Cardiomyopathies

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Cardiomyopathies

Definition: diseases of heart muscle

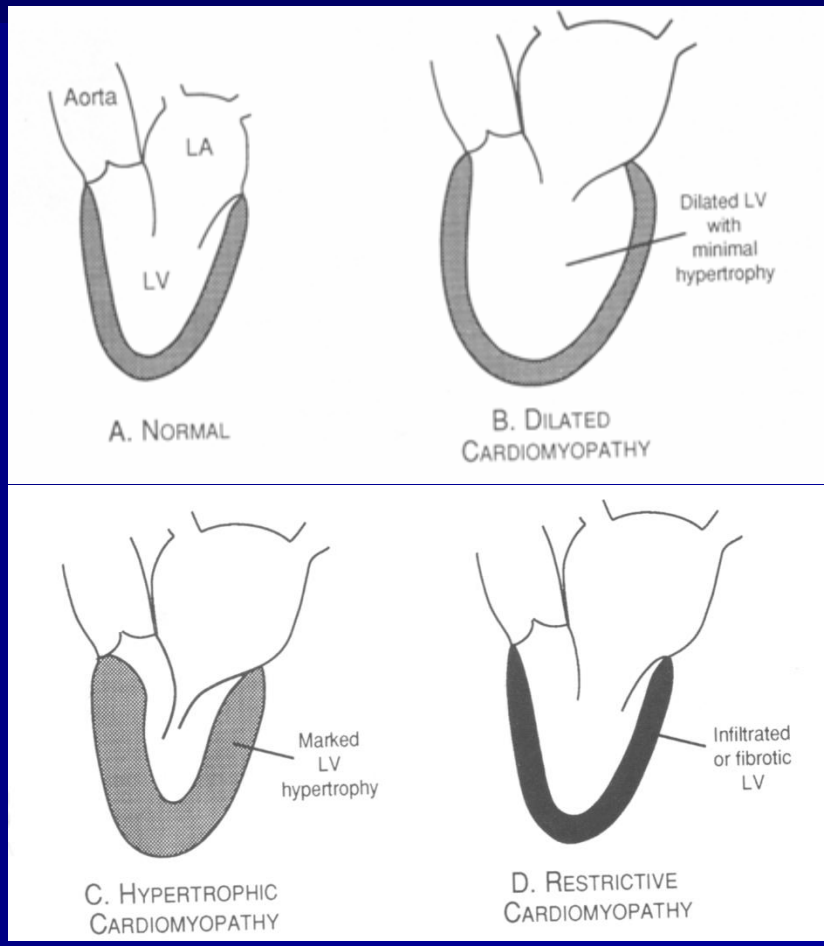
- 1980 WHO: unknown causes
  - Not clinically relevant
- 1995 WHO: "diseases of the myocardium associated with cardiac dysfunction "
  - pathophysiology
  - each with multiple etiologies

Cardiomyopathy

WHO Classification

anatomy & physiology of the LV

1. Dilated
   - Enlarged
   - Systolic dysfunction
2. Hypertrophic
   - Thickened
   - Diastolic dysfunction
3. Restrictive
   - Diastolic dysfunction
4. Arrhythmogenic RV dysplasia
   - Fibrofatty replacement
5. Unclassified
   - Fibroelastosis
   - LV noncompaction



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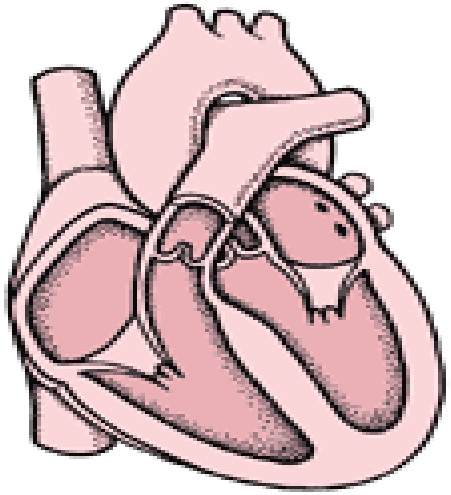
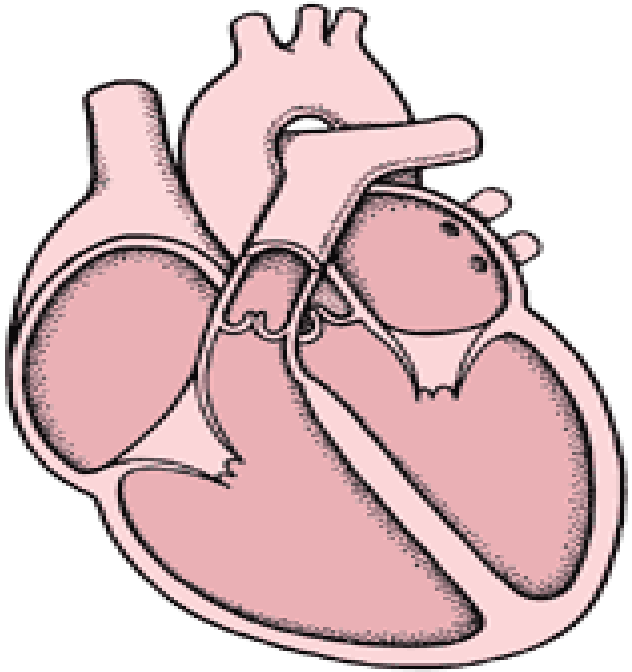
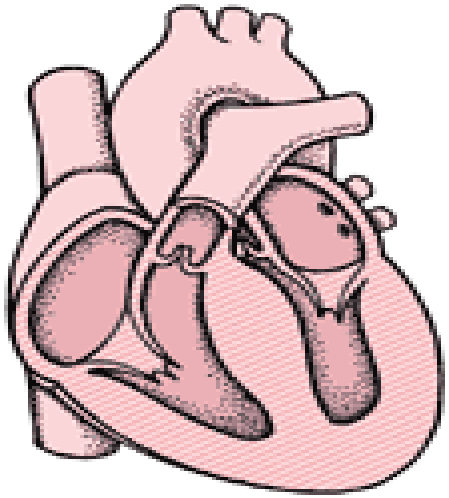
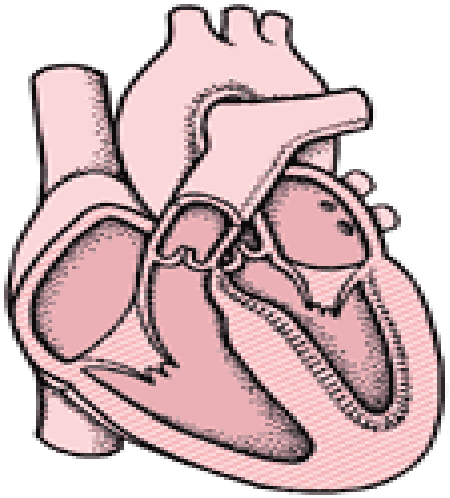


Cord normal



CMP dilatativă

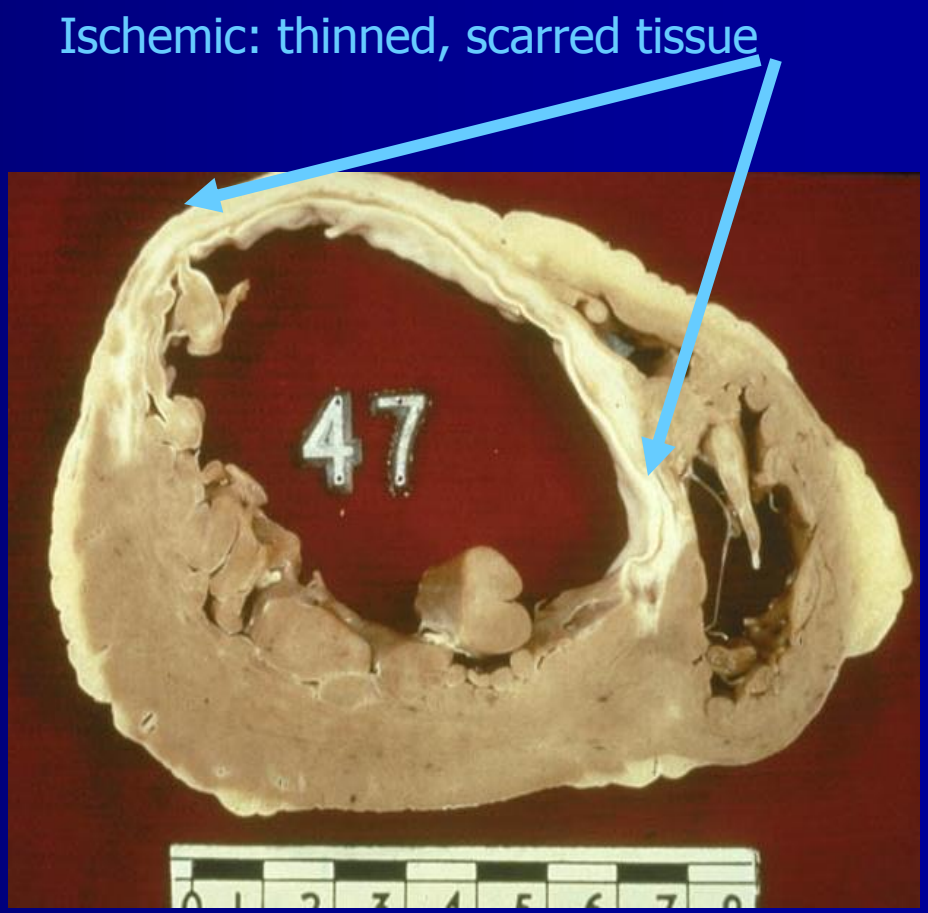




CMP hipertrofică CMP restrictivă

CM: Specific Etiologies

- Ischemic
- Valvular
- Hypertensive
- Inflammatory
- Metabolic
- Inherited
- Toxic reactions
- Peripartum



Dilated Cardiomyopathy

- Dilation *and* impaired contraction of ventricles:
  - Reduced *systolic* function with or without heart failure
  - Characterized by myocyte damage
  - Multiple etiologies with similar resultant pathophysiology

- Majority of cases are **idiopathic**
  - incidence of idiopathic dilated CM 5-8/100,000
  - incidence likely higher due to mild, asymptomatic cases
  - 3X more prevalent among males and African-Americans

DCM: Etiology

Ischemic
Valvular
Hypertensive
Familial
Idiopathic
Inflammatory
- **Infectious**
  - **Viral – picornovirus, Cox B, CMV, HIV**
  - **Ricketsial - Lyme Disease**
  - **Parasitic - Chagas' Disease, Toxoplasmosis**
- **Non-infectious**
  - **Collagen Vascular Disease (SLE, RA)**
  - **Peripartum**

Toxic
- **Alcohol, Anthracyclins (adriamycin), Cocaine**

Metabolic
- **Endocrine –thyroid dz, pheochromocytoma, DM, acromegaly,**

Nutritional
- **Thiamine, selenium, carnitine**

Neuromuscular (Duchene's Muscular Dystrophy--x-linked)

DCM: Infectious

Acute viral myocarditis

- Coxasackie B or echovirus
- Self-limited infection in young people
- Mechanism?:
  - Myocyte cell death and fibrosis
  - Immune mediated injury
  - BUT:
    - No change with immunosuppressive drugs

DCM: toxic

Alcoholic cardiomyopathy

- Chronic use
- Reversible with abstinence
- Mechanism?:
  - Myocyte cell death and fibrosis
  - Directly inhibits:
    - mitochondrial oxidative phosphorylation
    - Fatty acid oxidation

DCM: inherited

Familial cardiomyopathy

- 30% of 'idiopathic'
- Inheritance patterns
  - Autosommal dom/rec, x-linked, mitochondrial
- Associated phenotypes:
  - Skeletal muscle abn, neurologic, auditory
- Mechanism:
  - Abnormalities in:
    - Energy production
    - Contractile force generation
  - Specific genes coding for:
    - Myosin, actin, dystophin…

Dilated Cardiomyopathy

MECHANISMS IN HEART FAILURE

Ischemic injury
Myocardial disease
Genetics

Neurohormones
Cytokines
Oxidative stress

Altered molecular expression
Ultrastructural changes
Myocyte hypertrophy
Myocyte contractile dysfunction
Apoptosis
Fibroblast proliferation
Collagen deposition
Ventricular remodeling

Hemodynamic Derangement
Clinical Heart Failure
Arrhythmia

Pathophysiology

- Initial Compensation for impaired myocyte contractility:
  - Frank-Starling mechanism
  - Neurohumoral activation
  - ↑ intravascular volume

- Eventual decompensation
  - ventricular remodeling
  - myocyte death/apoptosis
  - valvular regurgitation

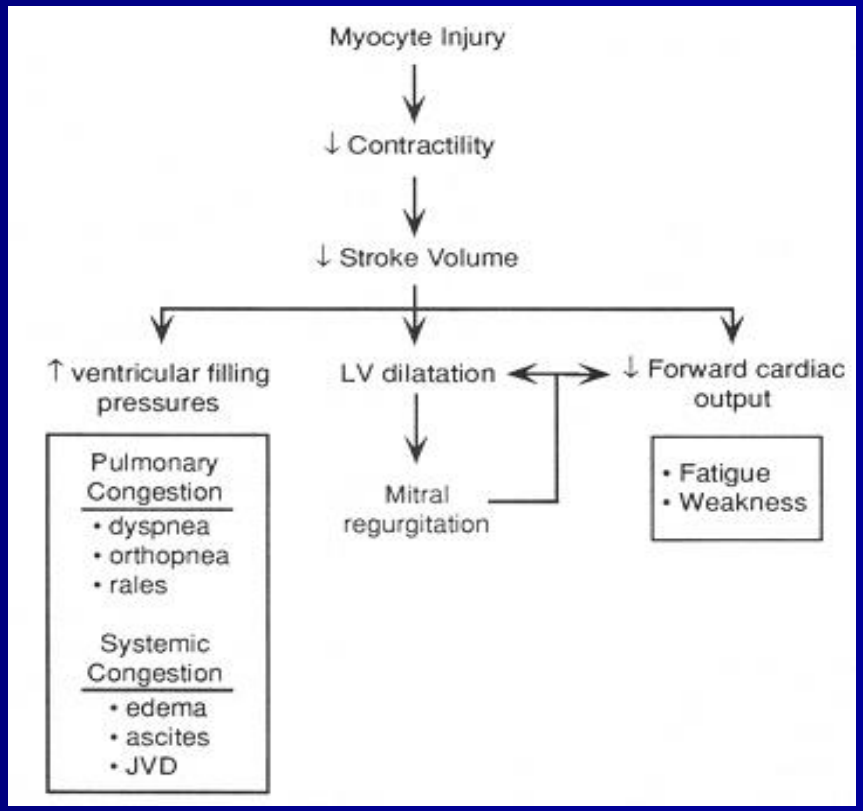
Clinical Findings

Biventricular Congestive Heart Failure

-Low forward Cardiac Output
-fatigue, lightheadedness, hypotension

-Pulmonary Congestion
-Dyspnea,
-orthopnea, & PND

-Systemic Congestion
-Edema
-Ascites
-Weight gain



Physical Exam

Decreased C.O.
- Tachycardia
- ↓ BP and pulse pressure
- cool extremities (vasoconstriction)
- Pulsus Alternans (end-stage)

Pulmonary venous congestion:
- rales
- pleural effusions

Cardiac:
- laterally displaced PMI
- S3 (acutely)
- mitral regurgitation murmur

Systemic congestion
- ↑ JVD
- hepatosplenomegaly
- ascites
- peripheral edema

Diagnostic Studies

CXR -enlarged cardiac silhouette,
vascular redistribution interstitial edema,
pleural effusions

EKG –normal
tachycardia, atrial and ventricular
enlargement, LBBB, RBBB, Q-waves

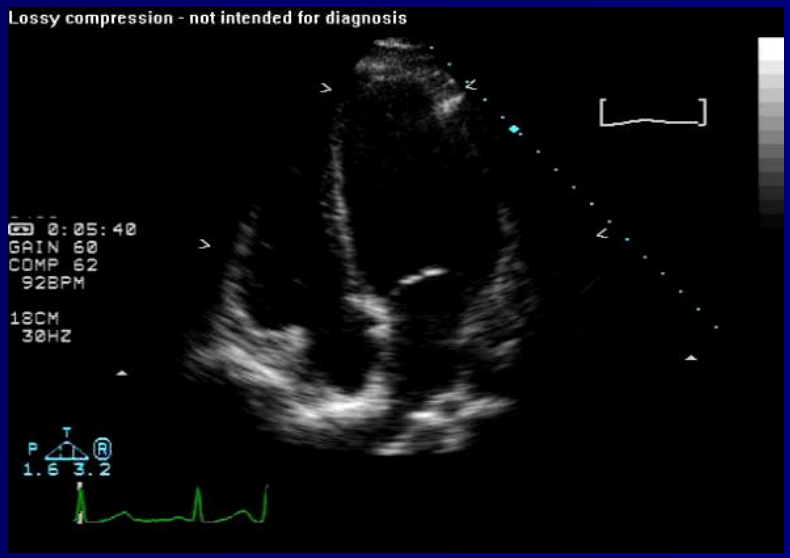
Blood Tests
(ANA,RF, Fe^{2+}, TFT's,ferritin,)

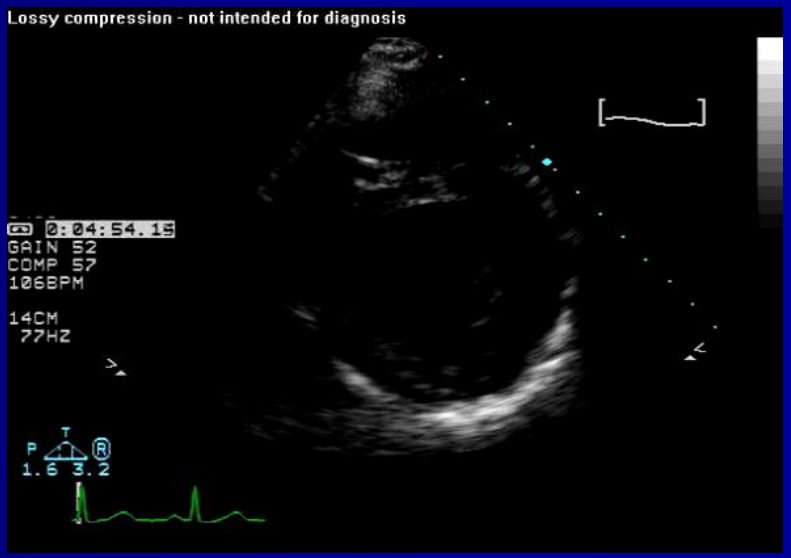
Echocardiography
LV size, wall thickness function
valve dz, pressures

Cardiac Catheterization
hemodynamics
LVEF
angiography

Endomyocardial Biopsy

Echo in dilated CM





Hypertrophic Cardiomyopathy

Left ventricular hypertrophy not due to pressure overload
Hypertrpohy is variable in both severity and location:
- -asymmetric septal hypertrophy
- -symmetric (non-obstructive)
- -apical hypertrophy

Vigorous systolic function, but impaired diastolic function
- impaired relaxation of ventricles
- elevated diastolic pressures

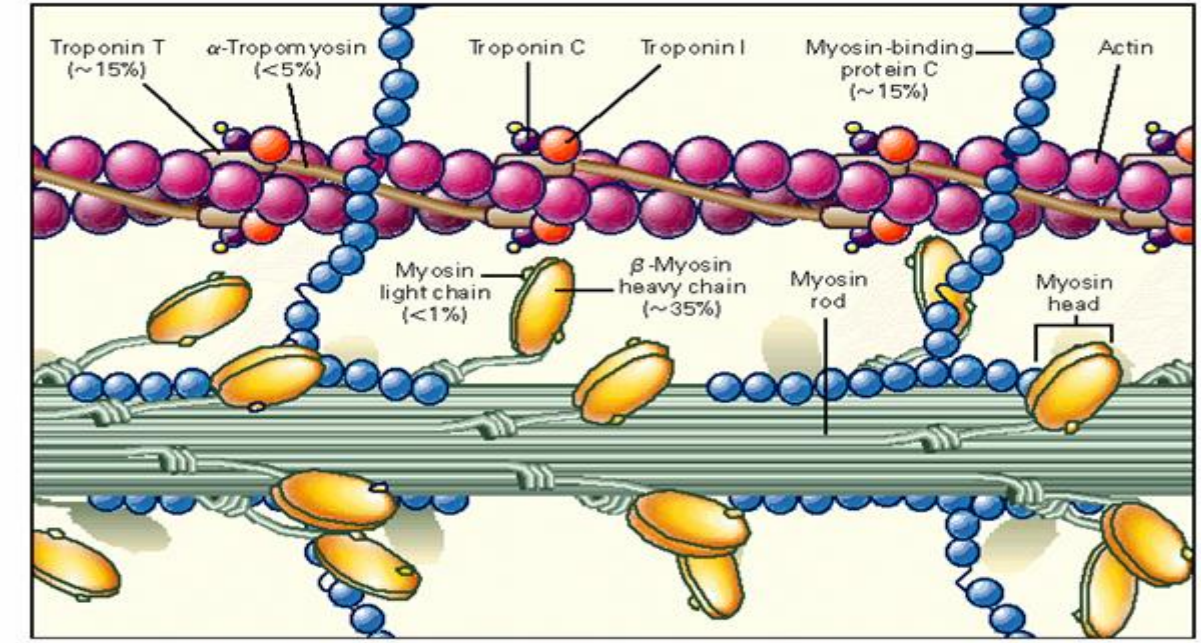
prevalence as high as 1/500 in general population
- mortality in selected populations 4-6% (institutional)
- probably more favorable (≤1%)

Etiology

Familial in ~ 55% of cases with autosomal dominant transmission
Mutations in one of 4 genes encoding proteins of cardiac sarcomere
account for majority of familial cases

β-MHC
cardiac troponin T
myosin binding protein C
α-tropomyosin

Remainder are spontaneous mutations.



Physical Exam

Bisferiens pulse (“spike and dome”)
S4 gallop
Crescendo/Descrescendo systolic ejection murmur

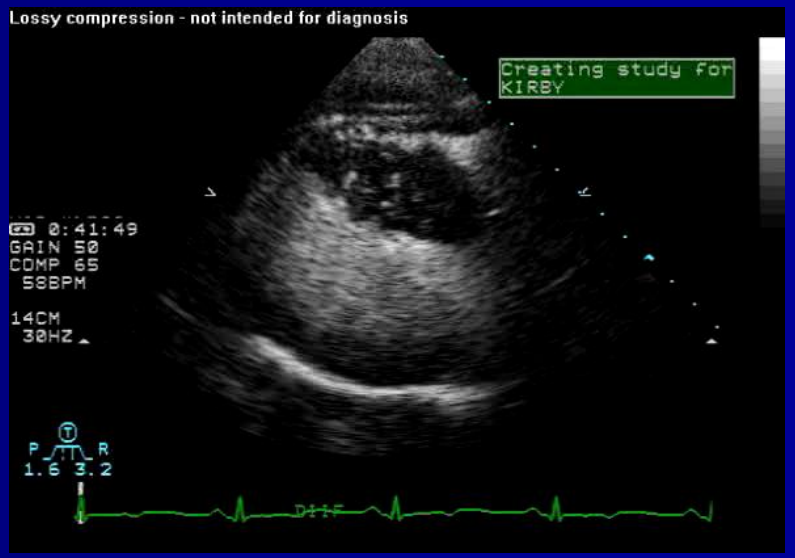
HOCM vs. Valvular AS

	Intensity of murmur	
	HOCM	AS
Valsalva (↓preload, ↓ afterload)	↑	↓
Squatting (↑ preload, ↑ afterload)	↓	↑
Standing (↓preload, ↓ afterload)	↑	↓

Holosystolic apical blowing murmur of mitral regurgitation

Diagnostic Studies

- EKG
  - NSR
  - LVH
  - septal Q waves
- 2D-Echocardiography
  - LVH; septum >1.4x free wall
  - LVOT gradient by Doppler
  - Systolic anterior motion of the mitral valeregurgitation
- Cardiac Catheterization
  - LVOT gradient and pullback
  - provocative maneuvers
  - Brockenbrough phen



HCM-ASH using contrast

Treatment

For symptomatic benefit

β-blockers

↓ mvO2

↓ gradient (exercise)

arrythmias

Calcium Channel blockers

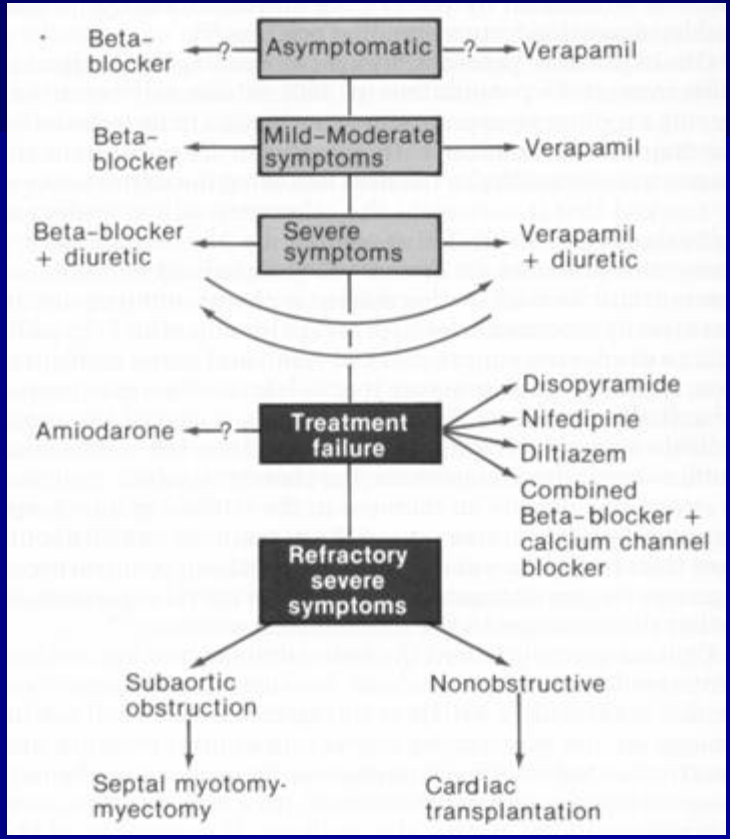
Anti-arrhythmics

afib

amiodorone

Disopyramide

AICD for sudden death



antibiotic prophylaxis for endocarditis

No therapy has been shown to improve mortality

HCM: Surgical Treatment

For severe symptoms with large outflow gradient (>50mmHg)
Does not prevent Sudden Cardiac Death

Myomyectomy
- removal of small portion of upper IV septum
- +/- mitral valve replacement
- 5 year symptomatic benefit in ~ 70% of patients

Dual Camber (DDD pacemaker) pacing
- decreases LVOT gradient (by~25%)
- randomized trials have shown little longterm benefit
- possible favorable morphologic changes

ETOH septal ablation

AICD to prevent sudden death

Hypertrophic CM

- Most common cause of death in young people.
- The magnitude of left ventricular hypertrophy is directly correlated to the risk of SCD.
- Young pts with extreme hypertrophy and few or no symptoms are at substantial long-term risk of SCD.

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Spirito P. *N Engl J Med.* 1997;336:775-785.
Maron BJ. *N Engl J Med*. 2000;342:365-373.

Prognosis

Sudden Death 2-4%/year in adults
4-6% in children/adolescents

AICD for: survivors of SCD with Vfib
episodes of Sustained VT
pts with family hx of SCD in young family members
High risk mutation (TnT, Arg403Gln)

Predictors of adverse prognosis:

- early age of diagnosis
- familial form with SCD in 1st degree relative
- history of syncope
- ischemia
- presence of ventricular arrhythmias on Holter (EPS)

EPS

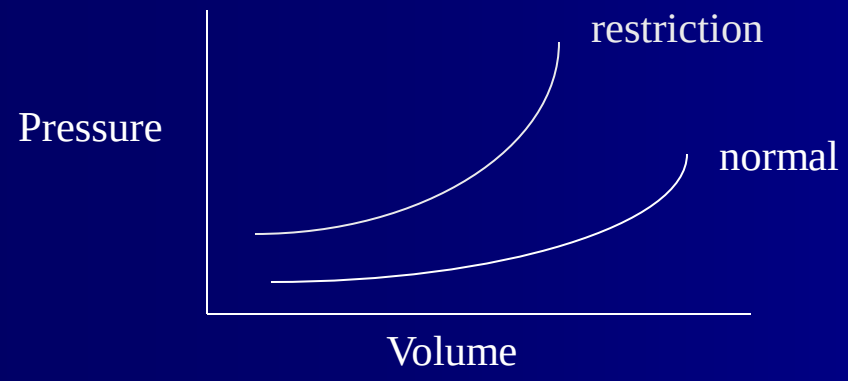
Amiodorone (low dose)

Prophylactic AICD?

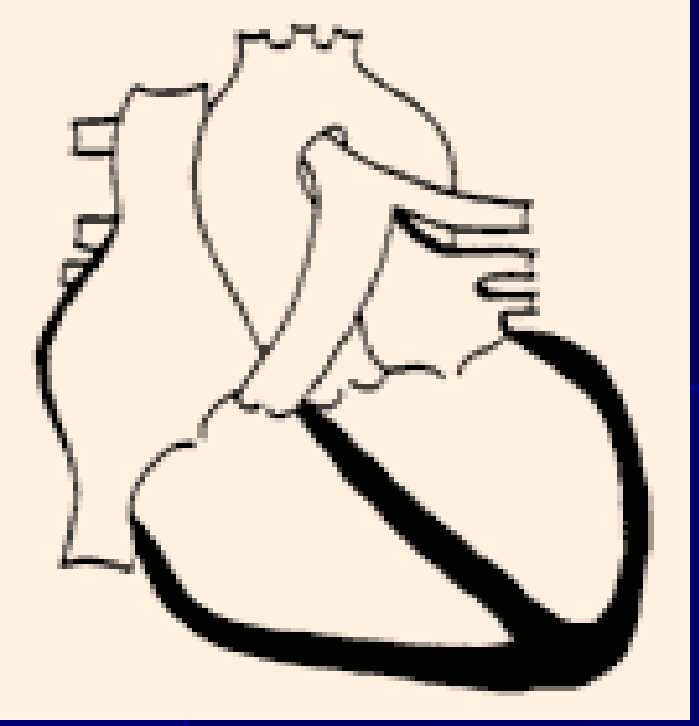
Restrictive Cardiomyopathy

Characterized by:

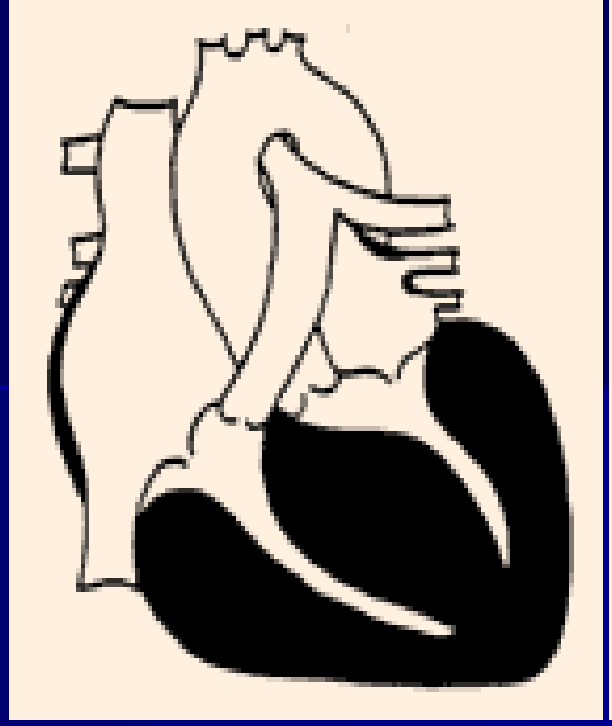
- impaired ventricular filling due to an abnormally stiff (rigid) ventricle
- normal systolic function (early on in disease)
- intraventricular pressure rises precipitously with small increases in volume



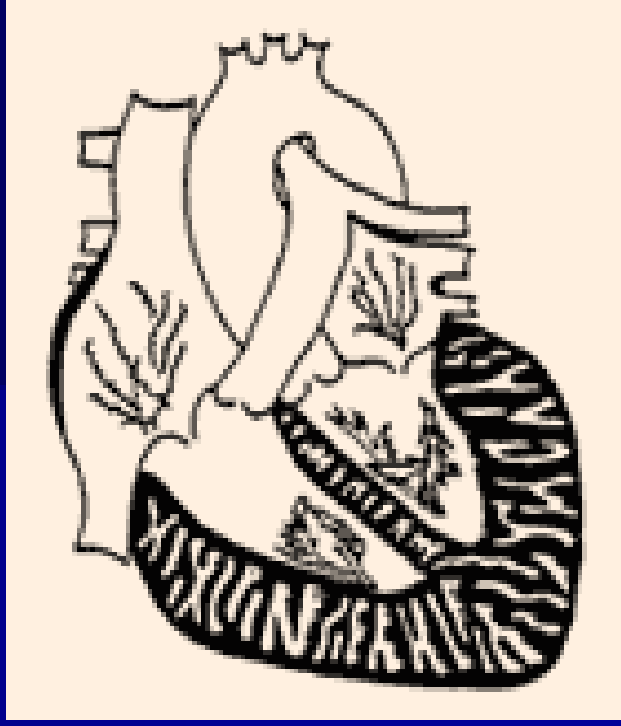
Causes : infiltration of myocardium by abnormal substance
fibrosis or scarring of endocardium



CMP dilatativă



CMP hipertrofică

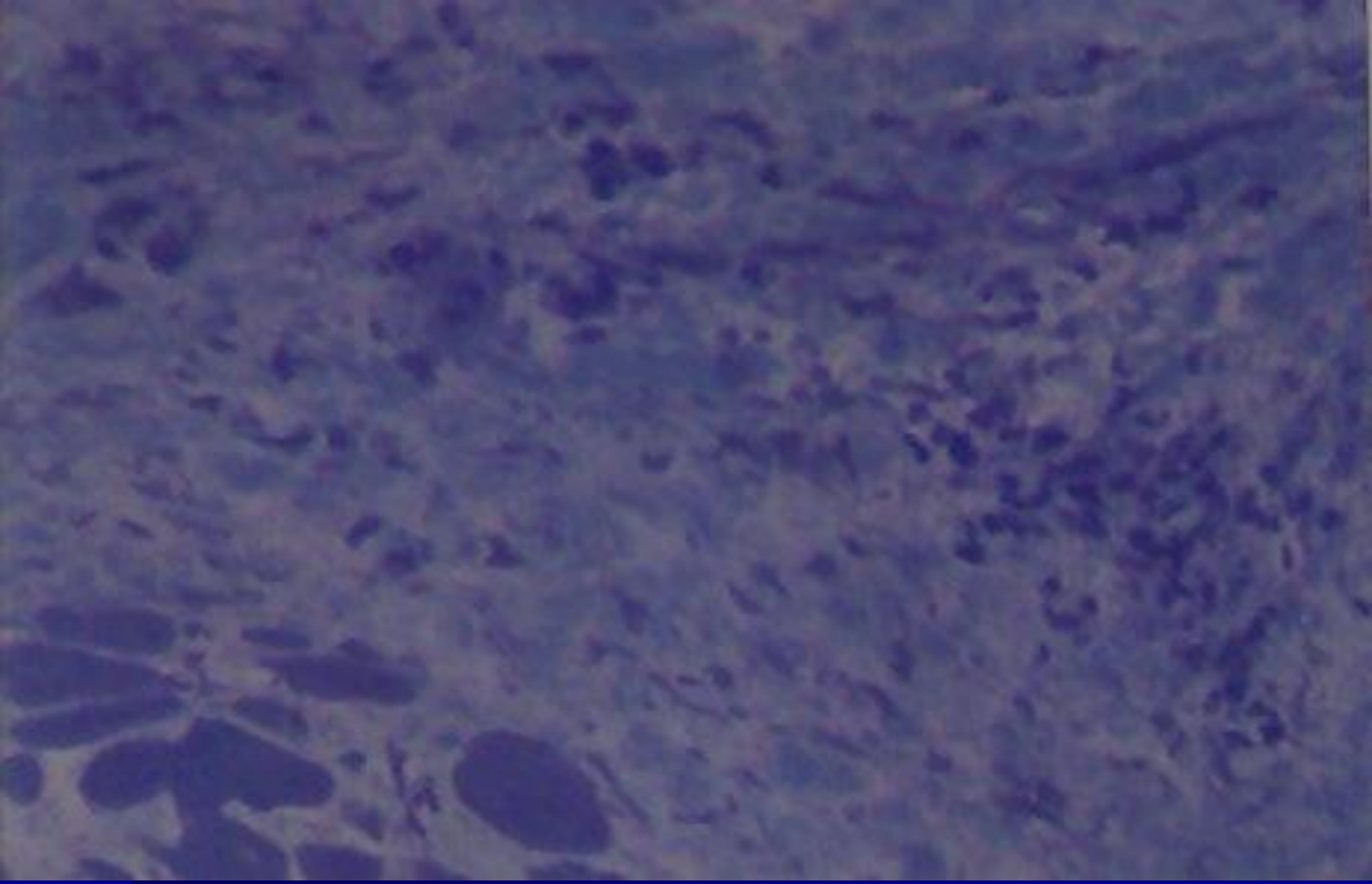


CMP restrictivă

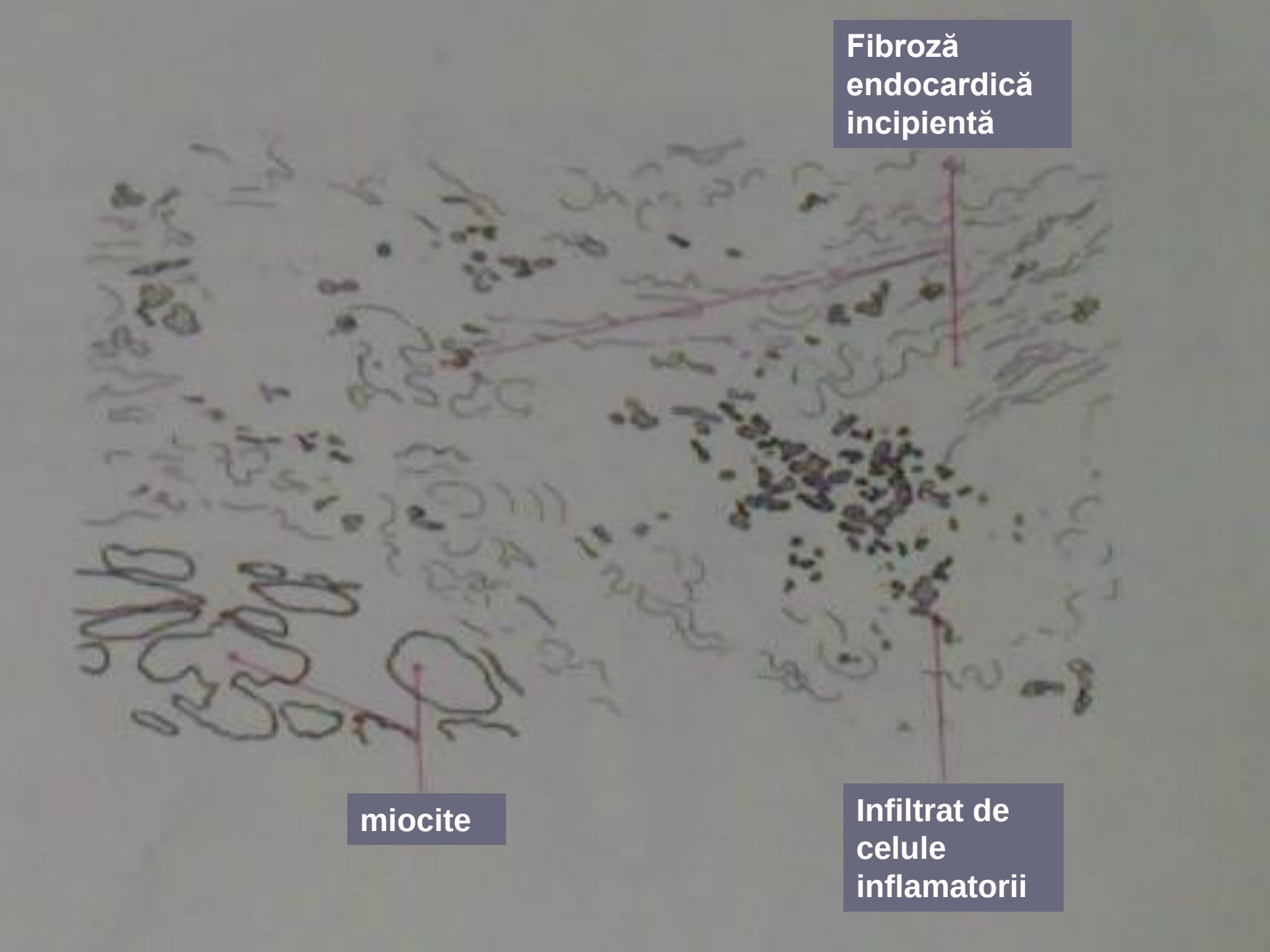
Cardiomiopatie restrictivă

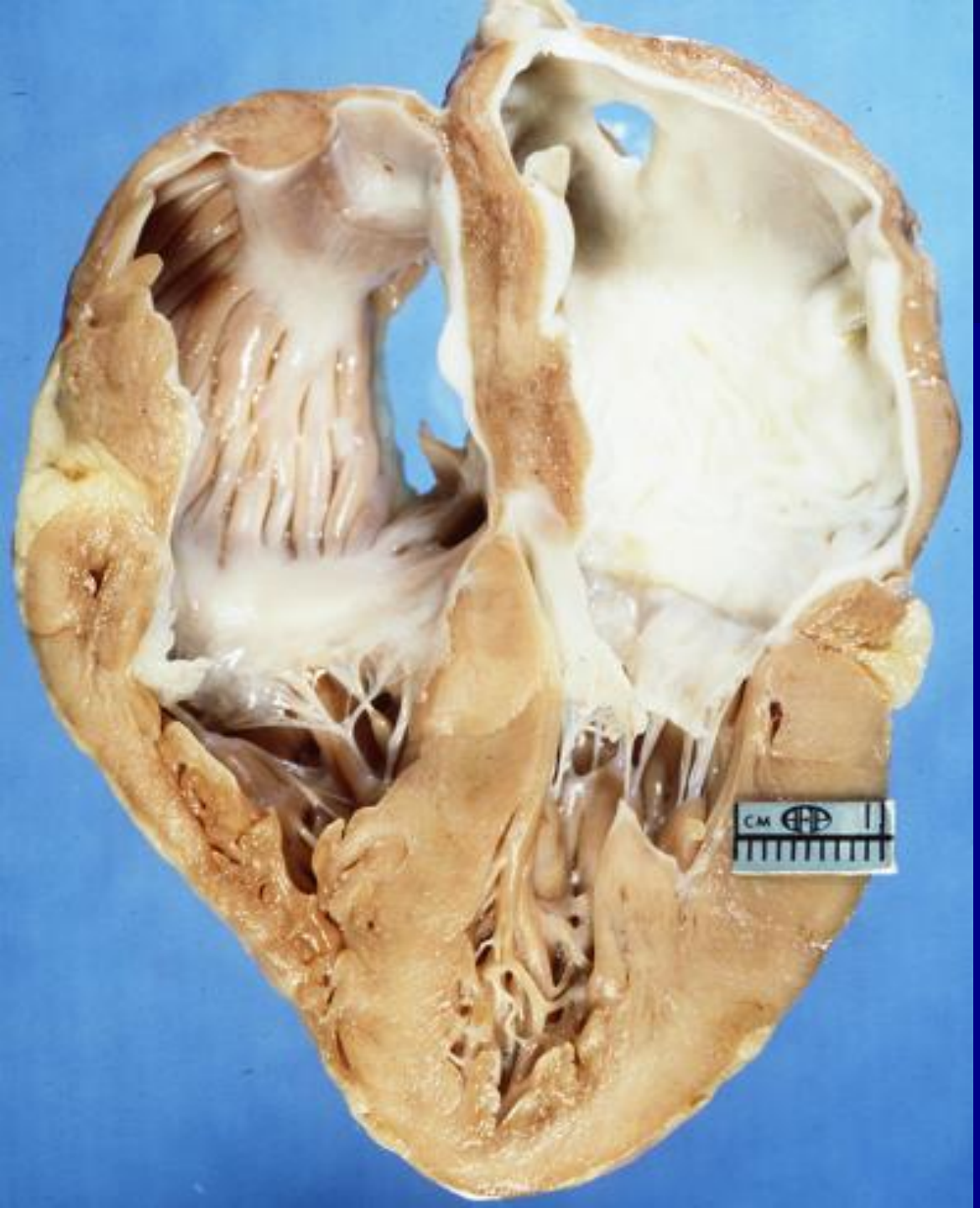
Ethiology

- **cardiaca amiloidosis**
- **hemocromatosis**
- **sarcoidosis**
- **radiotherapy and chimiotherapy**
- **Loeffler syndrome**
- (hipereozinofilic syndrome) and fibrosis endomiocardic
- **genetic factors**



Histologic. Infiltrat de celule inflamatorii


Fibroză endocardică incipientă
miocite
Infiltrat de celule inflamatorii



Restrictive CMP

Hipertrofia VS
Fibroză apicală
a endocardului

Clinical manifestations

Pacients difficult tolerate exercises presenting dyspnea and fatigue explained by increased venous pressure and unable increase cardiac output by

- tachycardia
- anginal pain
- nonspecific cardiac pain

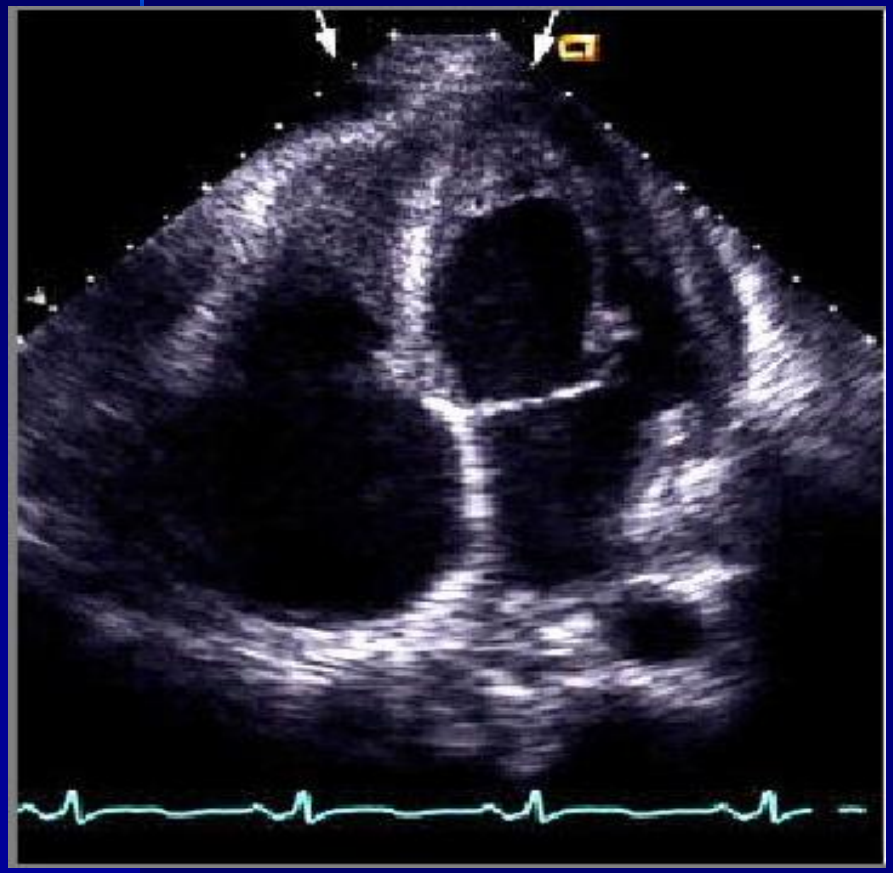
Arrhythmias (atrial fibrillation, ventricular extrasystole)

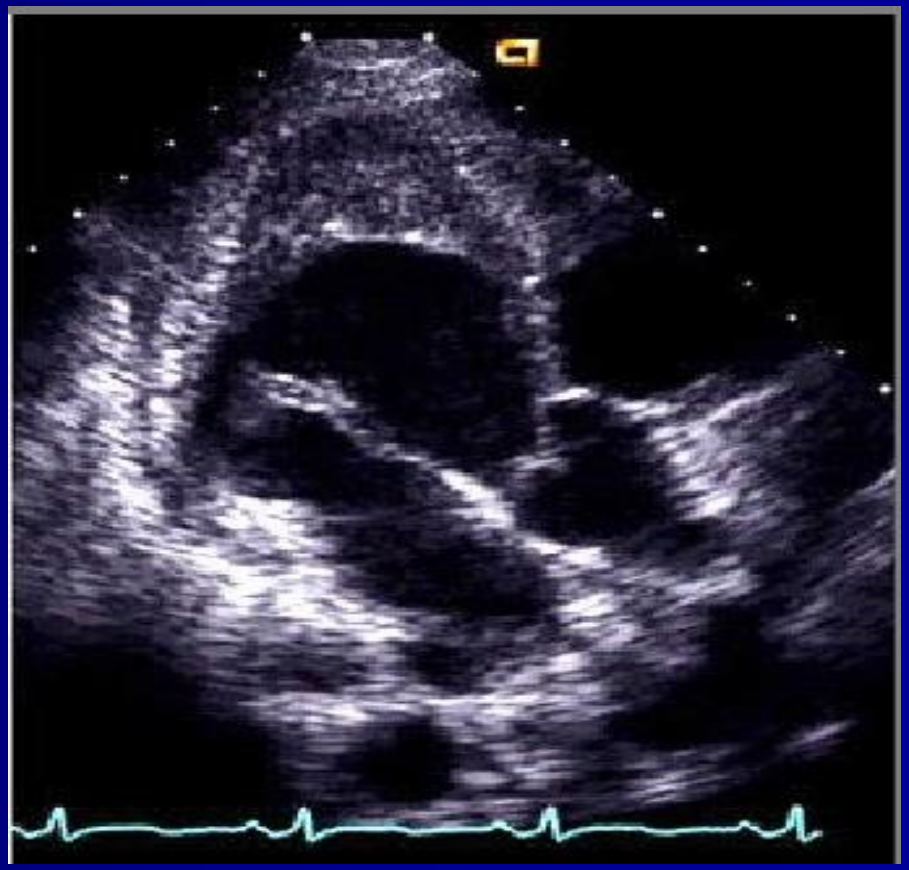
thrombotic syndrome

Diagnosis

- ECG
- Chest Radiography
- Echocardiography with Doppler
- Computer tomography
- Biopsy
- Genetic study

CMPR EcoCG





Treatment

Treatment is symptomatic:

Heart failure
Arrhythmias
Conduction disorders

Prognostic is reserved

Treatment - managment

- Avoid alcohol because chronic alcohol consumption increases the risk of cardiomyopathy in some people and aggravate symptoms in patients who develope the disease
- identify treatable causes (hemochromatosis, carcinoid)

Sault restriction

Recomanded cuantity of sodium - 2 grams / day.

Alimentation rich in sodium must be evitated: chips, hazzelnuts with sault, meat prepaired with sault, pizza, cheese, conservated products.

It is recommended consumption of fresh fruits and vegetables.

- **Avoiding liquid excess.**

- **Regular weighing is recommended and in case that weight gain is more than 1-1.5 kg per 2 days the patient neeeds medical consultation (to start with diuretic)? Patients with restrictive cardiomyopathy should avoid excessive exercise**

Simptomatic treatment

- Diuretics (hidroclortiazida 50 mg/zi, furosemidă 40 mg/zi)
- Vasodilatators (izosorbit dinitrat 20-60mg/zi
  lisinopril 5mg/zi)
- Inderect anticoagulants (warfarin 3 mg/zi)
- Cardiac glicozides (digoxina (low doses),

Surgycal treatment

- Cardiac pacemaker
- Cardioverter defibrilator
- Cardiac transplant
- Stem celulles transplant