P892 Accuracy of right atrial pressure estimation using a multi-parameter approach derived from Inferior vena cava semi-automated edge-tracking echocardiography

Abstract: **P892**

Accuracy of right atrial pressure estimation using a multi-parameter approach derived from Inferior vena cava semi-automated edge-tracking echocardiography

Authors:
S Albani[1], B Pinamonti[1], M De Scordilli[2], E Fabris[1], A Perkan[1], P Geri[3], C Gregori[4], G Barbati[4], G Sinagra[1], L Mesin[5], [1]Postgraduate School in Cardiovascular Sciences, Cardiovascular Department, University Hospital of Trieste - Trieste - Italy, [2]University of Trieste, Department of Medical Science, Surgery and Health (DCSMCS) - Trieste - Italy, [3]University of Trieste, Department of Pneumology and Respiratory Intermediate Care Unit, ASUITS - Trieste - Italy, [4]University of Trieste, Department of Medical Sciences, Biostatistics Unit, University of Trieste, Trieste, Italy - Trieste - Italy, [5]Politecnico di Torino, Mathematical Biology and Physiology - Department of Electronics and Telecommunications - Turin - Italy,

Topic(s):
Echocardiography: Technology

Citation:

Background: In clinical practice, as stated in the ASE guidelines, the echocardiographic estimation of right atrial pressure (RAP) is based on the size of the inferior vena cava (IVC) and its inspiratory collapse. However, this method has proven to have limits of reliability and reproducibility. The use of a recently developed software that with a semi-automatic technique highlight the edges of the IVC could help to standardize the echocardiographic assessment of RAP.

Aim of the study: The aim of the study was to assess feasibility and accuracy of a new semi-automated approach to estimate the RAP.

Standard acquired echocardiographic images were processed with a semi-automatic technique, indexes related to the collapsibility of the vessel during inspiration (Caval Index, CI), during the whole respiratory cycle (Respiratory Caval Index, RCI) and through the heart cycle transmitted movements' (Cardiac Caval Index (CCI) were derived (figure 1).

Using these indexes, we developed two models:

a) the Binary Tree Model (BTM), further divided in BTM3 and BTM5 (RAP estimated in 3 and 5 classes, respectively);

b) the Regression Model (RM), further divided in RM linear (continuous model) and RM3 and RM5 (RAP estimated in 3 and 5 classes respectively).

RAP assessed using these innovative techniques were compared with two standard estimation (SE) echocardiographic methods A and B.

Direct RAP measurements obtained during a right heart catheterization (RHC), performed within 6 hours, were used as reference.

Results: 62 consecutive 'all-comers' patients that had a RHC were enrolled; 13 patients were excluded for technical reasons. Therefore 49 patients were included in this study (26 males and 23 females; mean age of 62.2±15.2 years, 75.5% pulmonary hypertension, 34.7% severe left ventricular dysfunction and 51% right ventricular dysfunction). The two SE methods showed poor accuracy for RAP estimation (method A: ME=51%, R2= 0.22; method B: ME=69%, R2= 0.26). Instead, the new semi-automatic methods BTM3 and

BTM5 based on parameters derived from IVC edge tracking (mean IVC diameter, CI, CCI and RCI) had a misclassification error of only 14% (R2=0.47) and 22% (R2=0.61), respectively, to classify RAP. The accuracy was lower for RM than BTM (RM3: ME=61%, R2=0.39; RM5: ME=55%, R2=0.39). However, the RM showed the lowest mean bias in estimating RAP: 0.23 [-8.34; 8.81] mmHg.

Conclusions: A multi-parametric approach using the new indexes, such as CCI and RCI, derived from a semi-automated edge tracking of the IVC is a promising tool for a more accurate estimation of RAP. This study proposes an innovative method for the non-invasive estimation of the RAP, which requires confirmation on larger population.