Name Kousar Irshad
ID 15799
Subject PHTSIOLOGY

Q.1. Establish a differentiation criteria between arteries, veins and capillaries.

	Artery	vein	capillary
Function	Carries oxygenated blood away from the heart, except for the pulmonary artery	It carries deoxygenated blood from body parts to cells except for the pulmonary vein	It takes care of the diffusion of gases and nutrients from blood to cells of the body
Lumen	Small	Large	Very small
Wall	Thick	Thin	Very thin
Other functions	Presence of muscular walls Largest artery-aorta	Presence of valve to avoid back flow of blood	Semi permeable walls for the transportation of gases and nutrients
How structure fits function	Strength and elasticity needed to withstand the pulsing of the blood, prevent bursting and maintain pressure wave	Thin walls and narrow lumen bring blood into close contact with body tissue allowing diffusion of materials between capillary and surrounding tissues	Wide lumen offers less resistance to blood flow

Q.2. Name classes of antibodies. What are the characteristics of antibodies.

There are five immunoglobulin classes (isotypes) of antibody molecules found in serum, they are:

IgG
IgM
IgA
IgE
IgD

They are distinguished by the type of heavy chain they contain. IgG molecules possess heavy chains known as γ-chains; IgMs have μ-chains; IgAs have α-chains; IgEs have ε-chains; and IgDs have δ-chains. The variation in heavy chain polypeptides allows each immunoglobulin class to function in a different type of immune response or during a different stage of the body's defense. The amino acid sequences that confer these functional differences are located mainly within the Fc domain.

Antibody classes also differ in their valency, i.e. the number of arms available to bind antigen. This arises from the ability of certain immunoglobulins to form multimers through linkage of their Fc domains via a J chain. For example, IgM is a pentamer of five identical "Y" shaped monomers. Therefore, the complete IgM protein contains 10 heavy chains, 10 light chains and 10 antigen binding arms (giving IgM a valency of 10)

Characteristics of Antibodies:
Antibodies show the following characteristics and perform different functions

(i) IgA:

It is the second most abundant class, constituting about 10 to 15 per cent of antibodies of serum. It is mainly found in sweat, tears, saliva, mucus, colostrum (first milk secreted by a mother) and gastrointestinal secretions.

Smaller quantities are present in blood and lymph. IgA has an extra polypeptide called a J-(joining) chain and extra protein known as secretory component. Levels decrease during stress, lowering resistance to infection. Provides localized protection in external secretions (tears, intestinal secretions, etc.) against bacteria and viruses. When IgA is excreted through faeces, it is called coproantibody

(ii) IgD:

It is mainly found on the surfaces of B cells as antigen receptors, where it activates B cells for antigen recognition. It is about 0.2% of all antibodies in the blood.

(iii) IgE:

It is less than 0.1% of all antibodies in the blood; located on mast cells and basophils releasing histamine from mast cells and basophils. It is involved in allergic and hypersensitivity reactions; provides protection against parasitic worms. This immunoglobulin was discovered in 1966 by Ishizaka.

(iv) IgG:

This is the most abundant class of Ig in the body constituting approximately 80% of the total Igs. It is found in the blood, lymph and intestine. It protects against bacteria and viruses by enhancing phagocytosis, neutralizing toxins and complement activation. It is the only class of antibody to cross the placenta from mother to foetus thereby conferring considerable immune protection in new-borns.

(v) IgM:

IgM is about 5 to 10% of all antibodies in the blood. It is also found in lymph. It is the largest Ig which is secreted first by the plasma cells. It is so named because it is a macroglobulin at least five times larger than IgG. IgM is the oldest immunoglobulin class. It activates the B cells. It is also the earliest immunoglobin to be synthesised by the foetus, IgM has a J chain and its each dimer contains polypeptide called a secretory component.

It cannot cross the placental barrier. IgM is 500-1000 times more effective than IgG in opsonisation (to be described ahead), in bacterial action and in bacterial agglutination. But in neutralization of toxins and viruses, it is less active than IgG. It helps in complement activation.

Q.3. Explain the significance of lymphatic ducts.

There are two lymph ducts in the body the right lymphatic duct and the thoracic duct. The right lymphatic duct drains lymph from the right upper limb, right side of thorax and right halve of head and neck. the thoracic duct drains lymph into the circulatory system at the left brachiocephalic vein between the left sub-clavian and left internal jugular veins.
it transports up to four liters of lymphatic fluid each day. This process is primarily caused by the breathing actions and is assisted by the smooth muscle of the duct.

the main function of thoracic duct is to transport lymph back into the circulatory system .interstitial fluid is collected by lymph capillaries from the interstitial space. Lymph then moves through lymphatic vessels to lymph nodes. Lymphatic vessels merge to create the lymphatic ducts which drain into the venous system.
significance:
1. It is responsible for the removal of interstitial fluid from tisssues.

2. It absorbs and transports fatty acids and fats as chyle from the digestive system.

3. It transports white blood cells to and from the lymph nodes into the bones.

4.the lymph transports antigen presenting cells, such as dendrite cells to the lymph nodes where an immune response is stimulated.

the main function of the lymphatic ducts is to provide a return route for the blood for the surplus three litres.

Q.4. what are the clinical menifestations of a patient having kidney disease. Also write functions of kidney.

Clinical Manifestations of a patient having Kidney Disease
1. Tired, have less energy or are having trouble concentrating:
A severe decrease in kidney function can lead to a buildup of toxins and impurities in the blood. This can cause people to feel tired, weak and can make it hard to concentrate. Another complication of kidney disease is anemia, which can cause weakness and fatigue.
2. Having trouble sleeping:
When the kidneys aren't filtering properly, toxins stay in the blood rather than leaving the body through the urine. This can make it difficult to sleep. There is also a link between obesity and chronic kidney disease, and sleep apnea is more common in those with chronic kidney disease, compared with the general population.
3. Have dry and itchy skin:
Healthy kidneys do many important jobs. They remove wastes and extra fluid from your body, help make red blood cells, help keep bones strong and work to maintain the right amount of minerals in your blood. Dry and itchy skin can be a sign of the mineral and bone disease that often accompanies advanced kidney disease, when the kidneys are no longer able to keep the right balance of minerals and nutrients in blood.
4. Feel the need to urinate more often:
If a patient feel the need to urinate more often, especially at night, this can be a sign of kidney disease. When the kidneys filters are damaged, it can cause an increase in the urge to urinate. Sometimes this can also be a sign of a urinary infection or enlarged prostate in men.

5. Seeing blood in urine:
Healthy kidneys typically keep the blood cells in the body when filtering wastes from the blood to create urine, but when the kidney's filters have been damaged, these blood cells can start to "leak" out into the urine. In addition to signaling kidney disease, blood in the urine can be indicative of tumors, kidney stones or an infection.
6. Urine is foamy:
Excessive bubbles in the urine – especially those that require to flush several times before they go away—indicate protein in the urine. This foam may look like the foam you see when scrambling eggs, as the common protein found in urine, albumin, is the same protein that is found in eggs.
7. experiencing persistent puffiness around eyes:
Protein in the urine is an early sign that the kidneys' filters have been damaged, allowing protein to leak into the urine. This puffiness around a patient eyes can be due to the fact that your kidneys are leaking a large amount of protein in the urine, rather than keeping it in the body.
8. Ankles and feet are swollen:
Decreased kidney function can lead to sodium retention, causing swelling in patient's feet and ankles. Swelling in the lower extremities can also be a sign of heart disease, liver disease and chronic leg vein problems.
9. Having a poor Appetite:
This is a very general symptom, but a buildup of toxins resulting from reduced kidney function can be one of the causes.
10. Muscles are cramping:
a. Electrolyte imbalances can result from impaired kidney function. For example, low calcium levels and poorly controlled phosphorus may contribute to muscle cramping.
Functions Of Kidney
The main role of the kidneys is maintaining homeostasis. This means they manage fluid levels, electrolyte balance, and other factors that keep the internal environment of the body consistent and
comfortable.
Following are the functions of kidney in a wide aspect:
Waste excretion:
The kidneys remove a number of waste products and get rid of them in the urine. Two major compounds that the kidneys remove are: urea, which results from the breakdown of proteins uric acid
from the breakdown of nucleic acids.
Reabsorption of nutrients:
Functions of the kidneys include removing waste, reabsorbing nutrients, and maintaining pH balance.
The kidneys reabsorb nutrients from the blood and transport them to where they would best support

health. They also reabsorb other products to help maintain homeostasis.
Reabsorbed products include:
glucose, amino acids, bicarbonate, sodium, water, phosphate, chloride, sodium, magnesium, and potassium ions
Maintaining pH:
In humans, the acceptable pH level is between 7.38 and 7.42. Below this boundary, the body enters a state of acidemia, and above it, alkalemia.
Outside this range, proteins and enzymes break down and can no longer function. In extreme cases, this can be fatal.
The kidneys and lungs help keep a stable pH within the human body. The lungs achieve this by moderating the concentration of carbon dioxide.
The kidneys manage the pH through two processes:
Reabsorbing and regenerating bicarbonate from urine: Bicarbonate helps neutralize acids. The kidneys can either retain it if the pH is tolerable or release it if acid levels rise.
Excreting hydrogen ions and fixed acids: Fixed or nonvolatile acids are any acids that do not occur as a result of carbon dioxide. They result from the incomplete metabolism of carbohydrates, fats, and proteins. They include lactic acid, sulfuric acid, and phosphoric acid.
Osmolality regulation:
Osmolality is a measure of the body's electrolyte-water balance, or the ratio between fluid and minerals in the body. Dehydration is a primary cause of electrolyte imbalance.
If osmolality rises in the blood plasma, the hypothalamus in the brain responds by passing a message to the pituitary gland. This, in turn, releases antidiuretic hormone (ADH).
In response to ADH, the kidney makes a number of changes, including:
• increasing urine concentration
• increasing water reabsorption
• reopening portions of the collecting duct that water cannot normally enter, allowing water back into the body.
• Retaining urea in the medulla of the kidney rather than excreting it, as it draws in water
Regulating blood pressure
The kidneys regulate blood pressure when necessary, but they are responsible for slower adjustments.
They adjust long-term pressure in the arteries by causing changes in the fluid outside of cells. The medical term for this fluid is extracellular fluid. These fluid changes occur after the release of a vasoconstrictor called angiotensin II. Vasoconstrictors are hormones that cause blood vessels to narrow.
They work with other functions to increase the kidneys' absorption of sodium chloride, or salt. This effectively increases the size of the extracellular fluid compartment and raises blood pressure. Anything that alters blood pressure can damage the kidneys over time, including excessive alcohol consumption, smoking, and obesity.
Secretion of active compounds

The kidneys release a number of important compounds, including:
Erythropoietin: This controls erythropoiesis, or the production of red blood cells. The liver also produces erythropoietin, but the kidneys are its main producers in adults.
Renin: This helps manage the expansion of arteries and the volume of blood plasma, lymph, and interstitial fluid. Lymph is a fluid that contains white blood cells, which support immune activity, and interstitial fluid is the main component of extracellular fluid.
Calcitriol: This is the hormonally active metabolite of vitamin D. It increases both the amount of calcium that the intestines can absorb and the reabsorption of phosphate in the kidney.

Q.5.what is the difference between systemic circulation and pulmonary circulation .give signs and symptoms of myocardial infarction.

Pulmonary and Systemic Circulations
The double circulatory system of blood flow refers to the separate systems of pulmonary circulation and systemic circulation in amphibians, birds, and mammals (including humans). The adult human heart consists of two separated pumps: the right side, which pumps deoxygenated blood into the pulmonary circulation, and the left side, which pumps oxygenated blood into the systemic circulation. Blood in one circuit has to go through the heart to enter the other circuit.

Pulmonary Circulation
The pulmonary circulation is the portion of the cardiovascular system that carries oxygen-poor (deoxygenated) blood from the heart to the lungs and returns oxygenated blood back to the heart. Deoxygenated blood from the body leaves the right ventricle through the
pulmonary arteries, which carry the blood to each lung. The pulmonary arteries are the only arteries that carry deoxygenated blood. In the lungs, red blood cells release carbon dioxide and pick up oxygen during respiration. The oxygenated blood then leaves the lungs through the pulmonary veins, which return it to the left side of the heart and complete the pulmonary cycle. The oxygenated blood is then distributed to the body through the systemic circulation before returning again to the pulmonary
circulation.
Systemic Circulation
The systemic circulation is the portion of the cardiovascular system that carries oxygenated blood from the heart to the body and returns deoxygenated blood back to the heart. Oxygenated blood from the lungs leaves the left ventricle through the aorta. From here it is distributed to the body's organs and tissues, which absorb the oxygen through a complex network of arteries, arterioles, and capillaries. The deoxygenated blood is then collected by venules and flows into veins before reaching the inferior and superior venae cavae, which return it to the right heart, completing the systemic cycle. The blood is then re-oxygenated through the pulmonary circulation before returning again to the systemic circulation.

Just like every other organ in the body, the heart needs its own blood supply, which it gets through the coronary circulation. Although blood fills the chambers of the heart, the heart muscle tissue is so thick that it needs blood vessels to deliver oxygen and nutrients deep within it. The vessels that deliver
oxygen-rich blood to the heart muscle are called coronary arteries; they branch directly from the aorta, just above the heart. The vessels that remove the deoxygenated blood from the heart muscle are known as cardiac veins.

Myocardial Infarction:

Acute myocardial infarction is the medical name for a heart attack. A heart attack is a life-threatening condition that occurs when blood flow to the heart muscle is abruptly cut off, causing tissue damage.

This is usually the result of a blockage in one or more of the coronary arteries. A blockage can develop due to a buildup of plaque, a substance mostly made of fat, cholesterol, and cellular waste products.

Symptoms of a heart attack include:

Angina: Chest pain or discomfort in the center of the chest; also described as a heaviness, tightness, pressure, aching, burning, numbness, fullness or squeezing feeling that lasts for more than a few minutes or goes away and comes back. It is sometimes mistakenly thought to be indigestion or heartburn.

Pain or discomfort in other areas of the upper body including the arms, left shoulder, back, neck, jaw, or stomach.

Difficulty breathing or shortness of breath.

Sweating or "cold sweat".

Fullness, indigestion, or choking feeling (may feel like "heartburn")Nausea or vomiting

Light-headedness, dizziness, extreme weakness or anxiety

Rapid or irregular heart beats.