

## Intraoperative Use of the ImaCor TEE Probe in Orthotopic Liver Transplantation\*

Steven Sheils MD, David Corbett MD, Luc Frenette MD  
Department of Anesthesiology, University of Alabama at Birmingham,  
Birmingham, AL 35249-6810

### Introduction

Hemodynamic instability secondary to volume fluctuations during orthotopic liver transplantation (OLT) influences outcome<sup>1</sup>. Intraoperative estimates of preload are required to guide volume management. Central venous pressure (CVP) is used although it does not accurately reflect preload. Transesophageal echocardiography (TEE) used in OLT can provide estimation of cardiac filling. Barriers to its use include cost, availability, and extensive training required for certification. The ImaCor TEE probe is a simplified, miniature monoplane device developed for critical care settings. Mid-esophageal four-chamber and trans-gastric two-chamber views can be obtained. The esophageal probe (5.5 mm diameter) may be less traumatic than the traditional TEE probe (13 mm diameter), benefiting patients with esophageal varices.

### Methods

We describe our experience using the ImaCor TEE Probe in OLT. Prior to its use, CVP measurements were used for preload estimation. A lower than baseline CVP was achieved during pre-anhepatic and anhepatic phases to aid in blood loss reduction and allograft engorgement. With reperfusion, hypotension occurred. Volume replacement targeted the preoperative CVP with addition of vasopressors for further blood pressure support.

In June of 2010, we employed the ImaCor probe in OLT. This device has been used, complication-free, in more than 40 patients. Baseline views were compared with views acquired during anhepatic and reperfusion phases. Fluids were administered or withheld accordingly on determination of cardiac filling.

### Results

During reperfusion the left ventricle was under-filled, even after re-establishment of the pre-operative CVP. CVP and left ventricular volume did not correlate in over 75% of the cases. Use of this device guided our intraoperative resuscitation, leading to directed therapy with volume and less vasoactive therapy for hemodynamic support.

### Conclusion

Due to our small sample size, it is not known if use of the ImaCor TEE probe affects outcome in OLT. It is well established that hemodynamic instability in OLT does<sup>1</sup>. With the ImaCor device, we have been able to assess cardiac filling and provide directed intraoperative resuscitation and hemodynamic stabilization. Its ease of use and clarity of information regarding cardiac filling and function have allowed us to rely less on CVP. To our knowledge, there has been no reported use of the ImaCor device in OLT.

### References

1. Krenn, C., Hoda, R., Nokkic, A., Greher, M., Plochl, W., Chevchik, O., & Steltzer, H. (2004) Assessment of Ventricular Contractile Function During Orthotopic Liver Transplantation. *Transplant International*, 17(2), 101-104.

\*Abstract accepted for presentation at The Liver Meeting 2011 (AASLD), San Francisco, November 5, 2011.

Please turn over for sample images.

# Hemodynamic TEE (hTEE™) Guidance of Orthotopic Liver Transplantation at UAB with the ImaCor ClariTEE probe

## STAGE 1: PREANHEPATIC PHASE-HEPATECTOMY

Maintain adequate filling pressures through assessing of RV and LV diastolic volume by hTEE to maintain B/P and CVP. (Here BP 102/60, CVP 9.)

## STAGE 2: ANHEPATIC PHASE

Begins with hepatectomy and ends when anastomoses are complete and open. Avoid fluid overload and pulmonary edema due to excessive crystalloid administration through assessing RV and LV diastolic volume with hTEE. Try to keep on the “dry side” as this will allow room for blood to be re-infused. (Here BP 74/50, CVP 9.)

## STAGE 3A: NEOHEPATIC PHASE

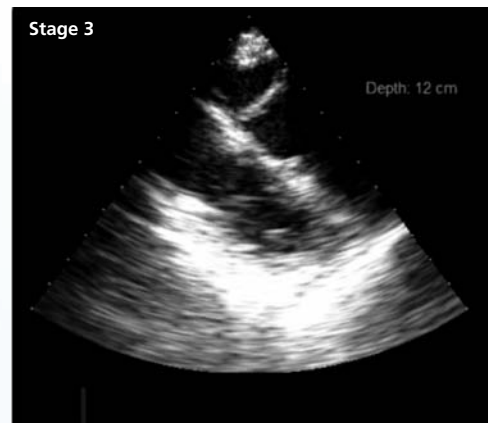
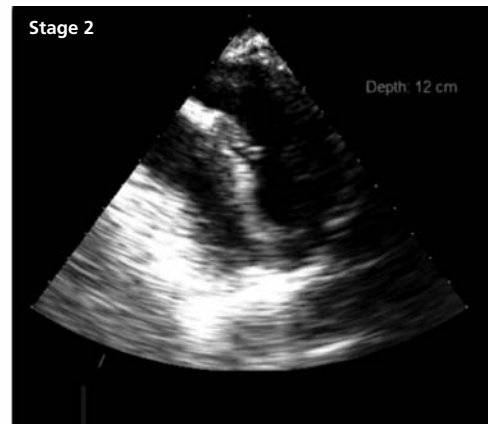
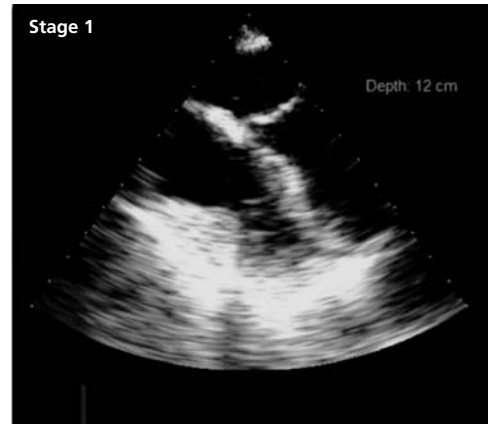
Begins with reperfusion of grafted liver by release of clamps on infra-and suprahepatic vena cava and portal vein. hTEE assessment of RV size and function to evaluate for post-reperfusion syndrome. RV will often increase in size significantly during the first five minutes of reperfusion. Function should remain normal to hyper dynamic. RV size and function should return to baseline within 20-30 minutes. Compare live hTEE images to baseline images for confirmation. If RV size remains increased and RV function is reduced treat hemodynamics and continue to monitor function and volume status with hTEE.

## STAGE 3B: NEOHEPATIC PHASE

Hepatic artery anastomoses and biliary reconstruction. Maintain adequate filling guided by RV and LV diastolic volume.

## POSTOPERATIVE

Transport to SICU. Obtain baseline hTEE images to confirm volume and function status and evaluate for “elevator syndrome” physiology. hTEE remains with patient in SICU and is used to assess hemodynamic status and guide treatment in the event of post-op hemodynamic compromise.



ImaCor Inc.  
839 Stewart Avenue Suite #3  
Garden City, NY 11530

P: 516.393.0970  
F: 516.393.0969  
info@imacormonitoring.com