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MATRIC NUMBER: 17/MHS01/206

DEPARTMENT: MEDICINE AND SURGERY

COURSE:

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Assignment

1. Discuss the pathophysiological process involved in renal failure.
2. With the aid of suitable diagrams, discuss the types of dialysis you know.

Answer

1. **Renal failure**

   This is also called **Kidney Failure**. This is a condition in which the kidneys lose the ability to remove waste and balance fluids. Renal failure could be chronic or acute but which ever it is, there are underlying pathophysiological processes involved before the kidneys fails. Whatever the underlying etiology is, once the loss of nephrons and reduction of functional renal mass reaches a certain point, the remaining nephrons begin a process of irreversible sclerosis that leads to a progressive decline in the glomerular filtration rate.

   A normal kidney contains approximately 1million nephrons, each of which contributes to the total Glomerular Filtration Rate (GFR). In a case of renal injury, the kidney has the ability to still maintain GFR, despite progressive destruction of nephrons, the remaining nephrons then manifest hyperfiltration and compensatory hypertrophy. This nephron adaptability allows for continued

normal clearance of plasma solute. As the kidney starts to lose its ability to function, the GFR decreases by 50% thereby causing plasma urea and creatinine levels to increase. Example, a rise in plasma creatinine level from 0.6mg/dL to 1.2mg/dL in a patient, although still within the adult reference range, actually represents a loss of 50% of functioning nephron mass. Secondly, the hyperfiltration and hypertrophy of the remaining nephrons has been hypothesized to represent a major cause of progressive renal dysfunction. The increased glomerular capillary pressure may damage the capillaries, leading initially to secondary focal and segmental glomerulosclerosis (FSGS) and eventually global glomerulosclerosis.

Factors other than the underlying disease process and glomerular hypertension that may cause progressive renal injury include the following;

- Systemic hypertension
- Nephrotoxins (eg. Nonsteroidal anti-inflammatory drugs (NSAIDs), intravenous contrast media)
- Decreased perfusion (eg from severe dehydration or episodes of shock)
- Proteinuria (in addition to being a marker of chronic kidney disease)
- Hyperlipidemia
- Smoking
- Uncontrolled diabetes.

2. **<u>Dialysis</u>**

This is a treatment that filters and purifies the blood using a machine. This helps keep your fluids and electrolytes in balance when the kidneys cannot do their jobs. The kidney filters blood by removing waste and excess fluid from the body. This waste is sent

to the bladder to be eliminated when you urinate. Now dialysis comes in when the kidneys fail.

Why is dialysis used?

- The kidney has various functions which includes removal of wastes, impurities and extra water from the body. It also helps in controlling blood pressure and regulating the levels of chemical elements (sodium and potassium) in the blood. The kidneys even activates a form of vitamin D that improves the absorption of calcium. So when the kidney cannot perform these function due to disease or injury, dialysis can help keep the body running as normally as possible. Without dialysis, the body is poisoned and other organs damaged due to the accumulation of salt and other waste products in the blood. Dialysis is not a cure for kidney disease or other problems affecting the kidney.

Types of dialysis

There are three types of dialysis and they are;

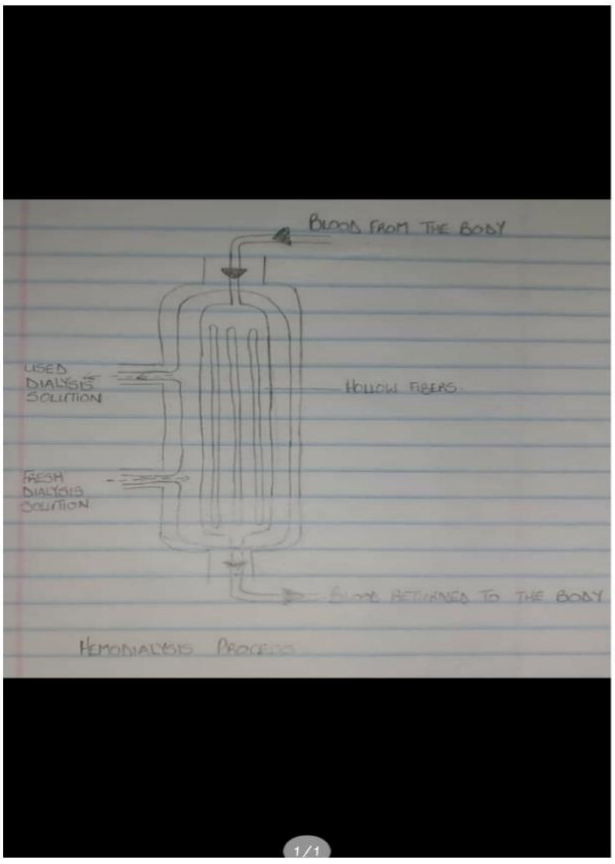
A. **Hemodialysis**

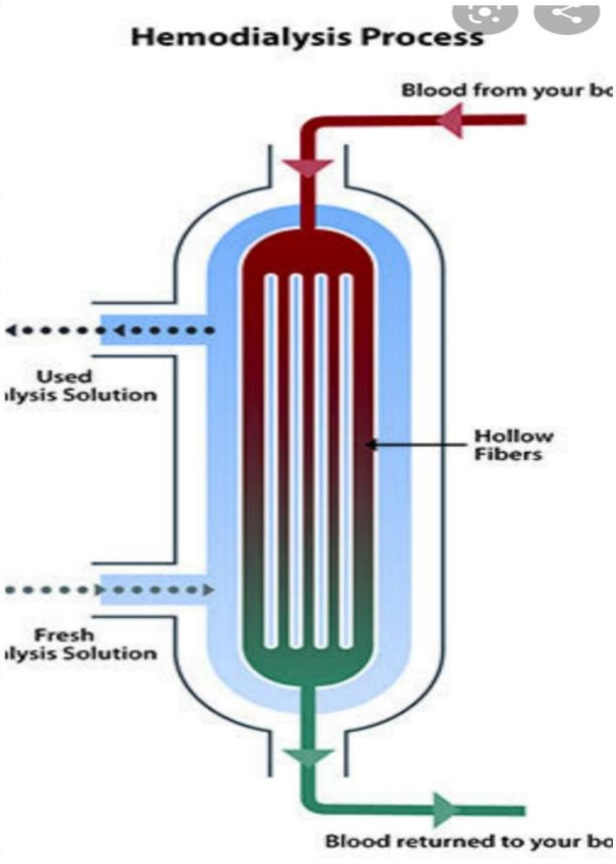
   This is the most common type of dialysis which uses artificial kidney (hemodialyzer) to remove the waste and extra fluid from the blood. In this process, the blood is removed from the body and filtered through the artificial kidney (hemodialyzer) then the filtered blood is returned to the body with the help of the dialysis machine.

   For the hemodialyzer to be used, surgery has to be performed to create an entrance point (vascular access) into the blood vessels. There are types of entrance points;

- Arteriovenous (AV) Fistula; this type connects an artery and a vein. It is the preferred option
- AV Graft; this type is a looped tube
- Vascular Access Catheter; this may be inserted into the large vein in the neck.

  The AV fistula and the AV graft are designed for long term use while the vascular access catheter is designed for short term or temporary use. Hemodialysis treatment usually last three to five hours and are performed three times a week but it depends on body size, amount of waste in the body and current state of the patient's health.



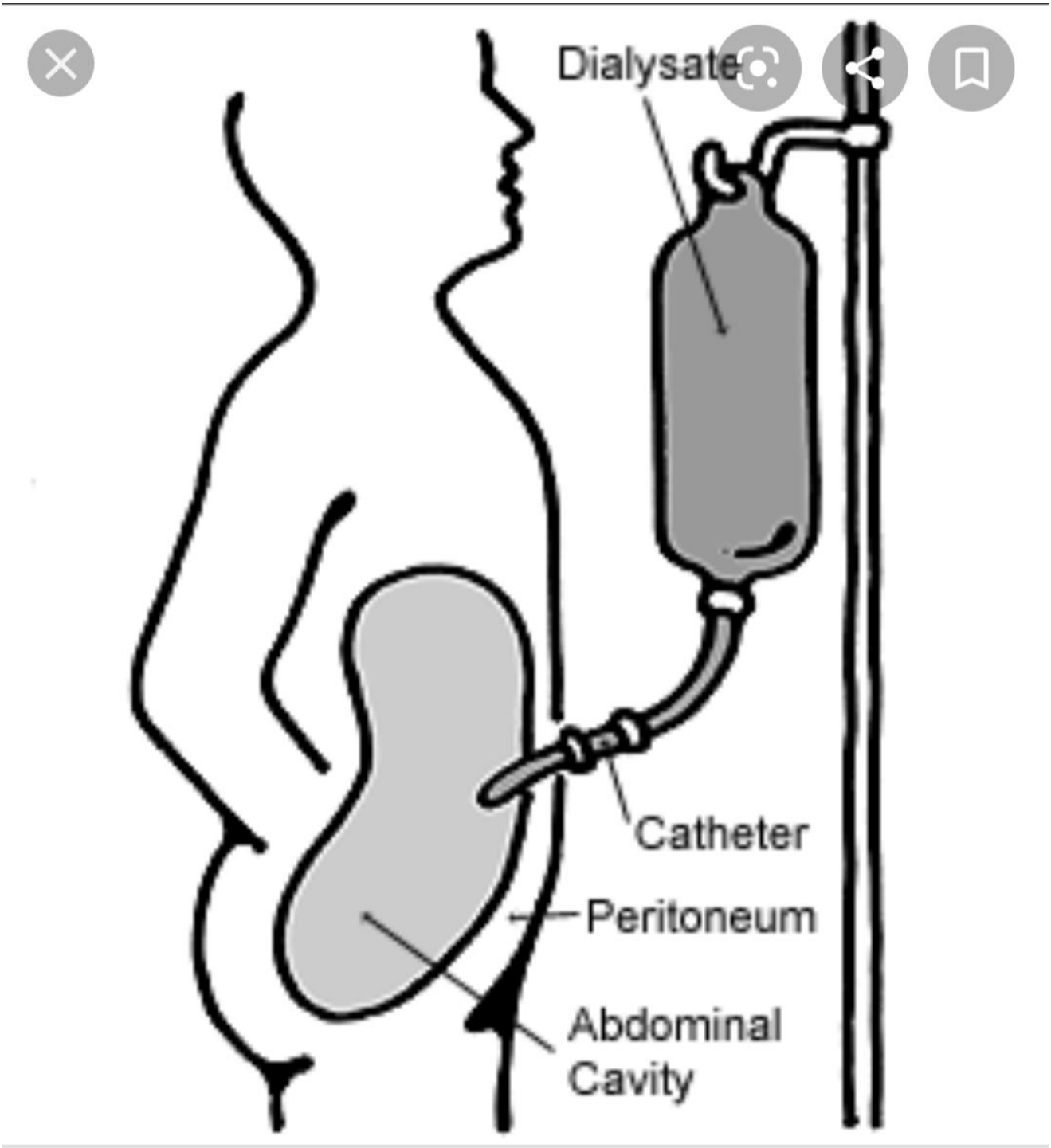


B. **Peritoneal Dialysis**

This involves surgery to implant a peritoneal dialysis (PD) catheter into the patient's abdomen. The catheter helps to filter the blood through the peritoneum, a membrane in the abdomen, a special fluid called **dialysate** flows into the peritoneum. This dialysate absorbs waste by washing around the intestine. The peritoneal membrane acts as a filter between the fluid and the blood stream. The dialysate draws waste out of the bloodstream, it's drained from the patient's abdomen.

This process takes a few hours and needs to be repeated four to six times per day. There are various types of peritoneal dialysis;

- Continuous Ambulatory Peritoneal Dialysis (CAPD); the patient's abdomen is filled with dialysate and drained multiple times each day. This method does not require a machine and must be performed while awake.
- Continuous Cycling Peritoneal Dialysis (CCPD); this uses a machine to cycle the fluid (dialysate) in and out of the abdomen. It is usually done at night while the patient is asleep.
- Intermittent Peritoneal Dialysis (IPD); this uses the same machine as CCPD but the process is longer so it is usually carried out in the hospital.



C. **Continuous Renal Replacement Therapy (CRRT)**
This therapy is used primarily in the intensive care unit for people with acute kidney failure. It is also known as

Hemofiltration. A machine passes the blood through a tubing, a filter then removes waste product and excess water. The blood is returned to the body along with replacement fluid. This procedure is performed 12 to 24 hours a day, generally every day.