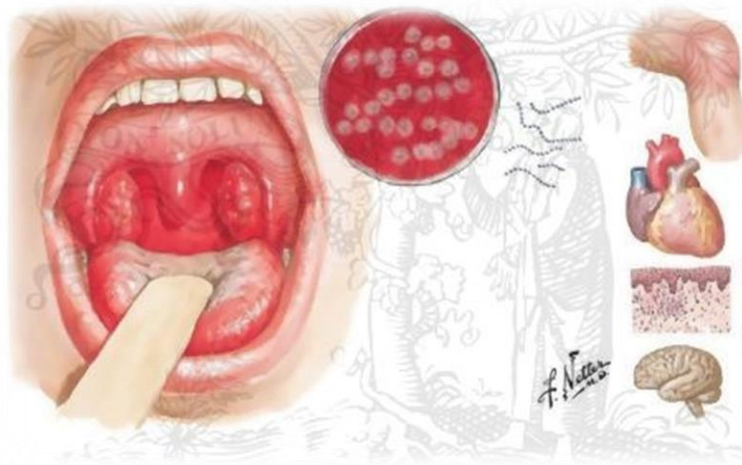


*Case 1*

*I have to travel to Al-Mozahmia*

*daily*





## New Terms

**Frothy phlegm:** foam-like mucus coughed up from the airways.

**Swollen feet:** called edema, it's due to accumulations of fluids in the ECF space. Due to many causes such as heart failure.

**Pitting edema:** Pitting edema can be demonstrated by applying pressure to the swollen area by depressing the skin with a finger. If the pressing causes an indentation that persists for some time after the release of the pressure, the edema is referred to as pitting edema.

**Palpitation:** Being able to feel the heart beats

**Cyanosis:** blueness of the skin.

**Jugular venous pressure (JVP):** is the indirectly observed pressure over the venous system via visualization of the internal jugular vein. It can be useful in the differentiation of different forms of heart and lung disease.

**Heart sound:** are the noises generated by the beating heart and the resultant flow of blood through it. Specifically, the sounds created when the heart valves close.

**Murmur:** an abnormal heart sound.

**Apex beat:** is the furthestmost point outwards (laterally) and downwards (inferiorly) from the sternum at which the cardiac impulse can be felt.

**Tenderness:** pain when an affected area is touched.

**Atrial fibrillation:** the enlarged left atrium beats rapidly in an irregular pattern.

**Preload:** the stretched condition of the heart muscle at the end of diastole just before contraction.

**Contractility:** measure of how forcefully the ventricle contracts at a given preload.

**Afterload:** the force against which cardiac muscle shortens.

**Mitral stenosis:** Narrowing of the bicuspid (mitral) valve orifice Increases resistance to blood flow from the left atrium to the left ventricle, Mitral stenosis usually results from a rheumatic fever.



## Scenario

A 40-year-old woman who commutes (travels) from Riyadh to a town 200 km away, for her job as a teacher tells her doctor that **she has been feeling very tired and noticed that it happened gradually** over the last 10-14 months, she also reports being **unable to sleep without the use of 3 pillows**, for the last 9-12 months she has noticed that she has **shortness of breath**. The patient has also noticed that **both her feet are swollen** at the end of the day. The swelling is a bit less by the next morning and she has no pain in her feet. **At the age of 13, she was diagnosed with "Rheumatic Fever"**

## Examination

- ✓ Positions her to be semi-sitting at 45 degrees in bed.
- ✓ **Vital signs:** Pulse rate (irregularly irregular - atrial fibrillation)
- ✓ BP normal, Temp. BR are slightly high but considered normal.
- ✓ Jugular venous pressure (JVP) is raised.
- ✓ **Loud first heart sound**. A murmur heard over the apex area (Mid-diastolic rumbling murmur)
- ✓ Bilateral basal crackles are heard over the lungs.
- ✓ Tenderness over the liver area (just below the right costal margin)
- ✓ Pitting edema of both feet and up to the ankle joint.

## Investigation

- ✓ **Electrocardiogram (ECG):** Changes consistent with **atrial fibrillation**. No P wave or high frequency of low voltage P wave.
- ✓ **Echocardiogram:** The changes are consistent with the diagnosis of **mitral stenosis**. NO CALCIFICATION of valve leaflets.

# Treatment

Dr. Ali advised her to undergo a surgery to fix **the mitral valve** but she rejected and asked for medication. The doctor prescribed her:

**Angiotensin Converting Enzyme (ACE) Inhibitor** : contributes the ventricular remodeling and enhance the parasympathetic activity which lead to decrease Afterload

**Diuretic**: Improve renal blood flow and water overload which lead to decrease preload

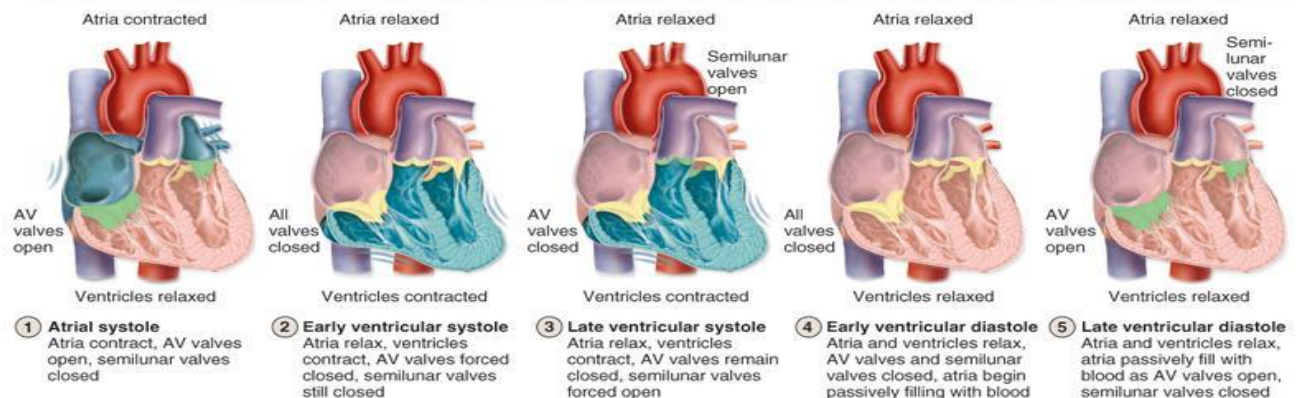
**Warfarin**: an anticoagulant that prevent the formation of thrombosis

**Digoxin**: inhibits Na<sup>+</sup>/K<sup>+</sup> ATPase enzyme which help in control the atrial fibrillation so this will lead to increase the contractility.

# Physiology of Cardiac Cycle

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Phase	Atrial systole	Early ventricular systole	Late ventricular systole	Early ventricular diastole	Late ventricular diastole
Atria	Contract	Relax		Relax	
Ventricles	Relax	Contract		Relax	
AV valves	Open	Closed		Open	
Semilunar valves	Closed	Open		Closed	





## Factors affecting cardiac output

$$(CO = HR \times SV)$$

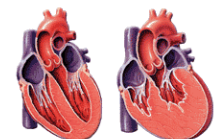
- Preload  $\uparrow$ CO
- Myocardial contractility  $\uparrow$ CO
- Afterload  $\downarrow$ CO
- Heart rate  $\uparrow$  CO

Which is 5 L/Min at rest

## Pathogenesis of Rheumatic valve disease

Group A streptococci cell wall contains 'M protein'  $\rightarrow$  Immune system generates antibodies against 'M protein'  $\rightarrow$  antibody will cross react with cardiac myofiber protein myosin and smooth muscle cells of arteries  $\rightarrow$  Which induces cytokine release and tissue destruction  $\rightarrow$  Inflammation.

## Congestive Heart Failure (CHF)

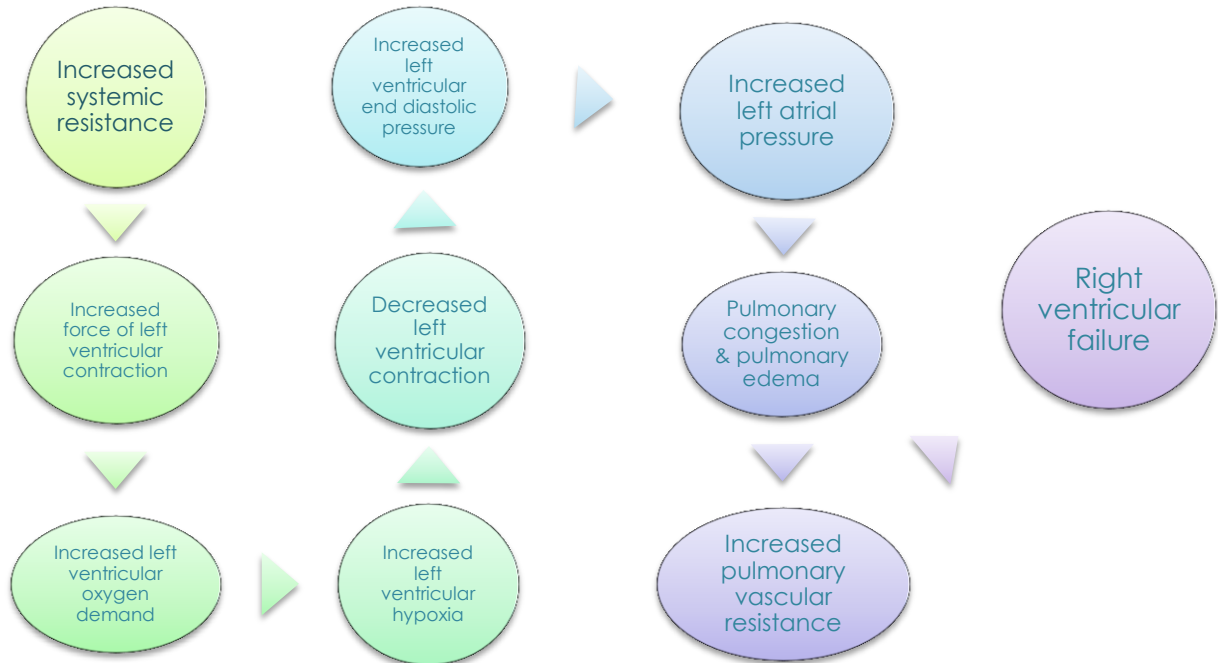


Normal Heart Congestive Heart

### Causes

- 1-Intrinsic causes (These result in reduction in ventricular contractility for example (myocardial infarction and cardiomyopathy)
- 2-Cardiac arrhythmias
- 3-Extrinsic causes (These make it more difficult to eject blood into aorta) for example: (hypertension and aortic stenosis)

# Pathogenesis



## Types of CHF:

Acute heart failure	Chronic heart failure	Left sided heart failure	Right sided heart failure
<ul style="list-style-type: none"> <li>• Develops rapidly and can be immediately life threatening because:</li> <li>• the heart does not have time to undergo compensatory adaptations.</li> </ul>	<ul style="list-style-type: none"> <li>• Is a long-term condition that is associated with the heart undergoing adaptive responses (e.g., dilation, hypertrophy).</li> </ul>	<ul style="list-style-type: none"> <li>• Occurs when the left ventricle is not pumping adequately; the main symptoms include shortness of breath.</li> </ul>	<ul style="list-style-type: none"> <li>• Occurs when the right ventricle is not pumping adequately. This tends to cause fluid buildup in the veins and swelling in the legs and ankles</li> </ul>

**Signs and symptoms:** Shortness of breath and chest pain.

**Treatment:** Diuretics, ACE inhibitors, Beta blockers and Digoxin.

**Mechanism of Edema:** ↑ hydrostatic pressure, ↑ capillary permeability, ↓ oncotic pressure, and lymphatic obstruction.



# Questions

## 1-What could be the cause behind irregularly irregular rhythms?

Atrial fibrillation.

## 2- Why do cardiologist use the Echocardiogram & Cardiac catheterization studies?

To assist the severity of the condition and exclusion of any associated cardiac problems.

## 3-List some of the factors affecting stroke volume?

- Preload
- Contractility
- Afterload

## 4-Malar flush usually is a sign of?

Mitral stenosis.

## 5-What is the Fowler's position?

It is a standard patient position to be semi-sitting at 45 degrees in bed.

## 6-Jugular venous being raised is a sign for which type of Heart failure?

Right-sided heart failure.

## 7-Where can you hear a murmur?

It can be heard over the apex area (Mitral valve).

## 8-What is the reason behind the mid-diastolic rumbling murmur also called the Carey-coombs murmur?

Mitral valvulitis for acute rheumatic fever.

## 9-What kind of test do we use to show the Mitral stenosis?

Echocardiogram.

## 10-Edema may be developed by?

Decrease the Oncotic pressure.

Increase the Hydrostatic pressure.

Increase the Capillary permeability.

Lymphatic Obstruction.

## 11-Where can we hear the Bilateral basal crepitation?

Can be heard at the base of both lungs.



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