

Valvular Heart Diseases

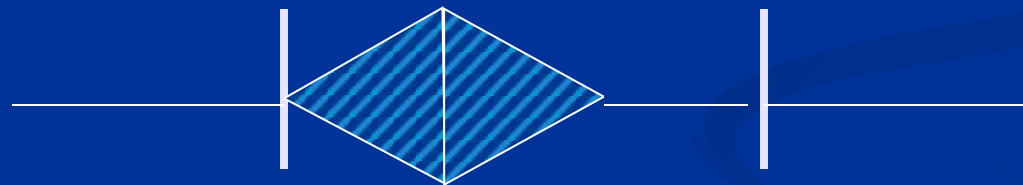
The background of the slide is a solid dark blue. In the bottom right corner, there are several decorative, wavy, light blue lines that sweep upwards and to the right, creating a sense of movement or flow.

Stages of Progression of Valvular Heart Disease

Stage	Definition	Description
A	At risk	Patients with risk factors for development of VHD
B	Progressive	Patients with progressive VHD (mild-to-moderate severity and asymptomatic)
C	Asymptomatic severe	Asymptomatic patients who have the criteria for severe VHD: C1: Asymptomatic patients with severe VHD in whom the left or right ventricle remains compensated C2: Asymptomatic patients with severe VHD with decompensation of the left or right ventricle
D	Symptomatic severe	Patients who have developed symptoms as a result of VHD

Innocent Murmurs

- Common in asymptomatic adults
- Characterized by
 - Grade I – II @ LSB
 - Systolic ejection pattern



- Normal intensity & splitting of second sound (S2)
- No other abnormal sounds or murmurs
- No evidence of LVH, and no ↑ with Valsalva

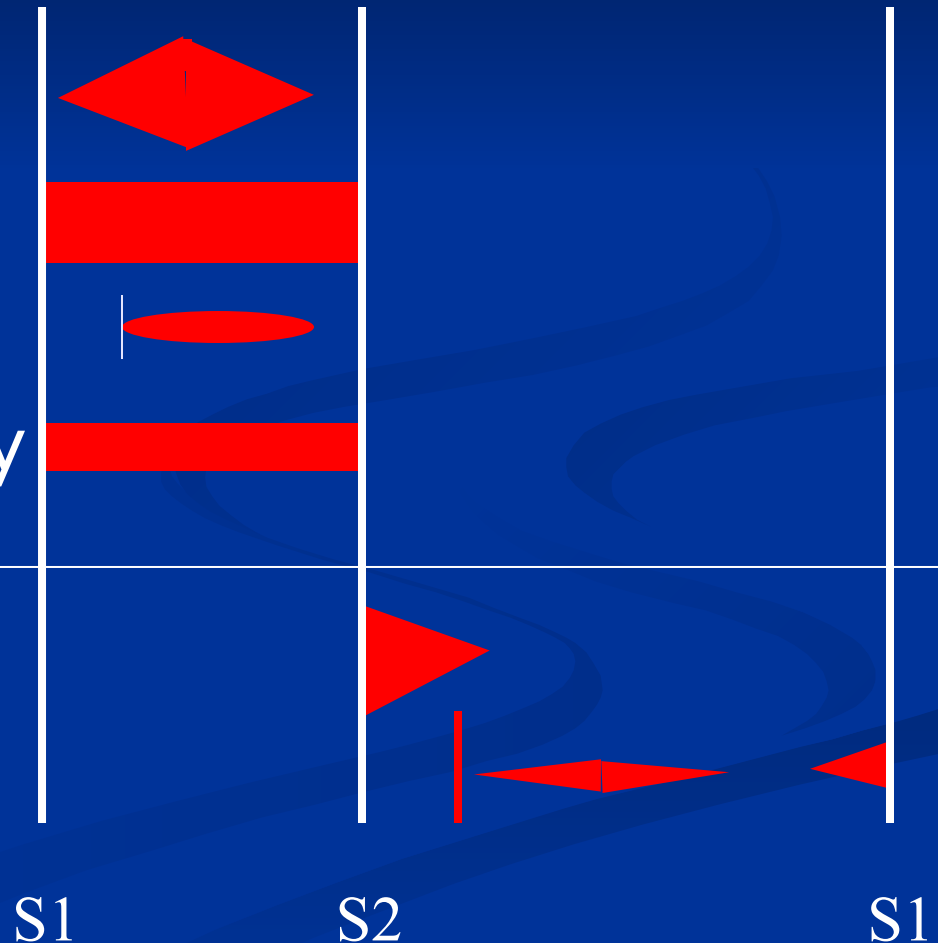
Common Murmurs and Timing

Systolic Murmurs

- Aortic stenosis
- Mitral insufficiency
- Mitral valve prolapse
- Tricuspid insufficiency

Diastolic Murmurs

- Aortic insufficiency
- Mitral stenosis



Mitral Valve Stenosis

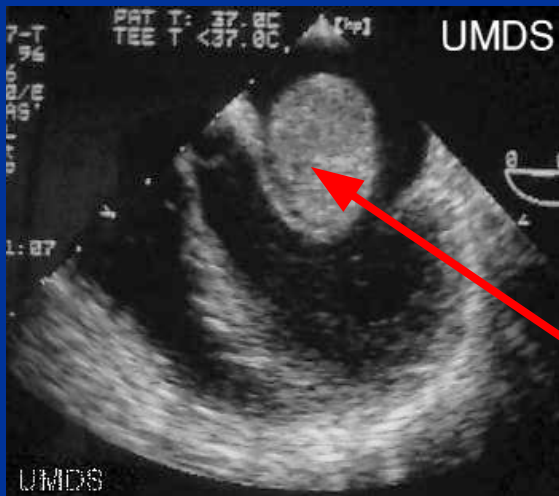
Mitral Stenosis

■ Etiology

- Rheumatic Heart Disease -99.8% of cases

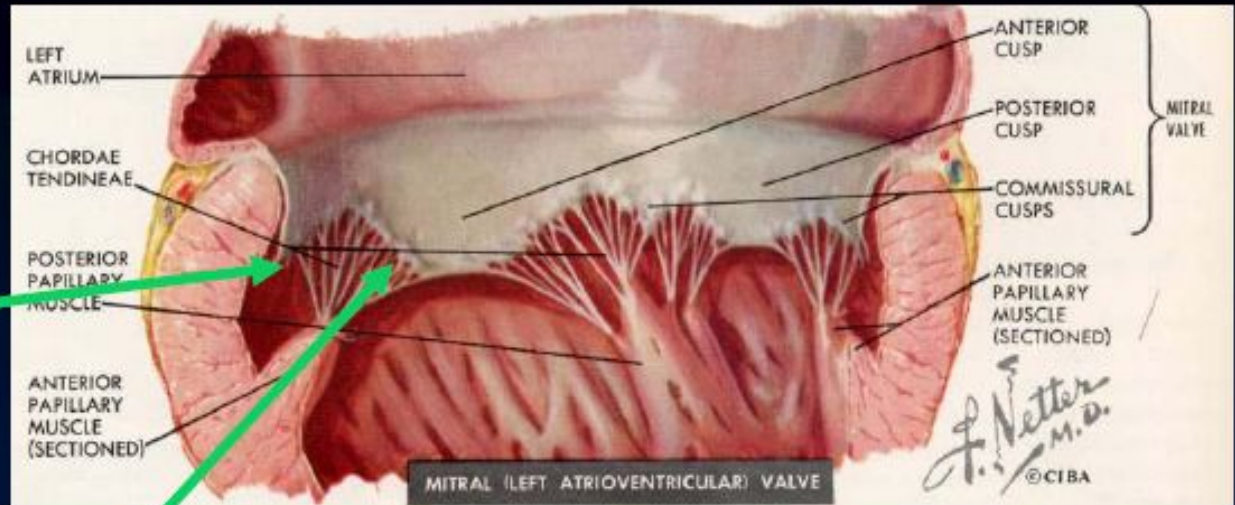
Normal Valve area: $>4 \text{ cm}^2$

Critical MS: $<1 \text{ cm}^2$



- Congenital mitral stenosis
- Infective endocarditis
- Carcinoid syndrome
- Fabray's Disease
- Hurler's syndrome
- Whipple's Disease
- Left atrial myxoma

Normal mitral valve

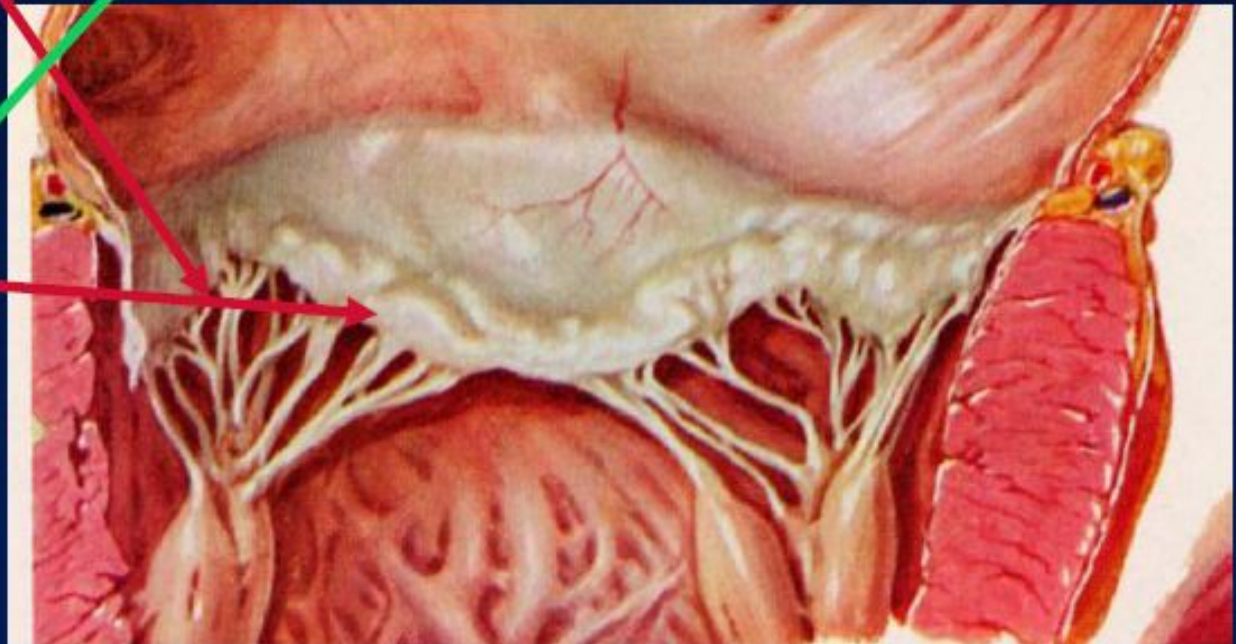


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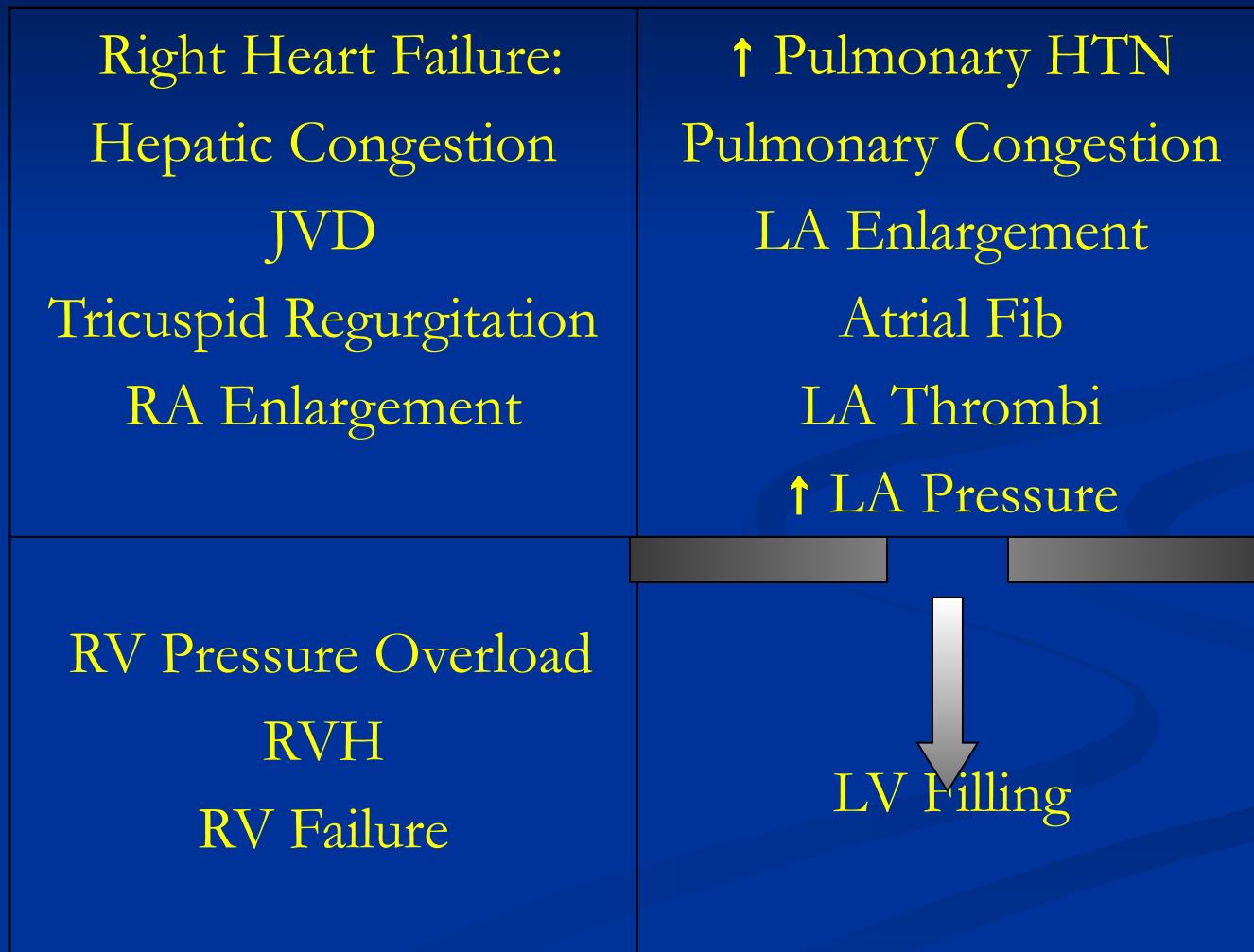
Fusion of chordae

Stenotic mitral valve

Thickening of cusps



Pathophysiology



Pathophysiology

- Left atrial dilatation
 - Allows larger volume at low pressure
 - Prone to A. Fib
 - Thrombi may form and embolize
- Pulmonary artery vasoconstriction
 - PVR increases
 - Pressure overload to RV
 - RV dilates
 - PI, TR
 - Leads to RVH and RV failure

Symptoms

- Left sided failure
- Hemoptysis, URI
- Systemic embolism
- Palpitations
- Fatigue
- Right sided failure
- Hoarseness

Signs

- Loud S1
- Opening snap following S2
- Narrow pulse pressure
- Diastolic murmur
- Atrial Fibrillation
- Pulmonary congestion; Right sided failure
- Sternal lift, Loud S2, Elevated Jugular pressure, edema, hepatomegaly

Recognizing Mitral Stenosis

Palpation:

- Small volume pulse
- Tapping apex-palpable S1
- +/- palpable opening snap (OS)
- RV lift
- Palpable S2

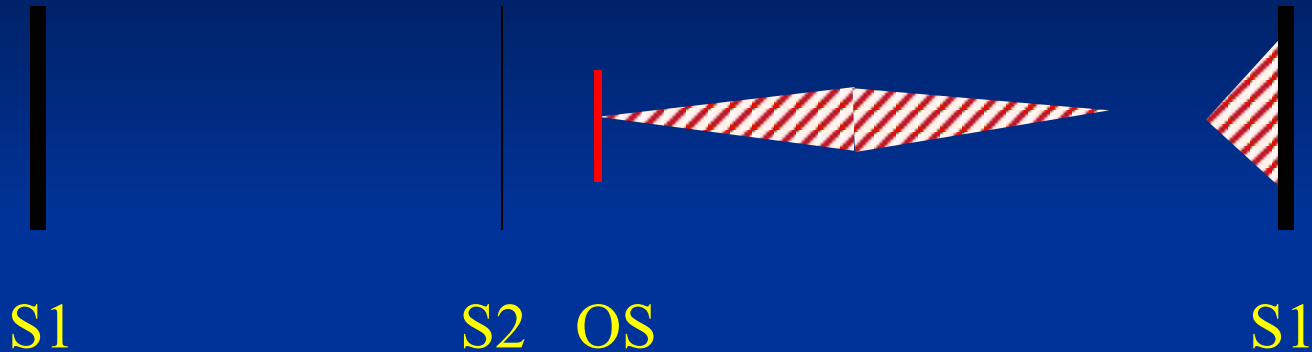
ECG:

- LAE, AFIB, RVH, RAD

Auscultation:

- Loud S1- as loud as S2 in aortic area
- A2 to OS interval inversely proportional to severity
- Diastolic rumble: length proportional to severity
- In severe MS with low flow- S1, OS & rumble may be inaudible

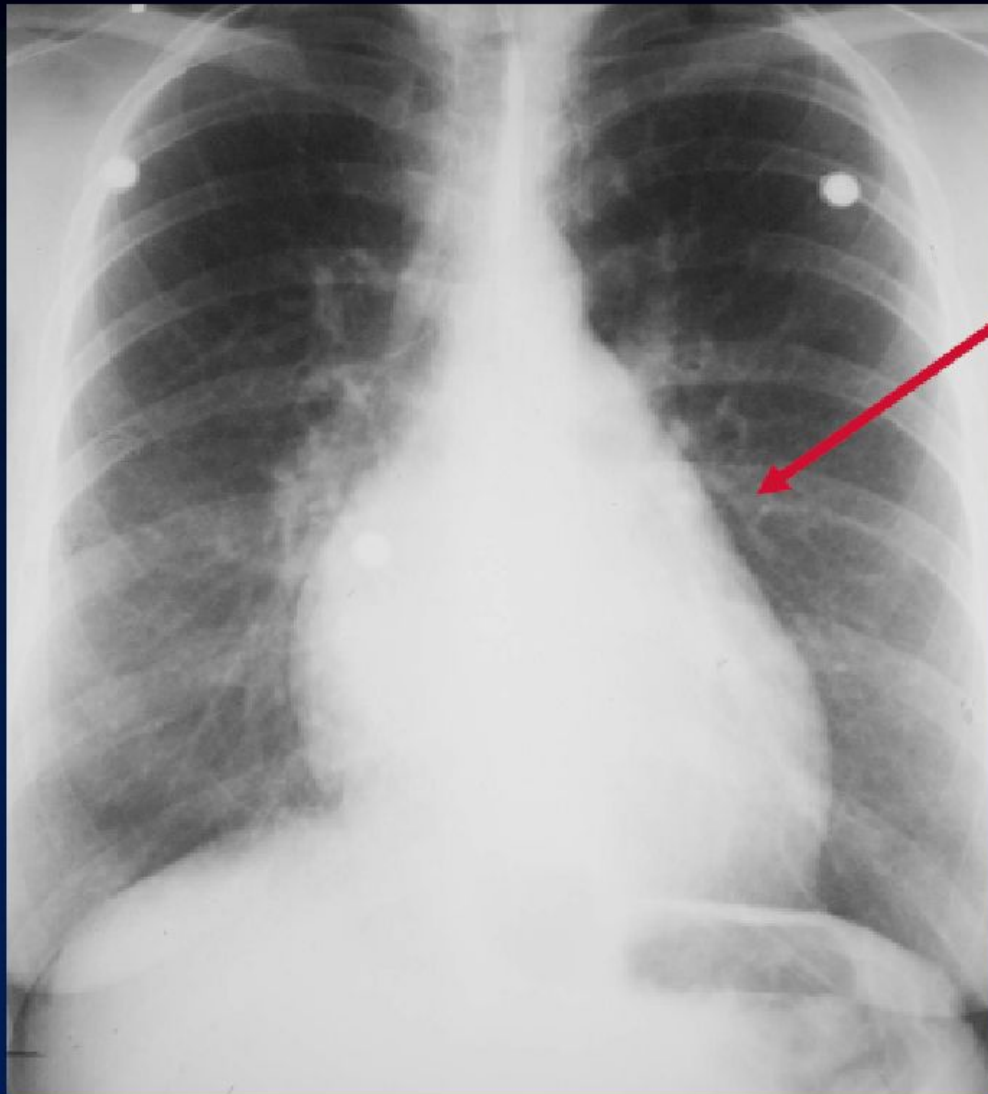
Mitral stenosis murmur



- First heart sound (S1) is accentuated and snapping
- Opening snap (OS) after aortic valve closure
- Low pitch diastolic rumble at the apex
- Pre-systolic accentuation (esp. if in sinus rhythm)

Lab Diagnosis

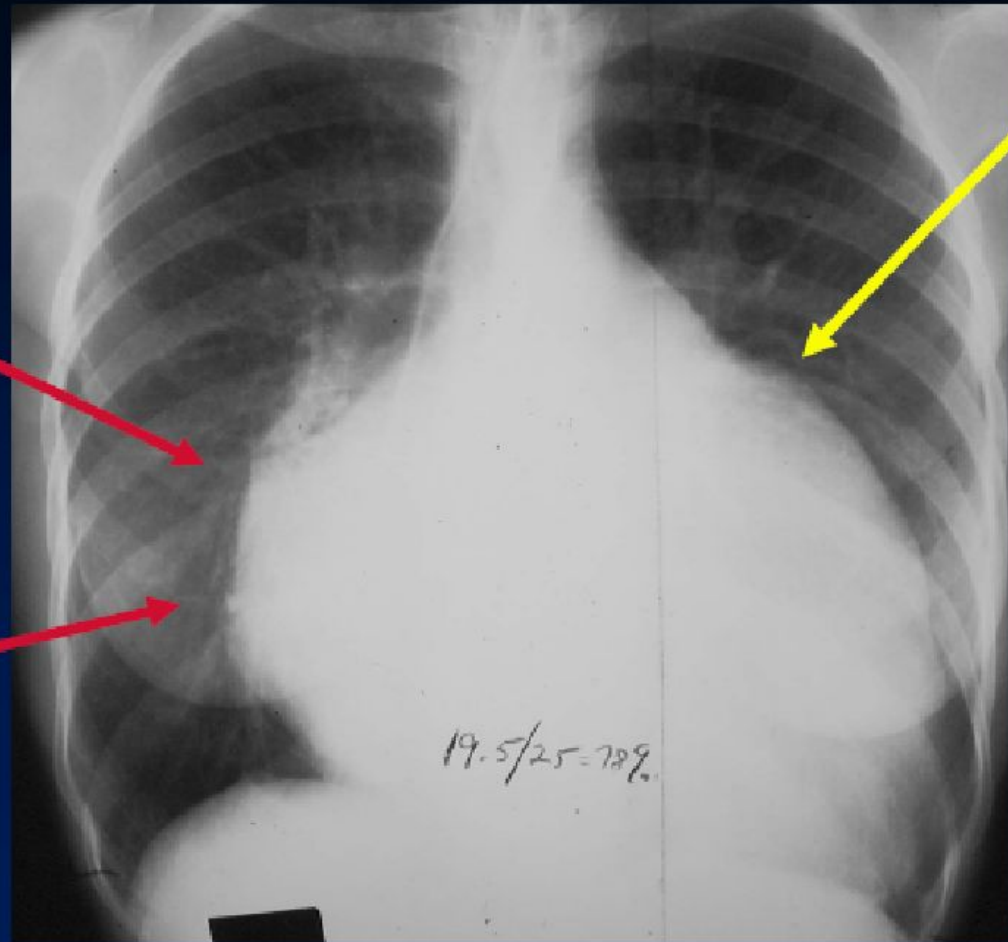
- EKG: A Fib, LAE, RVH
- CXR: Large LA, Pulm venous congestion, RV dilatation, interstitial/alveolar edema
- Echo: Valve orifice, calcification, pliability, size of the chambers, other valvular disease, quantification of stenosis and pulm. HTN
- Cardiac Catheterization: Pressures and area



**“Straightening”
of left heart
border**

Mitral Stenosis

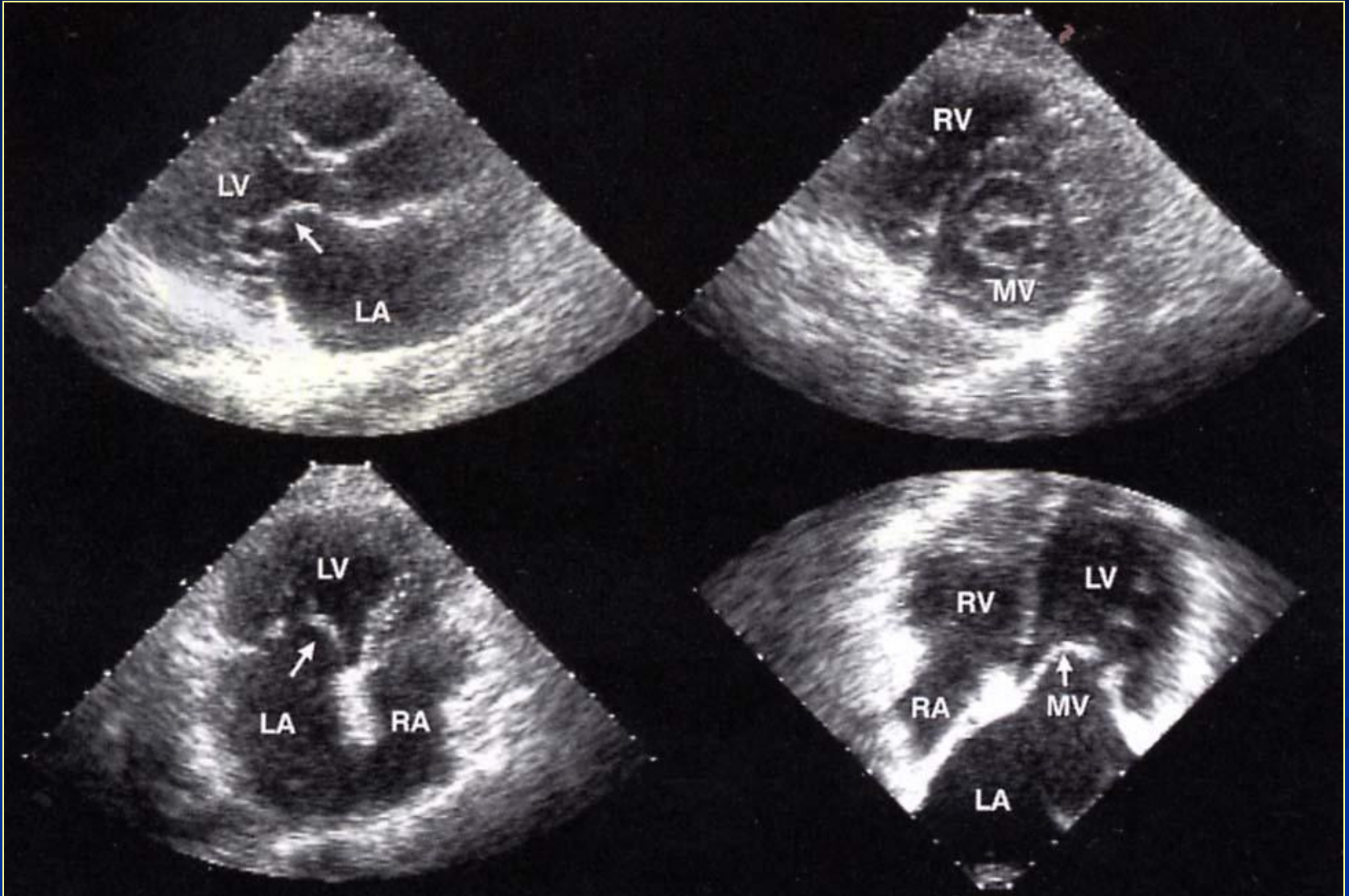
**Right atrial
enlargement
from
tricuspid
regurgitation**



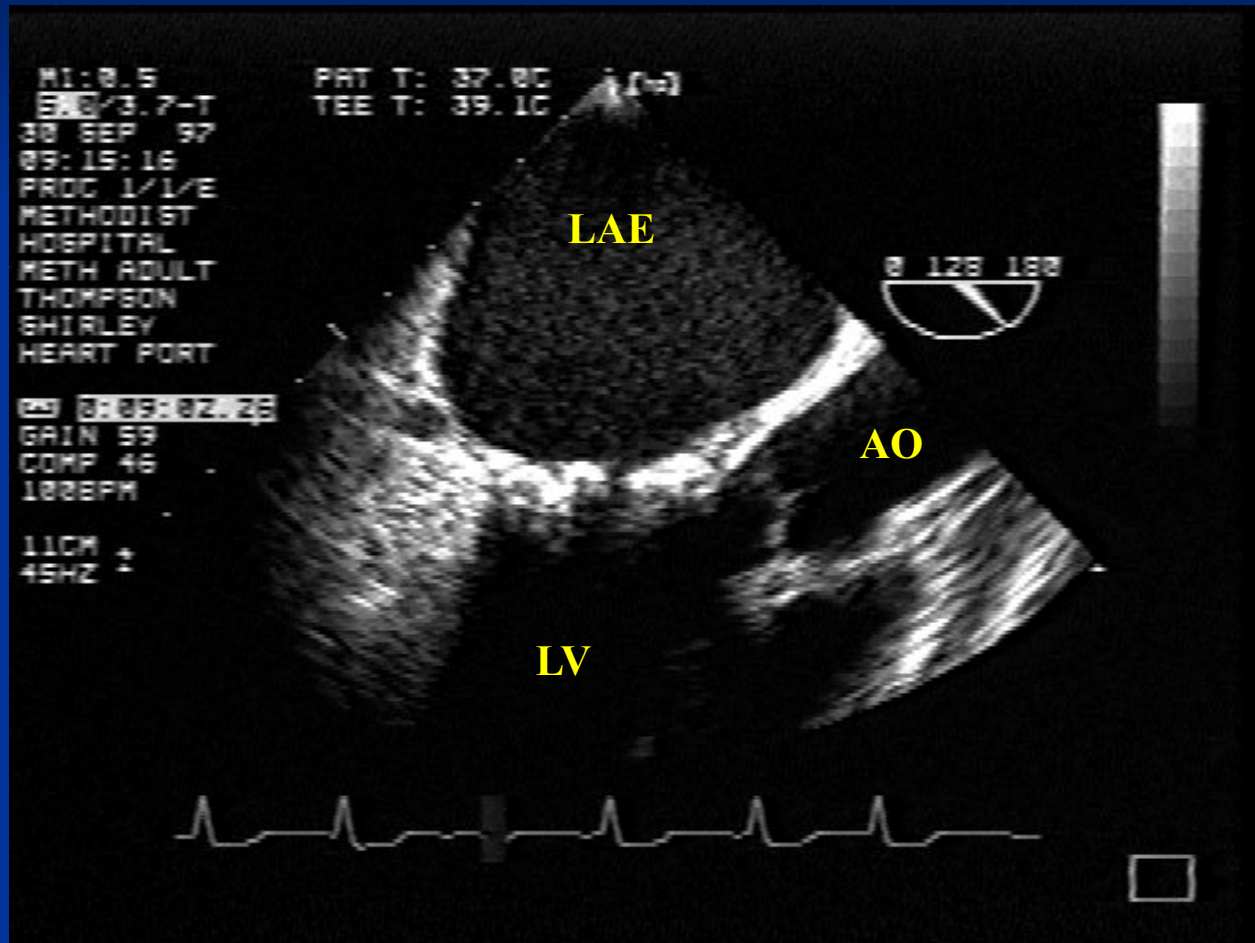
**Enlarged L
atrial
appendage
from mitral
stenosis**

**Mitral stenosis/regurgitation with
tricuspid regurgitation**

Echo - TTE



Echo - TEE



Therapy

■ Medical

- Diuretics: For pulmonary congestion, dyspnea and orthopnea
- Rate control in A Fib: Beta blockers, Ca channel blockers, amiodarone, propafenone, digitalis?
- Anticoagulation: In A Fib

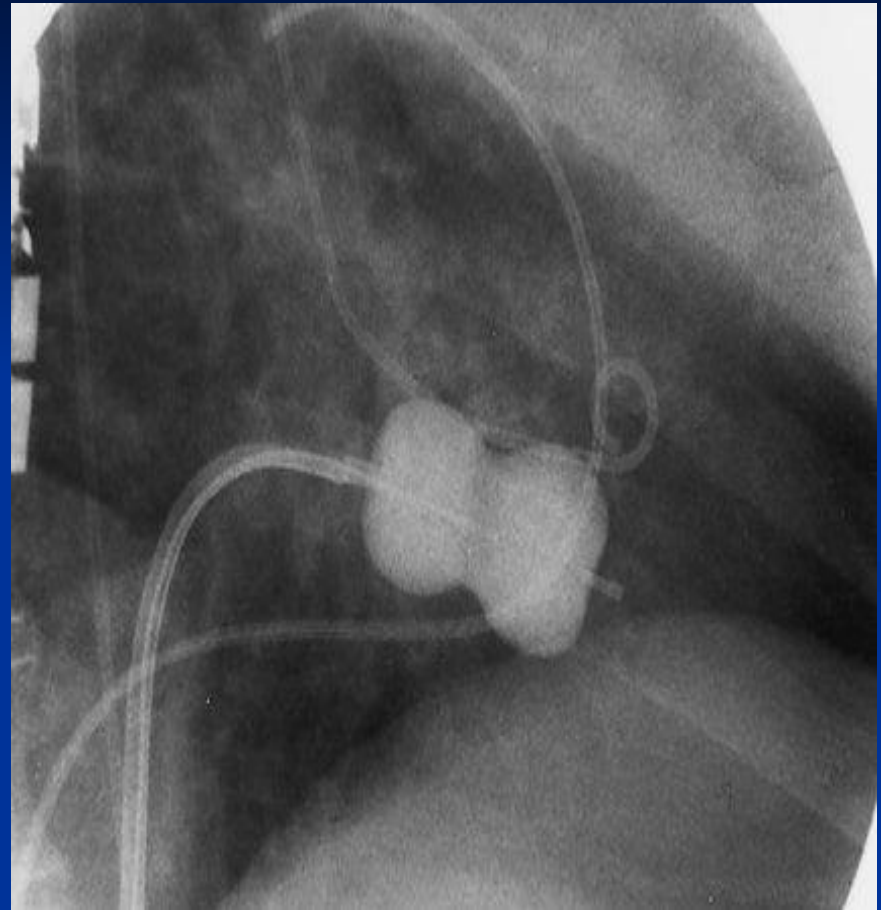
■ Balloon Valvuloplasty

- Effective long term improvement

Mitral Valvuloplasty

Percutaneous mitral balloon commissurotomy (PMBC) is recommended for symptomatic patients with severe MS (mitral valve area <1.5 cm², stage D) and favorable valve morphology in the absence of left atrial thrombus or moderate-to-severe MR

Percutaneous mitral balloon commissurotomy may be considered for symptomatic patients with mitral valve area greater than 1.5 cm² if there is evidence of hemodynamically significant MS based on pulmonary artery wedge pressure greater than 25 mm Hg or mean mitral valve gradient greater than 15 mm Hg during exercise.



Therapy

- Surgical
 - Mitral commissurotomy:
Effective long term improvement
 - Mitral Valve Replacement
 - Mechanical
 - Bioprosthetic

MV Surgery

- Mitral valve surgery (repair, commissurotomy, or valve replacement) is indicated in severely symptomatic patients (NYHA class III to IV) with severe MS (mitral valve area ≤ 1.5 cm², stage D) who are not high risk for surgery and who are not candidates for or who have failed previous percutaneous mitral balloon commissurotomy
- Concomitant mitral valve surgery may be considered for patients with moderate MS (mitral valve area 1.6 cm² to 2.0 cm²) undergoing cardiac surgery for other indications.

When to Perform Cardiac Catheterization in Valvular Patient?

- No “routine” cardiac catheterization
- Cardiac catheterization for hemodynamic assessment is recommended in symptomatic patients when noninvasive tests are inconclusive or when there is a discrepancy between the findings on noninvasive testing and physical examination regarding severity of the valve lesion.

Frequency of Echo Exam

Stage	Valve Lesion			
Stage	Aortic Stenosis*	Aortic Regurgitation	Mitral Stenosis	Mitral Regurgitation
Progressive (stage B)	Every 3-5 y (mild severity V_{max} 2.0-2.9 m/s) Every 1-2 y (moderate severity V_{max} 3.0-3.9 m/s)	Every 3-5 y (mild severity) Every 1-2 y (moderate severity)	Every 3-5 y (MVA >1.5 cm ²)	Every 3-5 y (mild severity) Every 1-2 y (moderate severity)
Severe (stage C)	Every 6-12 mo ($V_{max} \geq 4$ m/s)	Every 6-12 mo Dilating LV: more frequently	Every 1-2 y (MVA 1.0-1.5 cm ²) Once every year (MVA <1.0 cm ²)	Every 6-12 mo Dilating LV: more frequently

Secondary Prevention of Rheumatic Fever

Secondary prevention of rheumatic fever is indicated in patients with rheumatic heart disease, specifically mitral stenosis (MS)

Agent	Dosage
Penicillin G benzathine	1.2 million units IM every 4 wk*
Penicillin V potassium	250 mg orally BID
Sulfadiazine	1 g orally once daily
Macrolide or azalide antibiotic (for patients allergic to penicillin and sulfadiazine)†	Varies

Type	Duration After Last Attack
Rheumatic fever with carditis and residual heart disease (persistent VHD*)	10 y or until patient is 40 y of age (whichever is longer)
Rheumatic fever with carditis but no residual heart disease (no valvular disease*)	10 y or until patient is 21 y of age (whichever is longer)
Rheumatic fever without carditis	5 y or until patient is 21 y of age (whichever is longer)

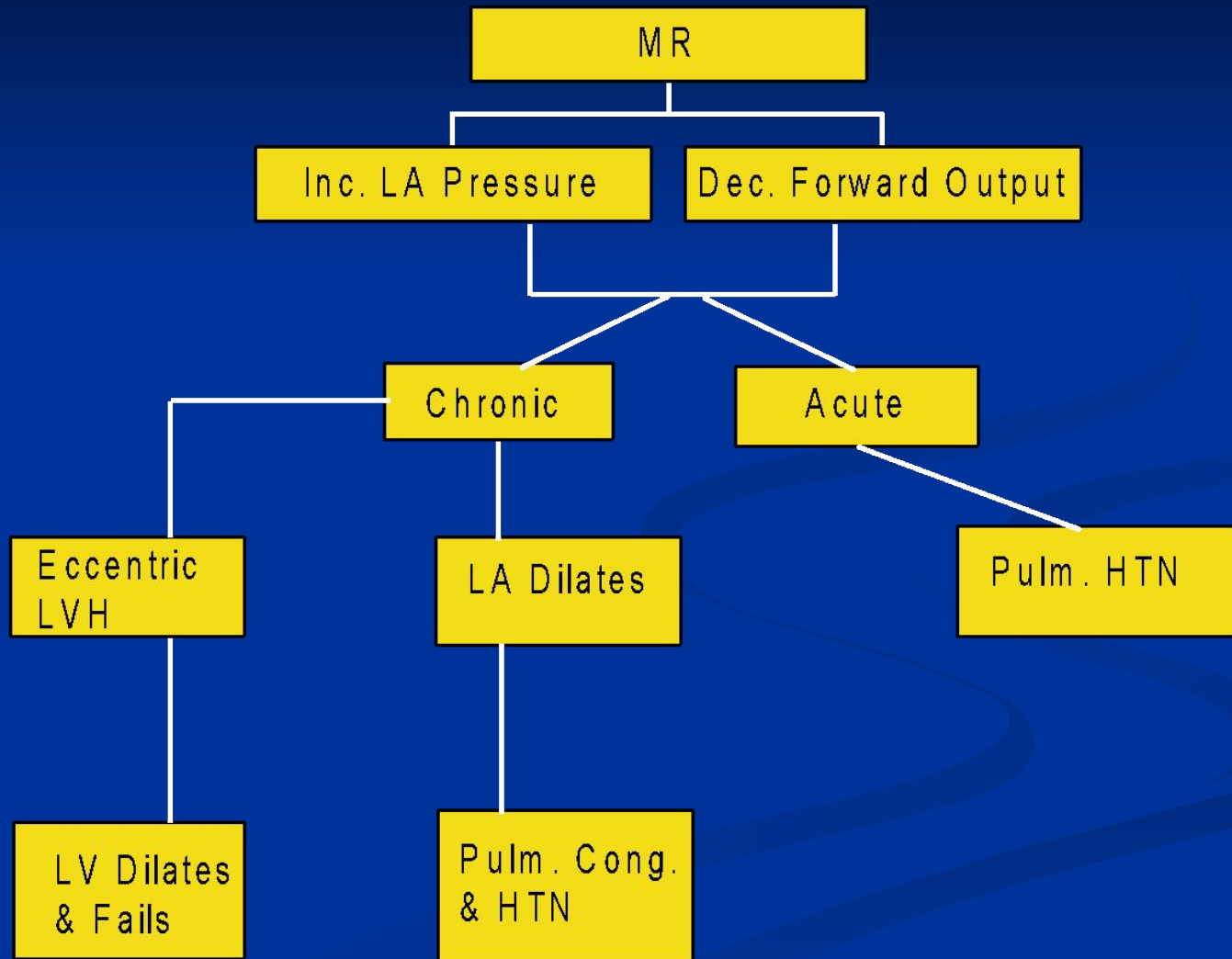
*Oral penicillin V potassium is acceptable substitute

Mitral Regurgitation

Etiology

- Valvular
 - Myxomatous CT Disease
 - Rheumatic
 - Endocarditis
- Chordae
- Annulus
 - Calcification
- Papillary Muscles
 - CAD (Ischemia, Infarction)
 - Infiltrative disorders
- LV Dilatation & Functional Prolapse

Pathophysiology



Symptoms

- Similar to MS
- Dyspnea, Orthopnea, PND
- Fatigue
- Pulmonary HTN, Right sided failure
- Systemic embolization in A Fib

Signs

■ Chronic MR

- Hyperdynamic, Displaced apex beat
- Apical holosystolic murmur
- Pounding pulse
- Variable Pulm. HTN

■ Acute MR

- Marked pulmonary congestion
- Short systolic murmur
- Small pulse
- Marked pulm. HTN; Loud single S2
- Giant V wave in LA pressure tracing

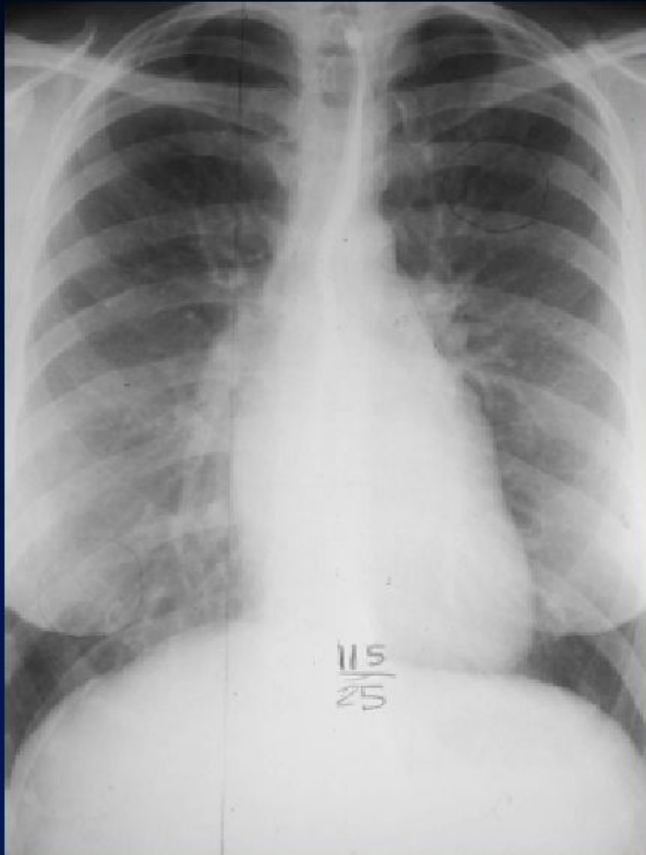
Diagnosis

- EKG: LVH, LAE
- CXR: Cardiac enlargement
- Echo: Abnormal anatomy, chamber size, EF, Qualitative assessment of MR and Pulmonary HTN, suitability for repair
- Cardiac Catheterization: Measure pulmonary arterial & Wedge pressures, EF, Severity of MR

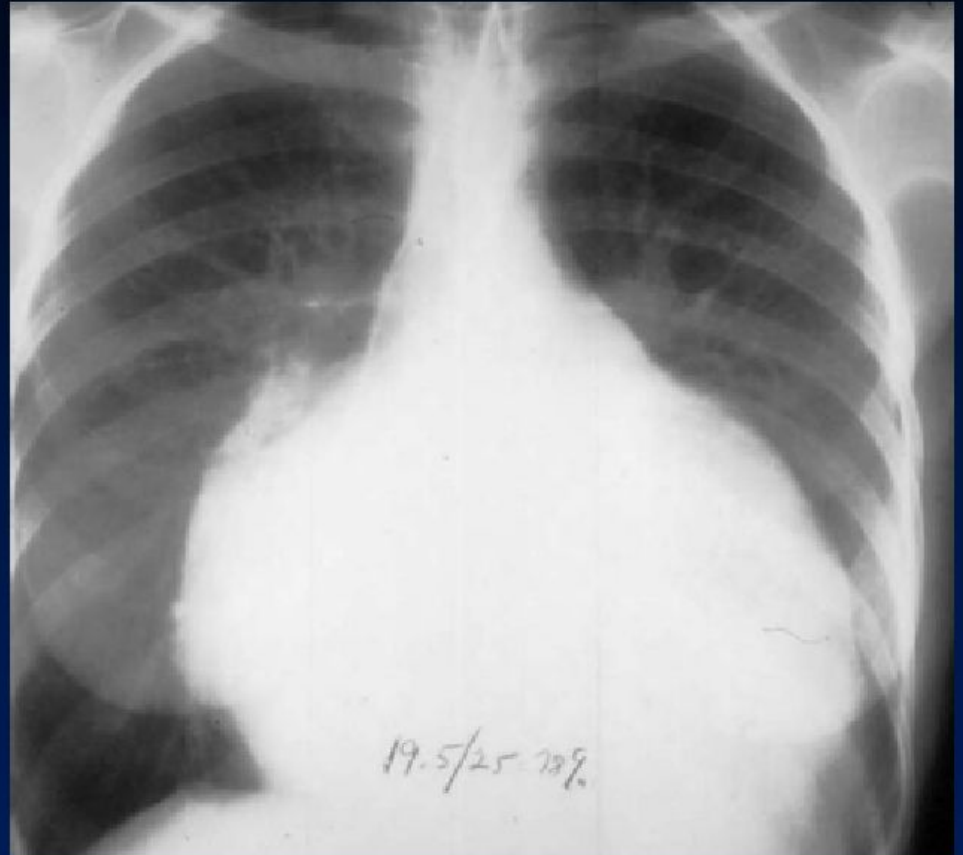


Mitral regurgitation

Difference in heart size – MS and MR

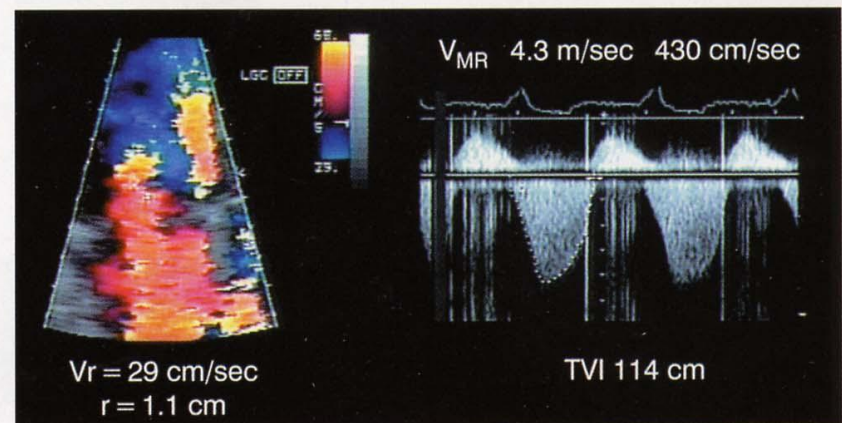
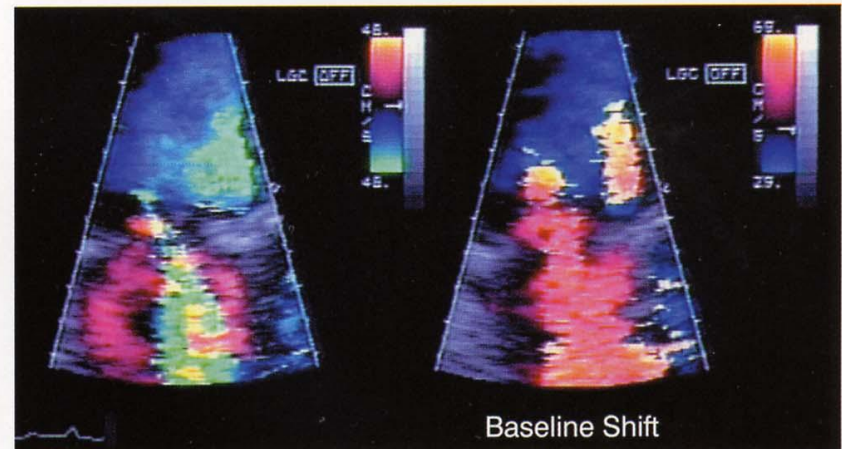
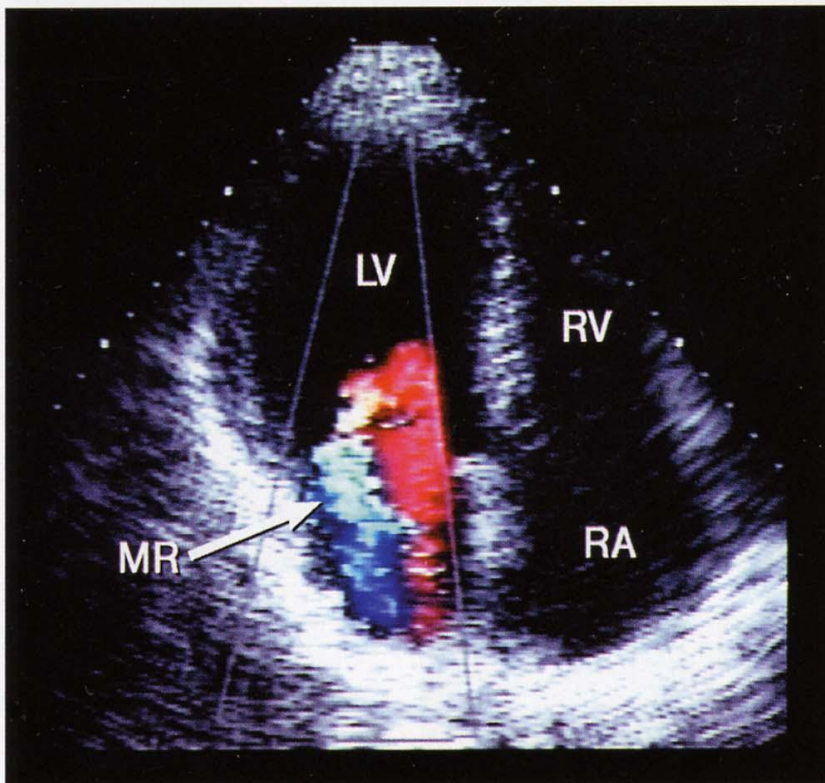


Mitral Stenosis



Mitral Regurgitation

Echocardiography



Echo assessment of severity

- Color Doppler – may be misleading
- Calculations
 - Effective regurgitant orifice
 - Regurgitant Volume, Regurgitant fraction
- Pulmonary venous flow reversal

Therapy

■ MEDICAL

- Diuretics: reduce vol. Overload
- Vasodilators: Increase forward output and decrease LV size
- Digitalis: Control HR, Inotrope in Chronic MR
- Anticoagulants: A Fib

■ SURGICAL: Indicated for severe symptoms and LV failure

- **Valve repair:** Preserves LV function
- **Valve Replacement:**
 - Bioprosthetic
 - Mechanical

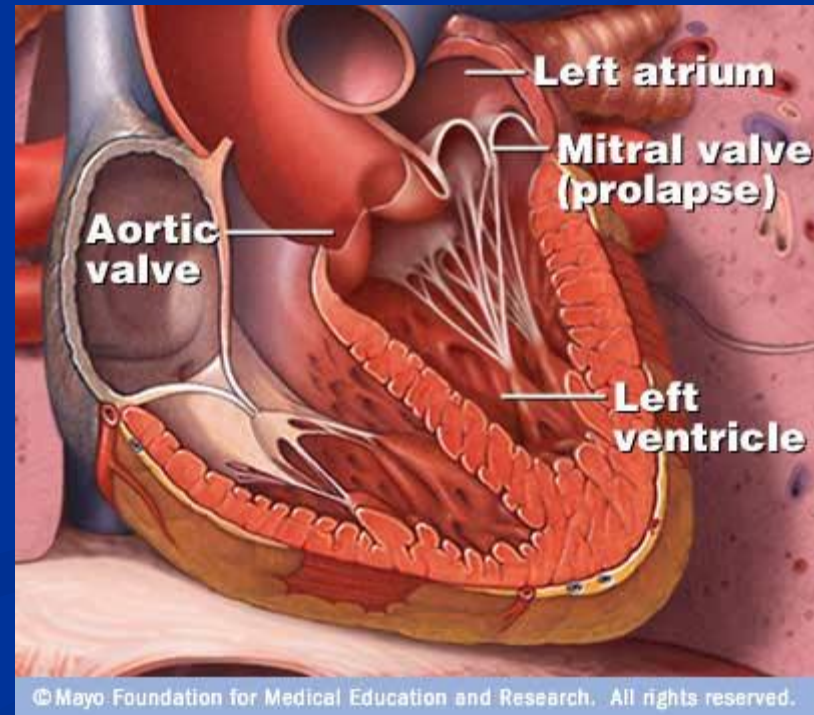
MV Repair

1. Mitral valve repair is performed at a lower operative mortality rate than MVR. Although no RCTs exist, virtually every clinical report, including data from the STS database, indicates that operative risk (30-day mortality) for repair is about half that of MVR.
2. LV function is better preserved following repair preserving the integrity of the mitral valve apparatus versus following MVR.
3. Repair avoids the risks inherent to prosthetic heart valves, that is, thromboembolism or anticoagulant induced hemorrhage for mechanical valves or structural deterioration for bioprosthetic valves.

Mitral Valve Prolapse

What is Mitral Valve Prolapse?

- Abnormal Mitral Valve mechanism which results in billowing of one or both mitral leaflets into the Left atrium towards the end of systole
- 3-5% of population
- 2:1 Female preponderance



Pathophysiology

■ Forms

- Functional
 - Common
 - LV is small, Hyperdynamic
 - Valve is normal
- Organic (Myxomatous Degeneration)
 - Uncommon
 - LV: Nl to Large
 - Thickened & Bulging valve leaflets

Symptoms

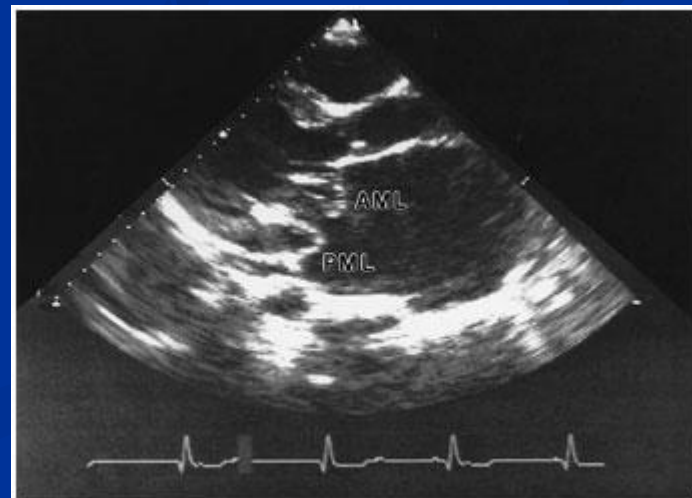
- Most patients: None
- Chest pain
- Palpitations
- Easy fatigability
- Arrhythmias
- TIA
- MR

Signs

- Mid-systolic Click
- Systolic murmur with co-existent MR
- Other connective tissue disorders

Diagnosis

- EKG: Non specific ST-T changes
- CXR: Usually normal
- Echo: Mitral valve anatomy, leaflet thickness, degree of prolapse, assessment of MR, LV function.



Therapy

■ Functional MVP

- Reassurance
- Periodic clinical follow-up

■ Organic MVP

- Treat MR
- Anticoagulation, if h/o TIA
- B-blockers for palpitations
- Endocarditis prophylaxis: **not anymore**
- ICD for Vtach
- MVR for severe MR