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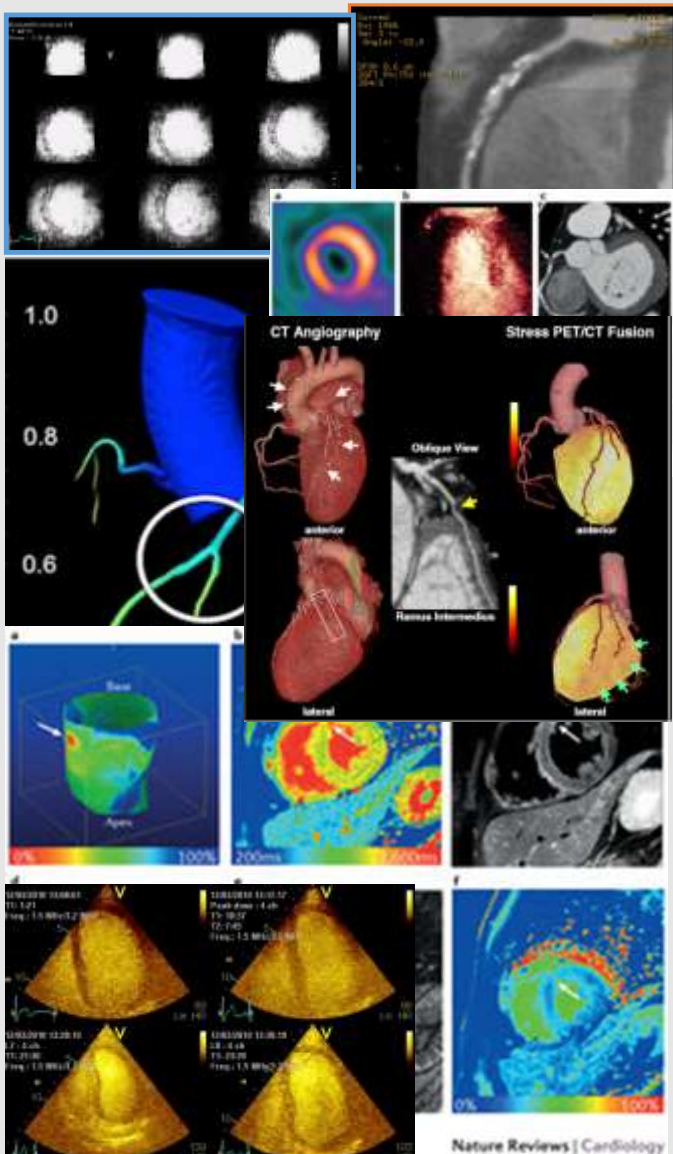
Stress Echo

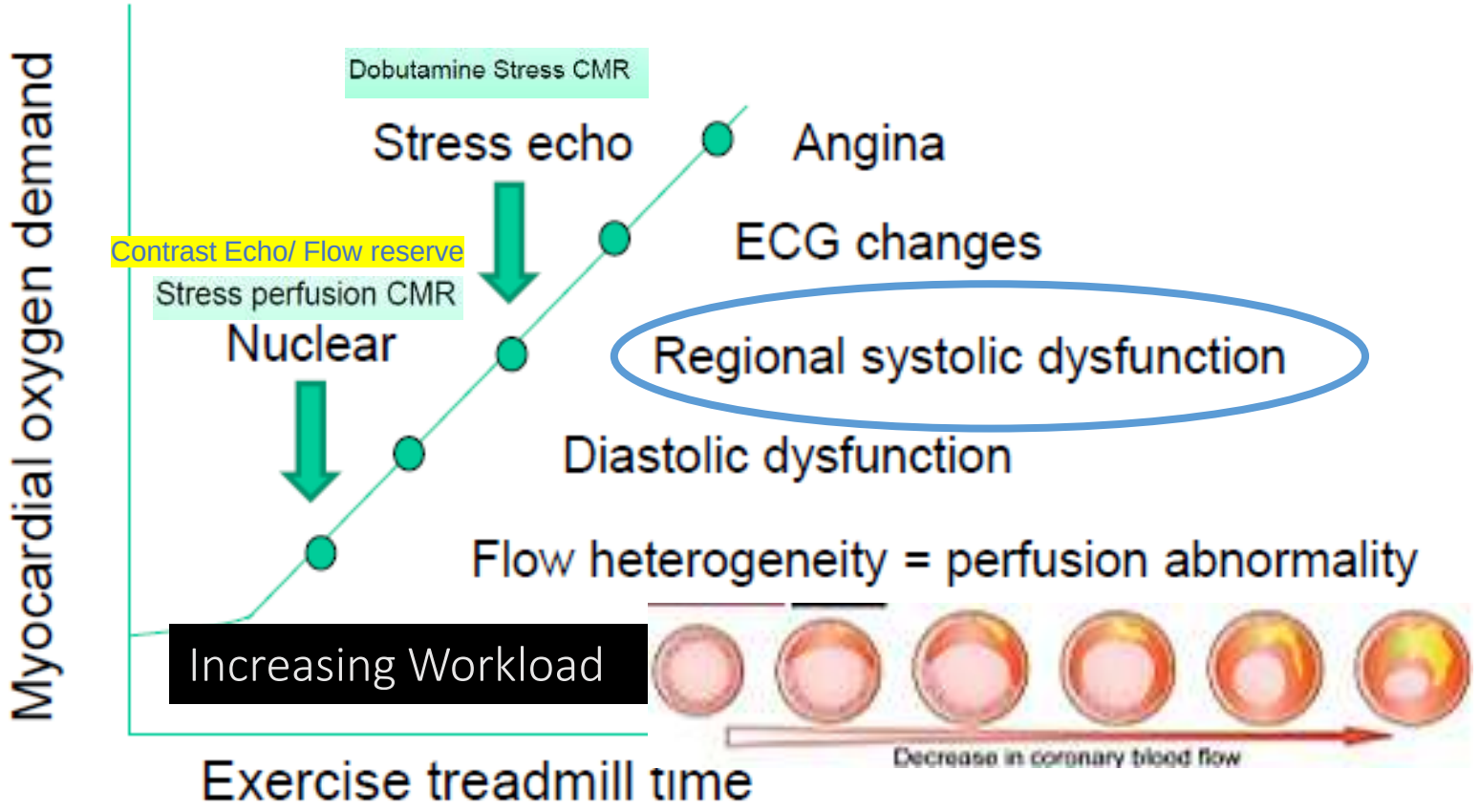
Methods and Mechanisms Tips and Tricks.

Goals of Cardiac Imaging in Coronary Artery Disease: *The Ultimate Goal is to Improve Prognosis*

- ✓ *Assessment of Ischaemic Burden* ✓
- ✓ *Prognosis / risk startification in patients with known or suspected CAD* ✓
- ✓ *Myocardial Perfusion* ✓ *?*
- ✓ *Ventricular dimensions and overall function* ✓
- ✓ *Coexisting significant valve disease* ✓
- ✓ *Detection of myocardial viability/myocardial scar* ✓
- ✓ *Direct imaging of coronary arteries* ✓
- ✓ *Vulnerable Coronary Plaque !!!*
- ✓ *Coronary Flow Reserve* ***?***

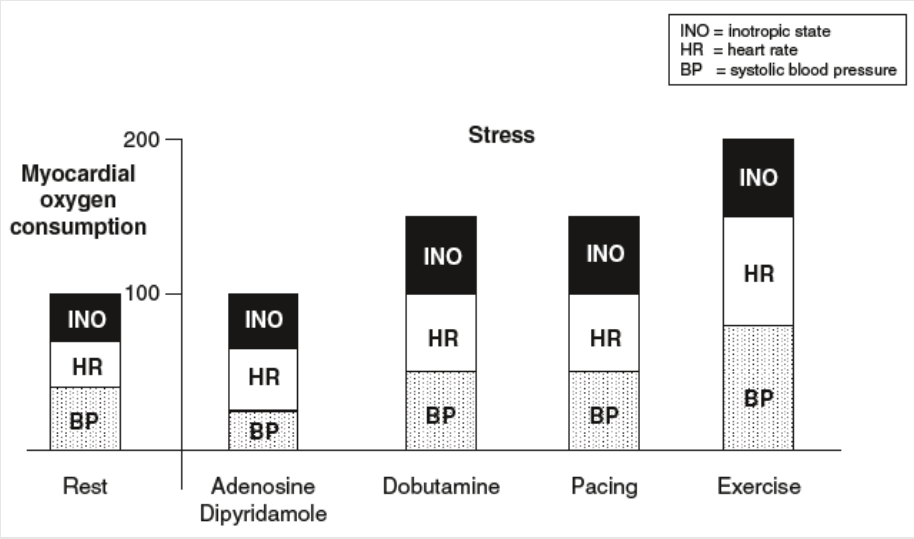


The Ischaemic Cascade

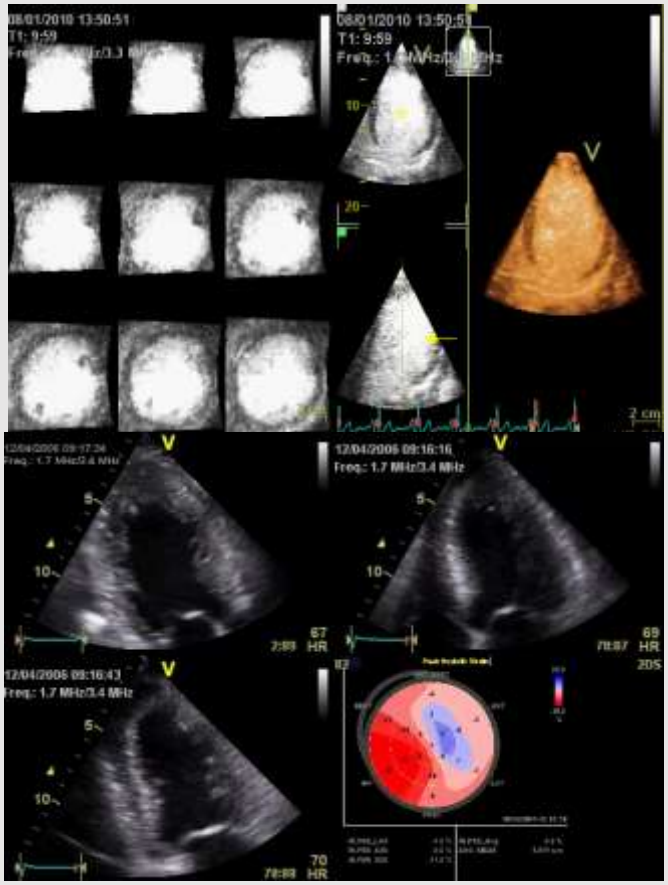


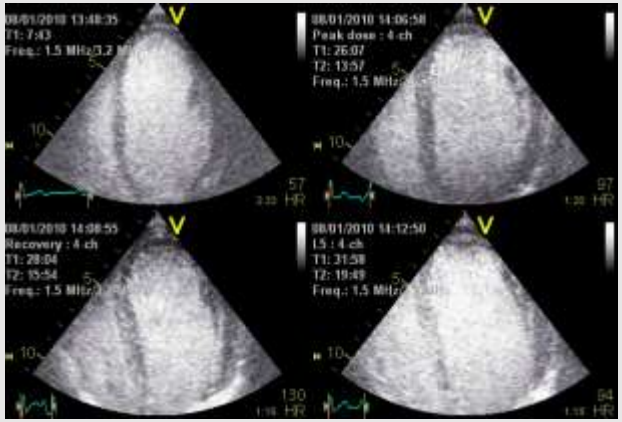
Stress Methods and Imaging with Echo

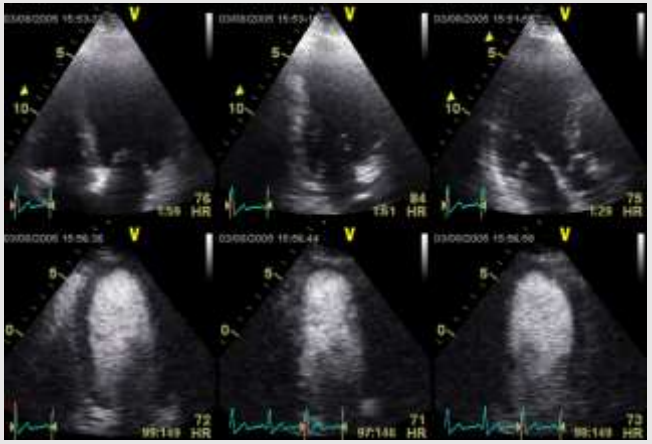
- Steep-lateral decubitus position
- Raised left arm
- Cut-out mattress to permit visualization of the true apex while avoiding LV foreshortening
- Imaging at quiet respiration or end-expiration

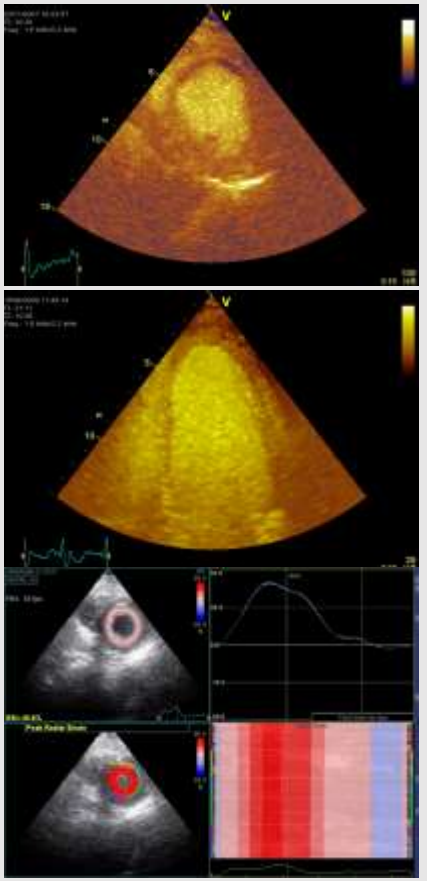


Know your Echo Machine - Optimize Contrast and Stress Echo Protocols

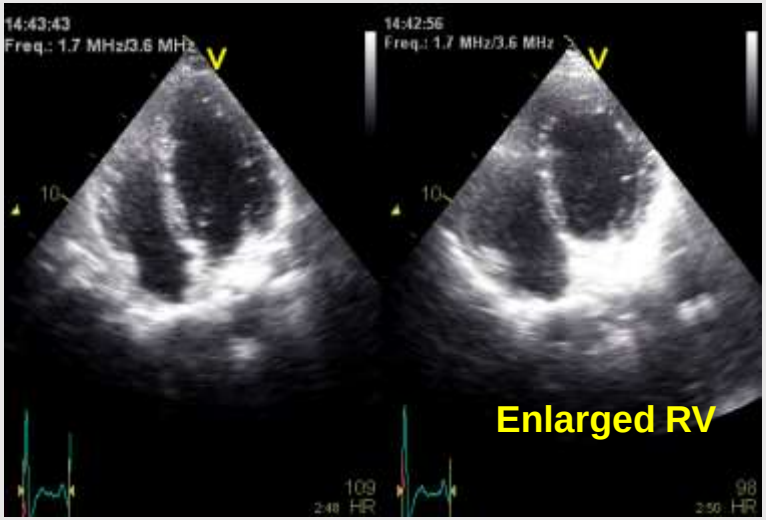


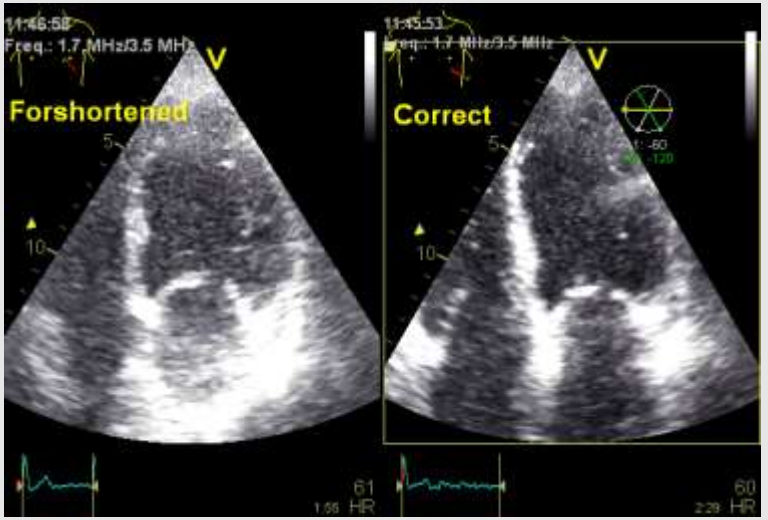






Tips for Obtaining Apical views





Medial Displacement

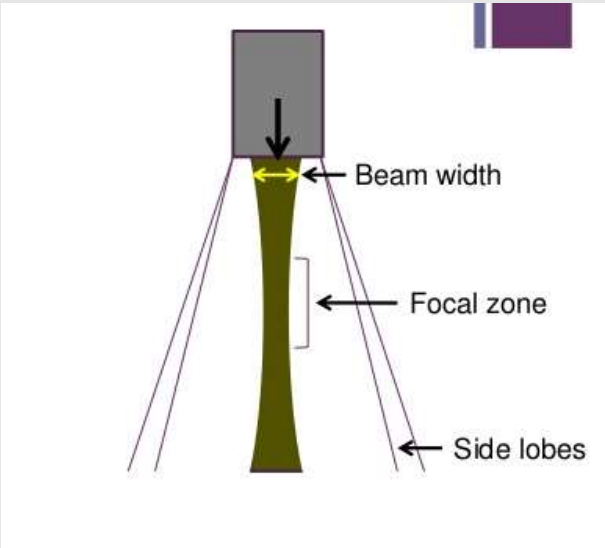
Superior Displacement

These views are performed in the interspace where the apex is felt, usually in the left 5th-6th interspace between the midclavicular and anterior axillary lines

Medially/ superiorly displaced position results in an enlarged RV and/or forshortened LV

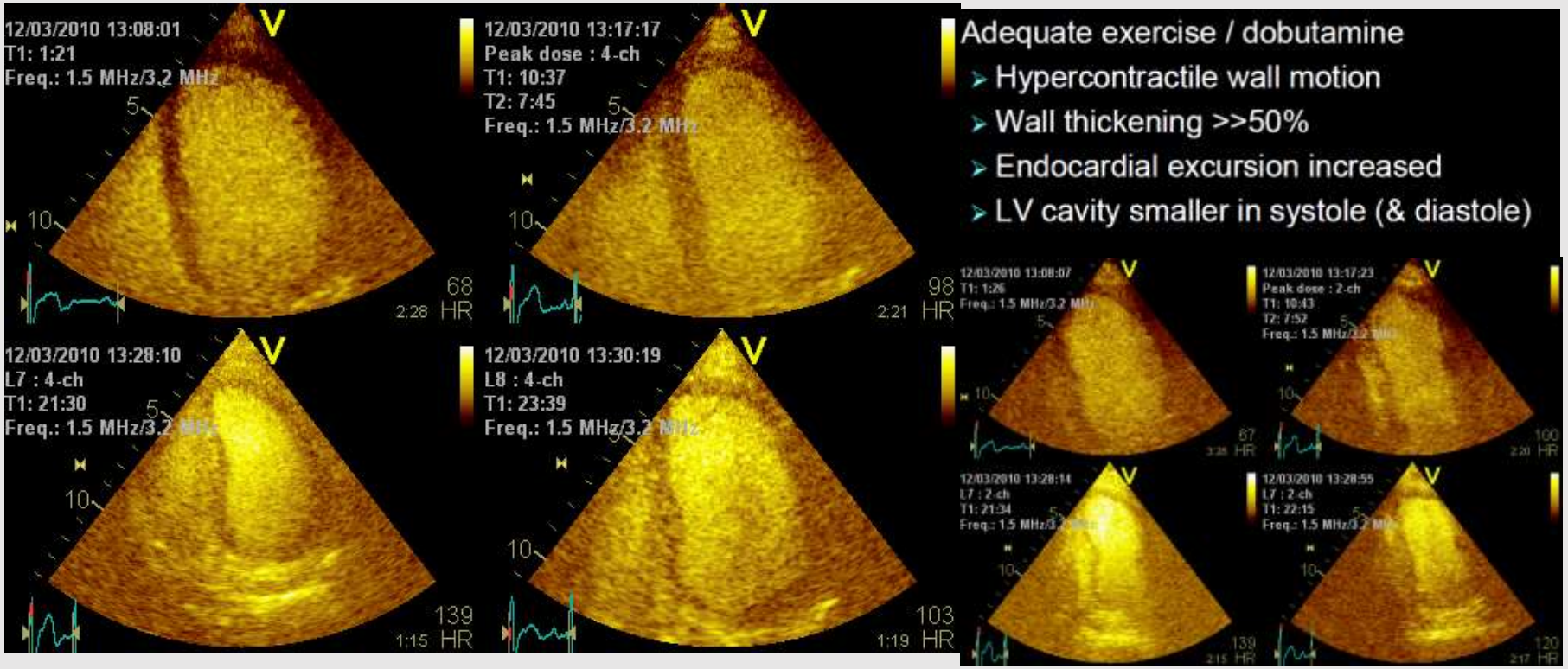
Tips for Optimising Apical views:

Moving the anterior or lateral wall to the middle of the sector can reduce wall-filling dropout

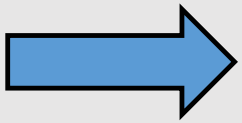


Prognostic Stratification of a Negative Stress Echo Test

Lack of response *is* *not normal*, *but* *not diagnostic of ischemia*



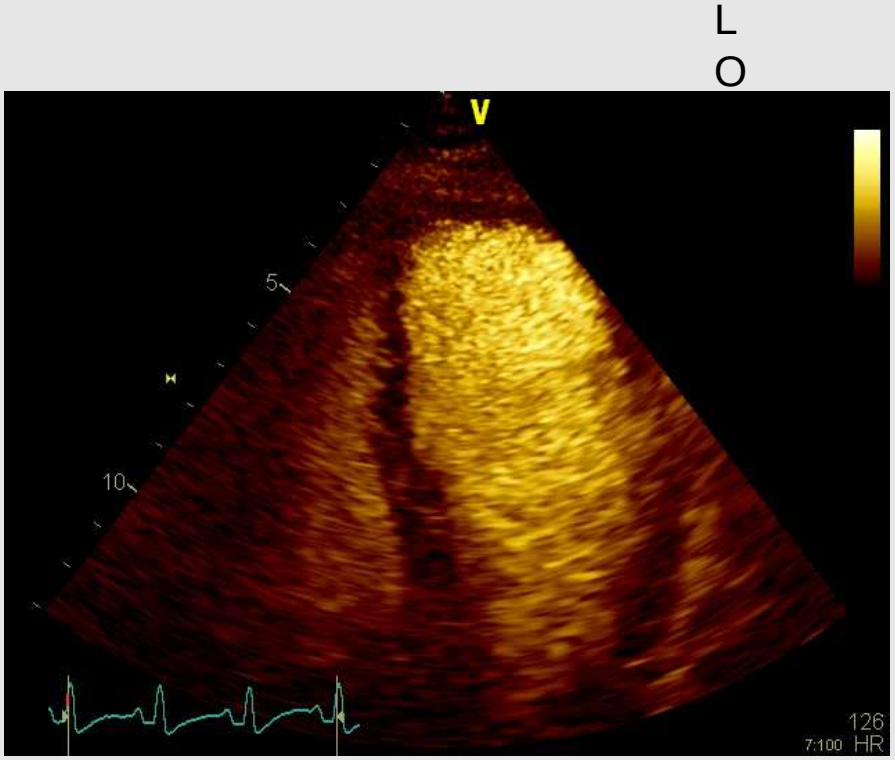
Maximal Stress Achieved
Resting EF> 50%
Anti- ischeamic Therapy Off



Very Low Risk of Hard Cardiac Events (<0.5%/year)

Abnormal Response: Inducible Ischaemia at a Low Workload

Baseline



Peak Stress

Stress Echo High Risk Characteristics (High Annual Risk >10%)

Low Dose/Workload (Ischaemic Threshold)

Resting EF<40%
Anti – ischaemic Therapy On

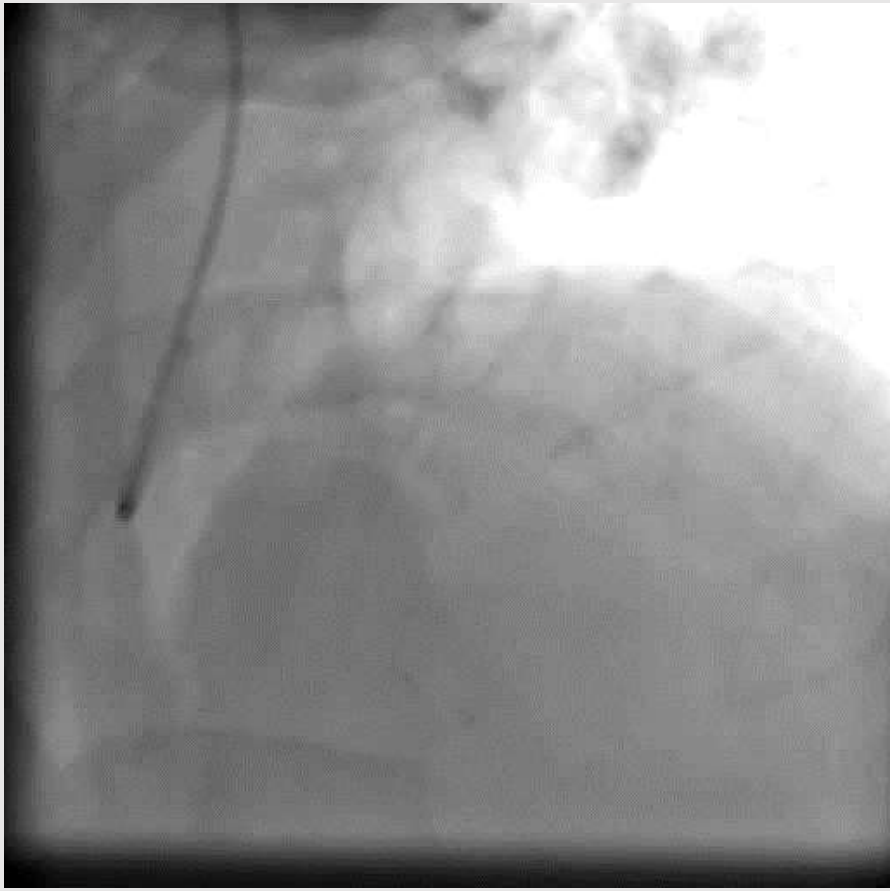
LAD Coronary Territory

High Peak WMSI

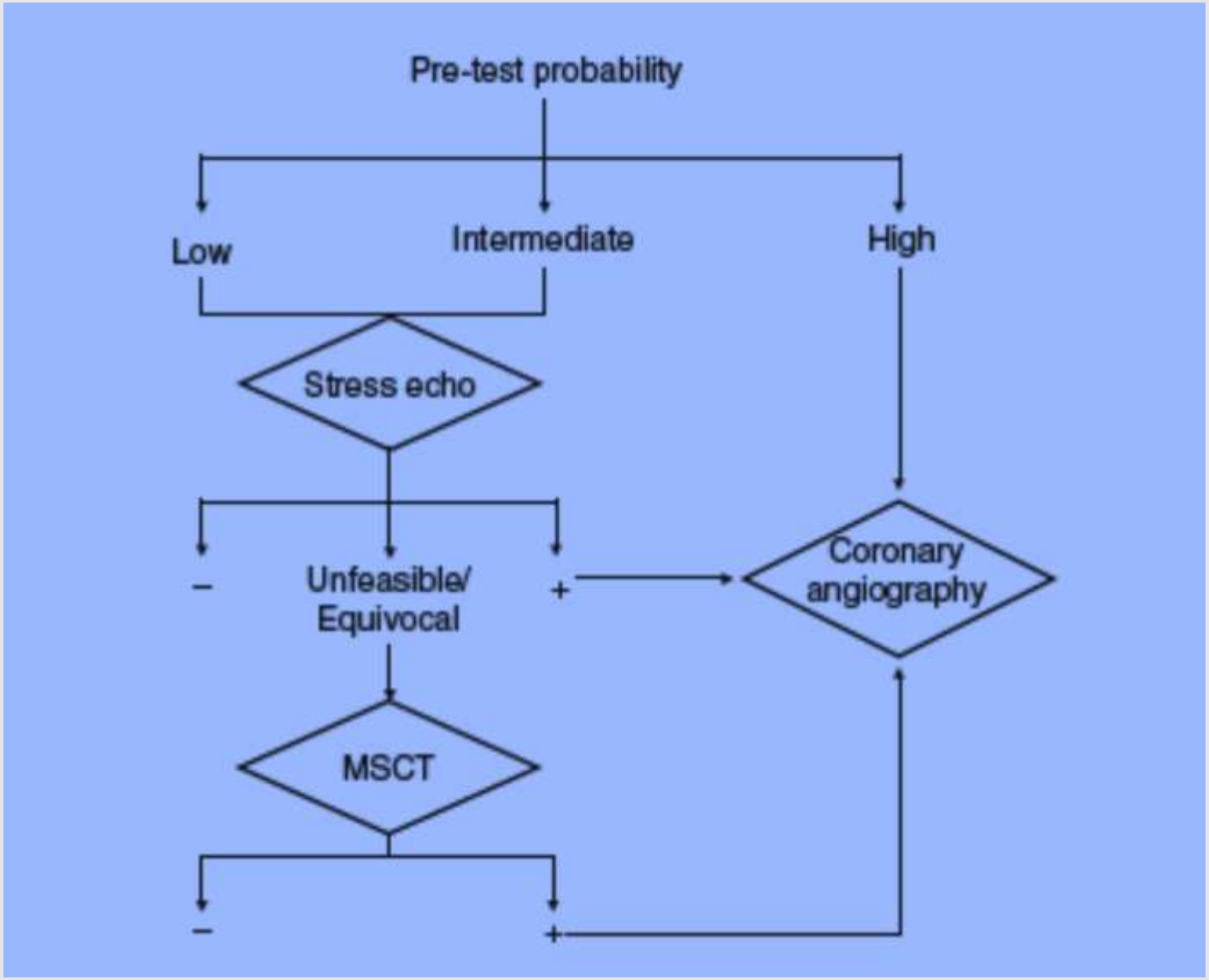
Slow Recovery
Heterozonal Positivity or Baseline Dyssynergy

The assessment and quantification of ischaemic burden rather than the pure detection of myocardial ischaemia, is the next important step towards optimizing therapy strategies in patients with CAD

A High Risk Coronary Lesion Detected

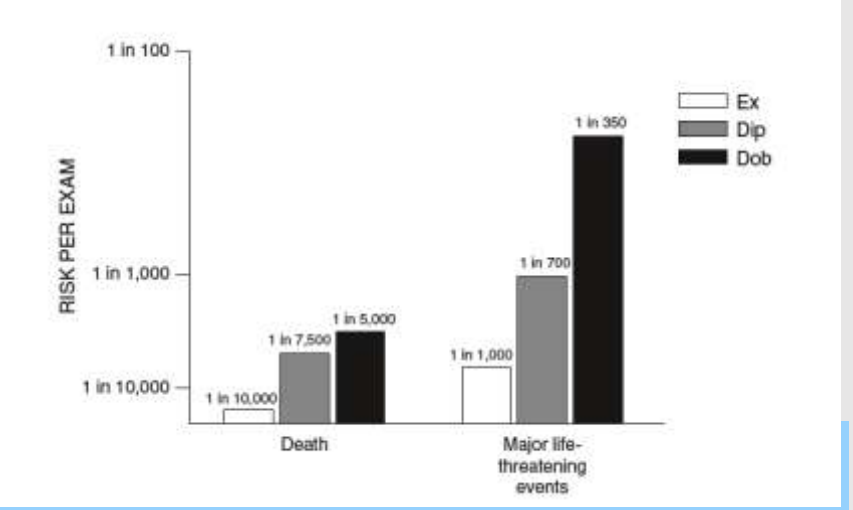


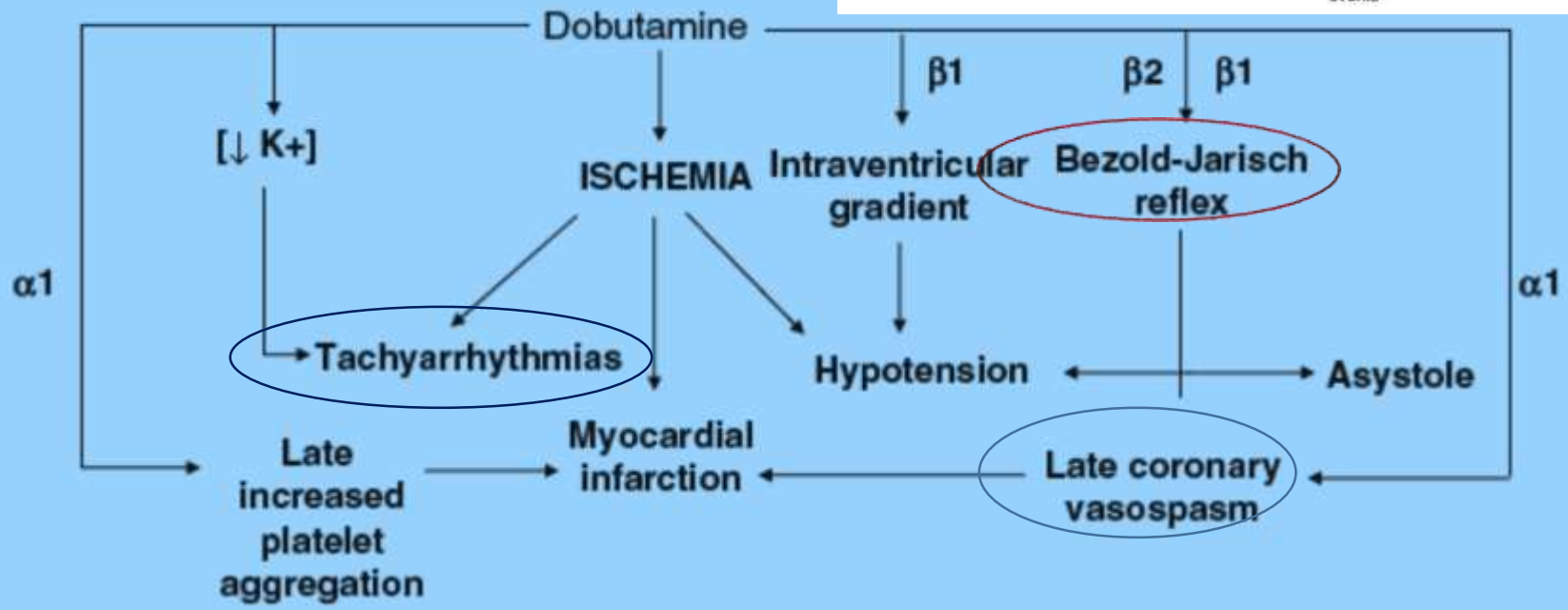
Selecting Suitable Patients



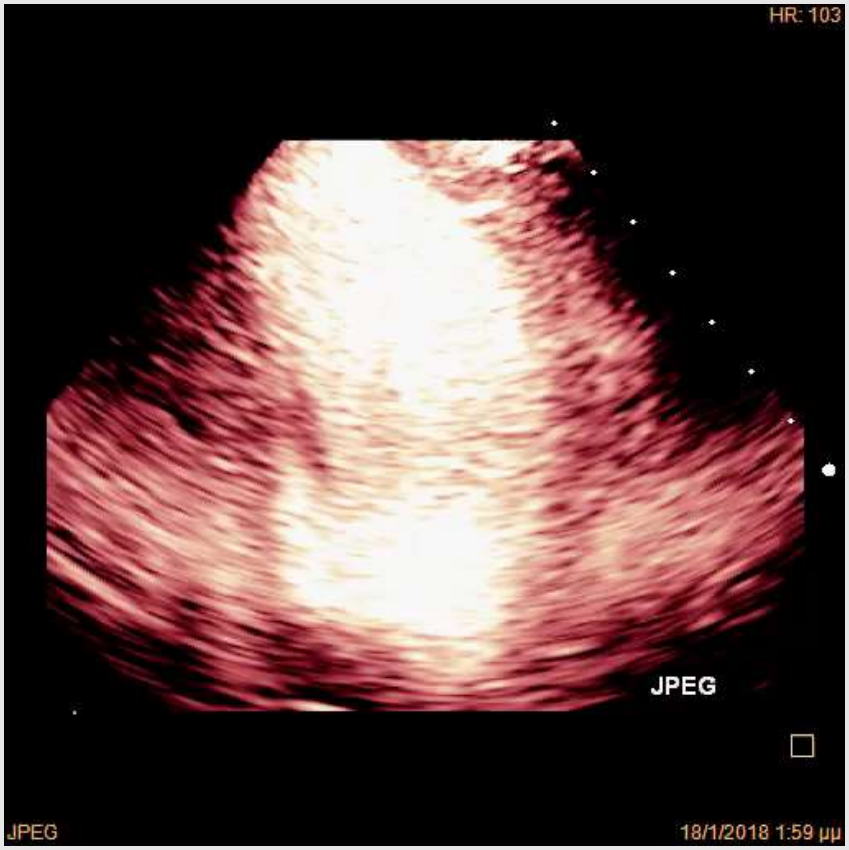
Tip: Know the Right Time to Stop

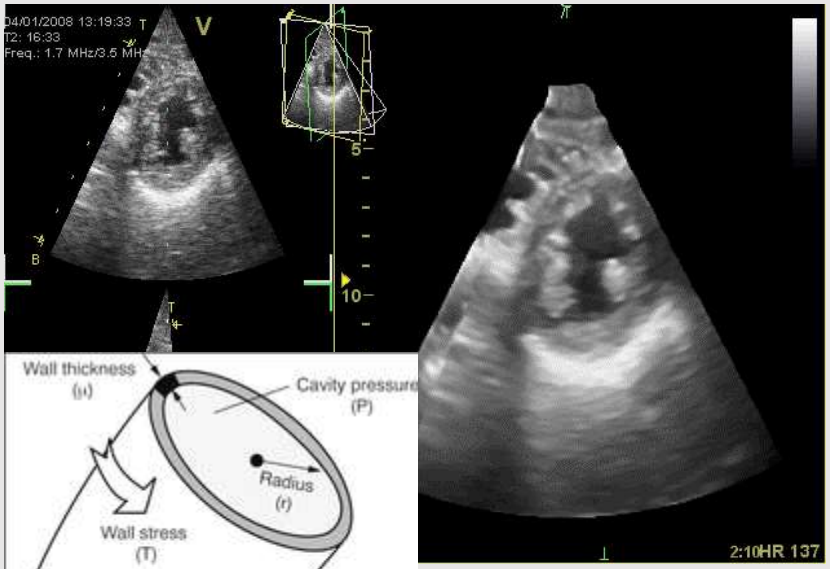
- Submaximal Stress has a Suboptimal Diagnostic Value
- Compared to Exercise complications are more common with pharmacologic stress and particularly dobutamine

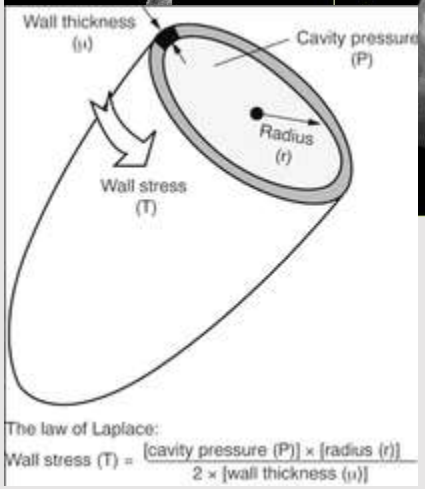




LV Obliteration (Increased inotropic state & decreased loading) ➡ Reduced wall stress ➡ Potential cause of false negative results and/or hypotension

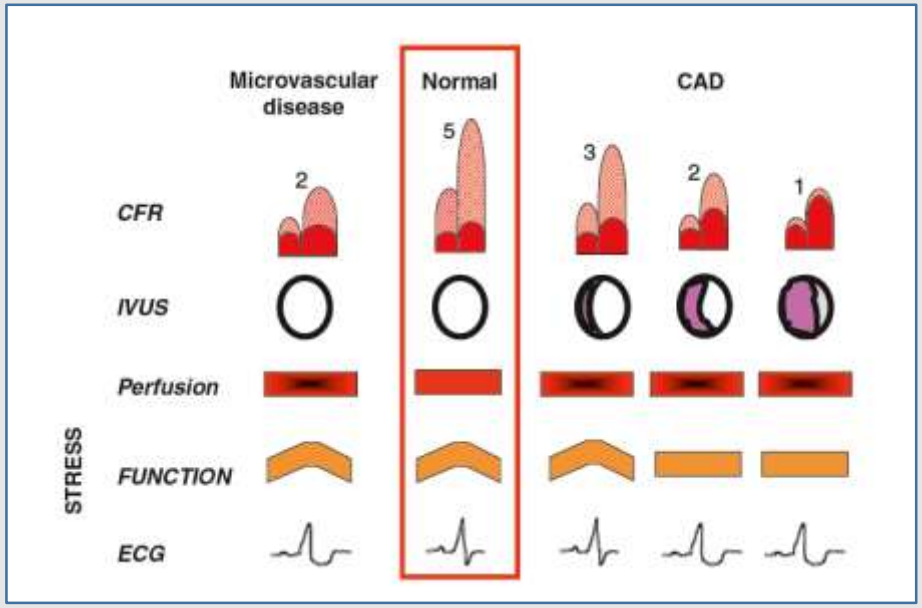






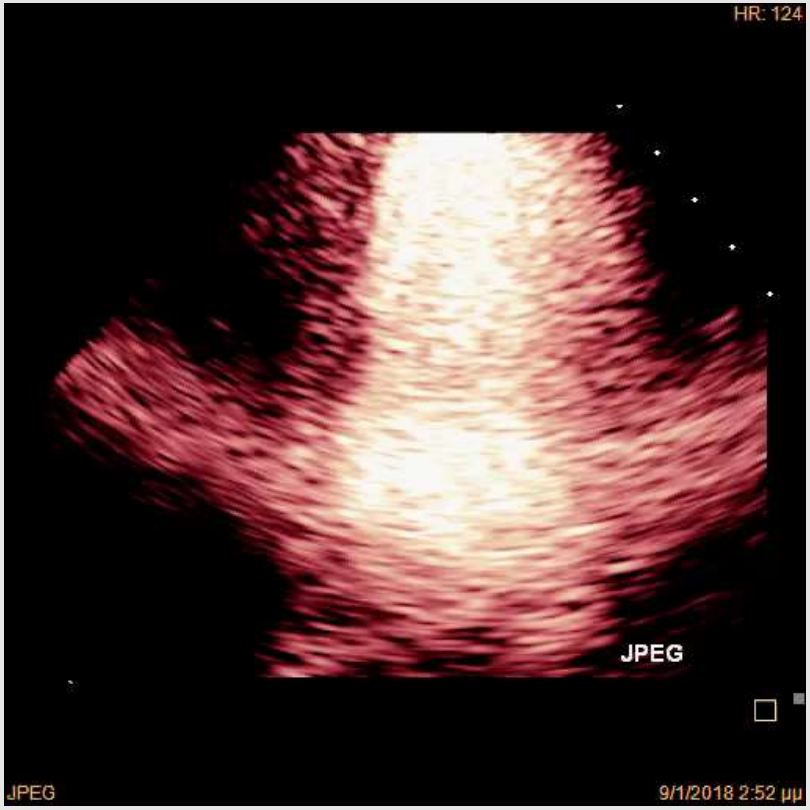
The gold Standard is not Always ‘Pure Gold’

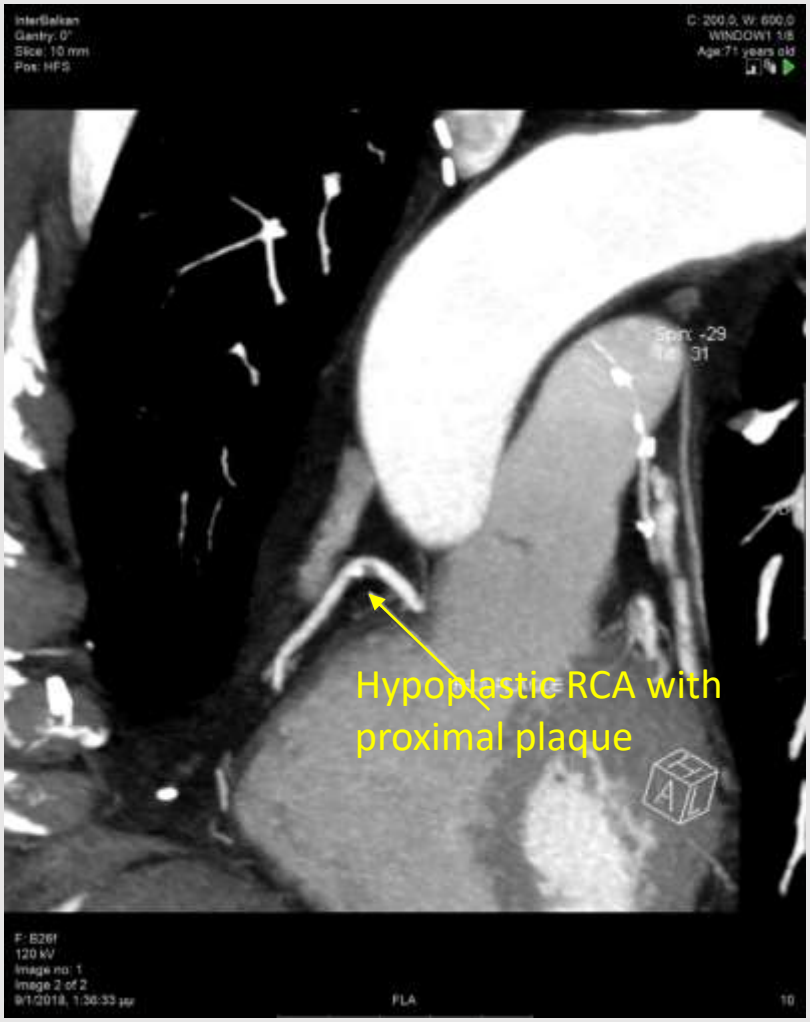
Comparison of ‘Physiology’(Ischaemia) to ‘Anatomy’ (% Stenosis)



- Limited reproducibility % stenosis
- % stenosis unrelated to CFR
- Underestimation of difuse disease
- Infarct –producing plaques often noncritical
- Thrombus, spasm, inflammation, rupture, and emboization unrelated to plaque size

Impaired Flow Reserve /Perfusion Defect and Normal Wall Motion at Peak Stress (Proximal RCA plaque)



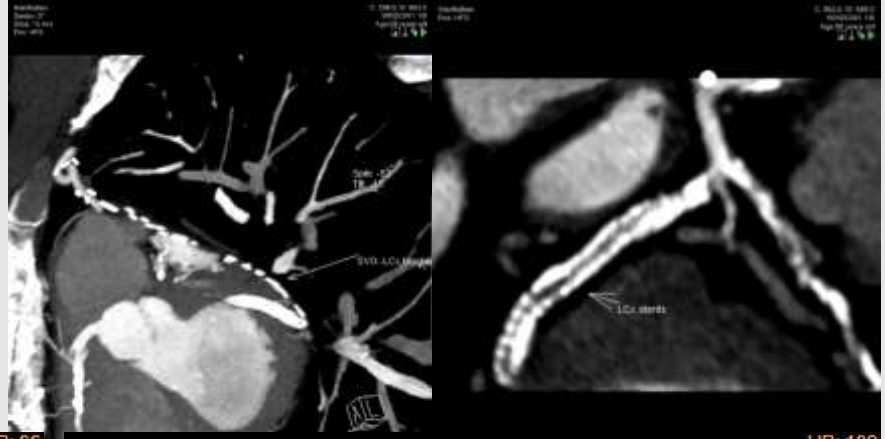


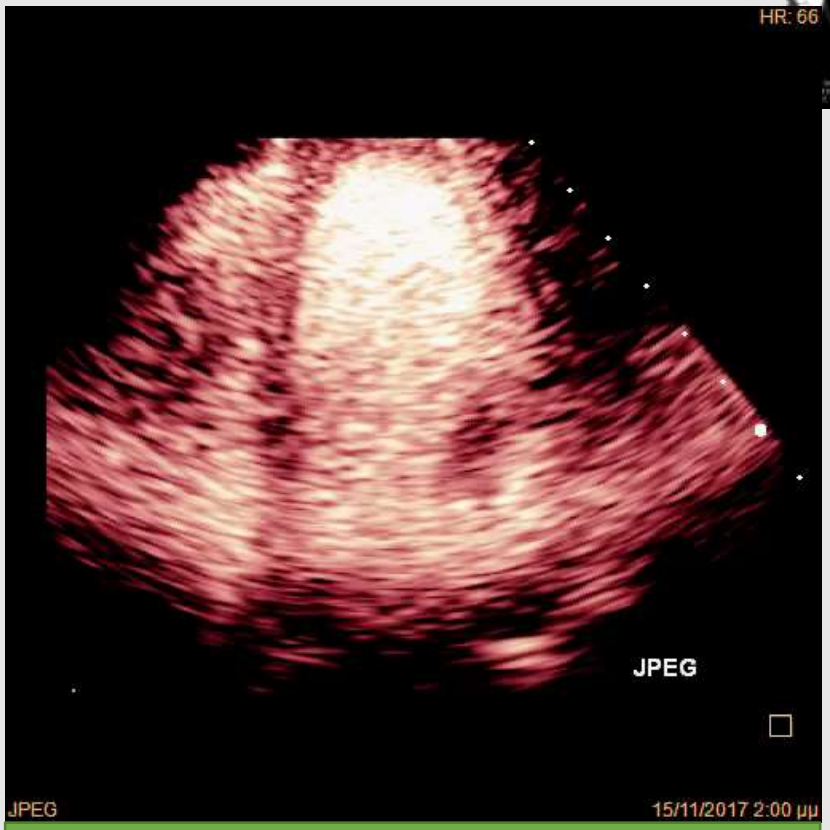
Factors Affecting Stress Echo Sensitivity

	Increases sensitivity	Decreases sensitivity
Previous myocardial infarction	Present	Absent
Antianginal therapy	Absent	Present
Stenosis severity	>75%	50–75%
Stenosis extent	Multivessel disease	Single-vessel disease
Stenosis morphology	Complex	Simple
Stenosis location	LAD	LCx
Stress intensity	Maximal	Submaximal
Variant (vasospastic) angina	Yes	No
Echocardiography interpretation criteria	Lack of hyperkinesia	Marked hypokinesia
Echocardiography reader	Expert	Beginner

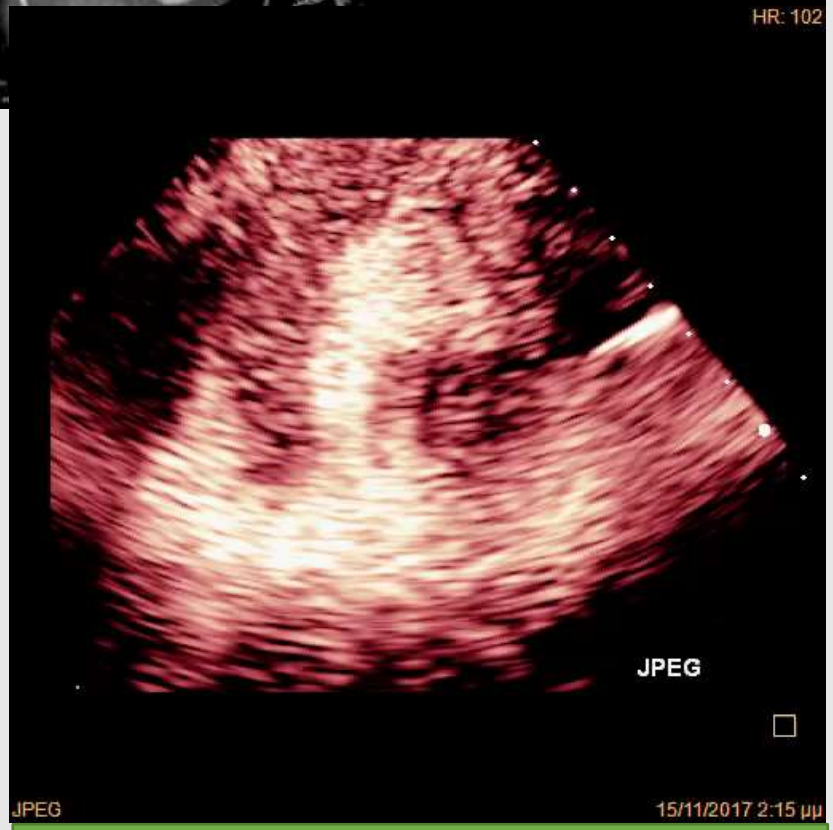
Lateral Wall Inducible Ischemia

Blocked Lcx Stent and SVG





Low Dose Dobutamine



Peak Dose Dobutamine

Factors Affecting Stress Echo Specificity

	Increases sensitivity	Decreases sensitivity
Resting wall motion abnormalities	Absent	Present
Left ventricular hypertrophy, left bundle branch block	Absent	Present
Stress intensity	Submaximal	Maximal
Variant (vasospastic) angina	No	Yes
Echocardiography interpretation criteria	Marked hypokinesia	Lack of hyperkinesia
Interpreting the basal third of the inferior wall	No	Yes
Echocardiography reader	Expert	Beginner

Before you Start:
Tips on Setting Up a Stress Echo Service

1. Training is Essential: Avoid the “See 1- Do 1 -Teach 1” philosophy (100 is the number)
2. Know your Echo Machine – How it works
3. Liberal Use of Contrast
4. Regular Echo Lab Quality Control (compare stress echo results with angiography or cardiac CT)
5. Safety Starts with Verification of Test Indication
6. Do not underestimate ischemic risk, a fixed inflexible approach can be dangerous.