Assessment of left ventricular ejection fraction using an ultrasonic stethoscope in critically ill patients

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Objective.— To test the hypothesis that bedside assessment of LVEF in ICU patients is accurate when performed using a new generation ultrasonic stethoscope, thereby improving the clinical judgment of experienced intensivists.

Design.— Prospective descriptive clinical study.

Setting.— Medical-surgical ICU of a Teaching hospital.

Patients.— Ninety-four patients were studied (mean age: 60 ± 17 years; men: 71; mean simplified acute physiologic score [SAPS 2]: 41 ± 15), 63 being mechanically ventilated and 36 receiving vasopressors and/or inotropes.

Intervention and measurements.— LVEF was independently assessed clinically by the attending physician and visually by two experienced intensivists with expertise in transthoracic echocardiography (TTE) which was performed successively with a pocket-size miniaturized device and a full-feature echocardiographic system. LVEF was considered as increased (LVEF > 75%), normal (LVEF: 50 to 75%), moderately reduced (LVEF: 30 to 49%), or severely reduced (LVEF < 30%).

For the purpose of the study, biventricular LVEF value measured independently off-line was used as reference. Overall mean image quality grade of the miniaturized device was inferior to that of the full-feature system (5.9 ± 3.7 vs 6.9 ± 3.7; P = 0.0009).

Diagnostic concordance between the clinically estimated LVEF and biventricular LVEF was poor (Kappa: 0.33; 95%CI: 0.16—0.49) and not improved by the knowledge of a previously determined LVEF value (Kappa: 0.44; 95%CI: 0.22—0.66). In contrast, the diagnostic agreement was good between LVEF visually assessed using the ultrasound stethoscope and using the full-feature system (Kappa: 0.75; CI95%: 0.63—0.87) and between LVEF assessed on-line and biventricular LVEF, regardless of the system used (Kappa: 0.75; CI95%: 0.64—0.87 and Kappa: 0.70; CI95%: 0.59—0.82, respectively).

Conclusions.— The use of an ultrasound stethoscope in ICU patients by front-line intensivists with expertise in echocardiography improves bedside assessment of LV systolic function and promises to increase the accuracy of the clinical judgment in prolonging physical examination. The potential therapeutic impact of such strategy remains to be determined.

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Transthoracic and transesophageal echocardiography during acute respiratory distress syndrome: incidence of acute cor pulmonale and patent foramen ovale. ARCOFOP multicenter study — preliminary results


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Background.— Acute increase in right ventricular overload secondary to acute respiratory distress syndrome (ARDS) may result in acute cor pulmonale (ACP). Hypoxemia could be worsened by the increased right-to-left shunting across a patent foramen ovale (PFO).

Objectives.— To assess the incidence of ACP and PFO in ventilated patients with ARDS during the first 48 hours. We secondary aimed to assess transthoracic echocardiography (TTE) feasibility and main measurements compared to transesophageal echocardiography (TEE).

Method.— This prospective observational study in nine intensive care units enrolled all patients with ARDS (new bilateral pulmonary infiltrates on chest X-ray, PaO2/FiO2 ratio ≤ 200 and no left ventricular pressure overload). TTE and TEE were performed by trained intensivists, digitally recorded and reviewed by two experts. ACP was diagnosed when right ventricle was dilated (end-diastolic right ventricle/left ventricle area ratio > 0.6 in the four-chamber views) associated with septal dyskinesia (eccentricity index > 1 on the short-axis view [TTE] and the transgastric short axis view [TEE]). PFO was detected by contrast study on the apical four-chamber view (TTE) and 0° and bicaval views (TTE).

Results.— Eighty-four patients were studied during 11 months (mean ± SD): age 54 ± 13 year-old, SAPS II 44 ± 17, PaO2/FiO2 118 ± 42, PEEP 11 ± 3 cmH2O. Day 28 mortality rate was 17%. Seventy-four patients were analysable (30 with TTE: 40.5%). ACP was diagnosed in 11 patients (14.9%) and PFO in 10 (13.5%). ACP and PFO were associated in four patients (5.4%). TTE compared to TEE measurements had sensitivity and specificity respectively of 25% and 100% (PFO) and 100% and 96% (ACP). TTE allowed measurement of other right ventricular function parameters: right ventricular fractional area change (38 ± 15%), tricuspid regurgitation velocity (273 ± 59 cm/s), tissue Doppler-derived tricuspid lateral annular systolic velocity (15 ± 4 cm/s) and tricuspid annular plane systolic excursion (20 ± 5 mm) (TAGSE). Median values (Wilcoxon test) were significantly different for right ventricular fractional area change (P = 0.03) and TAGSE (P = 0.05) between patients with ACP compared to patients without ACP.