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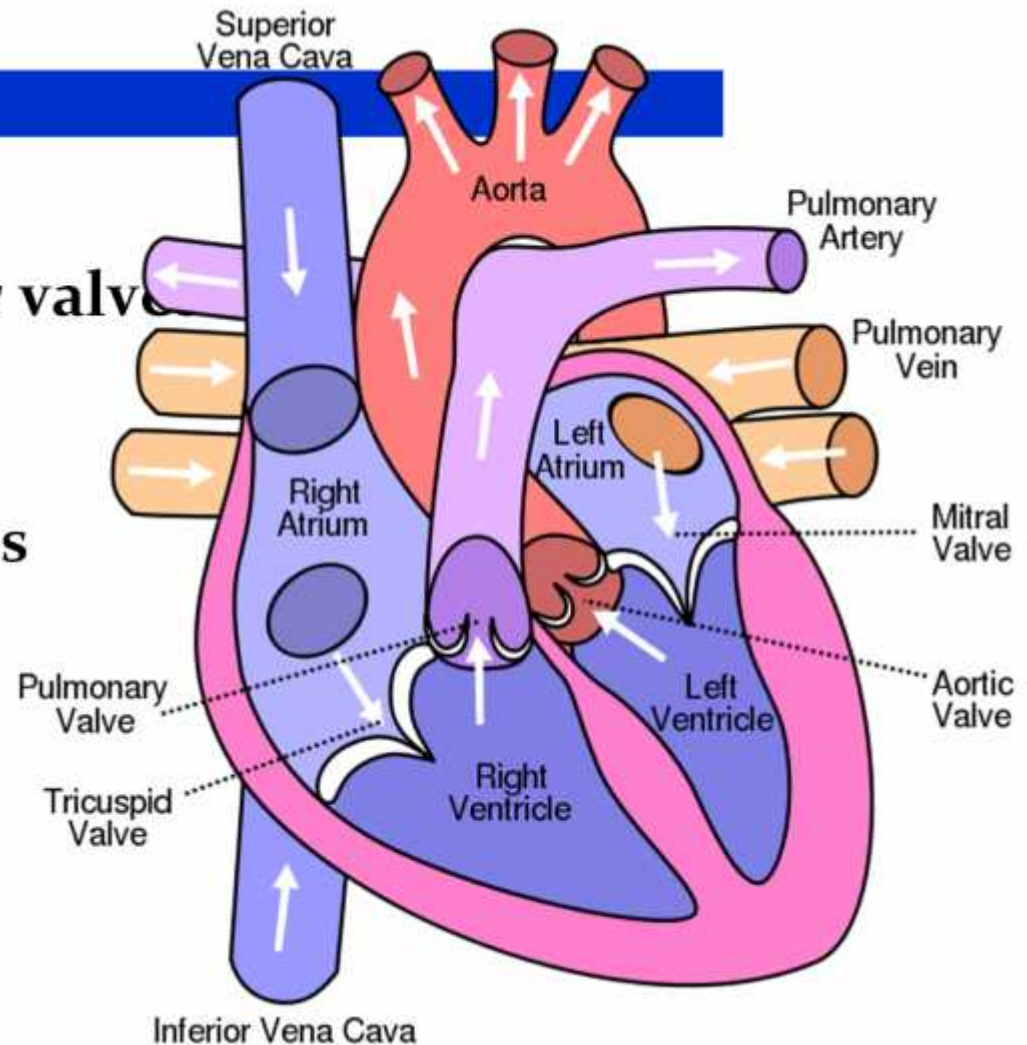
Valvular Heart Disease

M Saugi Abduh



Valvular Heart Disease

- Heart contains
 - Two atrioventricular valves
 - Mitral
 - Tricuspid
 - Two semilunar valves
 - Aortic
 - Pulmonic
- Valvular Disease



Normal Structure Mitral Valve

- Cross sectional Area 4-6cm²
- Anterior and Posterior Leaflets
- Chordae Tendineae → Papillary Muscles

Mitral Stenosis Etiology & Pathology

- **Rheumatic Fever- 99%**
- **Other**
 - **Congenital**
 - **Carcinoid**
 - **Lupus**
 - **Amyloid**
 - **Infective Endocarditis**
 - **Mucopolysaccharide Disease**

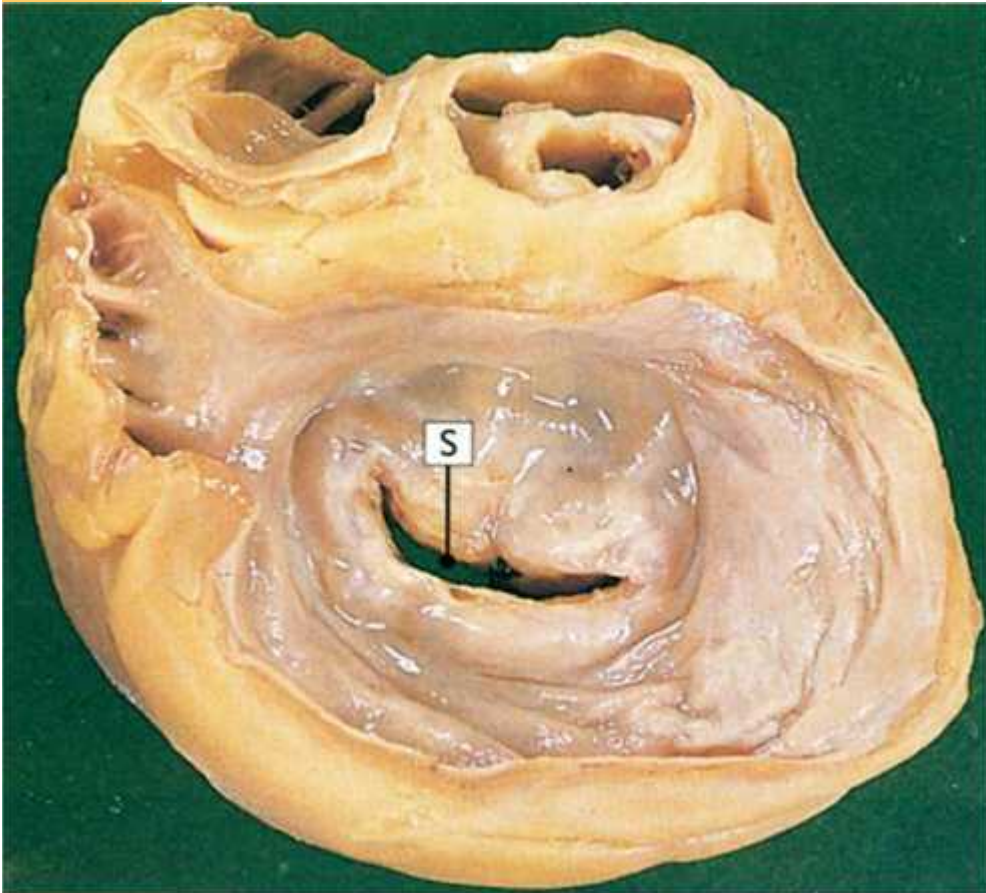
Stenotic Pathology

● Etiology & Pathology

- Commissural 30%
- Cuspal 15%
- Chordal 10%
- Mixed Remaining

- Valve becomes funnel shaped or “fish mouthed”
- Thickened immobile leaflets or chordal structures

Fig. 37-9



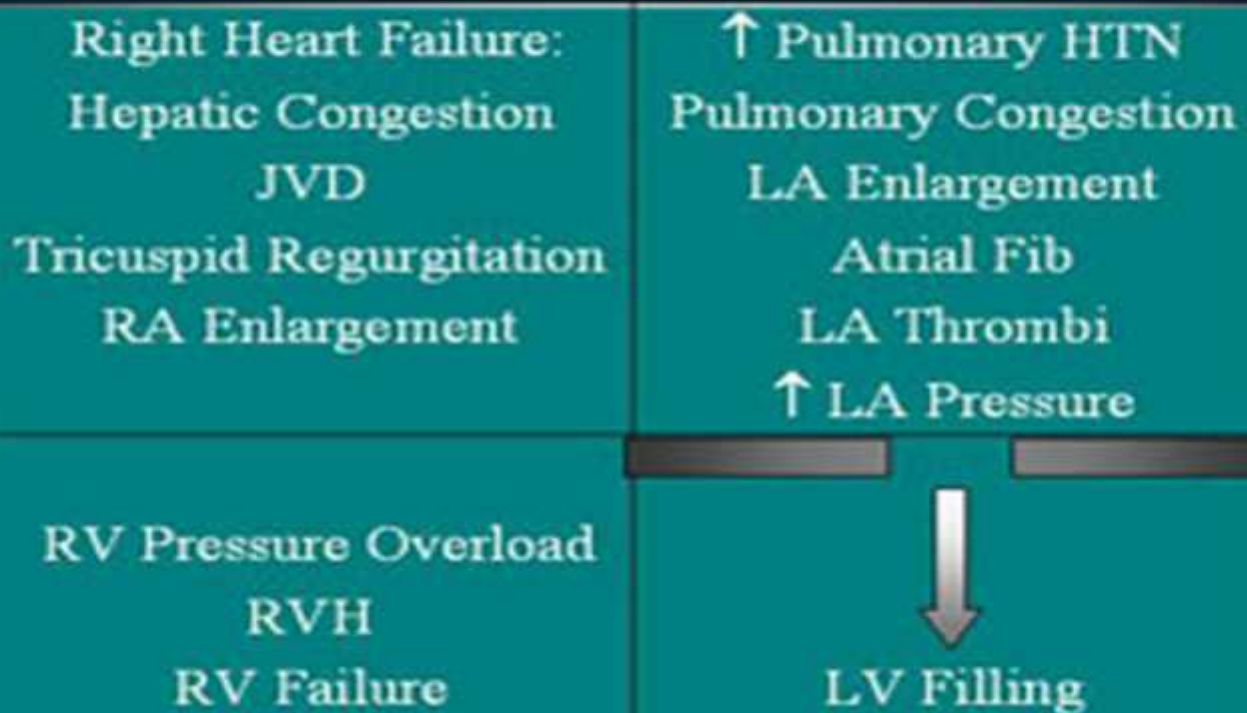
Fish mouth

Pathophysiology

- Mild MS- orifice $<2 \text{ cm}^2$
- Critical MS- $<1 \text{ cm}^2$
 - A-V pressure gradient $>20\text{mmHg}$
 - Increased LA Pressure
 - Increase Pulmonary Venous + Capillary Pressures
 - Increase Pulmonary Artery Systolic Pressure
 - Decrease RV Function (when PAS $>30\text{-}60\text{mmHg}$)



Mitral Stenosis: Pathophysiology



History

- **Exertional Dyspnea**
- **Cough/Wheezing**
- **Orthopnea/PND/CHF**
- **Hemoptysis-Rupture of Pulmonary Vein-Bronchial Vein Shunts**

History

- **Chest Pain-Increase RV Pressures or Unknown Etiology**
- **Systemic Emboli (LA clots)**
 - Increased LA size, Decreased C.O., Atrial Fib

Physical Exam

- **Auscultation**
 - Diastolic Rumble
 - Assoc Murmur of MR
 - Loud S1-thickened leaflets
 - Increased P2-pulmonary hypertension
- **Decreased B/P if C.O. decreased**
- **Prominent a wave if sinus rhythm present**

Physical Exam

- **Mitral Facies-pink, purple facial patches due to decrease CO and systemic vasoconstriction**
- **Hepatomegally**
- **Edema**
- **Ascites**
- **Hydrothorax With Right Heart Failure**

Diagnosis

- **ECG**
 - **Left Atrial Abnormality**
 - **P wave becomes bifid and greater than 0.12 sec in duration in V₁ and Lead II**
 - **RVH- right axis deviation**
 - **R wave > S wave in V₁**

Diagnosis

- **Chest X-ray**
 - Dilated LA, RA, RV
 - Elevated Left Main stem Bronchus
 - Interstitial Edema
- **Echo- Cornerstone of Diagnosis**
 - Thickened Calcified Leaflets
 - Doming of Leaflets on Opening

Natural History

- **Asymptomatic for 15-20yrs following Rheumatic Fever**
- **Additional 5-10 yrs for progression from mild to severe stenosis**
- **Stenosis progression approximately $.09 \text{ cm}^2/\text{yr}$**

Natural History

- **Presurgical Survival Rates**
 - **NYHA Class II 80%-10yrs**
 - **Class III 38%-10yrs, 62% 5yrs**
 - **Class IV 15%-5yrs**



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

Percutaneous Balloon Angioplasty

- Moderate-Severe MS
- Mild MS- if Pulmonary Artery Pressures or Wedge Pressure Elevate with Exercise

Valve Replacement

- Indications
 - Combined MS/MR
 - $<1.5 \text{ cm}^2$ -NYHA III or IV
 - $<1 \text{ cm}^2$
 - Class II if Pulmonary Artery Pressure $>70\text{mmHg}$
- Mortality
 - 3-8%
- Valve Type-Prosthetic or Bioprosthetic

Mitral Regurgitation

- Etiology
 - Rheumatic Heart Disease
 - Infective Endocarditis
 - Collagen Vascular Disease
 - Cardiomyopathy
 - Ischemic Heart Disease
 - Mitral Valve Prolapse-most common cause for valve surgery in US

Pathophysiology

- LV Compensation
 - Increased End Diastolic Volume
 - Increased Wall Tension
 - Increased Preload
 - Increased LV Emptying
 - Normal Ejection Fraction should be Super Normal >65% to maintain forward cardiac output and B/P

Pathophysiology

- LV Decompensation
 - Increase End Systolic Volume
 - Increased End Diastolic Volume
 - Leads to Annulus Dilatation (MR begets MR)
 - Decreased Ejection Fraction and Stroke Volume

Pathophysiology

- Ejection Fraction in Mitral Regurgitation
 - >65% normal in compensated MR
 - 50-65% mild impairment
 - 40-50% moderate-severe impairment
 - <35% advanced impairment

As ejection fraction decreases operative risk increases.

History

- Shortness of Breath
- Exertional Dyspnea
- Congestive Heart Failure
- Right Heart Failure
- Significant symptoms in chronic MR usually do not develop until LV decompensation occurs.

History

- Medical Treatment Survival
 - 80% 5yr
 - 60% 10yr
 - 30-45% 5yr if MR severe

Diagnosis

- **Physical Exam**
 - Holosystolic Murmur
 - Increase Carotid Impulse
- **ECG**
 - LA abnormality
 - LVH
 - RVH
- **Chest X-ray**
 - Increase LA, LV, RV, Interstitial Edema

Diagnosis

- **Echo**
 - **Transesophageal superior to transthoracic**
 - **Evaluation of Chamber Sizes, Regurgitant Jet, Leaflets**

Management of Acute MR

- **Medical**

- **After load Reduction (Nitroprusside & Intra aortic balloon pump)**
 - Decrease impedance to LV ejection
 - Decrease regurgitant volume into left atrium
- **Inotropic Support (Dobutamine)-if LV function reduced**

Management of Acute MR

- **Surgical Intervention**
 - **Progressive LV Failure or Hemodynamic Deterioration**
 - **CHF**
 - **Hypertension**
 - **Valve Disruption**

Management of Chronic MR

- **Medical**
 - **Digoxin**
 - **Diuretics***
 - **After load Reduction**
 - **Anticoagulation in A-fib**
 - **Endocarditis Prophylaxis**

Management of Chronic MR

- **Surgical**
 - **Indications**
 - **Asymptomatic Class I**
 - EF < 60% or LV Systolic Diameter >45mm
 - **Severe MR Class II, III, or IV**
 - generally considered for surgery unless EF <30%
 - **Valve Repair vs. Replacement**

Aortic Valve Normal Structure

- Valve sits at the base of Aortic Root
- Three Leaflets (cusps)-non coronary, right coronary, left coronary
- Normal cross-sectional area 3-4cm²

Aortic Stenosis Etiology and Pathology

- Valvular
- Supravalvular
- Subvalvular
- Hypertrophic Cardiomyopathy

Congenital Aortic Stenosis

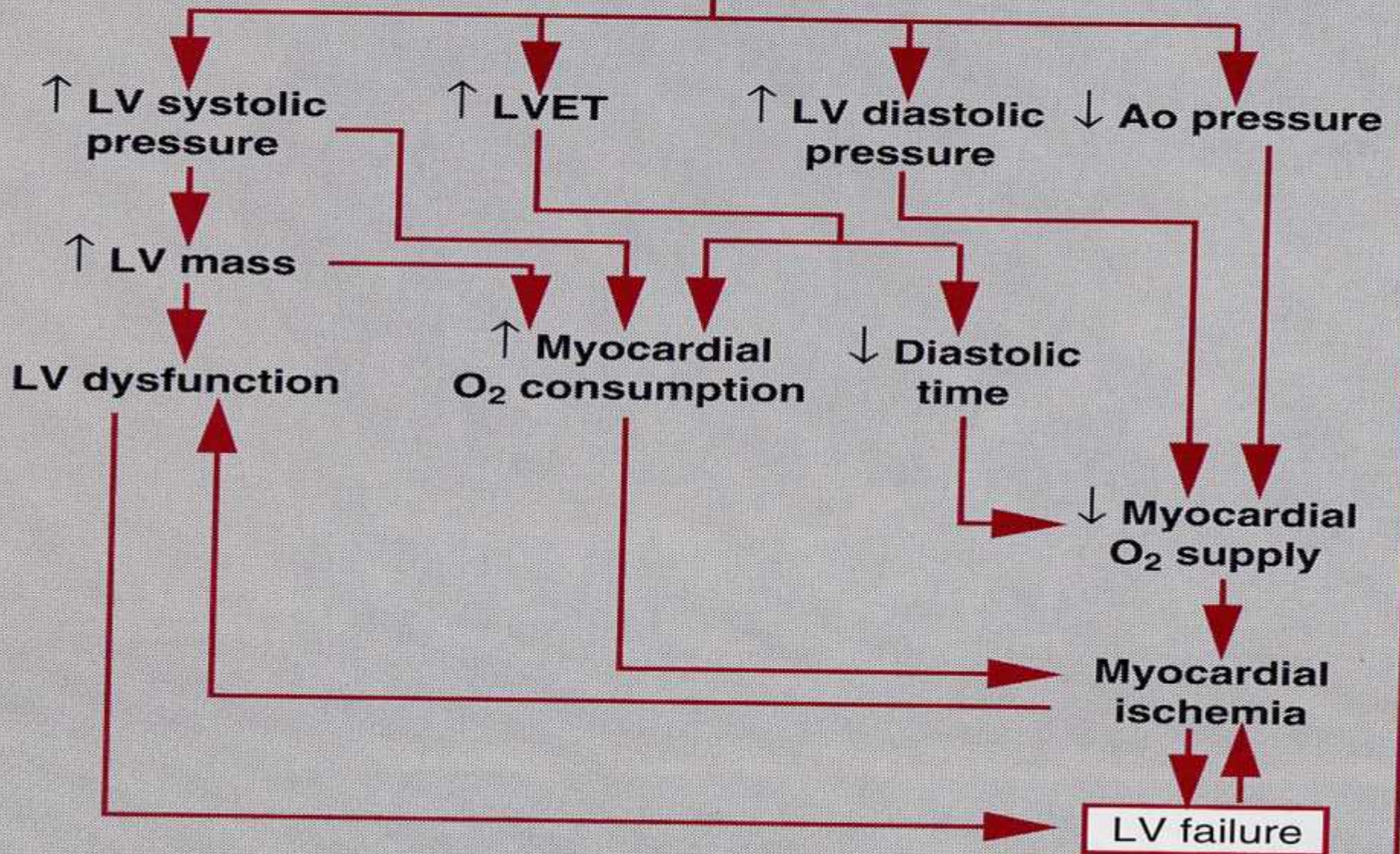
- **Unicuspid**
 - Presents less than one year of age
- **Bicuspid**
 - Adult Presentation
 - Chronic turbulent flow
 - Leads to fibrosis, rigidity, calcification
- **Tricuspid**
 - Leaflets of unequal size

Acquired Aortic Stenosis

- **Rheumatic**
 - Rare
 - Usually mitral valve also involved
- **Degenerative or Senile**
 - Most common cause of adult AS
 - Most common cause of valve replacement
 - Inflammatory or Infectious component??
 - >age 65 30% Aortic Sclerosis

Aortic stenosis

LV outflow obstruction



Hemodynamics

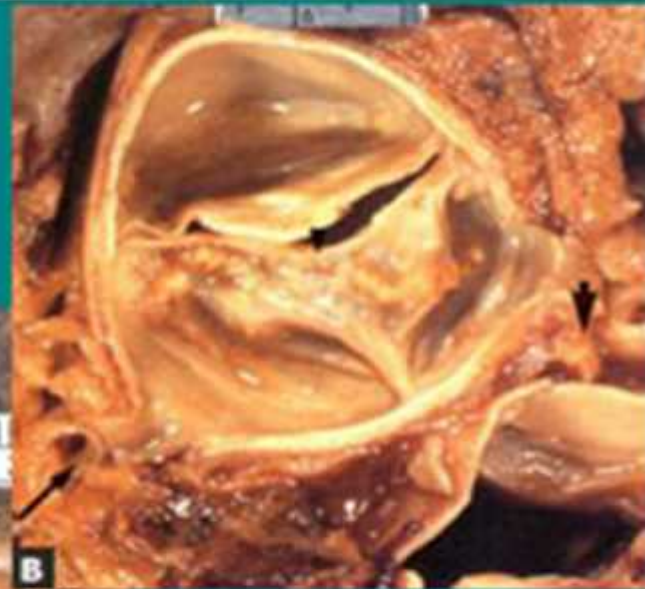
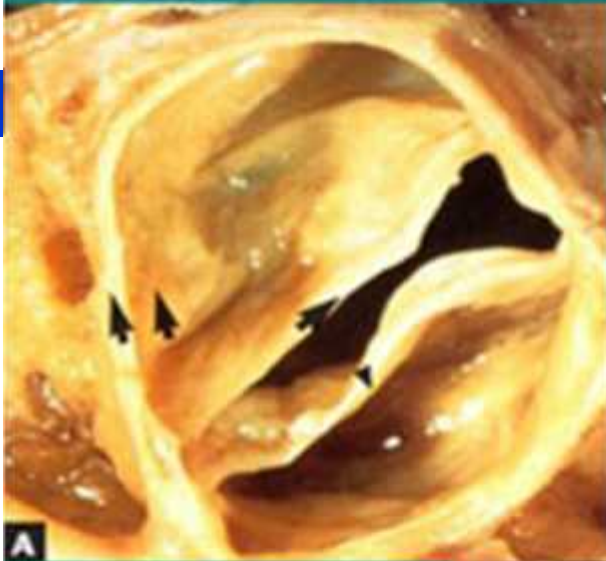
- Critical (Surgical) AS
 - Peak systolic pressure gradient $> 50\text{mmHg}$ in the presence of normal cardiac output
 - Valve area $< 0.7\text{-}0.8\text{cm}^2$
- Moderate AS
 - $1\text{-}1.5\text{cm}^2$
- Mild AS
 - $1.5\text{-}2\text{cm}^2$
- Aortic Sclerosis

History

- **Long latent period of increasing obstruction**
- **Symptoms usually begin in 5th or 6th decade**
- **Angina in 2/3 of patients**
 - Hypertrophied myocardium
 - Increased ventricular systolic pressure
 - All of which increase myocardial oxygen consumption
 - Oxygen supply-demand imbalance leads to subendocardial ischemia



Bicuspid Aortic Valve



© Continuing Medical

...bridging the care gap



Aortic Stenosis: Symptoms

- Cardinal Symptoms
 - Chest pain (angina)
 - Reduced coronary flow reserve
 - Increased demand-high afterload
 - Syncope/Dizziness (exertional pre-syncope)
 - Fixed cardiac output
 - Vasodepressor response
 - Dyspnea on exertion & rest
 - Impaired exercise tolerance
- Other signs of LV failure
 - Diastolic & systolic dysfunction

Diagnosis

- **Physical Examination**
 - **Systolic Murmur**
 - Diamond-Shaped, harsh, left sternal boarder to right intercostal spaces, neck and apex
 - Late peak, obliteration of S2, Dx of Critical AS
 - **Pulses Parvus**
 - Delayed and Prolonged Carotid Impulse

Diagnosis

- **ECG**
 - Classic LVH
- **Chest X-ray**
 - Concentric LVH
 - Calcification of Aortic Valve
- **Echo**
 - calculation of LV-Aortic pressure gradient and valve area

Diagnosis

- **Cardiac Catherization**

Medical Management

- **Endocarditis Prophylaxis**
- **Limit Physical Activity**
- **Watch Beta Blockers and Diuretics**
- ***Treatment of Critical AS in viable candidates is surgery**

Surgery (Valve Replacement)

- **Indications**

- **Symptomatic Patients -valve area 0.7-0.8cm² or less**
- **Asymptomatic Patients-progressive LV dysfunction (EF <35%) or hypotensive response to mild exercise**
 - **Delaying surgery in asymptomatic patients with good exercise tolerance is controversial**

Aortic Regurgitation Etiology and Pathology

- **Valvular**

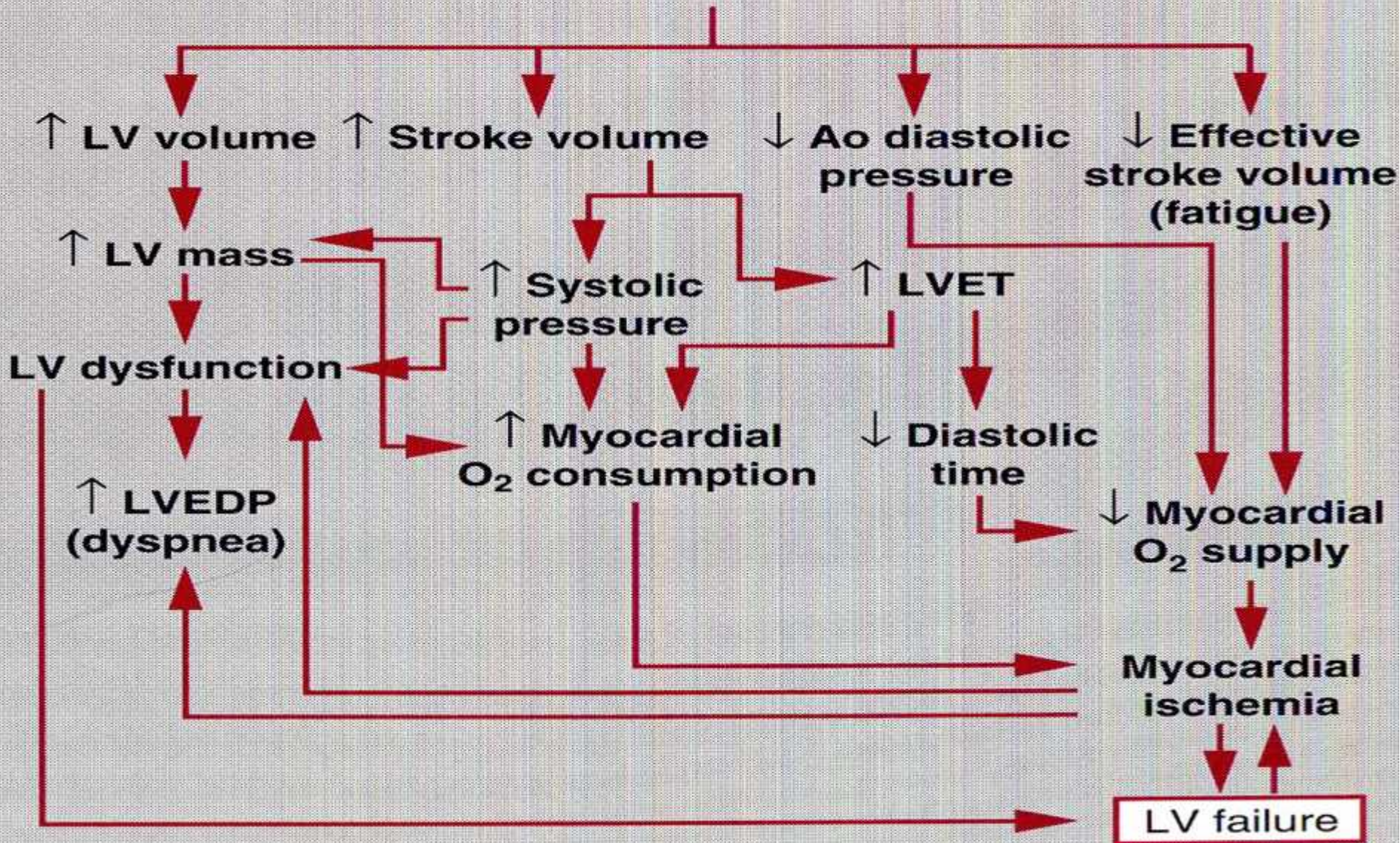
- **Rheumatic-Fibrotic Retraction of Leaflets**
 - **Ankylosing Spondylitis, Behcets, Psoriatic Arthritis, Giant Cell Arteritis**
- **Degenerative AS-75% w/AR**
- **Infective Endocarditis-Leaflet Destruction**
- **Trauma-ascending aortic tear**
- **Bicuspid aortic valve-prolapse or incomplete closure**
- **Myxomatous Degeneration-like MVP**
- **Appetite suppressant drugs-serotonin related valve deposits**

Etiology and Pathology

- **Aortic Root Disease**-More common than primary valvular. Root Dilatation leads to non-coaptation of leaflets.
 - **Degenerative-Hypertensive Aortic Dilatation**
 - **Cystic Medial Necrosis-Classic Marfans Syndrome**
 - **Aortic Dissection**
 - **Syphilitic Aortitis**
 - **Rheumatic Disease-same as valvular**

Aortic regurgitation

Diastolic regurgitation



Physical Examination

- **Diastolic Murmur**
 - Left sternal boarder
 - Decrescendo, high pitched
 - Best heard **Sitting Up, End Expiration**
 - Longer murmur equals worse AR

Diagnosis

- ECG
 - LVH
- Chest X-ray
 - Cardiomegaly predominantly inferior and leftward
- Echo
 - Can aid in detecting etiology, quantifying degree of regurgitation, and assessing LV size and function
- Cardiac Catheterization

Medical Treatment

- Symptomatic Moderate-Severe AR
 - Limit exertional activity
 - Aggressively treat B/P
 - Diuretics
 - Salt Restriction
 - Digoxin
 - Vasodilators (Nifedipine?)

Surgical Treatment

- Indications

- Defer surgery for chronic severe AR if good exercise tolerance, EF greater than 50%, end systolic diameter < 50 mmHg, and end diastolic diameter < 70 mmHg
- Be aware that progressive decline in LV function or size increases surgical morbidity and mortality

Surgical Treatment

- Mortality
 - 3-8% perioperative
 - 5-10% late mortality with significant preop LV dysfunction

Tricuspid and Pulmonic Valve Disorders

- Uncommon
- Both conditions cause an increase in blood volume in R atrium and R ventricle
- Result in Right sided heart failure

Diagnostic Tests

- Echo- assess valve motion and chamber size
- CXR
- EKG
- Cardiac cath- get pressures

Medications

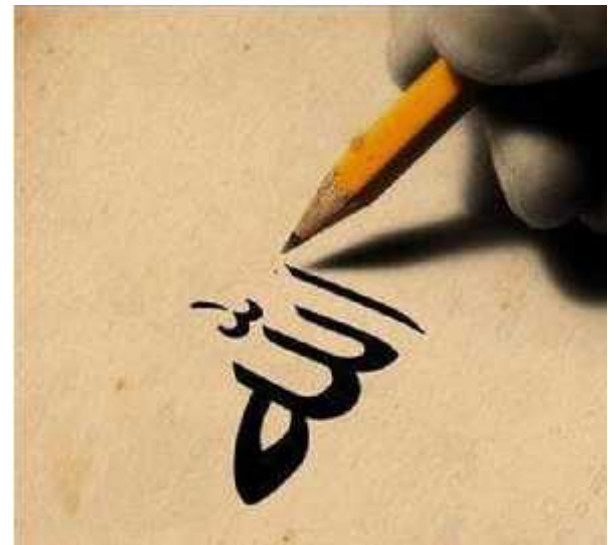
- Like Heart Failure
 - ACE inhibitors
 - Digoxin
 - Diuretics
 - Vasodilators
 - Beta blockers
 - Anticoagulants
 - *Prophylactic antibiotics



Medical/ Surgical Treatment

- Percutaneous balloon valvuloplasty
- Surgical therapy for valve repair or replacement:
 - Valve repair is typically the surgical procedure of choice
 - Open commissurotomy- open stenotic valves
 - Annuloplasty- can be used for both
 - Valve replacement may be required for certain patients Heart valve surgery
 - Mechanical-need anticoagulant
 - Biologic-only last about 15 years
 - Ross Procedure
 - MedlinePlus: Interactive Health Tutorials

Alhamdulillah! ♥



Physical Examination

- de Musset's Sign (head bobbing)
- Corrigan's Pulse "water hammer"
 - Abrupt Distention with Quick Collapse
- Bisferiens-pulse
 - 2 peaks
- Traube's Sign
 - Pistol shot sounds over femoral pulse
- Duroziez's Sign
 - Murmur over femoral pulse with compression

Physical Examination

- Quinckes Sign
 - Capillary pulsations
- Muller' s Sign
 - Systolic pulsations of uvula
- Hill' s Sign
 - Popliteal pulse exceed brachial pulse by $> 60\text{mmHg}$

Physical Examination

- Korotkoff Sounds
 - Can persist to 0mmHg
 - Wide Pulse pressure