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Reviews:

Identification and Management of Pump Thrombus in the Heartware Left Ventricular Assist Device System: A Novel Approach Using Log File Analysis. Jorde, et al. *JACC Heart Fail.* 2015;3(11):849-856. <http://www.ncbi.nlm.nih.gov/pubmed/26454842>.

The diagnosis of LVAD thrombosis can be very challenging and utilizes clinical and diagnostic means including signs of hemodynamic compromise, elevated lactate dehydrogenase levels, and imaging modalities such as echocardiography and CT scans. Jorde, et al. analysed the log files available from the bedside monitor of Heartware (HVAD) patients to devise a tool to assist in the diagnosis and management of device thrombosis. This is the first study of its kind documenting that the log files can be useful not only in the diagnosis but also in the monitoring of thrombus treatment with tissue plasminogen activator (tPA) and device exchange.

This was a retrospective study in which the log files of 15 patients with Heartware devices and pump thrombus events enrolled in the ADVANCE bridge to transplantation trial also treated at least once with tPA were analyzed. The beginning of the thrombus event was defined as the time when the power had a 3 standard deviation difference from the baseline power for at least 1.5 hours. The difference between the time of treatment and beginning of the thrombus event was defined as the "time until treatment". Several measures of power including maximum power reached during the thrombus event, change in power, and "percent of expected power" were analyzed in the study. The latter was based on the expected value of power consumption based on the motor speed setting of the HVAD pump. The 15 patients in this study had a total of 16 events of pump thrombus and an algorithm was derived to detect thresholds for growth rate of power and percent of expected power in the study. A validation cohort was used to validate the algorithm which included 53 thrombus events in 43 patients with device thrombus.

Cognitive function and left ventricular assist device implantation. Bhat, et al. *J Heart Lung Transplant.* 2015; 34(11):1398-1405. <http://www.ncbi.nlm.nih.gov/pubmed/26169667>.

Cognitive impairment is frequently impaired in patients with heart failure. The Montreal Cognitive Assessment (MoCA) is a simple screening tool that has been validated in neurologic and cardiovascular conditions. The authors used the MoCA to assess the extent of cognitive impairment in patients with advanced heart failure (HF) and re-evaluated them 8 months after left ventricular assist device (LVAD) implantation.

In this study, 176 patients with advanced HF were administered the MoCA and 56 patients had repeat testing 8 months after LVAD implantation. At baseline, 67% of patients had mild cognitive impairment (MCI) indicated by a MoCA score of <26 out of 30. Factors associated with increased risk of MCI in advanced HF patients included older age, higher CHADS3 risk scores, history of prior stroke and hypertension, and interestingly reduced serum cholesterol levels and statin use. After 8 months, in the

56 patients who had follow up MoCA testing after LVAD implantation, there was significant improvement in the total MoCA score especially in the visuospatial, executive, and delayed recall cognitive domains. This study found the MoCA to be a very useful tool in assessing mild cognitive impairment in advanced HF patients and should be considered for use. MCI was present in a large proportion (67%) of these patients and improved after LVAD implantation likely due to improved cardiac output.

Inhibition of ADAMTS-13 by Doxycycline reduces von Willebrand Factor degradation during supraphysiological shear stress: Therapeutic implication for left ventricular assist device-associate bleeding. Bartoli *et al.* *JACC Heart Fail.* 2015;3(11):860-869.
<http://www.ncbi.nlm.nih.gov/pubmed/26454844>.

Bleeding complications are not uncommon in patients with left ventricular assist devices. Due to the increased shear stress of continuous flow-LVADs, there is disintegration of von Willebrand factor (vWF) by ADAMTS-13 or the vWF protease. This acquired vWF deficiency leads to bleeding complications especially bleeding in the gastrointestinal tract. Doxycycline is an inexpensive drug which is known to be an inhibitor of ADAMTS-13. The effect of this drug on ADAMTS-13 was studied in an ex vivo model.

In the study, the effect of doxycycline was assessed on plasma ADAMTS-13 activity and purified recombinant ADAMTS-13 protein at baseline using enzyme-linked immunosorbent assay (ELISA), and was found to be significantly reduced. The authors then developed an ex vivo model to simulate LVAD-like supraphysiologic shear stress by exposing samples to a laboratory vortex mixer to generate a shear stress of 175 dyne/cm² which is approximately an order of magnitude greater than physiologic values. This was the first time that this model was described, which will hopefully help advance the field in the future by enabling further studies in this arena. After plasma ADAMTS-13 protein was exposed to shear stress, there was a similar pattern of vWF degradation observed as reported previously for LVAD patients, with a significant reduction in vWF:collagen binding activity. Subsequent application of Doxycycline significantly restored the vWF:collagen binding activity after the shear stress was applied, and this was accompanied by decrease in the plasma and recombinant ADAMTS-13 activity.

In conclusion, inhibiting ADAMTS-13 may be a novel, inexpensive mechanism to decrease vWF degradation and improve vWF function during supraphysiological shear stress without hyperactivating platelets. Further studies are needed to characterize the use of doxycycline in vivo in this context as a clinical target to reduce bleeding complications in VAD patients.

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No mechanical circulatory support device articles in November 2015

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