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Differential diagnosis of shock and multi-stage resuscitation of a severely burned patient guided by hTEE™

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Introduction

Management of complex burn and trauma cases can pose significant challenges for the intensivist: appropriate early resuscitation, in many cases resuscitation from additional major surgery case, and in some cases, diagnosis and treatment of sepsis. We report here on the use of a miniaturized TEE probe (the ImaCor hTEE™ probe, designed and cleared by the FDA to remain indwelling up to 72 hours) to guide differential diagnosis of shock and multi-stage resuscitation of a patient 74% total body surface area burns. Initial resuscitation followed the Brooke formula; subsequently the patient required resuscitation first for hypovolemic shock post-major surgery, and later for distributive shock associated with sepsis.

Case Report

A 40 year-old morbidly obese female who sustained 74% total body surface area burns with inhalation injury during a house fire underwent standard trauma resuscitation using the Brooke formula. She received a total of 20 L of crystalloid and 2.9 L of albumin in 10 hours. The patient underwent her first burn wound excision on post injury day 4; her post-operative course was largely uncomplicated. Approximately 36 hours post-operatively the patient experienced her first episode of hypotension (80/40) with a heart rate of 145 in sinus rhythm. At this point she had received a total of 49.3 L crystalloid, 9.2 L albumin with a urine output of 6.7 L. Other important physiologic data included an abrupt climb in her lactic acid from normal to 4.2, a low grade fever of 102.0 (relatively normal for a burn of this size) and WBC trending up from normal (9.4) to 14.6.

The clinical issue facing us was identifying the cause of this new hypotension. Two more likely etiologies were hypovolemic shock (36 hrs post-major surgery) and sepsis. The patient's overall massive resuscitation would make hypovolemia less likely, however, associated third-space fluid shifts from a major operation which result in intravascular collapse. The alternative diagnosis, distributive shock associated with sepsis, was supported by history of inhalation injury, a climbing white blood cell count and the low-grade fever. However other evidence appeared to refute this diagnosis: a normal appearing chest radiograph, normal urinalysis and negative blood culture data. Because of the diverging therapeutic interventions for these two likely etiologies, we placed an hTEE™ probe, revealing LVEDA of 6.8 cm2 and normal FAC. Based upon these findings the patient was bolused fluids and had her maintenance rate was advanced as well. Shortly thereafter, the clinical problem was resolved. Normal vital signs and lactate were recorded.

However, approximately 18-hours later, the patient again developed significant hypotension with MAP approaching 50 mmHg, also a slight climb in WBC to 18.6 and recorded fever of 103.6. With the hTEE™ probe still in place, a subsequent exam revealed LVEDA 9.9 cm2 and FAC 85%. A new diagnosis of sepsis was assigned, levophed and antibiotics were initiated and normal blood pressure was restored.

Discussion

This case illustrates the use of hTEE to help make evolving differential diagnosis of the cause of shock over the course of treating a patient with massive burns and inhalation injury. The patient was resuscitated from two distinct episodes of hypotension: an early episode of hypovolemic shock despite massive fluid resuscitation following a standard burn resuscitation protocol (the Brooke formula), and a later episode of distributive shock associated with sepsis.