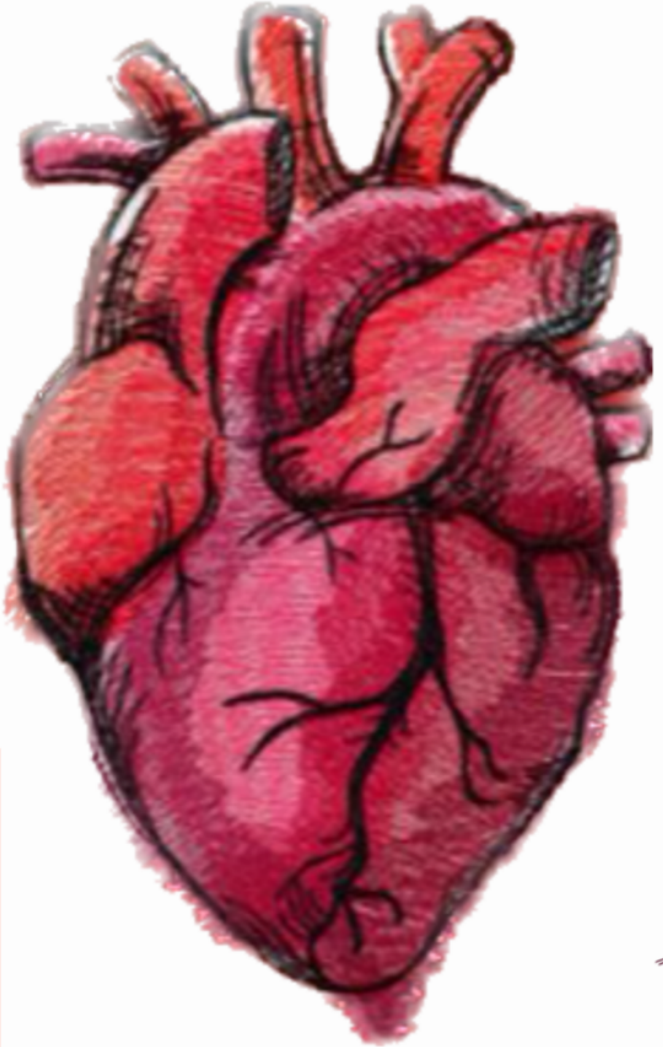


النادي الطبي

CARDIOVASCULAR SYSTEM

SUBJECT : Pathology

LEC NO. : 5

DONE BY : Abrar husban + Razan alfrayeh

وقل رب زدني علماً

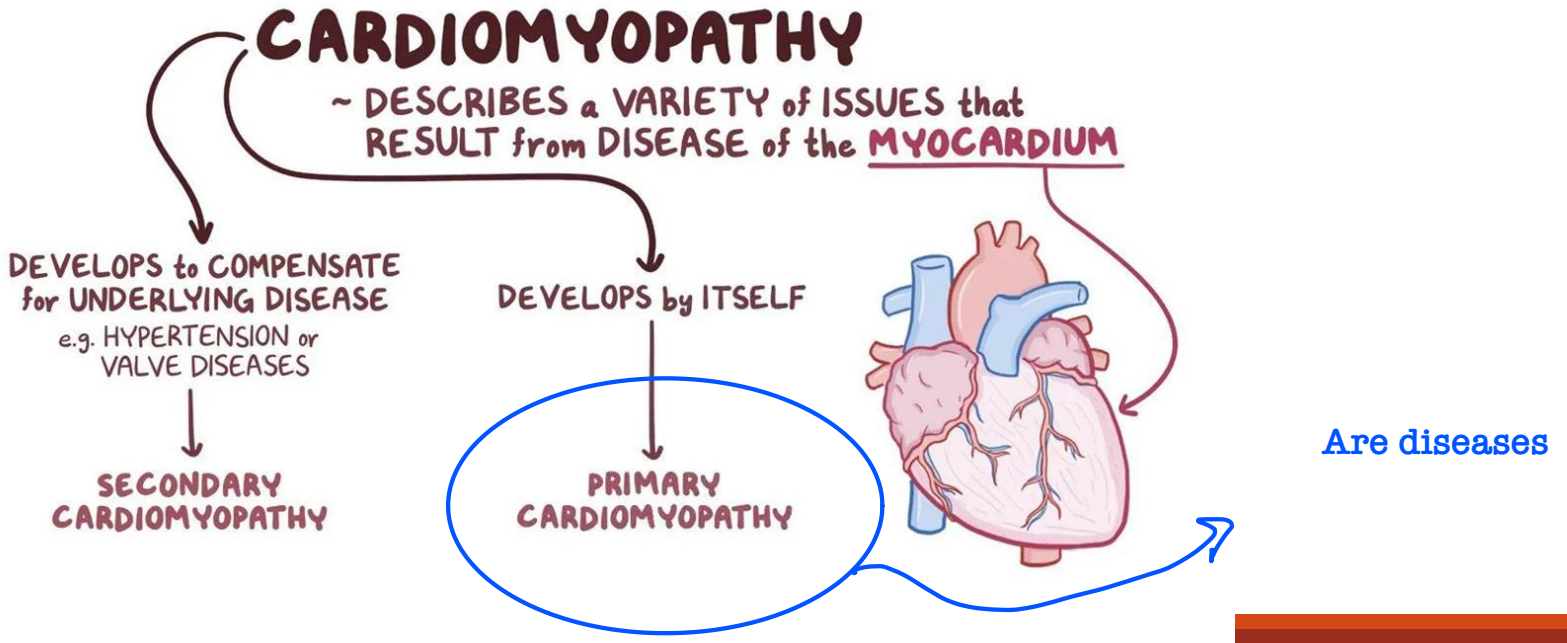
SCAN ME!

Cardiomyopathy and pericardium

DR. DUA' ABUQUTEISH

Cardiomyopathy

- **Cardio-myo-pathies** describes cardiac muscle diseases resulting in myocardial dysfunction



🚨We are looking to a cross section from left side 😄

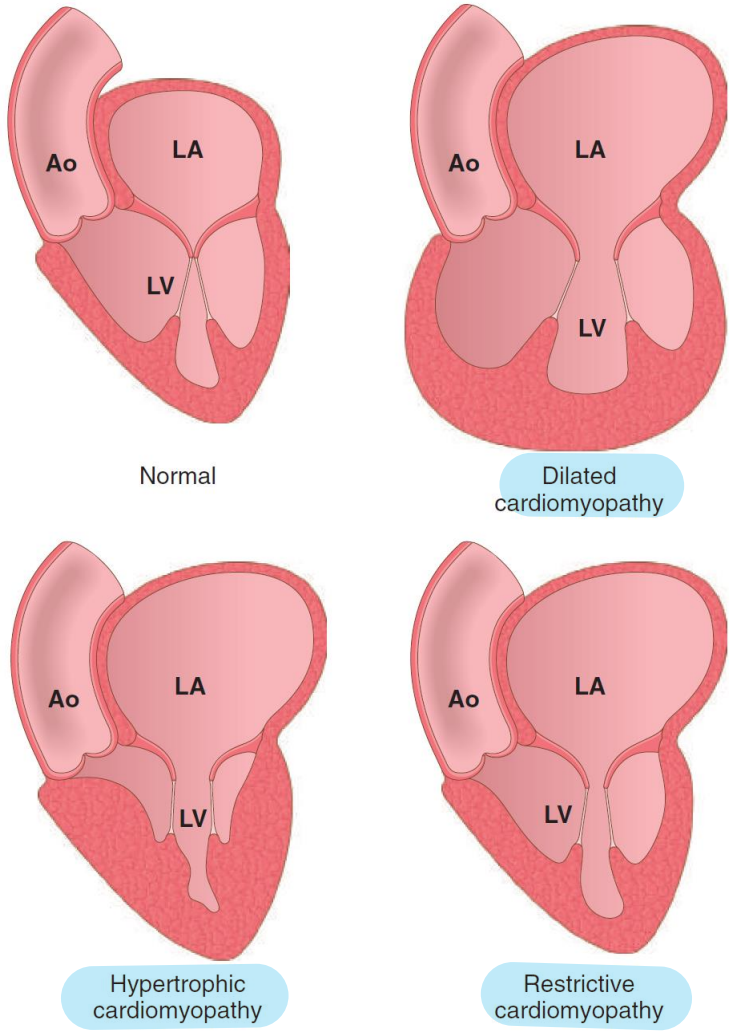


Fig. 11.23 The three major forms of cardiomyopathy. Dilated cardiomyopathy leads primarily to systolic dysfunction, whereas restrictive and hypertrophic cardiomyopathies result in diastolic dysfunction. Note the changes in atrial and/or ventricular dilation and in ventricular wall thickness. *Ao*, Aorta; *LA*, left atrium; *LV*, left ventricle.

- All the heart 4 champers are dilated .
  Systolic dysfunction

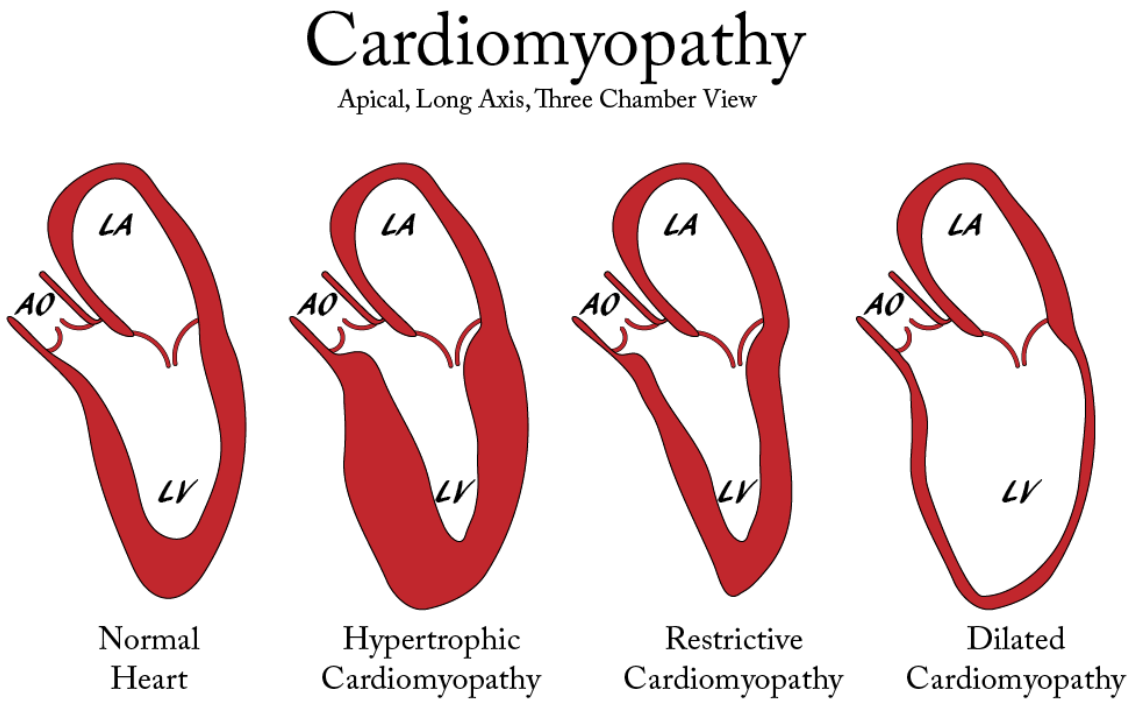
- Hypertrophy mainly in the left ventricle and venticular septum .
- Diastolic dysfunction

very importante

- Restrictive =it limits
  - Looks like normal heart.

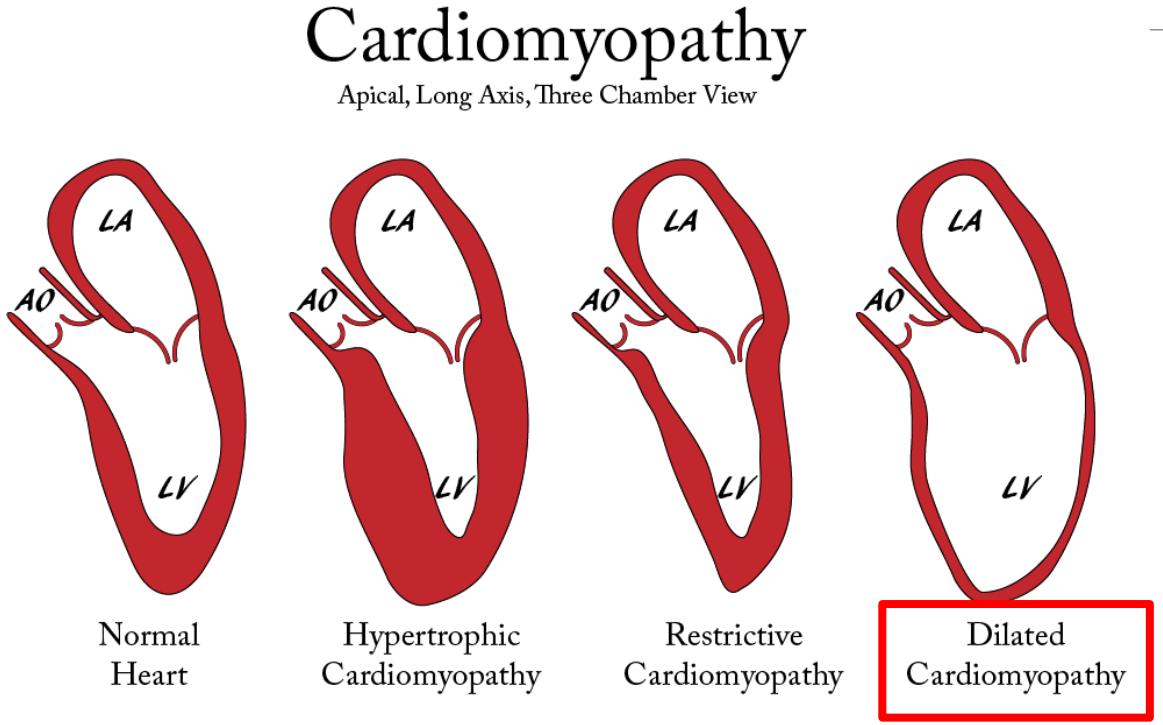
- When there is restriction in ventricle ...the blood during diastol cant enter the left ventricl .....so the blood will acummulate in left atrium leading to left atrial dialation .
- Diastolic dysfunction

Cardiomyopathy



1. **Dilated Cardiomyopathy (Most common; approx. 90%)**
2. **Hypertrophic Cardiomyopathy**
3. **Restrictive Cardiomyopathy**

Cardiomyopathy



1. **Dilated Cardiomyopathy (Most common; approx. 90%)**
2. **Hypertrophic Cardiomyopathy**
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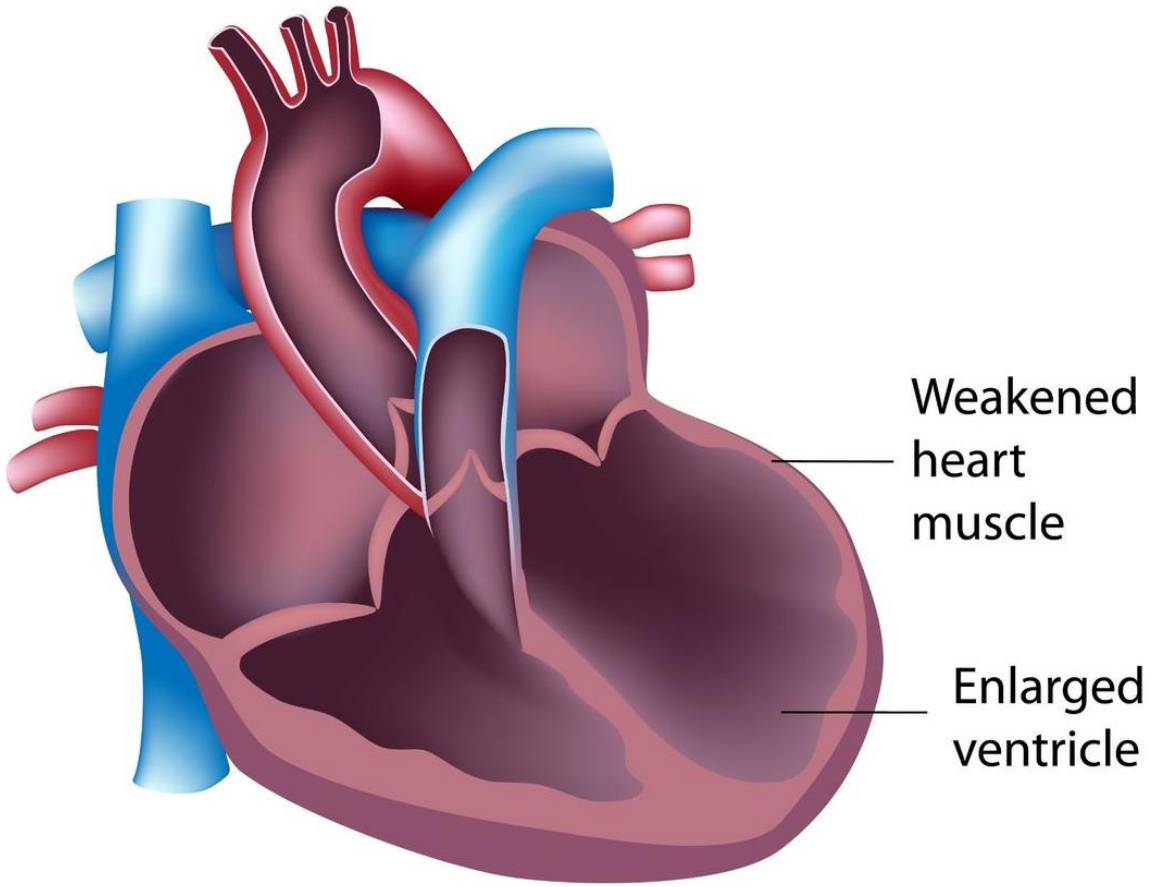
Dilated cardiomyopathy



Dilated Cardiomyopathy

عضلة القلب اللي فيها المشكله بتبطل contactile

The myocardiam Can be strethched and filled with blood as normal durring diastol ,but the problem appears durring systole when the heart need to contarct the EF is affected .
(normal EF = 70%.....here EF is reduced almost =30%)

يعني الSV رح تقل .....بيروح القلب بيتوسع (بيعمل Dilation) عشان اثناء ال diastol يعني اكتر عشان يطلع اكتر.

صح الجسم وصله كميه دم مناسبه وقتها بس القلب بيصير اله dialation بالمقابل .

So ,↑EDV ,↓EF , ↑ال يطلع بعد ما بتضلها بالقلب اللي الدم كميه و sv

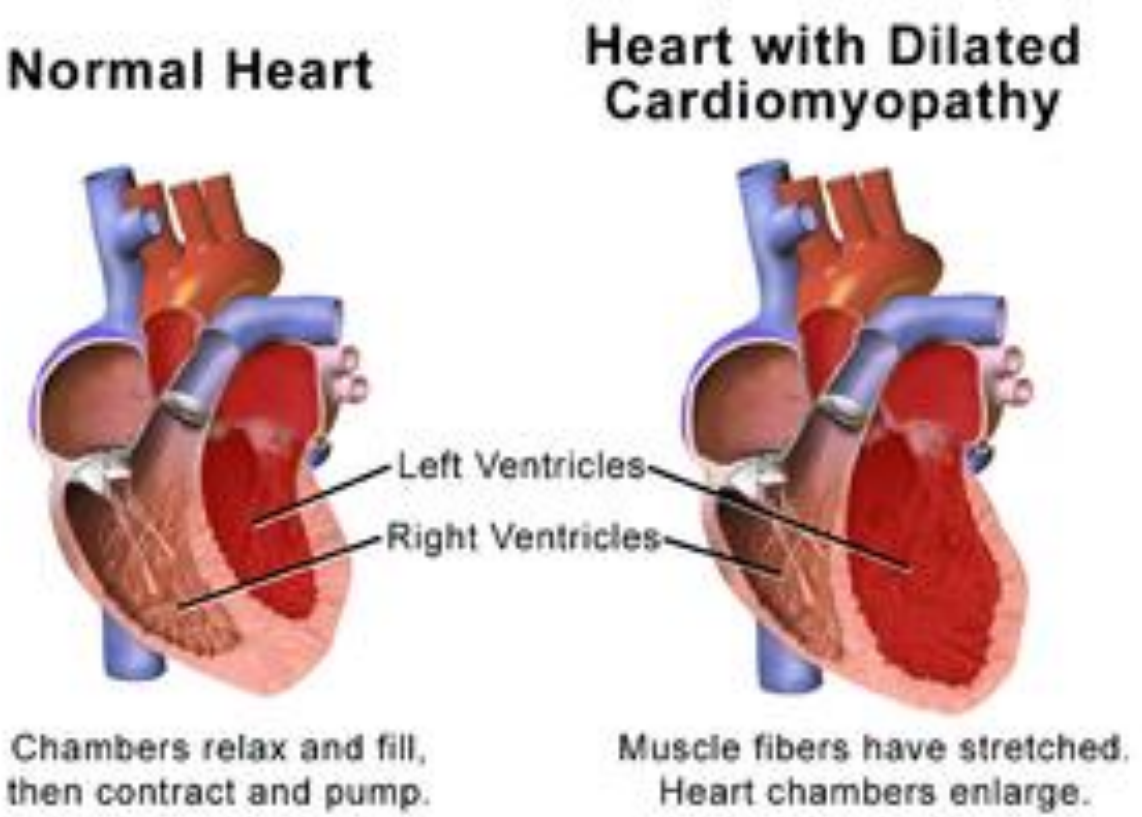
- **Progressive cardiac dilation,** usually with concurrent hypertrophy

  Results in systolic dysfunction (ventricles cannot pump), leading to bi-ventricular CHF

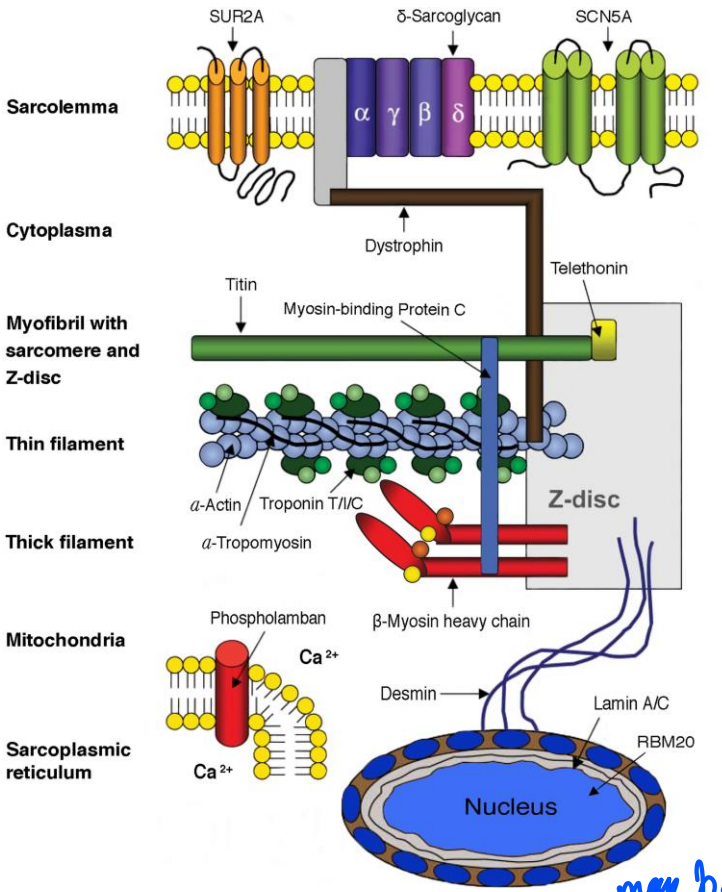
  كيف صار dilation ؟
  صار في Fibers fibrosis btwn myocardial
  So the fibers won't be attatched to each other .
  (the ventricle can not pump)
  Leading to bilateral congestive HF

- All chambers are dilated → Like ballon

Dilated Cardiomyopathy DCM



Dilated Cardiomyopathy Causes



Most common: no cause (idiopathic)

1. Genetic causes.

- Hereditary in 20% to 50% of cases

- Over 40 genes are known to be mutated

- Autosomal dominant (AD) inheritance: mutations in encoding cytoskeletal proteins, or proteins that link the sarcomere to the cytoskeleton (e.g., α-cardiac actin).

- X-linked: dystrophin gene mutations (Duchenne muscular dystrophy: DMD) →

may be

They have problems

Dilated Cardiomyopathy DCM Causes (cont.)

2. Infections (myocarditis):

The most common cause

- Coxsackievirus B and other enteroviruses, also **Chagas disease** (parasitic)

Trypanosoma cruszi

- Myocarditis; most common cause is coxsackievirus; acutely, it can cause death; in chronic cases, it can cause dilated cardiomyopathy

3. Alcohol or other toxic exposure:

- Alcohol and its metabolites (especially acetaldehyde) have a direct toxic effect on myocardium

4. Medications: Doxorubicin (Adriamycin) and cocaine → Chemotheraputic agent

5. Thiamine B1 deficiency (Wet Beri Beri)

V.B1 deficiency

Wet beri beri

Dry beri beri

Dilated Cardiomyopathy DCM Causes (cont.)

5. Peripartum cardiomyopathy:

- Occurs late in gestation or several weeks to months postpartum.

- Pathogenesis is multifactorial

- Approximately half of these patient spontaneously recover normal function

6. Iron overload in the heart (hemochromatosis)

Patients with thalasemia need frequent

Dilated Cardiomyopathy DCM Morphology

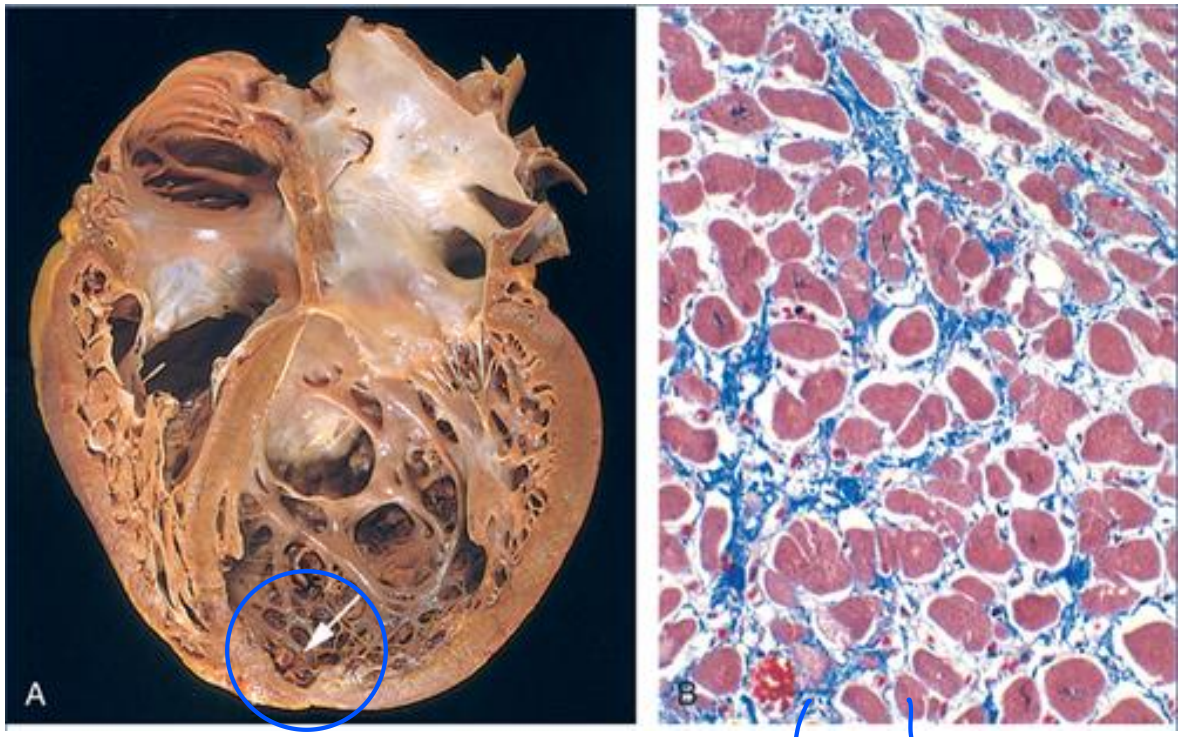
- The heart is enlarged (up to 2-3 times the normal weight) **, with dilation of all chambers**
- **Mural thrombi** are often present and may be a source of thromboemboli.

لأ معظم الدم اللي بيفوت ما بيطلع stasis فبيصير
So mural thrombi formatio

Histologic abnormalities are nonspecific:

- Myocytes exhibit **hypertrophy** with enlarged nuclei.
- Variable interstitial fibrosis

Dilated Cardiomyopathy Morphology



A. **Four-chamber dilatation & hypertrophy**, with a small mural thrombus (arrow) in the apex of the LV. There was no coronary artery disease.

B. **Typical myocyte hypertrophy & interstitial fibrosis** (Masson trichrome stain collagen blue).

وجود ال fibrosis بيعيق ال conductivity btwn myocyte
ف في احتمال يصير arrythmia

Dilated Cardiomyopathy DCM
Clinical features

- DCM occurs at any age, but most commonly between 20-50 years.
- Patients present with slowly progressive bi-CHF, including dyspnea, easy fatigability.
  Cogestive
- The fundamental defect in DCM is ineffective contraction.
- In end-stage DCM :the **cardiac ejection fraction** typically is **less than 25%** (normal 50% to 65%)

How to diagnose :
1history
2. ECG abnormality
3.eco-cardiogram

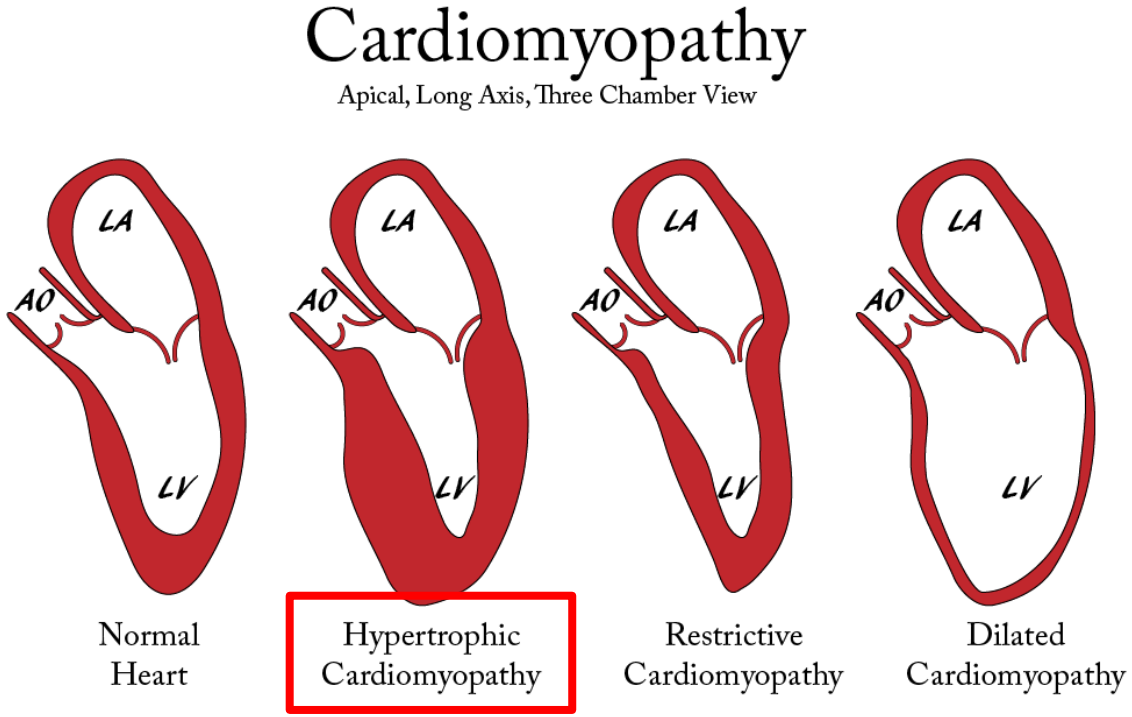
Dilated Cardiomyopathy DCM
Clinical features

Complications:

- Mitral and tricuspid regurgitation بيبعدوال cusps عن بعض
- Arrhythmia (heart's conduction system is stretched up)

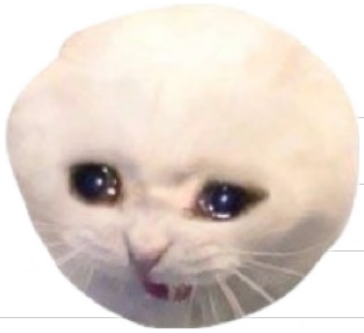
- Half of the patients die within 2 years, and only 25% survive longer than 5 years
- Death usually is due to progressive cardiac failure or arrhythmia.
- **Cardiac transplantation is the only definitive treatment.** ← The drugs only reduce

Cardiomyopathy



1. Dilated Cardiomyopathy (Most common; approx. 90%)
2. Hypertrophic Cardiomyopathy
3. Restrictive Cardiomyopathy

2. Hypertrophic Cardiomyopathy



النوع الثاني من **Cardiomyopathy** وهون المشكله بتكون بال **dyastolics**

اول اشي لازم نعرف معلومات عن هذا نوع

1-effect left side only (massive hypertrophy in LV

Right side——> normal

2-hypertrophy in ventricular suptum

3-——> mitral valve ← تكون ملزقه بال suptum فعندما يحدث contraction ممكن تسكر outFlow وهذا يسبب obstractive

4-chamber size very small

diastolic filling بتالي عندي مشكله في

stroke volume will decrease وهذا يؤدي الى انخفاض

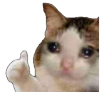
5-hypertrophic muscle

ischemia بدها كثير blood والدم المتوفر قليل بتالي ممكن يصير عنده

Hypertrophic Cardiomyopathy(HCM)

Also called Hypertrophic obstructive cardiomyopathy (HOCM)

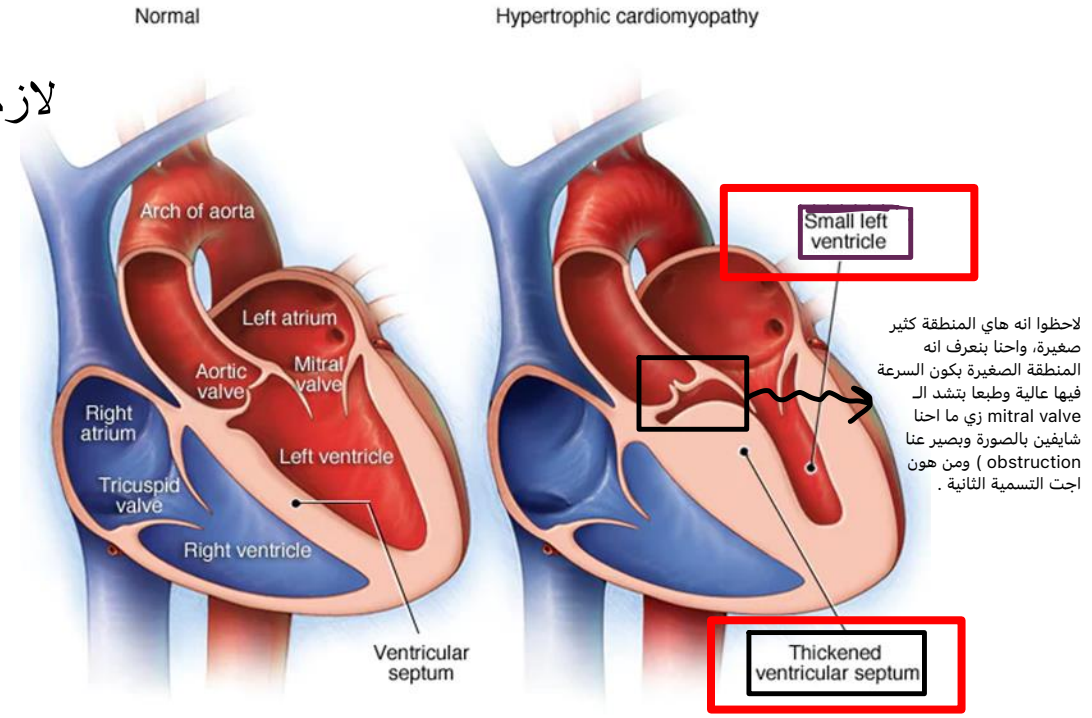
HCM is characterized by:



لازم هدول الـ 3 خصائص الاقيهم عشان احكي عنه HCM

1. **Massive LV & IVS myocardial hypertrophy**
2. **Defective diastolic filling**
3. **Ventricular outflow obstruction**

- ❑ Heart is thick-walled, heavy, and **hypercontractile**
- ❑ Systolic function usually is preserved , but the myocardium does not relax



Hypertrophic Cardiomyopathy(HCM) Causes

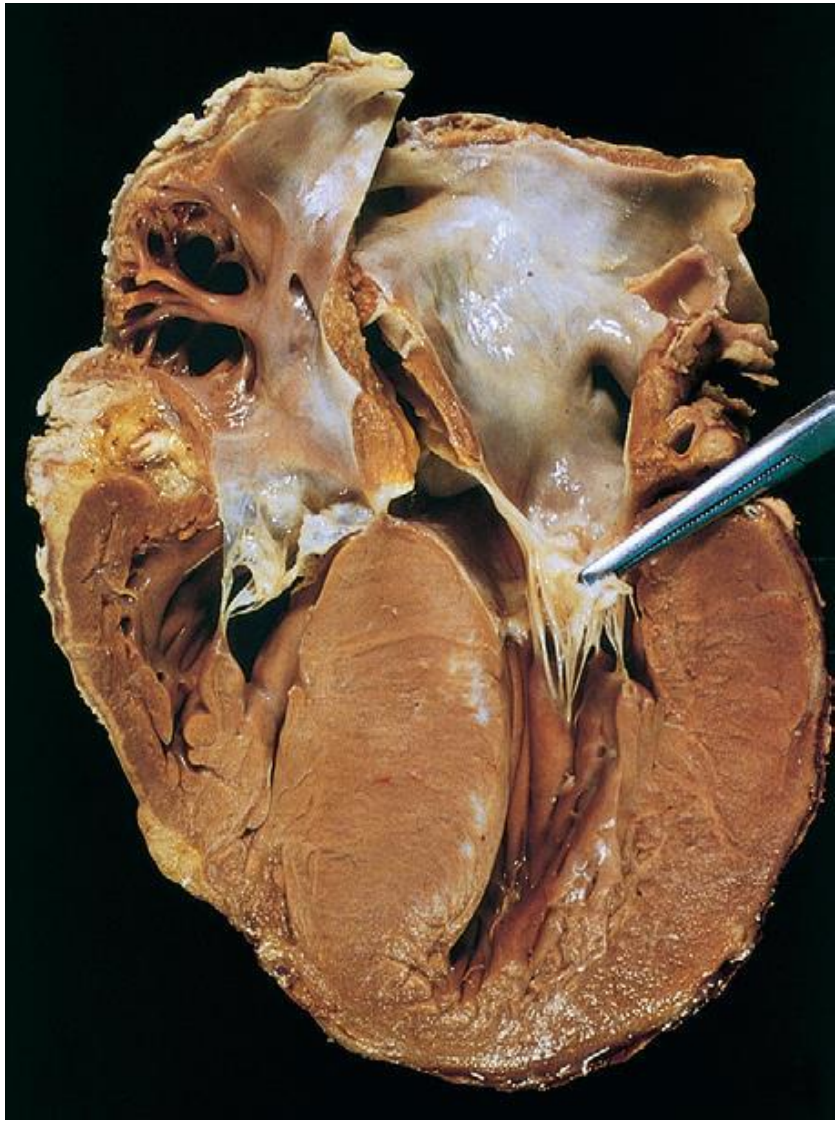
Most common cause is hereditary and is due to autosomal dominant mutations in sarcomere proteins

المرض بصير بسبب mutations في اي واحد من هدول 3 proteins

Disorder of sarcomeric proteins:

- **β-myosin heavy chain is most frequently affected**
- **Myosin-binding protein C and troponin T**.

Mutations in these three genes account for 70% to 80% of all cases of HCM.



Hypertrophic Cardiomyopathy(HCM) Morphology

- Massive myocardial hypertrophy without ventricular dilation.
- Disproportionate thickening of the ventricular **septum** relative to the left ventricle free wall (**Asymmetric septal hypertrophy**)
- On longitudinal sectioning, the ventricular cavity loses its usual round-to-ovoid shape and is compressed into a "banana-like" configuration.

Hypertrophic Cardiomyopathy(HCM)
Morphology

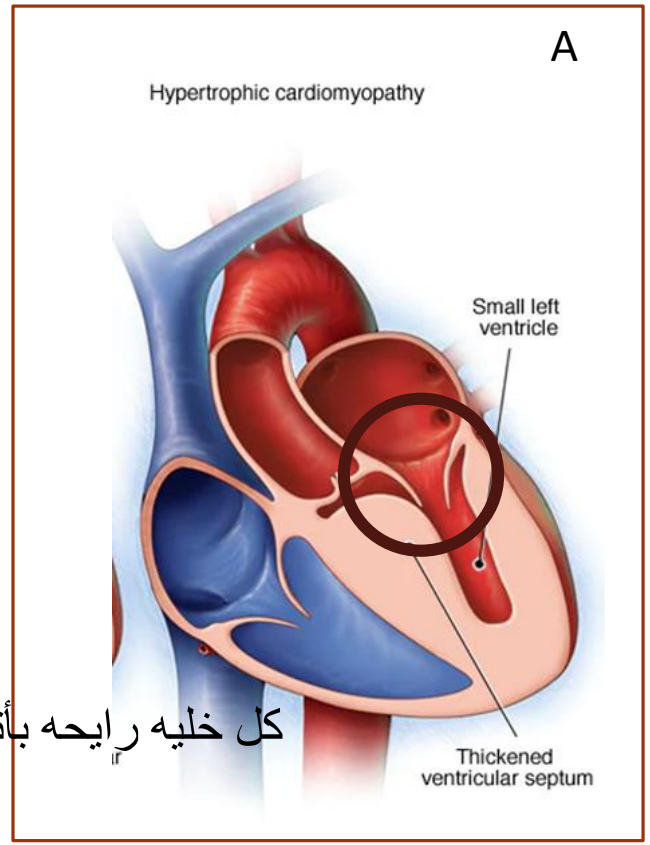
هون برضه بنلاحظ انه الـ ejection fraction طبيعية بس الـ CO يكون منخفض، ليش ؟

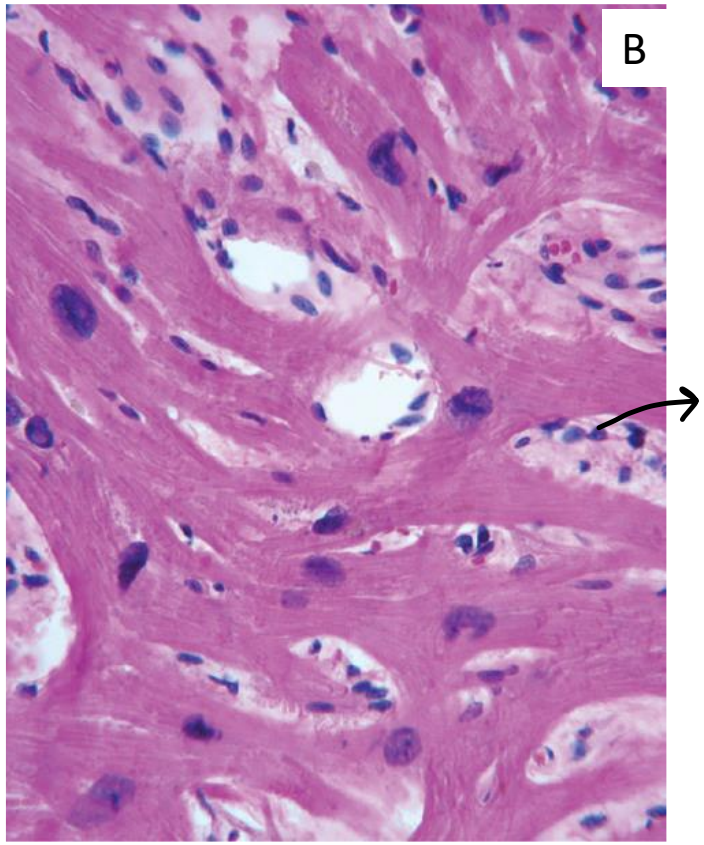
لانه اصلا كمية الدم اللي بتفوت عليه واللي بضخها قليلة بدي اعطيكوا ارقام وهمية، مثلا
~~EDV هو 50 والـ ESV هو 20 هون فعلا الـ EF طبيعية ولكن كمية الدم قليلة~~

هاي المنطقة غير كافية ابدا انه يتعبى الدم فيها، لهيك بنشوف diastolic dysfunction
واحنا بنعرف انه المسؤول عن تعبية الـ ventricle هو الـ atrium، ولائه ما في تعباية
منيحة للدم بصير يتراكم الدم pulmonary edema, shortness of breath, etc...
فبصير عنده lung وبعدها يرجع للـ atrium بالـ

A. Contact of the anterior mitral leaflet with the septum during ventricular systole, correlate with functional **left ventricular outflow tract obstruction.**

Venturi effect





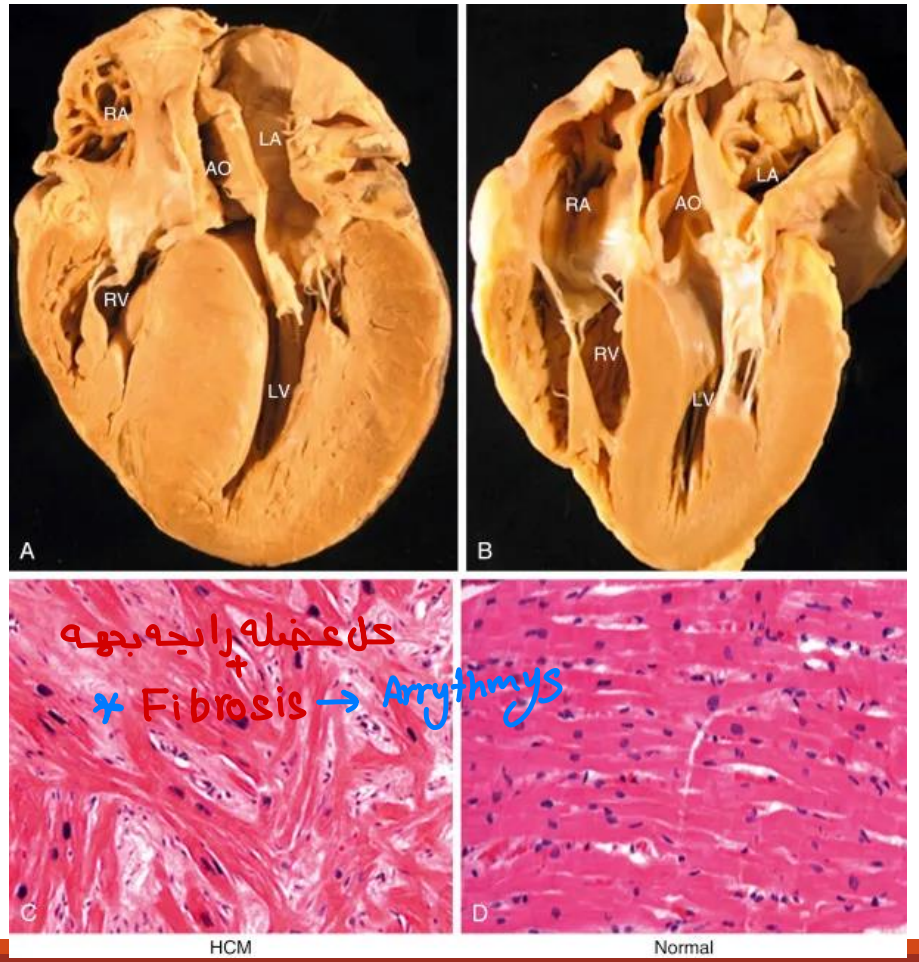
B. Histologic features:

- **Marked myocyte hypertrophy**
- **Haphazard myocyte disarray**
- **Interstitial fibrosis .**

كل خليه رايحه بأتجاه شكل

دائماً بس يكون في fibrosrs بكون عندي arithmetic

Hypertrophic Cardiomyopathy(HCM) Morphology

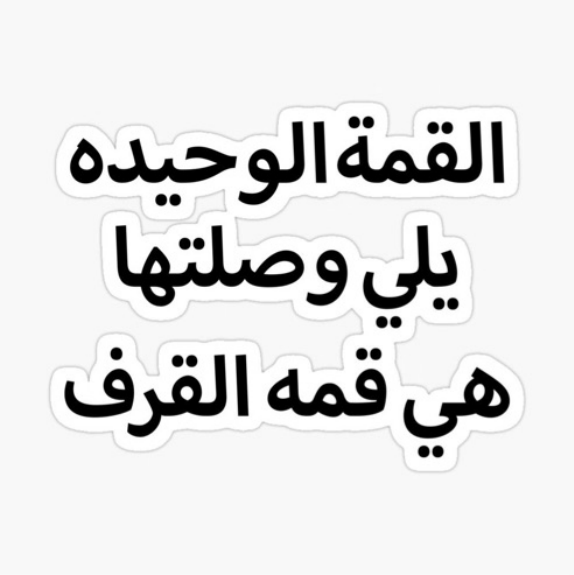


Hypertrophic Cardiomyopathy(HCM) Clinical features

- Can present at any age but it typically manifests during the post pubertal growth spurt.
- Massively hypertrophied left ventricle that paradoxically provides a markedly reduced stroke volume due to impaired diastolic filling and overall smaller chamber size.
- Patients can present with syncope during exercise
- Reduced cardiac output exertional dyspnea, with a harsh systolic ejection murmur.

Hypertrophic Cardiomyopathy(HCM)
Clinical features

- Myocardial ischemia, even in the absence of concomitant CAD, due to combination of massive hypertrophy, high left ventricular pressures, and compromised intramural arteries.



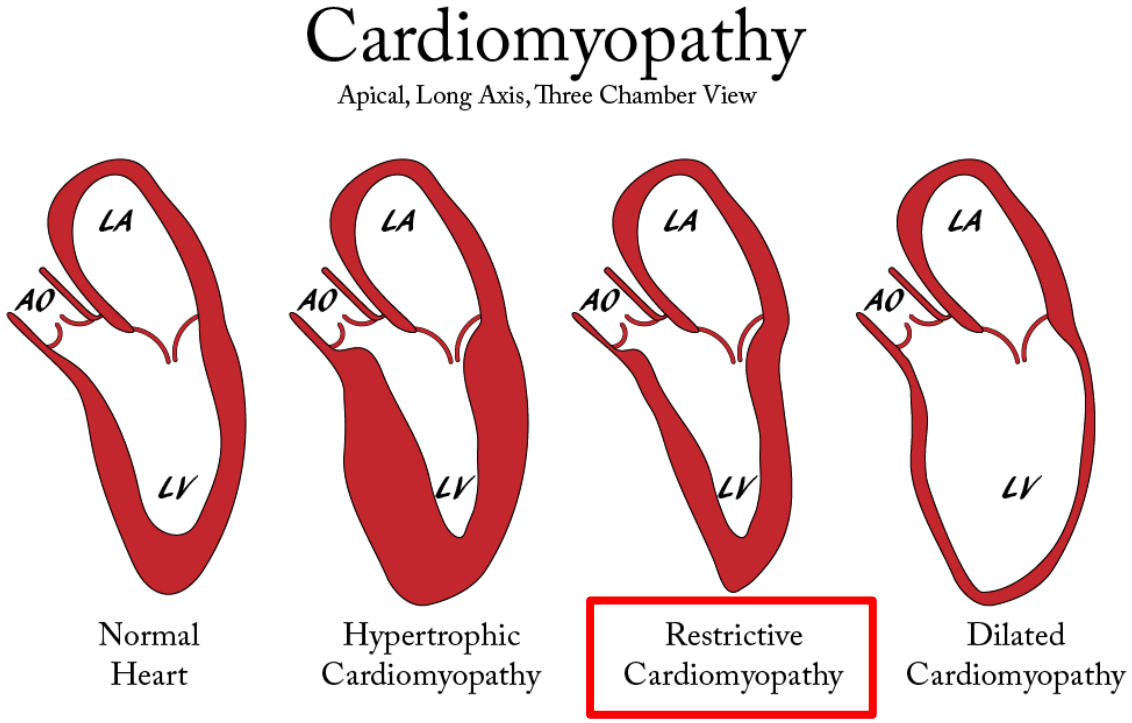
Hypertrophic Cardiomyopathy(HCM)
Clinical features

↑Filling كيف اعالج المريض؟
1- β or Ca^+ channels blocker
2- surgery → cut part From suptum

Major clinical problems:

- Arrythmias: such as atrial and ventricular fibrillations
- CHF
- Sudden death: **HCM is an important cause of sudden cardiac death,** one third of sudden cardiac death in athletes under the age of 35
- Most patients are improved by therapy that promotes ventricular relaxation
- Partial surgical excision of septal muscle also can relieve the outflow tract obstruction.

Cardiomyopathy



1. Dilated Cardiomyopathy (Most common; approx. 90%)
2. Hypertrophic Cardiomyopathy

سهلة ←

3. **Restrictive Cardiomyopathy**

عندي شغلات بتتجمع بالقلب ← Fibrosis

يتالي مش قادر يعمل ← diastolic ✱

Restrictive Cardiomyopathy

- **Primary decrease in ventricular compliance**, resulting in impaired ventricular filling during diastole

- The contractile (systolic) function of the left ventricle usually is unaffected.

Restrictive Cardiomyopathy Causes

Idiopathic or associated with systemic diseases:

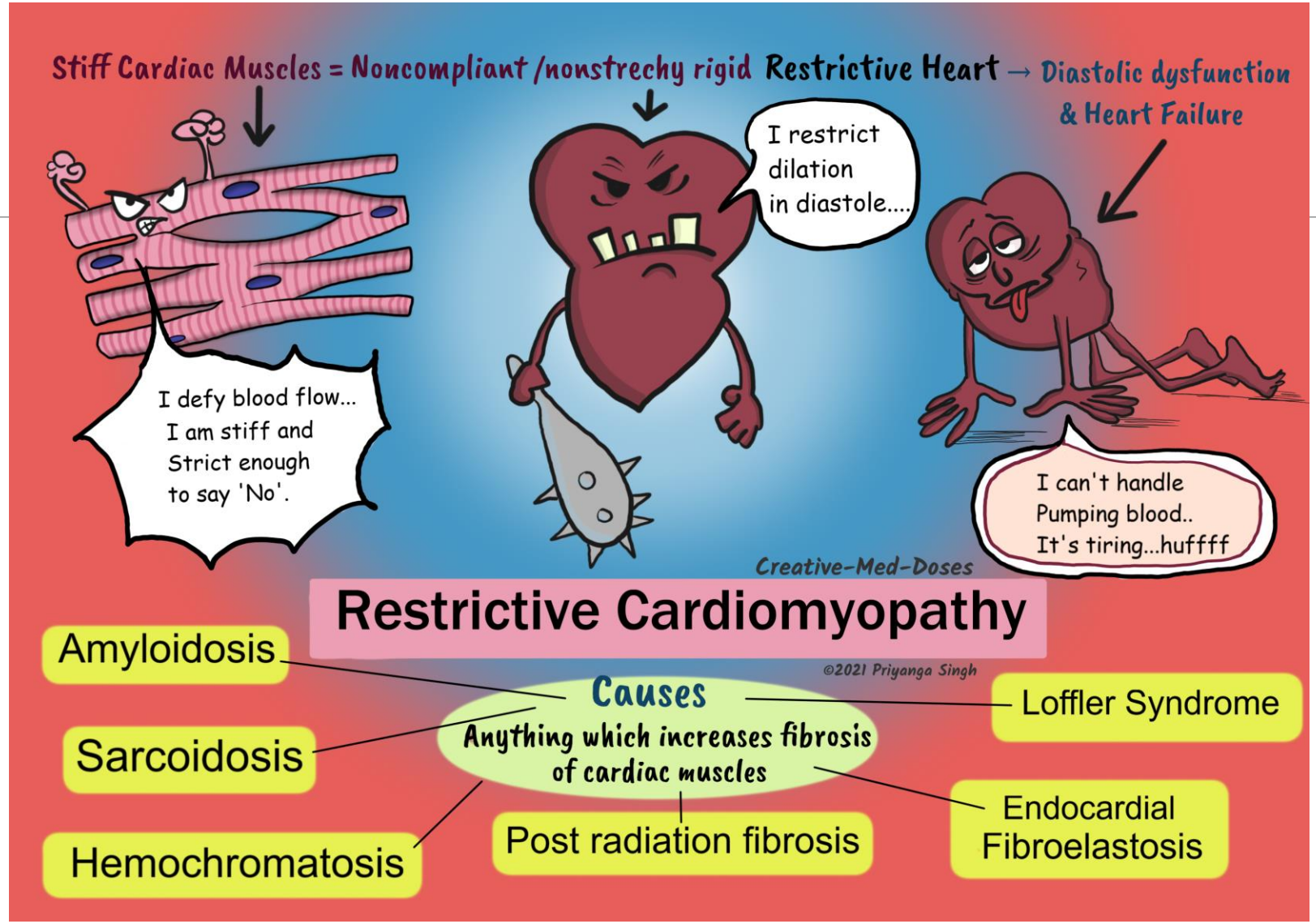
اختصار ←

LASHER

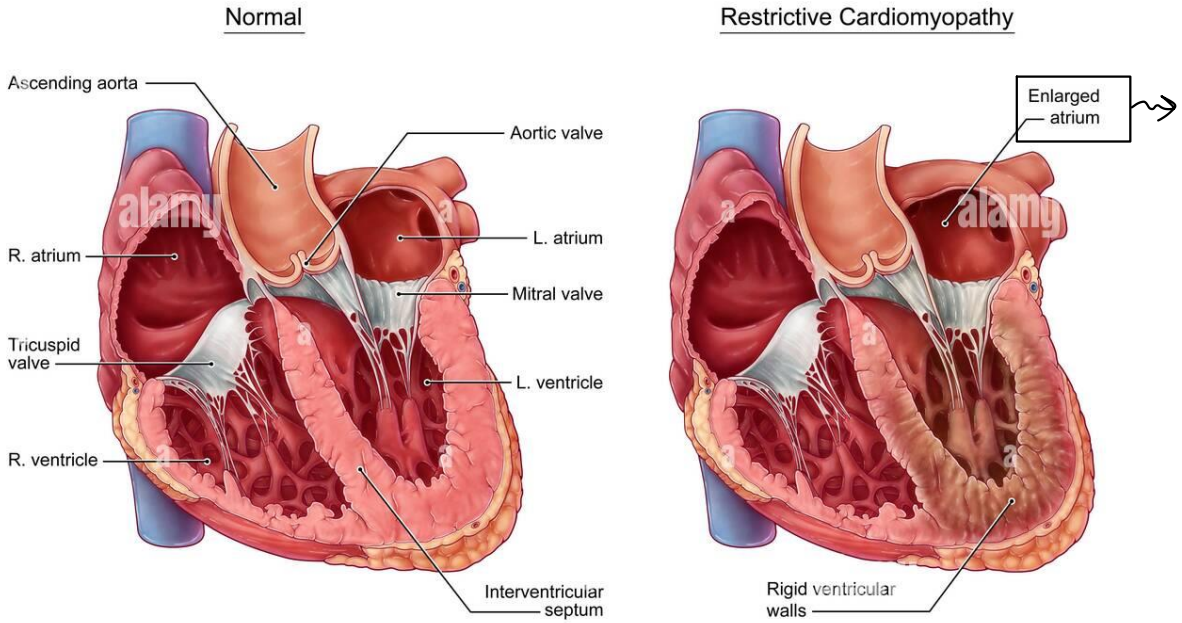
Systemic diseases:

- Amyloidosis → a buildup of abnormal amyloid deposits in the body
- Sarcoidosis → granuloma in many part of body → ex: heart
  - most common → Lung
- Radiation fibrosis
- Hemochromatosis → بتعمل سخلتين → dilated / restrictive
- Endocardial fibroelastosis (in kids) - there's fibrosis and elastosis in endocardium
- Loeffler syndrome - eosinophilic inflammation of endocardium and myocardium

Fibrosis وتسبب ← 40% كتير عالية بتوصل


Stiff Cardiac Muscles = Noncompliant /nonstrechy rigid Restrictive Heart → Diastolic dysfunction & Heart Failure
I defy blood flow... I am stiff and Strict enough to say 'No'.
I restrict dilation in diastole....
I can't handle Pumping blood.. It's tiring...huffff
Creative-Med-Doses
Restrictive Cardiomyopathy
©2021 Priyanga Singh
Causes
Anything which increases fibrosis of cardiac muscles
Amyloidosis
Sarcoidosis
Hemochromatosis
Post radiation fibrosis
Loffler Syndrome
Endocardial Fibroelastosis

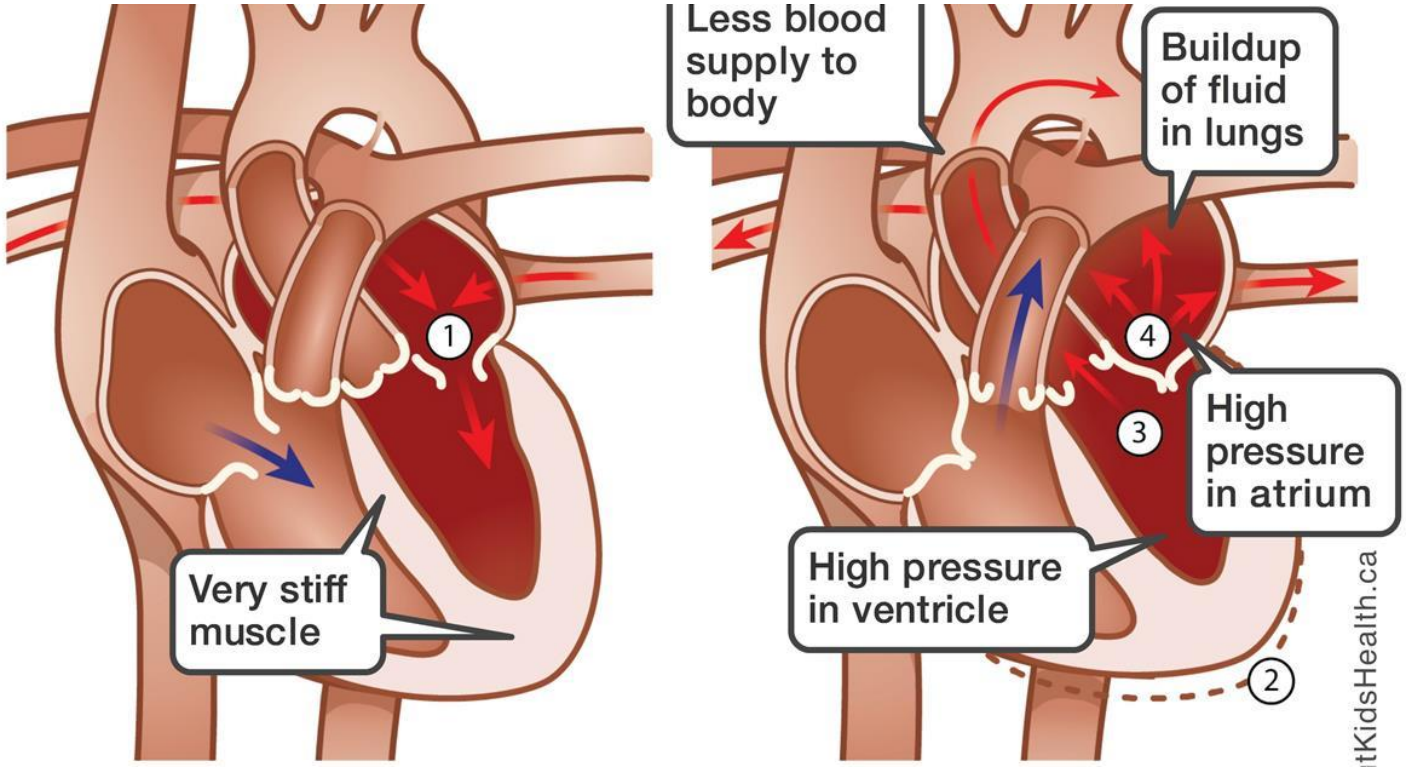
Restrictive Cardiomyopathy Morphology



during diastole of ventricle → atrial try to contract to fill ventricle and when the ventricle is stiff, the pressure in ventricle is high →hypertrophy in atrium

- The ventricles are of approximately normal size or only slightly enlarged
- Cavities are not dilated, and the myocardium is **firm**.
- Endomyocardial biopsy often can reveal a specific etiologic disorder.

اهم اشيء



Restrictive Cardiomyopathy

Restrictive Cardiomyopathy
Endomyocardial fibrosis

Endomyocardial fibroelastosis :

↳ Fibrosis + elestic = dense Fibrosis

- Most common form of restrictive cardiomyopathy.
- Children and young adults in Africa and other tropical areas
- Dense diffuse fibrosis of the ventricular endocardium and subendocardium.
- Linked to nutritional deficiencies and/or inflammation related to helminthic infections

دود ه

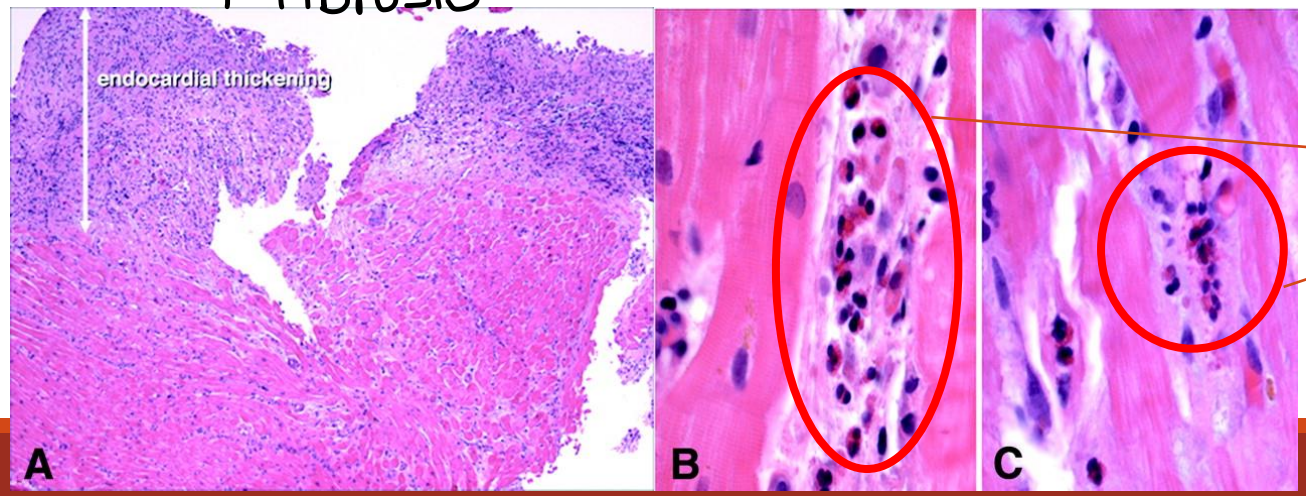
Restrictive Cardiomyopathy
Loeffler endo myocarditis

Loeffler end myocarditis:

- Endo-myocardial fibrosis, but without geographic predilection.
- Histologic examination: peripheral hyper eosinophilia and eosinophilic tissue infiltrates

in blood

↑ Fibrosis



Collection of interstitial eosinophils

هدول فيديوهات بيساعدوكم .....

https://youtu.be/2RvZQDj2ZNg?si=Z_5tDJ9XbT300fJL

https://youtu.be/dMPUnvPgTVk?si=mlB8kPLLdbOsSDyM