

Multiple choice questions

1. A 62-year-old woman with no comorbidities is referred to clinic with an incidental murmur and found to have severe aortic stenosis (V_{\max} 4.2 m/s from the apex) with preserved left ventricular ejection fraction. She reports no symptoms. She exercises regularly. She has an absent second heart sound and an anacrotic pulse. Which of these is of least clinical utility?
- Review in six months
 - High-sensitivity troponin measurement and referral for valve replacement if elevated
 - Discuss enrolment in a randomised controlled trial of early valve intervention
 - Exercise treadmill testing
 - Repeat aortic valve measurements from the right sternal edge

Answer: b)

The measurement of high-sensitivity troponin should not be used in isolation to guide decisions regarding aortic valve intervention, given the lack of data validating its prospective use in this setting.

Routine care in asymptomatic aortic stenosis of this severity with preserved left ventricular ejection fraction would be conservative; review in six months is reasonable. Exercise testing in physically active patients would also be reasonable. Given the physical examination findings, further valve interrogation to ensure that the velocity has not been underestimated is reasonable, as strategies may change depending upon the haemodynamic severity of the valvular obstruction. Close consideration should also be given to participation in a randomised controlled trial of early valve intervention if one is locally available, as the optimum timing of intervention in this setting will remain unknown without further data.

2. A 62-year-old woman with no comorbidities is referred to clinic with an incidental murmur and found to have very severe aortic stenosis (V_{\max} 5.4m/s) with preserved left ventricular ejection fraction. The valve is bicuspid. There is no aortopathy. She reports no symptoms. She exercises regularly. Based on current evidence, what is the best course of action?
- Review in six months
 - Troponin and brain natriuretic peptide measurement
 - Cardiac magnetic resonance
 - CT-AVC
 - Discussion with patient about referral for aortic valve replacement

Answer: e)

This patient has very severe aortic stenosis and a bicuspid aortic valve. The totality of prior observational data and the RECOVERY trial would suggest a prognostic benefit in aortic valve replacement at this stage, despite no symptoms. However, this requires careful discussion with the patient as the data remain limited and patients that are currently feeling well may prefer to continue with a conservative approach. Blood biomarkers, CT-AVC and cardiac magnetic resonance will not alter clinical decisions at this stage.

3. An 86-year-old man with limited mobility due to osteoarthritis undergoes routine review for aortic stenosis. At this visit, V_{max} is 3.5m/s (previously 4.2m/s) and there is new, severe left ventricular systolic dysfunction with a reduced stroke volume index. Coronary angiography performed three months ago for a single episode of chest pain demonstrated non-obstructive coronary artery plaque only. He has reported no dyspnoea, angina or pre-syncope since then. What is the recommended course of action?
- Review in six months
 - Cardiac magnetic resonance
 - Computed tomography calcium scoring of the aortic valve
 - Functional assessment
 - Consider referral for aortic valve replacement

Answer: e)

This patient has new left ventricular systolic dysfunction in the context of known severe aortic stenosis and should be considered for valve replacement even in the absence of symptoms. Transcatheter aortic valve implantation is the preferred modality in this age group.

Cardiac magnetic resonance may offer prognostic information and also differentiate infarct from non-infarct scar, but recent coronary angiography excluded severe proximal coronary artery disease which would likely be required if the deterioration in left ventricular function were due to ischemia or infarction. Valve calcium scoring is not helpful, even though the patient has low-flow low-gradient aortic stenosis, as the aortic stenosis was known to be severe previously. A functional assessment is not practical nor would it alter the decision to offer valve intervention.

4. An 86-year-old man with limited mobility due to osteoarthritis undergoes routine review for aortic stenosis. He has chronic dyspnoea due to chronic obstructive airways disease. He has hypertension and mild iron deficiency anaemia. He reports no change in baseline symptoms. Echocardiography parameters are as follows: ejection fraction 54% using Simpson's bi-plane, stroke volume index 40ml/m², aortic valve mean gradient 30mmHg, aortic valve area 1.3cm², concentric left ventricular hypertrophy, E/E' 16, moderate mitral regurgitation, severe tricuspid regurgitation, estimated systolic pulmonary artery pressure 65mmHg. What is the best course of action for his aortic stenosis?
- Conservative management
 - Troponin and brain natriuretic peptide measurement
 - Computed tomography calcium scoring of the aortic valve
 - Functional assessment
 - Consider referral for aortic valve replacement

Answer: a)

This patient has moderate aortic stenosis. Aortic valve replacement should not be considered. This is despite multiple features on echocardiography that would place this patient in the highest risk category based on the echocardiographic cardiac damage staging system, as there are no data demonstrating that this risk is modifiable with valve intervention.

Elevated troponin and brain natriuretic peptide levels are associated with left ventricular hypertrophy and elevated filling pressures, but do not inform the decision to offer valve

intervention in this setting. Valve calcium scoring may be useful if paradoxical low-flow low-gradient severe aortic stenosis is suspected, but in this case the stroke volume index is normal, rendering this diagnosis unlikely. A functional assessment is not practical nor is it of diagnostic utility in the absence of a low-flow state.

5. Which of these findings best constitutes a “positive” exercise treadmill test in aortic stenosis?
- a) Dyspnoea at peak exercise
 - b) Pre-syncope at peak exercise
 - c) 2mm upsloping ST depression at peak exercise
 - d) 60% maximal predicted heart rate achieved
 - e) Asymptomatic intermittent left bundle branch block at peak exercise

Answer: b)

Dyspnoea at peak exercise is normal. 2mm upsloping ST depression at peak exercise may be non-specific. Submaximal heart rate is non-specific. Intermittent left bundle branch block may be associated with underlying coronary or conduction disease but is not a specific finding correlated with aortic stenosis severity or outcome.

6. Which of the following statements is true?
- a) Randomised controlled trials have demonstrated improved outcomes with the use of blood biomarkers for risk stratification in asymptomatic severe aortic stenosis.
 - b) Randomised controlled trials have demonstrated improved outcomes with the use of myocardial tissue characterization for risk stratification in asymptomatic severe aortic stenosis.
 - c) Randomised controlled trials have demonstrated improved outcomes with the use of exercise testing for risk stratification in asymptomatic severe aortic stenosis.
 - d) Randomised controlled trials have demonstrated improved outcomes with early intervention in asymptomatic severe aortic stenosis ($V_{\max} > 4.0\text{m/s}$ or mean gradient $> 40\text{mmHg}$)
 - e) Randomised controlled trials have demonstrated improved outcomes with intervention in symptomatic aortic stenosis.

Answer: e)

Only this answer is correct (PARTNER cohort B data). Option d) is incorrect as inclusion criteria in RECOVERY included aortic-valve area of $\leq 0.75\text{ cm}^2$ with either $V_{\max} \geq 4.5\text{ m/s}$ or mean gradient $\geq 50\text{ mmHg}$.