Valvular Heart Disease
Mitral Stenosis
A 75 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
Mitral Stenosis

- Etiology
- Symptoms
- Physical Exam
- Severity
- Natural history
- Timing of Surgery
Mitral Stenosis: Etiology

- Primarily a result of rheumatic fever
  (~ 99% of MV’s @ surgery show rheumatic damage )
- Scarring & fusion of valve apparatus
- Rarely congenital
- Pure or predominant MS occurs in
  approximately 40% of all patients with rheumatic heart disease
- Two-thirds of all patients with MS are female.
Mitral Stenosis: Pathophysicsology

- **Normal valve area:** 4-6 cm²
- **Mild mitral stenosis:**
  - MVA 1.5-2.5 cm²
  - Minimal symptoms
- **Mod mitral stenosis**
  - MVA 1.0-1.5 cm² usually does not produce symptoms at rest
- **Severe mitral stenosis**
  - MVA < 1.0 cm²
# Mitral Stenosis: Pathophysiology

<table>
<thead>
<tr>
<th>Right Heart Failure:</th>
<th>Pulmonary HTN</th>
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<tbody>
<tr>
<td>Hepatic Congestion</td>
<td>Pulmonary Congestion</td>
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<tr>
<td>JVD</td>
<td>LA Enlargement</td>
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<tr>
<td>Tricuspid Regurgitation</td>
<td>Atrial Fib</td>
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<tr>
<td>RA Enlargement</td>
<td>LA Thrombi</td>
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<tr>
<td></td>
<td>↑ LA Pressure</td>
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<tr>
<td>RV Pressure Overload</td>
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<tr>
<td>RVH</td>
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<tr>
<td>RV Failure</td>
<td>LV Filling</td>
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Mitral Stenosis: Symptoms

- Fatigue
- Palpitations
- Cough
- SOB
- Left sided failure
  - Orthopnea
  - PND
- Palpitation
- Afib
- Systemic embolism
- Pulmonary infection
- Hemoptysis
- Right sided failure
  - Hepatic Congestion
  - Edema
- Worsened by conditions that ↑ cardiac output.
  - Exertion, fever, anemia, tachycardia, Afib, intercourse, pregnancy, thyrotoxicosis
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: Physical Exam

- 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)
Common Murmurs and Timing (click on murmur to play)

**Systolic Murmurs**
- Aortic stenosis
- Mitral insufficiency
- Mitral valve prolapse
- Tricuspid insufficiency

**Diastolic Murmurs**
- Aortic insufficiency
- Mitral stenosis
Auscultation - Timing of A2 to OS Interval

- Width of A2-OS inversely correlates with severity
- The more severe the MS the higher the LAP the earlier the LV pressure falls below LAP and the MV opens

<table>
<thead>
<tr>
<th>Say</th>
<th>Timing seconds</th>
<th>Severity of MS</th>
<th>Other HS’s</th>
</tr>
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<tbody>
<tr>
<td>Prrr</td>
<td>&lt; 0.06</td>
<td>Severe</td>
<td></td>
</tr>
<tr>
<td>Pada</td>
<td>.07-.08</td>
<td>Mod-severe</td>
<td></td>
</tr>
<tr>
<td>Pata</td>
<td>.08-.09</td>
<td>Mod</td>
<td></td>
</tr>
<tr>
<td>Papa</td>
<td>&gt; 0.10</td>
<td>Mild</td>
<td>PK 0.1-0.110</td>
</tr>
<tr>
<td>Tu-huh</td>
<td>≥ .12</td>
<td>A2-S3</td>
<td>0.12-0.18</td>
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Mitral Stenosis: Natural History

- Progressive, lifelong disease,
- Usually slow & stable in the early years.
- Progressive acceleration in the later years
- 20-40 year latency from rheumatic fever to symptom onset.
- Additional 10 years before disabling symptoms
Mitral Stenosis: Complications

- Atrial dysrrhythmias
- Systemic embolization (10-25%)
  - Risk of embolization is related to, age, presence of atrial fibrillation, previous embolic events
- Congestive heart failure
- Pulmonary infarcts (result of severe CHF)
- Hemoptysis
  - Massive: 20° to ruptured bronchial veins (pulm HTN)
  - Streaking/pink froth: pulmonary edema, or infection
- Endocarditis
- Pulmonary infections
Mitral Stenosis: EKG

- LAE
- RVH
- Premature contractions
- Atrial flutter and/or fibrillation
  - ↑ freq. in pts with mod-severe MS for several years
  - A fib develops in ≈ 30% to 40% of pts w/symptoms
A 75 year old woman with loud first heart sound and mid-diastolic murmer
Mitral Stenosis: Role of Echocardiography

- Diagnosis of Mitral Stenosis
- Assessment of hemodynamic severity
  - mean gradient, mitral valve area, pulmonary artery pressure
- Assessment of right ventricular size and function.
- Assessment of valve morphology to determine suitability for percutaneous mitral balloon valvuloplasty
- Diagnosis and assessment of concomitant valvular lesions
- Reevaluation of patients with known MS with changing symptoms or signs.
- F/U of asymptomatic patients with mod-severe MS
Mean gradient, 20 mm Hg
Functional valve area, 0.5 cm$^2$
Mitral Stenosis: Therapy

- **Medical**
  - Diuretics for LHF/RHF
  - Digitalis/Beta blockers/CCB: Rate control in A Fib
  - Anticoagulation: In A Fib
  - Endocarditis prophylaxis

- **Balloon valvuloplasty**
  - Effective long term improvement
Mitral Stenosis: Therapy

- **Surgical**
  - Mitral commissurotomy
  - Mitral Valve Replacement
    - Mechanical
    - Bioprosthetic
Recommendations for Mitral Valve Repair for Mitral Stenosis

**ACC/AHA Class I**

- Patients with NYHA functional Class III-IV symptoms, moderate or severe MS (mitral valve area <1.5 cm\(^2\)),* and valve morphology favorable for repair if percutaneous mitral balloon valvotomy is not available
- Patients with NYHA functional Class III-IV symptoms, moderate or severe MS (mitral valve area <1.5 cm\(^2\)),* and valve morphology favorable for repair if a left atrial thrombus is present despite anticoagulation
- Patients with NYHA functional Class III-IV symptoms, moderate or severe MS (mitral valve area <1.5 cm\(^2\)),* and a non-pliable or calcified valve with the decision to proceed with either repair or replacement made at the time of the operation.
Recommendations for Mitral Valve Repair for Mitral Stenosis

ACC/AHA Class IIB
- Patients in NYHA functional Class I, moderate or severe MS (mitral valve area <1.5 cm$^2$),* and valve morphology favorable for repair who have had recurrent episodes of embolic events on adequate anticoagulation.

ACC/AHA Class III
- Patients with NYHA functional Class I-IV symptoms and mild MS.

*The committee recognizes that there may be a variability in the measurement of mitral valve area and that the mean trans-mitral gradient, pulmonary artery wedge pressure, and pulmonary artery pressure at rest or during exercise should also be considered.