Lec. 4 | Mitral valve diseases

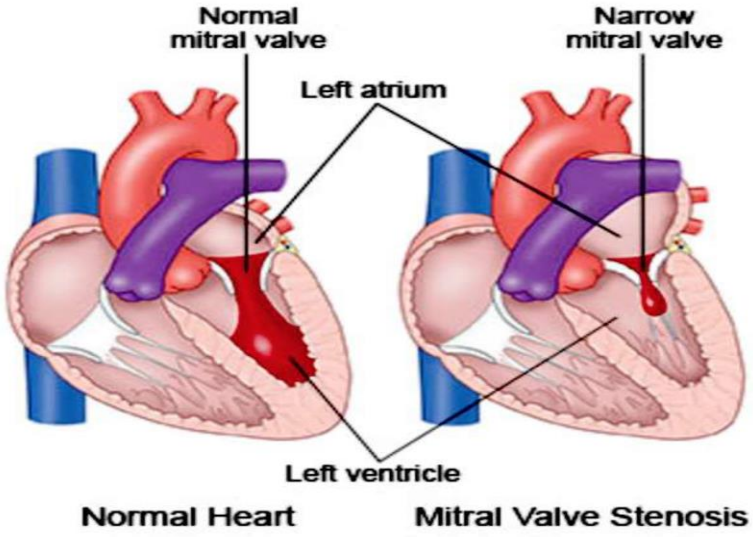
Dr. Hamdy Shams-eddin

Mitral valve diseases includes:

1. Mitral stenosis.
2. Mitral regurgitation.

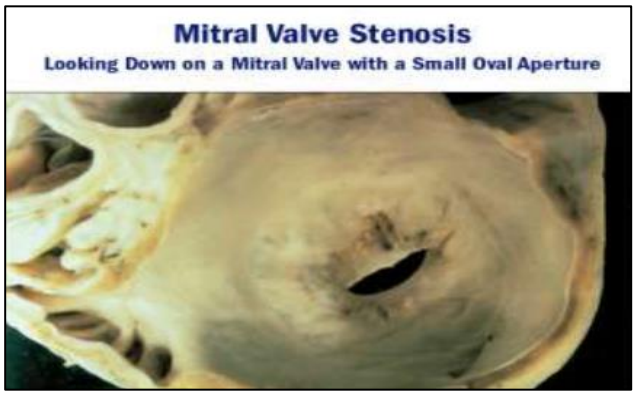
Mitral stenosis

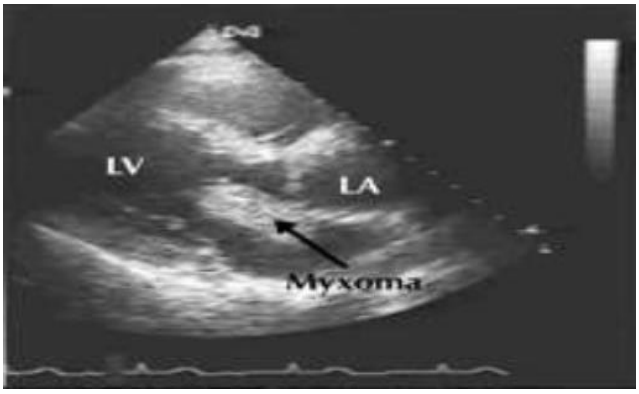
Definition: Obstruction to the blood flow between the left atrium and left ventricle

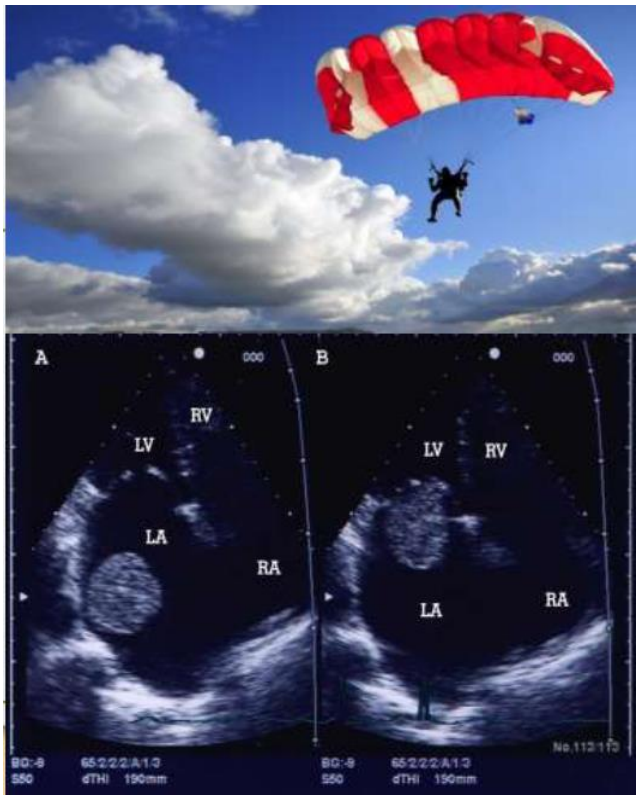


Etiology

- **Rheumatic heart disease** (**most common cause).**
- **Other rare causes:**
  1. Congenital heart disease (parachute mitral valve)
  2. Mitral annular calcification.
  3. Inflammatory diseases: Rheumatoid arthritis, SLE.
  4. Infiltrative diseases: Amyloidosis.
  5. Carcinoid syndrome.
  6. Prosthetic MV dysfunction.
  7. Irradiation-induced MS.
  8. Drug-induced MS: e.g. Methysergide.
  9. LA outflow obstruction: LA ball thrombus, Vegetation. LA myxoma.







Incidence

General incidence

- Ms account for 10% of all native valve disease (USA)
- Isolated MS present in 40% of cases of RHD.
- In the remaining 60% of cases associated with other valvular diseases- MR/AR

Age of presentation

- Earlier in 20s-30
- Now in 40s-50s (slower progression).

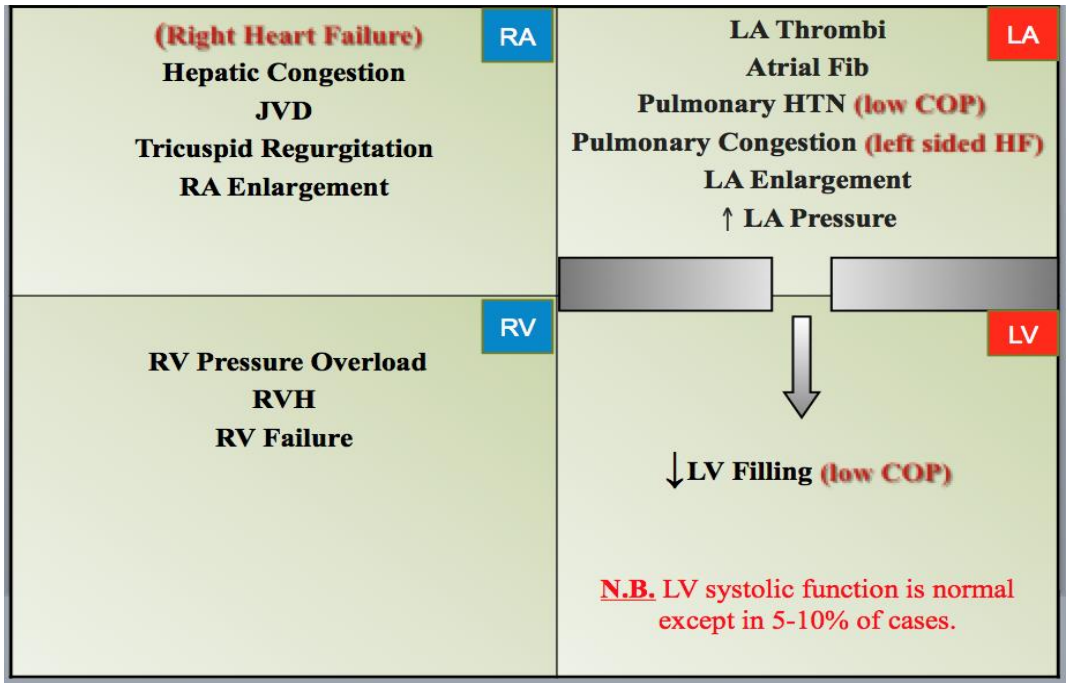
Gender: More common in females (2/3rd of all pts).

Symptoms : occur two decades after ondet of rheumatic fever

Pathophysiology

Normal valve area: **4-6 cm^2**

Clinical classification of MS	Mild MS	Mod. MS	Severe MS	Very severe MS
Valve area	>2.0 cm^2	1.5-2.0 cm^2	1.0-1.5 cm^2	≤ 1.0 cm^2
Mean transmitral Pressure gradients	< 5 mmHg	5-10mmHg	10-25mmHg	≥ 25 mmHg
Pulmonary artery systolic pressure	<30 mmHg	30-50 mmHg	> 50 mmHg	> 50 mmHg
Symptoms	No symptoms	Symptoms with exertion	Symptoms at rest	Symptoms at rest



Natural history

- Progressive: life long disease.
- Usually slow & stable in the early years.
- Progressive acceleration in the later years.
- 20-40 years latency from the rheumatic fever → symptom onset
- Additional 10 years before disabling symptoms

Complications

1) **Atrial fibrillation** (AF) (30-40%)
2) **Systemic embolization** (10-20%).
   Monthly recurrence rate = 15-40% without anticoagulation
3) **Congestive heart failure.**
4) **Pulmonary infarction.**
5) **Hemoptysis.**
   - Massive: due to ruptured bronchial veins (pul. HTN).
   - Streaking/pink froth: Pul. Edema , or infection.
6) **Endocarditis.**
7) **Chest infection.**

Diagnosis

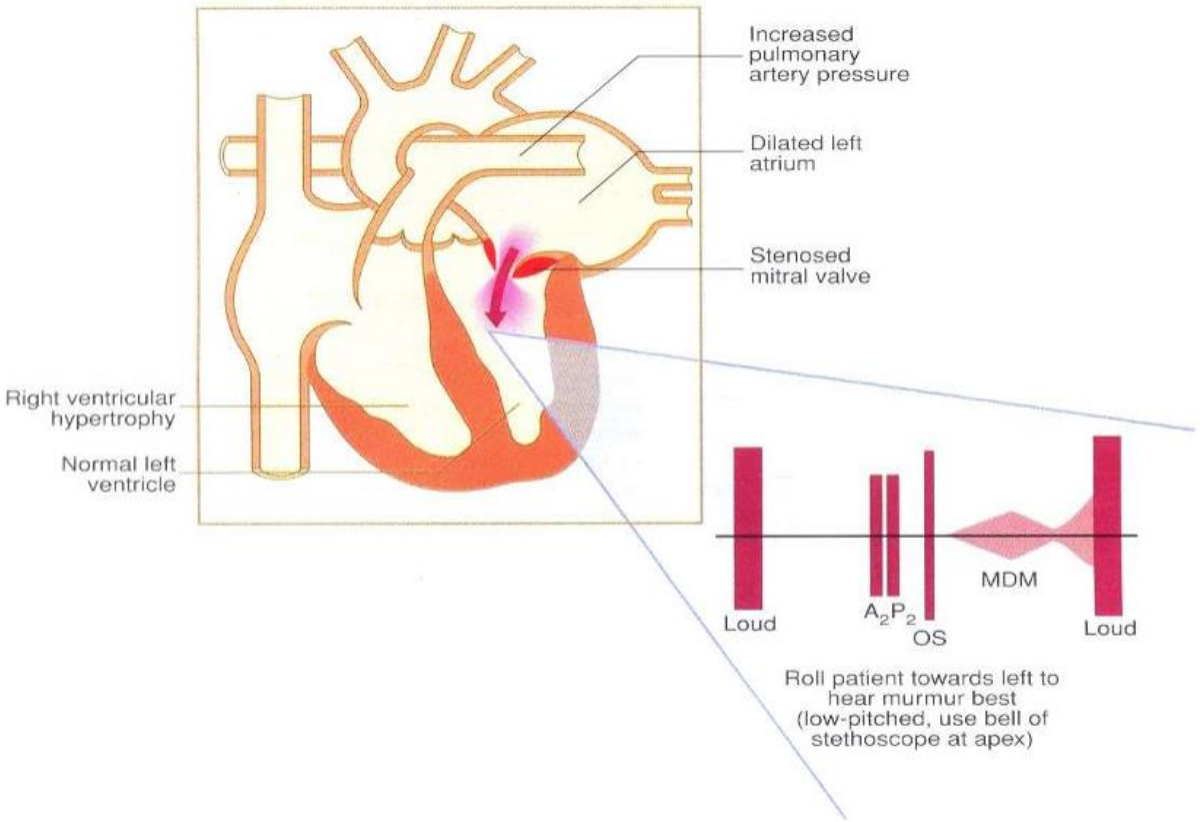
History

- Symptoms of pulmonary venous congestion.
- Symptoms of low COP.
- Symptoms of systemic venous congestion.
- Symptoms of complications.

The survival rate is severely reduced for symptomatic patients who refuse therapy with 44% survival at 5 years.

Examination

- **Mitral facies:** When MS is severe and low COP → facial vasoconstriction → (pinkish patches on the cheeks called Malar Flush) (rare)
- **JVP:** Prominent (a) wave in JVP, Prominent V wave due to TR.,
- **Signs of right sided heart failure:** in advanced stage



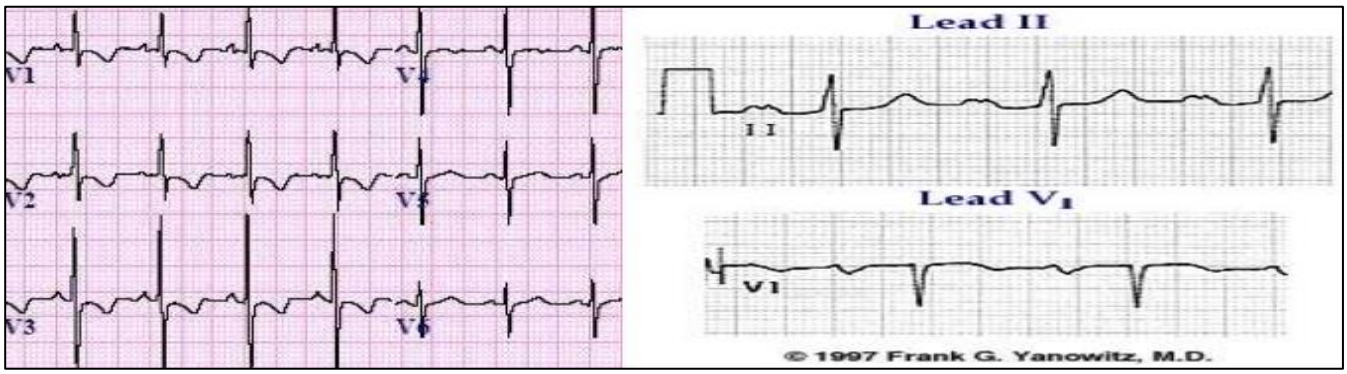
Diagnosis

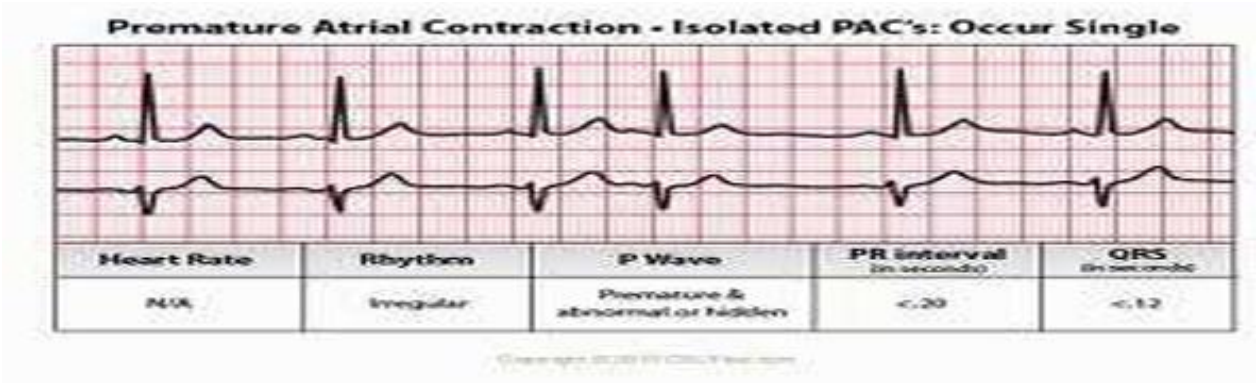
Examination

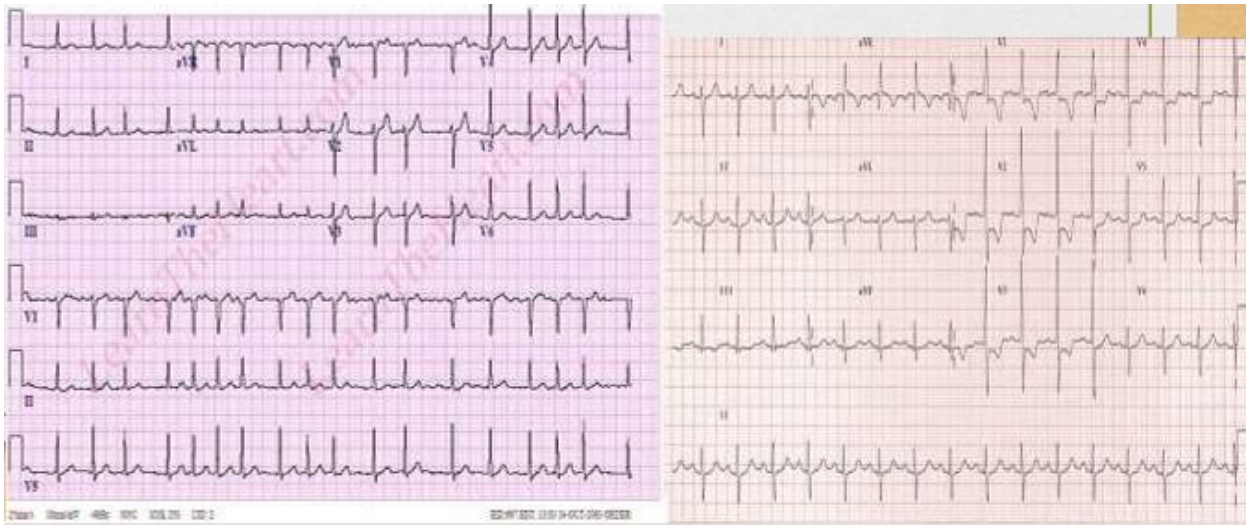
Investigations

1. ECG

- **Chamber hypertrophy:** LAE - RVH.
- **Arrhythmia:**
  - Premature contractions (extrasystole)
  - Atrial flutter
  - Atrial fibrillation.





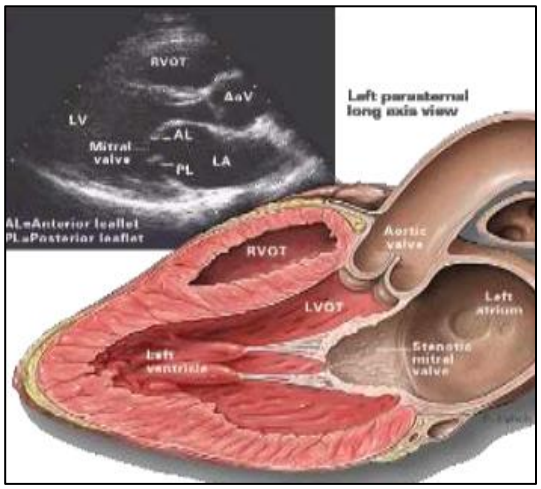


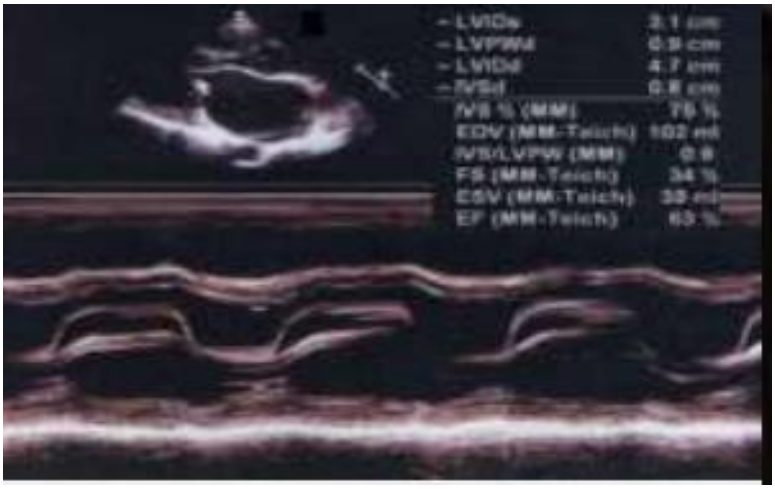
2. X-ray

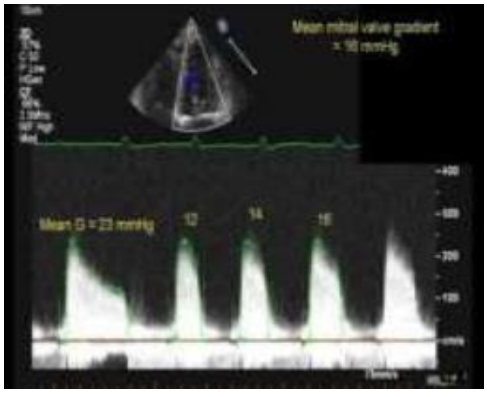
- **Early signs:-**
  - Straightening of Lt border of the cardiac silhouette
  - Prominence of the main pulmonary arteries.
  - Dilatation of the upper pulmonary veins.
  - Esophageal displacement by LAE.- Heart size normal.
- **Severe chronic MS.**
  - LA,RA, RV, pulmonary arteries & veins dilated.
  - Interstitial edema is sign of LA pressure >20 mmHg
  - Alveolar edema is a sign of acute hemodynamic decompansation

3. Echocardiography | *Role of echo in MS.*

1. Definite diagnosis of MS.
2. Diagnosis of severity (MVA).
3. Wilkin, s risk score.
4. Assessment of cardiac dimensions.
5. Assessment of cardiac function.
6. Assessment of pul. Hypertension.
7. Detection of complications.
8. Diagnosis of associated valve lesions.
9. FU of patient ..







ECHO: Wilkins Score for assessment of Mitral valve anatomy:

Grade	Mobility	Thickening	Calcification	Subvalvular thickening
1	Highly mobile valve with only leaflet tips restricted	Leaflet near normal in thickness (4-5 mm)	A single area of increased echo brightness	Minimal thickening just below the mitral leaflets
2	Leaflet mid and base portions have normal mobility	Mid leaflets normal, considerable thickening of margins (5-8 mm)	Scattered areas of brightness confined to leaflet margins	Thickening of chordal structures extending to one of the chordal length
3	Valve continues to move forward in diastole, mainly from the base	Thickening extending through the entire leaflet (5-8mm)	Brightness extending into the mid portions of the leaflets	Thickening extended to distal third of the chords
4	No or minimal forward movement of the leaflets in diastole	Considerable thickening of all leaflet tissue (>8-10 mm)	Extensive brightness throughout much of the leaflet tissue	Extensive thickening and shortening of all chordal structures extending down to the papillary muscles

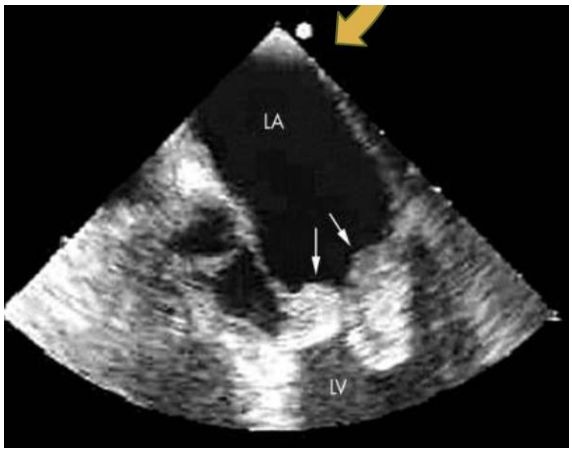
N.B: for Knowledge

4. Tran esophageal echo (TEE) | *Role of TEE in MS.*

(Detection of complications)

LA Thrombi.

Vegetations.



Treatment

A. **Medical treatment**
B. **Interventional treatment (balloon dilatation)**
C. **Surgical treatment**

A. Medical treatment

1. Prophylactic treatment

- **Against Rh. Activity:**

  LAP at least until age 40ys, sometimes lifelong prophylaxis .

- **Infective endocarditis.**

2. Definte treatment

Patients with MS present a mechanical obstruction to inflow of the MV and no medical therapy will specifically relieve the fixed obstruction

- **Patients in sinus rhythm:** for symptpmatic patient :
  - Diuretics → relieve congestion.
  - BBs → to lengthen diastolic filling period

.

- **Patients with AF:**

Acute AF	
Hemodynamic unstability	Hemodynamic stability
Immediate rate control (BBs or CCBs)	Restoration of sinus rhythm is superior to rate control
If ineffective and the Pt unstable → immediate CV	If can't restore sinus rhythm → rate control (digitalis ± BBs

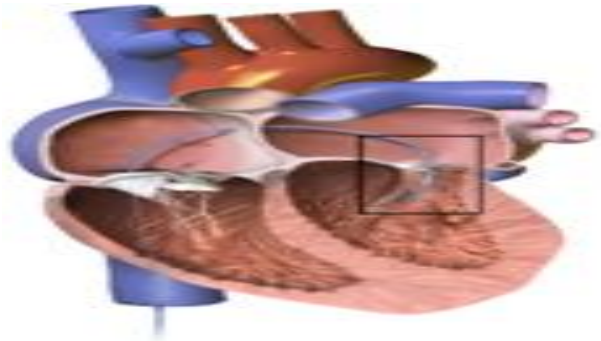
- **Prevention of thrombo-embolic events:**
  - ***Anti-coagulation is indicated in : (Class I : level B)***
    1. MS withAF in patients
       (paroxysmal, persistent & permanent).
    2. Prior embolic events (even in sinus rhythm).
    3. Detected LAthrombus.
  - INRtarget 2.5 (range 2.0-3.0).
  - Aspirin or other anti-platelets are not valid alternatives to decrease embolic events.

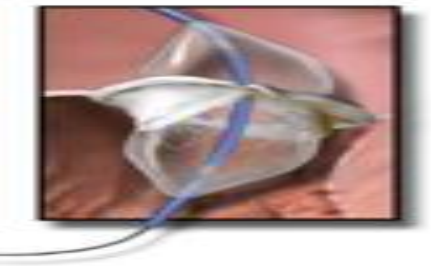
B. Interventional treatment (balloon dilatation=PTMC)

- It is effective long term treatment.
- **Mechanism of PTMC:** It relieves MS by splitting of fused commisures, which is similar to surgical commissurotomy.

Indications (Class I: Level A)

- Symptomatic patients (NYHA class >II).
- Asymptomatic patients with:
  - Pulmonary hypertension.
  - Moderate or severe MS.
  - Favorable valve morphology in absence of LA thrombus or moderate to severe MR.





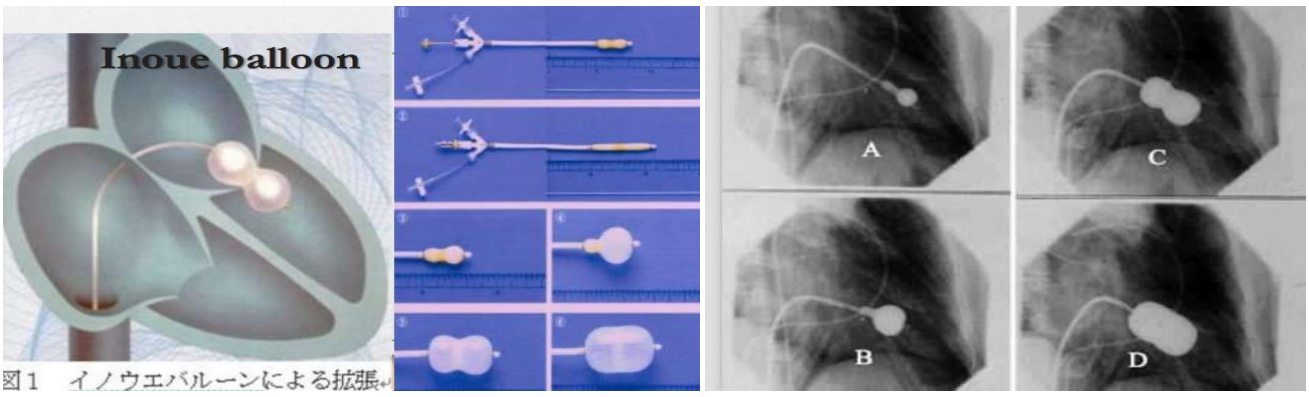
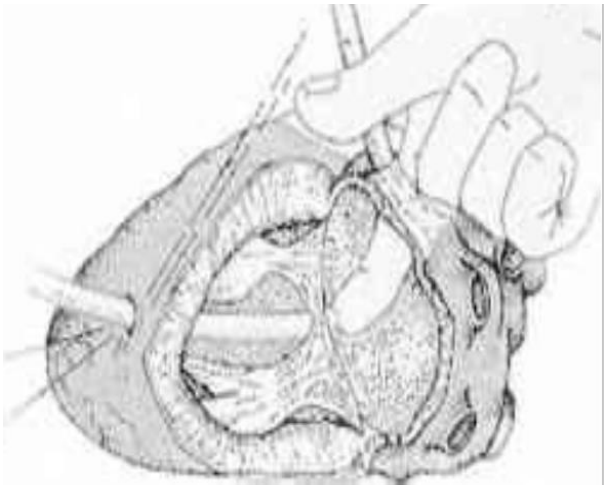
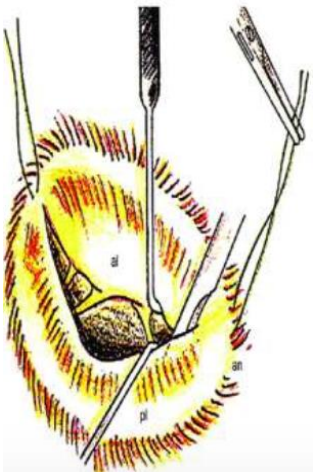


図1　イノウエバルーンによる拡張

C. Surgical treatment

- **Mitral commissurotomy.**
  1. Closed (no cardio-pulmonary bypass)
  2. Open (cardio-pulmonary bypass).
- **Mitral valve replacement**



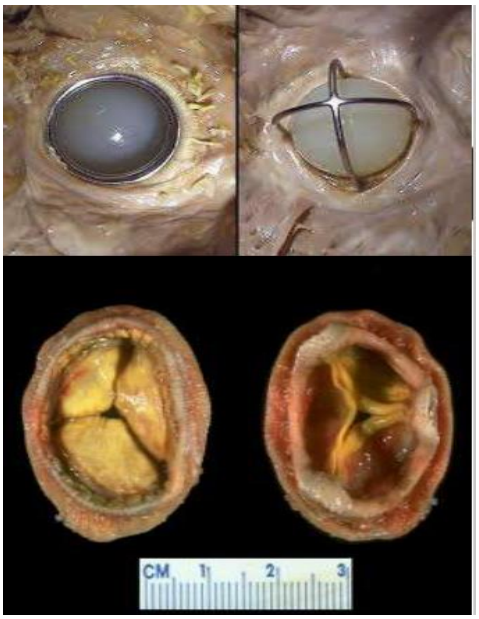


Mitral valve replacement

1. **Mechanical.**
2. **Bioprosthetic.**

Indications:

— Symptomatic moderate or severe MS when PTMC is contraindicated..
— Unfavorable valve morphology.



perative mortality:

It is about 5-20%

Depend on: age, PH, NYHA class or presence of CAD.

Complications:

1. valve thrombosis .
2. Valve dehiscence.
3. Valve infection
4. valve malfunction
5. embolic events.

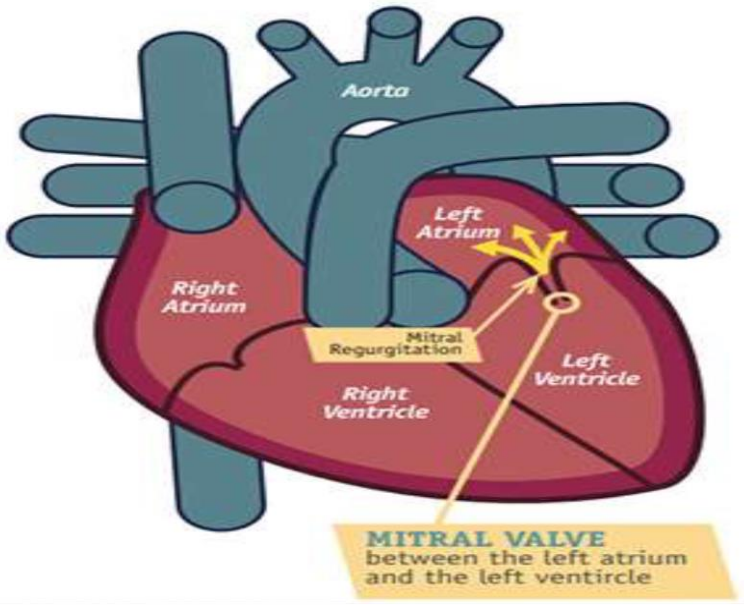
Table 2 Mechanical vs. Bioprosthetic Valves

	Mechanical	Bioprosthetic Valves
Types	**Tilting-disc bileaflet**	**Heterografts (porcine or bovine)**
Durability	20-30 years	10-15 years
Subsequent valve replacement or repair	Lower risk	Higher risk
Thromboembolism	Higher risk	Lower risk
Anticoagulation	Lifelong	Minimum 3 months

Mitral Regurgitation

Definition:

It is the passage of blood from the LV to the LA through the mitral valve during LV systole.



Etiology of mitral regurgitation

1) Acute or chronic MR

Acute MR:

- Rheumatic heart disease (leaflet inflammation).
- Infective endocarditis (chordal rupture).
- Myocardial infarction (papillary muscle ischemia/rupture).

Chronic MR:

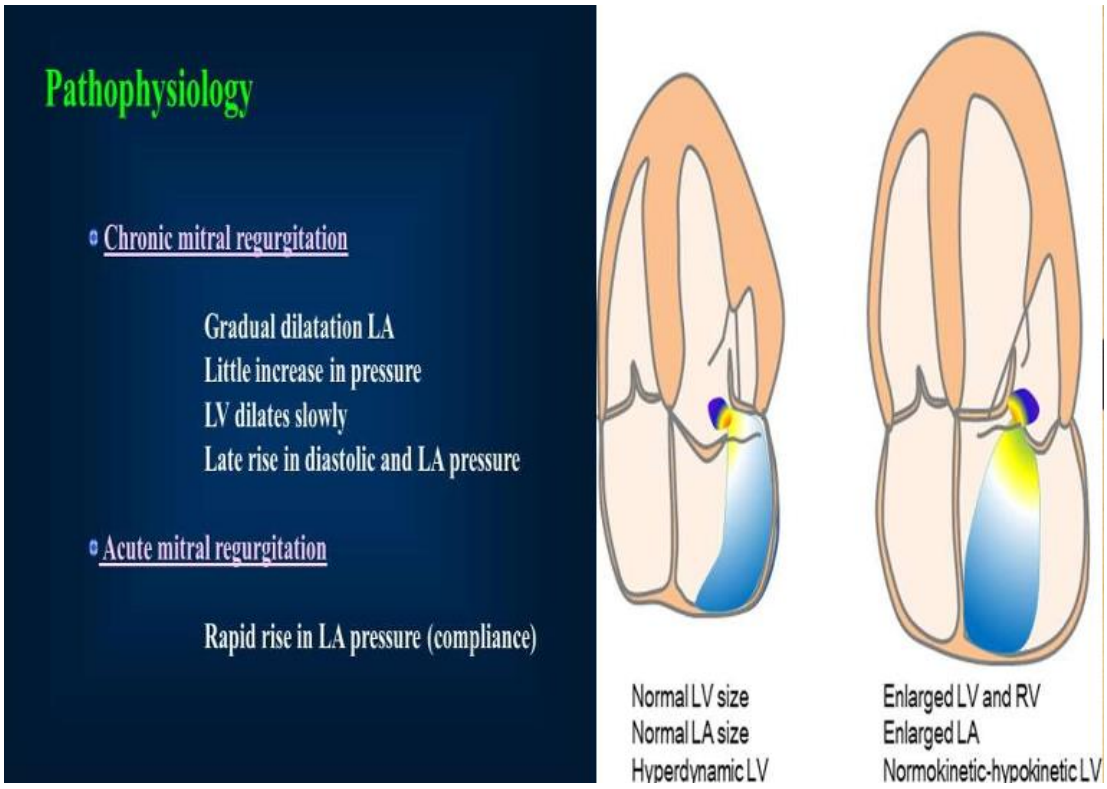
- Rheumatic heart disease.
- Infective endocarditis.
- Chronic ischemic heart disease/ischemic cardiomyopathy.
- Congenital.
- Connective tissue diseases: Rheumatoid arthritis, SLE, Marfan syndrome, etc..
- Cardiomyopathy: dilated or hypertrophic.
- Degenerative: age related, mitral valve prolapse (myxomatous degeneration).

2) Primary or secondary MR

Primary MR:

- Rheumatic.
- Congenital.
- Trauma.
- Infective endocarditis.
- Connective tissue diseases: SLE, Marfan syndrome, etc..
- Ischemic heart disease (CAD and AMI).
- Degenerative: age related, mitral valve prolapse (myxomatous degeneration).

Secondary MR: Annular dilatation due to myocardial disease, secondary to LV remodeling leading to failure of leaflets coaptation (due to AMI, dilated or hypertrophic cardiomyopathy, AR, etc.).



Clinical picture

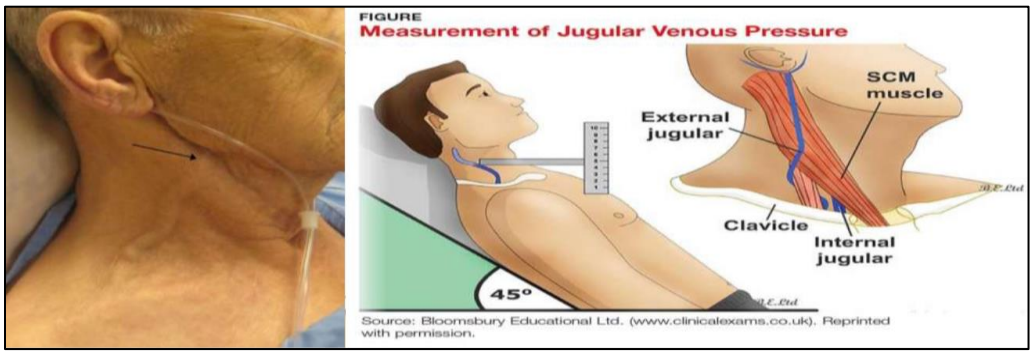
Symptoms

- No symptoms (for long time).
- Symptoms of left sided heart failure (pulmonary congestion).
- Symptoms of low cardiac output (PH).
- Symptoms of right sided heart failure (systemic venous congestion).

- **Symptoms of complications:**
  - Arrhythmias (AF).
  - Acute pulmonary edema.
  - PH.
  - Infective endocarditis.

Signs

- **Decubitus:** orthopnea (left sided HF).
- **Pulse:** Regular or irregular (atrial arrhythmias, AF).
- **JVP:** Congested pulsating neck vein.
  - "a" wave: may be absent (AF).
  - "V" wave: prominent (systolic expansion)= (TR).

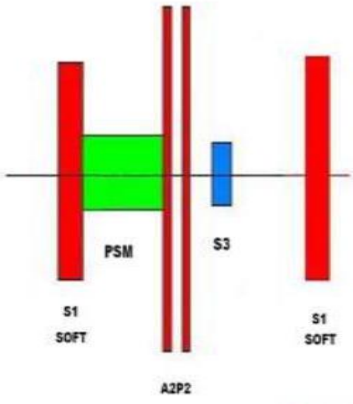


Cardiac Examination

1) Combined inspection and palpation

- **Apex:** palpable, shifted downward and lateral (LV), forceful, il-sustained with possible systolic thrill
- **Left parasternal and epigastric area:** pulsations of RV hypertrophy (CHF)
- **2nd left space (pulmonary area):** pulsations and diastolic shock (PH).

2) Auscultation



- **Heart sounds:**
  - S1: Muffled (MR)
  - S2: Accentuated and close splitting
  - S3
- **Murmurs:**
  - Pansystolic murmur at apex propagated to axilla (MR)
  - Early diastolic murmur (Graham-Steel) on pulmonary area (PH).

Investigations

- **ECG**
- **Chest X ray**
- **Echocardiography:**
  1. To assess regurge severity: In severe MR:
     - Regurgitation area (RA)= (jet area)/LA: ≥40.
     - ERO 4mm2.
     - Vena contracta: 7mm>.
  2. (LVESD, LVEDD, LV EF)

- **Catheterization:** MR grades III or IV, coronaries.

Treatment

Progressive MR:

Medical treatment:

vasodilators, antiarrhythmic AF), anti HF; ACE/ARB – diuretics, Anticoagulant (AF), prophylactic antibiotic for infective endocarditis and rheumatic fever.

Severe MR:

SYMPTOMATIC PATIENTS:

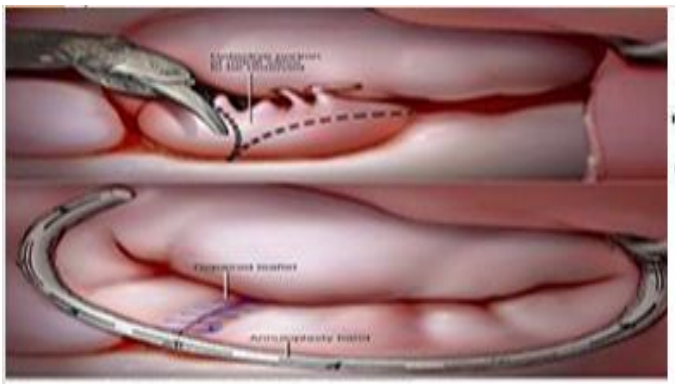
1. Surgery:

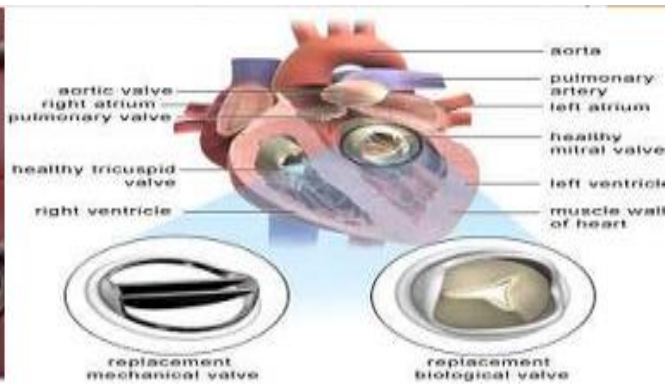
either mitral valve repair (it is best) or valve replacement.

Repair is the role for treating MR as it is less risky and has better long-term outcomes and avoids anticoagulants after surgery

MR repair

Indications for surgery in severe MR	
LVESD	>40 mm
PASP	>50 mmHg
LVEF	≤ 60%





2. Transcatheter mitral valve repair (mitral clip)

if surgery is high risk and contraindicated in patients with NYHA III or IV

ASYMPTOMATIC PATIENTS:

— ***medical treatment and FU.***

— **The following conditions require repair:**

1. Patients become symptomatic.
2. New onset AF.
3. PH (pulmonary pressure ≥50 mmHg).
4. Impaired LV function (EF: <60% and >30% or LVESD ≥40 mm).
5. By exercise stress test; patients become symptomatic.

If the patient is undergoing cardiac surgery for other indication.

QUIZ

1. **Which of the following is an auscultatory finding in mitral stenosis?** **(Mid 59)**
   a. Early diastolic murmur.
   b. Muffled 1st heart sound.
   c. Opening snap.
   d. Graham-Steel murmur

2. **Which of the following is a secondary cause of mitral regurgitation?** **(Mid 59)**
   a. Rheumatic fever.
   b. Infective endocarditis.
   c. Mitral valve prolapse.
   d. Dilated cardiomyopathy.

3. A 49-year-old woman presented to her cardiologist complaining of a reduced exercise tolerance. Physical examination revealed a loud first heart sound and mid-diastolic MS rumbling murmur with presystolic accentuation at the cardiac apex. A transthoracic echocardiogram was performed and showed rheumatic valve changes with commissural fusion and diastolic doming of the valve leaflets, a valve area of 1.1 cm2, and an elevated pulmonary artery pressure (PASP=55 mmHg). The patient was in normal sinus rhythm**.** **(Final 60)**
   What is your recommended treatment strategy?
   a. Valve repair.
   b. Valve replacement.
   c. PTMC (percutaneous transluminal commissurotomy).
   d. Follow-up and medical treatment.