

Chest Pain in the Emergency Room: Which Test for Which Patient?



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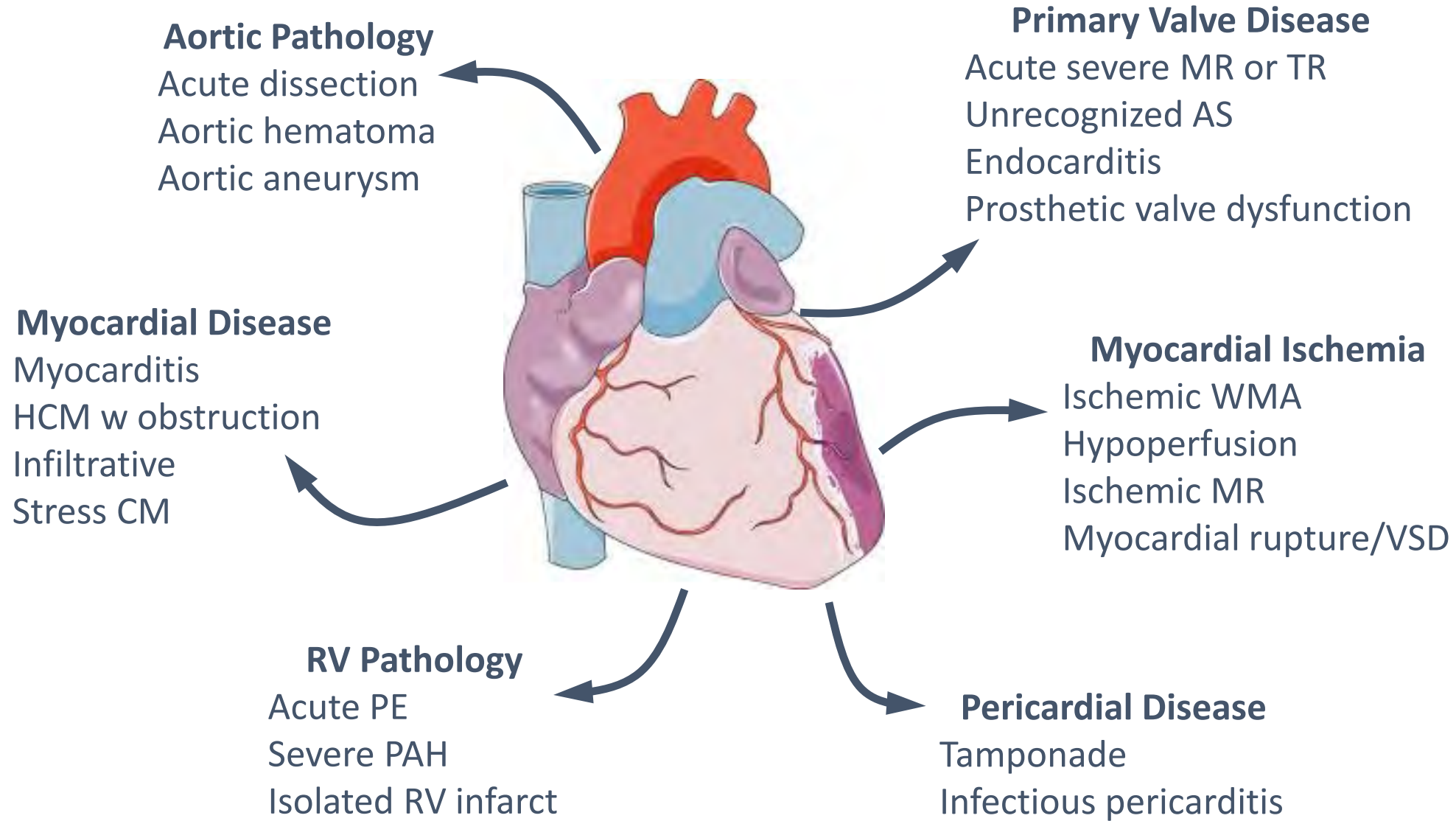
Research Support/Disclosures:

NIH: R01-HL078610, R01-HL130036, P51-OD011092, R01-135024

NASA: 18-18HCFBP_1_009

GE Healthcare, Lantheus, Philips

Diverse Etiologies of Acute Chest Pain



TTE for Acute Chest Pain

Role of Echocardiography

- Rapid and reliable diagnosis or exclusion of ACS or other serious disease
- Identification of high-risk features of a suspected or known condition
- Assessing for complications of ischemia, dissection, etc.
- Good all-around for other causes (aortic, valve, myocarditis, pericardial, etc.)

Why Echocardiography?

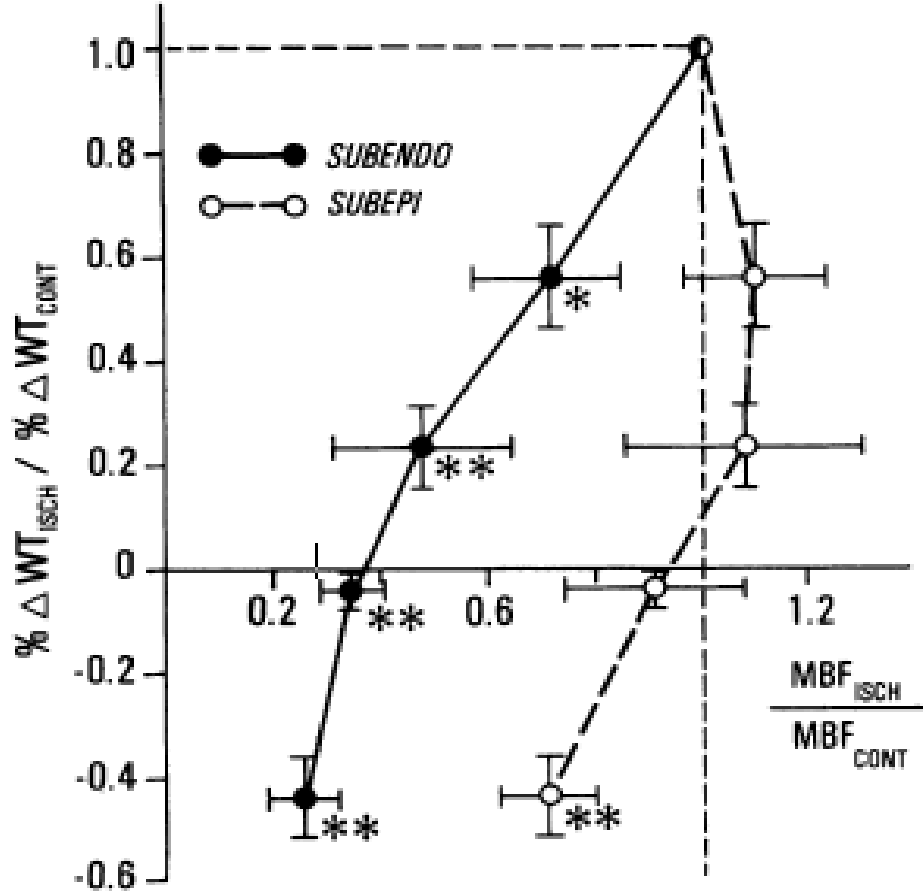
- Portable
- Information immediately available to the care team
- Inexpensive

Limitations of Echocardiography

- Variability in the scope of training or knowledge
- Artifacts and incomplete view of certain structures (e.g. aorta)

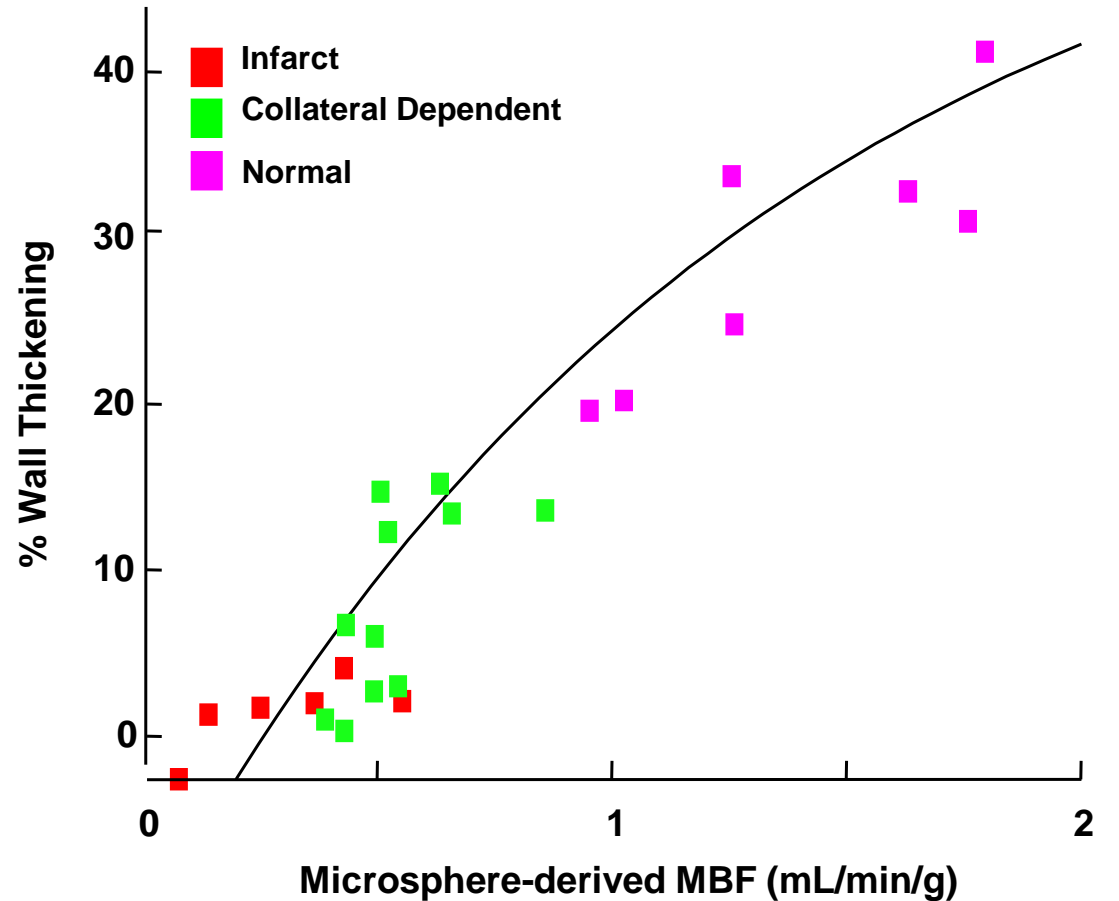
Flow-Function Relationships in Acute Ischemia

1. It doesn't take much ischemia to cause WMA



Gallagher G, Circulation 1980;62:1266

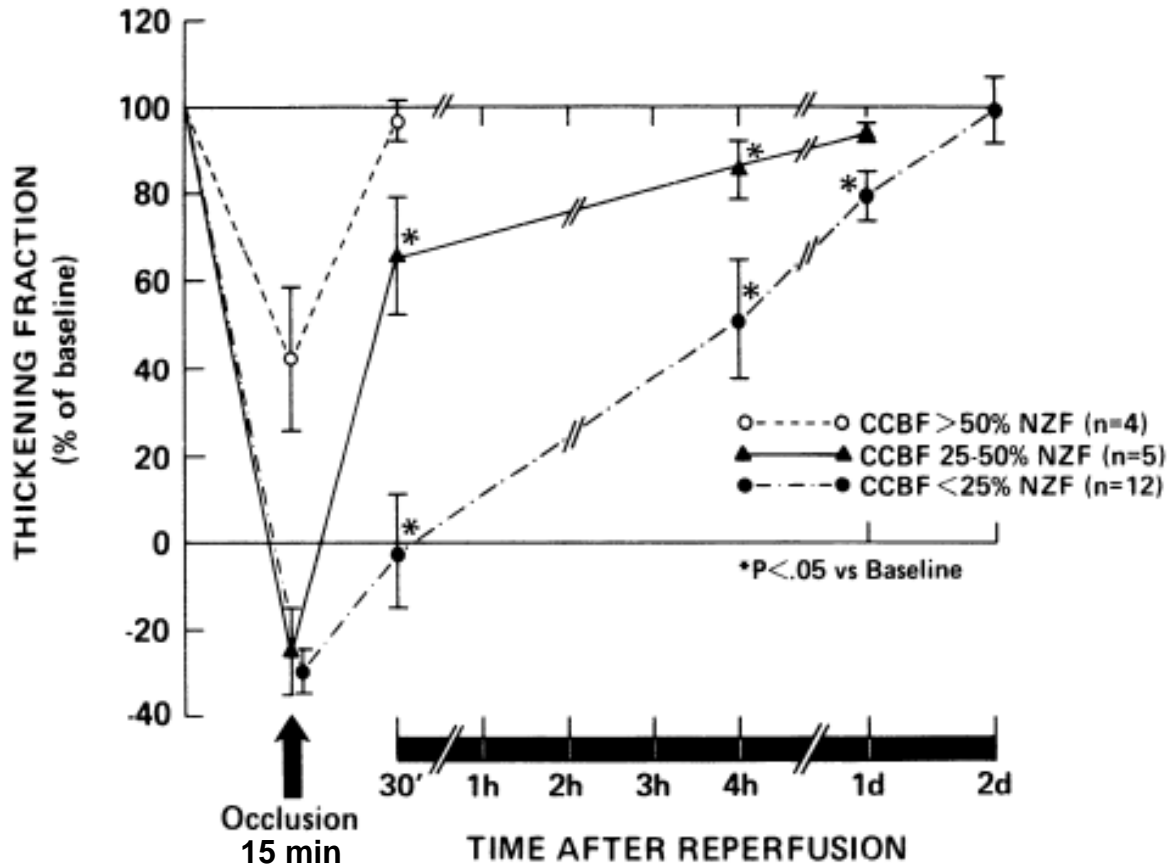
2. WMA don't necessarily indicate necrosis will occur



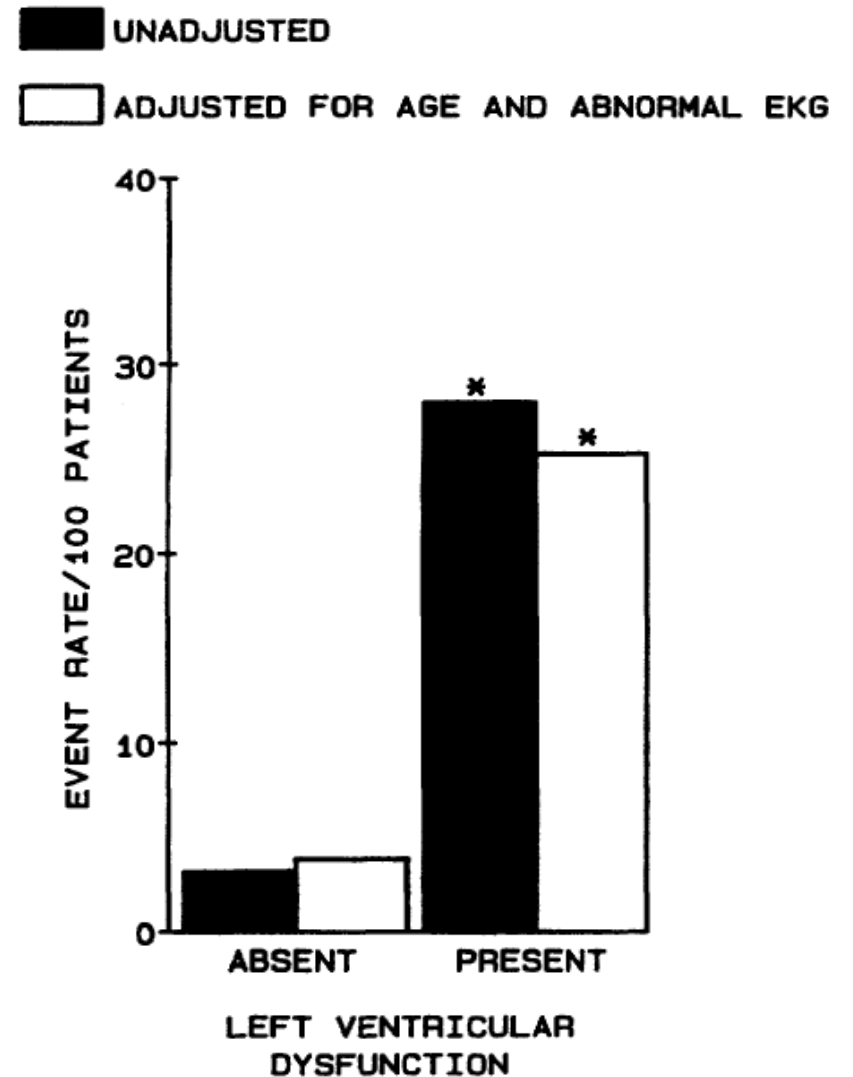
Leong-Poi H, et al., J Am Coll Cardiol 2005;45:565

Flow-Function Relationships in Acute Ischemia

3. Stunning depends on ischemic severity/duration

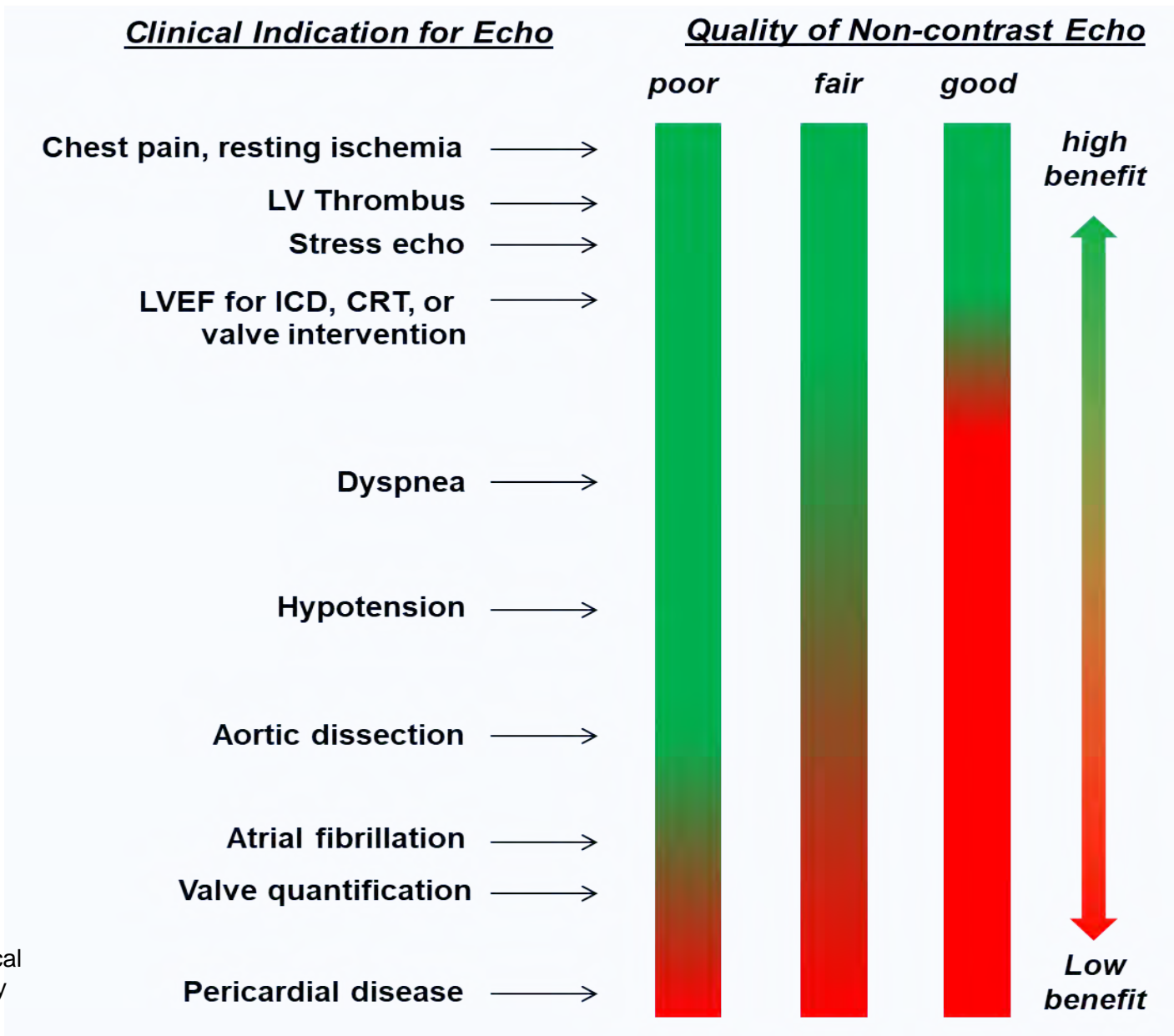


Bolli R, et al. Am J Physiol 1988;254:H1204

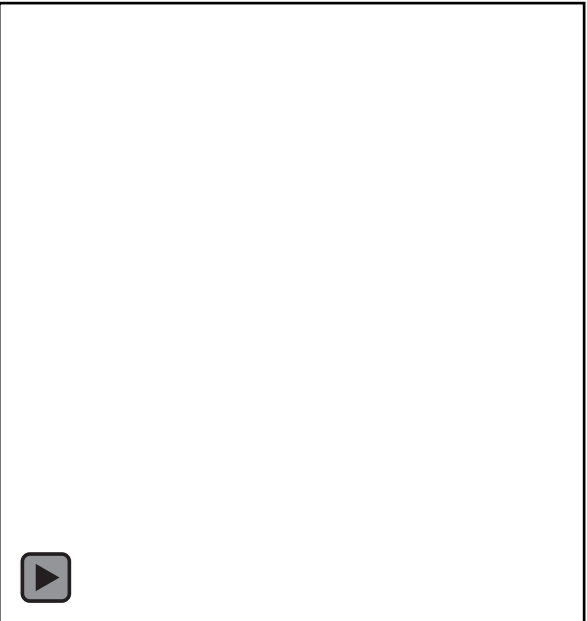
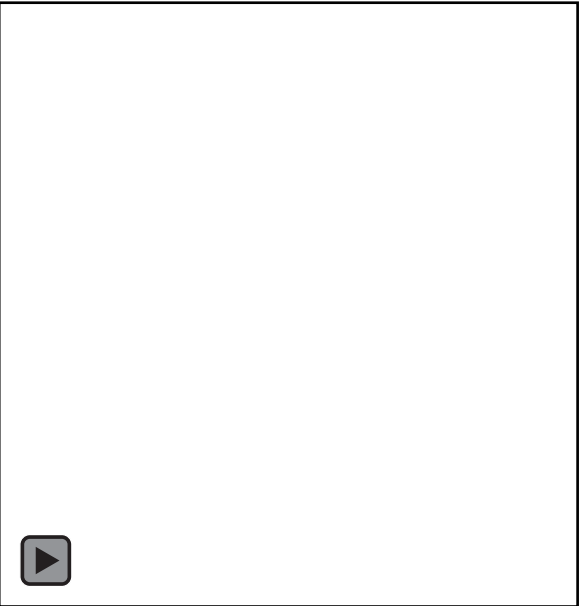


Sabia P, Circulation 1991;84:1615

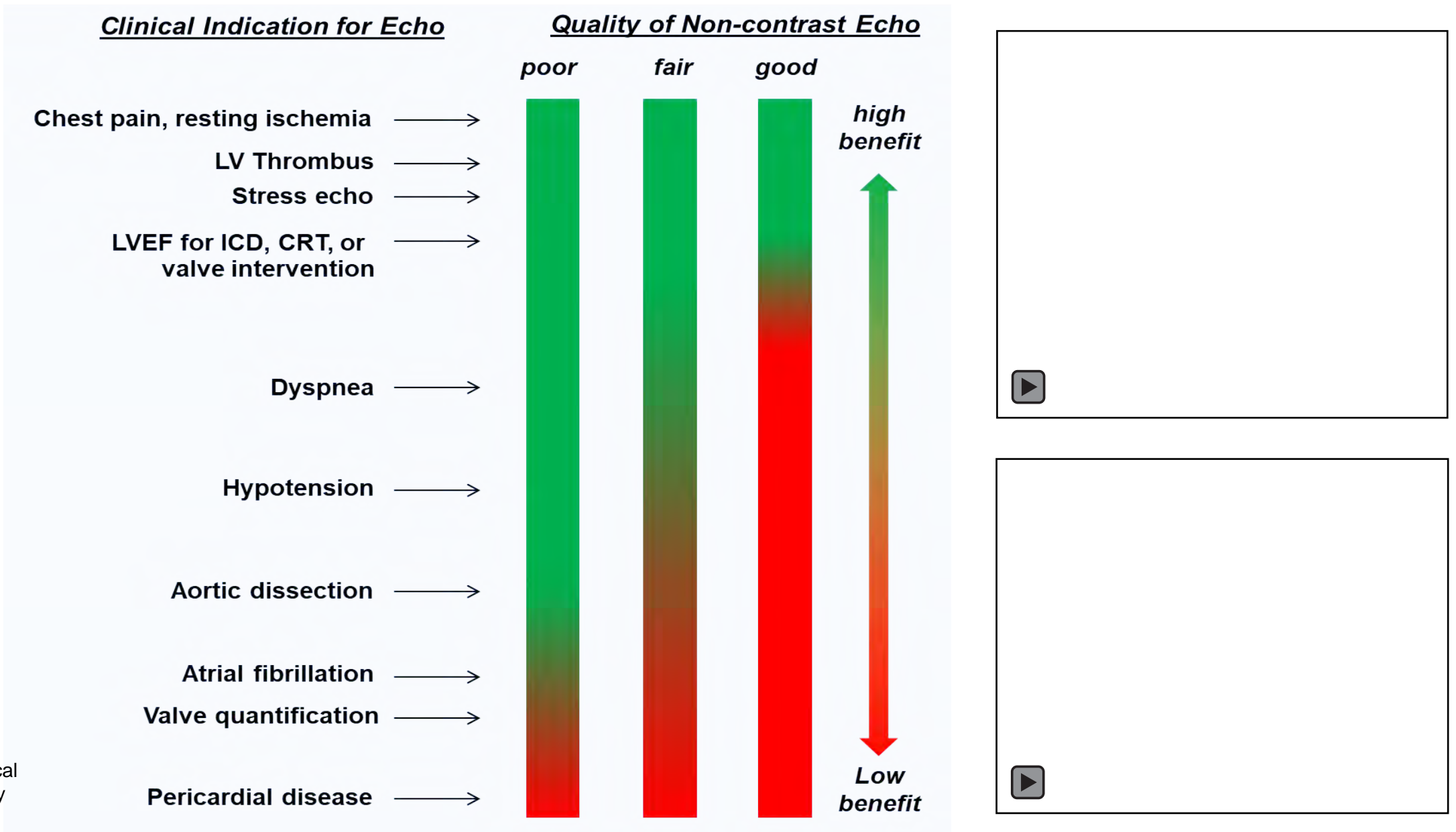
Contrast Echocardiography: Don't Forget Wall Motion



Lindner JR.
From Otto C,
Textbook of Clinical
Echocardiography

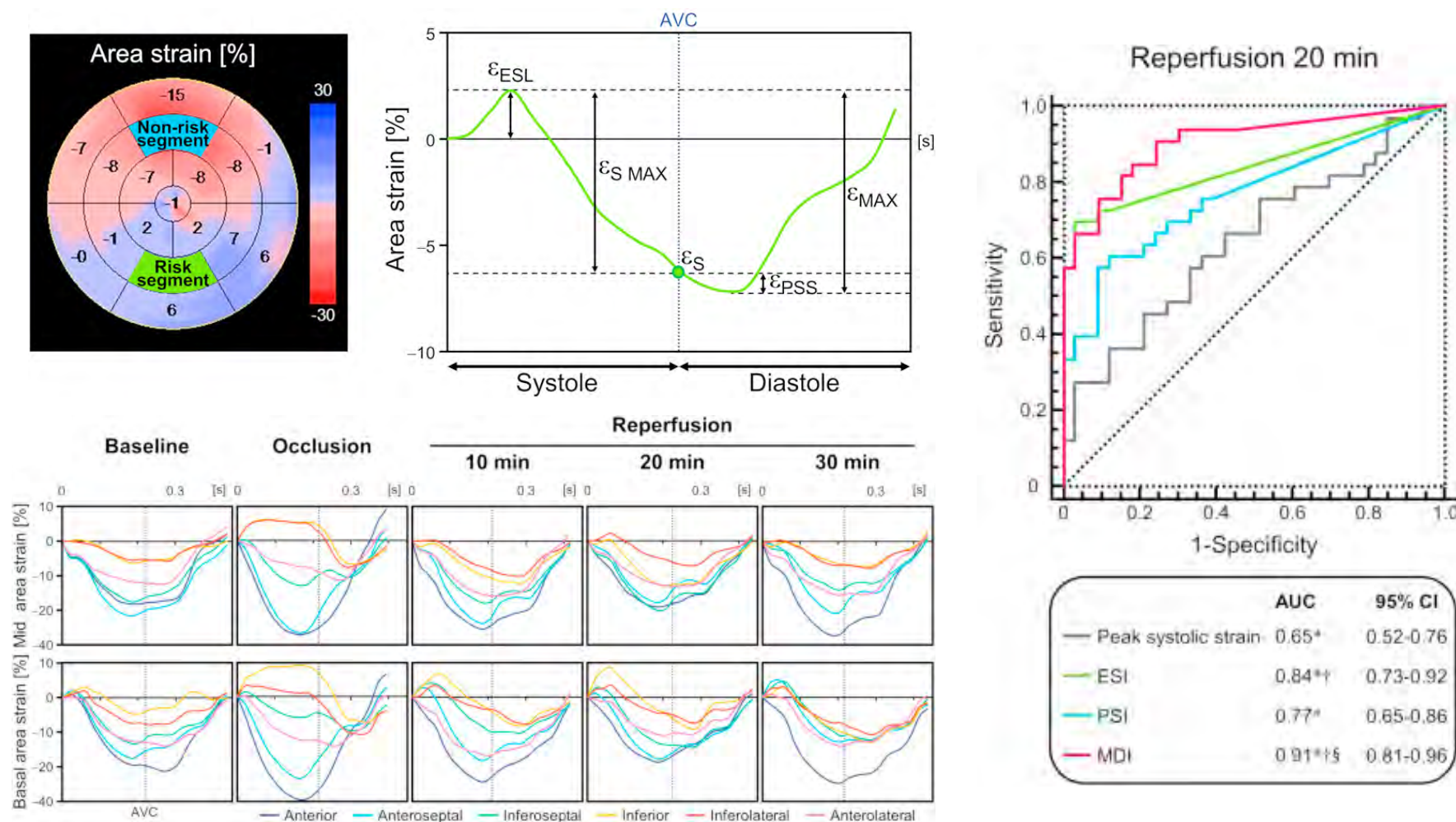


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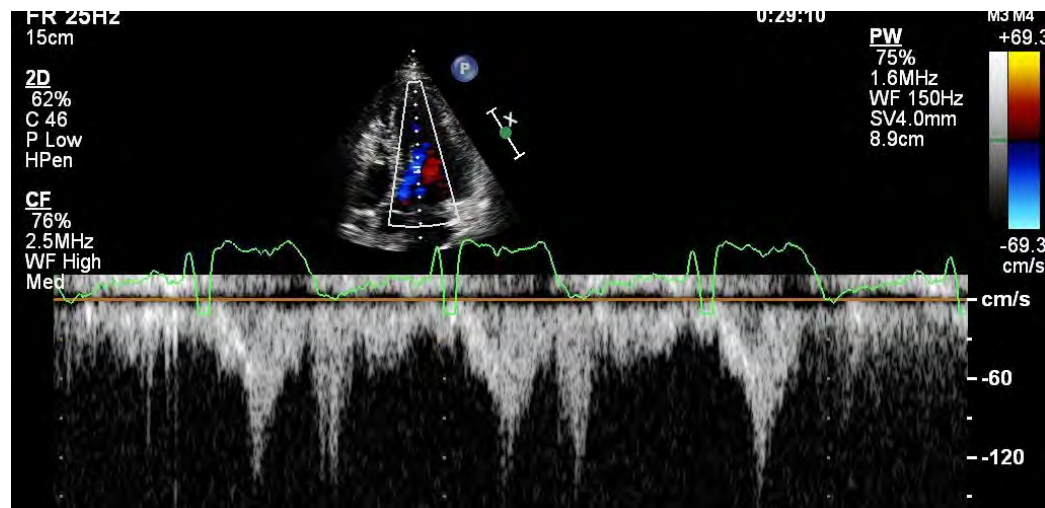
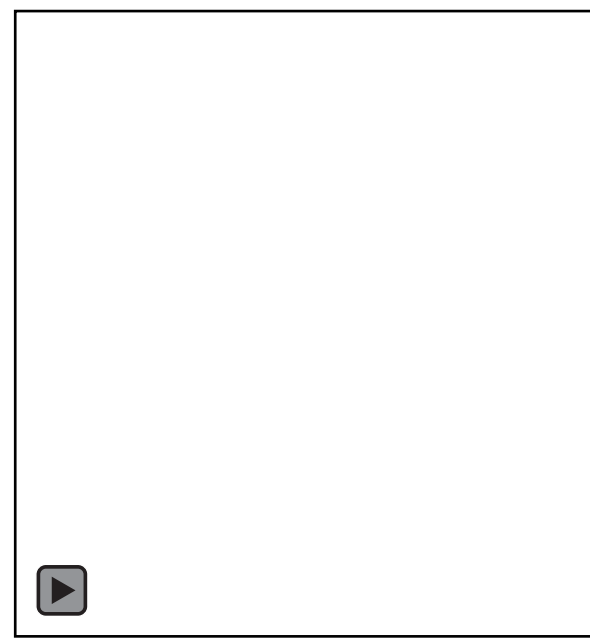
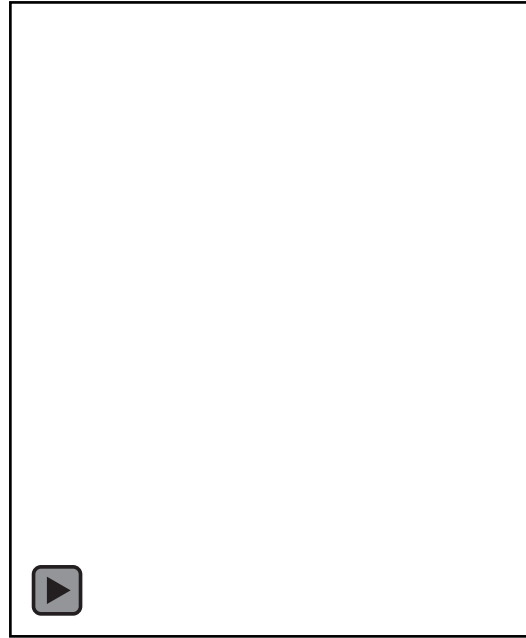
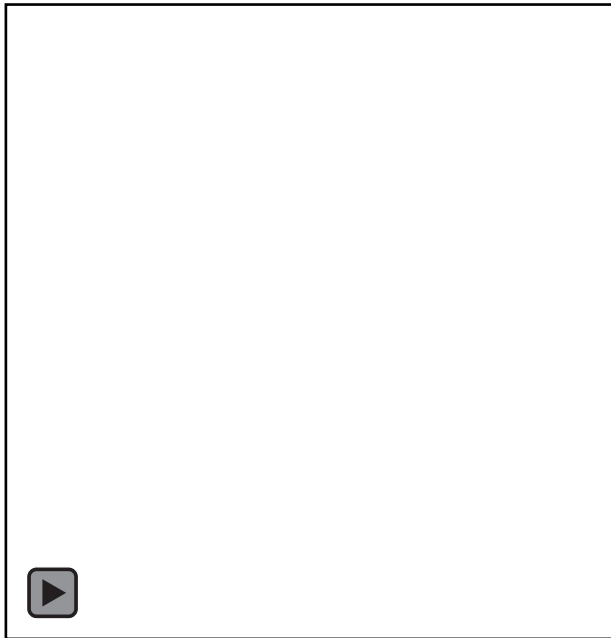


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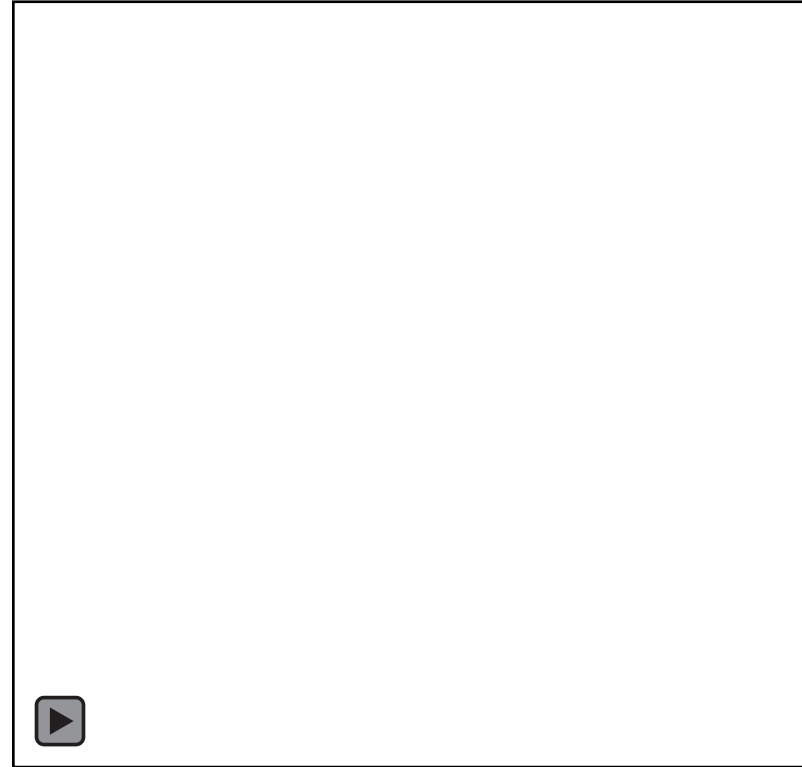
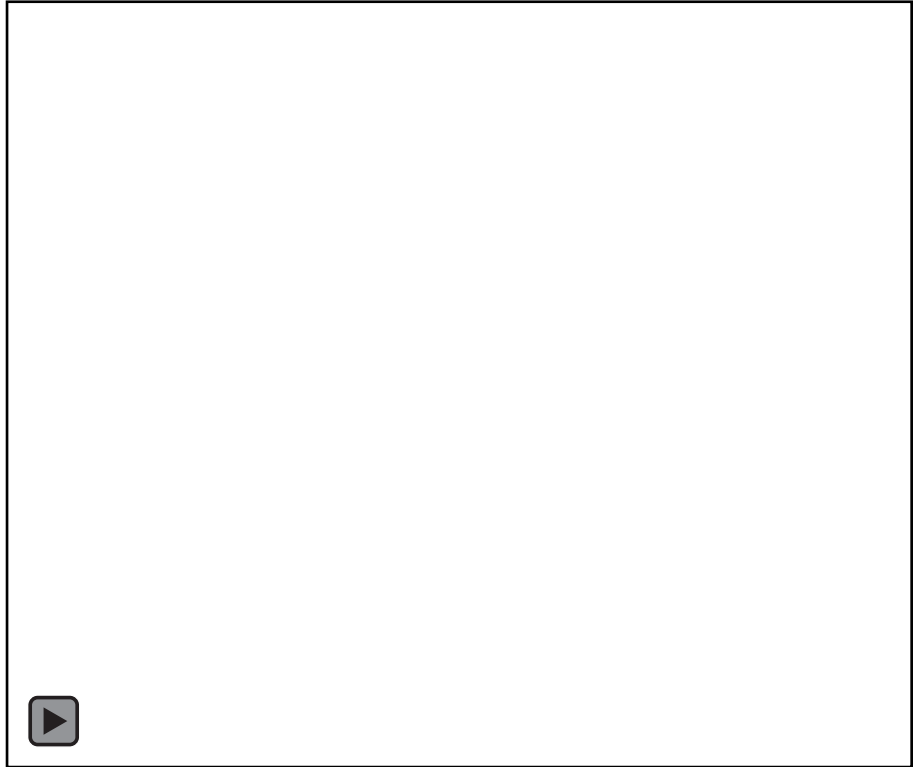
Contrast Echocardiography: Don't Forget Wall Motion



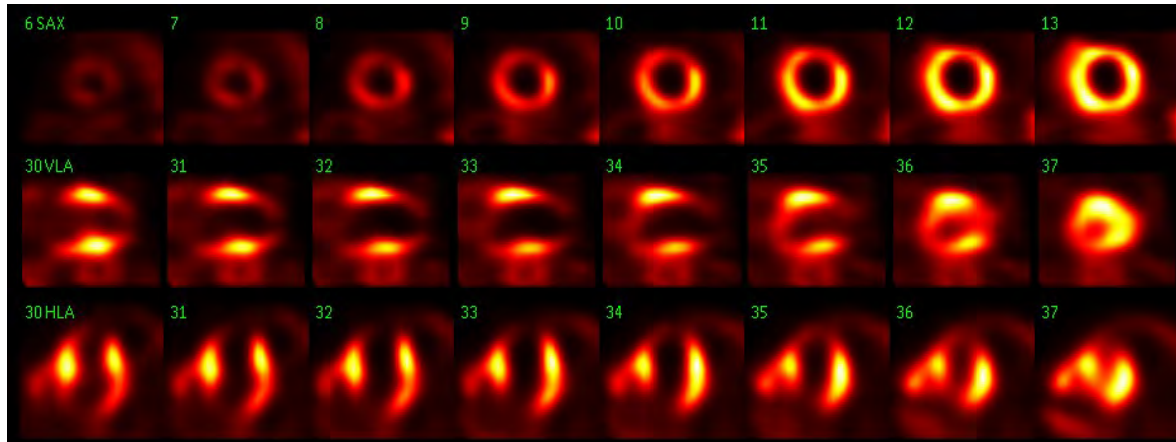
Actionable Causes of Chest Pain not from CAD



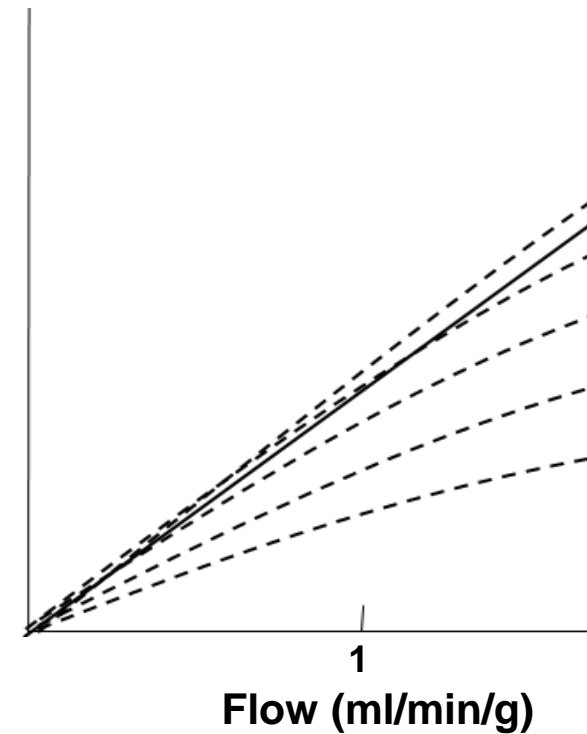
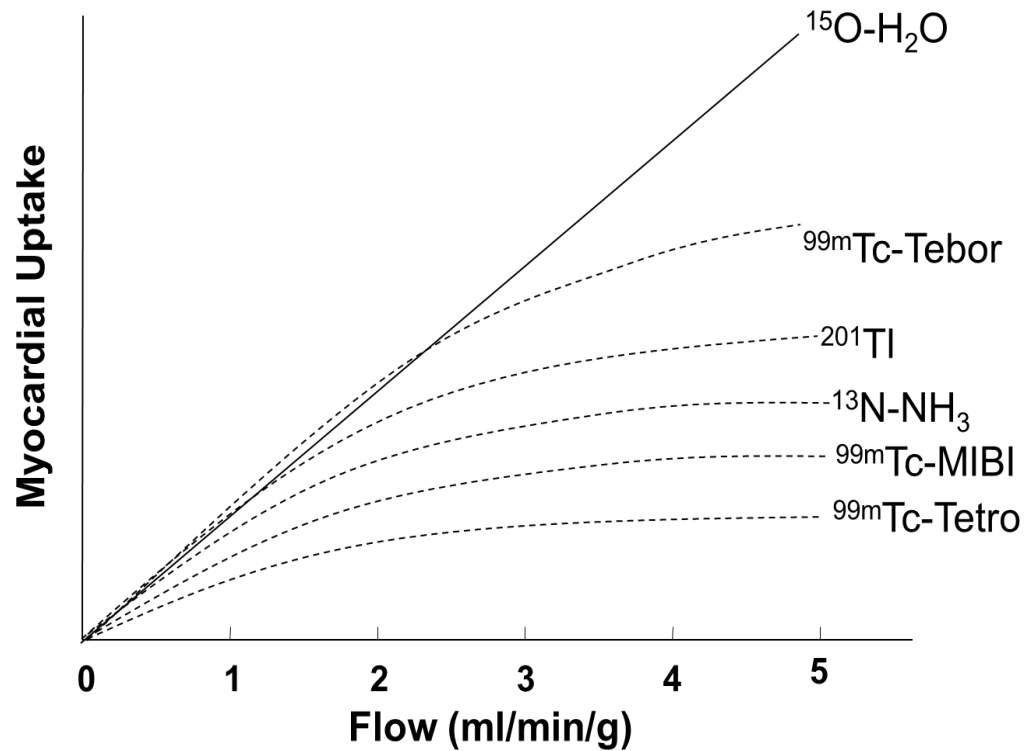
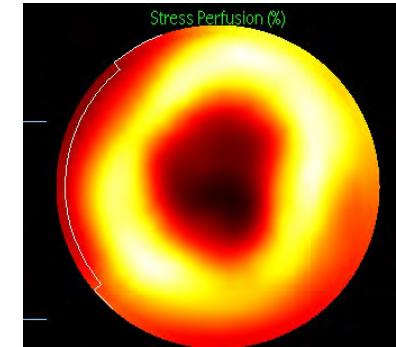
Actionable Causes of Chest Pain not from CAD



Myocardial Perfusion in ED Patients

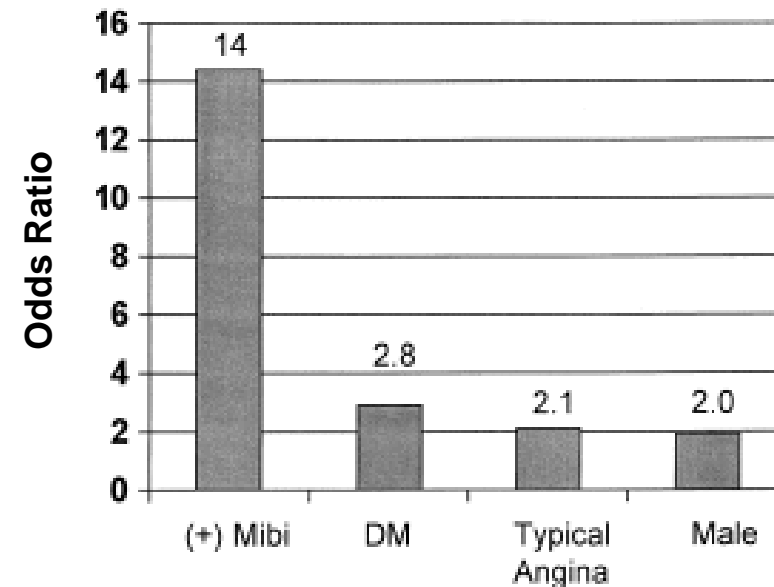
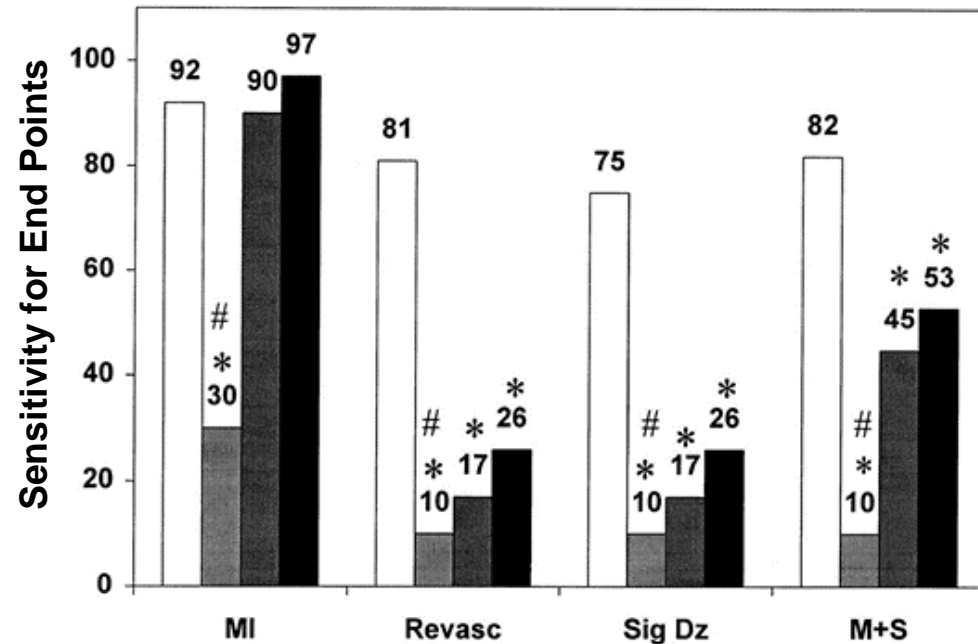


Polar Map

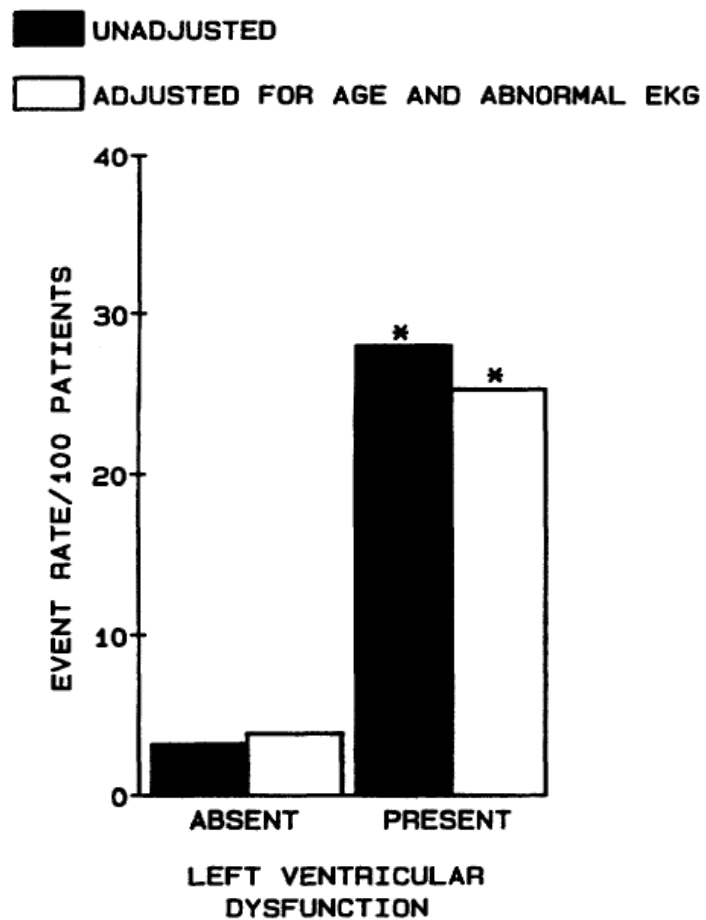


Myocardial Perfusion in ED Patients with CP

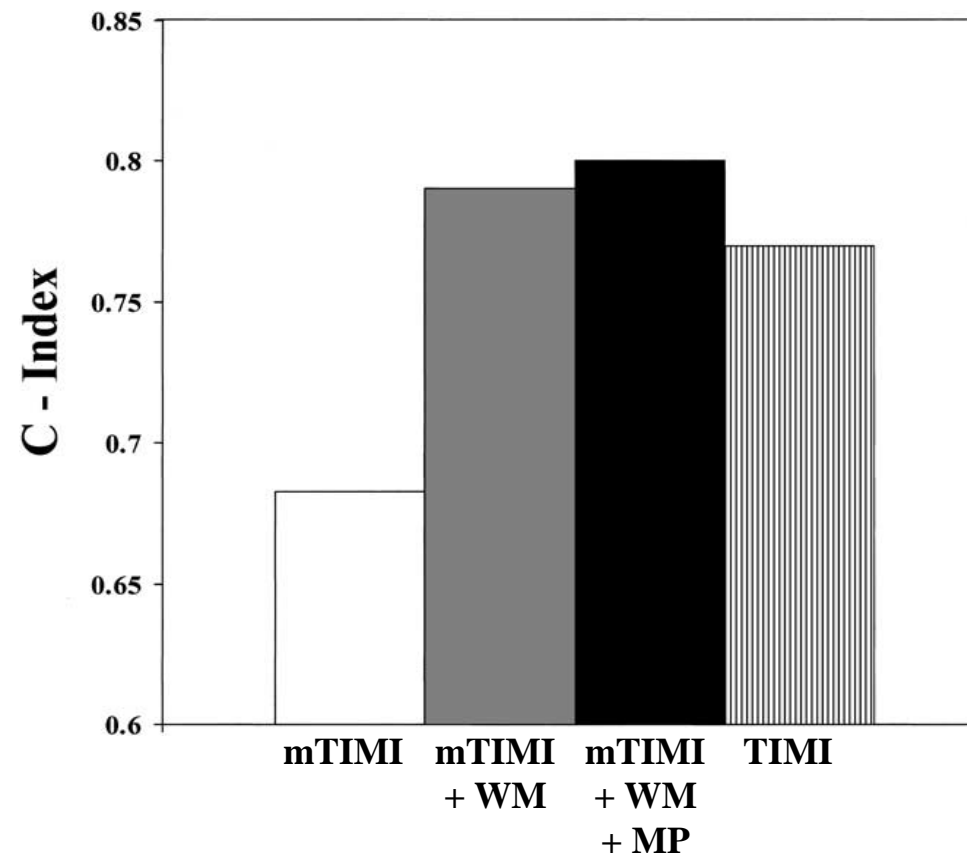
- ED presentation with CP
- Injection with ≈ 20 mCi ^{99m}Tc -MIBI during or soon after (<6 hrs) sx
- SPECT imaging 60-90 min after injection



Flow-Function Relationships in Acute Ischemia

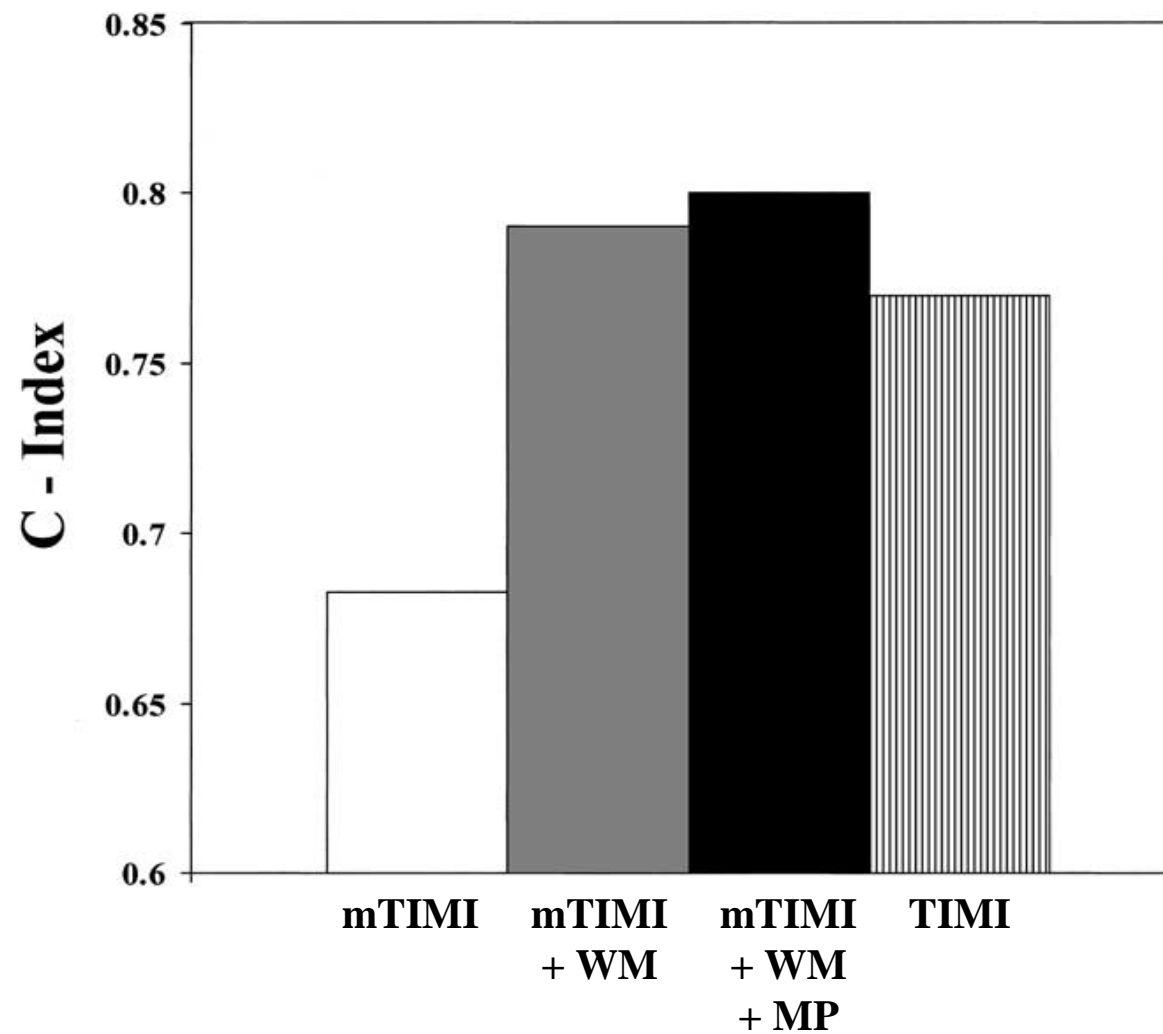
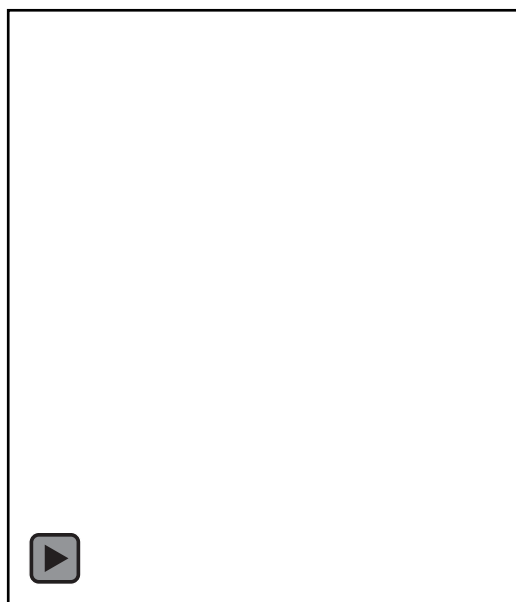
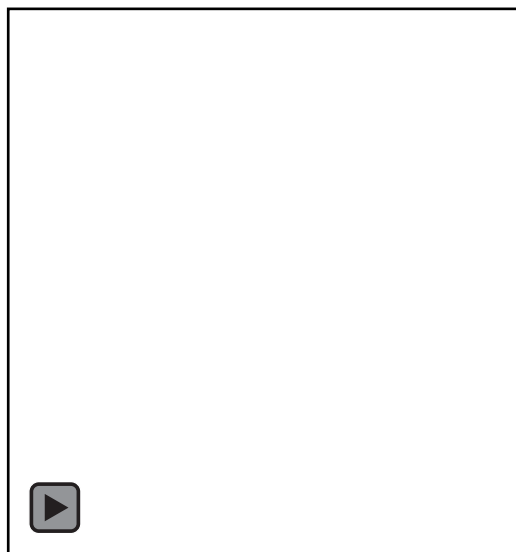


Sabia P, Circulation 1991;84:1615

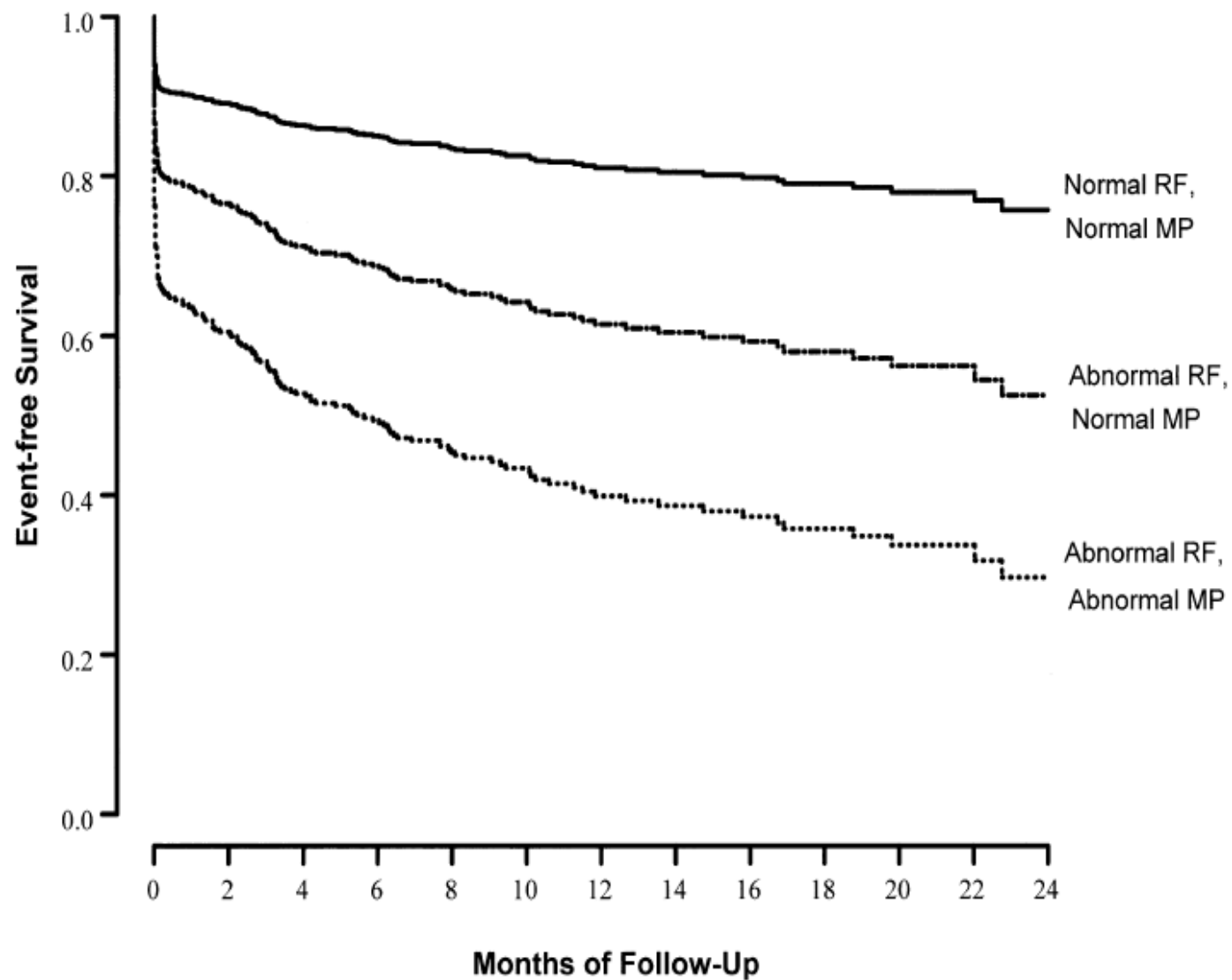


Tong KL, JACC 2005;46:920

POC Perfusion Imaging with MCE in the ED



POC Perfusion Imaging with MCE in the ED

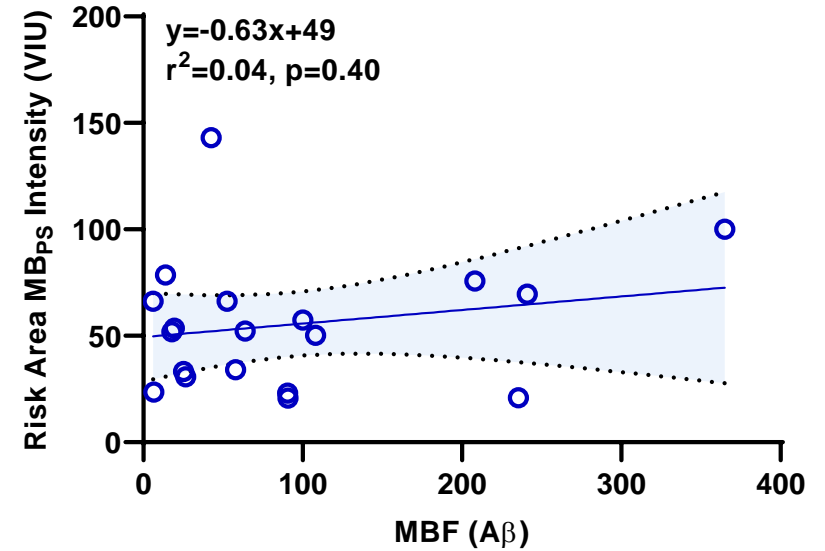
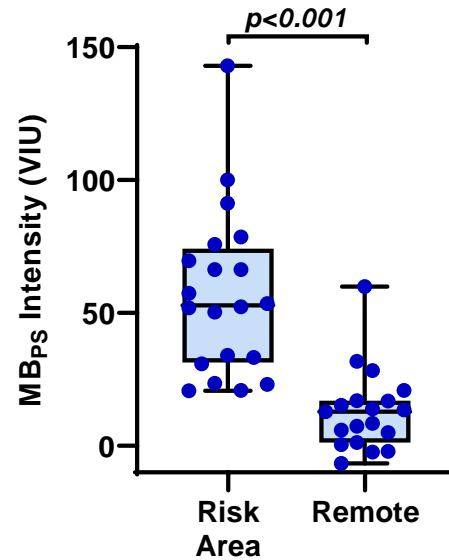
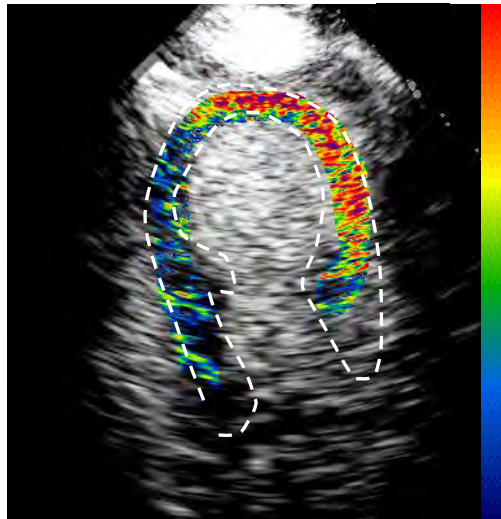


Ischemic Memory with Sonazoid

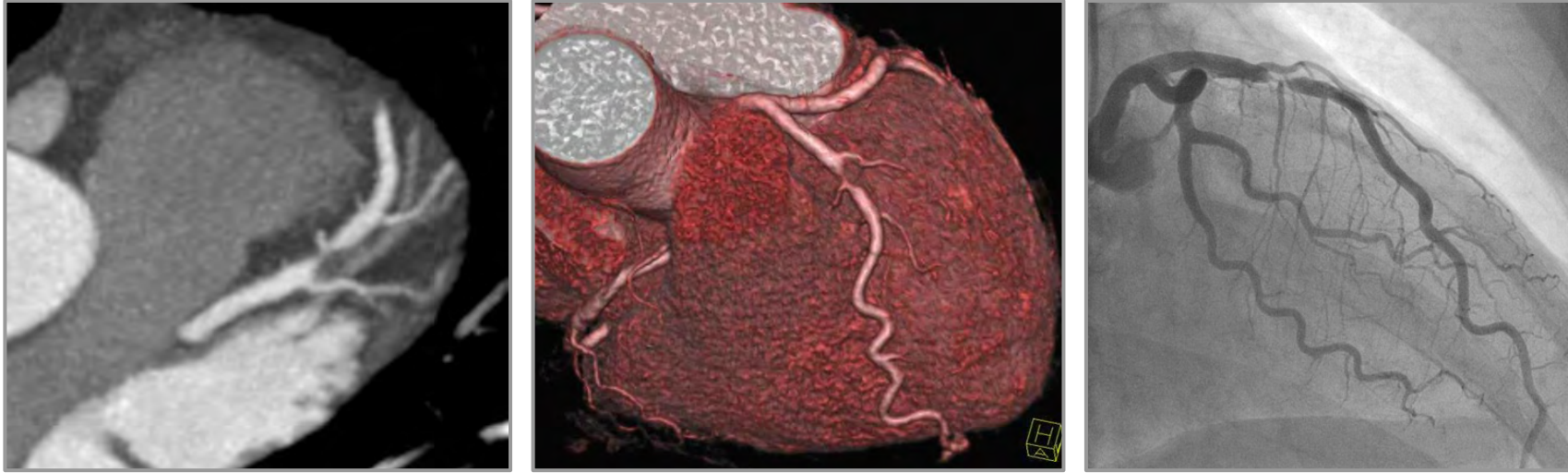
MCE Myocardial Perfusion



Ischemic Memory with MB_{PS} Retention



CT in ED Patients with CP



Why CT Angiography?

- Rapid high-resolution imaging now widely available
- Excellent negative predictive value
- FFR_{CT} now validated in acute CP setting
- Gold standard for evaluation of PE and aortic etiologies

Disadvantages

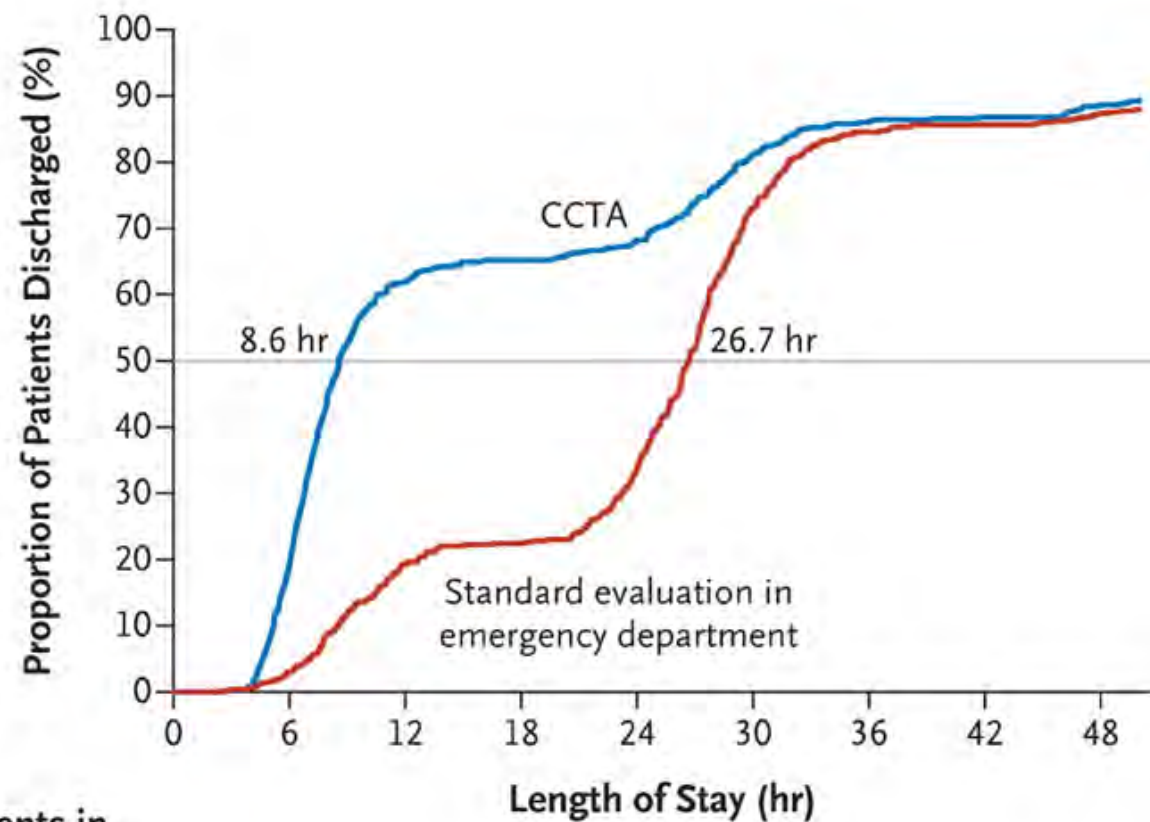
- Does not confirm ischemia as etiology
- PPV depends on pre-test probability (age)
- Limited use for stress CM, myocarditis

CTA for Detection of Stenosis

| Study | CT-STAT(7) | | ACRIN(46) | | ROMICAT II(8) | |
|--------------------------------------|--------------|----------|--------------|----------|---------------|----------|
| | Coronary CTA | Controls | Coronary CTA | Controls | Coronary CTA | Controls |
| ACS during index hospitalization (%) | 1.2 | 2.7 | 4 | 2 | 9 | 6 |
| MACE during follow-up (%) | 0.8 | 0.4 | 3 | 1 | 0.4 | 1.2 |
| Time to diagnosis (hours) | 2.9* | 6.2* | - | - | - | - |
| Length of stay (hours) | - | - | 18.0* | 24.8* | 23.2* | 30.8* |
| Direct ED discharges (%) | - | - | 50* | 23* | 47* | 12* |
| Invasive coronary angiography (%) | 7 | 6 | 5 | 4 | 11 | 7 |
| Coronary revascularization (%) | 4 | 2 | 3 | 1 | 7 | 4 |
| ED cost (\$) | 2,137 | 3,458 | - | - | 2,101 | 2,566 |
| Radiation dose (mSv) | 12 | 13 | | | 14* | 5* |

*significant difference between coronary CTA and control groups (p<0.05)

CT and Length of Stay

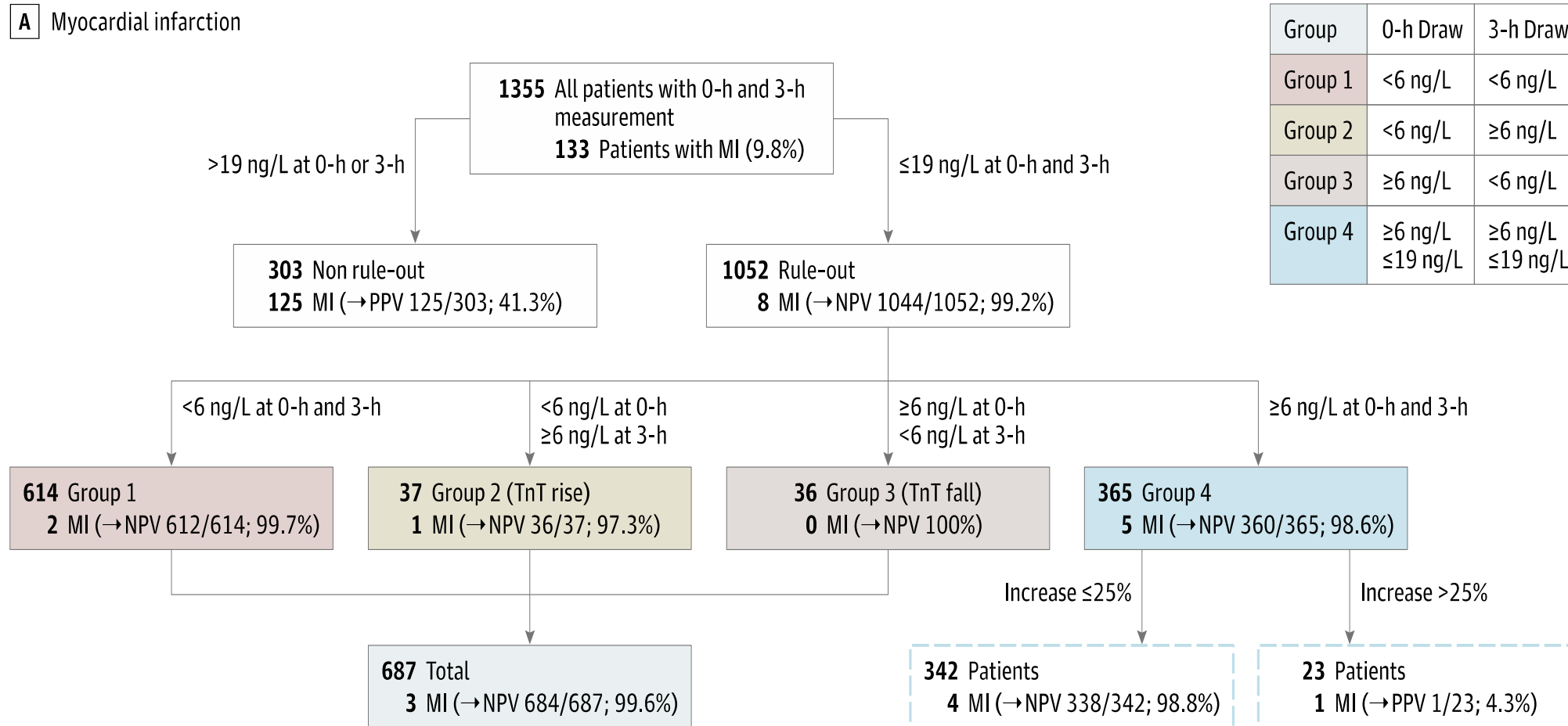


**No. of Patients in
Emergency
Department
or Hospital**

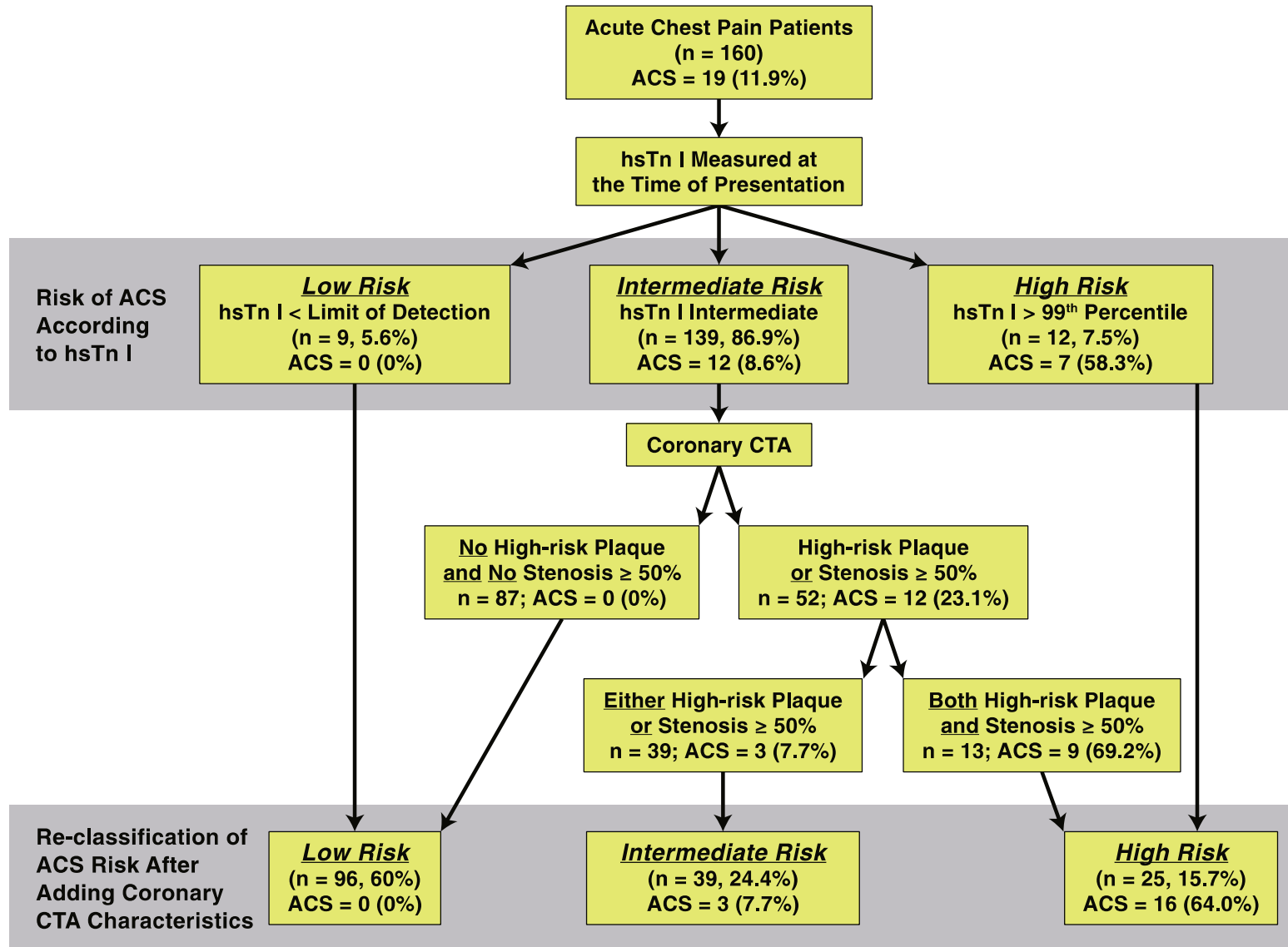
| | | | | | | | | | |
|---------------------|-----|-----|-----|-----|-----|-----|----|----|----|
| CCTA | 501 | 404 | 191 | 174 | 159 | 95 | 70 | 66 | 57 |
| Standard evaluation | 499 | 484 | 403 | 387 | 331 | 135 | 77 | 72 | 63 |

Impact of hsTroponin

A Myocardial infarction



High-sensitivity Troponin as a Prelude to CTA





POC Echo

- Equivocal ECG, symptoms, other cause for ↑troponin
- Ongoing symptoms
- Suspicion for alternative myocardial or other dz
- Unstable patient
- Need for immediate information (proximal dissection)
- The repeat customer

CT Angio

- Need to exclude PE or acute aortic syndrome
- Younger individual
- Low suspicion for alternative myocardial disease
- Pre-existing WMA or prior MI
- Symptoms long resolved
- Strong desire to shorten ED length of stay
- The repeat customer