

# Publication Brief

## Beneficial Aspects of Real Time Flow Measurements for the Management of Acute Right Ventricular Heart Failure Following Continuous Flow Ventricular Assist Device (VAD) Implantation

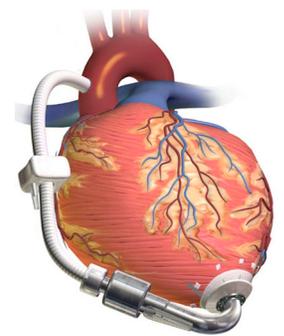


Fig. 1: Flowprobe on outflow cannula of HeartAssist 5 LVAD.

### INTRODUCTION

Optimal management of acute right heart failure, a common complication following implantation of an VAD for left ventricular circulatory support, requires a reliable estimation of left ventricular preload and contractility. This is possible with real-time pump blood flow measurements from a Transonic® ultrasonic Flowprobe on the outflow cannula of the VAD (Fig. 1).

### BACKGROUND & DIAGNOSIS

A 66-year-old female presented with end-stage heart failure due to dilated cardiomyopathy. Symptoms included severe left ventricular function impairment (EF 10%); right ventricular dysfunction, systolic pulmonary arterial pressure, 48 mmHg, and Cardiac Index, 1.92 L/min/m<sup>2</sup>. After four days of milrinone intravenous therapy, the patient was implanted with a HeartAssist 5 (Micromed Cardiovascular Inc. Houston, TX) with a custom Transonic® Flowprobe on the outflow graft to continuously measure real-time pump blood flow. Edema and severe fluid retention prevented complete closure of the thorax. On days one and two post-op, mean flow, accompanied by a pulsatile waveform, was 4.8 L/min.

On day three post-op, real-time flow began a progressive decline and loss of pulsatility accompanied by an increase in central venous pressure and progressive renal failure. Thermodilution measurements and echocardiography confirmed acute right heart failure.

### TREATMENT

On day ten post-op, the patient was placed on VA extracorporeal membrane oxygenation (ECMO). The ECMO circuit included a CentriMag pump with a "Transonic Inside" flow board and a H9XLA Flowsensor. Real-time flow and pulsatility recovered immediately and the ECMO circuit was disconnected on day 14 post-op. On day 17 post-op, the thorax was closed. Further recovery was uneventful.

### CONCLUSION

By enabling the monitoring of the left ventricular preload and contractility throughout the post-operative period, Transonic® real-time flow measurement proved to be a useful tool both for the diagnosis and the management of right heart failure, including weaning from ECMO. It was a reliable alternative to conventional techniques for the measurement of cardiac output in the clinical setting.

- Thermodilution measurements validated Transonic® real-time flow measurements.
- The loss of flow pulsatility foreshadowed insufficient LV preload, which allowed earlier intervention.
- Other currently available continuous flow VADs can only estimate pump blood flow by calculating the motor's power consumption and the pump's rotational speed which is subject to external factors such as blood viscosity and loading of the ventricle.

### TRANSONIC TAKE HOME

A powerful testament of the value of flow measurements during ventricular life support.

### REFERENCE

Spiliopoulos S, Guerso D, Koerfer R, Tenderich G, "Beneficial aspects of real time flow measurements for the management of acute right ventricular heart failure following continuous flow ventricular assist device implantation," J Cardiothorac Surg. 2012; 7:119. (Transonic Reference # 9760AH)