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### Introduction

Transesophageal echocardiography (TEE) has demonstrated the ability to identify treatable causes of shock in patients following cardiac surgery (1, 2). Unfortunately, utilization of TEE in unstable patients following cardiac surgery is limited by the availability of trained echocardiographers, equipment and resource availability, and physician bias that a diagnosis can be established by other means. Some but not all of these limitations may be overcome through technological innovation. We report a case demonstrating the utility of a newly available TEE monitoring system (ClariTEE™, ImaCor, Uniondale, NY) in an unstable patient following cardiac surgery that consists of a disposable miniaturized monoplane TEE probe and a mobile ultrasound machine

### Case Report

A 66 year old female S/P AVR and CABG x 3 arrived in the CVICU on Levophed at 6 mcg/min. OR reported EF post op of 35%. She had 200 ml of chest tube output in the first post op hour. The cardiac index was 1.9. The B/P 107/57, CVP 9. The SVO<sub>2</sub>-60%. PAP 45/26. A ClariTEE probe (ImaCor Inc. Uniondale, NY) revealed a poorly functioning left ventricle with inferior and septal wall motion abnormalities. (Video 1) The LV showed increased size when a volume response assessment (bilateral leg lift) was performed and a total of 2.5 liters of PRBC, FFP and platelets were administered over the next 3 hrs and milrinone was started at .25 mcg/kg/min. (Figure 1) Chest tube output was 100-300 cc per hour during the next 3 hours.

A second imaging session was performed 3 hrs later. Cardiac index was 1.6. B/P is now 95/52, CVP 14. SVO<sub>2</sub> was 45%. PAP is 44/28. Levophed has been reduced to 3 mcg/min. A volume response assessment was again performed with no change in LV size indicating the patient is now euvolemic. (Figure 2) Milrinone is increased back to .5 mcg/kg/min due to low mixed venous oxygen and continuing poor LV function. Chest tube output was still 100 cc per hour at minimum.

A third imaging session was performed approximately 3 hrs later. Hemodynamics had not changed significantly and the patient had received another 3 units of PRBC and 3 units of FFP. During imaging at the mid esophageal level a non-hemodynamically significant thrombus appeared to be forming adjacent to the left atrium. (Video 2) LV function and size remained the same. Chest tube output continued to be a concern amounting to at least 100 cc per hour.

The fourth imaging session 3 hours later revealed a significant change. Hemodynamics had become somewhat less stable with the cardiac index at 1.6 and B/P 107/62, CVP is 20 and PAP 56/36. Levophed has been increased to 10 mcg/min and the Milrinone is still at 5 mcg/kg/min. During this time period the chest tube output has reached almost 1 liter in 3 hours. (Video 3) The thrombus now appears to be causing obstruction to LV inflow and the decision is made to return to the OR.

The next morning the TEE is repeated. Hemodynamics are much improved with the Cardiac index 2.6 B/P 116/54, CVP is now 10 and the PAP is 38/26. Meds are also changed with Epinephrine at 2 mcg/min, Milrinone at .5mcg/kg/min and Nipride at .4. Left ventricular function was slightly improved from baseline on inotropic support

### Discussion

- TEE monitoring gave us the ability to accurately gauge fluid responsiveness in this patient with a moderately reduced EF. (3,4)
- Fluid management was accomplished more confidently than with a PAC alone with the added benefit of visualizing a thrombus and monitoring its progress before it became hemodynamically significant.
- Hemodynamic TEE (HdTEE) management in this patient with a miniaturized TEE probe provided a dynamic evaluation of myocardial filling and function beneficial in this rapidly changing clinical course.

- *Teaching point:* We use TEE as standard of care in the operating room for cardiac surgery. Resource limitations of TEE machines and probes, staffing and concern for leaving a large TEE probe unattended in situ for a long period of time has made HdTEE impractical. Transthoracic echo would be an option, but is difficult in cardiac surgery. Serial TEE assessment could be of great clinical value in post operative cardiac surgery patients.

## References

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- 3) Chung AT, Savino JS, Weiss SJ, et al. Echocardiographic and Hemodynamic Indexes of Left Ventricular Preload in Patients with Normal and Abnormal Ventricular Function. Anesthesiology 81: 376-87, 1994.
- 4) Swenson JD, Bull D, Stringham J. Subjective Assessment of Left Ventricular Preload Using Transesophageal Echocardiography: Corresponding Pulmonary Artery Occlusion Pressures. J of Cardiothoracic and Vascular Anesthesia 15: 580-583, 2001.

## Figure/Video Legend

Figure 1: Left ventricular end diastolic area (LVEDA ) and fractional area change (FAC) from transgastric short axis (TgSax). Patient is fluid responsive.

Figure 2: LVEDA and FAC from TgSax. Later time period, patient now is euolemic by LVEDA.

Video 1: TgSax view showing inferior and septal wall motion abnormalities

Video 2: Mid esophageal four chamber (Me4Chx) showing development of clot behind the left atrium

Video 3: Me4Chx showing localized tamponade behind the left atrium.