from single to dual and triple imaging. For noninvasive detection of CAD, RWMA show the highest specificity and LVCR the highest sensitivity, with CFVR showing intermediate values.

P4408
Quadruple imaging stress echocardiography as the new standard

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Background: The new standard adopted in Stress echo (SE) 2020 is the Integrated Quadruple (IQ) imaging approach, optimizing the versatility of SE to include in a one-stop shop the core "ABCD" (Asynergy+B-lines+Contractile reserve+Doppler flowmetry) protocol: regional wall motion abnormalities (RWMA); B-lines at lung ultrasound; left ventricular contractile reserve (LVCR); and coronary flow velocity reserve (CFVR).
Purpose: To assess the feasibility of IQ-SE in the prospective, large scale, multicenter, international effectiveness SE2020 study
Methods: We enrolled 1308 all-comers (age 63±11, 810 males) referred to clinically-driven exercise (n=599), dipyridamole (n=649) or dobutamine (n=60) SE for known or suspected coronary artery disease (n=1180: 30% with previous myocardial infarction, 8% with previous coronary artery bypass grafting and 35% with previous percutaneous coronary intervention) and/or heart failure (n=128, with resting ejection fraction <35%), were enrolled by 16 different laboratories of 4 countries (Bulgaria, Italy, Russia, Serbia). All readers had passed the quality control reading for RWMA and B-lines. All underwent IQ-SE, with evaluation of RWMA (17-segment model, Wall Motion Score Index, WMSI, each segment from 1= normal to 4= dyskinetic), CFVR (stress/rest ratio of peak diastolic flow velocity on left anterior descending coronary artery), LVCR (stress/rest ratio of systolic blood pressure by cuff sphygmomanometer/end-systolic volume from 2D by biplane Simpson rule), and B-lines (4-site simplified scan on antero-lateral chest, each space scored from 0 = black, to 10= white). Standard positivity criteria were adopted for RWMA (WMSI stress>rest), CFVR (<2.0), LVCR (<2.0 for exercise and dobutamine, <1.1 for dipyridamole) and B-lines (stress increase >2.0).
Results: RWMA, CFVR, LVCR, and B-lines were analyzed in all patients. The positivity rate was 23% (300 pts) for RWMA, 31% (400 pts) for CFVR, 37% (489 pts) for LVCR and 30% (389 pts) for B-lines. The positivity rate with full IQ-SE rose to 57% (751 pts) when at least 1 of the 4 criteria was considered. When the 309 pts with positive RWMA were excluded, the positivity rate fell to 0% for RWMA, 17% for CFVR, 23% for LVCR, 22% for B-lines, and 45% for IQ-SE (see figure). In the overall population, stress-rest ΔWMSI was directly related to ΔB-lines (r=0.235, p<0.001), and inversely related to CFVR (r=-0.439, p<0.001) and LVCR (r=-0.237, p<0.001). The 1008 patients with negative SE by wall motion criteria showed a positivity rate of 17% (175 pts)

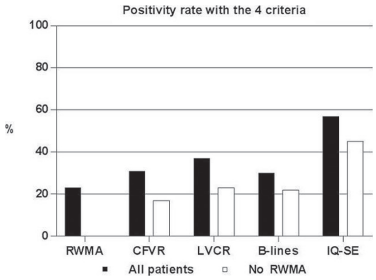

Figure 1

Conclusions: In the effectiveness SE2020 study, IQ-SE is extremely feasible, user-friendly, and substantially increases the positivity rate of RWMA. IQ-SE provides a versatile view of 4 key variables, only marginally inter-related, of recognized prognostic relevance: epicardial coronary artery stenosis (RWMA), coronary microcirculation (CFVR), myocardial function (LVCR) and pulmonary congestion (B-lines).

P4409
The relation between left atrial functions and ventilatory insufficiency during exercise in left heart disease: a stress echo/gas exchange analysis during exercise

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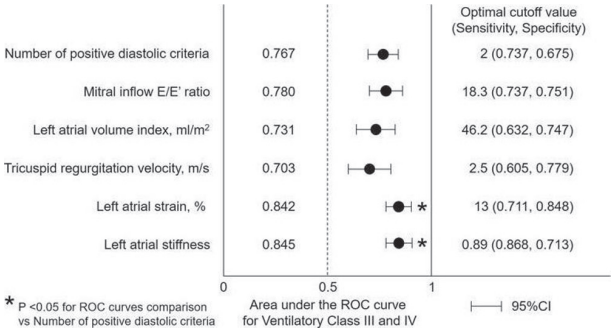
Background: The stepwise backward effects of loss in left atrial (LA) functional properties are a reduction in lung vessel compliance and vascular remodeling that trigger ventilatory insufficiency. We aimed at investigating the link between ventilatory insufficiency vs LA functional parameters and echo-derived diastolic parameters suggesting an elevated LA pressure in cardiac disorders of different origin.
Methods: A total of 275 patients (119 heart failure, 55 aortic stenosis, 45 primary mitral regurgitation, 14 hypertrophic cardiomyopathy and 42 controls) with exercise induced-dyspnea underwent cardiopulmonary exercise testing combined with Echo-Doppler with assessment of LA strain. Diagnostic accuracy for exercise ventilatory insufficiency (Ventilatory Class III and IV: minute ventilation-carbon dioxide production slope >36, n=38) was assessed in echo-derived diastolic parameters (mitral inflow E/E' ratio, LA volume index (LAVI) and tricuspid regurgitation velocity), number of positive diastolic parameters (E/E' >14, LAVI >34 ml/m^2 and tricuspid regurgitation velocity >2.8 m/s), LA strain and LA stiffness assessed using mitral inflow E/E' ratio /LA strain ratio.
Results: The area under the receiver operating characteristic curve (AUC) of E/E' (median 14, IQR 11 to 21), LAVI (ml/m^2, median 37, IQR 27 to 49), tricuspid regurgitation velocity (m/s, median 2.2, IQR 1.9 to 2.5), number of positive diastolic parameters (median 1, IQR 0 to 2), LA strain (%, median 24, IQR 14 to 31) and LA stiffness (median 0.63, IQR 0.37 to 1.32) for exercise ventilatory insufficiency were 0.78 (95% CI 0.70 to 0.86), 0.73 (95% CI 0.64 to 0.82), 0.70 (95% CI 0.60 to 0.81), 0.77 (95% CI 0.69 to 0.84), 0.84 (95% CI 0.78 to 0.90) and 0.85 (95% CI 0.78 to 0.91) (p<0.05, respectively, figure). The AUC of LA strain (p=0.007) and LA stiffness (p<0.001) were significantly improved compared to the AUC of the number of positive diastolic parameters. The optimal cutoff value of LA strain and LA stiffness were 13% and 0.89 with high sensitivity (0.71 and 0.87) and specificity (0.85 and 0.71), respectively.



Conclusions: In left heart disease patients, echo-derived diastolic parameters and LA function are closely associated with exercise ventilatory sufficiency. LA dynamics have a key role in the detection of ventilatory sufficiency of left heart diseases irrespective of heart failure.

BEST POSTERS IN NON-INVASIVE DIAGNOSTIC IN HEART FAILURE

P4411
Reliability of lung ultrasound for differentiation of cardiogenic and non-cardiogenic dyspnea

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Introduction: The differentiation of cardiogenic and non-cardiogenic dyspnea on the basis of physical examination is an extremely difficult task, especially at the emergency units. Reliable and precise diagnostic tool should be additionally used to facilitate the proper differentiation. Herein, we compare the reliability of B-lines lung ultrasound (LUS) detection against other conventional modalities.
Methods: 116 patients were enrolled, divided in three groups. 44 patients with cardiogenic dyspnea presented by acute decompensated HFrEF (III–IV NYHA class, EF <50%, E/e' >15); 42 patients with non-cardiogenic dyspnea and 30 healthy controls. All patients underwent LUS, chest X-ray (CXR), echocardiography, and were tested for NT-proBNP.
Results: Average patients' B-lines score >15 (17) was diagnosed in 41 (93%) from 44 patients with cardiogenic dyspnea. In this group the number of B-lines strongly correlated with the NT-proBNP levels (r=0,82, p<0,0001), and interstitial or alveolar edema on the CXR (r=0,86, p<0,001). A moderate correlation with EF and E/e' (r=0,64, p<0,001) was also detected. No B-lines (n=40) or single ones (n=2) were found in patients with non-cardiogenic dyspnea. In this group a moderate correlation was found between LUS, CXR, echocardiography and NT-proBNP (r=0,567, p<0,0001). The estimated single B-lines in a definite lung zone were not proven to be a sign of cardiogenic dyspnea. Their detection corresponded with low levels of NT-proBNP (usually <400pg/ml) and lower E/e' ratio (<8) further verifying a low left ventricle filling pressure excluding decompensated heart failure.
Conclusions: B-lines detection with lung ultrasound seems to be easy-to-perform and reliable non-invasive diagnostic tool for establishment of dyspnea origin. The method advantages includetime-saving and specific verification of car-