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### Inferior Vena Cava Diameter and Collapsibility Index: A Practical Non-Invasive Evaluation of Intravascular Fluid Volume in Critically-III Patients

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#### Abstract

**Background:** Assessment of intravascular volume status is an essential parameter for the diagnosis and management of critically-ill patients. Generally, central venous pressure (CVP), which is an invasive measure, has been recommended for this purpose. Since CVP has been associated with many complications, inferior vena cava diameter and collapsibility index (IVC-CI) were used in the present study to evaluate the intravascular volume status of critically-ill patients at Rajavithi Hospital.

**Objective:** To conduct a prospective, cross-sectional study to evaluate the IVC diameter as a guidance for estimating the volume status in critically-ill patients by bedside ultrasonography, focusing on correlations between CVP and IVC-CI and IVC diameter.

**Material and Method:** Critically-ill patients who had been placed with a functioning central venous catheter were prospectively enrolled. Evaluation of intravascular volume status was performed by bedside ultrasonography to measure the IVC diameters (IVCD), both end-inspiratory (iIVCD) and end-expiratory (eIVCD). The IVC collapsibility indices (IVC-CI) were calculated by an equation and then were compared with the CVP values.

**Results:** Of the 70 enrolled patients, with a mean age of 63.8 + 1.9 years, 64.3% were intubated. The most common indication of ICU admission was sepsis with hemodynamic instability (80.0%). The volume status of patients was stratified by their CVP levels as hypovolemic 15.7%, euvoletic 32.9% and hypervolemic 51.4% which correspond with the IVC-CI of 45.69 + 16.16%, 31.23 + 16.77%, and 17.82 + 12.36% respectively ( $p < 0.001$ ). The highest significant correlation was found between the CVP and IVC-CI ( $r = -0.612$ ,  $p < 0.001$ ). In addition, there was a significant correlation between CVP and iIVCD ( $r = 0.535$ ,  $p < 0.001$ ); and between the CVP and mean IVCD ( $r = 0.397$ ,  $p = 0.001$ ).

**Conclusion:** The present study supported the correlation between CVP and IVC-CI. The authors conclude that the IVC-CI can provide a useful guide for noninvasive intravascular volume status assessment of critically-ill patients.

**Keywords:** Central venous pressure, Inferior vena cava diameter, Collapsibility index, Intravascular fluid volume, Ultrasonography

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