

Role of Stress Echo in Valvular Heart Disease

ECHO HAWAII

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Not only ischemia!

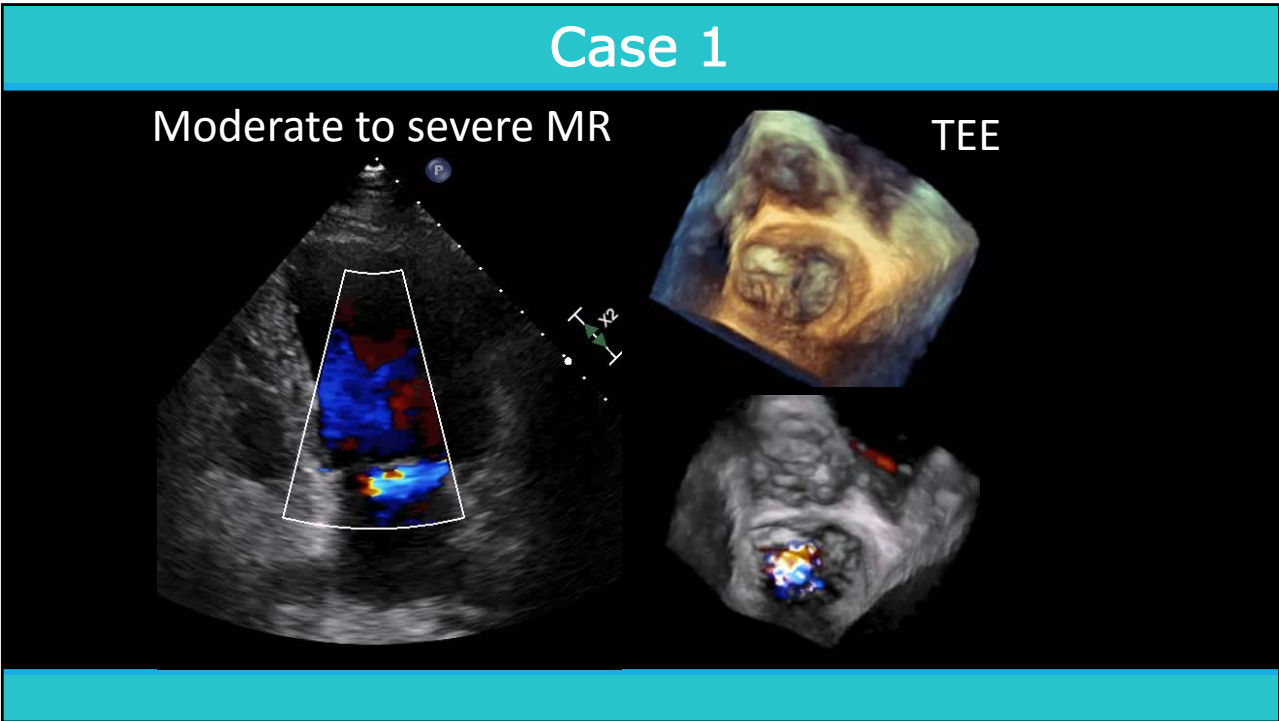
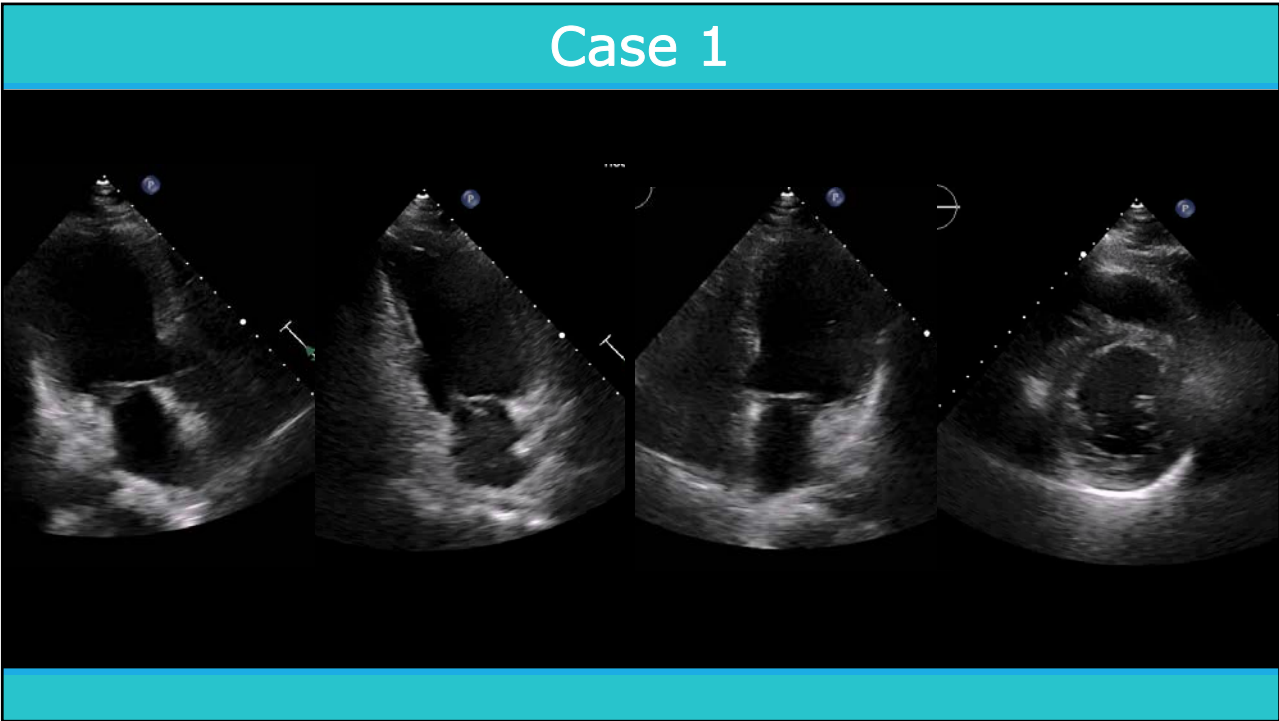
- Cardiomyopathy
- Prosthetic Valve
- Diastolic Dysfunction
- Pulmonary hypertension
- Valvular Heart Disease

Not only ischemia!

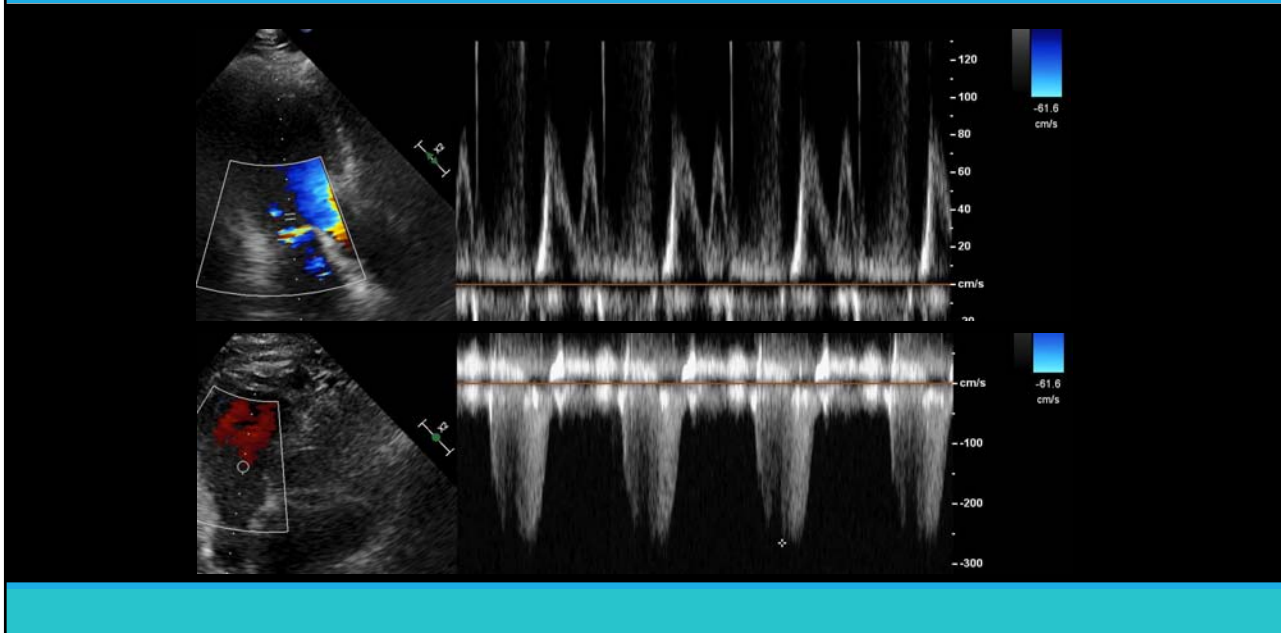
- Valvular Heart Disease
- Mitral regurgitation
- Mitral stenosis
- Aortic stenosis
- Aortic regurgitation

Case 1

- 68 y.o. male
- With a history of hypertension and mitral regurgitation.
- He presented for a second opinion regarding surgical management of mitral regurgitation.
- He had no symptom during any activities.



Case 1



Question 1

- 68 y.o. asymptomatic male with moderate to severe MR

Your recommendation is...

1. Surgical MV repair
2. Percutaneous MV replacement
3. Anticoagulation therapy
4. Stress echocardiography

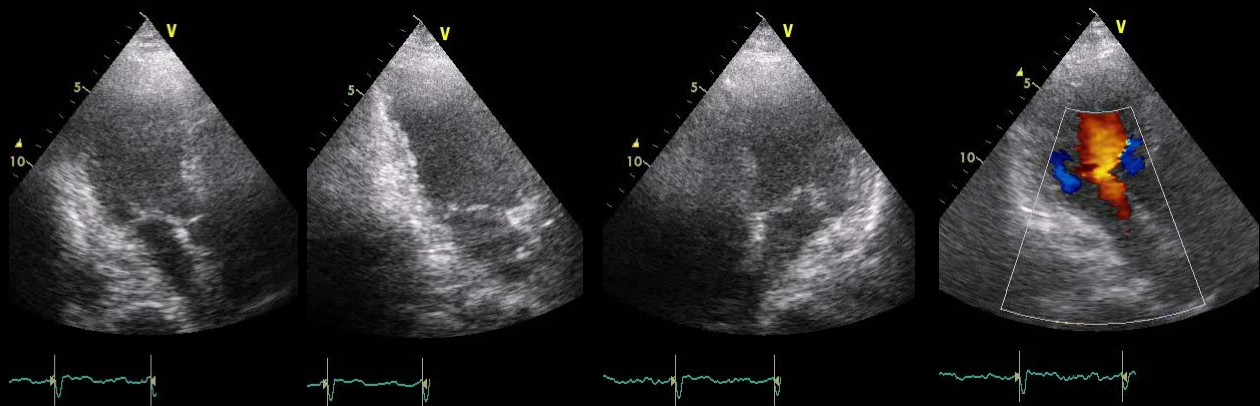
Question 1

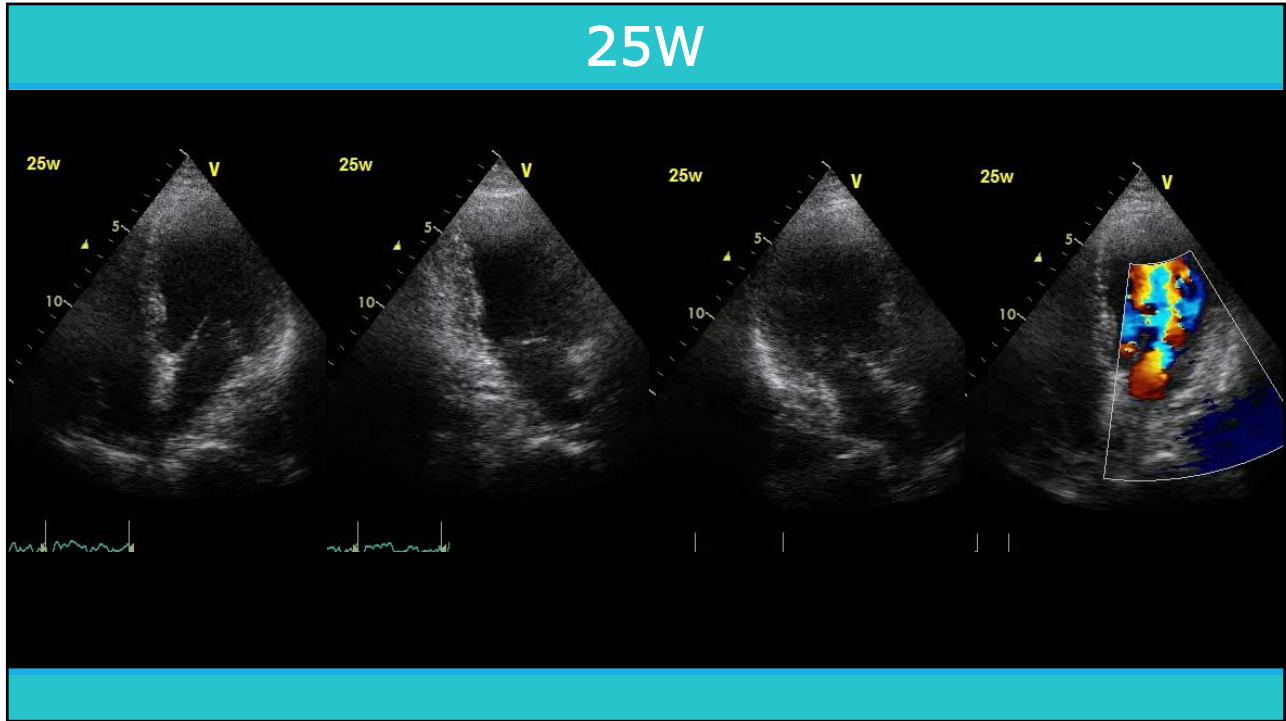
- 68 y.o. asymptomatic male with moderate to severe MR

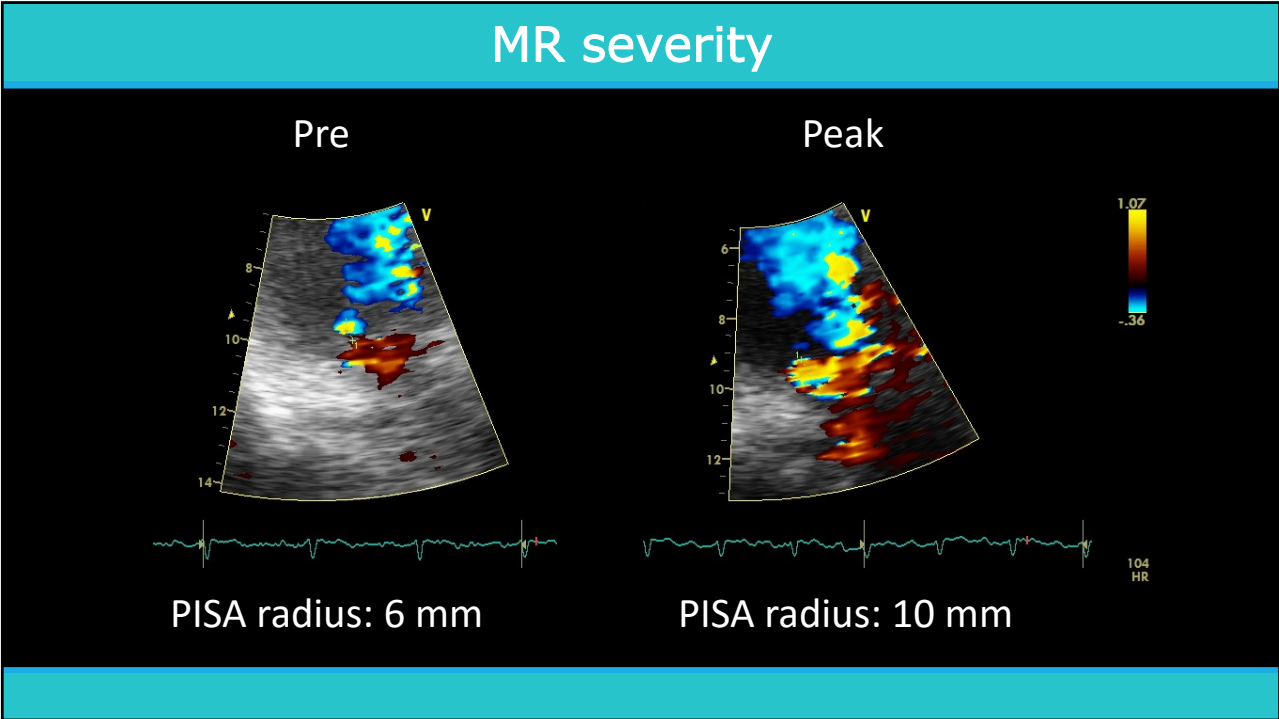
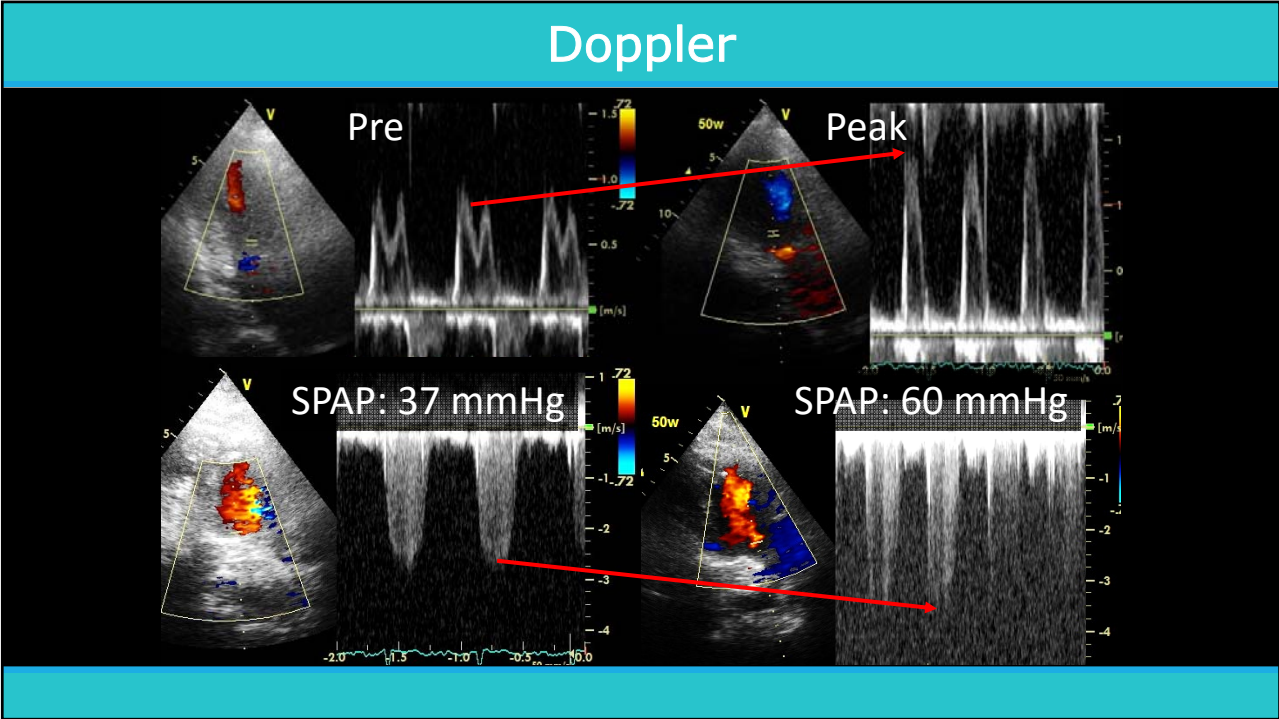
Your recommendation is...

1. Surgical MV repair
2. Percutaneous MV replacement
3. Anticoagulation therapy
4. **Stress echocardiography**

Baseline







Summary

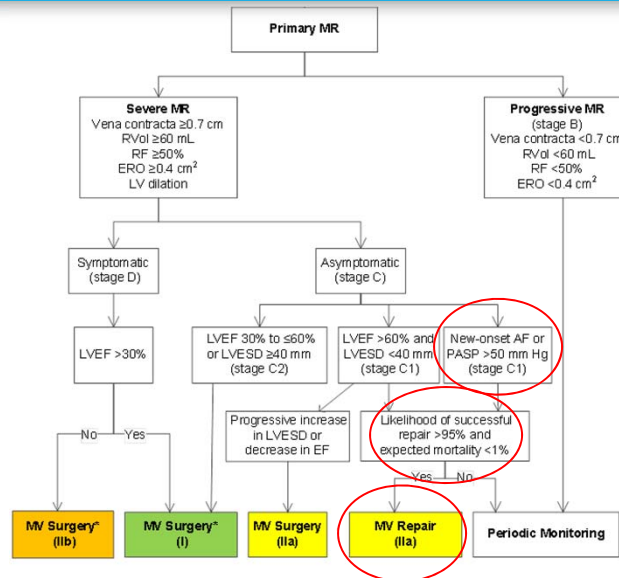
- Exercise induced pulmonary hypertension:
SPAP: 60 mmHg
- Significant increase in simple PISA radius
from 6 mm to 10 mm (Severe MR)
- Good contractile reserve: EF 62→74%
- Symptom was occurred during exercise.

Recommendation is...

Decision

Surgery (repair if low risk)

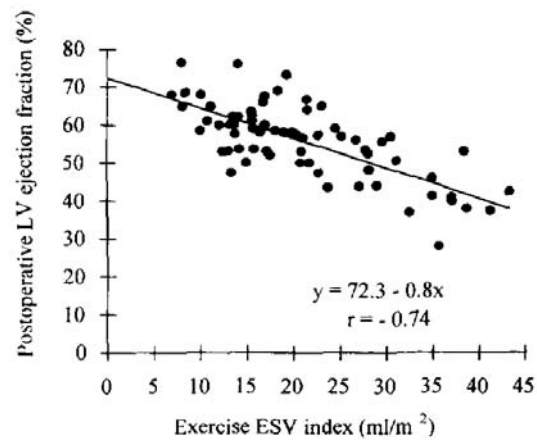
2017 updated ACC/AHA Guideline



Nishimura RA et al. J Am Coll Cardiol. 2017 Jul 11;70(2):252-289.

Stress Echocardiography and Mitral Regurgitation Exercise ESVI and Post operative EF

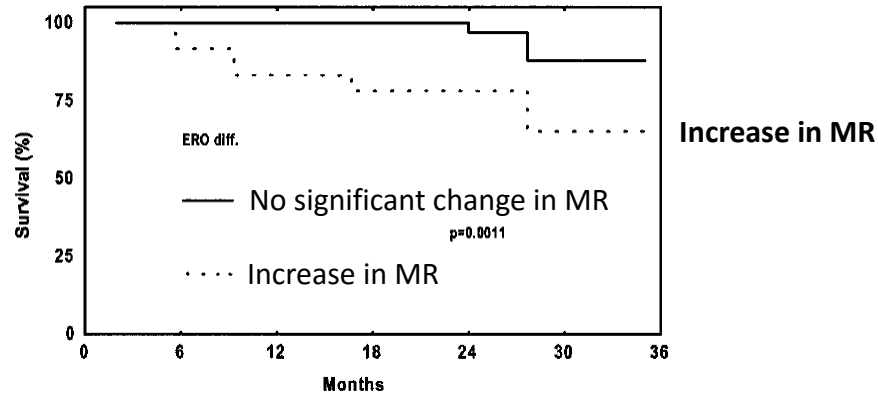
74 patients with severe MR who underwent exercise echocardiography and mitral valve surgery.



Leung DY et al. J Am Coll Cardiol. 1996 Nov 1;28(5):1198-205.

Prognostic Importance of Exercise-Induced Changes in Mitral regurgitation

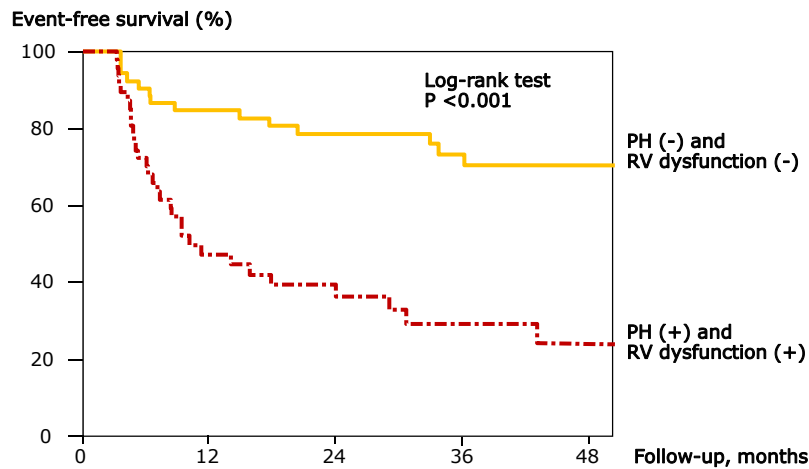
98 consecutive patients with MR who underwent exercise echocardiography.



Lancellotti P et al. *Circulation*. 2003 Oct 7;108(14):1713-7.

Predictors of outcomes in Patients with MR undergoing exercise echocardiography

196 consecutive patients with moderate to severe MR who underwent exercise echocardiography.



Kusunose K et al. *Circ Cardiovasc Imaging*. 2013 Mar 1;6(2):167-76.

Mitral regurgitation

Key Points

Exercise SE provides information about disease severity and individual outcome in MR. MR severity, SPAP, and left and right ventricular contractile reserve should be evaluated according to the clinical context. An increase by ≥ 1 grade in MR (from moderate-to-severe MR), an SPAP ≥ 60 mmHg, and a lack of contractile reserve ($< 5\%$ increase in EF or $< 2\%$ increment in global longitudinal strain) are markers of poor prognosis.

Cut off

MR grade: an increase by ≥ 1 grade

Systolic pulmonary artery pressure: 60 mmHg

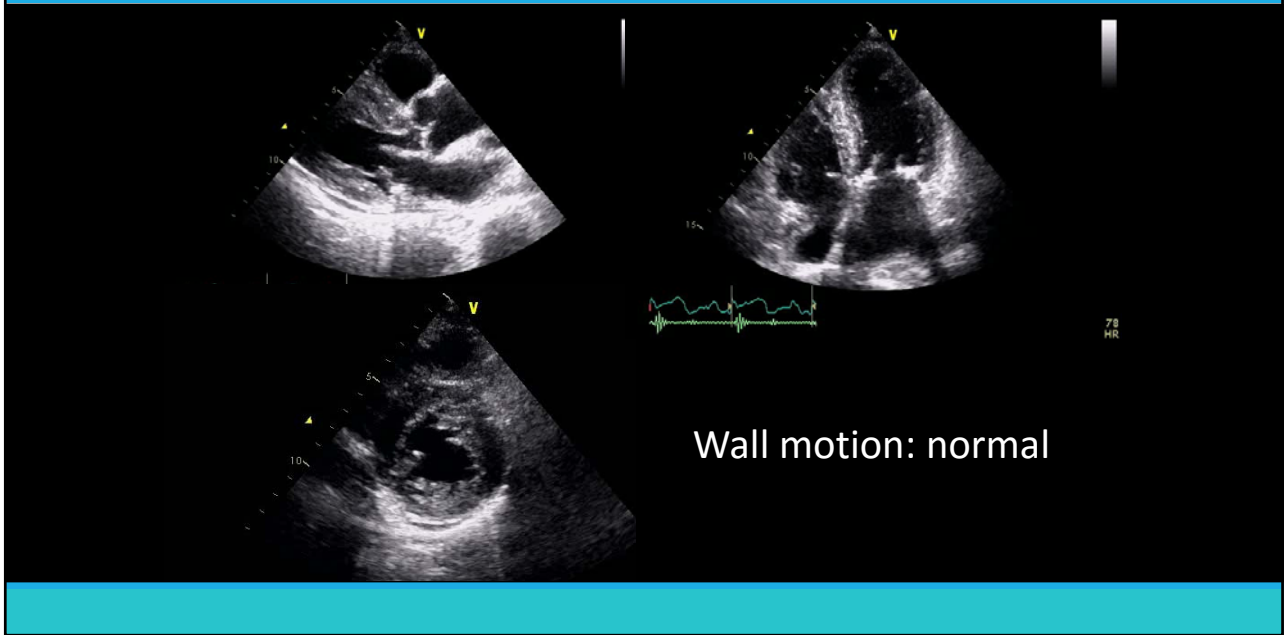
Contractile reserve: 5% increase in EF

J Am Soc Echocardiogr. 2017 Feb;30(2):101-138. doi: 10.1016/j.echo.2016.10.016.

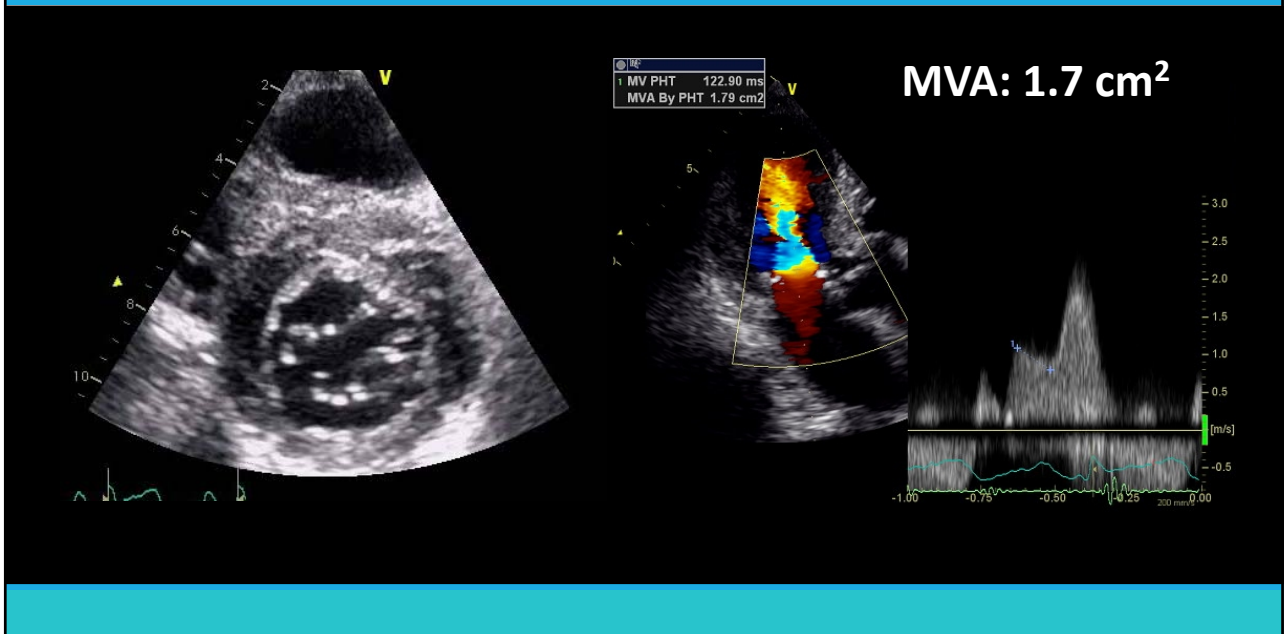
Case 2

- 72 y.o. female
- With a history of hypertension and mitral stenosis.
- She presented for a second opinion regarding management of mitral stenosis.
- She noted a slight fatigue.

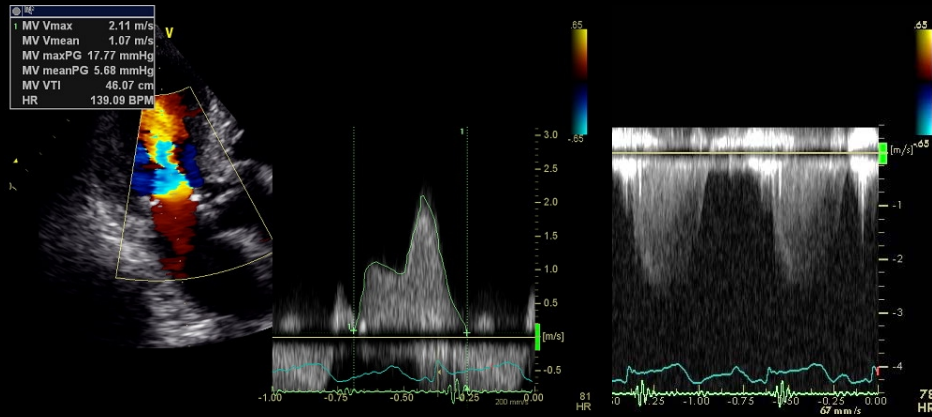
Case 2



Mitral stenosis



Mitral stenosis



Mean PG: 5.7 mmHg

SPAP: 33 mmHg

Question 2

- 72 y.o. mild symptomatic female with moderate MS

Your recommendation is...

1. Cardiac CT
2. Coronary angiography
3. Cardiac MRI
4. Stress Echocardiography

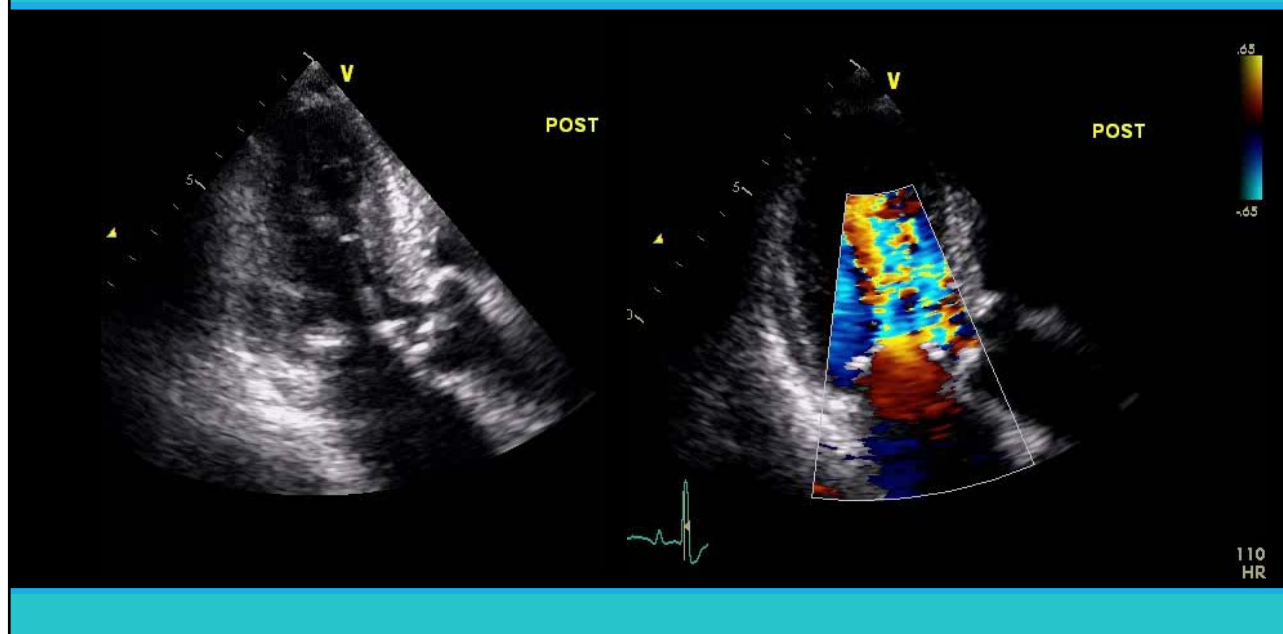
Question 2

- 72 y.o. mild symptomatic female with moderate MS

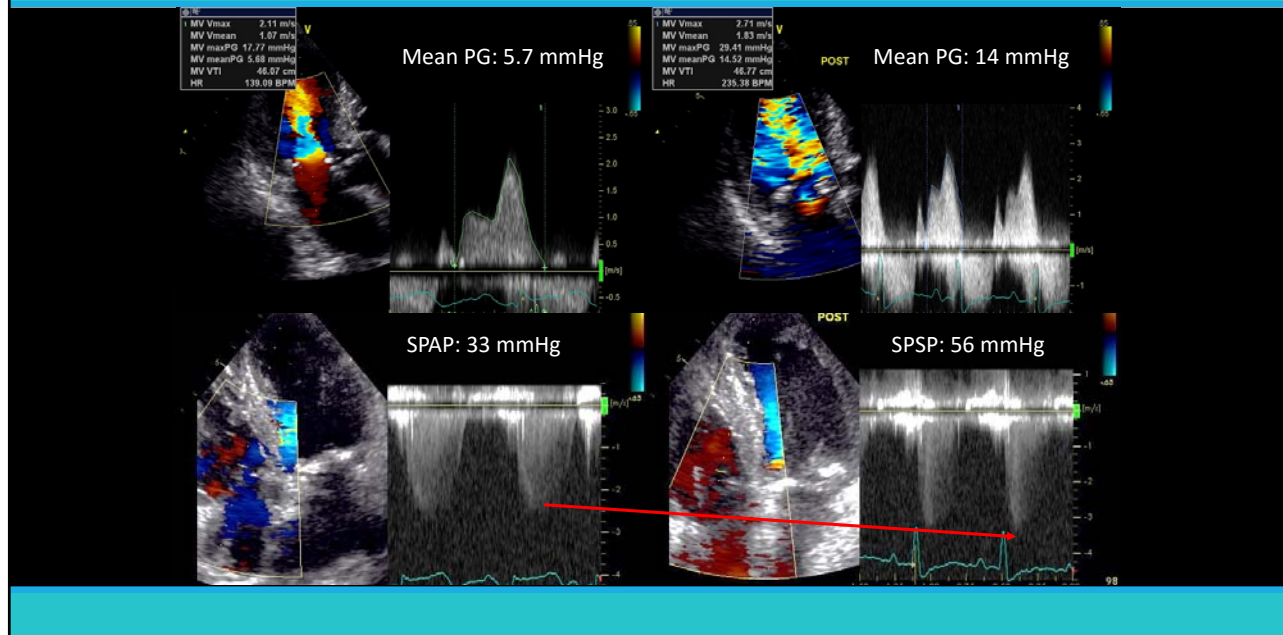
Your recommendation is...

1. Cardiac CT
2. Coronary angiography
3. Cardiac MRI
4. **Stress Echocardiography**

Case 2



Case 2



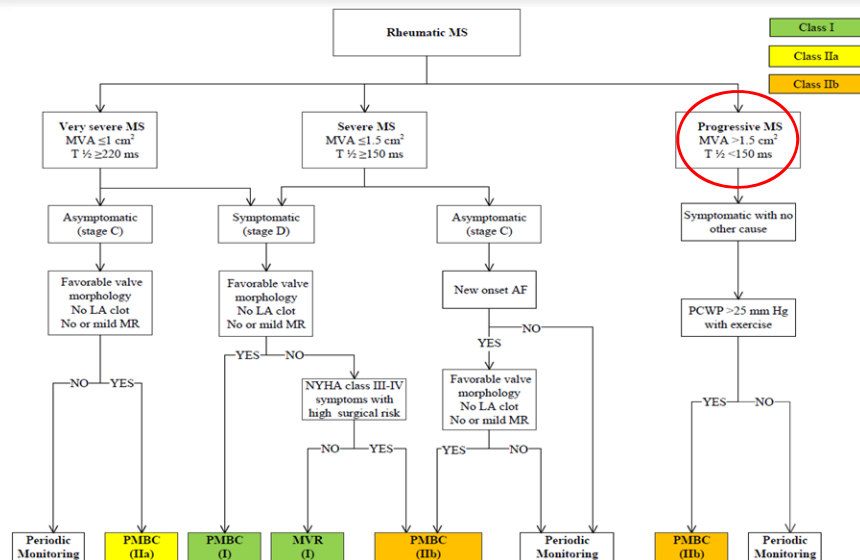
Summary

- Exercise induced pulmonary hypertension: SPAP: 56 mmHg
 - Significant increase in MV gradient from baseline of 6 to 14 mmHg
 - No wall motion abnormality
 - Symptom was not increased
- Your recommendation is...

Decision

- Carefully periodic monitoring

2017 updated ACC/AHA Guideline



Mitral stenosis

Key Points

SE is indicated to reveal symptoms and assess haemodynamic consequences of MS—based on the gradient and SPAP increase during stress—in patients with discordance between symptoms and stenosis severity. Exercise SE is preferred for SPAP assessment. MS should be considered severe if exertion results in a mean gradient >15 mmHg and SPAP >60 mmHg.

Cut off

Mean pressure gradient: 15 mmHg

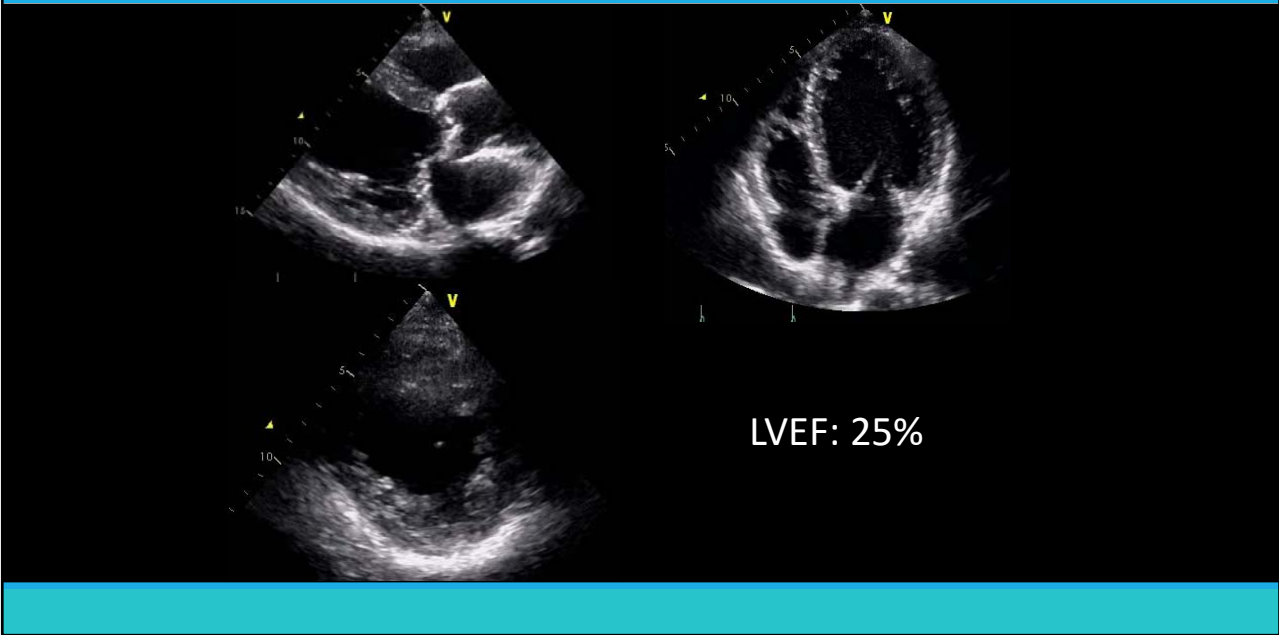
Systolic pulmonary artery pressure: 60 mmHg

J Am Soc Echocardiogr. 2017 Feb;30(2):101-138. doi: 10.1016/j.echo.2016.10.016.

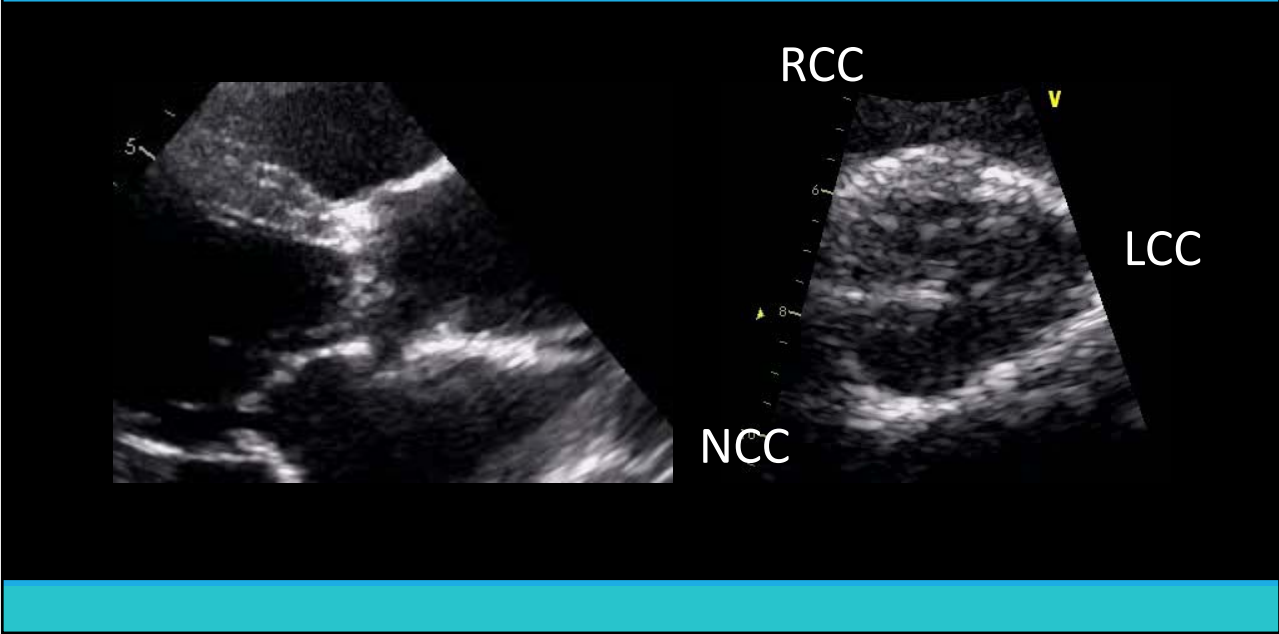
Case 3

- 82 y.o. male
- With a history of aortic stenosis and coronary artery disease (post PCI to LAD).
- He noted a fatigue.

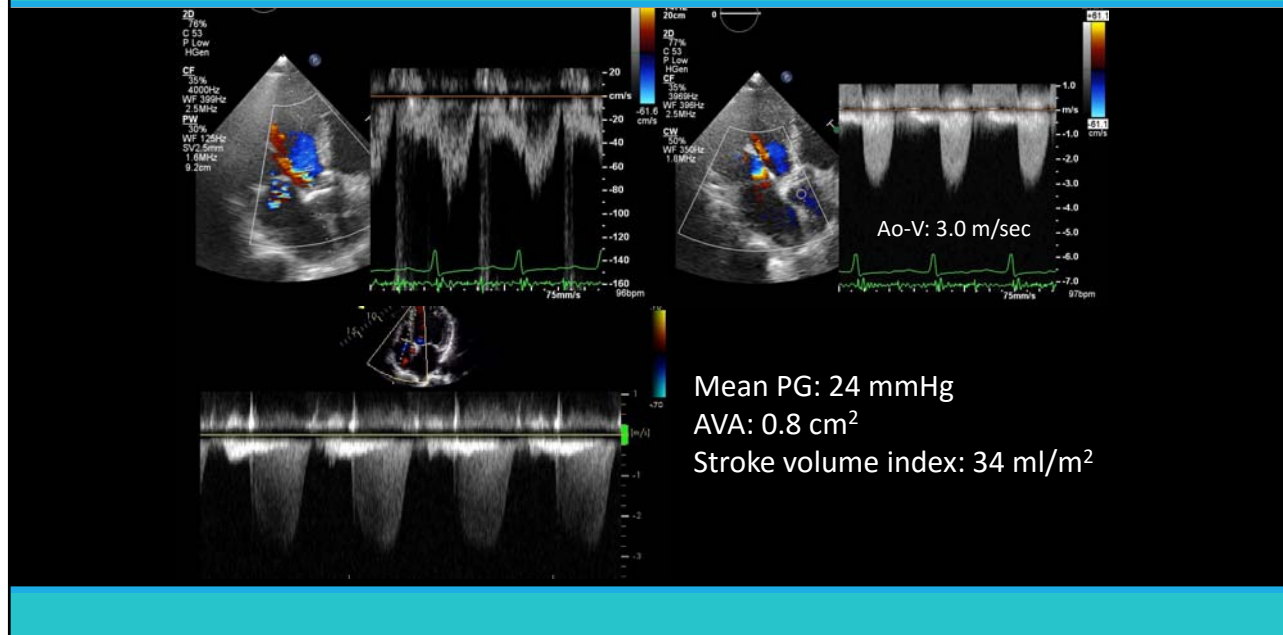
Case 3



Case 3



Case 3



Question 3

- 82 y.o. mild symptomatic male with low gradient and low flow AS

Your recommendation is...

1. AVR
2. TAVI
3. Exercise echocardiography
4. Dobutamine echocardiography

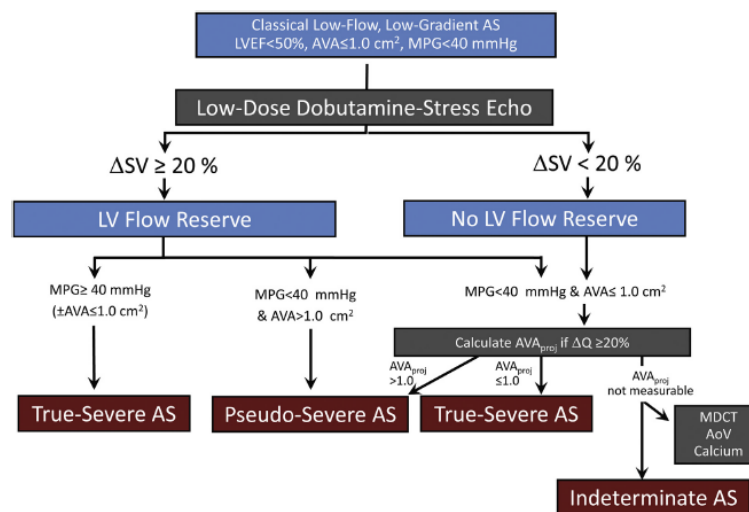
Question 3

- 82 y.o. mild symptomatic male with low gradient and low flow AS

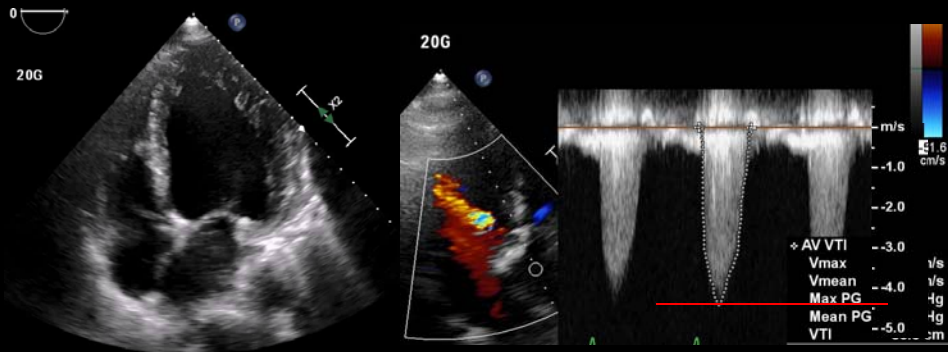
Your recommendation is...

1. AVR
2. TAVI
3. Exercise echocardiography
4. Dobutamine echocardiography

Chart



Dobutamine 20γ

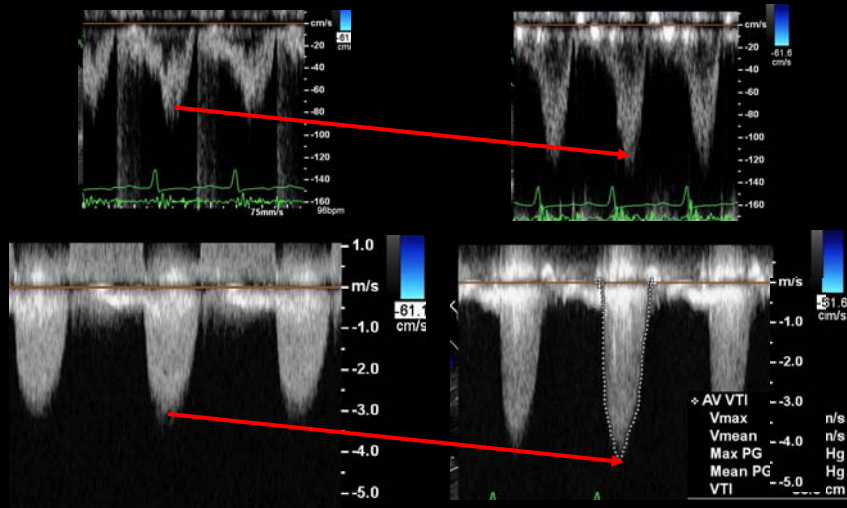


EF: 30%
 Mean PG: 41 mmHg
 AVA: 0.82 cm²
 Stroke volume index: 44 ml/m²
 ΔSV: 23%

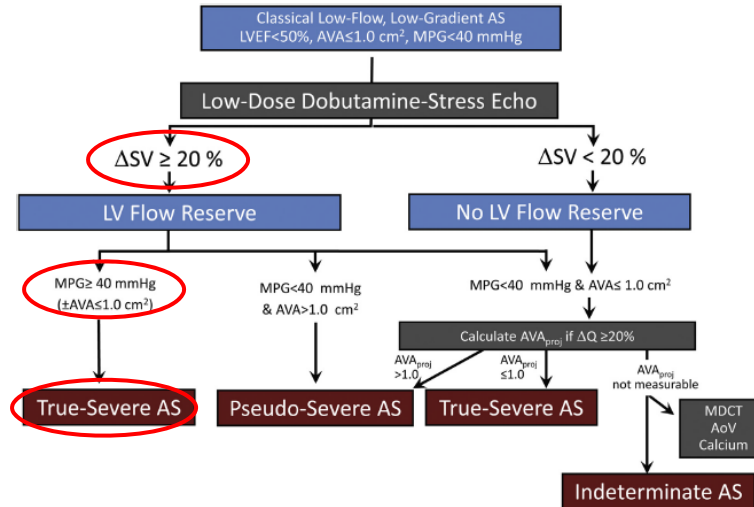
Case 3

Pre

Peak



Chart



Summary

- 82 y.o. mild symptomatic male with low flow low gradient AS
 - Preserved contractile reserve:
SVi 34→42 ml/m² (ΔSV>20%)
 - True severe AS

Your recommendation is...

Decision

Intervention
(surgical AVR or TAVI)

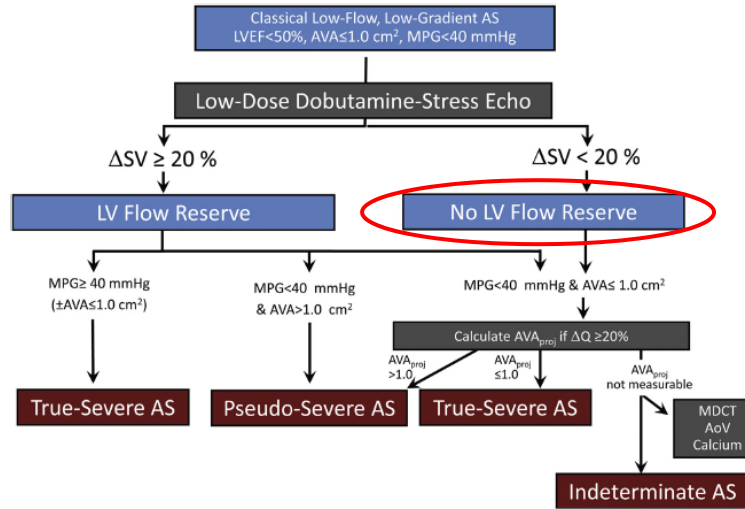
Aortic stenosis (low gradient)

Key Points

In classical low-flow, low-gradient AS with reduced LVEF, a low-dose dobutamine SE is recommended to: (i) assess LV flow reserve, which is helpful for surgical risk stratification and (ii) differentiate true- from pseudo-severe AS, which is key for guiding the decision to perform AVR. In paradoxical low-flow, low-gradient AS with preserved LVEF, exercise or dobutamine SE may also be used to differentiate true- from pseudo-severe AS.

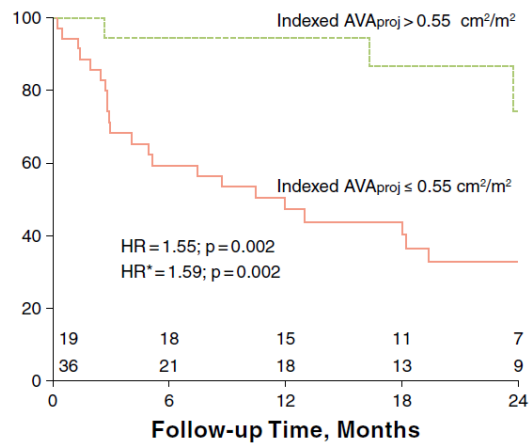
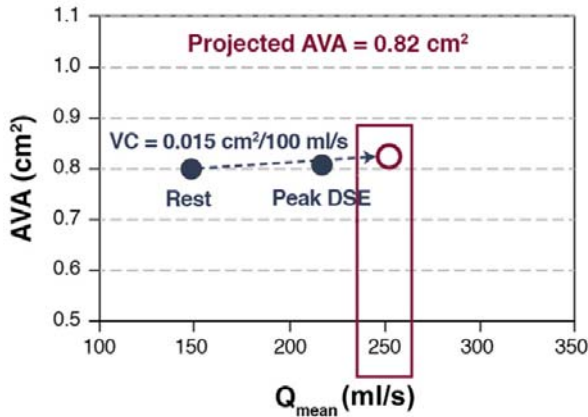
LV flow reserve
True AS or pseud-severe AS

Problem of AVA in low gradient AS



J Am Soc Echocardiogr. 2017 Feb;30(2):101-138. doi: 10.1016/j.echo.2016.10.016.

Projected AVA



Clavel MA et al. JACC Cardiovasc Imaging. 2013 Feb;6(2):175-83.

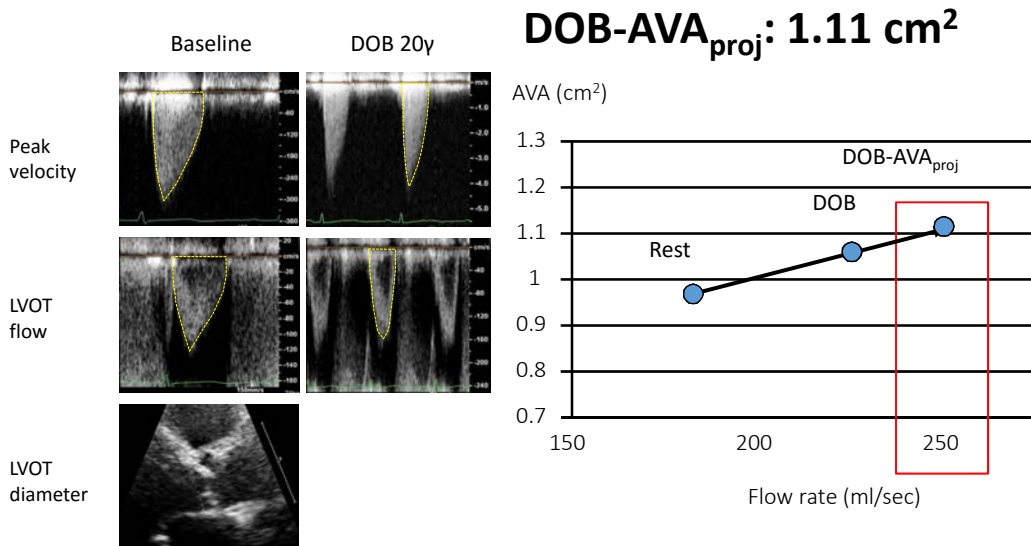
Projected AVA



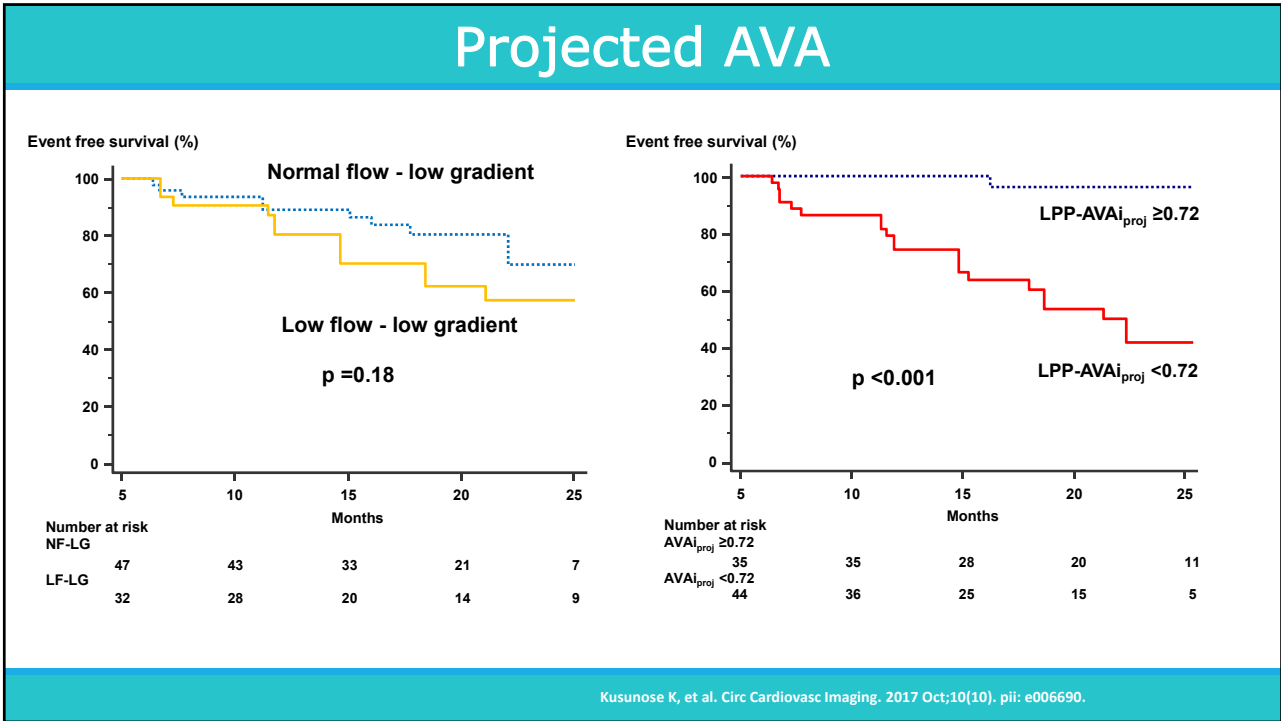
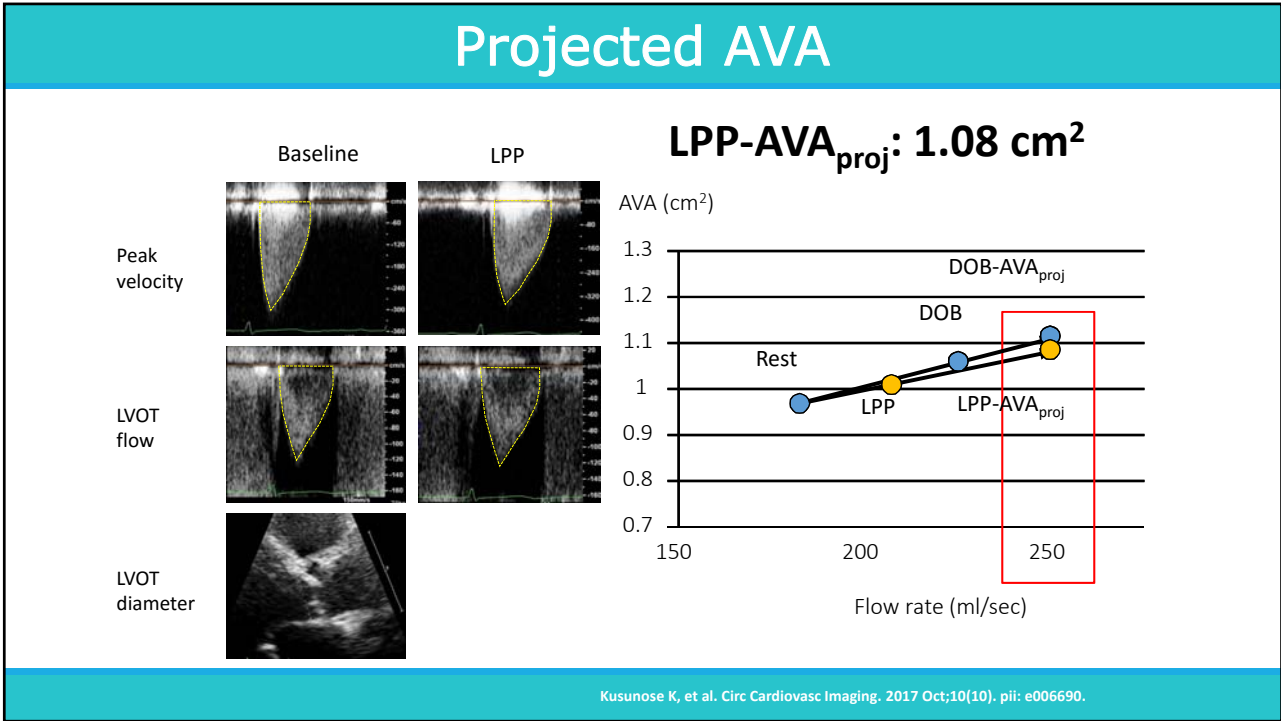
	All (n = 22)	
	Baseline	During LPP
HR, beats/min	64 ± 9	66 ± 8
Systolic BP, mm Hg	133 ± 20	132 ± 22
Stroke volume, ml	52 ± 18	57 ± 25*

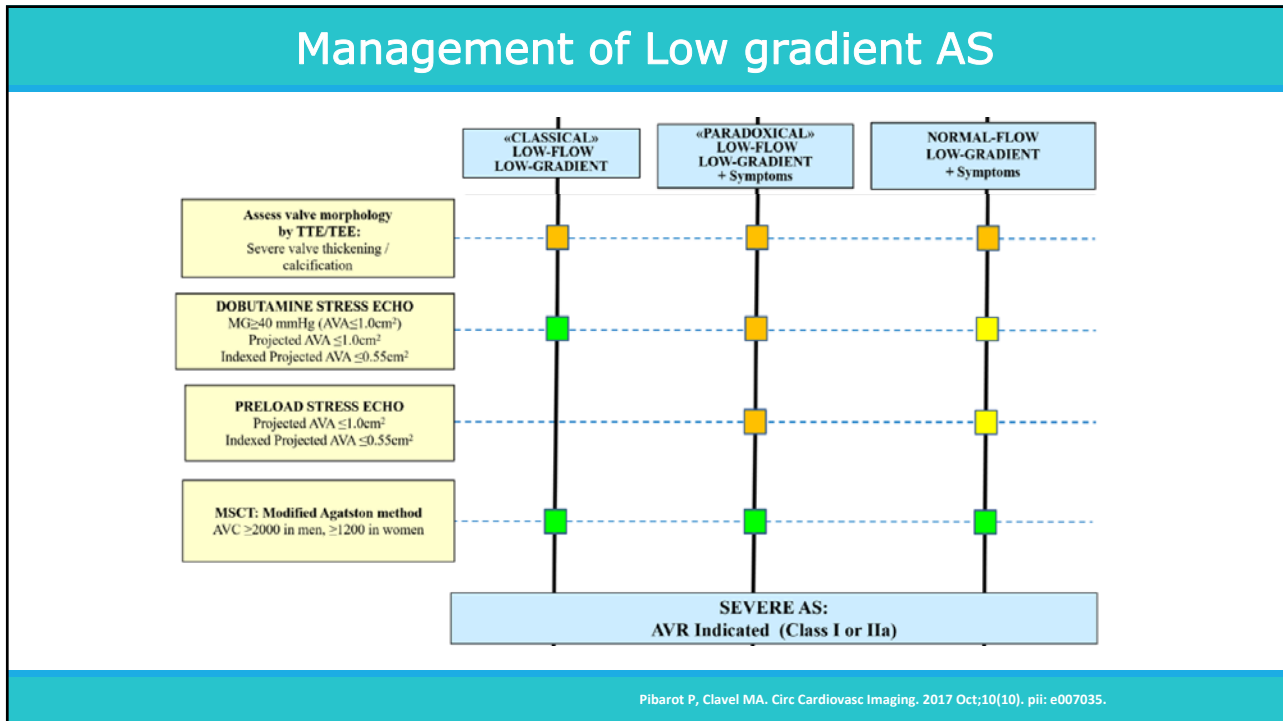
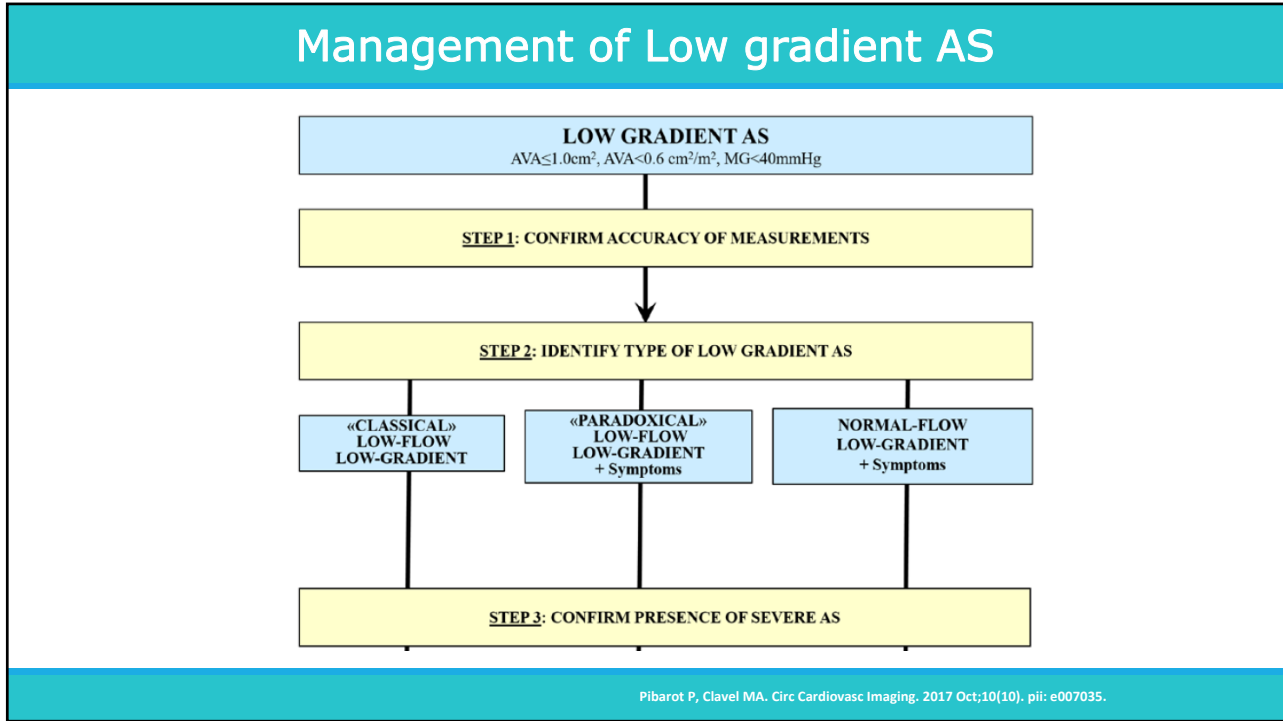
Yamada H. JACC Cardiovasc Imaging. 2014 Jul;7(7):641-9.

Projected AVA



Kusunose K, et al. Circ Cardiovasc Imaging. 2017 Oct;10(10). pii: e006690.





Aortic regurgitation

Very few data in this field.

Key Points

In AR, SE is used to assess symptoms, exercise tolerance, and the LV response to stress but not the valve disease severity. A lack of contractile reserve is associated with post-operative LV dysfunction.

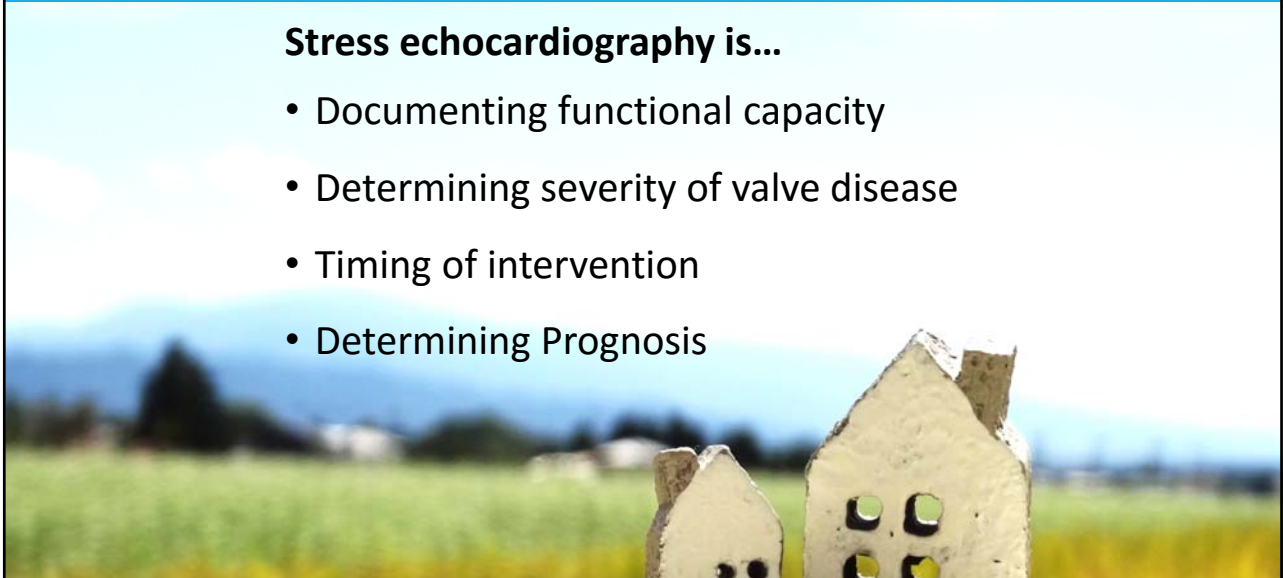
Contractile reserve (>5% change in LVEF)

J Am Soc Echocardiogr. 2017 Feb;30(2):101-138. doi: 10.1016/j.echo.2016.10.016.

Take Home Message

Stress echocardiography is...

- Documenting functional capacity
- Determining severity of valve disease
- Timing of intervention
- Determining Prognosis



Thank you for your attention!!

