VALVULAR HEART DISEASE

OBJECTIVES

- Discuss the perceived incidence of Valvular Heart Disease (VHD).
- Review key concepts regarding the definition of valvular heart disease.
- Focus on Aortic Stenosis and Mitral Regurgitation.
- Review 2014 ACC/AHA Guidelines of care for Aortic Stenosis (AS) and Mitral Regurgitation (MR).

OBJECTIVES CONTINUED

- Review common clinical finding of VHD.
- Review common diagnostic studies and explanation of results.
- Discuss medical and surgical treatment options.
- Highlight patient education.

INCIDENCE OF VHD?

- It is estimated that 5 million Americans have VHD*.
- It is estimated that 1.5 million Americans suffer from Aortic Stenosis (AS)**.
- It is estimated that 500,000 have AS and 250,000 are symptomatic from AS***.

*** VHD INCIDENCE CONTINUED

FREQUENCY OF VHD

- Aortic Regurgitation (AR) was mild 13% of Framingham Study participant and 29% of Helsinki Aging Study patients.
- Mitral Regurgitation (MR) was at least mild in 19% of Framingham subjects who underwent echocardiography.

VHD INCIDENCE CONTINUED

- Mitral stenosis is a leading concern in developing countries due to Rheumatic Fever.
- However in the U.S. mitral annular calcification causing stenosis are seen.
Prevalence is loosely understood.
There are questions of underestimation.
VHD risk increases with age.
The US Census Bureau estimates an increasing population size from 45 million to 80 million by 2050.
HEART VALVES
- Aortic Valve – gateway from the left ventricle to the aorta
- Mitral Valve – trapdoor from the left atrium to the left ventricle
- Pulmonic Valve – gateway from right ventricle to the pulmonary vasculature.
- Tricuspid Valve – trapdoor from the right atrium to the right ventricle

AUSCULTATION ZONES
- EKG: rhythm, chamber enlargement, acute ST changes, evidence of infarction
- Chest x ray: cardiac size, presence of effusion(s), cardiac border, pulmonary congestion

DIAGNOSTIC STUDIES
- Transthoracic echocardiogram (TTE): hallmark study to assess function and anatomy. Class I, level C
- Transesophageal echocardiogram (TEE): can provide further detail on valve anatomy, vascular anatomy, chamber sizes.
- Heart catheterization: used to verify echocardiogram findings when discrepancy occurs, most sensitive exam. Class I, level C
- Exercise stress test: quantify symptoms. IIa, level B

2014 AHA/ACC GUIDELINE FOR THE MANAGEMENT OF PATIENTS WITH VALVULAR HEART DISEASE
- Stage
  - A: At risk – those who have risk factors for developing VHD
  - B: Progressive - Patients with progressive VHD (mild to moderate severity by echo and asymptomatic)
  - C1: Asymptomatic patients with severe VHD with compensated ventricle(s)
  - C2: Asymptomatic patients with severe VHD with decompensated ventricle(s)
  - D: Symptomatic, severe – patients who have developed symptoms due to VHD (D1, D2, D3)
CLASSIFICATION OF RECOMMENDATION

- **COR**
  - Benefit >>> Risk (should be offered)
  - Benefit >> Risk (reasonable to perform)
  - IIb - Benefit >/= Risk (may be considered)
  - III - risk of no benefit or harm

LEVEL OF EVIDENCE

- **LOE**
  - A multiple population evaluations, multiple random trials
  - B single randomized trial or nonrandomized studies
  - C limited population, consensus opinion, case studies

AORTIC STENOSIS (AS)

- Most common form of ventricular outflow obstruction
- It is the narrowing of the aortic valve orifice
  - Congenital etiology (bicuspid)
  - Calcified disease of a normal valve
  - Rheumatic reasons

RISK FACTORS ASSOCIATED WITH AS

- Older age
- Male gender
- CKD
- DM
- Hypercholesterolemia / calcemia
- Metabolic syndrome
- Smoking / HTN
- Aortic jet velocity/ degree of calcification (echo)

COMMON SYMPTOMS

- Late symptoms:
  - Angina
  - Syncope
  - Heart failure(JVD, orthopnea, edema, PND)

- Early symptoms:
  - Dyspnea on Exertion
  - Decreased Exercise tolerance
  - Exertional angina/ dizziness/ lightheadedness

PHYSICAL EXAM FINDINGS

- Auscultation- reveals a mid to late systolic murmur. Murmur grade generally III/VI or greater, crescendo in nature, heard best in the 2nd right intercostal space. Associated with bruit to the carotids.

  - Rate is generally regular unless associated with atrial fibrillation

  - Late AS can demonstrate a late pulse pressure, laterally placed PMI, a delay or diminished carotid upstroke.
**DIAGNOSTIC FINDINGS**

- **EKG:** Left ventricular hypertrophy, ST segment depression, T wave inversion, left atrial enlargement
- **Echocardiogram:** anatomy, hemodynamics, consequences
  - generally an orifice less than 1.2 cm² (0.8 to 1)
  - Aortic V (max): < 2 m/s to > 4 m/s
  - Mean gradient between 20 to 40 Hg
  - Peak gradient value is generally given
  - Assessment of LV function

**STAGES OF AS**

- **A - at risk**
  - anatomy congenital problem or sclerosis
  - hemodynamics Aortic V max < 2 m/s
  - left ventricle will not demonstrate any abnormalities
  - patient does not have symptoms

**STAGES OF AS CONTINUED**

- **B - progressive**
  - valve anatomy mild to moderate leaflet calcification with reduction of motion OR Rheumatic valve changes
  - hemodynamics will mention “mild AS”, Aortic Vmax 2 to 2.9 ms or Mean gradient < 20 mm Hg
  - “moderate AS”, Aortic Vmax 3 to 3.9 m/s or mean gradient 20 to 39 mm Hg
  - Normal Ventricle, early diastolic dysfunction may be present, no symptoms

**STAGES OF AS CONTINUED**

- **Stage C: Asymptomatic severe**
  - C1: severe leaflet calcification or congenital stenosis.
    - Aortic Vmax ≥ 4 m/s or mean gradient ≥ 40 mm Hg
    - AVA ≤ 1.0cm² (or AVAi ≤ 0.6 cm²/m²)
  - Very severe Vmax ≥ 5 m/s or mean gradient ≥ 60 mm Hg
  - LV changes—diastolic dysfunction, mild hypertrophy, normal EF
  - Symptoms—none, consider exercise testing

**STAGES OF AS CONTINUED**

- **Stage D - severe AS**
  - D1 - symptomatic severe high gradient
  - D2 - symptomatic severe low-flow/low gradient with LVEF
  - D3 - symptomatic severe low gradient
  - Associated with LV diastolic dysfunction, LVH, +/- Pulmonary artery hypertension, EF < 50%
  - Symptoms of DOE, angina, syncope, Heart failure.

- **Stage C - asymptomatic but severe**
  - C2: same as C1
  - HOWEVER - LVEF <50%
  - No LV diastolic dysfunction
  - No mild LV hypertrophy (LVH)
  - Just as in C1, no clinical symptoms
SUMMATION OF RECOMMENDATIONS FROM AHA/ACC

AHA/ACC 2014 Valvular Heart Disease Guideline

CLINICAL TAKE HOME FOR AS

- Surgery is a Class I recommendation for:
  - Severe AS demonstrated by Vmax \(> 4\) m/s or mean gradient \(> 40\) mm Hg, with symptoms.
  - Asymptomatic, with LVEF >50%, with findings as above, who is undergoing other cardiac surgery.
  - Asymptomatic, with LVEF >50%, and findings above.

WHICH PATIENTS CAN YOU MONITOR?

- Stage A (AS Vmax < 2m/s): echo every 5 years or with symptoms changes.
- Stage B mild AS (Vmax 2 to 2.9 m/s) or mean gradient < 20 mm Hg: echo every 3 to 5 years.
- Stage B Moderate AS (Vmax 3 to 3.9 m/s) or mean gradient 20 to 39 mm Hg: echo every 1-2 years.
- Stage C only if EF >50%: echo every 6 to 12 months.

MEDICAL THERAPY OPTIONS

- ACE-I, beta blockers, Class I, LOE B
  - Goal: control HTN, 'fixed' valve obstruction generally occurs late in process.
  - ACE-I may benefit LV remodeling, retard LV fibrosis.
  - Beta blockers: can assist in rate control, arrhythmia management.
- Vasodilators, Class IIb, LOE C: only in class IV Heart Failure with invasive monitoring. These patients are generally pending surgery. (nitroprusside, nicardipine)

MEDICATIONS CONTINUED

- Diuretics: use with caution, avoid if LV cavity is small. They can cause sharp decrease in cardiac output.
- ‘statin’ therapy: no studies demonstrate prevention of progression of AS.

MITRAL VALVE REGURGITATION (MR)

- Symptoms: fatigue, exertional dyspnea, orthopnea, right sided heart failure, edema.
- Physical exam: JVD, prominent a wave.
- Auscultation: 5th intercostal space, left midclavicular region systolic murmur, at times a brisk impulse with radiation to the left arm pit.
- S1 may be difficult to hear.
  - Usually holosystolic.
**ECHOCARDIOGRAM FINDINGS**

- Flow across Mitral valve into the left atrium / pulmonary veins
- Assess valve morphology, rupture of chordae, flail leaflet, evidence of vegetation.
- Assess EF and wall motion of the left ventricle

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**MR OVERVIEW**

- Severe acute primary
  - Abrupt disruption of the mitral valve apparatus.
  - Associate with Myocardial infarction or trauma.
  - Can be associate with endocarditis or connective tissue disorder.
  - Essentially an acute change that does not allow compensation.

- Chronic primary
  - Pathology of at least one component of the MV, i.e. leaflets, chordae tendineae, papillary muscles, annulus.
  - Can occur in Mitral valve prolapse (MVP)
  - Severe myxomatous diseases.
  - Fibroelastic diseases.
  - Connective tissues disorders.
  - Less common, rheumatic heart disease, endocarditis, radiation to the heart.
  - If corrected early, you can save the integrity of the heart.

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**MR OVERVIEW**

- Chronic secondary
  - The MV is usually normal.
  - LV dysfunction has caused distortion of the valvular structures.
  - Seen in MI, ischemia, idiopathic myocardial diseases.
  - LV is generally dilated.
  - Fixing / repairing the valve leaves the underlining problem and may not be curative.

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**MEDICAL MANAGEMENT OF MR**

- Vasodilator therapy can increase forward flow towards the aorta.
- Acutely consider IV nitrates.
- Diuretics with caution.
- ACE-I in chronic management.
- Betablockers in depressed EF / chronic management.
SURGICAL OPTIONS

- **AS**: "gold standard" open chest aortic valve replacement via sternotomy
  - Sub select individuals:
    - Transcatheter Aortic Valve Replacement (TAVR)
    - Balloon valvuloplasty

- **MR**: "gold standard" open chest sternotomy.
  - Sub select individuals:
    - Right thoracotomy incision
    - Mitral valve clipping.

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