Utility of Echocardiography for Cath Lab Complication Management

Jong-Min Song

Asan Medical Center
University of Ulsan College of Medicine

Complications of PCI

- **Coronary artery complications**
  - Dissection and abrupt closure
  - Intramural hematoma
  - Perforation
  - Distal embolization
  - Side branch occlusion

Myocardial Ischemia

Complications of PCI

- **Vascular complications**
  - Access site bleeding
  - Retroperitoneal bleeding
  - Atheroembolism
  - **Aortic dissection**

Complications of PDA closure

- **PDA closure using device of coil**
  - Device embolization
  - Cardiac perforation
  - Partial left pulmonary artery obstruction

Complications of ASD closure

- **ASD closure using device**
  - Device embolization
  - Malposition
  - Thrombus formation

Echocardiography

- Myocardial ischemia or infarction
- Aortic dissection
- Cardiac or coronary perforation
- Device embolization
- Thrombus formation

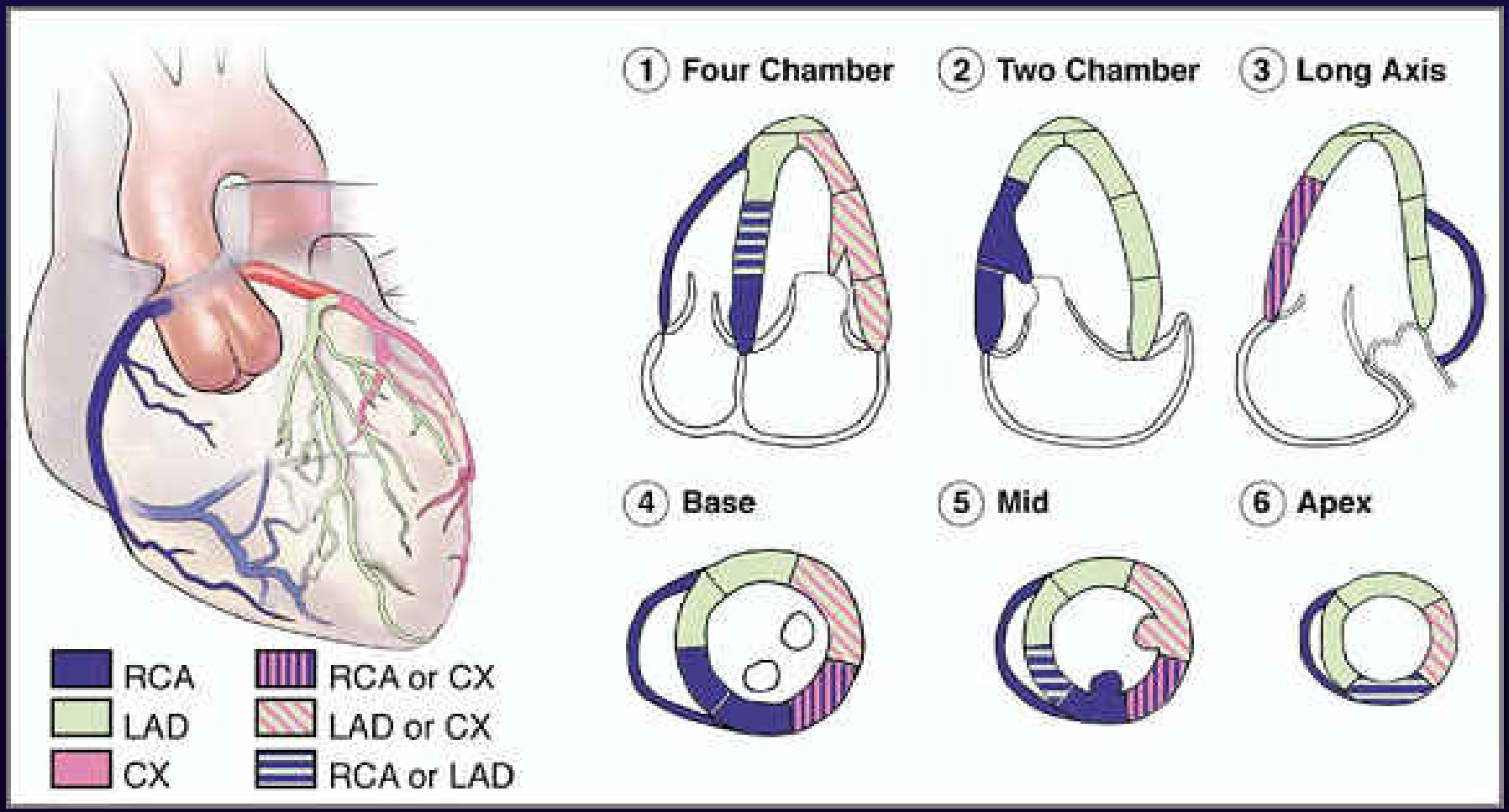
Myocardial ischemia

- **Role of echocardiography**
  - Detection of wall motion abnormality
  - Culprit coronary artery

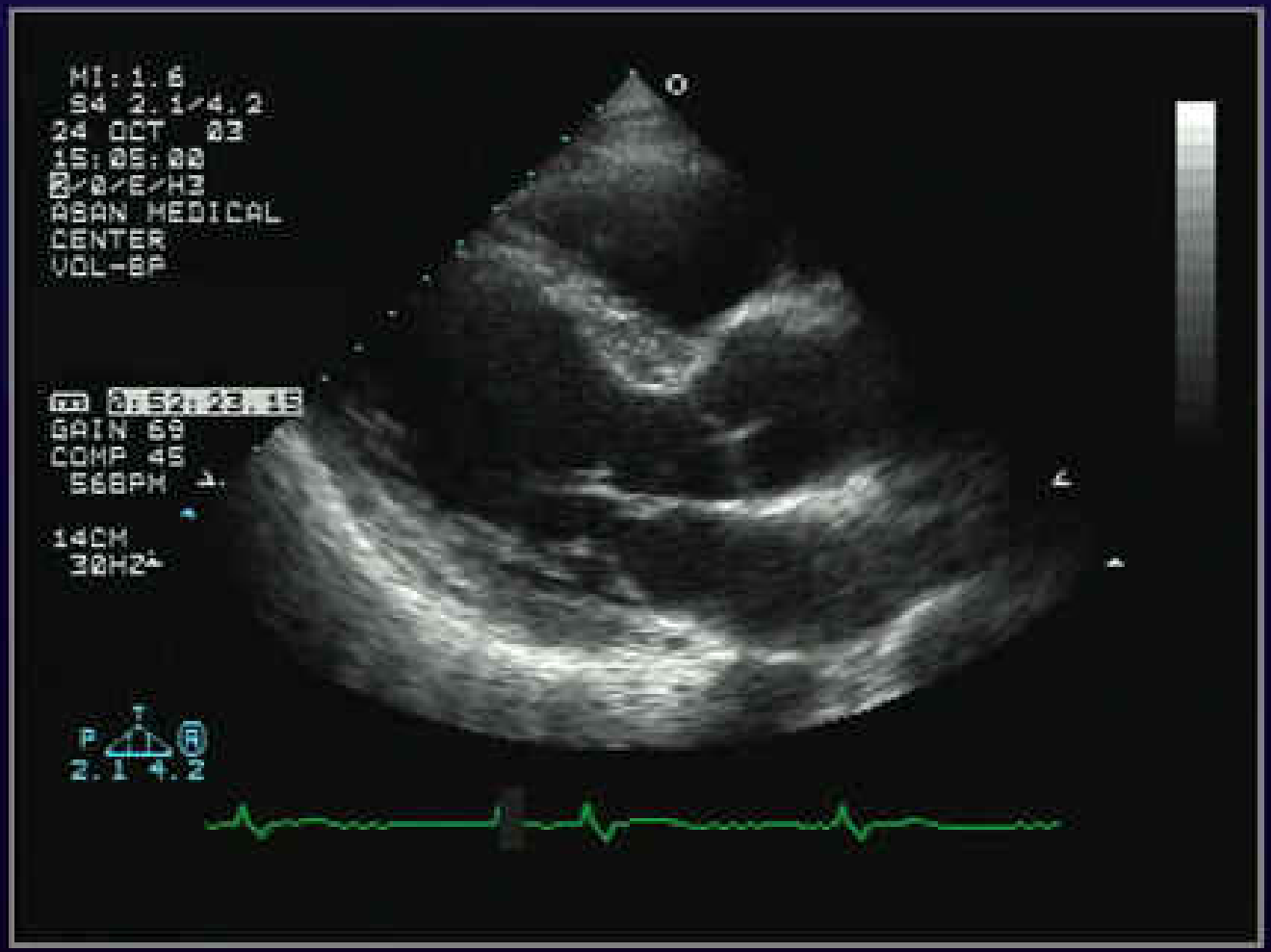
Regional Wall Motion Abnormality

- **Normal**
  - Systolic wall thickening > 30-40 %
- **Hypokinesis**
  - Systolic wall thickening < 30 %
- **Akinesis**
  - Systolic wall thickening < 10 %
  - >25 % of wall thickness involved with ischemia or infarct
- **Dyskinesis**
  - Moving outward during systole
  - Aneurysm

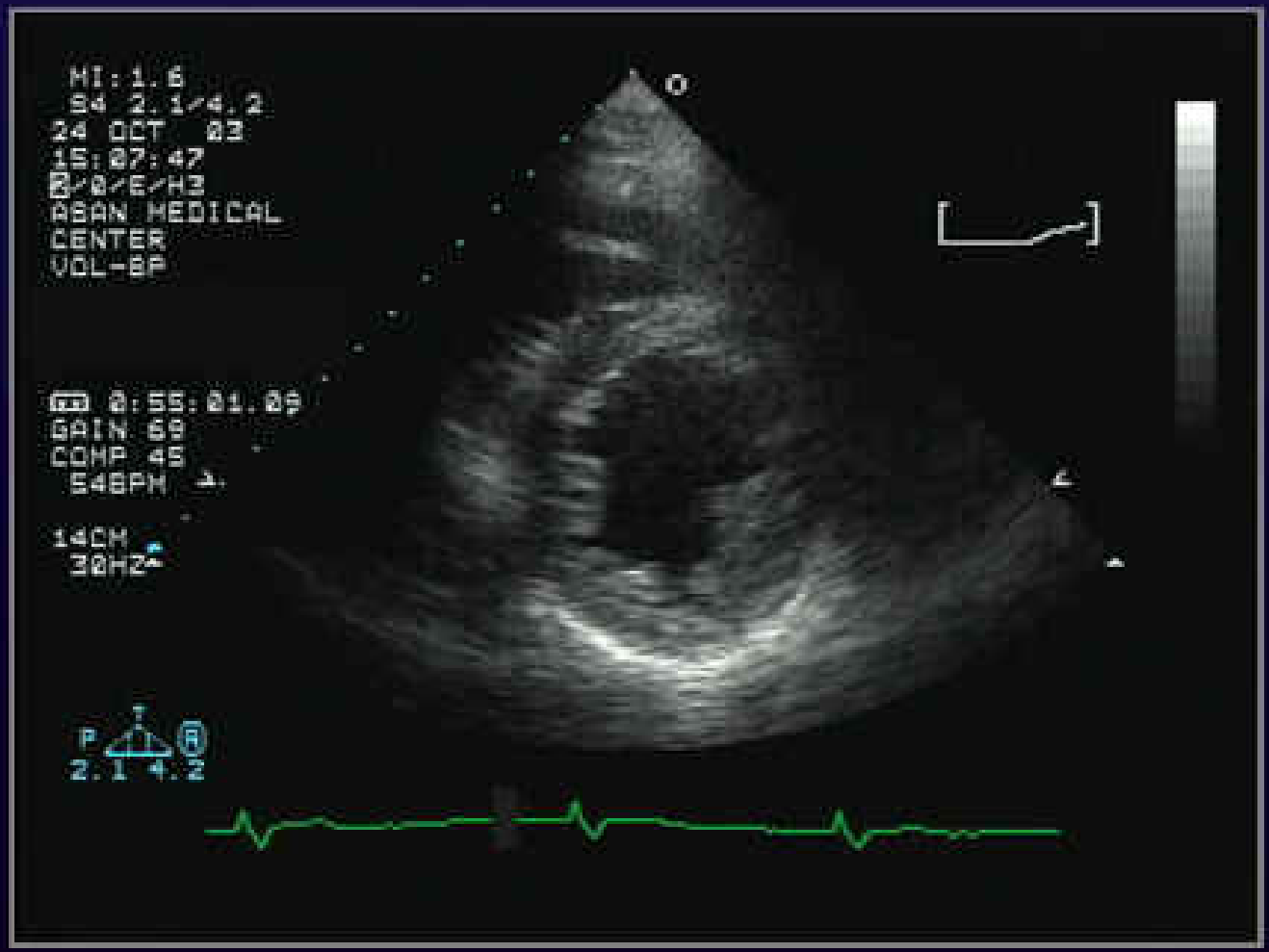
Coronary Artery Territory



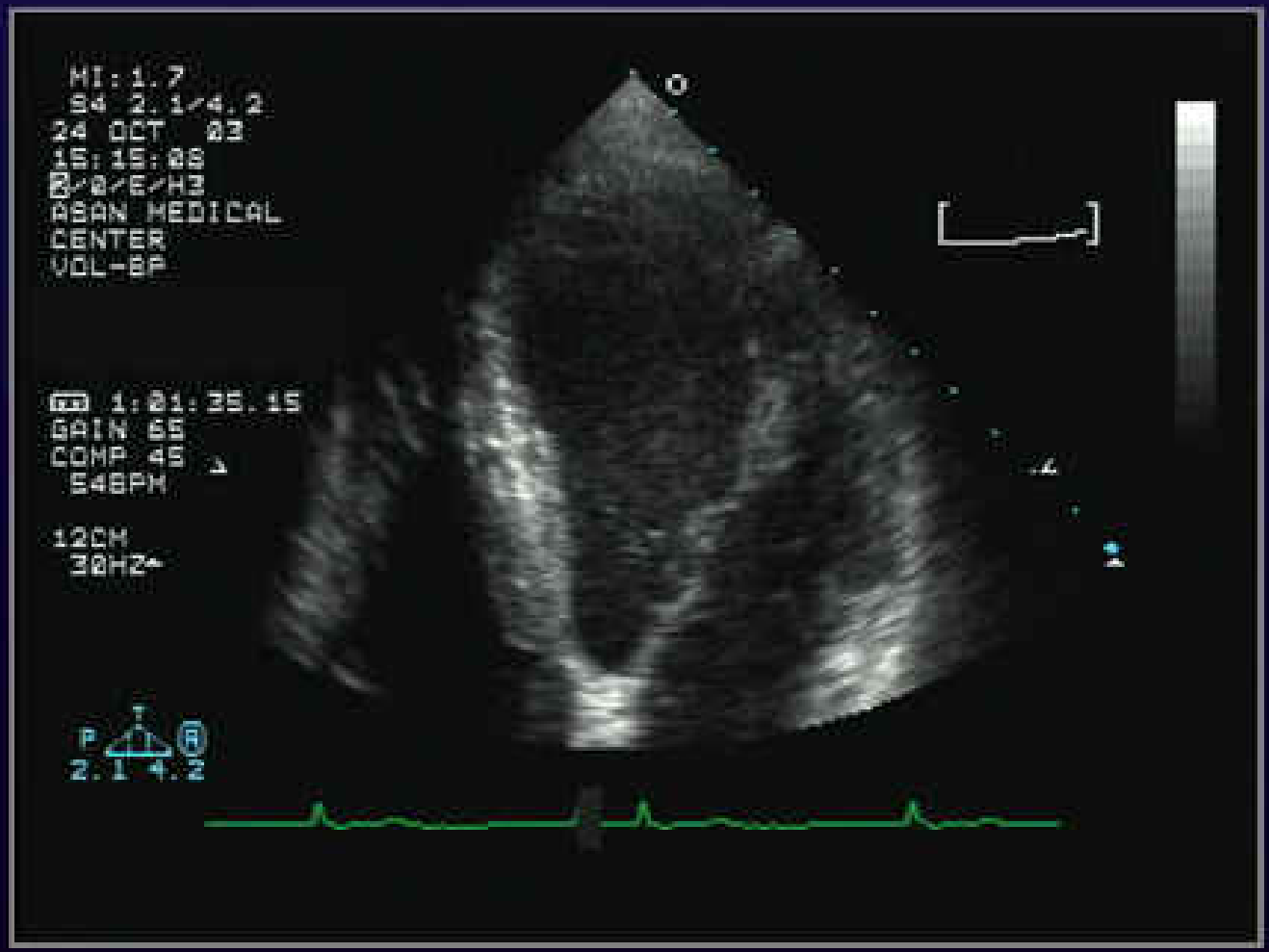
Case 1


MI:1.6
S4 2.1/4.2
24 OCT 03
15:05:00
A/B/E/H3
ASAN MEDICAL
CENTER
VOL-8P
GAIN 69
COMP 45
14CM
30Hz
P
2.1 4.2

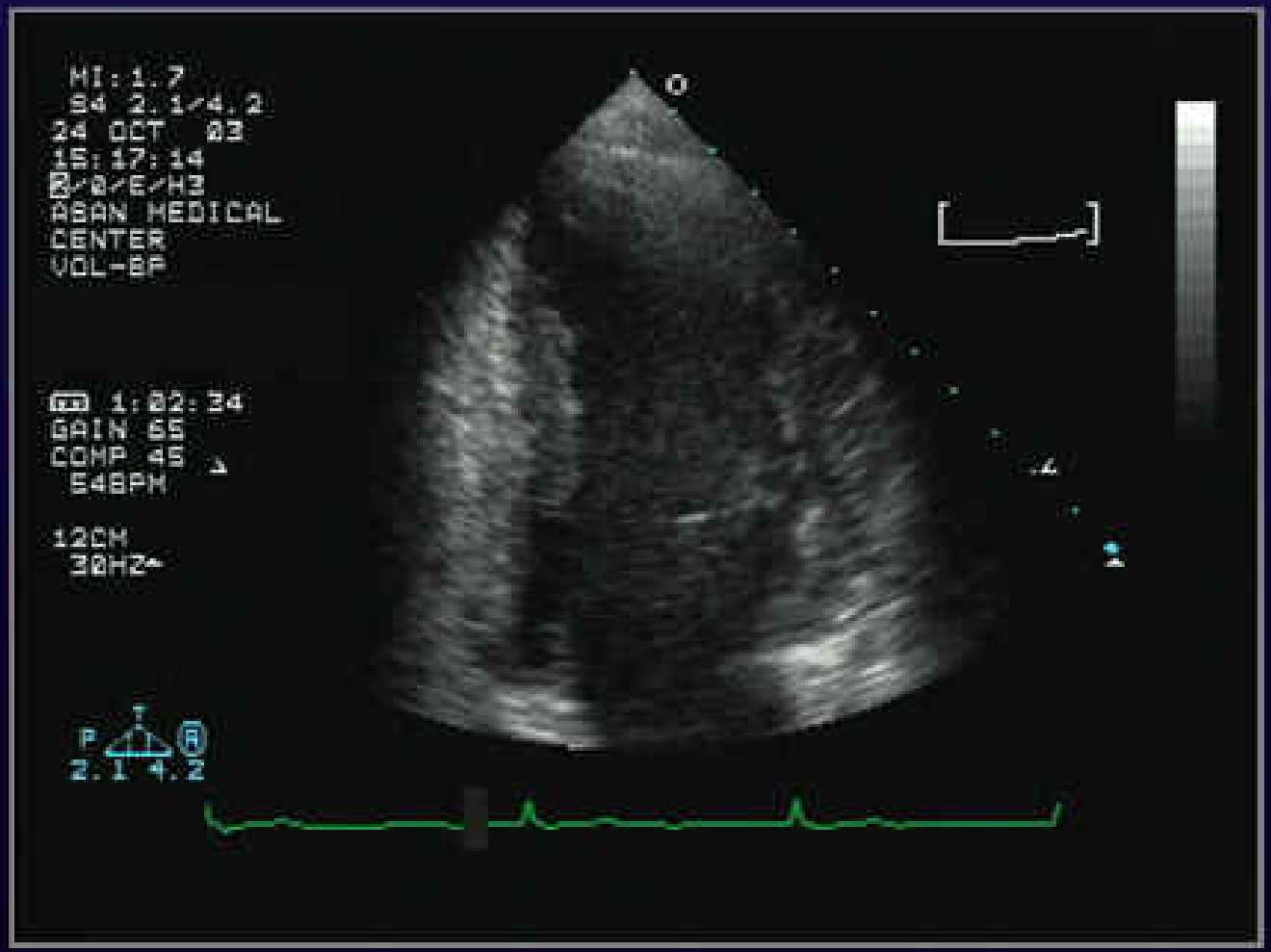
Case 1


MI:1.6
S4 2.1/4.2
24 OCT 03
15:07:47
A/B/E/H3
ASAN MEDICAL
CENTER
VOL-8P
0:55:01.0
GAIN 69
COMP 45
546PM
14CM
30HZ
P
A
2.1 4.2

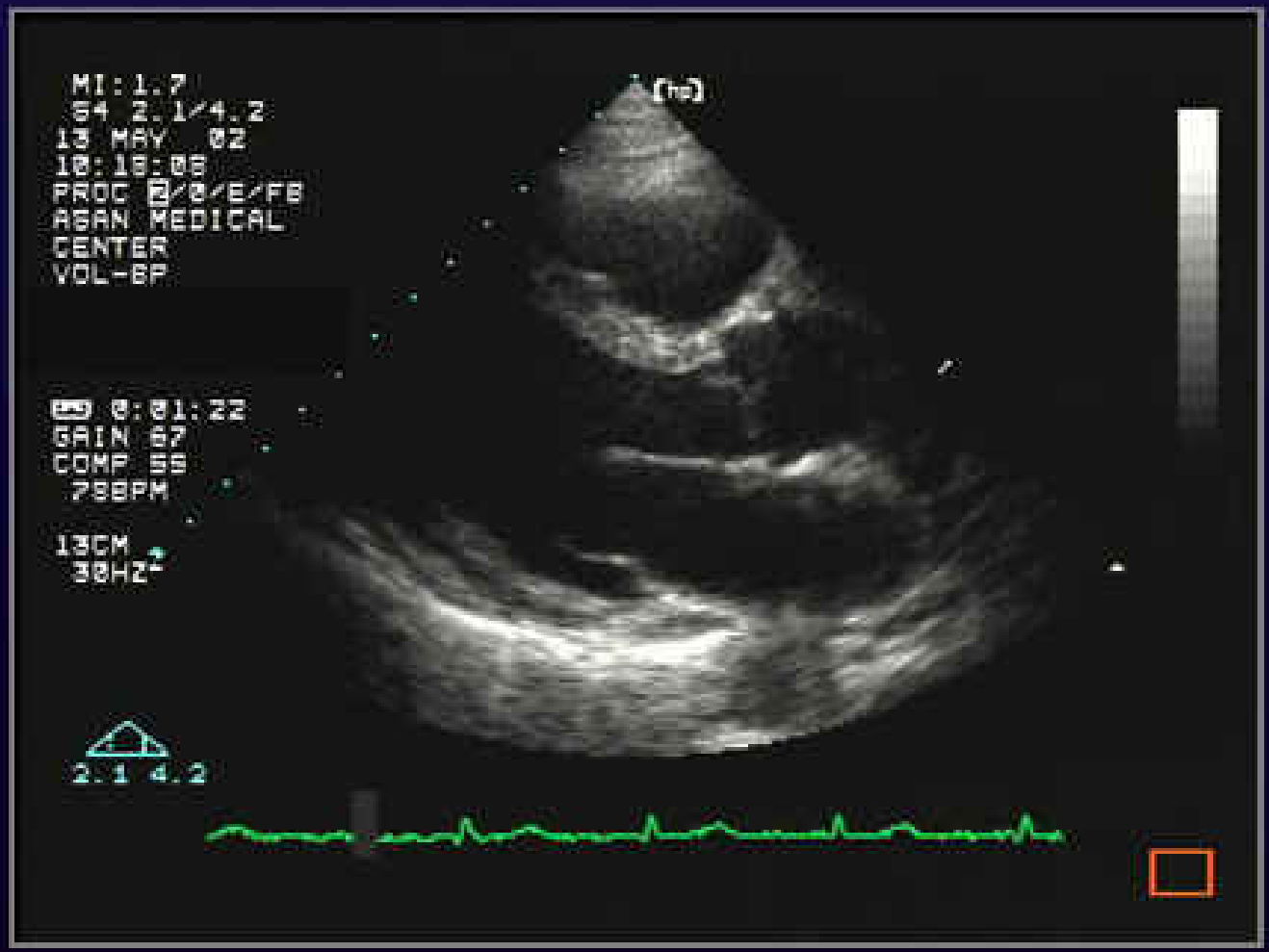
Case 1


MI:1.7
S4 2.1/4.2
24 OCT 03
15:15:08
B/D/E/H3
ASAN MEDICAL
CENTER
VOL-8P
1:01:35.15
GAIN 65
COMP 45
546PM
12CM
30HZ
P
A
2.1 4.2

Case 1


MI:1.7
S4 2.1/4.2
24 OCT 03
15:17:14
B/D/E/H3
ASAN MEDICAL
CENTER
VOL-8P
1:02:34
GAIN 55
COMP 45
548PH
12CM
30HZ
P
R
2.1 4.2

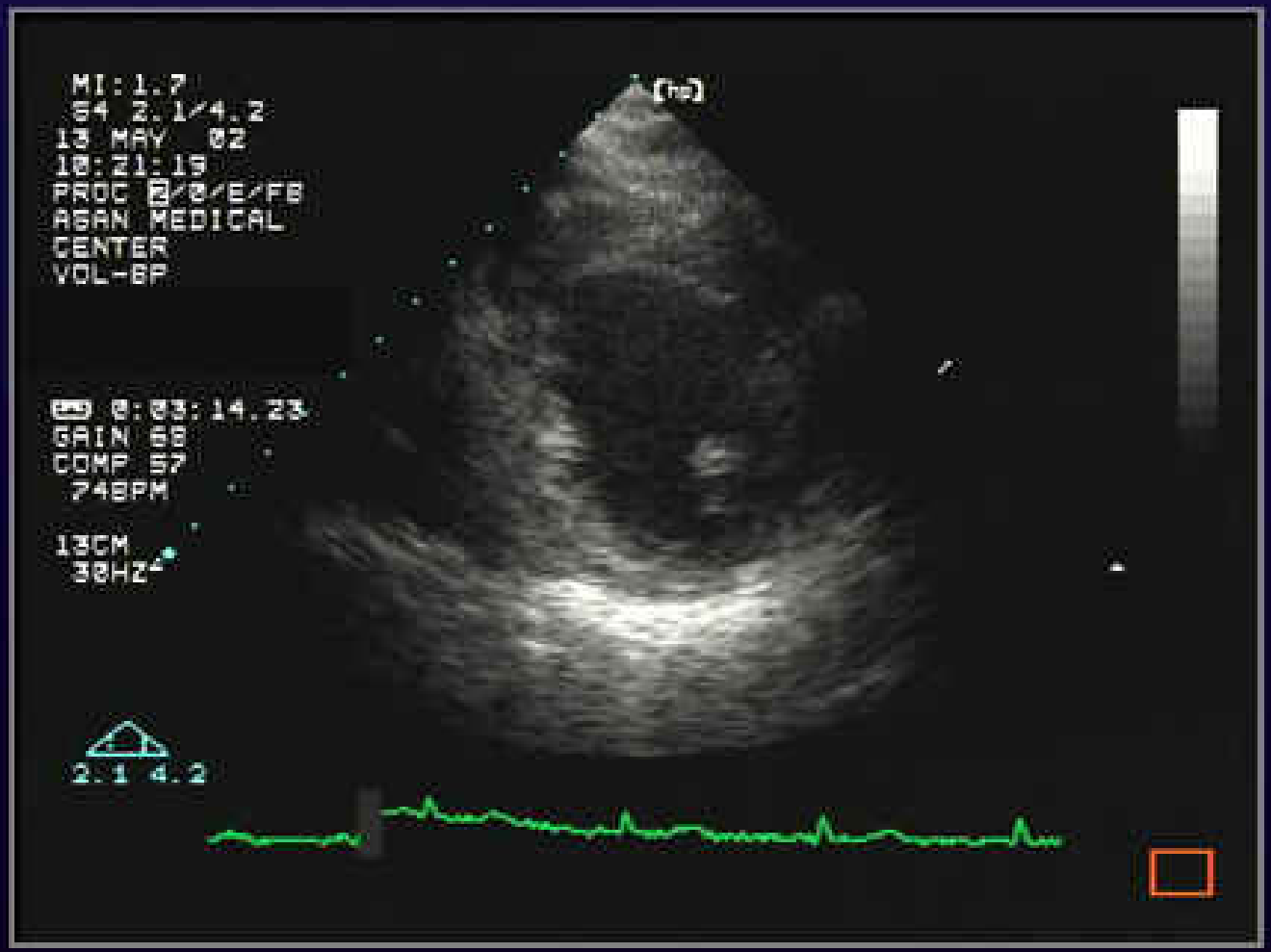
Case 2



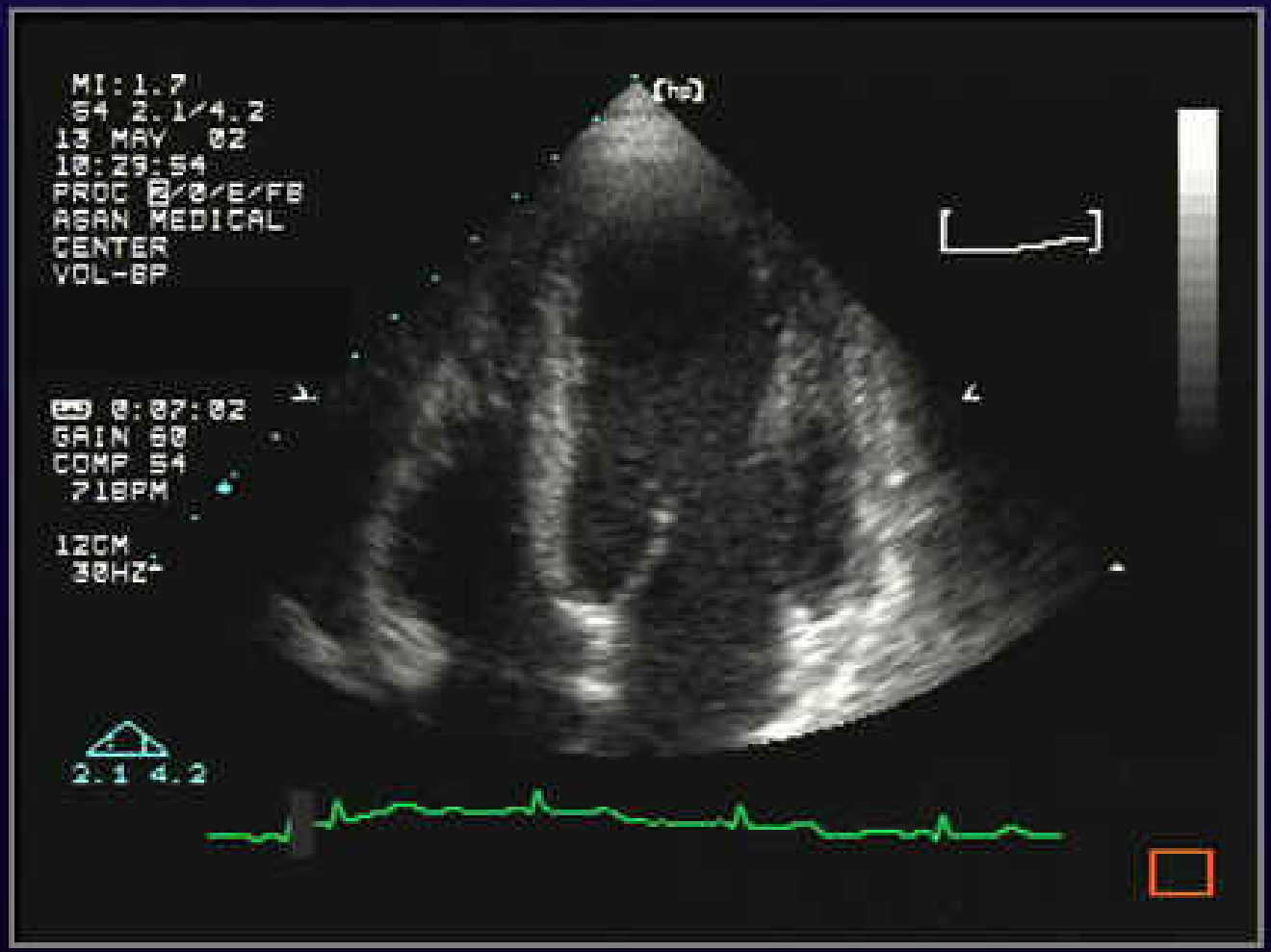
ASAN Medical Center

UNIVERSITY OF ULSAN COLLEGE OF MEDICINE

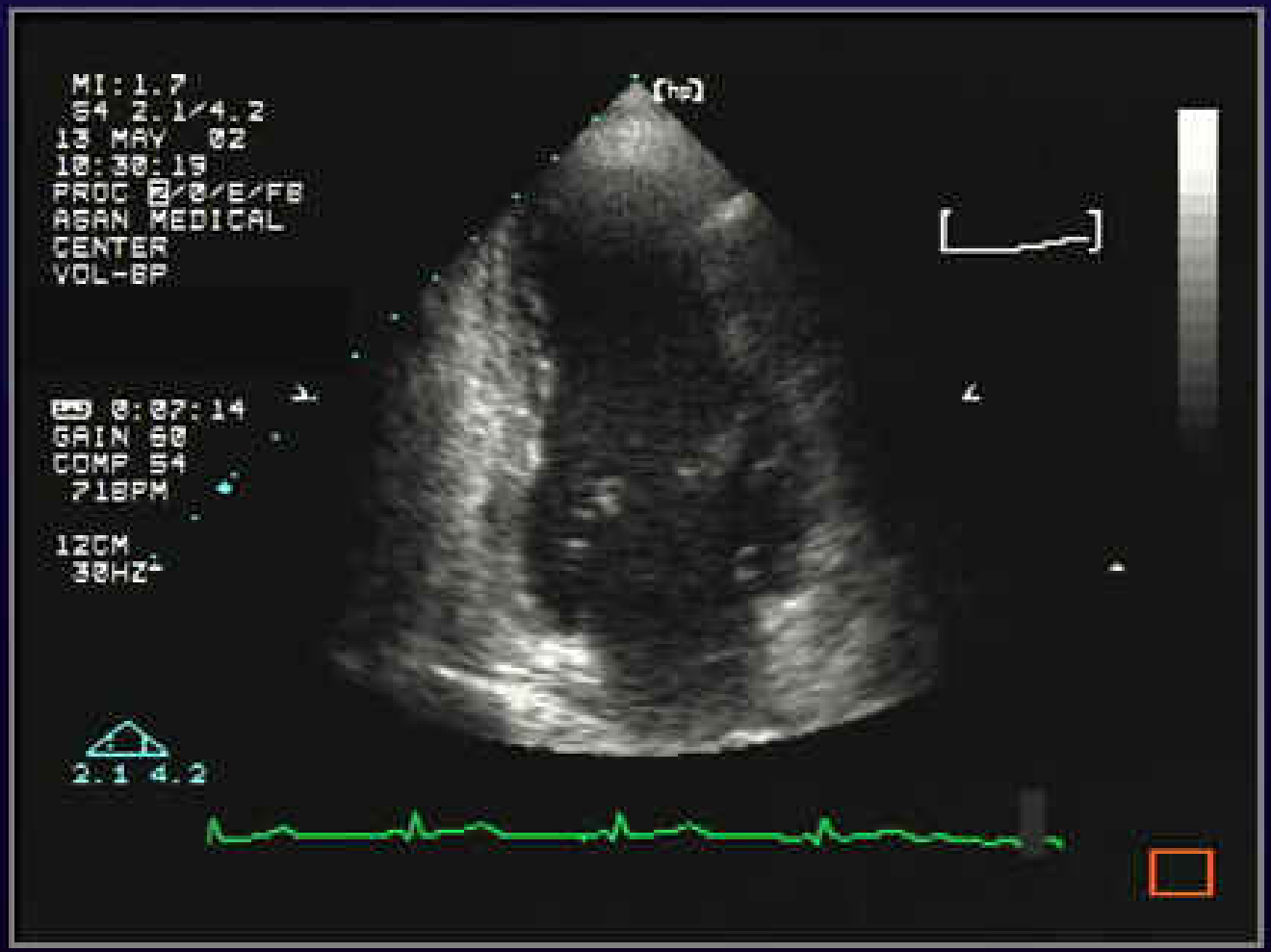
Case 2


MI:1.7
S4 2.1/4.2
13 MAY 02
10:21:19
PROC 2/0/E/FB
ASAN MEDICAL
CENTER
VOL-BP
0:03:14.23
GAIN 68
COMP 57
74BPM
13CM
38HZ
2.1 4.2

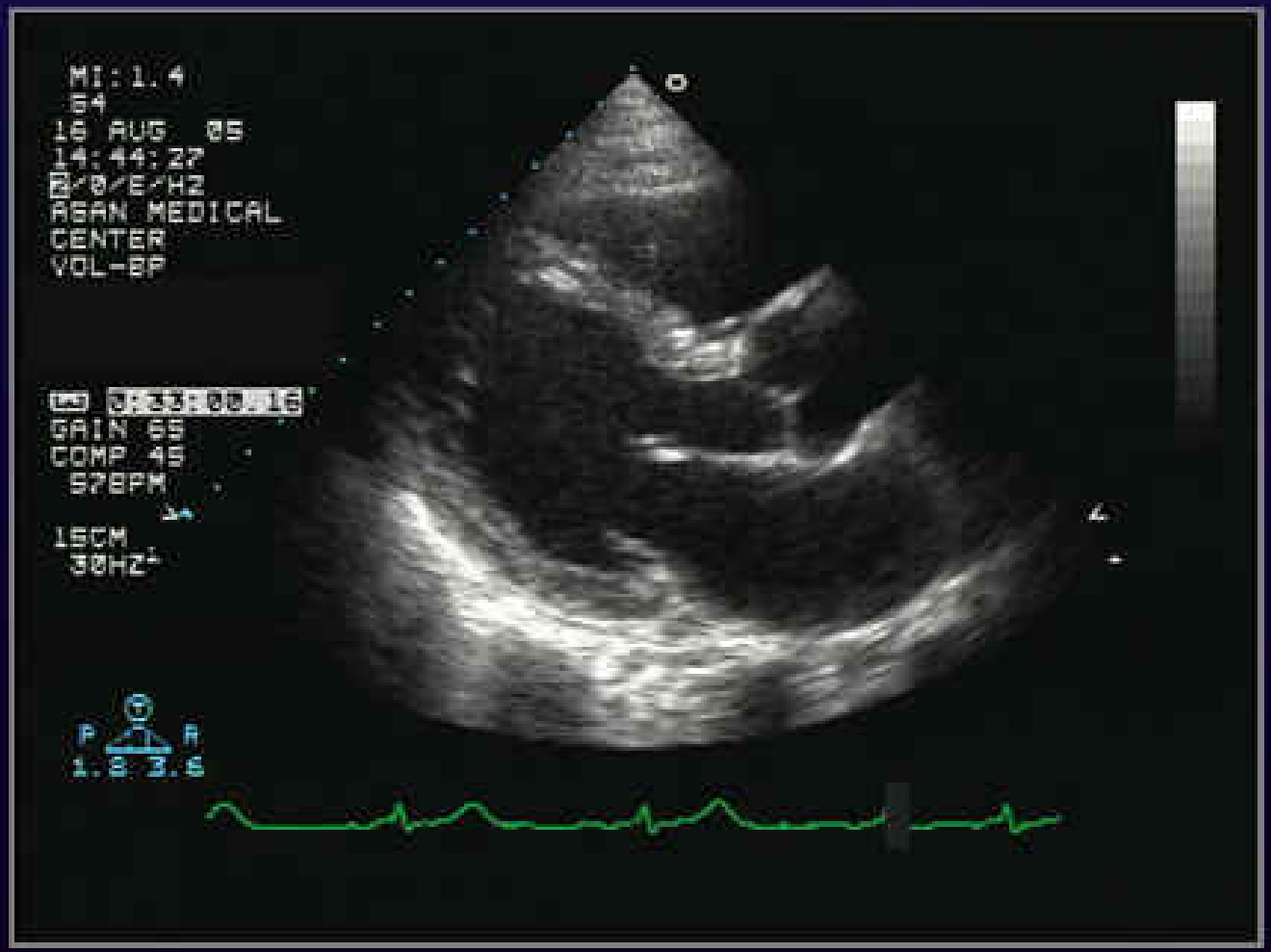
Case 2


MI:1.7
54 2.1/4.2
13 MAY 02
10:29:54
PROC 2/0/E/FB
ASAN MEDICAL
CENTER
VOL-BP
0:07:02
GAIN 60
COMP 54
71BPM
12CM
30HZ
2.1 4.2

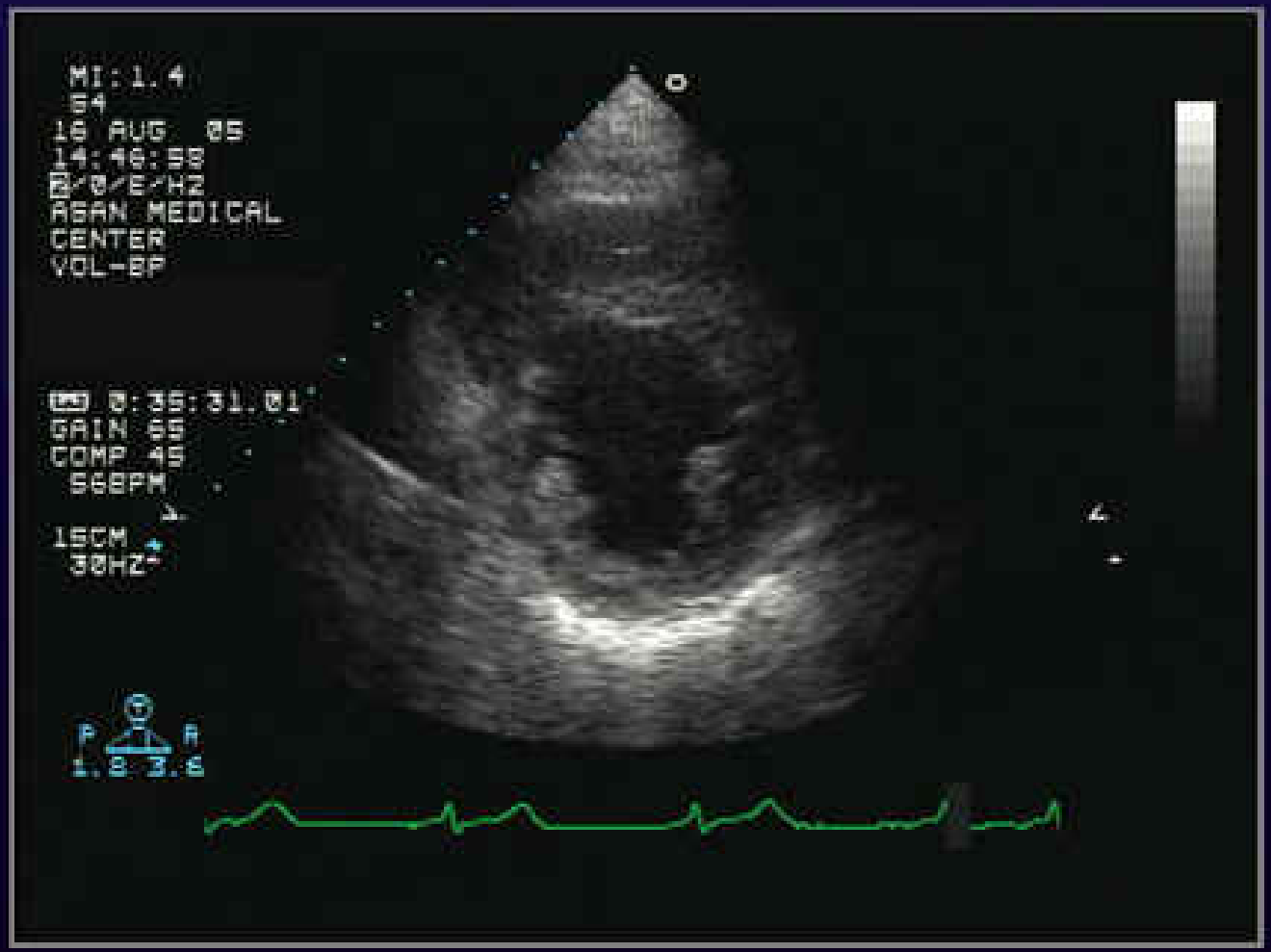
Case 2


MI:1.7
54 2.1/4.2
13 MAY 02
10:30:13
PROC 2/0/E/FB
ASAN MEDICAL
CENTER
VOL-BP
0:07:14
GAIN 60
COMP 54
71BPM
12CM
30HZ
2.1 4.2

Case 3


MI:1.4
54
16 AUG 05
14:44:27
2/0/E/HZ
ASAN MEDICAL
CENTER
VOL-BP
GAIN 65
COMP 45
578PM
15CM
30HZ
P
R
1.8 3.6

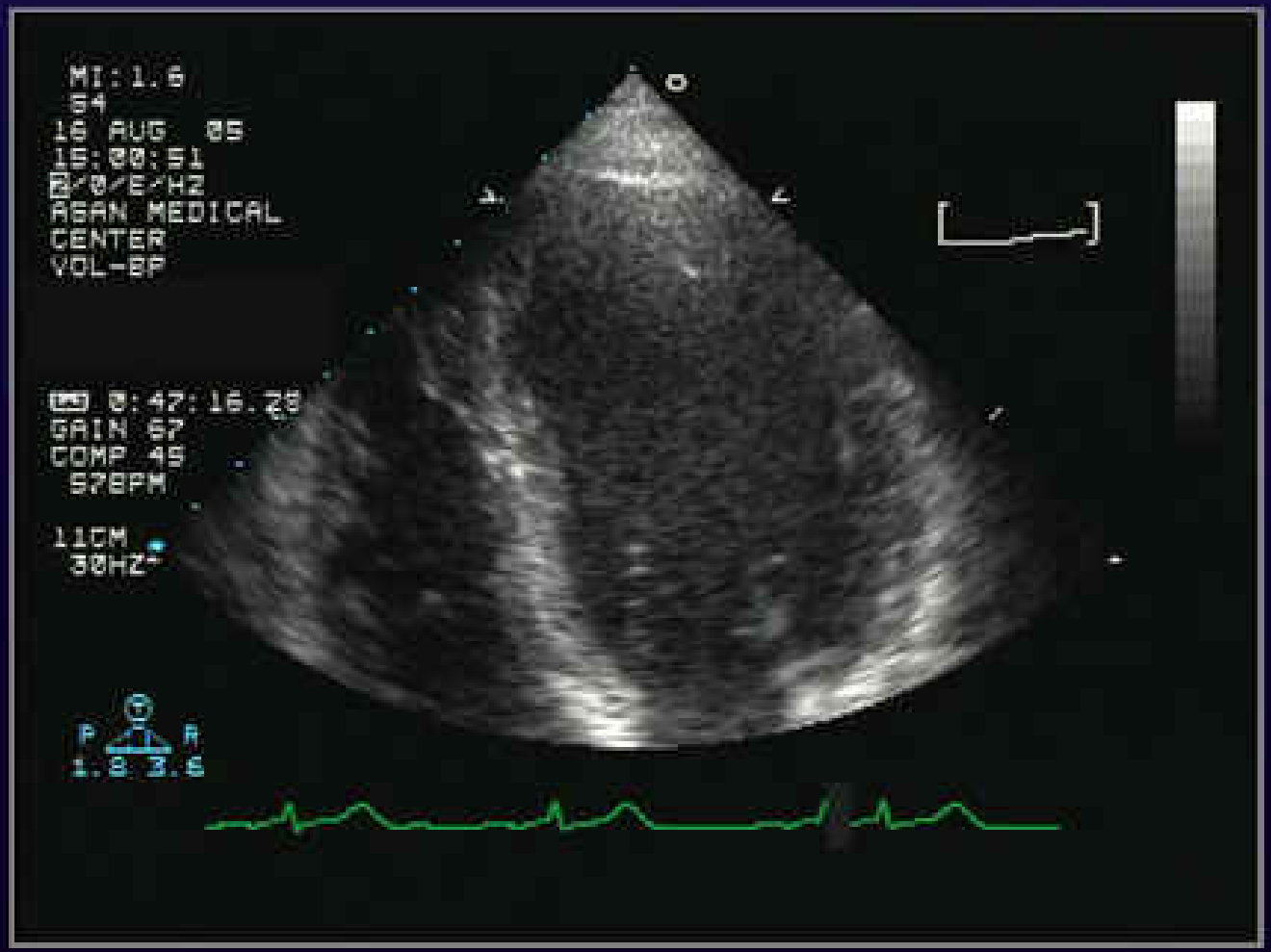
Case 3



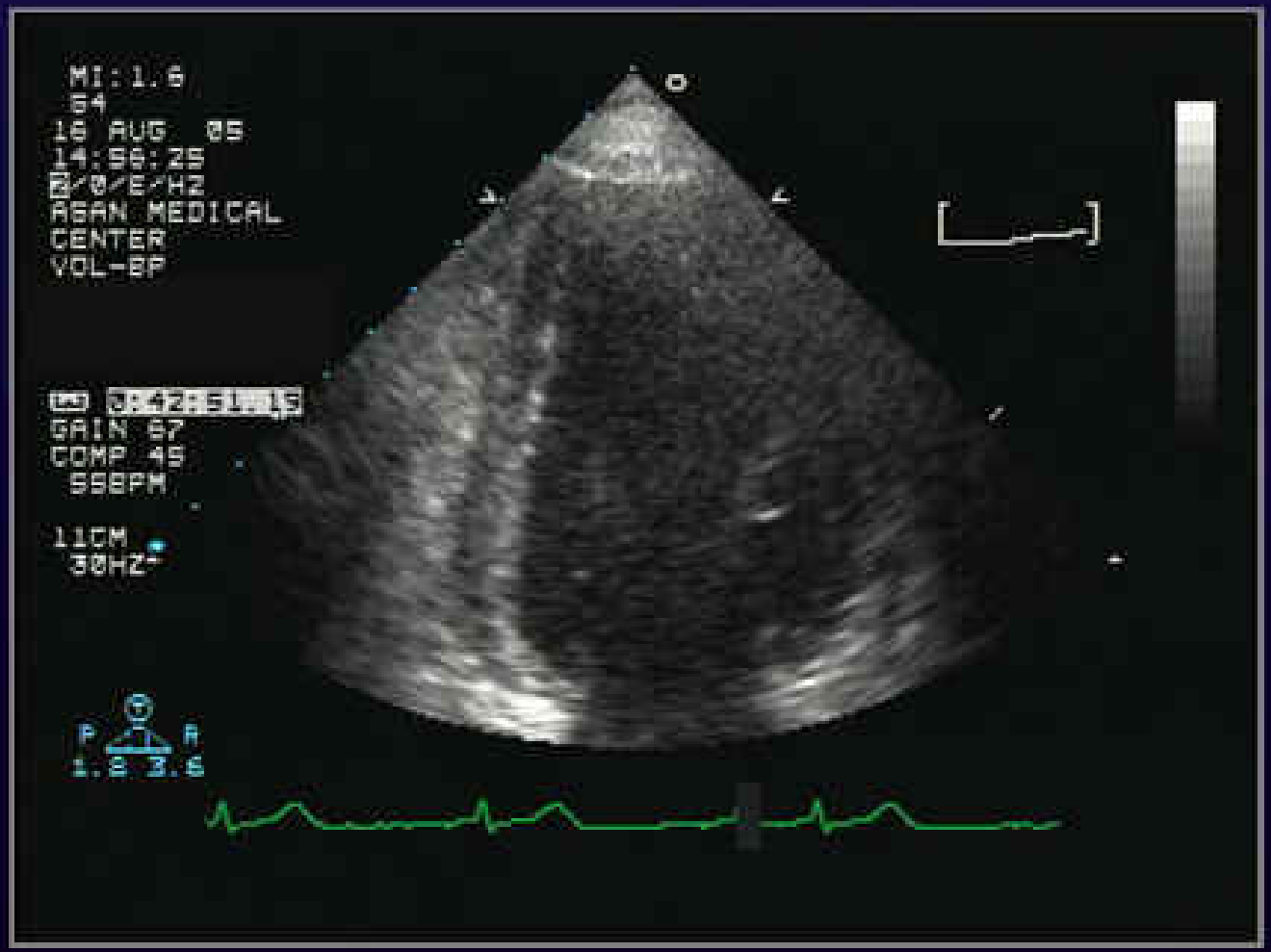
ASAN Medical Center

UNIVERSITY OF ULSAN COLLEGE OF MEDICINE

Case 3


MI:1.6
54
16 AUG 05
15:00:51
2/0/E/HZ
ASAN MEDICAL
CENTER
VOL-8P
0:47:16.28
GAIN 67
COMP 45
57BPM
11CM
30HZ
P R
1.8 3.6

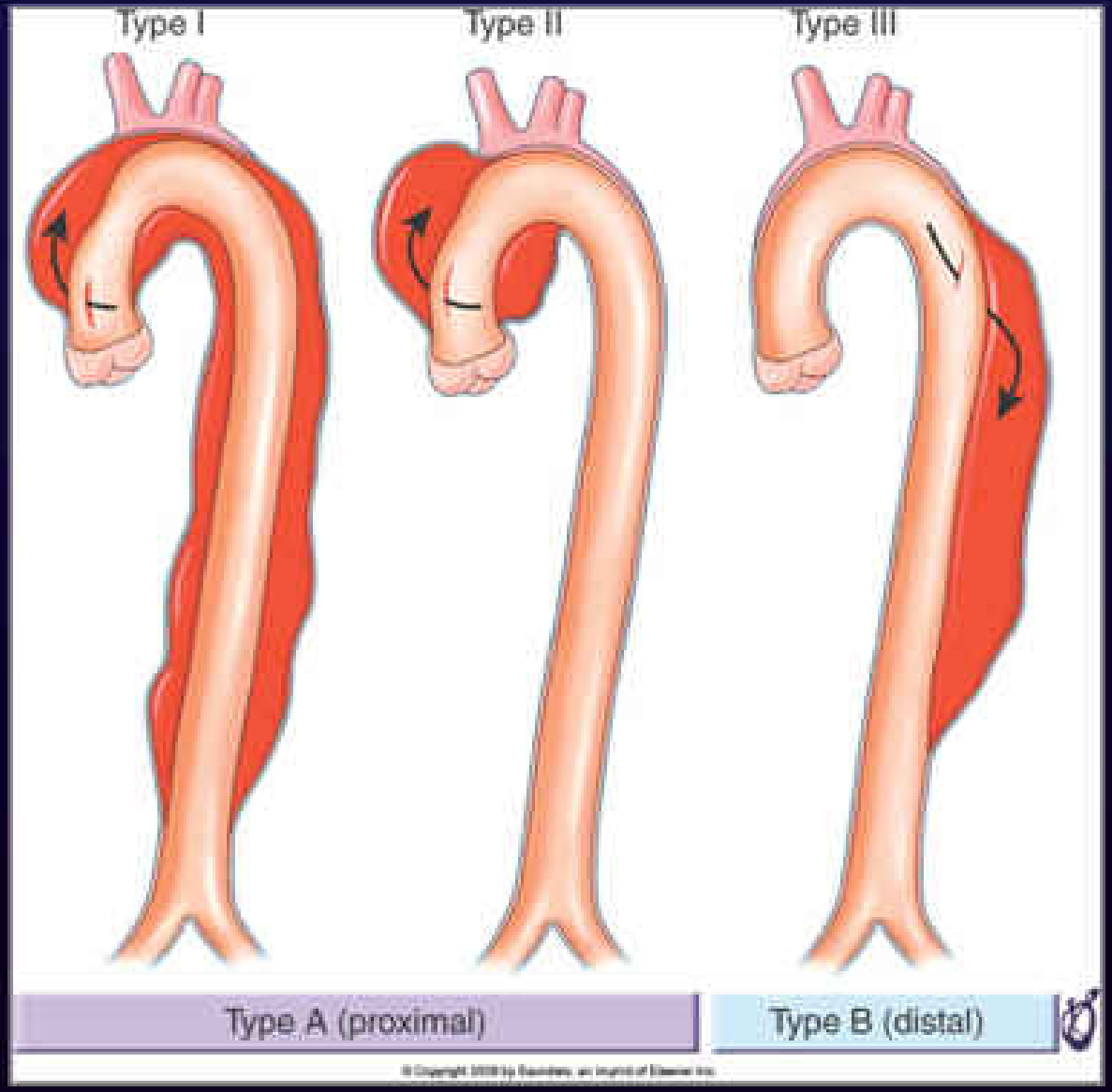
Case 3


MI:1.6
54
16 AUG 05
14:56:25
A/B/E/HZ
ASAN MEDICAL
CENTER
VOL-BP
GAIN 57
COMP 45
558PM
11CM
30HZ
P
A
1.8 3.6

Aortic dissection

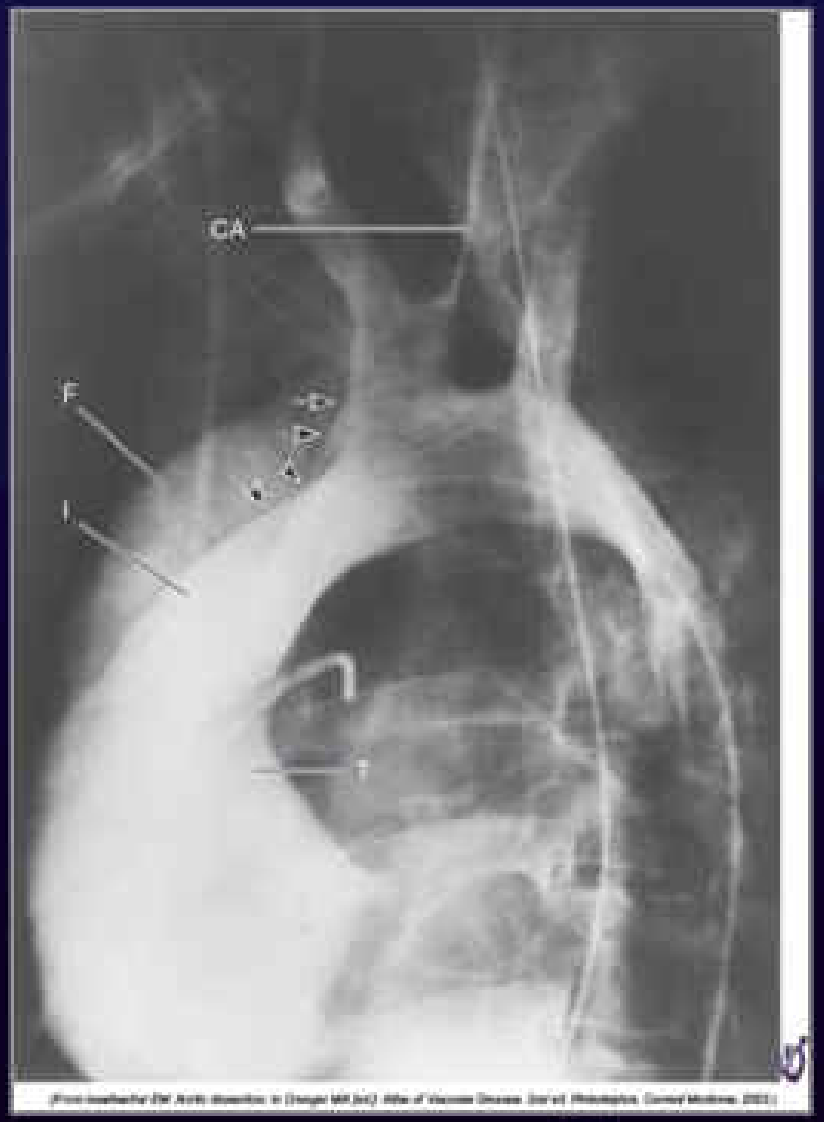
- **Iatrogenic aortic dissection**
  - Cardiac catheterization was reported to cause 14 of 723 dissections (2 percent) in a report from the IRAD registry
    - Am J Cardiol 2002;89:623-6

Classification



Diagnostic Techniques

- **Aortography**
  - **Diagnostic clues**
    - Visualization of 2 lumens or an intimal flap
    - Aortic lumen deformity, branch vessel abnormalities, AR

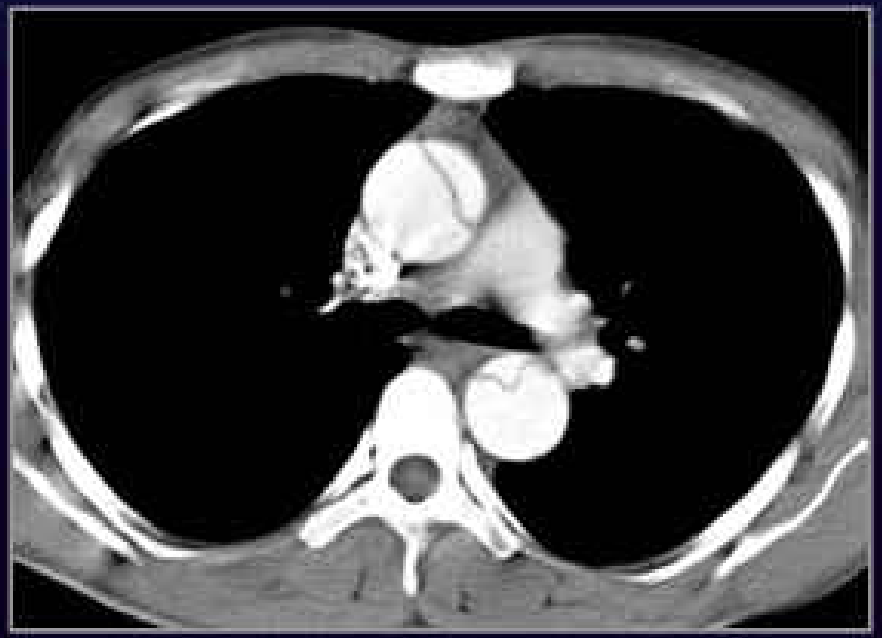


Diagnostic Techniques

- **Aortography**
  - **Advantages**
    - Delineate the extent
    - Brach vessel or coronary artery involvement
    - Aortic regurgitation
  - **Disadvantages**
    - Invasive
    - **Not so sensitive**, 77%
      - Intramural hematoma
      - Thrombosis of the false lumen
      - Simultaneous opacification of both lumens
    - Contrast materials
    - The time to complete the study

Diagnostic Techniques

- **Contrast-enhanced CT**
  - **Diagnostic clues**
    - 2 distinct aortic lumens and intimal flap
    - 3-dimensional display by spiral CT
      - Aorta and branches

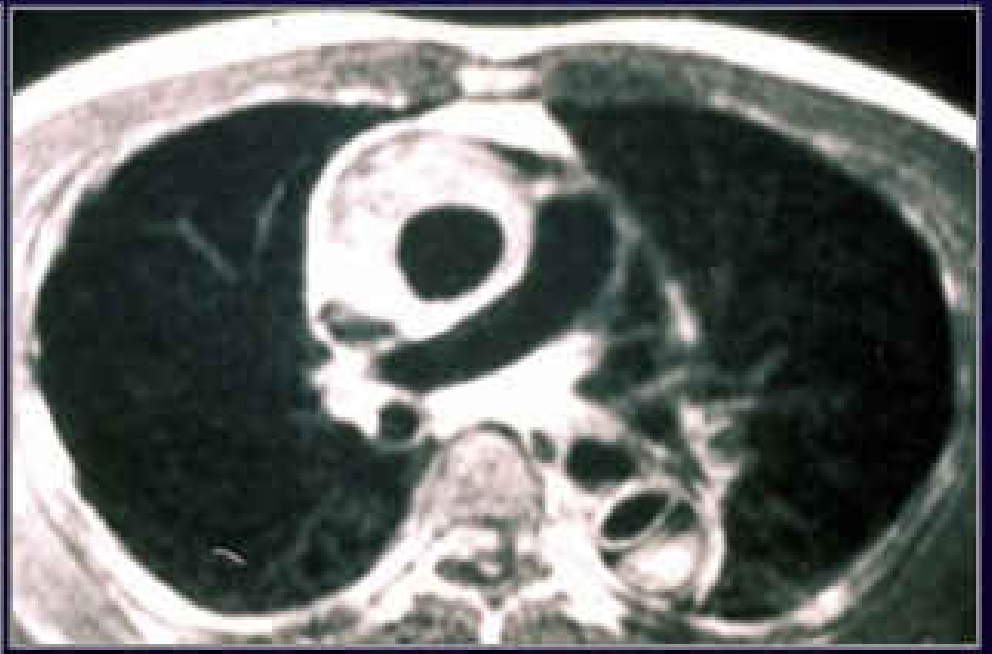


Diagnostic Techniques

- **Contrast-enhanced CT**
  - **Advantages**
    - Noninvasive
    - High sensitivity and specificity (96-100%)
    - Readily available
    - Thrombus in the false lumen
    - Pericardial effusion
    - Branch vessel compromise
  - **Disadvantages**
    - Contrast materials

Diagnostic Techniques

- MRI

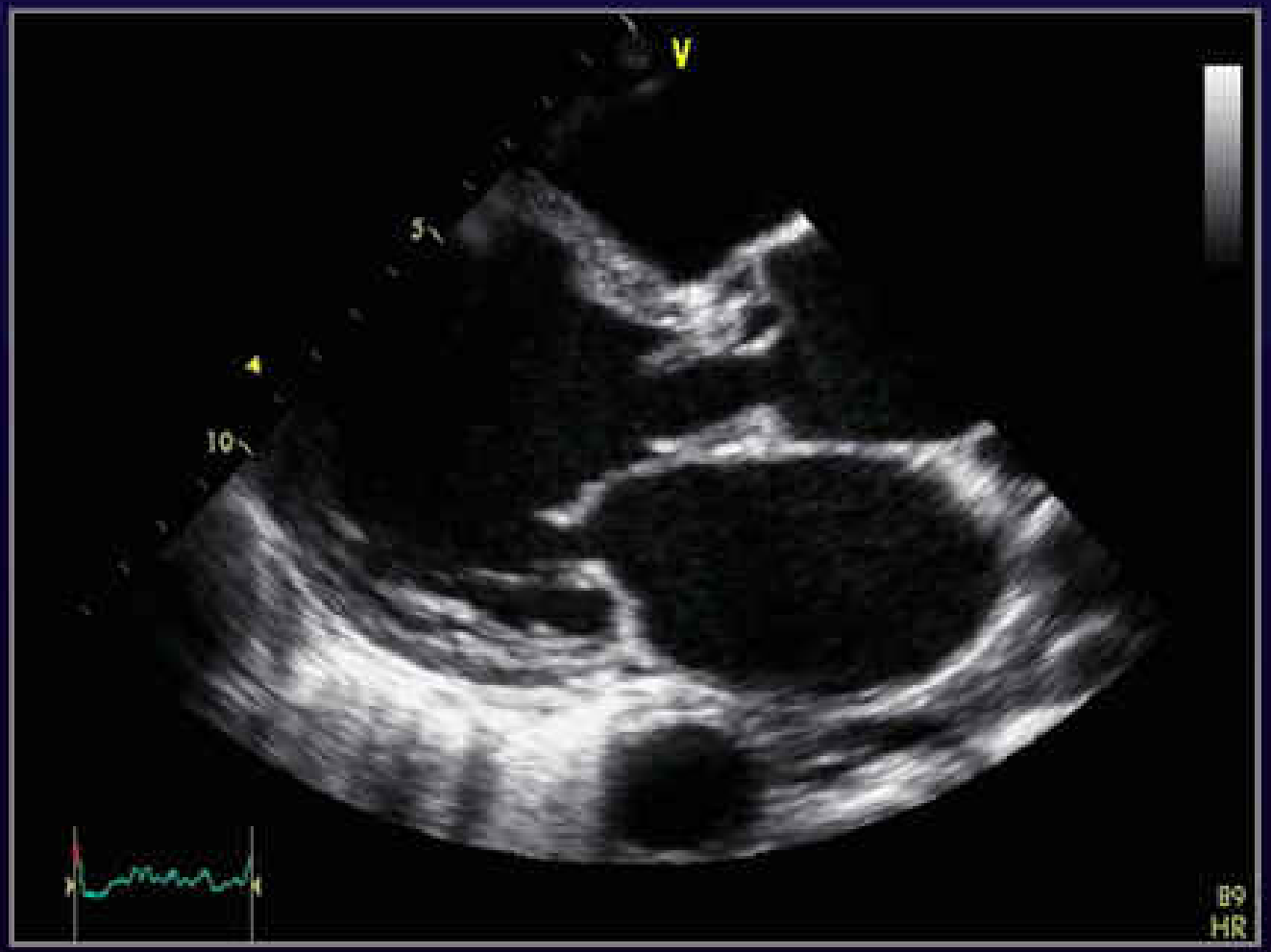


Diagnostic Techniques

- **MRI**
  - **Advantages**
    - Not require contrast materials
    - High sensitivity and specificity (around 98%)
    - High image quality with multiple imaging planes
      - Extent
      - Branch vessel involvement
    - Aortic regurgitation by cine-MRI technique
  - **Disadvantages**
    - Contraindicated in pacemaker or ICD
    - Not readily available
    - Lengthy study
      - Relatively contraindicated for unstable patients

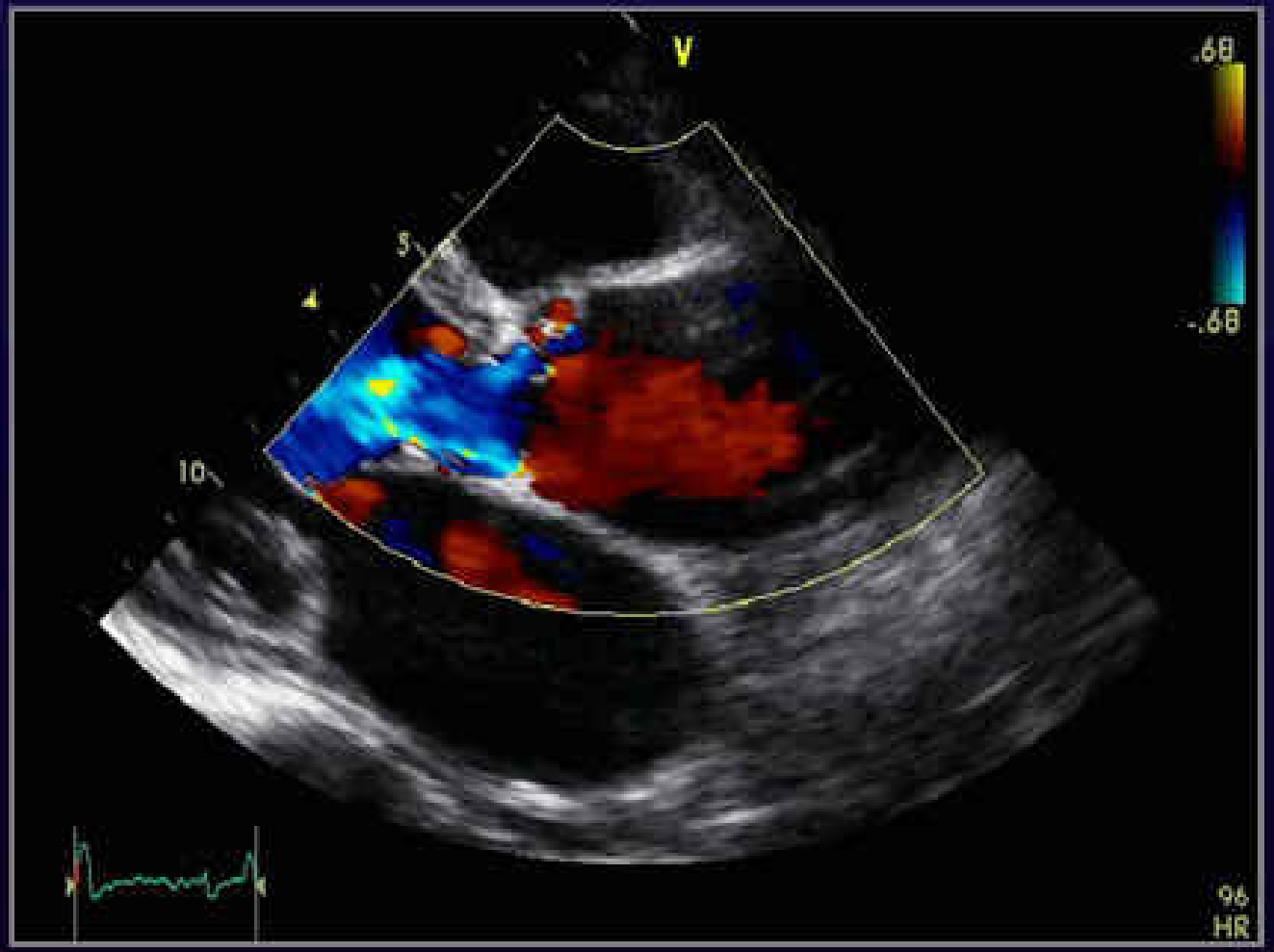
Diagnostic Techniques

- Transthoracic echocardiography (TTE)



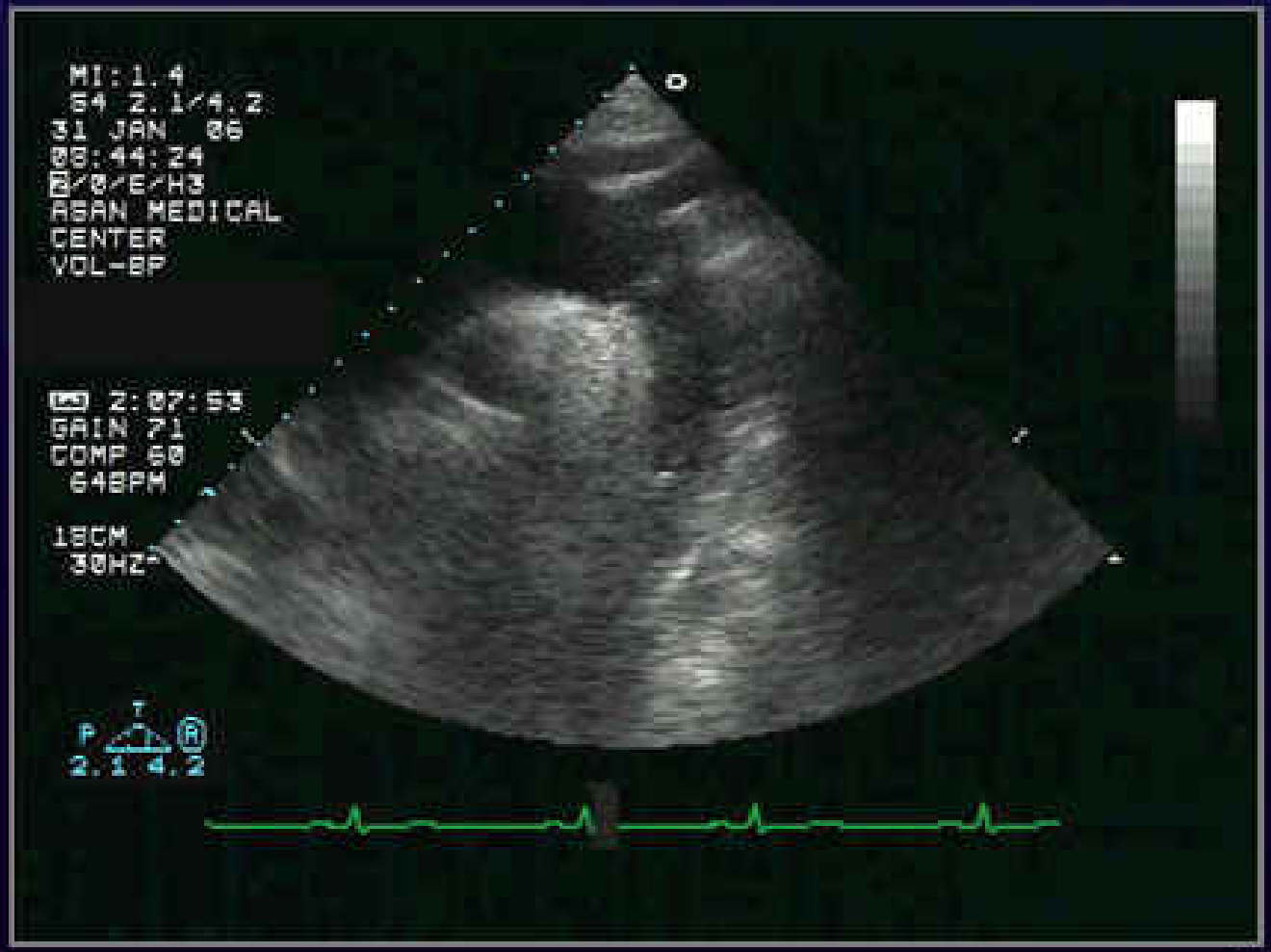
Diagnostic Techniques

- Transthoracic echocardiography (TTE)



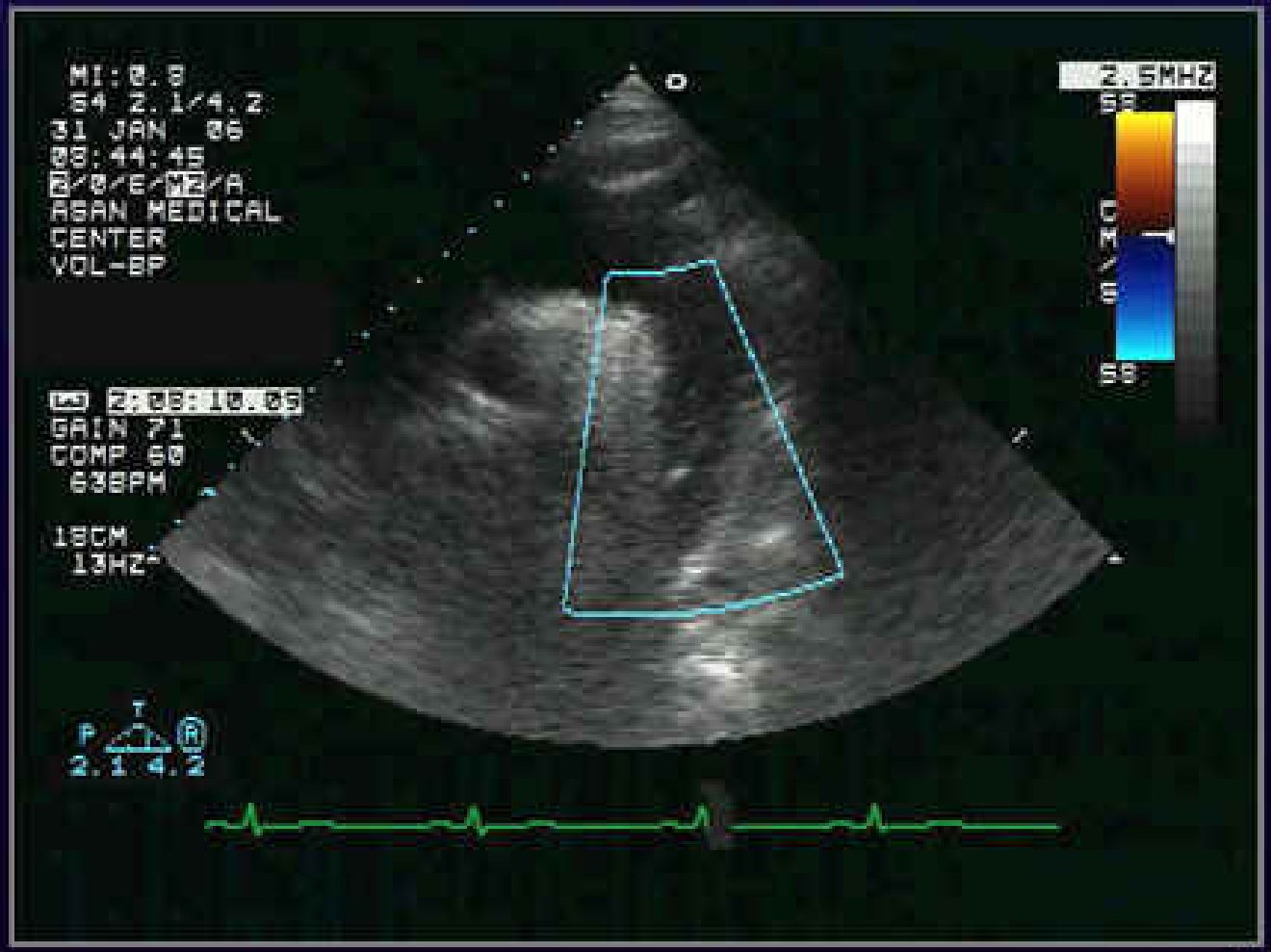
Diagnostic Techniques

- Transthoracic echocardiography (TTE)



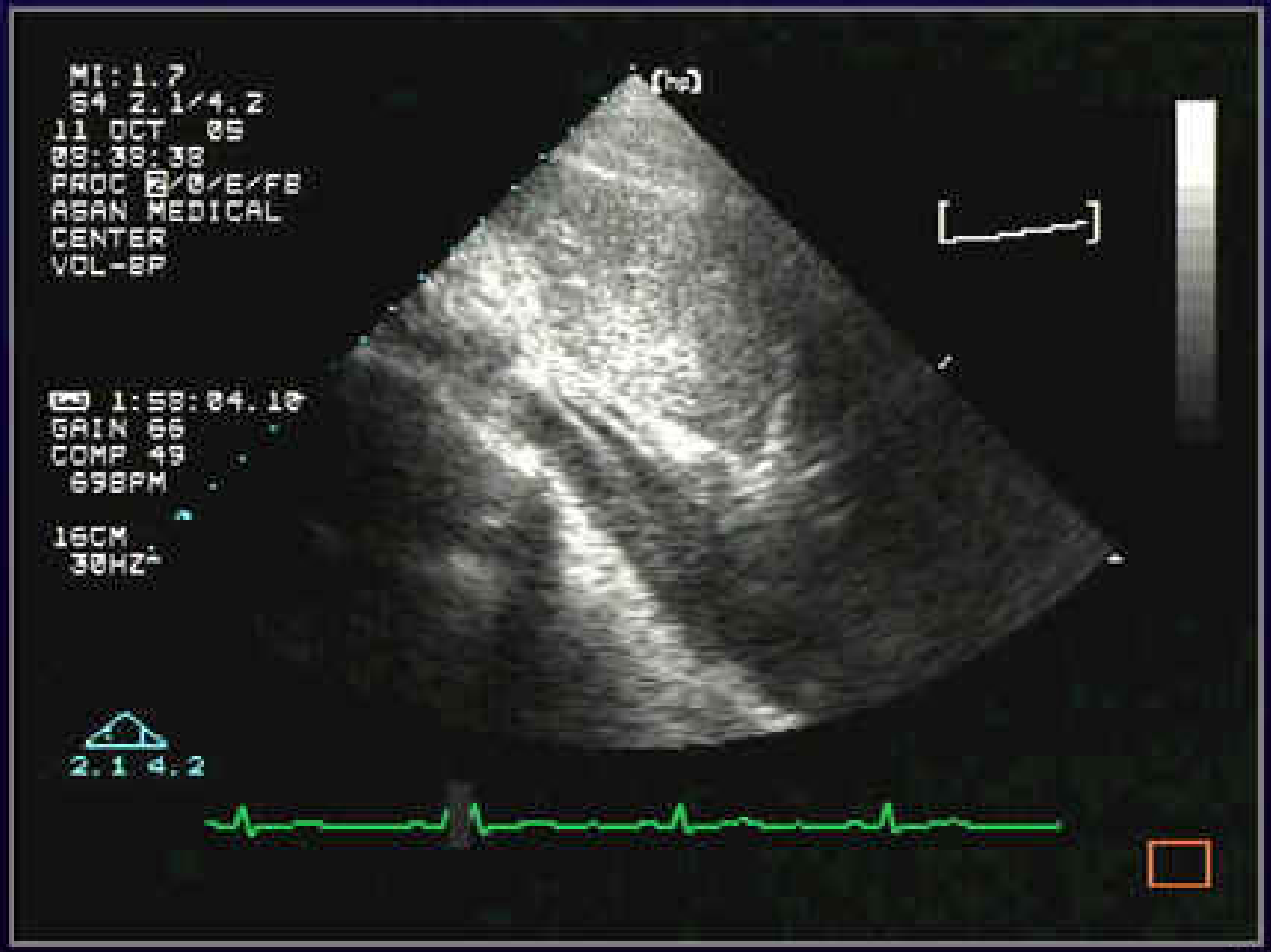
Diagnostic Techniques

- Transthoracic echocardiography (TTE)



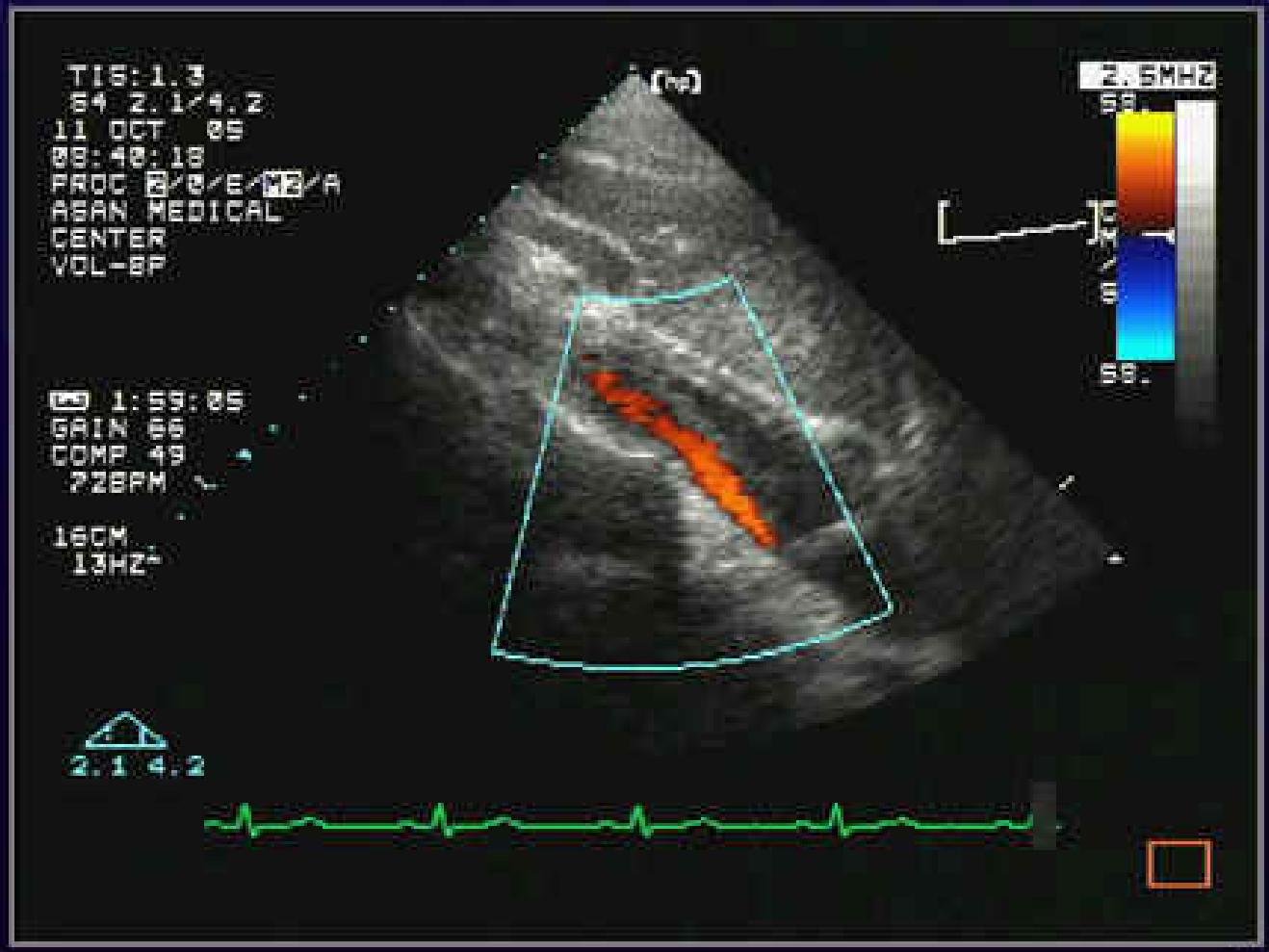
Diagnostic Techniques

- Transthoracic echocardiography (TTE)



Diagnostic Techniques

- Transthoracic echocardiography (TTE)



Diagnostic Techniques

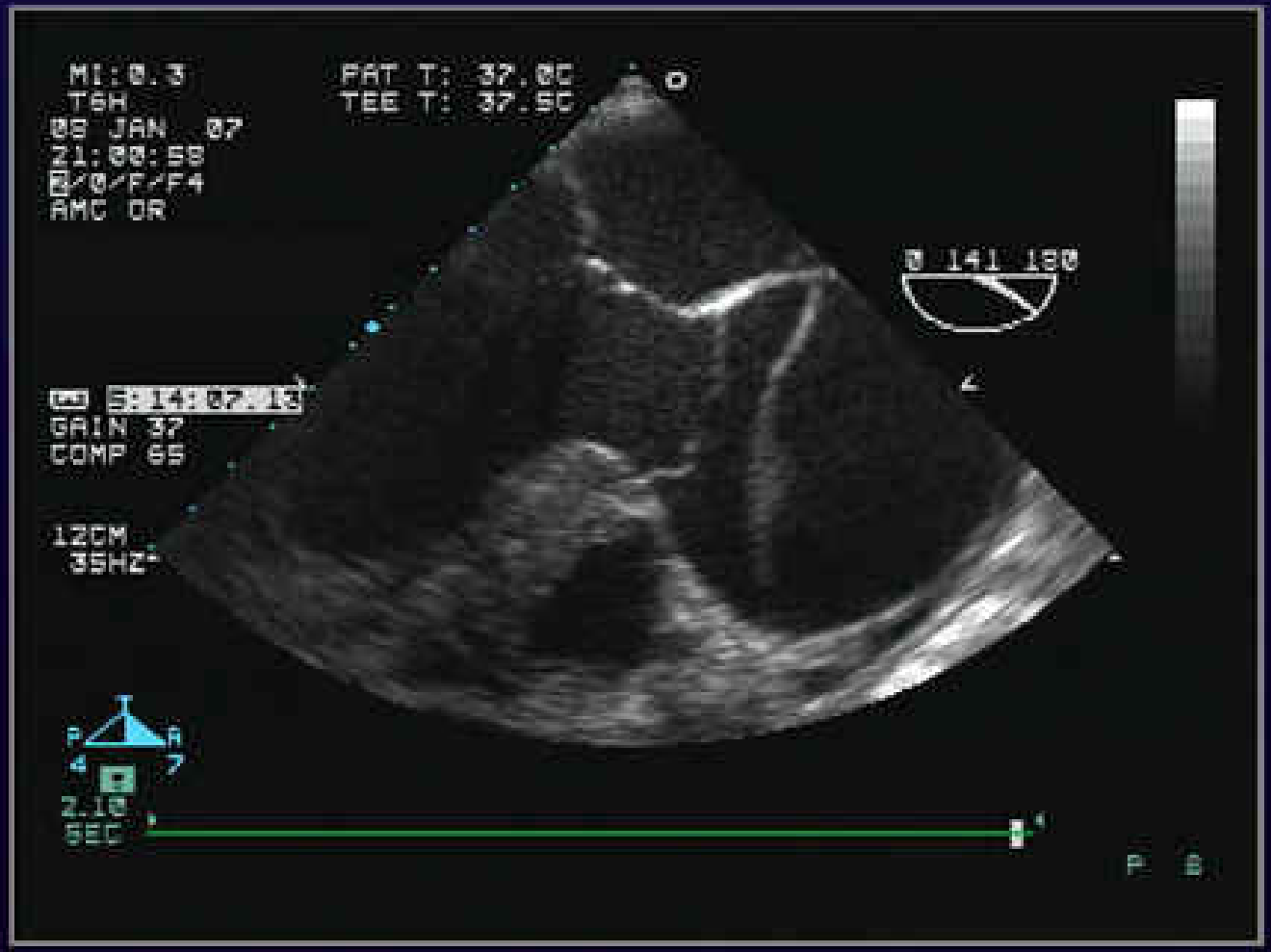
- **Echocardiography**
  - **Advantages**
    - Readily available
    - Noninvasive
    - Quick to perform at the bedside
  - **Transthoracic echocardiography (TTE)**
    - Sensitivity: 59 – 85%
    - Specificity: 63 – 96%
    - Limited by image quality

Diagnostic Techniques

- **Transesophageal echocardiography (TEE)**
  - **Advantages**
    - High imaging quality with high frequency ultrasound
    - Not require contrast materials
    - Aortic regurgitation
    - Pericardial effusion
    - High sensitivity and specificity
      - Sensitivity: 98 – 99%
      - Specificity: 94 – 97%
  - **Disadvantages**
    - Not visualize distal ascending aorta and proximal arch

Diagnostic Techniques

- Transesophageal Echocardiography (TEE)

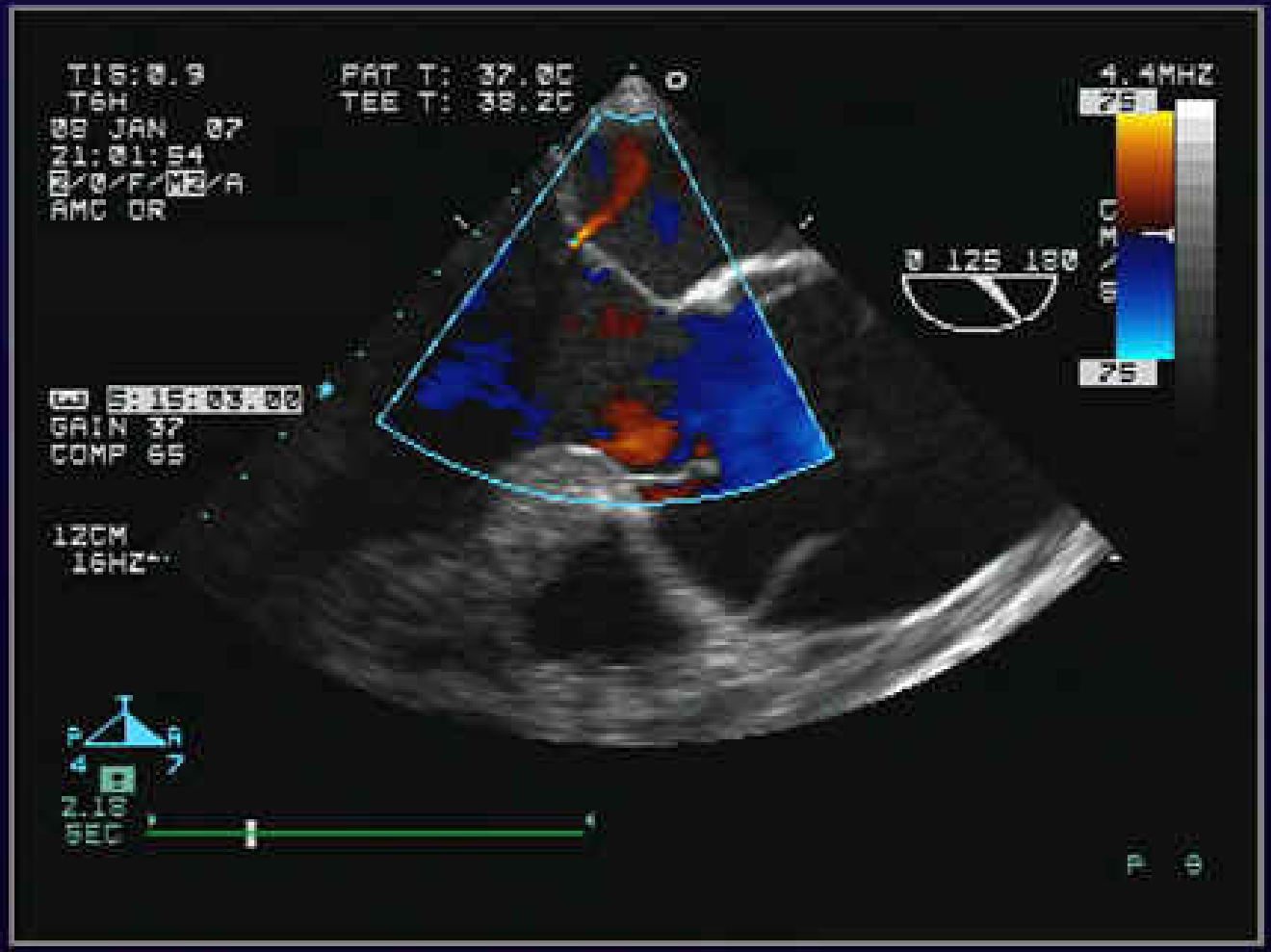


ASAN Medical Center

UNIVERSITY OF ULSAN COLLEGE OF MEDICINE

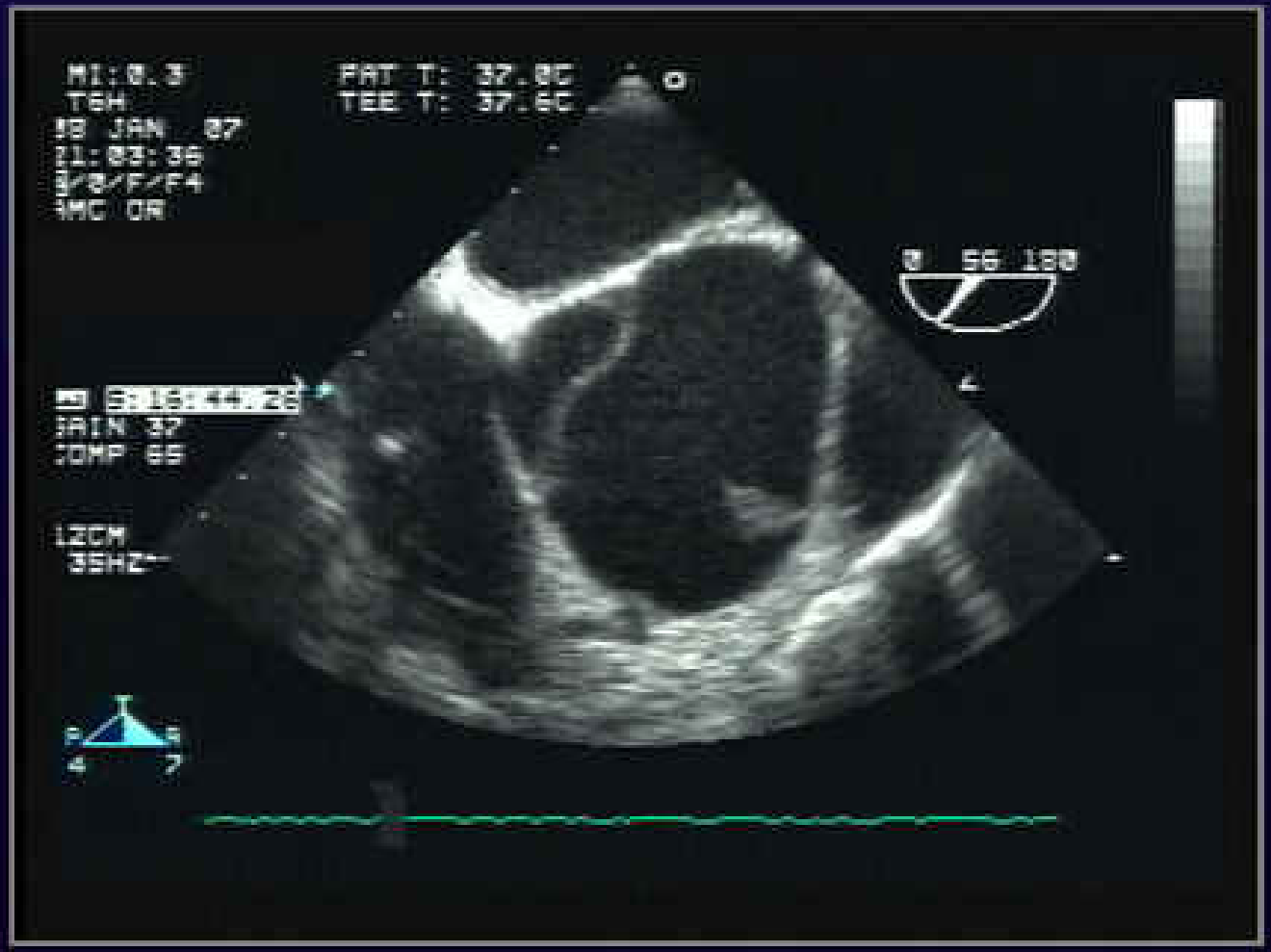
Diagnostic Techniques

Transesophageal Echocardiography (TEE)



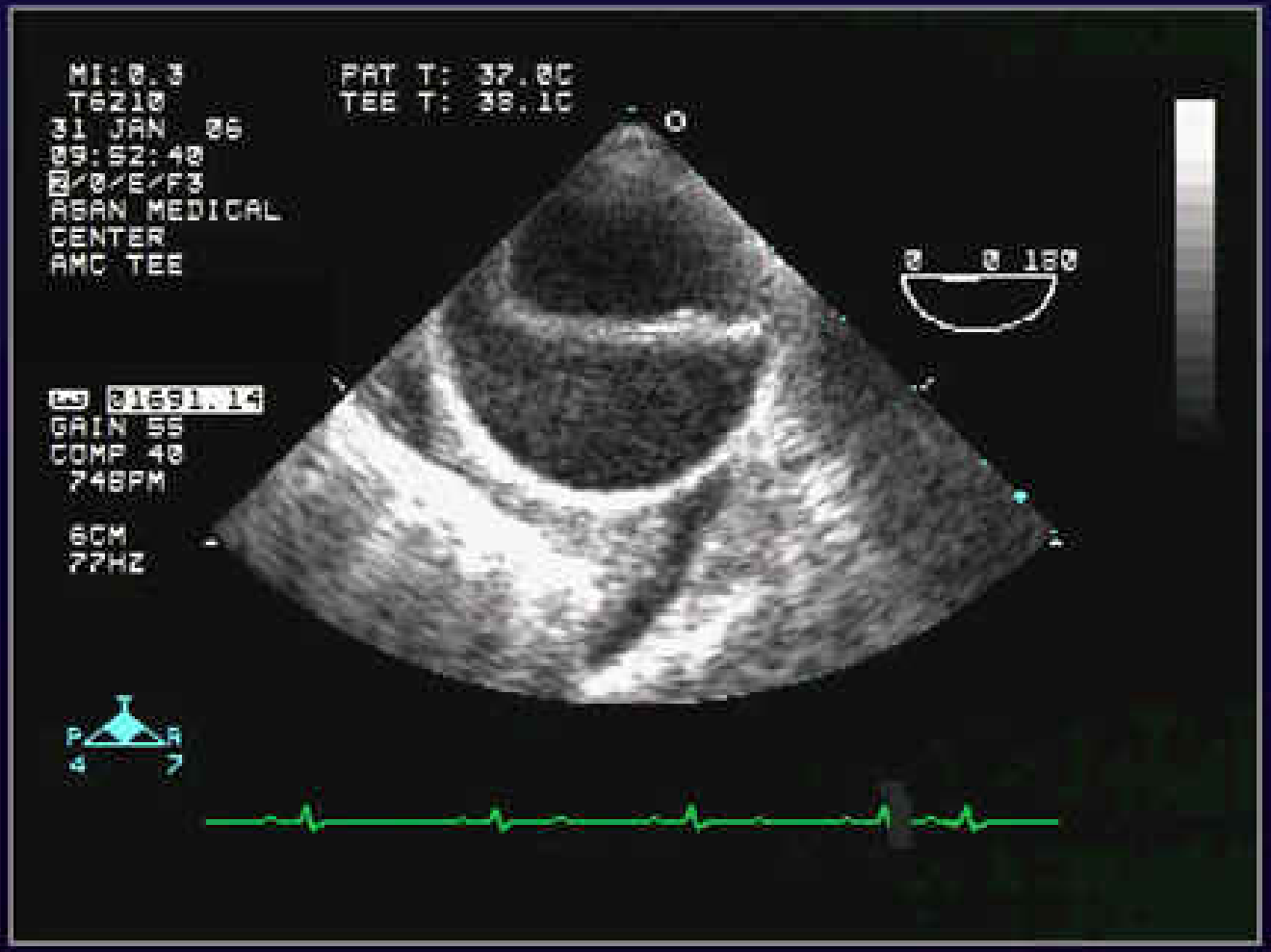
Diagnostic Techniques

- Transesophageal Echocardiography (TEE)



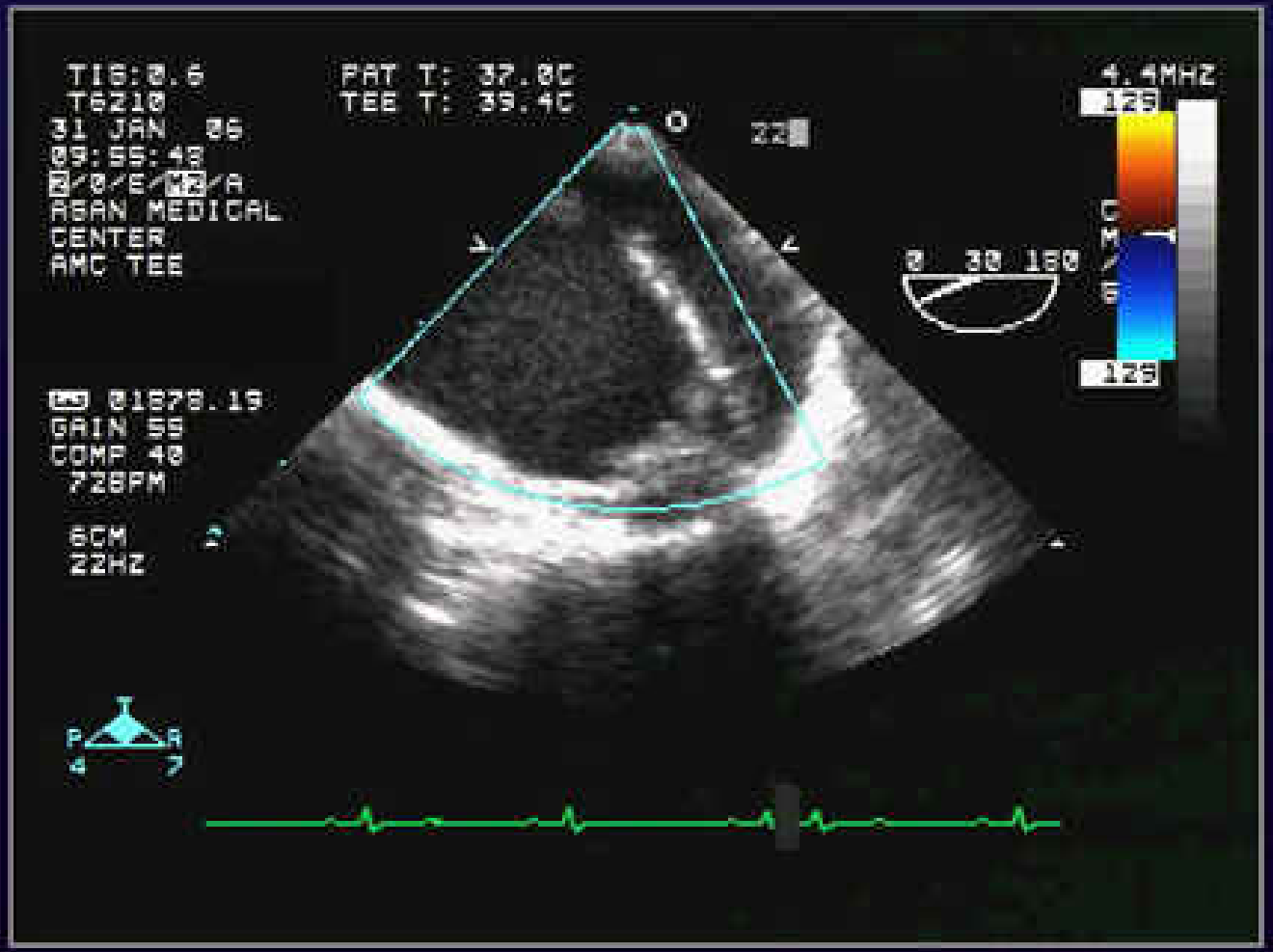
Diagnostic Techniques

Transesophageal Echocardiography (TEE)

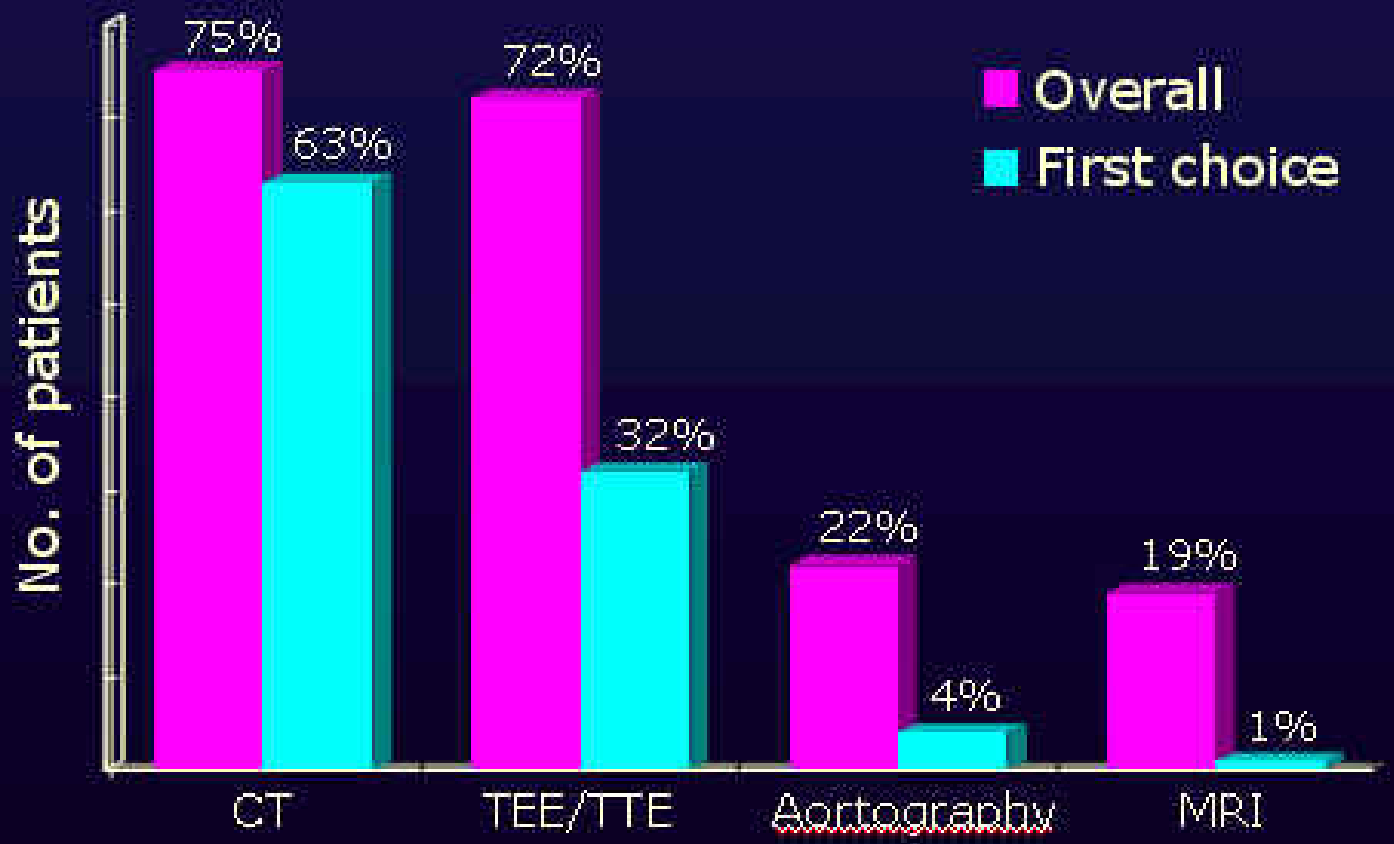


Diagnostic Techniques

Transesophageal Echocardiography (TEE)



Diagnostic Techniques



Moore AG et al (IRAD) Am J Cardiol 2002:89:1235-8

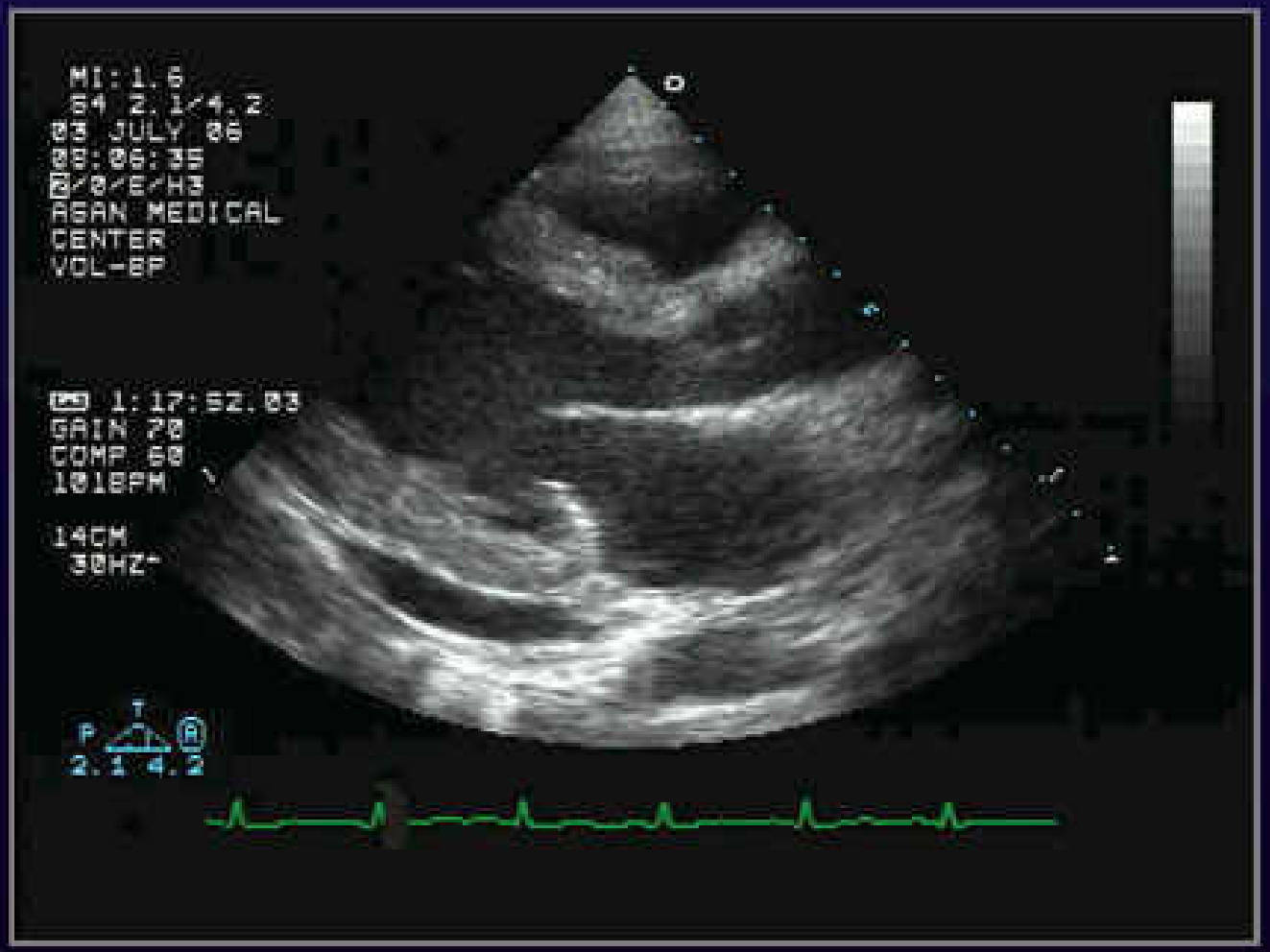
Definitive Therapy

- **Surgery**
  - Acute proximal dissection
  - Complicated acute distal dissection
    - Progression with vital organ compromise
    - Rupture or impending rupture (saccular aneurysm)
    - Retrograde extension into the ascending aorta
    - Dissection in Marfan syndrome
- **Medical**
  - Uncomplicated acute distal dissection
  - Stable isolated arch dissection
  - Stable chronic dissection

Cardiac/coronary perforation

- **Role of echocardiography**
  - Detection of pericardial effusion
    - Contrast echocardiography
  - Evaluation of hemodynamic significance
  - Guidance for periocardiocentesis

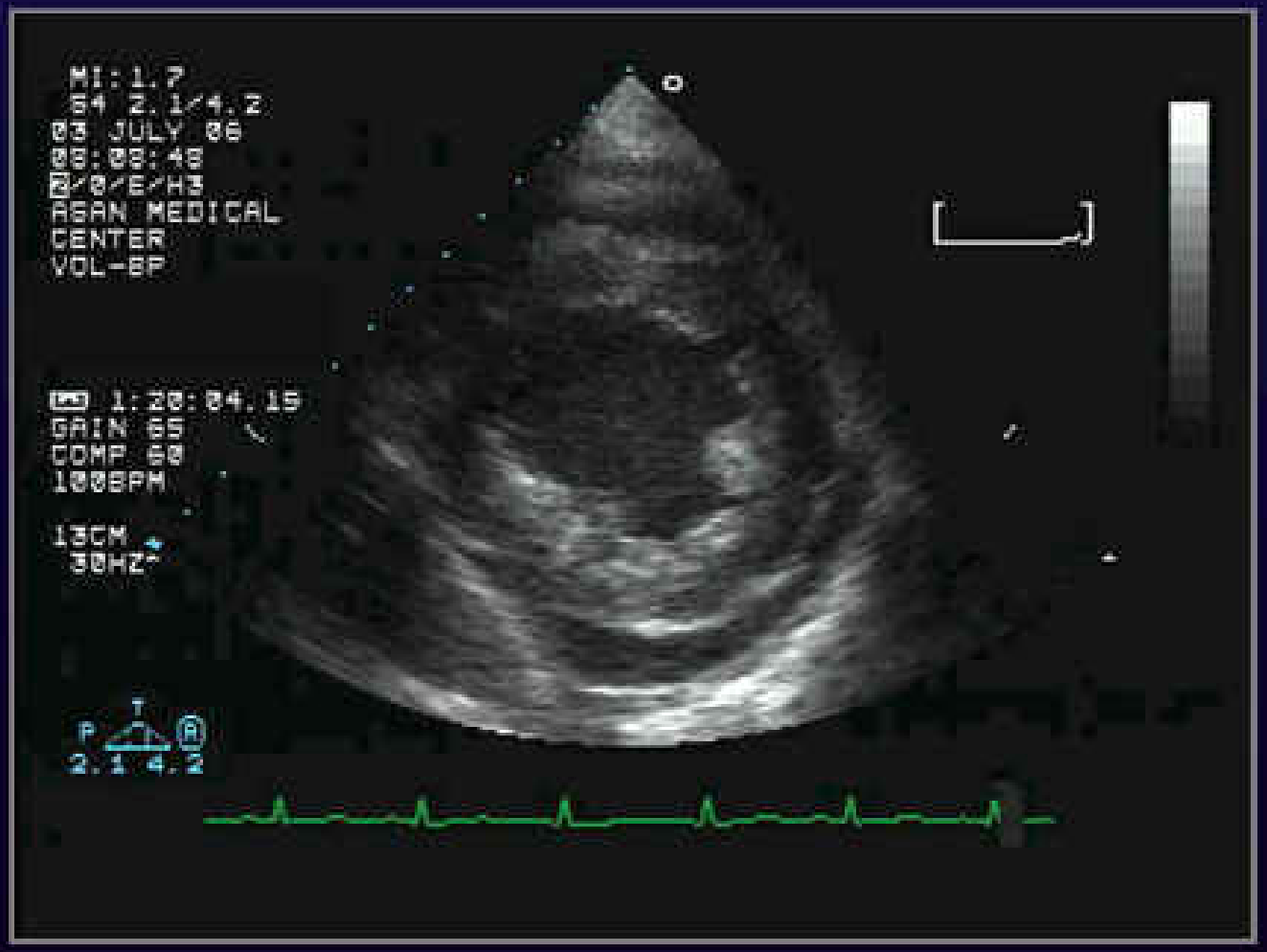
Pericardial Effusion



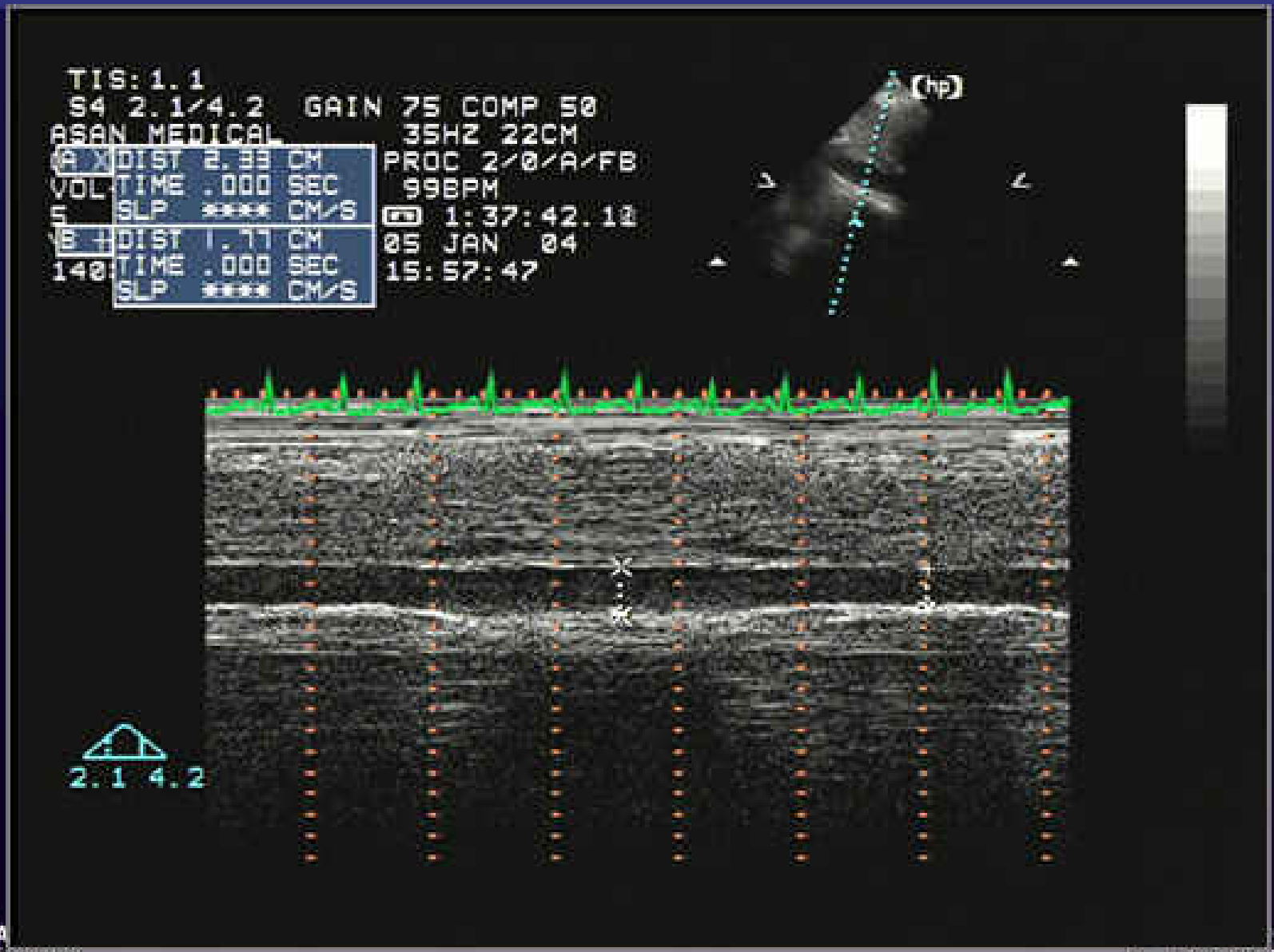
ASAN Medical Center

UNIVERSITY OF ULSAN COLLEGE OF MEDICINE

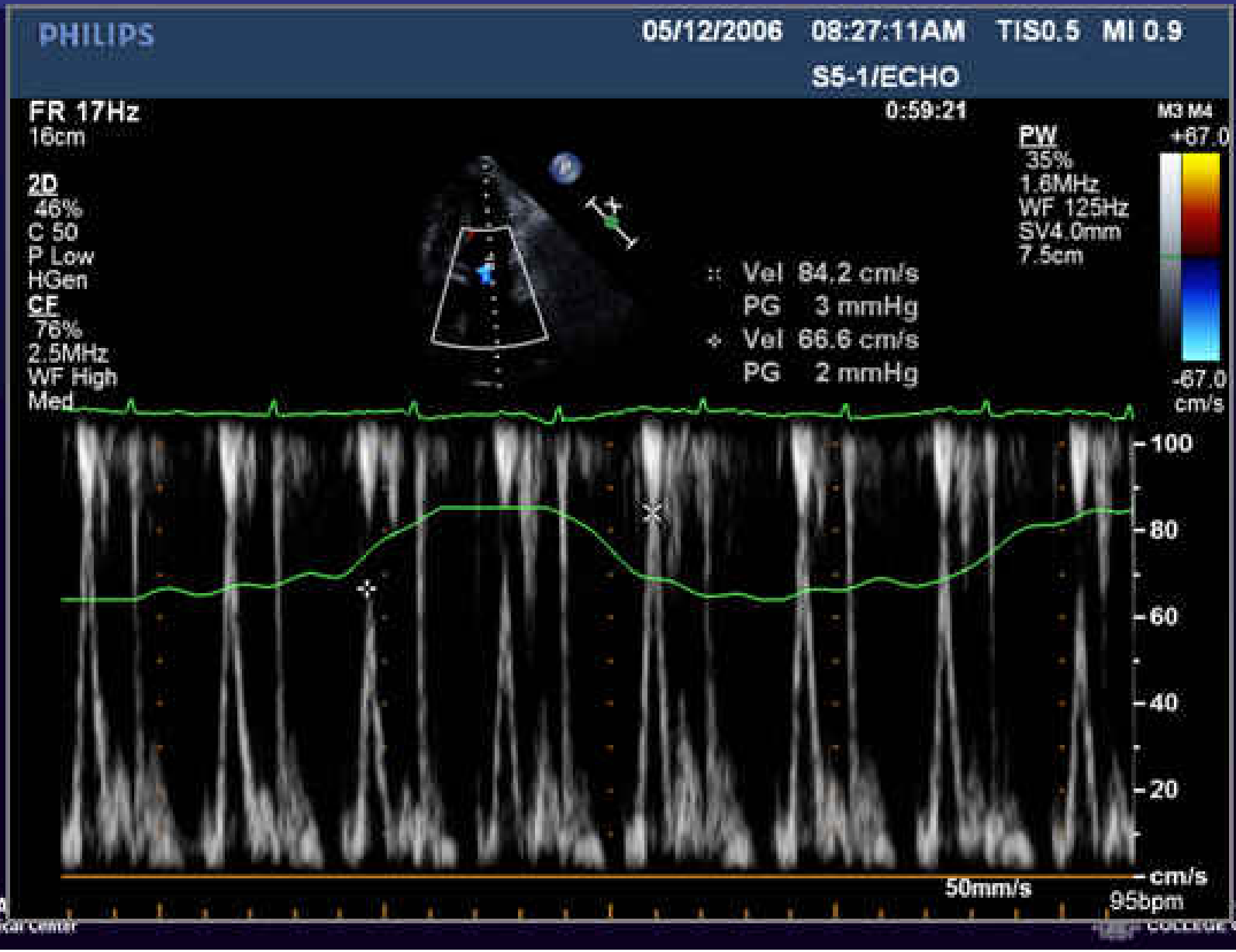
Pericardial Effusion



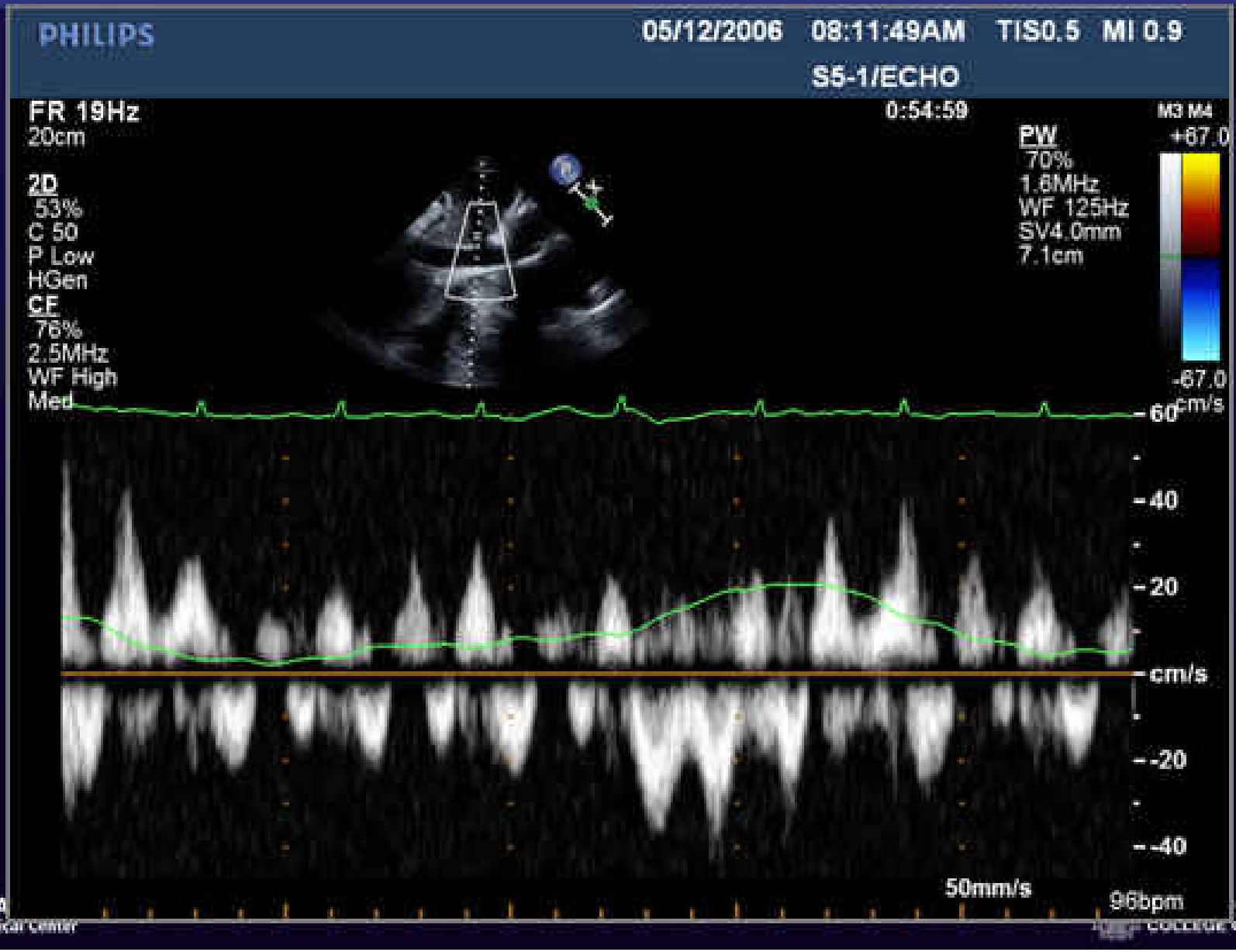
IVC Plethora



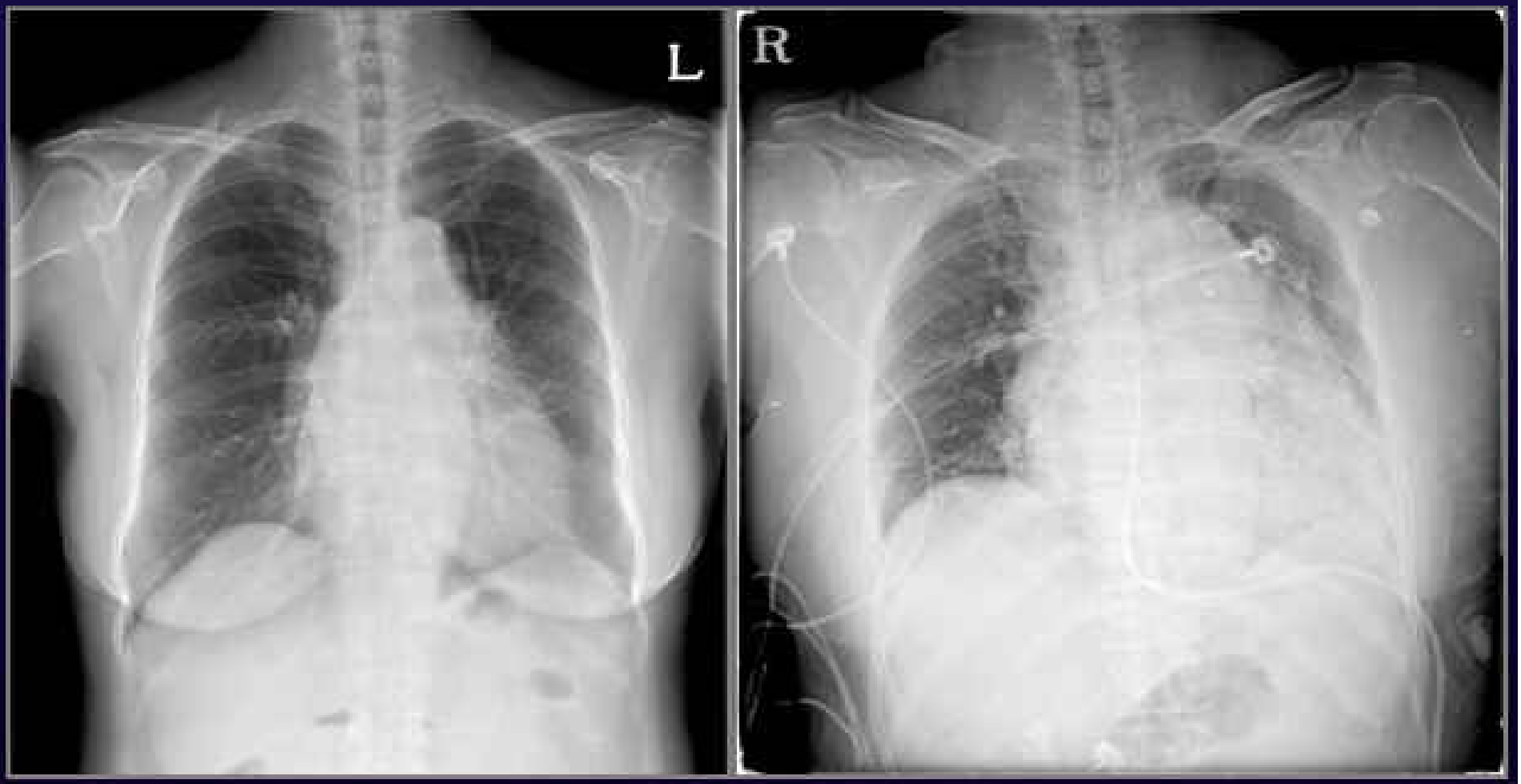
Mitral Inflow



Hepatic Venous Flow



Case 4 (57YO/F, PDA)



Role of Echocardiography

- **Device embolization**
  - Localization of device
  - Surgical removal
- **Thrombus formation**
  - Diagnosis
  - Follow-up after anticoagulation

Thank you for your attention.