Non-invasive assessment of hemodynamic response of volume expansion in spontaneously breathing septic shock patients.

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Abstract:

Introduction: The cornerstone of treating patients with septic shock remains as it has been for decades, intravenous fluids. Dosing intravenous fluid during resuscitation of septic shock remains largely empirical. There is now a large body of evidence to show that various dynamic parameters (both invasive and non-invasive) have a high sensitivity and specificity for predicting fluid responsiveness. Large variations in IVC size with IPPV accurately predict fluid responsiveness but its use is still of debate in spontaneously breathing patients.

Objectives: To evaluate the extent to which, respiratory changes in IVC diameter, IVC-collapsibility index (IVC-CI) and left ventricular outflow tract VTI variations can be used to predict fluid responsiveness in septic shock spontaneously breathing not receiving positive mechanical ventilation patients in comparison to static parameters as central venous pressure.

Methods: A total of thirty spontaneously breathing septic shock patients enrolled in our study were subjected to fluid loading of crystalloids 10ml/kg infusion over 15 minutes. All patients were divided into two groups according to fluid responsiveness that defined by an increase in cardiac output 15% or more that measured by transthoracic echocardiography (TTE). Data were collected before and after fluid challenge including mean arterial pressure (MAP), heart rate (HR), central venous pressure (CVP) and oxygen saturation, inferior vena cava collapsibility index (IVCC) by TTE through subcostal window, long axis view, and left ventricular outflow tract VTI by TTE through apical window, 5-chamber view to assess which parameter could reflect fluid status and responsiveness of the patient.

Results: There was no statistical significant difference between fluid responsive and non-responsive group regarding baseline heart rate (p value :0.75), heart rate after volume expansion(p value :0.91),baseline mean arterial blood pressure(p value :0.85), MAP after volume expansion(p value :0.15) , baseline central venous oxygen saturation(p value : 0.28) and saturation after volume expansion (p value : 0.69). It was found that central venous pressure and IVCC have a poor predictive values. Results showed that baseline CVP (AUC:0.59, sensitivity of 55% , specificity of 66%), CVP after volume expansion (AUC:0.52, sensitivity of 50%, specificity of 66%), baseline IVCC (AUC:064 sensitivity of 72% specificity of 58%), IVCC after volume expansion(AUC : 0.60 sensitivity of 66% specificity of 75%) and percentage of change of IVCC variations before and after fluid responsiveness (AUC:0.57 sensitivity of 83% specificity of 58%) . LVOT VTI variation showed a high predictive values, results showed that baseline VTI (AUC:0.80 sensitivity of 83% specificity of 83%) ,VTI after volume expansion (AUC:0.61 sensitivity of 50% specificity of 83%) and LVOT VTI percentage of change between before and after volume expansion (AUC:0.92 sensitivity of 94 % specificity of 83%.).

Conclusion: In spite of high predictive value of IVCC to assess fluid responsiveness in mechanically ventilated patients, IVCC and CVP have a poor ability to predict fluid responsiveness in spontaneously breathing septic shock patient. In contrast, LVOT VTI has high predictive values in this type of patients.

Key words: *Septic shock , Fluid responsiveness , IVC collapsibility index , LVOT VTI.*