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Upstream quality control of regional wall motion analysis in Stress Echo 2020

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Background: The effectiveness trial "Stress echo (SE) 2020" is at the starting blocks to evaluate novel applications of SE in and beyond coronary artery disease. Upstream quality control of the subjective reading of regional wall motion by aspiring recruiting centers remains pivotal.

Purpose: To control quality and harmonize reading criteria across SE2020 centers.

Methods: One reader from each of the 72 candidate centers from 10 countries (Italy, Brazil, Serbia, Russia, Hungary, Bulgaria, Poland, UK, Argentina, Kazakhstan) of SE 2020 network asked credentials to read a set of 20 SE video-clips selected by the core lab. A multiple choice 6-answer test was given for each study. All aspiring centers met the pre-requisite of high volume activity ($>$100 studies per year). The diagnostic gold standard was the reading of core lab in agreement with angiographic verification. The a priori determined pass threshold was 18/20 ($\geq$90%). The core lab prepared for readers an optional web-based learning 2-hours module (http://se2020.altervista.org). For those who failed, a second attempt was allowed after obligatory web-based training. Kappa (k) statistics was used to assess intra- and inter-observer agreement.

Results: Of the initial 72 who started, only 54 completed the first attempt. Individual readers' score on first attempt ranged from 07/20 to 20/20 (accuracy from 35% to 100%, median 75%: see figure, upper panel). 38 readers who failed the first attempt, took it again after the web-based session and their accuracy improved (75% pre- vs. 96% post-, p$<$0.001: see figure, lower panel). A total of 52 readers were eventually successfully accredited as per February 10th, 2017. The overall kappa agreement of the certified 38 readers, evaluated before and after web-based training, was 0. 56 (fair) on first attempt and rose to 0.90 (good) on last attempt.
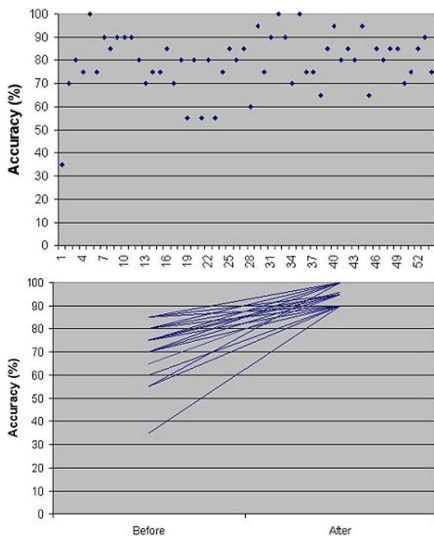

Figure 1

Conclusions: In SE reading, the volume of activity or years of experience is not synonymous with diagnostic quality. The accuracy of experienced readers can be substantially increased and the variability deflated when a priori reading criteria are shared and explained via a user-friendly web-based learning.

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Reduced left ventricular rotation reserve in patients with psoriatic arthritis - a low-level bicycle Ergometer exercise test

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Background: A chronic systemic inflammation in patients with psoriatic arthritis (PsA), together with traditional cardiovascular risk factors, leads to early myocardial impairment by a shared inflammatory pathway.

Purpose: The aim of this study was to explore the role of a possible early involvement of left ventricular (LV) apical rotation on exercise in this population.

Methods: Global LV longitudinal strain, apical rotation and maximal unrotation rate during early diastole were compared between 60 patients with PsA but without cardiovascular diseases and 27 age-, blood pressure- and gender-comparable healthy subjects at rest and with a low-level (25 W, 3 min increments) bicycle Ergometer exercise.

Results: Although there was no significant difference in LV structure and function between patient and control group, patients with PsA had obviously low global LV longitudinal strain at rest (18.6±3.0 vs. 20.4±2.6, p$<$0.05) and exercise (25W: 21.9±2.8 vs. 23.2±2.4, 50W: 23.3±2.9 vs. 25.1±2.8, p$<$0.05). Although LV apical rotation in patients was preserved at rest, the apical rotation reserve was dramatically reduced with exercise (25W: 3.6±1.8 vs. 5.3±3.3, 50W: 6.2±2.5 vs. 8.5±4.5, p$<$0.05). Moreover, LV apical rotation reserve index was negatively correlated with Ln(C-reactive protein) (p$<$0.05).

Conclusions: Patients with PsA had reduced rotation reserve with exercise which correlated with inflammatory burden. Reduced reverse rotation will likely impair early diastolic filling on exercise. Assessment of LV apical rotation even on mild exercise can unmask early limitations of cardiac function.

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Significance of heart rate recovery after exercise testing in patients with type 2 diabetes and silent myocardial ischemia

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Background: Silent myocardial ischemia (SMI), presence of myocardial ischemia without chest pain, is more prevalent in patients with diabetes mellitus (DM). Heart rate recovery (HRR) after exercise stress testing is proven predictor of hard cardiac events, but its significance in patients with SMI is not fully evaluated.

Purpose: We sought to evaluate the relation between SMI and HRR after exercise stress test in patients with type 2 DM.

Methods: Out of 3011 patients that performed exercise stress testing (Bruce protocol) in our laboratory from 2015–2016, we identified 98 consecutive patients with type 2 DM. Duke treadmill score, achieved metabolic equivalents (METs), target heart rate, as well as HRR were calculated in all patients. Heart rate recovery was defined as the difference in heart rate between peak exercise and 1 minute later. For the patients undergoing stress echocardiography a value $\leq$18 bpm was considered abnormal and a value $\leq$12 bpm was considered abnormal for ECG treadmill testing.

Results: The SMI was present in 30/98 patients (30.6%). Patients with SMI and diabetes compared to patients w/o SMI had lower reached maximum heart rate (133.4±18.9 vs 141.1±15.9 bpm, p=0.039), lower values of HRR (25.1±11.8 vs 41.5±11.8 bpm, p$<$0.001), and lower Duke score (median of 2 vs. median of 7, p$<$0.001). Target heart rate was achieved in 14 patients with SMI compering to 53 patients without SMI (46.7% vs 77.9%, p=0.002). In multivariate analysis HRR (OR 0.87, 95% of CI is 0.813–0.931], p$<$0.001), Duke score (OR 0.726, 95% of CI was 0.592–0.884, p=0.001), maximum heart rate (OR 1.08, 95% of CI was 1.016–1.166, p=0.016) and target heart rate (OR 0.05, 95% of CI was 0.009–0.976, p=0.048) were independent predictors of SMI.

Conclusion: HRR after exercise stress testing is the strongest predictor of SMI in patients with type 2 DM. In addition, lower values of Duke score and maximum heart rate, as well as percentage of achieved target heart rate, can support diagnosis of silent myocardial ischemia.