



Xray of patient with driveline looped inside abdominal pocket to ensure a silicone interface with skin at the driveline exit site.

Infection rates between velour versus silicone at the driveline exit site[†]

The driveline material exposed next to the skin at the exit site may influence the risk of infection. Researchers studied the data of 23 Heartmate II patients, 16 with velour material at the exit site and 7 with silicone. The silicone group incorporated the driveline into the skin much quicker than the velour group (70 versus 145 days.) In addition, no patients within the silicone group developed a driveline site infection during the time period studied, while 28 percent of patients in the velour group did. Surgeons have begun looping the driveline inside the body so that the silicone portion of the driveline is in contact with the skin.

Driveline exit site dressing technique improves infection rates*

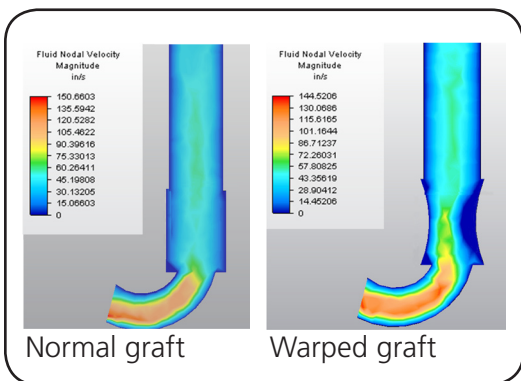
A major concern for LVAD patients is keeping the driveline site free from infection. To address this issue, nurses at the Utah Artificial Heart Program implemented a new foam dressing technique. When compared with national data from the HeartMate II clinical trial, patients at our center who used the new dressing technique for the entire length of treatment had significantly fewer infections than patients in the national trial who did not use this technique.

Development of new mock heart model*

UAHP engineers have developed an innovative new model to better understand how blood flows through the HeartMate II device once implanted. The model includes an artificial ventricle, heart valves, and a HeartMate II device. It uses air pressure and a simulator to imitate changes in heart beat and blood pressure. Engineers were also able to simulate other factors that affect blood flow, such as resistance.

Fluid flow analysis of a common inflow graft warping problem in HeartMate II LVAD*

Inflow graft pre-treatment of the HeartMate II LVAD with a polymer sealant is common practice to help mitigate bleeding. However, due to the expansive properties of the sealant, adverse warping of the graft may occur. Inflow graft models were created using the dimensions from a normal inflow graft and an explanted inflow graft, showing warping. Computational fluid flow analyses were then generated for each model to graphically show blood flow through each inflow graft and compare the turbulent versus non-turbulent flow. Higher turbulent flow was seen through the compressed portion of the warped inflow graft. Whether this novel finding is of any pertinence clinically is currently under in-vivo study.



HeartMate II use inside hyperbaric chamber*

Hyperbaric oxygen treatment is used to treat a variety of conditions, such as decompression sickness, carbon monoxide poisoning, and skin grafts. As the number of LVAD patients increases, the likelihood of a

patient needing hyperbaric oxygen treatment also increases. UAHP engineers tested a HeartMate II model inside a hyperbaric chamber and determined that pressures up to three times of the normal atmosphere did not affect the proper operation of the HeartMate II device.

Analysis of LVAD patients with sleep disordered breathing*

Sleep-disordered breathing is very common in patients with heart failure. This condition is typically treated with oxygen therapy. Our team analyzed the data of 23 HeartMate II patients diagnosed with sleep disordered breathing both before and after LVAD implantation to determine if the LVAD can improve this sleep disorder. We found that LVAD therapy alone does not offer a significant benefit over oxygen therapy in treating sleep disordered breathing. However, LVAD patients who also used oxygen therapy showed improvements over pre-LVAD sleep data.

Thromboelastography (TEG): An evaluation of its correlation with Activated Partial Thromboplastin Time (aPTT) in patients implanted with a Total Artificial Heart*

TEG analysis is a simple whole-blood clotting test which provides a comprehensive view of various phases of coagulation. In conjunction with aPTT, TEG has traditionally been used as a guide when optimizing anticoagulation in patients implanted with a Total Artificial Heart. With the variability which is common in TEG analysis and the lack of variance shown in aPTT levels, the goal of this study was to examine the correlation between TEG and aPTT. No correlation was seen between simultaneous TEG analysis and aPTT, with the TEG values exhibiting large amounts of variability. While independently, both aPTT and TEG may provide a good assessment of anticoagulation, their individual measured values are not interchangeable. These new findings may be helpful for providers caring for patients with a Total Artificial Heart.

Is high-dose vasopressor (HDV) use associated with increased risk of renal failure after LVAD implant?*

Immediate post-implant management of LVAD patients remains challenging and lacks standard guidelines for best care. Researchers examined whether HDV is associated with post LVAD implant renal failure. The Utah Artificial Heart database was queried to select 165 LVAD patients from 1995-2009 with post-implant renal failure, defined as a $\geq 50\%$ increase in creatinine or requirement for hemodialysis. High dose epinephrine ($>.05$), norepinephrine ($>.05$), and phenylephrine ($3\mu\text{g}/\text{min}$) were found to be associated with increased

renal failure post-LVAD, while milrinone ($>.4$) use is protective. This association does not prove a cause-and-effect relationship but a cautionary message against widespread use of some HDVs in the intensive care setting after LVAD implantation.

Pre-implant characteristics predict death in post-Levitronix CentriMag® temporary VAD*

The Utah Artificial Heart database was queried for 105 patients implanted with the CentriMag® temporary VAD. A retrospective analysis was performed collecting clinically relevant pre-implant data to predict death before hospital discharge and at 30 days. Data was analyzed using logistic regression to determine the significance of each of 18 variables, such as age, gender, and length of support. Single VADs had significantly longer support duration as compared to BiVADs and CPS; however, CPS had greater odds of death before discharge as compared to a single VAD or BiVADs.

The versatility and outcomes for patients with TandemHeart® percutaneous ventricular assist device support†

The TandemHeart® temporary ventricular assist device (TVAD) has traditionally been used as support for patients undergoing high risk cardiovascular interventions and experiencing cardiogenic shock. 48 patients were retrospectively analyzed for cardiovascular interventions: percutaneous coronary intervention, ventricular tachycardia, ablations, and circulatory support only. Clinical presentation data which includes elective PCI, cardiogenic shock, AMI without cardiogenic shock, and VT was compiled. Survival at discharge, one month, six months, and one year was performed. Researchers found TVAD support allowed for improved survival in a population of patients with excessively high expected mortality and proved reliable and effective in a variety of clinical situations.

* *ASAIO Journal*. March/April 2011; 57(2)

† *J Heart Lung Transplant*. April 2011; 30(4S)

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