

# Rheumatic Heart Disease

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12/4/2025



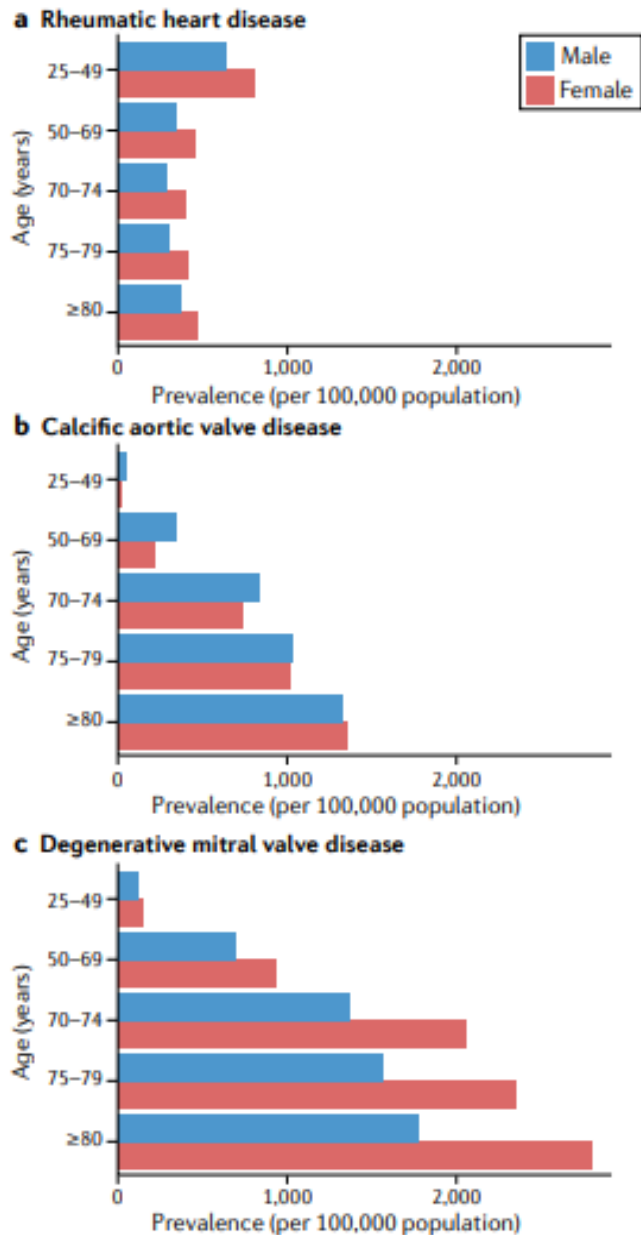
**UT Southwestern**  
Medical Center



 **Parkland**

# Aim to improve knowledge of:

- Rheumatic heart disease epidemiology and clinical features
- Cardiac valvular complications of rheumatic heart disease (RHD)
- Echo findings in RHD
- Management strategies for mitral stenosis



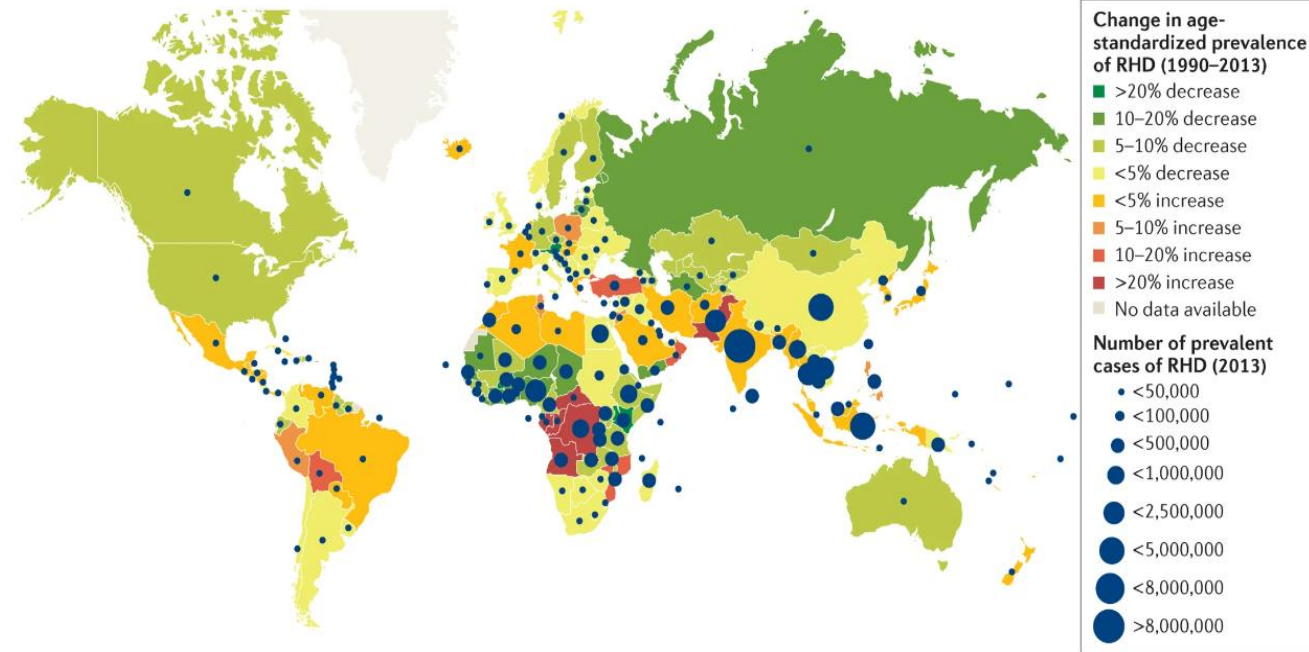
-Rheumatic heart disease remains common worldwide

-Unlike other etiologies which increase with age, RHD more common in younger patients, more women

-Global disparities: majority AS and MR in industrialized, higher income nations; majority RHD in nations with less health care resources

# RHD Epidemiology

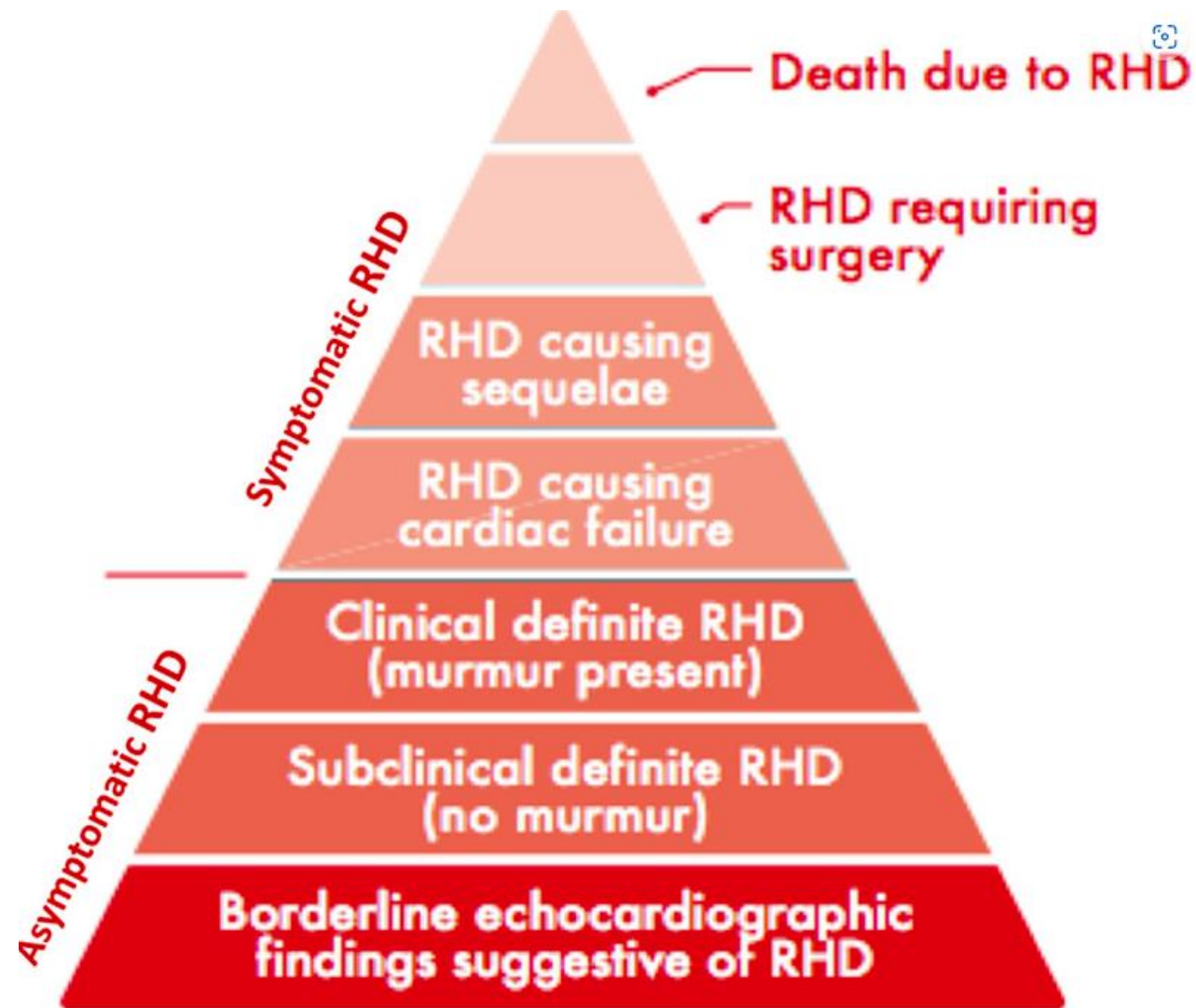
- Greater than 38 million cases and ~ 300,000 deaths globally in 2017
- Highest prevalence and mortality in Oceania, South Asia, and sub-Saharan Africa



# RHD Epidemiology

- Sub-Saharan Africa: 0.5-3% school age children with RHD
- Zambia: study of school children screened with portable cardiac ultrasound resulted in RHD diagnosis 11.8 per 1000 children





# RHD Pathophysiology

Group A Strep (*Streptococcus pyogenes*) pharyngitis



Acute Rheumatic Fever



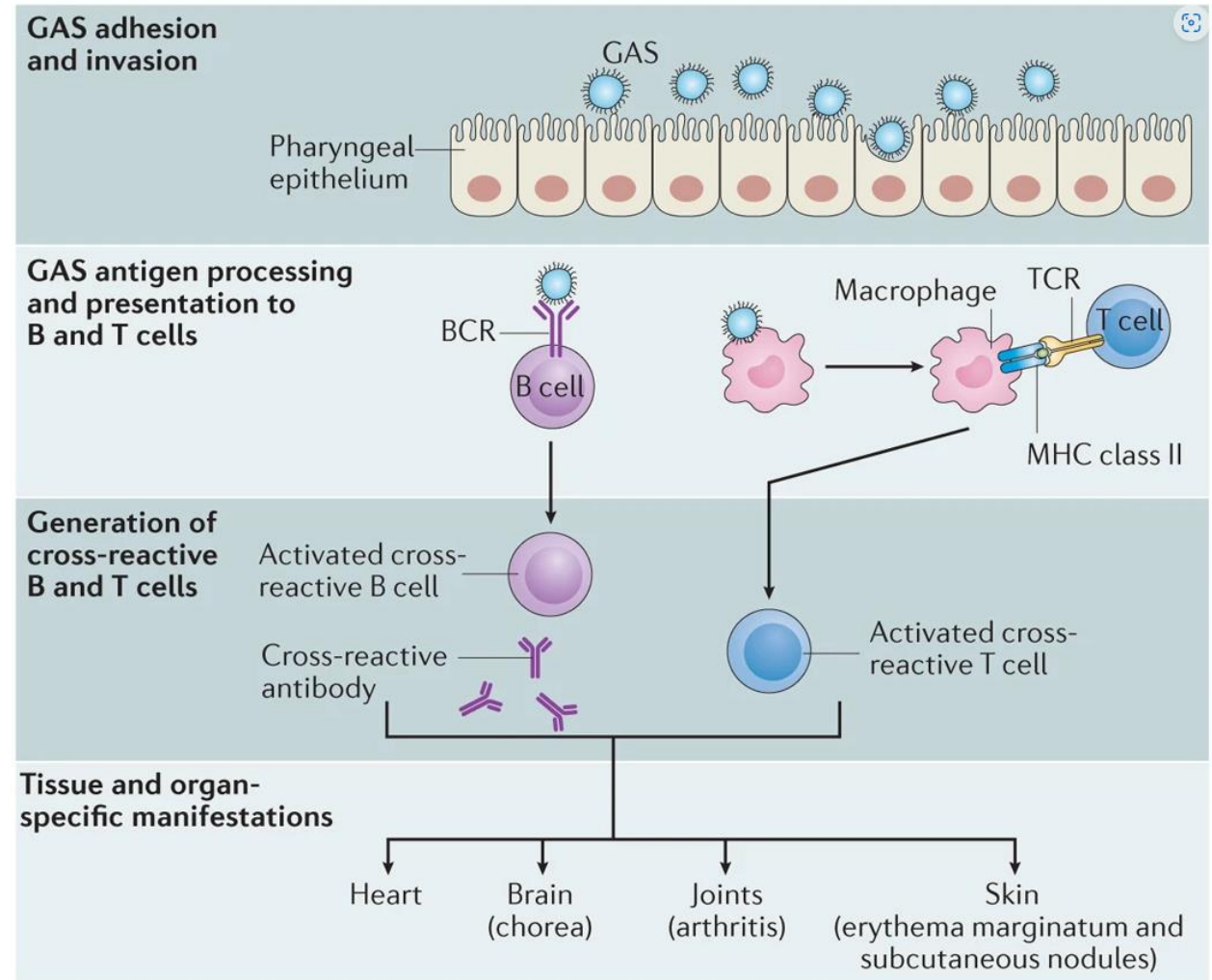
Immune/inflammatory Response



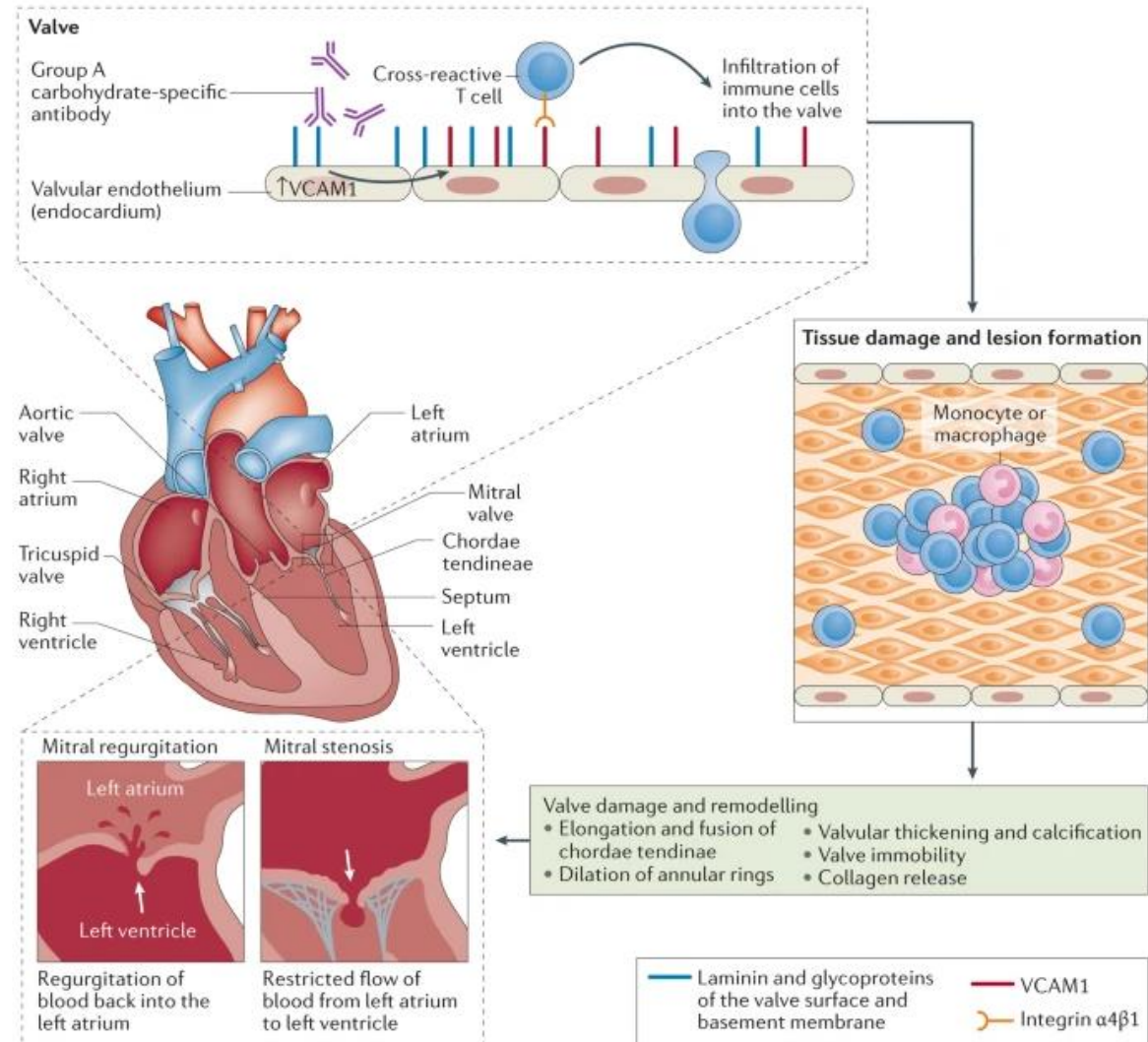
Recurrent episodes

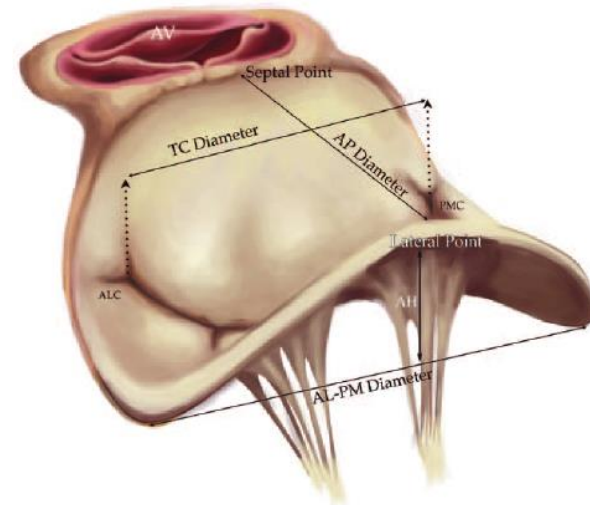
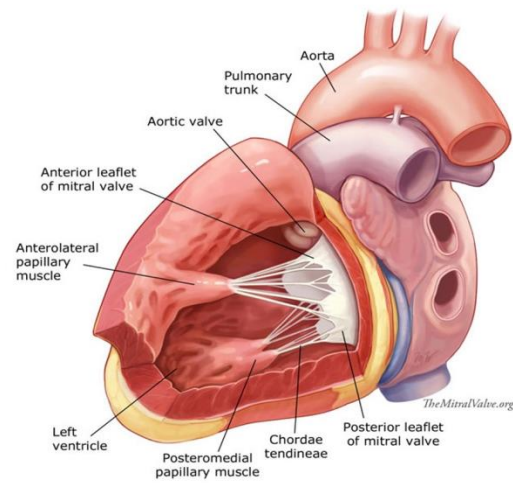
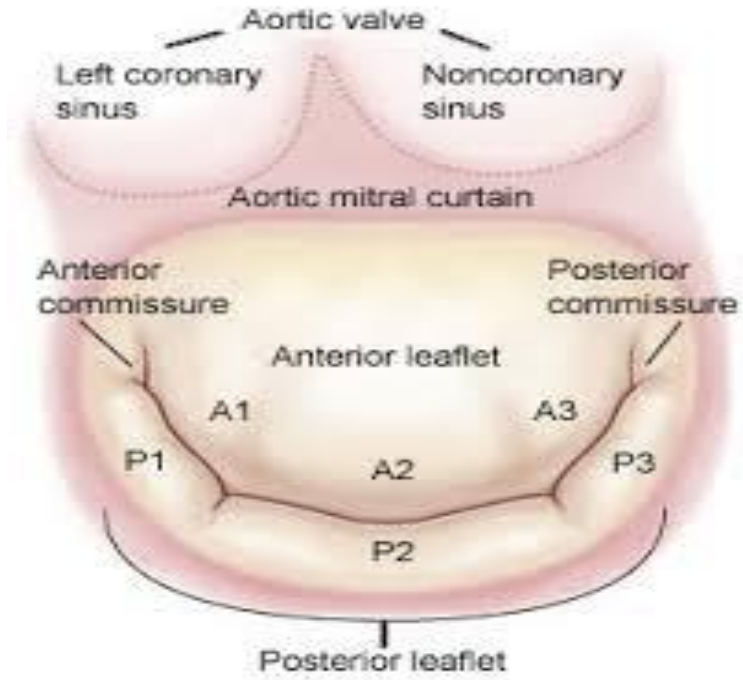
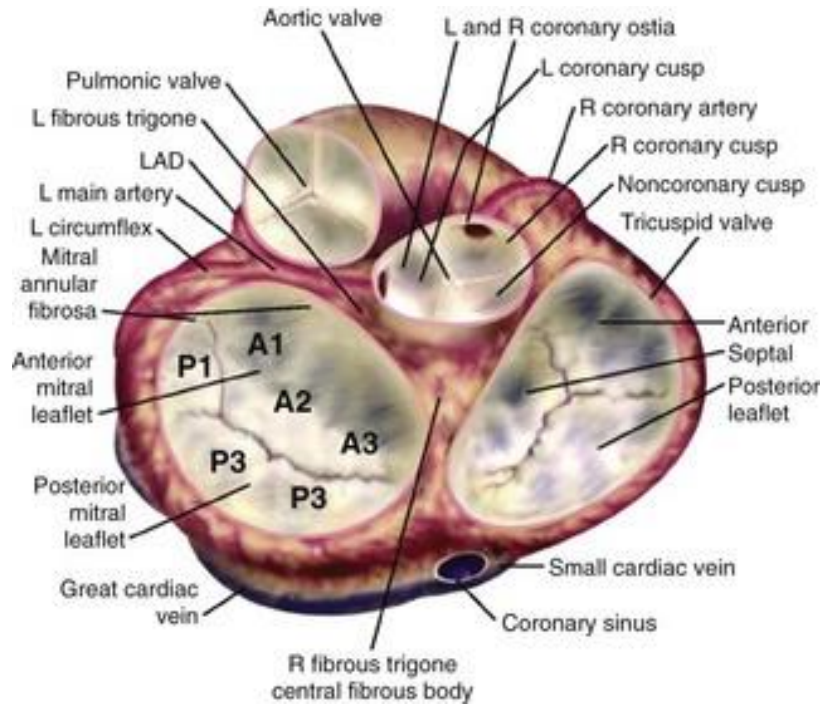


Worsening inflammatory response and progressive valve damage

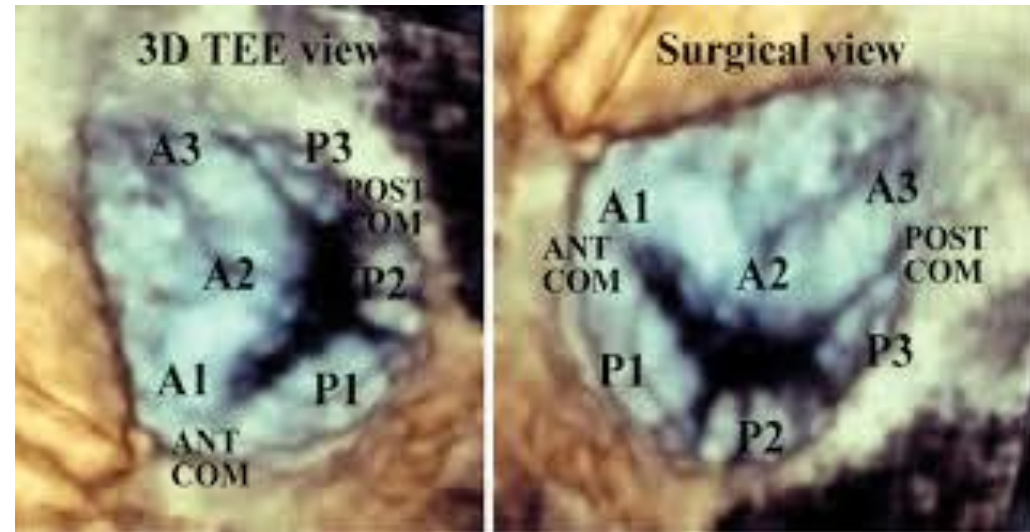
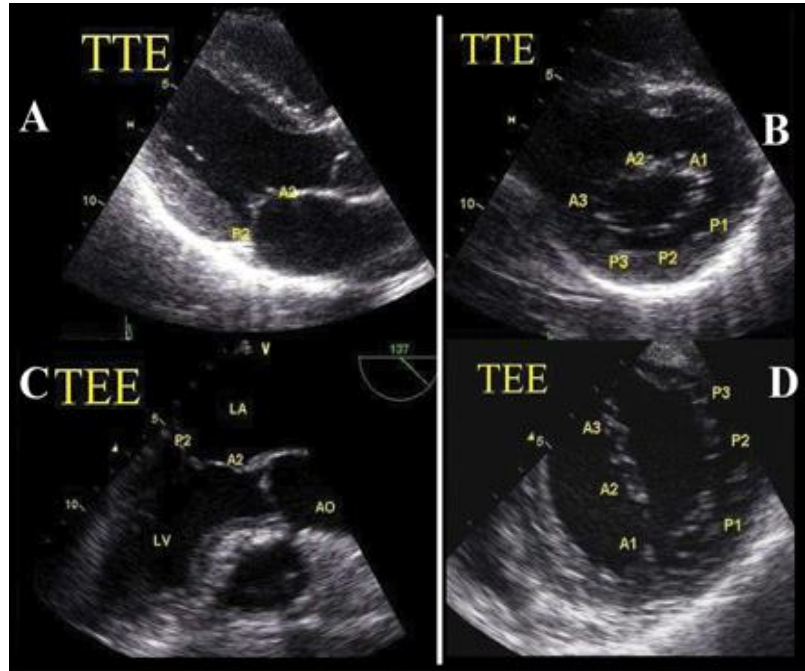


# RHD Pathophysiology





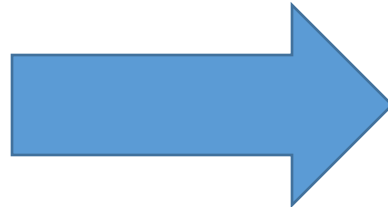
# Mitral Valve Imaging



# RHD Pathophysiology

- Childhood:

- Acute mitral valvulitis
- Annular dilatation
- Elongation of the chordae
- Tethering of posterior leaflet
- Relative prolapse of anterior leaflet
- Predominantly mitral regurgitation



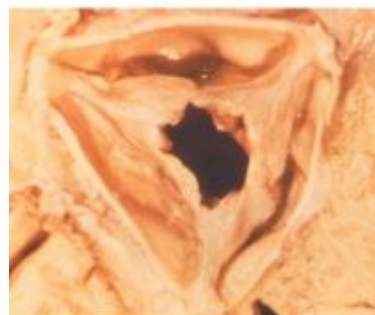
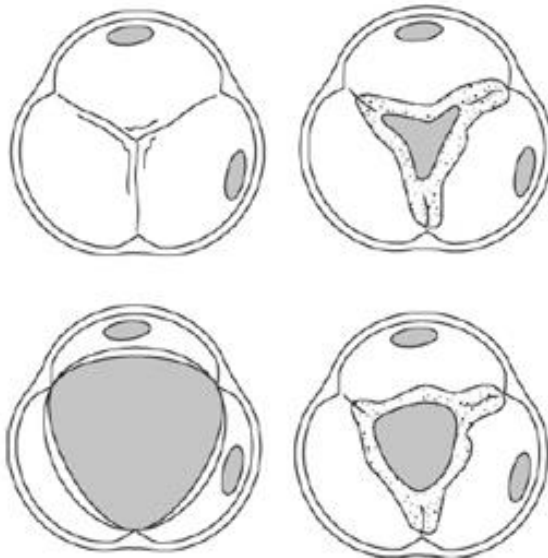
- Adulthood:

- Mitral leaflet and chordal thickening/fibrosis
- Commissural fusion
- Leaflet doming, restricted leaflet opening, reduced mitral valve orifice area
- +/- associated mitral regurgitation
- +/- aortic valve commissural fusion-> aortic regurgitation

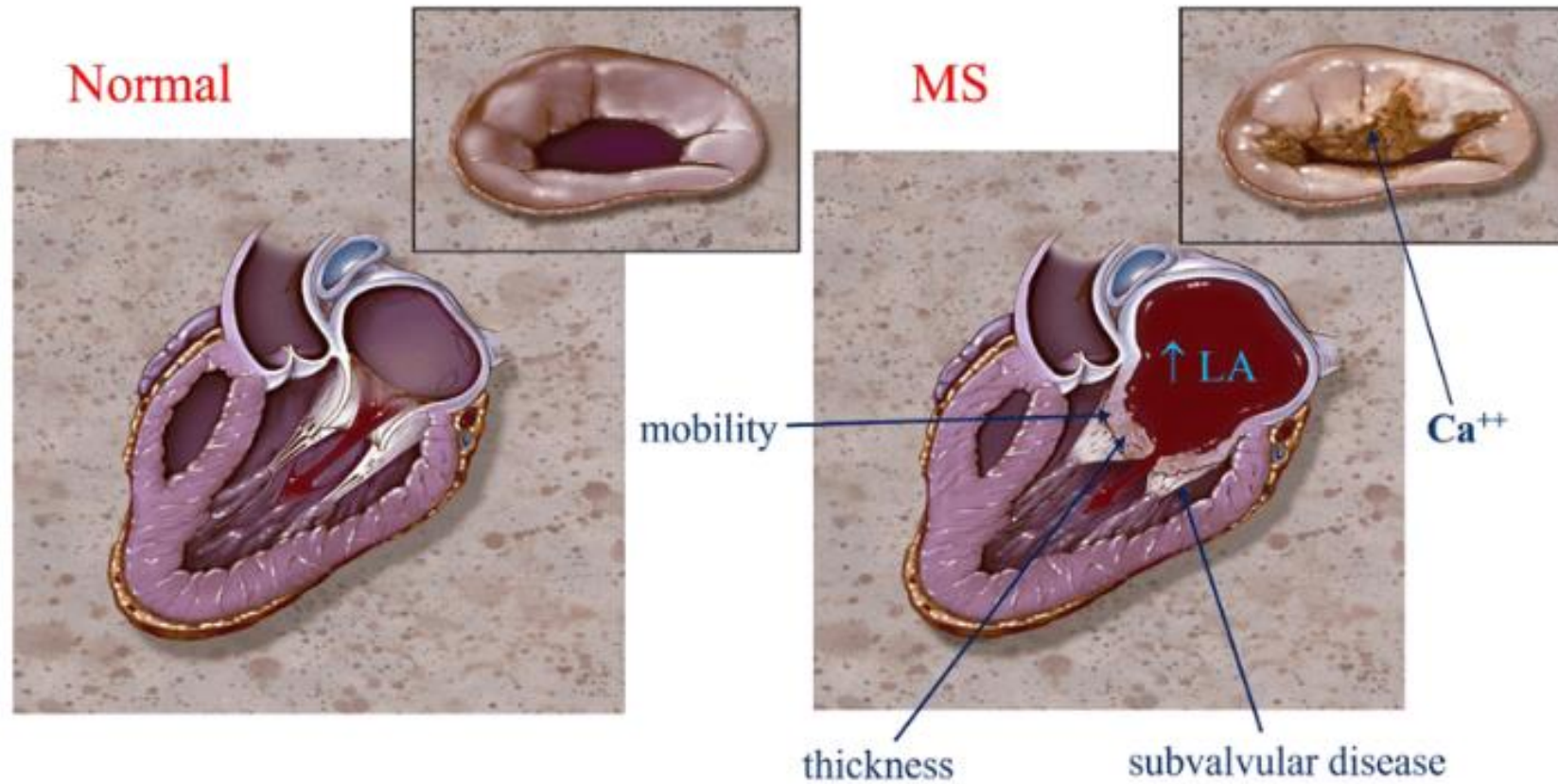
# RHD- Aortic Valve (more rare than mitral)

Normal

Rheumatic



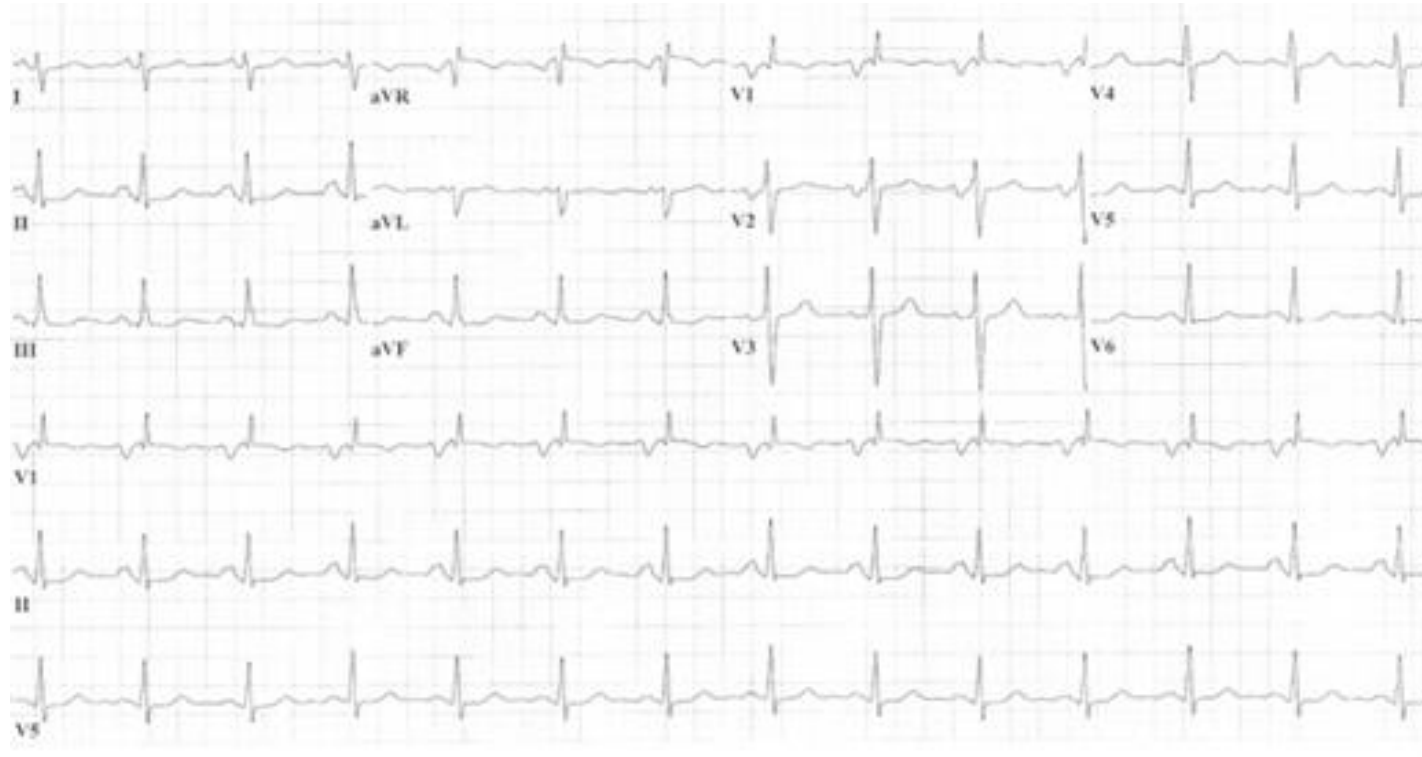
# RHD – Mitral stenosis



# RHD - Mitral Stenosis

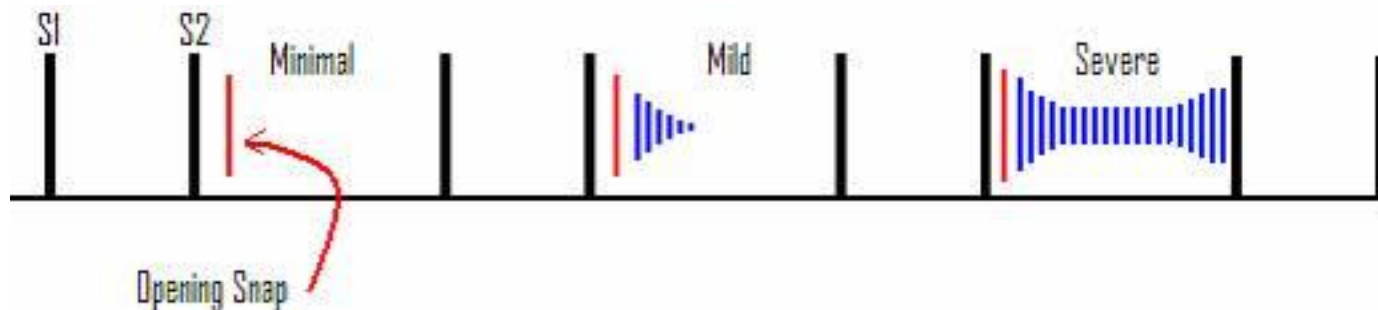
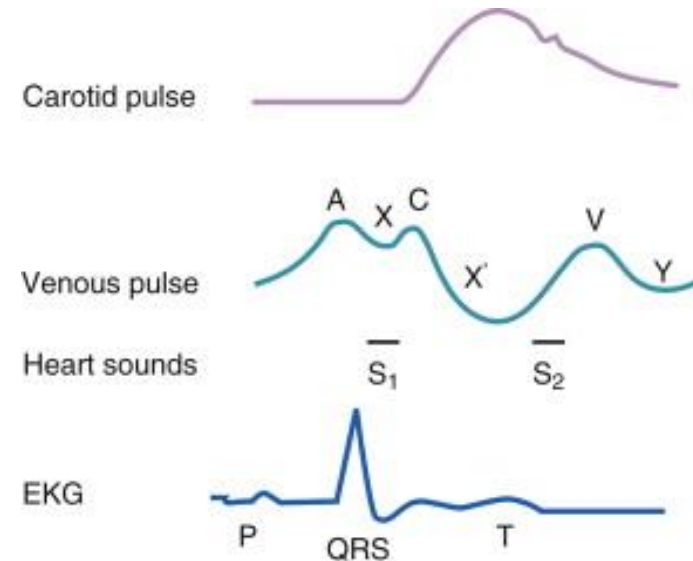
- Increased left atrial pressure, increased pulmonary capillary wedge pressure
- Clinical features:
  - Slowly progressive (decades)
  - Dyspnea, increased with exertion or other states that increase heart rate/cardiac output (i.e. pregnancy)
  - Atrial fibrillation -> embolic events, stroke
  - Pulmonary hypertension->Right sided heart failure
  - Tricuspid regurgitation secondary to PH
  - Advanced: pulmonary edema, blood-tinged/hemoptysis

# RHD - Mitral Stenosis

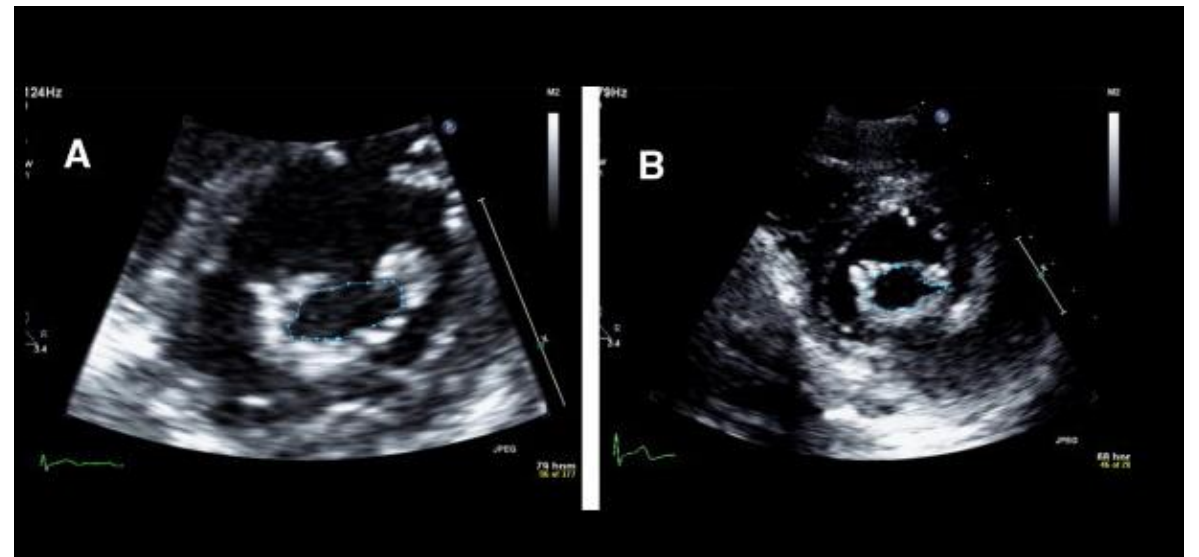
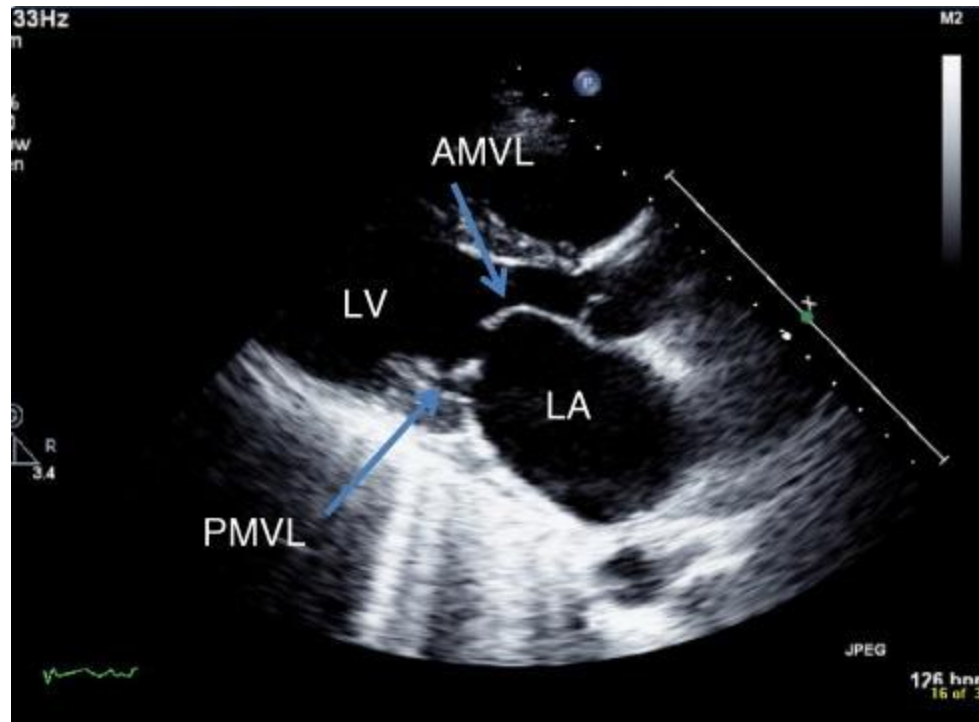


# RHD- Mitral Stenosis

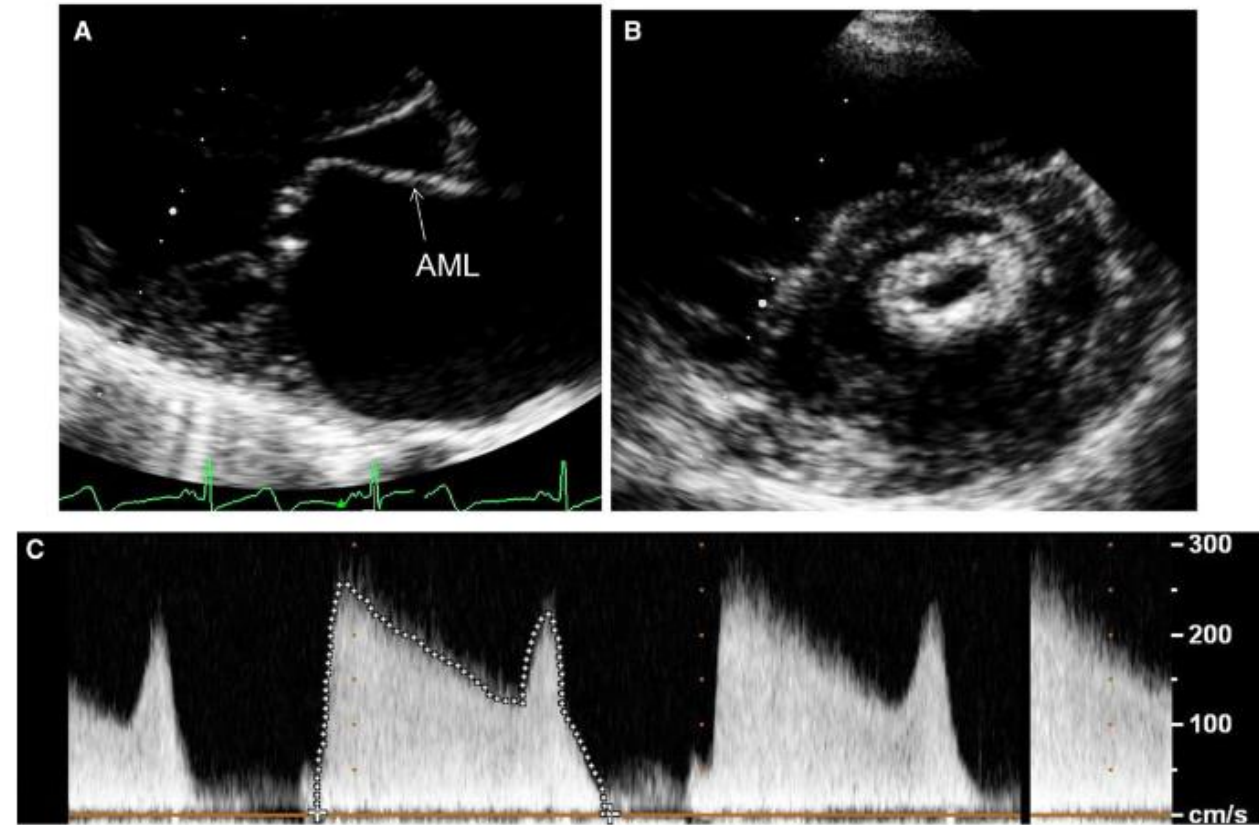
- Physical Exam:
  - JVD: Prominent “a” wave (if in NSR), no “a” wave if AF
  - Low pitched diastolic rumble
  - Loud S1 (stiff leaflets close)
  - P2 louder when PH present
  - Opening snap after S2 : this interval becomes shortened as MS worsens : less than 70 msec = severe MS



# RHD – Mitral stenosis



# RHD – Mitral stenosis



# RHD - Mitral Stenosis

- Echo findings:
  - Thickened leaflets, doming, commissural fusion
  - Reduced mitral valve area on planimetry/Doppler
  - Increased transmitral gradient (at HR = x)
  - Dilated LA; normal LV size
  - Pulmonary HTN – increased RVSP, RA, RVH

# Echo Assessment of mitral stenosis

- Diastolic color flow acceleration
- Mean gradient – trace VTI of CW mitral inflow
- Always report HR; Average several cardiac cycles if afib
- MVA by pressure half time or planimetry
  - $MVA = 220 / PHT$

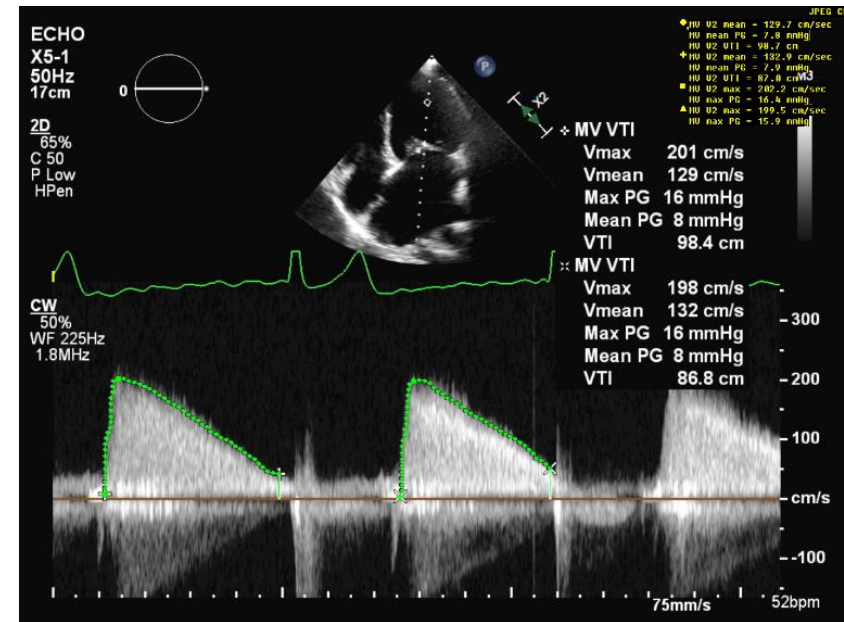


1.17 cm<sup>2</sup>

1.82cm<sup>2</sup>

2.13cm<sup>2</sup>

(Normal MVA > 4 cm<sup>2</sup>)



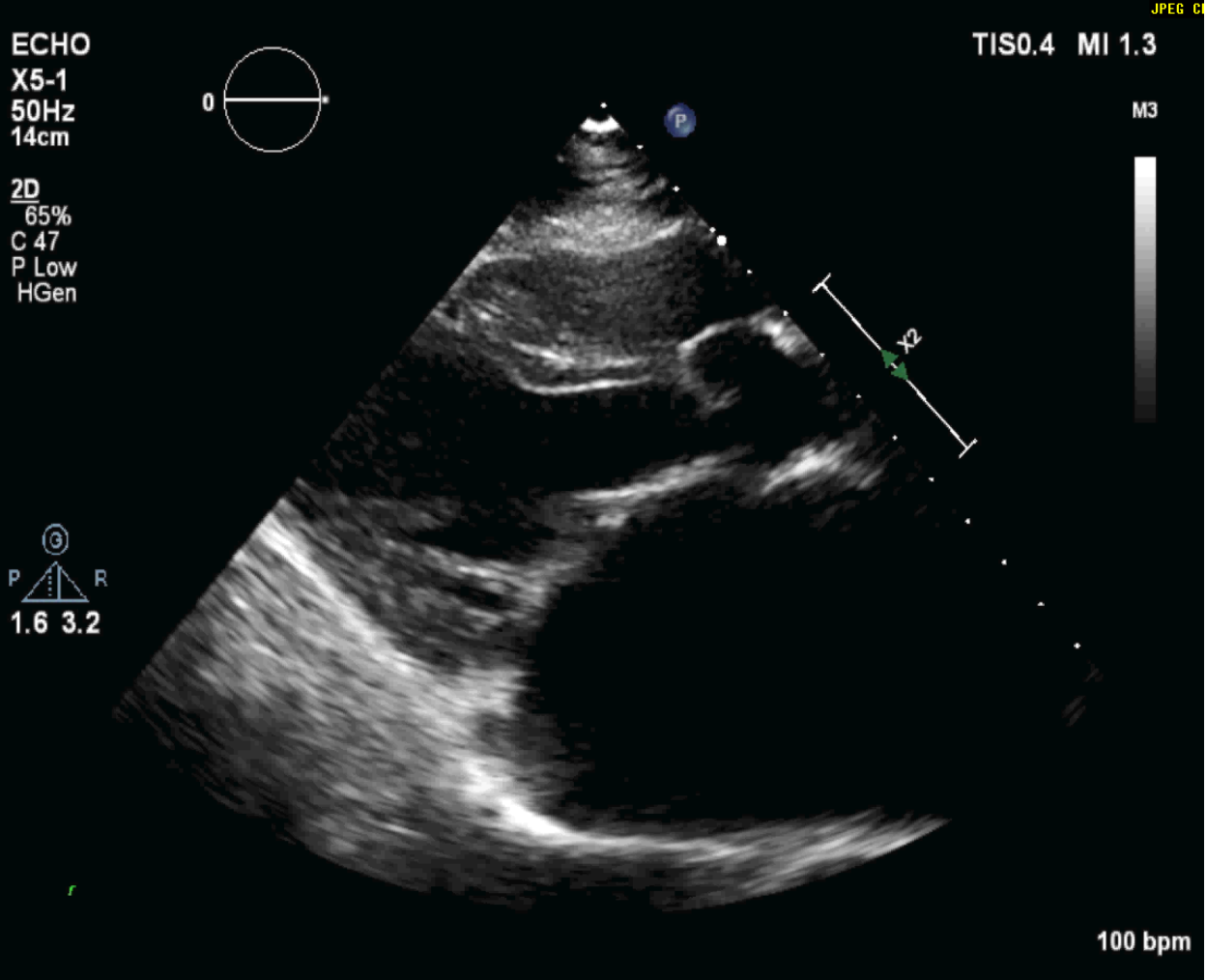
ECHO  
X5-1  
50Hz  
14cm

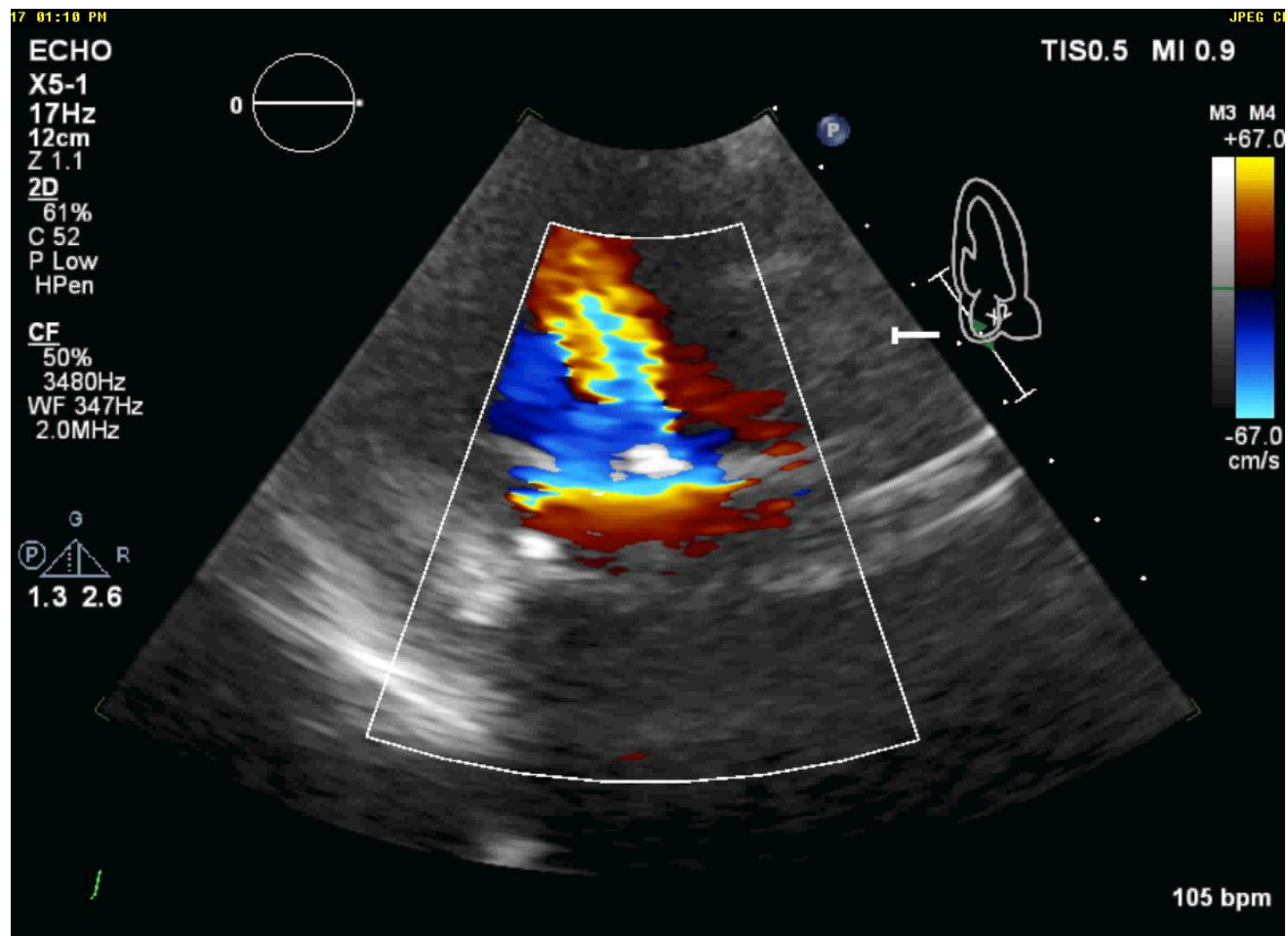


TISO.4 MI 1.3

M3

2D  
65%  
C 47  
P Low  
HGen





17 01:10 PM

JPEG C

ECHO

X5-1

50Hz

17cm



TIS0.3 MI 1.1

M3

2D

57%

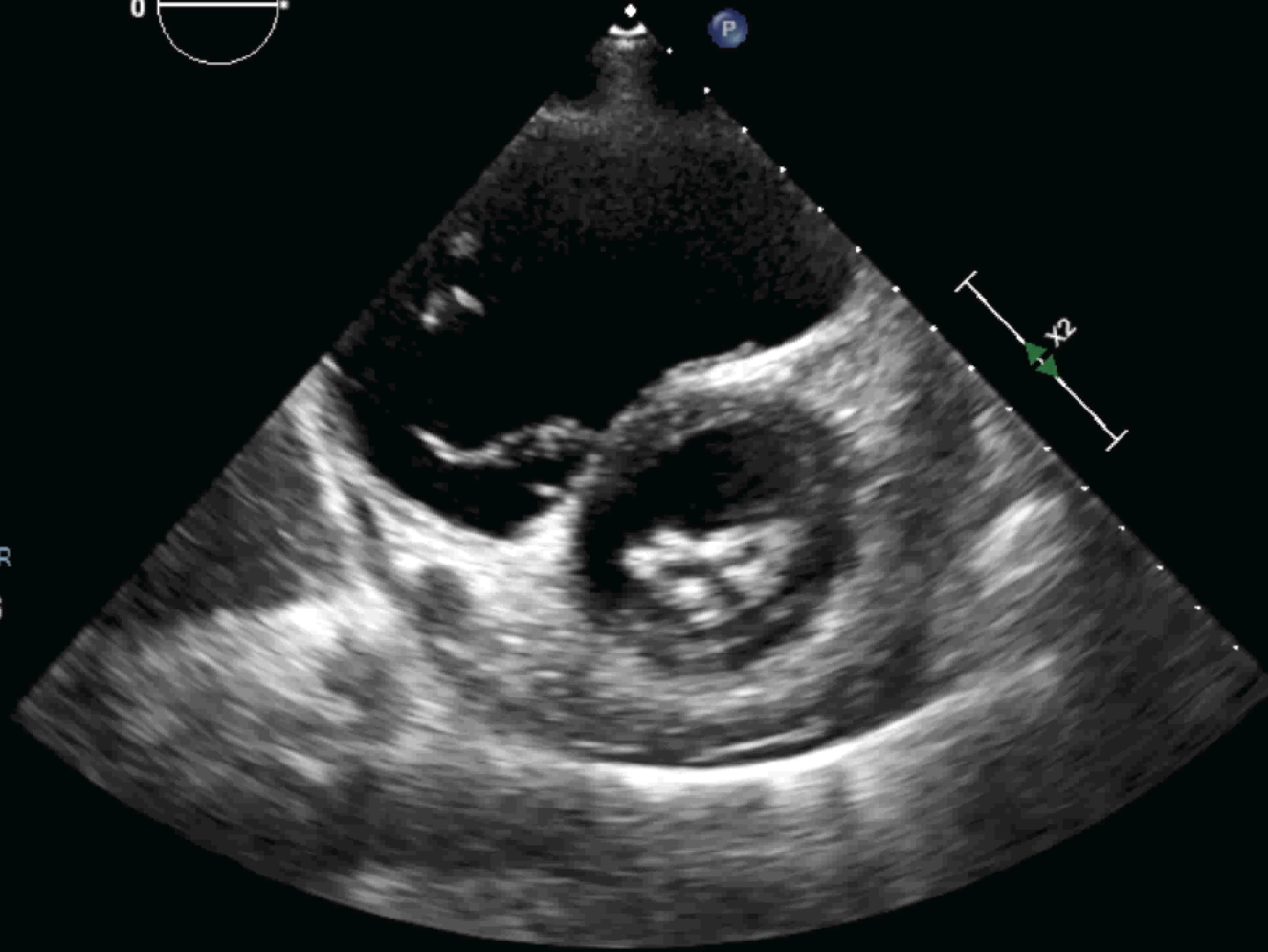
C 55

P Low

HPen

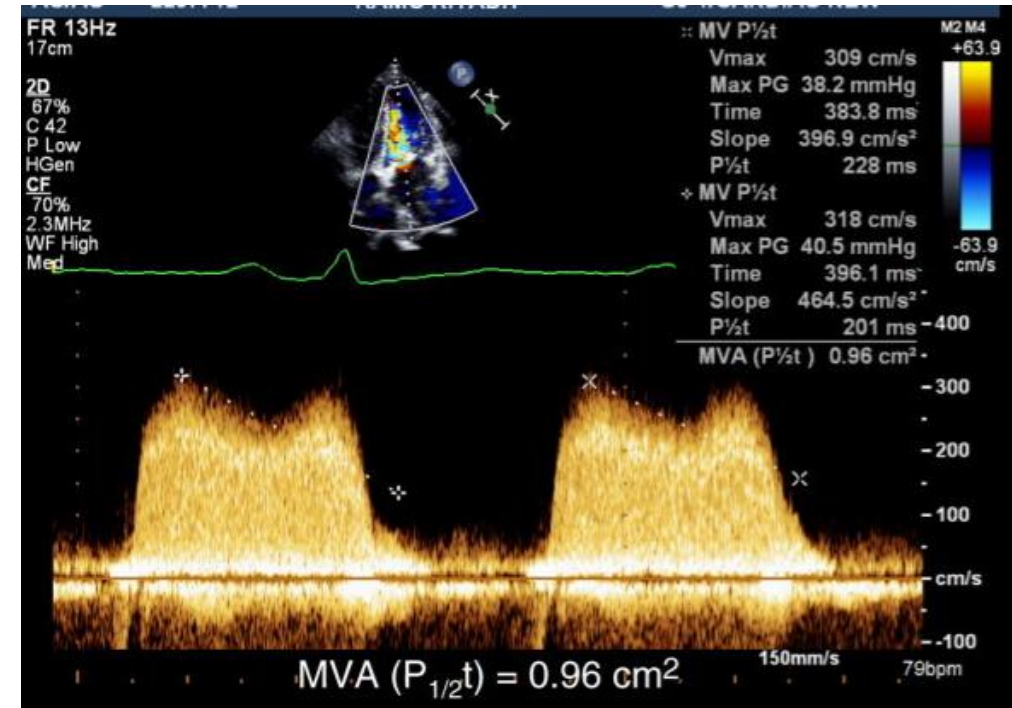
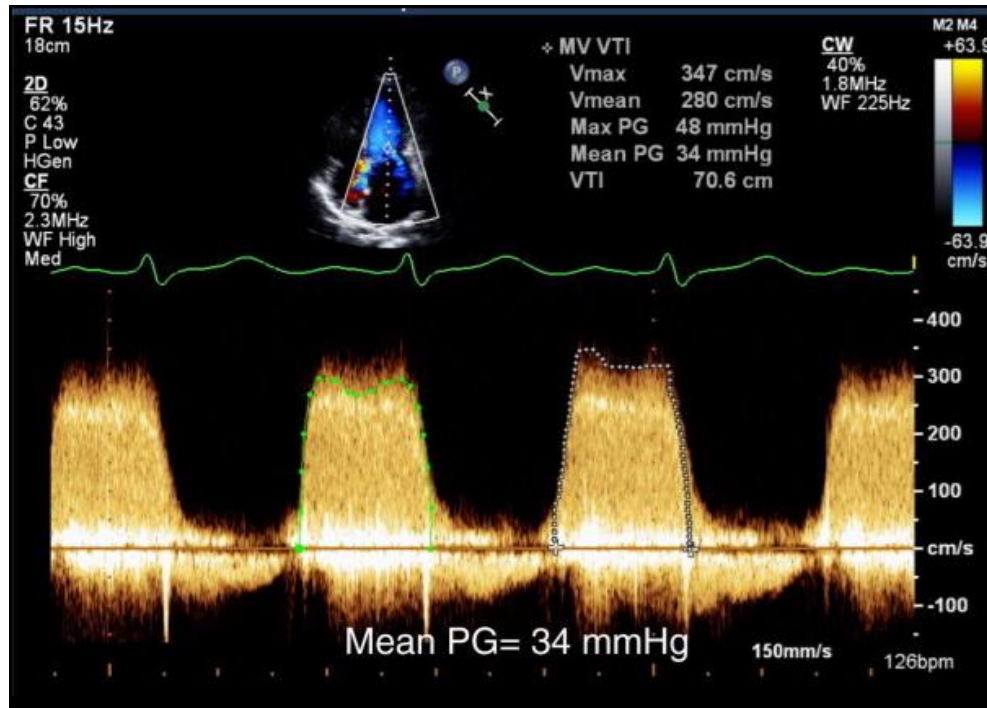


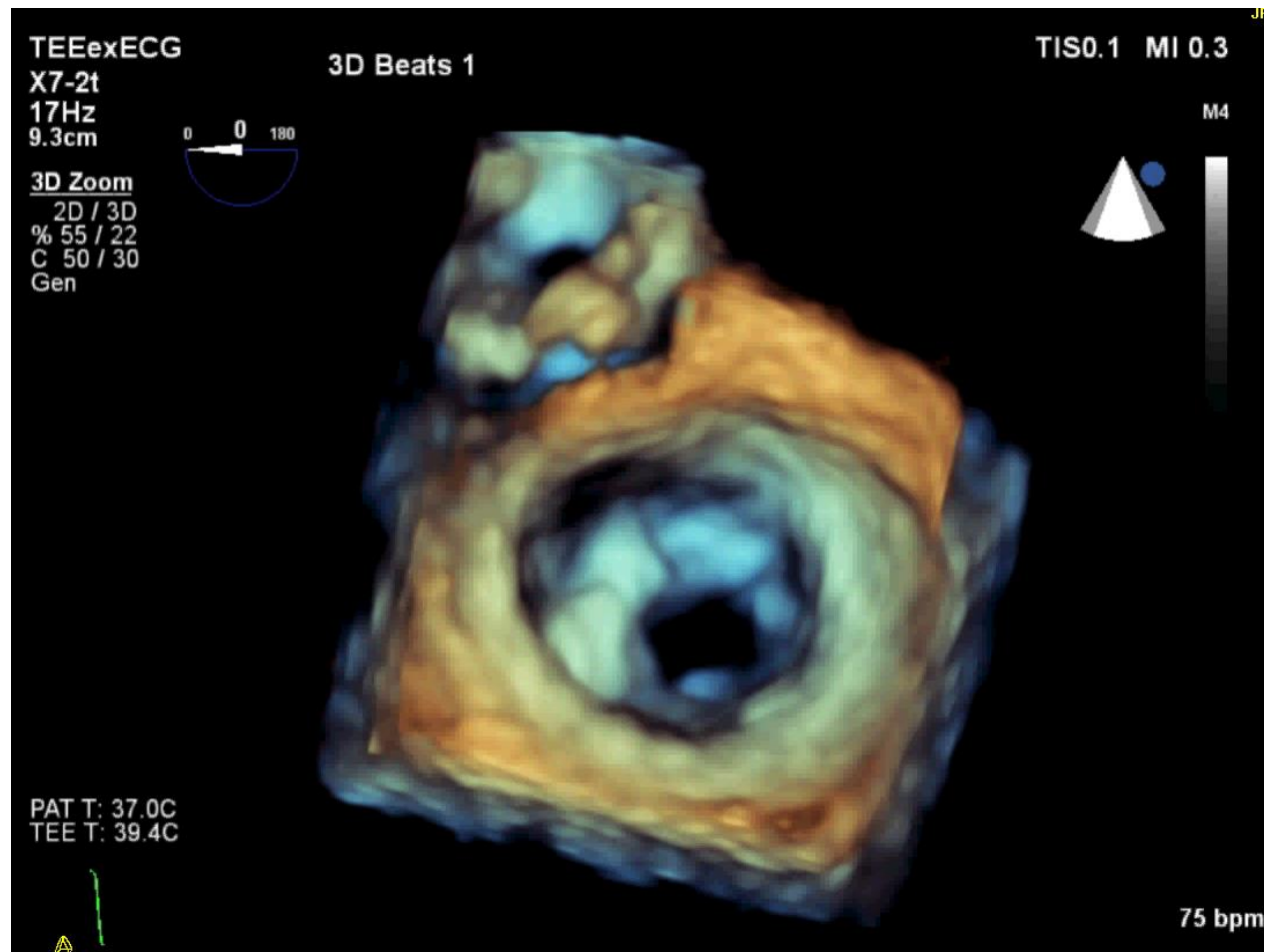
1.3 2.6



83 bpm

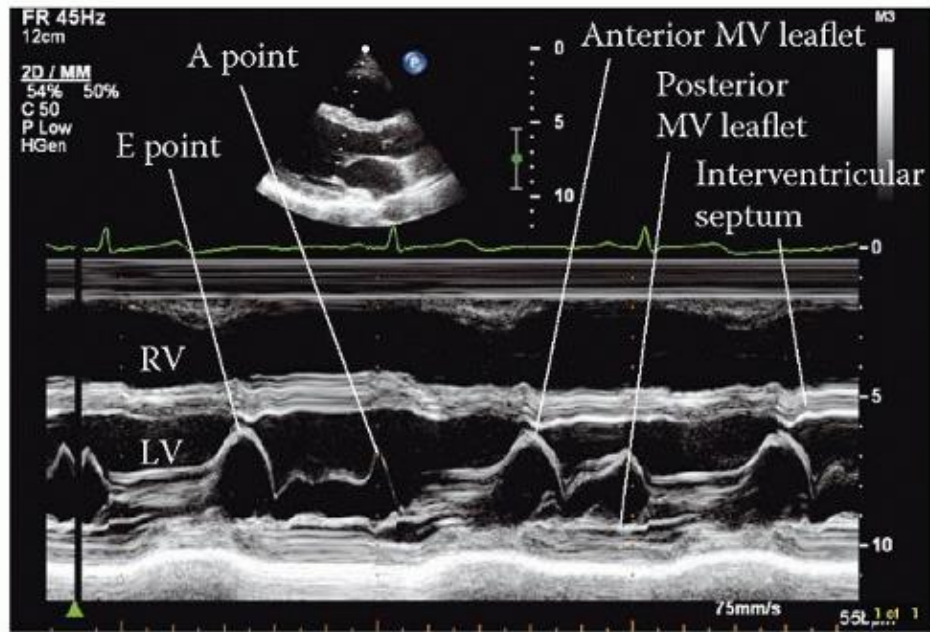
# RHD – Mitral stenosis



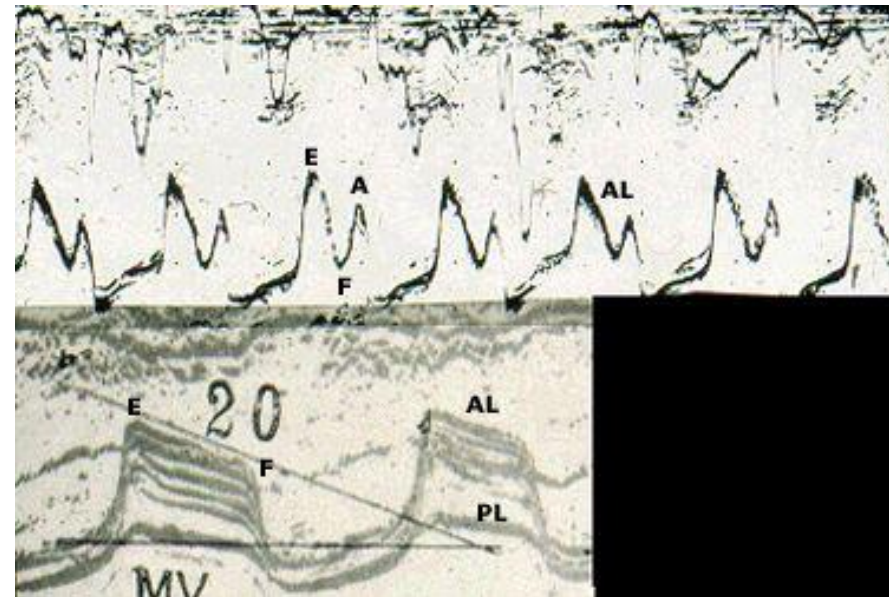
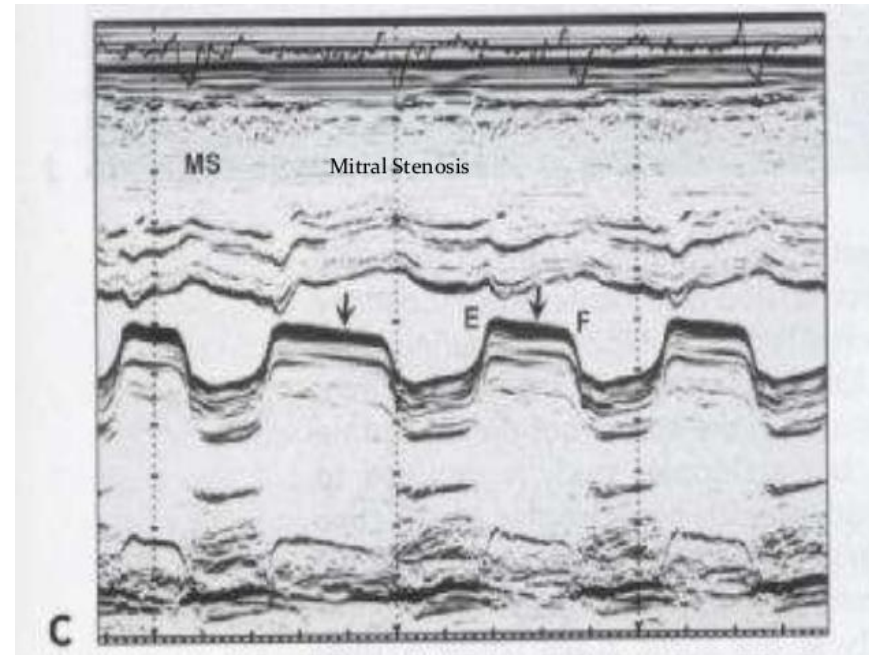


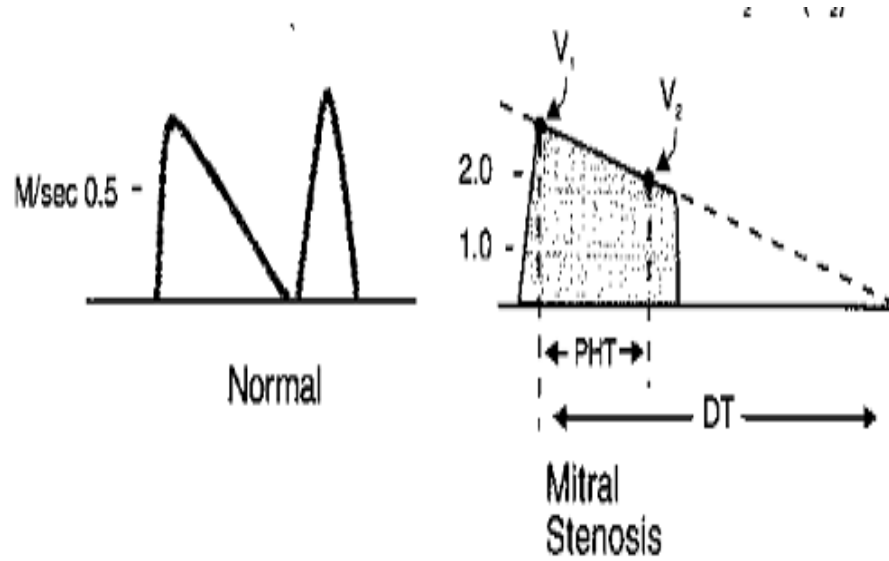
3D planimetry is a good way to ensure smallest mitral valve area is obtained

# M-Mode pearls



<b>View</b>	Parasternal long axis
<b>Modality</b>	M-mode





PHT = time interval (msec)  
 Between Max gradient and the  
 time where the gradient is half  
 the initial value ( $P=4v^2$ )

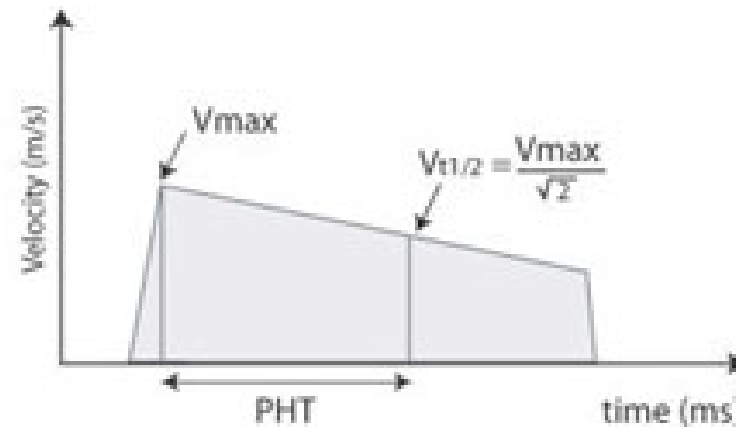
DT= time from Vmax to zero

MVA by pressure halftime:

$$\text{MVA} = 220 / \text{PHT}$$

$$\text{PHT} = \text{DT} \times 0.29$$

$$\text{MVA} = 759 / \text{DT}$$



# Mitral Stenosis Severity – ACC/AHA 2020

## MVA

Progressive  
**(Stage B)**

>1.5 cm<sup>2</sup>; PHT<150 msec, Mildly dilated LA, normal PASP

Severe Asymptomatic  
**(Stage C)**

<1.5 cm<sup>2</sup>; PHT>150 msec, Sev. dilated LA, PASP>50 mmHg

Severe Symptomatic  
**(Stage D)**

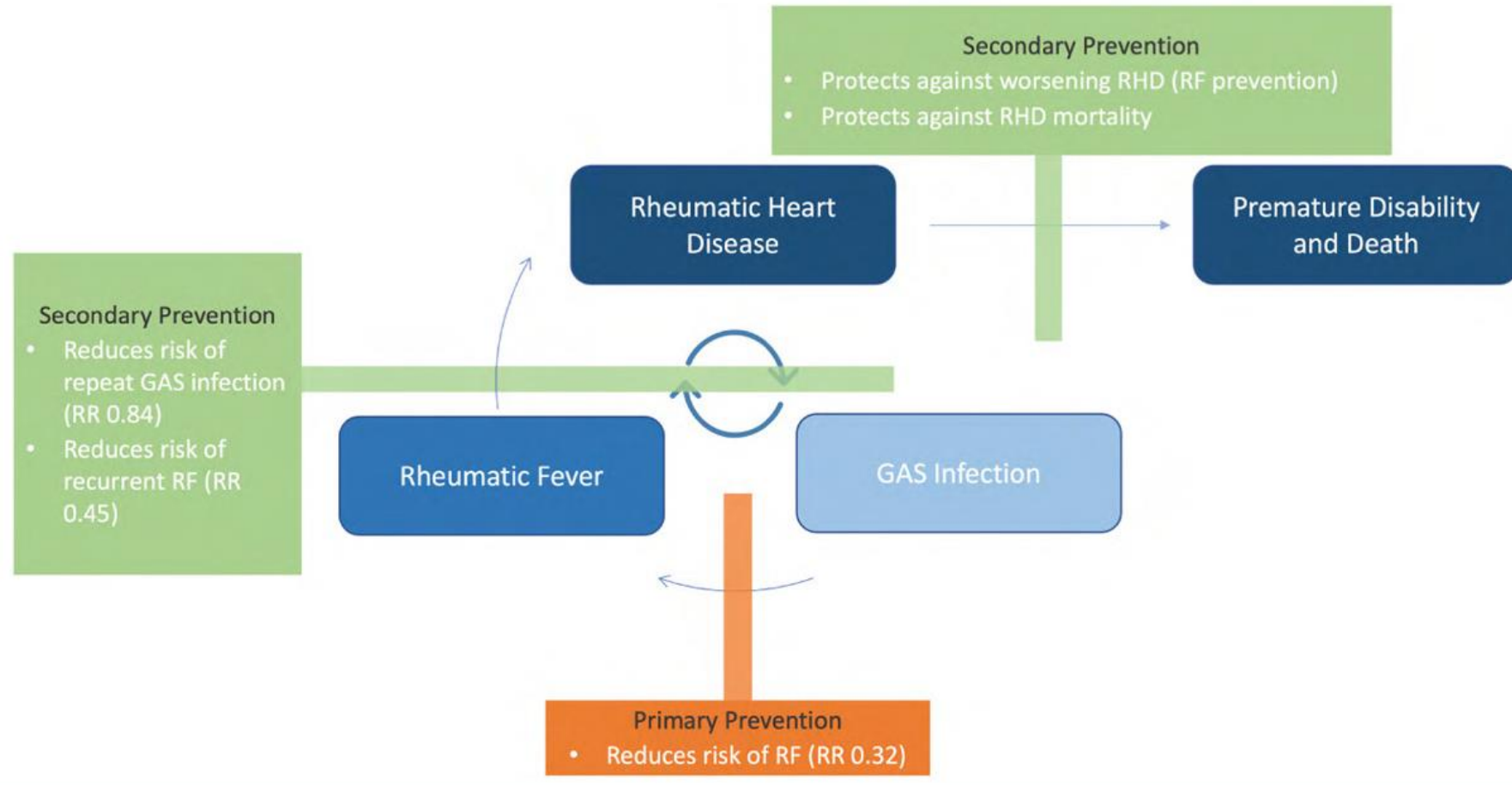
<1.5 cm<sup>2</sup>; PHT >150 msec, Sev. dilated LA, PASP>50 mmHg      ++ DOE

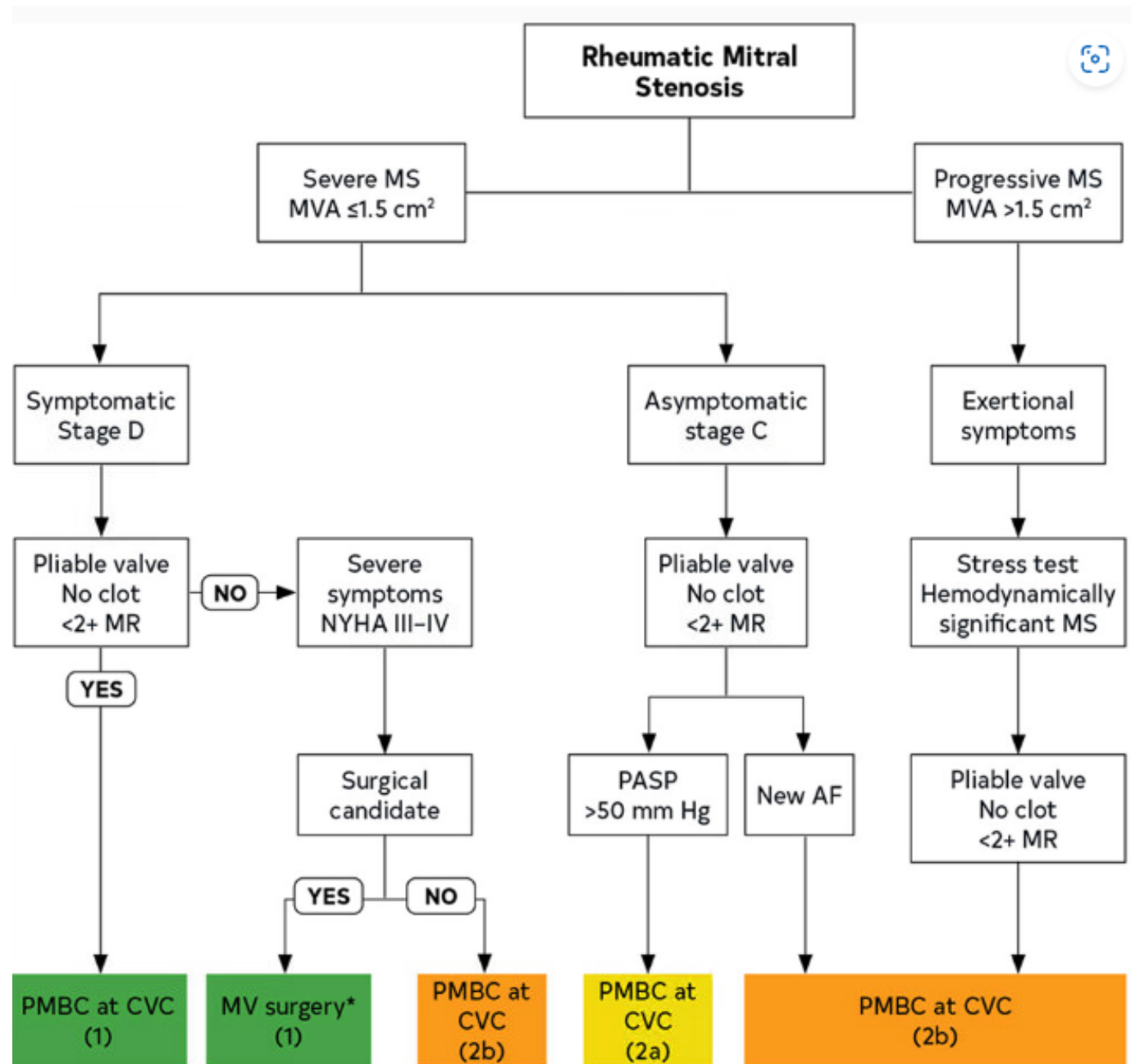
\* Very Severe = MVA <1.0 cm<sup>2</sup>

\*\* Mean gradient >5-10 mmHg accompanies severe mitral stenosis, varies by HR/clinical conditions

# Mitral Stenosis: Important Questions

- Severity ?
- Symptomatic vs. Asymptomatic?
- Clinical Consequences:
  - LAA thrombus / Atrial Fib / Pulmonary HTN
  - Is mitral regurgitation also present ?
- Treatment?
  - Medical (rate control, anticoagulation)
  - Invasive
    - Balloon Valvuloplasty vs. Surgery





## Mitral Stenosis - Wilkins Score

Grade	Mobility	Subvalvular Thickening	Valvular Thickening	Calcification
1	Highly mobile valve with only leaflet tips restricted.	Minimal thickening just below the mitral leaflets.	Leaflets nearly normal in thickness (4-5 mm).	Single area of increased echo brightness.
2	Leaflet mid and basal portions normally mobile.	Thickening of chordal structures extending up to one third of chordal length.	Mid leaflets normal, considerable thickening of margins (5-8 mm).	Scattered areas of brightness confined to leaflet margins.
3	Valve continues to move forward in diastole, mainly from base.	Thickening extending to the distal third of chords.	Thickening extending through the entire leaflet (5-8 mm).	Brightness extending into midportion of the leaflets.
4	No or minimal forward movement of the leaflets in diastole	Extensive thickening and shortening of all chordal structures extending down to papillary muscles.	Considerable thickening of all leaflet tissue (>8-10 mm).	Extensive brightness throughout much of the leaflet tissue.

\*Score ranges from 4-16

\*8 or less is favorable for balloon valvuloplasty

# Mitral Stenosis – Class 1 recommendations

- Percutaneous mitral balloon valvuloplasty/ commissurotomy (PMBC)
  - Severe, symptomatic (Stage D) MS: favorable anatomy with pliable valve, less than 2+ MR, no LA thrombus
- Mitral valve surgery (commissurotomy/replacement)
  - Severe, symptomatic (Stage D, NYHA III-IV) MS: non-pliable valve, 2+ or more MR

# Mitral Stenosis – Diagnostic Testing

- Exercise Testing – Class I recommendation when symptoms out of proportion to MS severity by resting echo
  - Stress echo (treadmill, supine bike echo) or invasive cath
  - Assess MV gradients, PA pressure with stress

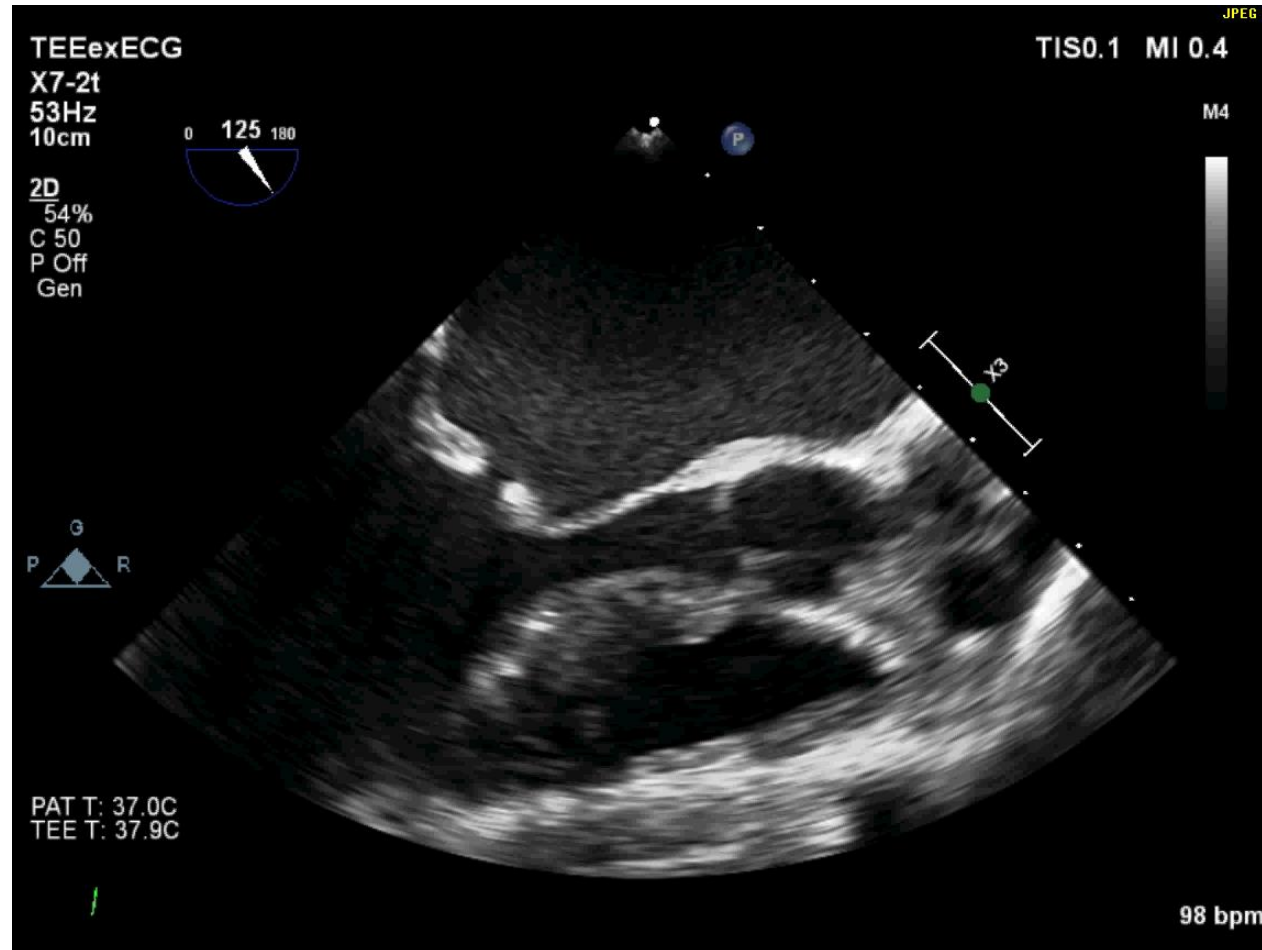
- 45 yo with rheumatic mitral stenosis and shortness of breath comes for cath. PA pressure 90/45 mmHg (mean 60), LVEDP 5 mmHg, C.O. 3L/min. Mitral valve area 1.0 cm<sup>2</sup>. Echo reveals fused commissures, mild thickening of mitral valve leaflets and chordal apparatus, focal calcification of anterior mitral leaflet, and mild MR. What is best next step in her care:
  - a) Beta Blocker and warfarin
  - b) IV epoprostenol
  - c) Surgical mitral valve replacement
  - d) Percutaneous balloon mitral valvuloplasty

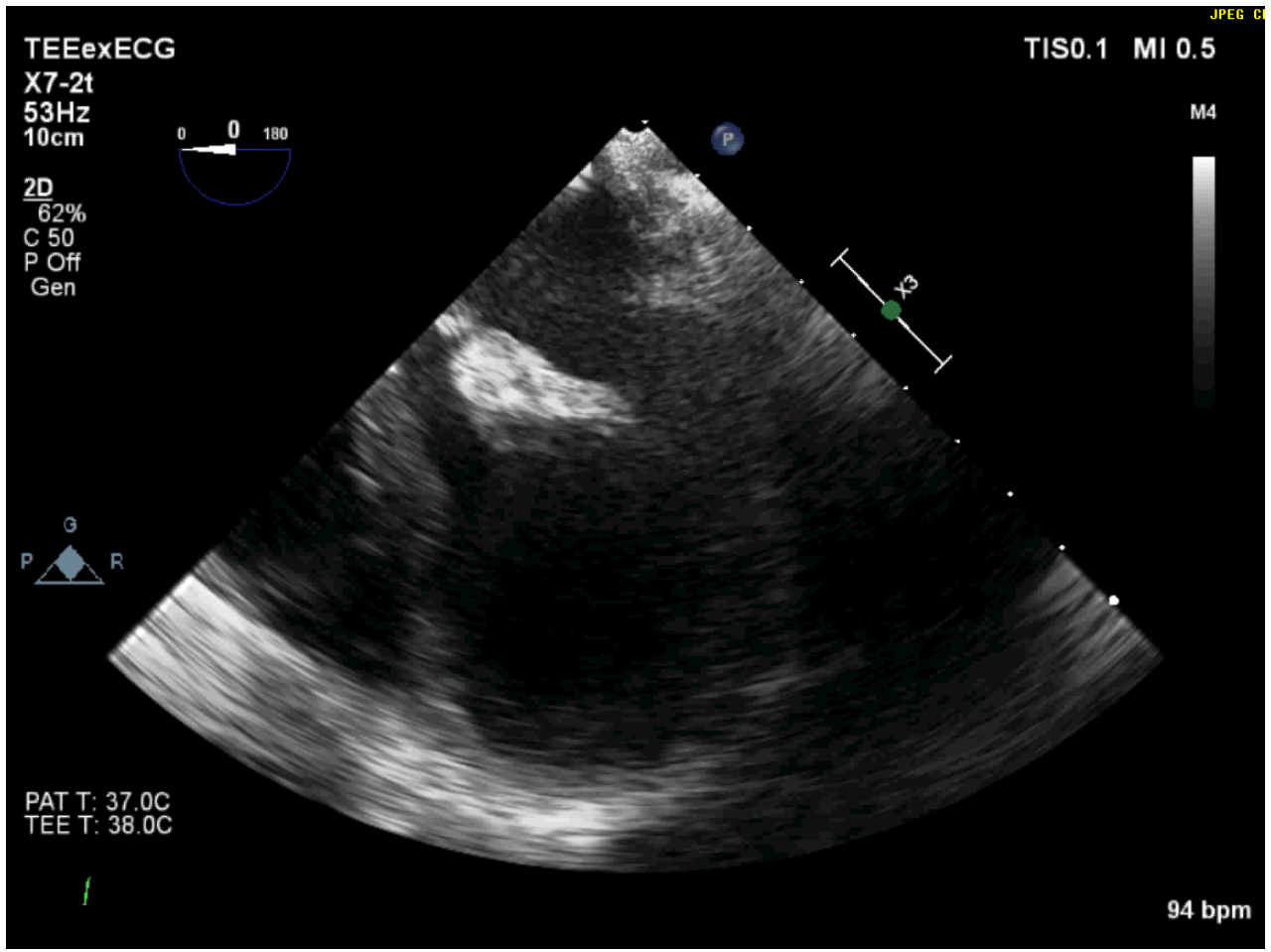
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  - a) Beta blocker and warfarin
  - b) IV epoprostenol
  - c) Surgical mitral valve replacement
  - d) **Percutaneous balloon mitral valvuloplasty**

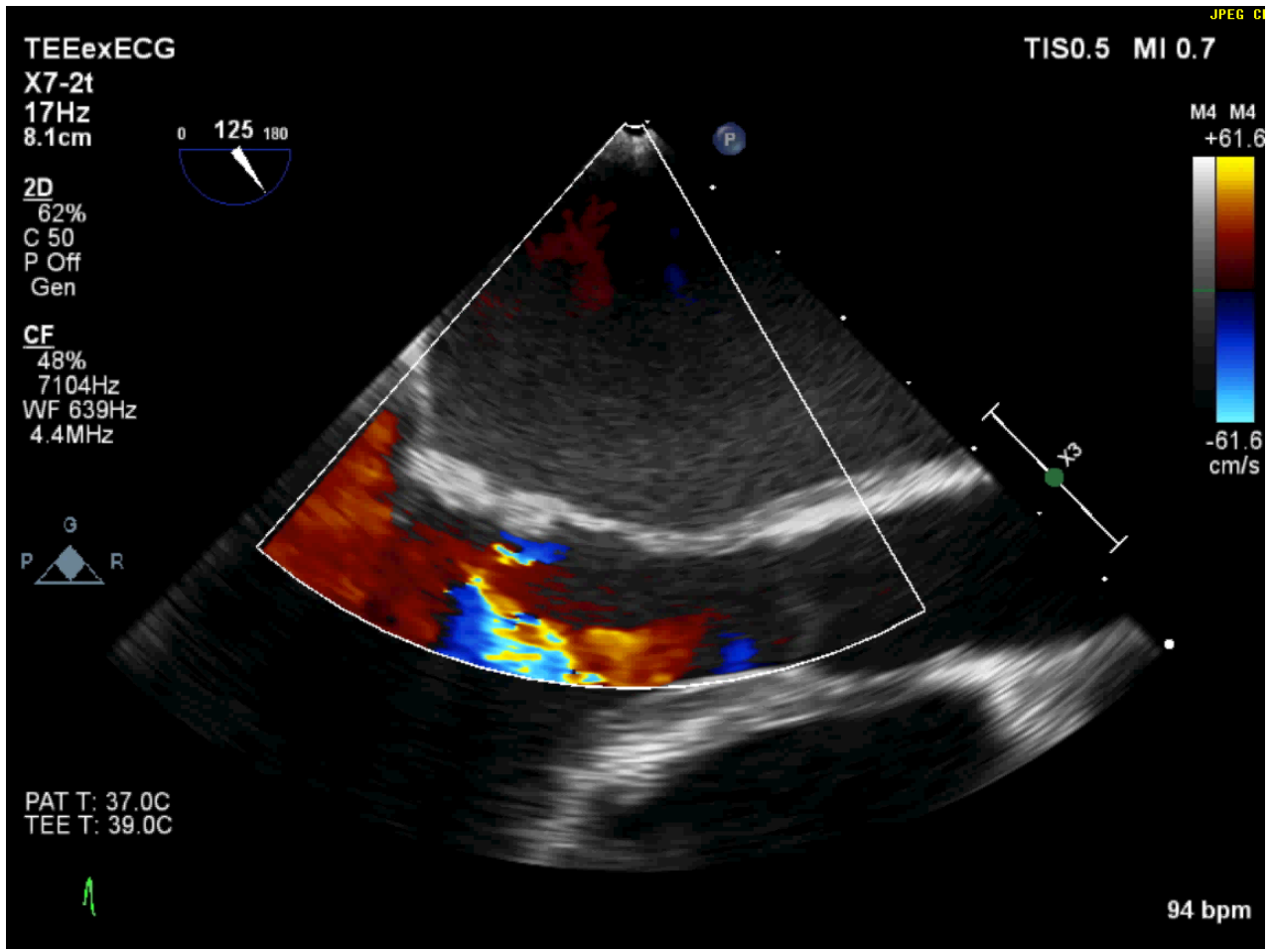
# Mitral Stenosis

- Percutaneous mitral balloon valvuloplasty is indicated for severe, symptomatic MS and favorable anatomy, no LA thrombus

# Mitral stenosis: pre-valvuloplasty







**TEEexECG**

01/25/2017 12:12:34PM

MR max vel = 281.7 cm/sec  
MR max PG = 31.7 mmHg

X7-2t

18Hz

10cm

Z 1.1

2D

59%

C 50

P Off

Gen

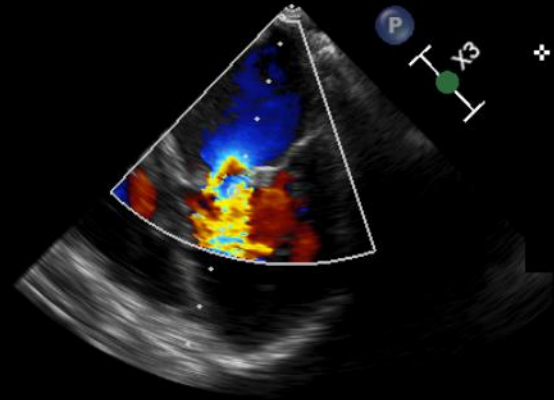
CF

48%

6838Hz

WF 615Hz

4.4MHz



**MR VTI**

Vmax 282 cm/s

Vmean 234 cm/s

Max PG 32 mmHg

Mean PG 24 mmHg

VTI 80.4 cm

M4 M4

+59.3

cm/s

cm/s

cm/s

cm/s

cm/s

cm/s

cm/s

cm/s

cm/s

**CW**

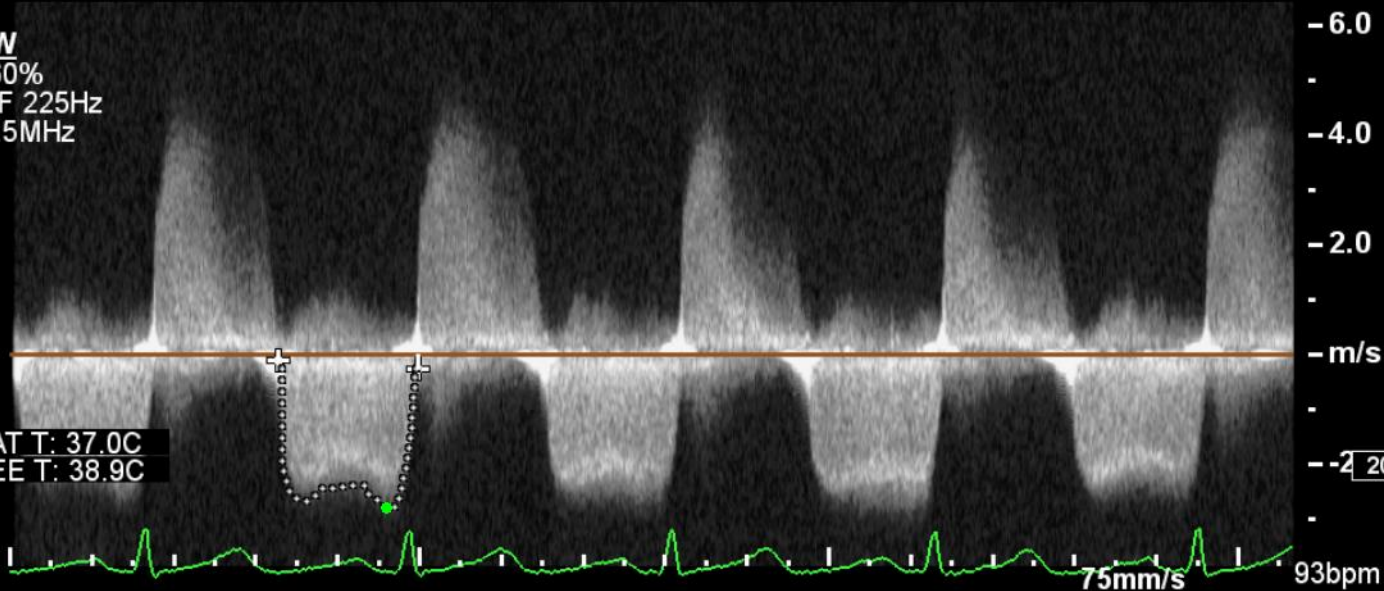
60%

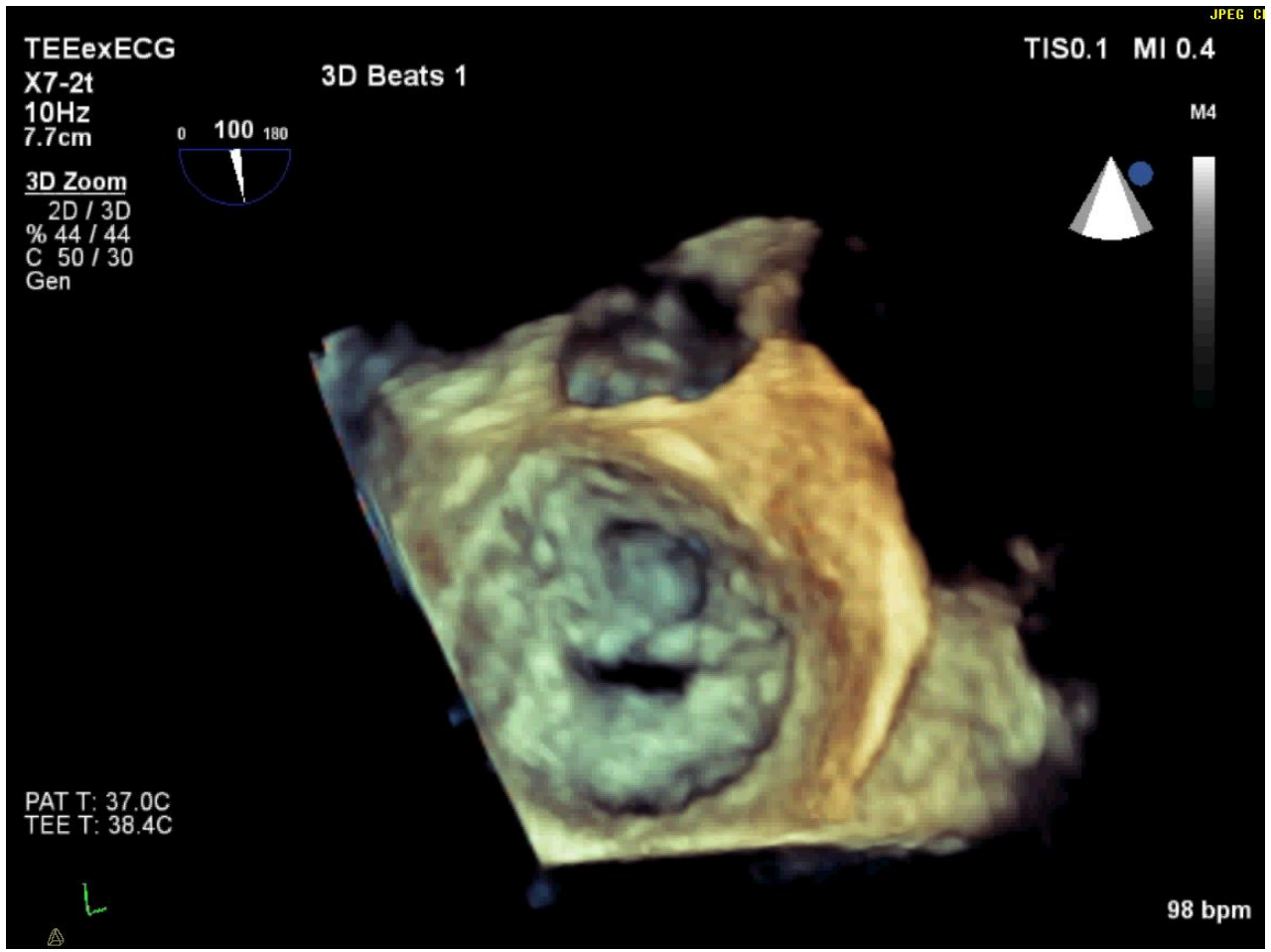
WF 225Hz

2.5MHz

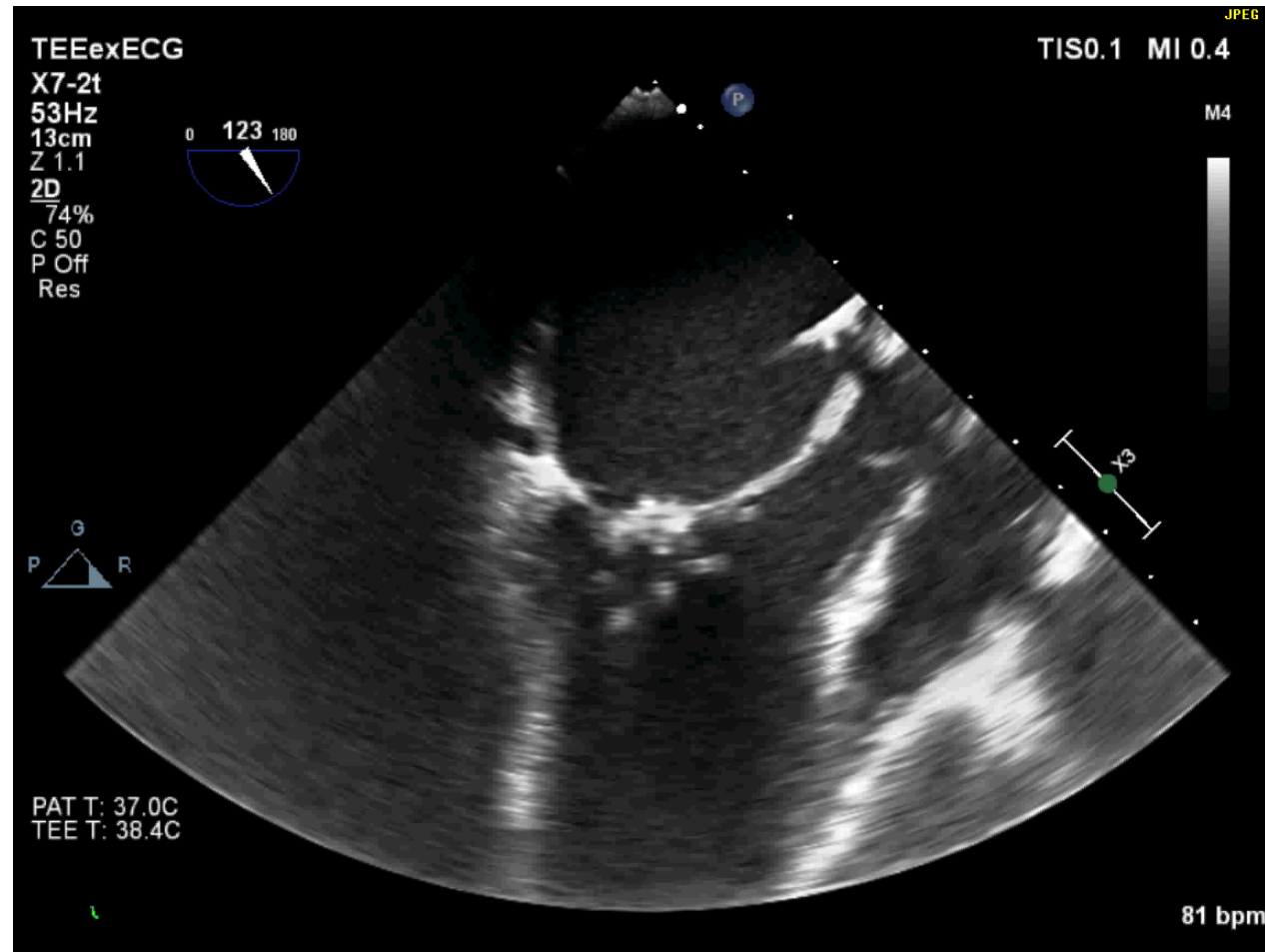
PAT T: 37.0C

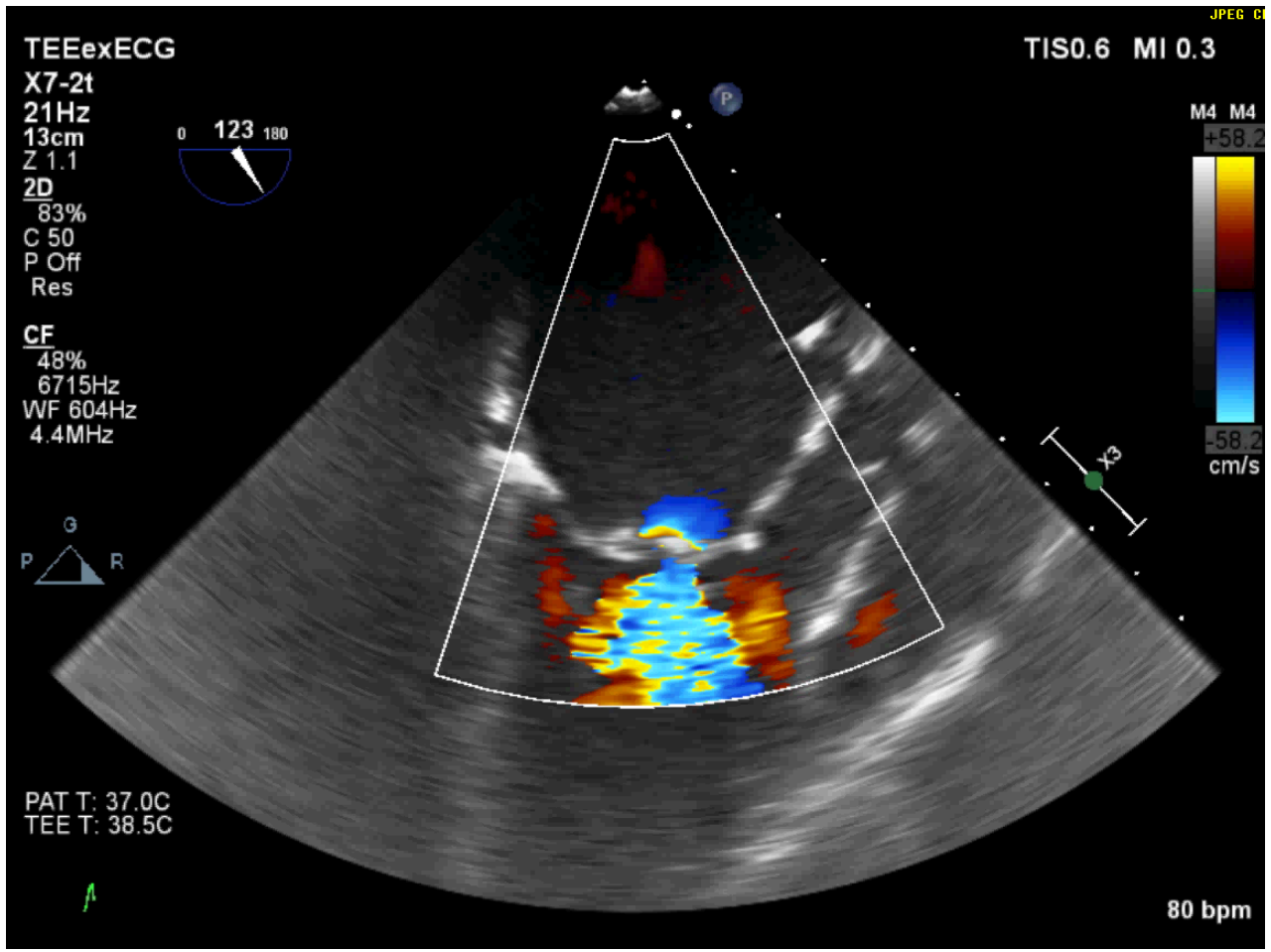
TEE T: 38.9C





# Post-valvuloplasty





# TEEexECG

X7-2t  
14Hz  
13cm

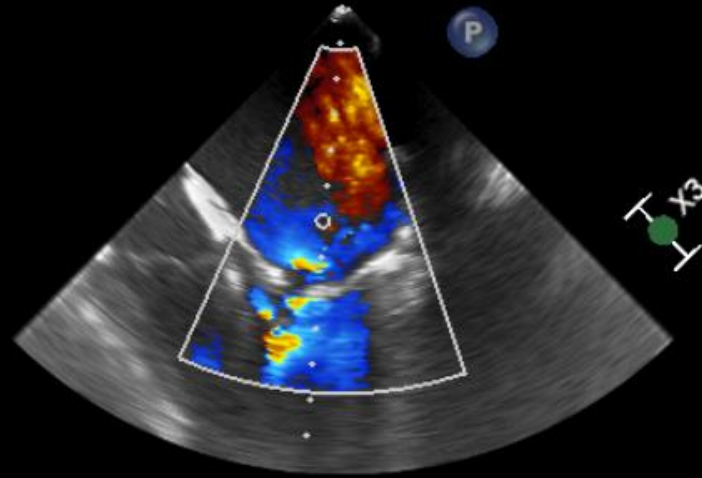


## 2D

80%  
C 50  
P Off  
Res

## CF

48%  
3552Hz  
WF 319Hz  
4.4MHz



● MU U2 mean = 176.2 cm/sec  
MU mean PG = 13.5 mmHg **0.0**  
MU U2 UTI = 70.1 cm  
+ MU U2 max = 238.9 cm/sec  
MU max PG = 22.8 mmHg  
■ MU P1/2t max vel = 223.1 cm/sec  
▲ MU dec slope = 455.8 cm/sec<sup>2</sup>

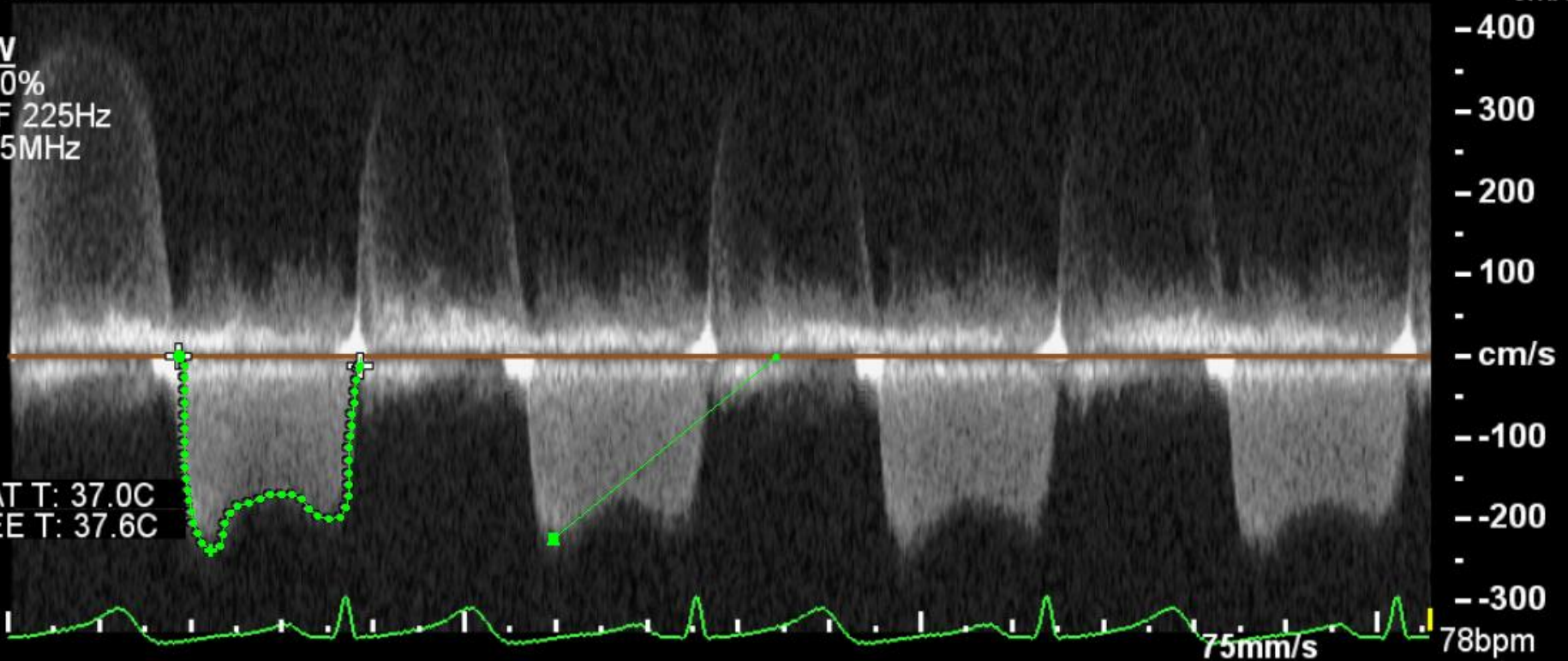
## ✦ MV VTI

Vmax 239 cm/s  
Vmean 175 cm/s  
Max PG 23 mmHg  
Mean PG 13 mmHg  
VTI 69.8 cm

-30.8  
cm/s

## CW

60%  
WF 225Hz  
2.5MHz



PAT T: 37.0C  
TEE T: 37.6C

75mm/s

78bpm

- A 55 yo woman w/ mitral stenosis s/p successful mitral valvuloplasty 2 years ago comes for follow up complaining of progressive dyspnea. Previously able to do Zumba classes, now walking her dog is difficult. She has gained weight. Exam notable for soft, early diastolic rumble preceded by a crisp opening snap. There is a wide separation of A2 opening snap interval. Her echo shows mean transmitral gradient 4 mmHg, MVA by echo 2.0 cm<sup>2</sup>. HR is 60 bpm. You recommend:
  - a) Supine bike stress echo
  - b) Start Metoprolol and Lasix
  - c) TEE
  - d) Cardiac MRI

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  - a) **Supine bike stress echo**
  - b) Start Metoprolol and Lasix
  - c) TEE
  - d) Cardiac MRI

- Stress Testing – recommendation when symptoms out of proportion to echo estimated MS severity
  - Stress Echo (treadmill, supine bike echo, or cath)
  - Assess MV gradients, PA pressure with stress
  - Abnormal: Mean gradient >15 mmHg, PASP > 60 mmHg , PCWP >25

You are consulting on a 30 year old woman with symptomatic severe mitral stenosis presenting for mitral balloon valvuloplasty. She is in NSR. TEE prior to the procedure reveals a Wilkins score of 4, mild MR, and left atrial thrombus. She currently takes asa 81, estrogen-containing OCP, Lasix, and metoprolol. You recommend:

- a) Discontinue birth control pill
- b) Begin Xarelto 20 mg daily.
- c) Start LMWH bridge to warfarin with periodic INR monitoring
- d) Referral for urgent mitral valve replacement surgery

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- d) Referral for urgent mitral valve replacement surgery

- Class I indication for Vitamin K antagonist for mitral stenosis and:
  - left atrial thrombus
  - atrial fibrillation
  - prior embolic event
- Patients with mitral stenosis and mechanical valve replacements were excluded in DOAC trials. DOACs have been studied in observational studies but randomized studies are few and inconclusive for changing practice.

- A patient is referred in her 28<sup>th</sup> week of 1<sup>st</sup> pregnancy with murmur. She reports murmur as a child. A few weeks ago, developed dyspnea and orthopnea. On exam, HR is 112 bpm and regular, BP 125/72 mmHg, minimal bibasilar rales, 2/4 diastolic murmur heard at the apex. JVP is mildly elevated, no edema. ECG shows sinus tachycardia. Echo shows rheumatic deformity of mitral valve with mean gradient 8 mmHg. Which is best medical therapy to help with symptoms?
  - a) Digoxin
  - b) Amiodarone
  - c) Lisinopril
  - d) Metoprolol

- A patient is referred in her 28<sup>th</sup> week of 1<sup>st</sup> pregnancy with murmur. She reports murmur as a child. A few weeks ago, developed dyspnea and orthopnea. On exam, HR is 112 bpm and regular, BP 125/72 mmHg, minimal bibasilar rales, 2/4 diastolic murmur heard at the apex. JVP is mildly elevated, no edema. ECG shows sinus tachycardia. Echo shows rheumatic deformity of mitral valve with mean gradient 8 mmHg. Which is best medical therapy to help with symptoms?
  - a) Digoxin
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  - c) Lisinopril
  - d) Metoprolol**

- Pregnancy can uncover symptoms of mitral stenosis due to increased HRs and plasma volumes (peaks at end of second trimester). Medical therapy with metoprolol can slow the HR, increase diastolic filling time, and improve symptoms.
- Balloon valvuloplasty with shielding can be considered if patients fail medical therapy, safest after 1<sup>st</sup> trimester.
- Mitral valve surgery during pregnancy has a high mortality rate and should be a last resort

Thank you from Dallas, TX!



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 **Parkland**