Thursday, March 22, 1990
10:30AM–12:00NOON, Room 26
Exercise Testing and Prognosis

EXERCISE ECG TEST RESULTS IN THE TIMI II TRIAL

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A submaximal supine bicycle ergometry test was performed predischarge and a maximal test 6 weeks post infarction in 1,958 patients (pts) treated with rt-PA and heparin in the TIMI II trial. The occurrence of ischemic ST segment depression (STD) as well as ST segment elevation (STE) were determined in 991 pts randomized to an invasive strategy 18-48 hrs after rt-PA therapy (I) and 967 pts randomized to a conservative strategy (C). ST segment shifts were significantly more common in pts randomized to C (p<0.01).

†p=0.15; *p=0.045	Predischarge		6 Weeks	
% Pts	I	C	I	C
STD	8.7	10.6	12.4	14.6
STE	8.4	12.9	5.9	8.3
Both	2.0	2.1	1.3	2.1
None	80.9	74.5	80.4	74.8
	p=0.003		p=0.013	
Pain or STD	13.8	16.1†	18.8	22.4*

The pooled 6 month relative risk of death or recurrent myocardial infarction was 1.0 (0.4, 2.4) in pts with an abnormal versus normal predischarge test; incidence rates were 2.7% and 2.7%, respectively. Thus, in a large post infarct patient series treated with rt-PA, exercise induced ischemic ECG abnormalities are more common when patients are treated with a conservative strategy. An abnormal predischarge supine bicycle ergometry exercise test is not predictive of death or recurrent myocardial infarction in the 6 months following the index event.

SIGNIFICANCE OF A NEGATIVE EXERCISE TEST IN PATIENTS WITH ONE OR TWO-VESSEL CORONARY DISEASE: PERPSECTIVES FROM THE VETERANS ADMINISTRATION COOPERATIVE STUDY OF ANGIOPLASTY COMPARED TO MEDICAL THERAPY.

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The ACME Study is a randomized trial of angioplasty compared to medical therapy in patients with single (1VD) and double (2VD) vessel (> 70% diameter reduction) stenoses. An exercise test (ETT) showing myocardial ischemia off all medications is needed for entry. Of the first 226 patients who met clinical and angiographic criteria, 36 had negative maximum ETTs as shown below.

	Positive ETT	Negative ETT
Patients (n)	190	36
Age (m ± S.D.)	60.9 ± 8.0	59.1 ± 9.0
Angina (n; %)	164; 86%	32; 89%
Angina Duration (mo.)	37.5 ± 57.7	28.3 ± 46.7
Prior MI (n; %)	66; 35%	20; 56%*
Diabetes (n; %)	34; 18%	3; 8%
Hypertension (n; %)	145; 77%	24; 67%
Maximum Double Product	24.6×10^3	25.9×10^3
70-79% stenosis	36.1%	59.5%*
80-89%	25.2%	14.3%*
≥90%	38.7%	26.2%*

(* p < .05)

Collaterals were found to be no more common in the ETT positve group than in the ETT-negative patients. In patients with 1VD or 2VD, prior infarction and the anatomic degree of coronary stenosis importantly influence ETT outcome.

PRE-DISCHARGE EXERCISE TESTING ADDS INDEPENDENT PROGNOSTIC INFORMATION TO CLINICAL RISK INDICATORS IN UNSTABLE ANGINA

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Patients discharged from hospital after unstable angina continue to experience adverse events despite apparently successful medical therapy. Although exercise testing is useful in risk stratification after myocardial infarction, data in unstable angina have been conflicting. In a prospective study, we performed symptom limited exercise tests prior to hospital discharge in 107 patients (72 males, 35 females) with unstable angina. The prognostic value of the exercise test was compared with clinical and ECG descriptors using stepwise logistic regression. The exercise test descriptors were: exercise capacity (METS), rate-pressure product (RPP), angina or ECG changes. The clinical descriptors were: age, sex, current smoking, diabetes, prior stable angina, prior myocardial infarction, minor elevations of cardiac enzymes (<2 x normal)) and the ECG descriptors were: resting or reversible ST/T changes and evolutionary T wave changes.

During follow up (mean 12.8 ± 1.4 months), 29 patients (27%) had adverse events, which included 9 patients (8%) with an acute myocardial infarction, 2 deaths and 22 patients (20%) with recurrent unstable angina. The results of logistic regression analysis indicated that the following variables were independent predictors of adverse outcome:

	Odds Ratio	(95% CI)	p
Evolutionary T wave changes	5.6	(1.8-17.0)	<0.005
Diabetes	5.7	(1.5-21.7)	<0.01
Low RPP (<18000)	3.6	(1.3-11.0)	<0.02
Rest pain in hospital	3.1	(1.1-9.1)	<0.05
Positive Exercise ECG	2.6	(0.9-7.0)	0.07

The logistic regression model derived from this data set identified patients with adverse outcomes with a sensitivity of 93%, specificity of 50%, positive predictive value of 41% and negative predictive value of 95%.

Conclusion: In patients with unstable angina the result of a pre-discharge exercise test provides independent prognostic information and when combined with clinical and ECG data could be used to assess risk of adverse outcome.

SIX MINUTE WALK IDENTIFIES ADVANCED HEART FAILURE PATIENTS WITH POOR PROGNOSIS

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Low peak oxygen consumption (PkVO2) measured during maximal exercise testing has been an independent predictor of mortality in heart failure. To determine whether the six minute walk (6MW) can reliably identify a subpopulation of heart failure pts at high risk, we studied 54 pts referred for transplantation. In addition to the 6MW, during which pts walked as far as possible, and symptom limited incremental exercise, pts bicycled 6 min at 20 Watts to approximate the walking VO2 for comparison to anaerobic threshold (AT), from V-slope and ventilatory criteria.

The pts were grouped by the distance covered during the 6MW. The groups were similar in age (53 vs 51,NS), ejection fraction (21 vs 20,NS), and etiology (40% ischemic cardiomyopathy vs 36%,NS). All 15 pts in Group 1 had PkVO2 ≤15ml/kg, and 12 pts (80%) were above AT at 20W (low-level exercise).

	Group 1	Group 2	P
6MW	<1100 ft	>1100 ft	
$PkVO_2$ ≤15 ml/kg	15/15(100%)	20/39(52%)	<0.00002
20W exercise >AT	12/15(80%)	12/39(31%)	<0.003

However, in group 2, 20 pts (52%) also had $PkVO_2$ ≤ 15 ml/kg, 11 of whom exceeded AT at 20 watts, suggesting a second subpopulation willing to walk a longer distance despite low aerobic capacity.

The 6MW, a convenient office test which is well tolerated by heart failure pts, is highly specific though insensitive for identifying a group who have PkVO2 ≤15ml/kg and exceed AT with daily activity. The 6MW aids in the initial selection of pts in whom aggressive therapy such as transplantation may be indicated.