

คณะแพทยศาสตร์ศิริราชพยาบาล  
มหาวิทยาลัยมหิดล วิทยาเขตถนนวิภาวดี




## Echocardiogram

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โรงพยาบาลศิริราช

## Echocardiogram

ICD 9 Diagnostic ultrasound of heart ( 88.72 )

- What is echo?
- How is echo useful?
- How can I do echo?
- How can I interpret the echo report ?

## Indication for echocardiogram

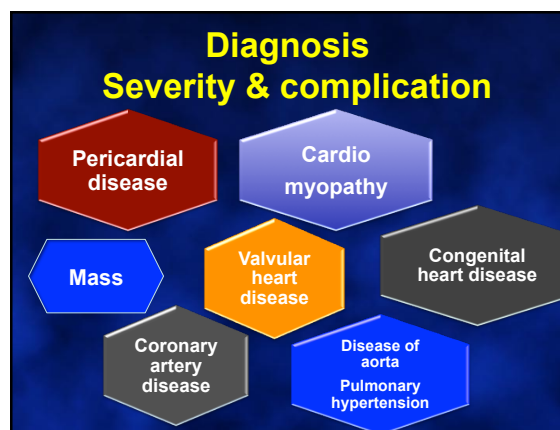
- Diagnosis
- Plan of management
- Follow up after treatment

APPROPRIATE USE OF ECHOCARDIOGRAPHY

ACCF/ASE/AHA/ASNC/HFSA/HRS/SCAI/SCCM/  
SCCT/SCMR 2011 Appropriate Use Criteria for  
Echocardiography


A REPORT OF THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION APPROPRIATE USE CRITERIA TASK FORCE, AMERICAN SOCIETY OF ECHOCARDIOGRAPHY, AMERICAN HEART ASSOCIATION, AMERICAN SOCIETY OF NUCLEAR CARDIOLOGY, HEART FAILURE SOCIETY OF AMERICA, HEART RHYTHM SOCIETY, SOCIETY FOR CARDIOVASCULAR ANGIOGRAPHY AND INTERVENTIONS, SOCIETY OF CRITICAL CARE MEDICINE, SOCIETY OF CARDIOVASCULAR COMPUTED TOMOGRAPHY, SOCIETY FOR CARDIOVASCULAR MAGNETIC RESONANCE, AMERICAN COLLEGE OF CHEST PHYSICIANS

J Am Soc Echocardiogr 2011;24:229-67

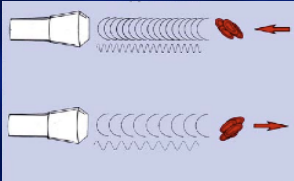


## Doppler Effect ( Doppler Shift )

'the changing in frequency related to motion between the transducer and the target'




Christian Doppler  
(1803-1853)




Changing the pitch of sound affected by motion either toward or away from the listener

## Echocardiogram (Ultrasound cardiogram)



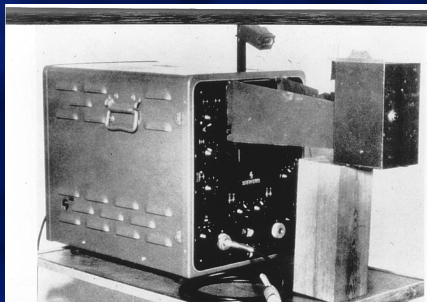
Inge Edler (right) and Hellmuth Hertz photo-graphed when attending a congress on echocardiography in Rotterdam in 1979



Dr. Inge Edler with linear echo machine

Eur J Echocardiography (2001) 2, 3-5

Early echocardiographic equipment used by Edler and Hertz to record M-mode echograms (from Edler et al ).



Feigenbaum H. Circulation 1996;93:1321-1327



A multielement transducer that provides an electronic linear scan and represents the first real-time, two-dimensional, echographic system (from Bom et al ).



Feigenbaum H. Circulation 1996;93:1321-1327



An early real-time sector scanner that originated as a modified electric toothbrush.



Feigenbaum H. Circulation 1996;93:1321-1327



## Echocardiogram

TTE

(transthoracic  
echo)

TEE

(transesophageal  
echo)

Stress  
Echo

3D-Echo

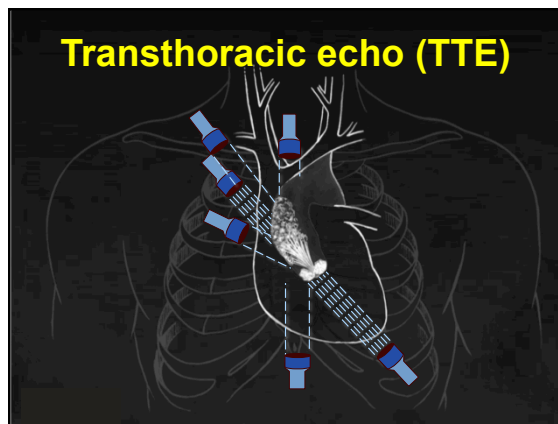
TDI

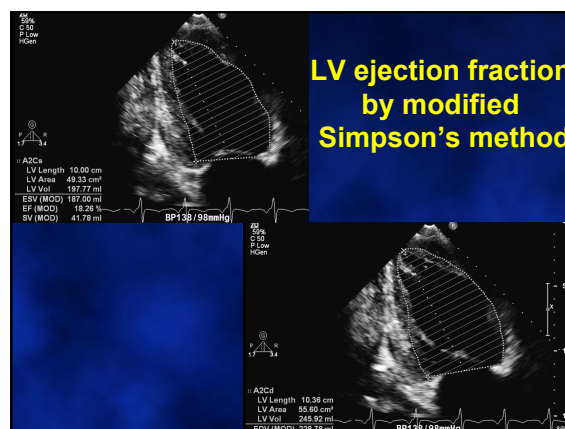
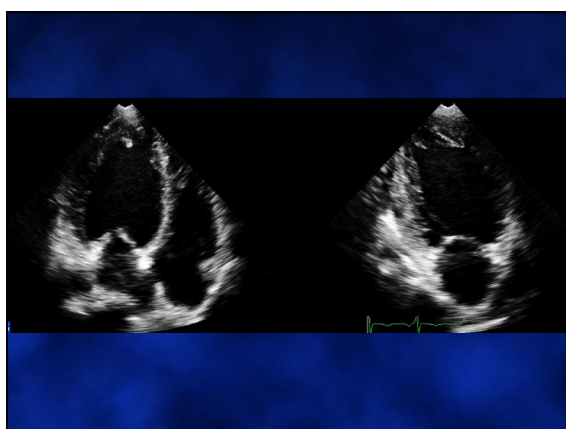
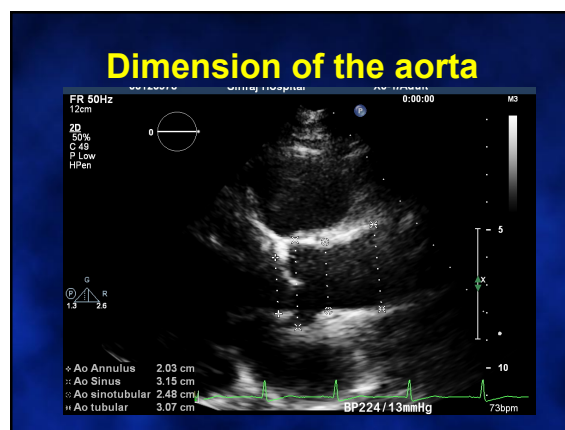
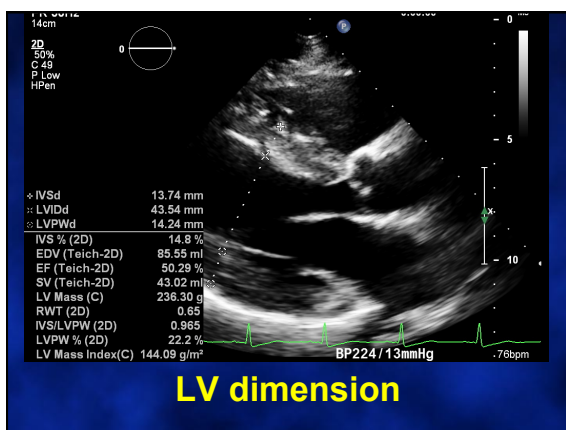
(Tissue-Doppler imaging)

## Echo machine & transducers

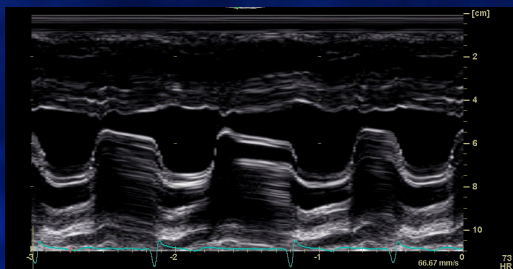


## Transthoracic echo (TTE)

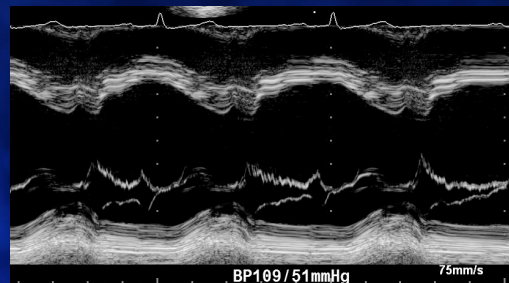




### M-mode: Mitral stenosis



### M-mode: Aortic regurgitation



### 2D-Echo

VS

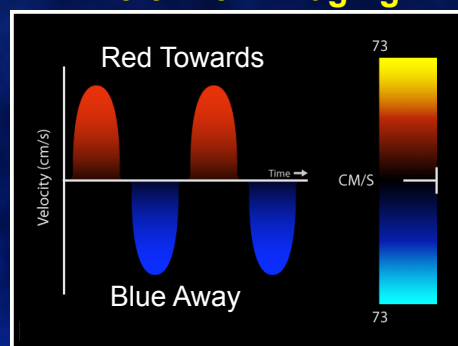
### Doppler Echo

- Tissue
- Anatomy
- Structural
- Perpendicular
- High

Target  
Goal of Dx  
Information  
Alignment  
Transducer  
Frequency

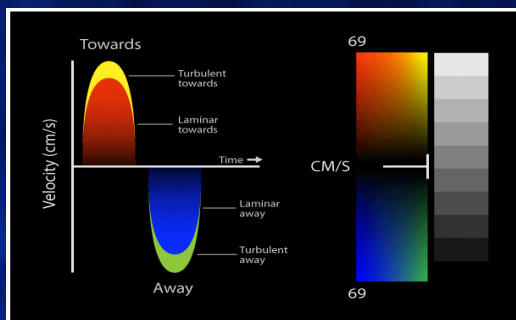
- Blood
- Physiology
- Functional
- Parallel
- Low

### Color flow imaging



### Color flow imaging

'The higher velocity, the lighter shade'



### PW Versus CW Doppler

#### Pulsed Wave

Single crystal

Intermittent

Specific location

Low velocities < 2m/sec

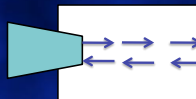
#### Continuous

2 crystals

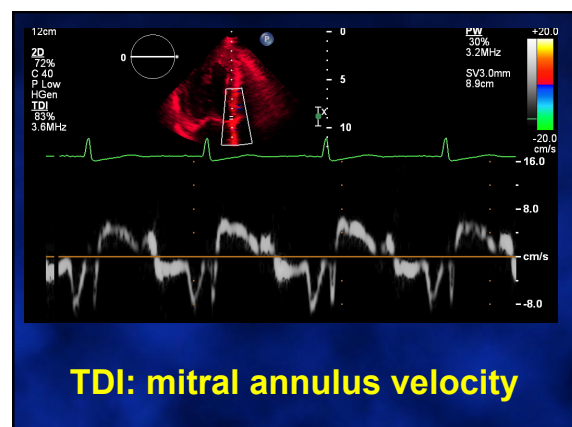
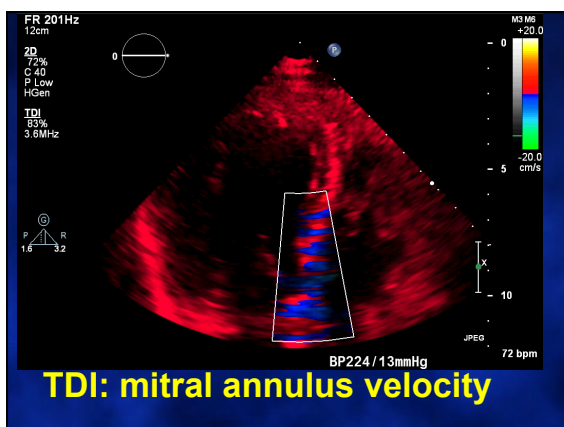
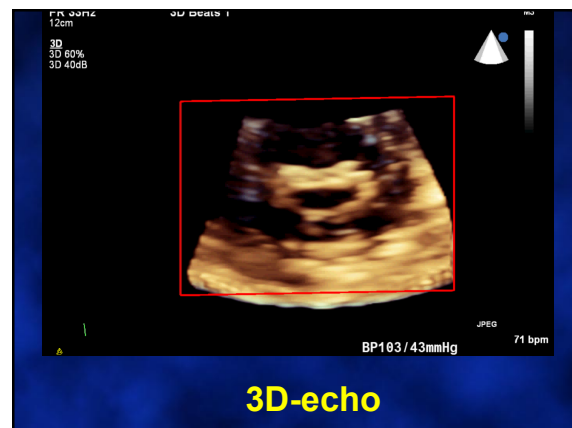
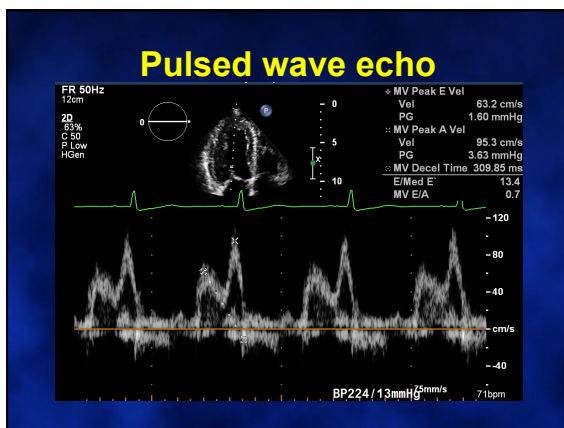
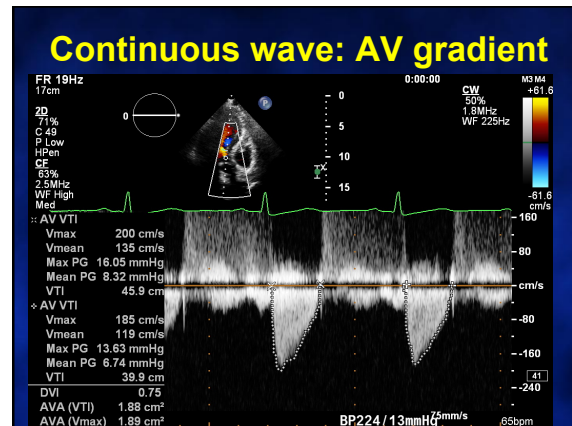
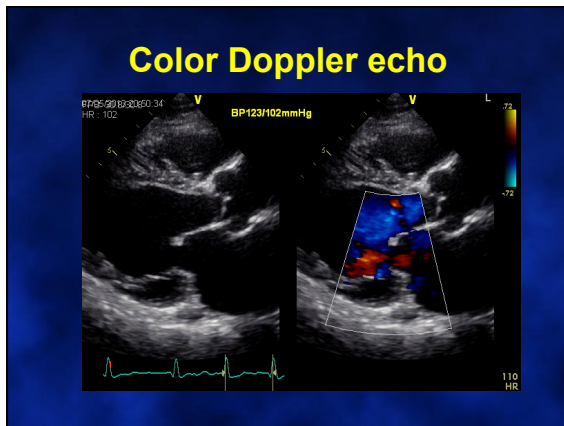
Continuous

Range ambiguity

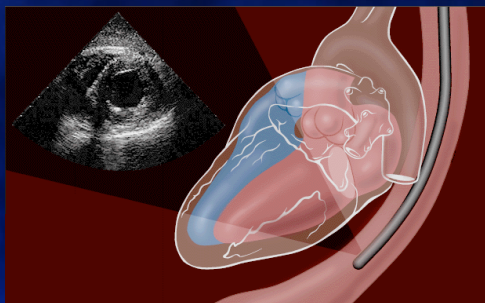
High velocities < 9m/sec







## Transesophageal echo ( TEE )

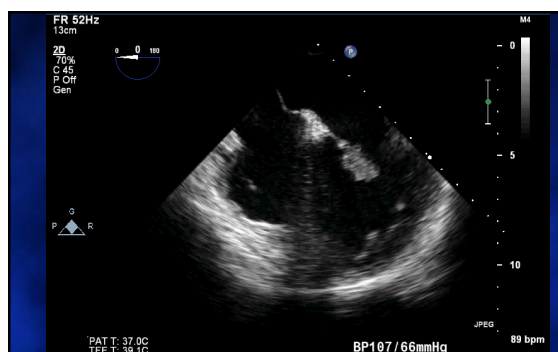


## Transesophageal echo probe

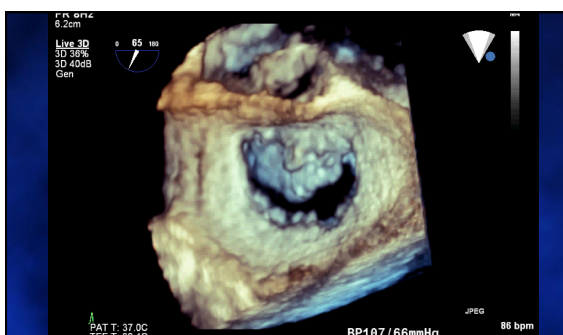


## Indication of TEE

- Suboptimal image quality
- Intracardiac mass/source of cardiac embolism
- Valvular heart disease/prosthetic valve
- Aortic dissection
- Device closure
- Cardioversion/ RF catheter ablation

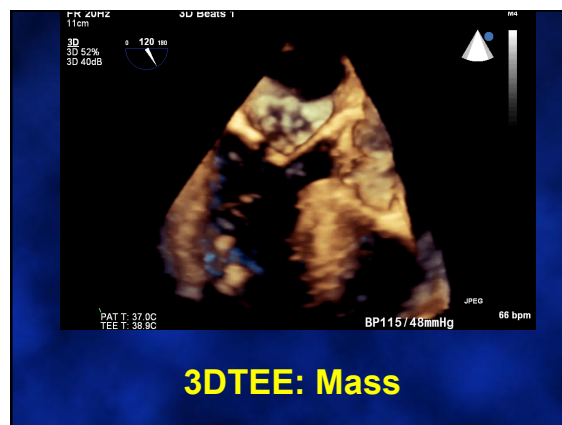
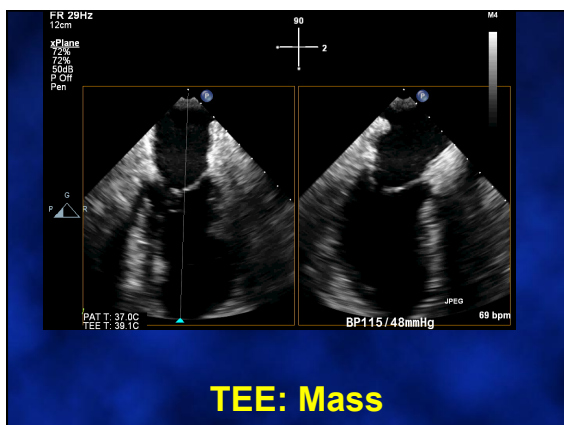


## TEE: Vegetation



## Real-time 3DTEE:vegetation

## TTE: ? Mass at the LVOT



## Stress Echocardiography

### Stress Echocardiography

#### Exercise

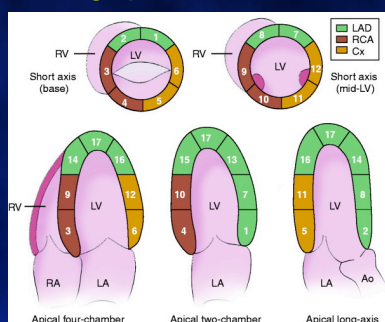
- Treadmill
- Supine bicycle
- Upright bicycle
- Hand grip
- Stair step

#### No exercise

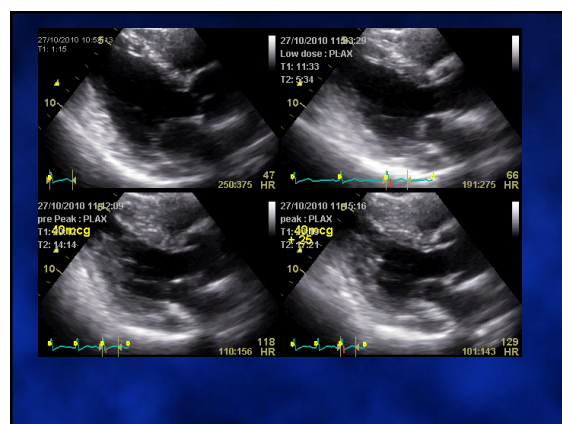
- Dobutamine
- Dipyridamole
- Adenosine
- Pacing

DSE is for patients unable or unwilling to exercise adequately.

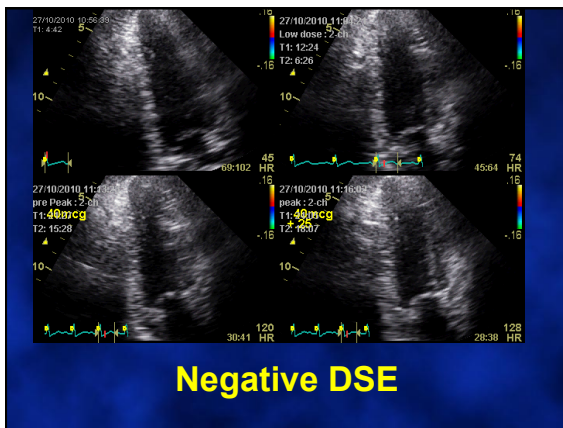
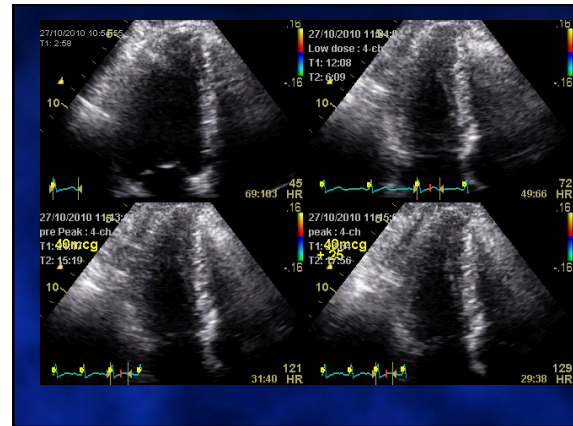
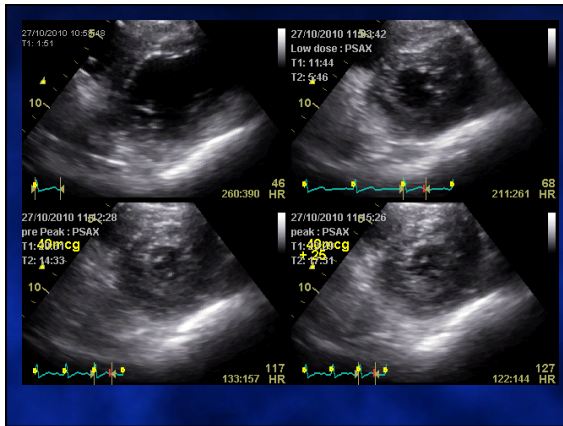
### Echocardiographic views for wall motion



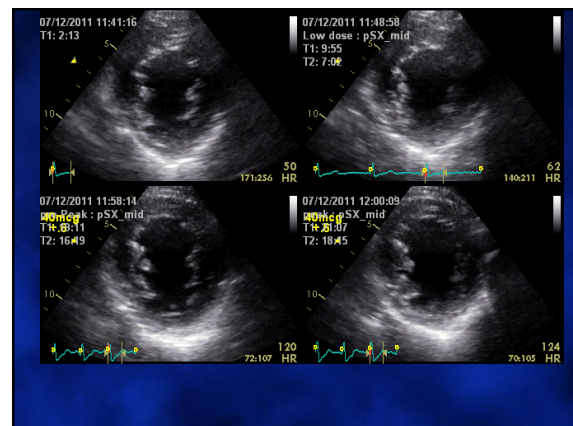
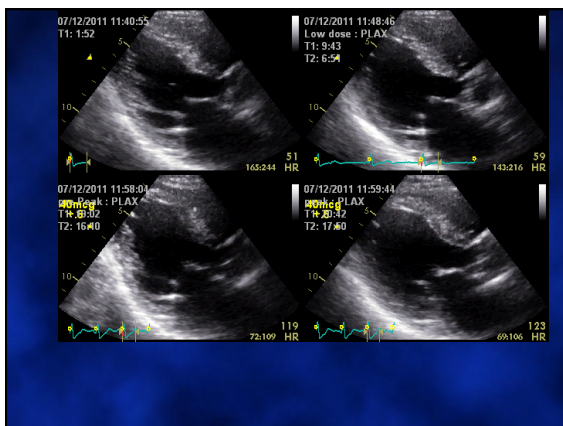
Otto, Clinical Echocardiography 4th edition, 2009



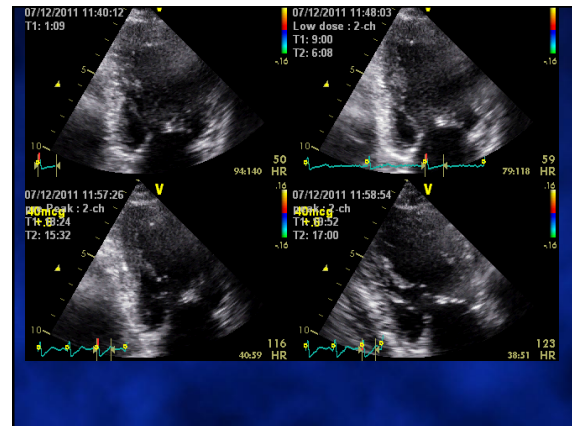
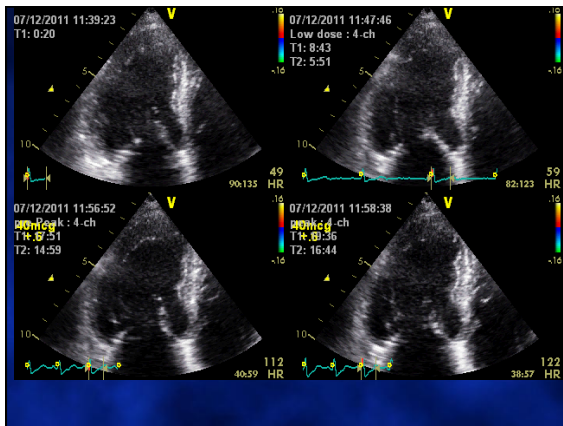




**M 65 y/o post CABG 4 years ago presented with recurrent chest pain**







### What is correct for myocardial ischemia correlated with coronary artery disease?

1. LAD
2. LCX
3. RCA
4. Multivessel diseases
5. Negative DSE

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1. LAD
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4. Multivessel diseases
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### Conclusions

- Echocardiogram is the most fantastic tool for cardiologists!
  - Structural heart disease
  - Hemodynamic assessment
- Echo results depend on image quality and operator.