

Valvular Heart Disease

1. Transthoracic echo (TTE) is indicated for evaluating valves in patients with symptoms, $\geq 3/6$ systolic, any continuous or diastolic murmur.
2. TEE provides improved images of mitral valves, the left atrial appendage, prosthetic valves, and for evaluation of endocarditis.
3. Cardiac cath is recommended for preop assessment for CAD in to determine whether concurrent CABG is needed at time of surgery.
4. Calcification of a trileaflet or bicuspid AV (akin to atherosclerosis) is most common cause of AS in the US. Less common is rheumatic
5. Risk factors associated with AS include DM, male gender, smoking, HTN, older age, and hyperlipidemia. Lipid therapy & ACEi have no effect on valve disease progression or cardiovascular death.
6. Aortic sclerosis (without obstruction), is present in $> 25\%$ of persons > 65 yrs; $< 20\%$ develop obstruction over 10 yrs; there is 50% increased MI or death risk over 5 yrs, due to atherosclerosis burden.
7. In mild AS; annual gradient increases by 7 mmHg and AVA decreases by 0.1 cm²; worsened by AV calcification, renal disease, older age.
8. 50% of adults undergoing AV surgery have bicuspid valve; which is associated with aortic dilation & increased risk of dissection.
9. Serial aorta imaging if dilation is present; root replacement once diameter is > 5.0 cm; earlier if progression is rapid, family history of dissection, or there is known underlying connective tissue disease.
10. Severe AS manifests as angina ($>50\%$), syncope ($< 1\%$ SCD risk), CHF. Auscultatory features: mid- to late-peaking systolic murmur radiating to carotids; single S₂; decrease & delay in carotid pulses.
11. Dobutamine echo is used in AS & LV dysfunction, to assess whether the LV is unable to generate sufficient gradient to open a mildly stenotic valve. If AVA increases with dobutamine, AS is not present (*pseudostenosis*). If AVA does not increase, true AS is present.
12. 1-year mortality is 50% in unoperated symptomatic AS. Symptoms during exercise & high BNP are early predictors for symptom onset.
13. AVR carries 3 – 4% periop mortality due to thromboembolism, bleeding, prosthesis dysfunction, & endocarditis.
14. Percutaneous balloon valvotomy is not performed for calcific AS; complications rate is $> 10\%$, & restenosis in 1 yr in most patients.
15. MS is mostly rheumatic, $> 80\%$ are women. In US, presents is in fifth decade (20 – 30 yrs after initial rheumatic fever), but at younger ages (adolescent) in immigrants from endemic areas.
16. Moderate MS (gradient 5-10 mmHg) causes dyspnea with exercise, anemia, or pregnancy. Afib occurs in $> 30\%$ of symptomatic patients and is associated with worse symptoms & poor long term-outcome.
17. Auscultatory findings include opening snap with a low pitched mid-diastolic murmur that accentuates presystole & intensified S₁.
18. TTE shows commissural fusion, leaflet thickening, calcification, & doming in diastole, involvement of chordae/subvalvular apparatus.
19. 10 yr survival is $>80\%$ in asymptomatic MS patients, $< 15\%$ symptomatic patients.

20. Valvotomy is indicated with MVA < 1.0 cm², PA pressure > 50 mmHg & pliable leaflets, minimal fusion & valvular/subvalvular calcification by TTE. Pulm HTN is not a contraindication. complications include severe MR, embolism, & tamponade; mortality is 1%,
21. In patients with afib referred for MVR LA ablation & appendage ligation should be considered to reduce postop afib & stroke rates.
22. Clinical presentation in acute valvular regurgitation includes tachycardia, CHF, pulmonary edema, and hemodynamic shock.
23. Most common acute AI causes are aortic dissection & endocarditis.
24. MI patients with acute respiratory failure may have acute MR.
25. Afterload-reducing and inotropic medications may stabilize patients with acute valve regurgitation but do not supplant urgent surgery.
26. Surgical intervention is indicated in symptomatic patients with severe left-sided valvular regurgitation.
27. Timing of surgery in asymptomatic patients with chronic valvular regurgitation is determined by LV end-systolic dimension and EF.
28. Chronic AI results from leaflet dysfunction (bicuspid AV, prolapse, endocarditis), or annular dilation from root enlargement due to Marfan syndrome, bicuspid AV, & HTN.
29. PE in AI shows widened pulse pressure; bounding peripheral/carotid pulses; diffuse lateral PMI; early- to holo-diastolic murmur at LUSB.
30. Mortality is > 10%/yr in untreated symptomatic AI; AVR is indicated; & root replacement if diameter is > 5 cm, or > 4.5 cm in bicuspid AV.
31. In asymptomatic AI & normal LVEF, serial evaluation for progression is indicated. Nifedipine or ACEi to slow LV dilation is controversial.
32. Chronic primary MR results from MVP & endocarditis. Secondary (functional) MR is a consequence of ischemic or dilated CM.
33. In secondary MR, pre- & afterload reduction & resynchronization therapy (biventricular pacing) for dilated CM decrease MR.
34. In primary severe MR, MV repair (annuloplasty) is preferred over MVR for LVEF preservation and avoidance of anticoagulation.
35. MVP: 2 – 3% in US, M:F 1:1. Midsystolic click & late systolic murmur. MVP *syndrome*: autonomic dysfunction; causes palpitations, atypical chest pain, dyspnea, fatigue, dizziness, neuropsychiatric complaints.
36. TR is due mostly to left-sided heart disease causing pulmonary HTN, enlarged RV annulus; or primary pulmonary HTN & lung disease (*cor pulmonale*). Other causes include endocarditis, pacer lead injury, carcinoid, mediastinal radiation, & trauma; pergolide, ergotamine, methysergide; appetite suppressant fenfluramine/dexfenfluramine.
37. Surgery for severe TR is done with other planned cardiac surgery.
38. Endocarditis should be suspected in patients with new or abnormal murmur, particularly in patients with fever or a compelling history.
39. Blood cultures should be obtained in febrile patients with implanted devices (valve prosthesis/pacemakers), & those with known native valve disease before starting antibiotics for noncardiac infections.
40. INR should be 2–3 for AVR & no risk factors; 2.5–3.5 for MVR, or AVR +1 risk factor (afib, low EF, prior thromboembolism, hypercoagulable condition). ASA 81 mg/d is recommended in all patients.

Parameter	Normal Cardiac Measurements	Normal Value
Ejection fraction		>55%
Left ventricular end-diastolic dimension		<60 mm
Left ventricular end-systolic dimension		<40 mm
Left atrial dimension		<40 mm
Pulmonary artery systolic pressure		<30 mm Hg
Ascending aorta diameter		<3.5 cm

Serial Evaluation of Asymptomatic Patients with Left-Sided Valvular Conditions

Factors Considered	Lesion Severity	Frequency
Aortic Stenosis		
Stenosis severity; rate of progression	Mild ($V_{max} < 3$ m/s, AVA > 1.5 cm ²)	Clinical eval yearly Echo every 3-5 y
	Moderate (V_{max} 3-4 m/s, AVA 1.0-1.5 cm ²)	Clinical eval yearly Echo every 1-2 y
	Severe ($V_{max} > 4$ m/s, AVA < 1.0 cm ²)	Clinical eval yearly Echo yearly
Mitral Stenosis		
Stenosis severity; rate of progression	Mild (MVA > 1.5 cm ² , MPG < 5 mm Hg, PASP < 30 mm Hg)	Clinical eval yearly Echo every 3-5 y
	Moderate (MVA 1.0-1.5 cm ² , MPG 5-10 mm Hg, PASP 30-50 mm Hg)	Clinical eval yearly Echo every 1-2 y
	Severe (MVA < 1.0 cm ² , MPG > 10 mm Hg, PASP > 50 mm Hg)	Clinical eval yearly Echo yearly
Aortic Regurgitation		
Regurgitation severity; rate of progression; EF; LV chamber size; ascending aorta dilation	Mild (VC < 0.3 cm, ROA < 0.10 cm ² , RV < 30 mL/beat); normal EF	Clinical eval yearly Echo every 2-3 y
	Severe (VC > 0.6 cm, ROA ≥ 0.3 cm ² , RV ≥ 60 mL/beat, RF $> 50\%$)	
	EF $> 50\%$; LV size normal	Clinical eval every 6-12 mo Echo yearly
	EF $> 50\%$; LV size increased	Clinical eval every 6 mo Echo every 6 to 12 mo
Mitral Regurgitation		
Regurgitation severity; rate of progression; EF; LV chamber size; pulmonary pressure	Mild (VC < 0.3 cm, ROA < 0.10 cm ² , RV < 30 mL/beat); normal EF mL/beat); EF normal; LV size normal	Clinical eval yearly Echo only if symptomatic
	Severe (VC ≥ 0.7 cm, ROA ≥ 0.4 cm ² , RV ≥ 60 mL/beat, RF $> 50\%$)	Clinical eval every 6-12 mo Echo every 6-12 mo

AVA = aortic valve area; MPG = mean pressure gradient; MVA = mitral valve area; PASP = pulmonary artery systolic pressure, RF = regurgitant fraction; ROA = regurgitant orifice area; RV = regurgitant volume; VC = vena contracta width; Vmax = maximum aortic jet velocity.

Timing of Intervention for Severe Left-Sided Valvular Conditions

Aortic Stenosis	Mitral Stenosis	Chronic Aortic Regurgitation	Chronic Mitral Regurgitation
<i>INTERVENTION</i>	<i>INTERVENTION</i>	<i>INTERVENTION</i>	<i>INTERVENTION</i>
Aortic valve replacement	Percutaneous valvotomy if anatomy amenable <i>and</i> if less than moderate mitral regurgitation <i>and</i> no left atrial appendage clot by TEE ^a ; otherwise, mitral valve replacement	Aortic valve replacement with aortic root replacement if needed	Mitral valve repair if anatomy amenable; otherwise, mitral valve replacement
<i>IF</i>	<i>IF</i>	<i>IF</i>	<i>IF</i>
Patient symptomatic	Patient symptomatic	Patient symptomatic	Patient symptomatic
<i>OR</i>	<i>OR</i>	<i>OR</i>	<i>OR</i>
Ejection fraction <50%		Ejection fraction <50%	Ejection fraction <60%
<i>OR</i>		<i>OR</i>	<i>OR</i>
		End-systolic dimension >55 mm <i>or</i> end-diastolic dimension > 70 mm	End-systolic dimension >40 mm
		<i>OR</i>	<i>OR</i>
Patient needs other cardiothoracic surgery (e.g., CABG)	Abnormal hemodynamic response to exercise (PAP increases by 25 mm Hg)	Abnormal hemodynamic response to exercise (PAP increases by 25 mm Hg)	(Consider if) pulmonary hypertension or atrial fibrillation
<i>OTHERWISE</i>	<i>OTHERWISE</i>	<i>OTHERWISE</i>	<i>OTHERWISE</i>
Serial evaluation	Serial evaluation	Serial evaluation	Serial evaluation

PAP = pulmonary arterial pressure; ^aAll patients considered for percutaneous valvotomy should undergo TEE to assess for LA appendage clot & MR severity whether or not they are in SR or afib.

Clinical Criteria for the Diagnosis of Endocarditis

Definite Endocarditis

- 2 major criteria *or*
- 1 major and 3 minor criteria *or*
- 5 minor criteria

Major Criteria

- Persistently positive blood cultures of organisms typical for endocarditis^a
- New valvular regurgitation
- Positive echocardiogram

Minor Criteria

- Predisposing condition or injection drug use
- Fever
- Embolic vascular phenomena
- Immunologic phenomena (eg, glomerulonephritis, rheumatoid factor)
- Positive blood cultures not meeting major criteria

^aOr a single positive culture for *Coxiella burnetii* or IgG antibody titer >1:800. Most cases of native valve endocarditis are caused by strep & staph species. Less common pathogens causing culture-negative or slow-growing endocarditis include HACEK organisms (*Haemophilus*, *Actinobacillus*, *Cardiobacterium*, *Eikenella*, and *Kingella*), fungi, & mycobacteria. The most common reason for culture-negative or slow-growing cultures is prior antibiotic treatment.

Patients Requiring Bacterial Endocarditis Prophylaxis for Dental Procedures

Patients with:

- Prosthetic heart valves or valve repair with prosthetic material
- Prior endocarditis
- Congenital heart disease
 - Unrepaired cyanotic congenital heart disease
 - Palliative shunts and conduits
- Prosthetic valve
 - Repair with prosthetic material or device for the first 6 months after intervention
- Valve disease in heart transplant recipients