

EXERCISE TESTING: STILL MORE OPTIONS FOR RISK ASSESSMENT

3232 Hypotensive response after treadmill exercise test for peripheral arterial disease is associated with an increased risk of long-term mortality: a prospective cohort study of 2023 patients

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Purpose: It is not clear whether a hypotensive blood pressure response (HBPR) after exercise in patients with suspected peripheral arterial disease (PAD) is associated with an increased risk of long-term mortality. Therefore we assessed the relationship between hypotensive blood pressure response after exercise in patients with suspected PAD, long-term mortality and the effects of cardiovascular medication.

Methods: An observational prospective study was performed between 1993 and 2005 in 2023 consecutive patients with suspected PAD. Systolic blood pressure (SBP) was measured in supine position after 15 minutes rest and after a treadmill exercise test of 5 minutes with a walking speed of 4 km/h. HBPR was defined as a decrease in exercise SBP compared to the resting SBP. Cox proportional hazard models were used to analyse the relationship between HBPR, long-term mortality and cardiovascular medication.

Results: During follow-up (mean 5.0 years), 526 patients died (26%). HBPR was present in 93 patients (5%). At baseline patients with HBPR were significantly younger compared to patients with normal BP response (NorBPR). After adjustment for age, sex, smoking, COPD, hypercholesterolemia, history of cardiovascular diseases, heart failure, renal failure and resting SBP patients with HBPR had an increased risk of long-term mortality compared to NorBPR (HR 1,7 [1,1-2,7]). After adjustment for the same risk factors we found that the use of statins were significantly associated with a reduced risk of long term mortality in patients with HBPR (HR 0,5 [0,4-0,7]). Beta-blocker use showed after adjustment of the same clinical risk factors a nearly significantly reduced mortality risk as well (HR 0,9 [0,7-1,1]).

Conclusion: Hypotensive response after exercise in patients with suspected PAD is an independent risk factor for long-term mortality. Statins and beta-blockers can reduce the risk of long-term mortality.

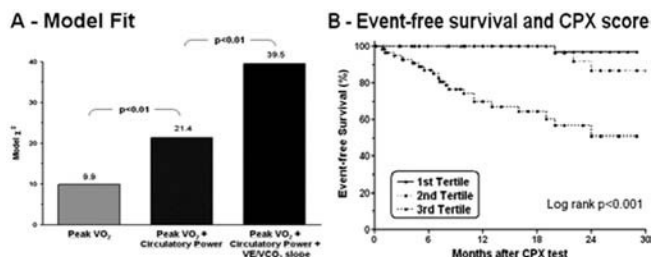
3233 A new cardiopulmonary exercise test score to assess risk in chronic heart failure patients

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Purpose: 1) To evaluate the incremental prognostic value of VE/VCO₂ slope and peak circulatory power (PCP=peak VO₂ x SBP) in a chronic heart failure (CHF) population treated with contemporary therapies; 2) to create a cardiopulmonary exercise test (CPX) score to assess risk in these patients.

Methods: We studied 169 consecutive patients with stable CHF who underwent symptom-limited CPX (mean age and ejection fraction 55±11y and 32±7%, respectively; 81% on beta-blockers, 35% with ICD and/or CRT devices). Using Cox proportional hazards models, univariate and multivariate hazard ratios (HR) were determined for all variables predicting the combined endpoint of death or heart transplantation.

Results: During a follow-up of 17±9 months, 10 patients (5.9%) died and 15 others (8.9%) underwent heart transplantation. Univariate analysis identified 10 predictors of event-free survival. Only 3 variables remained statistically significant in the multivariate Cox model and were used for the prognostic score: peak VO₂, VE/VCO₂ slope and PCP. The predictive model that included these 3 variables had the highest prognostic value (Fig. 1A). The CPX score (mean 33.0±15.4, range 1.4-97.2) stratified the risk of events and identified low- and high-risk individuals (Fig. 1B). C statistic was 0.92 (95%CI: 0.86-0.97; p<0.001) for events at 1 year. A CPX score >40.0 identified patients with events at 1 year with a sensitivity and specificity of 0.97 (95%CI 0.76-1.00) and 0.79 (95%CI 0.70-0.84), respectively.



Model Fit and Event-free survival

Conclusion: Peak VO₂, VE/VCO₂ slope and PCP provide incremental prognostic

information in stable CHF patients. A CPX score integrating these 3 variables is a promising risk stratification tool that requires prospective external validation.

3234 High frequency ECG - A novel tool for improving the diagnostic accuracy of exercise testing in the community setting

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Clinical data together with ST changes during exercise test are commonly used to detect ischemic heart disease (IHD). A new technology, which quantifies induced ischemic subtle changes in the depolarization phase using analysis of high frequency QRS components (HFQRS), was recently reported to better identify stress-induced ischemia. Our aim was to test the clinical applicability of this novel technique in a large patient population in three community cardiology centers.

Methods: High-resolution ECG was acquired during clinically indicated exercise test in 616 consecutive pts (age 57±11 yo, 404 men). HFQRS data were evaluated automatically using computerized analysis. Patients with evidence of ischemia in exercise ECG or HFQRS data were referred for follow-up imaging tests (stress echocardiography, SPECT perfusion imaging, CT angiography, or angiography). The follow-up imaging tests were used as the gold standard for presence of IHD. Recent diagnosis of IHD by standard imaging tests was also used as reference of IHD.

Results: In 511 pts, no evidence of ischemia in the exercise test was observed and thus they were not referred for follow up testing. In 105 pts, either (or both) positive exercise ECG or HFQRS result was observed. Of the first 50 pts who completed the follow up tests, 36 had unequivocal exercise ECG (follow-up tests indicated IHD in 10 pts). HFQRS analysis was unequivocal in 32 pts (follow-up tests indicated IHD in 8 pts). HFQRS analysis resulted in significantly higher diagnostic performance for detecting IHD using exercise testing (table).

	Exercise ECG	HFQRS
No. of pts	36	32
Sensitivity	60% (6/10)	75% (6/8)
Specificity	54% (14/26)	92% (22/24)**
Pos. predictive value	33% (6/18)	75% (6/8)*
Neg. predictive value	78% (14/18)	92% (22/24)
Accuracy	56% (20/36)	88% (28/32)**

*p<0.05, **p<0.005.

Conclusions: This is the first large scale study to evaluate the utility of the HFQRS technique in a realistic clinical scenario. The results show the feasibility of this technique in the community setting while improving the diagnostic accuracy of exercise ECG.

3235 Comparison of Calcium Score with heart rate and gas exchange response to exercise as predictors of coronary artery disease in patients with type 2 diabetes mellitus

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Introduction: The most frequent causes of death in patients with type 2 diabetes mellitus (DM2) are complications of coronary artery disease (CAD). Often, atherosclerosis does not cause significant stenosis. In many cases coexistent microangiopathy, neuropathy, metabolic changes and peripheral vessel disease lead to dyspnea, lower tolerance of physical activity and inability to perform diagnostic exercise test.

Hypothesis: We hypothesized that ventilation parameter changes are useful in assessment of the extent of atherosclerosis in patients with DM2 and dyspnea at rest.

Material and methods: 106 patients with DM2, aged 59±7 years, with history of exercise dyspnea had Cardio-Pulmonary Exercise Test (CPET) on ZAN 680 cycloergometer according to RAMPE protocol. Atherosclerosis was assessed by two methods: Calcium Score (CS) on LightSpeed VCT 64 and in Cathlab. 48 patients had multivessel disease qualified to CABG.

Results: 1. All pts had no chest pain and ST deviation in ECG typical for cardiac ischaemia during exercise. Only 45 pts had diagnostic test (achieved 85% of HRpred.).

2. In linear regression analysis the strongest negative correlation was observed between CS and: Energy (r=-0.52), VO₂peak (r=-0.51), VO₂%N (r=-0.48), VEmax (r=-0.44), HRmax., HRmax.-rest and O₂pulse (for all r=-0,4)

3. Probability of multi vessel diagnosis depending on CS result: CS > 100: OR=98 sen=96 spec=81; CS > 200: OR=60 sen=92 spec=84; CS > 300: OR=79 sen=85 spec=93; CS > 400: OR=192 sen=77 spec=98;

4. Probability of multi vessel diagnosis depending on CPET result: VO₂peak<20 ml/kg/min. OR=16,7 sen=81 spec=74; VO₂%N<85% OR=14,4 sen=75 spec=83; VEmax.<55 l/min. OR=11,5 sen=77 spec=71; Max.Energy<530kcal/h OR=6,5 sen=73 spec=71; VO₂AT<10,5ml/kg/min OR=5 sen=73 spec=66