study examining the clinical outcomes of consecutive patients supported with the Impella Right Direct (RD) or Right Peripheral (RP) at 2 institutions during a 6-year period. In this study, 18 patients received right ventricular (RV) mechanical circulatory support, 15 with the Impella RD and 3 with the Impella RP. Before RV MCS, all patients required intravenous inotropes, 7 (39%) required inhaled nitric oxide, 7 (39%) required intra-aortic balloon counterpulsation, and 2 (11%) had experienced a cardiac arrest. Device implantation resulted in an improvement in cardiac index and reduced central venous pressure. Fourteen (78%) patients recovered sufficient RV function to facilitate device explantation after 7 days (range, 2–19 days) of support, and 4 (22%) patients died on support after 6 days (range 1–11 days). Survival to 30 days was 72% and to 1 year was 50%. At 1-year follow-up, only 1 patient demonstrated severe RV dysfunction on echocardiography.

Conclusions:

Most patients with acute right ventricular failure rapidly recover sufficient RV function to facilitate device explantation, highlighting an expanding role for minimally invasive temporary RV assist devices optimized for the treatment of recoverable acute right ventricular failure.

Early elevations in pump power with the HeartMate II left ventricular assist device do not predict late adverse events.

Salerno CT, Sundareswaran KS, Schleeter TP, et al. The Journal of Heart and Lung Transplantation. Volume 33, Issue 8, Pages 809–815, August 2014

The aim of this study was to evaluate the prevalence of early pump power elevation events in patients with the HeartMate II (HMII) and its impact on subsequent development of stroke and pump thrombosis.

This study analyzed measurements of pump power and pump speed measured during the initial hospitalization period and follow-up from 138 consecutive patients implanted with a HMII between January 2009 and December 2012. An early power elevation (PEL) event was defined as power ≥ 10 W within the first 14 post-operative days. Patients were divided into two groups: those with an early PEL event and those without (NP).

Median follow-up duration was 316 (range 2 to 1,264) days. Twenty-seven (20%) patients had early PEL events that lasted for a total duration of 4 (range 1 to 77) hours per patient. Pump speed averaged 9,400 rpm in both groups. There was no difference between the two groups noted at first follow-up (6.6 [5.9 to 8.7] W vs 6.7 [5.5 to 7.7] W, $p = 0.940$). No differences in the prevalence of hemorrhagic stroke (4% vs 3%, $p = 0.56$), ischemic stroke (0% vs 4%, $p = 0.41$), hemolysis (7% vs 5%, $p = 0.32$), pump thrombosis (7% vs 4%, $p = 0.21$) or survival (76% at 1 year in both groups) were found between the two groups.

Conclusions:

The authors conclude that in this single-center experience, PEL events that occurred early all resolved by discharge. The authors did not find a relationship between early PEL events and subsequent development of pump thrombosis, hemorrhagic stroke or ischemic stroke.

Pump size of Berlin Heart EXCOR pediatric device influences clinical outcome in children

Miea O, Schmitt KRL, Delmo-Walter E, et al. The Journal of Heart and Lung Transplantation. Volume 33, Issue 8, Pages 816–821, August 2014

This study performed in a pediatric cohort aimed to evaluate whether the Berlin Heart (BH) EXCOR device pump size in relation to body surface area (BSA) had an impact on clinical outcome.

This was a retrospective study and children requiring implantation of a BH between 2000 and 2013 were included. Patients were categorized into three groups according to BH stroke volume per BSA: optimal (30 to 50 ml/m²); small (<30 ml/m²); and large (>50 ml/m²). Eighty children (median age 2.2 years, median BSA 0.50 m²) underwent BH implantation. Fifty-five (69%) children had an optimally sized pump implanted, whereas 8 children (10%) had small pump and 17 (21%) large pump implantation. Overall survival rate was 69%. Weaning was possible in 15 children (19%), and 39 children (49%) were transplanted. Mortality, myocardial recovery and transplantation were not related to age, BSA or pump size. Thromboembolic events occurred significantly more frequently in children treated with large pumps.

Conclusions:

The broad range of body sizes in children from newborns to adolescents requires a wide choice of appropriately sized devices. Large pump size in relation to BSA is an independent risk factor for occurrence of thromboembolic events.

Psychosocial assessment of candidates and risk classification of patients considered for durable mechanical circulatory support

Maltby MC, Flattery MP, Burns B et al. The Journal of Heart and Lung Transplantation. Volume 33, Issue 8, Pages 836–841, August 2014

This study examined the efficacy of the psychosocial assessment of candidates for transplantation (PACT) to assess psychosocial outcomes in LVAD patients.

This was a retrospective study in which patients who received LVAD implants between June 2006 and April 2011 were reviewed and PACT was applied to this cohort. Forty-eight patients (72% men, 44% non-white, 50.4 years old) were divided into high-scoring and low-scoring groups. Nine patients with low PACT scores were falsely categorized as high-risk, whereas 4 with high scores had poor social outcomes. The score had a high positive-predictive value (0.86) but low negative-predictive value (0.31). The PACT was revised (modified [m]PACT) to measure indicators, such as social support and understanding of care requirements, identified to more closely affect LVAD outcome. The mPACT exhibited improved accuracy. The percentage of patients incorrectly classified for social risk decreased from 27% with the PACT to 8% with the mPACT. Patients with higher mPACT scores had decreased 30-day readmission rates (26% vs 67%, $p = 0.045$) after device implantation.

Conclusions:

By emphasizing social support, psychologic health, lifestyle factors, and device understanding, the mPACT showed improved performance in risk-stratifying candidates for LVAD therapy. The authors recommend prospective validation of their assessment scoring system.

A minimally invasive off-pump implantation technique for continuous-flow left ventricular assist devices: Early experience

Strueber M, Meyer AL, Feussner M, et al. The Journal of Heart and Lung Transplantation. Volume 33, Issue 8, Pages 851–856, August 2014

The authors report their experience in implantation of HeartWare (HeartWare International, Inc. Framingham, MA) ventricular assist device (HVAD) via off-pump via thoracotomy.

A total of 26 patients were included in this review. All patients were Interagency Registry for Mechanically Assisted Circulatory Support categories 2 or 3 and underwent implantation of an HVAD as an elective procedure via thoracotomy and mini sternotomy approach. Implantation

was performed without the use of cardiopulmonary bypass, but 1 patient did require conversion to on-pump surgery. There were no perioperative deaths or right heart failure events. The mean intensive care unit stay was 1.5 days. Transfusions of 1 to 3 units of packed red blood cells were required in 16 patients, whereas 10 patients maintained a stable perioperative hematocrit of at least 30% and did not require transfusion. Survival through 90 days was 100%, and survival through 180 days was 87%.

Conclusions:

The authors experience was favorable in respect to outcome, safety, and use of blood products. The authors suggest that their technique can be used as an alternative approach for left ventricular assist device implantation using the HVAD.

Circulation

None

JACC Heart Failure

Body Position and Activity, But Not Heart Rate, Affect Pump Flows in Patients With Continuous-Flow Left Ventricular Assist Devices

Muthiah K, Guota S, Otton J et al. *JCHF*. 2014;2(4):323-330. doi:10.1016/j.jchf.2014.02.008

The aim of this study was to determine the contribution of pre-load and heart rate to pump flow in patients implanted with continuous-flow left ventricular assist devices (cfLVADs). The device evaluated in this study was HeartWare HVAD (HeartWare International, Inc. Framingham, MA).

Two studies were performed in the patient cohort. In 11 patients, paced heart rate was increased to approximately 40 beats/min above baseline and then down to approximately 30 beats/min below baseline pacing rate (in pacemaker-dependent patients). Ten patients underwent tilt-table testing at 30°, 60°, and 80° passive head-up tilt for 3 min and then for a further 3 min after ankle flexion exercise. This regimen was repeated at 20° passive head-down tilt. Heart rate alteration by pacing did not affect LVAD flows or LV dimensions. LVAD pump flow decreased from baseline 4.9 ± 0.6 l/min to approximately 4.5 ± 0.5 l/min at each level of head-up tilt ($p < 0.0001$ analysis of variance). With active ankle flexion, LVAD flow returned to baseline. There was no significant change in flow with a 20° head-down tilt with or without ankle flexion exercise. There were no suction events.

Conclusions:

The authors conclude that centrifugal cfLVAD flows are not significantly affected by changes in heart rate, but change significantly with body position and passive filling.

Journal of cardiac surgery

None

Annals of Thoracic Surgery

Lessons Learned From the First Fully Magnetically Levitated Centrifugal LVAD Trial in the United States: The DuraHeart Trial.

Moazami N, Steffen RJ, Naka Y et al. for the SUSTAIN Investigators. The Annals of Thoracic Surgery. Volume 98, Issue 2, Pages 541–547, August 2014

The US SUSTAIN trial was a multicenter, prospective, single-arm observational study in advanced heart failure patients listed for transplantation. Patients were followed for a total of 6 months. The DuraHeart is a continuous centrifugal-flow left ventricular assist device that uses active magnetic levitation for impeller positioning designed for improved hemocompatibility and durability.

Sixty-three patients were enrolled at 23 centers. Forty-six patients (73%) reached the primary end points of survival to transplantation, alive on the original device at 180 days and listed for transplantation, or explant for recovery. Median duration of support was 267 days (range, 10 to 952 days) with a total support time of 46 patient-years. There was no clinical hemolysis reported during the study. There were no cases of pump thrombosis reported, and 3 cases of pump thrombus “in transit” (0.06 events/patient-year) were observed. There were 6 (10%) cases of magnetic levitation system failure, all secondary to cable wire fractures (0.12 events/patient-year). All patients were hemodynamically stable with the backup hydrodynamic mode. Major adverse events included gastrointestinal bleeding (0.52 events/patient-year), ischemic and hemorrhagic strokes (0.17 events/patient-year and 0.09 events/patient-year, respectively), and driveline infections (0.67 events/patient-year).

Conclusions:

The authors conclude based on the results that the DuraHeart demonstrated good hemocompatibility. They however suggest that the reliability of full magnetic levitation systems deserves higher priority in future pump designs.

European Heart Journal

None