



Diameter  
of aorta  
مقعر  
فانقلب صابرة - شغل كوبي  
فهدول النامي بصير عندهم HF

## Pathophysiology-Congestive Heart Failure

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# □ Heart Failure

→ عدم قدرة القلب  
Blood perfusion  
demand, لا يستطيعون  
الorgans

- The inability of the heart to maintain an output adequate to maintain the metabolic demands of the body.
- Heart failure may result from a primary abnormality of the heart muscle—for example, an infarction—that impairs ventricular function and prevents the heart from pumping enough blood.

infarction

function lity  
structurly

## □ What is HF

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- Complex syndrome that can result from any structural or functional cardiac disorder that impairs the ability of the heart to function as a pump to support physiological circulation.
- Heart failure may also be caused by problems unrelated to MI:
  - ✓ Mechanical disturbances in ventricular filling during diastole, due to blood volume that's too low for the ventricle to pump. *اضطرابات*
  - ✓ Systolic hemodynamic disturbances—such as excessive cardiac workload caused by volume overload or pressure overload—limit the heart's pumping ability.

Type of heart failure	Description
<b>Left-sided heart failure</b>	The left ventricle of the heart struggles to pump blood, resulting in a buildup of fluid in the pulmonary veins, causing shortness of breath.
<b>Right-sided heart failure</b>	Right side of the heart struggles to pump blood to the lungs, resulting in fluid backup in the legs, feet, and abdomen.
<b>Systolic heart failure</b>	The left ventricle cannot contract completely, meaning that the heart cannot pump with enough force to move blood throughout the body properly.
<b>Diastolic heart failure</b>	The left ventricle cannot relax, not allowing it to fill completely, resulting in not enough blood being pumped to the rest of the body.

③ Filling dia stolic HF وفي نوع right side ② أو باء HF ← Left side ① ممكن يغير (HF) انواع  
انه القلب مش قادر يحمل كمية Blood level قليل  
Systolic HF ④ من قادر يرفع الدم

Stages و Stages left side باء ل right HF (اليسرى)

work load على القلب عالي نتيجة Sympathetic و RAS

فتتعب بمل قادر يرفع

β-blocker ← antagonist medications ال

Ca<sup>2+</sup> blockers channels Sympathetic  
عشان تخفف workload على القلب

# Stages HF

- Compensated phase
  - Supply temporarily meets the altered demand, no or very mild symptoms and signs
- Decompensated heart failure:
  - new or worsening symptoms/signs of dyspnoea, fatigue or oedema leading to hospitalisation or unscheduled medical care

Shortness of Breath  
انخفاض عزم التنفس  
التي عند HF

اعراضهم

تعب عام

تدخلوا  
hospitalization  
في هذه الحالة

right او left edema اذا كان  
نوع ال edema اذا كان

right ← اذا كان في فخذ في يوم ما يصل الدم لا  
ascites ما يعني ما يكمل طريقته بجمع للجسم بغير عند

edema بالطن اسما Ascites ما يتقبل الدم من ال organs بغير عندهم تجمع سوائل بالرجلين  
في البطن / بس اذا كان left بغير عنده pulmonary edema تجمع سوائل بالرئتين اسوة انواع تجمع السوائل

وليام ما بقدرينام بشكل straight لازم يدخل رافع جنبه فيق نفس وهو ناسم ولذا رفع راسه بغير  
shortness of Breath عندهم

Shortness of Breath  
في ال

# Compensated and Decompensated Heart Failure

الجسم يحاول يرجع  
الوضع الطبيعي

ما استطاع الجسم + يدخل بواي المرحلة  
يعود للوضع الطبيعي

# □ Pathophysiology

- Main Causes of Heart Failure:

- Ischemic Heart Disease (35-40%) ✓

- Cardiomyopathy (dilated) (30-34%) myocardial

- Hypertension (15-20%) ارتفاع الضغط  
atriums و تضخم و تضيق ال

- Other Causes:

- Valvular Heart Disease. valvular aortic stenosis رجوع دمون

- Congenital Heart Disease.

- Alcohol and Drugs.

- Arrhythmias.

Compensation

# Pathophysiological Changes in HF

فكر انه يح جمع دم اكثر

activation Sympathetic system

hypertrophy

- Ventricular Dilatation.
- Myocyte Hypertrophy.
- Salt and Water Retention.
- Sympathetic Stimulation.
- Peripheral Vasoconstriction.

لما القلب يكثف انه الدم مشكاهما

Reabsorption

ان اكان القلب مشكاهم يكون compensated

واذا كثير للفشل كبير

workload بغير التأثير عكسي بحدته

عندة القلب بضعف بغير diastolic HF بعينه systolic HF death

## Symptoms:

- Exertional Dyspnea. → كإجراء بالنفس ضيق النفس
- Orthopnea. ضيق النفس أو عدم النوم
- Paroxysmal Nocturnal Dyspnea. ضيق النفس وهو نايم يبيح attack

## Signs:

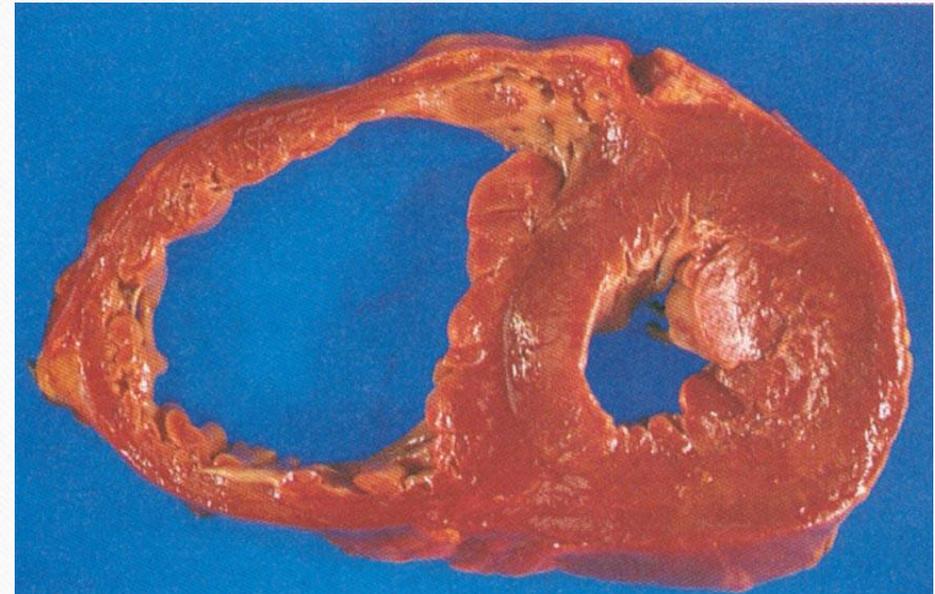
- Cardiomegaly.
- Elevated Jugular Venous Pressure.
- Tachycardia.
- Hypotension.
- Bi-basal crackles. الشخص لا يتنفس تسمع له صوت تجمع سائل بال Lungs
- Pleural effusion. تجمع سائل بملء Pleural cavity
- Ankle Edema. تجمع سائل بالرجلين
- Ascites. تجمع سائل بالبطن
- Tender hepatomegaly. تضخم بال Spleen و الكبد Liver

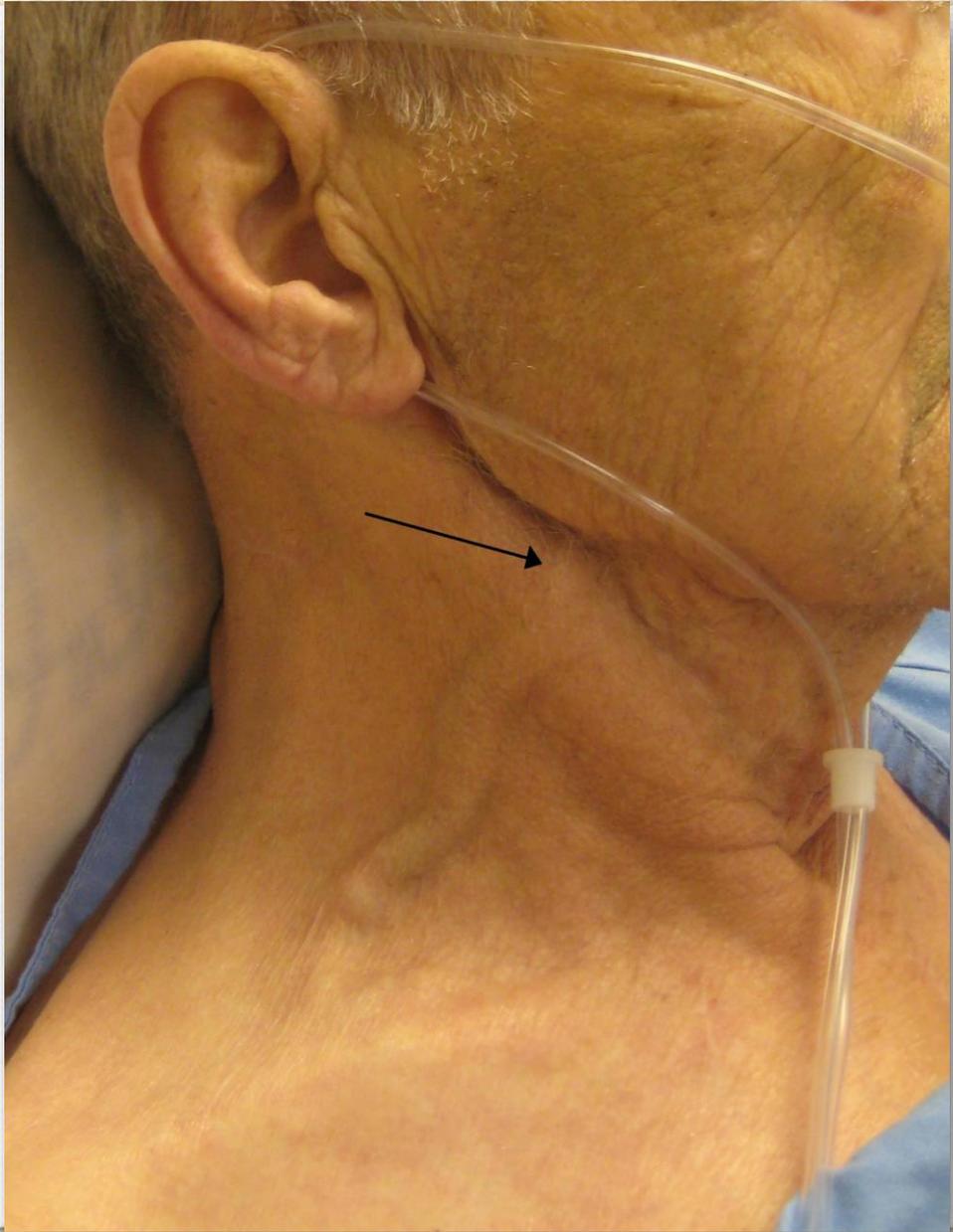
- **Edema**

- Bilateral lower extremity edema
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- **Hypertension**

- Hypertrophic Cardiomyopathy





## □ Classification of HF:

- از ازار شويه عوارضه ببعب يحسن بي ائى بيوا
- I. No limitation. Normal physical exercise doesn't cause fatigue, dyspnea or palpitations. *طهقان القلب*
  - II. Mild limitation. Comfortable at rest but normal physical activity produces fatigue, dyspnea or palpitations. *exertion بملتن ببعب*
  - III. Marked limitation. Comfortable at rest but gentle physical activity produces marked symptoms of HF.
  - IV. Symptoms of HF occur at rest and are exacerbated by any physical activity.

HF symptoms  
و ببعب

# Point of maximum Impulse (PMI)

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- The **apex beat**, also called the **point of maximum impulse (PMI)**, is the furthestmost point outwards (laterally) and downwards (inferiorly) from the sternum at which the cardiac impulse can be felt. The cardiac impulse is the result of the heart rotating, moving forward, and striking against the chest wall during systole.
- The normal apex beat can be palpated in the **precordium *left 5th intercostal space***, at the point of intersection with the *left midclavicular line*. In children the apex beat occurs in the **fourth rib interspace medial to the nipple**. The apex beat may also be found at abnormal locations; in many cases of dextrocardia, the apex beat may be felt on the right side. Lateral and/or inferior displacement of the apex beat usually indicates enlargement of the heart.

# ❖ Compensatory Mechanisms

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## ✓ Increased Heart Rate:

- Sympathetic = Norepinephrine

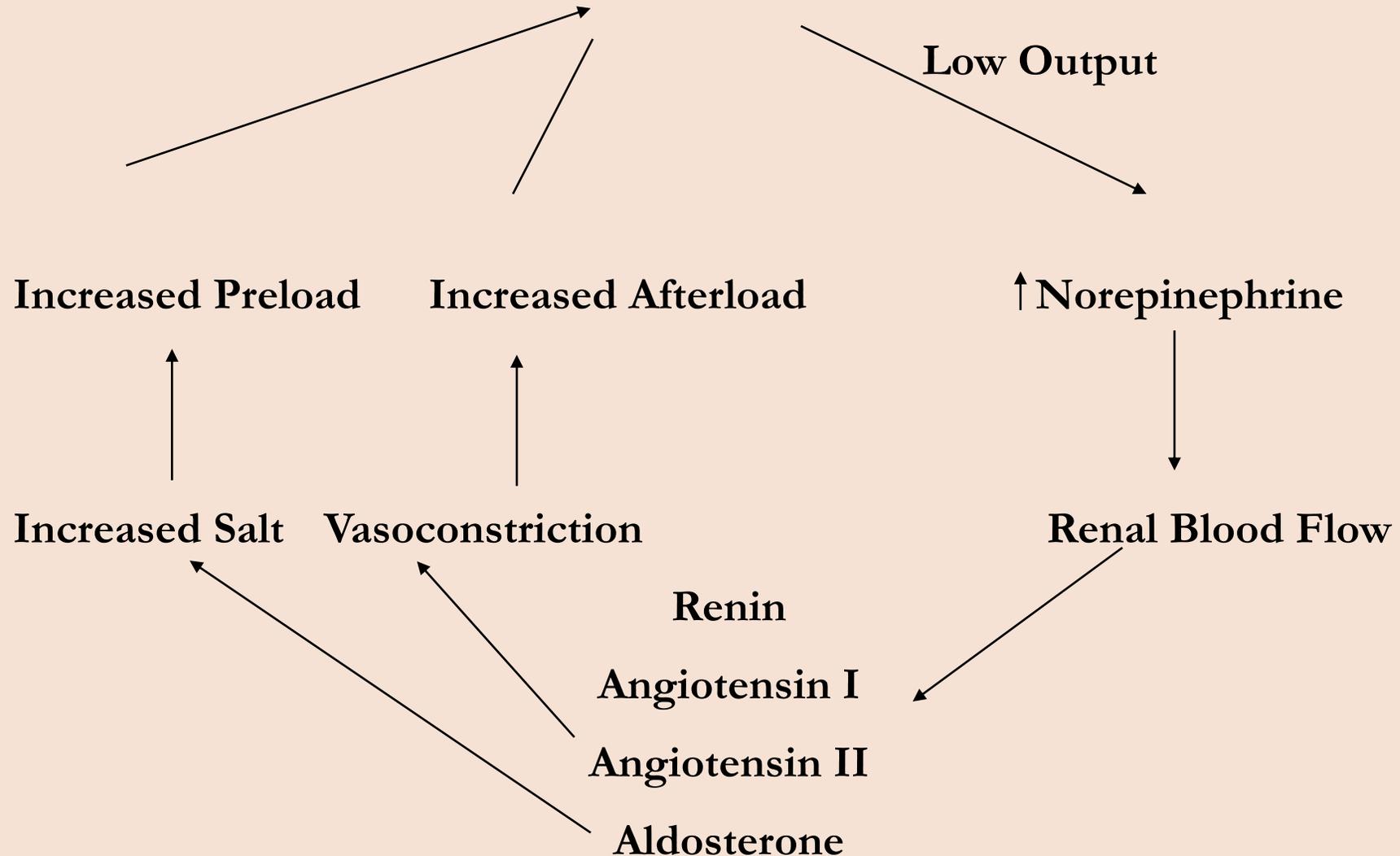
## ✓ Dilation:

- Frank Starling = Contractility

## ✓ Neurohormonal:

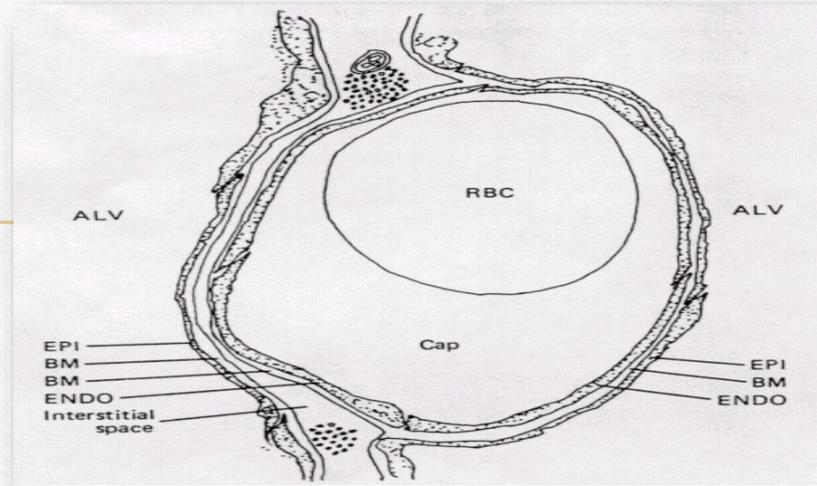
- Redistribution of Blood to the Brain

# CHF Vicious Cycle

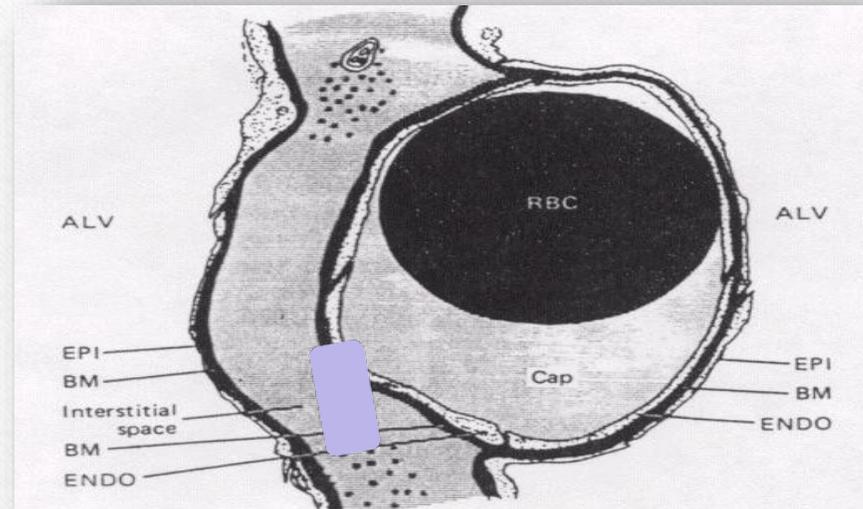


# ❖ Infiltration of Interstitial Space

## ➤ Normal Micro-anatomy

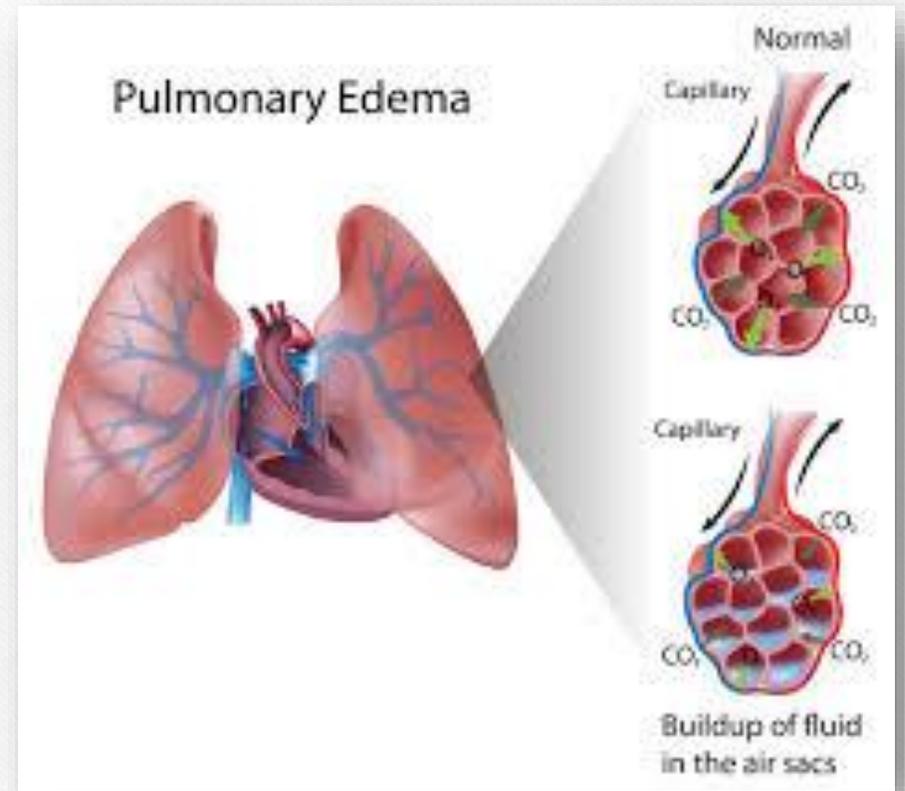
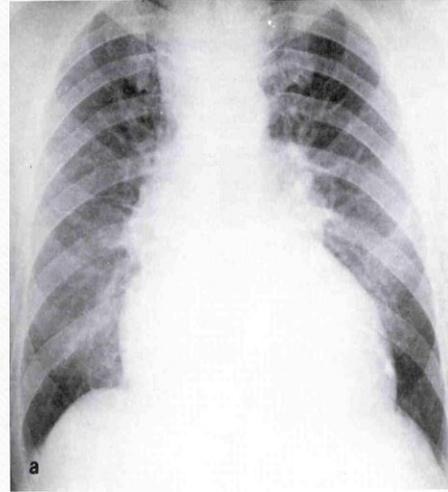
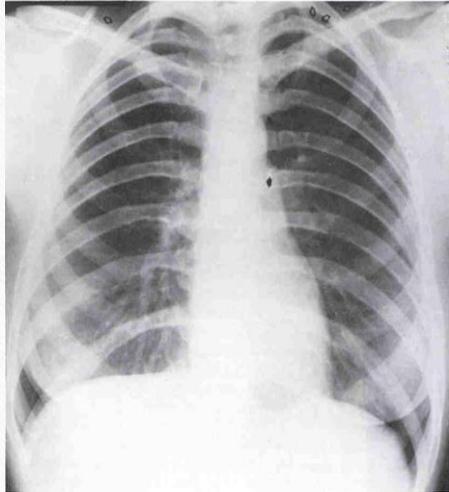


## ➤ Micro-anatomy with fluid movement.



# Acute Pulmonary Edema

a true life-threatening emergency



# □ Treatment

All

- Prevention. Control of risk factors
- Lifestyle.
- Treat etiologic cause / aggravating factors.
- Drug therapy.
- Personal care. Teamwork.

Selected patients

- Revascularization if ischemia causes HF.
- ICD (Implantable Cardiac Defibrillator).
- Ventricular resyncronization.
- Ventricular assist devices.
- Heart transplant.
- Artificial heart.
- Neoangiogenesis, Gene therapy

انفاثة اللجان  
المر فوق

Heart contraction  
more electrical impulse  
شاك  
بالل  
لعل  
لعل

Blood vessel  
Surgery  
also  
زيج  
Ischemia also

Angiogenesis  
of generation  
of new Blood vessel

# Treatment Objectives\*

-  **Survival**
-  **Morbidity**
-  **Exercise capacity**
-  **Quality of life**
-  **Neurohormonal changes**
-  **Progression of CHF** ✓
-  **Symptoms**

# Treatment- Pharmacologic Therapy

✓ Diuretics

مدرات  
كافيه  
edema

✓ ACE inhibitors

RAAS

← عكس  
Sympathetic  
RAAS  
مضاد الالديسترون

✓ Beta Blockers

القلب ليس له  
التي  
Vasoconstriction  
التي  
بين الينوع

✓ Digitalis

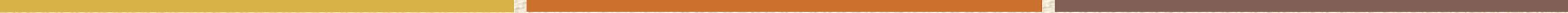
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تزيد الالديسترون في القلب  
على خلايا رينين  
جذب  
حباتنا  
ad  
نفس  
الفرق  
الفرق

✓ Spironolactone

مدر  
effective  
ما يعطون الالديسترون  
عنه + K

✓ Others



**Thank You**

