

# ***Low-Gradient Severe Aortic Stenosis***

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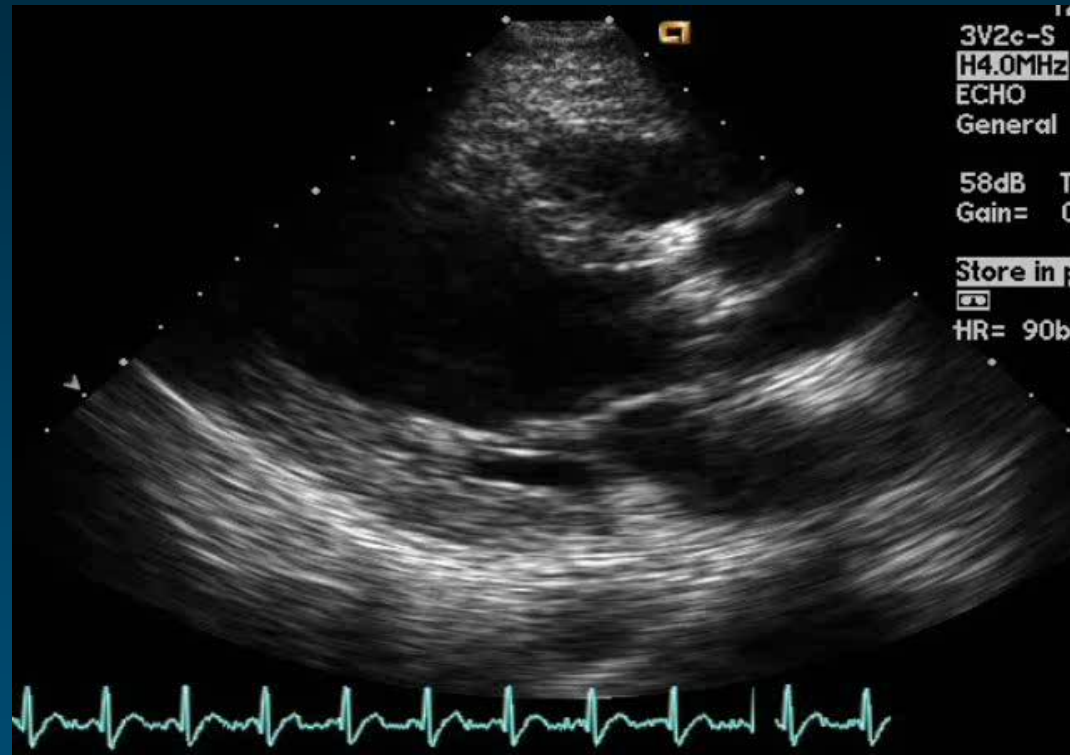


# ***Severity of Aortic Stenosis***

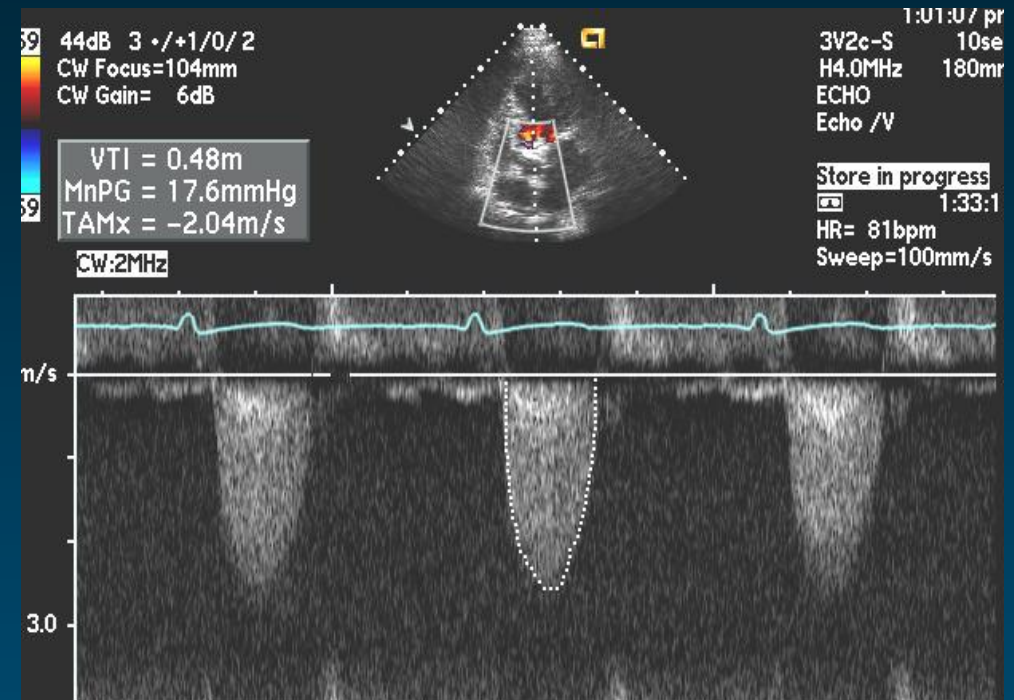
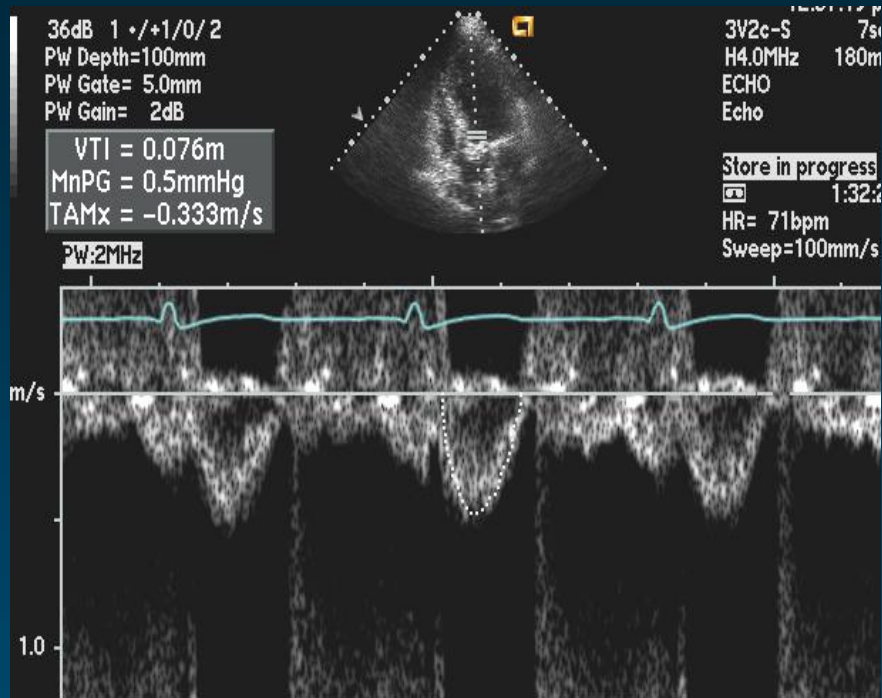
Indicator	Mild	Moderate	Severe
Jet velocity (m/sec)	< 3.0	3.0 – 4.0	> 4.0
Mean gradient (mmHg)	< 25	25 – 40	> 40
Valve area (cm <sup>2</sup> )	> 1.5	1.0 – 1.5	< 1.0

**30% of pt: AVA < 1.0 cm<sup>2</sup> + mean PG < 30mmHg**

# ***Case : 70 yo Man with Dyspnea***



# Case : 70 yo Man with Dyspnea



$$AVA = 3.14 * 8/48 = 0.52\text{cm}^2$$

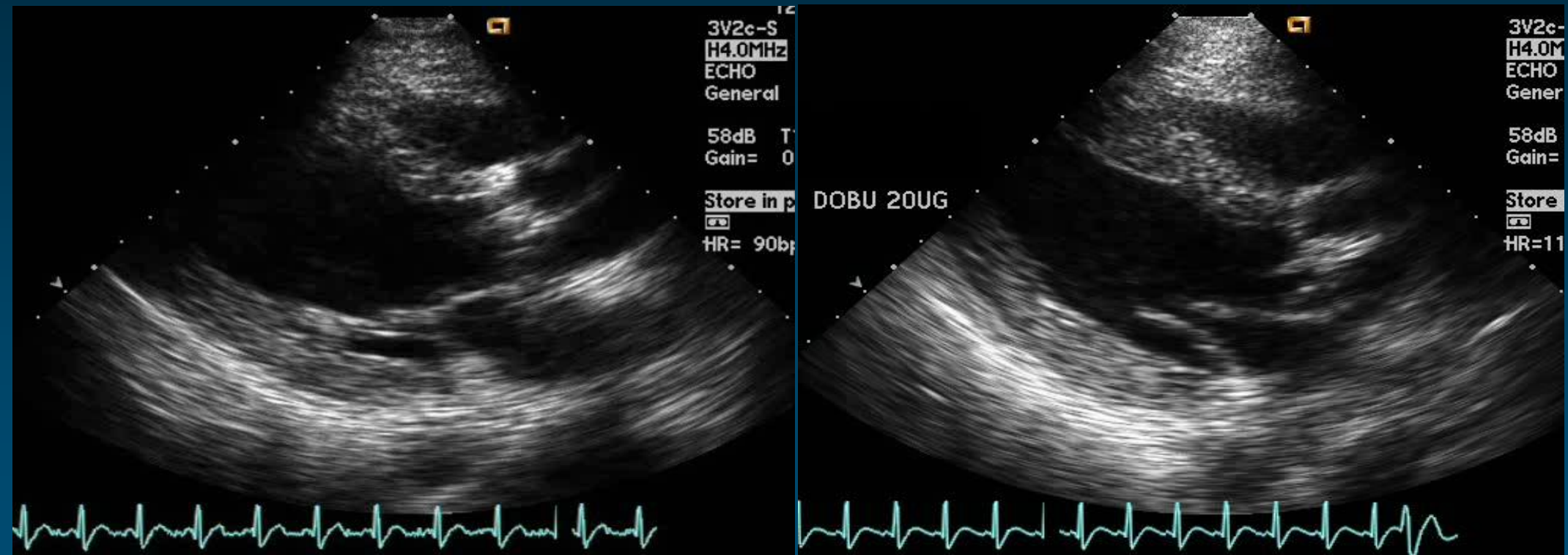
$$V_{\text{max}} = 2.5 \text{ m/s}$$

$$\text{mean PG} = 18 \text{ mmHg}$$

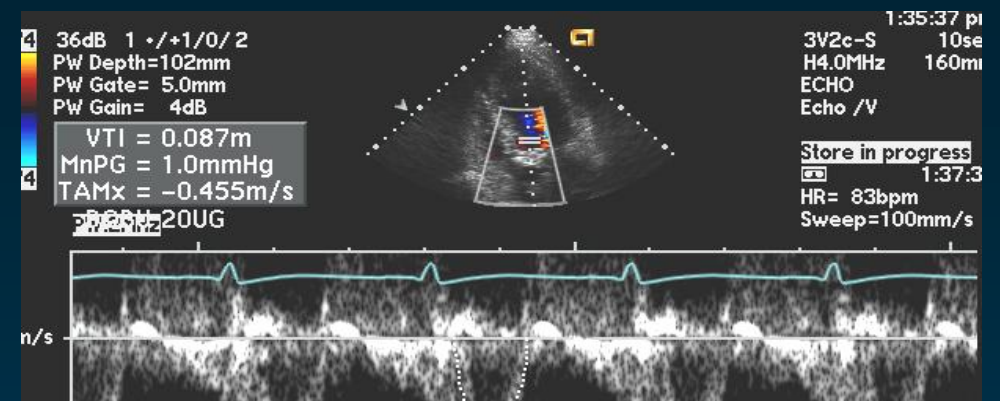
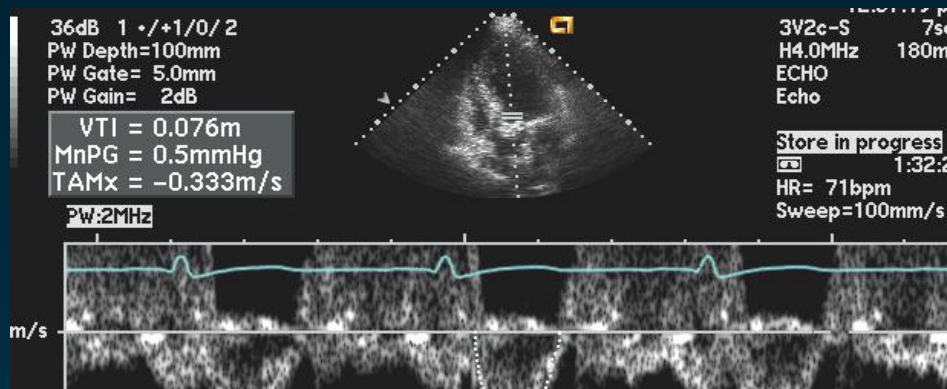
**Low-flow, low-gradient severe AS**

# ***Case : 70 yo Man with Dyspnea***

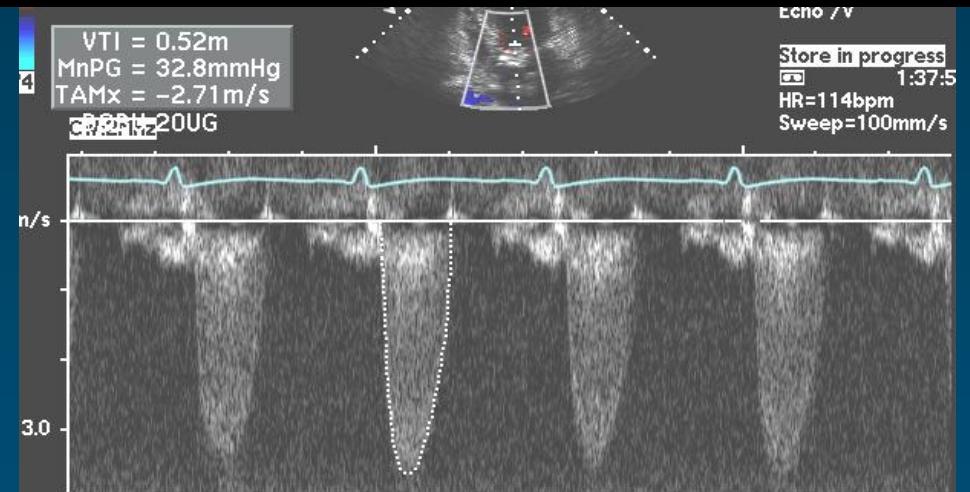
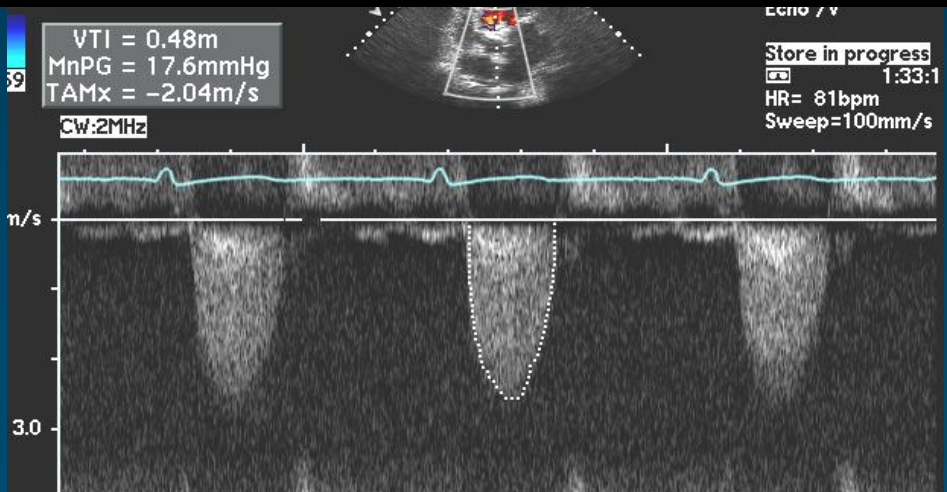
## **Low Dose Dobutamine Echo**







## Severe AS with LV dysfunction d/t afterload mismatch

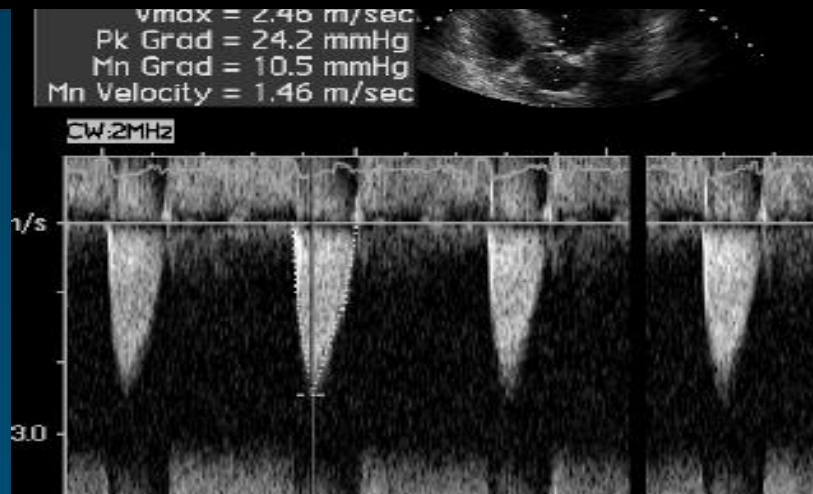


$$AVA = 3.14 * 8/48 = 0.52\text{cm}^2$$

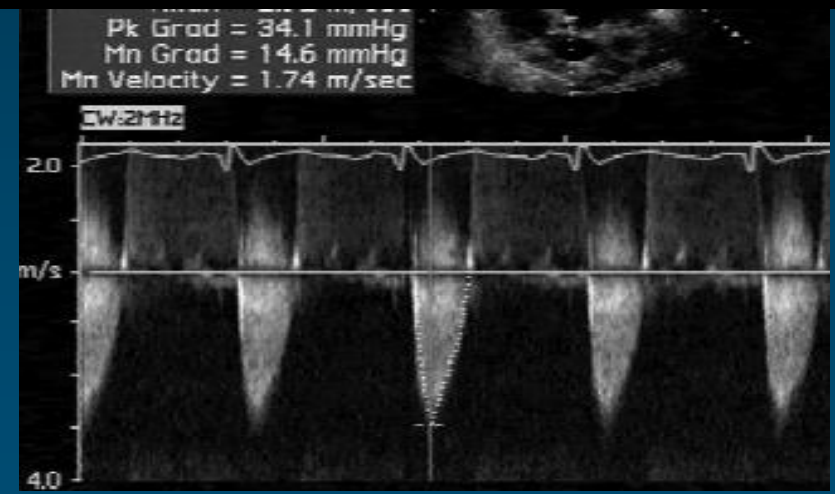
$$AVA = 3.14 * 9/52 = 0.54\text{cm}^2$$



## Pseudo severe AS with LV dysfunction d/t myocardial disease



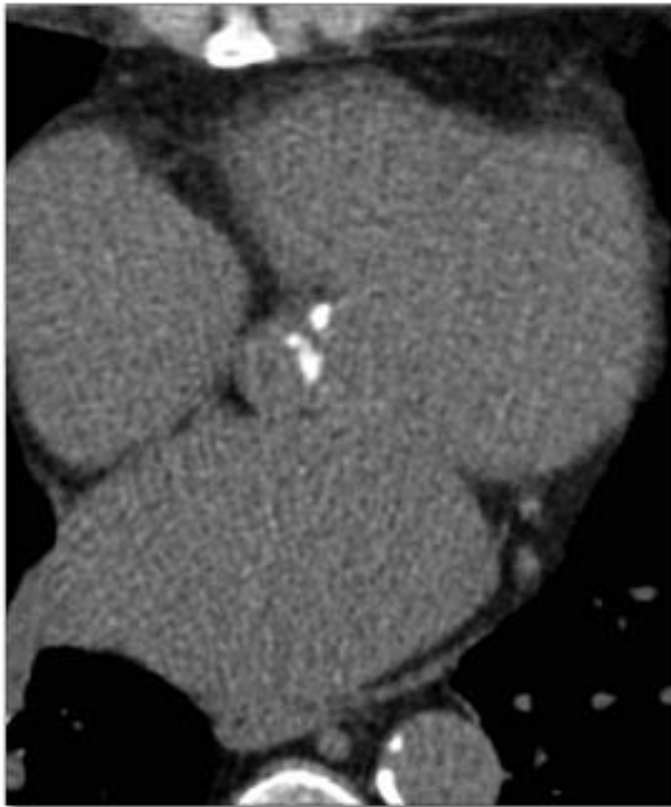
$$AVA = 3.14 * 8/36 = 0.7 \text{ cm}^2$$



$$AVA = 3.14 * 12/40 = 1.04 \text{ cm}^2$$

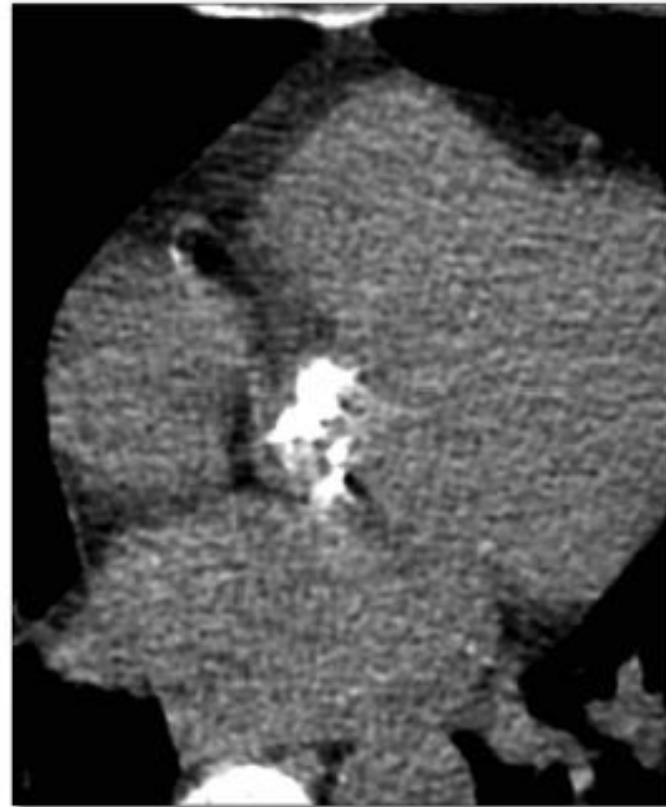
# ***AV Calcification: True vs Pseudo***

Pseudo-Severe AS



AVC Score = 737 AU  
AVC Density = 194 AU/cm<sup>2</sup>  
AVA = 0.88 cm<sup>2</sup>; MG = 18 mm Hg

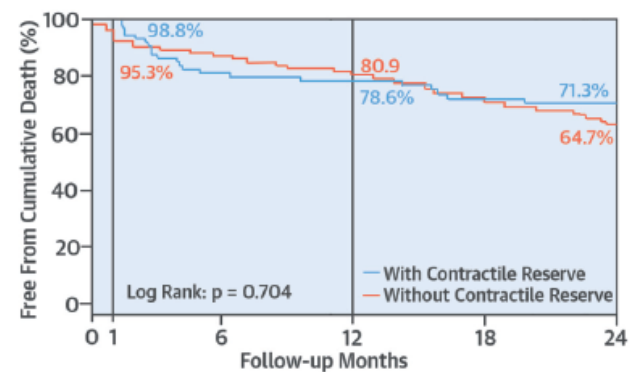
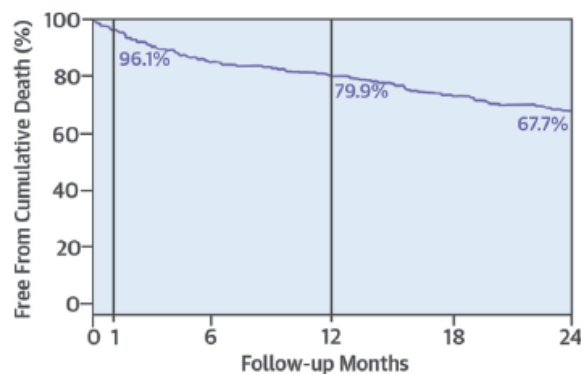
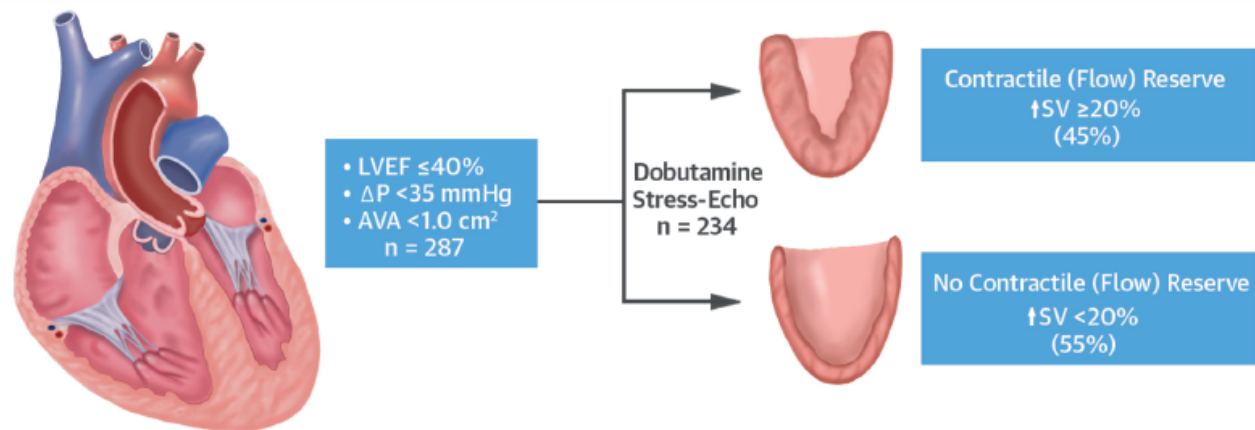
True-Severe AS



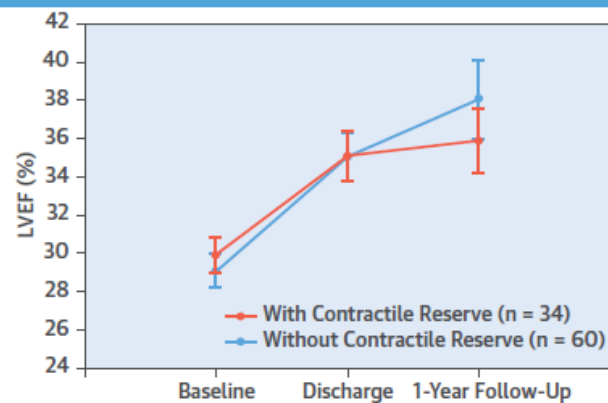
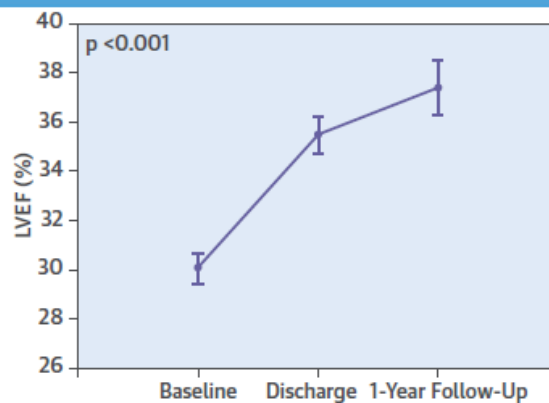
AVC Score = 3,127 AU  
AVC Density = 753 AU/cm<sup>2</sup>  
AVA = 0.64 cm<sup>2</sup>; MG = 26 mm Hg



## TAVR in Patients with Low-Flow, Low-Gradient Aortic Stenosis



## Changes in LVEF Over Time



EOA  $<1 \text{ cm}^2$ , MG  $<40 \text{ mm Hg}$ , and LVEF  $<50\%$

Dobutamine stress echocardiogram

Increase SV  $\geq 20\%$   
MG  $\geq 40 \text{ mm Hg}$   
EOA  $\leq 1.0 \text{ cm}^2$

True severe AS

Heart team risk  
assessment

Intermediate, high,  
or extreme risk

TAVR

Increase SV  $\geq 20\%$   
MG  $<40 \text{ mm Hg}$   
EOA  $>1.0 \text{ cm}^2$

Pseudo severe AS

Medical therapy vs.  
consider enrollment in  
TAVR-unload trial

Increase SV  $<20\%$   
(no contractile  
reserve)

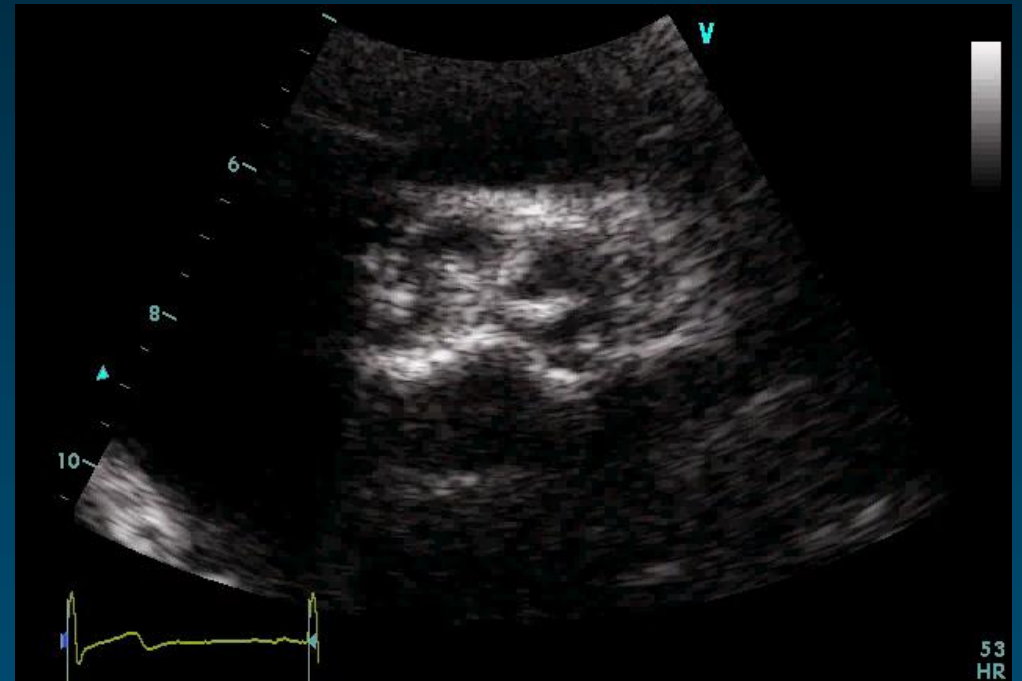
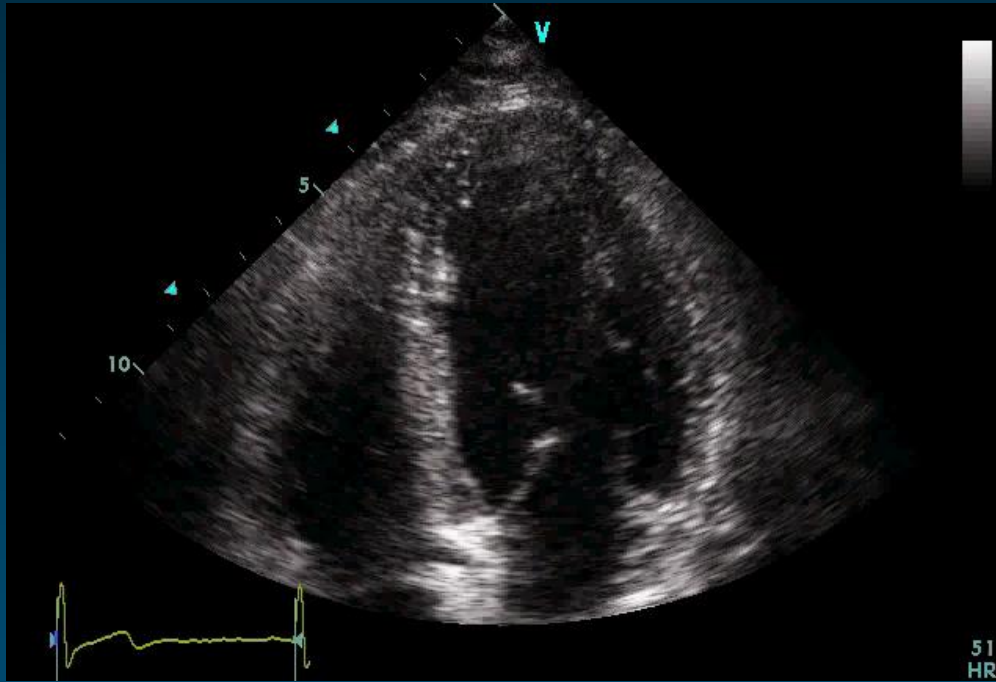
Favor TAVR if AS  
deemed severe  
by MDCT  $\text{Ca}^{2+}$   
 $\text{♀} \geq 1,200$ ,  $\text{♂} \geq 2,000$ ?

Low risk for SAVR

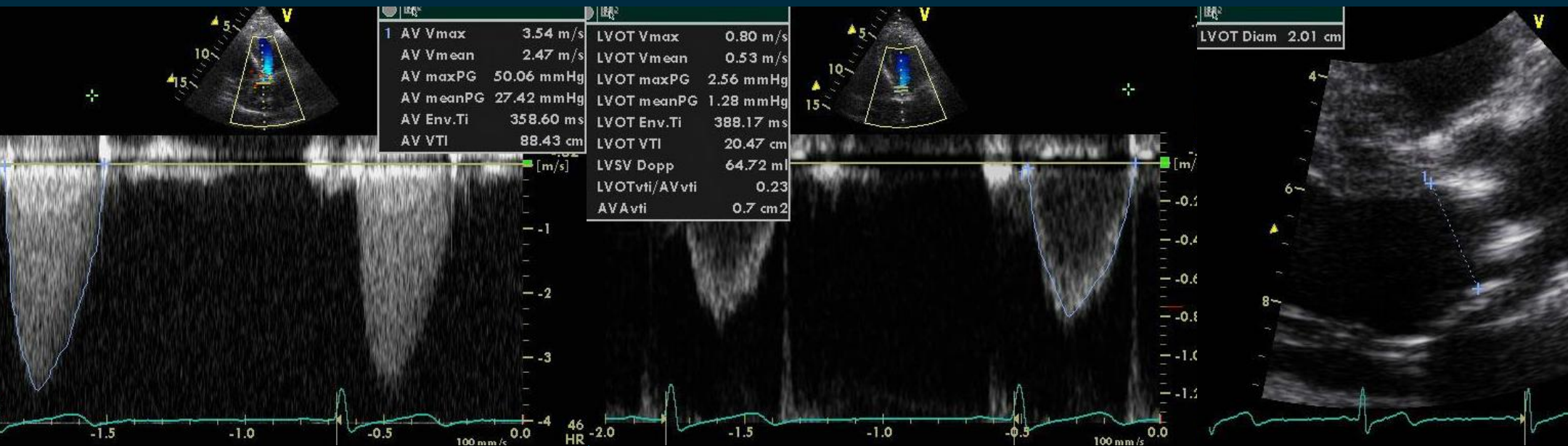
TAVR vs. SAVR pending low-risk trials results  
Favor TAVR if noninferior

# *Case*

## 75 YO Gentleman with SOB



# Case

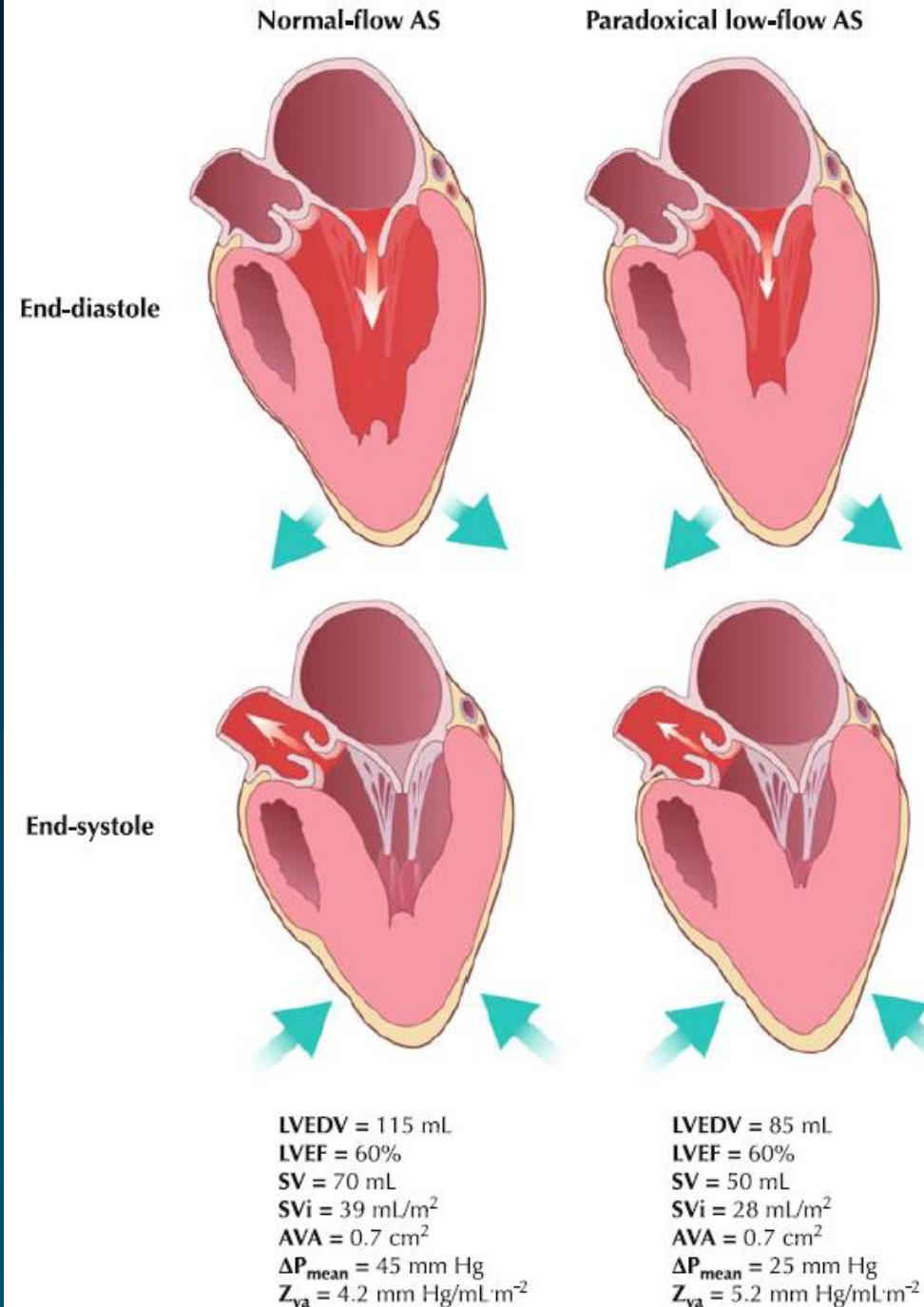


**Vmax: 3.5m/sec, Mean PG: 28mmHg, AVA: 0.7 cm<sup>2</sup>**

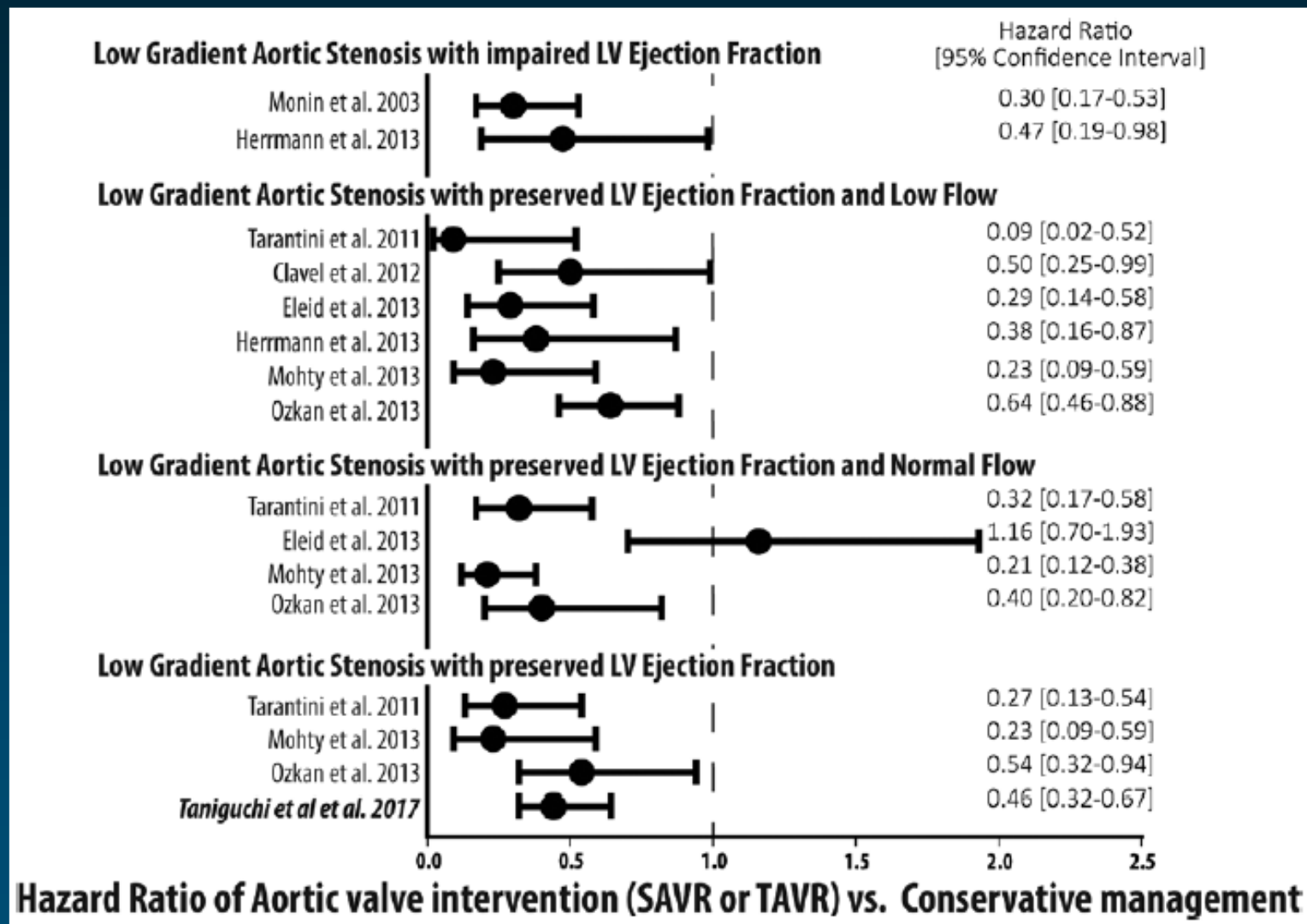
**Paradoxical LFLG AS**



# ***Paradoxical Low-flow, Low-Gradient Severe AS with Normal EF***



# Intervention vs Conservative



# ***Indication for LFLGAS with Normal EF***

Intervention should be considered in symptomatic pts with low-flow, low-gradient (<40mmHg) AS with **normal EF after careful confirmation of severe AS**

**IIa**

**C**

# ***Low-Gradient Severe AS***

- **Low-flow, low-gradient**
  - Reduced EF vs Normal EF
- **Normal –flow, low-gradient**
  - Small body size:  $0.6\text{cm}^2/\text{m}^2$
  - Inherent limitation of the Guidelines
  - Measurement error
    - » LVOT diameter
    - » CW Doppler
    - » LVOT PW Doppler



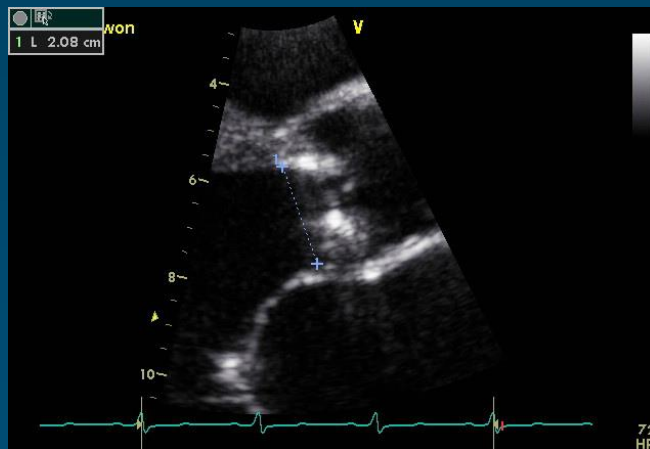
# ***Relation of AVA to Gradient***

<b>Aortic valve area (cm<sup>2</sup>)</b>	<b>Mean gradient (mmHg)</b>
4	1.7
3	2.9
2	6.6
1	26
0.9	32
0.8	41
0.7	53
0.6	73
0.5	105

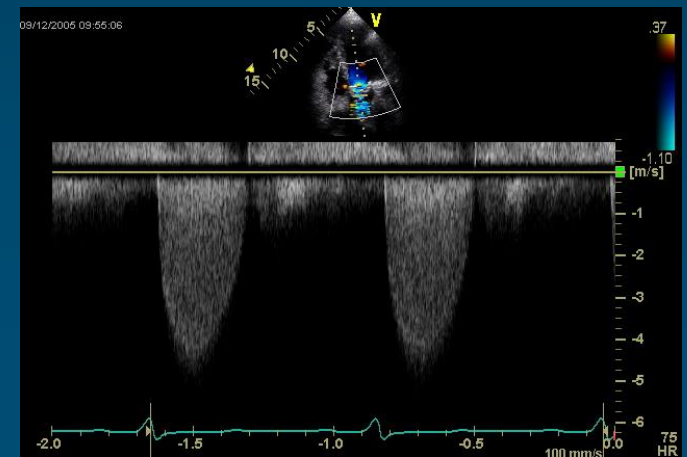
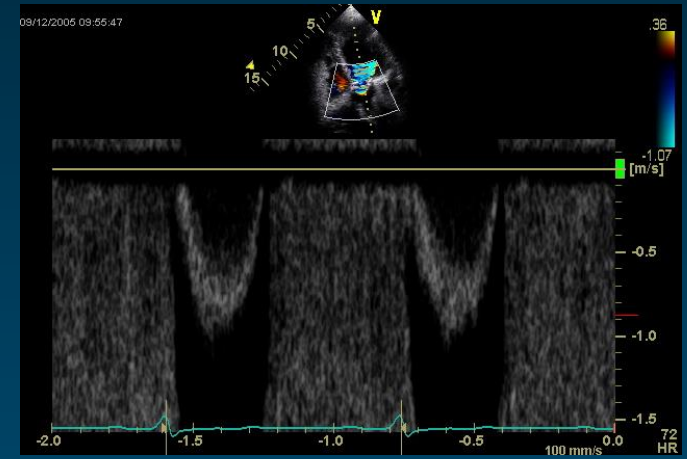
# Echo Measurement of AV Area

$$AVA = A_{LVOT} \times \frac{TVI_{LVOT}}{TVI_{AV}}$$

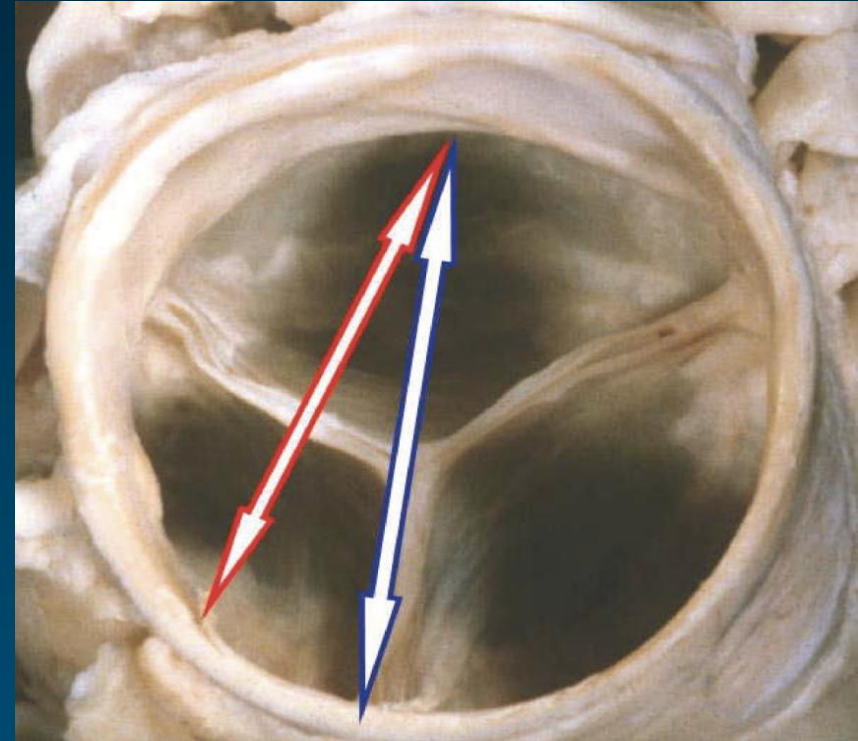
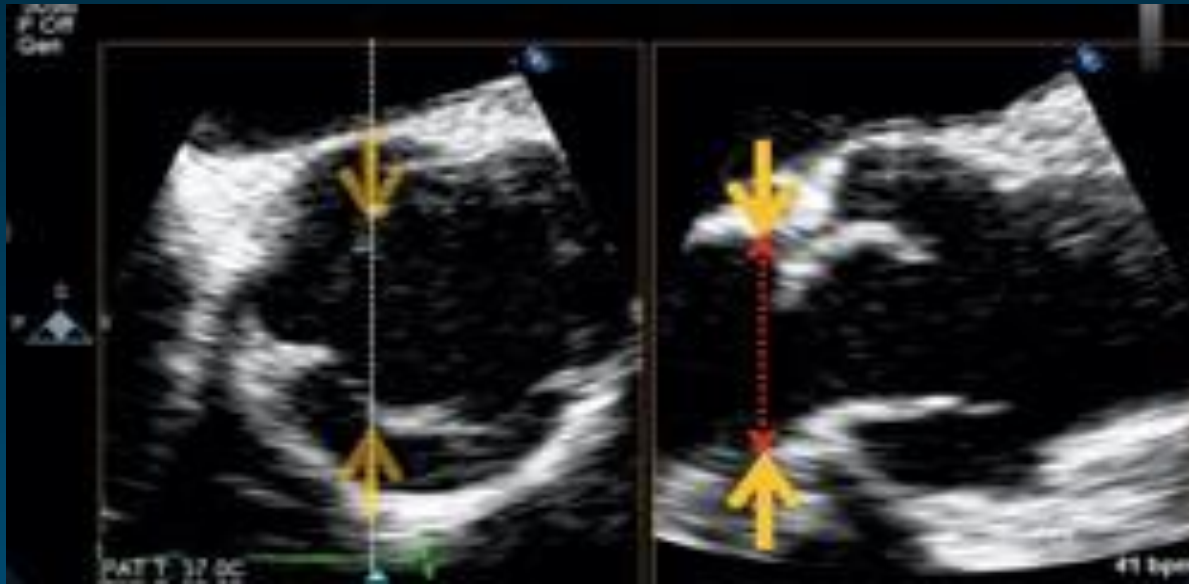
$$0.785 \times (LVOT \text{ diameter})^2$$

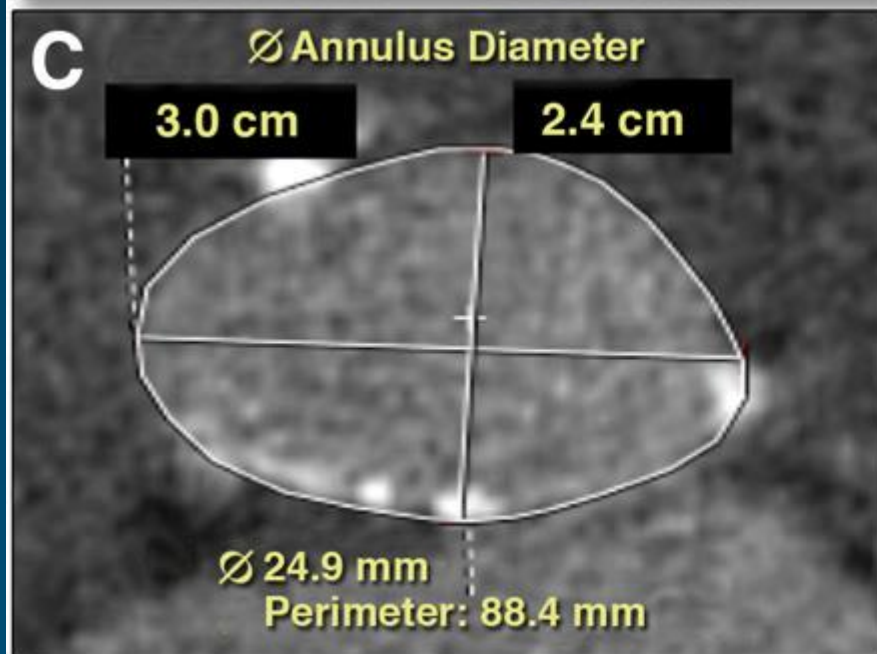
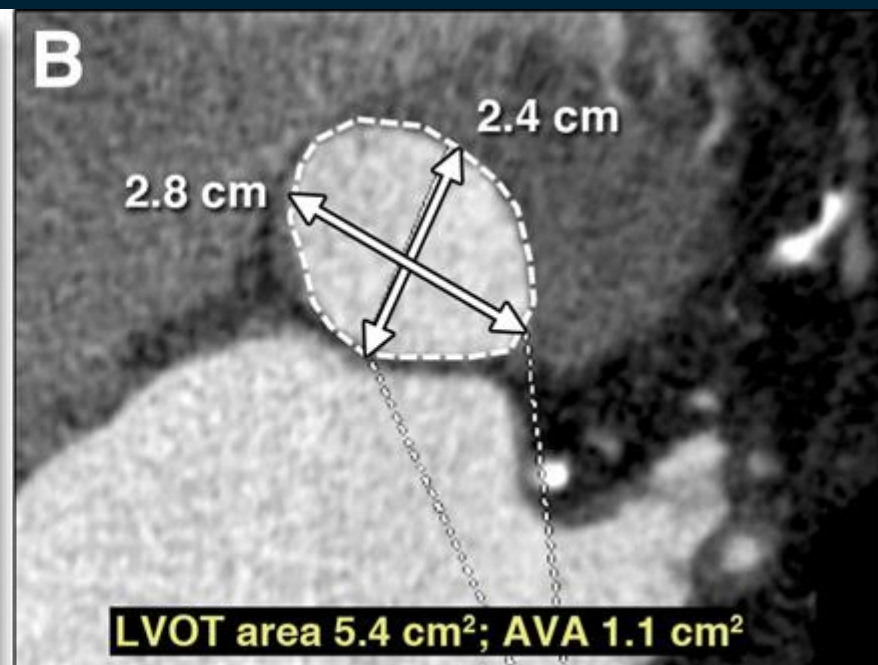
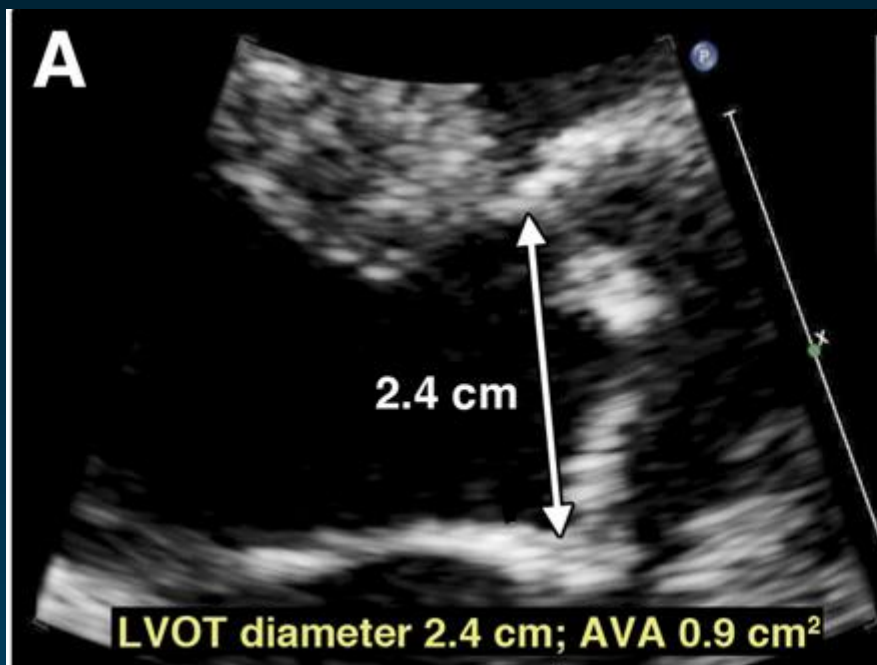


X



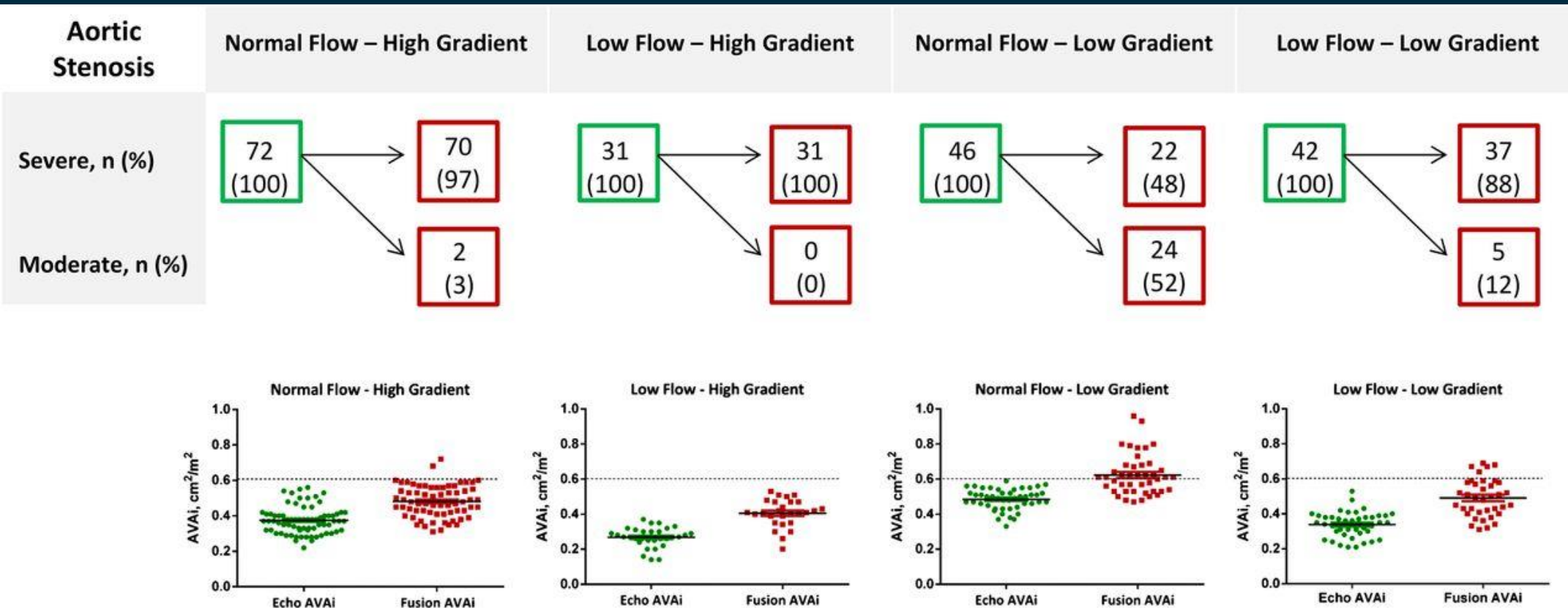
# ***Measurement of Annulus***



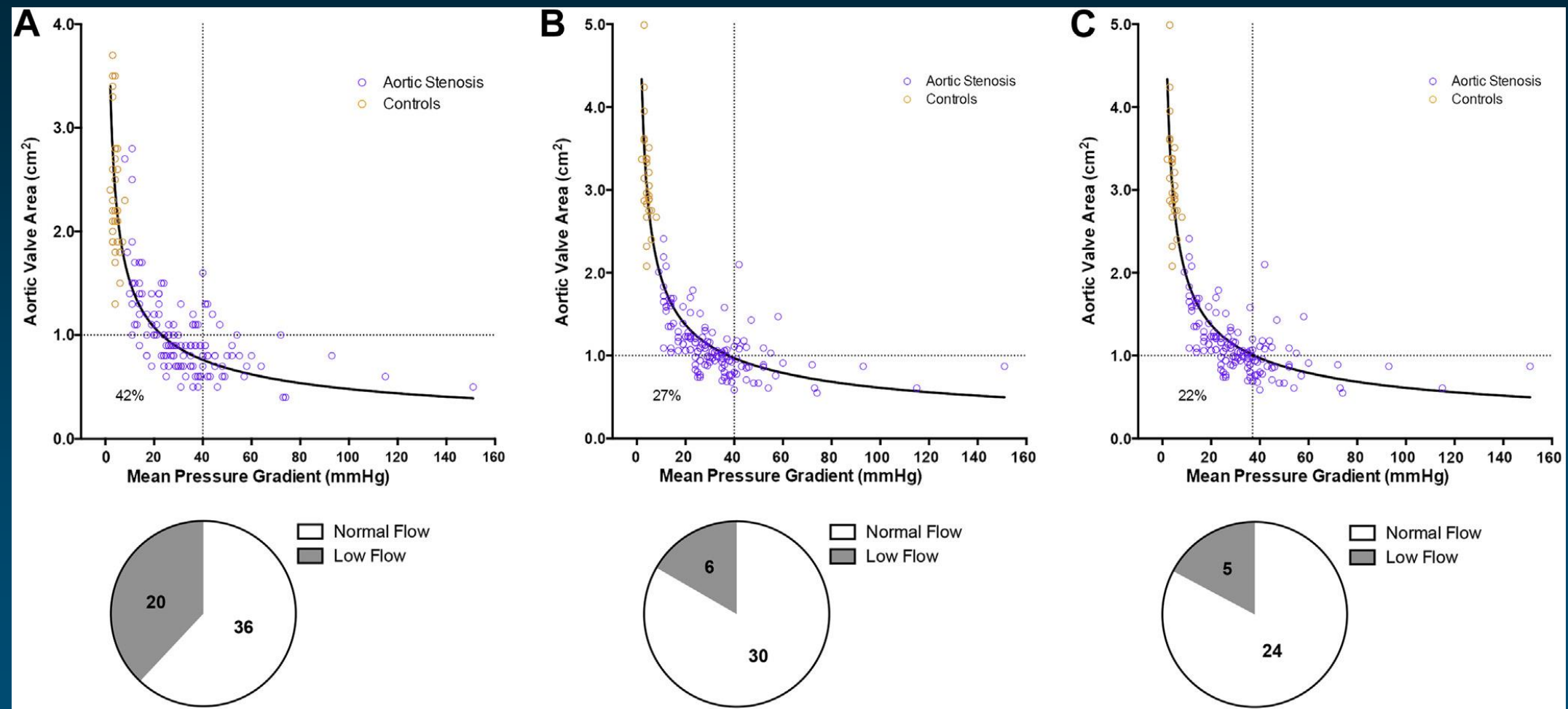




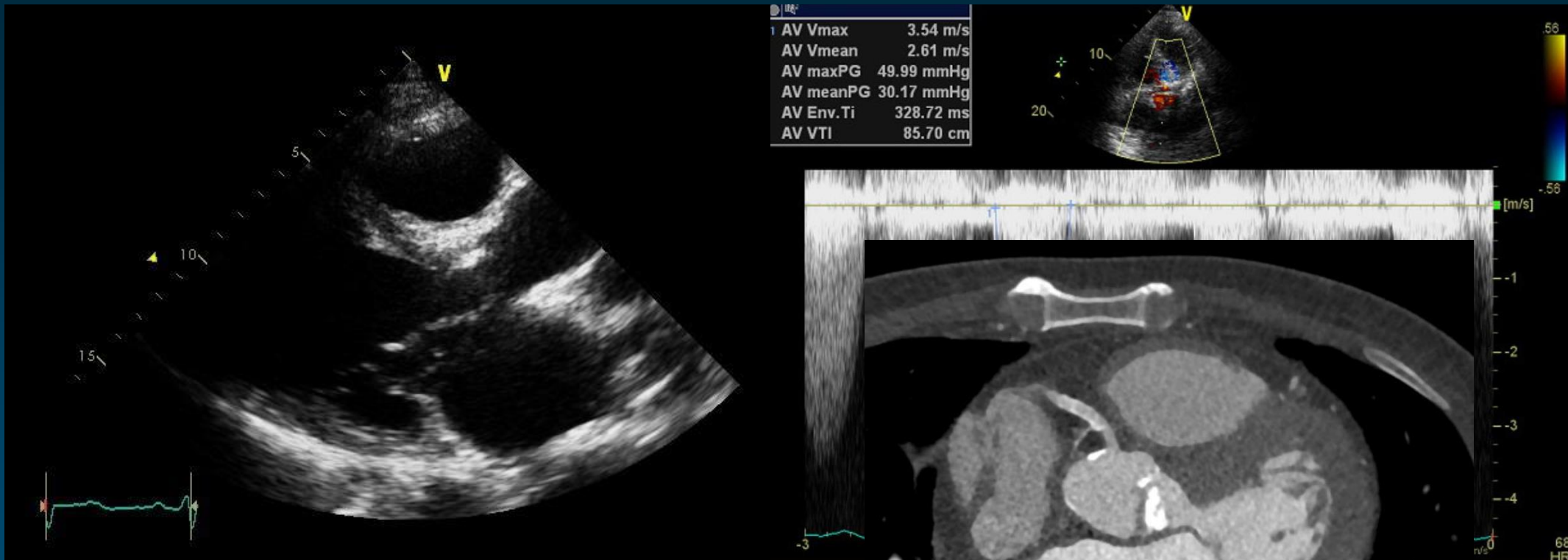
# AVA: LVOT Planimetry by CT



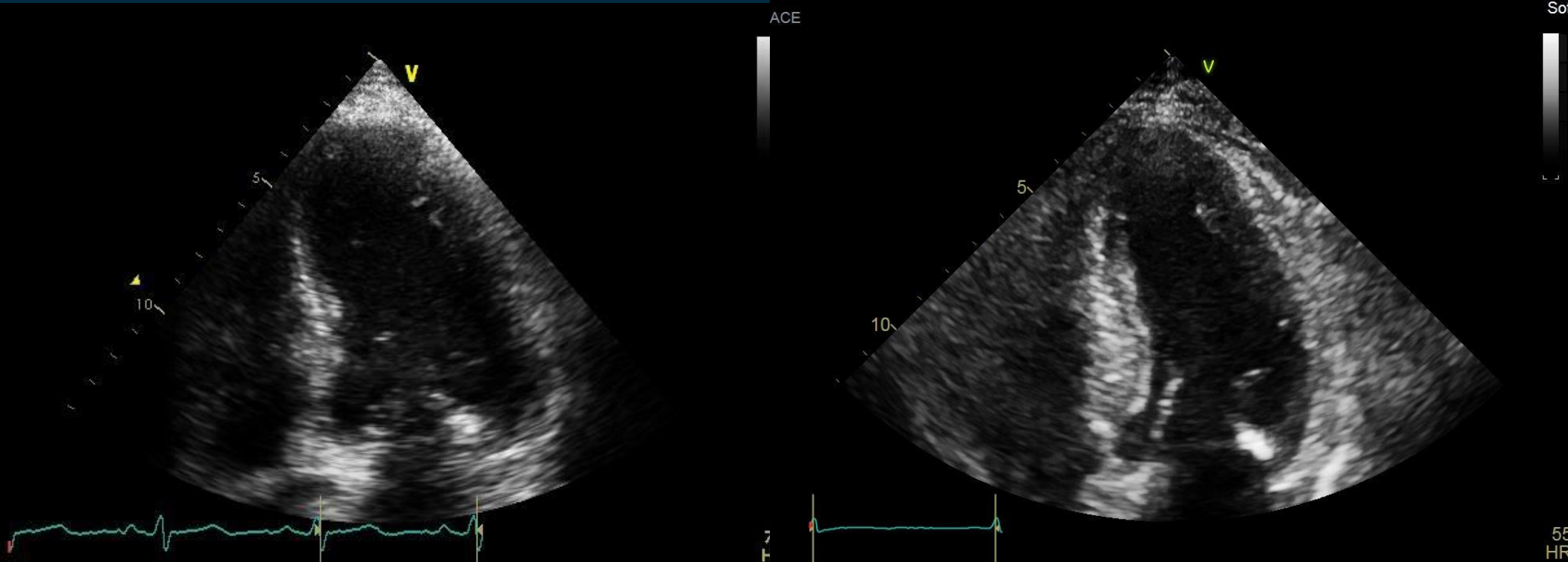
# Reclassification of AS Severity using CMR



# ***82yo Man, dyspnea, DMESRD s/p PCI on mid LAD***



***82yo Man, dyspnea, DMESRD  
s/p PCI on mid LAD***



**Pre**

**Post**

# ***Low-Gradient Severe AS***

- **Low-flow, low-gradient**
  - Reduced EF: dobutamine echo, AVC score
  - Normal EF: careful confirmation of severe AS
- **Normal –flow, low-gradient**
  - Small body size:  $0.6\text{cm}^2/\text{m}^2$
  - Inherent limitation of the Guidelines
  - Measurement error