

# VALVULAR HEART DISEASE

# Heart murmurs

- ◎ **The production of murmurs is due to 3 main factors:**
  - **high blood flow rate through normal or abnormal orifices**
  - **forward flow through a narrowed or irregular orifice into a dilated vessel or chamber**
  - **backward or regurgitant flow through an incompetent valve, septal defect, or patent ductus arteriosus**

# Heart murmurs

## ◎ Intensity grading:

- 1 is so faint that it is heard only with special effort
- 2 is soft but readily detected
- 3 is prominent but not loud
- 4 is loud (and usually palpable)
- 5 is very loud
- 6 murmur is loud enough to be heard with the stethoscope just removed from contact with the chest wall

# Heart murmurs

- ⦿ **Systolic murmur begins with or after the first heart sound and ends at or before the subsequent second heart sound**
- ⦿ **Diastolic murmur begins with or after the second heart sound and ends before the subsequent first heart sound**
- ⦿ **Continuous murmur begins in systole and continues without interruption through the timing of the second heart sound into all or part of diastole**

# Heart murmurs

- **Most systolic heart murmurs do not signify cardiac disease, and many are related to physiological increases in blood flow velocity**
- **Diastolic and continuous murmurs virtually always represent pathological conditions and require further cardiac evaluation**

PRESENCE OF CARDIAC MURMUR

SYSTOLIC MURMUR

DIASTOLIC OR CONTINUOUS MURMUR

Grade 1 plus 2  
and midsystolic

Grade 3 or higher  
holosystolic or  
late systolic

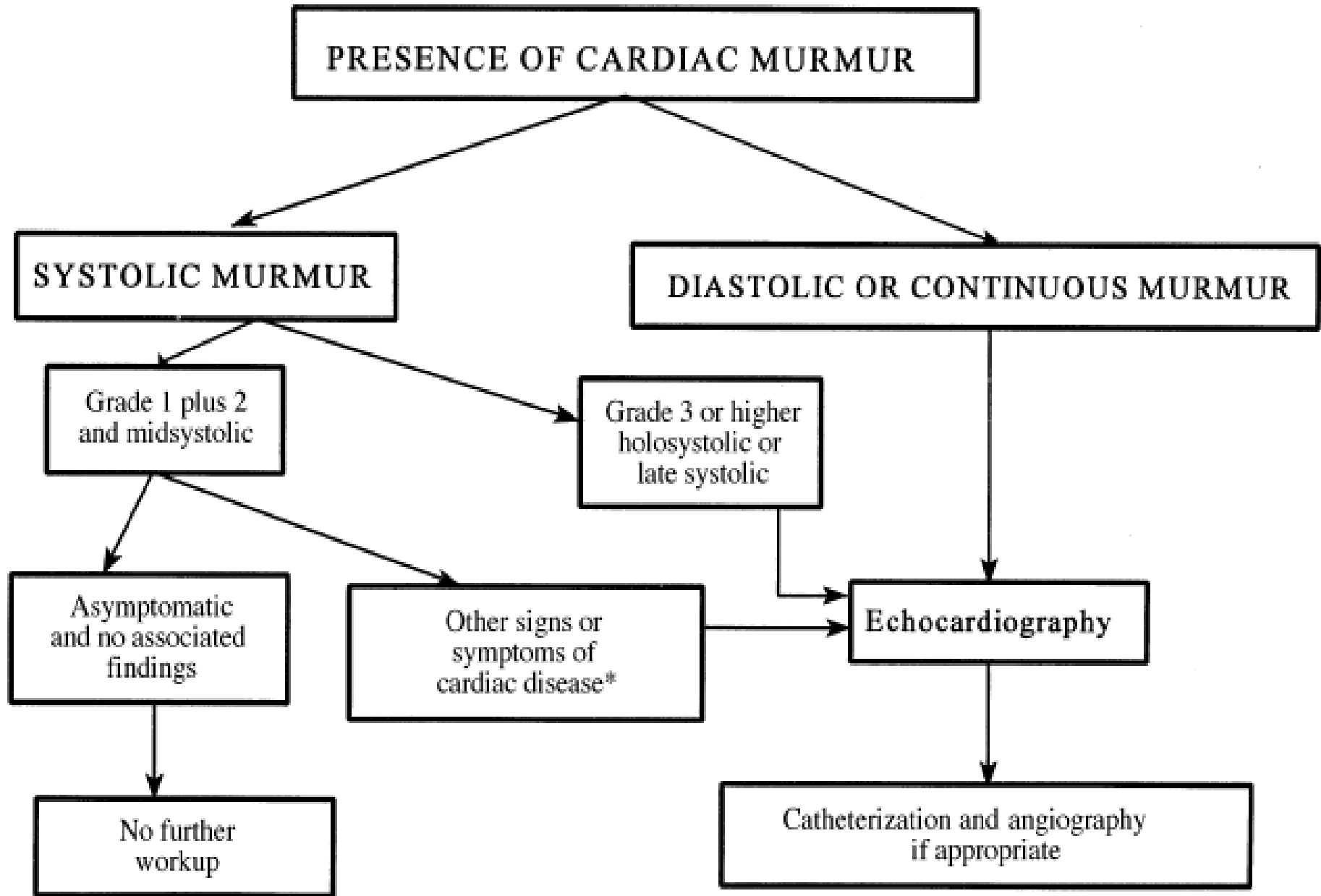
Asymptomatic  
and no associated  
findings

Other signs or  
symptoms of  
cardiac disease\*

Echocardiography

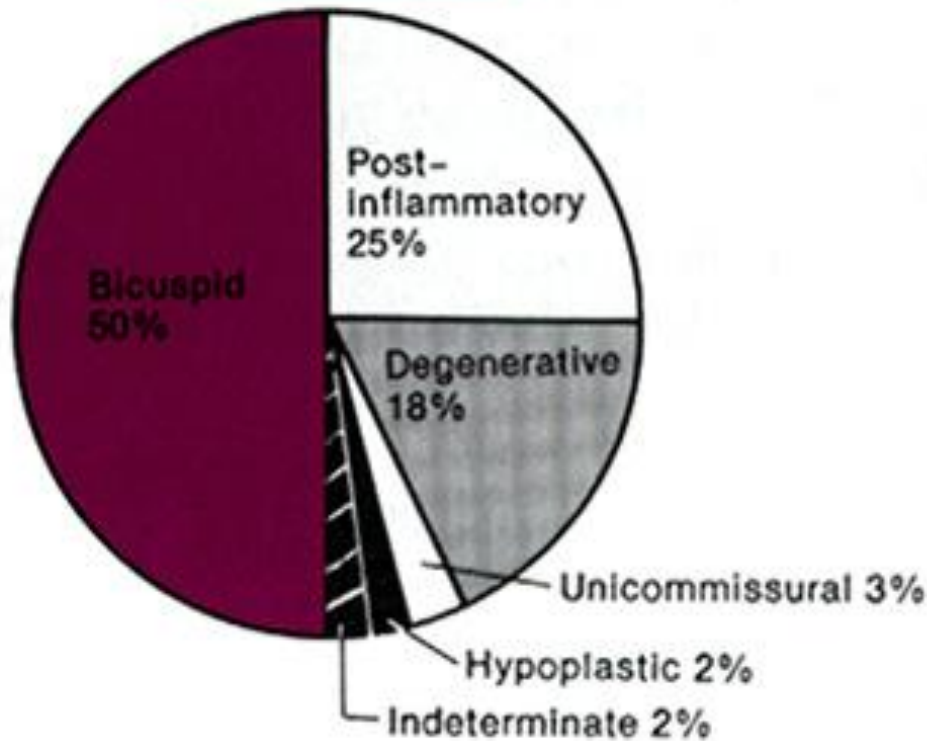
No further  
workup

Catheterization and angiography  
if appropriate

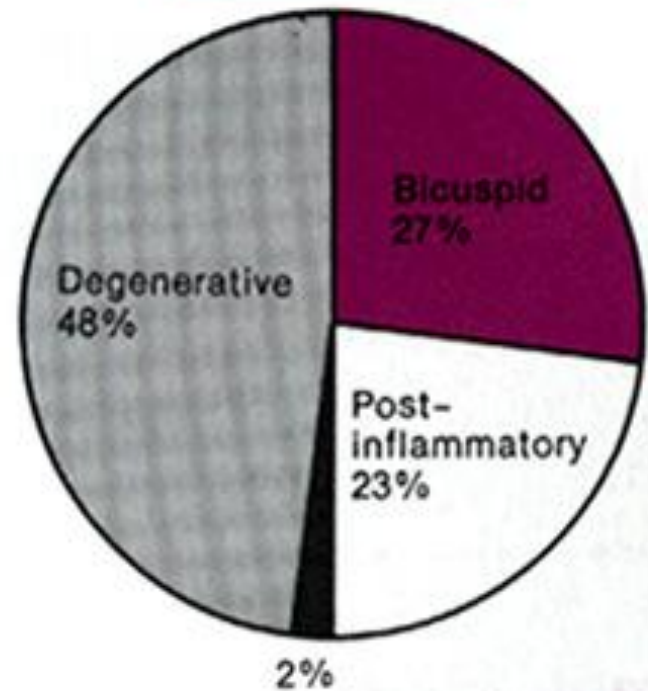


# Aortic stenosis (AS) – etiology

< 70 yr old  
(n = 324)



≥ 70 yr old  
(n = 322)



# Aortic stenosis

- ⦿ normal adult valve orifice is 3.0 to 4.0 cm<sup>2</sup>
- ⦿ aortic valve area must be reduced to  $\frac{1}{4}$  its normal size before significant changes in the circulation occur
- ⦿ Classification
  - mild: area  $>1.5\text{cm}^2$
  - moderate: area 1.0 to 1.5 cm<sup>2</sup>
  - severe: area  $<1.0\text{ cm}^2$
- ⦿ In severe stenosis the mean transvalvular pressure gradient is generally  $>50\text{ mmHg}$

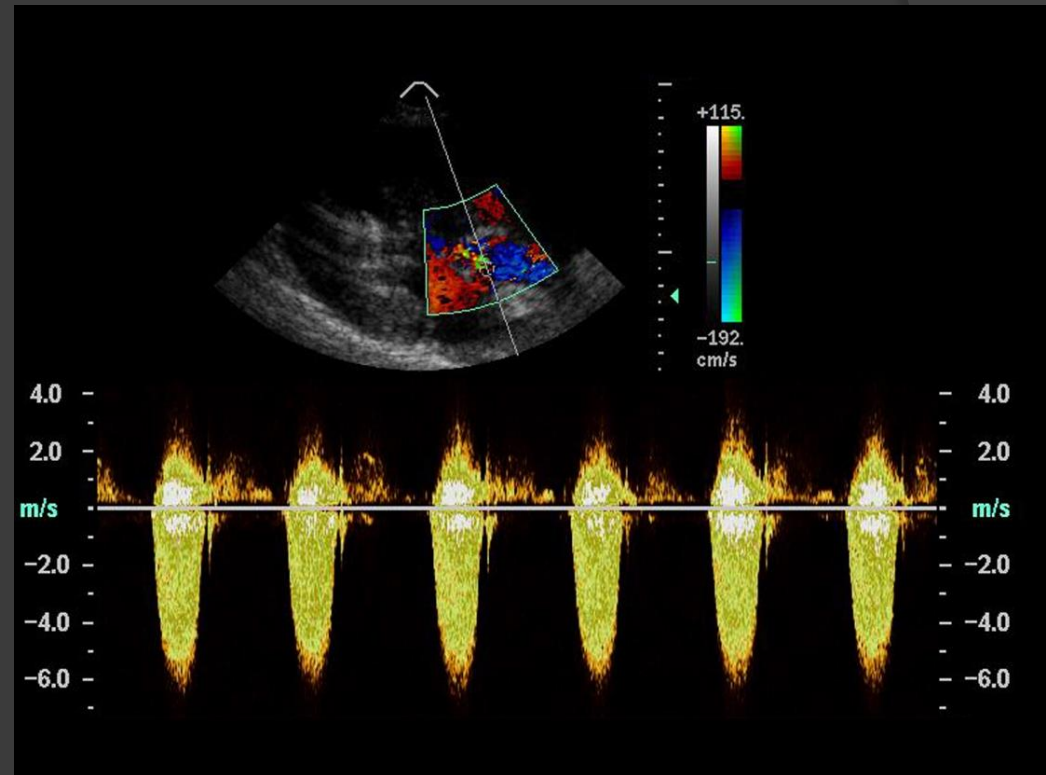
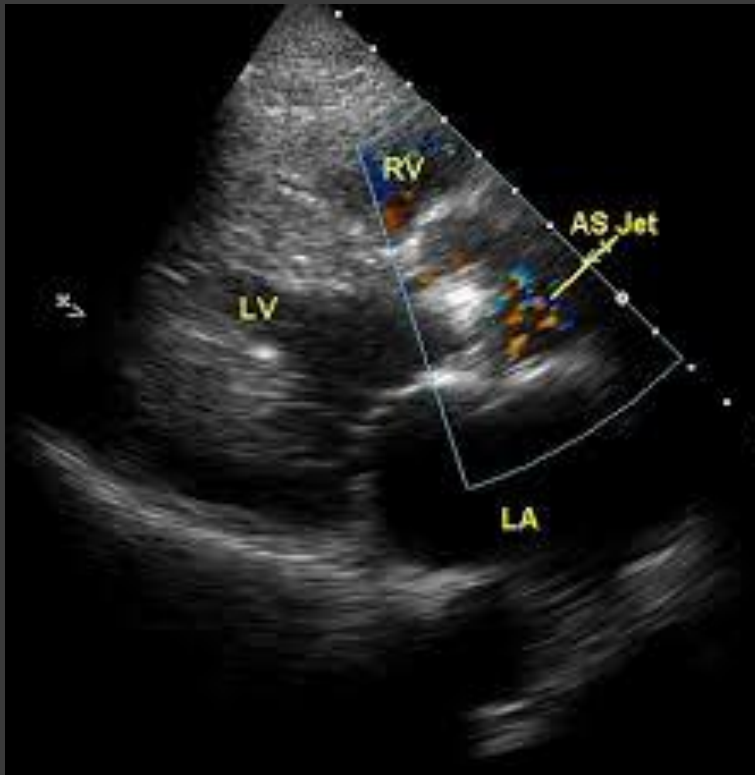


# Aortic stenosis

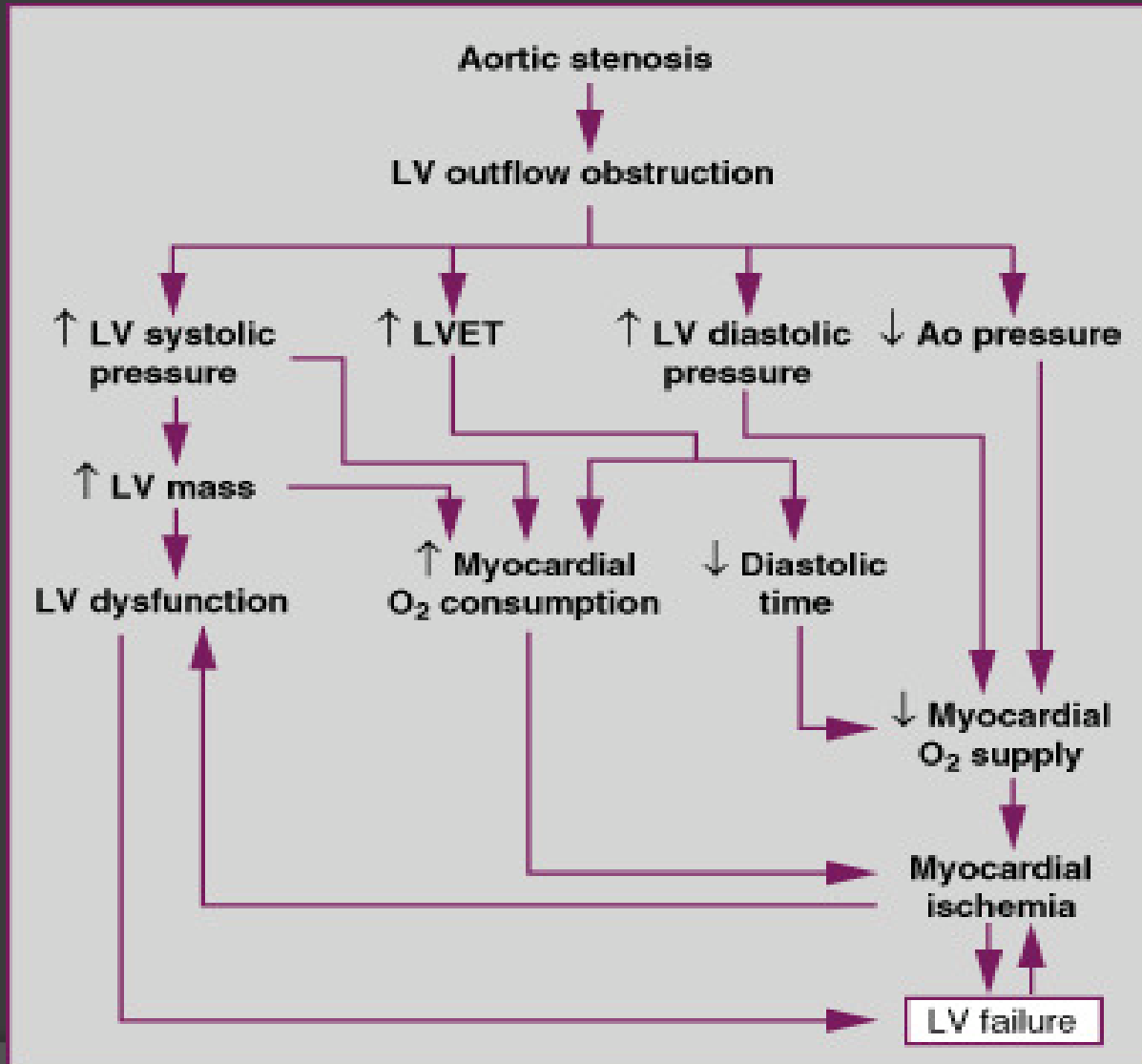
**Table 4** Echocardiographic criteria for the definition of severe valve stenosis: an integrative approach

	Aortic stenosis	Mitral stenosis	Tricuspid stenosis
Valve area (cm <sup>2</sup> )	<1.0	<1.0	-
Indexed valve area (cm <sup>2</sup> /m <sup>2</sup> BSA)	<0.6	-	-
Mean gradient (mmHg)	>40 <sup>a</sup>	>10 <sup>b</sup>	≥5
Maximum jet velocity (m/s)	>4.0 <sup>a</sup>	-	-
Velocity ratio	<0.25	-	-

# Aortic stenosis



# AS - pathophysiology

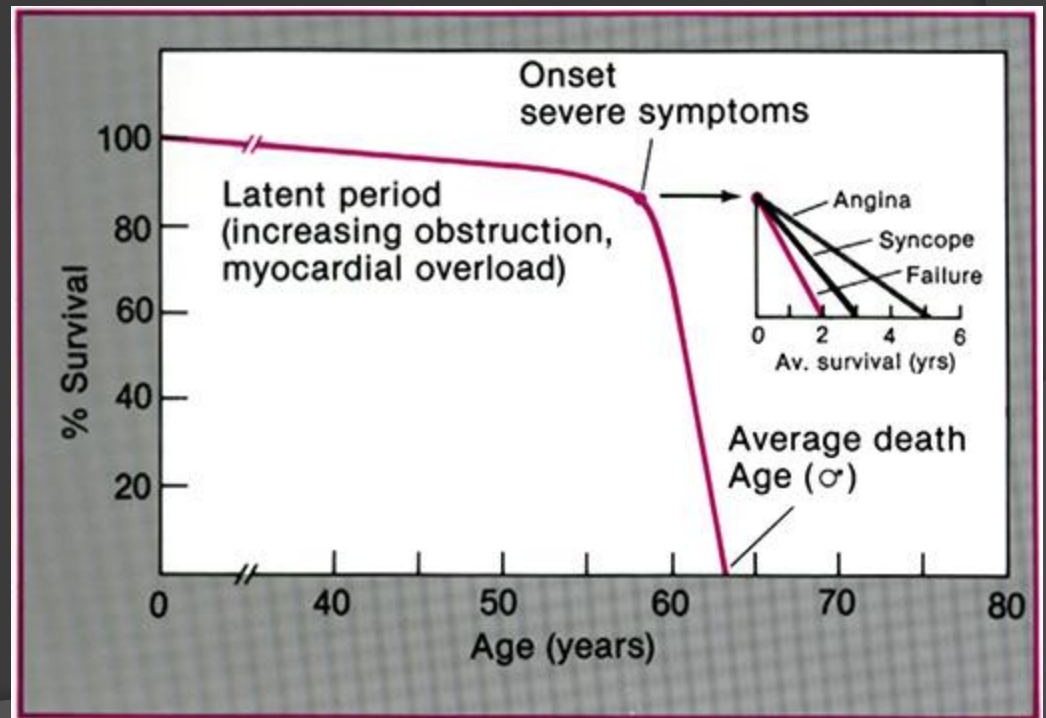


# AS – clinical manifestations

- ⦿ a long latent, asymptomatic period
- ⦿ cardinal symptoms: angina pectoris, syncope, heart failure
- ⦿ the arterial pulse rises slowly and is small and sustained (pulsus parvus et tardus)
- ⦿ the systolic murmur of AS
  - late-peaking
  - heard best at the base of the heart
  - often well transmitted along the carotid vessels and to the apex

# AS – natural history


- asymptomatic patients have an excellent prognosis
  - once patients with AS become symptomatic with angina or syncope, the average survival is 2 to 3 years, whereas with congestive heart failure it is 1.5 years



# AS - treatment

- ① aortic valve replacement
- ① transcatheter aortic valve implantation
- ① balloon aortic valvuloplasty

# AS - treatment

Patient related factors			Cardiac related factors		
Age <sup>1</sup> (years)	<input type="text" value="64"/>	<input type="text" value="0.14"/>	NYHA	<input type="text" value="III"/>	<input type="text" value="2958358"/>
Gender	<input type="text" value="female"/>	<input type="text" value=".2196434"/>	CCS class 4 angina <sup>8</sup>	<input type="text" value="no"/>	<input type="text" value="0"/>
Renal impairment <sup>2</sup> <i>See calculator below for creatinine clearance</i>	<input type="text" value="normal (CC &gt;85ml/min)"/>	<input type="text" value="0"/>	LV function	<input type="text" value="very poor (LVEF 20% or less)"/>	<input type="text" value="9346919"/>
Extracardiac arteriopathy <sup>3</sup>	<input type="text" value="no"/>	<input type="text" value="0"/>	Recent MI <sup>9</sup>	<input type="text" value="yes"/>	<input type="text" value="1528943"/>
Poor mobility <sup>4</sup>	<input type="text" value="yes"/>	<input type="text" value=".2407181"/>	Pulmonary hypertension <sup>10</sup>	<input type="text" value="severe (PA systolic &gt;55 mmHg)"/>	<input type="text" value="3491475"/>
Previous cardiac surgery	<input type="text" value="no"/>	<input type="text" value="0"/>	Operation related factors		
Chronic lung disease <sup>5</sup>	<input type="text" value="no"/>	<input type="text" value="0"/>	Urgency <sup>11</sup>	<input type="text" value="elective"/>	<input type="text" value="0"/>
Active endocarditis <sup>6</sup>	<input type="text" value="no"/>	<input type="text" value="0"/>	Weight of the intervention <sup>12</sup>	<input type="text" value="2 procedures"/>	<input type="text" value="5521478"/>
Critical preoperative state <sup>7</sup>	<input type="text" value="no"/>	<input type="text" value="0"/>	Surgery on thoracic aorta	<input type="text" value="no"/>	<input type="text" value="0"/>
Diabetes on insulin	<input type="text" value="yes"/>	<input type="text" value=".3542749"/>			
EuroSCORE II <input type="text" value=""/>	<input type="text" value="11.08 %"/>				
<b>EuroSCORE II</b>					
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# Aortic Regurgitation (AR) - etiology

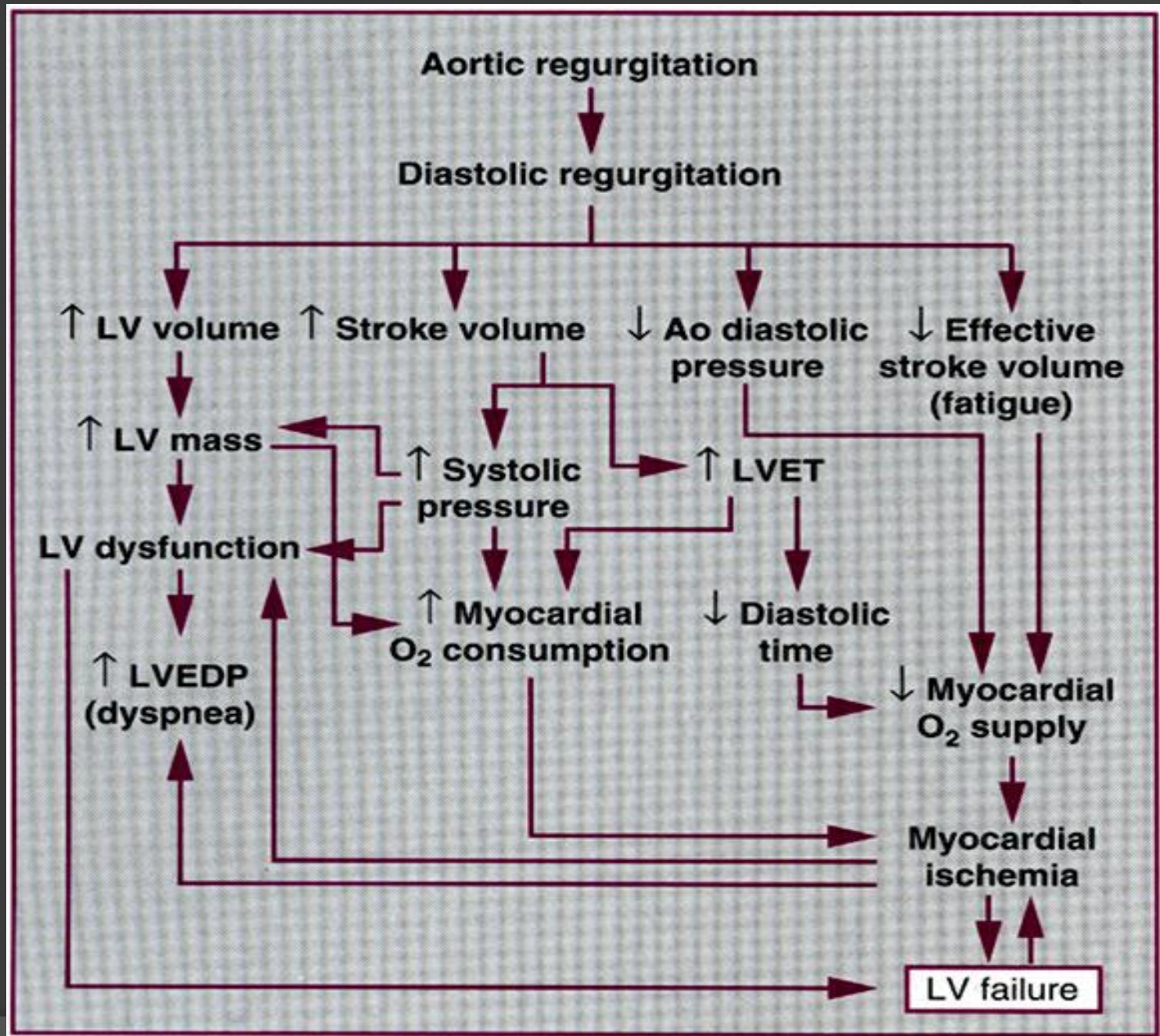
## ⦿ Valvular disease

- Rheumatic fever
- Concomitant with aortic stenosis
- Infective endocarditis
- Bicuspid valve

## ⦿ Aortic root disease

- Age related aortic dilatation
- Marfan syndrome
- Aortic dissection





# Clinical manifestations – history of AR

- ① most patients remain asymptomatic
- ① exertional dyspnea
- ① orthopnea and paroxysmal nocturnal dyspnea
- ① angina pectoris – the late sign
- ① „Uncomfortable awareness of the heartbeat”

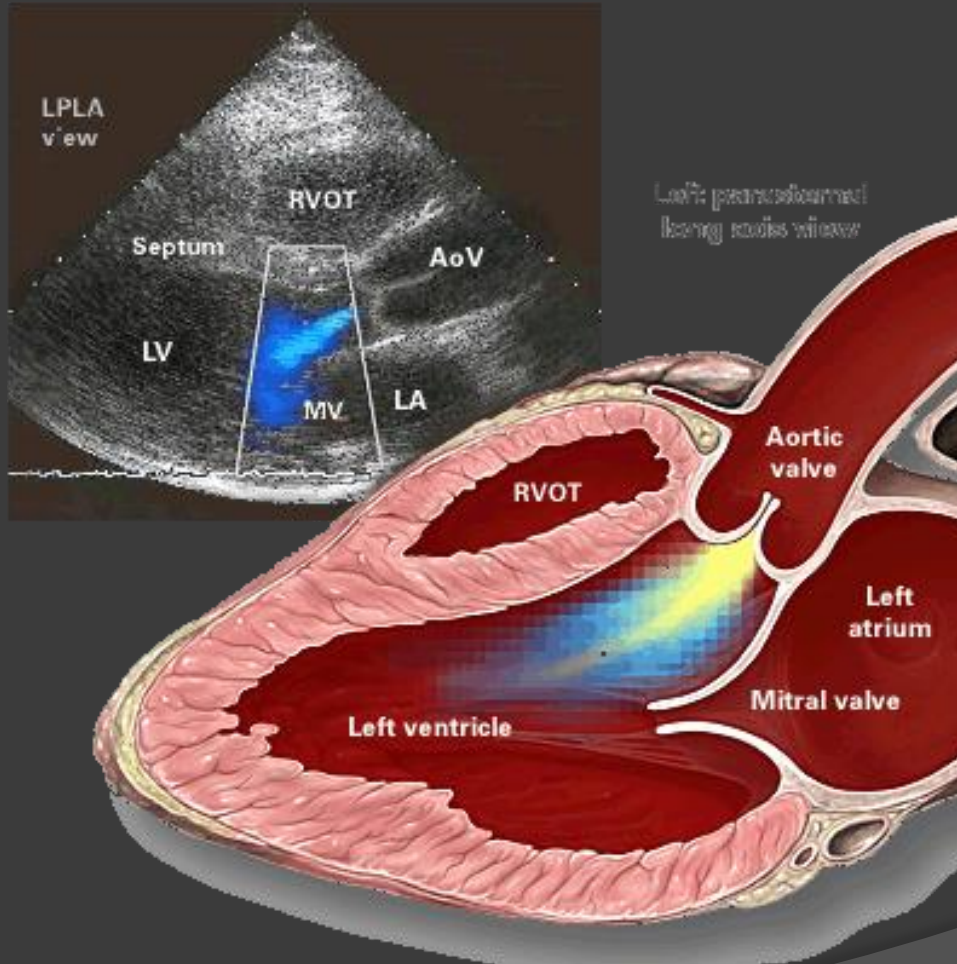
# Clinical manifestations – physical examination

- ⦿ ↑ systolic blood pressure
- ⦿ ↓ diastolic blood pressure
- ⦿ hyperdynamic, diffuse apical impulse
- ⦿ diastolic murmur

# Clinical manifestations – physical examination

- ⦿ **De Musset sign** - head nodding in time with the heart beat
- ⦿ **Corrigan pulse (water-hammer)** - rapid upstroke and collapse of the carotid artery pulse
- ⦿ **Muller sign** - pulsations of uvula

# AR - workup



# Prognosis

- ⊙ **Relatively good prognosis (asymptomatic patients with moderate severe AR):**
  - 75% survive 5 years
  - 50% survive 10 years
- ⊙ **In symptomatic patients**
  - Angina pectoris – expected survival: 4 years
  - Heart failure – expected survival: 2 years

# Treatment

- ① Aortic valve replacement
- ① Correction of dilated aortic root

# Mitral stenosis (MS) – etiology

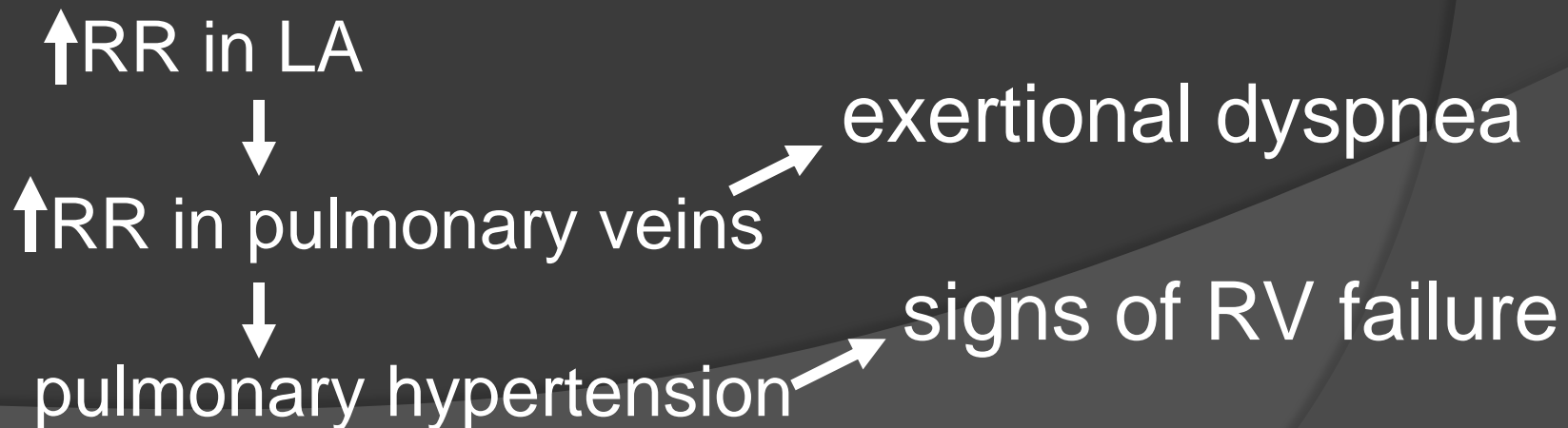
- **RHEUMATIC FEVER !!!**

- **Congenital**



# MS – Pathophysiology

- ⦿ Normal mitral orifice: 4-6cm<sup>2</sup>
- ⦿ 2cm<sup>2</sup> – mild MS
- ⦿ 1cm<sup>2</sup> – critical MS -> pressure of 25mmHg in left atrium is required to maintain normal cardiac output



# MS – history

- ⦿ **exertional dyspnea**
- ⦿ **risk of pulmonary edema**
- ⦿ **hemoptysis**
- ⦿ **angina-like chest pain**
- ⦿ **systemic embolisation (mainly in patients with atrial fibrillation)**

# MS – physical examination

- mitral facies (pinkish-purple patches on the cheeks)
- accentuation of S1
- diastolic murmur, best heard at the apex, radiating to the left axilla
- RV failure

# Treatment

- ① **medical – anticoagulant therapy**
- ① **valvotomy**
  - **Surgical**
  - **Balloon mitral valvuloplasty**
- ① **mitral valve replacement**

# Treatment – anticoagulant therapy

Anticoagulant therapy with a target INR in the upper half of the range **2 to 3** is indicated in patients with either permanent or paroxysmal **AF**. In patients with sinus rhythm, anticoagulation is indicated when there has been prior embolism, or a thrombus is present in the left atrium (recommendation class I, level of evidence C) and should also be considered when TOE shows dense spontaneous echo contrast or an enlarged left atrium (M-mode diameter 50 mm or LA volume 60 ml/m<sup>2</sup> (recommendation class IIa, level of evidence C)

# Mitral regurgitation (MR) - etiology

- ⦿ **chronic rheumatic heart disease**
- ⦿ **secondary to dilation of LV**
- ⦿ **degenerative calcification of the mitral valves**
- ⦿ **dysfunction of the papillary muscles**

# MR – history

- ⦿ **chronic weakness and fatigue (secondary to a low cardiac output) are more prominent features in MR**
- ⦿ **History is like in MS, but less dramatic**
  - **acute pulmonary edema occurs less frequently**
  - **hemoptysis and systemic embolisation are less common**
  - **the development of atrial fibrillation affects the course adversely but not as dramatically as it does in MS**

# MR – physical examination

- ⦿ **holosystolic murmur:**
- ⦿ **usually constant in intensity**
- ⦿ **blowing**
- ⦿ **loudest at the apex with radiation to the axilla**



# MR – Treatment

- ◎ **the reconstructive procedures**
  - **annuloplasty (with the use of a rigid or a flexible prosthetic ring)**
  - **reconstruction of the valve**
  - **repair of the subvalvular apparatus: replacement, reimplantation, elongation or shortening of chordae tendineae, splitting of the papillary muscle**
- ◎ **mitral valve replacement**

# Mitral valve prolapse (MVP)

- **Affects 3 to 5% of the population**
- **Usually a primary condition**
- **A large majority of patients are asymptomatic**
- **Patients may complain of syncope, presyncope, palpitations, chest discomfort**
- **The auscultatory finding: systolic click**

# MVP

- ⦿ **Echocardiography confirms the diagnosis**
- ⦿ **Sometimes coexist mild MR**
- ⦿ **Progressive MR is the most frequent serious complication (10-15%)**
- ⦿ **Asymptomatic patients without evidence of MR have an excellent prognosis**
- ⦿ **Patients with MVP and severe MR should be treated as are other patients with severe MR**