CCS: Trainee Review Program 2021

ECHO WORKSHOP

GILLIAN NESBITT

Objective

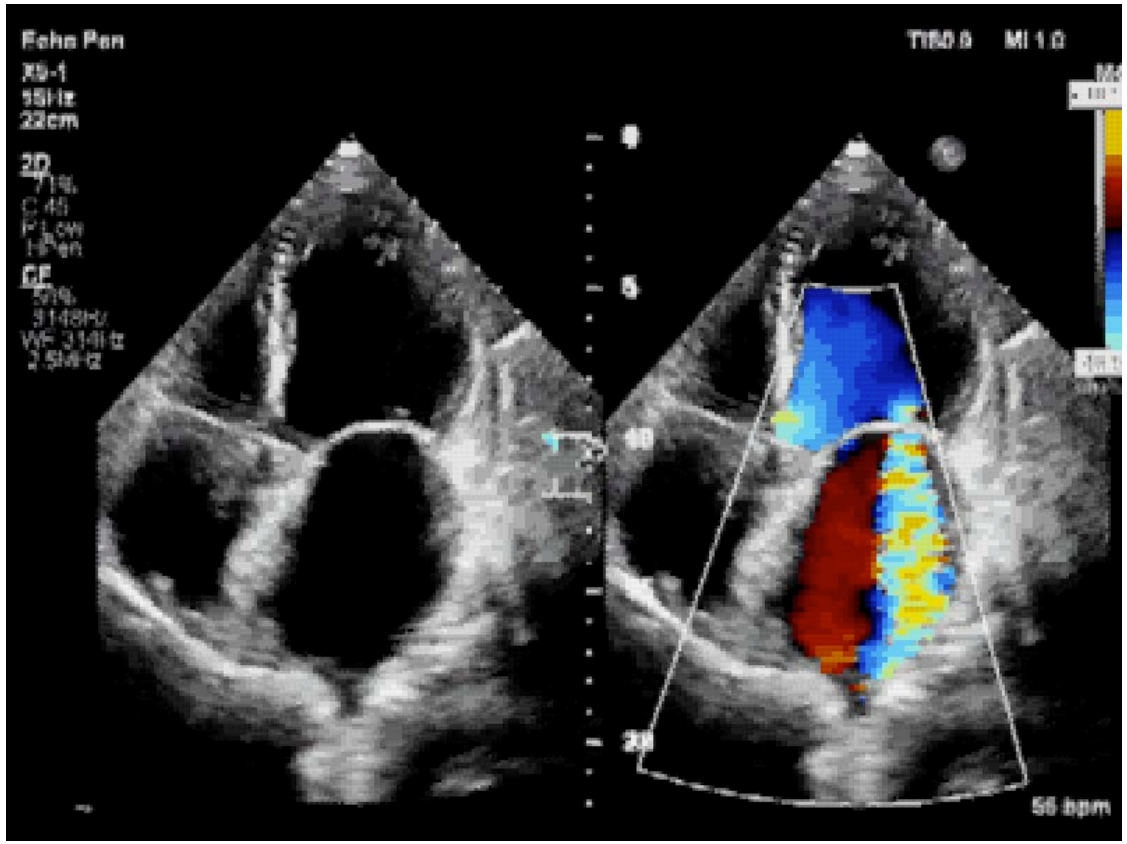
Evaluate echo still images and subsequently formulate conclusions and next steps in clinical management

CLINICAL CASE

75-year-old male with known history of CAD – 3 DES to proximal, mid LAD and circumflex.

History of permanent AF

NYHA III despite maximally tolerate carvedilol, ramipril and spironolactone



Case 1

Echo Math: Calculate the ERO

Radius = 0.98 cm

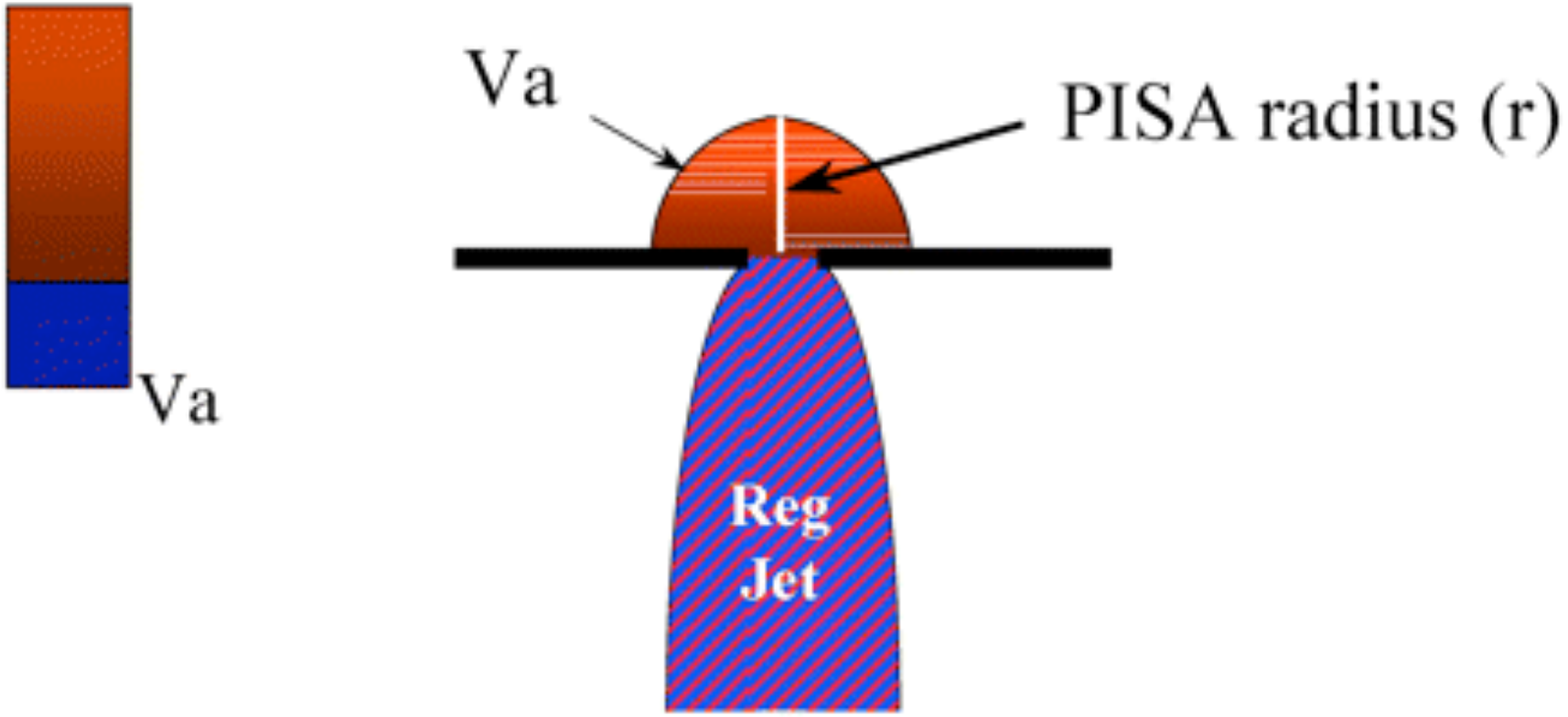
Va = 37 cm/sec

MR peak velocity = 5.53 m/sec

MR TVI = 187 cm

PISA

Flow Convergence Method



$$\text{Reg Flow} = 2\pi r^2 \times Va$$

$$\text{EROA} = \text{Reg Flow} / PkV_{Reg}$$

Severity

Quantitative Criteria

ERO $\geq 0.4\ cm^2$

RV $\geq$ 60 ml

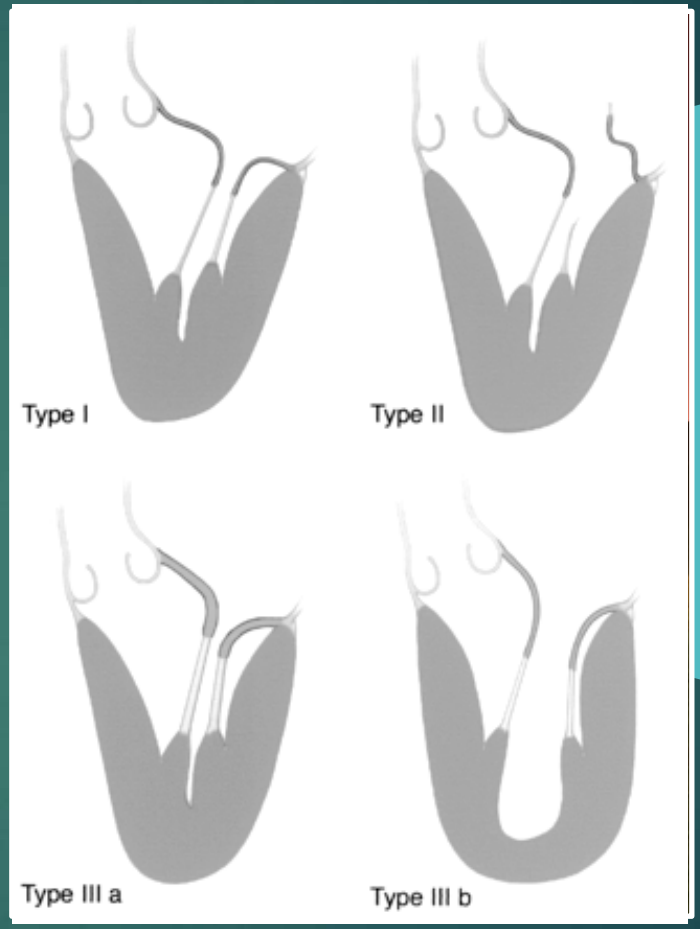
RF $\geq$ 50%

Specific Criteria for Severe MR

- Flail leaflet
- VCW ≥ 0.7 cm
- PISA radius ≥ 1.0 cm at Nyquist 30-40 cm/s
- Central large jet > 50% of LA area
- Pulmonary vein systolic flow reversal
- Enlarged LV with normal function

Etiology and Mechanism

Type I: Normal leaflet motion
Type II: Exaggerated leaflet motion
Type III: Restricted valve motion
Type IV: Systolic anterior motion
Type V: Hybrid conditions



Indications for Mitral Clip

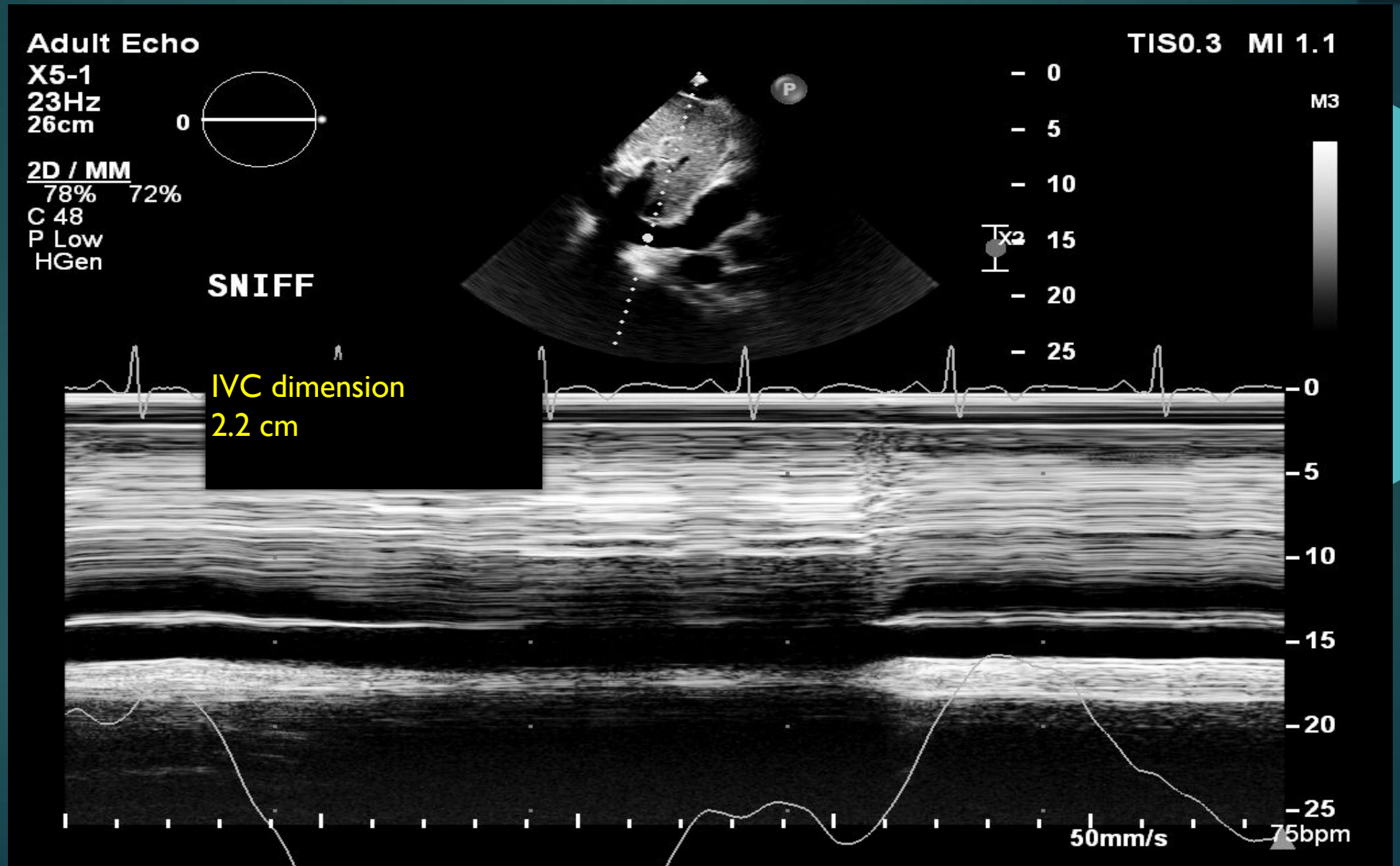
- Disease of the ventricle
- Reserve intervention for severe MR with symptoms despite GDMT

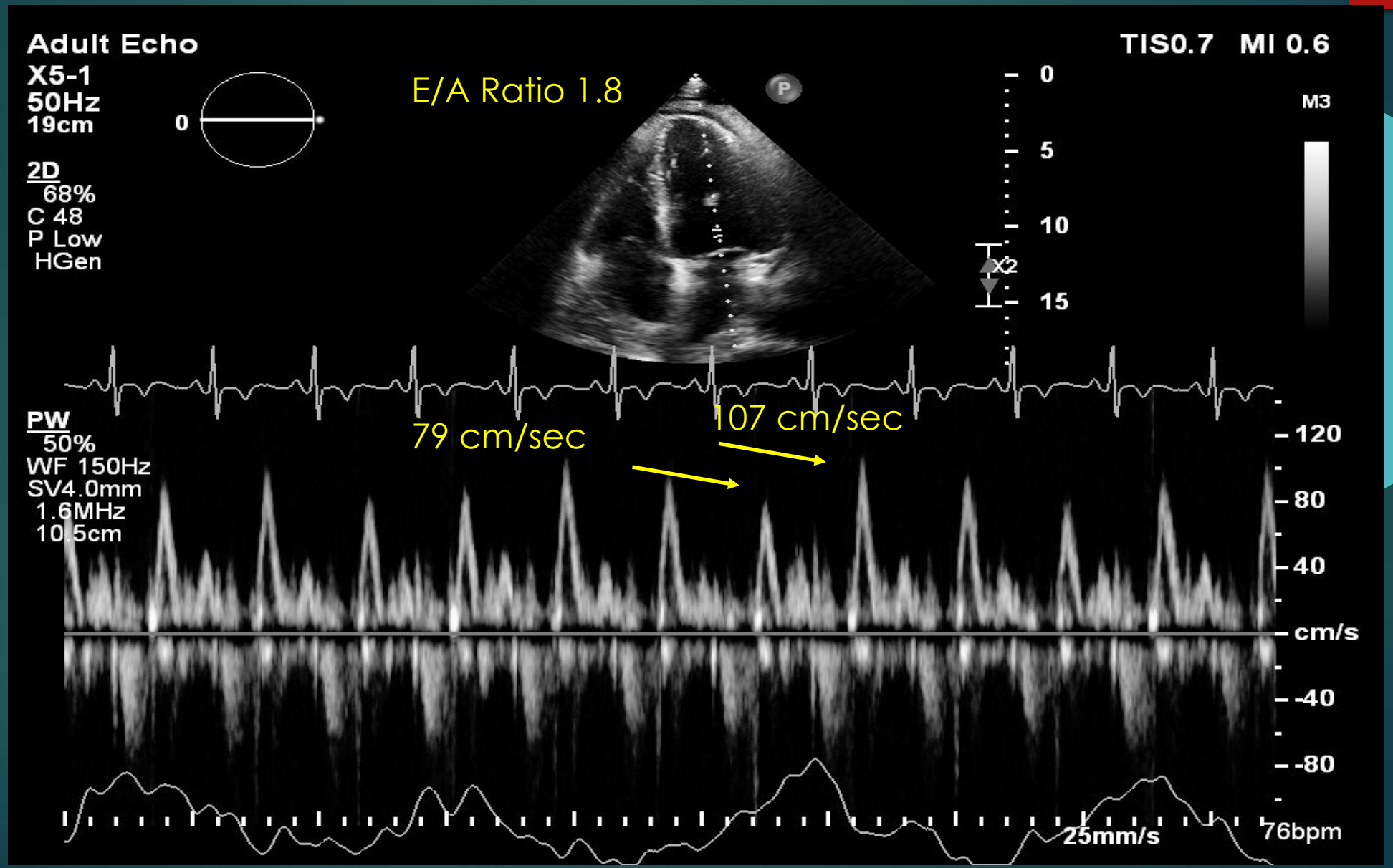
Mitral anatomy favorable
LVEF 20%–50%
LVESD ≤70 mm
PASP ≤70 mm Hg

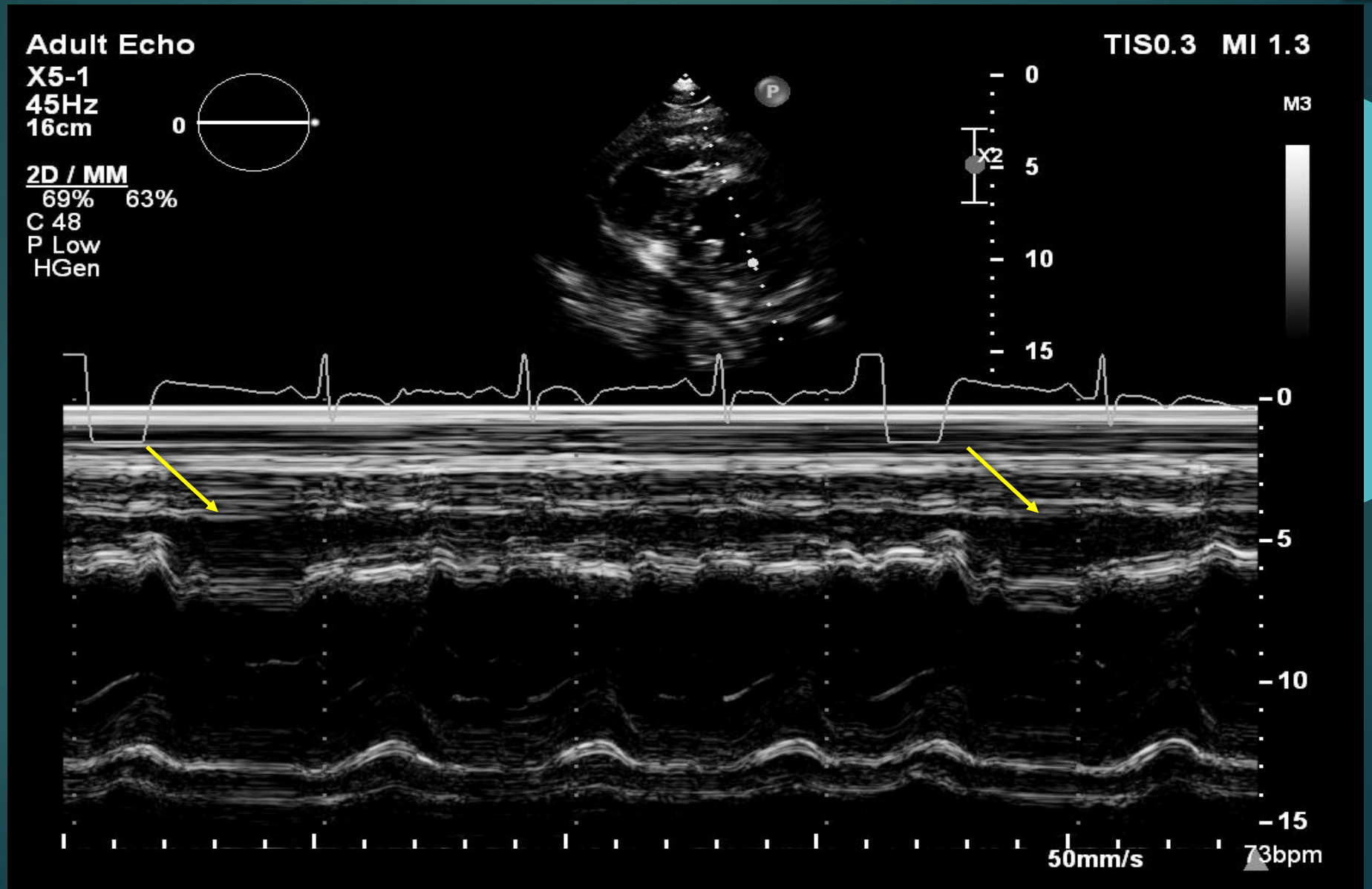
Case 2

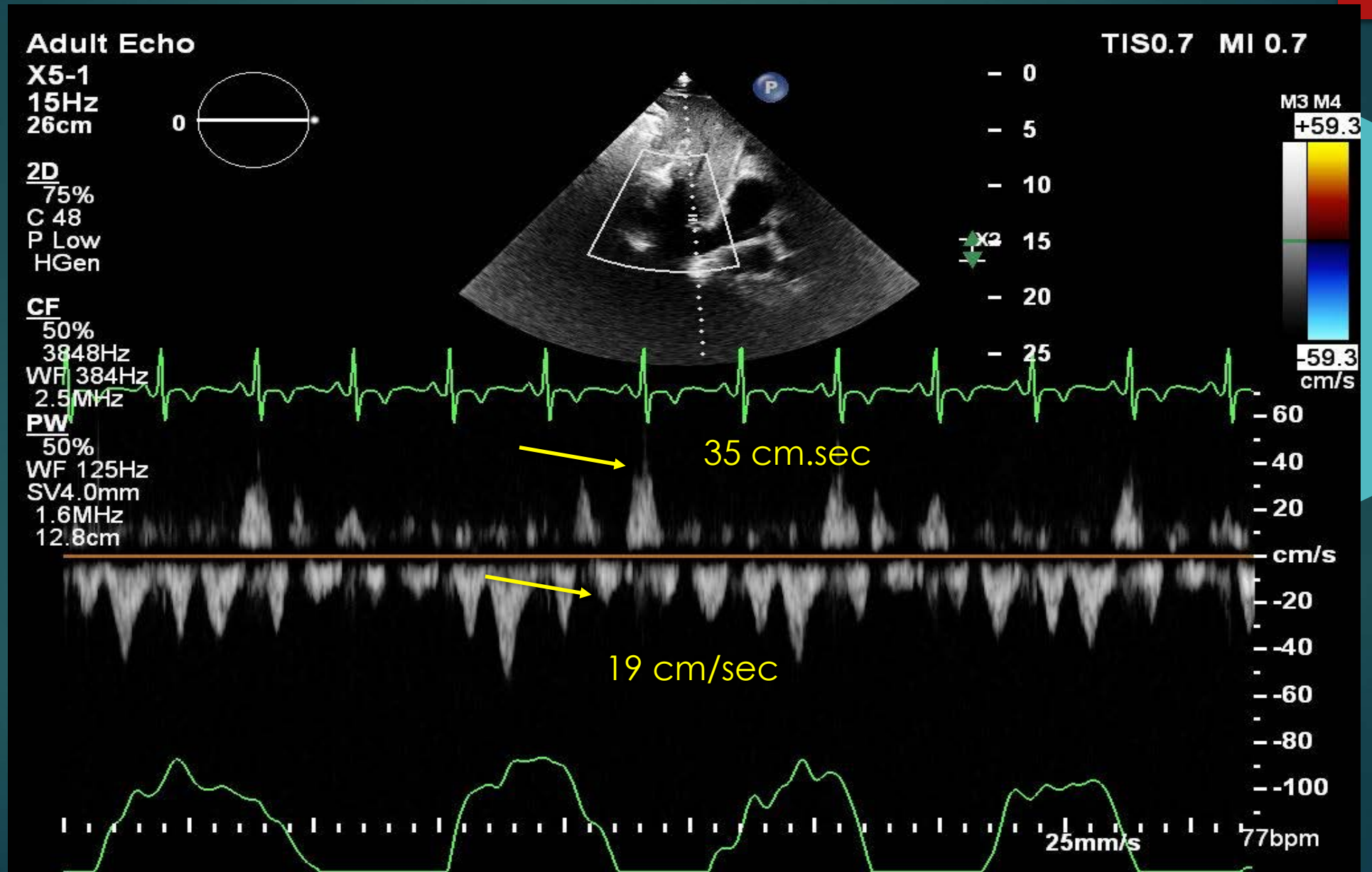
2 months ago, 48-year-old male, presents with an acute cardiac pain syndrome

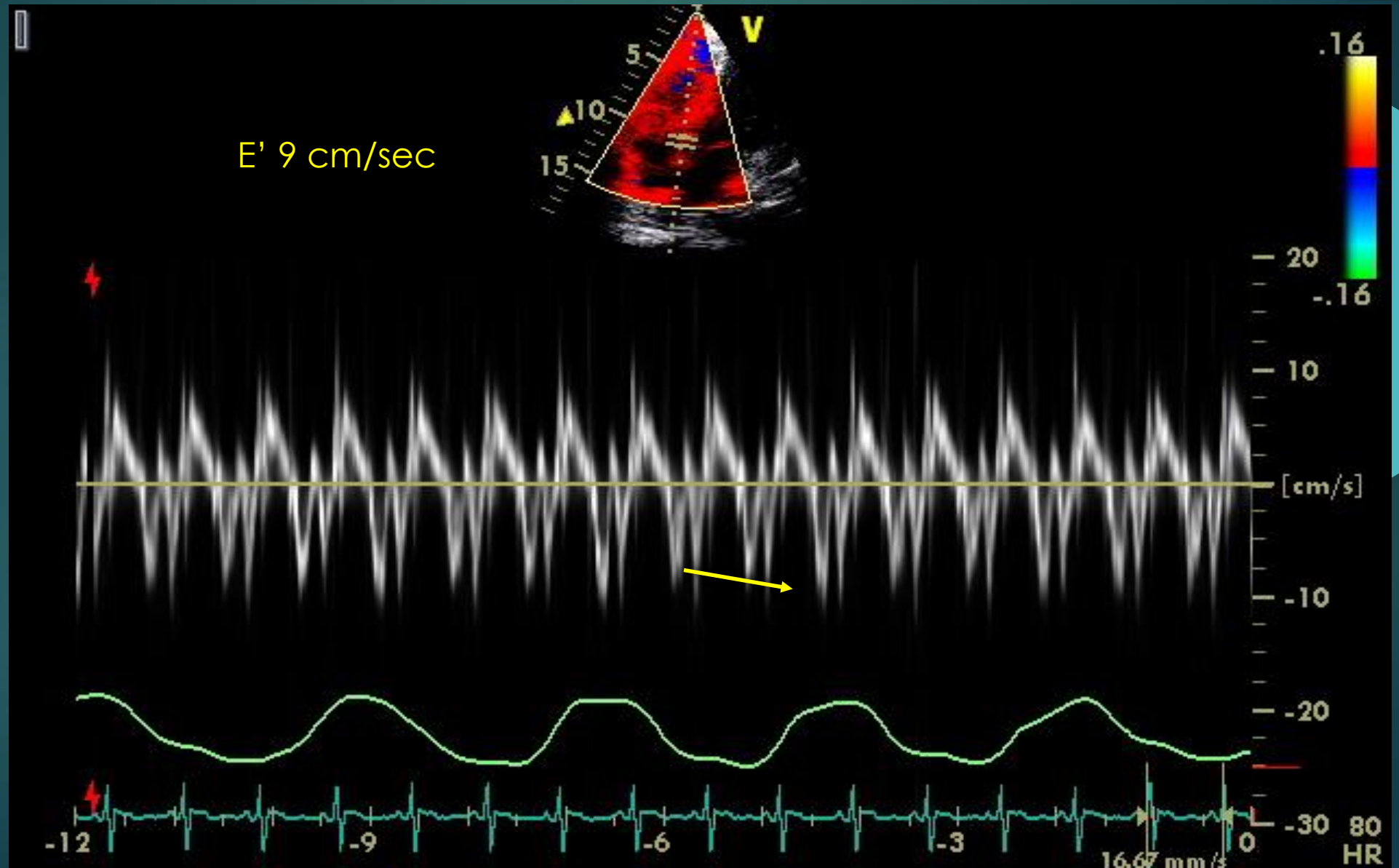
Now represents with chest pain and progressive dyspnea, decline in functional capacity as well as development of edema

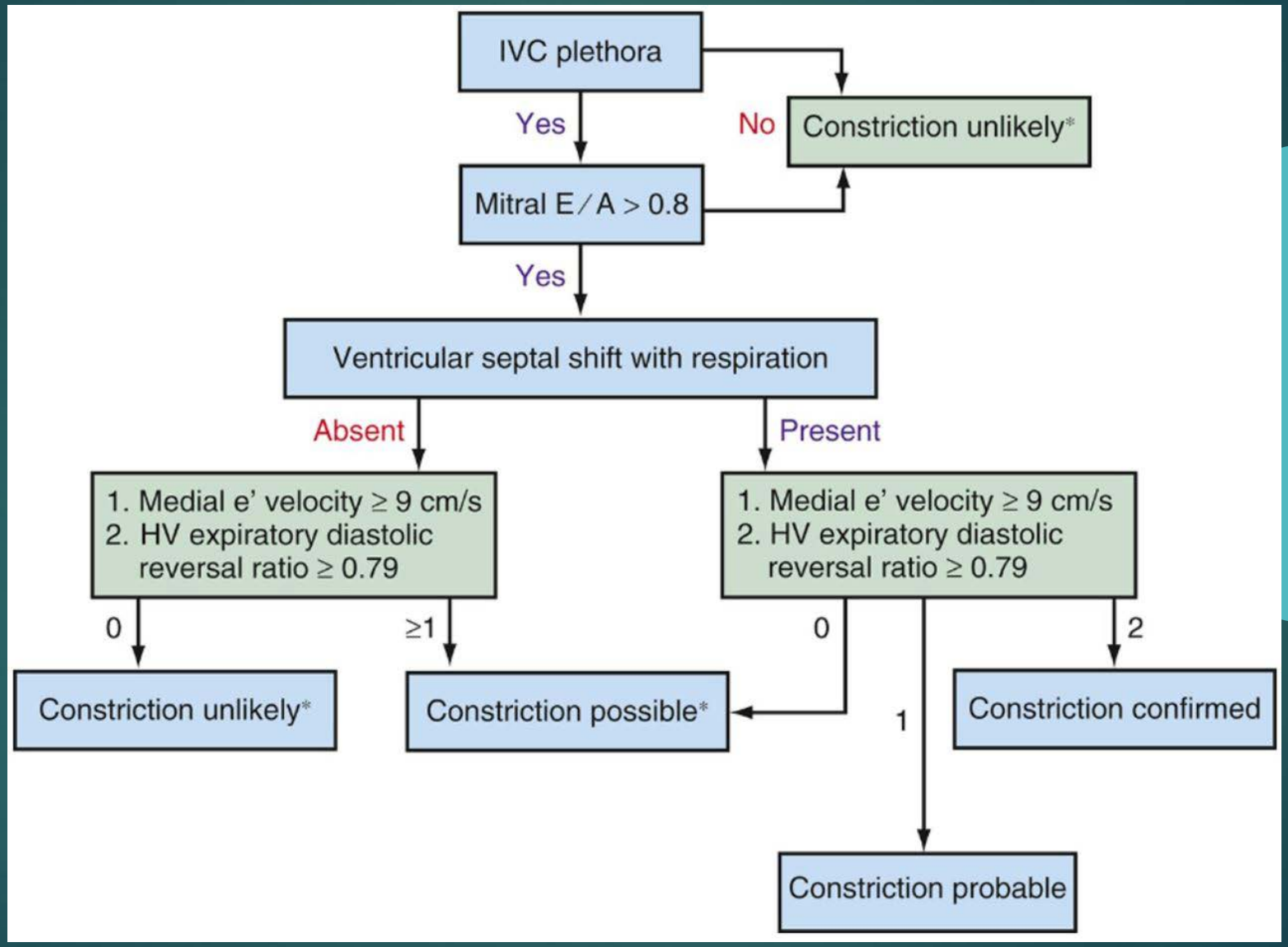

Adult Echo
X5-1
23Hz
26cm
0
2D / MM
78%
72%
C 48
P Low
HGen
SNIFF
TIS0.3 MI 1.1
M3
0
5
10
15
20
25
IVC dimension
2.2 cm
50mm/s
75bpm


Adult Echo
X5-1
50Hz
19cm
2D
68%
C 48
P Low
HGen
TIS0.7 MI 0.6
M3
E/A Ratio 1.8
0
5
10
15
PW
50%
WF 150Hz
SV4.0mm
1.6MHz
79 cm/sec
107 cm/sec
120
80
40
cm/s
-40
-80
25mm/s
76bpm

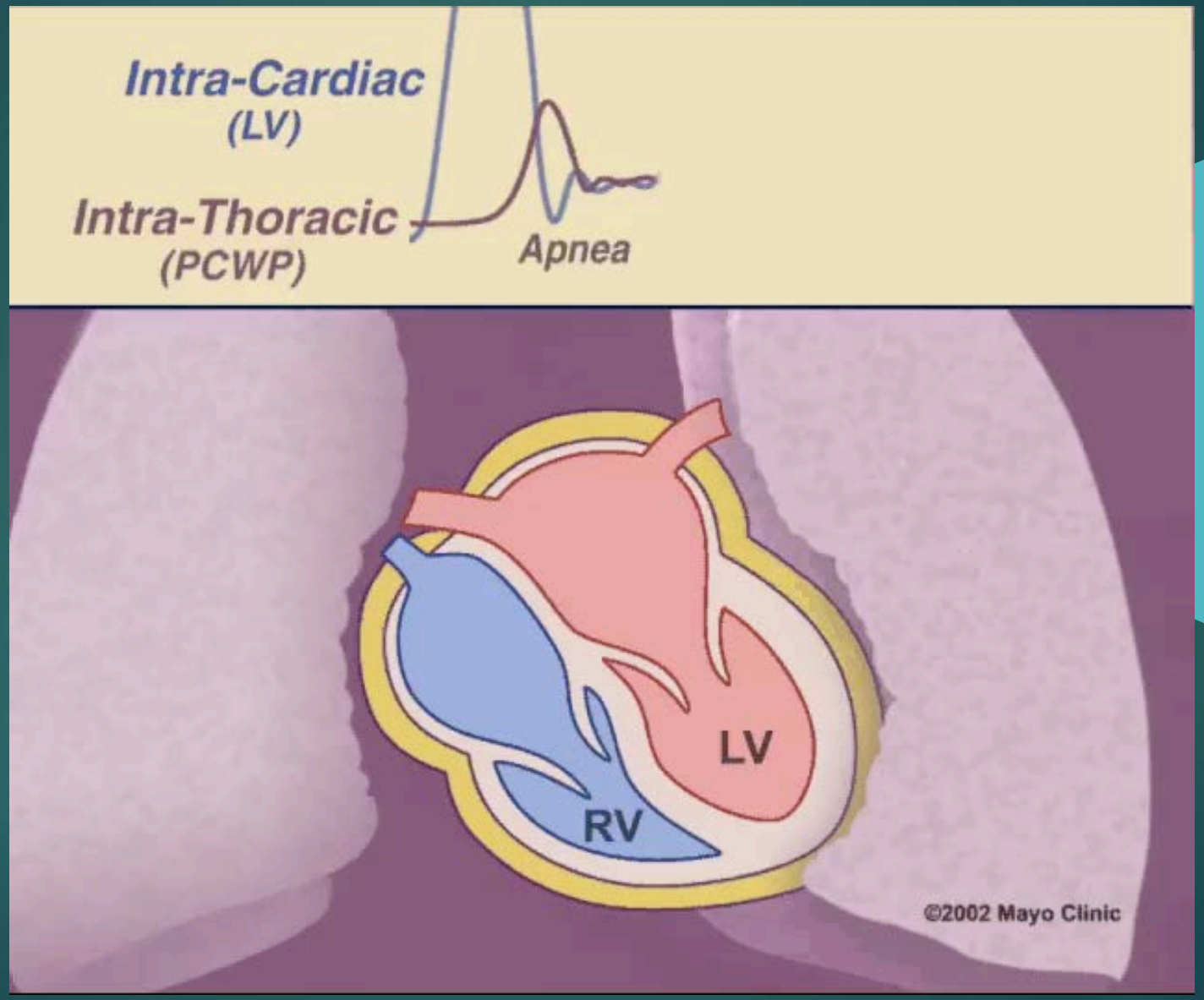

Adult Echo
X5-1
45Hz
16cm
2D / MM
69% 63%
C 48
P Low
HGen
TIS0.3 MI 1.3
M3
0
5
10
15
X2
50mm/s
73bpm

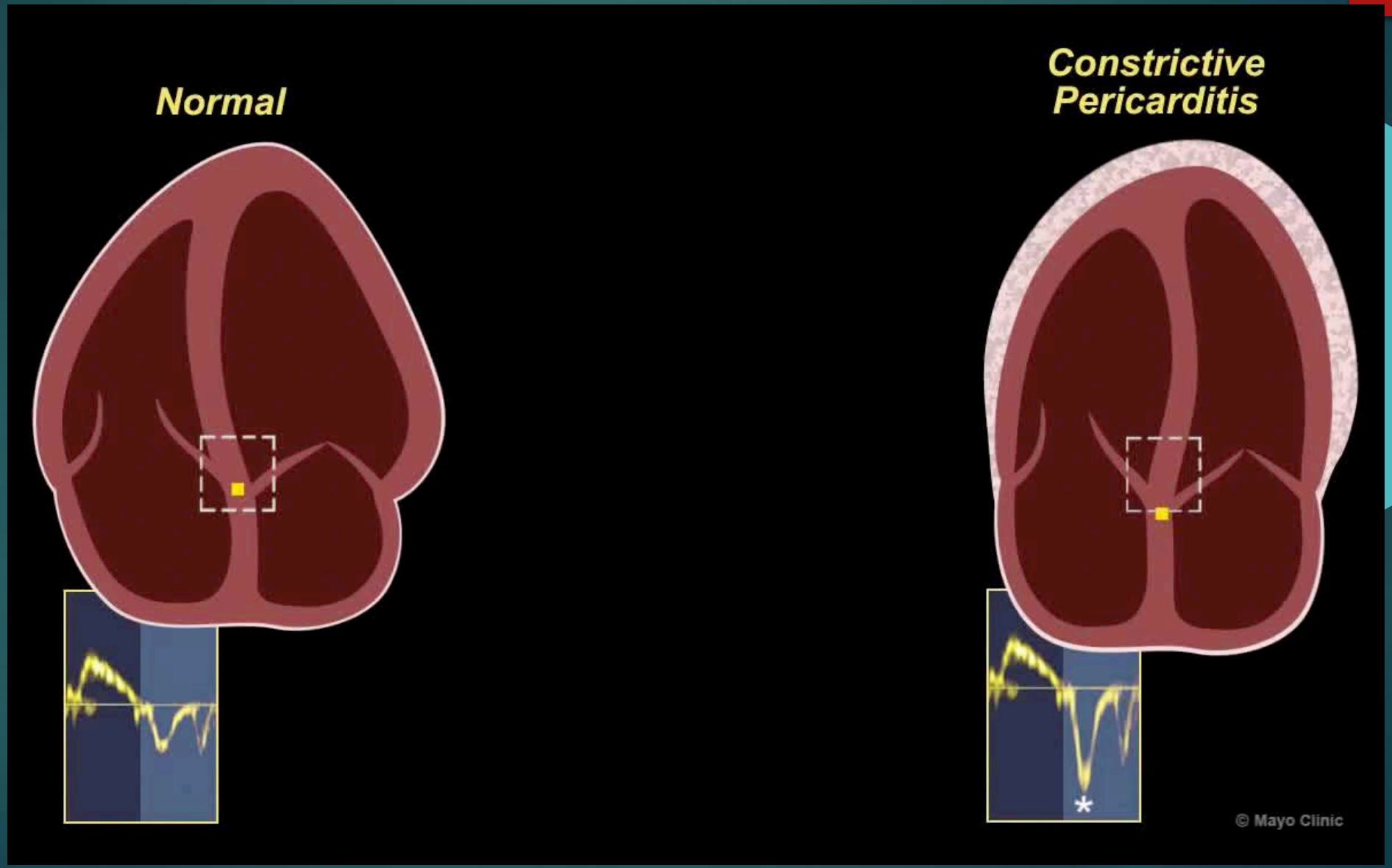

Adult Echo
X5-1
15Hz
26cm
TIS0.7 MI 0.7
2D
75%
C 48
P Low
HGen
CF
50%
3848Hz
WF 384Hz
2.5MHz
PW
50%
WF 125Hz
SV4.0mm
1.6MHz
12.8cm
M3 M4
+59.3
-59.3
cm/s
35 cm.sec
19 cm/sec
25mm/s
77bpm


E' 9 cm/sec
V
5
10
15
.16
-.16
20
10
[cm/s]
-10
-20
-30
-12
-9
-6
-3
0
80
HR



Welch et al Circ Cardiovasc Imaging 2014;7:526


Intra-Cardiac
(LV)
Intra-Thoracic
(PCWP)
Apnea
LV
RV
©2002 Mayo Clinic


Normal
Constrictive Pericarditis
*
© Mayo Clinic

Case 3

- 63 year old female past medical history significant for:
  - Elevated cholesterol
  - Hypertension
  - Smoking

  - Called to ED emergently due to hemodynamic instability


ECHO TGH
S5-1
31 Hz
17.0cm
2D
HGen
Gn 50
C 46
3/2/0
75 mm/s
P
G
P R
1.6 3.2

Short answer question

- In the setting of an aortic aneurysm what are the surgical cutoffs ?

Degenerative disease

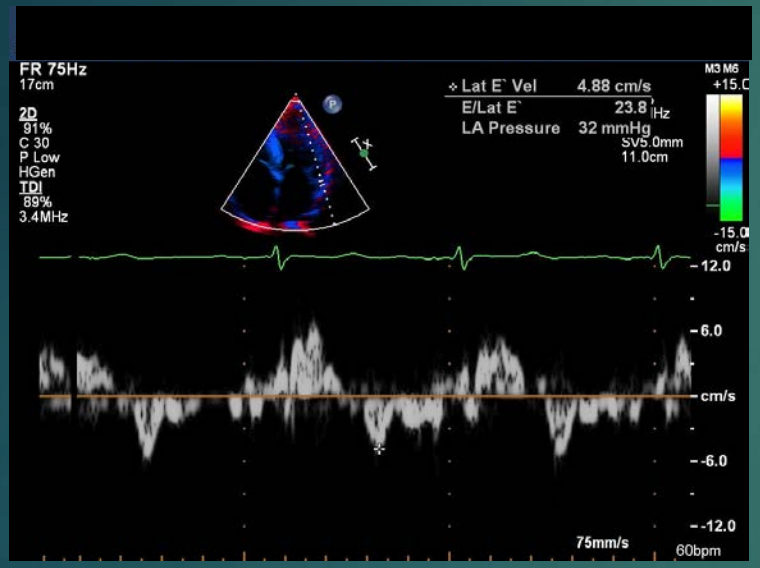
Marfan's

Bicuspid

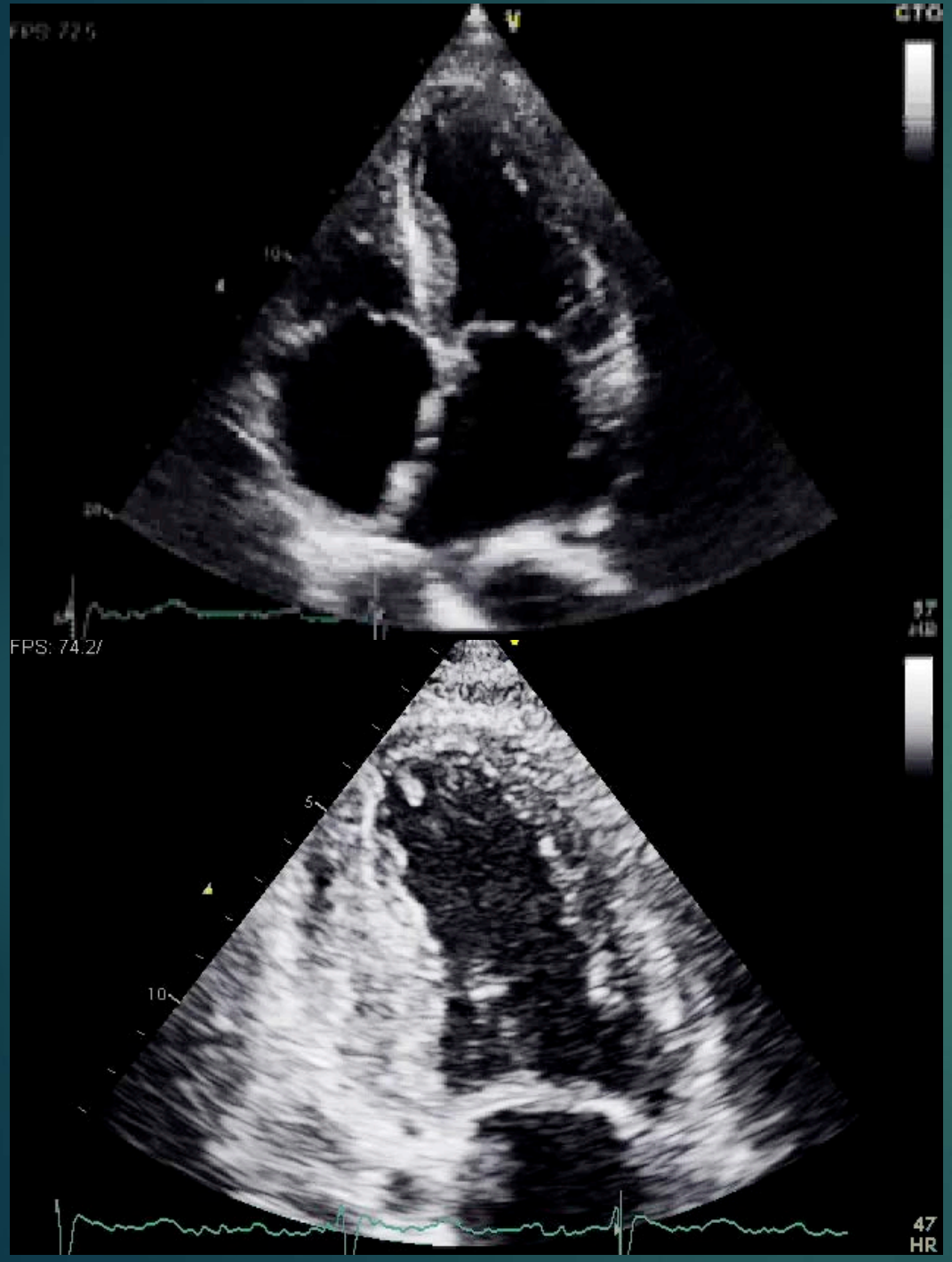
Loeys-Dietz

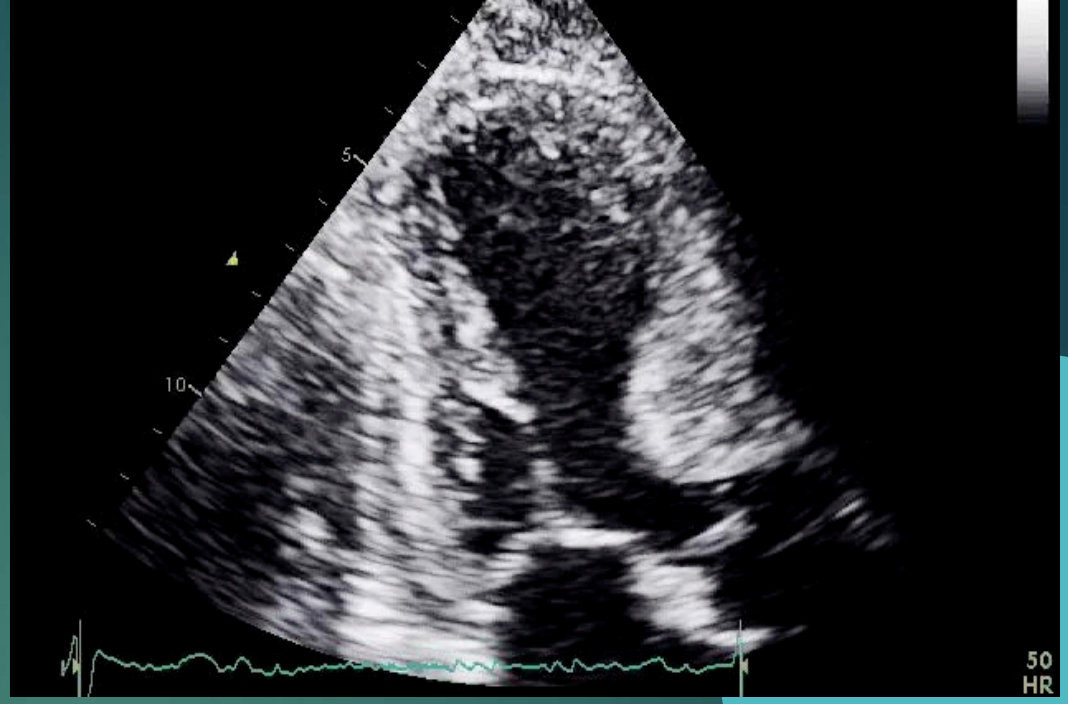
Case 4

- 81-year-old male – past medical history significant for Hep C with cirrhosis, constipation, and carpal tunnel syndrome – presented with a 1-year history of increased SOB edema and weakness which has progressed over the last few months
- Presented to the ED – elevated troponin I 208, BNP 1862 and sinus rhythm with type 1 second degree AV block;



LAVI of 44 ml/m^2
TR velocity 0f 3.0 m/sec

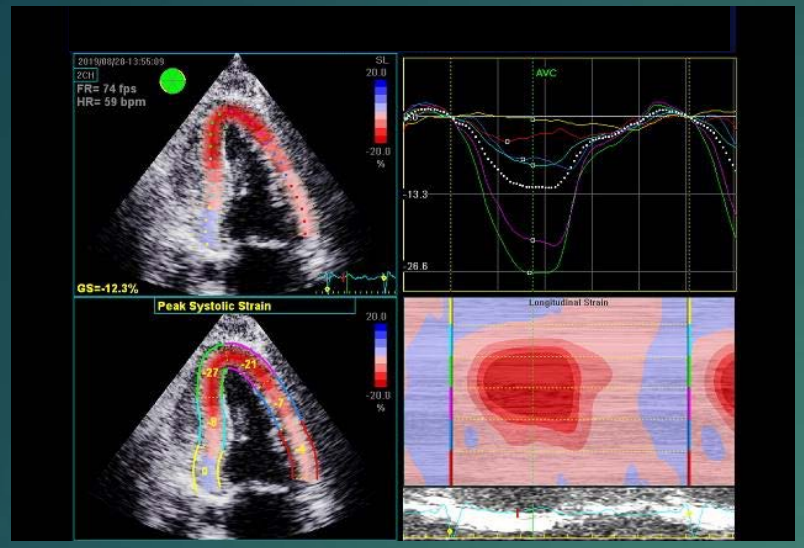


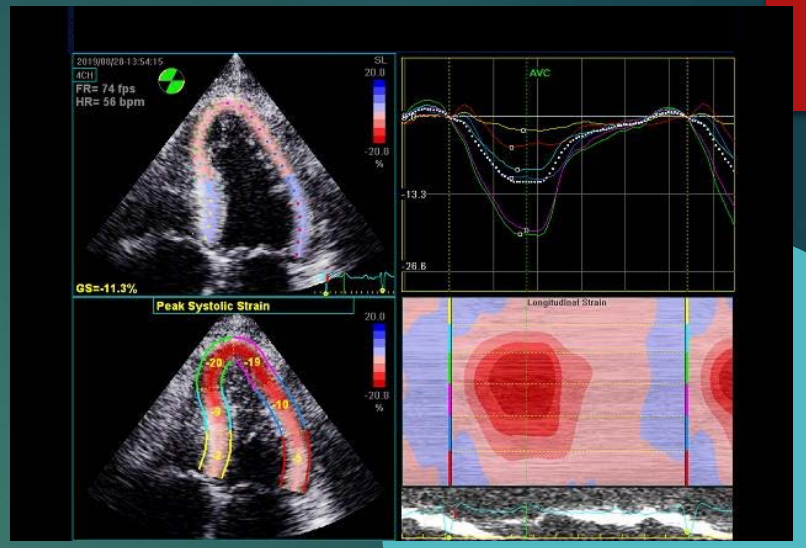


- Increased wall thickness
- Valvular thickening
- Biatrial enlargement
- Intratrial thickening
- Pericardial effusion

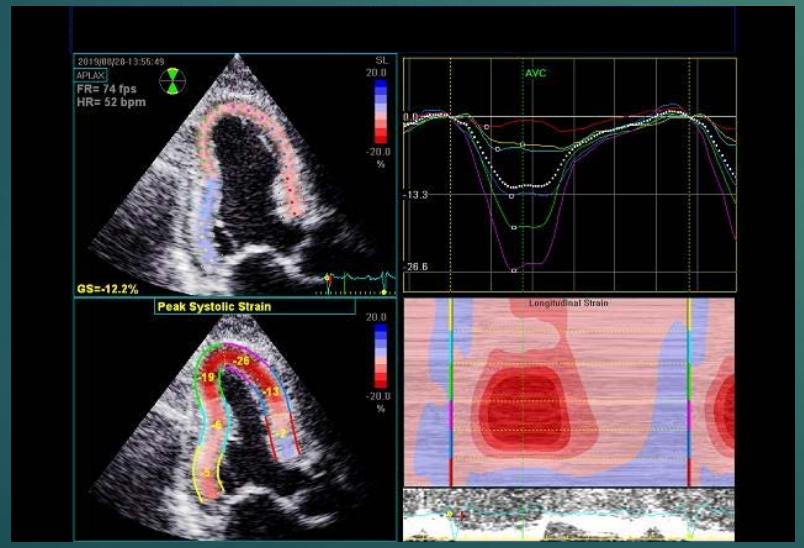
What is the diastolic grade?

WHAT TEST WOULD YOU ORDER NEXT TO MAKE THE DIAGNOSIS?


2019/08/28-13:55:09
2CH
FR= 74 fps
HR= 59 bpm
GS=-12.3%
AVC
Peak Systolic Strain
Longitudinal Strain


2019/08/28-13:54:15
4CH
FR= 74 fps
HR= 56 bpm
GS=-11.3%
AVC
Peak Systolic Strain
Longitudinal Strain

RALS = 2.2


APLAX
FR= 74 fps
HR= 52 bpm
GS=-12.2%
AVC
Peak Systolic Strain
Longitudinal Strain


Peak Systolic Strain
ANT_SEPT
SEPT
ANT
INF
LAT
POST
28/08/2019-13:58:56
GLPS_LAX -12.2 %
GLPS_A4C -11.3 %
GLPS_A2C -12.3 %
GLPS_Avg -11.9 %
AVC_MAN 351 msec
HR_ApLAX 52 bpm
FR_min 74 fps

Average apical LS
Average basal LS + Mid LS

Value> 1.0

93% Sensitive

82% Specific

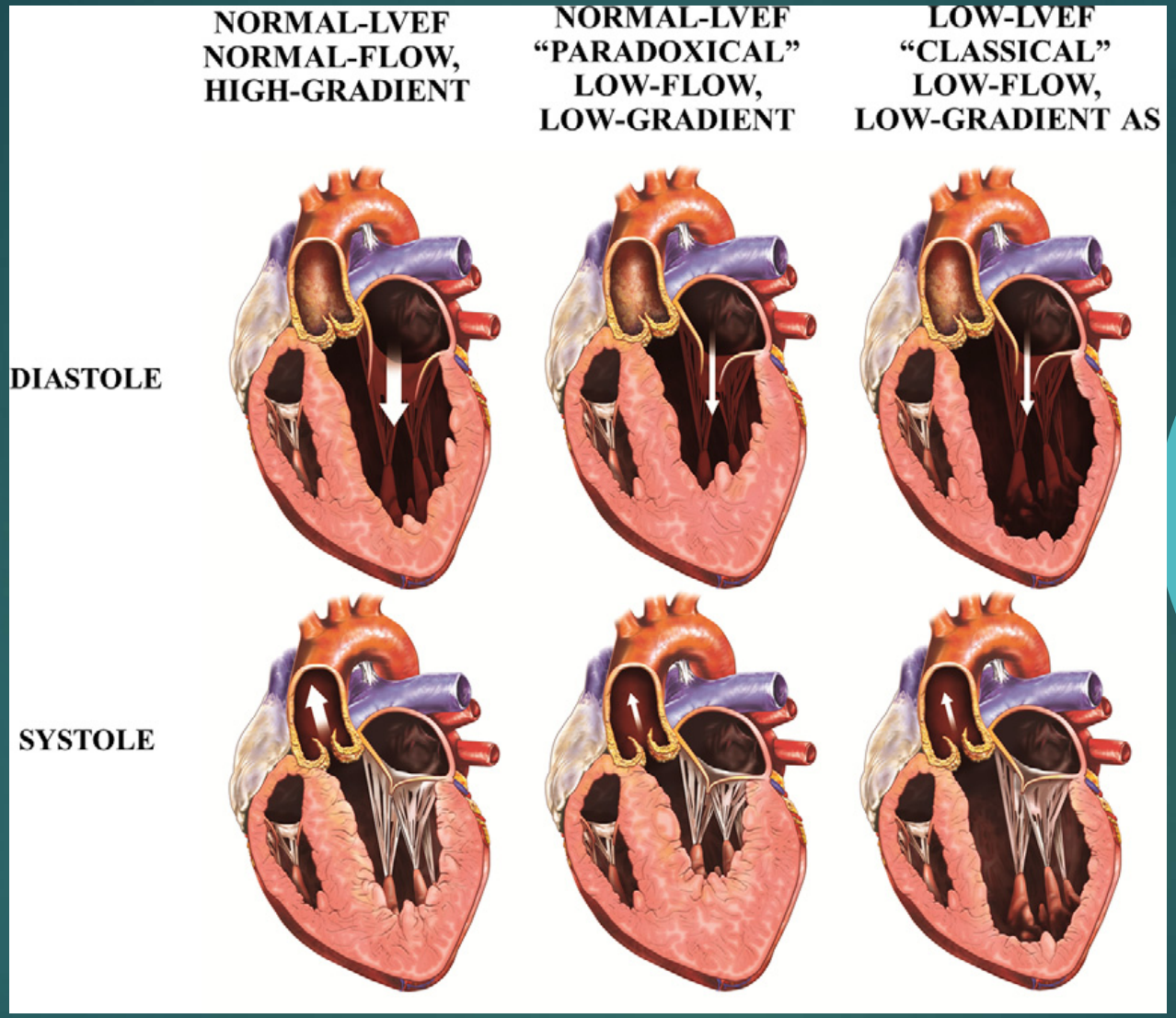
Relative apical sparing of longitudinal strain using two-dimensional speckle-tracking echocardiography is both sensitive and specific for the diagnosis of cardiac amyloidosis

Dermot Phelan, Patrick Collier, Paaladinesh Thavendiranathan, Zoran B Popović, Mazen Hanna, Juan Carlos Plana, Thomas H Marwick, James D Thomas

Heart 2012; 98:1442-1448

Case 5

- Does this 84-year-old woman with dyspnea on minimal exertion, LV systolic dysfunction and a systolic ejection murmur have true or pseudo AS?



EF 40%
SV 53 ml
3.5 m/sec
29 mmHg
0.77 cm^2

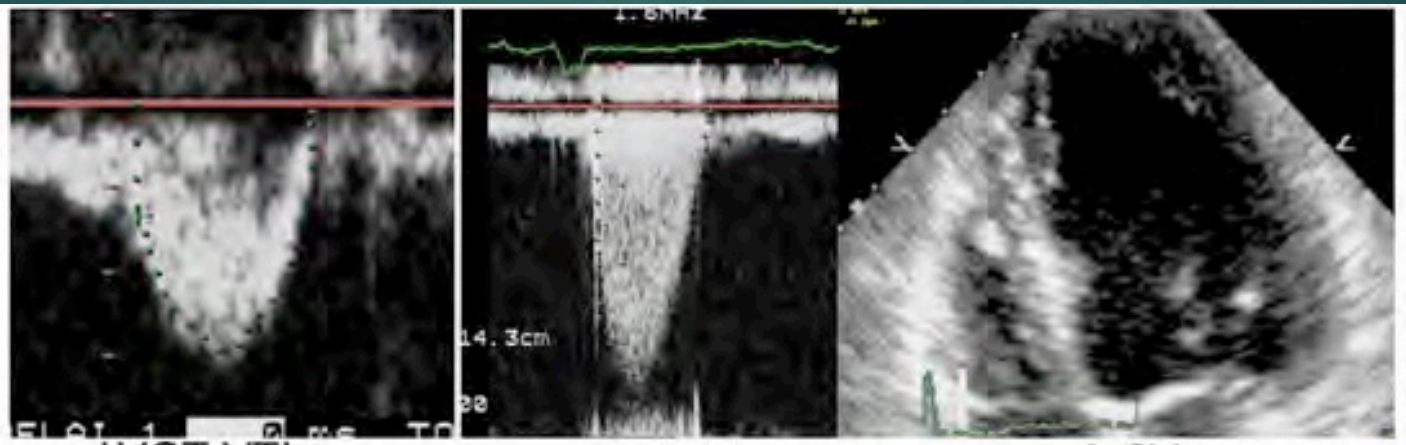
D1

D3

D2

J Am Coll Cardio 2012;60:1845

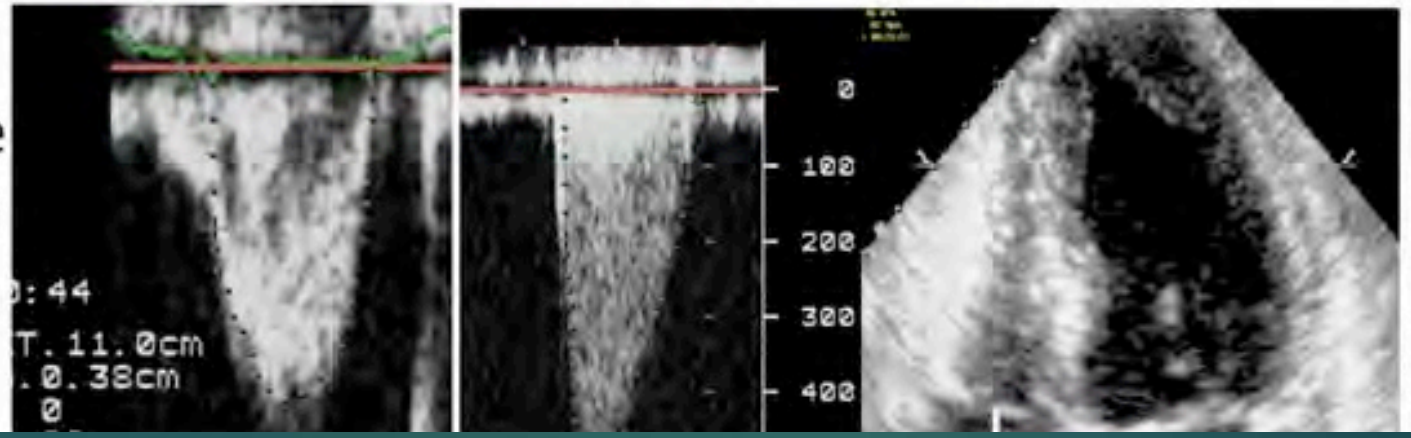
Resting Echo



LVOT VTI | Ao VTI | 4-CV

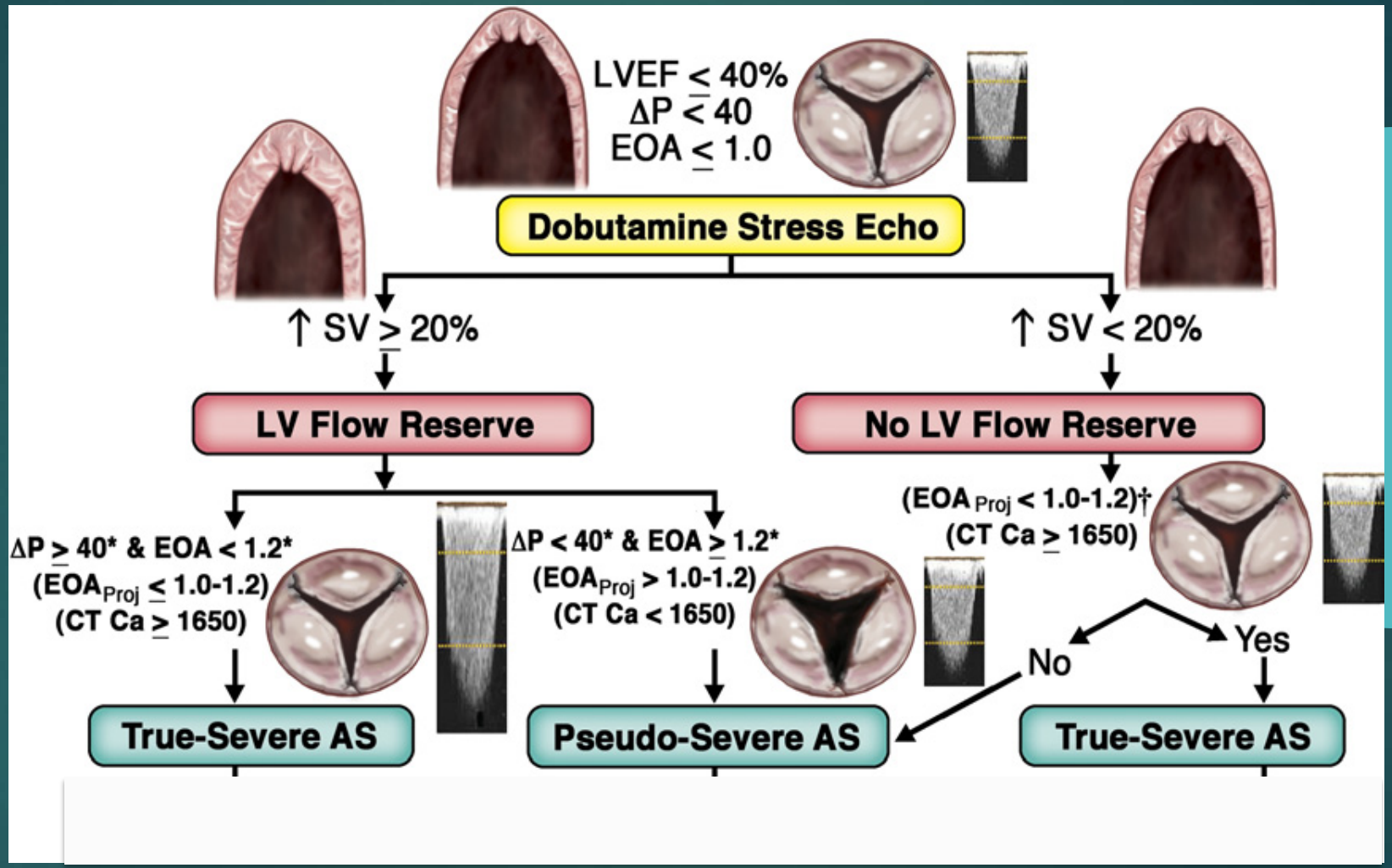
SV= 53 ml
EF= 40%
PPG= 49 mmHg
MPG= 29 mmHg
AVA= 0.77 cm^2

Dobutamine Stress Echo



SV= 73 ml
EF = 50%
PPG= 92 mmHg
MPG= 52 mmHg
AVA= 0.75 cm^2

Lancellotti et al, JASE 2017



J Am Coll Cardio 2012;60:1845

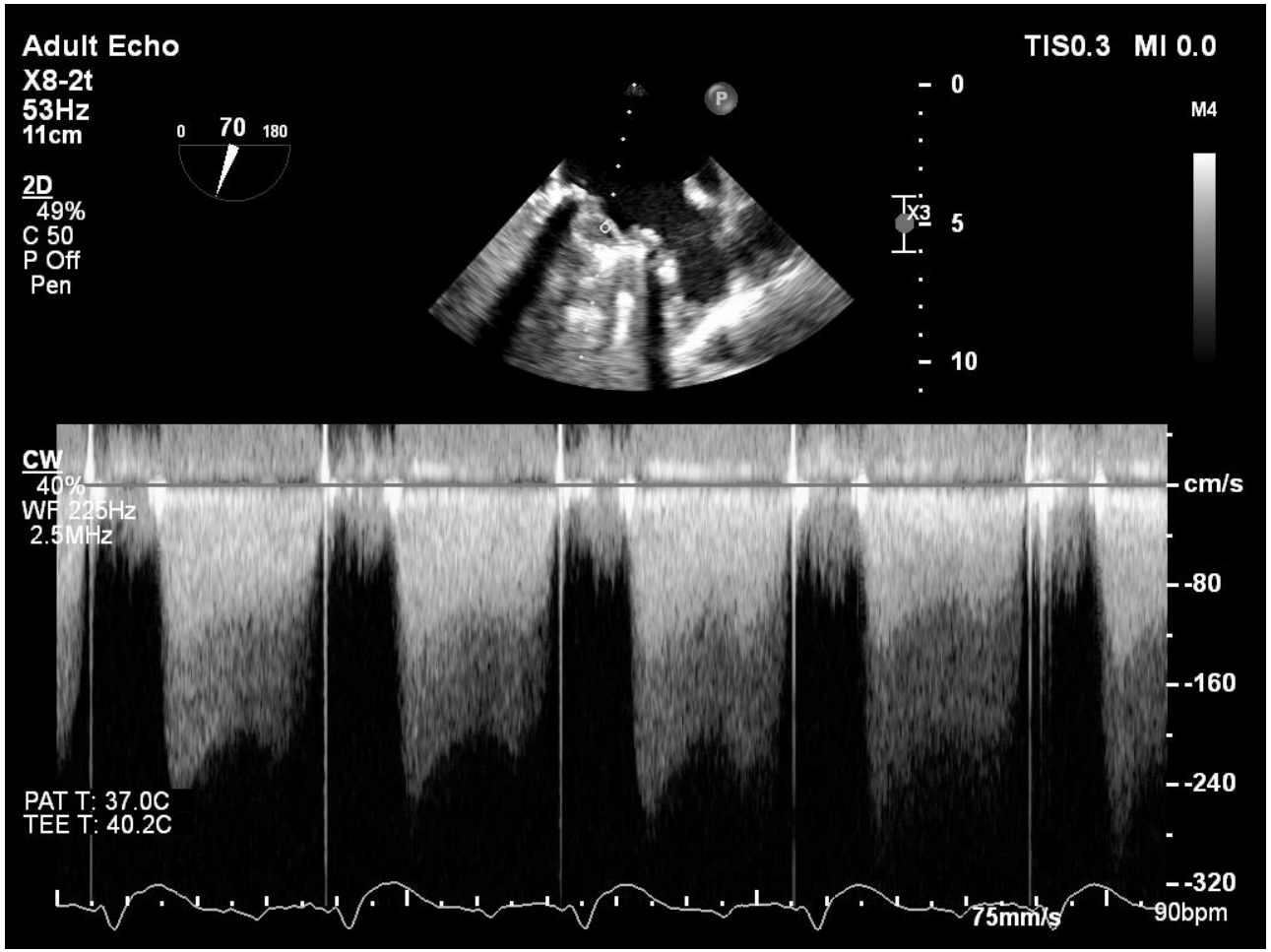
Case 6

- 57 year old with a mechanical mitral valve replacement and tricuspid valve repair secondary to valvular regurgitation in 2012
- Presents in cardiogenic shock

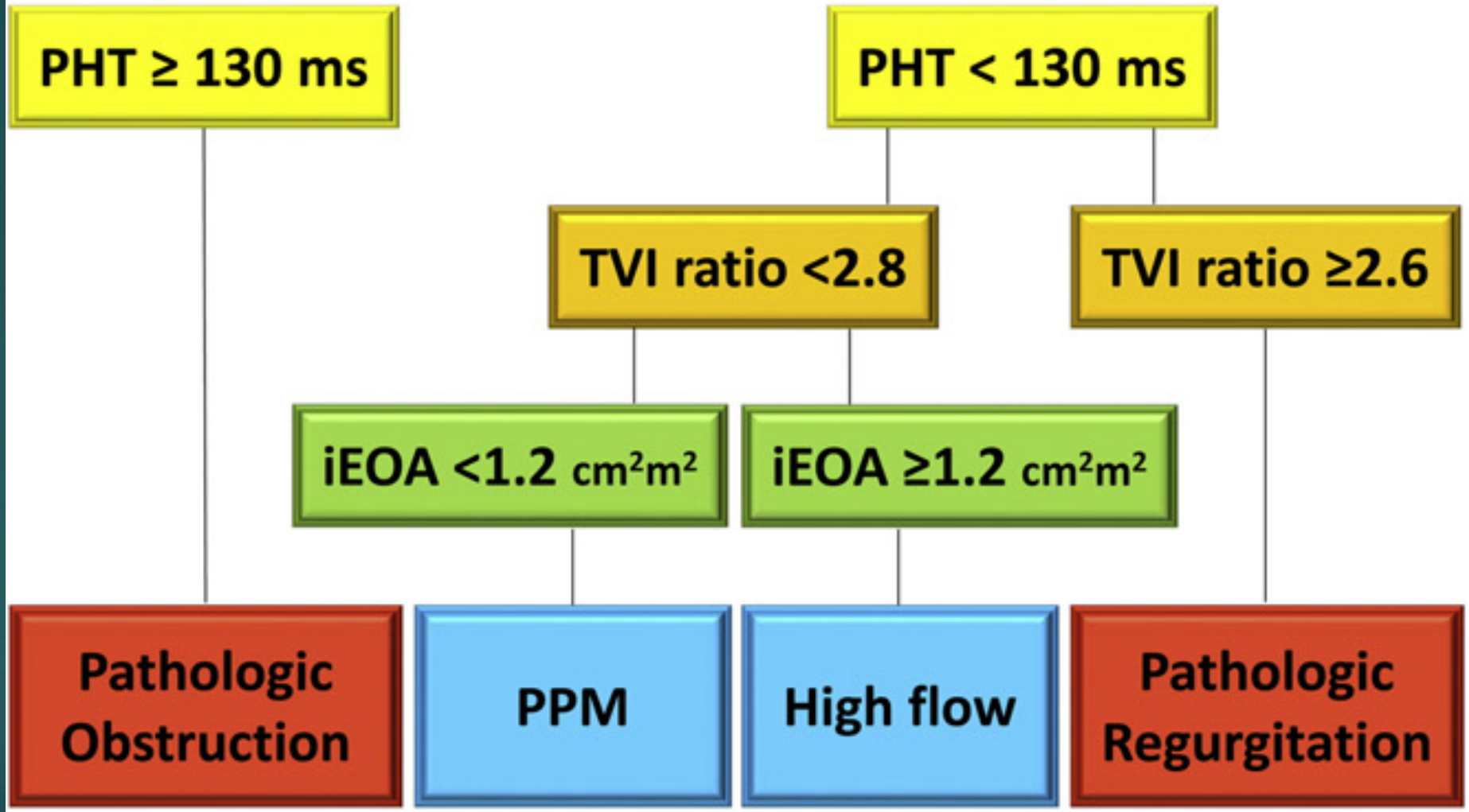
Baseline hemodynamic data

- E velocity is 1.4 m/sec
- Mean gradient 4 mmHg (72 bpm)
- TVI ratio 1.89
- PHT 95 msec

- E velocity is 2.5 m/sec
- Mean gradient 15 mmHg (90 bpm)
- TVI ratio is 4.8
- PHT 182 msec

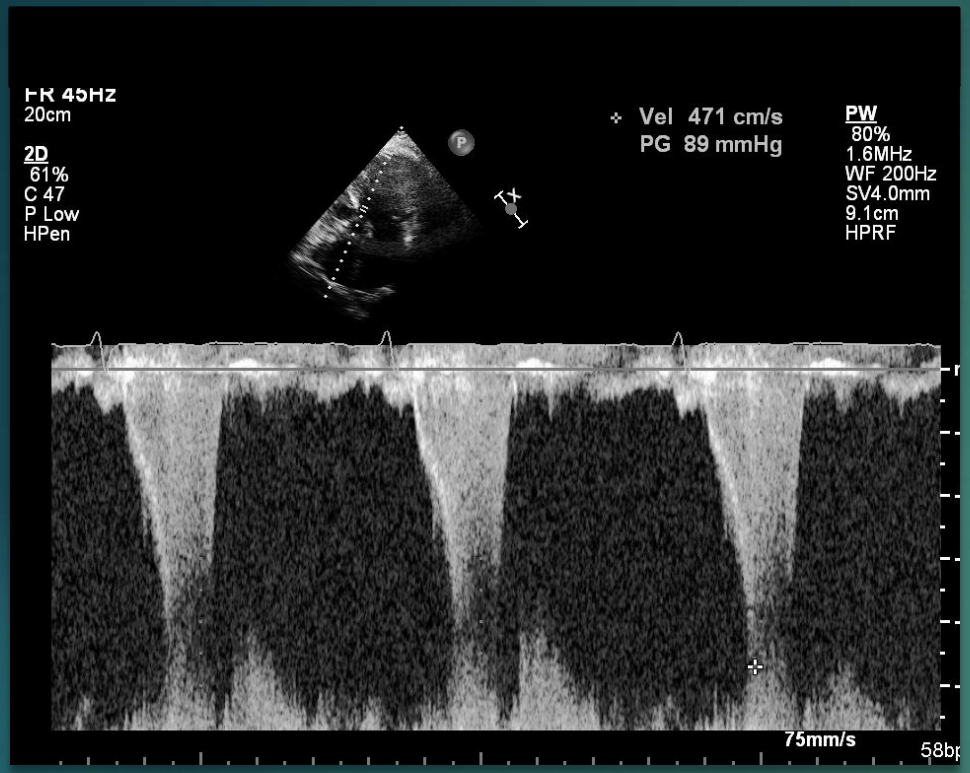


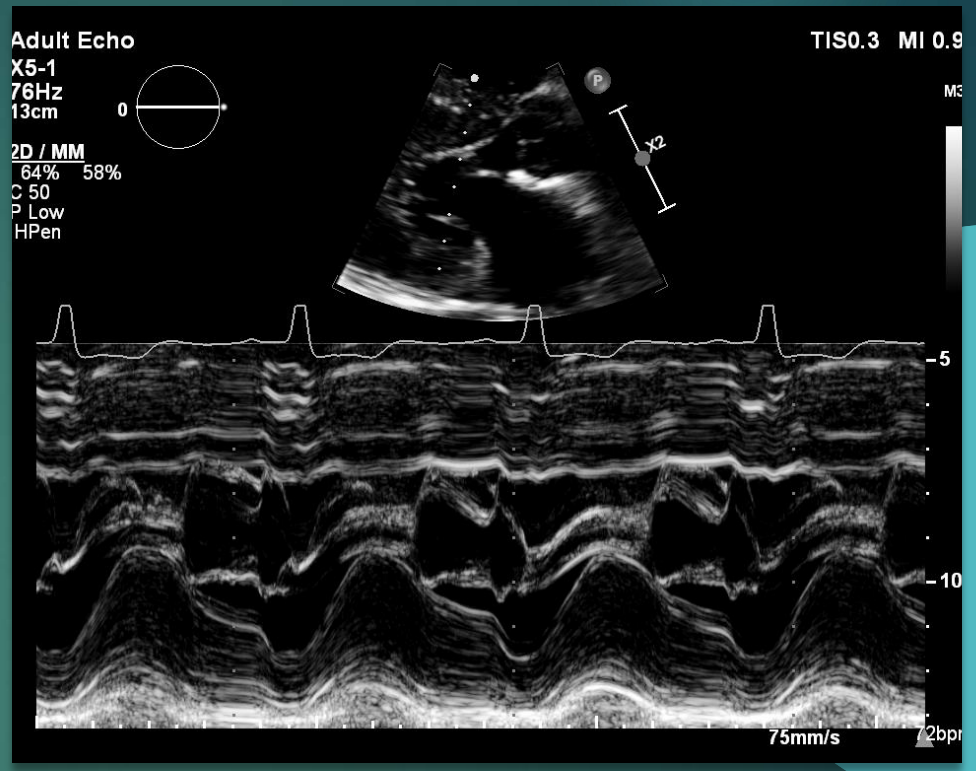
Mechanical Mitral Valve Prosthesis with High Mean Gradient



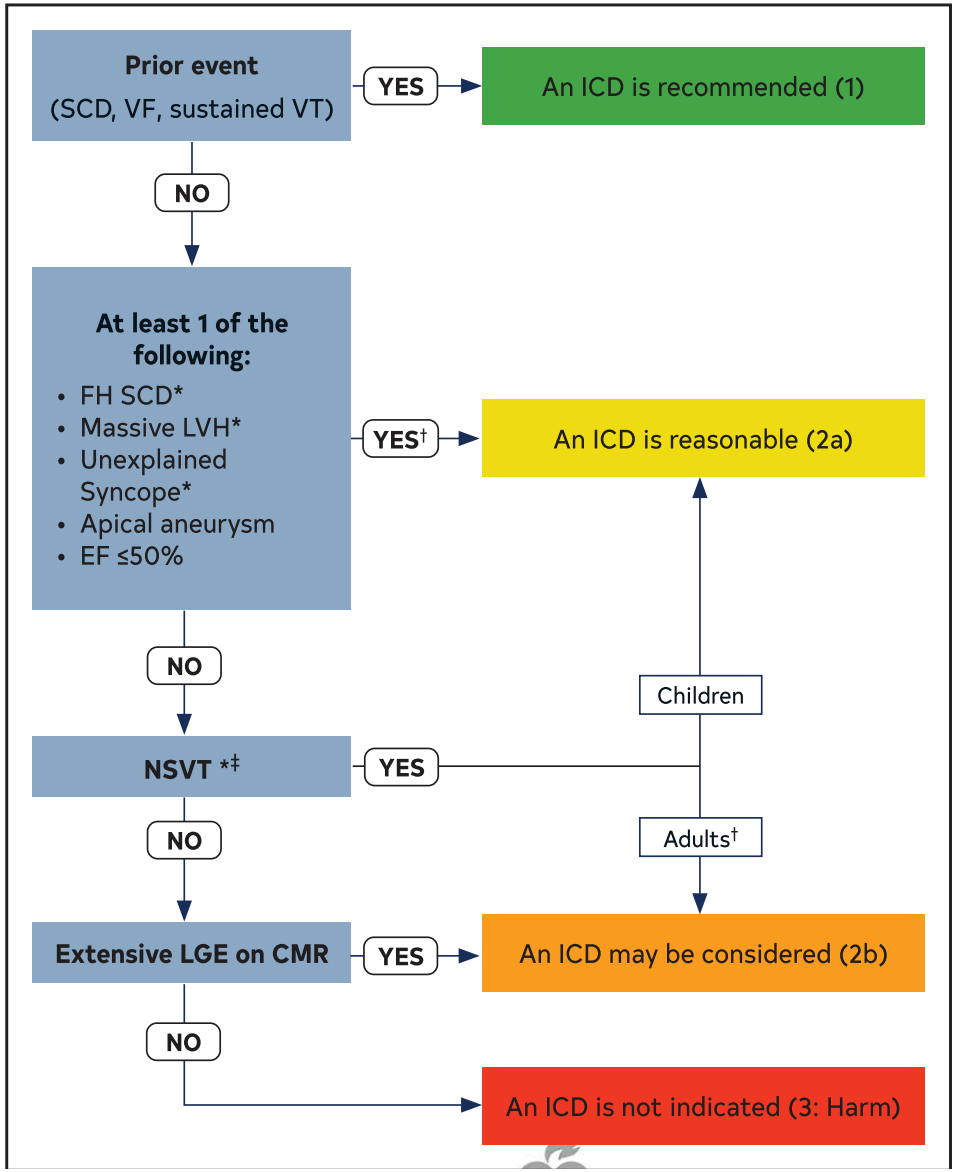
Treatment

- Thrombosed left sided mechanic prosthetic heart valve who present with symptoms of valve obstruction:
  - Slow infusion, low dose fibrinolytic therapy
  - Emergency surgery


20cm
2D
61%
C 47
P Low
HPen
Vel 471 cm/s
PG 89 mmHg
PW
80%
1.6MHz
WF 200Hz
SV4.0mm
9.1cm
HPRF
75mm/s


Adult Echo
TIS0.3 MI 0.9
X5-1
76Hz
13cm
2D / MM
64% 58%
C 50
P Low
HPen
-5
-10
75mm/s

Case 7



Circulation. 2020;142:

Conclusion

- In the absence of an oral exam component, I can see echo images as a gateway to assessment of clinical competency
  - Diagnosis
  - Management