

hTEE Management of a Severely Burned Patient

Dr. Donald Reiff, MD and S. Chris Bellot, MD
University of Alabama at Birmingham, Birmingham, AL.

Abstract

This case report describes how hTEE™, hemodynamic management guided by a miniaturized, disposable transesophageal ultrasound probe (ClariTEE®, ImaCor Inc., Garden City, NY) was used in the management of an immuno-suppressed patient with AIDS, 65% BSA burned, and presumed sepsis. hTEE was ordered in this setting three days post-admission, and notably following resuscitation with a modified Brooke formula. hTEE revealed an underfilled LV, hypovolemia not detected by PAC (diastolic pressure 17 mmHg). Administration of a fluid bolus (2 L over 45 minutes) and follow-up hTEE revealed more normal filling and a significant improvement in resuscitation measured by SvO₂. hTEE was further used to rule out LV dysfunction and guide fluid administration. In summary, hTEE imaging provided critical information on fluid status and guided medical management in a high-risk burn patient.

Case Presentation

A 49-year-old female with AIDS had undergone fluid resuscitation with a modified Brooke protocol (2 mL/(kg × %BSA burned) in 24 hours, half in first 8 hours) for a 65% BSA burn. The patient appeared euvolemic by PAC (diastolic pressure 17 mmHg), but possibly under-resuscitated by SvO₂ (50%). hTEE was ordered in the clinical setting of presumed sepsis in this immuno-suppressed patient. Baseline hTEE revealed a hypovolemic LV with grossly normal function (LVEDA 8.3 cm², LVESA 4.1 cm², LVFAC 51%).

A fluid bolus of 2 liters was administered over the next 45 minutes. A follow up hTEE session revealed a more appropriately filled LV (LVEDA 14.4 cm², LVESA 4.7 cm², LVFAC 67%). It is also significant that SvO₂ increased to near normal (63%). Further treatment consisted of fluid administration at an increased rate and occasional bolus when necessary, as assessed by hTEE.

Discussion

It is well known that burn patients suffer significant fluid loss: acute loss into burned skin within 1-2 hours and increased vascular permeability in 8-12 hours (c.f. Bak et al., 2009). Moreover, the importance of early fluid resuscitation is well-recognized and incorporated into a variety of standard protocols:

- a. Parkland formula 4 mL/(kg × %BSA burned) in 24 hours, half in first eight hours; thus 15.6 L (26% of body mass) in 60 kg patient with 65% BSA burned.

- b. Modified Brooke formula 2 mL/(kg × %BSA burned) in 24 hours, half in first eight hours; thus 7.8 L (13% of body mass) in 60 kg patient with 65% BSA burned.

However, it is also well known that over-resuscitation has no benefit and can cause major complications (Chung et al., 2009), E.G. abdominal compartment syndrome.

The presence of cardiac dysfunction, which is common after burns (Bak et al.; 2008), argues for TEE. "Preload variables, global systolic function, and oxygen transport showed no need to increase the total fluid volume within 36 hours of a major burn. Early (12 hours) signs of central circulatory hypovolemia, however, support more rapid infusion of fluid at the beginning of treatment" (Bak et al., 2009).

TEE has been shown safe and effective in burn patients. "TEE [in burn patients] is a safe procedure that serves multiple diagnostic purposes. TEE is being used to better understand the fluid status and cardiac physiology of the critically ill burn patient" (Etherington, Saffle and Cochran, 2010). "TEE altered resuscitation management in almost two thirds of patients" (Burns et al., 2005). As in the case presented here, "many patients with 'acceptable' pulmonary artery occlusion pressure parameters may in fact have inadequate left ventricular filling. In addition, TEE offers the advantage of direct assessment of cardiac valve competency, myocardial wall contractility, and pericardial fluid." (Burns et al., 2005).

Conclusion

This case illustrates the unique diagnostic advantage of hemodynamic TEE, providing continuously available direct assessment of cardiac filling and function in critically ill burn patients, critical for the determination of appropriate fluid resuscitation and management.

References

- Bak Z, et al., Burns;34:603-9.
- Bak Z, et al., J Trauma 2009;66:329-36.
- Burns JM, et al., J Trauma. 2005;59:36-40.
- Chung KK, et al., J Trauma. 2009;67:231-7.
- Etherington L, Saffle J, Cochran A. J Burn Care Res. 2010;31:36-9.