CVS module – 5
Cardiomyopathies, Myocarditis and cardiac tumor

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Cardiomyopathies

- Cardiac diseases due to intrinsic myocardial dysfunction.

- May be :
- primary: that confined to the myocardium
- Secondary: presenting as the cardiac manifestation of a systemic disorder.

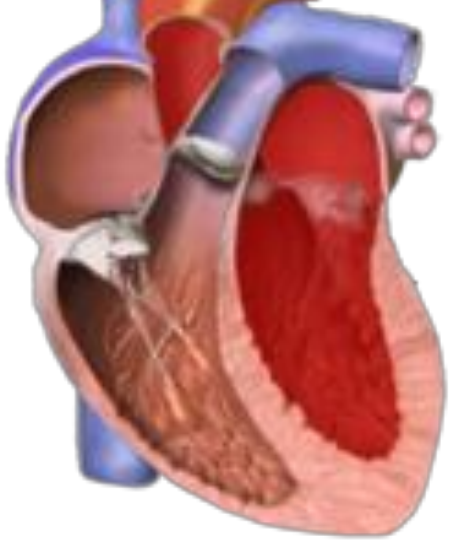
- Clinically they are classified into three major types:
- Dilated cardiomyopathy (DCM) (90% of cases
- Hypertrophic cardiomyopathy (HCM)
- Restrictive cardiomyopathy(RCM).

Up normal dilatation in the left ventricles

Volume inside

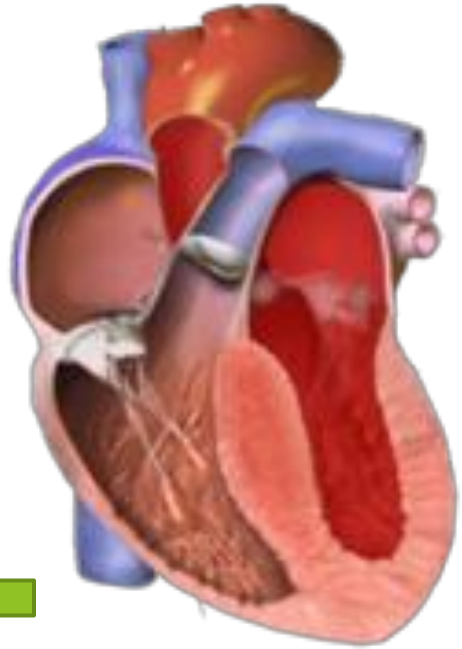
Fibrosis
Restriction in the contractility

Types



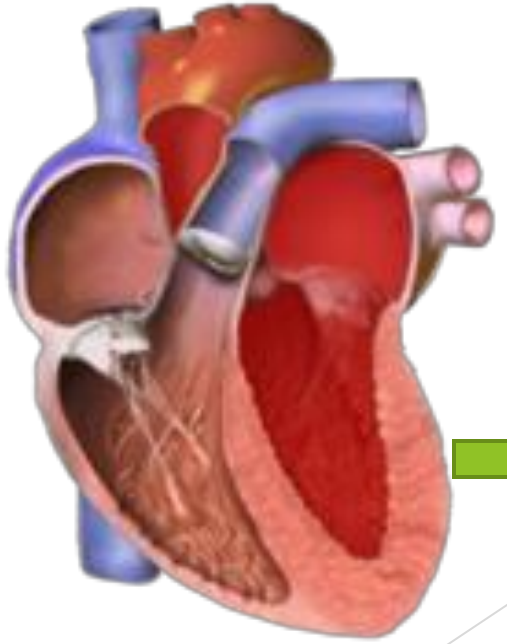
Normal

Dilated



Hypertrophic

thick-walled,
heavy, and hypercontractile



Restrictive

flabby, poorly contractile

Table 11.5 Cardiomyopathies: Functional Patterns, Causes

ركزو على اول عامودين الباقيين احفظو لبل سلايدات

انتبهو عالاسباب لبتكون موجوده بالسلايدات

Functional Pattern	Left Ventricular Ejection Fraction*	Mechanisms of Heart Failure	Causes	Secondary Myocardial Dysfunction (Mimicking Cardiomyopathy)
Dilated	<40%	Impairment of contractility (systolic dysfunction)	Genetic; alcohol; peripartum; myocarditis; hemochromatosis; chronic anemia; doxorubicin (Adriamycin); sarcoidosis; idiopathic	Ischemic heart disease; valvular heart disease; hypertensive heart disease; congenital heart disease
Hypertrophic	50%–80%	Impairment of compliance (diastolic dysfunction)	Genetic; Friedreich ataxia; storage diseases; infants of diabetic mothers	Hypertensive heart disease; aortic stenosis
Restrictive	45%–90%	Impairment of compliance (diastolic dysfunction)	Amyloidosis; radiation-induced fibrosis; idiopathic	Pericardial constriction

Its common in the developing countries due to the presence of alcohol

Affecting the ESV

ventricle fully ال ما بفتح
عشان هيك حيضل ال EDV موجود جواته دم

If EDV high will have high SV
With increase ejection fraction
القلب ما عم برتاح

disposition of the materials outside the heart

May happen in the cancer therapy

No contractility
No volume
Opposite to the previous one

*Range of normal values is approximately 50% to 65%.

1. Dilated Cardiomyopathy

Normal valves
No atherosclerosis

- Dilated cardiomyopathy (DCM) is characterized by a poorly contracting dilated left ventricle with a normal or reduced left ventricular wall thickness

Dilated is the most common type

- DCM is the most common cause of congestive cardiac failure (CCF).

- It occurs more frequently in men than women and is most common between ages 20 and 60 years.

- By definition, valvular and vascular lesions (e.g., atherosclerotic coronary artery disease) that can cause cardiac dilation secondarily are absent.

Pathogenesis

- In most cases, no definite cause is identifiable, but causes can be classified as: Mostly idiopathic
- Genetic : in 20% to 50% of cases, either as:
- Autosomal dominant : Mutations affecting cytoskeletal proteins or proteins that link the sarcomere to the cytoskeleton. Flopping مرتخية
- X-linked : Mutations in dystrophin, a cell membrane protein that physically couples the intracellular cytoskeleton to the ECM.

Pathogenesis. Cont.

- Acquired causes such as:

- Infections: e.g. coxsackievirus, adenovirus.
- Nutritional deficiency: carnitine selenium deficiencies
- Cardiotoxins: e.g. Adriamycin: a chemotherapeutic drug.
- Puerperium: usually occur late in gestation or several weeks to months postpartum.

بعد الولاده

- Due to pregnancy-associated hypertension, volume overload, nutritional deficiency, gestational diabetes.
- Alcohol :

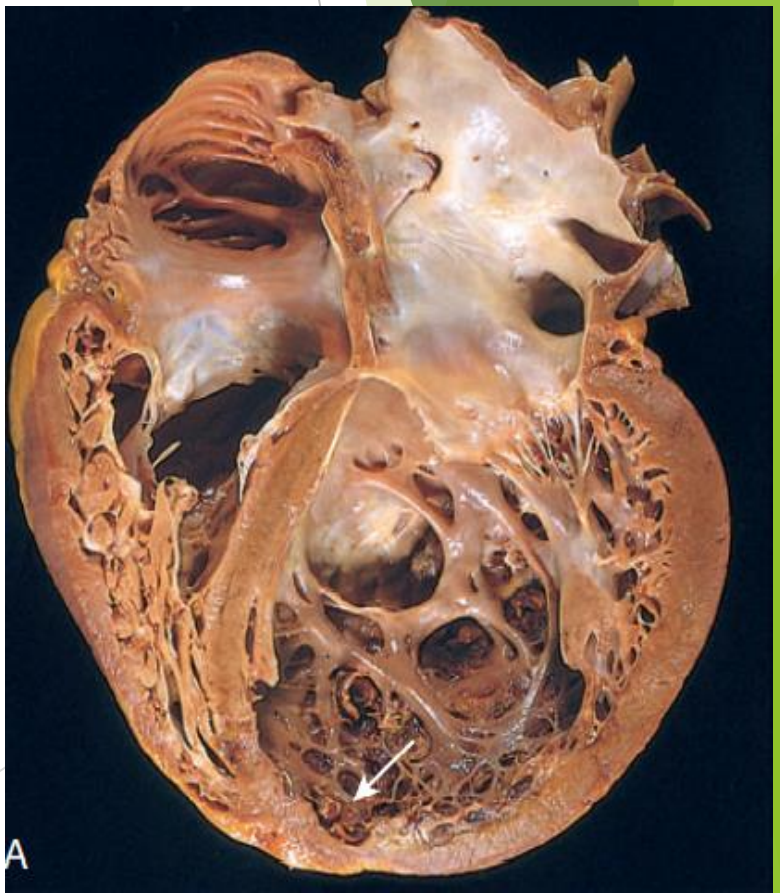
All caused by alcohol

- Direct toxic effect on the myocardium.
- Thiamine deficiency

Gross Morphology

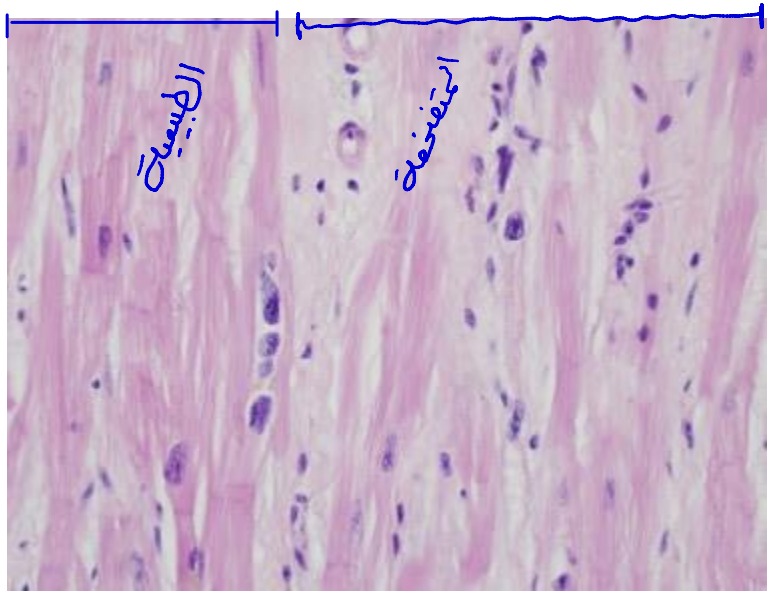
- The heart assumes a globular shape. كروي الشكل
- Ventricular chamber dilatation.
- Atrial enlargement. Because its a blood reservoir for the ventricles
- Mural thrombi are often present and may be a source of thromboemboli.

اي منطقة بكون فيها stasis بصير فيها thrombi

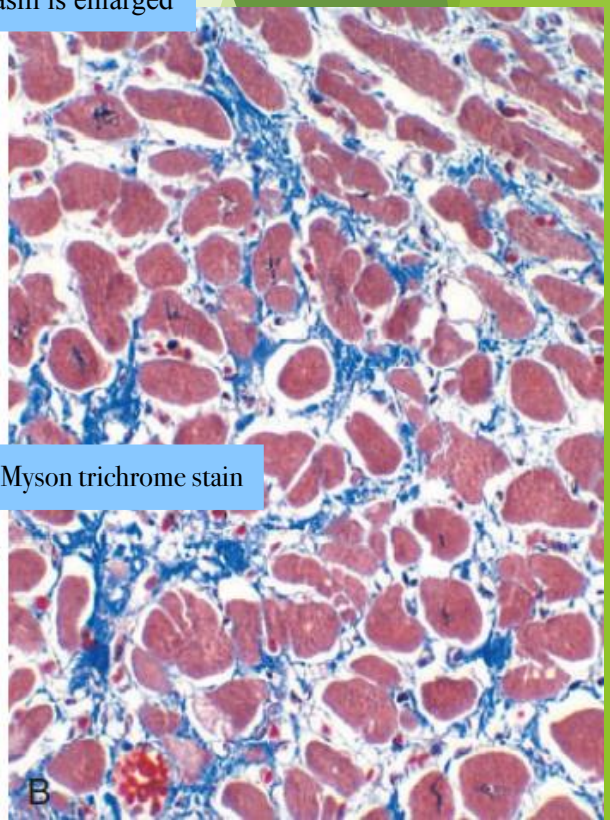


Histological features

- The characteristic histologic abnormalities in DCM are nonspecific.
- Myocytes exhibit hypertrophy with enlarged nuclei.
- interstitial and endocardial fibrosis,



the same cytoplasm is enlarged



Myson trichrome stain

Clinical features

- The fundamental defect in DCM is ineffective contraction.
- It typically manifests with signs of slowly progressive CHF, including dyspnea, easy fatigability, and poor exertional capacity.
- Secondary mitral regurgitation .
- abnormal cardiac rhythms.
- Embolism from intracardiac (mural) thrombi.
- Cardiac transplantation is the only definitive treatment.

2. Hypertrophic Cardiomyopathy

- Hypertrophic cardiomyopathy (HCM) is defined by the presence of increased left ventricular (LV) wall thickness (in a non dilated chamber) that is not explained by abnormal loading conditions ?

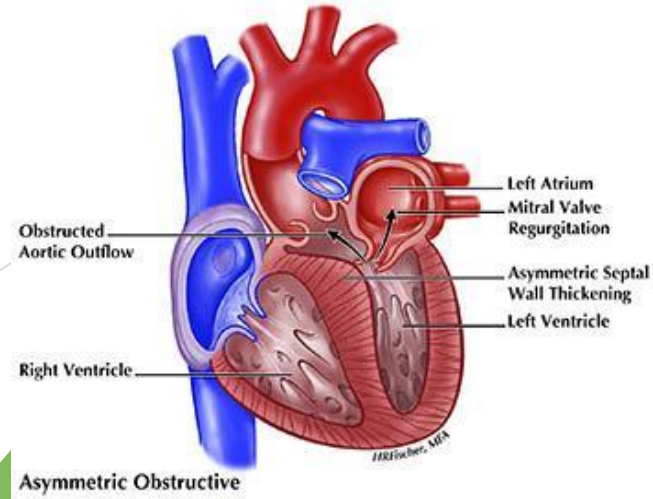
الفرق بينها وبين لقبلها بهاي النقطة

Hypertensive
- might be a complication due to it
- but its not the cause

- Typically associated with defective diastolic filling, and ventricular outflow obstruction.

- Systolic function usually is preserved in HCM, but the myocardium does not relax and therefore exhibits primary diastolic dysfunction

Always present because the chamber is small



Asymmetric Obstructive

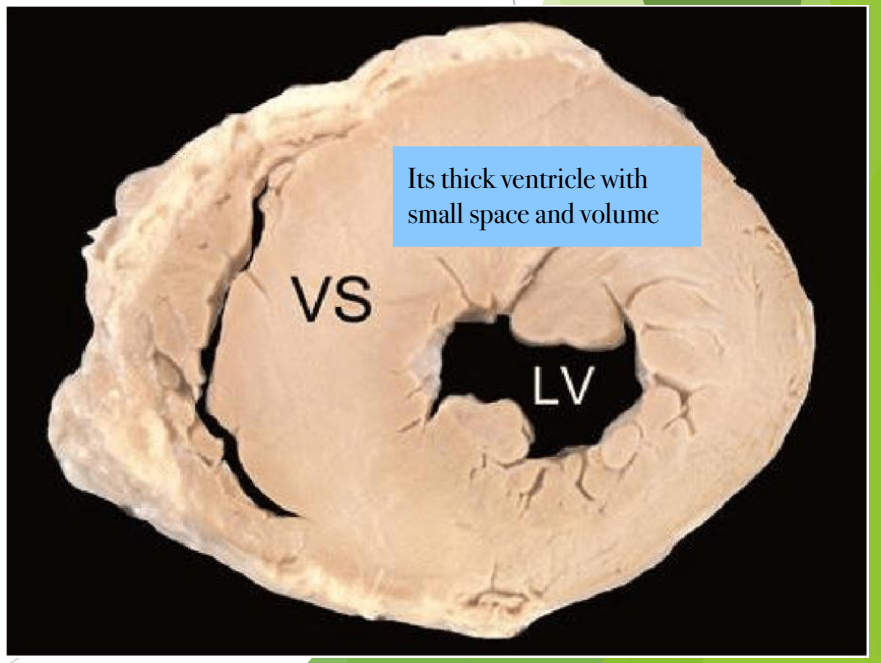
Pathogenesis

- Most cases of HCM are caused by mutations (usually autosomal dominant) in one of the proteins that form the contractile apparatus:

  - ß-myosin heavy chain is most frequently involved.
  - Myosin-binding protein C .
  - Troponin T.

Gross MORPHOLOGY

- Hypertrophic cardiomyopathy is marked by massive myocardial hypertrophy without ventricular dilation.



Histological features

- The characteristic histologic features in HCM are marked myocyte hypertrophy, haphazard myocyte (and myofiber) disarray, and interstitial fibrosis

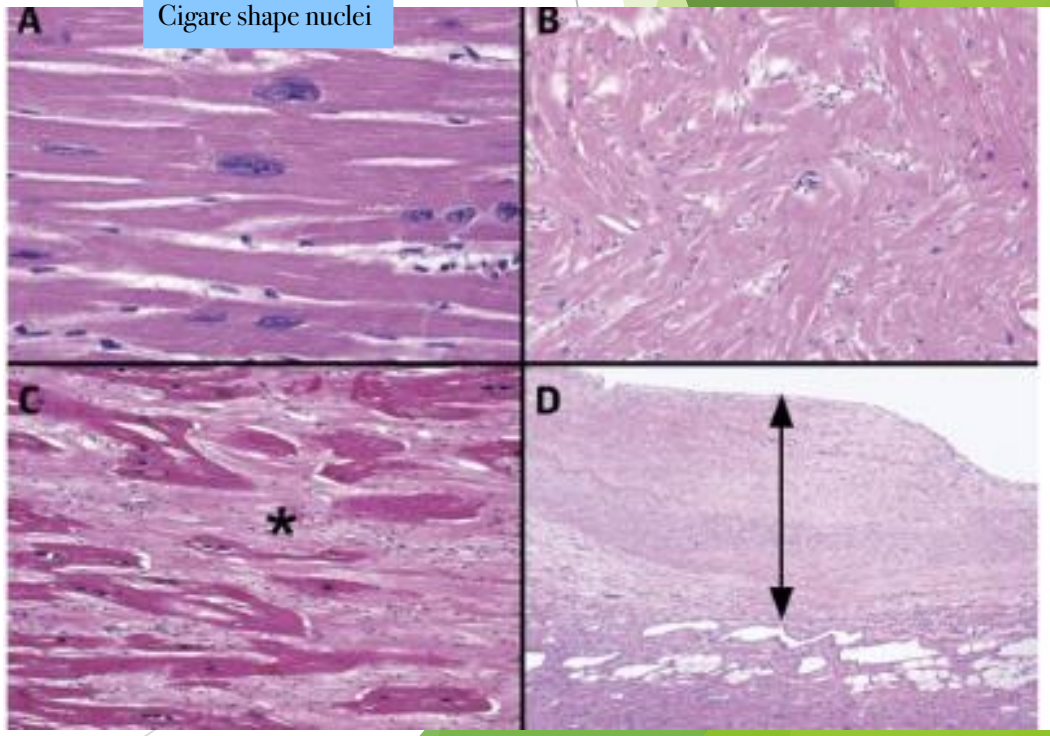
Irregular proliferation

In the dilator type there will be hypertrophy but in the hypertrophic type it will be much more appeared and noticeable

Will be fibrotic with time

- A) Myocyte hypertrophy.
- (B) myocyte disarray.
- (C) interstitial (pericellular-type) fibrosis (asterisk).
- (D) endocardial fibrosis (double-headed arrow).

Cigare shape nuclei



Clinical Features

Underlying cause of the athletes that during the gym having the collapse and result with shock that lead to death.
The manifest explains this due to the high oxygen demand while exerscing

- HCM typically manifests during the postpubertal growth spurt.
- characterized by massive left ventricular hypertrophy associated with reduced stroke volume(due to impaired diastolic filling and overall smaller chamber size).
- Reduced cardiac output and a secondary increase in pulmonary venous pressure cause exertional dyspnea.
- A combination of massive hypertrophy, high left ventricular pressures, and compromised intramural arteries frequently leads to myocardial ischemia (with angina), even in the absence of concomitant CAD.

Coronary artery disease is a complication due to Ischemia

Clinical Features

- So Major clinical problems include :

- atrial fibrillation with mural thrombus formation.
- ventricular fibrillation leading to sudden cardiac death.
- CHF.

- In almost one third of cases of sudden cardiac death in athletes younger than 35 years of age, the underlying cause is HCM.

3. Restrictive Cardiomyopathy

- Restrictive cardiomyopathy is characterized by a primary decrease in ventricular compliance, resulting in impaired ventricular filling during diastole.

- May be:
  - idiopathic. Moving fibrosis
  - Or associated with systemic diseases that affect the myocardium, e.g.: radiation fibrosis, amyloidosis, sarcoidosis, or products of inborn errors of metabolism.

Secondary effect to the heart

Epitheloid granulomas in any part of the body

Gaucher syndrome

Deposition of glucose
Glycogen inside the cells
May accumulate in the liver spleen BM and heart
By the time will cause fibrosis

Protein deposition
Acellular amorphous material
Has a type in the: Alzheimer
Plasma cell myeloma
DM
In the dialysis patient

Multi-able myeloma (plasma myeloma) ?
Neoplastic Proliferation of plasma cells
- amyloses is a famous complication to it

Commonest forms of restrictive cardiomyopathy include:

- 1. Cardiac amyloidosis :
- caused by the deposition of extracellular proteins (amyloid).

- can occur in the setting of:
- systemic amyloidosis (e.g., multiple myeloma) BM sheaths of plasma cells
- or restricted to the heart (e.g., senile cardiac amyloidosis).

May be more than 20%
With immunocells test
Protein electrophoresis

تقدم بالعمر

Myelomas >> mostly old age

- 2. Endomyocardial fibrosis :
- characterized by dense diffuse fibrosis of the ventricular endocardium and subendocardium, often involving the tricuspid and mitral valves
- is principally a disease of children and young adults.
- The fibrous tissue markedly diminishes the volume and compliance of affected chambers, resulting in a restrictive physiology.

And contractility

- Causes:
- nutritional deficiencies.
- inflammation related to helminthic infections with hypereosinophilia.

Myocarditis

- Myocarditis is an inflammatory disease of the myocardium caused by different infectious and noninfectious triggers.

- Classified according to the cause into:
- Infectious:
- Viral infections, e.g.: coxsackie viruses A and B , enteroviruses, Cytomegalovirus (CMV), human immunodeficiency virus (HIV).

Not any infecting agent. will infect the heart

In the inflammatory bowel disease
Ulcerative colitis
Inflammatory bowel disease
Will be given immunotherapy so by time will be asked for a biopsy for CMV just to check if its affected secondary
If yes then we will stop the immunotherapy

- Noninfectious:
- systemic diseases of immune origin, such as systemic lupus erythematosus and polymyositis.
- Drug hypersensitivity reactions (hypersensitivity myocarditis)

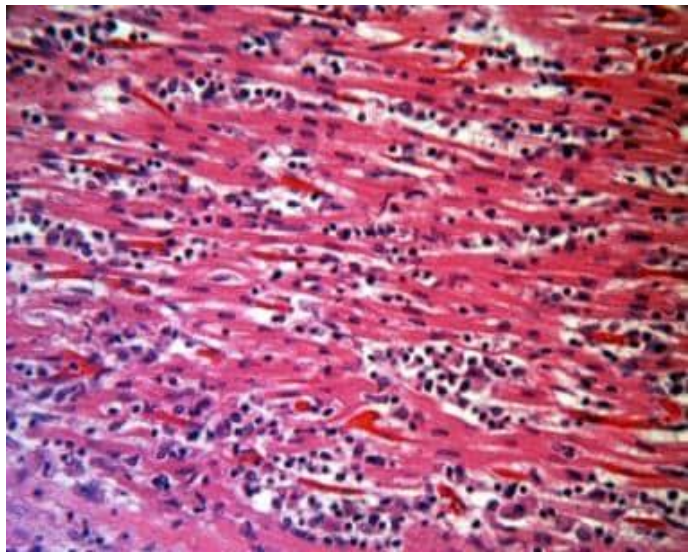
For all muscles

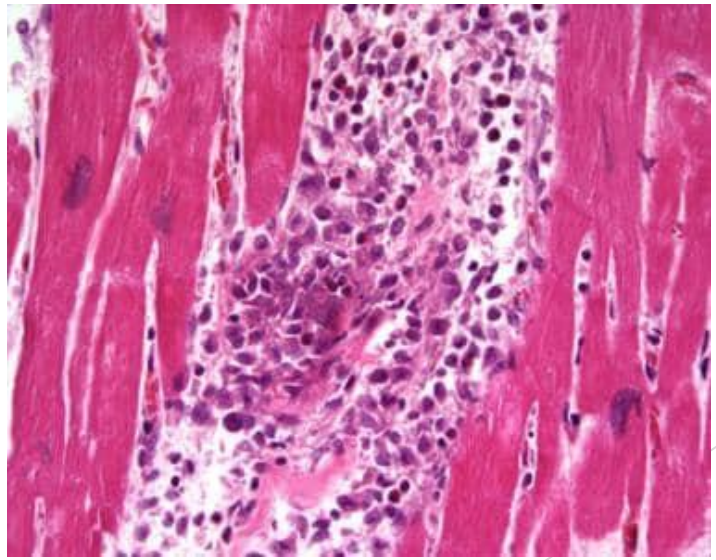
Gross Morphology

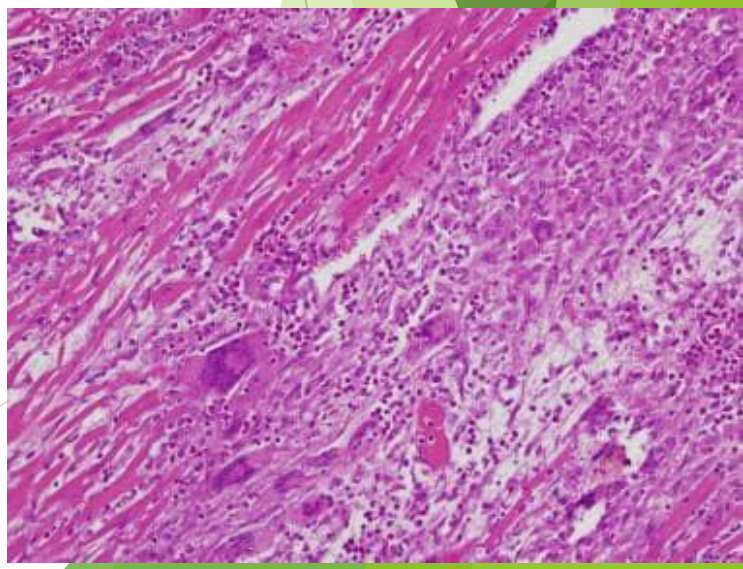
- In acute myocarditis, the heart may appear normal or dilated.
- in advanced stages, the myocardium typically is flabby and pale and hemorrhagic areas.
- Mural thrombi may be present.

Histological features myocarditis is characterized by:

- Edema and myocyte injury.
- Interstitial inflammatory infiltrates: Hint to the cause
- Lymphocytic type: numerous lymphocytes. Lymphocytes >> viral
- Hypersensitivity myocarditis: abundant eosinophils. Granuler red cytoplasm
- Giant cell myocarditis: containing multinucleate giant cells With inflammatory cells







Cardiac Tumors

Secondary > mitastasis

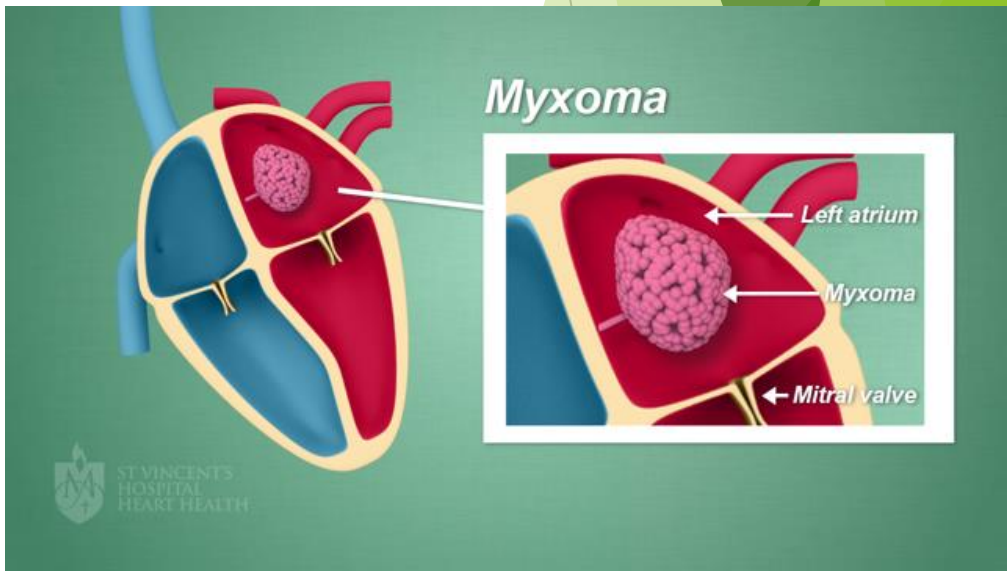
CARDIAC MYXOMA MOST COMMON IN BENIGN

- Cardiac tumors are rare. Cardiac tumors comprise primary and secondary metastatic tumors.
- Primary tumors:
- Primary cardiac tumors are uncommon; and usually benign.
- In descending order of frequency, the most common tumors are: From high to low
  - Myxomas (most common).
  - Fibromas. From Fibrous tissue
  - Lipomas. From Fat
  - papillary fibroelastomas. Elastic tissue and fibrous tissue in the heart
  - Rhabdomyomas (most frequent in infants and children, they often regress spontaneously).

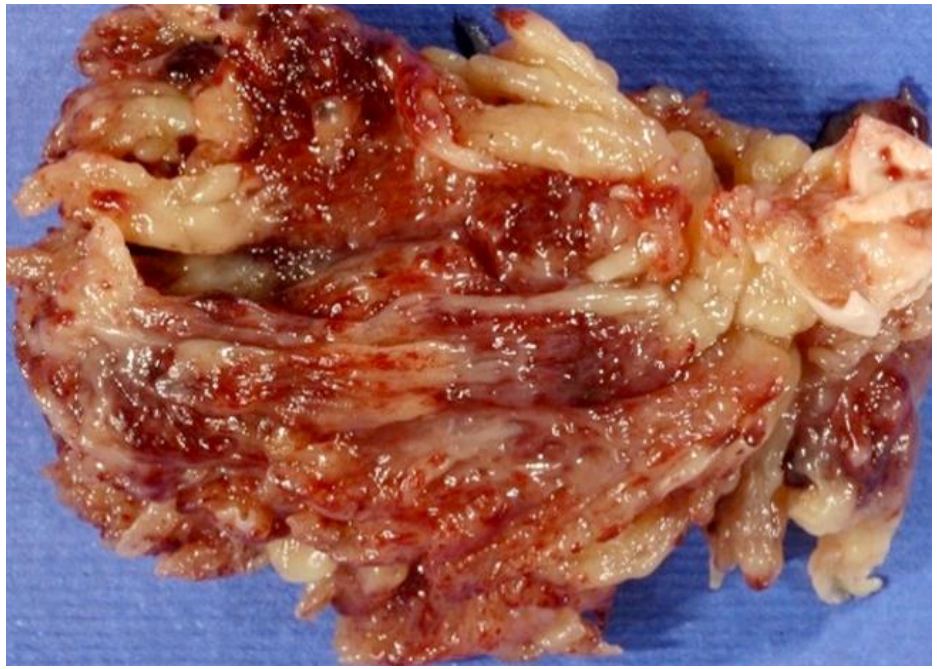
- Angiosarcomas constitute the most common primary malignant tumor of the heart. Cancer of BV

Myxoma

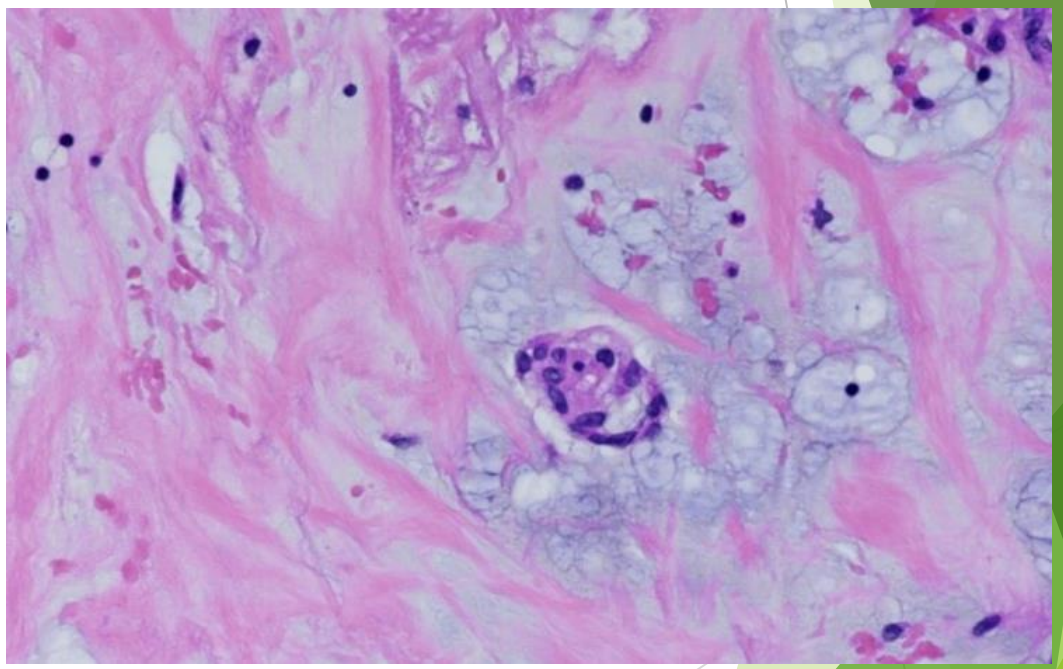
- Most common primary tumors of the heart, usually single in sporadic forms and mainly located in the left atrium.
- May cause sudden death, usually due to mitral valve obstruction.
- clinical manifestations:
  - valvular “ball-valve” obstruction.
  - embolization.
  - fever and malaise.
- Echocardiography is the diagnostic modality of choice.
- surgical resection is almost uniformly curative.



Morphology



Grossly : appear as sessile or pedunculated mass.



Microscopic: neoplastic cells within myxoid stroma

Table 11.6 Cardiovascular Effects of Noncardiac Neoplasms

Direct Consequences of Tumor
Pericardial and myocardial metastases
Large vessel obstruction
Pulmonary tumor emboli
Indirect Consequences of Tumor (Complications of Circulating Mediators)
Nonbacterial thrombotic endocarditis
Carcinoid heart disease
Pheochromocytoma-associated heart disease
Myeloma-associated amyloidosis
Effects of Tumor Therapy
Chemotherapy
Radiation therapy

Tumor implant in the heart

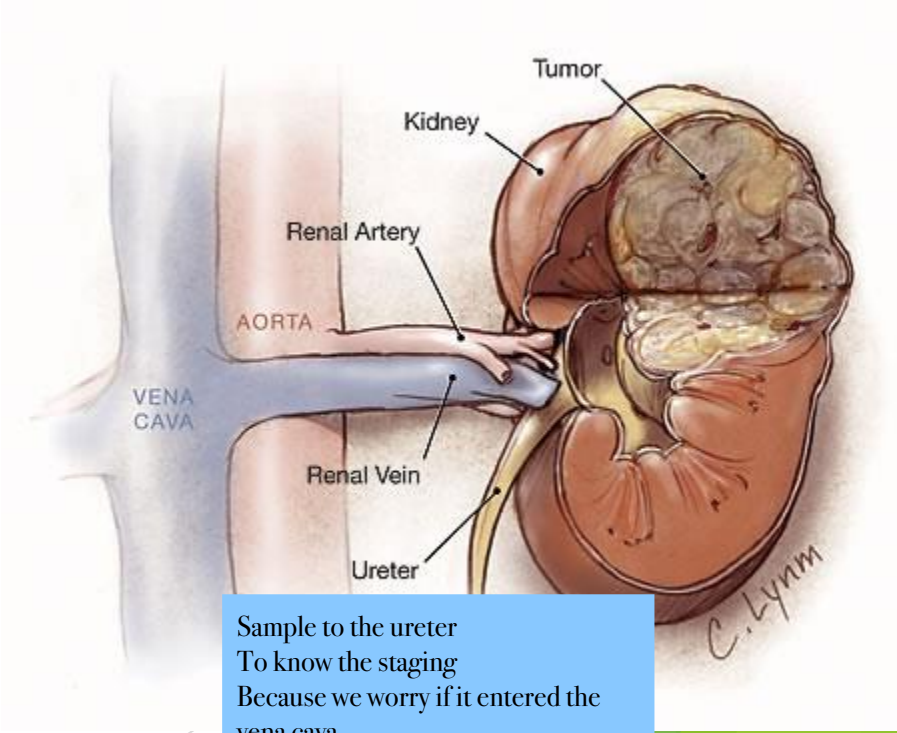
Non cardiac

Secondary cardiac tumors

- The most frequent metastatic tumors involving the heart are:
- carcinomas of the lung.
- Carcinoma of the breast.
- melanomas.
- leukemia's and lymphomas.

- Metastases can reach the heart and pericardium by:
- lymphatic extension.
- hematogenous seeding
- direct contiguous extension.
- venous extension

When breast or lung tumor enter direct without the help of vessels



Sample to the ureter
To know the staging
Because we worry if it entered the vena cava

Carcinoid Heart Disease

Most common in GI

Will release bioactive amides
Serotonin
Histamine
Liver will do inactivation of these but if the liver is dysfunctional it will accumulate and spread

But if in the lung carcinoid will transport it to blood till the heart (Even without the liver carcinoid

But liver metastasis MUST to happen carcinoid syndrome

- The carcinoid syndrome results from bioactive compounds such as serotonin released by carcinoid tumors (tumor arising from Neuroendocrine cells).
- Cardiac lesions typically do not occur until there is a massive hepatic metastasis since the liver normally inactivates circulating mediators before they can affect the heart.
- Classically, endocardium and valves of the right heart are primarily affected since they are the first cardiac tissues bathed by the mediators.

If the carcinoid benign or malignant ??

It was benign

New classification

Carcinoid has grades
1 neuroendocrine
2 to malignancy
3 to malignancy

Considered as Paraneoplastic syndrome

- The mediators elaborated by carcinoid tumors include serotonin (5-hydroxytryptamine), kallikrein, bradykinin, histamine, prostaglandins, and tachykinins.

- systemic manifestations include :
- Flushing.
- Diarrhea.
- Dermatitis.
- Bronchoconstriction.

GOOD LUCK

THANK YOU