VALVULAR HEART DISEASE MITRAL VALVE DISEASE

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Valves of the Heart





A 55 year old woman with loud first heart sound and mid-diastolic murmur

Chronic dyspnea Class 2/4 Fatigue Recent **Orthopnea/PND Nocturnal palpitation** Pedal edema **DIAGNOSIS????**

Mitral Stenosis pathophysiology

Normal MVA:

4 -6 cm²

Symptoms not apparent until area < 2 cm²

	valve area (cm sq)	mean gradient (mmHg)*
Mild	> 1.5	< 5
Moderate	1.0 - 1.5	5 -10
Severe	< 1.0	> 10

Transvalvular gradient increase with tachycardia



Mitral Stenosis

CAUSES:

1-Rheumatic 98%, Female > Male
2- rare : congenital, malignent carcinoid, SLE, calcification, lutembacher syndrome, ...

Forms :

 1- Commissural
 30%

 2- Cuspal
 15%

 3- Chordal
 10%

 4- Combined
 45%

Mitral Valve Stenosis

Pathophysiology

- Minimum of 20 yrs for severe MS to develop after Acute Rheumatic Fever
- Pressure elevates in
 - Left atrium
 - Pulmonary tree
 - Right heart

Atrial contraction: 20-30% of COP

Atrial fibrillation

COP

Mitral Stenosis Physiology/Natural History

Mitral stenosis ---- \uparrow LA pressure $\rightarrow \uparrow$ PV pressure $\rightarrow \uparrow$ interstitial edema $\rightarrow \pm$ alveolar flooding

LA dilatation----fibrosis of atrial wall---disorganization of atrial muscle---PAC---AF

Adaptations:

- -pulmonary vascular constriction, intimal hyperplasia, medial hypertrophy \rightarrow reversible pulmonary hypertension \rightarrow ± fixed pulm htn
- -down regulation of neuroreceptors, 1 ymphatic drainage

Left Ventricular End Diastolic Pressure: Normal

Pulmonary Hypertension:

- **1- Passive backward**
- 2- Pulmonary arteriolar constriction
- **3- Organic obliteration**

Mitral Stenosis: Pathophysiology



Mitral Stenosis: Pathophysiology

Right Heart Failure: Hepatic Congestion JVD Tricuspid Regurgitation RA Enlargement ↑ Pulmonary HTN
 Pulmonary Congestion
 LA Enlargement
 LA Stretch----Atrial Fib
 LA Stasis---Thrombi
 ↑ LA Pressure

RV Pressure Overload RVH RV Failure

LV Filling

Mitral Stenosis Clinical Manifestation

Latent (sub clinical) phase in RHD 20-30 yrs **DYSPNEA** Hemoptysis **ORTHOPNEA Chest pain Pulm Edema** thromboembolism Others: rare (inf endocarditis, Hoarseness, Dysphagia) 5-10 yrs of symptoms before disabling With physically limiting symptoms 10 yr survival 0-15% 10-20% systemic embolism (low COP, elderly, AF) 30-40% develop AF With onset of severe pulm hypertension Mean survival < 3 yrs

Mitral Stenosis Physical Examination

Mitral facies: bilateral cyanotic or dusky pink discoloration over upper cheeks Pulse : Small volume, Atrial Fibrillation JVP: prominent a wave (absent in AF) Apex Beat: Normal position, Tapping Diastolic thrill, Parasternal lift

Auscultation:

Loud 1st heart sound, loud pulmonary component of 2nd heart sound Opening snap, Mid-Diastolic murmur, pre-systolic accentuation Severity of MS: A2- OS : Width of A2-OS inversely correlates Duration of murmur: directly correlates

Mitral Stenosis: Physical Exam





S1

S2 OS

S1

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)

Mitral Stenosis Management Guidelines

Initial Evaluation

History Physical ECG: P wave, AF, RVH

CXR: Left atrial enlargement, lung congestion, calcified mitral valve

Echocardiogram: Transthoracic or Transoesophageal: Diagnostic, severity, presence of left atrial thrombus Cardiac magnetic resonance: Cradiac catheterization:

40 year old male with history of recent stroke.





Echocardiography: Parasternal









FIGURE 62–19 Parasternal long (left) and short axis (right) 2D echocardiographic views showing the characteristic findings in rheumatic mitral stenosis. Note the commissural fusion that results in doming of the leaflets in the long axis view and in a decrease in the width of the mitral orifice in the short axis view. This patient has relatively thin, flexible leaflets with little subvalvular involvement. Ao = aorta; LA = left atrium, LV = left ventricle.

(From Otto CM: Valvular Heart Disease. Elsevier, Philadelphia, 2004.)

Stasis of blood flow and thrombus formation





Diastolic Anterior Motion of Posterior Leaflet





Normal

Mitral Stenosis

MV VTI for Pressure Gradient







Mitral Stenosis: Complications

- 1- Atrial dysrrhythmias(PAC ,AF 30-40%, A flutter)
- 2- Systemic embolization (10-25%)
 - Risk of embolization is related to, age, presence of atrial fibrillation, previous embolic events
- 3- Right heart failure
- 4- Pulmonary hypertension
- **5-** Pulmonary infarcts (result of severe CHF)
- 6- Hemoptysis
 - Massive: 2^o to ruptured bronchial veins (pulm HTN)
 - Streaking/pink froth: pulmonary edema, or infection
- 7- Endocarditis-very rare
- 8- Pulmonary infections

Mitral Stenosis Management Guidelines

Medical Therapy

ASYMPTOMATIC

Rheumatic fever prophylaxis Infective endocarditis prophylaxis---NO Limitation of strenuous physical activities Correction of anemia, infection, thyrotoxicosis Control of HR (negative chronotropes): avoid tachycardia

Mitral Stenosis: Therapy

Symptomatic:

1- Na restriction, Diuretics for LHF/RHF

2- Digitalis/Beta blockers/CCB: Rate control in A Fib

3- Anticoagulation: In A Fib, Pulm embolism

4- Management of AF: cardioversion or rate control to slow ventricular respons

Mitral Stenosis Management Guidelines

Interventional :

Percutaneous mitral balloon valvotomy (PMBV)

Surgical Options:

- Open Mitral Commissurotomy
- Mitral Valve Replacement
 - Mechanical
 - Bioprosthetic

Mitral Stenosis Management Guidelines

Indications for PMBV (class I and Ila)

Suitable anatomy, no LA clot, ≤ mild MR

Symptomatic pts (NYHA class II-IV) with MVA <1.5 cm²

Asymptomatic pts with MVA <1.5 cm² and PASP 50 mmHg at rest, 60 with exercise

Balloon Mitral Commissurotomy









Early inflation



Mitral Stenosis Management Guidelines

Indications for MVR (class I and IIa)

Symptomatic pts (NYHA class III and IV) with MVA < 1.5 cm² unsuitable for PMBV History of complication (Emboli) with sever MS

NYHA class I and II pts with MVA < 1.0 cm² and PASP >60 at rest unsuitable for PMBV

MITRAL REGURGITATION

Etiology of Mitral Regurgitation: 1- Valve leaflet Disease 2- Subvalvular Disease 3- Annulus Disease

Valve leaflets: Do not close properly/Do not stay closed

- Chronic Rheumatic Heart Disease M > F
- Mitral Valve Prolaps
- SLE
- Trauma
- Endocarditis
- Rare: Drugs(central acting appetite suppressant (fenfluramine, dopaminagonist,..)

Etiology of MR Subvalvaular

Papillary muscles

Ischemia
Dysfunction
Scarring

Infarction

Necrosis
Rupture

Chordea tendinea rupture

Etiology of Mitral Regurgitation ANNULAR Level

Mitral annulus

Dilation**** (any cause of LV dilatation)

Calcification

Mitral Valve Regurgitation

Pathophysiology volume overload — LV dilatation and hypertrophy-LA dilatation -AF MV and AV are in parallel Amount of MR is dependent on LV outflow impedence, increased by aortic stenosis Symptoms depends on: **1- Severity of MR** 2- Rate of progression **3- Level of pulmonary artery pressure 4- Other cardiac diseases** Chronic Acute

Mitral Regurgitation: Pathophysiology

Acute Mitral Regurgitation: Pulmonary Edema High LA Pressure

Chronic Mitral Regurgitation: Dilated LA with less elevated pressure



MITRAL Regurgitation CLINICAL MANIFESTATION

SYMPTOMS OF LEFT SIDED HEART FAILURE (dyspnea, orthopnea, PND, fatigue)

Symptoms usually later than MS

Emboli and hemoptysis less than MS

Fatigue and weakness are commoner than MS

Smoother coarse than MS

Combined MS + MR is worse

Mitral incompetence physical examination

Pulse : normal, AF

Apex beat: shifted, thrusting, thrill

Auscultation: Soft S1, S2, S3 MURMUR: SYSTOLIC Radiation diastolic

Mitral Regurgitation holosystolic murmur, S3



Chronic Mitral Regurgitation Management Guidelines

Initial evaluation

History Physical Exam

ECG: LAE, AF, LVH

CXR: Cardiomegaly, LAE, Lung congestion, valve calcification

Echo: Diagnostic, severity, LV Function

Cardiac catheterization



Mitral regurgitation This plain chest radiograph from a female with known mitral regurgitation demonstrates cardiomegaly with left atrial (black arrow) and left ventricular enlargement (red arrow), as well as mild pulmonary venous redistribution, all features characteristic of mitral regurgitation. (Photo courtesy of Jonathan Kruskal, MD.) Normal LV Size and function (EF 60%) Mitral leaflet prolapse and severe mitral regurgitation PA pressure estimated at 50 mmHg (elevated) Enlarged left atria





Chronic Mitral Regurgitation Management Guidelines-Asymptomatic Patient

Scheduled Follow-up*

Instruct all pts to report any cv symptoms

	<u>office interval</u>	<u>echo interval</u>
Mild MR	12 mos	if sxs
Moderate MR	12 mos	1-2 yrs
Severe MR	6-12 mos	6-12 mos**

Endocarditis prophylaxis: NO

*assumes no symptoms and no sequellae** consider exercise echo

MR-Treatment- Symptomatic Medical or Surgical

MEDICAL TREATMENT

Low sodium diet Preload reduction • Diuretics Afterload reduction • Vasodilators - Nitroprusside, ACE inhibitors, Hydralazine Digoxin SBE prophylaxis: NO



Chronic Mitral Regurgitation SURGICALManagement

Indications for Surgery (class I and IIa)

Symptomatic pts with severe MR and an LV appearing "less than hopeless" (EF > 30, ESD < 55 mm)*

Asymptomatic pts with moderate or severe MR and any of the following: EF 30-60%, ESD > 45 mm, AF, PASP > 50 at rest, PASP > 60 with exercise

MR-Treatment

Surgical

- Symptomatic
 - Class II, III, IV
- Elevated LVESV > 30ml/m2 BSA
- Left Ventricular End Systolic Dimension >4.5 CM

Chronic Mitral Regurgitation Management Guidelines

Surgical Options

Mitral valve repair Mitral valve replacement with *preservation* of subvalvular apparatus Mitral valve replacement with *excision* of subvalvular apparatus MVR with CABG (in ischemic MR)

Mitral Valve Prolapse



Mitral Valve Prolapse

Other terms: Floppy valve, Barlow's syndrome Etiology: unknown, it is associated with

- Marfan's syndrome
- Thyrotoxicosis
- Rheumatic Heart Disease
- Hypertrophic Cardiomyopathy
- IHD (Myocardial Infarction)
- Atrial Septal Defect

Pathophysiology

- Valve leaflet has redundant tissue with myxomatous degeneration of mitral valve leaflet
 - **During systole:** mitral valve leaflet prolapses into the left atrium, click sound and papillary muscle strain and some mitral incompetence

Mitral Valve Prolapse

Incidence • 10-20 % of population • F > M, Familial incidence Clinical Presentation • Asymptomatic • Symptomatic • Palpitations • Arrhythmias • Atypical Chest Pain

Mitral Valve Prolapse Clinical Features

Most are asymptomatic Atypical chest pain Palpitations Fatigue Dyspnea unrelated to exertion Midsystolic click Second heart sound may be diminshed by late systolic murmur with crescendos into S2

MVP-Physical Exam/Diagnosis

Thin, young females Abnormalities Skeletal Heart Auscultation Mid-systolic click Mid-late systolic murmur



Figure 10-68: A midsystolic nonejection sound (*C*) occurs in mitral valve prolapse and is followed by a late systolic murmur that crescendos to S_1 . With assumption of the upright posture, venous return decreases, the heart becomes smaller, the *C* moves closer to S_1 , and the mitral regurgitant murmur has an earlier onset. With prompt squatting, both venous return and afterload increase, the heart becomes larger, the *C* moves toward S_2 , and the duration of the murmur shortens. (From Shaver JA. *Examination of the Heart*, Part IV: Auscultation. Dallas: American Heart Association; 1990:13. Reproduced with permission from the publisher and the

MVP-Physical Exam/Diagnosis

EKG

- Normal
- Abnormal
 - Arrhythmias: SVT
 - NSST-T changes

Chest X-ray:

may be normal, or show pectus excavatum, straight thoracic spine, or scoliosis ECHO

- Confirm the diagnosis
- R/O other abnormalities

Mitral Regurgitation: Parasternal



Normal LV Size and function (EF 60%) Mitral leaflet prolapse and severe mitral regurgitation PA pressure estimated at 50 mmHg (elevated) Enlarged left atria





MVP-Treatment

Reassurance and follow up

Beta blockers: for atypical chest pain and palpitation

MV Repaire: sever MR

