

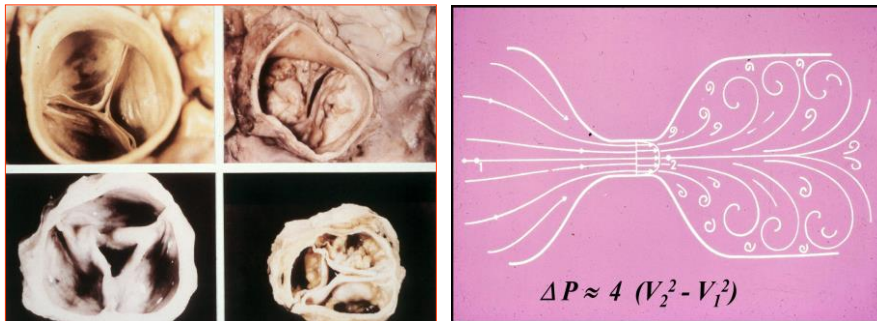
Dobutamine Stress testing In Low Flow, Low EF, Low Gradient Aortic Stenosis *Case Studies*

William A. Zoghbi MD, FASE, MACC

*Professor and Chairman, Department of Cardiology
Elkins Family Distinguished Chair in Cardiac Health
Houston Methodist Hospital*



Flow dependence of
Velocity, Gradients, & Valve Motion/Orifice



Aortic Stenosis

AHA & ACC Guidelines

HOUSTON
Methodist
DEBAKEY HEART &
VASCULAR CENTER

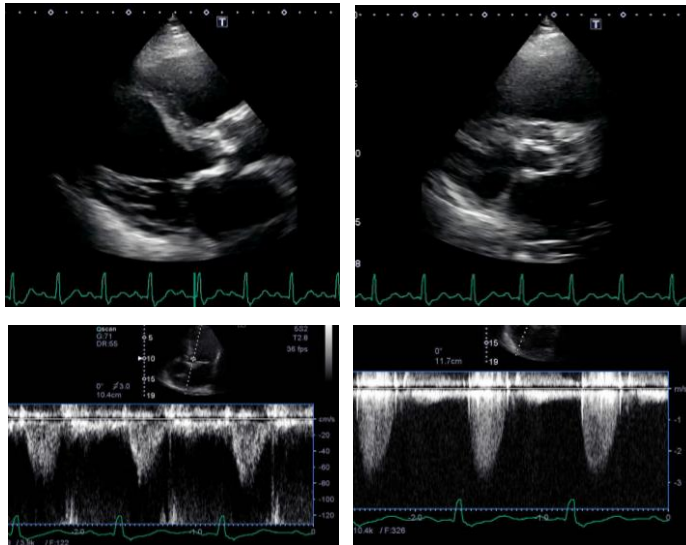
Indicator	Mild	Moderate	Severe
Jet velocity	< 3.0 m/s	3.0 – 4.0	> 4.0 m/s
Mean gradient	< 25 mmHg	25 – 40	> 40 mmHg
Valve area	> 1.5 cm ²	1.0 – 1.5	< 1.0 cm ²

In Normal or High flow Conditions (SV > 35 mL/m²)

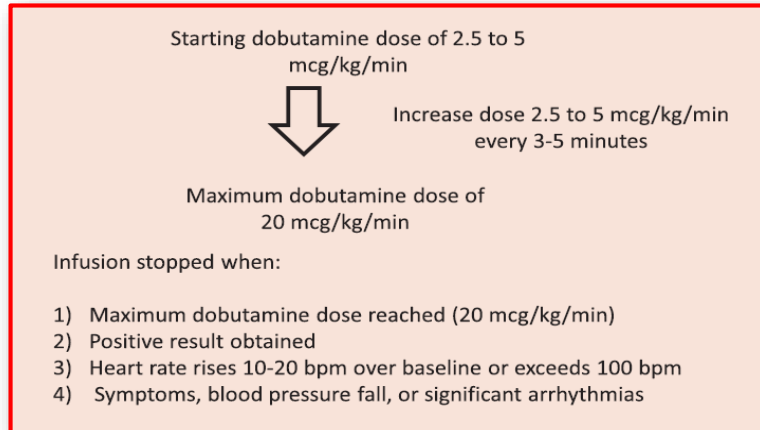
Nishimura R. et al. JACC 2014

Low Flow, Low EF, “Severe AS” Is It?

HOUSTON
Methodist
DEBAKEY HEART &
VASCULAR CENTER



Dobutamine Stress ECHO Protocol in Low Flow, Low EF, Severe AS



Baumgartner H, et al. Recommendations on the Echocardiographic Assessment of Aortic Valve Stenosis: A Focused Update from the European Association of Cardiovascular Imaging and the American Society of Echocardiography. *J Am Soc Echocardiogr.* 2017 Apr;30(4):372-392.

Dobutamine Stress ECHO Protocol

3 types of responses

SV & LVEF	Gradient	AVA	Implication
↑	↑	–	Severe AS
↑	–	↑	AS not severe
–	–	–	Severe CM / ?Severe AS

Case 1

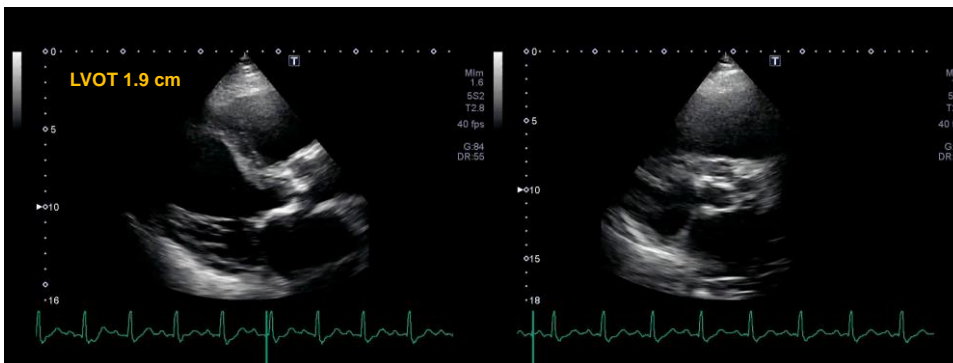
Clinical Presentation

- 87 yo male with CAD s/p CABG, aortic stenosis, systolic HF EF 30-35%, HTN, DM, CKD III, TIA, paroxysmal AF presents with dyspnea and decompensated HF, NYHA III
- Exam: 124/59, HR 63, BMI 23 kg/m²
 - CV: RRR, +S3, II/VI SEM LSB

Echocardiogram

Parasternal

Short Axis – Aortic Valve



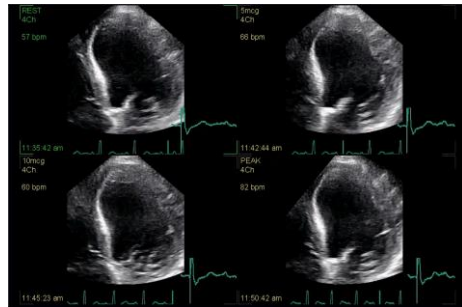
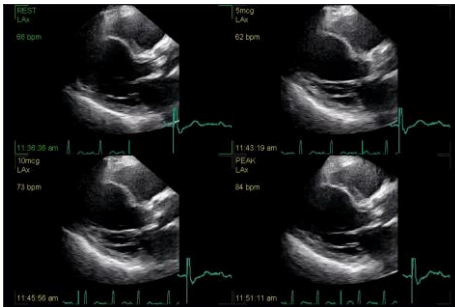
Vitals: BP 112/56 mmHg, HR 71 bpm

Dobutamine Stress ECHO



Parasternal

Apical 4 – Chamber

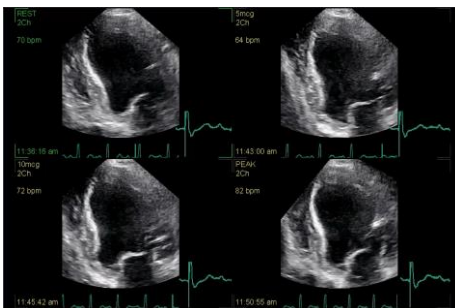


Dobutamine Stress ECHO



2 – Chamber

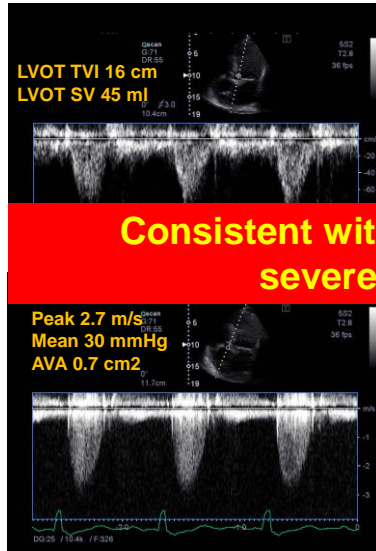
Short Axis



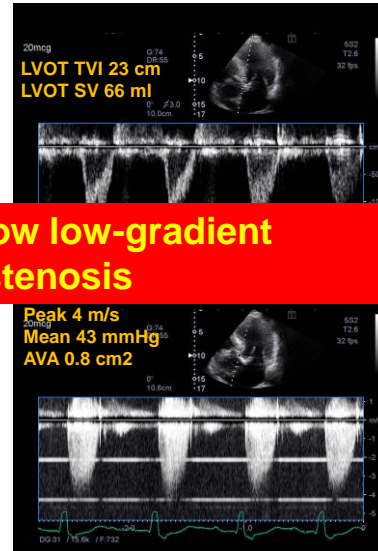
Baseline LVEF 30-34%
Peak LVEF 35-39%

Doppler

Baseline



Peak



Consistent with low-flow low-gradient severe aortic stenosis

Case 2

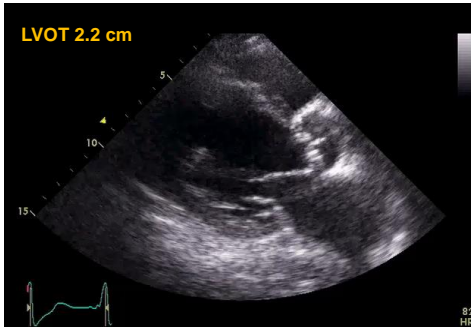
Clinical Presentation

86 yo M with CAD s/p CABG, aortic stenosis, systolic HF EF 25% s/p CRT-D, COPD presents with dyspnea, NYHA IV

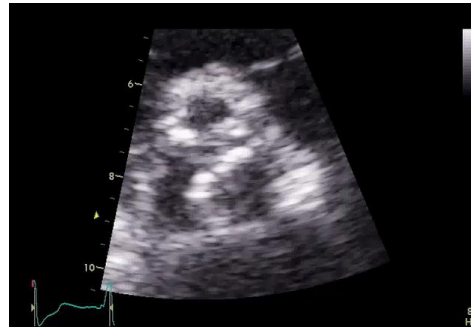
- Exam: 108/51, HR 79 , 3L O₂ 93%, BMI 21 kg/m²
 - CV: RRR, II/VI systolic murmur RUSB, +JVD (12 cm), decreased breath sounds, 1+ edema

Echocardiogram

Parasternal



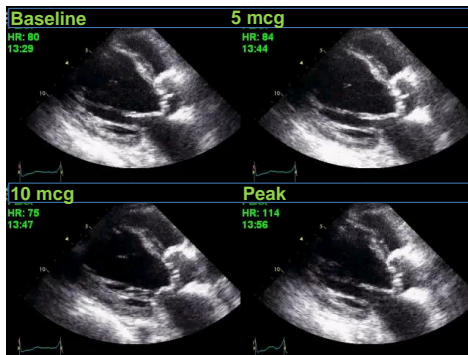
Short Axis – Aortic Valve



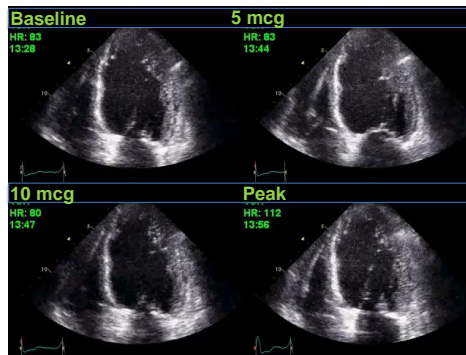
Vitals: BP 100/53 mmHg, HR 85 bpm

Dobutamine Stress ECHO

Parasternal



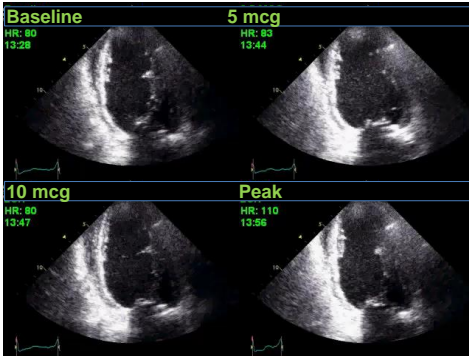
Apical 4 – Chamber



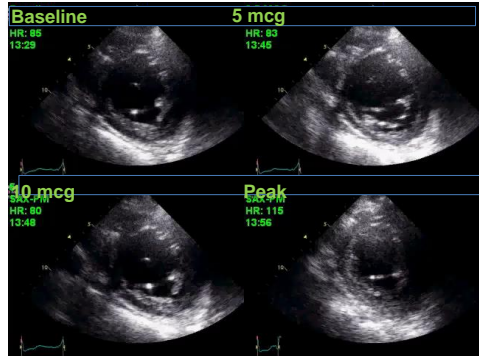
Dobutamine Stress ECHO



2 – Chamber



Short Axis

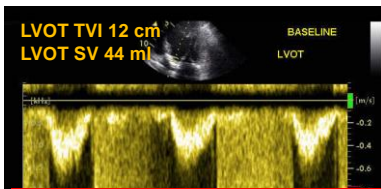


Baseline LVEF 25-29%
Peak LVEF 30-34%

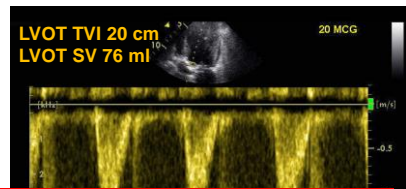
Doppler



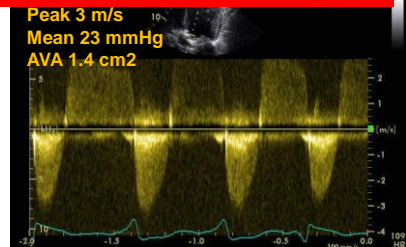
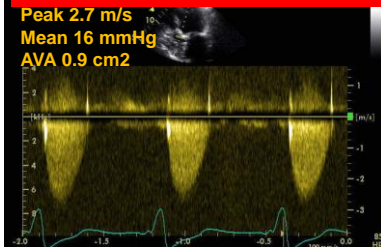
Baseline



Peak Dobutamine



**Consistent with pseudo-severe aortic stenosis
Mild aortic stenosis**



Case 3

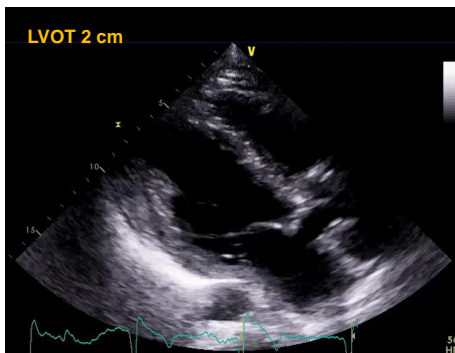
Clinical Presentation

78 yo M with CAD, aortic stenosis, systolic HF EF 40%, COPD, CKD presents with dyspnea, NYHA III

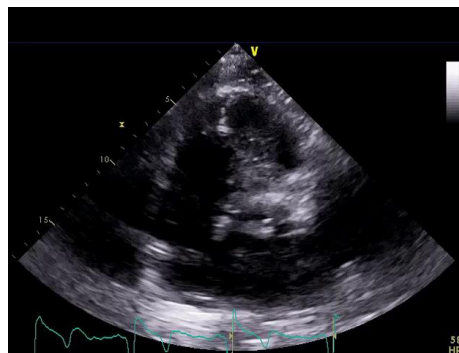
- Exam: 127/51, HR 70, BMI 21 kg/m²
 - CV: RRR, II/VI systolic murmur RUSB, +wheezing, 2+ edema, +JVD

Echocardiogram

Parasternal



Short Axis – Aortic Valve



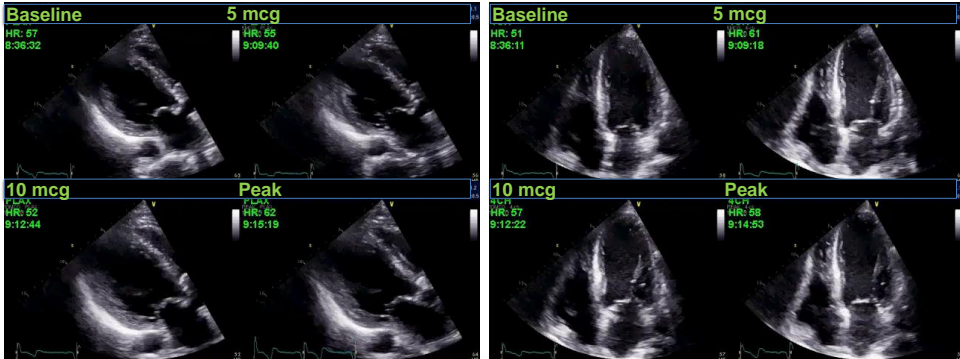
Vitals: BP 166/71 mmHg, HR 59 bpm

Dobutamine Stress ECHO



Parasternal

Apical 4 – Chamber

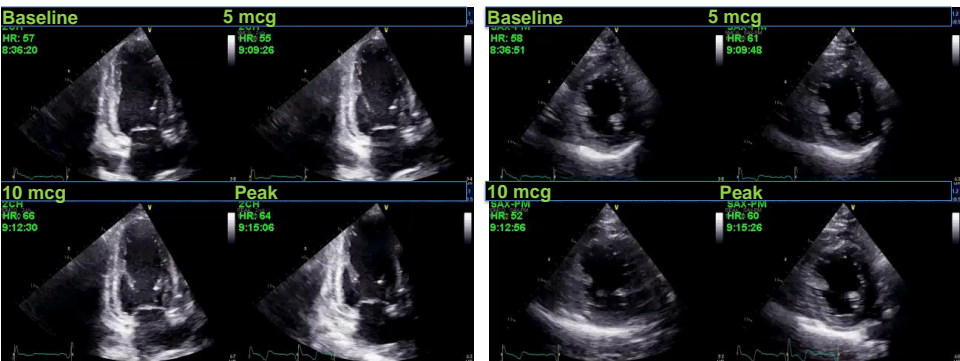


Dobutamine Stress ECHO



2 – Chamber

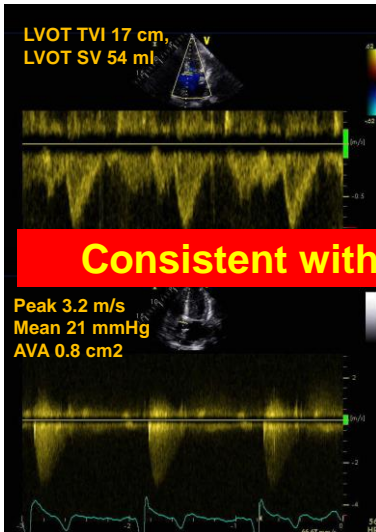
Short Axis



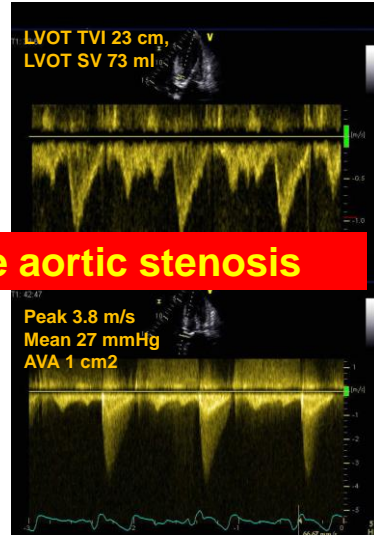
Baseline LVEF 40-44%
Peak LVEF 50-54%

Doppler

Baseline

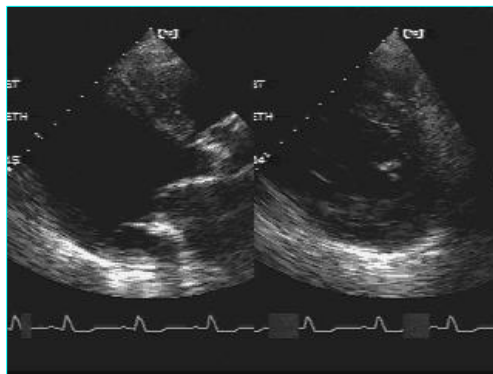


Peak Dobutamine

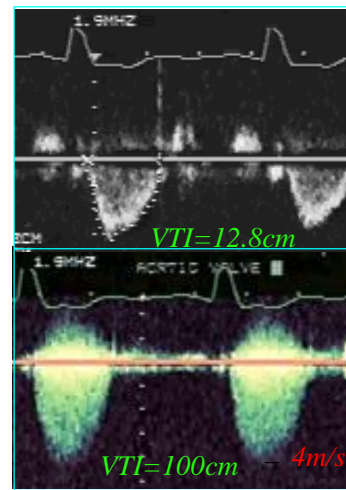


Consistent with moderate aortic stenosis

75M with AS & NYHA Class III Heart Failure
Is DSE Needed?



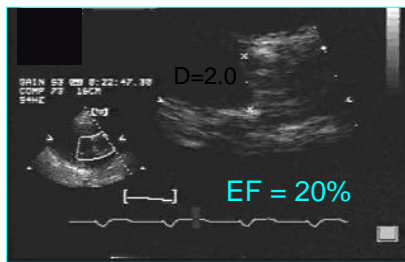
SV = 40 ml
Mn Gr = 46 mmHg
AVA = 0.40cm²



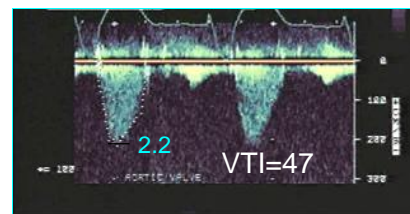
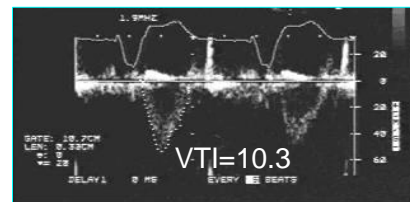
Case

- 72 yr old man with NYHA class III heart failure
- Systolic ejection murmur
- The aortic valve was calcified
- LV dilated with an EF of 20%.

72M With Class III Heart Failure



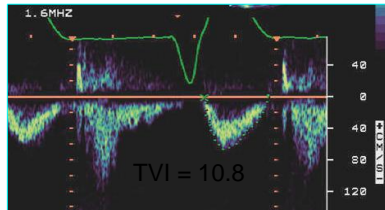
Peak V = 2.2m/s
Mean Grad = 11mmHg
SV = 32 ml
AVA = $32/47 = 0.69\text{cm}^2$



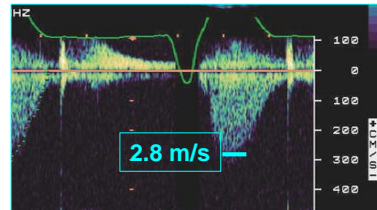
72M With Class III Heart Failure

Dobutamine infusion at 20mcg/kg/min

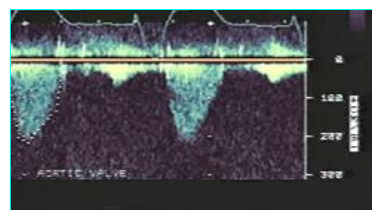
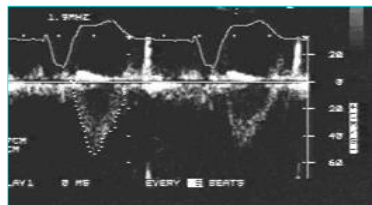
Pulsed Doppler- LVO



CW Aortic Valve

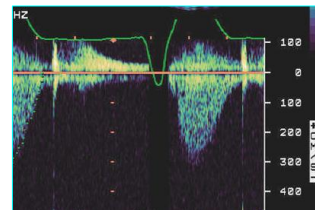
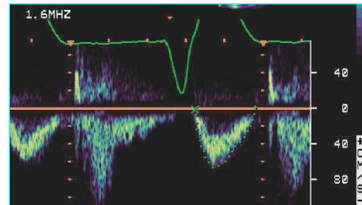


Baseline



Peak V = 2.2m/s
Mean Grad = 11mmHg
SV = 32 ml
AVA = 32/47 = 0.69cm²

Dobutamine



Peak V = 2.8 m/s
Mean Grad = 14 mmHg
SV = 35 ml
AVA = 35/52 = 0.69cm²

Dobutamine Echo in AS with Depressed LVEF & Low Gradient

3 types of responses

SV & LVEF	Gradient	AVA	Implication
↑	↑	-	Severe AS
↑	-	↑	AS not severe
-	-	-	Severe CM / ?Severe AS

Low Flow, Low EF, Low Gradient Severe AS

