Valvular Heart Disease

Aortic Stenosis

Aortic Stenosis

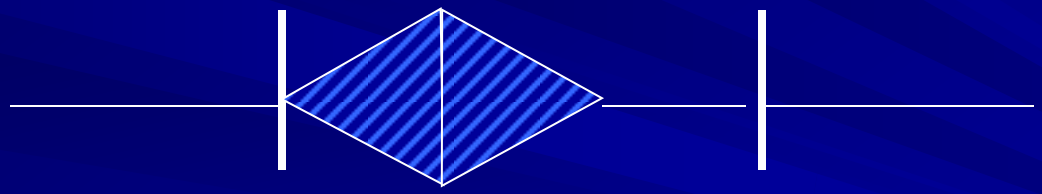
- Etiology
- Physical Examination
- Assessing Severity
- Natural History
- Prognosis
- Timing of Surgery

Common Clinical Scenarios

- Younger people
  - Functional murmuazr vs MVP vs bicuspid AV
- Older people
  - Aortic sclerosis vs aortic stenosis

Innocent Murmurs

- Common in asymptomatic adults
- Characterized by
  - Grade I – II @ LSB
  - Systolic ejection pattern



S1 S2

  - Normal intensity & splitting of second sound
  - No other abnormal sounds or murmurs
  - No evidence of LVH, enlargement

An 83 year old man with exertional dyspnea

- Previously well
- Gradual onset Class 2/4 dyspnea
- Occasional lightheadedness with exertion
- O/E: 2/6 ejection murmur

An 83 year old man with exertional dyspnea

- Is there significant valvular heart disease?
- Which valve?
- Is the valve playing a role in his dyspnea?
- How do you distinguish AV sclerosis from stenosis?
- What are the clinical signs of severe AS?
- What tests are appropriate?
- When is surgery indicated?

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

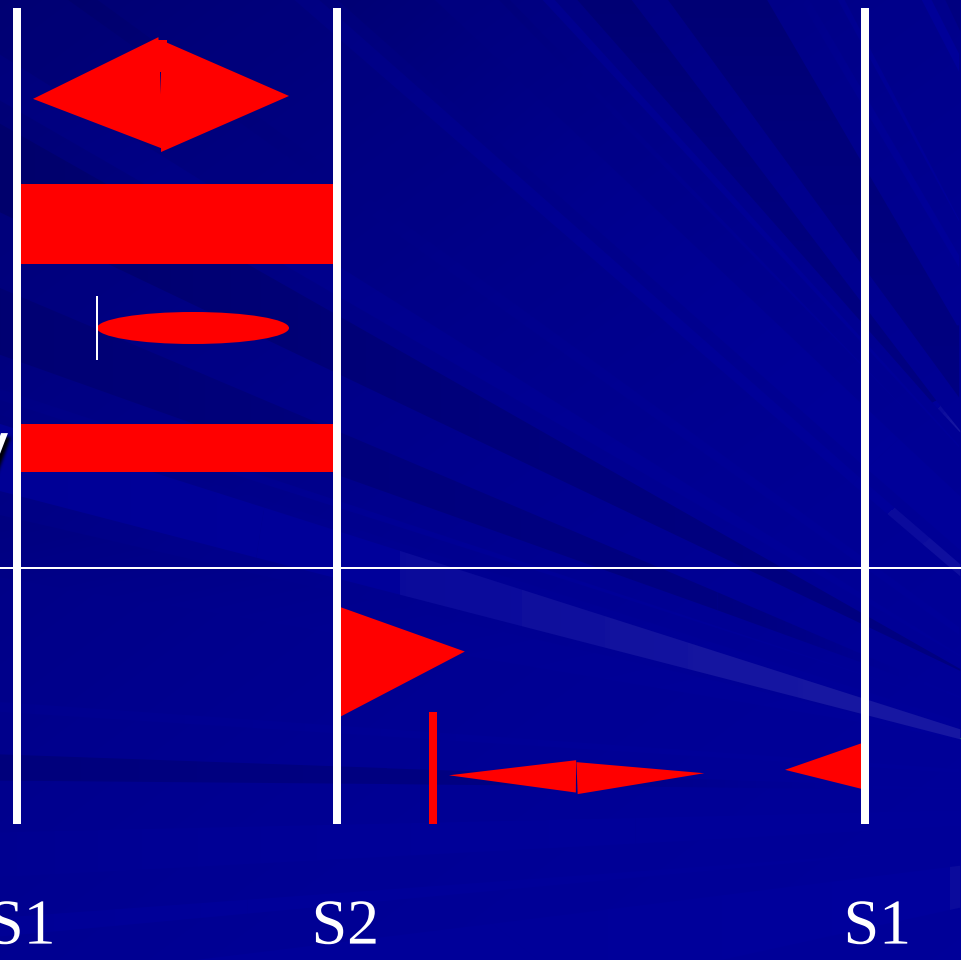
Common Murmurs and Timing (click on murmur to play)

<u>Systolic Murmurs</u>

- Aortic stenosis
- Mitral insufficiency
- Mitral valve prolapse
- Tricuspid insufficiency

<u>Diastolic Murmurs</u>

- Aortic insufficiency
- Mitral stenosis



Aortic Stenosis: Physical Findings

Mild-Moderate

Severe

Aortic Stenosis: Physical Findings

- Intensity DOES NOT predict severity
- Presence of thrill DOES NOT predict severity
- "Diamond" shaped, harsh, systolic crescendo-decrescendo
- Decreased, delay & prolongation of pulse amplitude
- Paradoxical S2
- S4 (with left ventricular hypertrophy)
- S3 (with left ventricular failure)

Recognizing Aortic Stenosis

Sign	Correlation with Severity
JVP-prominent A wave	No
Carotid-delayed, anacrotic	Yes
A2 audible over carotids	If A2 transmitted to carotids mean AV gradient < 50 mm Hg and stenosis not severe
Apex- sustained, atrial kick -enlarged, displaced	Yes Yes
Thrill	No
Cardiomegaly- Clinical/CXR	Yes
Soft S1	Yes
Paradoxical S2	Yes
S3, S4	Yes
SEM- intensity - late peak	No Yes
ECG- LAE, LVH	Yes

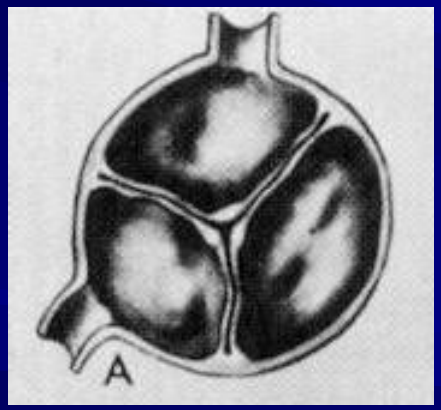
An 83 year old man with exertional dyspnea

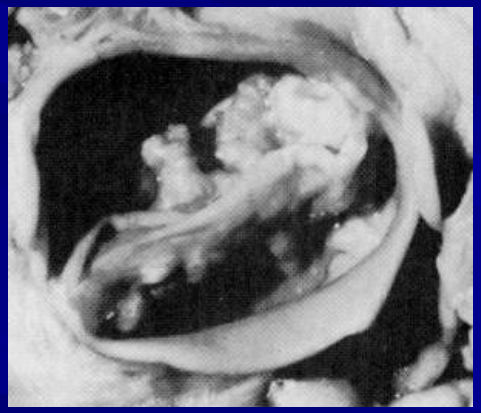
Aortic Stenosis - Etiology

- Young patient think congenital
  - Bicuspid
    - 2% population
    - 3:1 male:female distribution
    - Co-existing coarctation 6% of patients
- Rarely
  - Unicuspid valve
  - Sub-aortic stenosis
    - Discrete
    - Diffuse (Tunnel)
- Middle aged patient(4&5th decades) think bicuspid or rheumatic disease
- Old patient think degenerative (6,7,8th decades)

Aortic Stenosis: Etiology

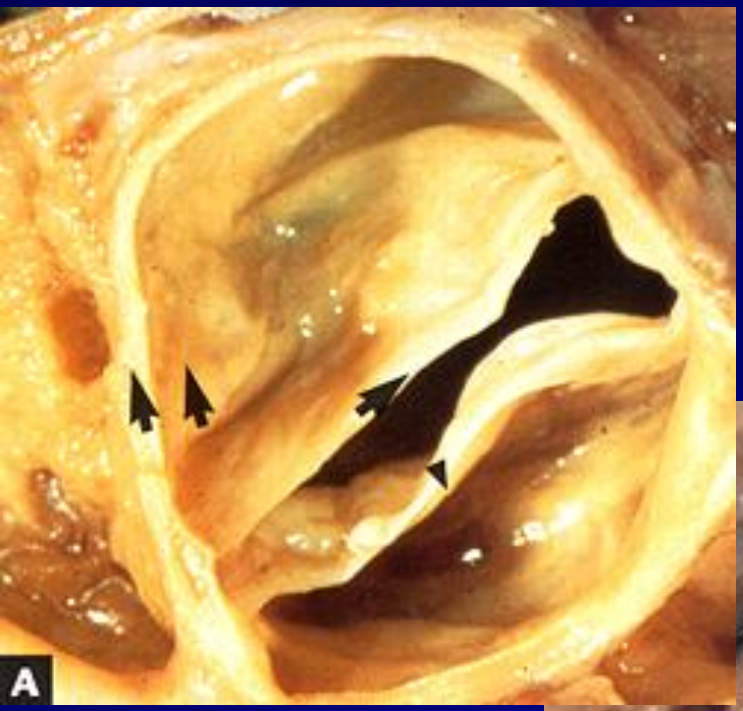
- Congenital bicuspid valve is the most common abnormality
- Rheumatic heart disease and degeneration with calcification are found as well

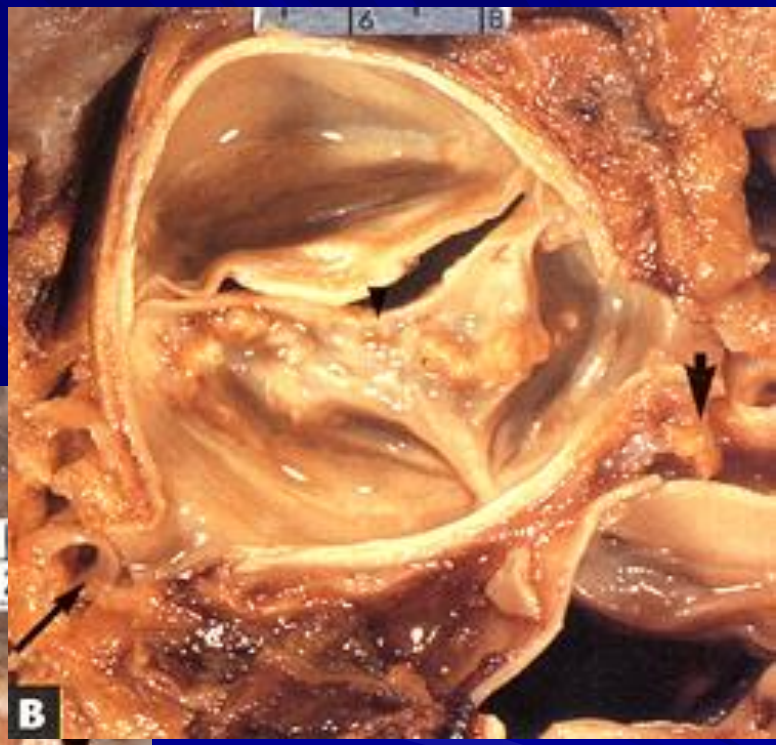




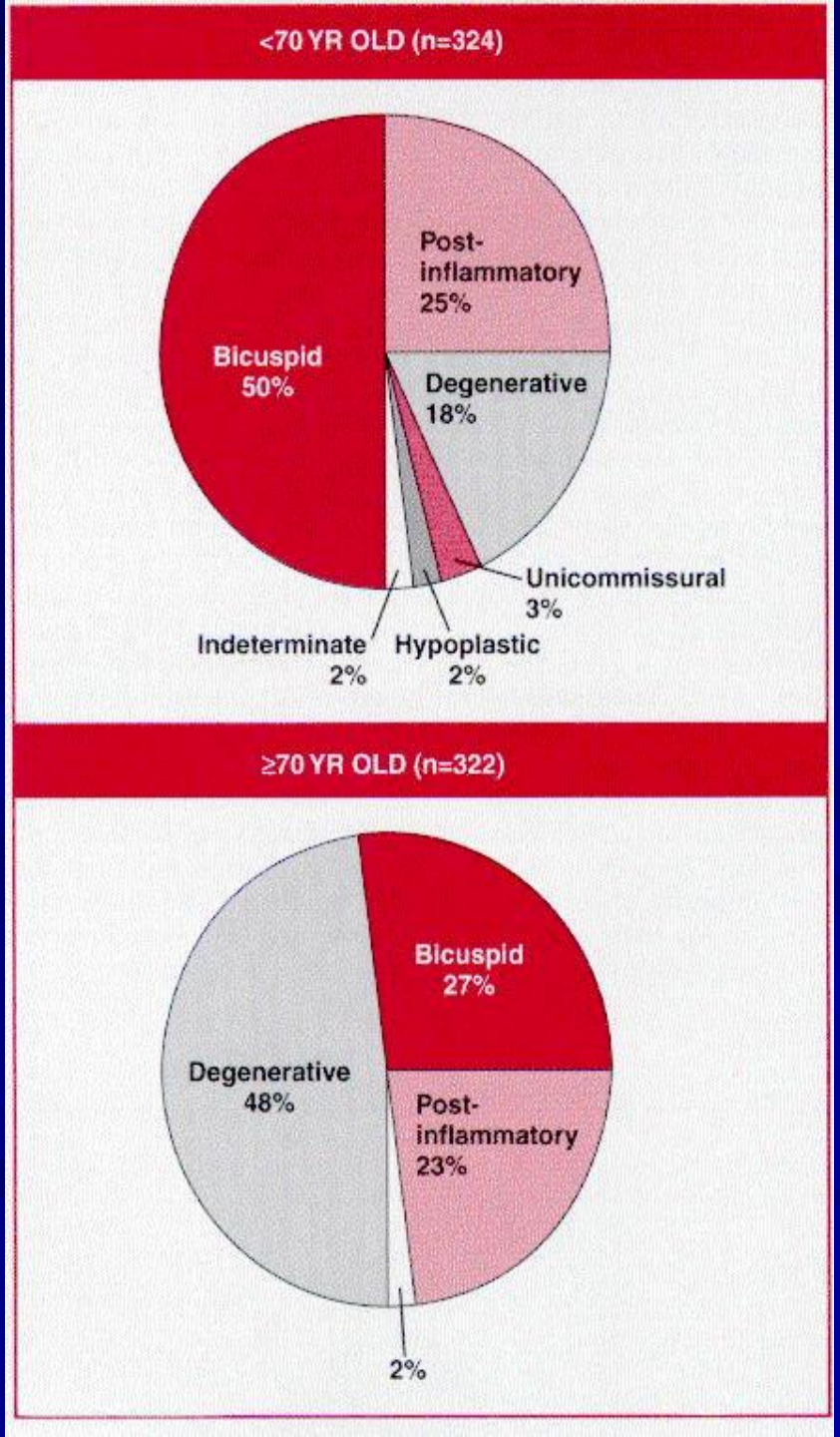
Normal

Bicuspid Aortic Valve





Etiology of



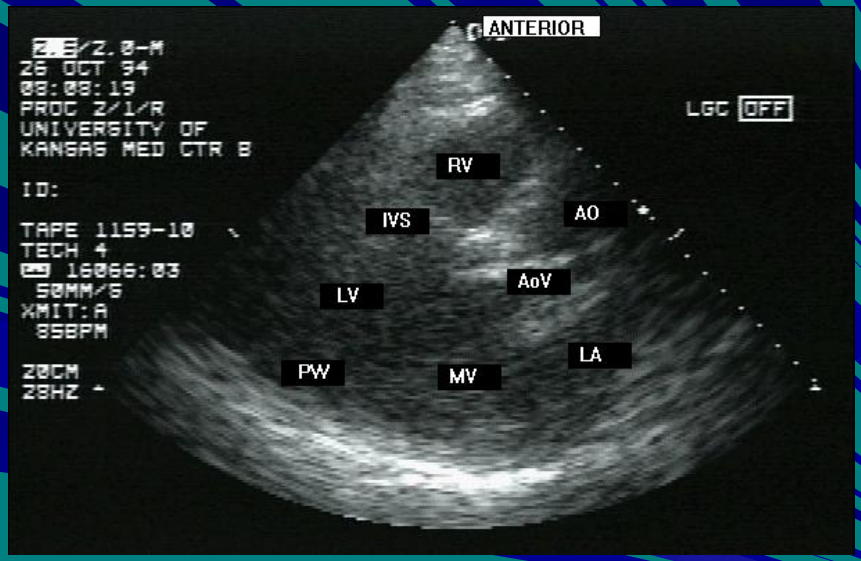
Aortic Stenosis

Severity of Stenosis

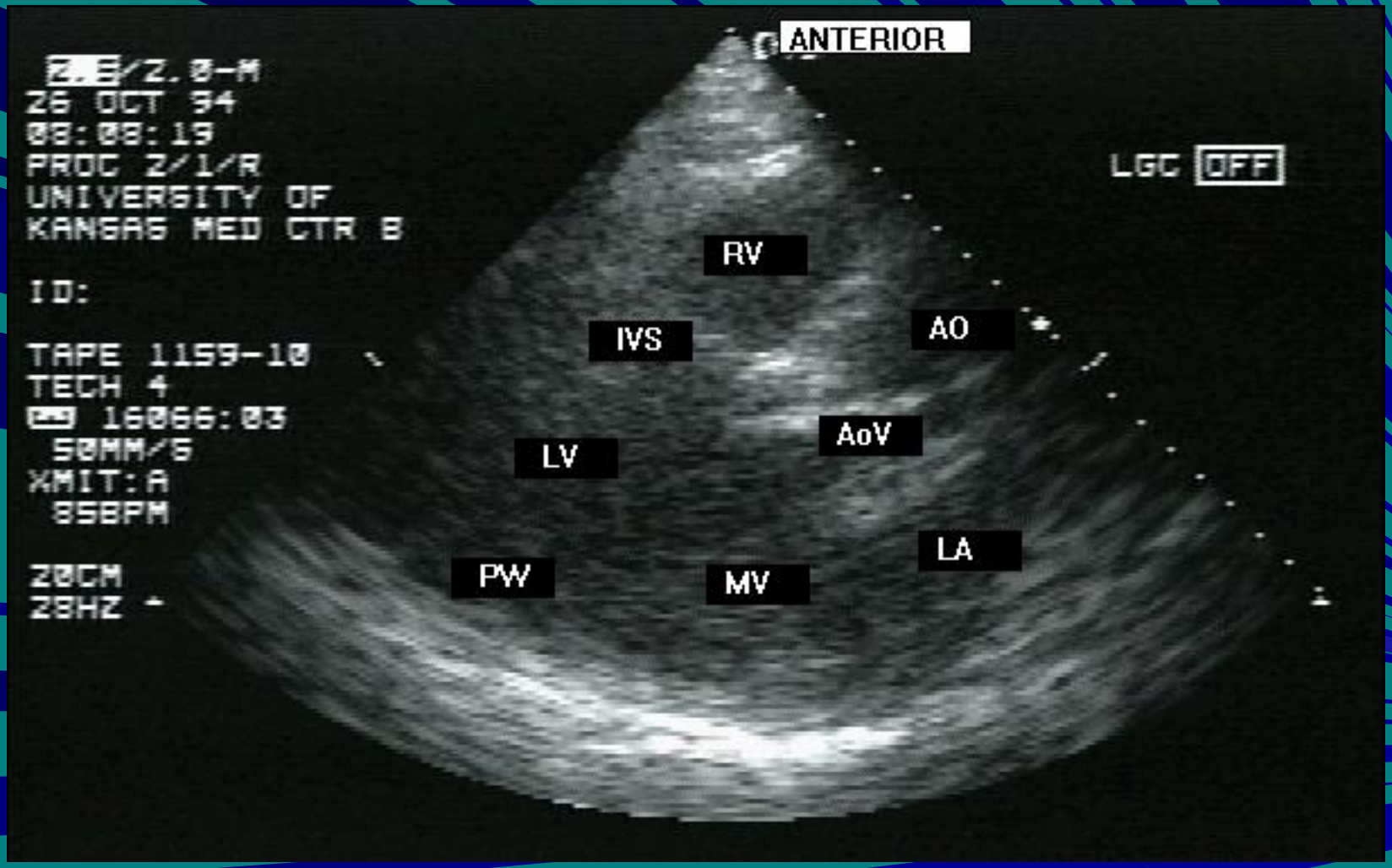
- Normal aortic valve area 2.5-3.5 cm^2
- Mild stenosis 1.5-2.5 cm^2
- Moderate stenosis 1.0-1.5 cm^2
- Severe stenosis < 1.0 cm^2
- Onset of symptoms
  - ~ 0.9 cm^2 with CAD
  - ~ 0.7 cm^2 without CAD

Echocardiogram

- Etiology
- Valve gradient and area
- LVH
- Systolic LV function
- Diastolic LV function
- LA size
- Concomitant regional wall motion abnormalities
- Coarctation associated with bicuspid AV



Echocardiogram



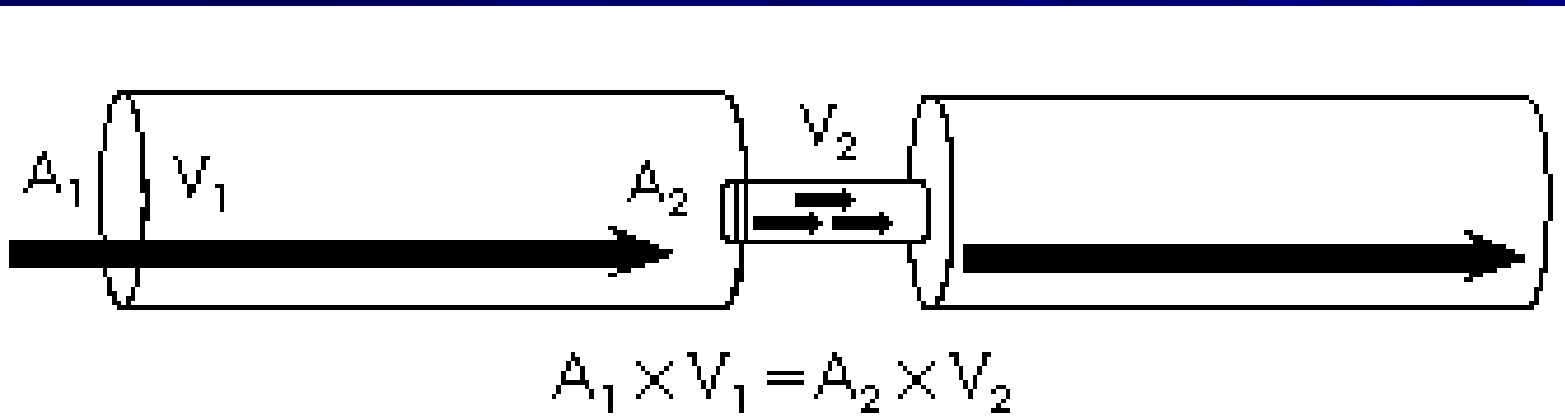


Figure 1: Principles of the Use of Doppler Ultrasonography and the Continuity Equation in Estimating Aortic-Valve Area. For blood flow (A_1 x V_1) to remain constant when it reaches a stenosis (A_2), velocity must increase to V_2. Doppler examination of the stenosis detects the increase in velocity, which can be used to calculate the aortic-valve gradient or to solve the continuity equation for A_2. A denotes area, and V velocity

Aortic Stenosis: Prognosis

Symptom/Sign	Live expectancy
Angina	5 years
Syncope	2-3 years
Congestive Heart Failure	1-2 years

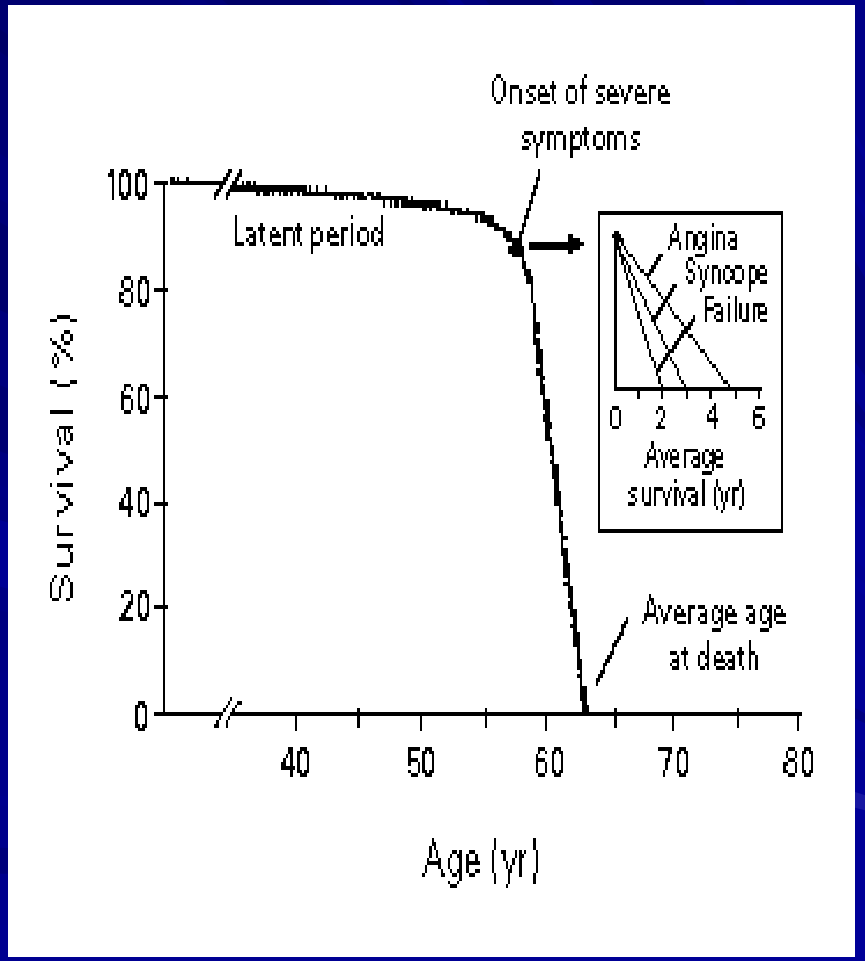
Therapy: Valve replacement for severe symptomatic

Operative mortality (elderly) ~4-8%

Event rate in asymptomatic

Natural History of Aortic Stenosis

- Heart failure reduces life expectancy to less than 2 years
- Angina and syncope reduce life expectancy between 2 and 5 years
- Rate of progression ↓ @ 0.1 cm2/year



Operative mortality of AVR in the elderly

- ~ 4-24%/year
- Risk factors for operative mortality
  - Functional class
  - Lack of sinus rhythm
  - HTN
  - Pre-existing LV dysfunction
  - Aortic regurgitation
  - Concomitant surgical procedures:CABG/MV surgery
  - Previous bypass
  - Emergency surgery
  - CAD
  - Female gender

Prosthetic Heart Valves

Types of Prosthetic Heart Valves

Mechanical

- Caged-ball
  - Starr-Edwards
- Tilting-disc
  - Single-tilting
    - Medtronic-Hall
    - Omniscience
    - Bjork-Shiley
  - Bileaflet-tilting
    - St.Jude

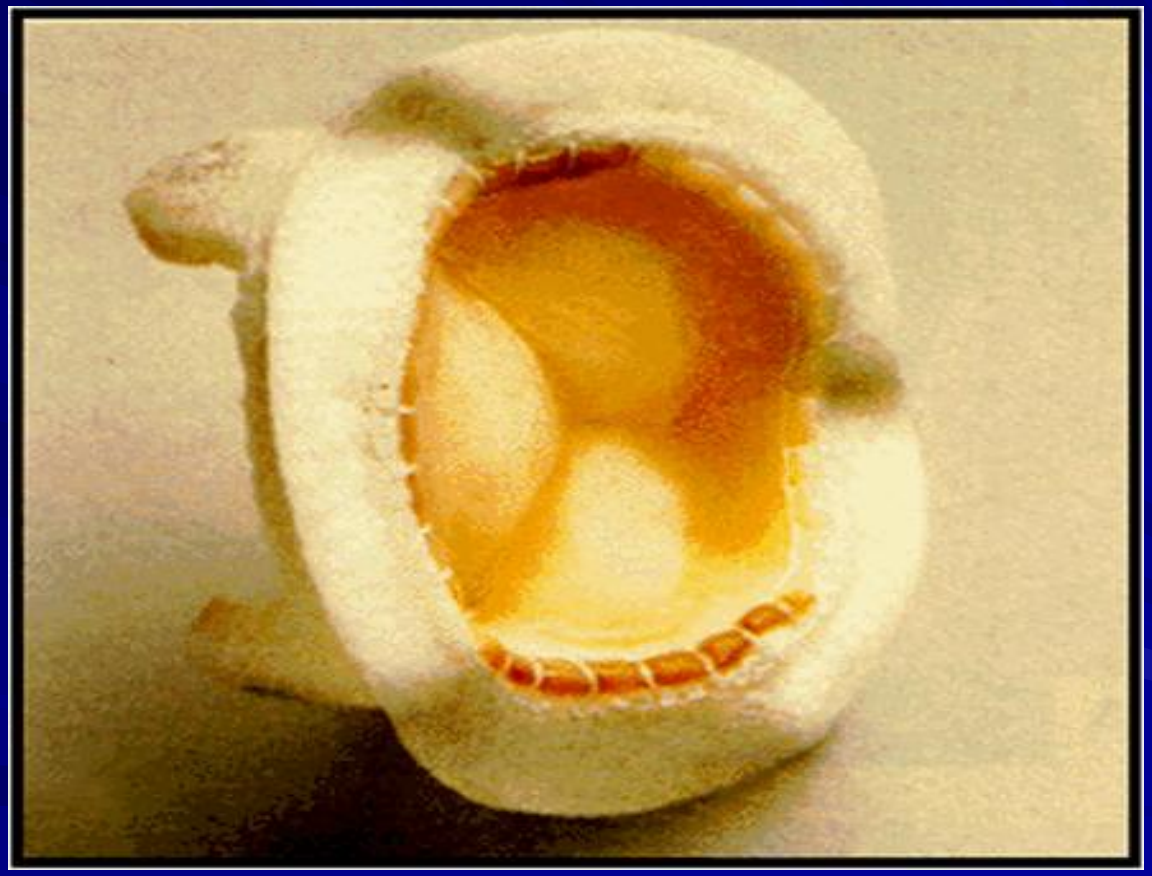
Bioprosthetic

- Heterograft (porcine or bovine)
  - -Porcine aortic valve
    - Carpentier-Edwards
    - Hancock
  - -Bovine pericardial
    - Carpentier-Edwards
  - -Stented valves (porcine)
    - Carpentier-Edwards
    - Hancock
  - -Stentless valves (porcine)
    - Toronto SPV
    - Freestyle
    - CryoLife-O-Brian
- Homograft
  - -Human cadaveric aortic valve

Caged-Ball Valve

Disc Valve

Bio-prosthetic Valve



Prosthetic Valves

- MECHANICAL
  - Durable
  - Large orifice
  - High thromboembolic potential
  - Best in Left Side
  - Chronic warfarin therapy
- BIO-PROSTHETIC
  - Not durable
  - Smaller orifice/functional stenosis
  - Low thromboembolic potential
  - Consider in elderly
  - Best in tricuspid position