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COURSE: RENAL PHYSIOLOGY

QUESTIONS

- 1) Discuss the pathophysiological process involved in renal failure
- 2) With the aid of suitable diagram discuss the types of dialysis you know

ANSWERS

1) PATHOPHYSIOLOGICAL PROCESS INVOLVED IN RENAL FAILURE

Some pathophysiological process includes:

- a) Common urinary symptoms
- b) Renal failure
- c) Nephrotic Syndrome

A) COMMON URINARY SYMPTOMS

Polyuria, nocturia and urinary frequency. Normal urine output per day is 800–2500 mL. Therefore, a reasonable criterion to satisfy the definition of polyuria is excretion of 3.0 L of urine daily, provided the patient is not on high fluid diet.

Nocturia: It is a condition in which you wake up during the night because you have to urinate. Causes can include high intake of fluid, sleep disorders and bladder obstruction.

Urinary frequency means the increase in the number of times the patient goes for urination.

Polyuria: It is differentiated from increased frequency by measuring the 24hour urine output. Causes of polyuria includes kidney disease, liver failure, chronic diarrhoea, Cushing's syndrome and so many others.

Dysuria: It is a symptom of pain, discomfort or burning when urinating. It is due to irritative or inflammatory disorders of the urinary bladder. This is often associated with an increased frequency of urination.

Incontinence: This refers to the inability to retain urine in the bladder. It can be caused as the result of the disturbance of neural control of micturition, damage to the urethral sphincters and so many others.

Enuresis: It refers to the involuntary passages of urine at night or during sleep. It is normal in children up to 2-3 years of age.

B) **RENAL FAILURE**

It refers to the deterioration of renal functions resulting in a decline in the glomerular filtration rate and rise in urea and non nitrogenous substances in the blood. It is of two types:

- I) Acute Renal Failure
- II) Chronic Renal Failure

I) **ACUTE RENAL FAILURE**: It refers to the sudden decline in glomerular filtration over a period of days or weeks associated with a rapid increase in blood urea.

The causes of acute renal failure can be divided into three main categories:

1. Acute renal failure resulting from decreased blood supply to the kidneys; this condition is often referred to as prerenal acute renal failure to reflect the fact that the abnormality occurs as a result of an abnormality originating outside the kidneys. For example, prerenal acute renal failure can be a consequence of heart failure with reduced cardiac output and low blood pressure or conditions associated with diminished blood volume and low blood pressure, such as severe hemorrhage.
2. Intrarenal acute renal failure resulting from abnormalities within the kidney itself, including those that affect the blood vessels, glomeruli, or tubules.
3. Postrenal acute renal failure, resulting from obstruction of the urinary collecting system anywhere from the calyces to the outflow from the bladder. The most common causes of obstruction of the urinary tract outside the kidney are kidney stones, caused by precipitation of calcium, urate, or cystine.

II) **CHRONIC RENAL FAILURE**: It refers to a slow, insidious, irreversible deterioration of renal functions resulting in the clinical syndrome of uraemia, manifested by excretory, metabolic, neurological, haematological and endocrinal abnormalities.

C) **NEPHROTIC SYNDROME**: Nephrotic syndrome is the combination of nephrotic-range proteinuria with a low serum albumin level and edema. Nephrotic syndrome has many causes, including primary kidney diseases such as minimal-change disease, focal segmental glomerulosclerosis, and membranous glomerulonephritis. Nephrotic syndrome can also result from systemic diseases that affect other organs in addition to the kidneys, such as diabetes, amyloidosis, and lupus erythematosus.

2) TYPES OF DIALYSIS

Dialysis is a treatment that filters and purifies the blood using a machine. It helps keep the fluids and electrolytes in balance when their kidneys can't do their jobs. There are 3 major types of dialysis, which includes:

- a) Hemodialysis
- b) Peritoneal dialysis
- c) Continuous Renal Replacement Therapy

A) HEMODIALYSIS:

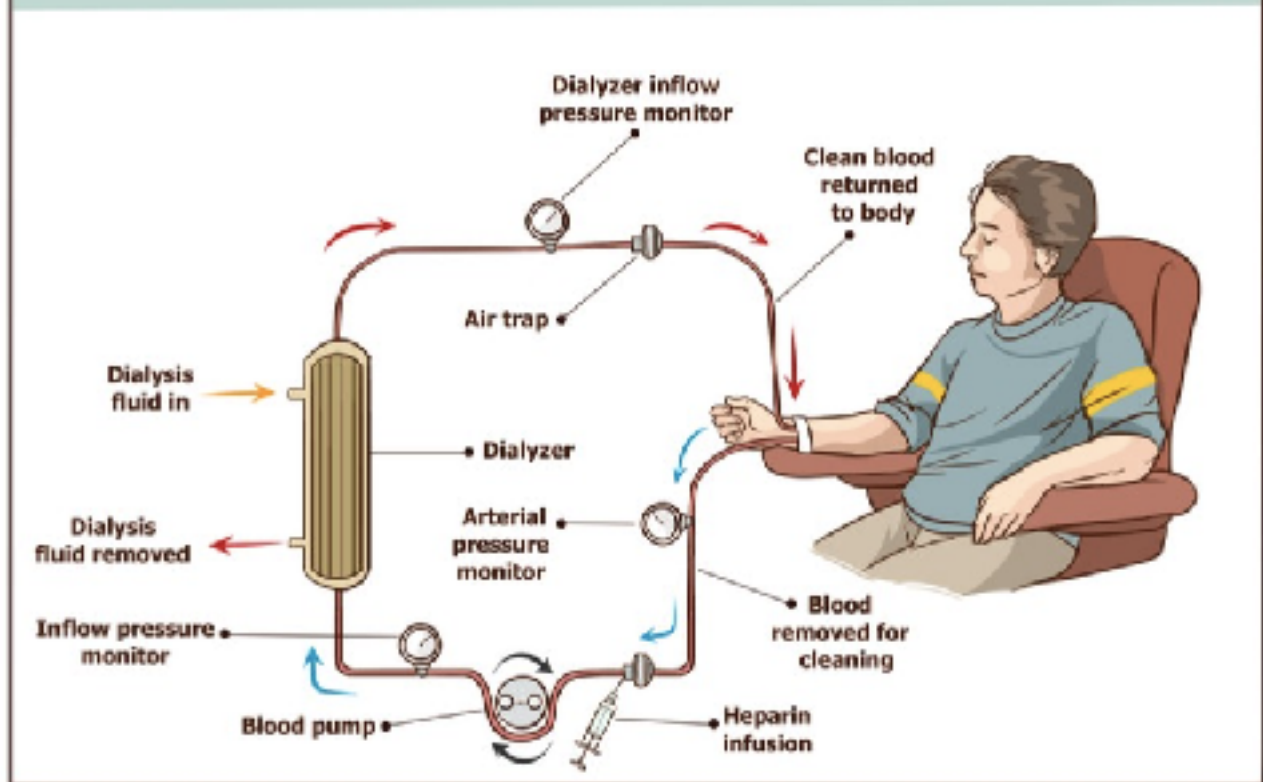
Hemodialysis is the most common type of dialysis. This process uses an artificial kidney (hemodialyzer) to remove waste and extra fluid from the blood. The blood is removed from the body and filtered through the artificial kidney. The filtered blood is then returned to the body with the help of a dialysis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

NOTE: 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

Hemodialysis



receive AV grafts are ready in two to three weeks. Catheters are designed for short-term or temporary use.

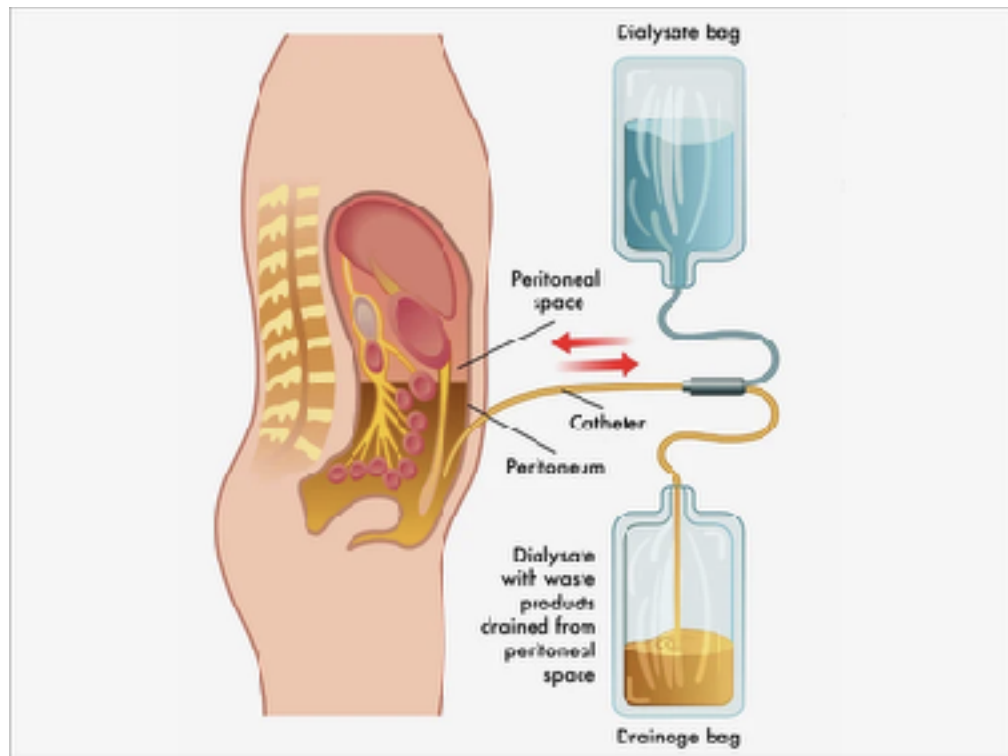
B) PERITONEAL DIALYSIS:

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 different types of peritoneal dialysis and they include:

i) ***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.



ii) ***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.

iii) ***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.

C) CONTINUOUS RENAL REPLACEMENT THERAPY:

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.

AKI: Renal Replacement Therapy (RRT)

SCUF

