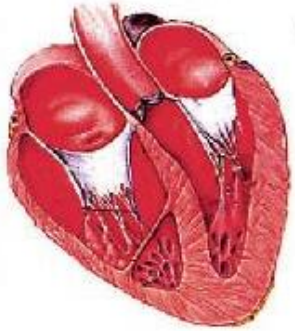
HEART DISEASES
(2)

Pavel Maruna

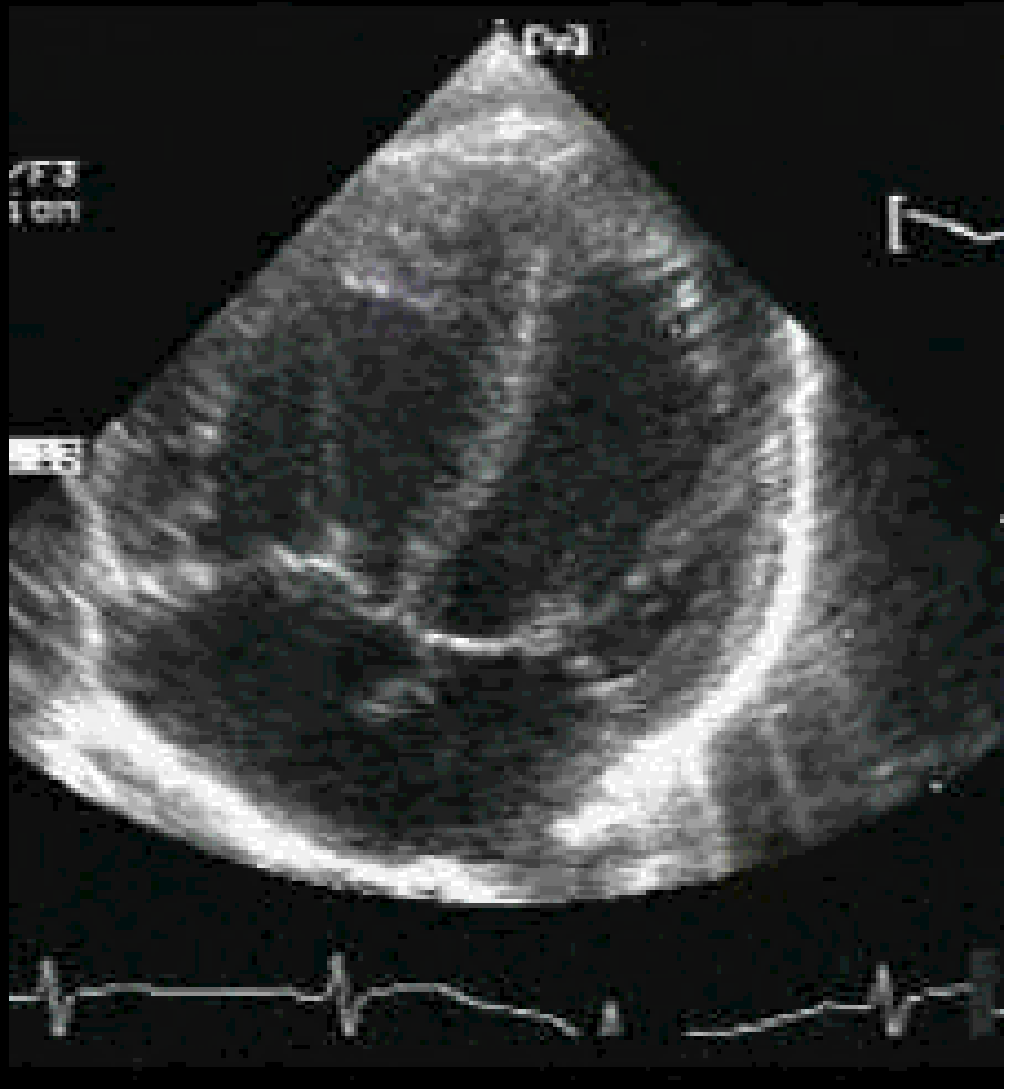


Echocardiography

2D image

1D (Doppler)

2D + colour Doppler



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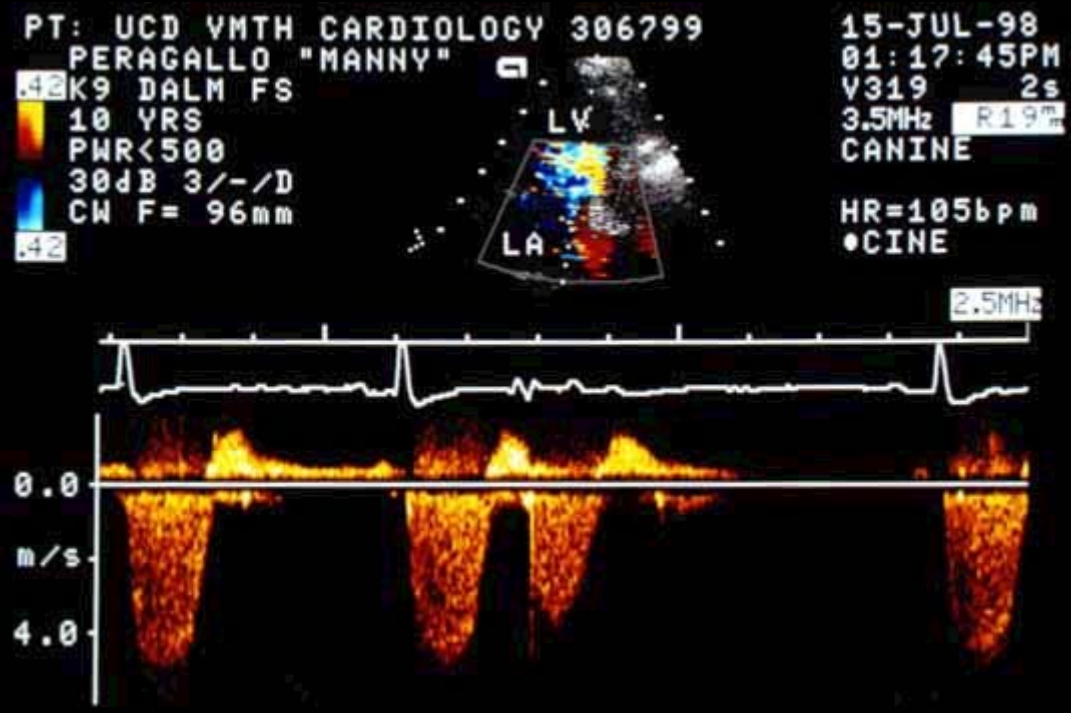

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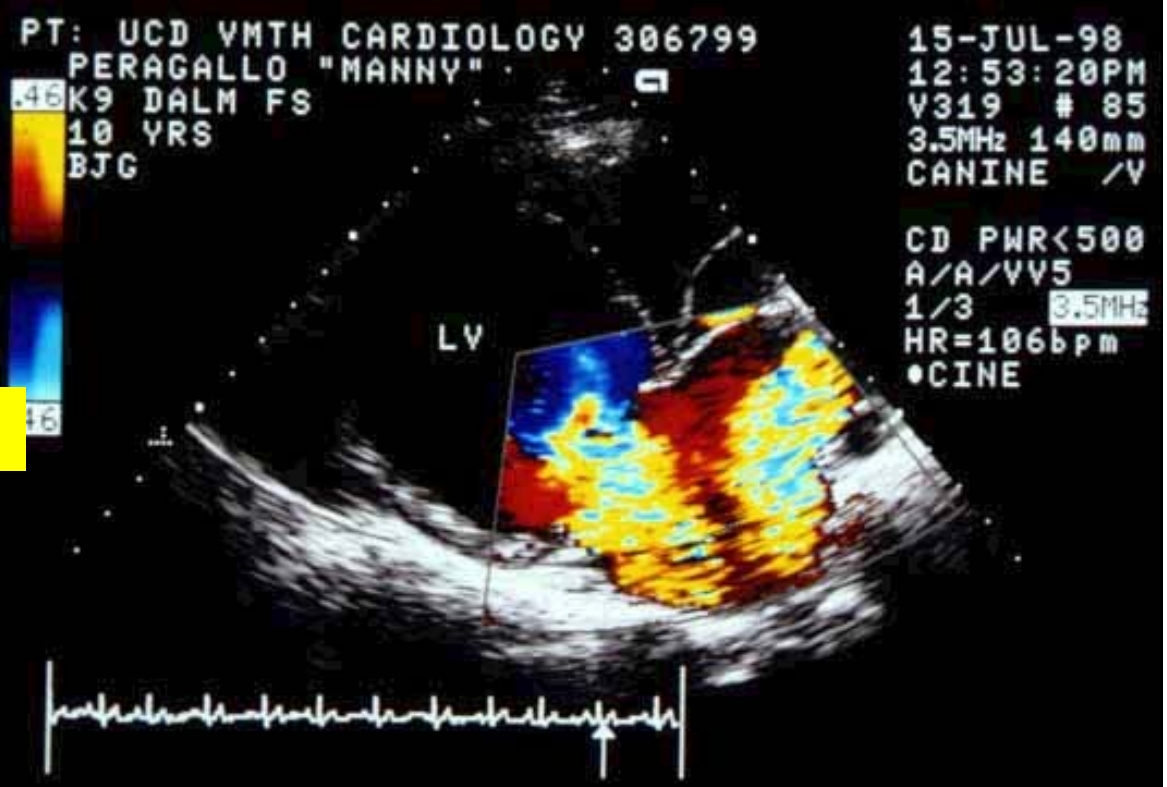
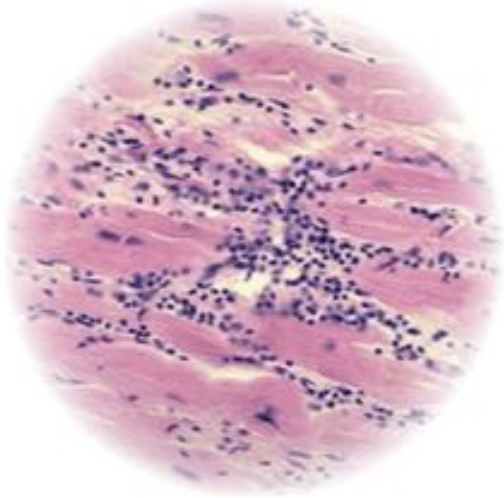


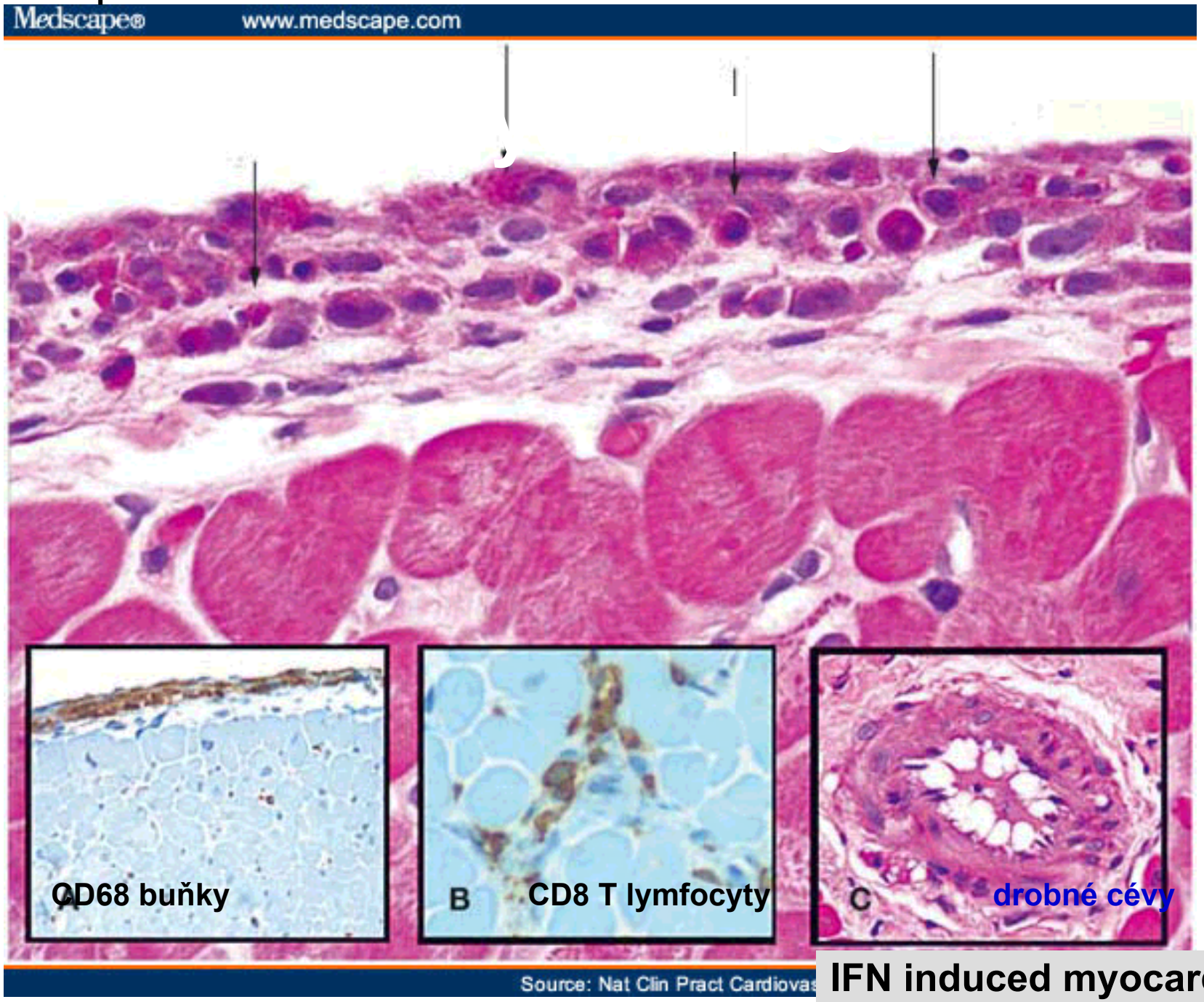
Myocarditis

Etiology: infection + (auto)immunity

- rheumatoid fever
- diphteria
- streptococcal infection
- mycoplasma
- salmonelosis
- Weil dis. (leptospirosis)
- ricketsia
- influensa, polio, parotitis, CMV
- Chagas dis. (trp. crusii)
- systemic dis. of connective tissue
- immunocomplex. vasculititis
- Fiedler idiopatic myocarditis (virosis ?)

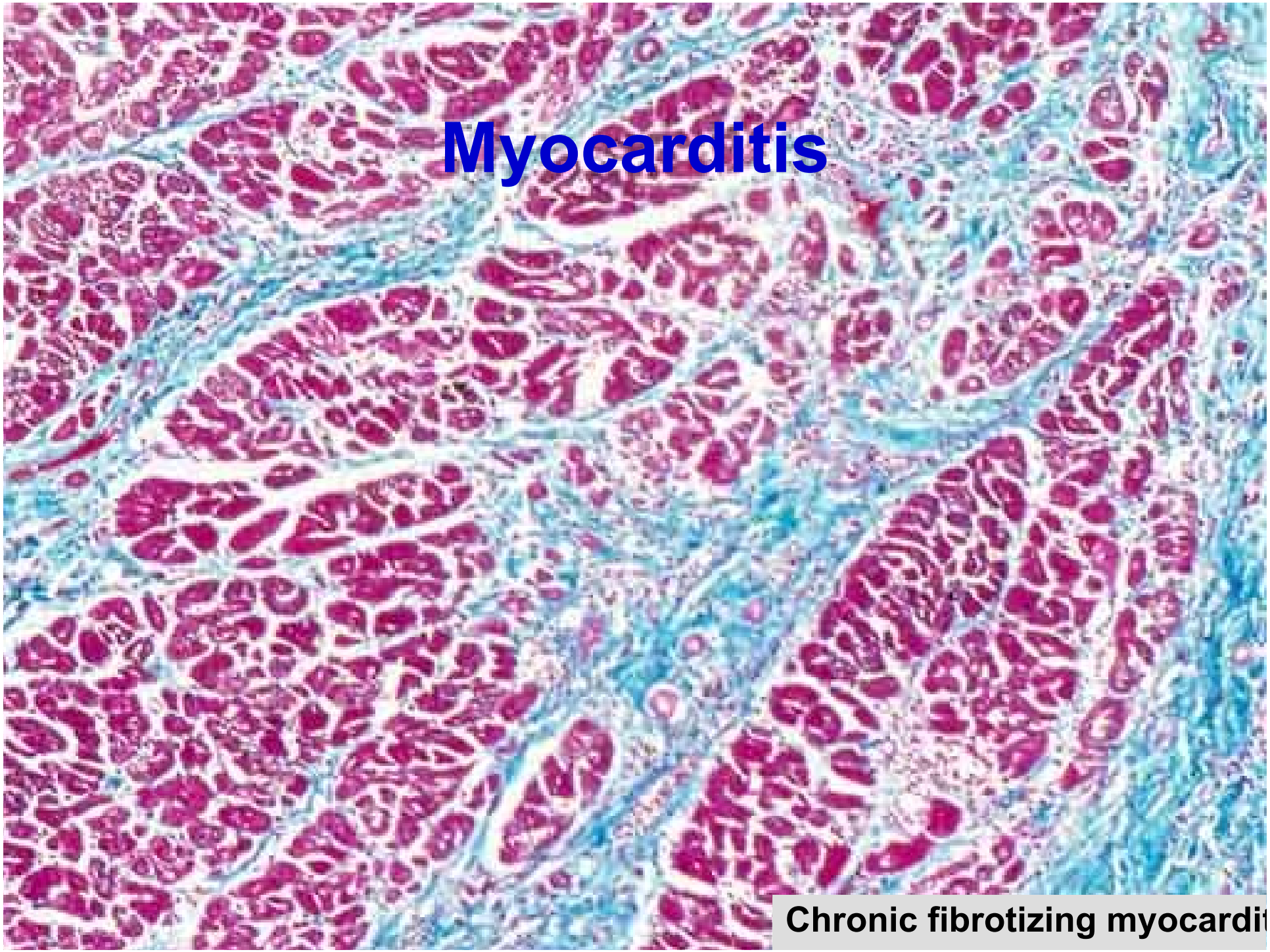


Eosinophil and mononuclear infiltration



IFN induced myocarditis

Myocarditis



Chronic fibrotizing myocardit

Myocarditis

Giant cell myoc

Myocarditis

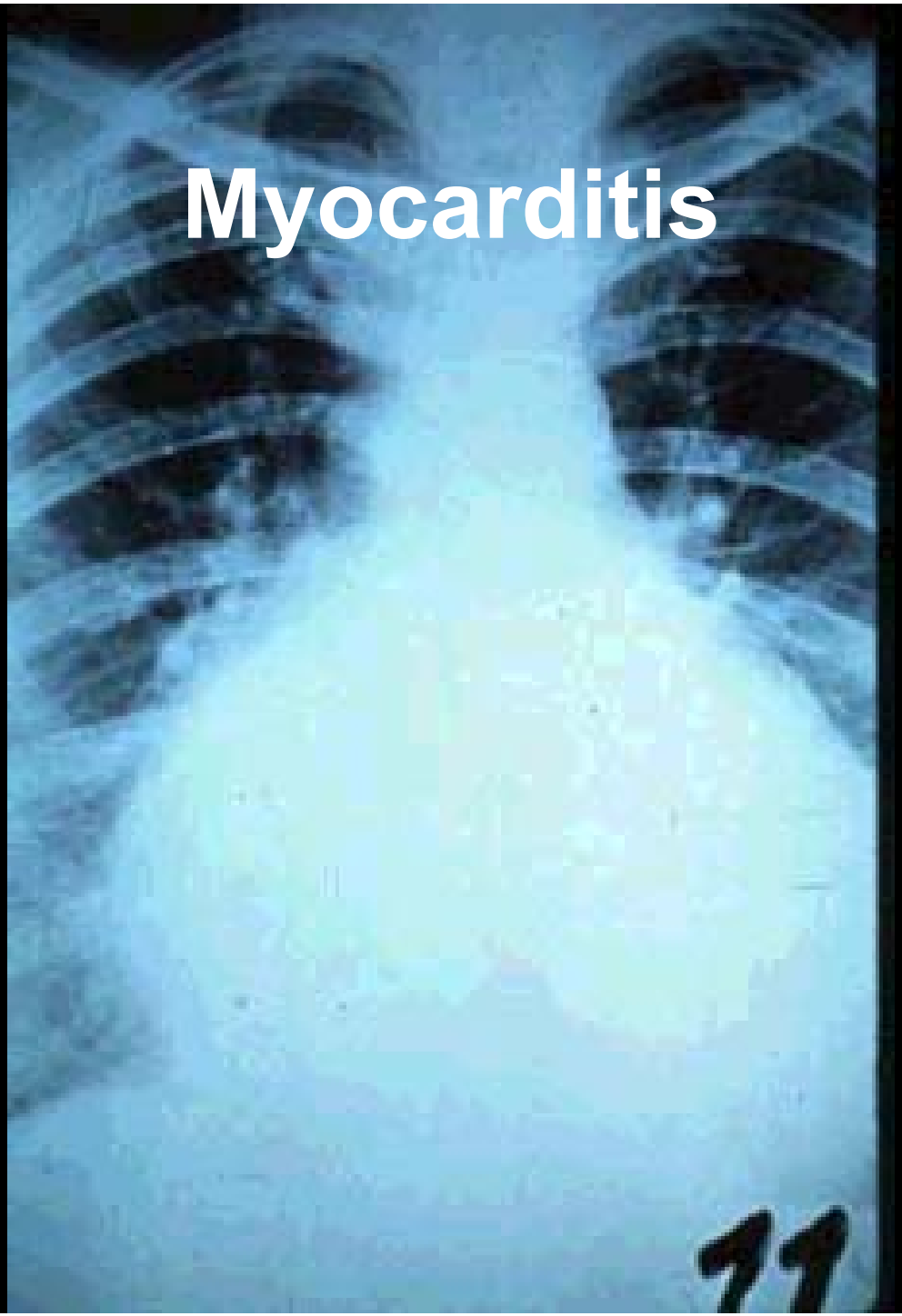
Manifestation:

- ♥ asymptotic
- ♥ chest pain, dyspnoe, palpitation
- ♥ arrhythmia
- ♥ cardiac failure
- ♥ ECG: variable finding (PQ int., ST-T, blocks), "myocarditic curve"

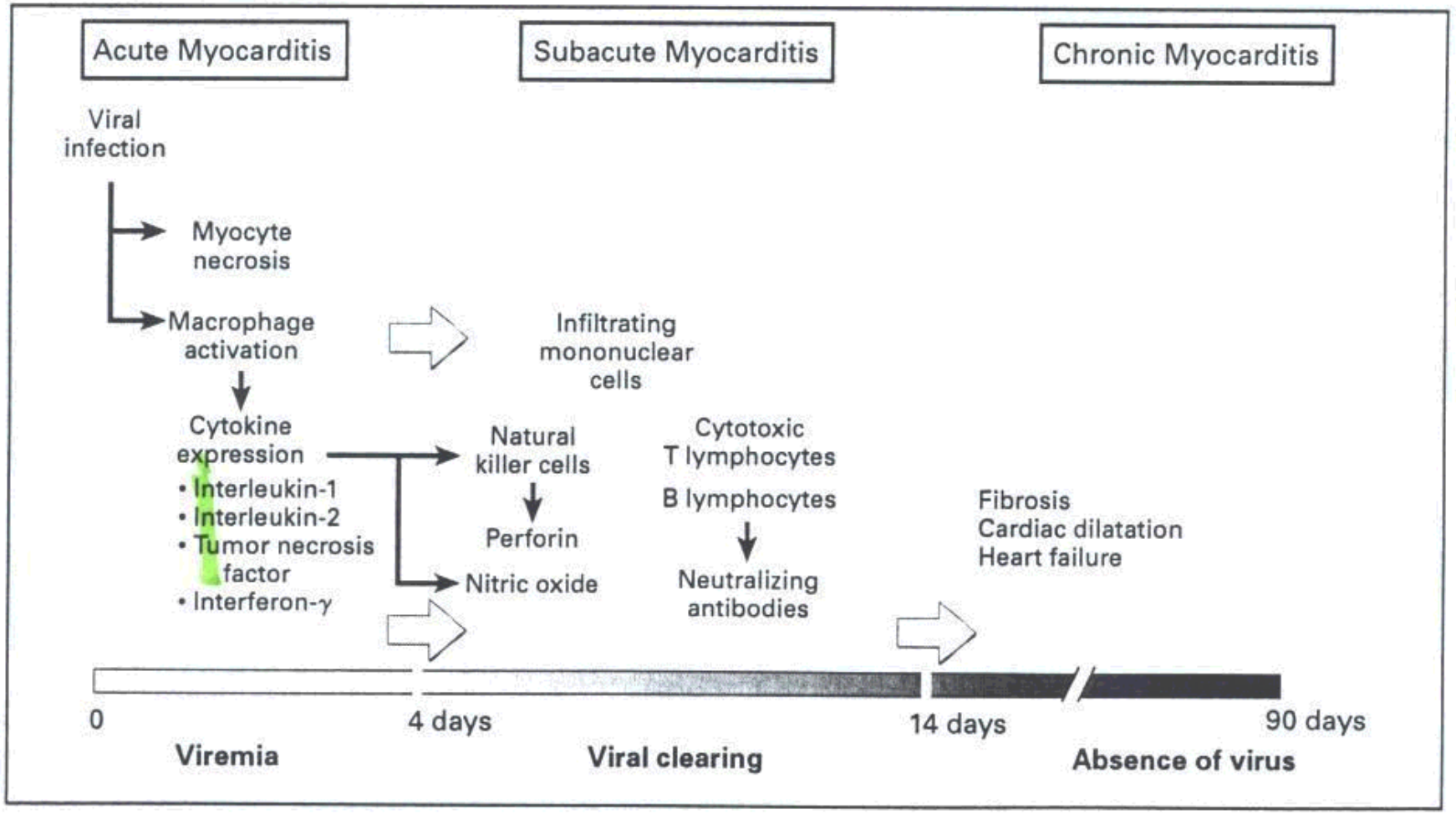
Diagnosis:

difficult – echocardiography

Myocarditis



Myocarditis

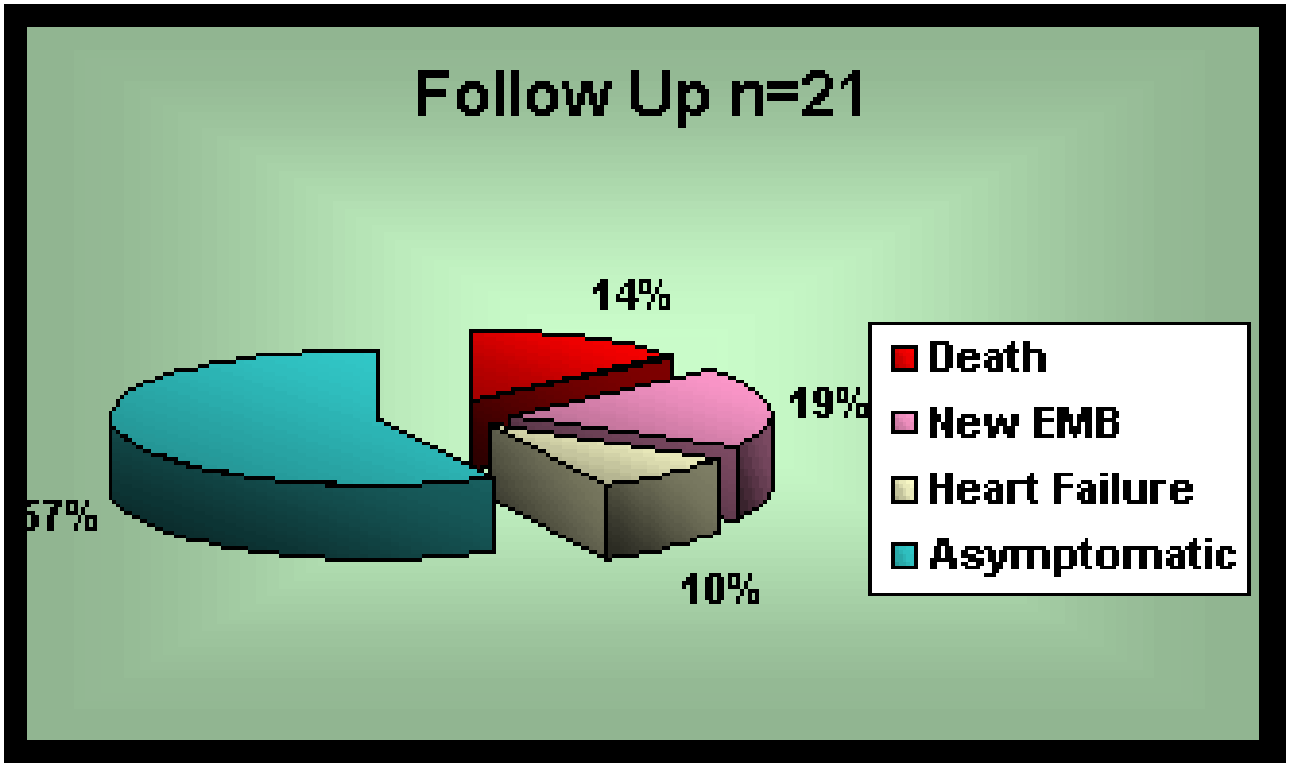


Time Course of Experimental Viral Myocarditis in Mice.
Adapted from Kawai[11] with the permission of the publisher. The timeline is not drawn to scale.

Myocarditis

Prognosis:

recovery / cardiac failure / latent development of dilated CM



Cardiomyopathy

Definition:

= chronic disorder of myocardium with abnormal ventricular both function and morphology

weakening of the heart muscle or a change in heart muscle structure

prolonged course, slow progression

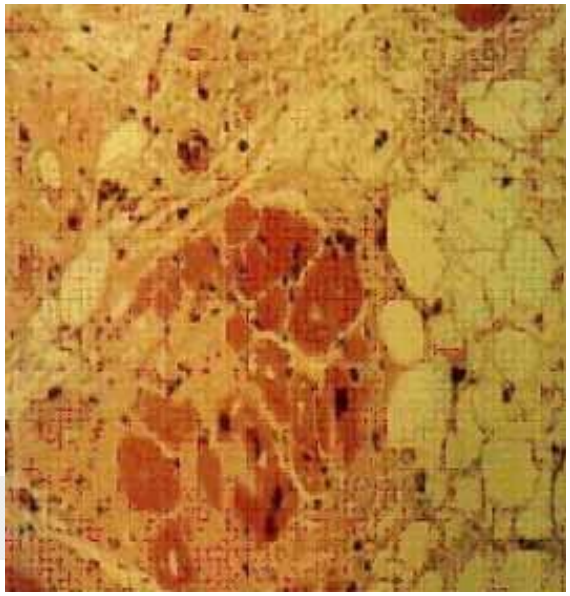
Pathogenesis:

"universal" reaction of cardiac muscle

on various noxa

→ inflammation, hypertrophy, degeneration, necrosis, fibrosis

→ accumulation of lipids, glycogen, amyloid



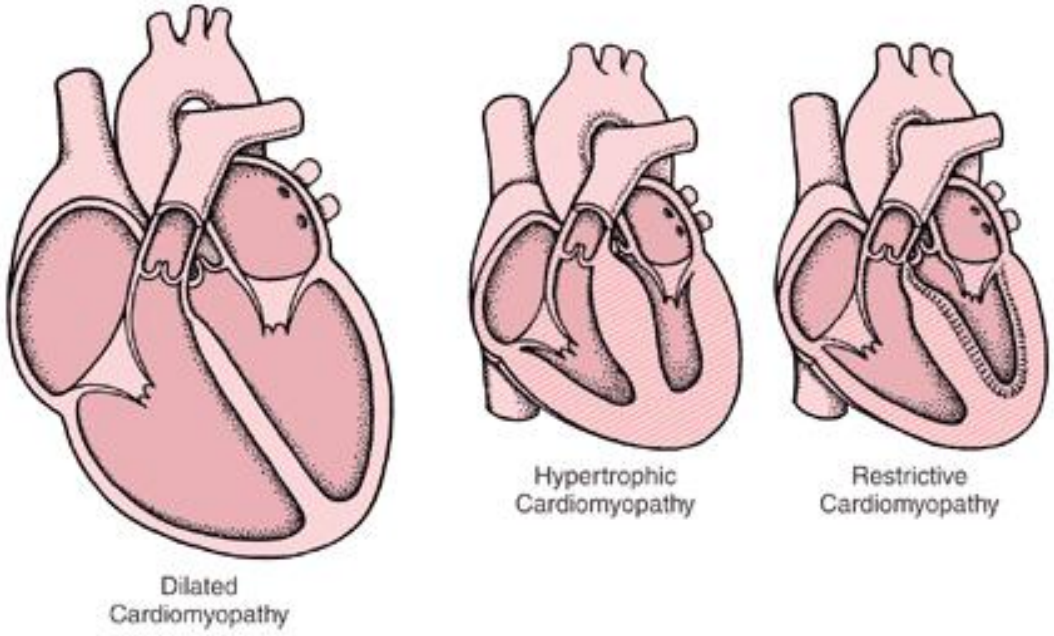
Lipoid deposits in myocardium

Cardiomyopathy

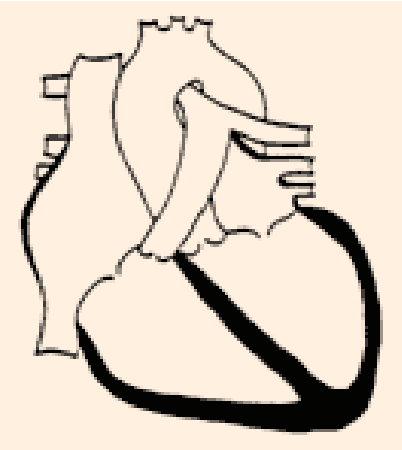
Primary:

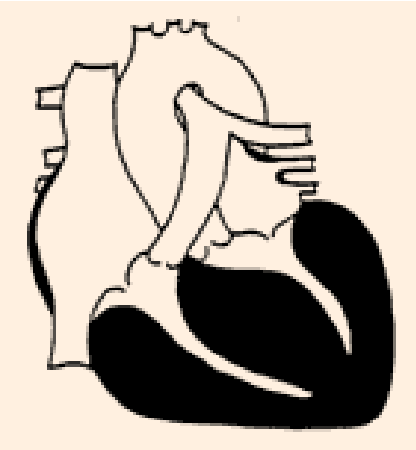
Genetic factors, worse prognosis

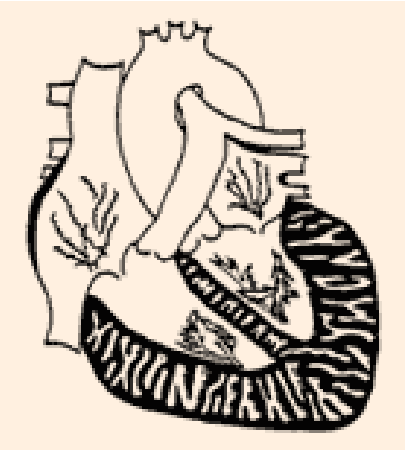
(must be excluded ischemia, hypertension, congenital + acquired cardiac defects)



Cardiomyopathy



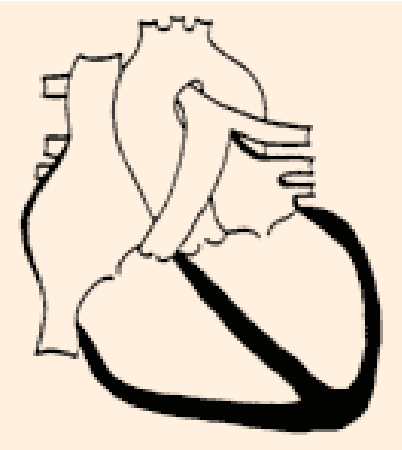


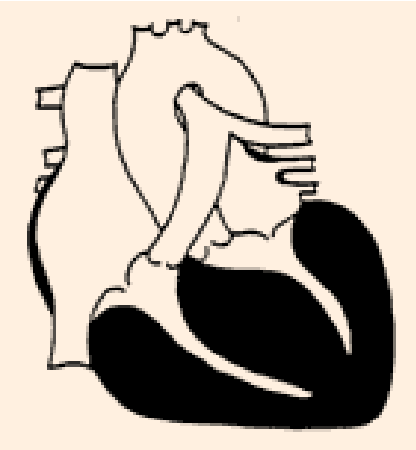


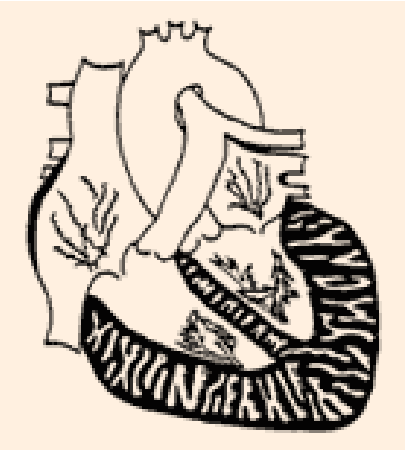
Dilated CM

- destruction of muscle fibers
- dilatation without hypertrophy

Cardiomyopathy



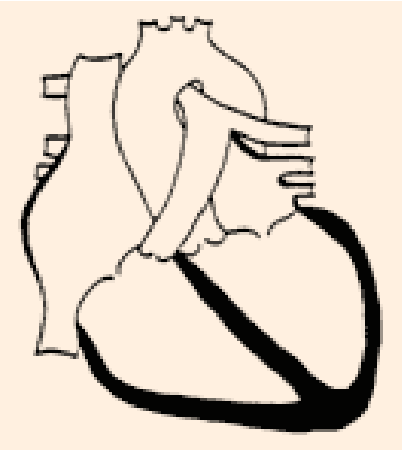


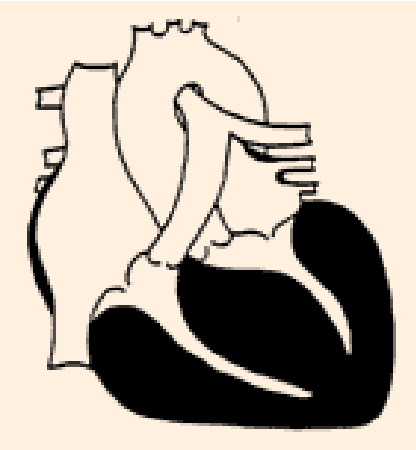


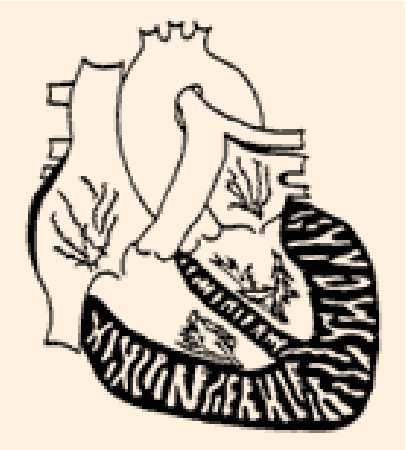
Hypertrophic CM

- asymmetric hypertrophy
- obstruction of LV offtake

Cardiomyopathy



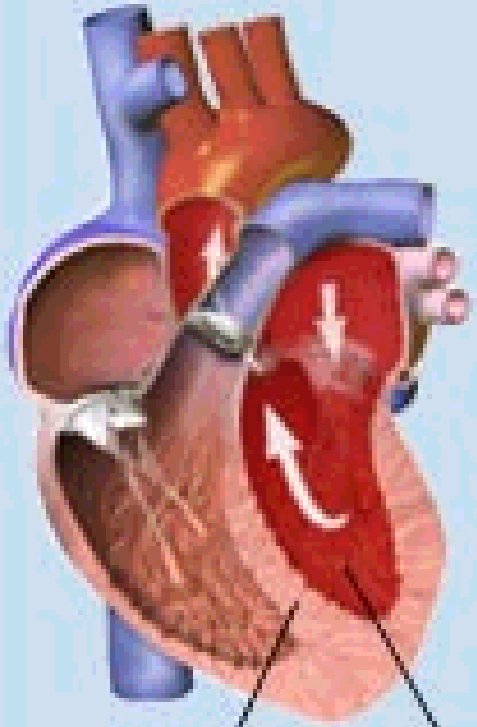




Restrictive CM

- **subendocard. fibrosis**
- **arrhythmia**

Normal



A healthy left ventricle pumps enough oxygenated blood to meet the body's needs.

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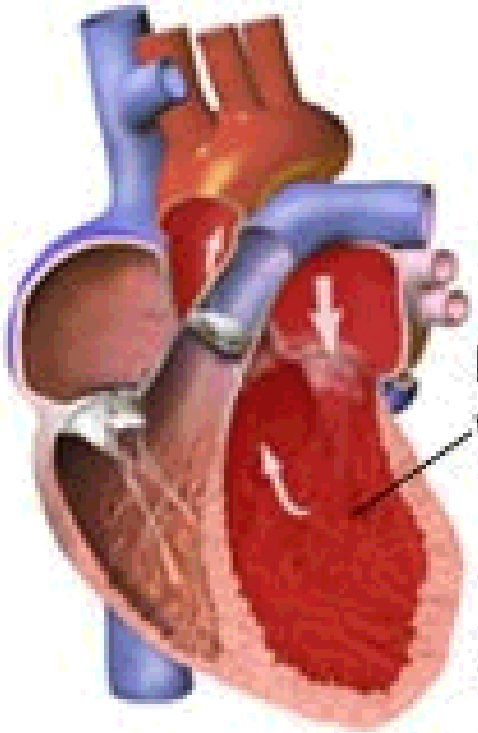
Cardiomyopathy

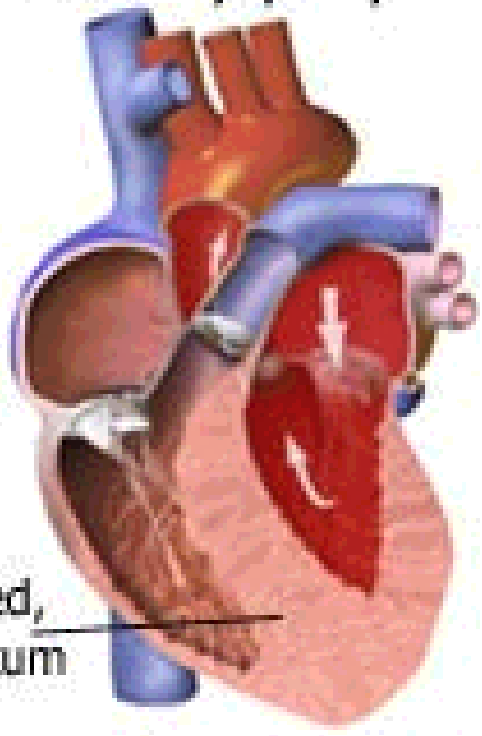
A condition in which a ventricle has become enlarged, thickened and/or stiffened. As a result, the heart's ability to pump is reduced. Two types of cardiomyopathy include:

Dilated cardiomyopathy



An enlarged, weakened left ventricle struggles to pump enough blood to meet the body's needs.

Hypertrophic cardiomyopathy



Left ventricle cannot fully relax between heartbeats, resulting in less blood flow.

Cardiomyopathy

Secondary:

infectious

- **bacterial**
- **viral (coxsackie)**
- **ricketsia**
- **mycosis**
- **parasitic (Chagas dis.)**

toxic (alcohol, Co, narcotics, psychofarmacs, adriamycin, prokainamid)

endocrine / metabolic (↓T4, ↑T4, ↑GH, uremia, ↓vit.B1, K, Mg)

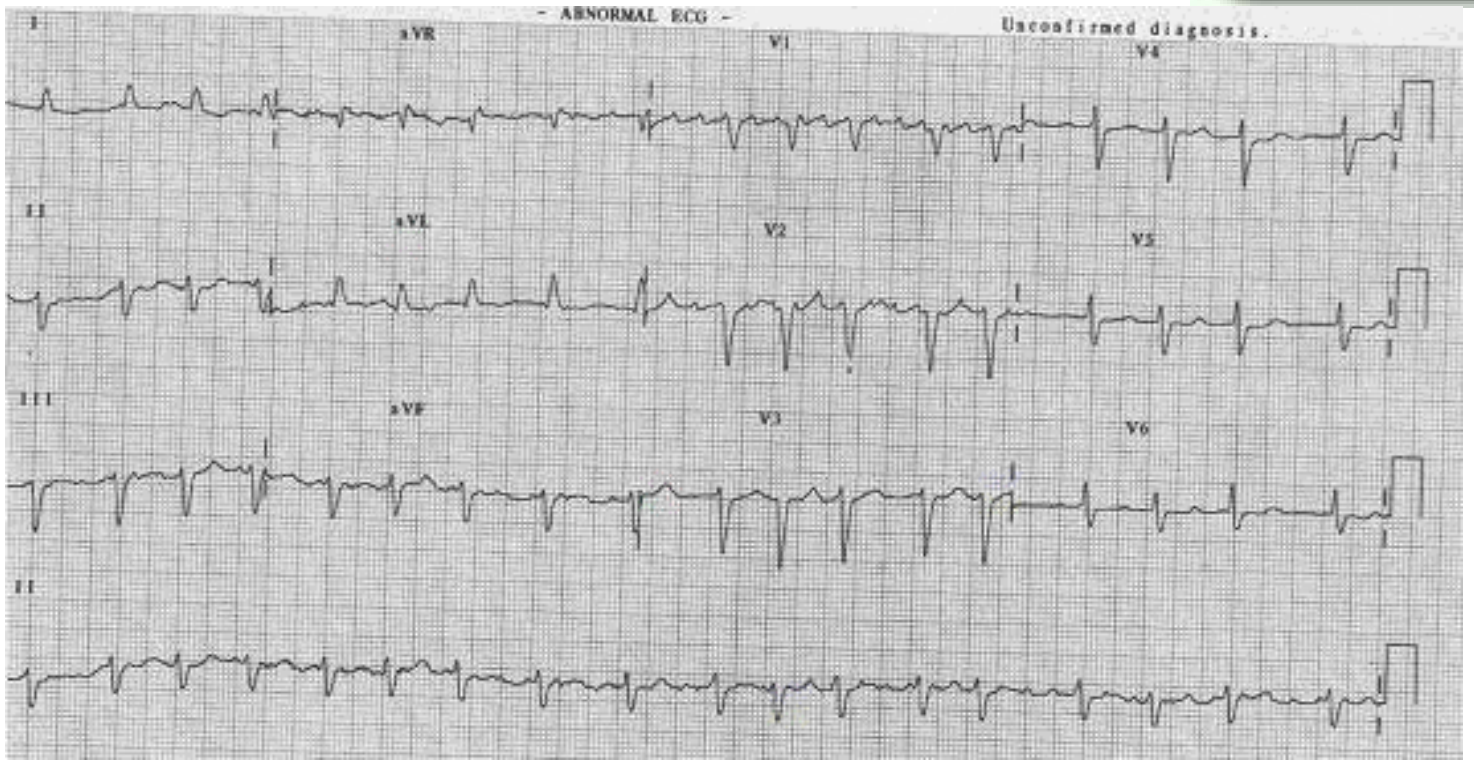
allergy, autoimmunity (immunocomplex., SLE, sarkoidosis…)

Cardiomyopathy

ECG:

SVES, VES, atrial fibrillation
RBBB, LBBB
T wave aplanation / inversion
LV hypertrophy (♂ > 400 g, ♀ > 385 g)

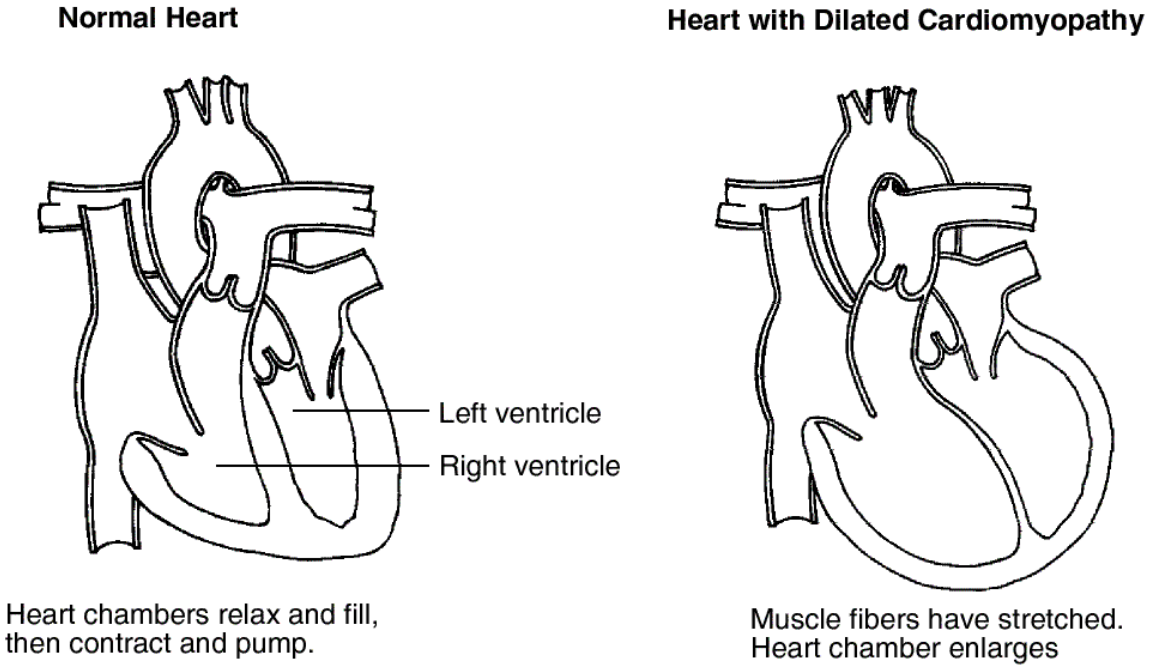
It is unusual for patients with cardiomyopathy to have a normal ECG



Dilated (congestive) CM

Characteristics:

- ♥ **heart dilation (without hypertrophy), diffuse hypokinesis (systolic + diastolic dysfunction)**
- ♥ **(passive) pulmonary hypertension, right heart failure**
- ♥ **arrhythmia, blocks**

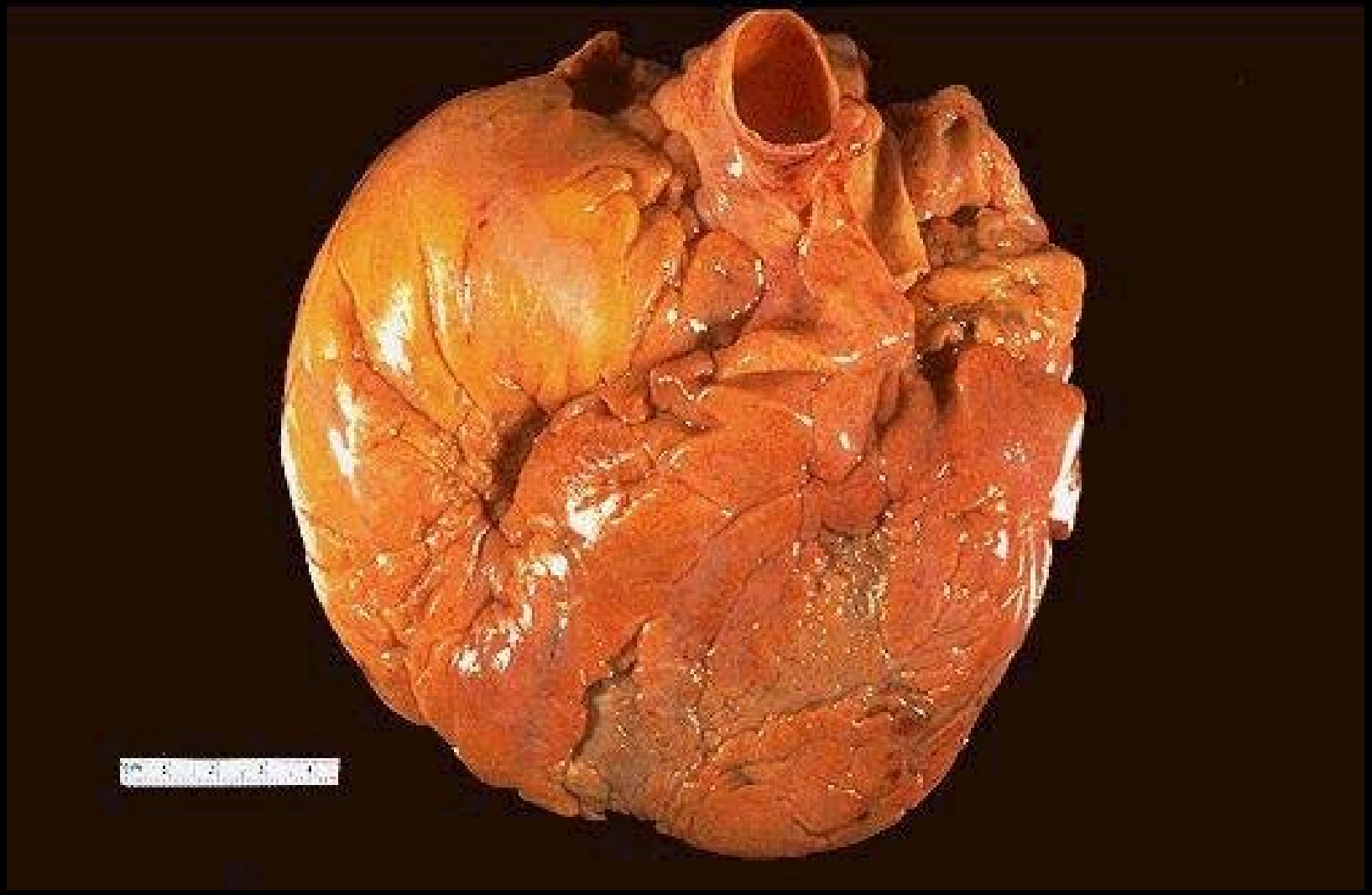


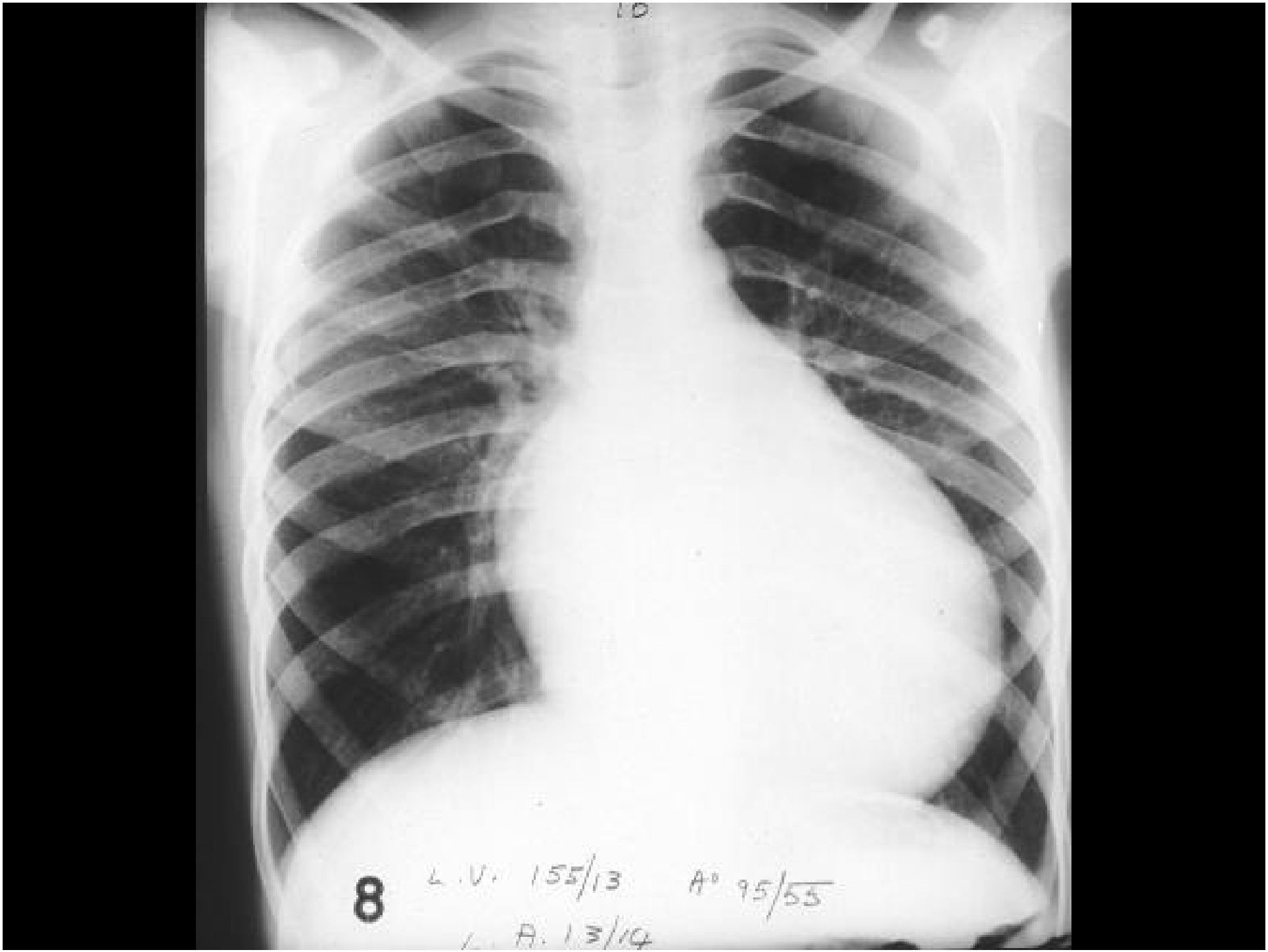
Dilated (congestive) CM

Links:

- **alcoholism (+ malnutrition, ↓vitamin., hepatopathy…)**
- **coxsackie B (e.g. intrauterine infection)**
- **hereditary factors (...to examine relatives)**
- **drug factors (ATB, sympathomimetics)**

Dilated (congestive) CM




8
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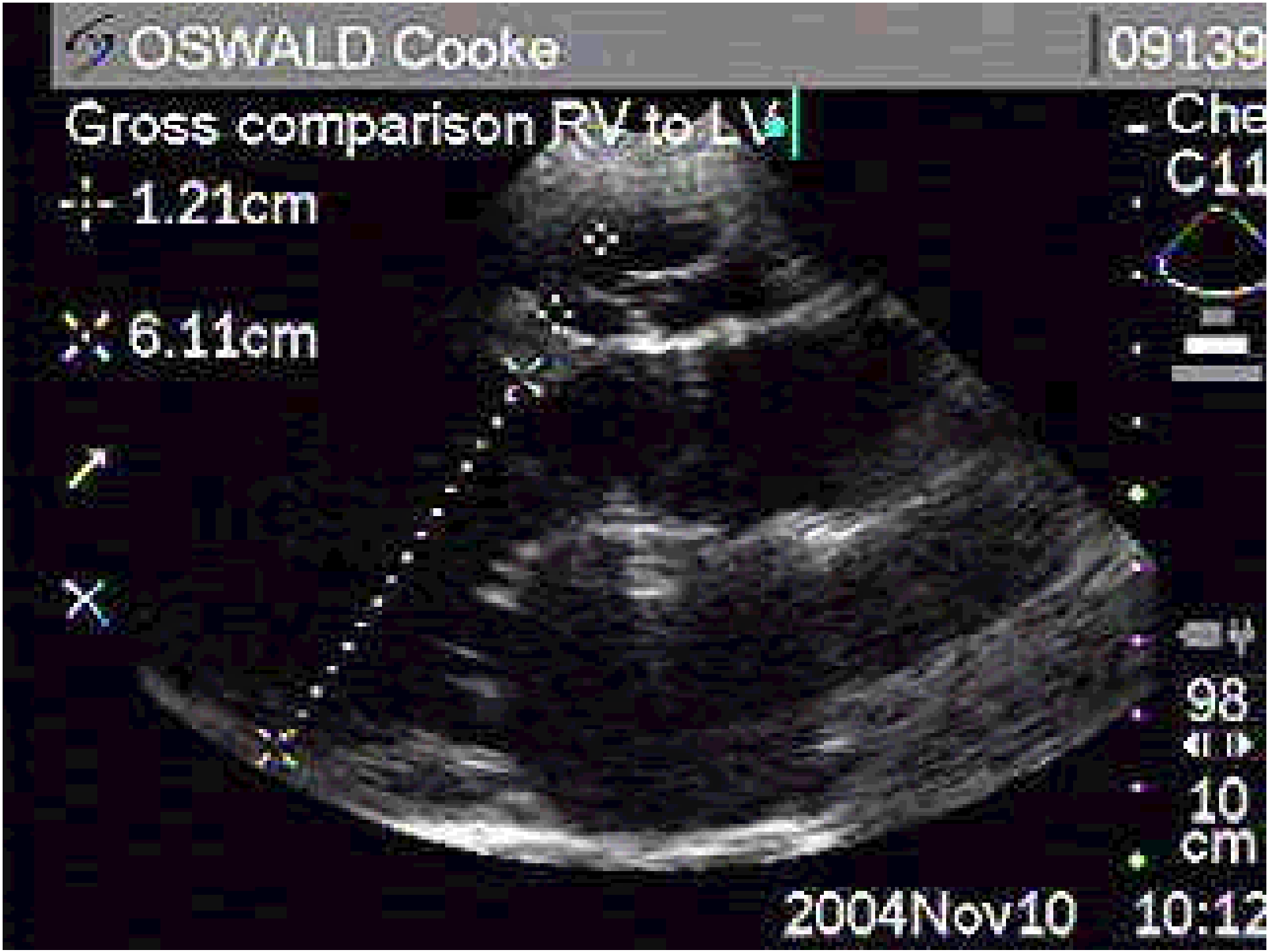

OSWALD Cooke
09139
Gross comparison RV to LV
1.21cm
6.11cm
2004Nov10
10:12

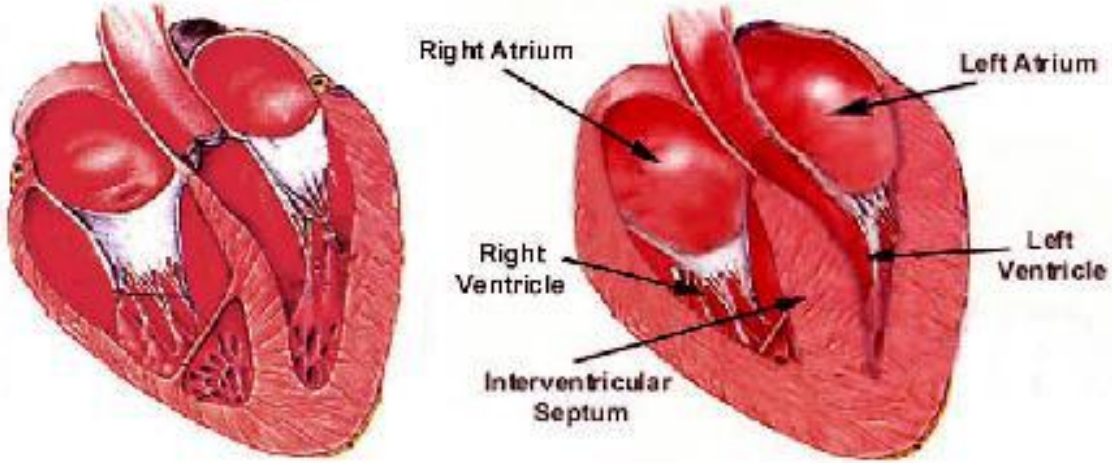
Hypertrofic (obstructive) CM

= subaortic stenosis = subvalvular idiopatic aortic stenosis

Characteristics:

The influence of catecholamines on fetal heart or ↑ catecholamine receptors in fetus

Often AD heredity (to examine relatives)



Hypertrofic (obstructive) CM

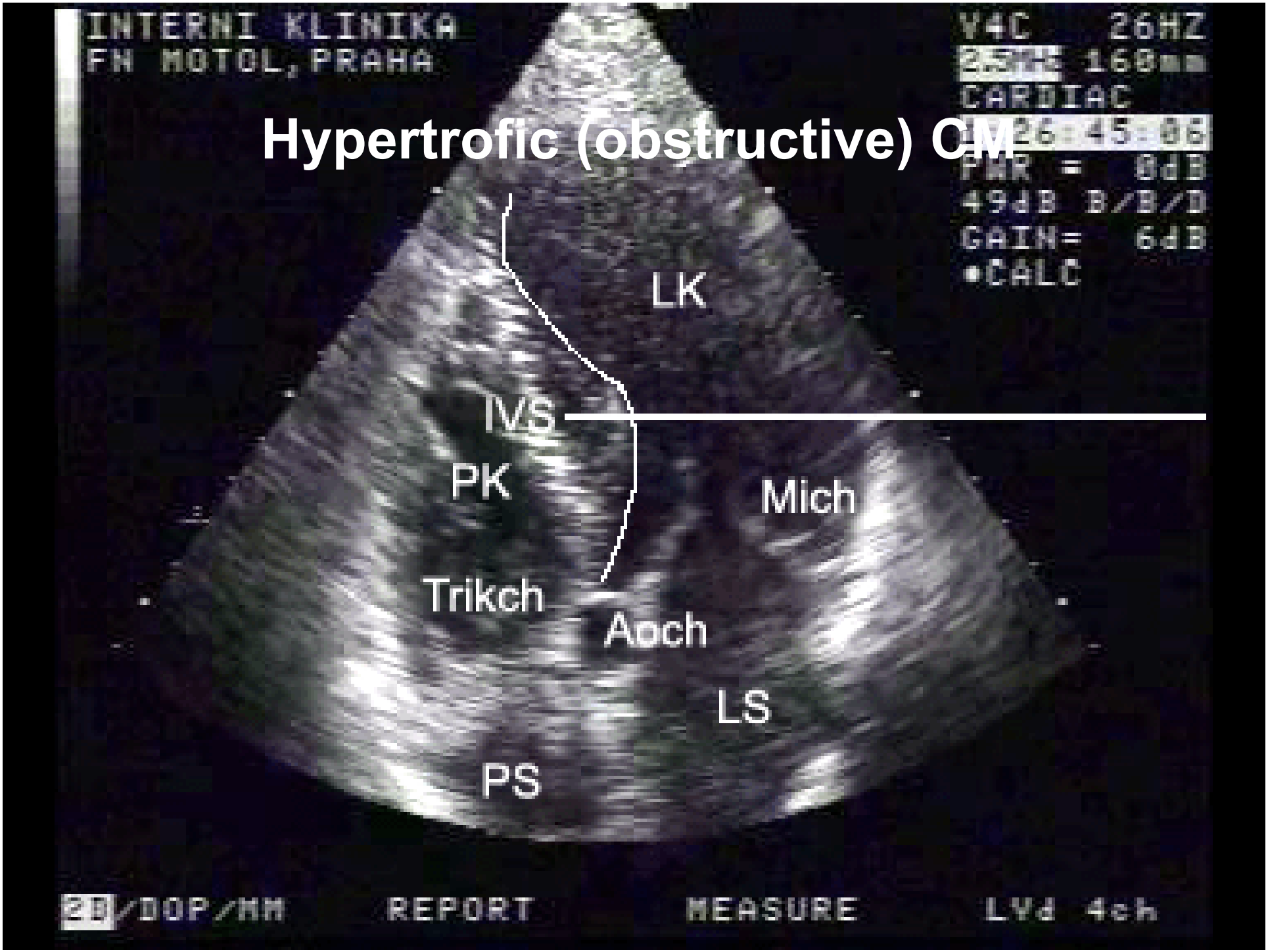
♥ asymmetric hypertrophy LV > septum > RV (with ECG picture)

♥ microscopy: disorganization of musculature, islets of fibrosis

♥ vault of hypertr. septum >>> obstruction of aortic intake

→ normal systolic function, low diastolic compliance
→ ventricular arrhythmia (risk of sudden death)
→ dizziness, syncope
→ intolerance of strain, dyspnoe
→ palpitation

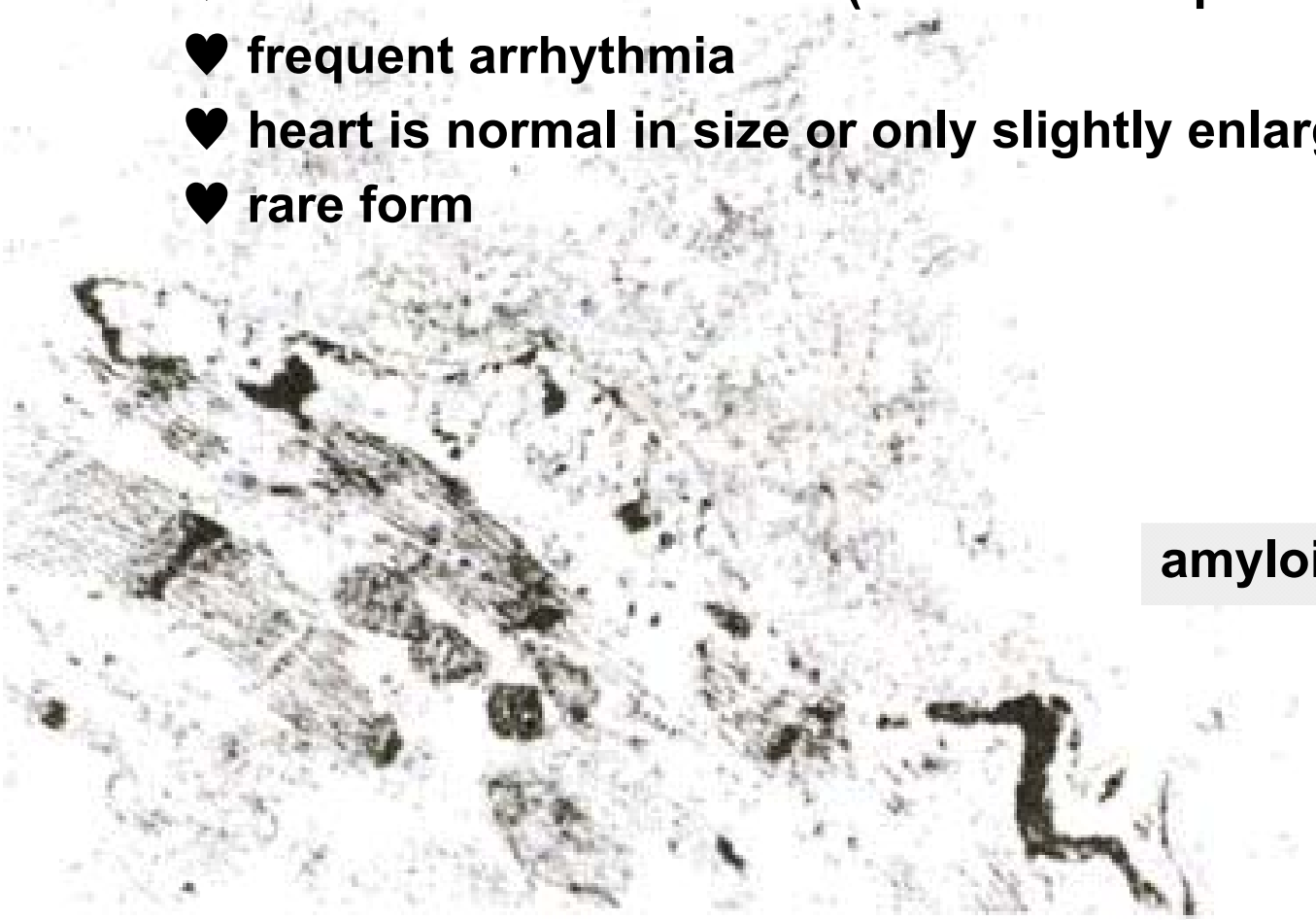
Hypertrofic (obstructive) CM



Restrictive CM

Characteristics:

- ♥ subendocardial fibrosis (event. eosinophil infiltration)
- ♥ frequent arrhythmia
- ♥ heart is normal in size or only slightly enlarged
- ♥ rare form



amyloid deposits

Restrictive CM

Symptoms:

- ♥ excessive tiredness (fatigue), poor tolerance of exercise
- ♥ cough - difficulty breathing
- ♥ palpitation, syncope - arrhythmia

Restrictive CM

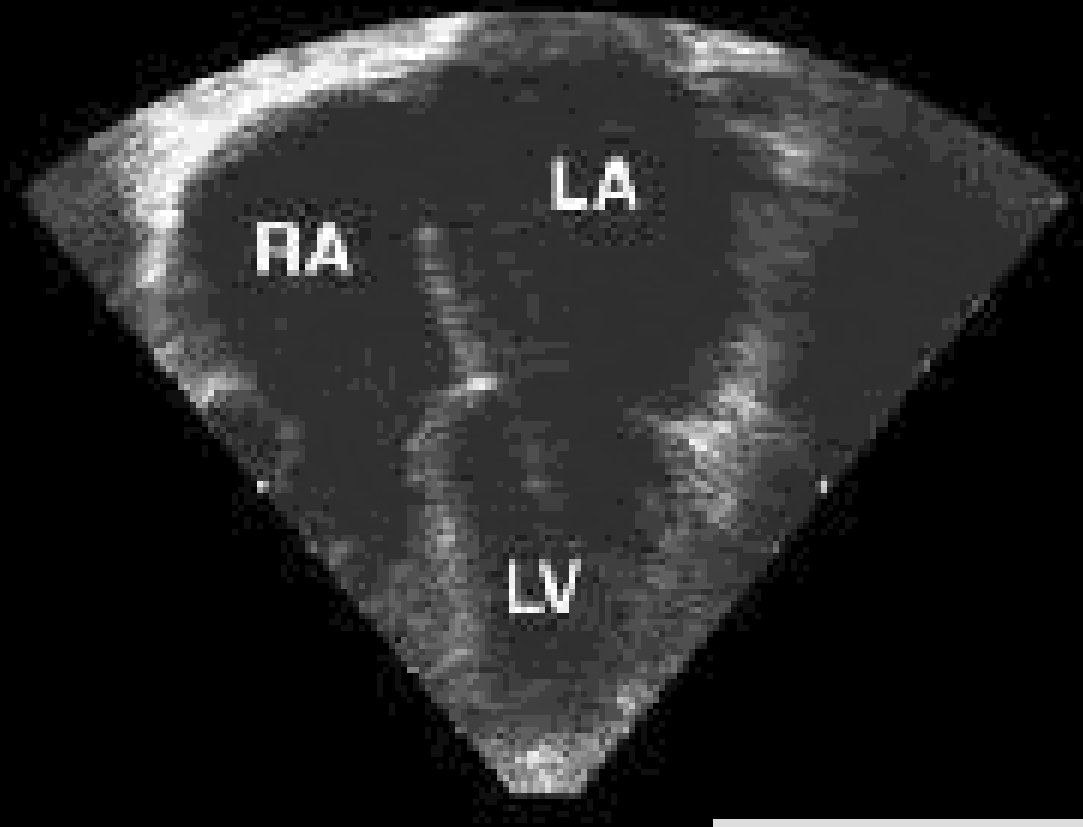
Prognosis:

People with restrictive CM may be candidates for heart transplant.

Prognosis is dependent on the underlying cause but it is usually poor.

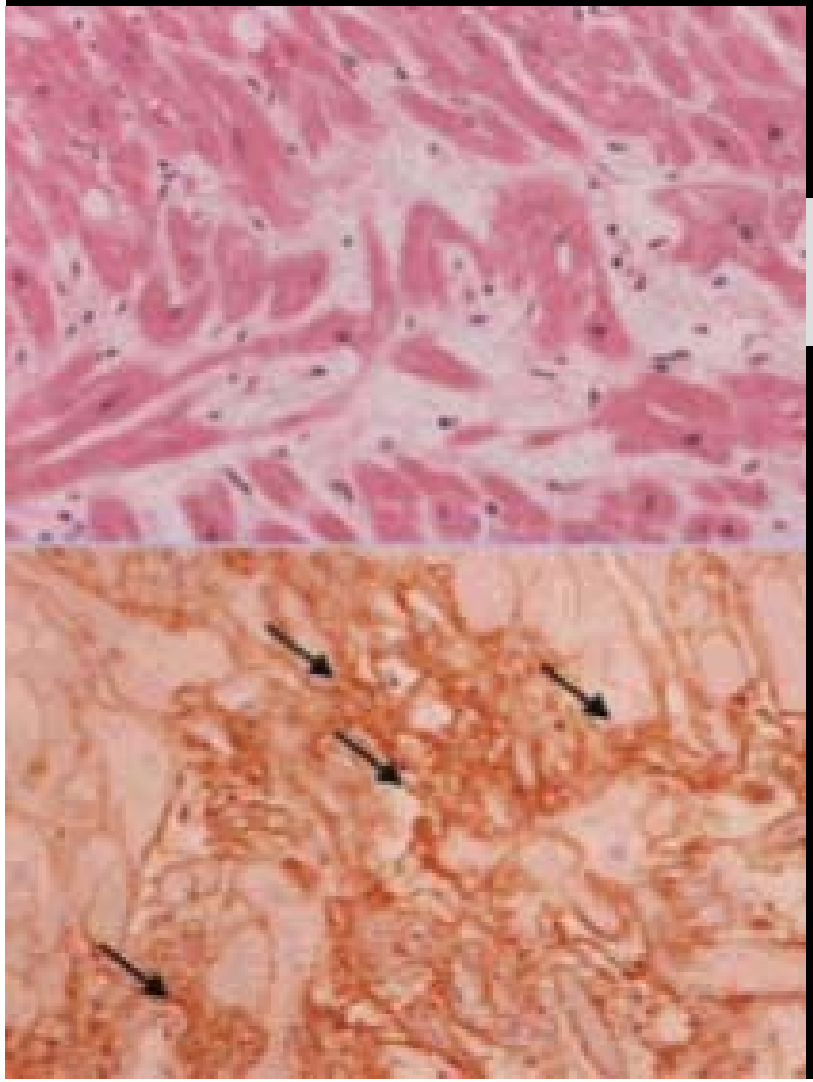
Average (mean) survival after diagnosis is 9 years.

Restrictive CM



Characteristic echo finding:
RA, LA size > LV size

Restrictive CM



eosinophil fibrillar structures in myocardial interstitium

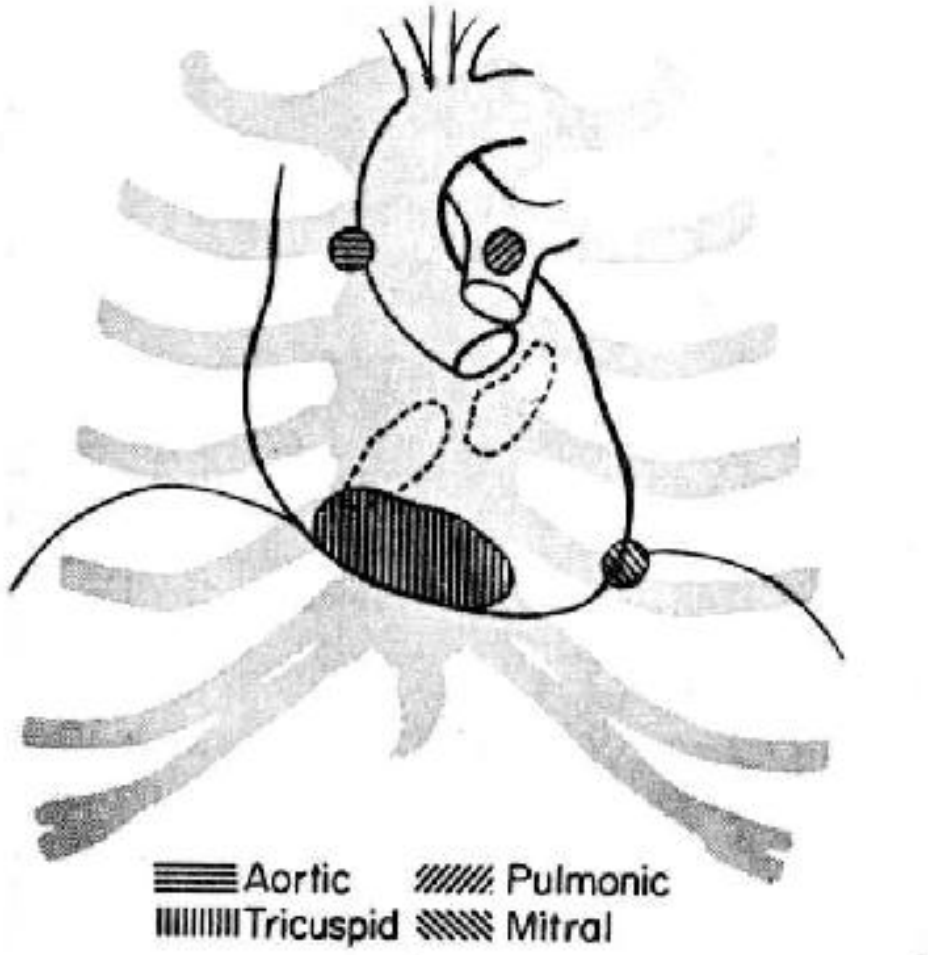
Valvular heart disease

1 % prevalence
mitral + aortic disease

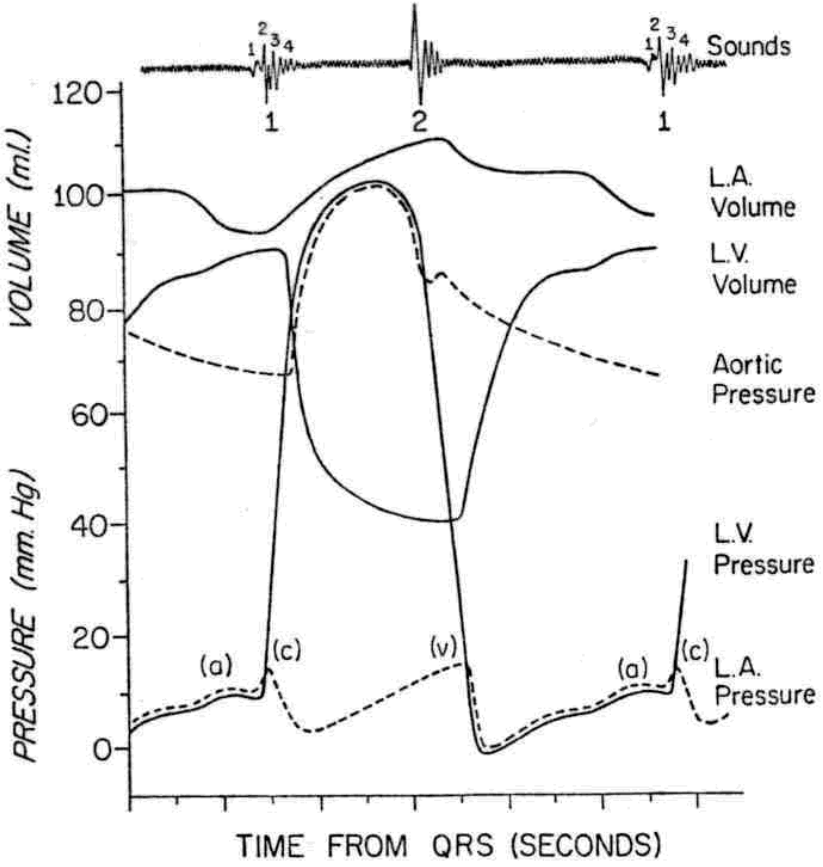
Etiology:

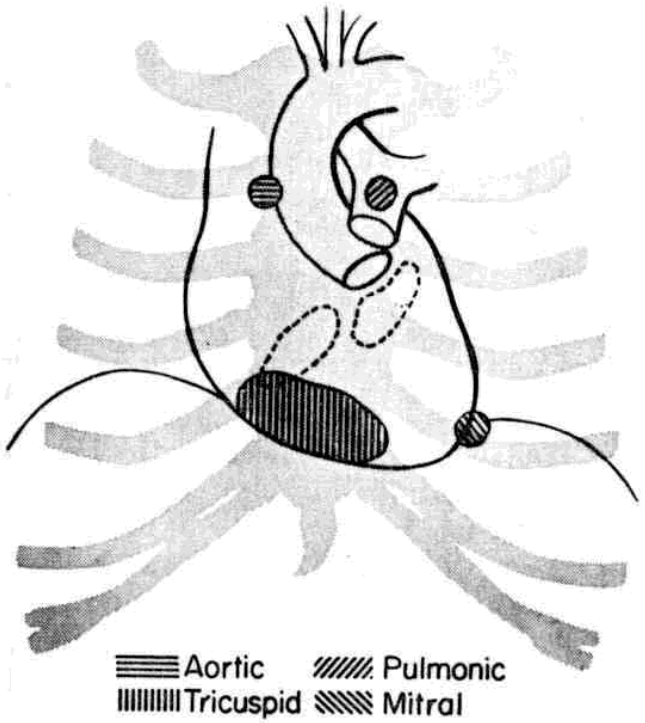
- **rheumatism**
- **infectious endocarditis**
- **ischemic heart disease**
- **pox**

Valvular heart disease



Valvular heart disease





Mitral stenosis

- **Primarily the result of rheumatic fever**
- **The most frequent post-rheumatic disease (recidiv. tonsilitis, 60% patients with rheumatic fever in history)**
- **Pure or predominant mitral stenosis occurs in 40 % of all patients with rheumatic heart disease**
- **Usually combination with mitral insufficiency**
- **Rarely congenital**

Mitral stenosis

Pathogenesis:

- ♥ scarring + fusion of valve apparatus
- ♥ retardation of quick phase of LF filling (+ participation of atrial fibrillation)
  → ↓CO, poor tolerance of exercise
- ♥ LV hypertrophy / dilation
  → arrhythmia
  → thrombosis / embolism
- ♥ postcapillary pulmonary hypertension
  → pulmonary edema / pulmonary vasoconstriction
  → „tricuspidalization“ (RV dilation / hypertrophy)

Mitral stenosis

Symptoms:

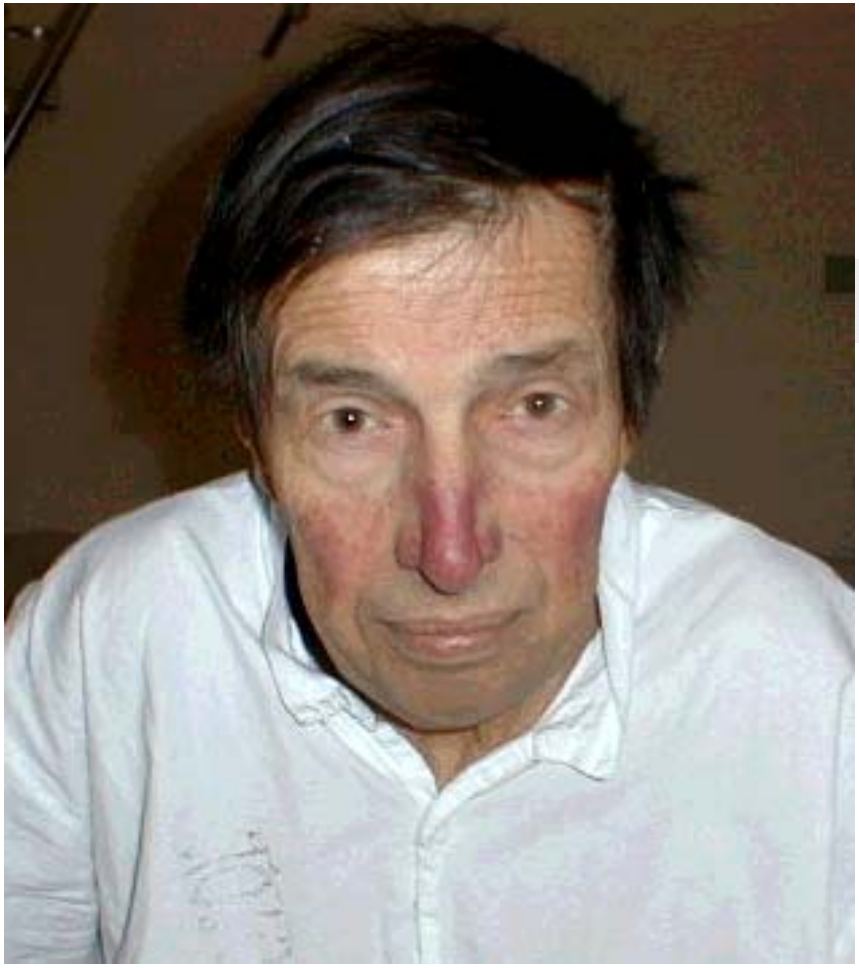
- ∅ 4 - 6 cm^2 ... normal valve area
- ∅ 1,5 - 2,5 cm^2 ... minimal symptoms
- ∅ 1 - 1,5 cm^2 ... no symptoms at rest
- ∅ ≤ 1 cm^2 … severe stenosis, pulmonary edema

Mitral stenosis

Symptoms:

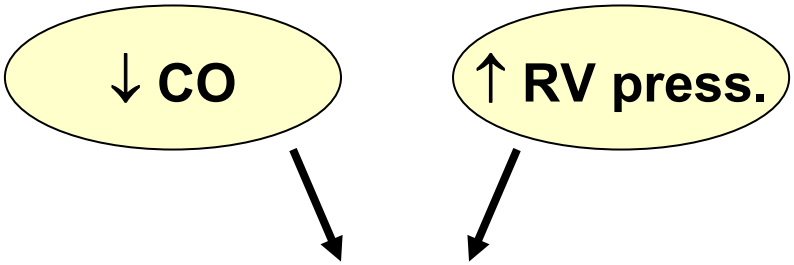
- fatigue, poor tolerance of exercise
- palpitations
- cough
- left sided failure (orthopnea)

Mitral stenosis



facies mitralis

Mitral stenosis



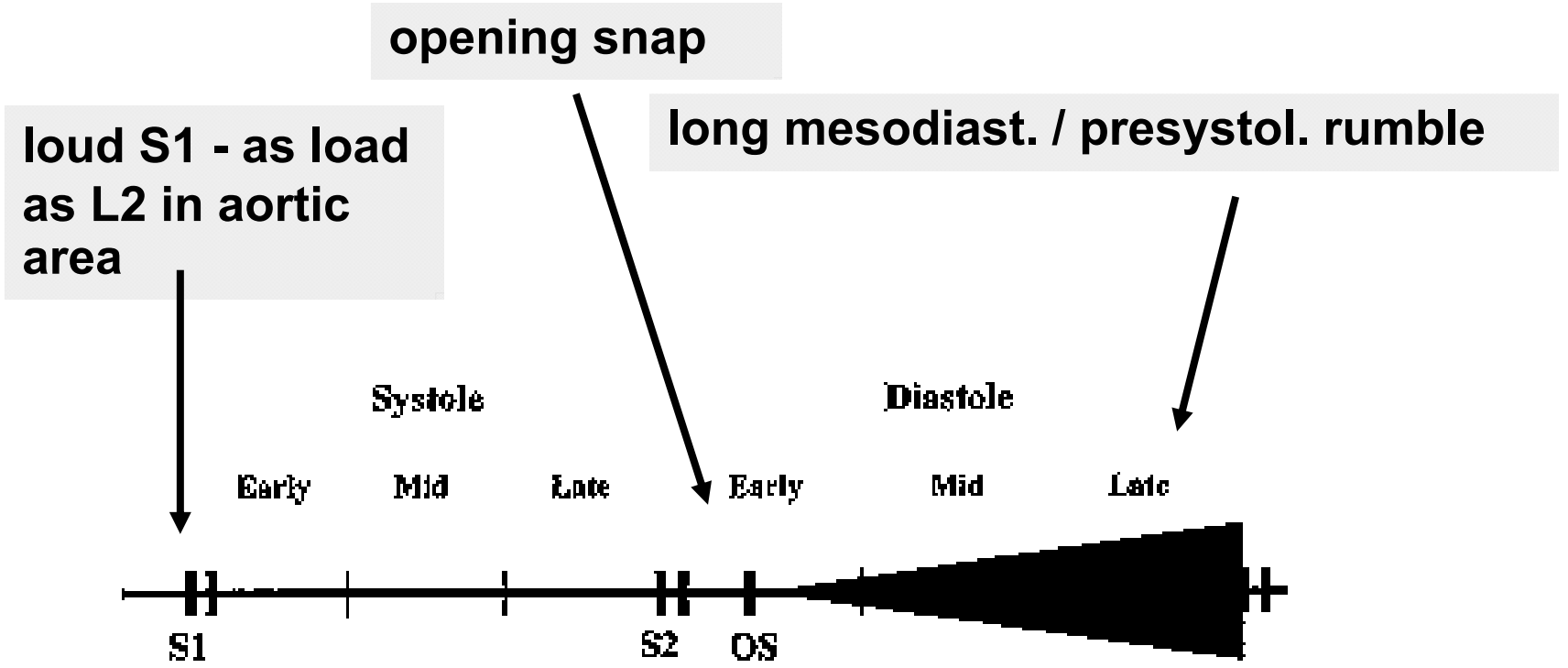
capillary + venous dilation

... erythema

cyanosis of lips, tongue, auricles

Mitral stenosis

Diagnostics: Auscultation / phonocardiography



Mitral stenosis

Diagnostics:

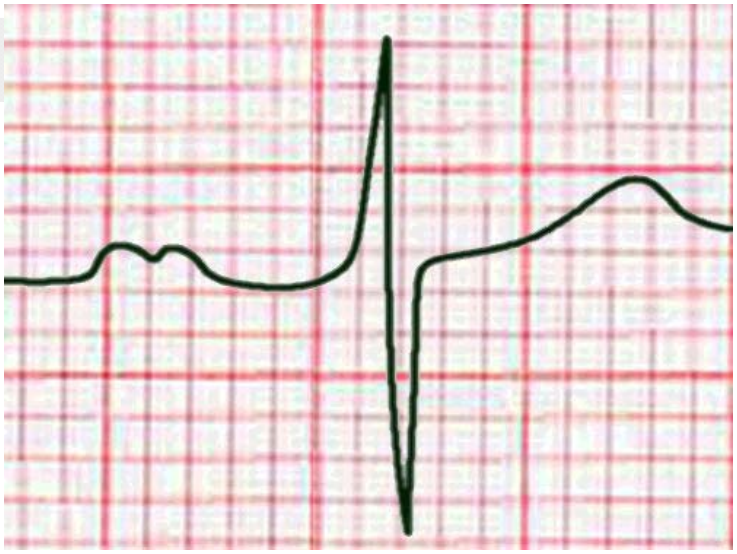
Phonocardiography

ECG

Chest X-ray – LV enlargement, prominent pulmonary veins

Echocardiography (!)

P mitrale



Mitral stenosis

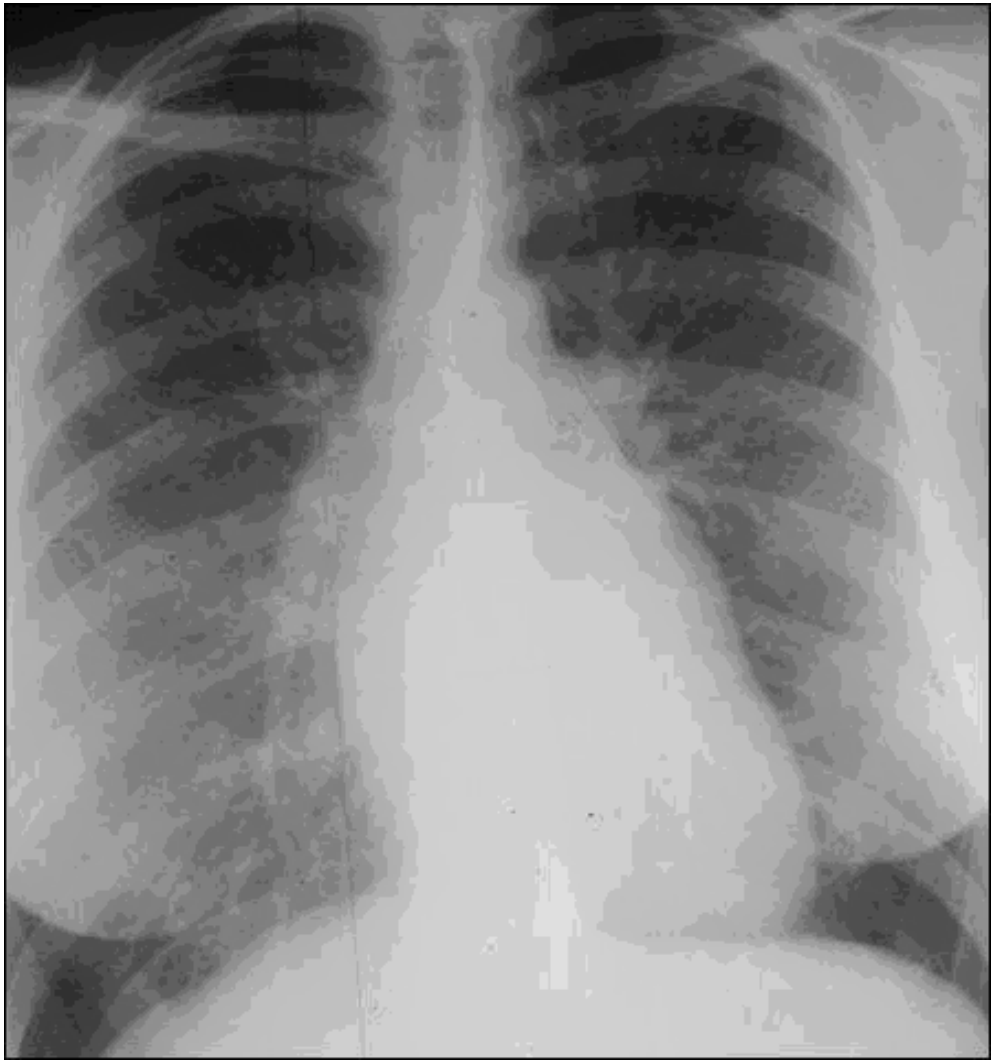
Diagnostics:

Phonocardiography

ECG

Chest X-ray

Echocardiography (!)



LV enlargement

prominent pulmonary veins

Mitral stenosis

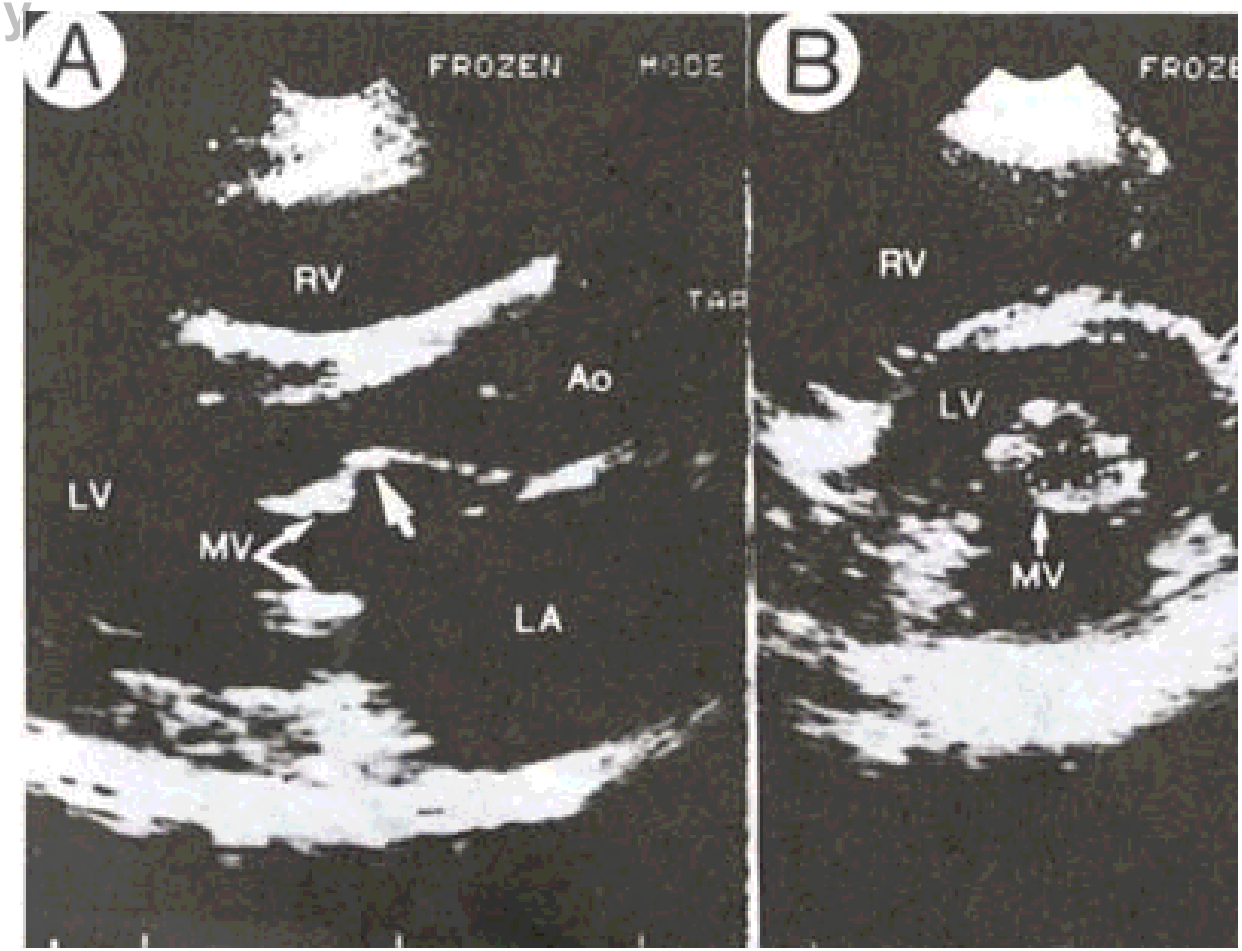
Diagnostics:

Phonocardiography

ECG

Chest X-ray

Echocardiography



Mitral stenosis

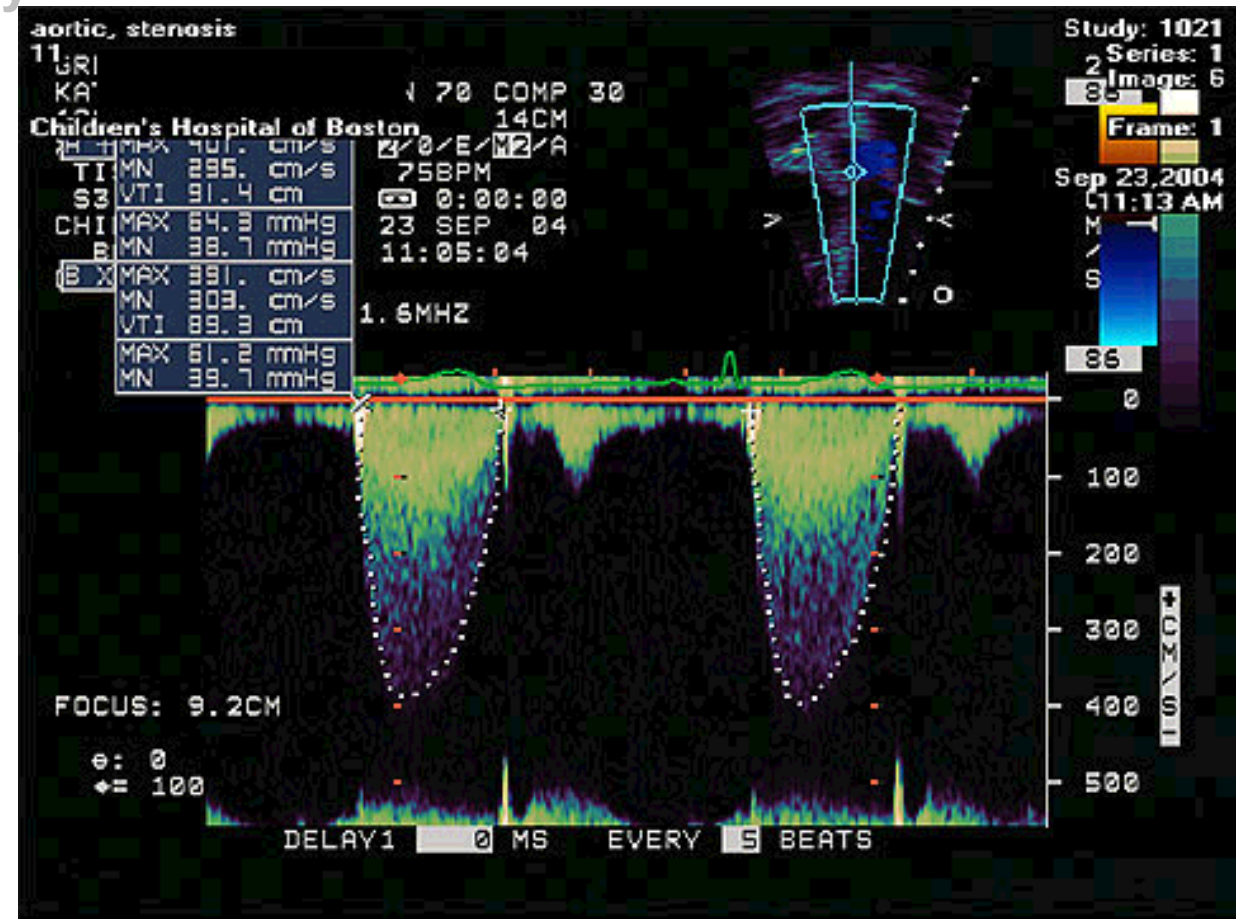
Diagnostics:

Phonocardiography

ECG

Chest X-ray

Echocardiography



Mitral insufficiency

Ethiology:

- **! valvular prolapsus**
- **rheumatic fever - endocarditis (shortening, thickening of MV, without latention)**
- **ischemic disease (dysfunction of papillary muscles)**
- **bacter. endocarditis (valvular rupture, perforation)**
- **obstructive cardiomyopathy**
- **“relative insufficiency” (LV dilation)**

Mitral insufficiency

Pathogenesis:

♥ regurgitation of CO from LV to LA (> 50 %)

→ LA hypertrophy / dilation (larger than mitr. stenosis)

→ decrease of LV systolic filling

… long-term good tolerance

→ poor tolerance of exercise, dyspnoe, palpitations

Prognosis:

↓ long latent course

complications (bacterial endocarditis, embolism)

quick terminal progress

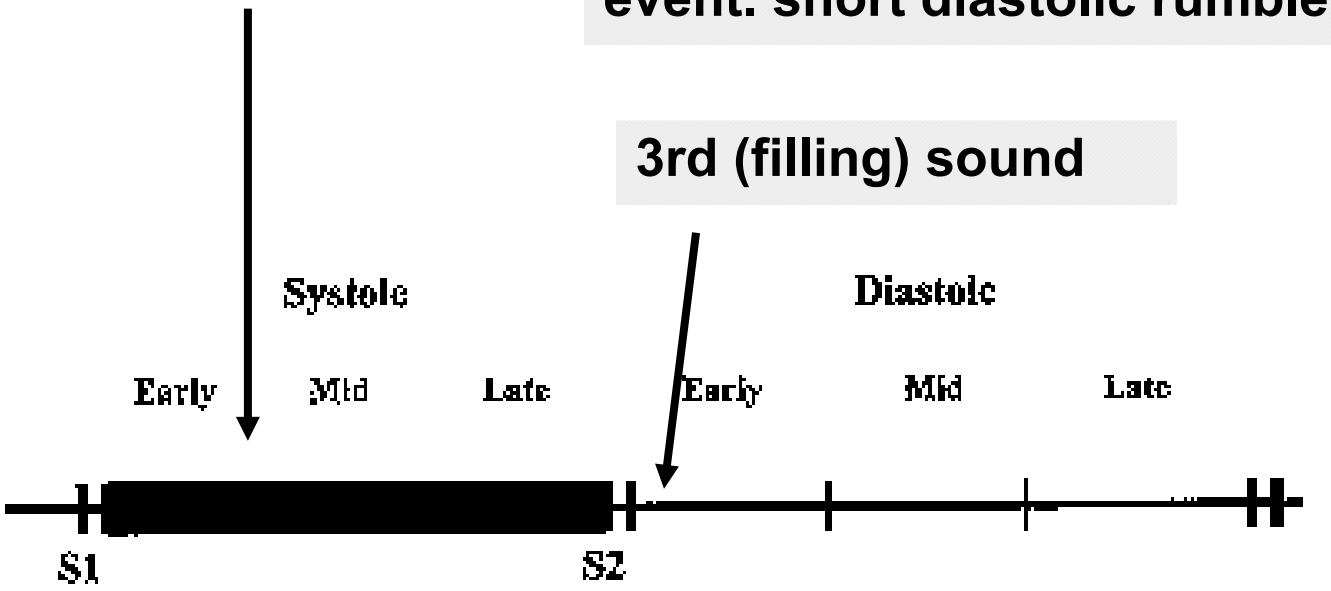
Mitral insufficiency

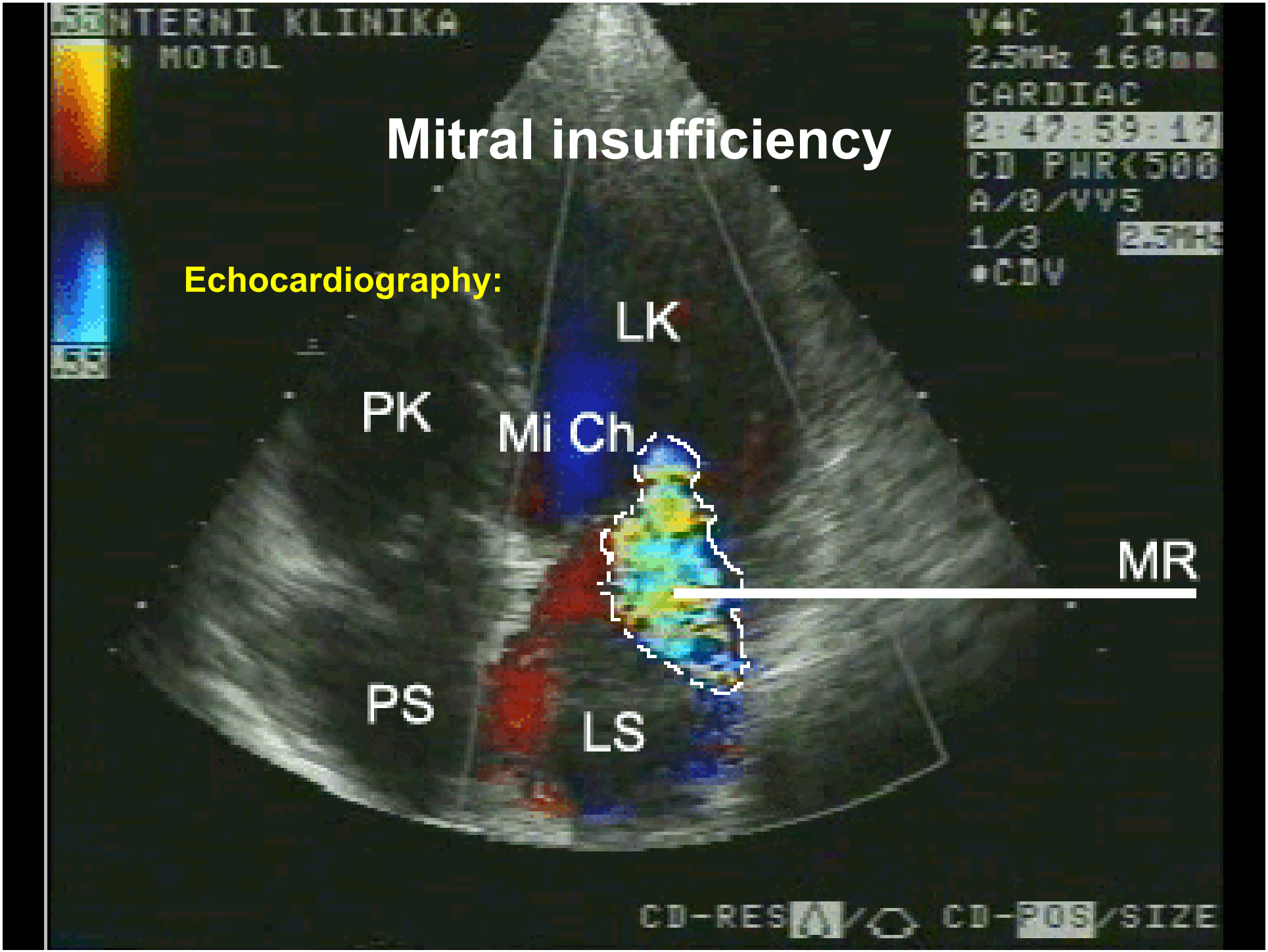
Auscultation:

holosystolic rumble on apex (systolic whirl)

event. short diastolic rumble

3rd (filling) sound

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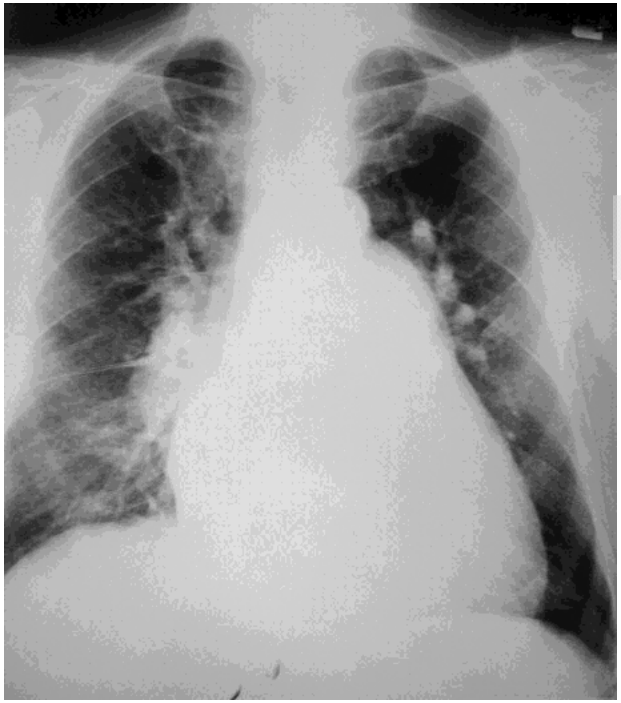
Mitral insufficiency
Echocardiography:
LK
PK
Mi Ch
MR
PS
LS
CD-RES
CD-POS/SIZE

Combined mitral disease

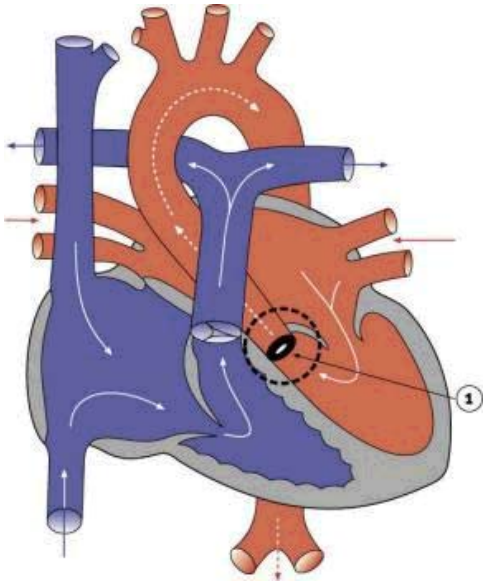
Mitral ostium > 1 cm² … dominant insufficiency … LV hypertrophy

Mitral ostium < 0,6 cm² … dominant stenosis … LV hypertrophy, pulmonary hypertension



combined mitral disease

Aortis stenosis



normal aortic size ∅ 3 cm^2
hemodyn. important stenosis ... ¼ (= 0,7 cm^2)

Etiology:

- **rheumatic fever (combination with insufficiency)**
- **congenital (valvular adhesion)**
- **degenerative (sclerosis) (elderly patients, benign course)**

Localization:

- **supravalvular (necking above valve)**
- **valvular**
- **subvalvular**

Aortis stenosis

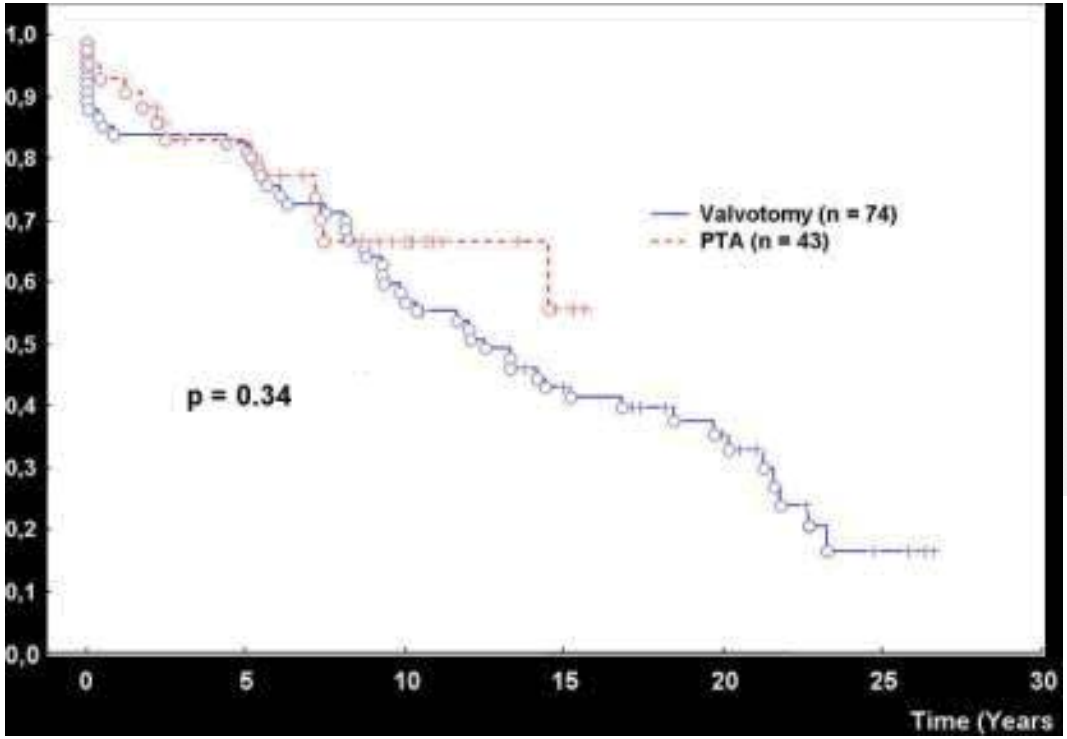
Pathogenesis:

- ♥ ↑ systolic gradient (LV – aorta)
  → *pulsus parvus, pulsus tardus*
  → systolic pressure 100-110 mm Hg
  → normal CO, but no ↑ during exertion (…syncope, dizziness)
- ♥ LV hypertrophy → LA hypertrophy → pulmonary propagation (concentric HY … x X-ray picture)

Aortis stenosis

Prognosis:

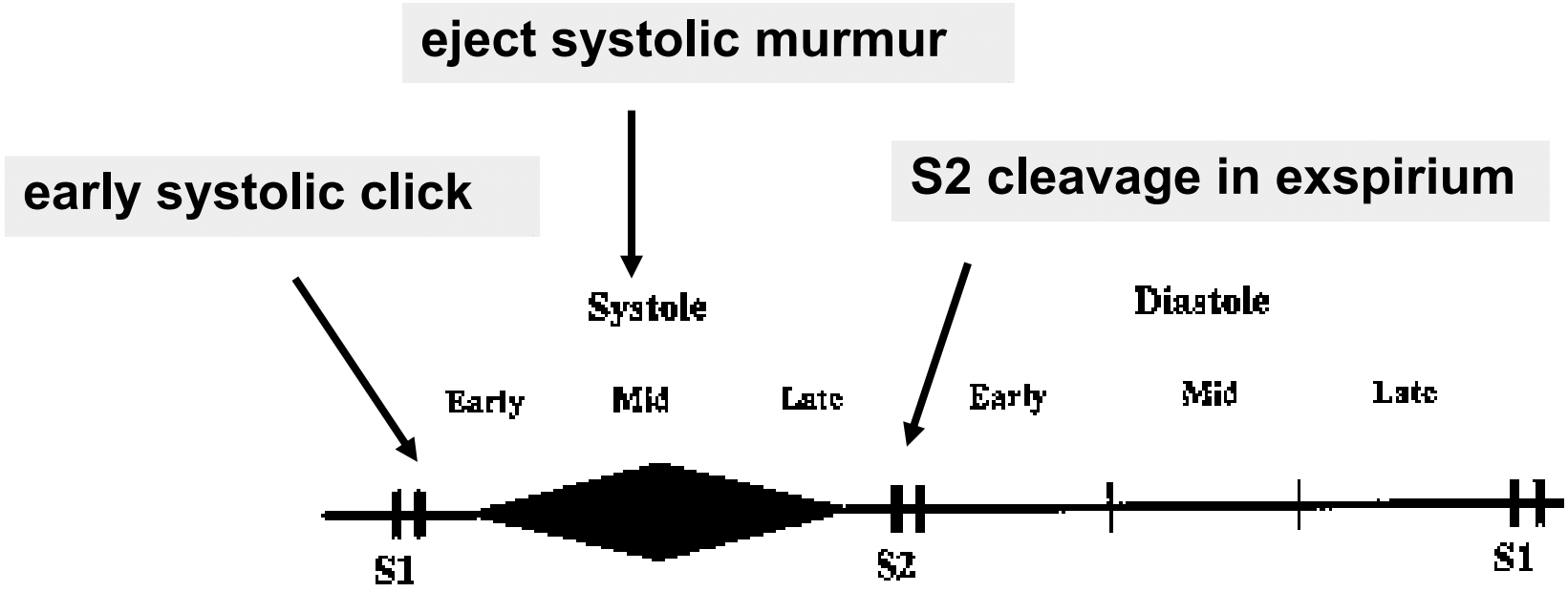
slow progress (...surgery: systolic gradient 50-70 mm Hg)
complications: bacterial endocarditis, AMI
terminal cardiac failure



Survival curve of patients after palliative surgery - valvotomy, or PTA (balloon valvuloplastic)

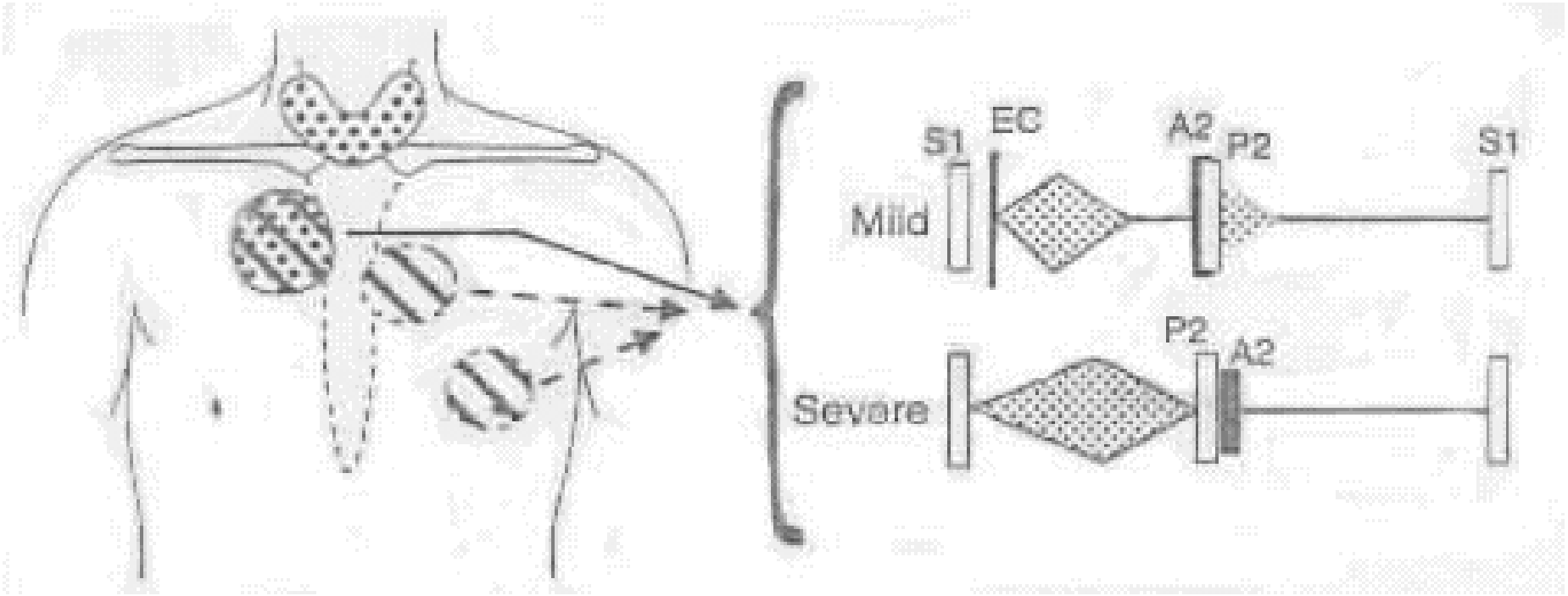
Aortis stenosis

Auscultation:



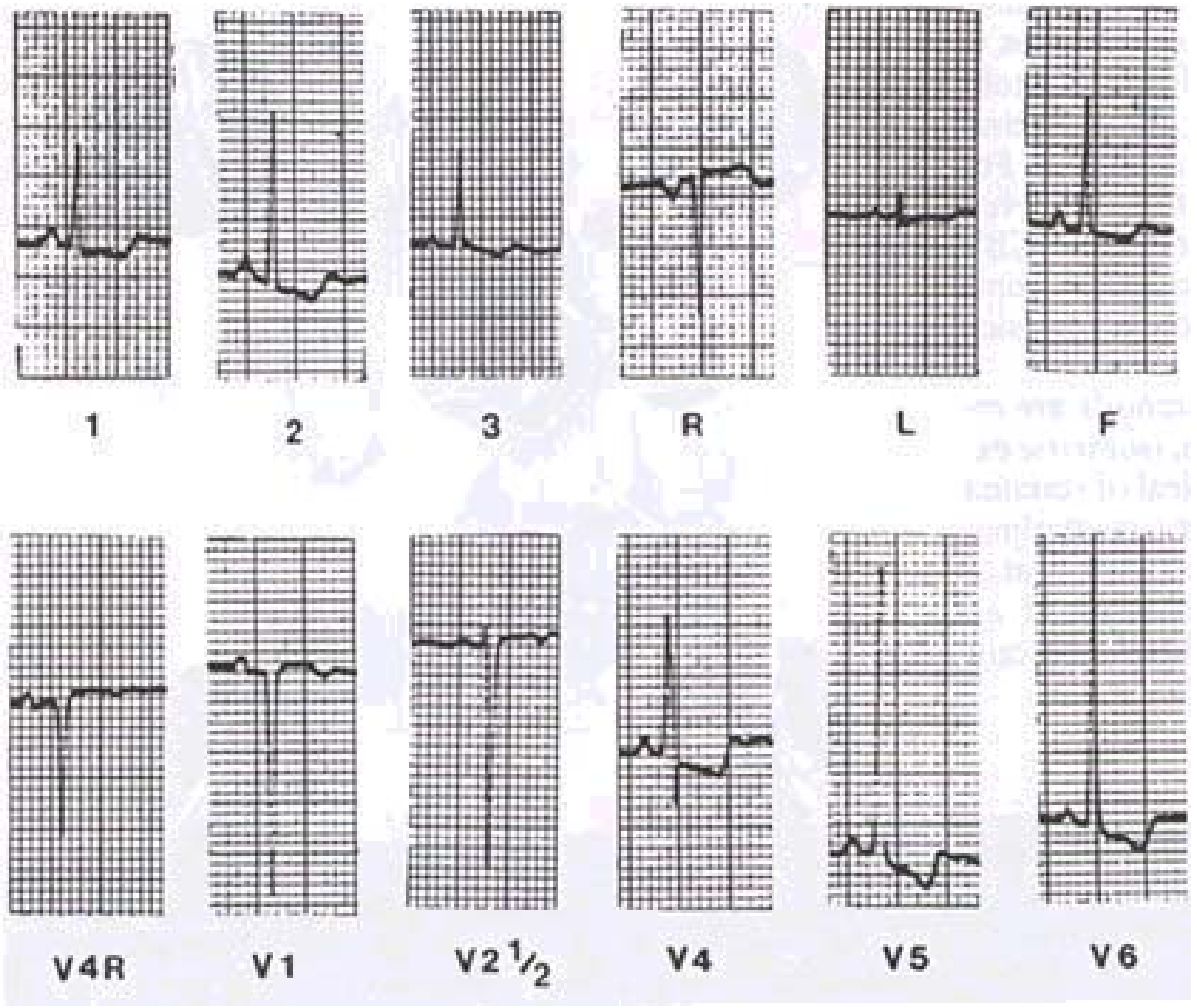
Aortis stenosis

Auscultation:



Aortis stenosis

ECG: LV overloading



Aortis stenosis

Cardio-CT:

Diffuse calcification of all 3 aortic comisuras, mild stenosis in 66-yr. male

Aortic insufficiency

Etiology:

- **rheumatic fever - endocarditis !! (without delay, often combined with mitral disease)**
- **bacterial endocarditis**
- **congenital disease**
- **dissection of aortic aneurysm**
- **pox**
- **“relative insufficiency” = dilation of aorta (e.g. during pox)**

Aortic insufficiency

Pathogenesis:

depend on ∅ valve, gradient, and LV compliance

♥ (compensatory) LV hypertrophy / dilation

♥ (compensatory) ↓ peripheral resistance
→ Corrigan pulses (high, quick, ↑ pressure amplitude)
→ Quincke capillary pulsation

♥ good exertion tolerance (due to ↓ vascular resistance)

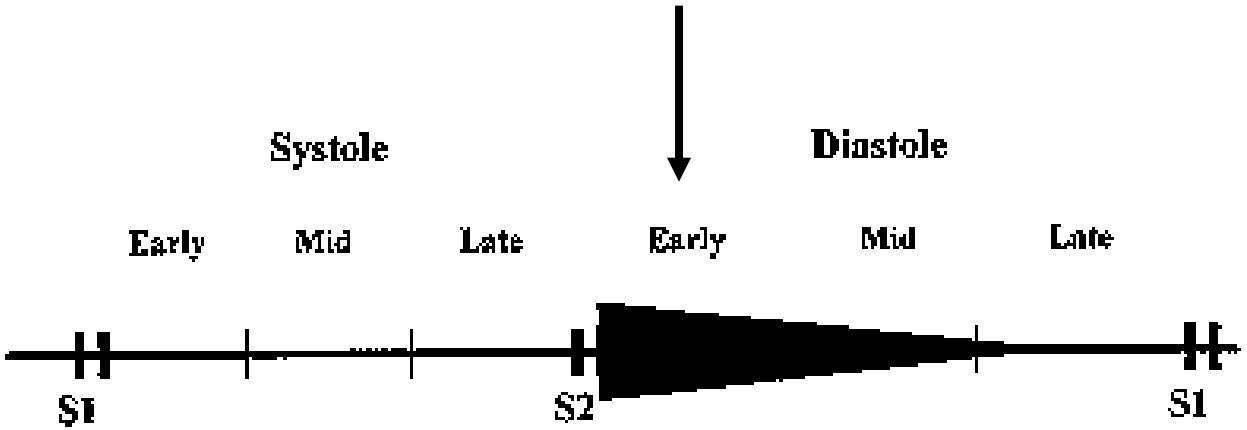
Prognosis:

10 x years latent course, palpitations
complications: bacterial endocarditis
terminal cardiac failure

Aortic insufficiency

Auscultation:

decrescend diastolic murmur



Aortic insufficiency

Echocardiography: