

Stress Echocardiography: When is it the best test? RI-ACC Symposium

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Stress Echocardiography: Case History

45 year old women smoker with left-sided, sharp chest pain

PE: BP 152/88 HR 80

ECG: WNL

LABS: LDL 170, HDL 38

What is the pretest probability of CAD?

- a. 5%
- b. 20%
- c. 40%
- d. 80%

Pretest Likelihood of CAD: Low versus high risk patients

Noncardiac CP

Atypical CP

Typical CP

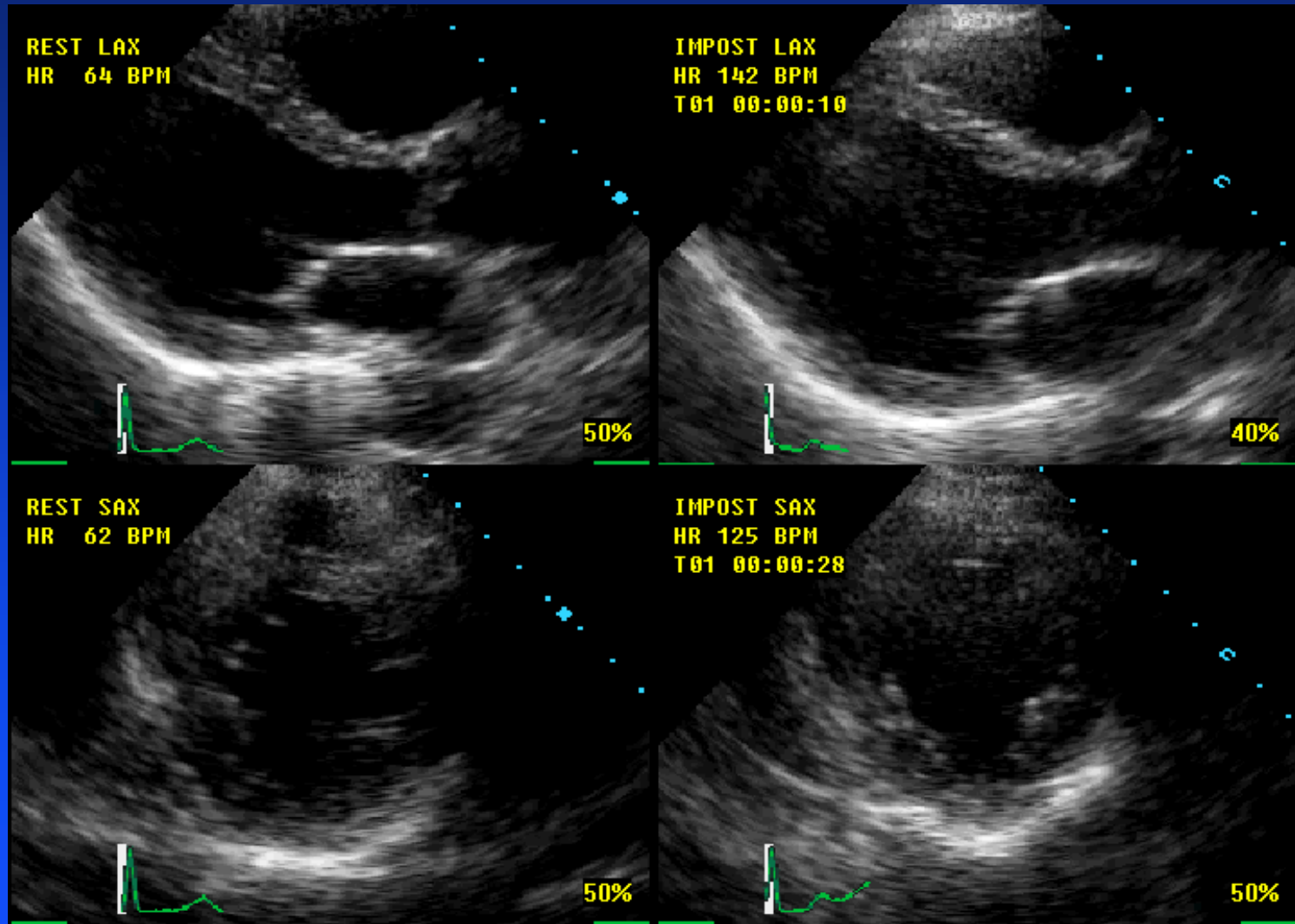
Age	M	W	M	W	M	W
35	3-35	1-19	8-59	2-39	30-88	10-78
45	9-47	2-22	21-70	5-43	51-92	20-79
55	23-59	4-25	45-79	10-47	80-95	38-82
65	49-69	9-29	71-86	20-51	93-97	56-84

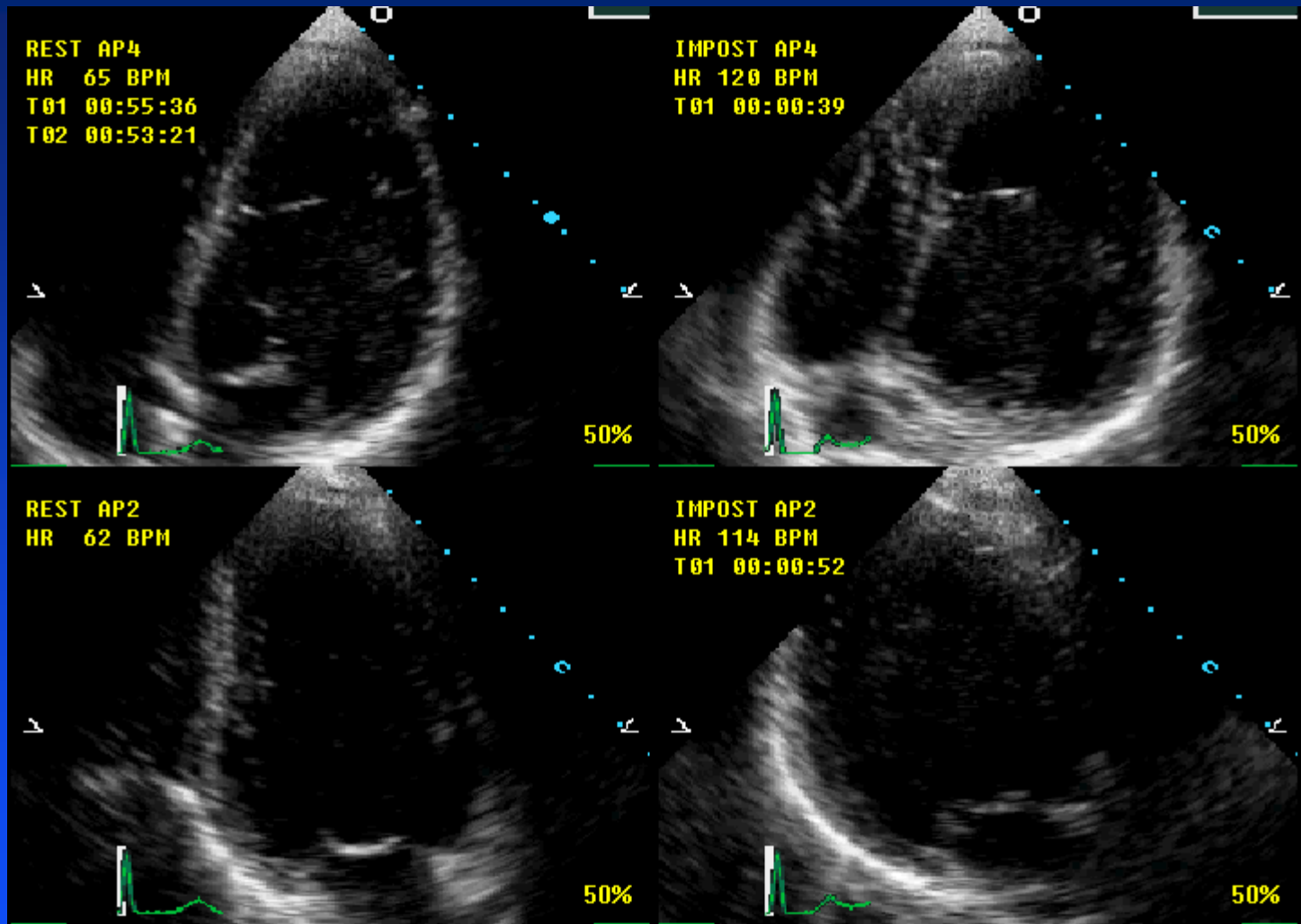
High risk= tob, lipids, HTN w/ nml ECG Duke Database

Stress Echocardiogram: Results

- Exercised 7:34 minutes on Bruce protocol
- Peak HR=158 BPM, peak BP=160/80
- Stress ECG: 2mm inferolateral, downsloping ST depression
- Symptoms: leg fatigue, typical chest pain
- Echo results:

Stress Echocardiogram



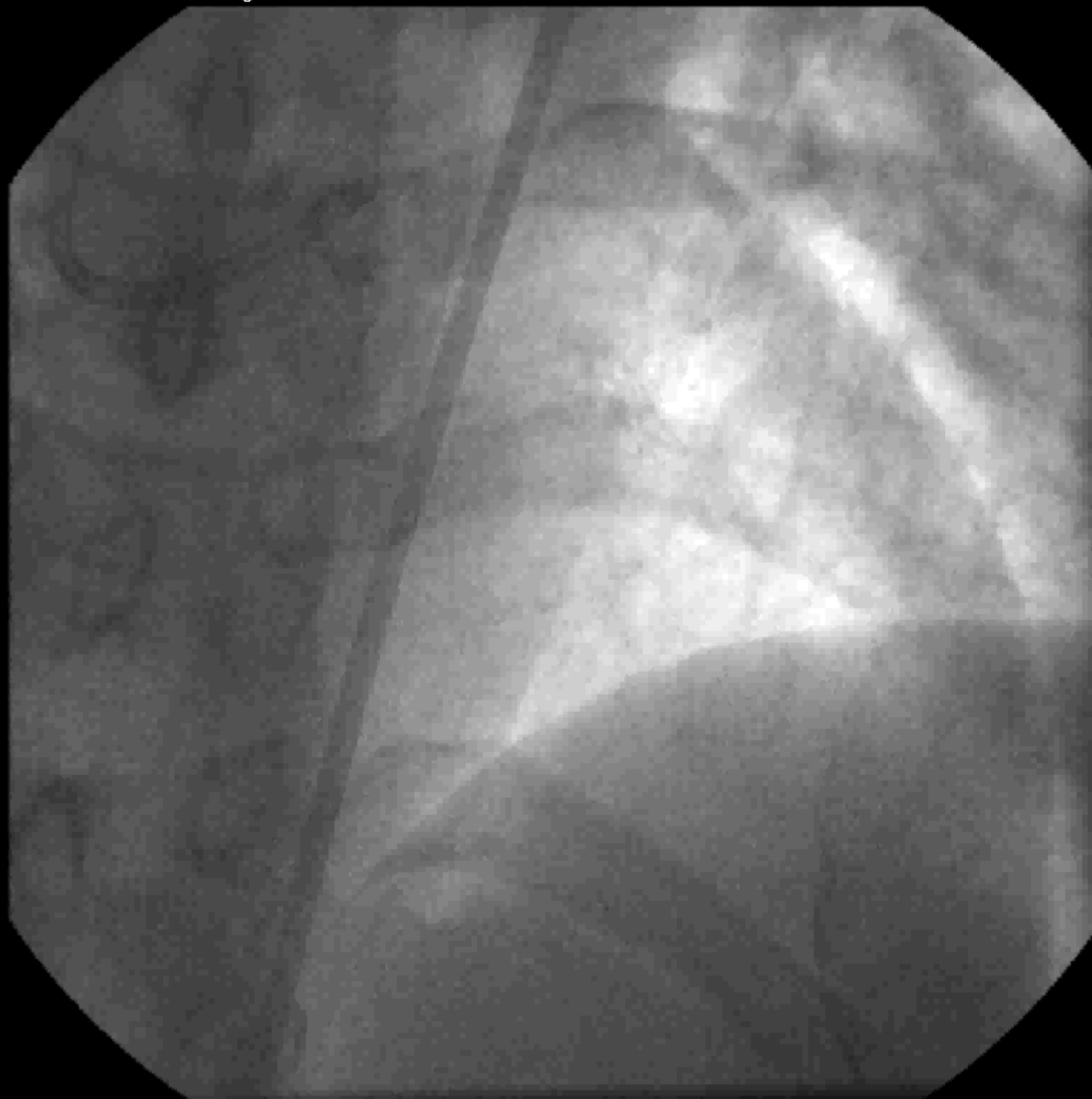


Cardiac Catheterization-images

Lossy Compression - not intended for diagnosis

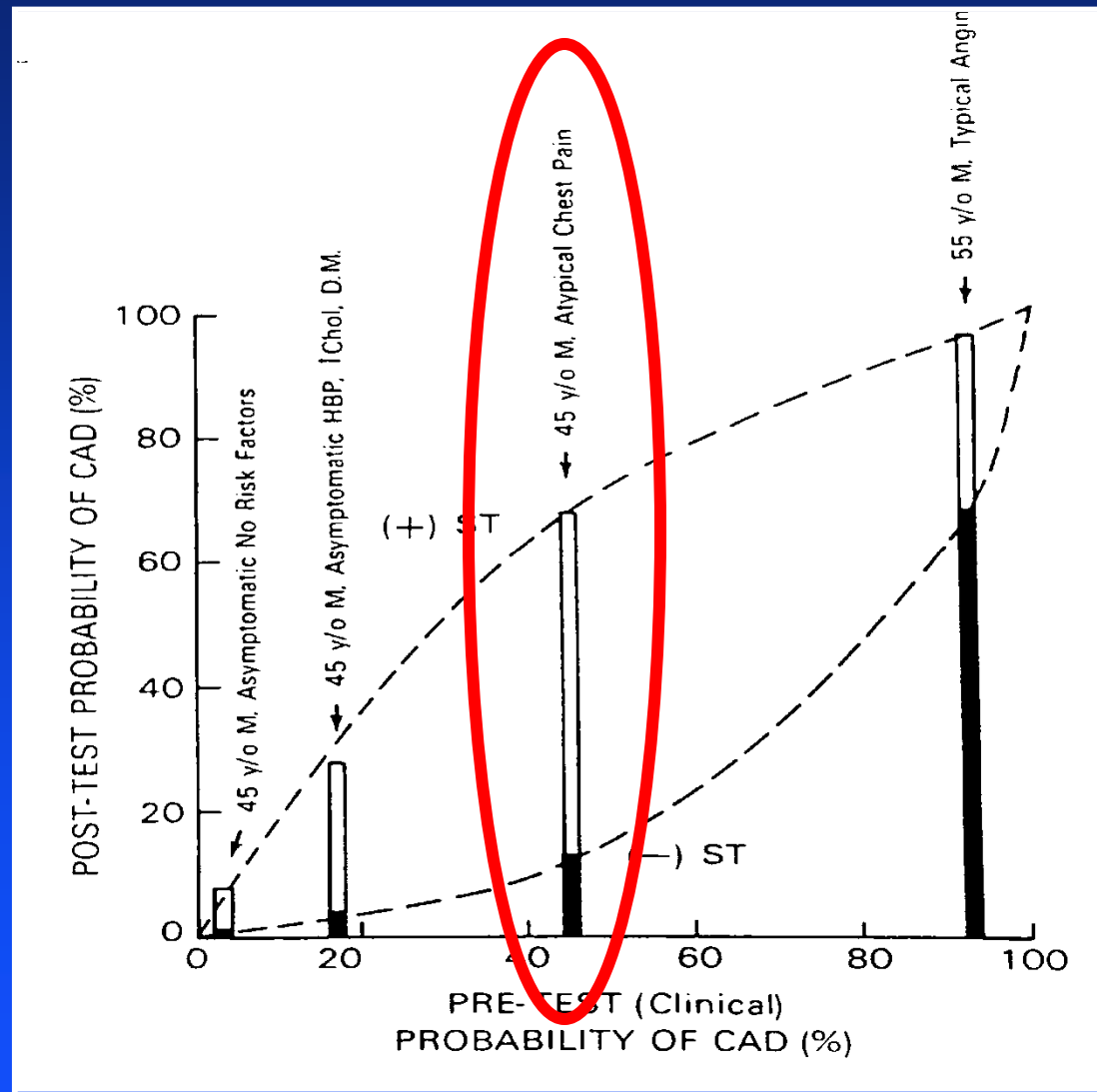


Lossy Compression - not intended for diagnosis



After LAD stent implantation

Bayes' Theorem: test intermediate risk



When is echo the best test?

- Detection of CAD
 - ◆ Regional *and* global LV *and* RV function
 - ◆ Low EF: viability with dobutamine
- Other etiologies of chest pain, dyspnea
 - ◆ Pulmonary hypertension
- Hemodynamics*
 - ◆ HCM: provokable gradients
 - ◆ Moderate to severe valvular disease

When is echo NOT the best test?

- Severe lung disease
 - ◆ Obesity limits any imaging
- Circumflex ischemia
 - ◆ Related to experience of reader
- Patient's unable to cooperate
 - ◆ Frail and elderly limited in any imaging

Noninvasive Risk Stratification in Patients with Suspected Ischemic Chest Pain[†]

High risk – greater than 3 percent annual mortality rate

1. Severe resting left ventricular dysfunction (LVEF <35 percent)
2. High-risk treadmill score (score ≤ -11)
3. Severe exercise left ventricular dysfunction (exercise LVEF <35 percent)
4. Stress-induced large perfusion defect (particularly if anterior)
5. Stress-induced multiple perfusion defects of moderate size
6. Large, fixed perfusion defect with LV dilation or increased lung uptake (thallium-201)
7. Stress-induced moderate perfusion defect with LV dilation or increased lung uptake (thallium-201)
8. Echocardiographic wall motion abnormality (involving greater than two segments) developing at low dose of dobutamine (≤ 10 mg/kg/min) or at a low heart rate (<120 beats/min)
9. Stress echocardiographic evidence of extensive ischemia

Intermediate risk – 1 percent to 3 percent annual mortality rate

1. Mild/moderate resting left ventricular dysfunction (LVEF = 35 percent to 49 percent)
2. Intermediate-risk treadmill score ($-11 < \text{score} < 5$)
3. Stress-induced moderate perfusion defect without LV dilation **OR** increased lung intake (thallium-201)
4. Limited stress echocardiographic ischemia with a wall motion abnormality only at higher doses of dobutamine involving less than or equal to two segments

Low risk – less than 1 percent annual mortality rate

1. Low-risk treadmill score (score ≥ 5)
2. Normal or small myocardial perfusion defect at rest or with stress*
3. Normal stress echocardiographic wall motion or no change of limited resting wall motion abnormalities during stress*

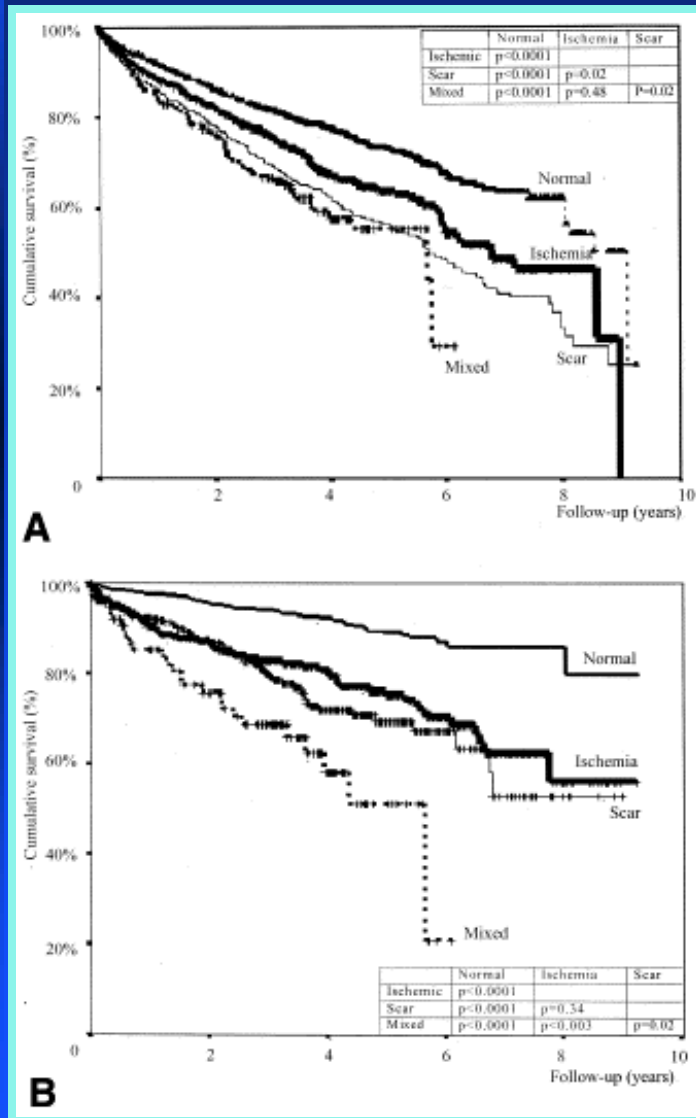
* Although the published data are limited, patients with these findings will probably not be at low risk in the presence of either a high-risk treadmill score or severe resting left ventricular dysfunction (LVEF < 35 percent).

[†] Reproduced with permission from: ACC/AHA/ACP Guidelines for the Management of Patients with Chronic Stable Angina. J Am Coll Cardiol 1999; 33:2092. Copyright © 1999 American College of Cardiology.

Stress Echocardiography

	N*	<u>Sensitivity/Specificity</u>	
Overall	750	84-88%	86-88%
SVDz		58-92%	
MVDz		82-100%	
LAD>RCA>L Cx			

Dobutamine Stress Echocardiography Predictive of Prognosis



- 3,156 patients
- ◆ 1,355 women
- ◆ Age = 63 ± 12 yrs
- ◆ F/U = 3.8 ± 1.9 yrs
- +DSE predictive of:
 - A. Total mortality
 - B. Cardiac mortality

Marwick JACC 2001;37:754

Exercise Stress Echocardiography Predictive of Prognosis

- 5798 patients (2,476 women), 3.2 ± 1.7 yrs
 - ◆ age 62 ± 12 years
- History of prior PTCA/CABG/MI
 - ◆ Men=56% Women=22%
- Positive tests: 35% men, 25% women
- MI/death: 5.3% men, 3.1% women
- MVA predictors of events:
 - ◆ Exercise WMSI and workload <6METS

• Arruda-Olsen AM. JACC 2002;39:625.

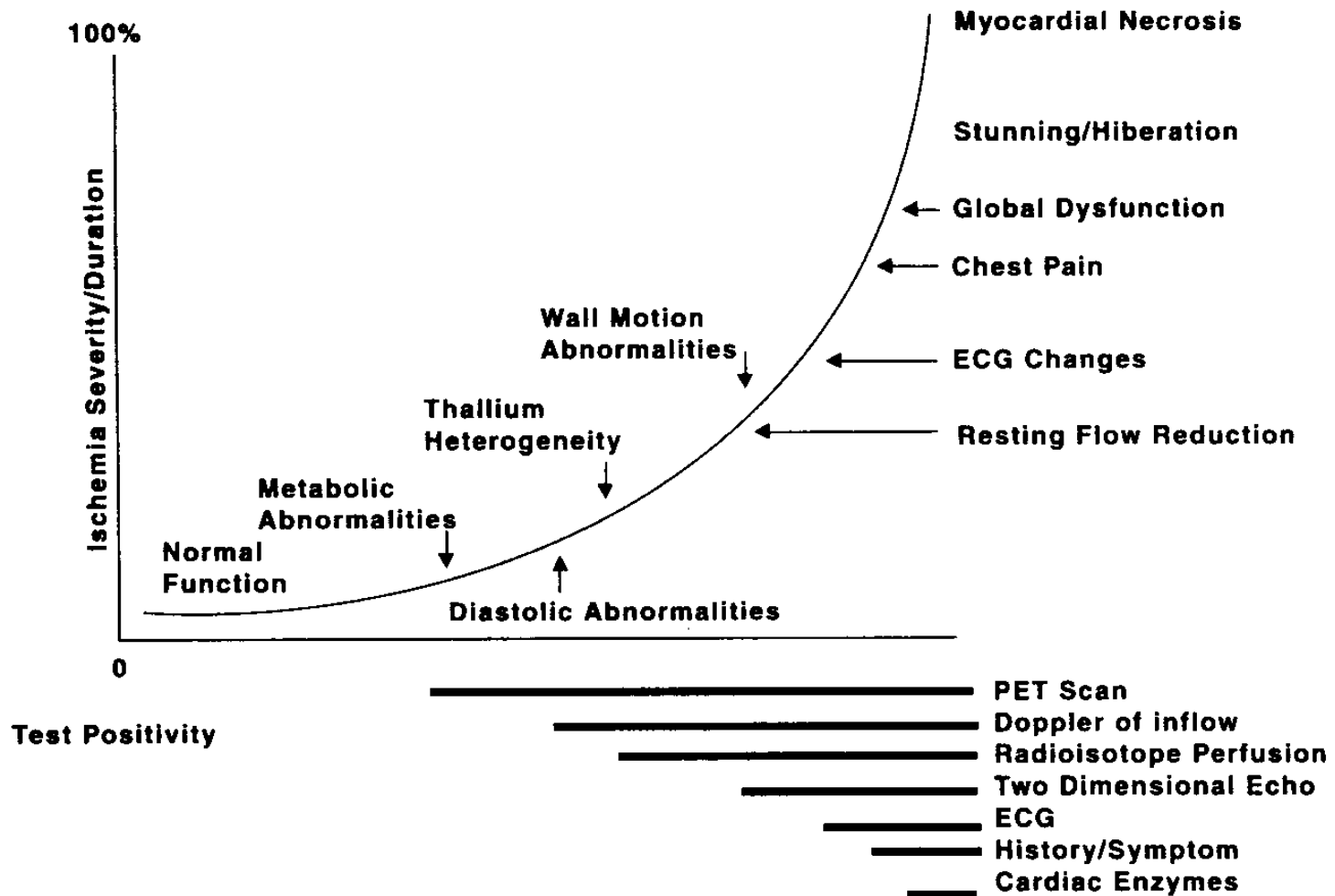
Stress Echocardiography

Compared with other modalities

- Meta-analysis comparing:
 - ◆ exercise SPECT (27 studies)
 - ◆ exercise echo (24 studies)
- Predominately male populations (69%)
- High prevalence of CAD (66-78%)
- Similar sensitivity
 - ◆ 85% vs 87%
- Stress echo had higher specificity
 - ◆ 77% vs 64%

– Fleischmann et al. JAMA 1998;280:913.

Ischemia Cascade



Stress Echocardiography

Compared with other modalities

ECHO

- Cardiac function
- Real-time imaging
- Additional information
- Patient convenience

Fewer False Positives:
Younger, lower risk

NUCLEAR

- Relative perfusion
- Quantitation of extent of perfusion abnormalities
- Literature on prognosis

Fewer False Negatives:
Preop high risk surgery