

**UHN**Peter Munk
Cardiac
Centre**APIL**Advanced
Perioperative
Imaging Lab**ASE**American Society of
Echocardiography*In cooperation with:*[OBJECTIVES](#) [FACULTY](#) [PROGRAM](#) [3D TEE WORKSHOPS](#) [THE CITY](#) [REGISTRATION](#)**Saturday, November 10th, 2018**

Presented by the Department of Anesthesiology
and Division of Cardiac Surgery

Peter Munk Cardiac Centre
Toronto General Hospital
University Health Network

J. Day/J. Moreno
Jennifer.Day@uhn.ca
Jacobo.Moreno@uhn.ca

Sixteenth Annual Toronto Perioperative TEE Symposium

Toronto - November 10-11, 2018

MaRS Auditorium

101 College St.
Toronto, M5G 1L7

TTE/TEE for TAVI (PBL)

Problem Based Learning Discussions:

Workshops • Multi-vendor • Hands-on 3D TEE • Basic TEE

Transcatheter Aortic Valve Implantation and the Role of Echocardiography

- Intra-procedure imaging
 - Pre-TAVI imaging
 - Immediate post TAVI imaging
- Assessment of paravalvular leaks
- Complications

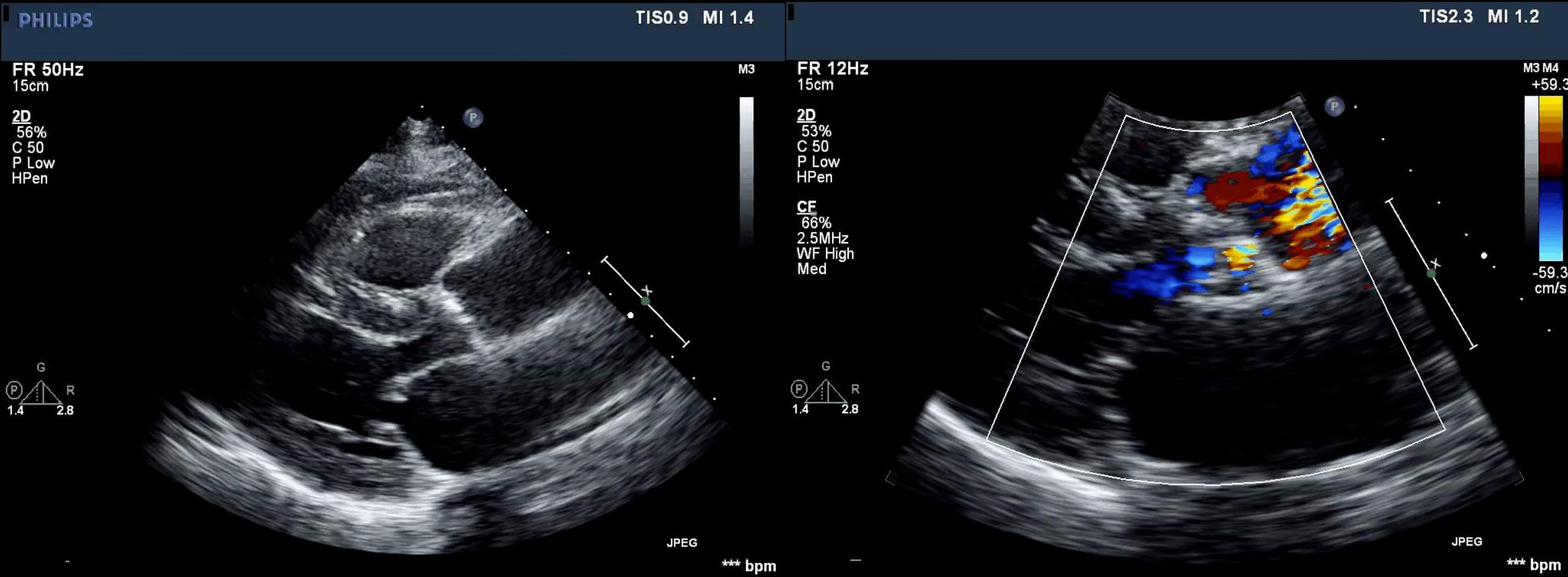


TTE CASES

TTE case 1

- 80 year old male
- Hx of CAD – previous PCI to the RCA and LAD
- Hx of PVD
- Moderate chronic renal insufficiency with creatinine clearance of 49
- COPD
- Spinal stenosis
- CCS class II – III
- Echocardiogram revealed an AVA of 0.7cm² with a peak and mean gradient measuring 86/48mmHg and normal LV function

TTE case 1



TTE case 1



PHILIPS

TIS 0.8 MI 1.4

FR 48Hz
16cm

2D
64%
C 50
P Low
HPen

G
1.4
R
2.8

G
1.4
R
2.8

JPEG

*** bpm

PHILIPS

TIS 0.8 MI 1.4

FR 48Hz
16cm

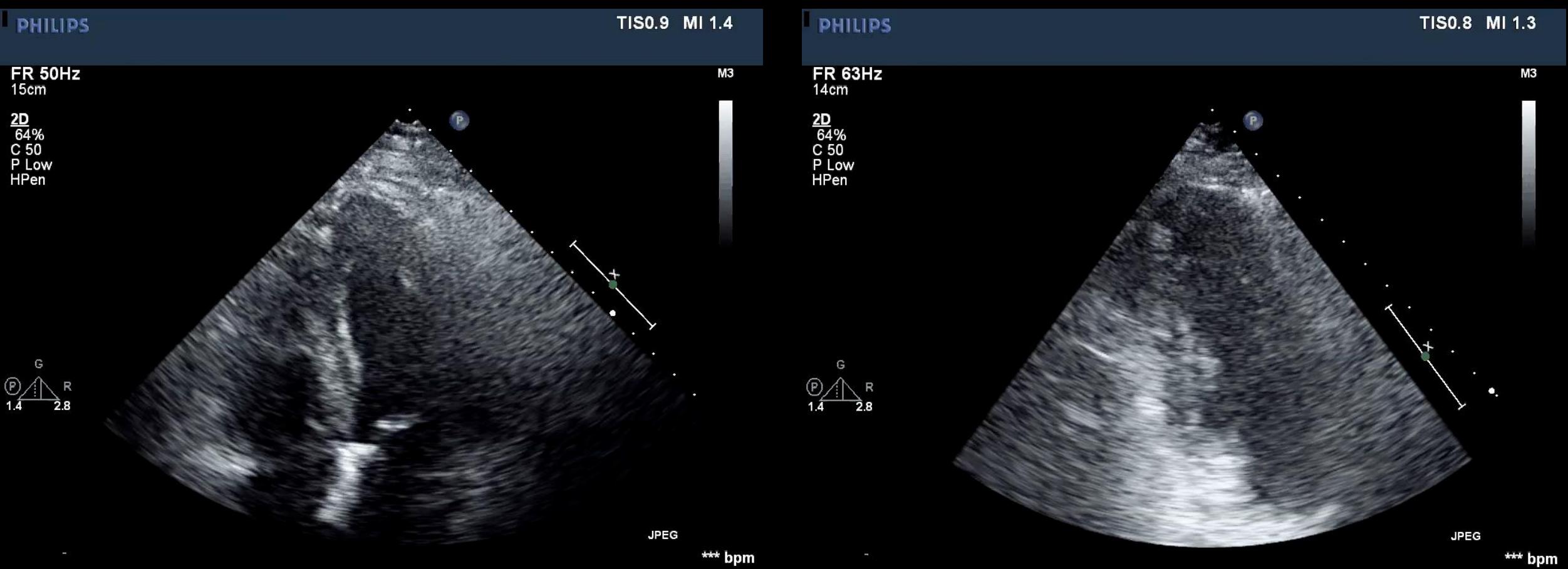
2D
64%
C 50
P Low
HPen

G
1.4
R
2.8

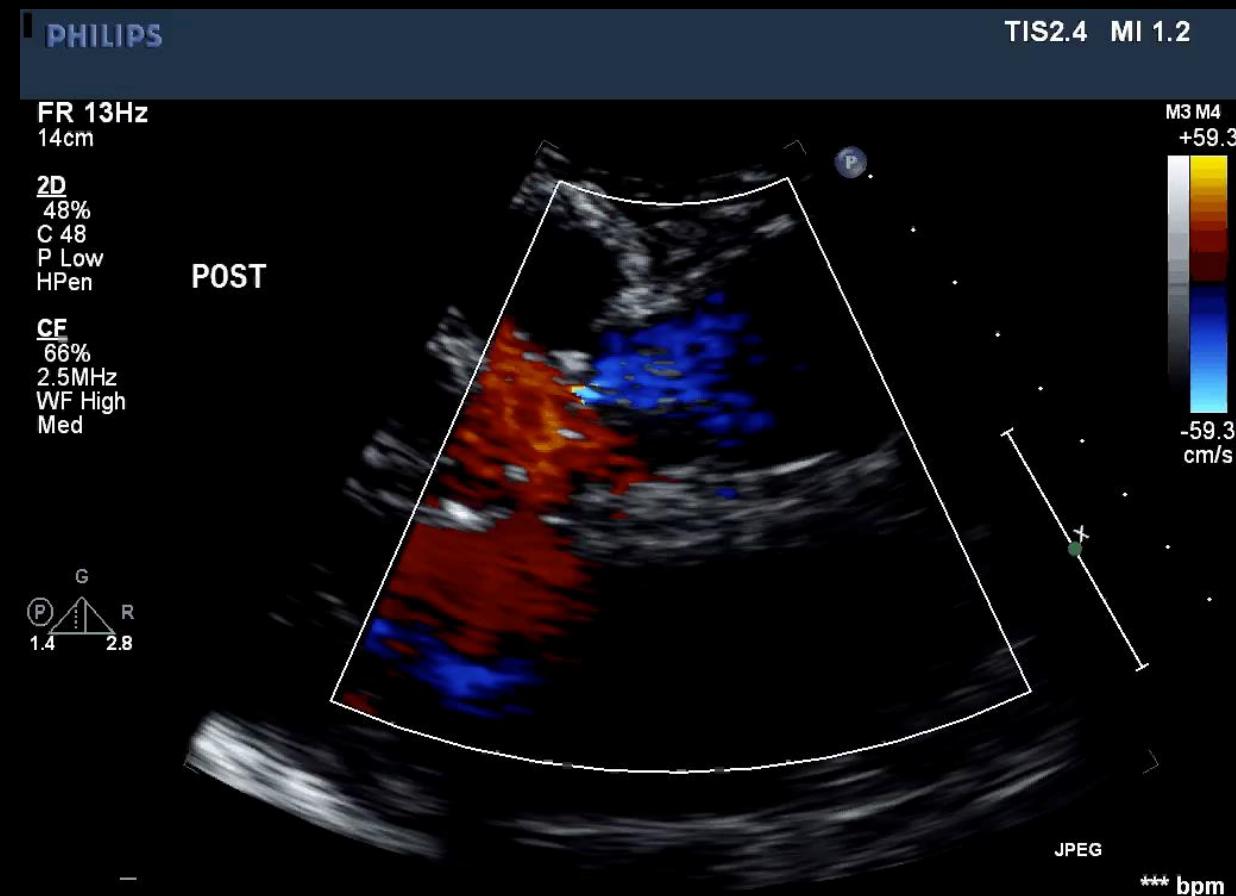
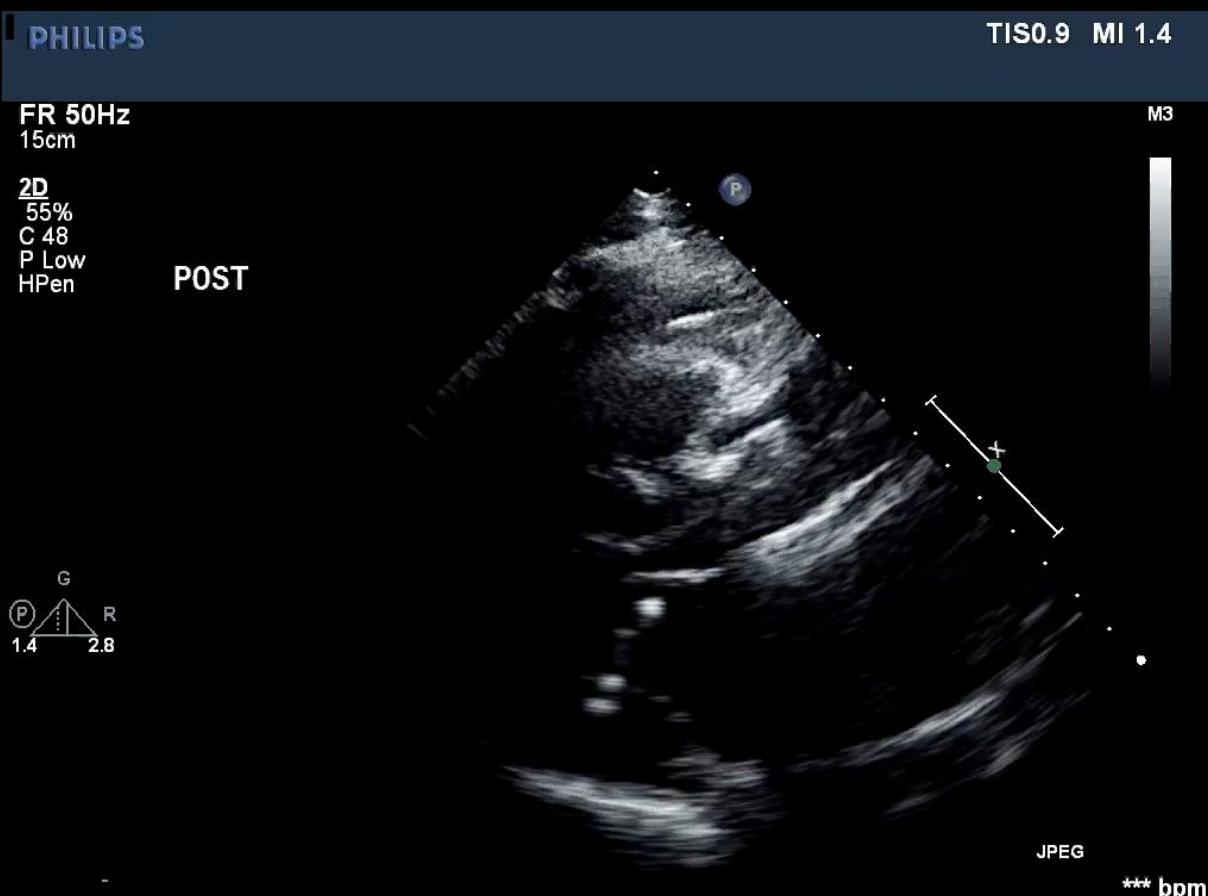
JPEG

*** bpm

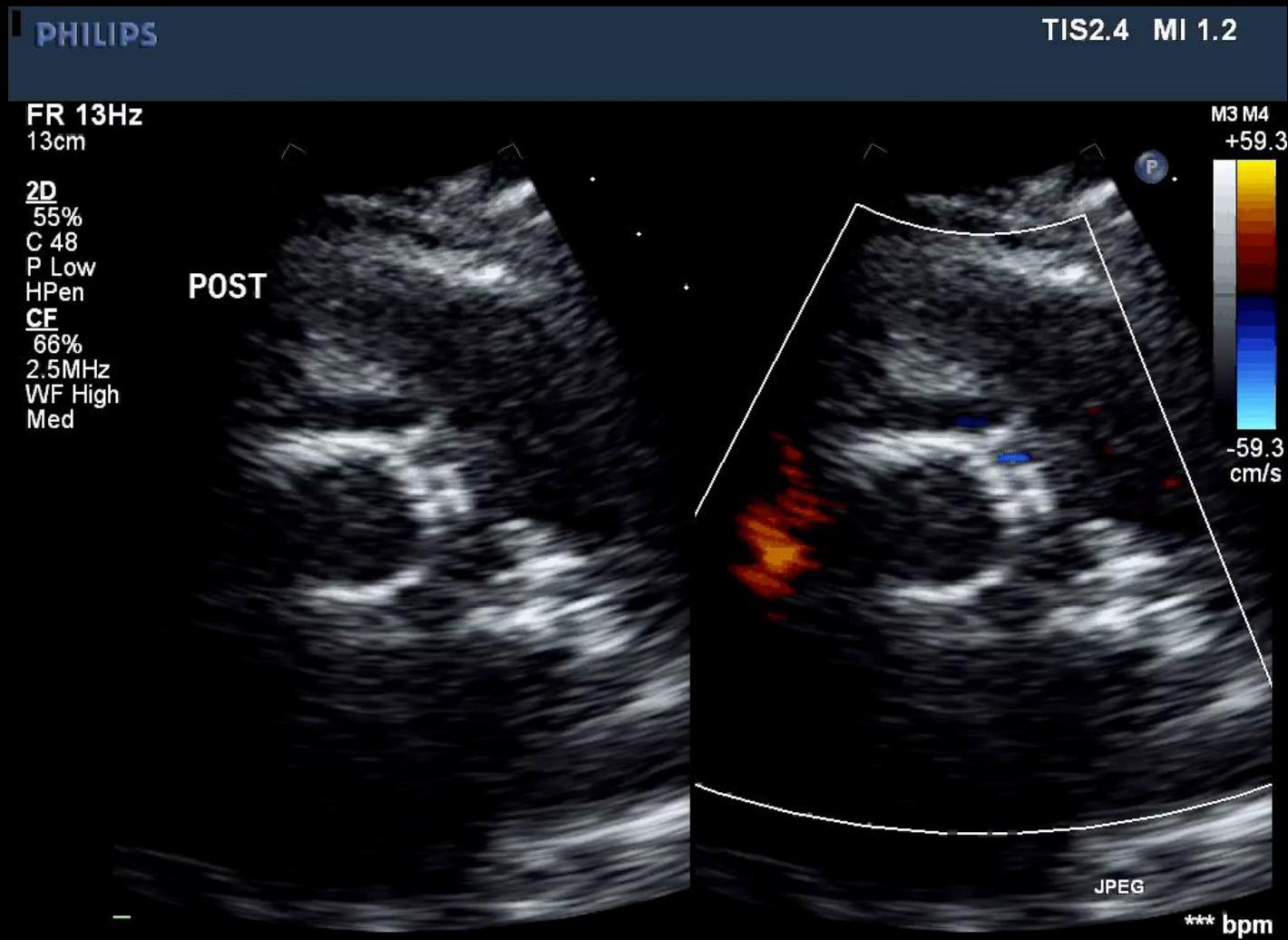
TTE case 1

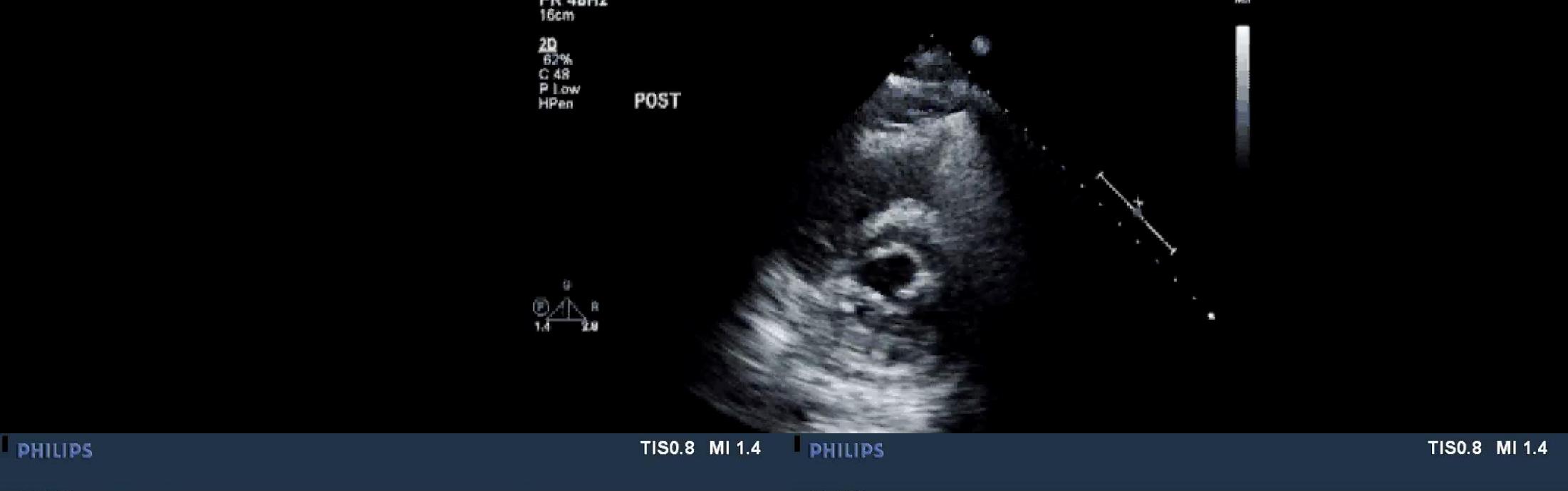


TTE case 1



TTE case 1





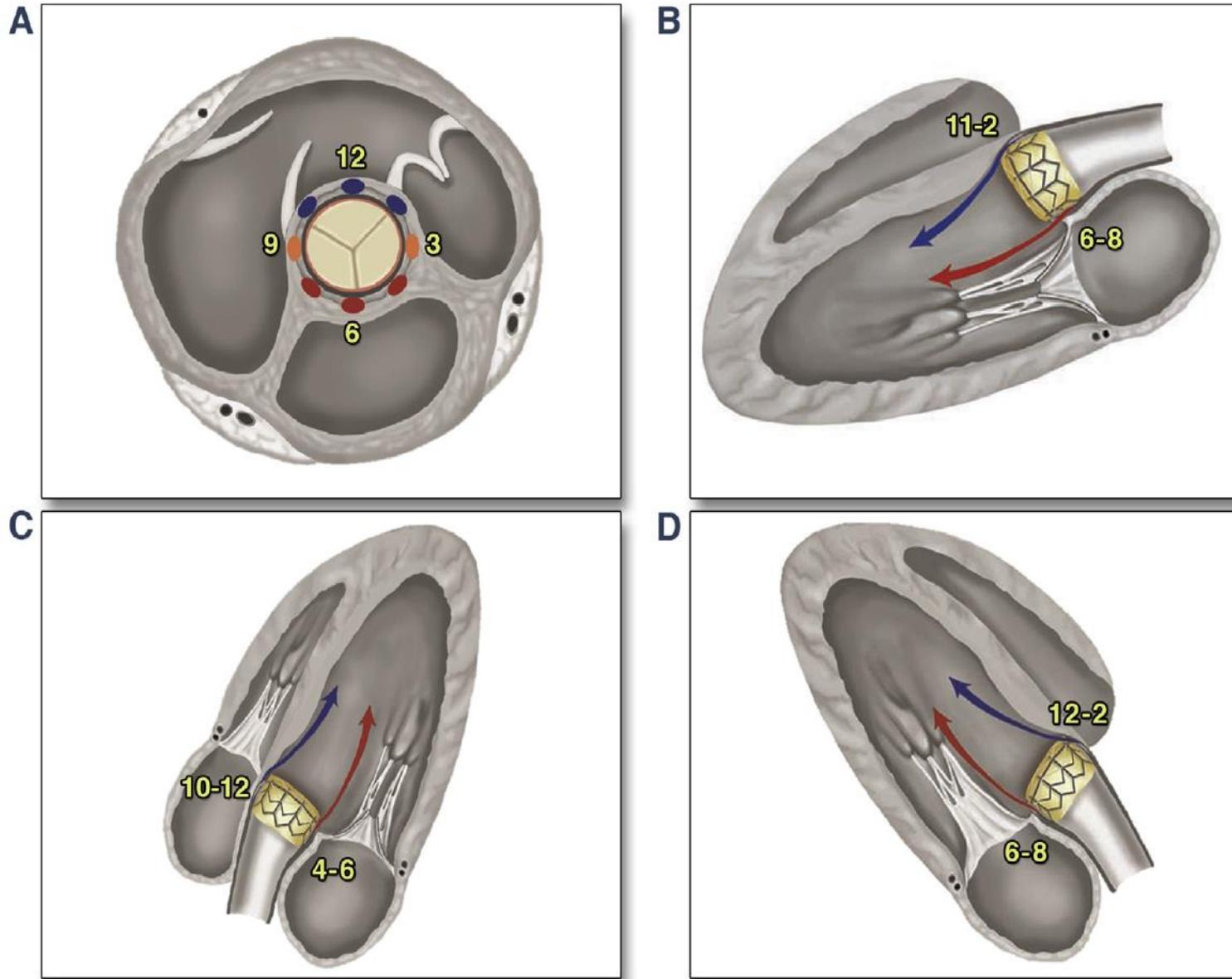
Diagnosis?

Assessment of paravalvular leak

TABLE 1 Scheme, Modalities, Parameters, and Criteria for Grading the Severity of PVR

	Trace	Mild	Mild	Moderate	Moderate	Severe
	1	1	2	2	3	4
	Trace	Mild	Mild-to-Moderate	Moderate	Moderate-to-Severe	Severe
Cineangiography	Grade 1	Grade 1	Grade 1	Grade 2	Grade 3	Grade 4
Invasive hemodynamics						
Aortic regurgitation index*	>25	>25	>25	10-25	10-25	<10
Doppler echocardiography						
Structural parameters						
● Valve stent	Usually normal	Usually normal	Normal/abnormal†	Normal/abnormal†	Usually abnormal†	Usually abnormal†
○ LV size‡	Normal	Normal	Normal	Normal/mildly dilated	Mildly/moderately dilated	Moderately/severely dilated
Doppler parameters (qualitative or semiquantitative)						
● Jet features§						
Extensive/wide jet origin	Absent	Absent	Absent	Present	Present	Present
Multiple jets	Possible	Possible	Often present	Often present	Usually present	Usually present
Jet path visible along the stent	Absent	Absent	Possible	Often present	Usually present	Present
Proximal flow convergence visible	Absent	Absent	Absent	Possible	Often present	Often present
○ Vena contracta width (mm): color Doppler	<2	<2	2-4	4-5	5-6	>6
○ Vena contracta area (mm ²): 2D/3D color Doppler¶	<5	5-10	10-20	20-30	30-40	>40
● Jet width at its origin (%LVOT diameter): color Doppler	Narrow (<5)	Narrow (5-15)	Intermediate (15-30)	Intermediate (30-45)	Large (45-60)	Large (>60)
○ Jet density: CW Doppler	Incomplete or faint	Incomplete or faint	Variable	Dense	Dense	Dense
○ Jet deceleration rate (PHT, ms): CW Doppler*‡	Slow (>500)	Slow (>500)	Slow (>500)	Variable (200-500)	Variable (200-500)	Steep (<200)
○ Diastolic flow reversal in the descending aorta: PW Doppler*‡	Absent	Absent or brief early diastolic	Intermediate	Intermediate	Holodiastolic (end-diast. vel. >20 cm/s)	Holodiastolic (end-diast. vel. >25 cm/s)
● Circumferential extent of PVR (%): color Doppler	<10	<10	10-20	20-30	>30	>30
Doppler parameters (quantitative)						
○ Regurgitant volume (ml/beat)#+	<15	<15	15-30	30-45	45-60	>60
○ Regurgitant fraction (%)	<15	<15	15-30	30-40	40-50	>50
○ Effective regurgitant orifice area (mm ²)**	<5	<5	5-10	10-20	20-30	>30
Cardiac magnetic resonance imaging						
Regurgitant fraction (%)††	<10	<10	10-20	20-30	20-30	>30
	<15	<15	15-25	15-25	25-50	>50

FIGURE 3 Location of the PVR Jets in the Different Transthoracic Echocardiographic Views



Pibarot et al. Assessment of
Paravalvular Regurgitation
JACC Vol. 8. NO 3, 2015 p345

Assessment of paravalvular leak

- Valve stent
- Jet features
 - Multiple jets
 - Jet width
 - Flow convergence
- Circumferential extent of PVR

TTE case 2

- 62 year old male
- Post liver transplant (2004)
- Hx of hypertension, OSA and renal dysfunction
- Surgical aortic valve replacement using a 27mm Freestyle bioprosthesis in 2010 that has failed and presented later with a calcified prosthesis and severe aortic regurgitation

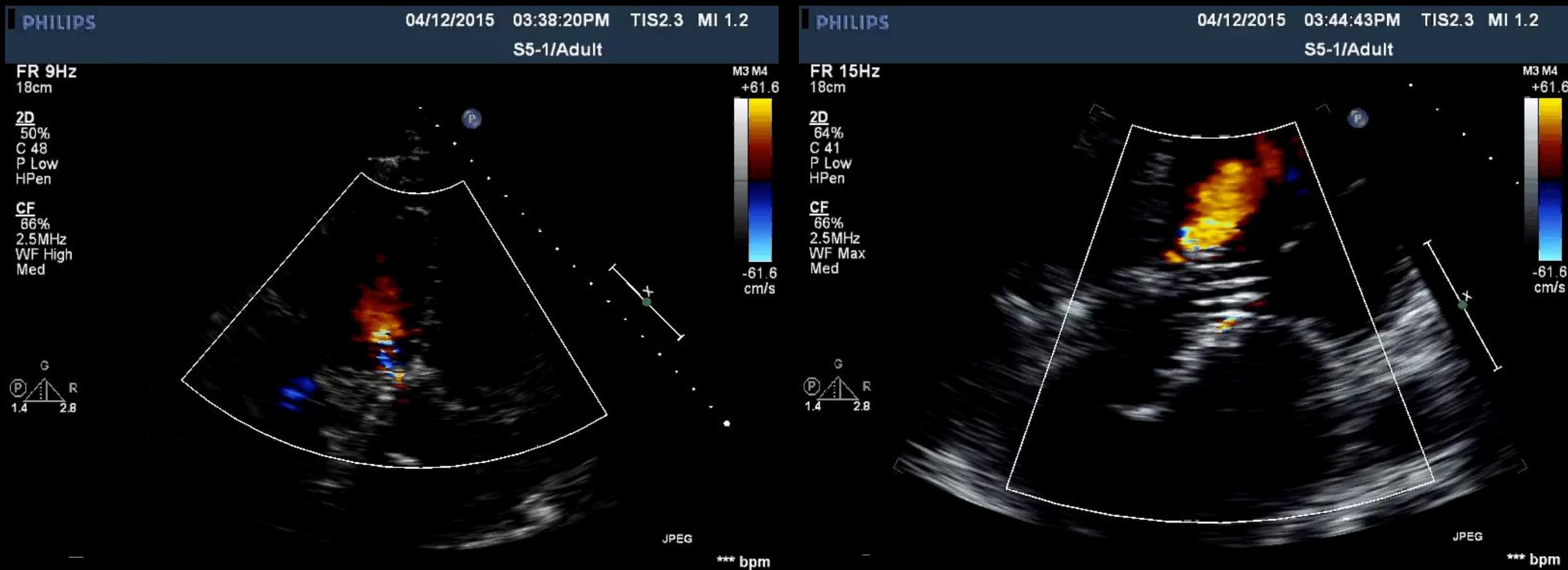
TTE case 2



TTE case 2

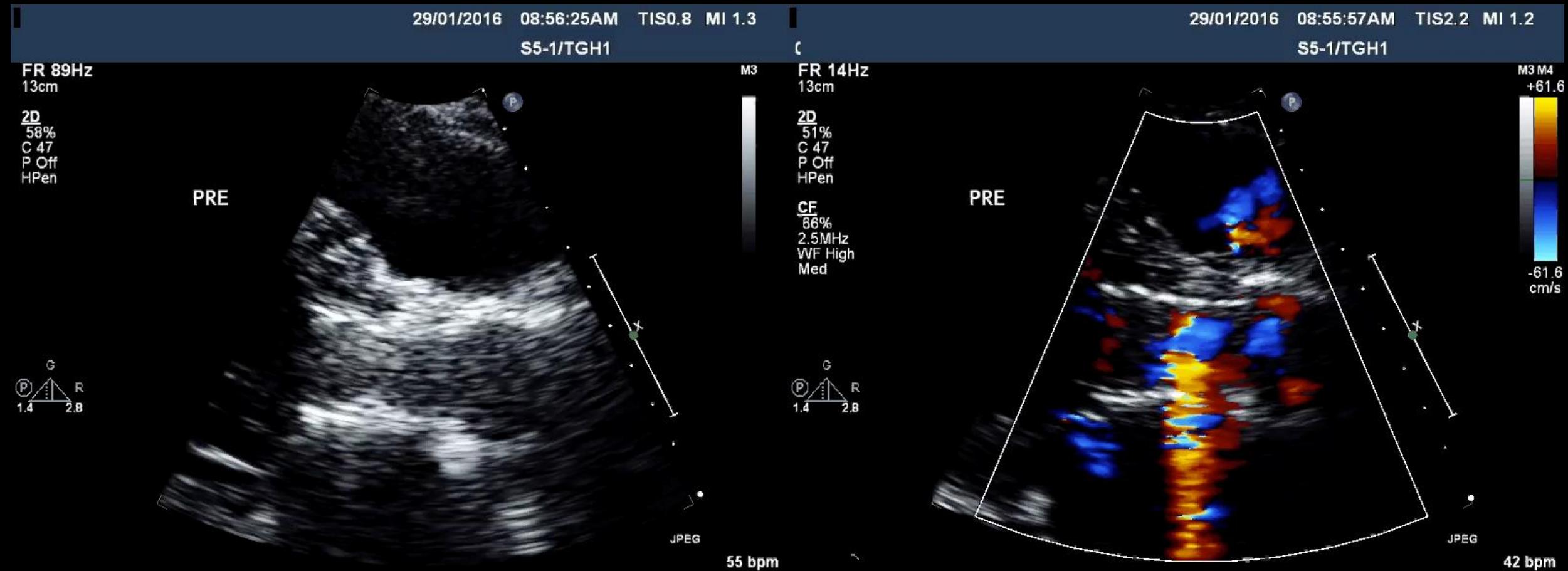


TTE case 2

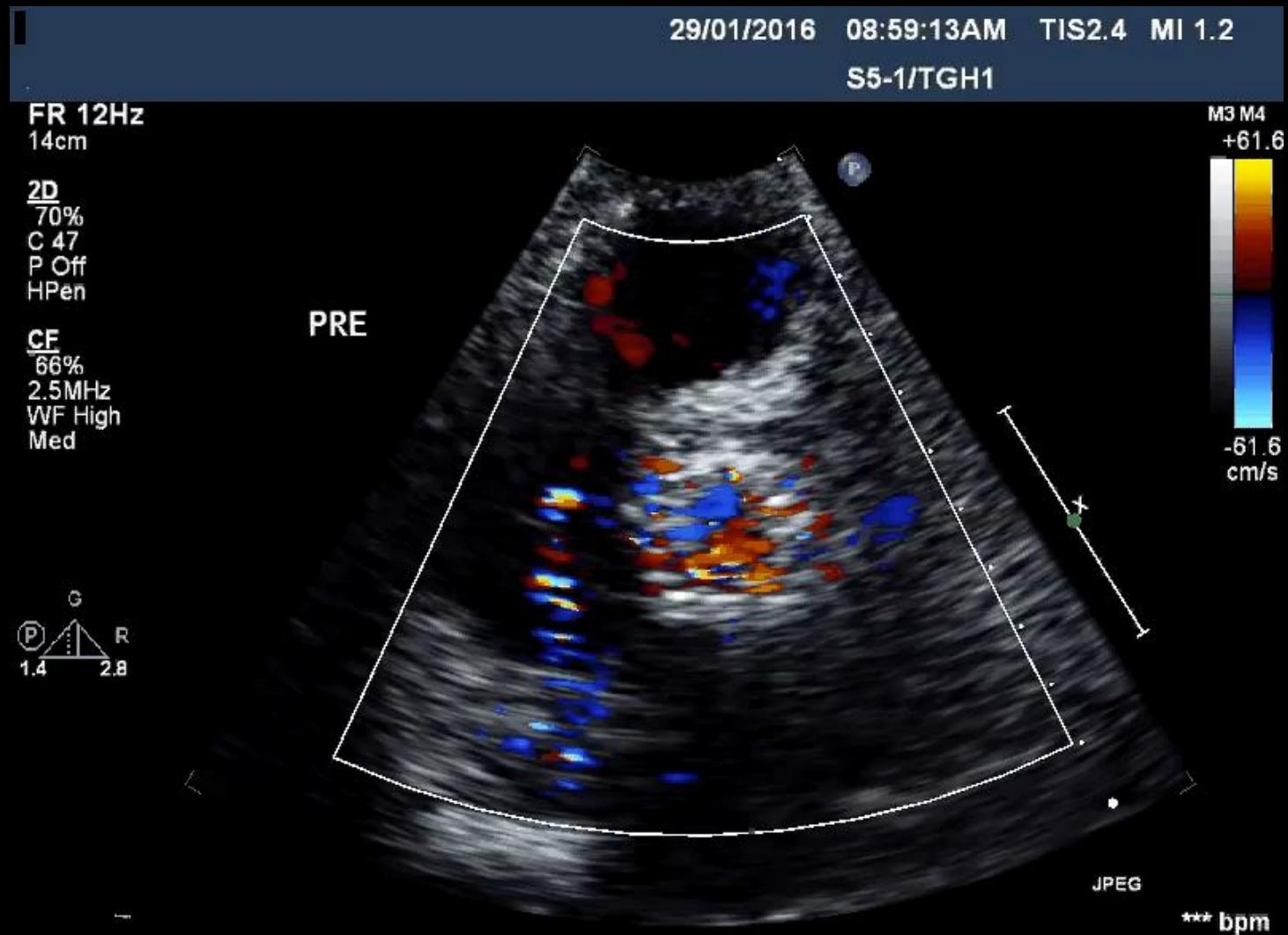


DIAGNOSIS?

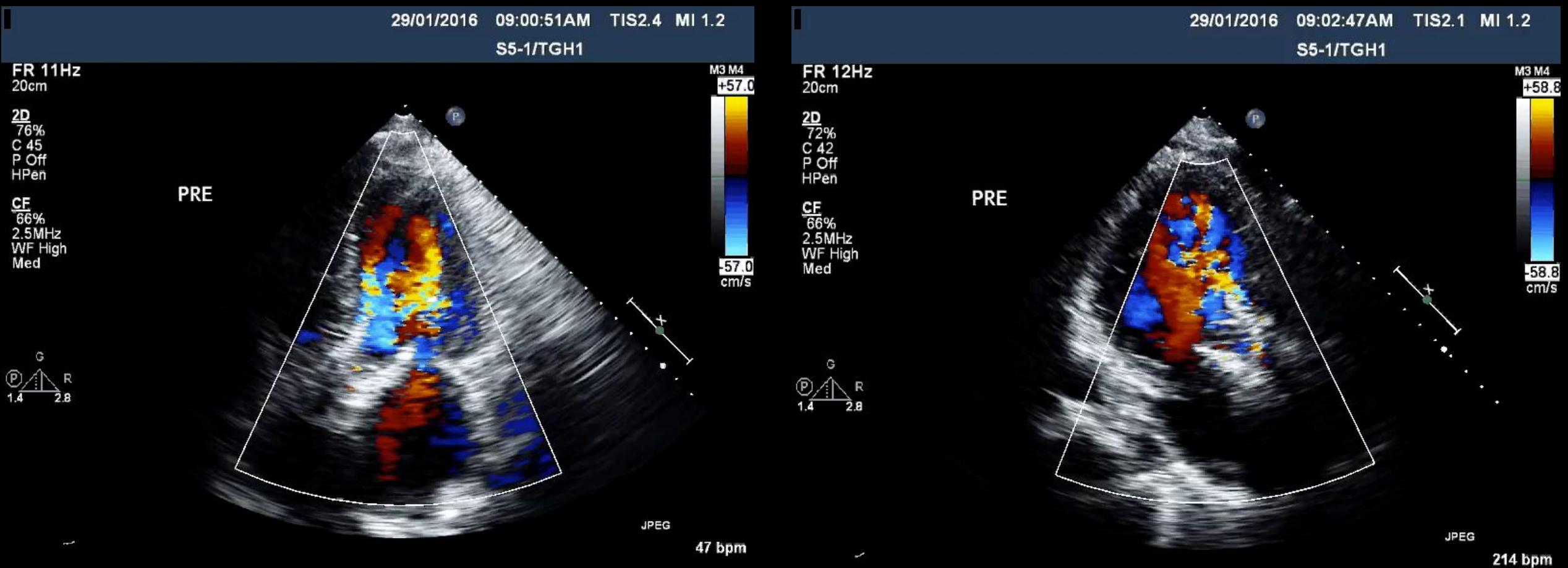
TTE case 2, 2nd TAVI



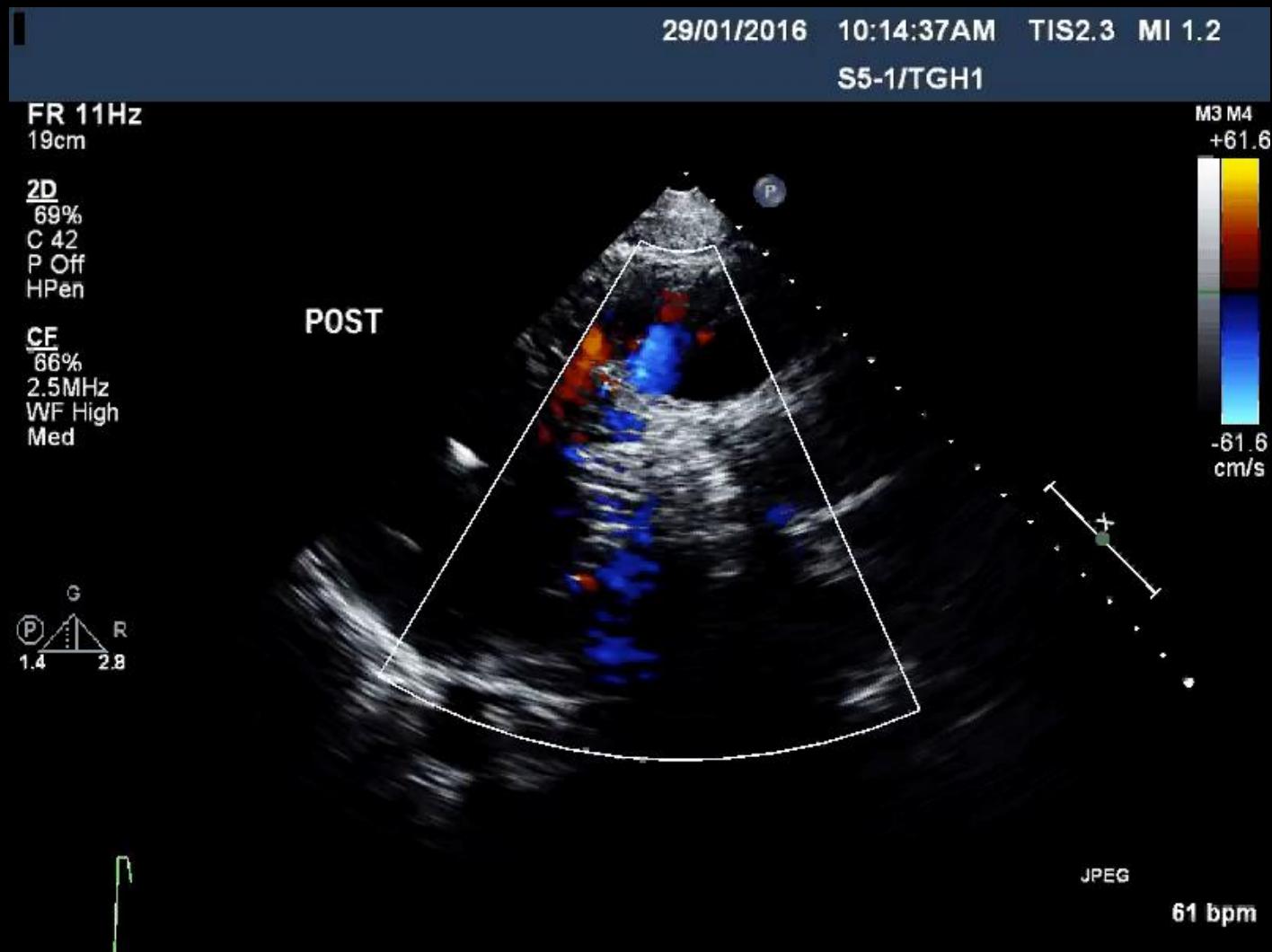
TTE case 2, 2nd TAVI



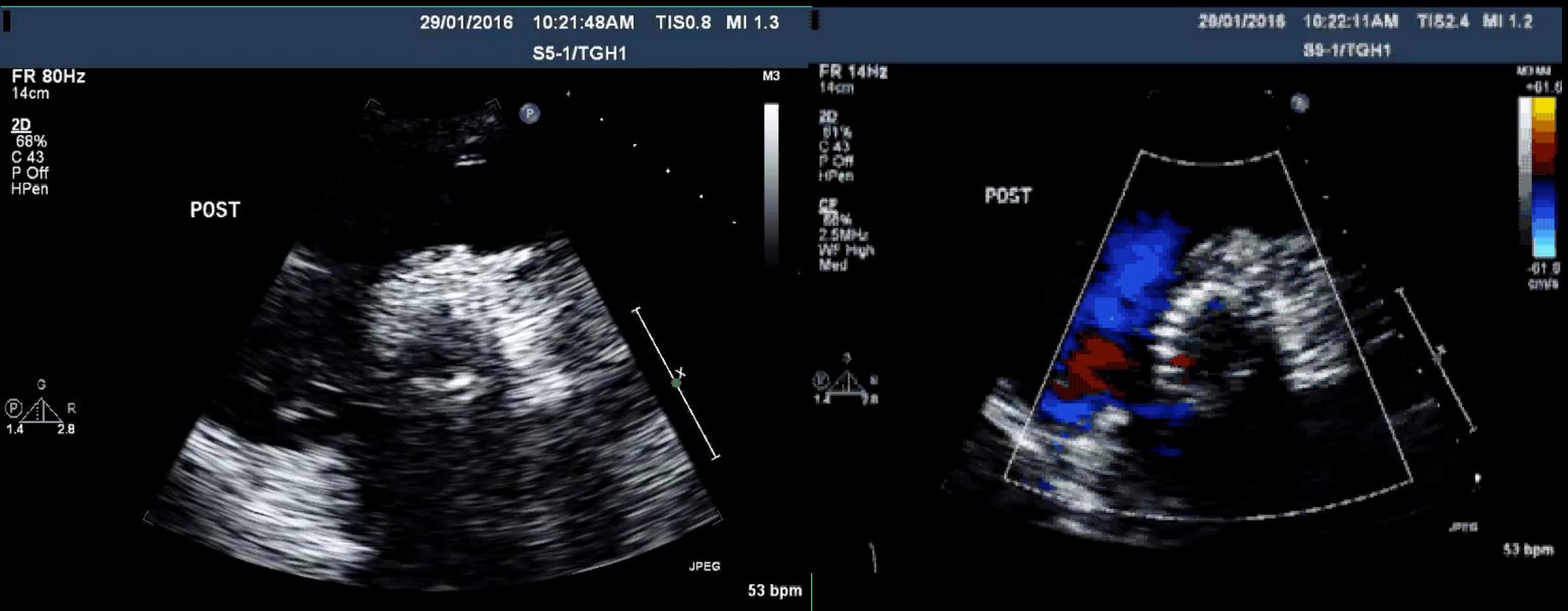
TTE case 2, 2nd TAVI



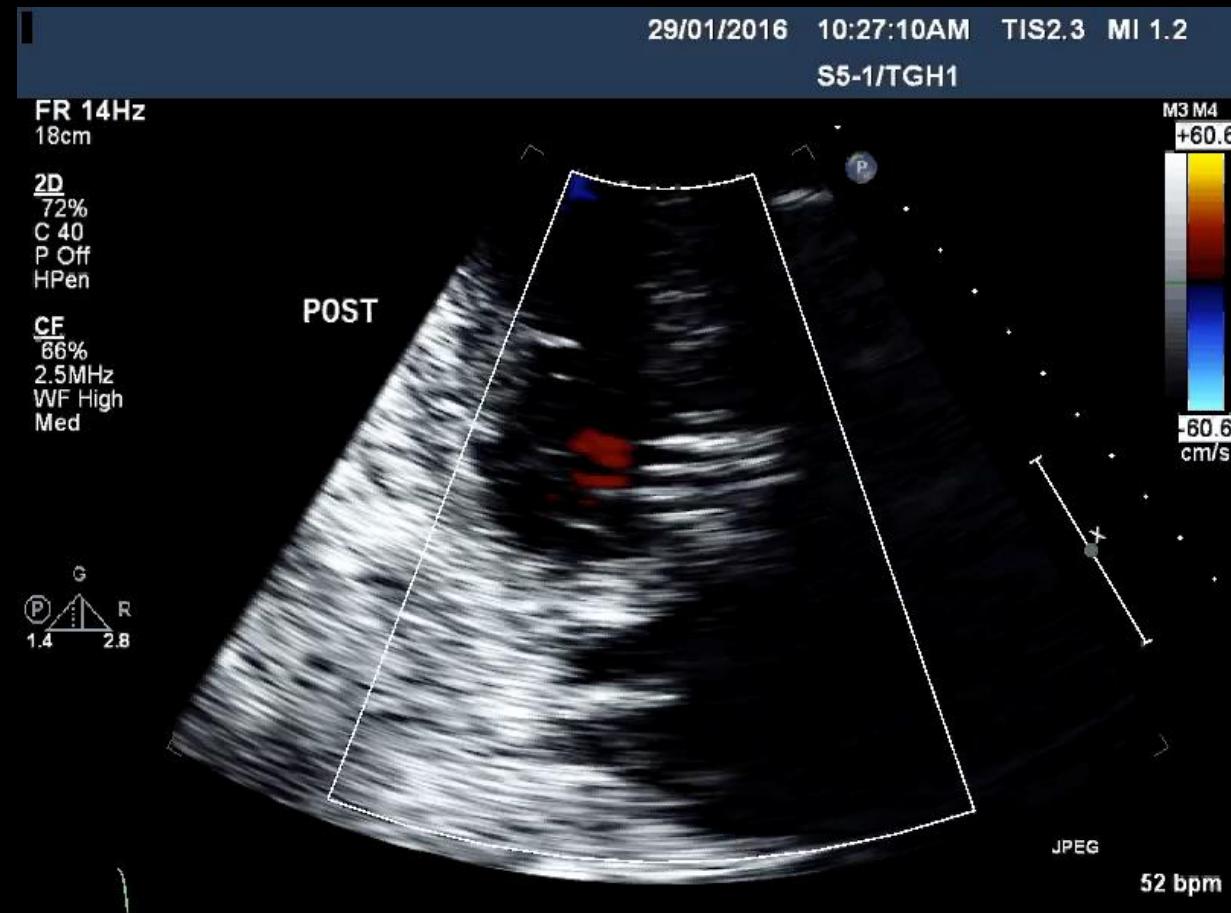
TTE case 2, 2nd TAVI



TTE case 2, 2nd TAVI



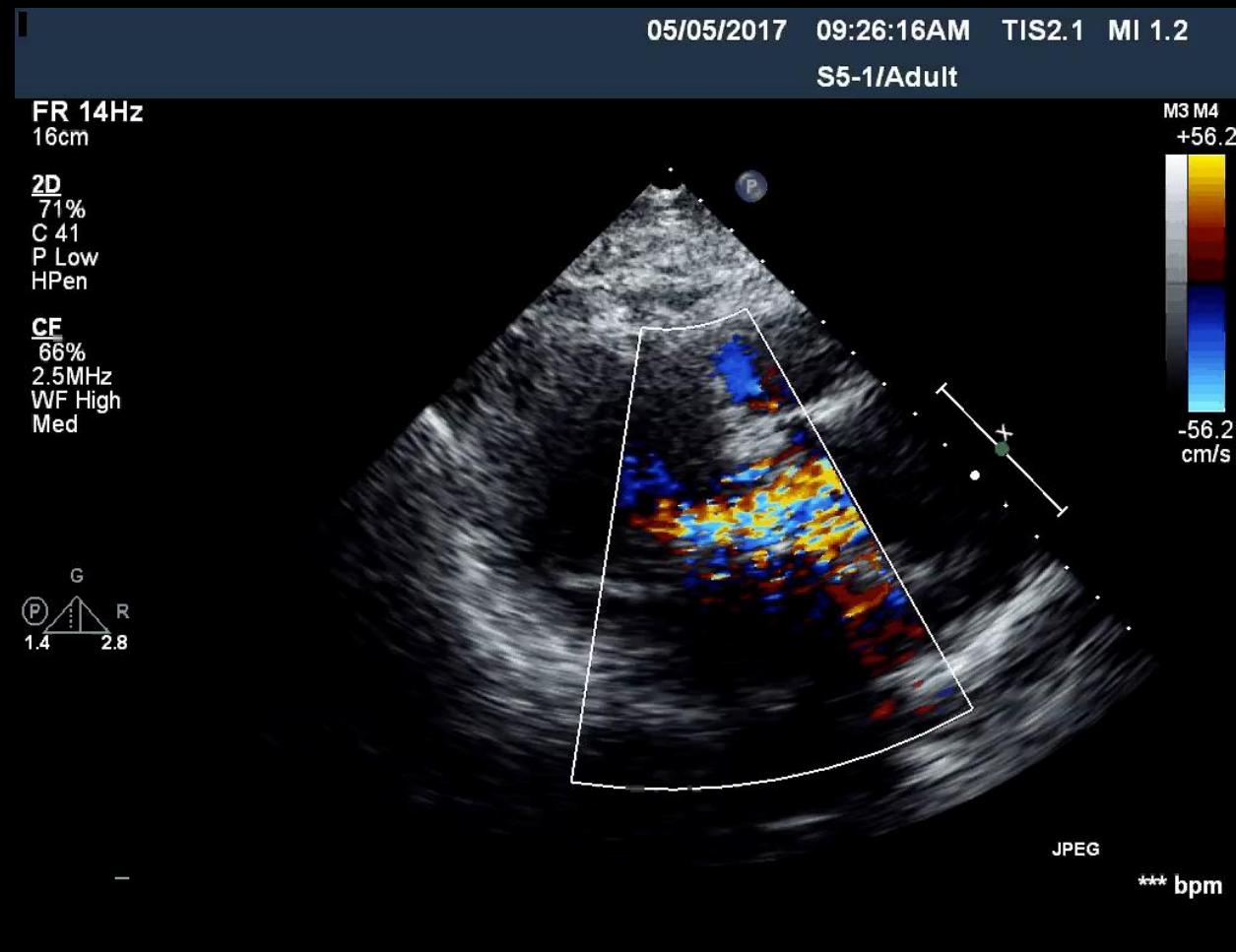
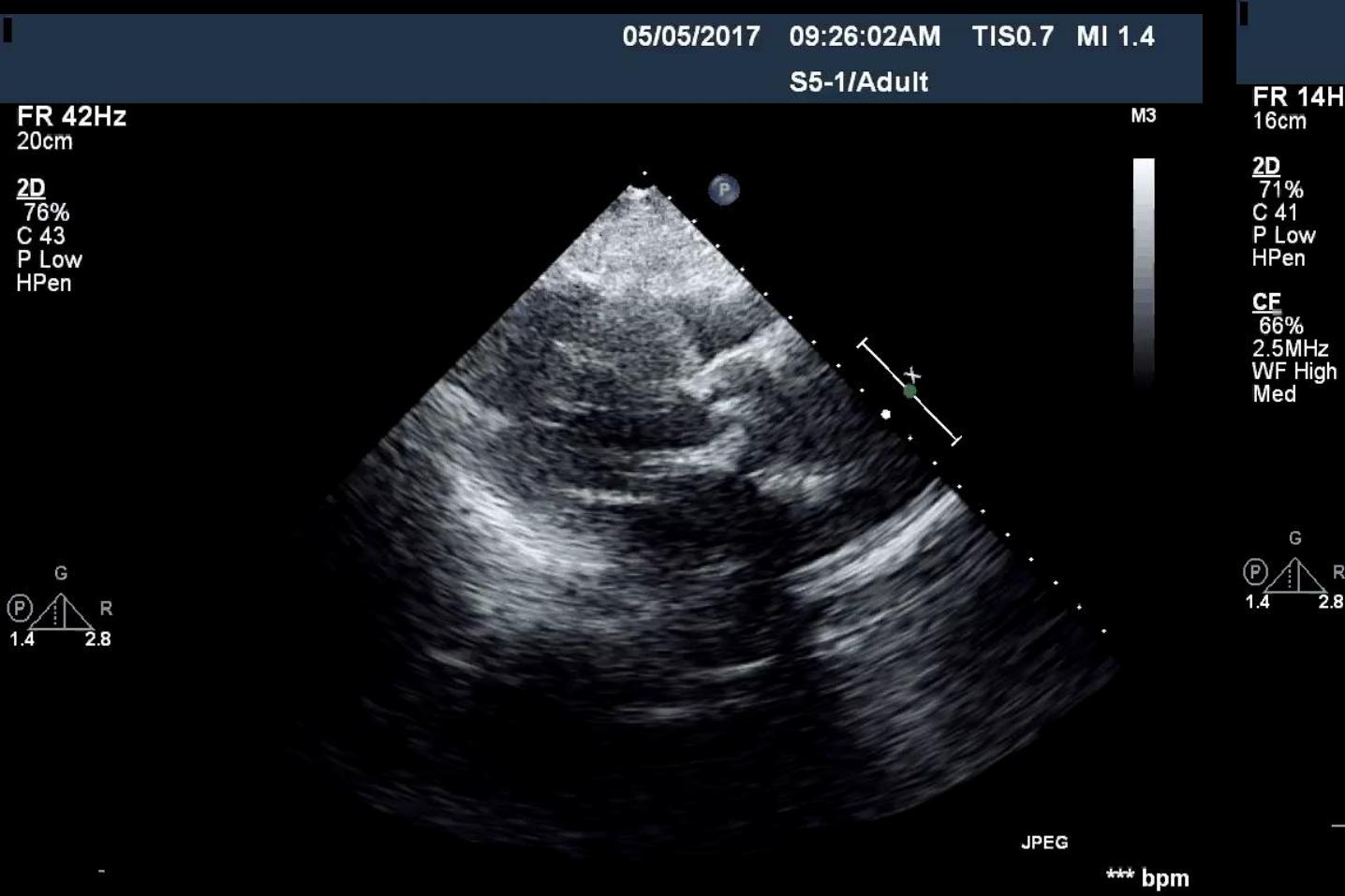
TTE case 2, 2nd TAVI



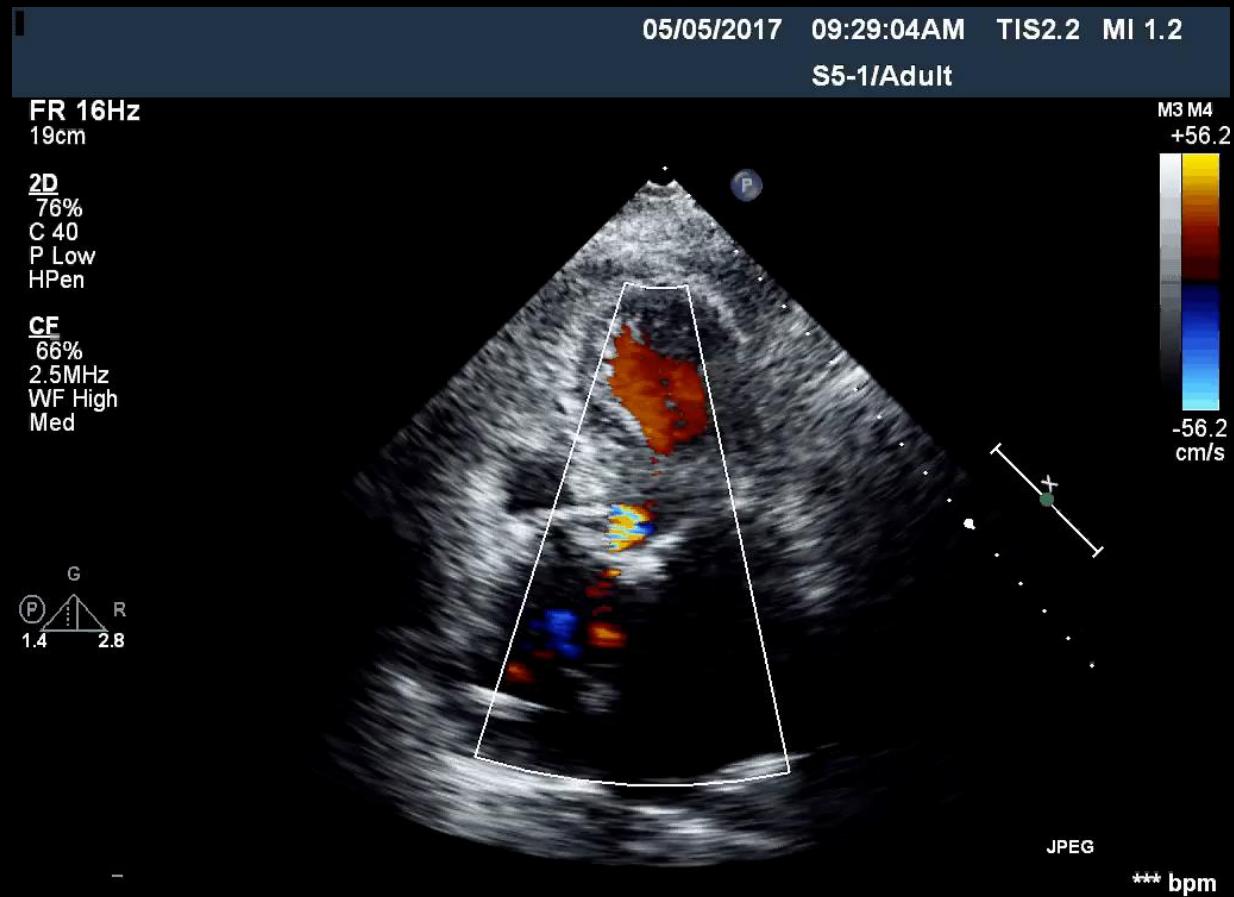
TTE case 3

- 85 year old female
- Severe aortic stenosis identified after a fall requiring hip surgery
- Hx of CAD with PCI to mid LAD
- PPM implanted over 10 years ago
- Echocardiography shows severe AS with an AVA measuring 0.8cm^2 and a peak/mean gradient measuring $72/46\text{mmHg}$, moderate aortic regurgitation and normal LV function

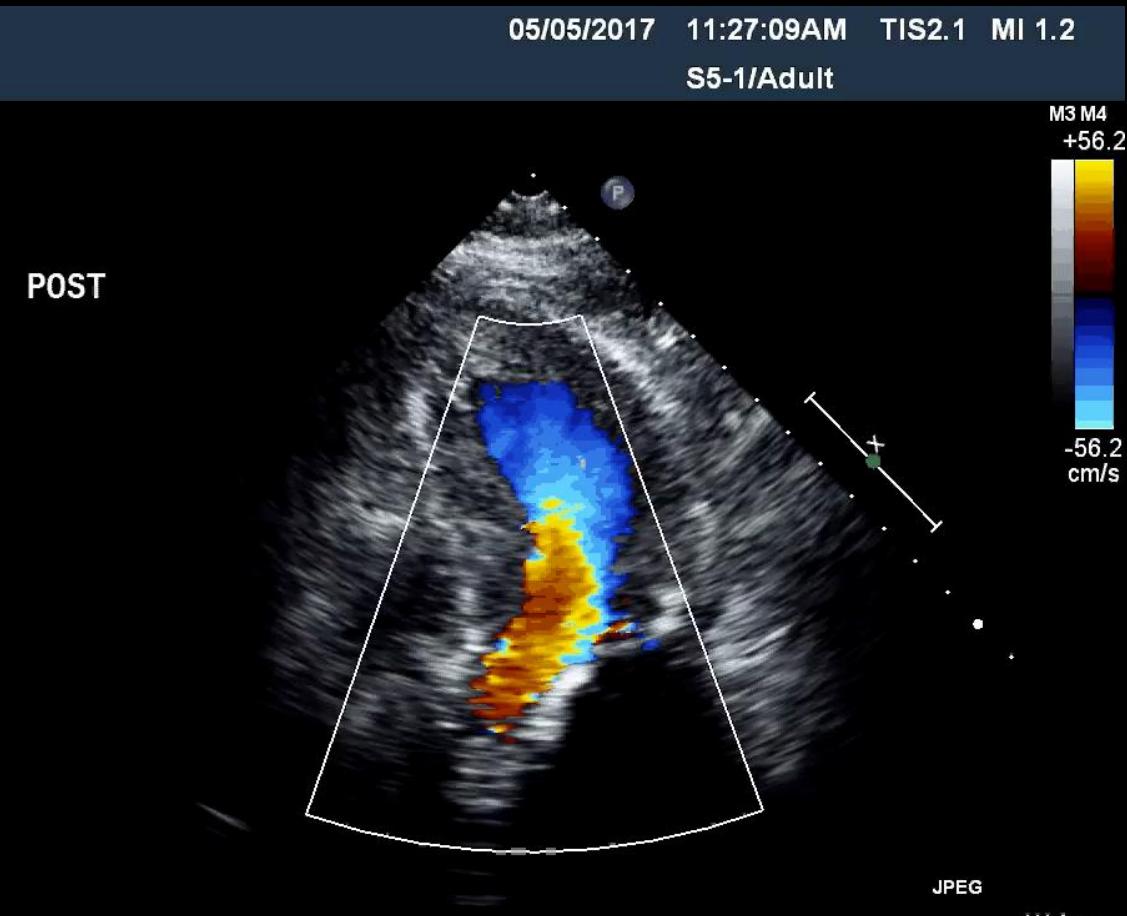
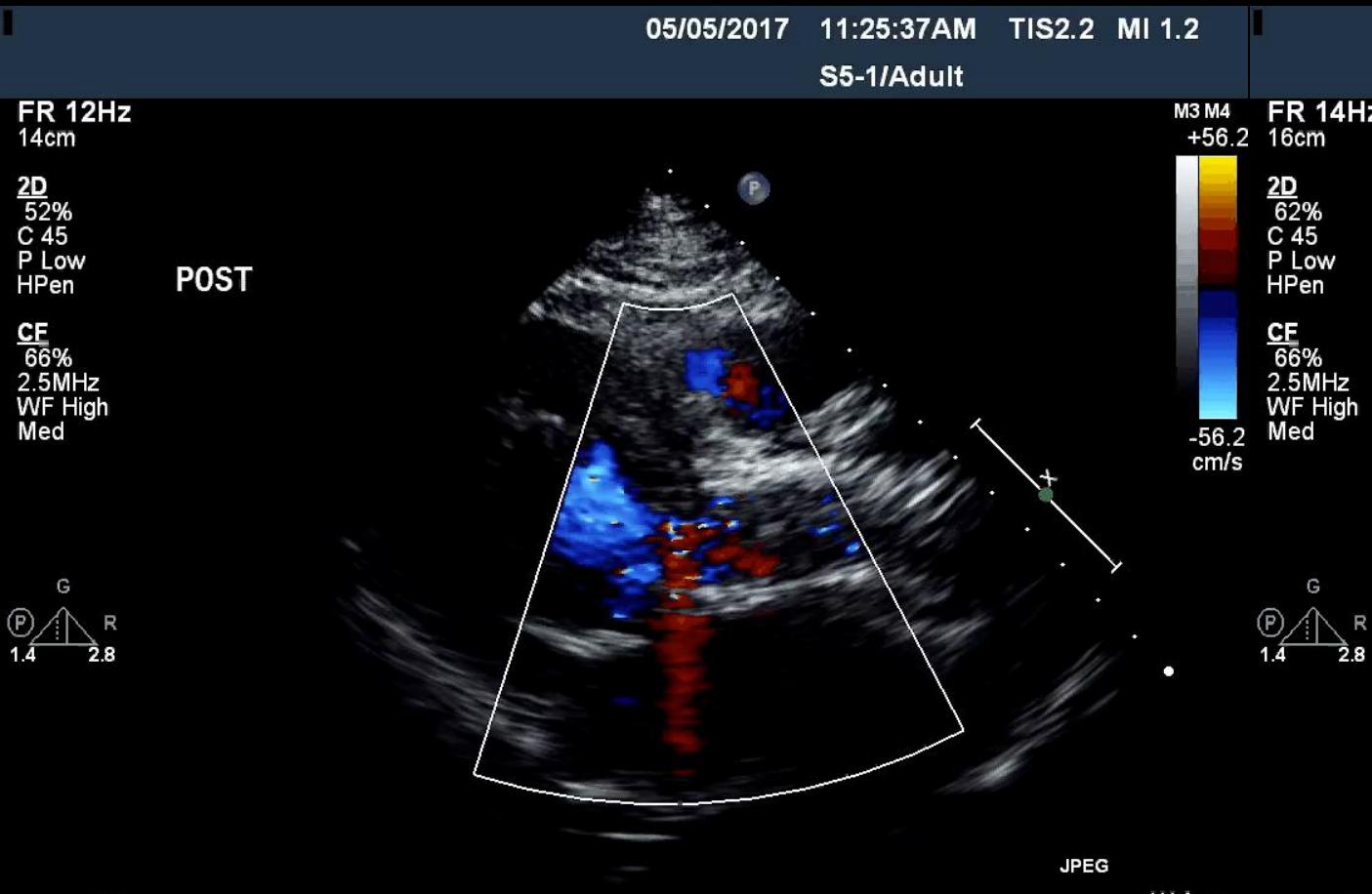
TTE case 3



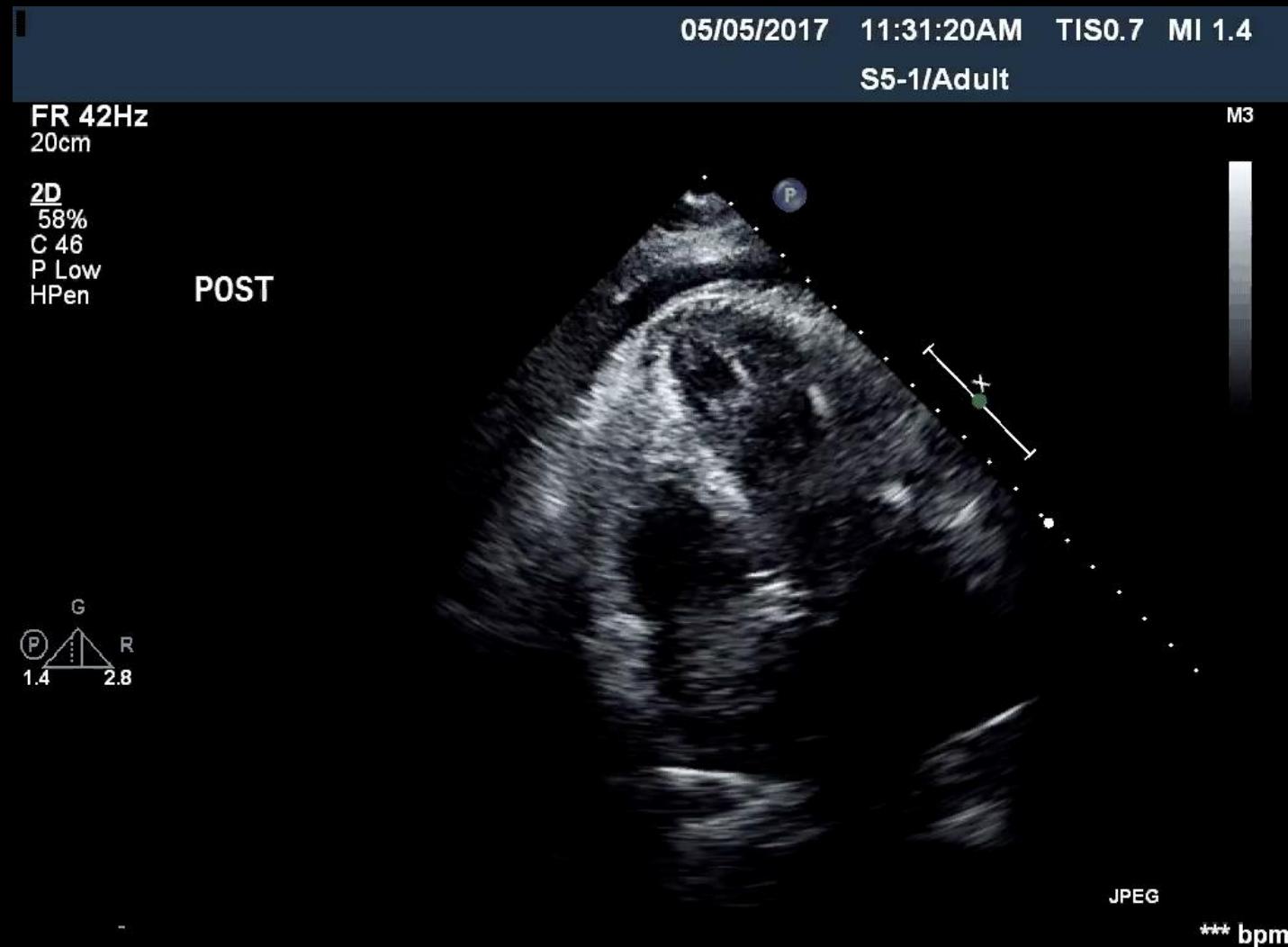
TTE case 3



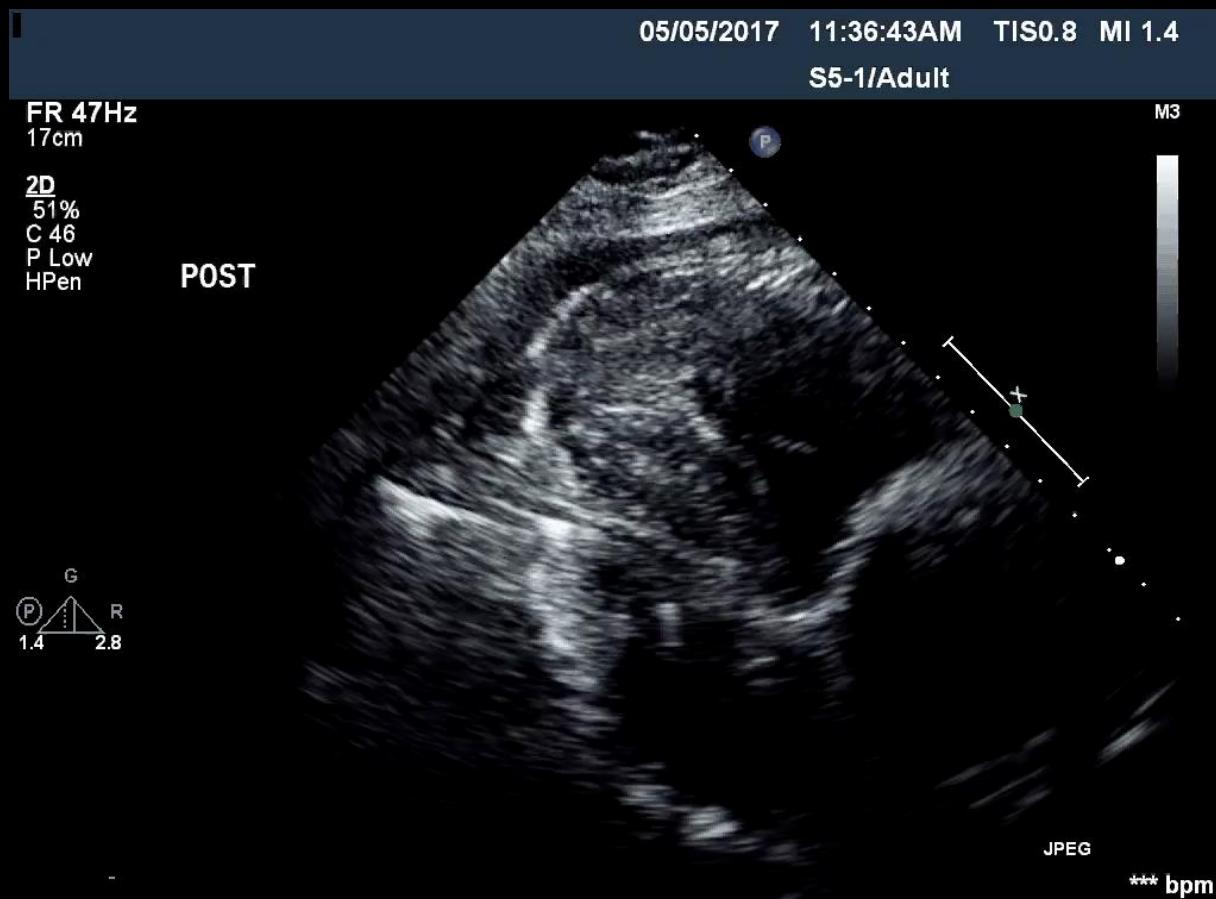
TTE case 3



TTE case 3



TTE case 3



TTE case 3

05/05/2017 11:38:23AM TIS0.7 MI 1.4
S5-1/Adult

FR 43Hz
19cm

2D
55%
C 46
P Low
HPen

POST

G
P R
1.4 2.8



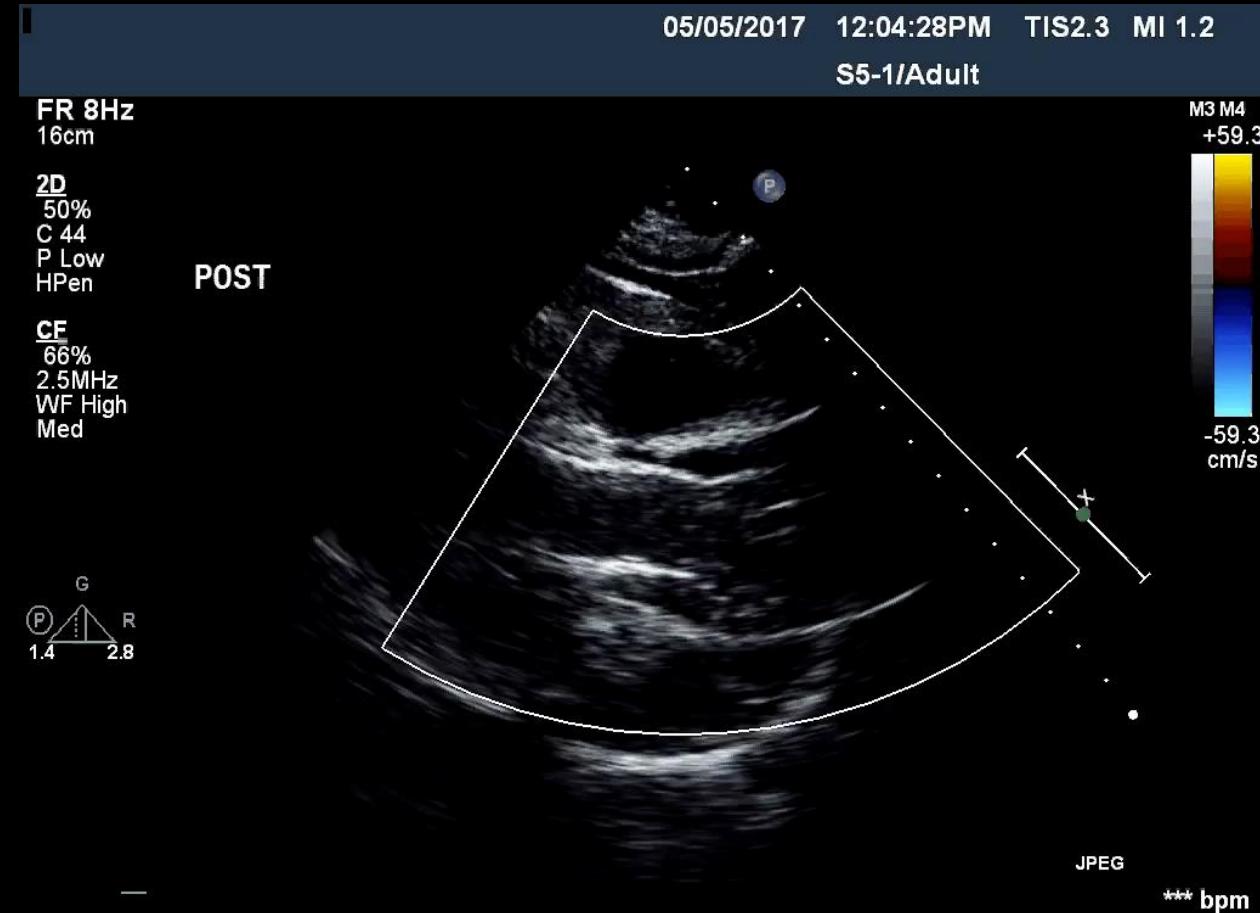
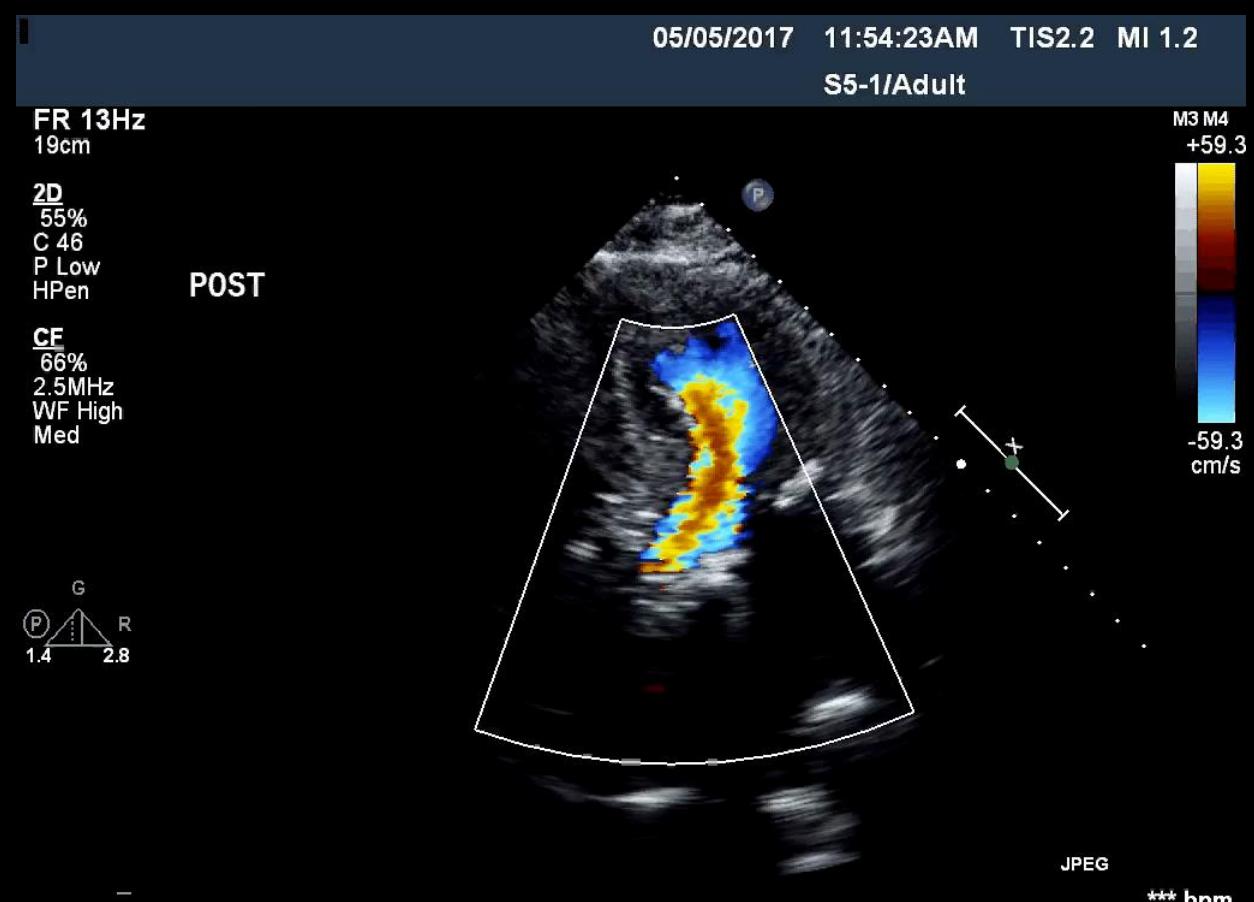
JPEG

*** bpm

TTE case 3



TTE case 3





DIAGNOSIS?



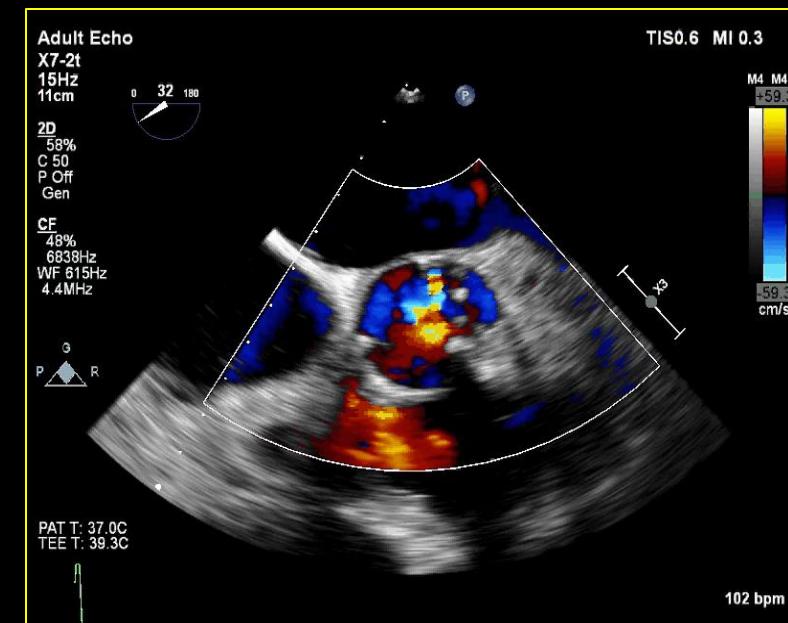
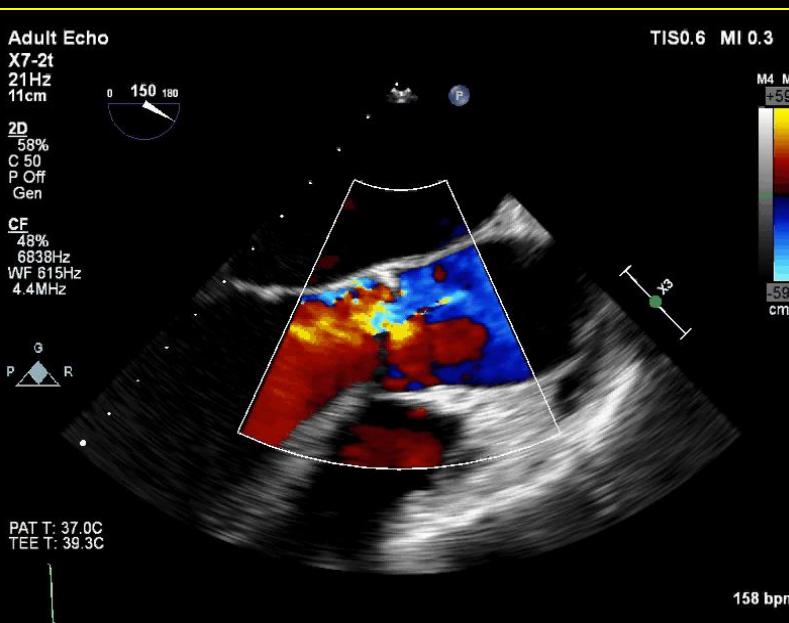
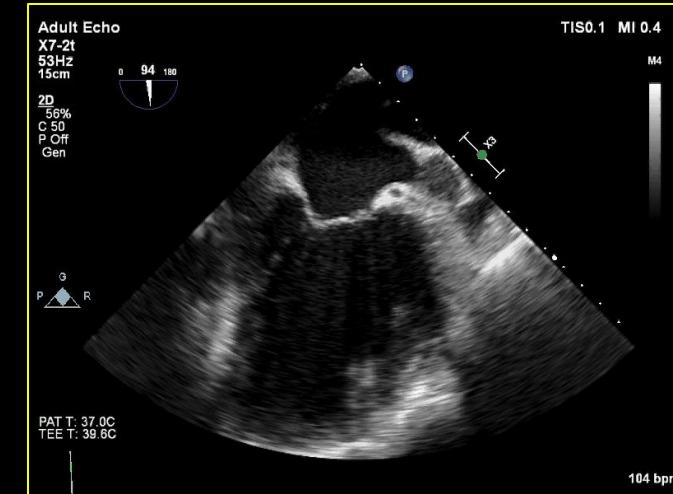
WHAT CAN WE DO
WITH TEE?



TEE CASES

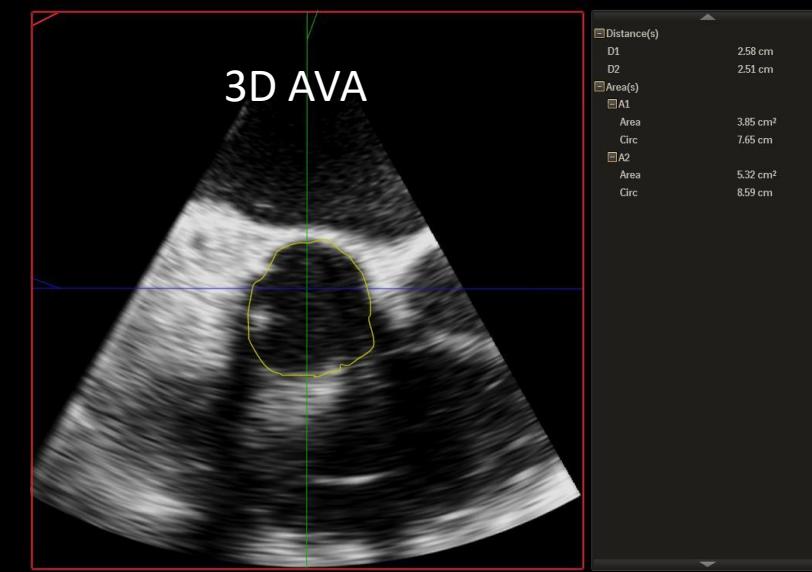
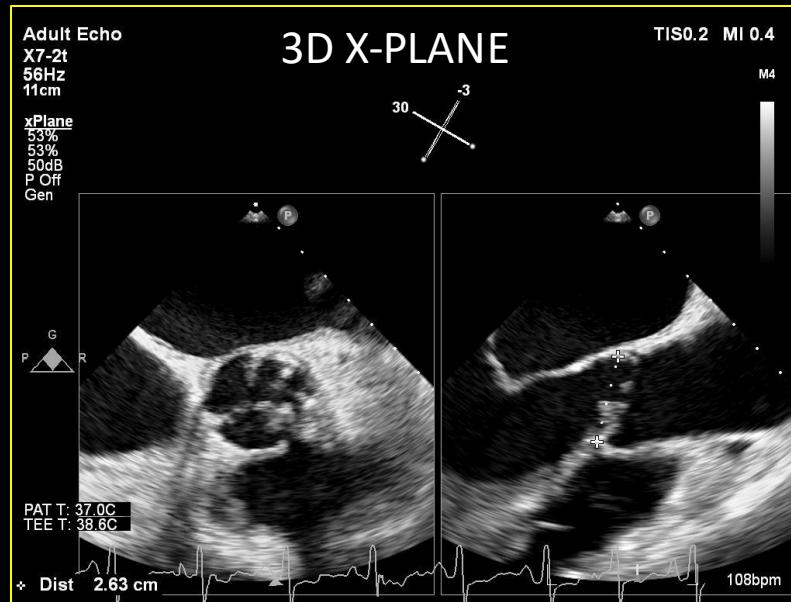
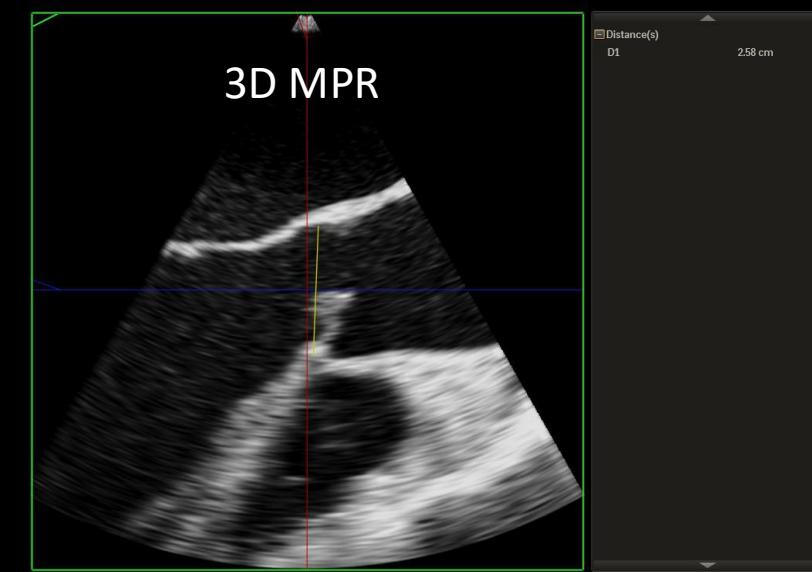
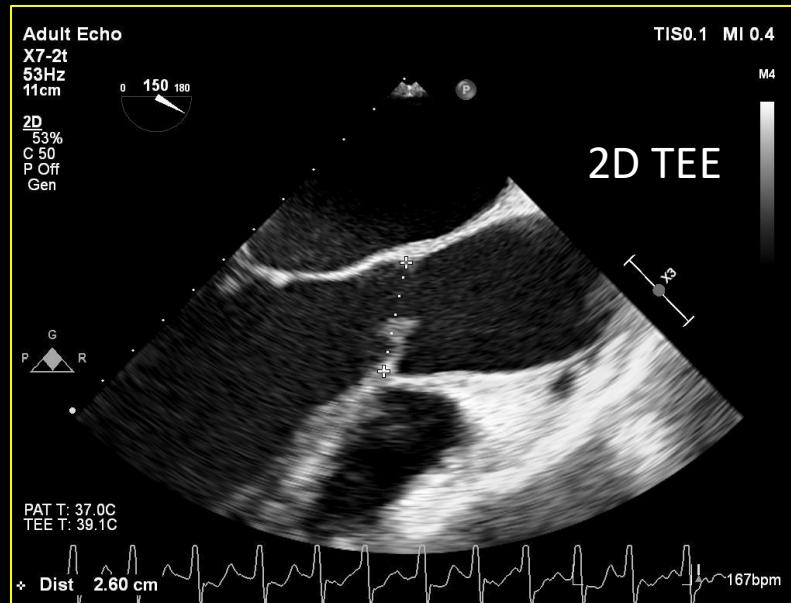


TEE CASE 1





TEE CASE 1





TEE CASE 1

Adult Echo
X7-2t
53Hz
16cm
2D
56%
C 50
P Off
Gen



G
P
R

PAT T: 37.0C
TEE T: 38.8C

TIS0.1 MI 0.4

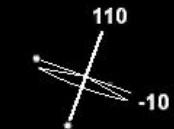
M4

95 bpm

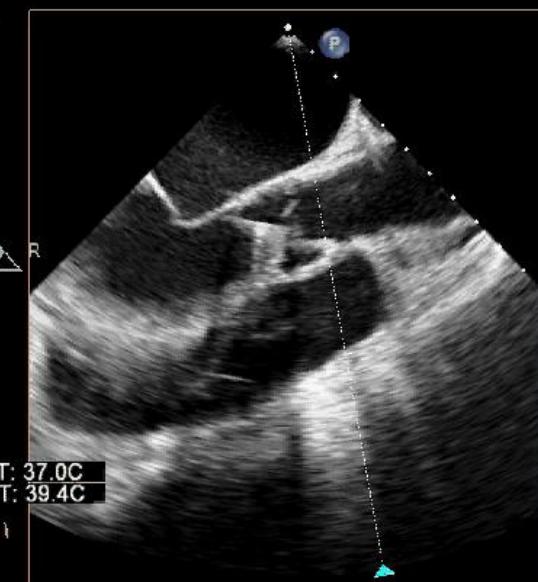
Adult Echo
X7-2t
40Hz
16cm

xPlane
56%
56%
50dB
P Off
Gen

PAT T: 37.0C
TEE T: 39.4C



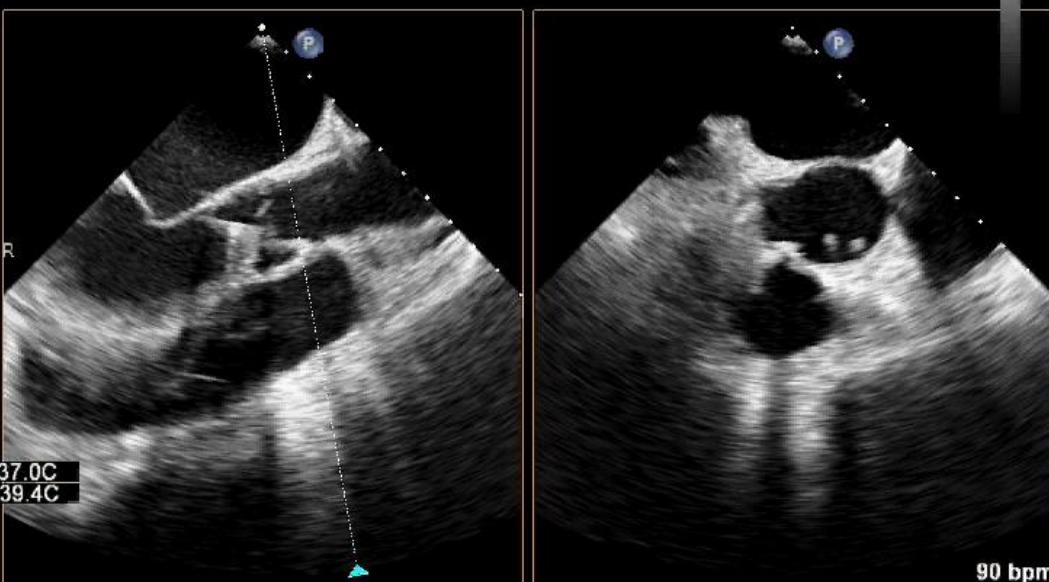
G
P
R



TIS0.1 MI 0.4

M4

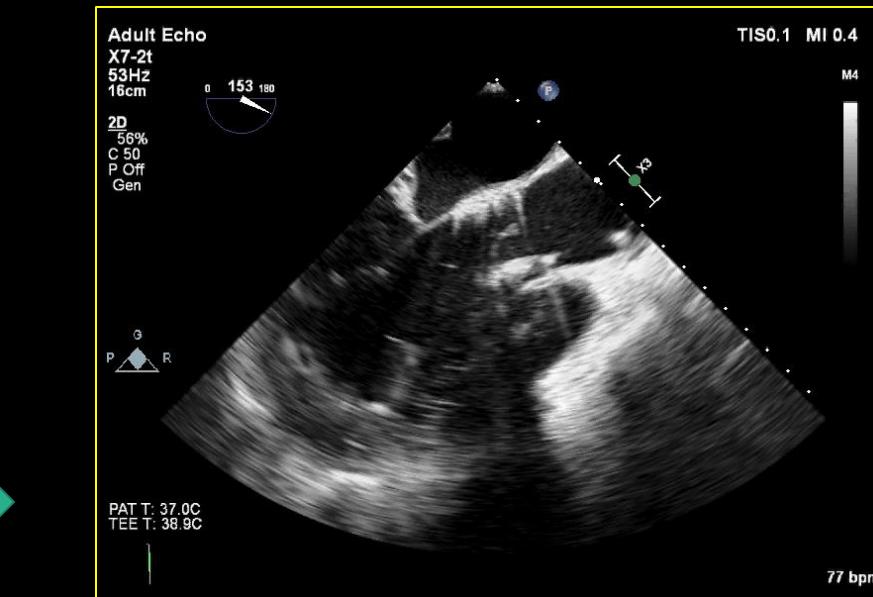
90 bpm





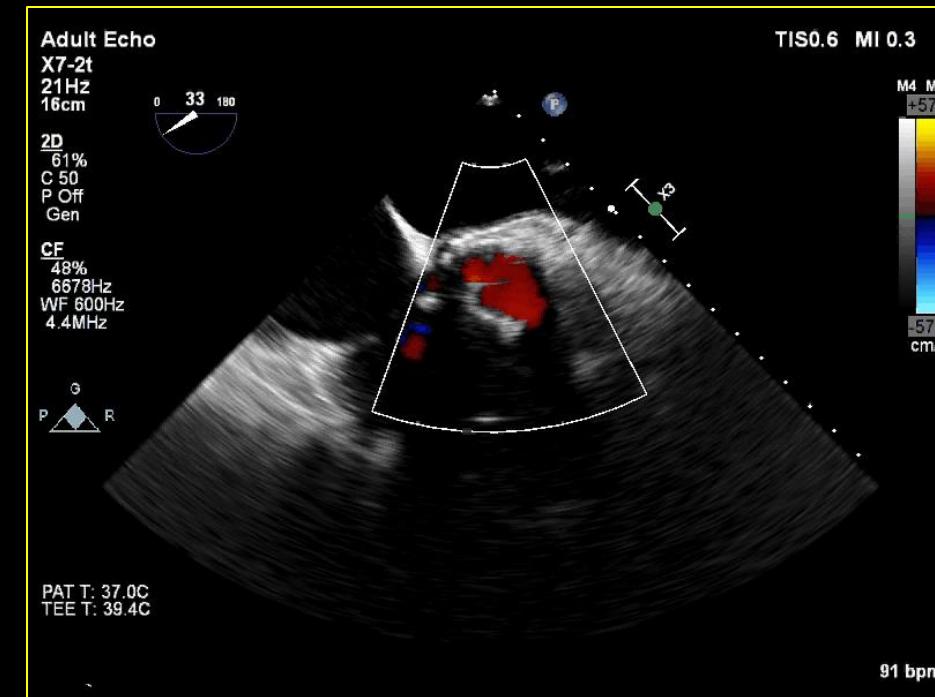
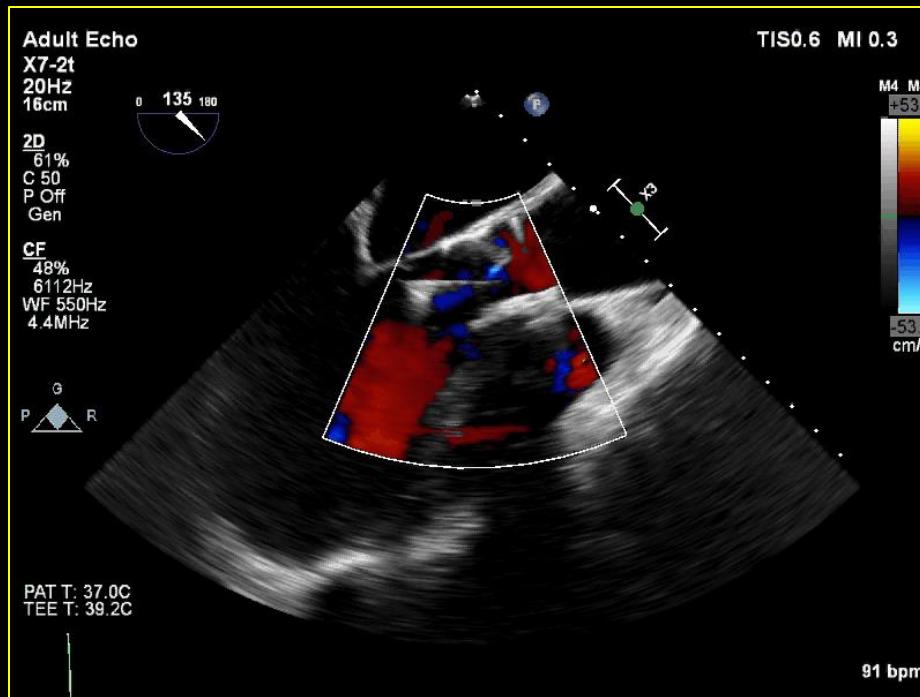
TEE CASE 1

Deployment



Sapien

Post Ballon
valvuloplasty

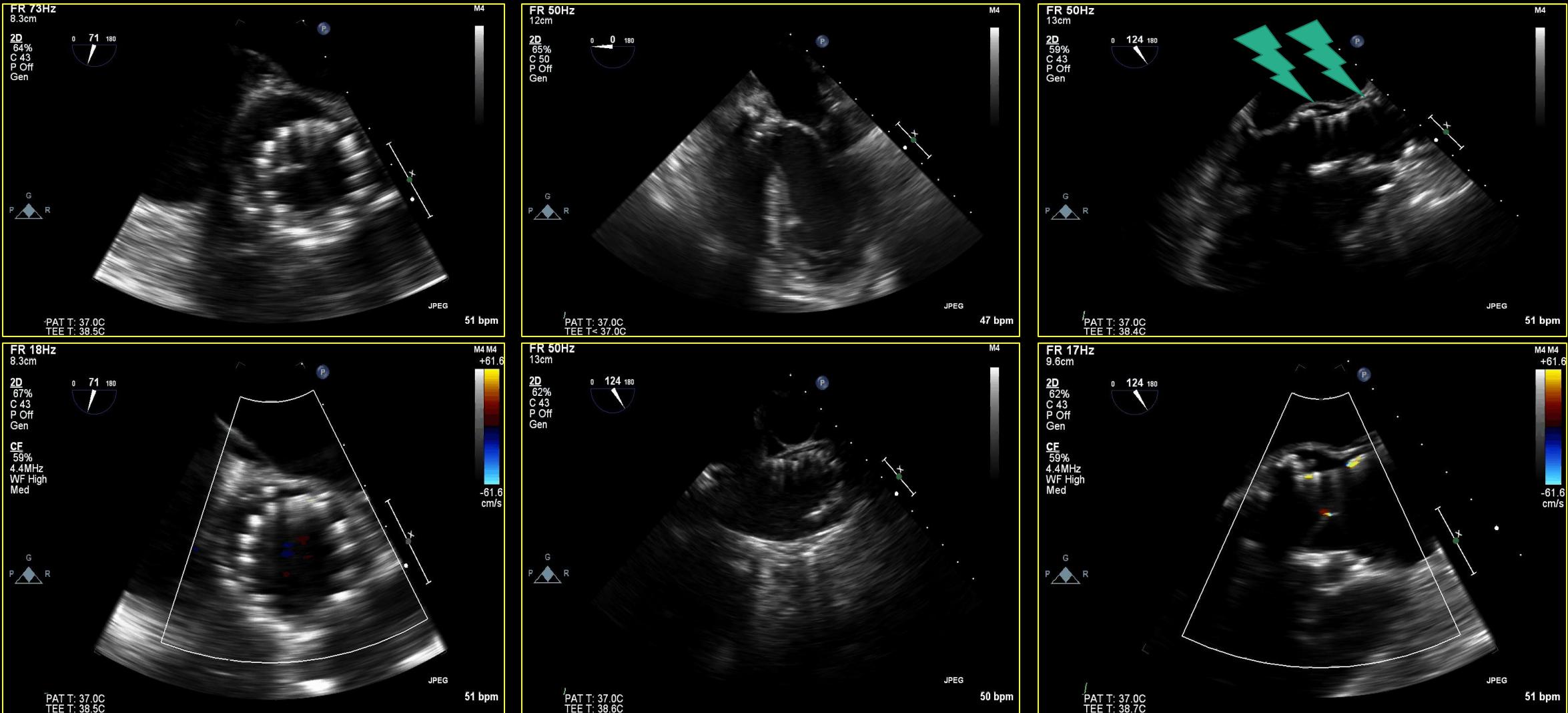




TEE CASE 2

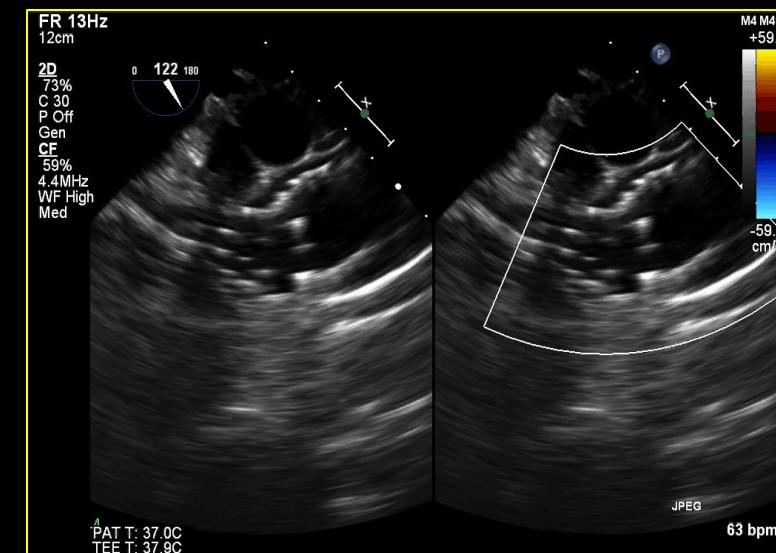
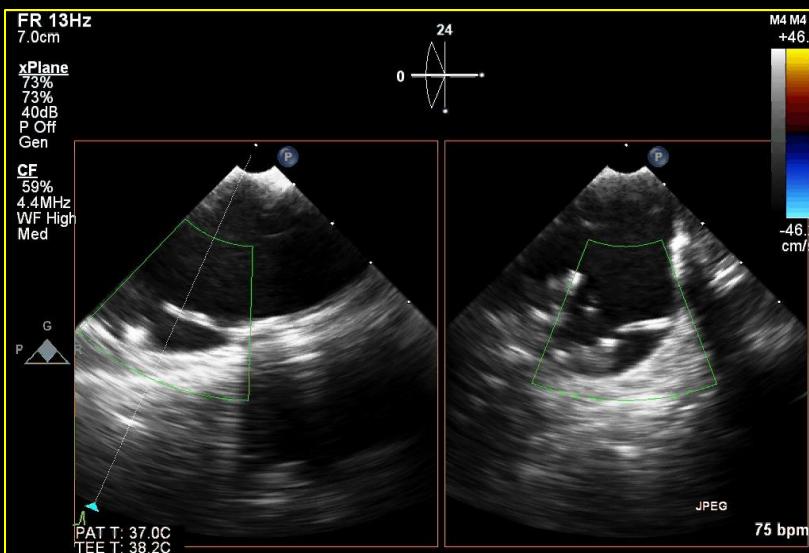
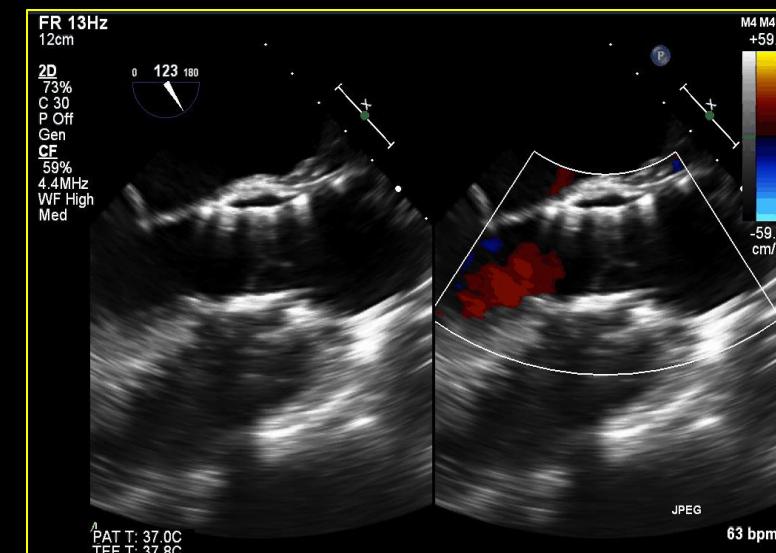
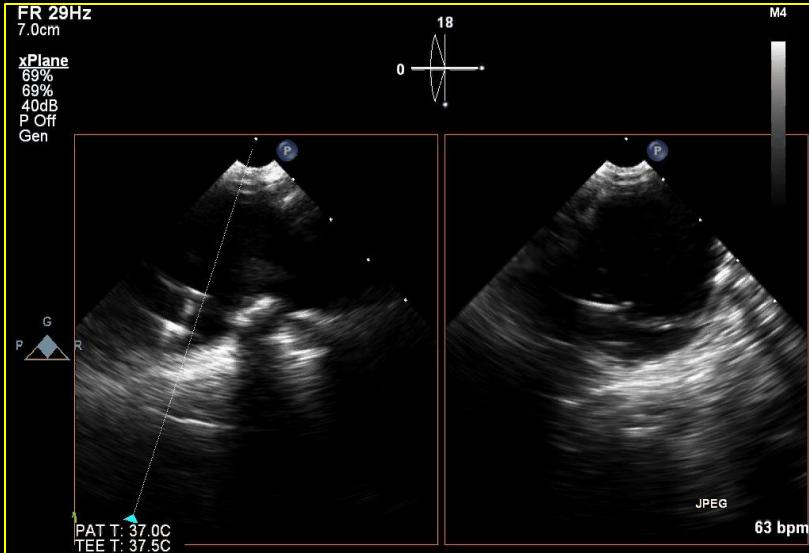


CoreValve





TEE CASE 2



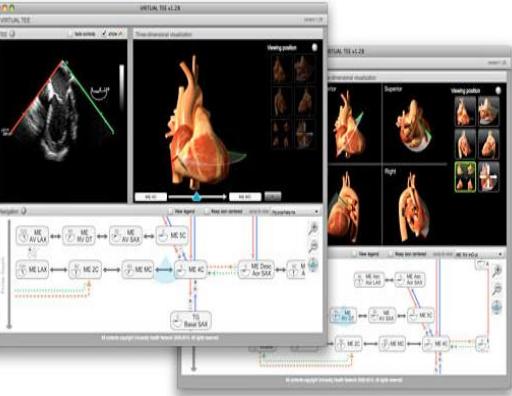
 Virtual Transesophageal Echocardiography

Toronto General Hospital Department of Anesthesia
Perioperative Interactive Education

Peter Munk Cardiac Centre  UHN

Site Menu

- Home
- 3D TEE
- Alternative Views
- Assessment of Cardiac Valves
- Colour Doppler
- Pathology
- Spectral Doppler
- Standard Views
- TEE Exam Study Notes
- TEE Handbooks
- TEE Simulation
- VIRTUAL TEE**
- ▶ Other PIE sites
- ▶ External Links



[Click here to open the VIRTUAL TEE application.](#)



Toronto General Hospital

Jacobo.Moreno@uhn.ca
Jennifer.Day@uhn.ca



Peter Munk Cardiac Centre



UHN

COURAGE LIVES HERE

Toronto General
Toronto Western
Princess Margaret
Toronto Rehab