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**COLLEGE: COLLEGE OF MEDICINE AND
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**COURSE: RENAL PHYSIOLOGY BODY
FLUID AND TEMPERATURE REGULATION.**

COURSE CODE: PHS 303

ASSIGNMENT

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

RENAL FAILURE

Renal failure is a condition in which the kidneys stop working and are not able to remove waste and extra water from the blood or keep body chemicals in balance. Acute or severe kidney failure happens suddenly (for example, after an injury) and may be treated and cured. Chronic kidney failure develops over many years, may be caused by conditions like high blood pressure or diabetes, and cannot be cured.

Renal failure occurs when your kidneys lose the ability to sufficiently filter waste from your blood. Many factors can interfere with your kidney health and function, such as;

- toxic exposure to environmental pollutants or certain medications
- certain acute and chronic diseases
- severe dehydration
- kidney trauma

TYPES OF RENAL FAILURE

Renal failure can be divided into two types;

- 1. Acute Renal Failure:** Acute kidney failure (AKF), otherwise known as acute kidney injury or acute renal failure, comes on suddenly, typically within a few hours or days. It may occur due to trauma to the kidney or decreased blood flow in the area. It can also occur due to a blockage, such as a kidney stone, or very high blood pressure.
- 2. Chronic Renal Failure:** Chronic kidney disease (CKD), also known as chronic renal failure or chronic renal disease, may affect more than 30 million people in the United States. When a condition is chronic, it means that it occurs over a long period of time. Damage to the kidneys occurs gradually and can eventually lead to kidney failure.

Renal failure can also be subdivided into;

1. ACUTE PRERENAL KIDNEY FAILURE

Prerenal acute renal failure (ARF) occurs when a sudden reduction in blood flow to the kidney (renal hypoperfusion) causes a loss of kidney function. In prerenal acute renal failure, there is nothing wrong with the kidney itself.

Prerenal acute renal failure is the most common type of acute renal failure, accounting for about 55 out of 100 acute renal failure cases.¹ It can be a complication of almost any disease, condition, or medicine that causes a decrease in the normal amount of blood and fluid in the body.

Causes of prerenal acute renal failure include:

- Severe blood loss and low blood pressure related to major cardiac or abdominal surgery, severe infection (sepsis), or injury.
- Medicines that interfere with the blood supply to the kidneys. Medicines such as ACE inhibitors and common pain medicines (NSAIDs) commonly cause prerenal acute renal failure in people who already have an increased risk for kidney problems.
- Severe dehydration caused by excessive fluid loss.
- Severe burns.
- Pancreatitis and liver diseases, such as cirrhosis, that create fluid shifts in the abdomen.

The kidneys can't filter toxins from the blood without enough blood flow. This type of kidney failure can usually be cured once your doctor determines the cause of the decreased blood flow.

2. ACUTE INTRINSIC KIDNEY FAILURE

Acute intrinsic kidney failure can result from direct trauma to the kidneys, such as physical impact or an accident. Causes also include toxin overload and ischemia, which is a lack of oxygen to the kidneys.

The following may cause ischemia:

- severe bleeding
- shock
- renal blood vessel obstruction
- glomerulonephritis

3. CHRONIC PRERENAL KIDNEY FAILURE

When there isn't enough blood flowing to the kidneys for an extended period of time, the kidneys begin to shrink and lose the ability to function.

4. CHRONIC INTRINSIC KIDNEY FAILURE

This happens when there's long-term damage to the kidneys due to intrinsic kidney disease. Intrinsic kidney disease develops from a direct trauma to the kidneys, such as severe bleeding or a lack of oxygen.

5. CHRONIC POST-RENAL KIDNEY FAILURE

A long-term blockage of the urinary tract prevents urination. This causes pressure and eventual kidney damage.

PATHOPHYSIOLOGICAL PROCESS OF KIDNEY FAILURE

A normal kidney contains approximately 1 million 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.

KIDNEY FAILURE STAGES

Kidney failure is classified into five stages. These range from very mild (stage 1) to complete kidney failure (stage 5). Symptoms and complications increase as the stages progress.

1) Stage 1

This stage is very mild. You may experience no symptoms and have no visible complications. Some damage is present. It's still possible to manage and slow progression by maintaining a healthy lifestyle. This includes eating a balanced diet, regularly exercising, and not using tobacco products. Maintaining a healthy weight is important, too. If you have diabetes, it's important to manage your blood sugar.

2) Stage 2

Stage 2 kidney disease is still considered a mild form, but detectable issues like protein in urine or physical damage to the kidneys may be more obvious. The same lifestyle approaches that helped in stage 1 are still used in stage 2. Also talk with your doctor about other risk factors that could make the disease progress more rapidly. These include heart disease, inflammation, and blood disorders.

3) Stage 3

At this stage kidney disease is considered moderate. Your kidneys aren't working as well as they should. Stage 3 kidney disease is sometimes divided into 3A and 3B. A blood test that measures the amount of waste products in your body differentiates between the two. Symptoms may become more apparent at this stage. Swelling in hands and feet, back pain, and changes to urination frequently are likely.

Lifestyle approaches may help. Your doctor may also consider medications to treat underlying conditions that could speed up failure.

4) Stage 4

Stage 4 kidney failure is considered moderate to severe. The kidneys aren't working well, but you're not in complete kidney failure yet. Symptoms can include complications like anemia, high blood pressure, and bone disease. A healthy lifestyle is still vital. Your doctor will likely have you on treatments designed to slow damage.

5) Stage 5

In stage 5, your kidneys are nearing or are in complete failure. Symptoms of the loss of kidney function will be evident. These include vomiting and nausea, trouble breathing, itchy skin, and more. At this stage you'll need regular dialysis or a kidney transplant.

DIALYSIS

Dialysis is the process of removing excess water, solutes, and toxins from the blood in people whose kidneys can no longer perform these functions naturally. 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 activate a form of vitamin D that improves the absorption of calcium. So when the kidney cannot perform these functions 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

1. Hemodialysis

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

To get the blood to flow to the artificial kidney, your doctor will perform surgery to create an entrance point (vascular access) into your blood vessels. The three types of entrance points are:

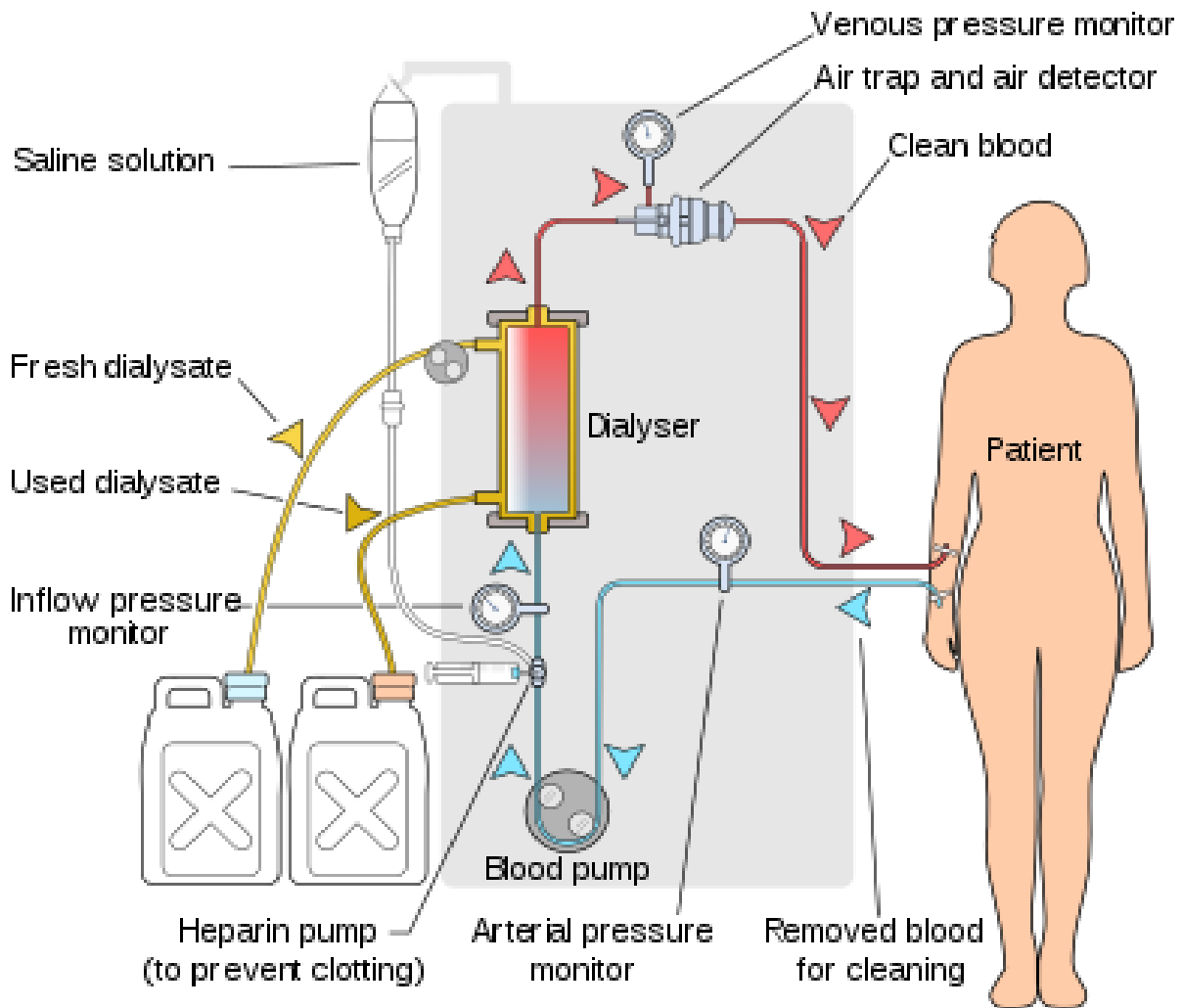
- **Arteriovenous (AV) fistula.** This type connects an artery and a vein. It's the preferred option.
- **AV graft.** This type is a looped tube.
- **Vascular access catheter.** This may be inserted into the large vein in your neck.

Both the AV fistula and AV graft are designed for long-term dialysis treatments. People who receive AV fistulas are healed and ready to begin hemodialysis two to three months after their surgery. People who receive AV grafts are ready in two to three weeks. Catheters are designed for short-term or temporary use.

Hemodialysis treatments usually last three to five hours and are performed three times per week. However, hemodialysis treatment can also be completed in shorter, more frequent sessions.

Most hemodialysis treatments are performed at a hospital, doctor's office, or dialysis center. The length of treatment depends on your body size, the amount of waste in your body, and the current state of your health.

After you've been on hemodialysis for an extended period of time, your doctor may feel that you're ready to give yourself dialysis treatments at home. This option is more common for people who need long-term treatment.



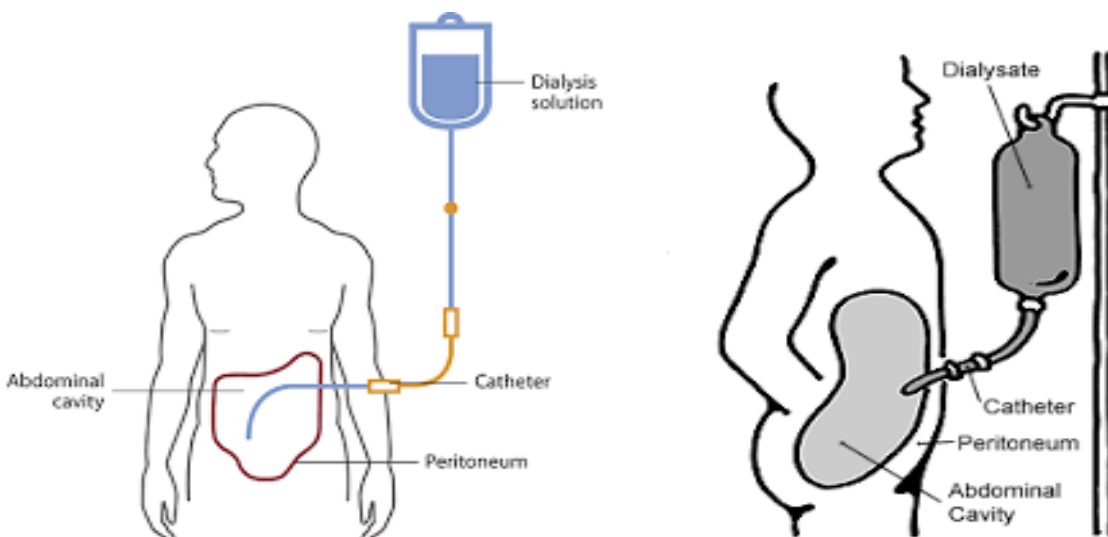
2. Peritoneal Dialysis

Peritoneal dialysis involves surgery to implant a peritoneal dialysis (PD) 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.

This process takes a few hours and needs to be repeated four to six times per day. However, the exchange of fluids can be performed while you're sleeping or awake.

There are numerous different types of peritoneal dialysis. The main ones are:

- **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.
- **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.
- **Intermittent peritoneal dialysis (IPD).** 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.



3. Continuous renal replacement therapy (CRRT)

This therapy is used primarily in the intensive care unit for people with acute kidney failure. It's also known as hemofiltration. A machine passes the blood through tubing. A filter then removes waste products and 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.