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MATRIC NUMBER: 17/MHS01/232

DEPARTMENT: MEDICINE AND SURGERY

COURSE: RENAL PHYSIOLOGY

LEVEL: 300

Question: 1) **Discuss the pathophysiological process involved in renal failure.**

Answer

Renal failure can be said to be a condition when your kidneys lose the ability to sufficiently filter waste from blood. The most common types are acute renal failure and chronic kidney disease.

In Acute kidney failure, the kidneys may abruptly stop working entirely or almost entirely and necessitating renal replacement therapy such as dialysis. There are good chances of recovery.

Chronic kidney failure is defined as the presence of kidney damage or decreased kidney function that persist for at least 3 months. Chronic renal failure is often associated with progressive and irreversible loss of large numbers of functioning nephrons.

Pathophysiological process involved in renal failure

1) Glomerular filtration rate (GFR): the normal range of glomerular filtration rate is 90 to 120 mL/min/1.73 m2. In the case of chronic renal failure, the glomerular filtration rate is ≤15 mL/min/1.73 m2. The ability to effectively dilute or concentrate urine is lost.

2) Acidosis: Each day the body normally produces about 50 to 80 millimoles more metabolic acid than metabolic alkali. Therefore, when the kidneys fail to function, acid accumulates in the body fluids.

3) Incident of Anemia: Anemia almost always develops in patients with severe chronic kidney failure. The most important cause of this anemia is decreased renal secretion of erythropoietin, which stimulates the bone marrow to produce red blood cells. If the kidneys are seriously damaged, they are unable to form adequate quantities of erythropoietin, which leads to diminished red blood cell production and consequent anemia.

4) Decreased production of active vitamin D: Serious damage of the kidney greatly reduces the blood concentration of active vitamin D, which in turn decreases intestinal absorption of calcium and the availability of calcium to the bones.

5) Plasma concentrations of Creatinine and Urea begin a hyperbolic rise as GFR diminishes. When the Glomerular filtration rate falls, creatinine and urea levels are high and are usually associated with systemic manifestations (uremia).

6) Sodium and Potassium: Sodium and water balance is well maintained by increased fractional excretion of sodium in urine and normal response to thirst, despite a diminishing Glomerular filtration rate. Thus, the plasma sodium concentration is typically normal and hypervolemia is infrequent unless dietary intake of sodium or water is very restricted or excessive.

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

Answer

Dialysis is a treatment that filters and purifies the blood using a machine. This helps keep your fluids and electrolytes in balance when the kidneys have failed. There are 2 major types of dialysis:

A) Hemodialysis is the most common types of dialysis. During hemodialysis the blood goes through a filter, called a dialyzer, outside the body. A dialyzer is sometimes called an artificial kidney. At the start of hemodialysis, the nurse or doctor makes an access or entrance into the blood vessel.

The dialyzer has two parts, one for the blood and another for a washing fluid called dialysate (which includes waste and extra fluid from the blood). The filtered blood is returned to the body with the help of the dialysis machine.

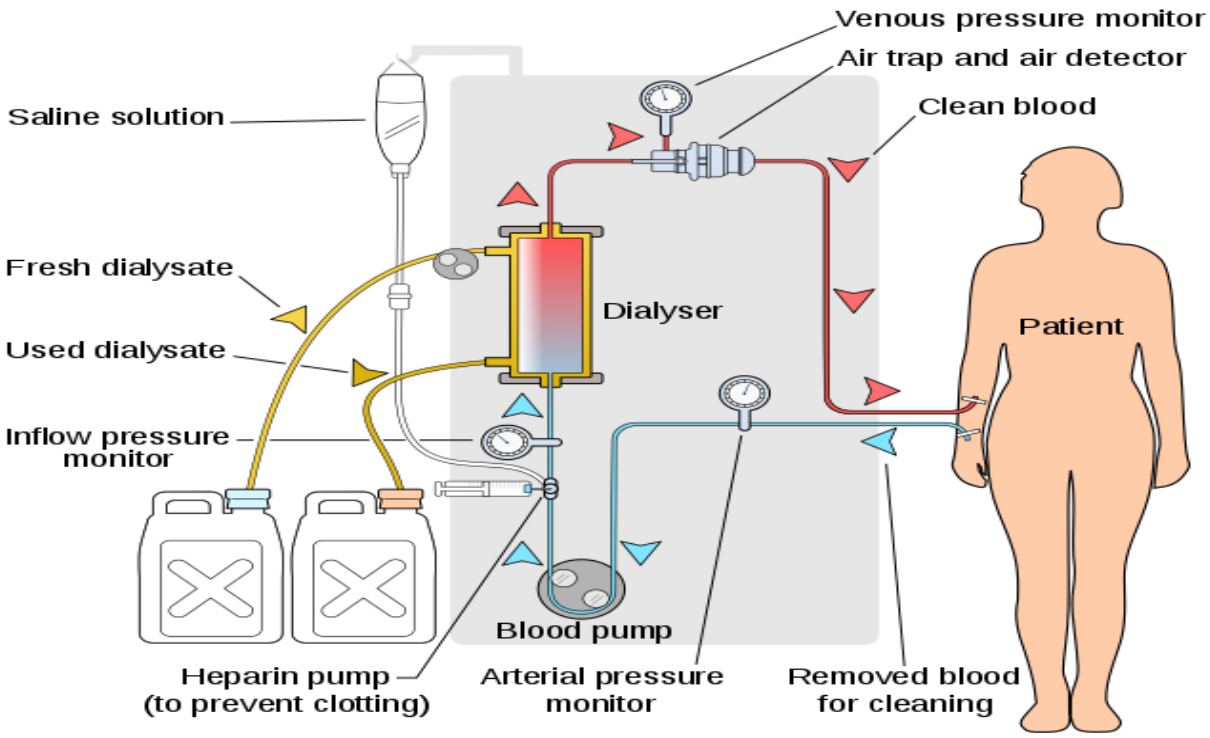


Diagram of a patient on a hemodialysis machine

B) Peritoneal dialysis: Peritoneal dialysis involves surgery to implant a peritoneal dialysis catheter into your abdomen. The catheter helps filter your blood through the peritoneum, a membrane in your abdomen. During treatment, a special fluid called dialysate flows into the peritoneum. The dialysate absorbs waste. Once the dialysate draws waste out of the bloodstream, it's drained from your abdomen.

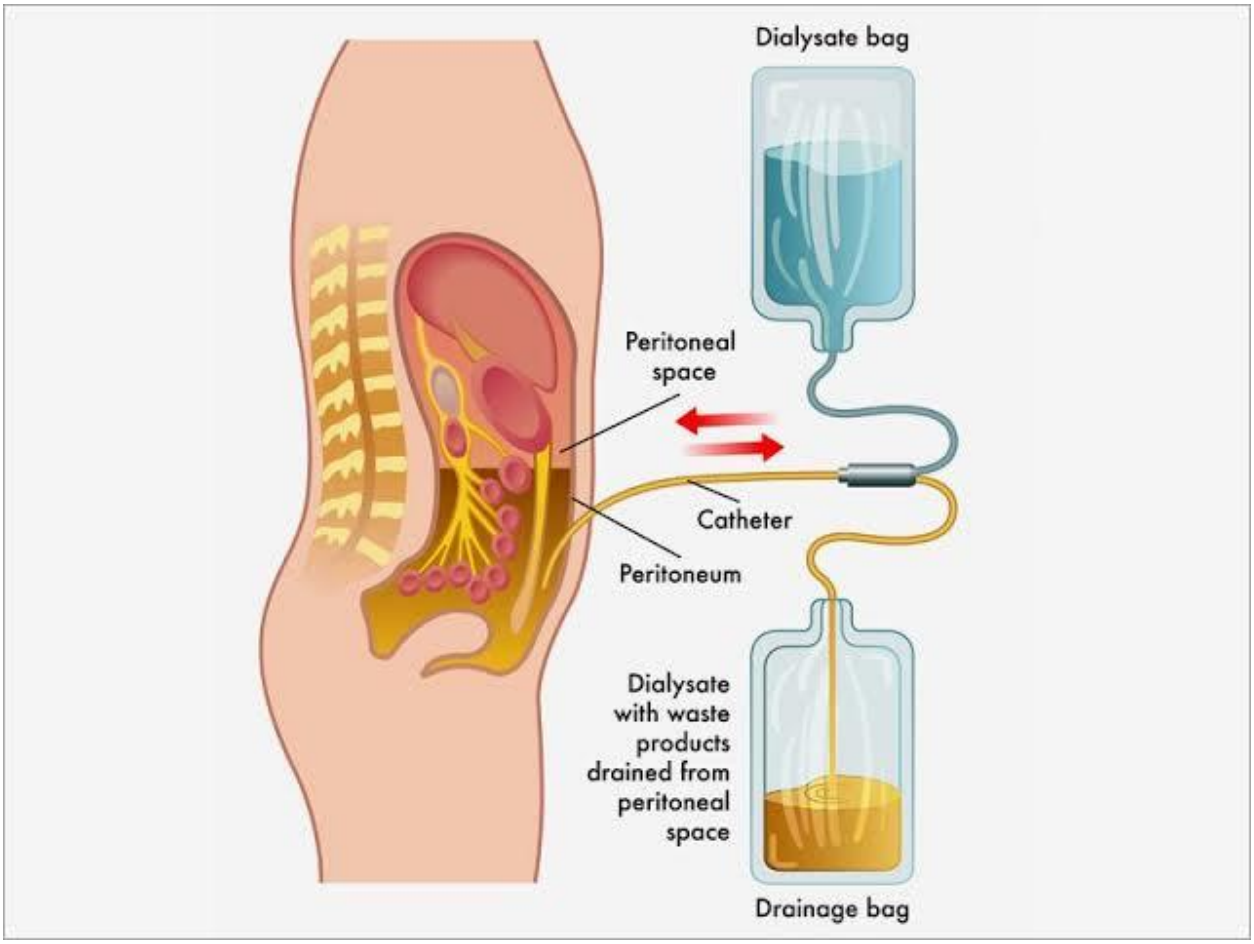
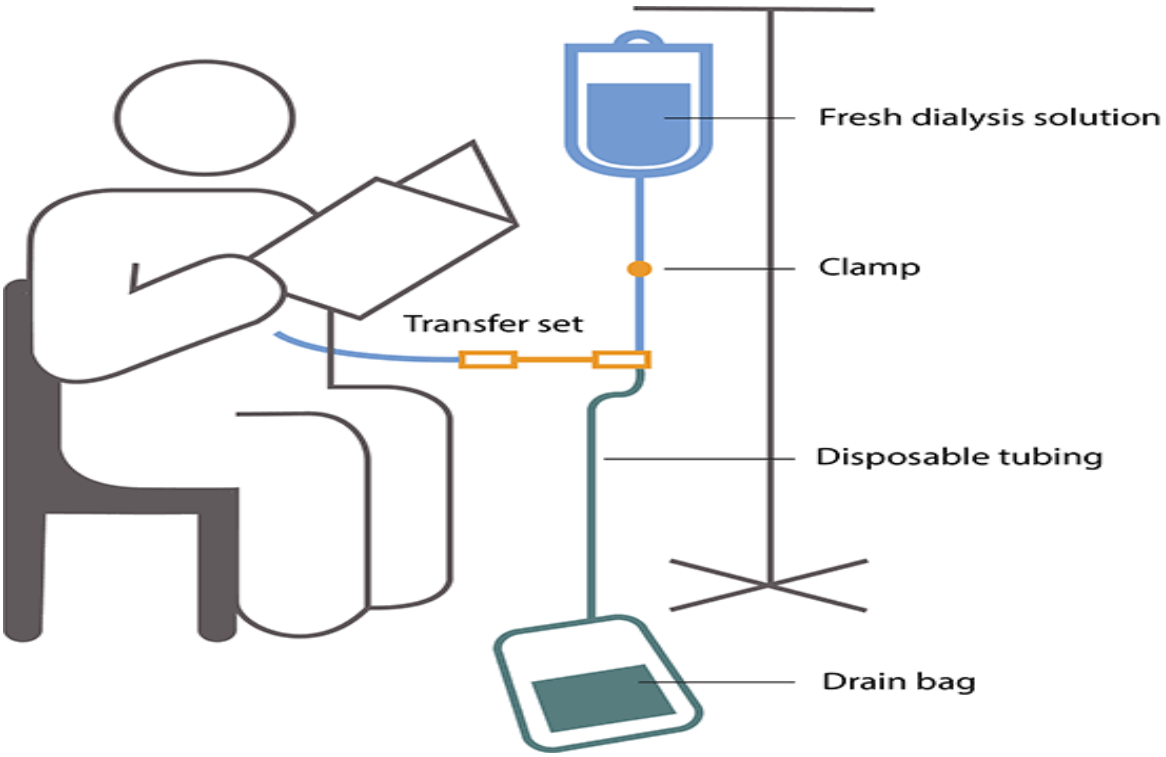


Diagram of peritoneal dialysis

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

- Continuous ambulatory peritoneal dialysis (CAPD): In CAPD, your abdomen is filled and drained multiple times each day. This method doesn't require a machine and must be performed while awake.



A patient on continuous ambulatory peritoneal dialysis

- Continuous cycling peritoneal dialysis (CCPD): CCPD uses a machine to cycle the fluid in and out of your abdomen. It's usually done at night while you sleep.

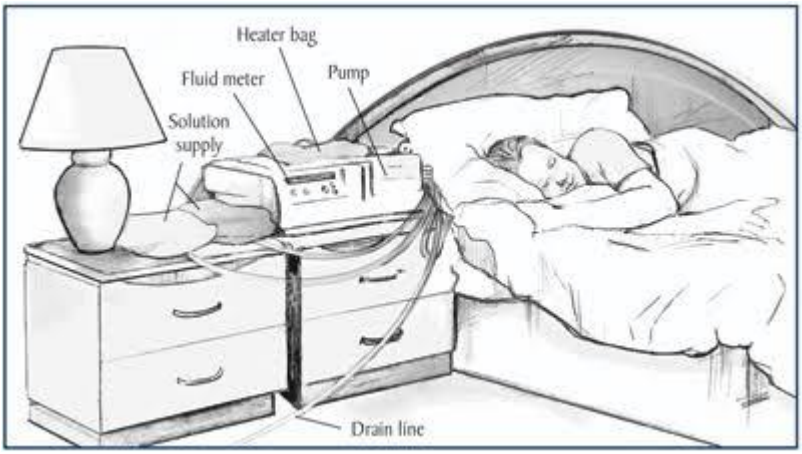


Diagram of a patient on CCPD

- Intermittent peritoneal dialysis: this treatment is usually performed in the hospital, though it may be performed at home. It uses the same machine as CCPD, but the process takes longer.