ABSTRACTS OF THE 19TH CONGRESS OF ECHOCARDIOGRAPHY

Poster session: Hemodynamics

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 ultrasound stethoscope, thereby improving the clinical judgement 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 II]: 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, biplane 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 biplane 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 biplane 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) (TAPSE). Median values (Wilcoxon test) were significantly different for right ventricular fractional area change (P = 0.03) and TAPSE (P = 0.05) between patients with ACP compared to patients without ACP.
**Conclusion.**— These preliminary results in patients with early severe ARDS under protective mechanical ventilation found low incidences of ACP and PFO. Good TTE sensitivity and specificity for ACP could allow easier follow-up when TTE is possible. ACP was associated with significantly decrease of right ventricular fractional area change and TAPSE.

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**Measurement of left ventricular volumes using real-time three-dimensional transesophageal echocardiography in ICU patients. Preliminary results**


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**Introduction.**— Real-time transesophageal echocardiography (RT3D TEE) is a recent imaging modality which has been validated against magnetic resonance imaging for the measurement of left ventricular (LV) volumes. If feasibility in ventilated patients in the ICU is not yet known. The main objective of the study was to test the hypothesis that bidimensional (2D) TEE underestimates LV volumes when compared to RT3D TEE. The secondary objective was to evaluate the feasibility of RT3D TEE in ventilated patients in the ICU and to assess the influence of the analysis software on values of LV volumes.

**Methods.**— During a two-month period, patients without cardiac history admitted in the ICU for neurological disorder requiring a mechanical ventilation were studied. A 2D TEE performed by an experienced intensivist ruled out any cardiac abnormality and three loops of RT3D TEE were recorded during an end-expiratory apnea to avoid excessive cardiac translation. Measurements were performed off-line using an Xcelera® workstation (Philips) on three non-consecutive cardiac cycles and averaged. LV end-diastolic volume (EDV) and end-systolic volume (ESV) were measured: with 2D TEE using biplane Simpson’s rule, with RT3D TEE using the QLAB® software with two distinct applications (3DQ and 3DQ advanced). LV ejection fraction (EF) and stroke volume (SV) were calculated from LV volumes obtained with 2D TEE and RT3D TEE. LVSV was also measured using the Doppler method applied at the level of the aortic ring. Values (median with 95th percentiles) provided by the different approaches (volumes and Doppler) were compared using non parametric tests.

**Results.**— In this pilot study, 10 patients were prospectively studied (age: 44 years [38—52]; SAPSII: 30 [24—37]; BMI: 24 kg/m² [21—29]). 2D TEE underestimated LV volumes when compared to RT3D TEE (EDV: 94 mL [79—157] vs 135 ml [112—149]: P = 0.09 and ESV: 49 ml [38—52] vs 63 mL [52—69]). 2D TEE tended also to underestimate LVSV when compared to RT3D TEE (49 mL [43—78] vs 70 ml [58—82]: P = 0.35). LVEF was similar when calculated with 2D TEE and RT3D TEE volumes (57% [51—63] vs 54% [50—57]). LVSV measured using RT3D TEE was similar to that measured by the Doppler method applied at the level of the aortic ring (70 mL [63—95]). Measurements performed using the 3DQ-advanced software provided results which values were intermediate between 2D TEE and 3DQ TEE (EDV: 123 mL [95—133]; ESV: 50 mL [42—58]).

**Conclusion.**— RT3D TEE appears as a promising technique which provides a more accurate measurement of LV volumes when compared to conventional 2D TEE. This new technique is feasible in ventilated patients in the ICU but requires the respect of a learning curve for the acquisition and analysis of results.

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