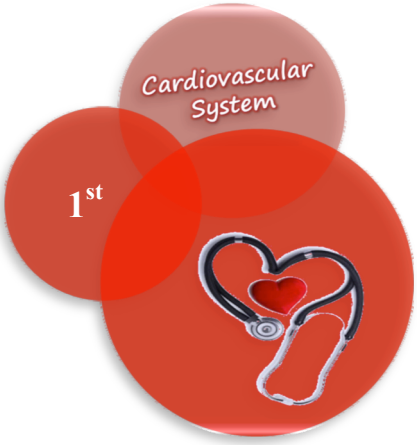

MED 433 TEAM

Problem Based Learning

First case:

I have to travel to almozahmia daily...

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Color Index

♥ Key points from the Scenario:

- 40-year-old female, lives in Riyadh, teacher in Al-Mozahmeia .
- She went to the GP because of gradually tiredness most of the time for the last 10-14 months.
- She is unable to sleep unless she uses 3 pillows under her head for the last 9-12 months.
- She has swollen feet & ankles at the end of the day without pain.
- She has shortness of breath for the last 9-12 months particularly with efforts and repeated cough sometimes with white frothy phlegm showing streaks of blood.
- She feels the beats of her heart while resting in the bed (palpitation).
- She had rheumatic fever when she was 13 years old.

♥ Examination:

- GP positions her to be semi-sitting at 45 degrees in the bed.
- Her pulse rate is high (irregularly irregular, atrial fibrillation).
- Normal blood pressure with slightly raised temperature & respiratory rate, and No pallor or cyanosis.
- Jugular venous pressure (JVP) is raised.
- Loud **first** heart sound & murmur over the apex area (mid-diastolic rumbling murmur) with normal apex beat (in the midclavicular line, 5th intercostal space).
- Tenderness over the liver area.
- Pitting edema of both feet and up to the ankle joint.

♥ Investigations → results

No P wave or high frequency of low voltage P wave.

- Electrocardiogram (ECG) → the changes are consistent with atrial fibrillation.
- Echocardiogram → the changes are consistent with diagnosis of mitral stenosis. NO calcification of the valve leaflets.

♥ Diagnosis:

- Congestive heart failure secondary to mitral valve stenosis.

♥ Management:

Dr. Ali advices her to undergo surgery to fix the mitral valve, but she reject this option and asked for medications. He described the following drugs:

- Angiotensin-converting enzyme inhibitor (ACEI) → contributes to ventricular remodeling and enhancement of parasympathetic activity. (↓ AFTERLOAD)
- Sloop diuretic → Improve renal blood flow and decreases water overload. (↓ PRELOAD)
- Warfarin → an anticoagulant that prevents the formation of thrombosis.
- Digoxin → Inhibits Na+ / K+ ATPase enzyme Helps in the control of atrial fibrillation. (↑ CARDIAC CONTRACTILITY)
- Mitral valve replacement After 2 years, her symptoms gradually worsened (Surgical).

Heart Failure

Heart failure (HF), often called congestive heart failure (CHF) occurs when the heart is unable to provide sufficient pump action to maintain blood flow to meet the needs body of oxygen and nutrient by the body tissues

Pathophysiology:

Heart failure can be caused by factors originating from within the heart (intrinsic disease or pathology) or from external factors:

Intrinsic factors	External factors
Dilated cardiomyopathy, hypertrophic cardiomyopathy and myocardial infarction.	- **Pressure load**: long-term (uncontrolled) hypertension. - Increased stroke volume: (**Volume load**), hormonal disorders such as hyperthyroidism, and pregnancy.

Types:

Acute HF (hours/days)	Chronic HF (months/years)
Develops rapidly and can be immediately life threatening because the heart does not have time to undergo compensatory adaptations, can often be managed successfully by pharmacological or surgical interventions.	Is a long-term condition that is associated with the heart undergoing adaptive responses (e.g., dilation, hypertrophy).

Left-sided vs. Right-sided HF:

Left-sided HF	Right-sided HF
Occurs when the left ventricle is not pumping adequately; the main symptoms include shortness of breath.	Occurs when the right ventricle is not pumping adequately. This tends to cause fluid build-up in the veins and swelling in the legs and ankles.

Symptoms: Shortness of breath (dyspnea) - Swelling (edema) in the legs, ankles and feet - Reduced ability to exercise - Persistent cough or wheezing with white or pink blood-tinged phlegm

Rheumatic fever

Is an inflammatory disease that occurs following a Streptococcus infection, such as pharyngitis. Believed to be caused by antibody cross-reactivity that can involve the heart, joints, skin, and brain, the illness typically develops two to three weeks after a streptococcal infection. Acute rheumatic fever commonly appears in children between the ages of 5 and 15.

Pathogenesis:

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

Clinical Presentations:

- **What are the possible mechanisms for the development of her oedema?**
  - ↑ hydrostatic pressure.
  - ↓ oncotic pressure (e.g., low serum albumin).
  - ↑ capillary permeability.
  - Lymphatic obstruction.
- **What are the factors affecting the stroke volume?**
  - Preload - Contractility - Afterload.
- **What are the Primary determinants of cardiac output (CO)?**

  CO=HR×SV
  - **Stroke volume** (volume of blood ejected during each ventricular contraction).
  - **Heart rate** (mainly it is under the control of anatomic nervous system).
  - ***β*-blockers** can ↓ CO by ↓ HR and contractility.
  - **Drugs** such as verapamil and dilitiazm can ↓ HR by slowing transmission through the AV node.
- **Give examples of causes of irregularly irregular rhythms?**
  - Atrial fibrillation.
  - Atrial or ventricular ectopics.
- **What the Echocardiogram and cardiac catheterization studies help in?**

  - Assessing the severity of the condition and exclusion of any associated cardiac problems.

♥ New terms:

- Frothy phlegm: frothy sputum is usually a symptom of some form of respiratory distress. Frothing occurs when phlegm or mucus in the lungs combines with fluid and air, and is then coughed up by a person. This is a symptom any sickness that causes a lot of congestion in the lungs. (Streaks of blood may duo to congestion of capillaries).
- 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. These sounds that provide important auditory data regarding the condition of the heart.
- Murmur: an abnormal heart sound.
- Apex beat: is the furthermost 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.
- Tenderness: pain when an affected area is touched.
- Atrial fibrillation: the enlarged left atrium beats rapidly in an irregular pattern.
- **Preload**: degree of tension on the ventricular muscle when it begins to contract. The primary determinant of the preload is end-diastolic volume. Both diuretics and vasodilators ↓ the preload.
- **Contractility:** measure of how forcefully the ventricle contracts at a given preload. Generally influenced by the activities of the sympathetic nervous system.
- **Afterload**: pressure or resistance against which the ventricles must pump blood, the primary determinant of which is systemic arterial pressure (↑ the afterload will ↓ SV, and stenotic valve ↑ afterload).
- 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. The damaged valve will not cause any symptoms unless it is severe.