



# The Echo Report: Going Beyond The Summary!

---

Swapnil Khoche  
Assoc. Professor , Anesthesiology  
skhoche@ucsd.edu

Where discoveries are delivered.<sup>SM</sup>

UC San Diego  
SULPIZIO CARDIOVASCULAR CENTER



# Disclosures

---

None

# Learning Objectives

- Review typical echocardiography report structure
- Identify clinical scenarios where the echo report summary may be insufficient
- Identify common pitfalls in echocardiographic quantification
- Understand basic Doppler principles and echo-derived hemodynamic calculations.



# Report Structure

## TRANSTHORACIC ECHOCARDIOGRAM REPORT

Patient Name: [REDACTED] Date of Exam: [REDACTED]  
Study Time: 3:36:00 PM Site ID: SCVC  
Medical Rec #: [REDACTED] Account #: [REDACTED]  
Accession#: [REDACTED] Height: 67.0 in  
Date of Birth: [REDACTED] Weight: 170.0 lb  
Patient Age: 62 years BSA: 1.89 m<sup>2</sup>  
Patient Gender: M BP: 139/89 mmHg

Procedure: Echo complete 2D / color flow / Doppler,  
Technical Quality: Technically adequate echocardiogram.  
Indications: Atherosclerosis, native coronary artery-  
Sonographer: [REDACTED]  
Referring Phys: [REDACTED]

### 2D MEASUREMENTS (normal ranges within parentheses):

Left Ventricle:	Normal	Aorta/Left Atrium:	Normal
IVSd:	0.94 cm (0.6 -1.0)	Aortic Root:	3.20 cm (2.8-4.0)
LVPMd:	0.88 cm (0.6 -1.0)	Aortic Root, index:	1.70 cm/m <sup>2</sup> (1.3-2.1)
LVId:	5.10 cm (4.2-5.8)	Left Atrium:	4.30 cm
LVId:	3.15 cm (2.5-4.0)		
'LV EF MOD BP:	64 %, (52%-72%)	LA Volume MOD:	Normal

Right Ventricle:	LA Vol A4C MOD:	34.0 ml	
TAPSE (2D):	2.65 cm	LA Vol A2C MOD:	38.0 ml
RV S' Vmax:	0.10 m/s	'LA Vol Index BP:	19.1 ml/m <sup>2</sup> , (16-34)

### LV Diastolic Function:

MV Peak E: 0.46 m/s MV e' (lateral): 0.05 m/s RUPV S Vmax: 0.70 m/s  
MV Peak A: 0.79 m/s MV e' (medial): 0.05 m/s RUPV D Vmax: 0.41 m/s  
E/A Ratio: 0.59 E/e' ratio (lateral): 9.27  
Decel Time: 206 msec

### SPECTRAL DOPPLER ANALYSIS (where applicable):

Mitral Valve: LV Outflow Tract:  
LVOT SI: 38.3 ml/m<sup>2</sup>  
LVOT SV: 72.3 ml

LVOT Vmax: 0.94 m/s LVOT VTI: 0.174 m LVOT Diameter: 2.30 cm

Tricuspid Valve and PA/RV Systolic Pressure: TR Max Velocity: 2.24 m/s  
, 'RVSP/PASP: 23.1 mmHg,  
RA Pressure: 3 mmHg , 'IVC Diameter: 1.94 cm,

## PHYSICIAN INTERPRETATION:

Left Ventricle: The left ventricular internal cavity size was normal. There is normal left ventricular function. LV EF by Simpson's biplane 64 %. There is no left ventricular hypertrophy. Mild or grade I (impaired relaxation pattern) LV diastolic filling.

Right Ventricle: The right ventricular size is normal. Global RV systolic function is normal. Normal PA pressure with right ventricular systolic pressure measuring 23.1 mmHg.

Left Atrium: The left atrium is normal sized.

Right Atrium: The right atrium is normal in size.

Pericardium: There is no evidence of pericardial effusion.

Mitral Valve: The mitral valve is normal in structure. No evidence of mitral valve regurgitation.

Tricuspid Valve: The tricuspid valve is normal in structure. Trace tricuspid regurgitation.

Aortic Valve: The aortic valve appeared normal (trileaflet). No evidence of aortic valve regurgitation is seen.

Pulmonic Valve: The pulmonic valve is normal. No indication of pulmonic valve regurgitation.

Aorta: The aortic root is normal measuring 3.20 cm and 1.70 cm/m<sup>2</sup> index.

Pulmonary Artery: The pulmonary artery is of normal size and origin.

Venous: The inferior vena cava was normal sized with respiratory variation greater than 50%.

### Summary:

1. The left ventricular size is normal and systolic function is normal.
2. The right ventricular size is normal and systolic function is normal.
3. Normal PA pressure with right ventricular systolic pressure measuring 23.1 mmHg.
4. Compared to prior study no significant change.

Electronically signed by [REDACTED]  
Signature Date and Time: [REDACTED]



# Measurements

---

## TRANSTHORACIC ECHOCARDIOGRAM REPORT

Patient Name:	[REDACTED]	Date of Exam:	[REDACTED]
Study Time:	3:36:00 PM	Site ID:	SCVC
Medical Rec #:	[REDACTED]	Account #:	[REDACTED]
Accession#:	[REDACTED]	Height:	67.0 in
Date of Birth:	[REDACTED]	Weight:	170.0 lb
Patient Age:	62 years	BSA:	1.89 m <sup>2</sup>
Patient Gender:	M	BP:	139/89 mmHg

Procedure: Echo complete 2D / color flow / Doppler

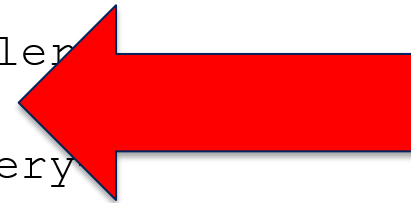
Technical Quality: Technically adequate echocardiogram.

Indications: Atherosclerosis, native coronary artery


Sonographer: [REDACTED]

Referring Phys: [REDACTED]

---



# Measurements



```
2D MEASUREMENTS (normal ranges within parentheses):
Left Ventricle:          Normal    Aorta/Left Atrium:          Normal
IVSd:                   0.94 cm (0.6 -1.0) Aortic Root:              3.20 cm (2.8-4.0)
LVPWd:                   0.88 cm (0.6 -1.0) Aortic Root, index: 1.70 cm/m² (1.3-2.1)
LVIDd:                   3.10 cm (4.2-5.8) Left Atrium:              4.30 cm
LVIDs:                   3.15 cm (2.5-4.0)
`LV EF MOD IP:          64 %, (52%-72%) LA Volume MOD:              Normal
Right Ventricle:
TAPSE (2D):              2.65 cm      , `LA Vol A4C MOD:            34.0 ml
RV S' Vmax:              0.10 m/s     , LA Vol A2C MOD:            38.0 ml
                                   , `LA Vol Index BP: 19.1 ml/m², (16-34)

LV Diastolic Function:
MV Peak E: 0.46 m/s MV e' (lateral):      0.05 m/s RUPV S Vmax: 0.70 m/s
MV Peak A: 0.79 m/s MV e' (medial):      0.05 m/s RUPV D Vmax: 0.41 m/s
E/A Ratio: 0.59      E/e' ratio (lateral): 9.27
Decel Time: 206 msec

SPECTRAL DOPPLER ANALYSIS (where applicable):
Mitral Valve: LV Outflow Tract:
LVOT SI: 38.3 ml/m²
LVOT SV: 72.3 ml

LVOT Vmax: 0.94 m/s LVOT VTI: 0.174 m LVOT Diameter: 2.30 cm

Tricuspid Valve and PA/RV Systolic Pressure: TR Max Velocity: 2.24 m/s
, `RVSP/PASP: 23.1 mmHg,
RA Pressure: 3 mmHg , `IVC Diameter: 1.94 cm,
```

# Interpretation

V

A

V

V

O

## PHYSICIAN INTERPRETATION:

Left Ventricle: The left ventricular internal cavity size was normal. There is normal left ventricular function. LV EF by Simpson's biplane 64 %. There is no left ventricular hypertrophy. Mild or grade I (impaired relaxation pattern) LV diastolic filling.

Right Ventricle: The right ventricular size is normal. Global RV systolic function is normal. Normal PA pressure with right ventricular systolic pressure measuring 23.1 mmHg.

Left Atrium: The left atrium is normal sized.

Right Atrium: The right atrium is normal in size.

Mitral Valve: The mitral valve is normal in structure. No evidence of mitral valve regurgitation.

Tricuspid Valve: The tricuspid valve is normal in structure. Trace tricuspid regurgitation.

Aortic Valve: The aortic valve appeared normal (trileaflet). No evidence of aortic valve regurgitation is seen.

Pulmonic Valve: The pulmonic valve is normal. No indication of pulmonic valve regurgitation.

Aorta: The aortic root is normal measuring 3.20 cm and 1.70 cm/m<sup>2</sup> index.

Pulmonary Artery: The pulmonary artery is of normal size and origin.

Venous: The inferior vena cava was normal sized with respiratory variation greater than 50%.

Pericardium: There is no evidence of pericardial effusion.



# Report Summary

## Summary:

1. The left ventricular size is normal and systolic function is normal.
2. The right ventricular size is normal and systolic function is normal.
3. Normal PA pressure with right ventricular systolic pressure measuring 23.1 mmHg.
4. Compared to prior study no significant change.

- Often sufficient
- Occasionally doesn't "paint the whole picture"

Going beyond the Report Summary

# Clinical Scenarios

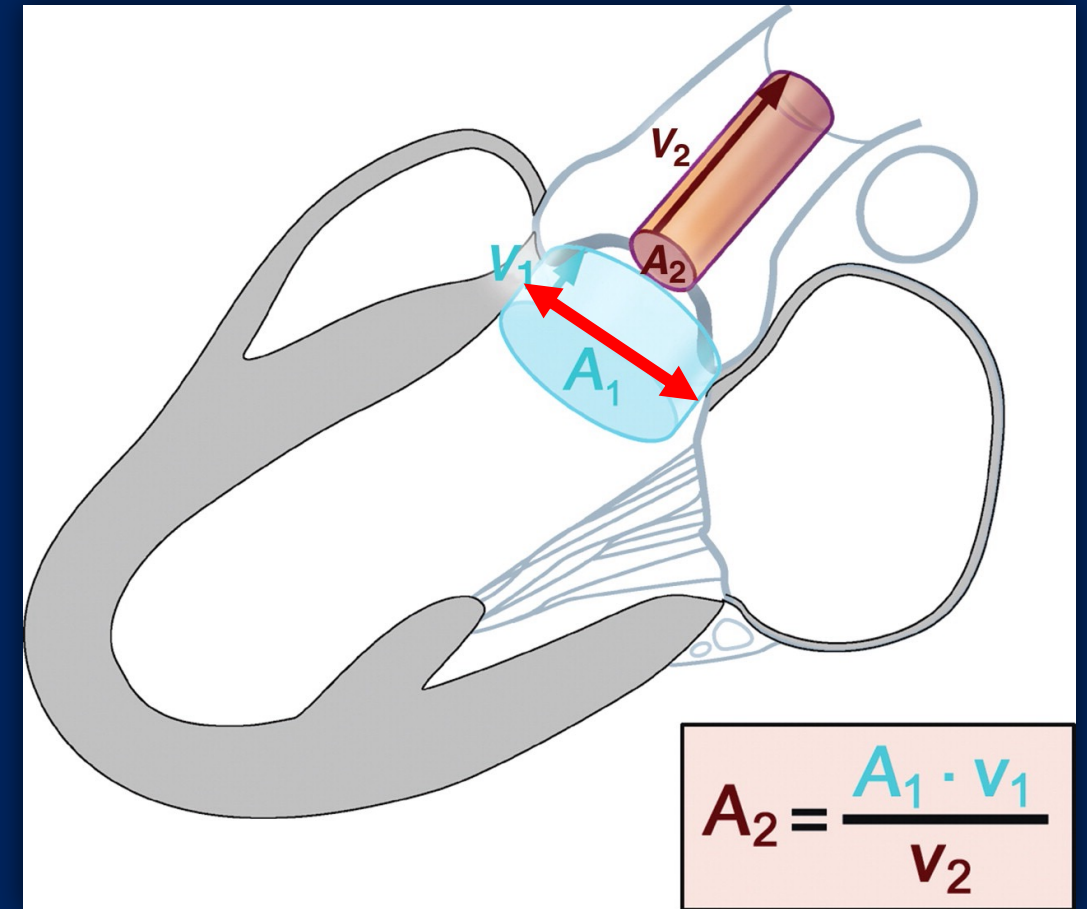
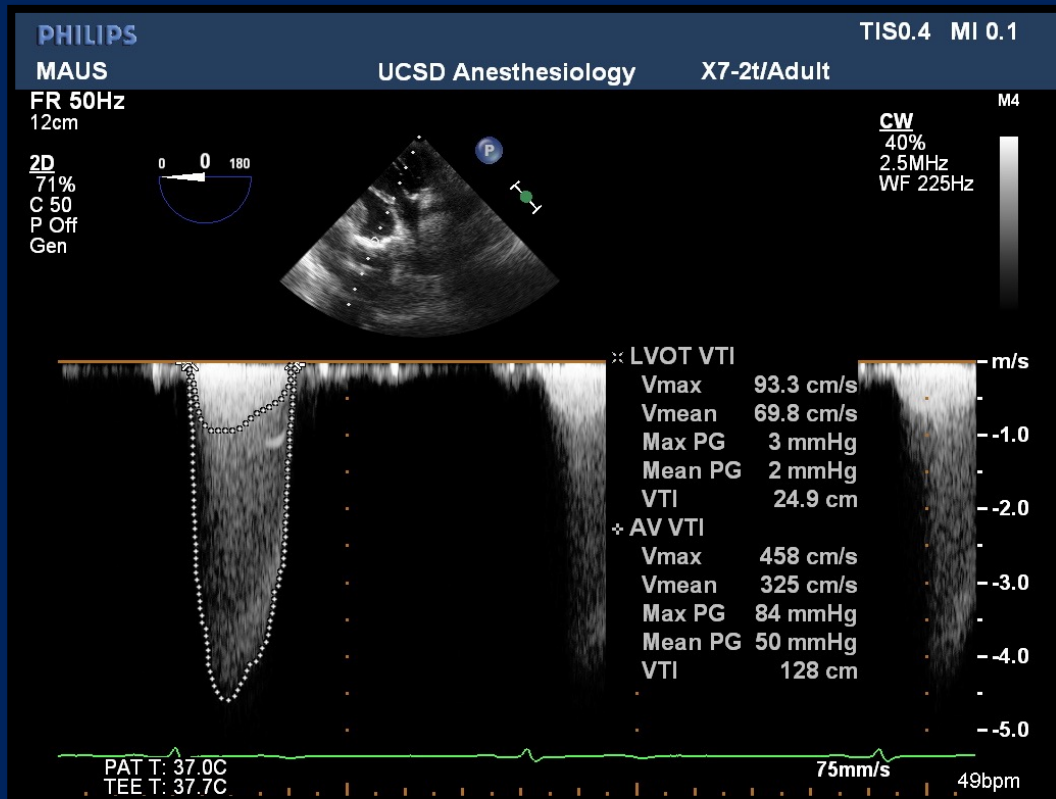
## Doesn't add up....

- 84 yo scheduled for left total hip arthroplasty
- **Echo Summary**
  - Poor quality study
  - Normal LV size with moderately Reduced LV Systolic Function with LVH, Severe or Grade III (Restrictive) LV diastolic Filling
  - Dilated Left Atrium
  - Aortic valve calcification with **Moderate to Severe** Aortic Stenosis
- **Quick Look at the Numbers**
  - LVEF 34%
  - AV – Mean Gradient 22 (consistent with Mild)
  - AV Area – Not Provided
  - Right Ventricular Systolic Pressure (47mmHg + CVP)



# How bad is the AS?

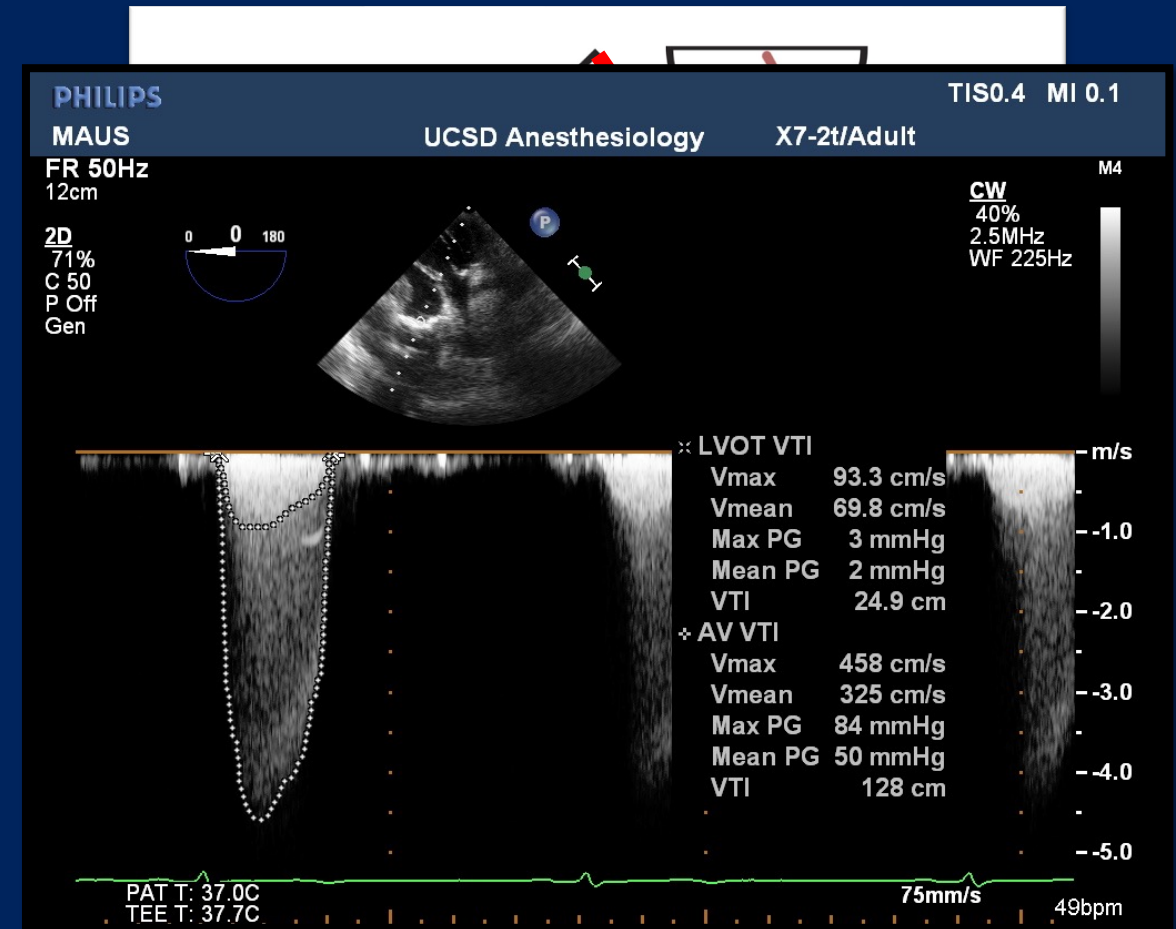
- Didn't give an AVA....Why?



**No AVA ... Now what?**

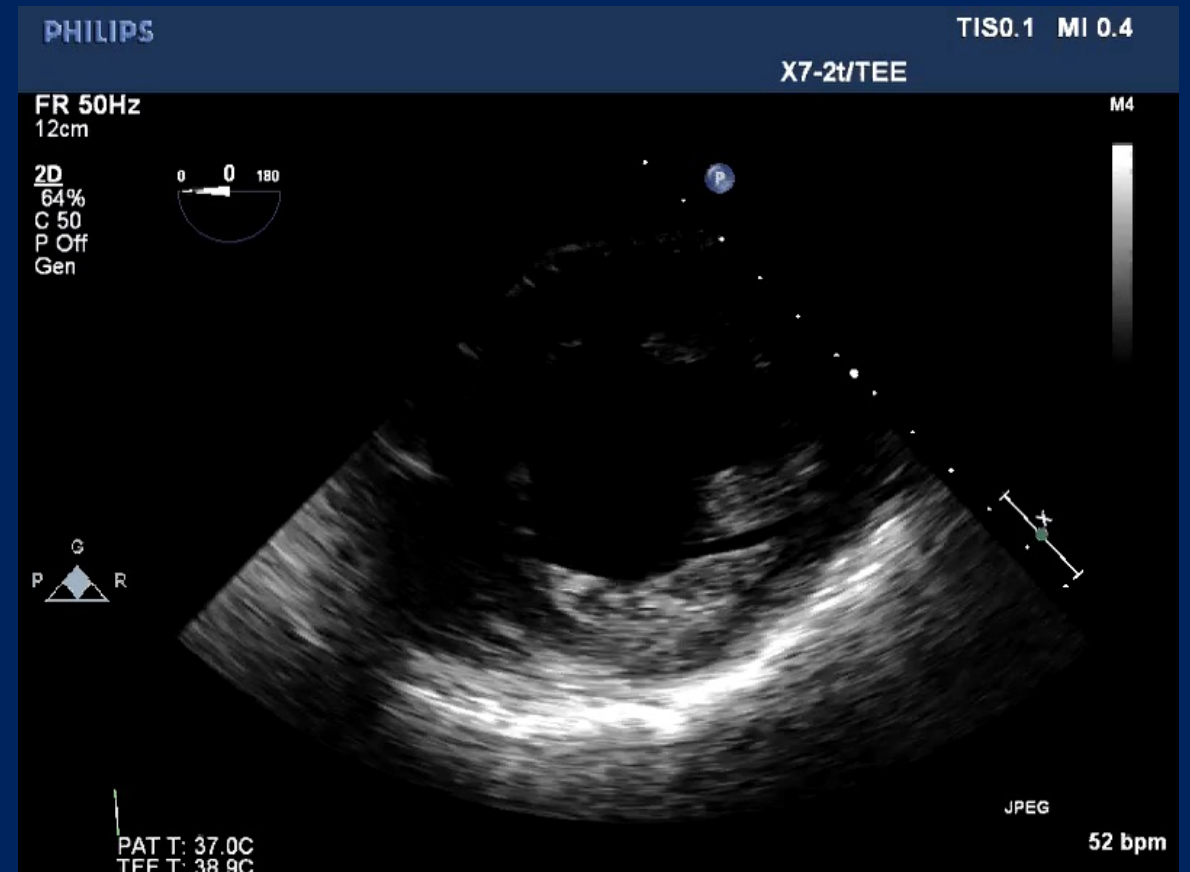
# How bad is the AS?

- But the gradient was reported as **Mild AS!**
- Poor imaging
- Pin hole AS
- Off axis measurement
- **Low Gradient AS**
  - Low EF
  - Heart can't generate the pressure!



# How bad is the AS?

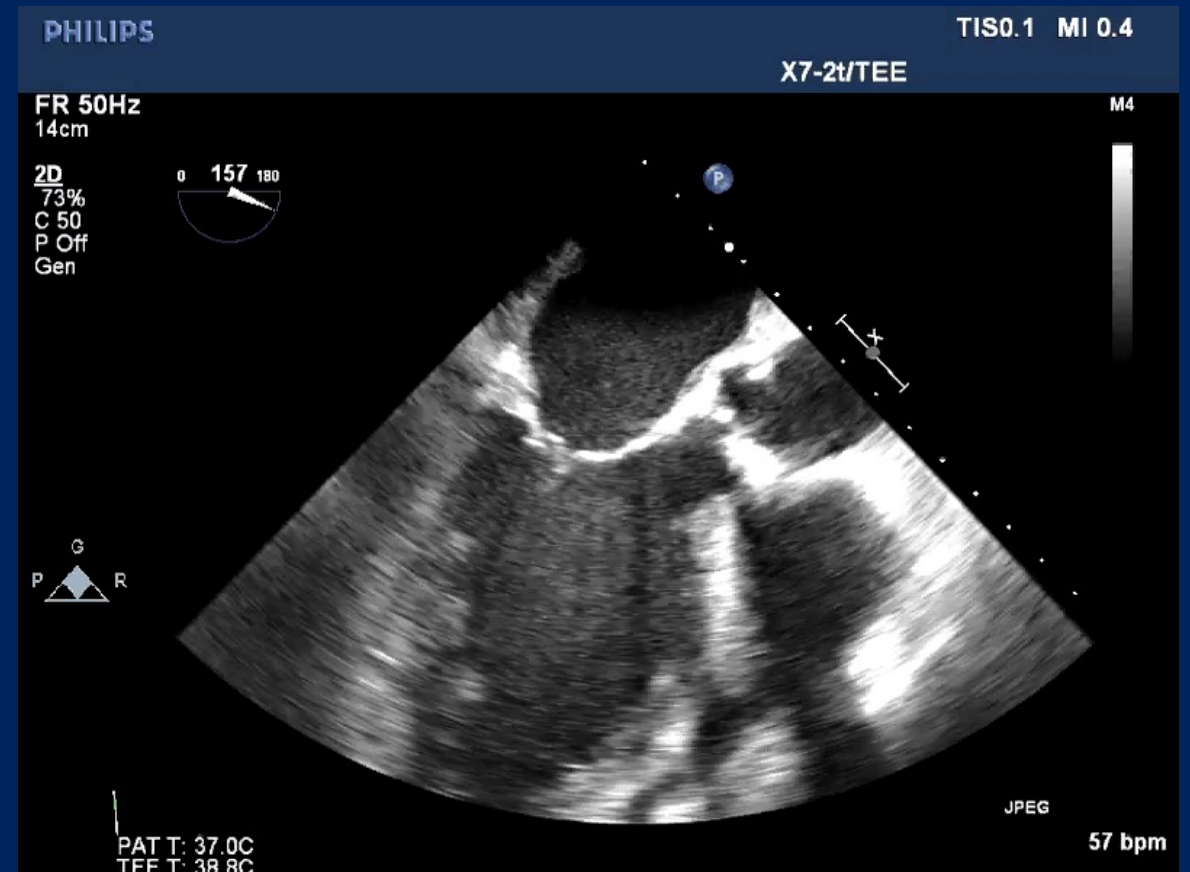
- So....What next?
- Like any clinical diagnosis, look at the whole picture
- Look for **secondary changes**
  - Significant LVH
  - Left Atrial Dilation
  - Diastolic Dysfunction
  - Pulmonary Hypertension





# How bad is the AS?

- So....What next?
- Like any clinical diagnosis, look at the whole picture
- Look for **secondary changes**
  - Significant LVH
  - Left Atrial Dilation
  - Diastolic Dysfunction
  - Pulmonary Hypertension



## Doesn't add up....

- 84 yo scheduled for left total hip arthroplasty

- **Echo Summary**

- Poor quality study
- Normal LV size with moderately Reduced LV Systolic Function
- Mild to Moderate LVH, Severe or Grade III diastolic Filling
- Dilated Left Atrium
- Aortic valve calcification, with Severe Aortic Stenosis

LV Thickness  
> 1.5 – 2cm

LA Volume  
Index  
> 35 ml/m<sup>2</sup>

$E \gg A$   
 $E' < 10$   
 $E/E' > 13$

- **Quick Look at the Numbers**

- LVEF 34%
- AV – Mean Gradient 22 (consistent with Mild)
- AV Area – Not Provided
- Right Ventricular Systolic Pressure (47mmHg + CVP)

NI = 25+CVP

# No RVSP?

- 48 yo Obese F with known Pulmonary Hypertension scheduled for ExLap.
- **Echo Summary**
  - Poor quality study
  - Small LV size with normal function
  - Dilated RV with mildly reduced RV function
  - IVC dilated and collapses <50% with inspiration
- **Quick Look at the Numbers**
  - TAPSE = 14mm
  - IVC = 2.4cm
  - PA Diameter = 2.2cm



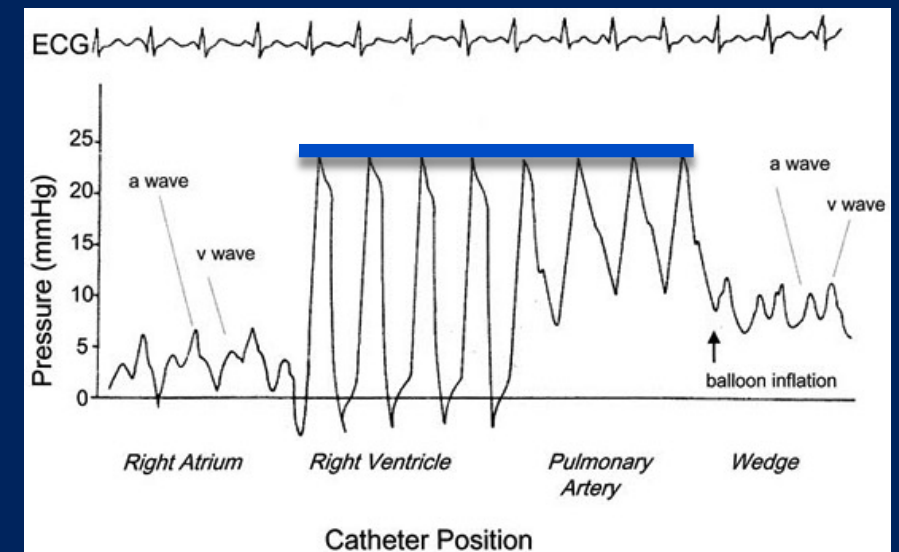
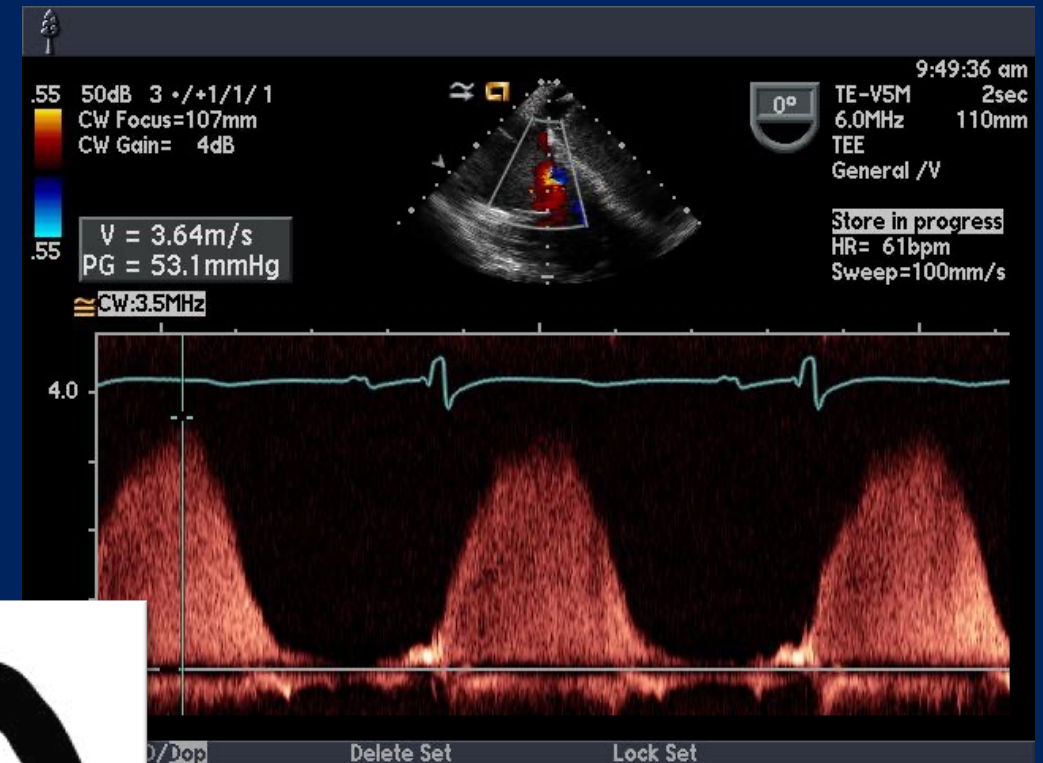
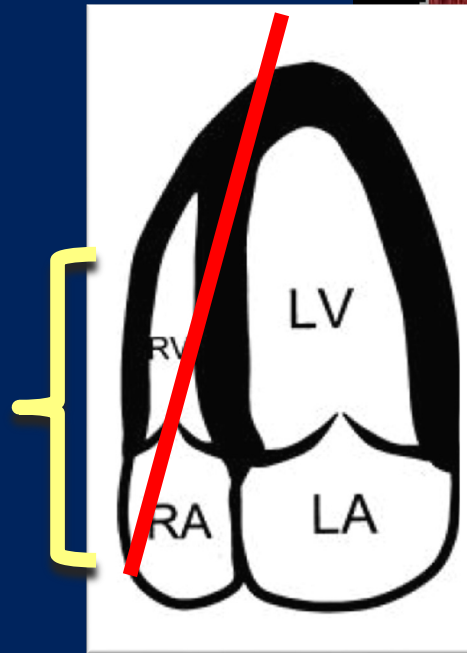
# No RVSP?

- No Estimated PA Pressure?

- $PG = 4 (\text{TR jet})^2$

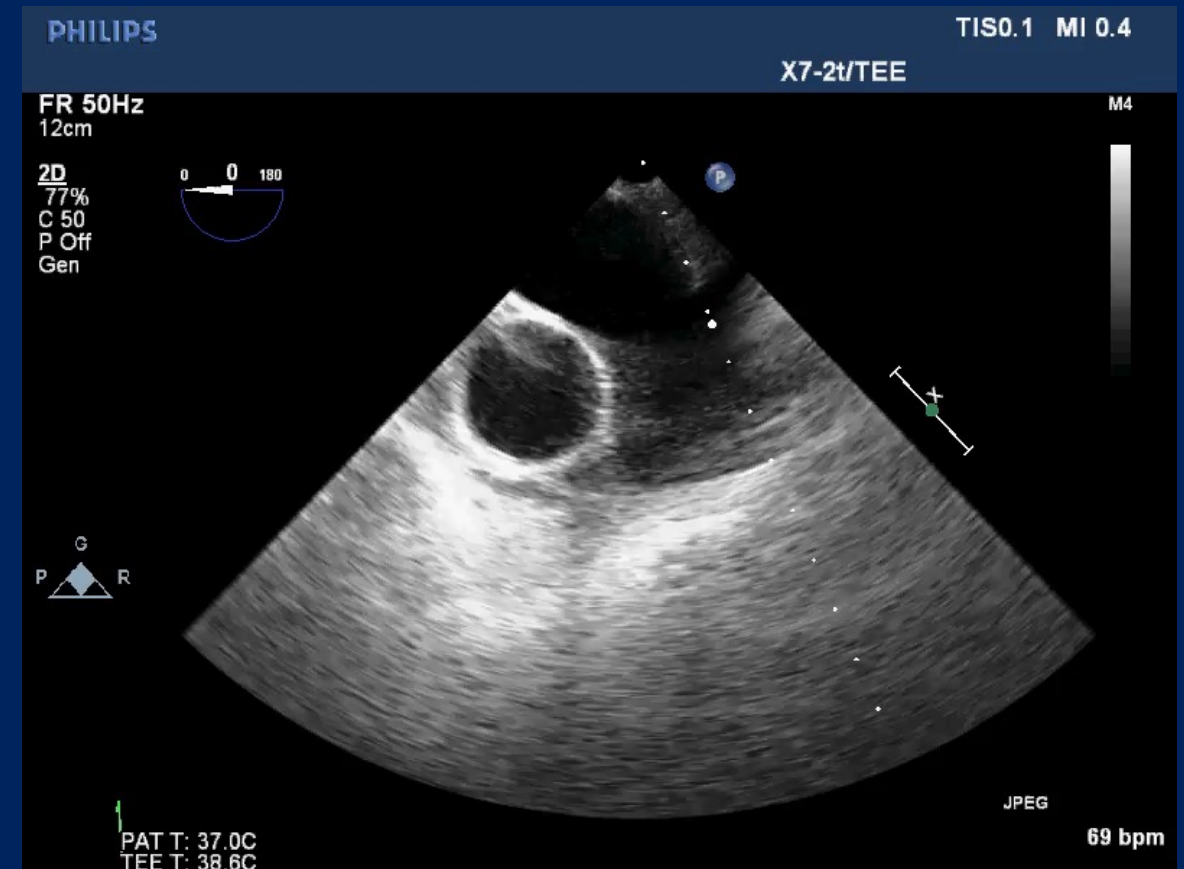
- Poor Alignment

- Trivial to absent TR



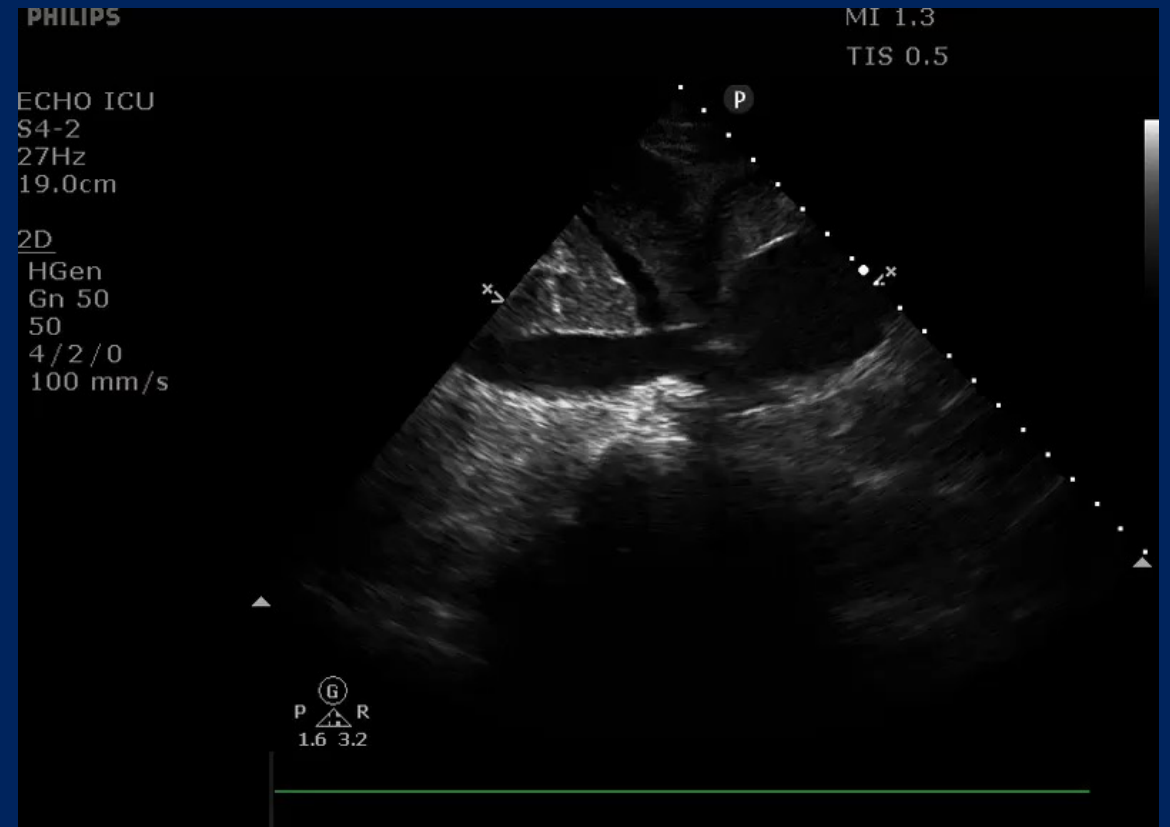
# No RVSP?

- So what else can we glean?
- Like any clinical diagnosis, look at the whole picture
- Look for **secondary changes**
  - Chronicity and Severity
    - Dilated PA



## No RVSP?

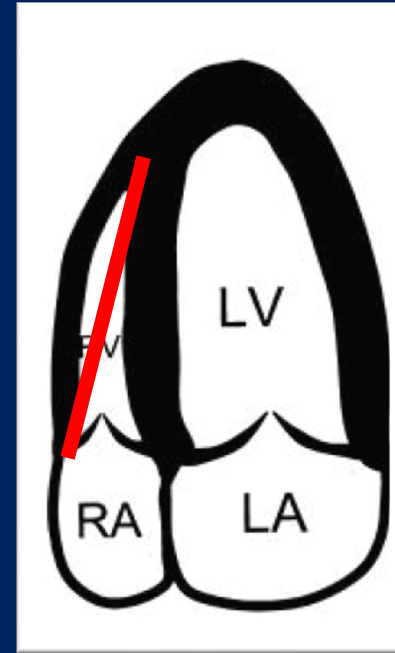
- Look for secondary changes
  - Chronicity and Severity
    - Dilated IVC without Collapsibility
    - Elevated CVP
      - Failing RV?



- IVC < 2.1 & Collapse = nl RAP
- IVC > 2.1 & No Collapse = high RAP

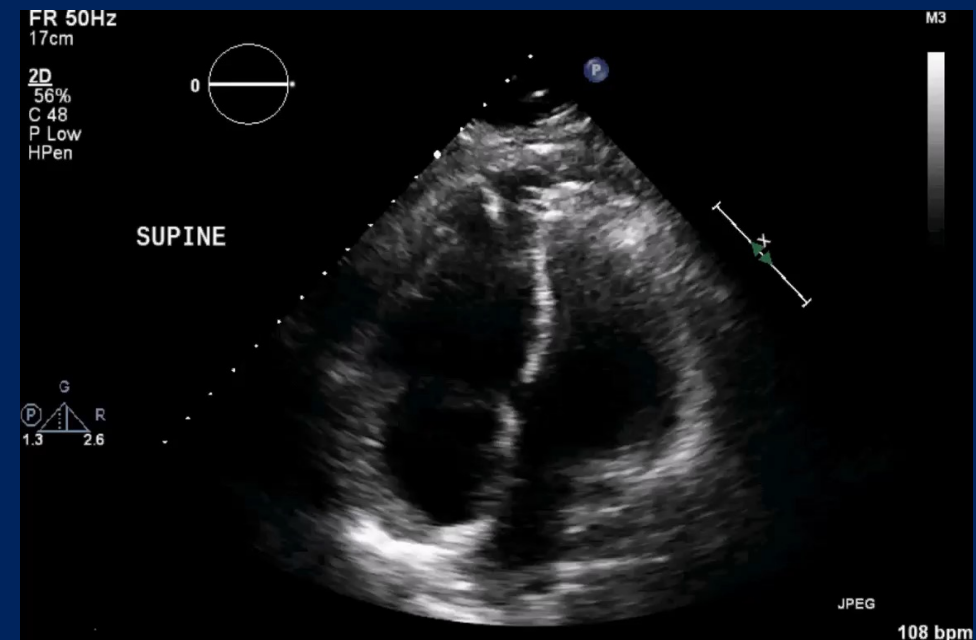
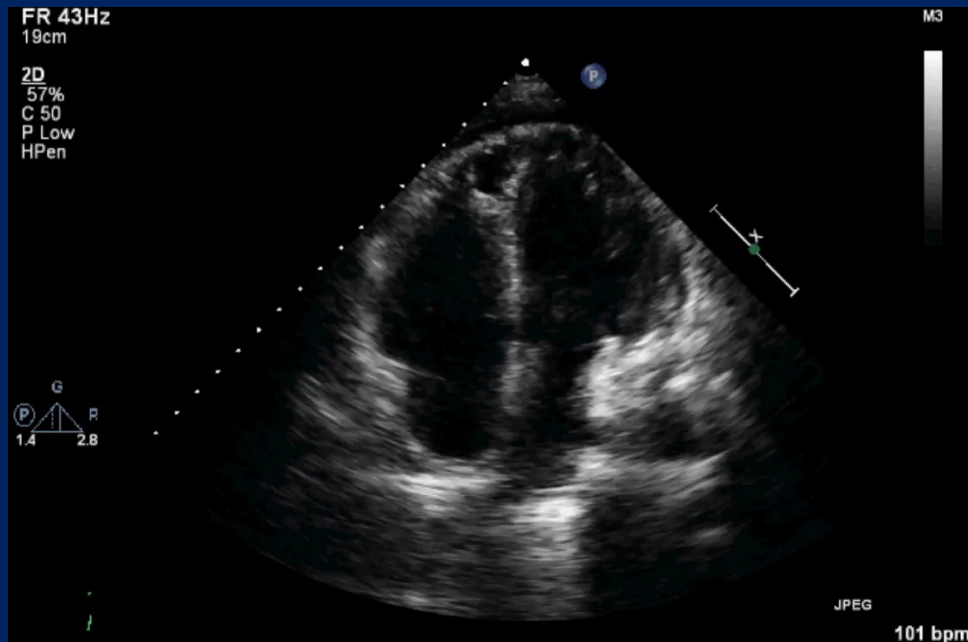
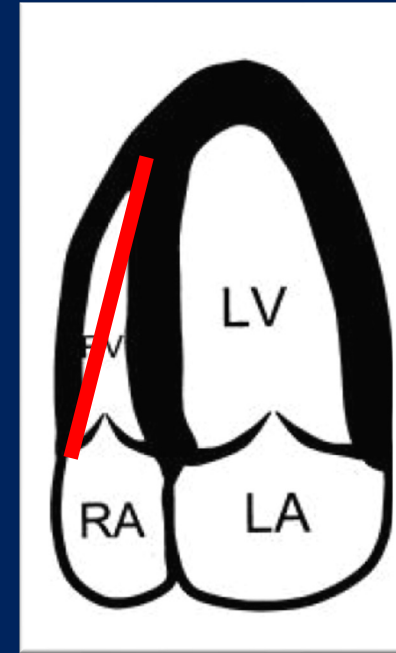
## No RVSP?

- Look for secondary changes
  - Chronicity and Severity
    - RV Function



## No RVSP?

- Look for secondary changes
  - Chronicity and Severity
    - RV Function
- **Normal TAPSE >17mm**





## No RVSP?

- 48 yo Obese F with known Pulmonary Hypertension scheduled for ExLap.

TAPSE  
<17 mm

- **Echo Summary**

- Poor quality study
- Small LV size with normal function
- Dilated RV with mildly reduced RV function
- IVC dilated and collapses <50% with inspiration

Underfilled  
LV

IVC > 2.1cm

<50%  
Collapse

- **Quick Look at the Numbers**

- TAPSE = 14mm
- IVC = 2.4cm
- PA Diameter = 2.2cm

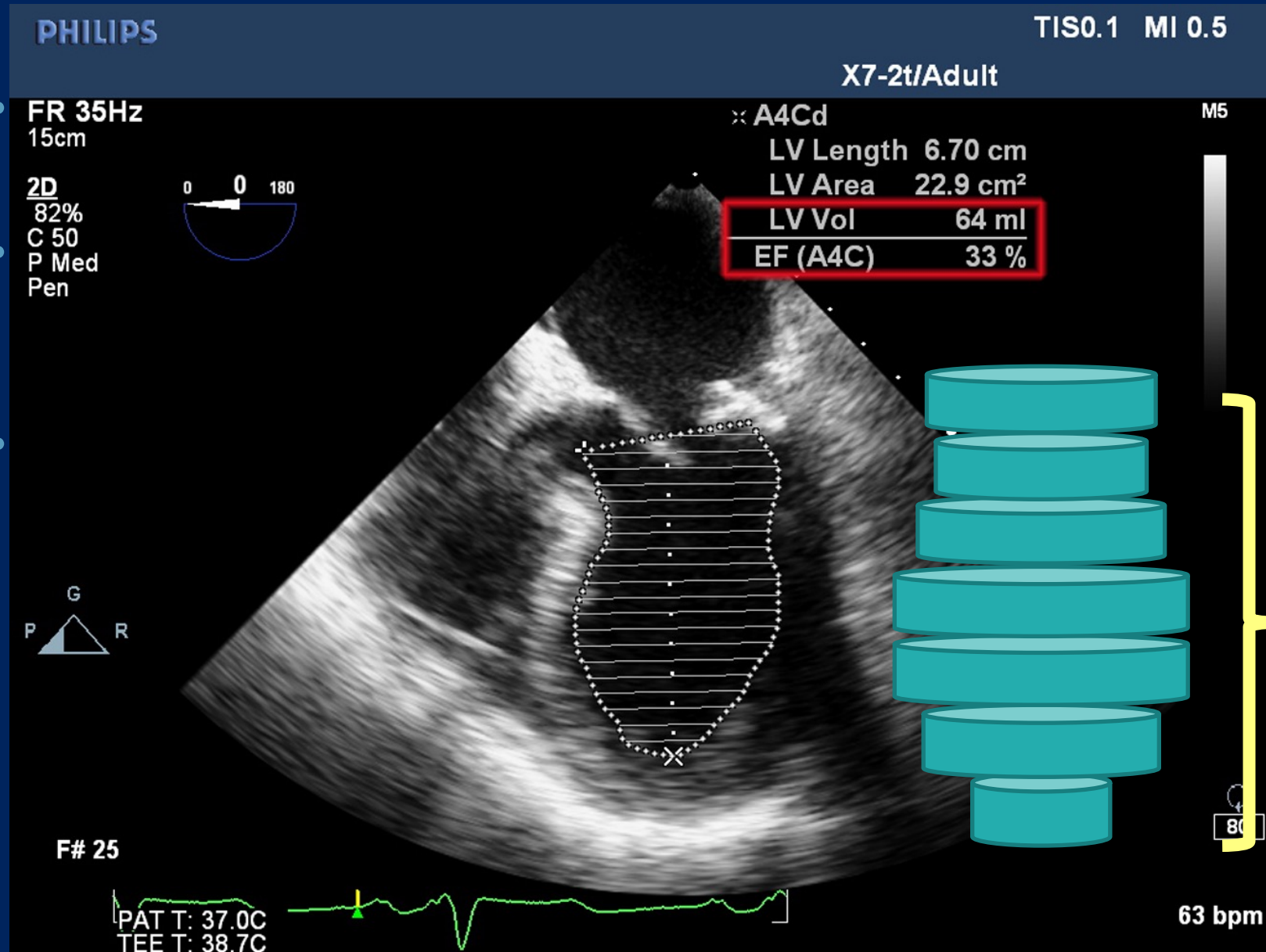
Elevated  
RAP

↓ RVF

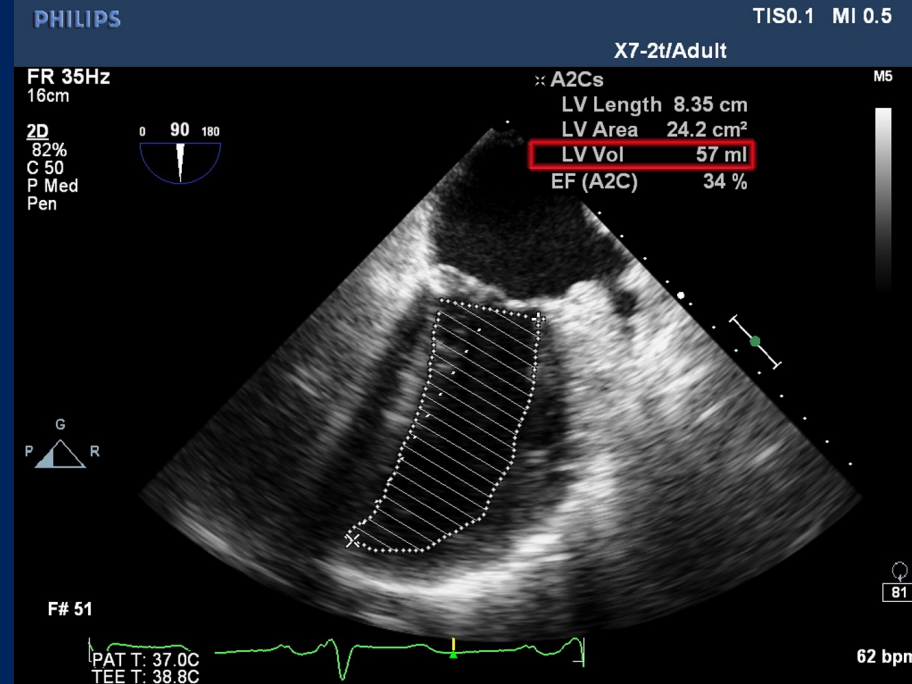
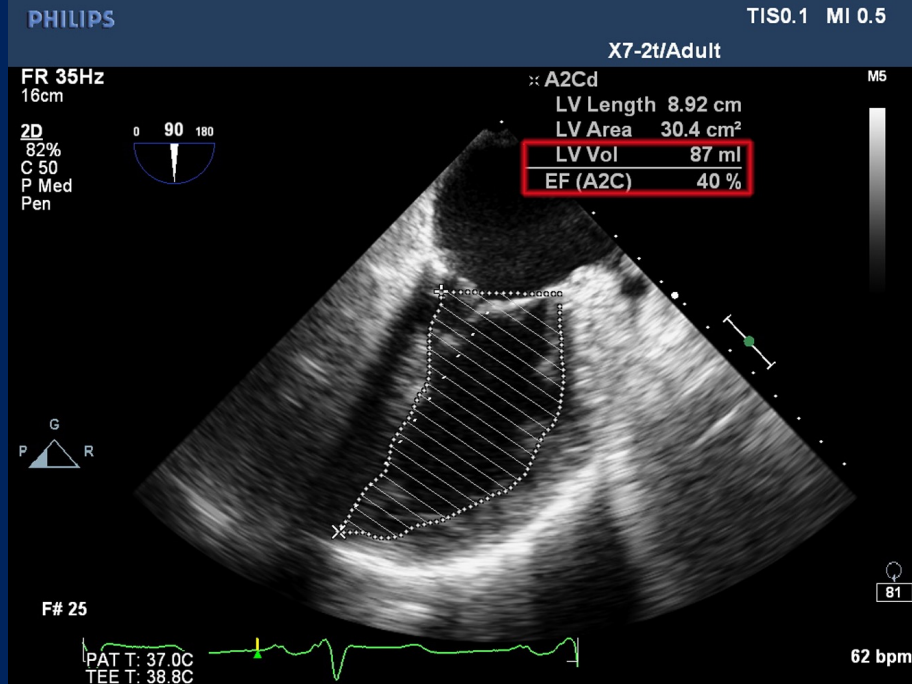
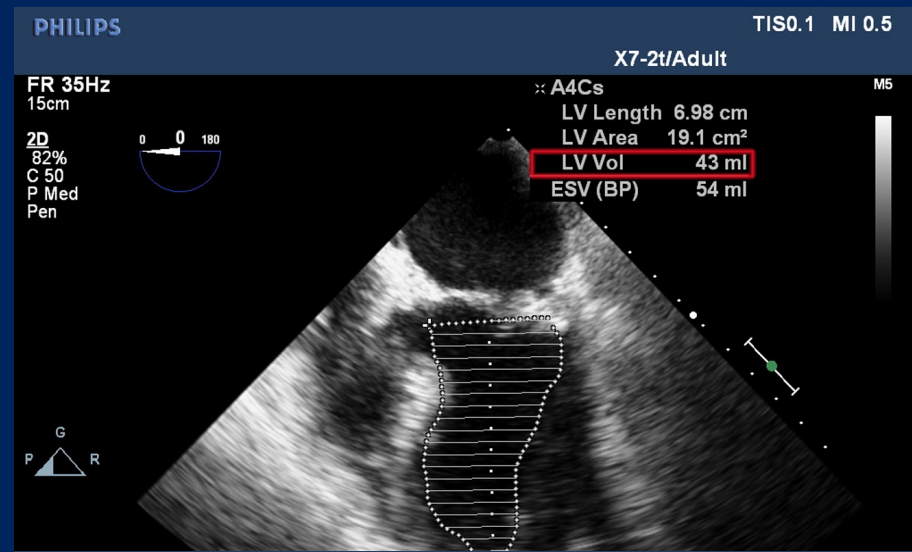
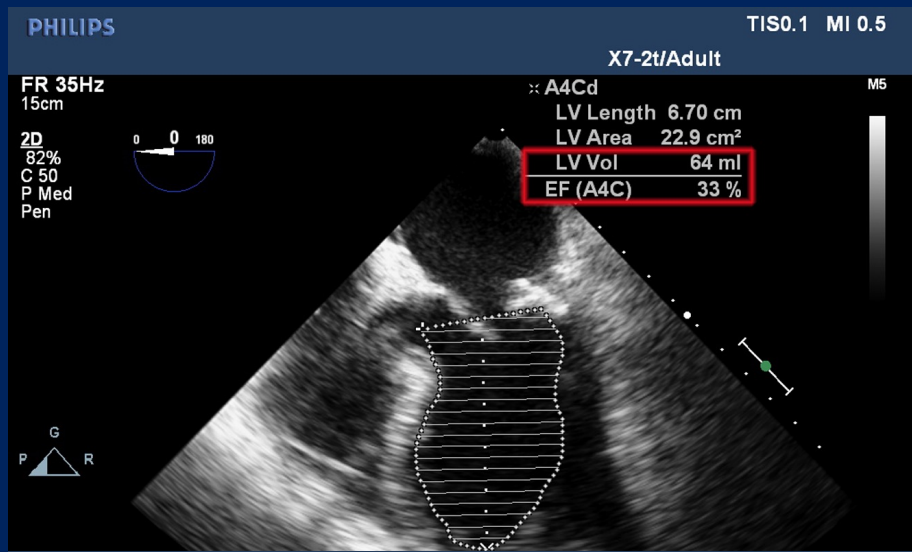
## Good EF?

- 42 yo F scheduled for ex lap (scheduled next week for MVR)
- **Echo Summary**
  - LV is mildly dilated with mildly reduced systolic function
  - RV is mildly dilated with depressed systolic function
  - Severe LA enlargement
  - Severe eccentric mitral regurgitation
  - Severe pulmonary hypertension
- **Quick Look at the Numbers**
  - LVEF = 46%
  - MR Regurgitant Fraction = 53%
  - MR EROA = 0.43 cm<sup>2</sup>
  - Stroke Volume (SVI) = 35 ml (21 ml/m<sup>2</sup>)

# Good EF?

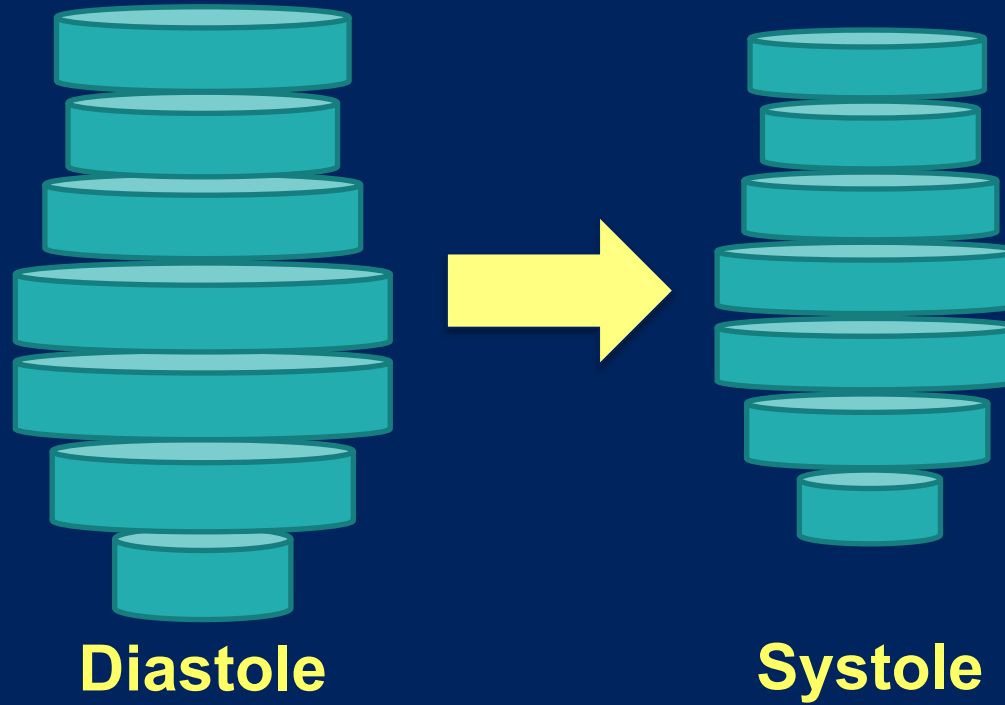


# Good EF?



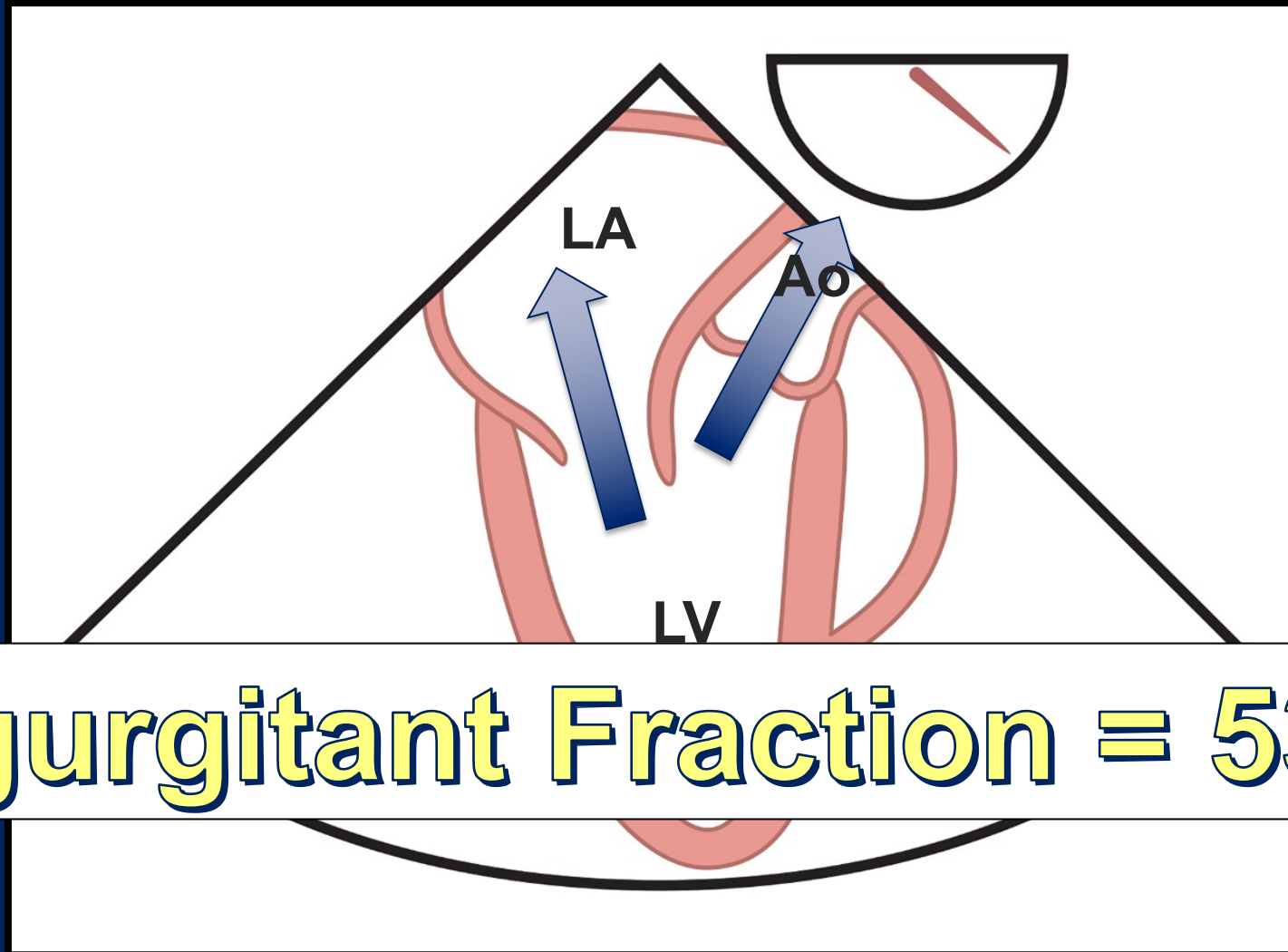
## Good EF?

- So how about this patient's EF?



## Good EF?

- So how about this patient's EF?

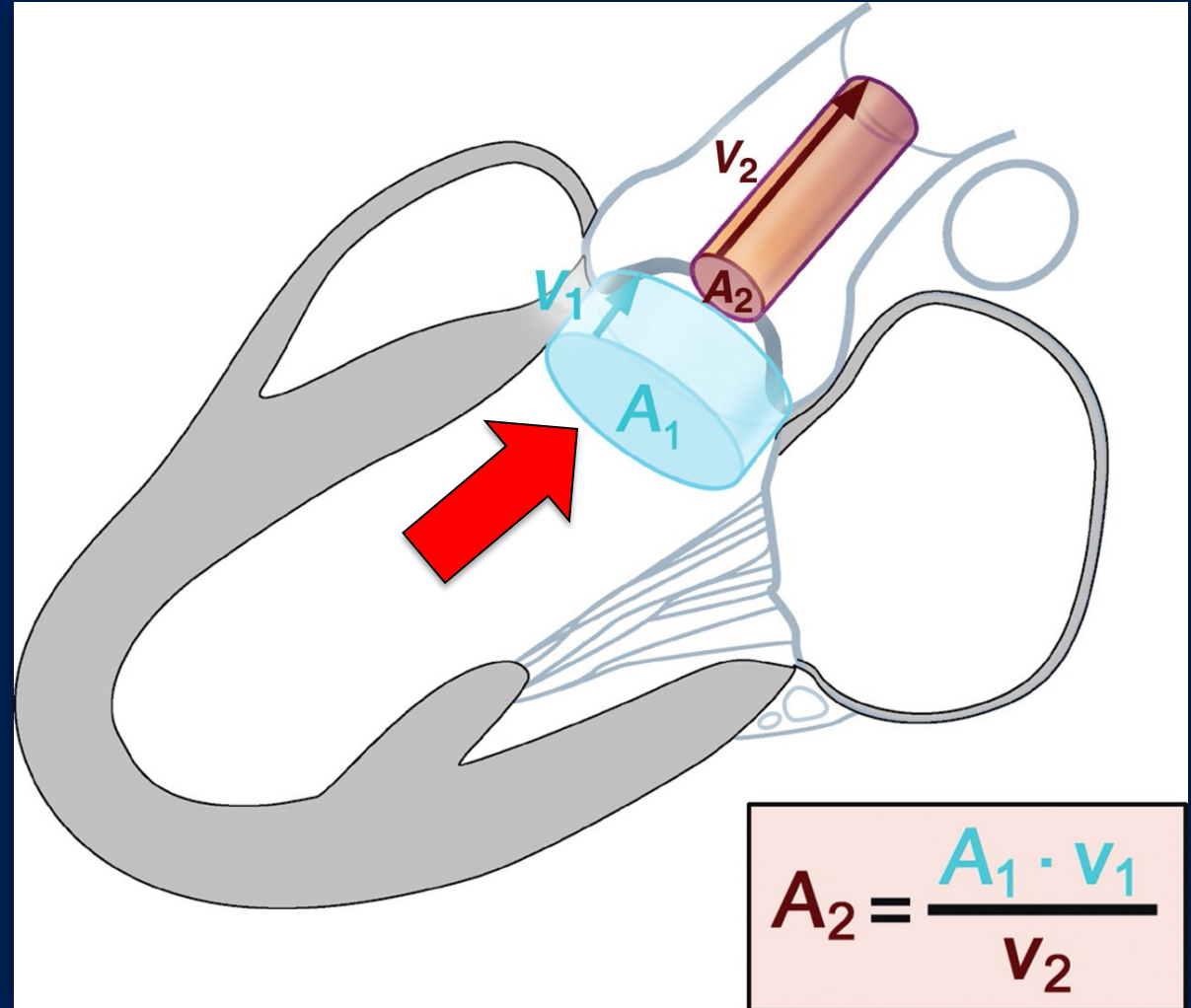


**Regurgitant Fraction = 53%**



## Good EF?

- What is her systolic function?
- Consider her
  - **SV (SVI)**
  - **CO**
- Typically derived from the LVOT only



## Good EF?

- 42 yo F scheduled for ex lap (scheduled next MVR)

Consider  
Modalities  
Other than  
EF



### • **Echo Summary**

- LV is mildly dilated with mildly reduced systolic function
- RV is mildly dilated with depressed systolic function
- Severe LA enlargement
- Severe eccentric mitral regurgitation
- Severe pulmonary hypertension

Secondary  
Changes



### • **Quick Look at the Numbers**

- LVEF = 46%
- MR Regurgitant Fraction = 53%
- MR EROA = 0.43 cm<sup>2</sup>
- Stroke Volume (SVI) = 35 ml (21 ml/m<sup>2</sup>)

Half of the  
ejection is  
going  
backwards!

nl SVI = 35  
ml/m<sup>2</sup>



# Take Away Points

- **Need good Doppler alignment for Gradients and AVA**
- **Poor LV function (low output of any type) = low AV gradient**
- **Need a TR jet to determine PASP**
- **IVC Collapsibility used to estimate RA pressure**
- **Ejection Fraction is not the only assessment of LV Function**
- **Don't forget to look for Secondary Changes**



# Thank You

---

Where discoveries are delivered.<sup>SM</sup>

UC San Diego  
SULPIZIO CARDIOVASCULAR CENTER

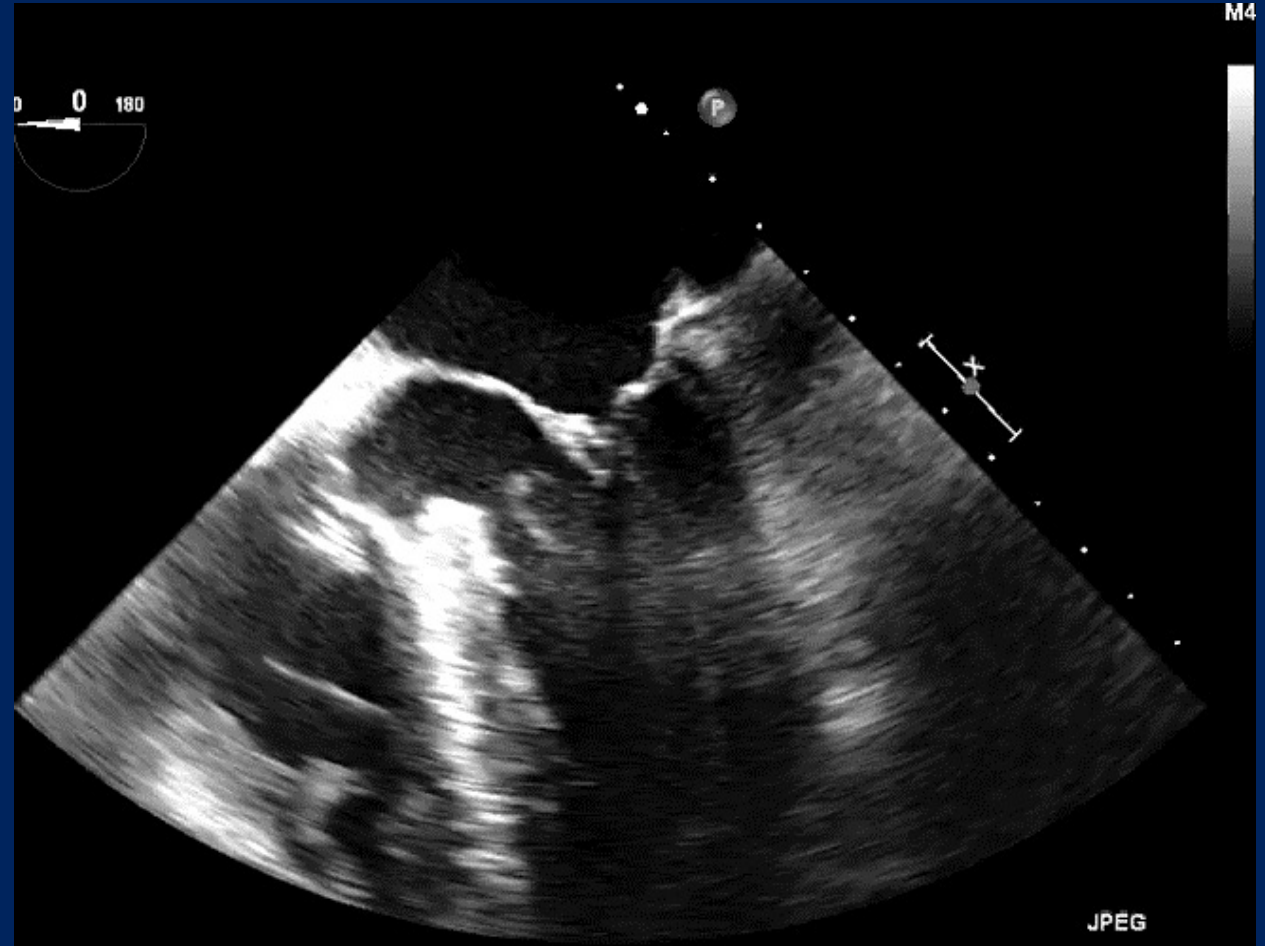
# Obstruction

- 64 yo M scheduled for left total knee replacement
- **Echo Summary**
  - Normal LV size and systolic function
  - Asymmetric left ventricular hypertrophy
  - With evidence of LVOT obstruction
- **Quick Look at the Numbers**
  - LVEF = 64%
  - IVS Thickness = 1.8cm
  - LVOT Peak Gradient = 31 mm Hg



# Obstruction

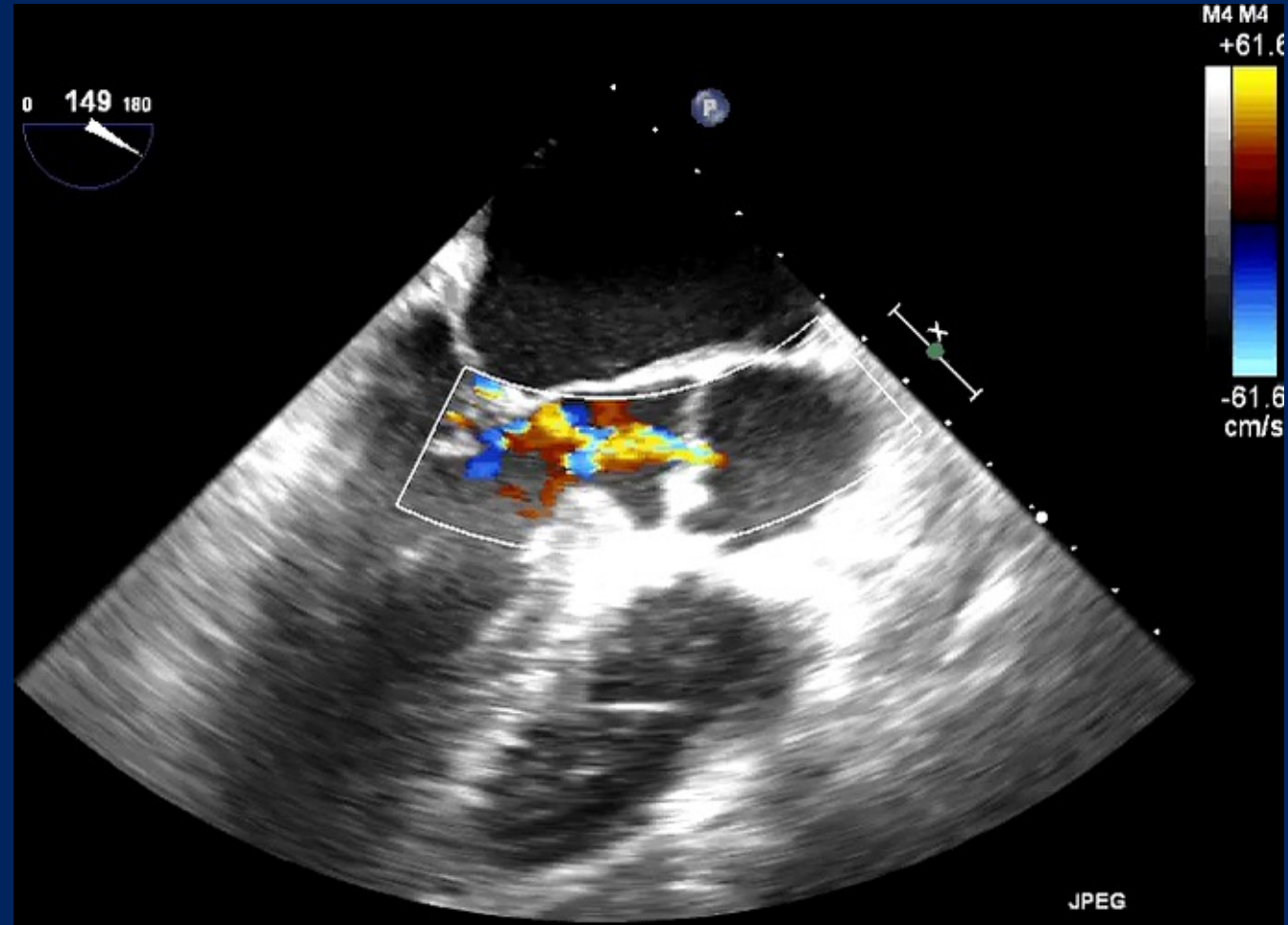
- Hypertrophic Obstructive Cardiomyopathy
- aka ... ASH, IHSS, HCM
- Classically basal anterior septum
- **Subaortic stenosis**
- LVH
- Diastolic Dysfunction
- *Arrhythmias*





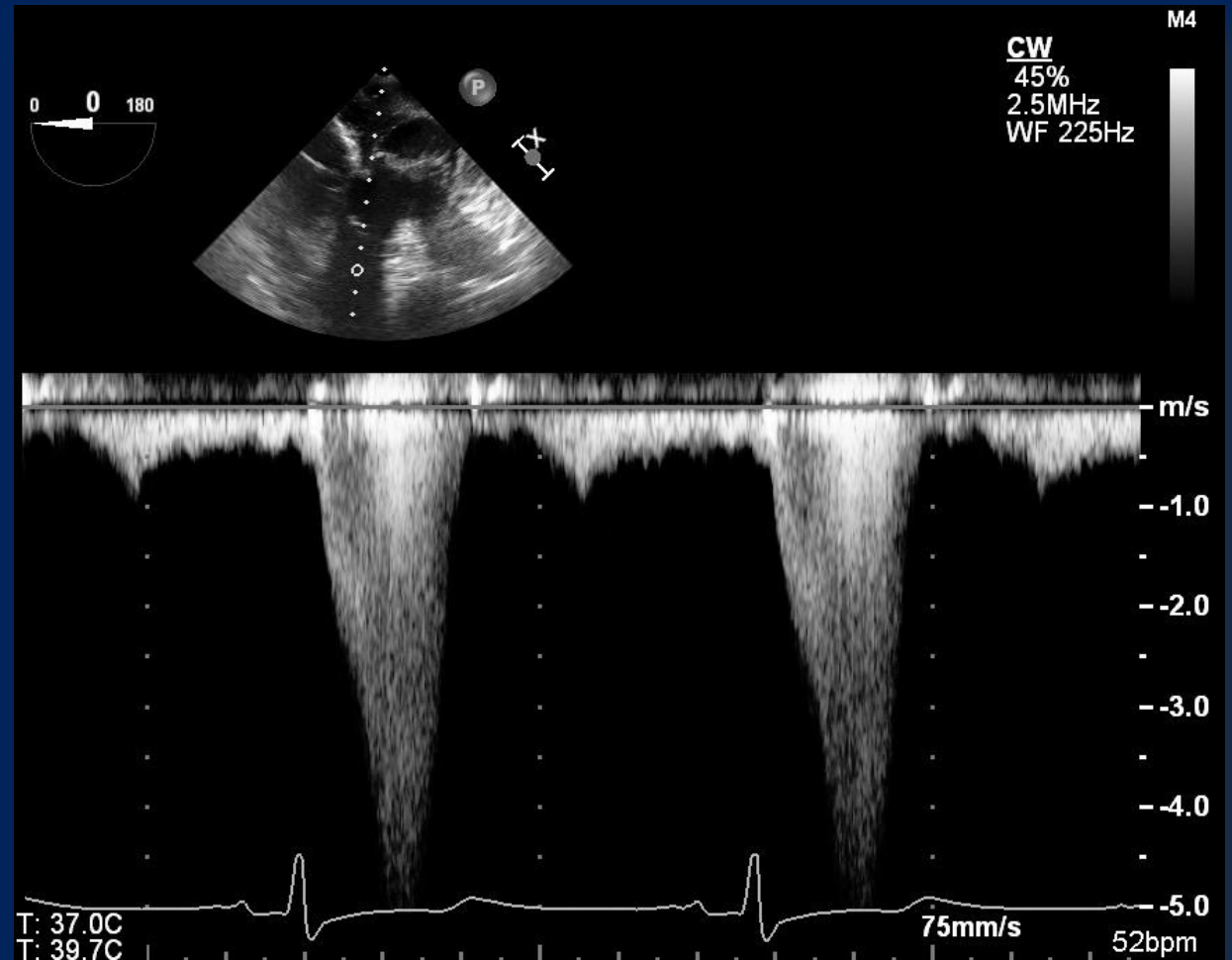
# HOCM

- So how bad is it?
- **Often asymptomatic**
  - At rest in 30%
  - With provocation in 70%
- Symptoms  $\neq$  severity
- **LVOTO = predictor of death**

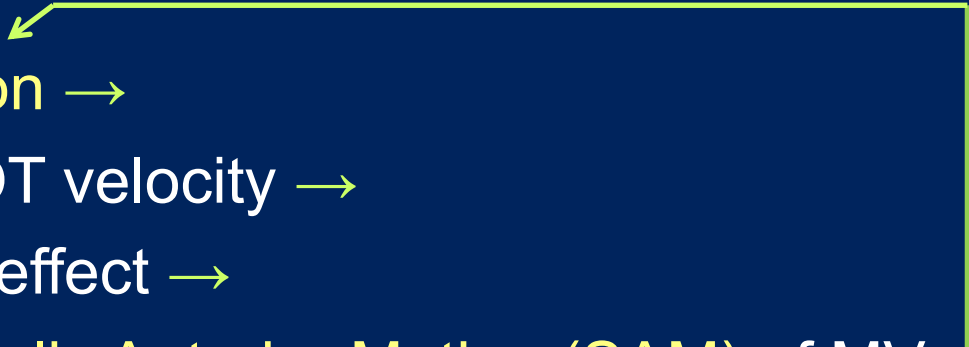


# HOCM

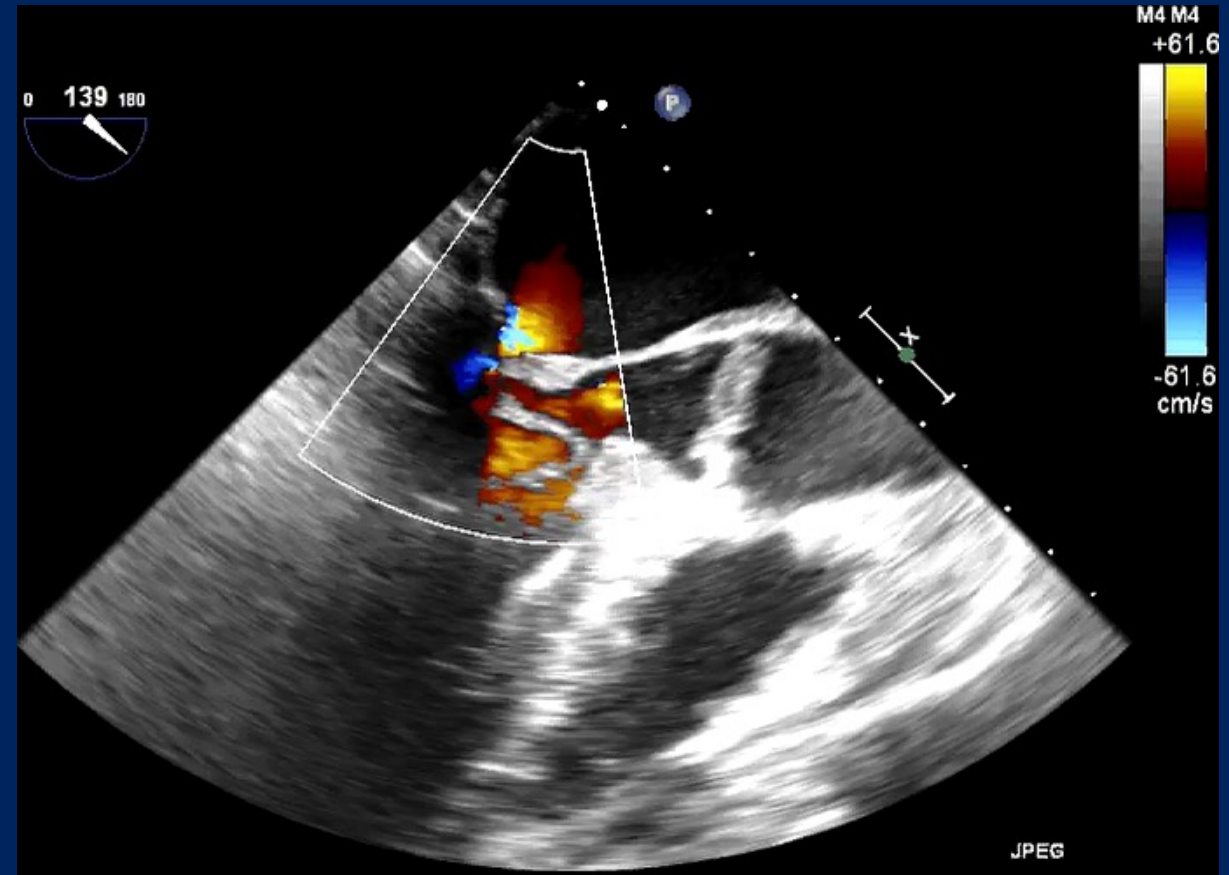
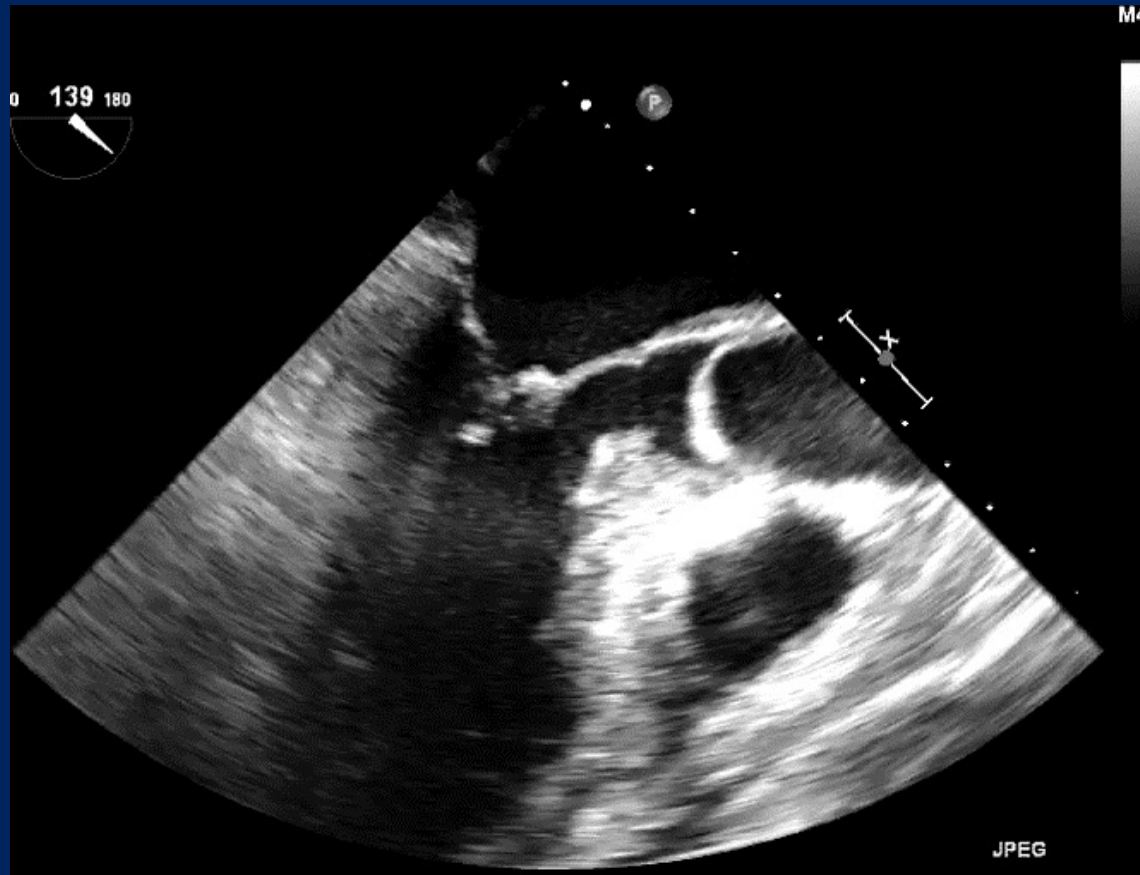
- **Gradients**
  - Mid to Late peaking
  - “Dagger-shaped”
- Indications for Surgery
- At Rest
  - **>30mmHg**
- With Provocation
  - **>60mm**



# HOCM

- Associated Mitral Regurgitation
  - **Systolic Anterior Motion (SAM)**
  - Dynamic obstruction →
    - Increased LVOT velocity →
    - Venturi effect →
    - Systolic Anterior Motion (SAM) of MV**
  - Creates **Subaortic Stenosis** – mid to late obstruction
  - **MR** – posterior leaflet unable to follow anterior leaflet
- 

# Systolic Anterior Motion



# Obstruction!

- 64 yo M scheduled for left total knee re

- **Echo Summary**

- Normal LV size and systolic function
- Asymmetric left ventricular hypertrophy
- With evidence of LVOT obstruction

LV Thickness  
>1.5 cm

## Hemodynamic Goals

Reduced heart rate  
Reduced LV contractility  
Increased SVR  
Prevent hypovolemia

- **Quick Look at the Numbers**

- LVEF = 64%
- IVS Thickness = 1.8cm
- LVOT Peak Gradient = 30 mm Hg

Increased  
Risk of Death