Valvular Heart Disease

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MITRAL STENOSIS (MS)

Causes of mitral stenosis:

rheumatic (mostly)
congenital
carcinoid, SLE, rheumatoid arthritis,calcification etc (very rarely)

Normal mitral valve orifice 4-6 cm^2
mild MS 2 cm^2
critical MS 1 cm^2

Pathophysiology of mitral stenosis

MS → increase left atrial pressure
→increase pulmonary venous and capillary pressure → increase pulmonary arterial pressure (=pulmonary hypertension) → right ventricular hypertrophy and dilatation → exertional dyspnea, hemoptysis, right heart failure

MS → low ventricular volume → impair left ventricular filling → decreased cardiac output, heart failure

Manifestation of mitral stenosis

- exertional dyspnea (principal symptom)
- orthopnea, pulmonary edema, pulmonary hypertension, right heart failure
- hemoptysis, chest pain, mitral facies (pink patches on cheeks)
- atrial fibrillation
- systemic embolism (due to left atrial dilatation with low flow → atrial thrombi, and atrial fibrillation)
- infective endocarditis
- hoarseness (due to compression of left recurrent laryngeal nerve by dilated left atrium)
- auscultation = loud first heart sound, opening snap, mid-diastolic murmur

Management of mitral stenosis

- avoid vigorous activity, echocardiography follow up, antibiotic prophylaxis
- diuretic, digoxin (control of atrial fibrillation), beta and calcium blockers (lower heart rate), anticoagulant (if atrial fibrillation, left atrial diameter>55 mm, high risk of systemic embolism)
- *Indications for surgery:* 1. mitral valve area < 1 cm^2

  2. progressive left atrial enlargement, onset of atrial fibrillation, pulmonary hypertension, heart failure
- *Valvotomy* (percutaneous balloon mitral valvuloplasty or surgical valvotomy): for symptomatic, hemodynamically severe stenosis without left atrial thrombi
- *Mitral valve replacement*: for combined MS with moderate or severe mitral regurgitation, or valves with extensive calcification, fibrosis, subvalvular fusion

Mitral regurgitation(MR)

Causes of mitral regurgitation:-

mitral valve prolapse (mostly)
rheumatic
infective endocarditis, collagen disease, cardiomyopathy, coronary artery disease, atrial fibrillation, trauma etc.

Pathophysiology of mitral regurgitation:-

MR → increase left atrial pressure (left atrial dilatation) → increase pulmonary pressure (=pulmonary hypertension) → right heart failure

MR →increase left ventricular end-diastolic volume and pressure → left ventricular dilatation and hypertrophy → increase end-systolic volume, preload, afterload, decreased cardiac output and ejection fraction

Manifestation of mitral regurgitation

- Exertional dyspnea, exercise intolerance, weakness (due to decreased cardiac output), right heart failure symptoms
- Hemoptysis and systemic embolism (rare)
- Auscultation: holosystolic murmur at apex radiating to axilla

Management of mitral regurgitation

- Reduce afterload (ACEI), diuretic, digoxin
- Prophylaxis for infective endocarditis
- Echocardiography follow up
- Surgical repair if : 1. Symptomatic severe MR; 2. severe MR with atrial fibrillation; 3. Hemodynamic decompensation (left ventricular end-systolic diameter > 40 mm, ejection fraction <60%)

Mitral valve prolapse (MVP)

- Floppy mitral valve, common in female
- Bulging or doming of enlarged leaflets toward left atrium often with resulting mitral regurgitation
- 1/3 MVP patients has similar involvement of tricuspid valve (tricuspid valve prolapse)

Causes of mitral valve prolapse :-

- Heritable (eg. Marfan syndrome, hyperthyrodism, collagen disease, atrial or ventricular septal defects etc)
- Myxomatous proliferation of mitral valve, leaflet thickening or redundancy
- Secondary to papillary muscle dysfunction
- Following rheumatic disease, myocardial infarction

Classification of mitral valve prolapse:-

1. ***Mitral valve prolapse syndrome:***
   young age (20-50 years), female predominant, disproportion between leaflet and left ventricular sizes, often normalize with aging, benign course.
2. ***Myxomatous mitral valve disease:***
   old age (40-70 years), male predominant, thickened redundant mitral valve
3. ***Secondary mitral valve prolapse*** eg.
   Marfan syndrome, hypertrophic cardiomyopathy, connective tissue disease etc

Manifestation of mitral valve prolapse

- **Majority asymptomatic (and remain so throughout lives). Excellent prognosis.**
- **Anxiety, fatigability, palpitation, autonomic dysfunction, syncope, chest discomfort, dizziness Auscultation: mid to late systolic click and late systolic murmur**

Complications of mitral valve prolapse

- **Hemodynamics: mitral regurgitation**
  left atrial and ventricular enlargement
  left ventricular systolic dysfunction(heart failure)
  pulmonary hypertension
- **Clinical : arrhythmias and sudden death**
  embolic events
  endocarditis

Management of mitral valve prolapse

- Avoid overdiagnosis. Assurance of excellent prognosis (if asymptomatic with no arrhythmia or MR). Echocardiography follow up
- Estimation of prognosis: age,gender, extent of leaflet thickening and redundancy, degree of mitral regurgitation, left ventricular dimensions and systolic function (ejection fraction)
- Endocarditis prophylaxis
- Beta blocker (relief palpitation, arrhytmias, chest discomfort). ACEI (reduce MR)
- Surgery if MVP with severe MR

Aortic Stenosis (AS)

- ***Causes of aortic stenosis:-***

  congenital

  rheumatic

  degenerative calcification, atherosclerosis

- Normal aortic orifice 3-4 cm^2

  mild AS 1.5-2 cm^2

  moderate AS 1-1.5 cm^2

  severe AS <1cm^2

Pathophysiology of aortic stenosis

AS → increase left ventricular pressures, left atrial, pulmonary wedge, arterial pressures, right ventricular systolic and diastolic pressures → left ventricular hypertrophy and dilatation → decreased cardiac output, myocardial ischemia (due to decreased coronary flow reserve), heart failure

Manifestation of aortic stenosis

- Gradually progressive, so asymptomatic for many years with good prognosis
- Angina, syncope (autonomic dysfunction), exertional dyspnea, heart failure (commonly)
- Gastrointestinal bleeding (idiopathic)
- Infective endocarditis, systemic embolism, atrial fibrillation, pulmonary hypertension, sudden death
- Once symptomatic (valve area usually $\leq$ 0.6 cm^2) with angina, syncope and heart failure, average survival without intervention is 5, 3 and 2 years, respectively.
- Weak pulse (pulsus tardus and parvus)
- Auscultation: systolic murmur over right second intercostal space radiating to carotids

Management of aortic stenosis

- Avoid vigorous activity. Infective endocarditis prophylaxis, echocardiography follow up yearly.
- Digoxin (if heart failure)
- Vasodilators,ACEI,diuretic
- Statins: slow progression of aortic stenosis (pleiotropic and antiinflammatory effects)
- Surgery (aortic valve replacement) if symptomatic severe AS. 50% patients undergoing aortic valve replacement have coronary artery disease and need concurrent coronary artery bypass

Aortic regurgitation (AR)

Causes of aortic regurgitation:-

rheumatic, calcification, infective endocarditis, trauma, congenital, SLE, rheumatoid arthritis, secondary to dilatation of aorta etc.

Pathophysiology of aortic regurgitatiion:-

AR → left ventricular and atrial hypertrophy and dilatation, increase left atrial, pulmonary wedge, arterial pressures, right atrial and ventricular pressures → decreased cardiac output, heart failure, myocardial ischemia (due to decreased coronary flow reserve)

Manifestation of aortic regurgitation

- Exertional dyspnea, angina, syncope, sudden death, heart failure symptoms
- Wide pulse pressure (=high systolic and low diastolic pressures)
- Head bob with each heartbeat (de Musset sign), increased pulse (Corrigan's pulse),

  pulsation in nail (Quincke's pulse),

  bruit over femoral artery (Duroziez's sign)

  Hill sign = popliteal cuff systolic pressure > brachial cuff systolic pressure > 60 mmHg
- Auscultation = holodiastolic murmur at left sternal border

Management of aortic regurgitation

- **Good prognosis if asymptomatic. Once symptomatic with angina and heart failure, survival without intervention is 4 and 2 years, respectively.**
- **Antibiotic prophylaxis for infective endocarditis, echocardiography follow up, avoid vigorous activity.**
- **Vasodilator (ACEI, calcium blocker) to reduce afterload**

- **Indication for surgery: 1. Symptomatic severe AR 2. Hemodynamic decompensation (left ventricular end-diastolic dimension > 70 mm, systolic dimension > 50 mm, 2. Ejection fraction < 50%**

- **Acute AR poor prognosis without surgery due to increase diastolic left ventricular pressures and poor hemodynamic tolerance**

Tricuspid Stenosis (TS)

- Rare
- Causes = rheumatic (90%), congenital, vegetation, endomyocardial fibrosis, extracardiac tumor etc.
- TS → increase diastolic pressure gradient between right atrium and ventricle > 2 mmHg→ increase right atrial pressure → systemic venous congestion, decreased cardiac output
- Manifestation: fatigue, dyspnea, peripheral edema, hepatomegaly, ascite, edema etc.
- Auscultation = opening snap, diastolic murmur at right sternal border that varies with respiration
- Treatment: diuretic. surgery if severe (tricuspid valve < 2 cm^2, mean diastolic pressure gradient > 5 mmHg)

Tricuspid Regurgitation (TR)

- Causes = dilatation of right ventricle, right ventricular hypertension, congenital heart disease, pulmonary hypertension, cardiomyopathy, cor pulmonale, rheumatic, infective endocarditis, papillary muscle dysfunction, trauma, collagen disease
- TR → increase pulmonary hypertension, increase right atrial and ventricular end-diastolic pressures → decrease cardiac output, heart failure
- Manifestation = dyspnea, orthopnea, fatigue, exercise intolerance, edema, hepatomegaly
- Auscultation = holosystolic murmur over right sternal border radiating to hepatic region
- Treatment = diuretic (control systemic congestion and decrease pulmonary pressure). Surgery if severe

Pulmonary Stenosis (PS)

- Causes = congenital (mostly), rheumatic
- Manifestation = mostly asymptomatic. Fatigue, dyspnea, angina, syncope, right heart failure
- Auscultation: systolic murmur at left sternal border radiating to neck
- Treatment: balloon valvuloplasty, surgical valvotomy, valve replacement

Pulmonary regurgitation (PR)

- Rare
- Causes = secondary to pulmonary hypertension (mostly), dilatation of pulmonary artery (idiopathic or connective tissue disease), infective endocarditis, congenital, trauma, rheumatic etc.
- Manifestation: right ventricular volume overload → pulmonary hypertension, right heart failure
- Auscultation: diastolic murmur at left parasternal region
- Treatment : surgery if severe or right ventricular enlargement and failure

Multivalvular disease

- Causes = rheumatic (mostly), collagen disease, degenerative calcification, infective endocarditis etc.
- Symptoms and management depend on relative severities of each valvular lesion