

- Chronic: Include acute processes over longer time, myxomatous degeneration, ischemic heart disease, dilated cardiomyopathy, rheumatic disease, lupus, congenital valvular disease, LA myxoma. All forms can be accelerated by systemic Htn.

Usual Treatment

- Medical therapy: Afterload reduction, CHF regimens, arrhythmia control, endocarditis prophylaxis
- Pharmacology: Includes Angiotensin inhibitors, hydralazine, cardiac glycosides, diuretics, nitrates, antibiotics

- Surgical therapy: Mitral valvuloplasty (repair), annuloplasty, mitral valve replacement (mechanical and tissue)
- Transcatheter mitral valve interventions: Edge-to-edge repair/enhanced coaptation, chordal repair, annuloplasty, mitral valve implantation

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Mitral regurgitation LA enlargement	Fatigue, exertional or nocturnal dyspnea	Pansystolic and late systolic murmur, rales	Doppler ECHO, 2D/3D ECHO ECG
	AFIB RV failure	Palpitations, defibrillation, anticoagulation Peripheral swelling, RUQ pain, tenderness	Irregular rhythm, bruises Ankle edema, hepatomegaly, hepatojugular reflux	ECG, PT/INR Cardiac cath 2D and Doppler ECHO
	Cardiomegaly		Displaced posterior MI	CXR, 2D ECHO
RESP	CHF, pulm edema	Dyspnea, orthopnea	Gallop, rales	CXR
GI	Congestive hepatopathy	Bleeding with minor trauma	Bruises	PT, PTT, LFTs
RENAL	Decreased perfusion Diuretic-induced Decreased K ⁺ , Mg ²⁺	Oliguria Palpitations	Muscle weakness Decreased reflexes	Decreased BUN, Cr Serum K ⁺ , Mg ECG
MS	Cachexia	Weight loss	Muscle wasting	Decrease weight

Key References: Bhattacharyya S, Khattar R, Chahal N, et al.: Dynamic mitral regurgitation: review of evidence base, assessment and implications for clinical management, *Cardiol Rev* 23(3):142–147, 2015; Al-Atassi T, Malas T, Mesana T, et al.: Mitral valve interventions in heart failure, *Curr Opin Cardiol* 29(2):192–197, 2014.

Perioperative Implications

Preoperative Preparation

- Antibiotic prophylaxis.
- Manage anticoagulation issues related to atrial fibrillation and the possible use of regional techniques.
- Optimize HR issues related to AFIB.
- Optimize symptoms related to CHF.
- TEE with 3D imaging is essential for disease classification, surgical planning, and post-intervention valve assessment.

Monitoring

- In procedures with expected wide variations in BP, direct arterial BP monitoring should be considered, especially with moderate or severe mitral regurgitation.
- In settings of LV failure, a pulm artery cath or TEE may be useful in assessing changes and guiding pharmacologic therapy.

Airway

- Avoid hypoxemia and hypercarbia, which maintains the lowest pulm vascular resistance and reduces risk of RV failure.

Preinduction/Induction

- “Faster, Fuller, Forward.”
- Avoid bradycardia, maintain high-normal preload, reduce afterload.
- Maintain stroke volume by avoiding myocardial depression and AFIB.

Maintenance

- Cardiac and pulm goals, same as induction.
- Avoid excessive PEEP, which reduces preload.
- If possible, follow cardiac output, using pharmacology as needed.
- Regional anesthetic techniques may be considered because they help to reduce afterload; however, caution is recommended in the setting of impaired LV function.

Extubation

- Airway management to avoid hypoxia and hypercarbia inducing RV strain and failure
- Requires vigilance on BP management to avoid Htn
- Transcatheter MV procedures slowly evolving to monitored anesthetic delivery without need for general endotracheal anesthesia

Adjuvants

- No known drug interaction problems

Postoperative Period

- Pain management critical to avoid hypertensive episodes.
- Both scheduled and prn-controlled analgesia useful for pain control.
- Fluid shifts and intraop volume management may alter LV function and antiarrhythmic blood concentrations.
- New onset AFIB.
- Consideration for pacemaker use: new-onset bradycardia and heart block related to manipulation and device insertion via direct pacing wires or transvenous pacing device.
- Consideration for restarting anticoagulation for chronic AFIB.

Anticipated Problems/Concerns

- High periop risk is best predicted by impaired LV function, symptoms of both LV and RV dysfunction.
- Htn can acutely worsen mitral regurgitation, causing CHF and pulm edema.

Mitral Stenosis

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Risk

- Bimodal age distribution: 20–39 y and 50–60 y.
- Mitral stenosis is 2–3 times more common in women and is the most common valve disease affecting pregnant women.
- Most common among immigrants to USA from regions where rheumatic fever is prevalent (e.g., Middle East, Asia, Latin America).

Perioperative Risks

- Increased risk of periop cardiac complications, including infectious endocarditis, pulm edema, resp failure, HF, tachyarrhythmias, new-onset AFIB or atrial flutter, embolic stroke of cardiac origin (0.7–0.9% risk of stroke after cardioversion)

Worry About

- Fluid status
- Paroxysmal AFIB or flutter
- Pregnancy
- Limited ability to increase cardiac output in response to increased metabolic demands or intravascular volume expansion
- Tachycardia, AFIB, or atrial flutter decreases atrial emptying by decreasing the duration of diastole
- Cardiomyopathy, pulm Htn, RV failure, hepatic dysfunction, tricuspid regurgitation, and associated aortic valve disease
- Pulm edema

Overview

- The normal mitral valve has an area of 4–6 cm². Symptoms start when the mitral valve area is reduced to 1.5 cm². Diastolic emptying of blood from the LA into the LV is impaired critically when the mitral valve area is <1 cm².
- MS can be classified as at risk for MS (Stage A), progressive MS (Stage B), asymptomatic severe MS (Stage C), or symptomatic severe MS (Stage D), based on the presence of dyspnea on exertion, exercise intolerance, diastolic doming and commissural fusion of the mitral valve leaflets, left atrial enlargement, and pulm Htn.
- Transmitral pressure gradient varies directly with blood flow across the valve; acute increases

in cardiac output or venous return to the heart increases the mitral valve gradient and increases LA and pulm venous pressures. Pulm edema occurs when the pulm venous pressure is >pulm capillary oncotic pressure.

- Elevated left atrial pressure leads to pulm venous Htn, left atrial dilation, left atrial thrombosis, AFIB, pulm Htn, RV failure, and tricuspid regurgitation.
- Symptoms of mitral stenosis can be elicited by conditions (fluid overload, exercise, pregnancy, sepsis, operation) that demand an increase in cardiac output or diastolic blood flow across the mitral valve.
- Deformity of the mitral valve apparatus may cause mitral stenosis in combination with mitral regurgitation or LV dysfunction.

Etiology

- Congenital heart disease (rare).
- Mitral valve repair with restrictive ring annuloplasty (rare).
- Acquired mitral stenosis is sequela of rheumatic carditis developing after group A streptococcal pharyngitis.
- Rheumatic carditis produces exudative and inflammatory lesions that lead to fibrosis, calcification, thickening, and commissural fusion of the mitral valve apparatus.
- Acquired prosthetic mitral stenosis from structural valvular deterioration after bioprosthetic mitral valve replacement or mechanical prosthetic valve dysfunction after mechanical mitral valve replacement.

Usual Treatment

- Anticoagulation to decrease risk of thromboembolic events in pts with AFIB, prior embolic event, or left atrial thrombus
- Digoxin, beta-blockers, or calcium channel blockers to control ventricular rate in pts with AFIB
- Diuretic therapy for symptomatic pulm edema, CHF, or RV failure
- Percutaneous balloon valvotomy in pts without extensive valve calcification, leaflet restriction, leaflet thickening, moderate-severe mitral regurgitation, left atrial thrombus, or involvement of the subvalvular apparatus
- Mitral valve replacement, repair, or open valvotomy in pts with symptomatic severe MS and MVA ≤ 1.5 cm²
- Transcatheter valve-in-valve mitral valve replacement in high-risk surgical pts with bioprosthetic mitral stenosis

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Mitral stenosis AFIB Pulm Htn	DOE, NYHA class Chest pain or tightness Palpitations DOE	Diastolic murmur Irregular pulse Sternal heave Prominent S ₂	ECHO Cardiac cath ECG CXR
RESP	Pulm edema	DOE Orthopnea Paroxysmal nocturnal dyspnea Hemoptysis	Tachypnea Rales Wheezes	CXR
GI	Cardiac cirrhosis		Hepatomegaly	LFTs
RENAL	Fluid retention Diuretic therapy	Dependent edema	Pedal edema	Serum lytes
CNS	Embolic stroke	Neurologic deficits, TIAs	Focal neurologic deficits	Head CT scan, TEE
HEME	Bleeding	Anticoagulation therapy	Ecchymosis	INR, PT, PTT

Key References: Nishimura RA, Otto CM, Bonow RO, et al.: 2014 AHA/ACC guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines, *Circulation* 129(23):e521–e643, 2014; Weiner MM, Vahl TP, Kahn RA: Case scenario: cesarean section complicated by rheumatic mitral stenosis, *Anesthesiology* 114(4):949–957, 2011.

Perioperative Implications

Preoperative Preparation

- Determine if pt is a candidate for percutaneous balloon valvotomy.
- Optimize fluid status of pts in CHF.
- Control ventricular rate in pts with AFIB.
- Replete K⁺ in pts with hypokalemia on digoxin therapy.
- Antibiotic prophylaxis for infectious endocarditis according to guidelines.
- Keep pt calm using reassurance, anxiolytics, and analgesics.
- Assess the risk of bleeding in anticoagulated pts and correct the prolonged PT (INR) with FFP if necessary.

Monitoring

- ECG to detect paroxysmal AFIB or flutter.
- Consider arterial catheter for continuous BP monitoring and ABG sampling.

- Consider CVP line, PA catheter, or TEE to measure pulm artery pressure, assess RV function, and guide intravascular volume management when large fluid shifts are anticipated.

Preinduction/Induction

- Cautious administration of drugs that decrease myocardial contractility, increase HR, or cause vasodilation.
- Hypoventilation and hypoxia may worsen pulm Htn and RV failure.
- Positive inotropic drugs may precipitate pulm edema.

Maintenance

- Control fluid administration.

Extubation/Postoperative Period

- Provide adequate analgesia.
- Increased risk of postop resp failure.

Adjuvants

- Consider regional anesthesia or periop epidural anesthesia and analgesia, especially for labor and delivery in the pregnant pt with mitral stenosis.
- Inhaled NO or epoprostenol for RV failure associated with pulm Htn.

Anticipated Problems/Concerns

- Pts have a limited ability to increase their cardiac output.
- Acute pulm edema is precipitated by increased cardiac output, increased HR, pregnancy, anxiety, fluid overload, exercise, and postop mobilization of sequestered (third space) interstitial and extracellular fluid.
- Bleeding in anticoagulated pts.

Mitral Valve Prolapse

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Risk

- Believed to be most common form of valvular heart disease, with an incidence of 2–3% in the general population. MVP is a progressive disease that begins in middle age and affects both men and women.
- Most common cause of chronic primary MR.
- Disease severity varies widely. Complications related to the disease are a consequence of arrhythmias,

infective endocarditis, and progressive severity of MR with associated LV dysfunction.

Perioperative Risks

- Acute HF or exacerbation of chronic HF as a consequence of MR
- Embolic stroke
- Arrhythmias
- Sudden cardiac death

Worry About

- Severity of MR
- Severity of associated LV dysfunction and HF
- AFIB, embolic stroke, sudden cardiac death
- Associated conditions: Marfan syndrome; Ehlers-Danlos syndrome, osteogenesis imperfecta, pseudoxanthoma elasticum, aneurysms-osteoarthritis syndrome, or hypertrophic cardiomyopathy