

(25% vs 9%, odds ratio [OR] 3.6, 95% CI 1.9 to 6.8, $P < 0.0001$). After adjusting for age, gender, smoking, blood pressure, use of antihypertensive drugs, LDL, HDL, triglycerides, white blood count, platelet count, TSH, hemoglobin, asthma, use of bronchodilators, body mass index, and actual blood sugar level, DM remained independently associated with an abnormal HRR (adjusted OR 2.1, 95% CI 1.0 to 4.1, $P = 0.04$). After further adjusting for exercise capacity, the association was attenuated (adjusted OR 1.9, 95% CI 1.0 to 3.9, $P = 0.06$). **Conclusion:** DM is associated with a higher likelihood of an abnormal HRR.

1184-139 The Exercise Tolerance Test Predicts Future Cardiovascular and All-Cause Death in Asymptomatic Women

Samia Mora, Yadong Cui, Maura K. Whiteman, Jodi A. Flaws, Roger S. Blumenthal, Johns Hopkins Medical Institutions, Baltimore, Maryland, University of Maryland School of Medicine, Baltimore, Maryland.

Background: Cardiovascular disease (CVD) is the leading cause of death in women, yet the prognostic significance of exercise tolerance tests (ETTs) in asymptomatic women is unknown. We investigated the value of ETTs in predicting future CVD and all-cause mortality in a low risk population of women.

Methods: From 1972 to 1976, 2,001 women between ages 40-80 years, without prior myocardial infarction, angina or claudication, underwent Bruce protocol ETTs in the baseline evaluation for the Lipid Research Clinics Prevalence Study. Abnormal (ABNL) ETTs had ≥ 1 mm ST depression or elevation, ventricular tachycardia, or exercise tolerance less than 6 minutes. Negative (NEG) ETTs had no ST changes, lasted ≥ 6 minutes, and met target heart rate. Inconclusive (INC) ETTs had no ST changes, lasted ≥ 6 minutes, but did not meet target heart rate.

Results: During an average 20-year follow-up, 30.2% of women with ABNL ETTs died versus 21.6% of those with INC ETTs and 13.3% with NEG ETTs. Women with ABNL and INC ETTs were at significantly increased risk for CVD death compared to those with NEG ETTs (age-adjusted RR 2.4 and 2.6, respectively) and for all-cause death (RR 1.4 and 1.7, respectively). In addition, the negative predictive value of the baseline ETT for long-term CVD death was 97%.

Conclusion: In a low risk population of women without cardiovascular disease, an abnormal or inconclusive ETT was a strong predictor of future cardiovascular mortality, suggesting that these women could benefit from aggressive risk factor control.

ETT	n	Deaths (%)	CVD Death RR (95% CI)	All-Cause Death RR (95% CI)
ABNL	692	30.2	2.4 (1.6-3.6)	1.4 (1.1-1.8)
INC	116	21.6	2.6 (1.3-5.4)	1.7 (1.1-2.5)
NEG	1193	13.3	1.0	1.0

1184-140 The Value of Exercise Electrocardiography in Women With Chest Pain: Comparison With Exercise Echocardiography

Ezra A. Amsterdam, Manish Patel, Jagdeep Mehrook, University of California, Davis, California.

BACKGROUND: The appropriate initial stress test for evaluating symptoms suggestive of coronary artery disease (CAD) in women is controversial. Because of a higher rate of false positive responses in women than men on standard exercise (Ex) electrocardiography (ECG), it has been proposed that the initial test in women should be a stress imaging modality. In current practice, a negative evaluation by the latter approach usually obviates the need for further invasive testing for CAD.

METHODS: To address this question, we analyzed the results of simultaneous Ex echocardiograms (Echo) and Ex ECG performed in women with no known cardiac disease as part of the initial evaluation for chest pain suggestive of CAD. All patients (pts) had a normal resting ECG and adequate exercise capacity by history. All tests were symptom-limited utilizing a Bruce protocol. A positive Ex Echo was defined as an exercise-induced regional wall motion abnormality and a positive Ex ECG was defined as Ex-induced ≥ 1.0 mm ST-segment depression.

RESULTS: The study group comprised 371 consecutive women (mean age 56 yrs [31-90]) evaluated by simultaneous Ex Echo and Ex ECG. Ex Echo was positive in 6.0% (22/371) and negative in 94.0% (349/371). Ex ECG was positive in 22.6% (84/371) and negative in 77.4% (287/371). In 84.5% (71/84) of pts with positive Ex ECG, Ex Echo was negative, suggesting a false positive Ex ECG. In this group of 71 pts, non-Echo Ex test data were analyzed for evidence of a false positive or low risk test: ≥ 7 METS, $\geq 95\%$ max predicted heart rate, double product $> 25,000$, ST depression < 1.5 mm, no Ex-induced chest pain). Three or more of these factors were present in 83.1% (59/71) of the pts with a positive Ex ECG and a negative Ex Echo.

CONCLUSIONS: These results indicate that 1) Ex ECG was negative and concordant with Ex Echo in a large majority of women and 2) $> 80\%$ of positive Ex ECG associated with neg Ex Echo were characterized by multiple low risk indicators consistent with a false positive or low risk result. Thus, Ex ECG is an appropriate initial test for evaluating women with symptoms suggestive of ischemic heart disease who have a normal resting ECG and can exercise.

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Physical Fitness, Smoking, and Long-Term Mortality Among Air Force Pilots Who Have Undergone Coronary Angiography

Patrick J. Fitzsimmons, William Krueyer, Michael S. Lauer, Cleveland Clinic Foundation, Cleveland, Ohio, Brooks Air Force Base, San Antonio, Armed Forces.

Background: Although poor physical fitness and smoking are known correlates of death risk, their importance once coronary anatomy is known is less clear.

Methods: We followed 1257 male US Air Force pilots (age 43 ± 6) for 13 years. None had known coronary disease or diabetes and none were taking any cardiovascular or antihypertensive medications. All underwent exercise testing and coronary angiography. Any coronary disease was defined as at least one 50% lesion in a major coronary artery or branch. Severe coronary disease was defined as a Duke angiographic prognostic weight score ≥ 42 (on a scale of 0 to 95). Poor physical fitness was defined as an estimated exercise capacity in the lowest quintile for age decade.

Results: Any coronary disease was present in 200 men (16%) while 25 (2%) had severe disease. There were 696 current smokers (55%). Smokers were more likely to manifest poor physical fitness (25% vs. 14%, odds ratio [OR] 2.03, 95% CI 1.52-2.73, $P < 0.0001$). After adjusting for age, blood glucose, blood pressure, cholesterol level, chronotropic response, and the angiographic severity of coronary disease, smoking remained an independent correlate of poor physical fitness (adjusted OR 1.78, 95% CI 1.31-2.43, $P = 0.0002$). During follow-up there were 51 deaths. In univariate analyses, death was associated with poor physical fitness (Quintile 1:Quintile 5 death rates 8% vs. 2%, hazard ratio [HR] 3.08, 95% CI 1.15-8.28, $P = 0.03$) and with smoking (5% vs. 2%, HR 2.18, 95% CI 1.16-4.10, $P = 0.02$). Even after adjusting for age, glucose, cholesterol, blood pressure, chronotropic response, and angiographic results, independent predictors of death included poor physical fitness (adjusted HR 2.35, 95% CI 1.22-4.53, $P = 0.01$) and smoking (adjusted HR 1.90, 95% CI 1.00-3.59, $P = 0.05$). There was no interaction between smoking and physical fitness for prediction of death.

Conclusions: In this cohort of otherwise healthy men, smoking was independently correlated with poor physical fitness, even after taking into account coronary angiographic findings. Both smoking and poor physical fitness were independently predictive of long term mortality.

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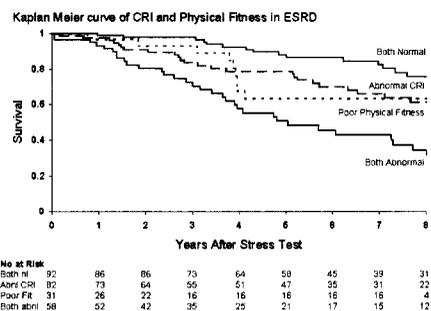
Prognostic Value of Exercise Testing in Patients With End Stage Renal Disease

Bhupinder Singh, Martin J. Schreiber, Eugene H. Blackstone, Claire E. Pothier Snader, Michael S. Lauer, Cleveland Clinic Foundation, Cleveland, Ohio.

Background: The prognostic value of exercise testing in patients with end-stage renal disease (ESRD) has not been well described.

Methods: We followed for 6 years 266 patients (age 49 ± 12 , 70% male) with ESRD who underwent symptom-limited exercise tests. Poor fitness was defined as poor functional capacity for age and gender based on a previously validated scheme. Chronotropic incompetence was failure to use 80% of heart rate reserve in patients not using beta-blockers. Heart rate recovery was the decrease in heart rate in the first minute after exercise; ≤ 12 was abnormal.

Results: There were 84 deaths; 65 later had renal transplants. Thirty-seven (14%) had heart failure, while 30 (14%) had prior CABG, and 56 (21%) had prior renal transplantation. Poor fitness was noted in 89 (33%), chronotropic incompetence in 140 (53%), and abnormal heart rate recovery in 139 (53%). Univariate predictors of death included poor fitness (48% vs. 23%, $P < 0.0001$), chronotropic incompetence (41% vs. 21%, $P < 0.0001$), and abnormal heart rate recovery (39% vs. 24%, $P < 0.0001$). After adjusting for age, gender, coronary disease, heart failure, insulin, prior renal transplantation, and later transplantation (as a time-dependent covariate), predictors of death included poor fitness (adjusted hazard ratio [HR] 1.9, 95% CI 1.2-3.0, $P = 0.005$) and chronotropic incompetence (HR 2.2, 95% CI 1.4-3.5, $P = 0.001$). (Figure)



Conclusion: Impaired functional capacity and chronotropic incompetence are predictive of death in patients with ESRD.