

Cardiomyopathy

ACOI IM Board Review 2019

Martin C. Burke DO, FACOI

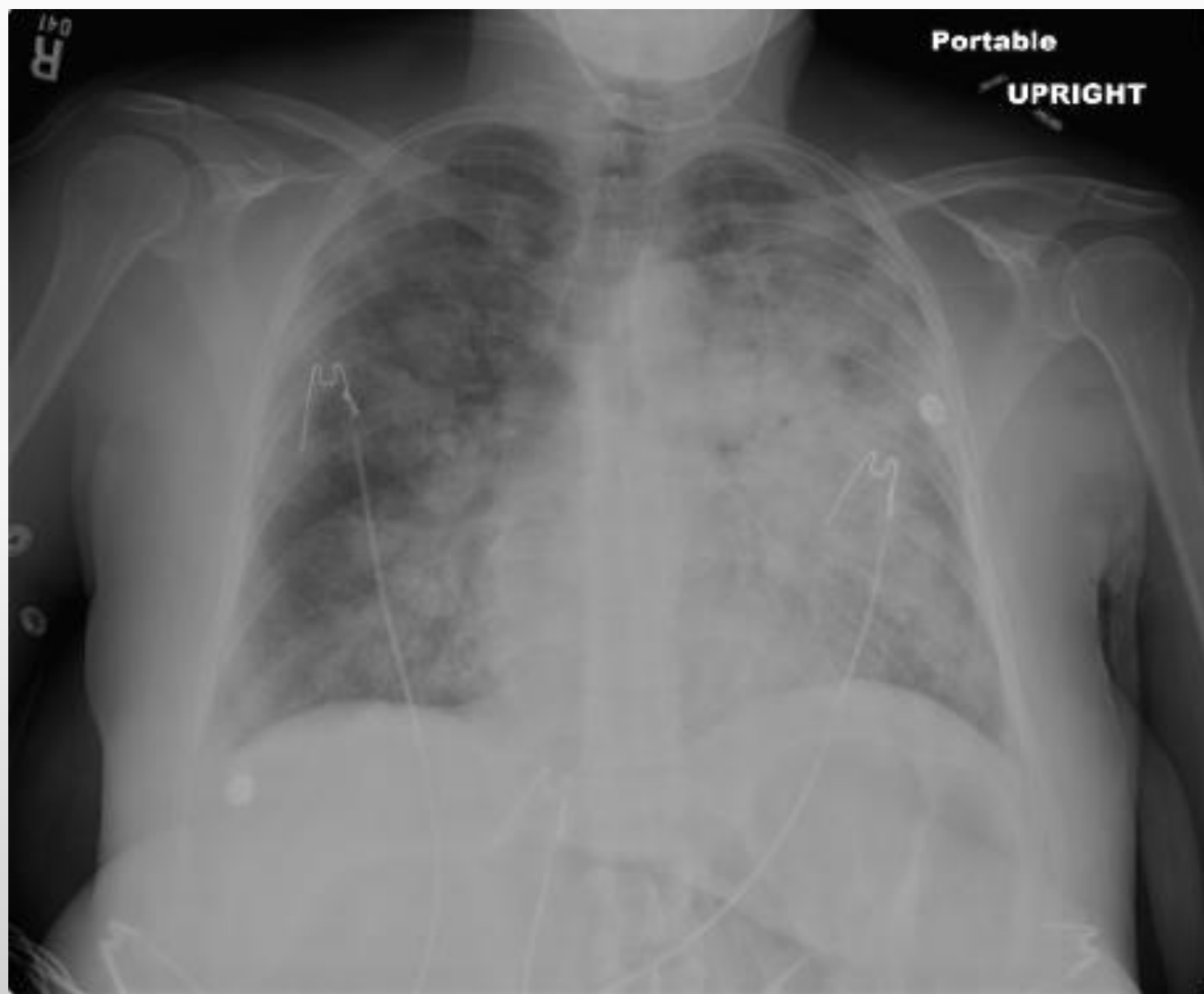
Disclosures

- I am Principal investigator and receive grants for heart failure trials from Boston Scientific, Medtronic and St. Jude Medical, investigating cardiac resynchronization therapy in systolic dysfunction related chf
- I have received consulting fees and contracts from Boston Scientific
- President and Chief Scientific Officer of the CorVita Science Foundation (CSF), a nonprofit alliance of clinicians devoted to cardiovascular care, education and clinical collaboration

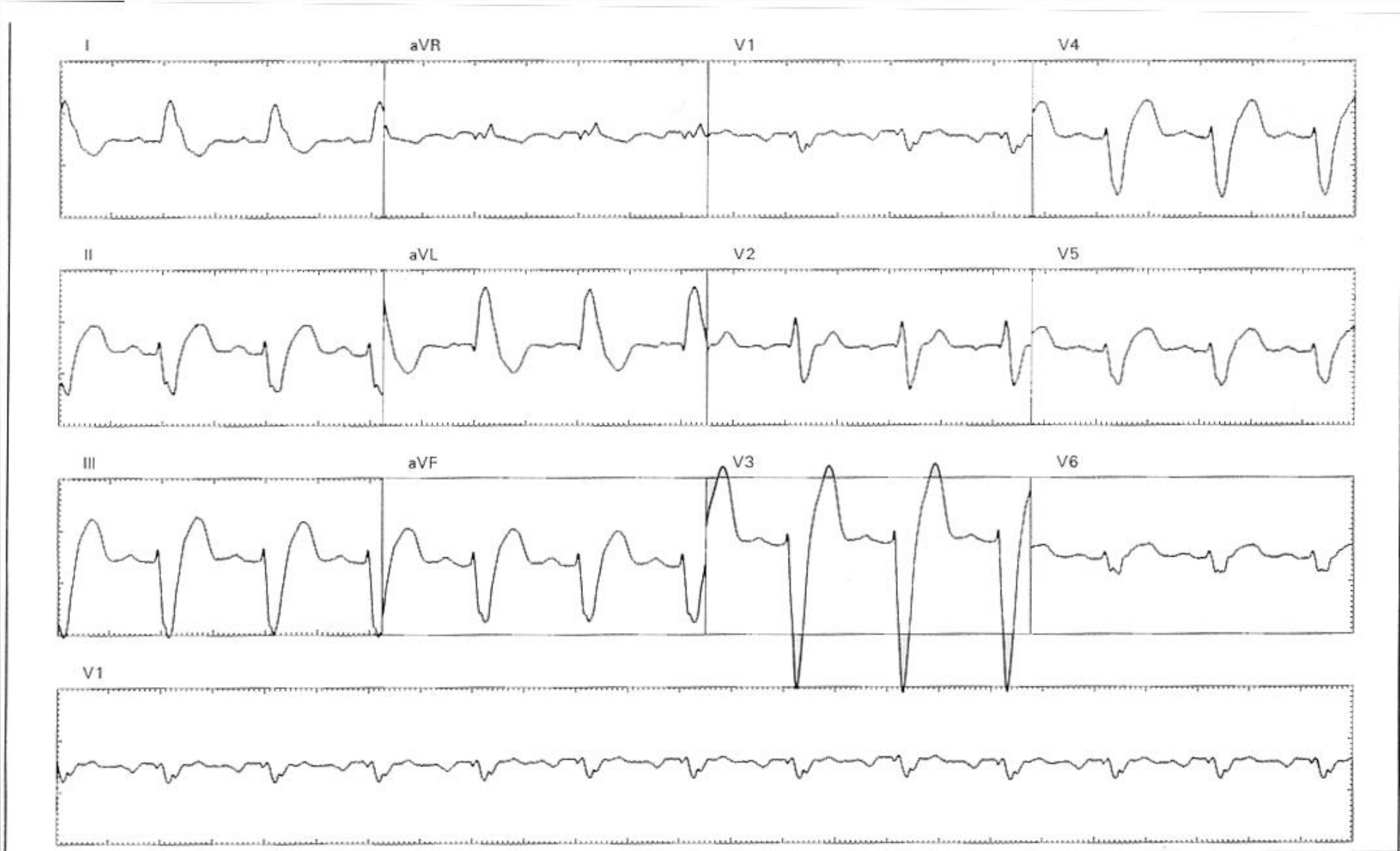
Cardiomyopathies

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

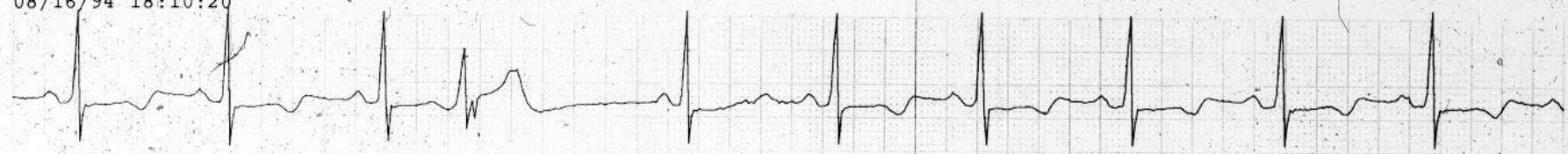


12-Lead ECG (IVCD/LAD)



M4/

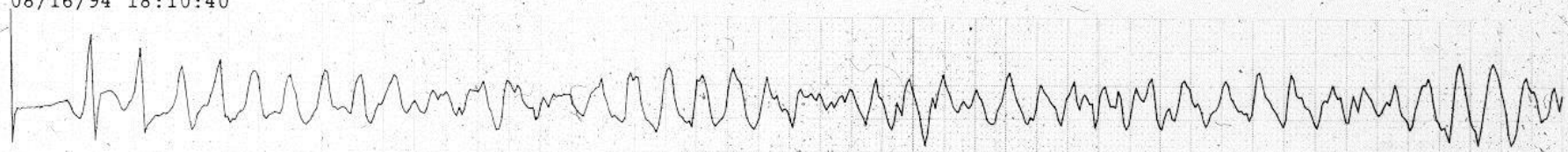
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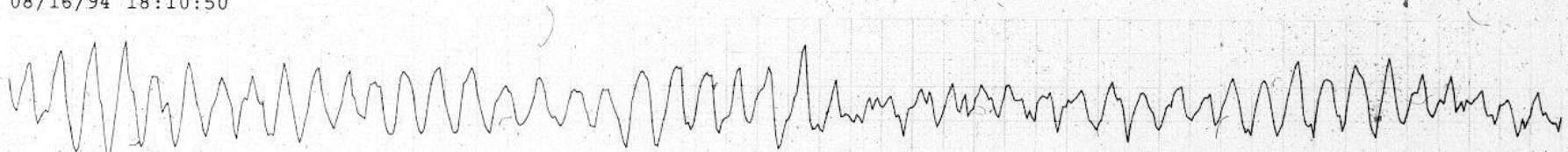
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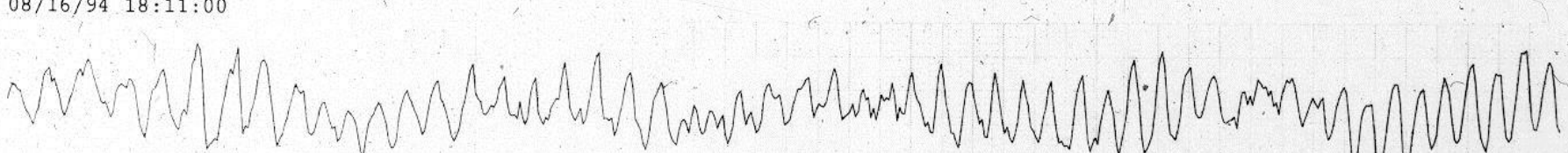
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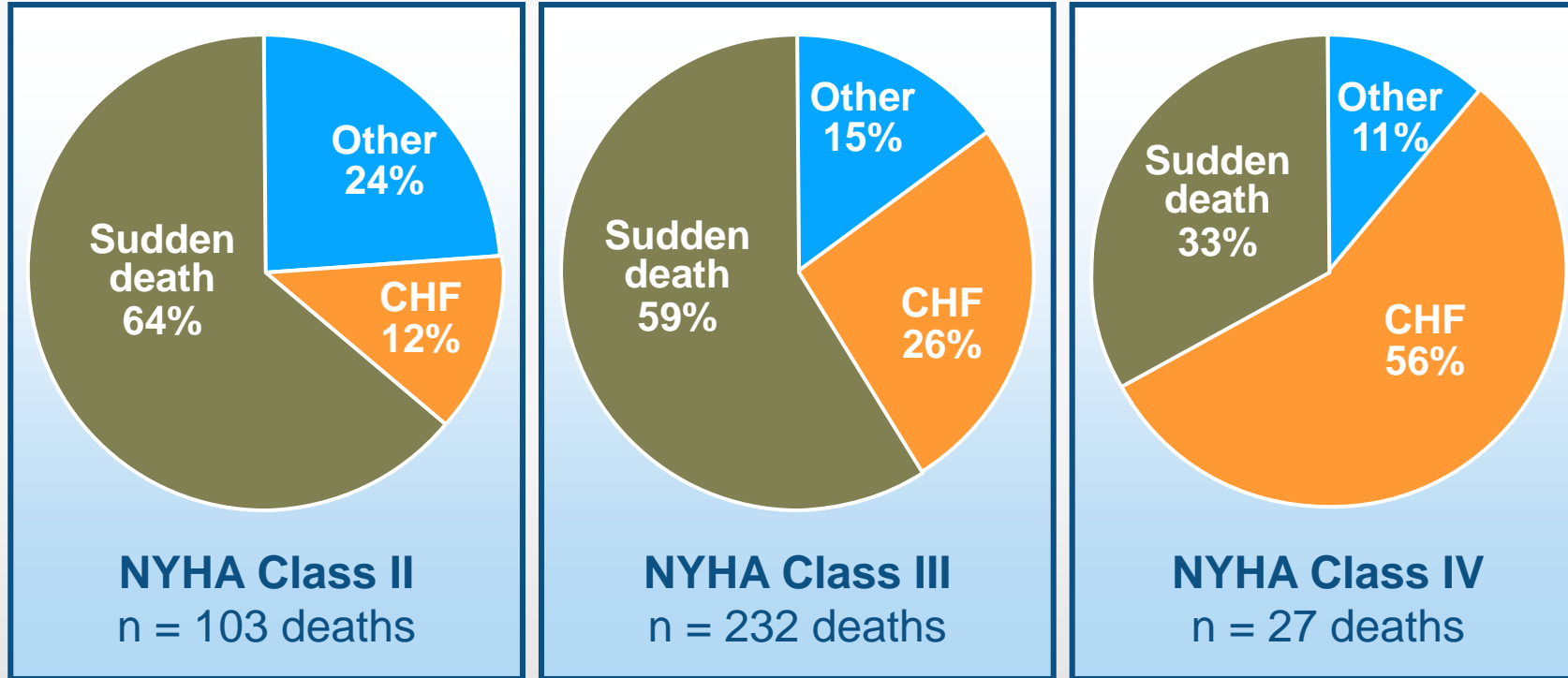
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Heart Failure Mortality



The likely mechanism of death moves from sudden death to pump failure as the heart failure progresses¹

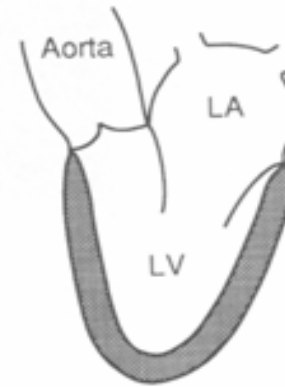
¹MERIT-HF Study Group. Effect of metoprolol CR/XL in chronic heart failure: metoprolol CR/XL randomised intervention trial in congestive heart failure (MERIT-HF) *Lancet* 1999;353:2001-2007

Cardiomyopathy

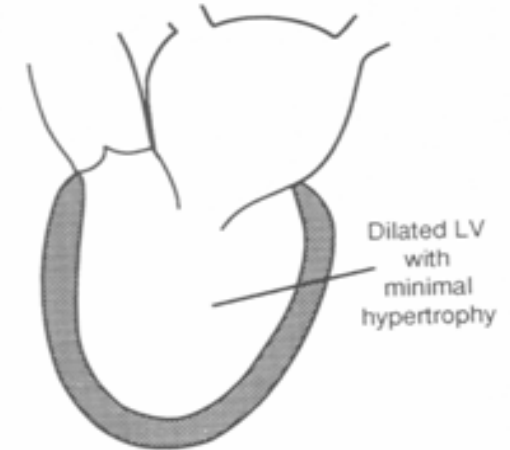
WHO Classification

anatomy & physiology of the LV

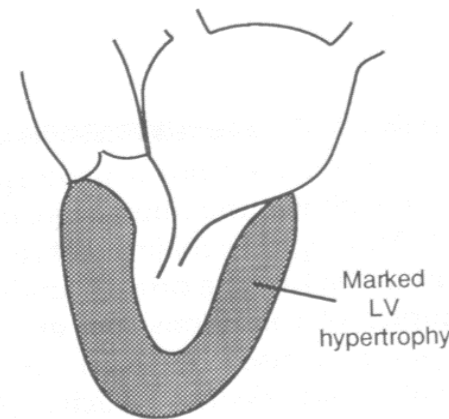
1. Dilated
 - Enlarged
 - Systolic dysfunction
2. Hypertrophic
 - Thickened
 - Diastolic dysfunction
3. Restrictive
 - Diastolic dysfunction
4. Arrhythmogenic RV dysplasia
 - Fibrofatty replacement
5. Unclassified
 - Fibroelastosis
 - LV noncompaction



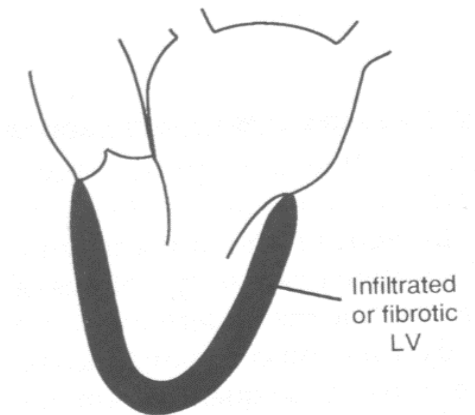
A. NORMAL



B. DILATED
CARDIOMYOPATHY



C. HYPERTROPHIC
CARDIOMYOPATHY

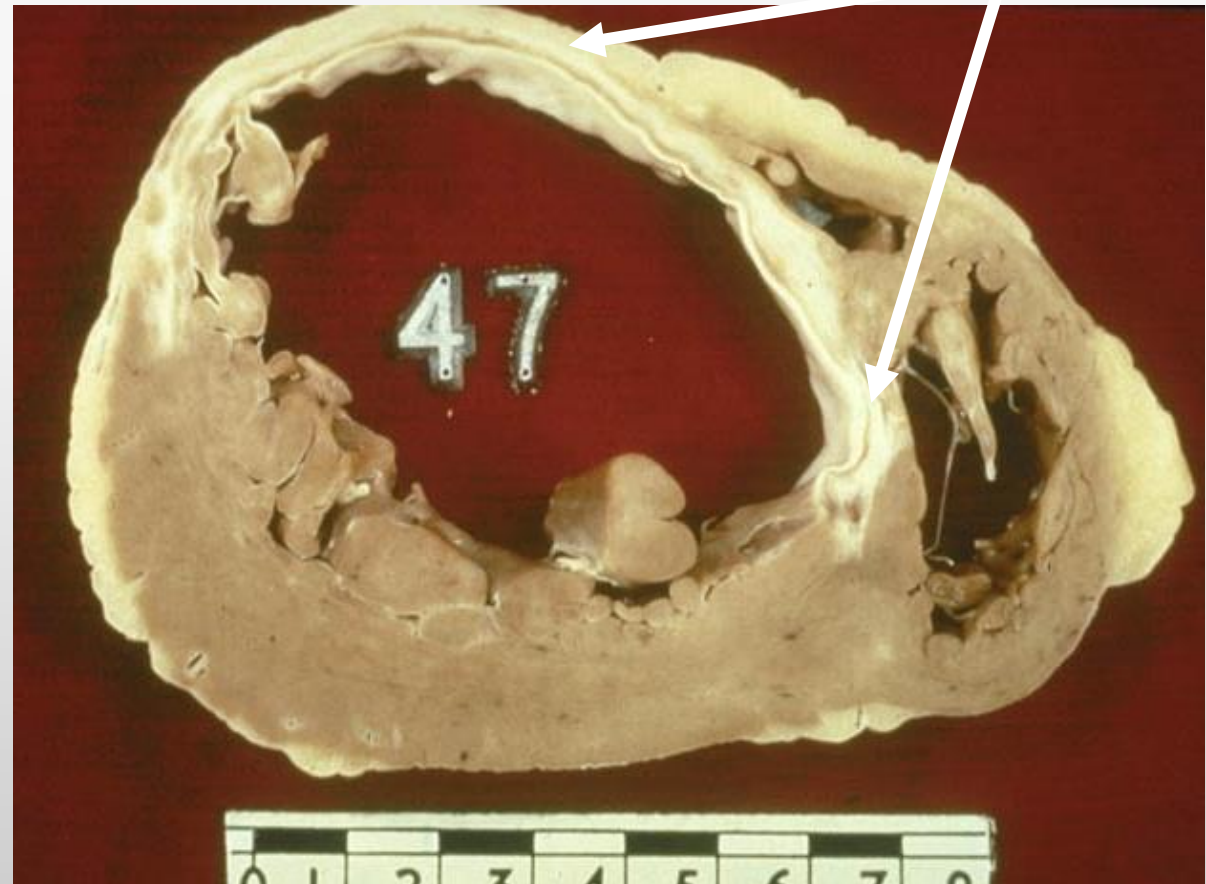


D. RESTRICTIVE
CARDIOMYOPATHY

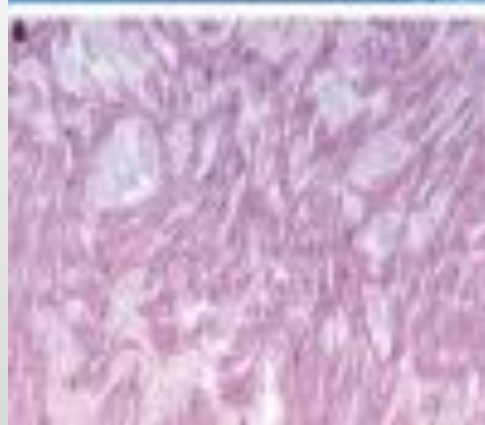
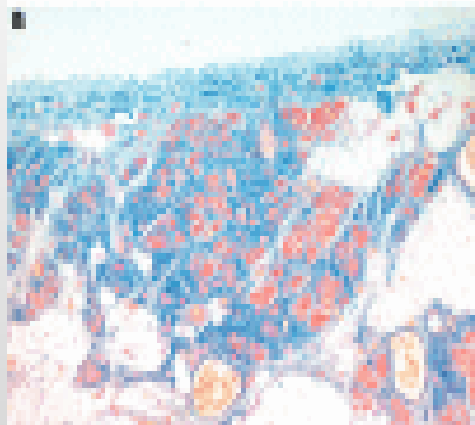
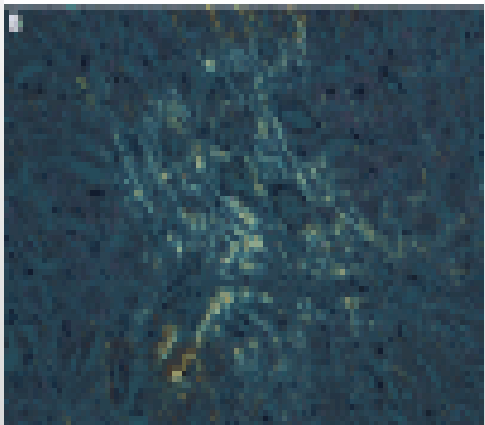
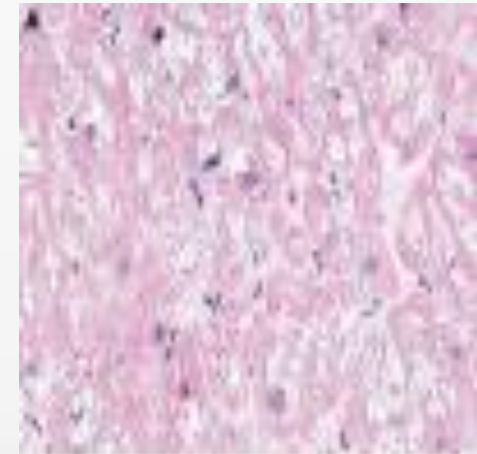
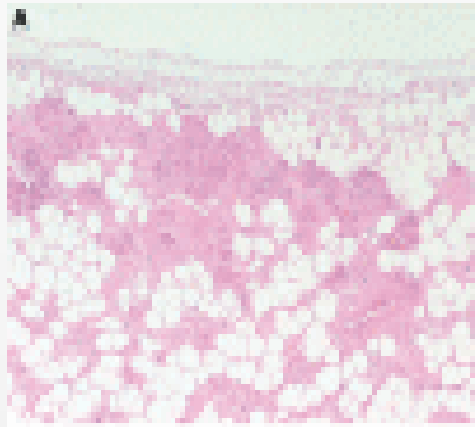
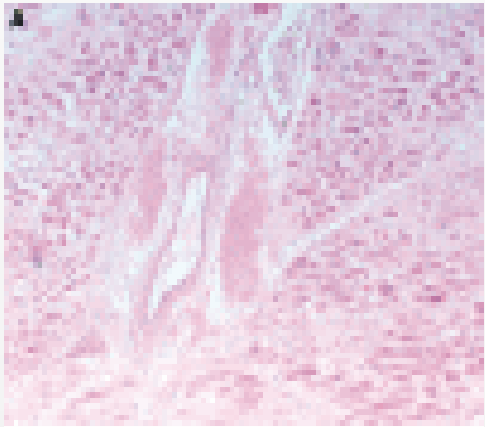
CM: Specific Etiologies

- Ischemic
- Valvular
- Hypertensive
- Inflammatory/infection
- Metabolic
- Inherited
- Toxic reactions (Chemo)
- Peri-partum
- Takotsubo (emotional)

Ischemic: thinned, scarred tissue



Histopathology



Amyloid

ARVC

HCM

Inherited
HCM

Fabry's
disease

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

Dilated Cardiomyopathy



DCM: inherited

Familial cardiomyopathy

- 30% of 'idiopathic'
- Inheritance patterns
 - Autosomal 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, dystrophin...

DCM: Infectious

HIV related Cardiomyopathy

Chagas Disease (Treponema)

Lyme Disease (Borrelia Bergdorferi)

Acute viral myocarditis

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

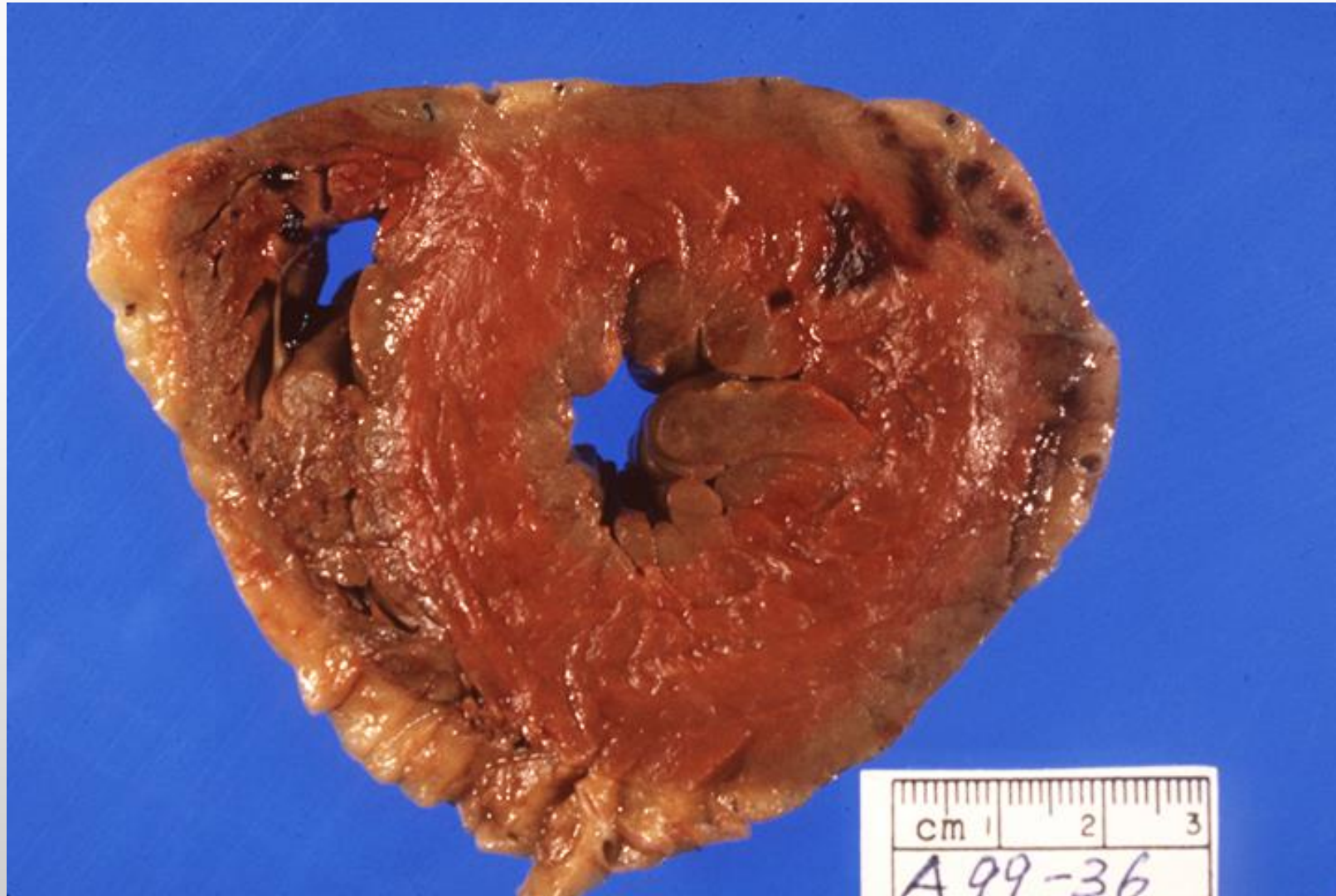
DCM: toxic

Chemotherapy- classic example is Doxorubicin (though time/survival is proving more complex)

Alcoholic cardiomyopathy

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

Hypertensive Hypertrophic Cardiomyopathy



Hypertrophic Cardiomyopathy-Inherited

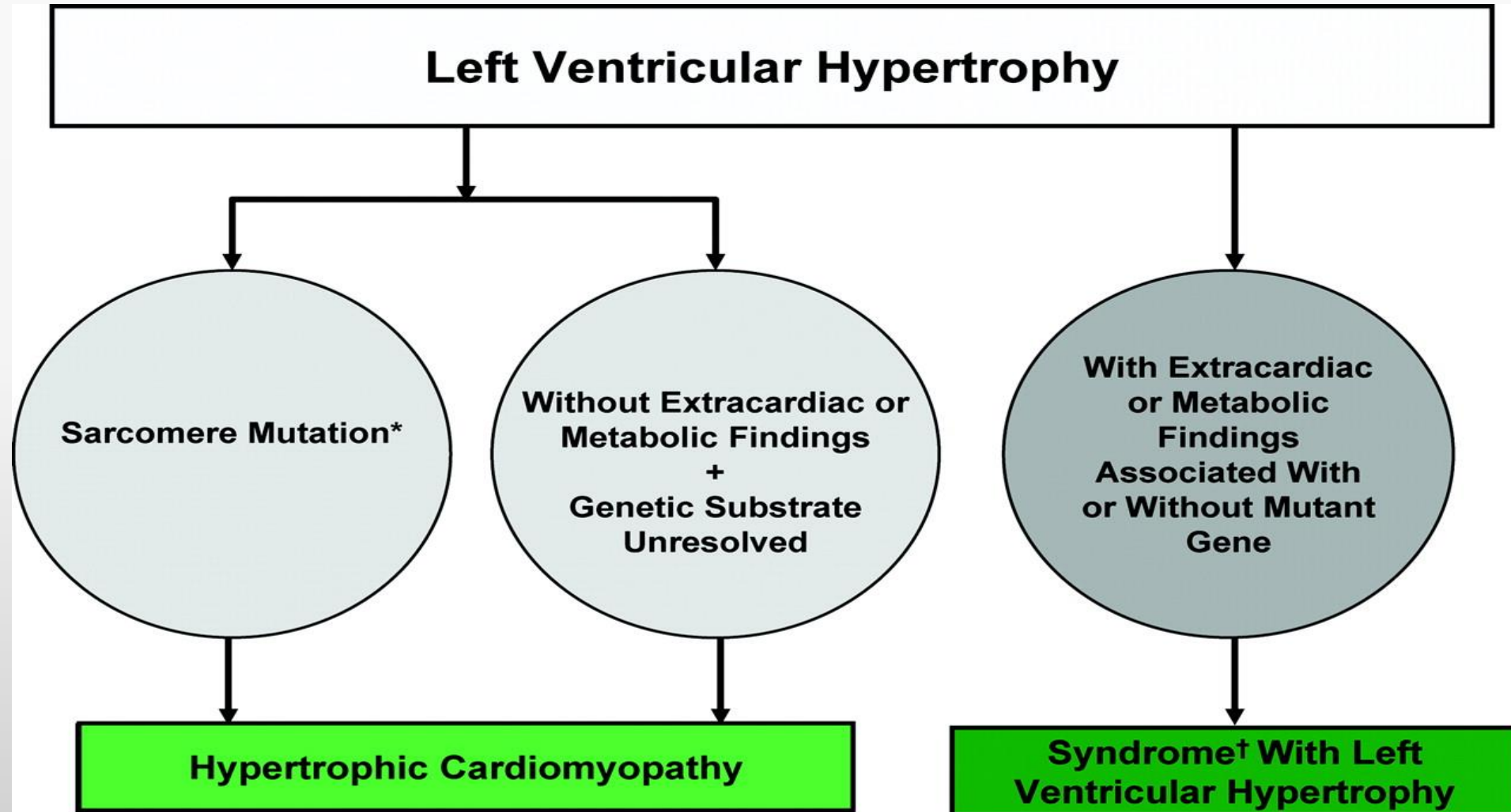


2011 ACCF/AHA Guideline for the Diagnosis and Treatment of Hypertrophic Cardiomyopathy

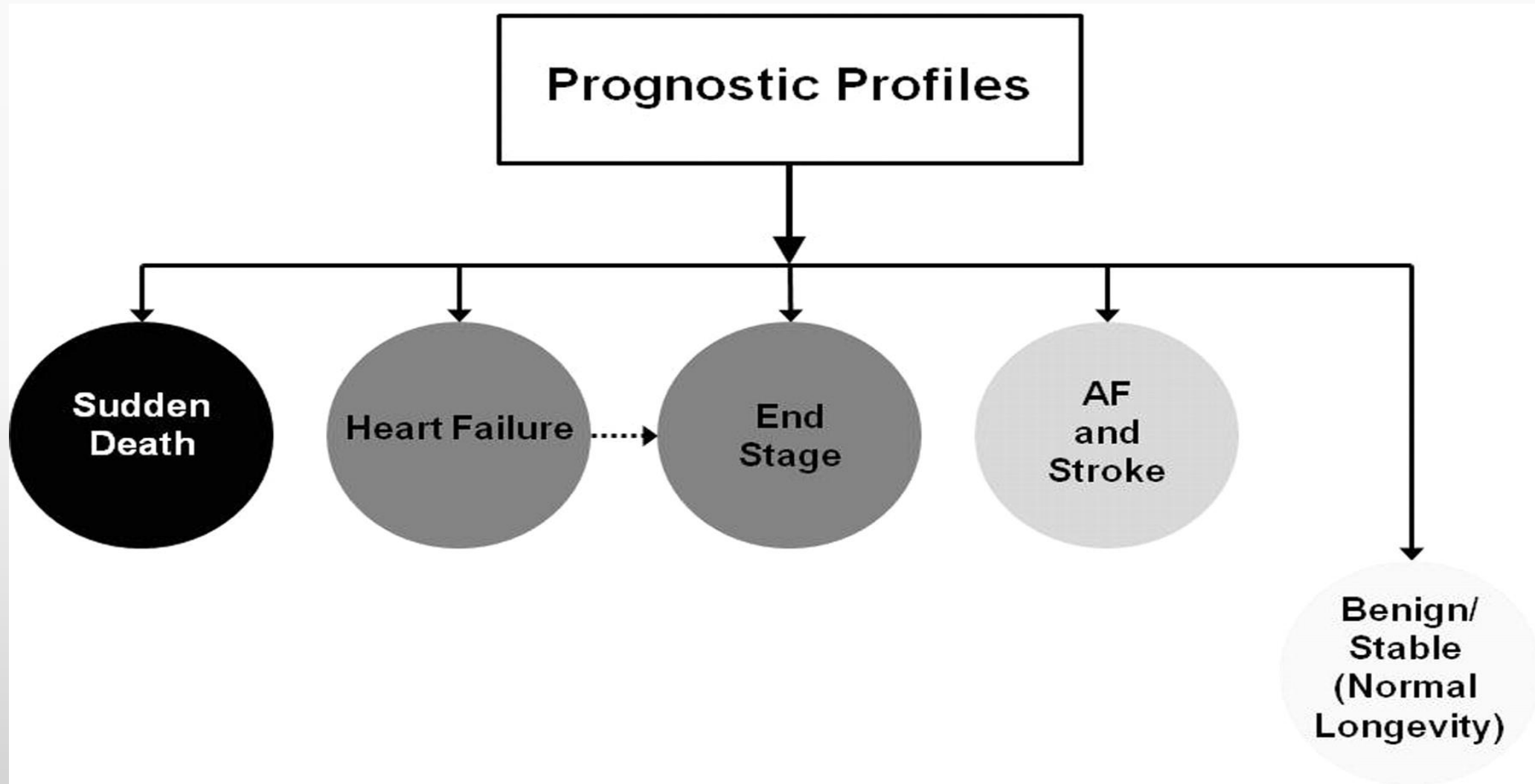
by , Bernard J. Gersh, Barry J. Maron, Robert O. Bonow, Joseph A. Dearani, Michael A. Fifer, Mark S. Link, Srihari S. Naidu, Rick A. Nishimura, Steve R. Ommen, Harry Rakowski, Christine E. Seidman, Jeffrey A. Towbin, James E. Udelson, and Clyde W. Yancy

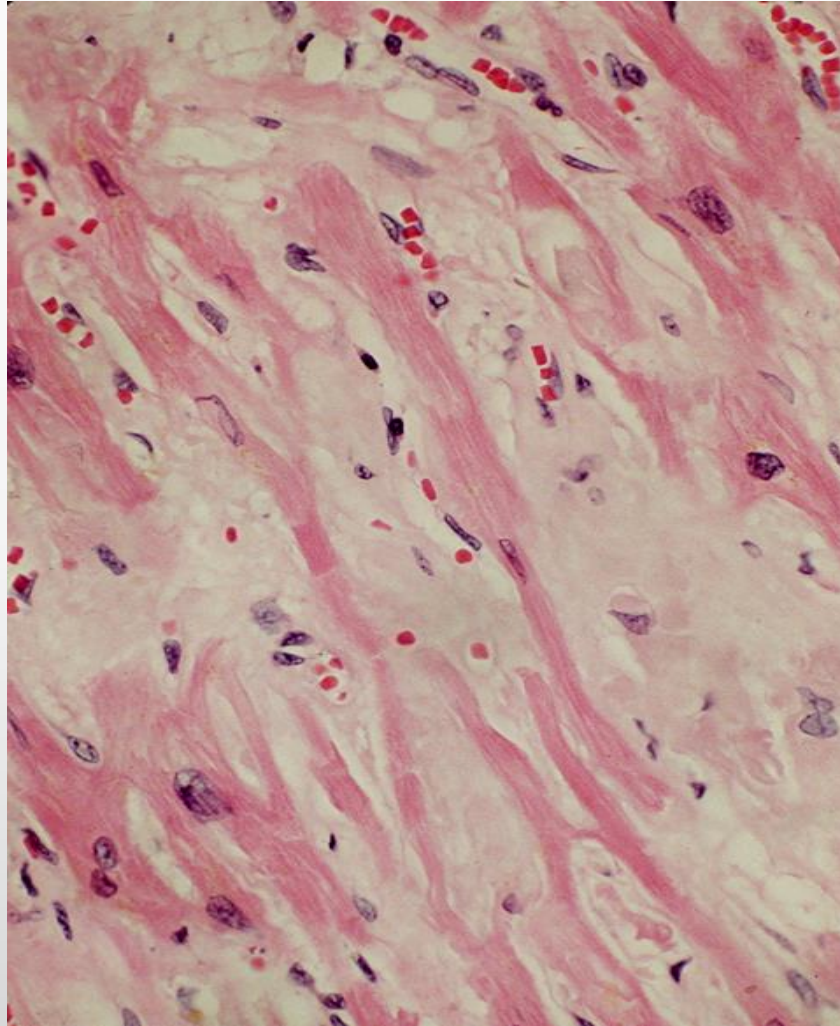
Circulation
Volume 124(24):e783-e831
December 13, 2011

Summary of the nomenclature that distinguishes HCM from other genetic diseases associated with LV hypertrophy. *At this time the overwhelming evidence links the clinical diagnosis of HCM with a variety of genes encoding protein components of the cardiac sarcomere.



Prognosis profiles for HCM and targets for therapy.





Amyloid infiltrative CM

**TABLE 4. CAUSES OF RESTRICTIVE
CARDIOMYOPATHY.**

Myocardial

Noninfiltrative disorders

- Idiopathic disease
- Familial disease
- Hypertrophy
- Scleroderma
- Diabetes mellitus
- Pseudoxanthoma elasticum

Infiltrative disorders

- Amyloidosis
- Sarcoidosis
- Gaucher's disease
- Hurler's syndrome
- Fatty infiltration

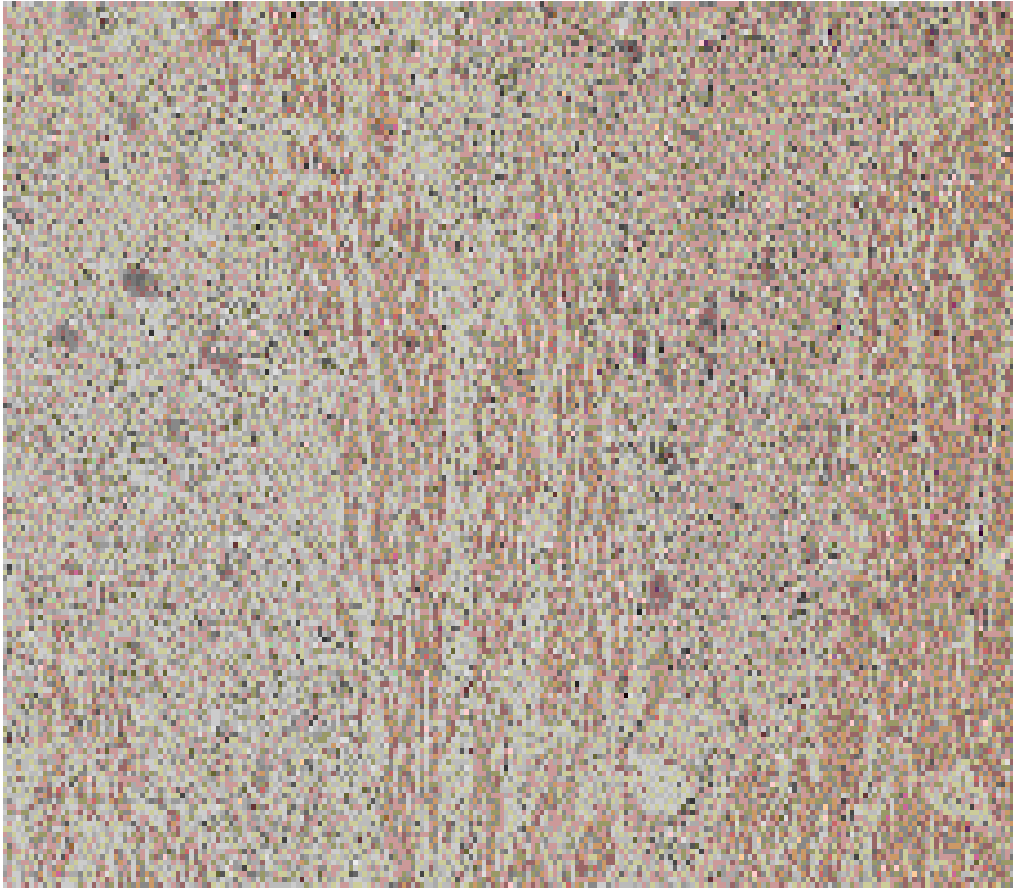
Storage disorders

- Hemochromatosis
- Fabry's disease
- Glycogen storage disease

Endomyocardial

- Endomyocardial fibrosis
 - Hypereosinophilic (Löffler's) syndrome
 - Carcinoid syndrome
 - Metastatic cancer
 - Exposure to radiation
 - Toxins
 - Anthracycline (doxorubicin or daunorubicin)
 - Serotonin
 - Methysergide
 - Ergotamine
 - Mercurial agents
 - Busulfan
-

Sarcoidosis



=Restriction

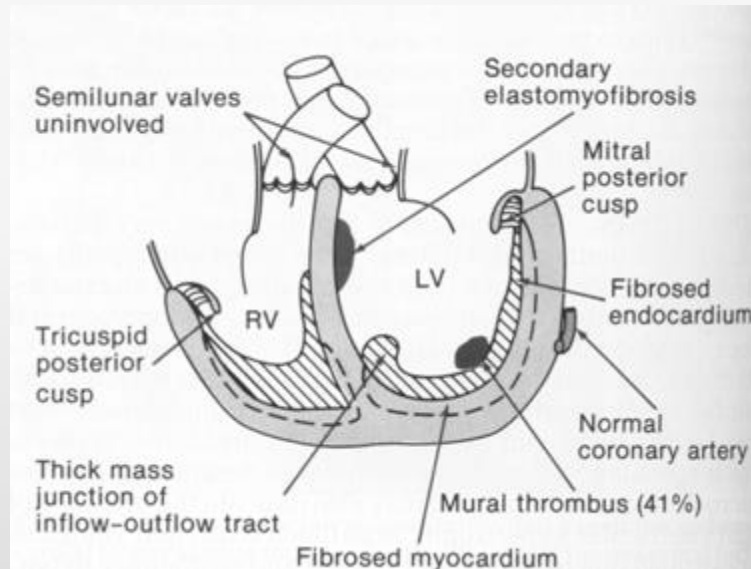
=Conduction System Disease

=Ventricular and Atrial Arrhythmias
(Sudden Cardiac Death)

=Mitral regurgitation

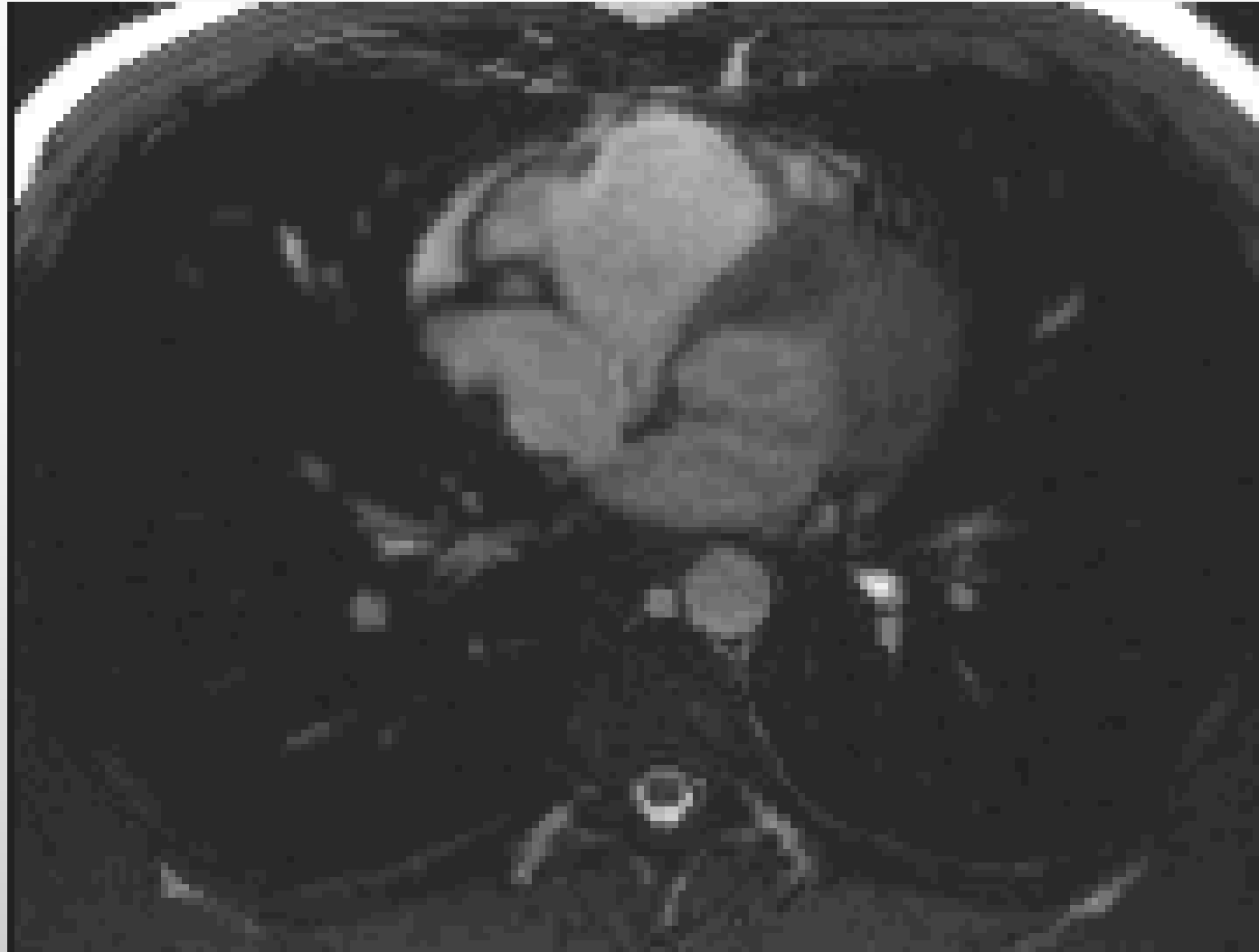
Endomyocardial Fibrosis

Endemic in parts of Africa, India, South and Central America, Asia
15-25% of cardiac deaths in equatorial Africa
hypereosinophilic syndrome (Loffler's endocarditis)



Thickening of basal inferior wall
endocardial deposition of thrombus
apical obliteration
mitral regurgitation
80-90% die within 1-2 years

MRI: RV Dysplasia



LV Noncompaction

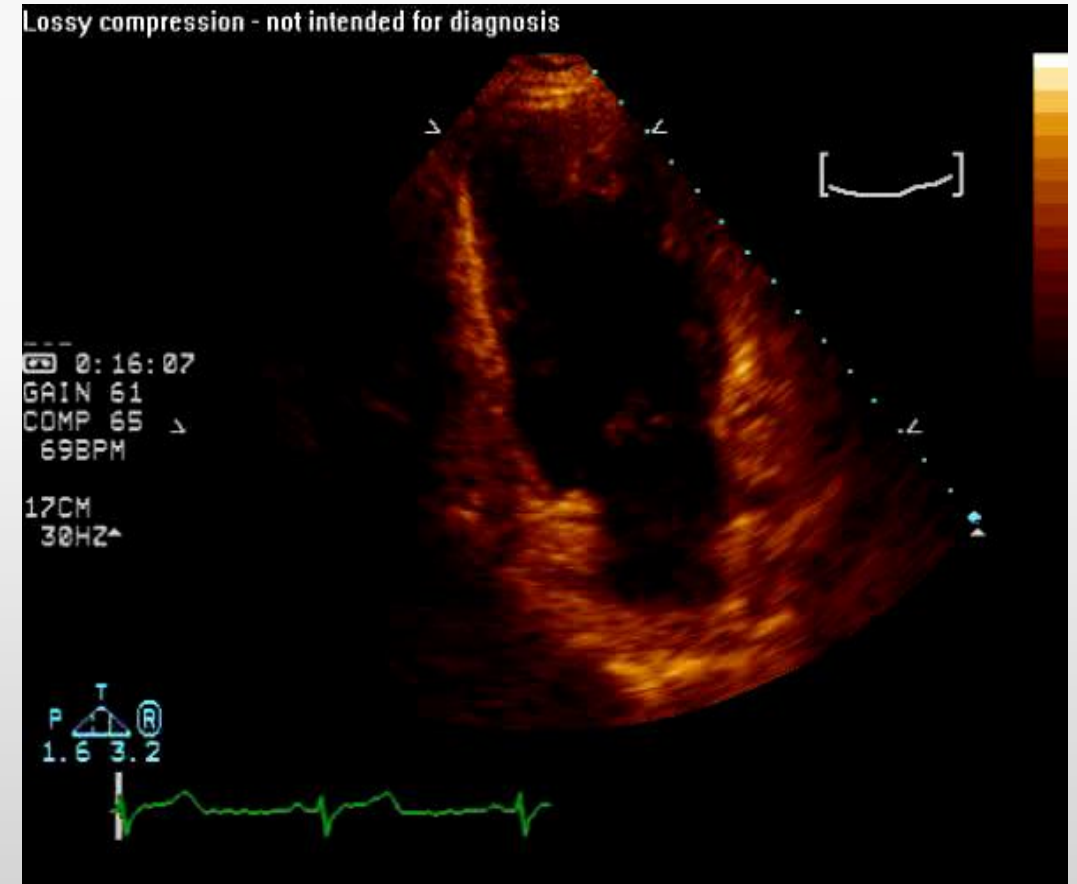
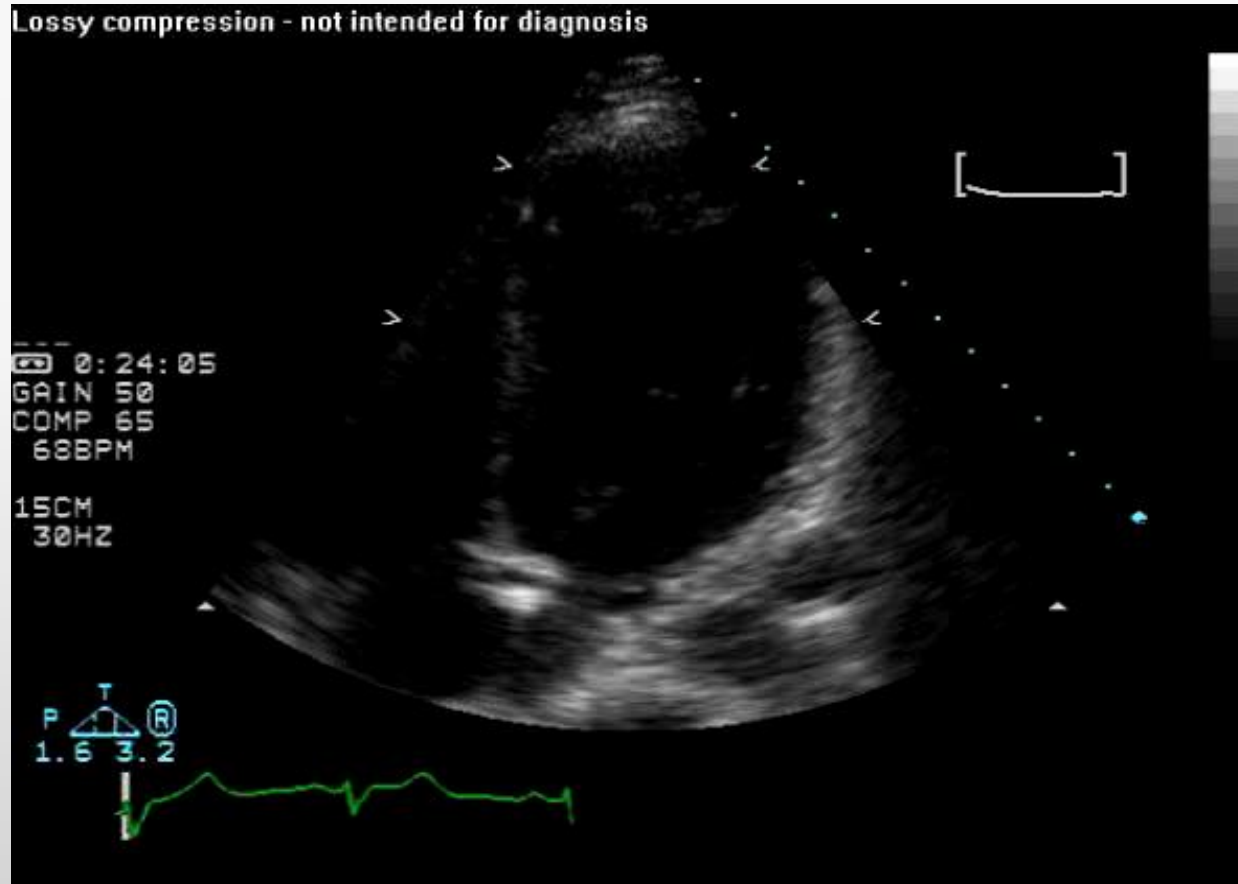
Diagnostic Criteria

- Prominent trabeculations, deep recesses in LV apex
- Thin compact epicardium, thickened endocardium
 - Stollberger C, JASE '04
- Other phenotypic findings

Prognosis and Treatment

- Increased risk of CHF, VT/SCD, thrombosis
 - Oechslin EN, JACC '00
- Hereditary risk
 - Screening of offspring
- Pregnancy: case report

Echo: LV Noncompaction



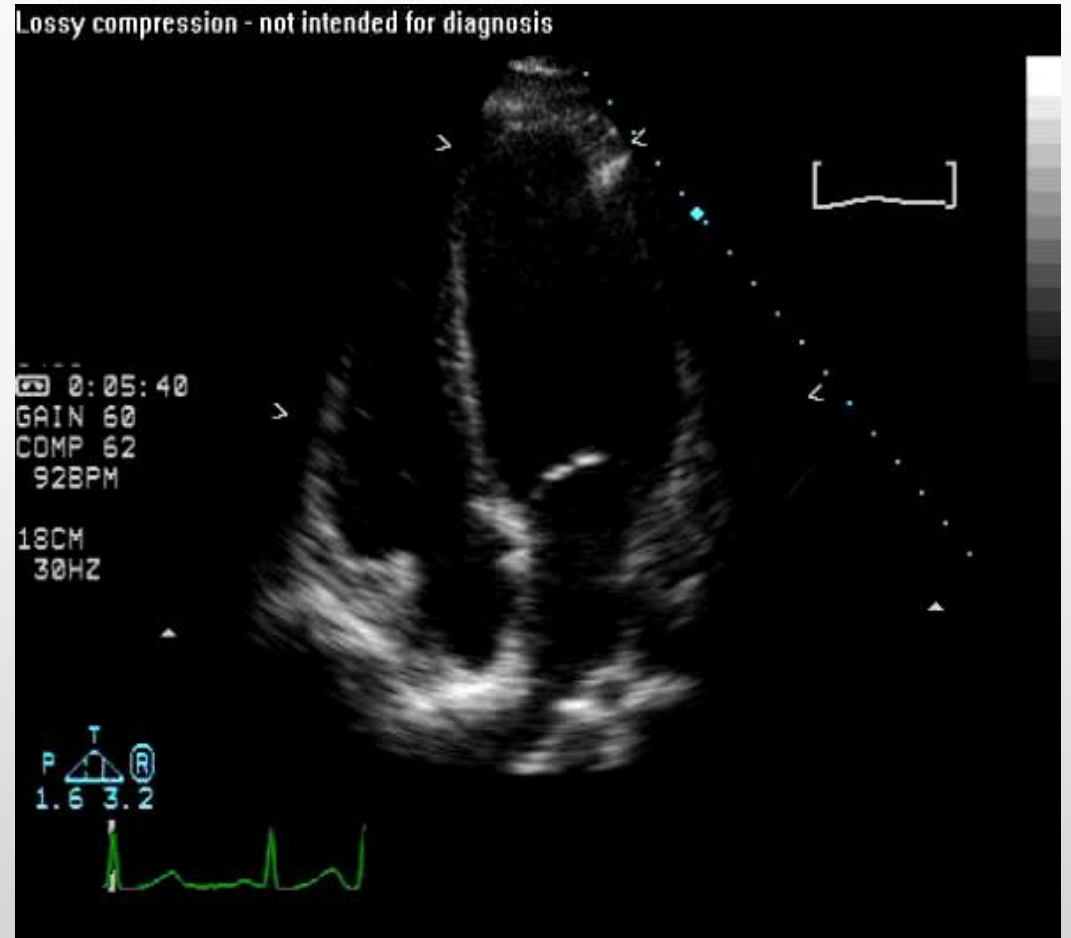
PPCM: Prognosis

- Death from CM: '91-97
 - 245 CM deaths in US, 0.88/100,000 live births, 70% peripartum
 - Increased risk with:
 - Maternal age
 - AA 6.4x greater
 - Whitehead SJ. ObGyn2003;102:1326.
- Risk of recurrent pregnancy
 - Retrospective survey : 44 women (16 vs 28)
 - Reduced EF, CHF 44% vs 21%, mortality 0 vs. 19%
 - Elkyam U. NEJM.2001;344:1567.
 - DSE:contractile reserve reduced in patients
 - 7 women: change in Vcf_c σ_{ES} relationship
 - Lampert MB. AJOG.1997.176.189.

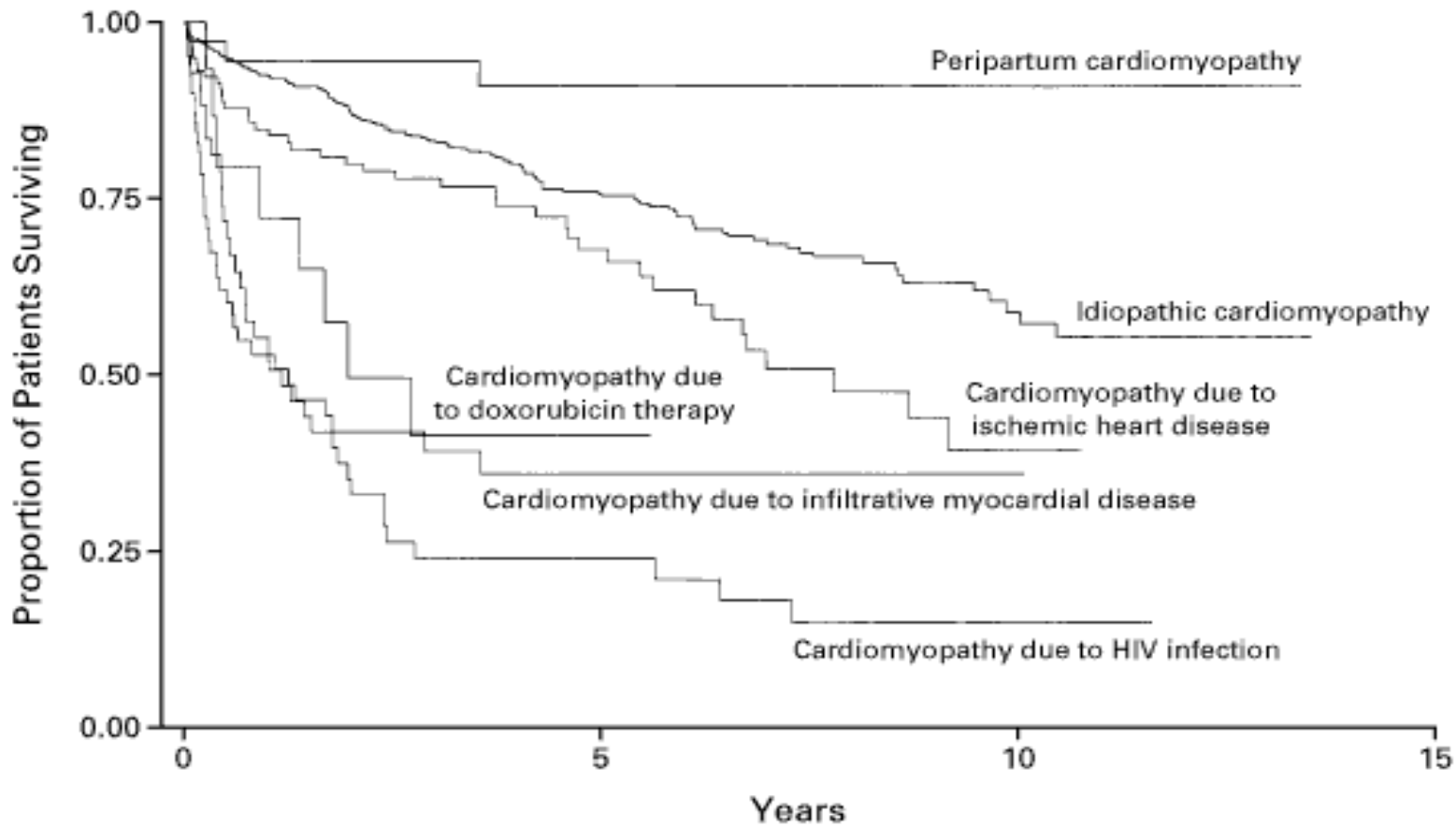
DCM: Peripartum

Diagnostic Criteria

- 1 mo pre, 5 mos post
- Echo: LV dysfunction
 - LVEF < 45%
 - LVEDD > 2.7 cm/m²
- Epidemiology/Etiology
- 1:4000 women
 - JAMA 2000;283:1183
- Proposed mechanisms:
 - Inflammatory Cytokines:
 - TNFa, IL6, Fas/AP01
 - JACC 2000 35(3):701.



Prognosis depends on Etiology



1230 pts. referred for unexplained CM. Felker GM. NEJM 2000;342:1077