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ASSIGNMENT ANSWERS

2) With the aid of suitable diagrams discuss the types of dialysis you know.

1) The pathophysiological processes involved in renal failure

It is well known that the kidney functions in blood filtration, removal of wastes from the body and maintainance of the body fluid balance. Renal failure which can also be called kidney failure occurs when the kidney loses its ability to sufficiently remove blood from the body. Factors such as toxic exposure to environmental pollution or some medications and acute/chronic diseases can interfere with the kidney's normal function, reduce blood flow to the kidneys and the body becomes overloaded with toxins leading to kidney failure.

Renal failure is classified into two: Acute and Chronic Renal failure

i) Acute renal failure: it is characterised by rapid onset of renal dysfunction and sudden increase in metabolic waste products (urea and creatinine) in the blood. The causes of acute renal failure can be grouped into Pre-renal. intra-renal and post-renal causes.

a) Pre-renal causes- they impair the flow of blood to the kidneys and lead to kidney injury. Conditions like heart failure and uncontrolled high blood pressure.

How does this happen?

The nephrons which are the functional unit of the kidneys are supplied with a dense network of blood vessels and high volumes of blood flow through them. When there is uncontrolled blood pressure which is high, arteries around the kidneys tend to become narrow and weak hence, they are not able to deliver enough blood to the kidney. It could also damage the blood vessels in the kidney and the kidney will not be able to filter blood as it should.

Heart diseases make the heart unable to pump blood efficiently which leads to congestion of blood in the heart caausng pressure to buid in the vein connected to the kidney which could lead to reduced supply of oxygen rich blood to the kidney.

b) Intra-renal causes- they result from diseases of the kidney tissue itself. They include: Glomerulonephritis , nephrotoxins such as heavy metals, alcohol and tubular necrosis amongst others.

Glomerulonephritis reduces the ability of the glomerulus to fiter blood properly. Waste then collect in the blood stream and the kidneys eventually fail. This also causes lack of protein in the blood because it gets expelled in urine instead of entering the blood stream.

Because of the kidneys ability to reabsorb and accumulate divalent metals, it is the first target organ of heavy metals hence, continuous exposure to heavy metals and in high doses and dependent on their half-life they can cause nephropathies hence, kidney failure.

c) Post-renal causes- they result from obstruction of the flow of urine anywhere along the renal tract distal to the opening of the collecting ducts, ureter, bladder neck or urethra. Conditions such as an enlarged prostate can cause renal failure.

When the prostate is enlarged it can compress the urethra and limits the flow of urine . When the urine cannot be excreted, renal failure results

ii) Chronic renal failure- this is characterized by progressive and irreversible deterioration of renal function. The diseases leading to the chronic failure can be grouped into:

a)Those causing glomerular pathology- glomerulonephritis, lipoid nephrosis, and lupus erythematosus amongst others

b) Those causing tubulointerstitial pathology- pyelonephritis, toxins and obstructive causes

Regardless of the initiating cause, Chronic renal failure evolves progressively through the following stages;

a) Decreased renal reserve- at this stage, damage to the renal parenchyma is marginal and the kidneys remain functional. The glomerular filtration rate is about 50% normal. Patients at this stage are usually asymptomatic except at times of stress.

b) Renal insufficiency- at this stage, about 75% of the functional parenchyma has been destroyed and glomerular filtration rate is about 25% accompanied by increase in serum creatinine. Polyuria and nocturia occurs

c) Renal failure- at this stage about 90% of the renal tissue has been destroyed. The glomerular filtration rate is about 10% normal. Tubular cells are non-functional and as a result, the regulation of sodium and water is lost resulting in oedema, metabollic acidosis and signs and symptoms of uraemia.

2) Types of dialysis

a) Hemodialysis- it is a treatment to filter wastes and water from the blood, as the kidneys are very functional. It helps control blood pressure and balance important ions in the body.

In hemodialysis, two needles are inserted into the arm and each of them is attached to a soft tube connected to the dialysis machine.The dialysis machine pumps blood through a filter called DIALYZER and returns the blood to the body. During the process, the machine checks blood pressure and controls how quickly blood flows through the filter and removal of fluid from the body.

Blood enters the dialyzer at one end and passes through many, very thin, hollow fibres and a dialysis solution specially prescribed by a doctor to suit the body's needs in the opposite direction on the outside of the fibres. Waste products from the body move into the dialysis solution. Filtered blood remain in the fibres and then return to the body.

The hemodialysis can only replace a part of the kidney's function. It is done to only improve health.

b) Peritoneal dialysis- it is a treatment for kidney failure that uses the lining of the abdomen or stomach to filter blood inside the body. It could be continuous ambulatory peritoneal dialysis which is manual or automated dialysis which is automated.

Before treatment starts, a surgeon places a soft tube called a catheter in the abdomen. When the treatment starts, a dialysis solution with salt, water and other additives flows from a bag through the catheter into the abdomen. When the bag is empty, the catheter is disconnected from it and covered with a cap just to ensure movement in case of physical activities. The solution absorbs waste and extra fluid from the body.

After a few hours, the solution is drained from the abdomen into a bag which should be disposed properly. Then, a fresh bag of dialysis solution is used. When the solution is fresh, it absorbs waste quickly but becomes slow as time passes hence, this process must be repeated four to six times everyday. This process is called exchange.

Dialysis in general is not a cure for renal failure.