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DEPARTMENT: MBBS

1. Discuss the pathophysiological process involves in renal failure.

Renal failure pathophysiology: 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 glomerular filtration rate. Stages of chronic renal failure are based on the glomerular filtration rate: the normal glomerular filtration is 125cc/min/1.73m

Stage 1: GFR is greater than or equal to 90ml/min/1.73m-kidney damage with normal or increased GFR.

Stage 2: GFR is equal to 60-89mL/min/1.73m. Mild decrease in GFR.

Stage 3: GFR is equal to 30-59mL/min/1.73m. Moderate decrease in GFR.

Stage 4: GFR is equal to 15-29mL/min/1.73m. Severe decrease in GFR.

Stage 5: GFR is less than 15mL/min/1.73m. Kidney failure.

ACUTE RENAL FAILURE: Abrupt cessation of activity of the nephrons usually presents initially as a marked fall in urine production(oliguria), which may even be total (anuria). This is accompanied by a rapid rise in serum urea and creatinine levels. Disturbances of fluid and electrolyte balances soon follow, particularly a rise in the serum potassium level and metabolic acidosis.

CHRONIC RENAL FAILURE: Progressive retention of nitrogenous metabolites causes a slow rise in serum creatinine levels due to insufficient glomerular filtration. Concomitant failure of tubular function produces widespread abnormalities in biochemical homeostasis, including salt and water retention, metabolic acidosis and other electrolyte imbalances, particularly hyperkalaemia.

Clinical manifestations of full blown Chronic Renal Failure: describes under 2 headings: (i)primary(renal) uraemic manifestations (ii) Secondary (systemic or extra-renal) uraemic manifestations.

PRIMARY URAEMIC MANIFESTATIONS

Metabolic acidosis. As a result of renal dysfunction, acid base balance progressively lost. Excess hydrogen ions and decline in bicarbonate levels in the blood resulting in metabolic acidosis.The clinical symptoms of metabolic acidosis include: compensatory breathing, hyperkalemia and hypercalcemia.

Hyperkalemia: A decreases glomerular filteration rate results in excessive accumulation of potassium in the blood since potassium is normally excreted mainly in the urine.

Sodium and water imbalance: as glomerular filtration rate declines, sodium and water cannot pass sufficiently into Bowman’s capsule leading to their retention.

Hyperuricaemia: decreased glomerular filtration results in excessive accumulation of uric acid in the blood .

Azotaemia: the waste products of protein metabolism fail to be excreted resulting in elevation in the blood levels of urea, creatinine, phenols and guadinines causing biochemical abnormality, azotaemia.

SECONDARY URAEMIC MANIFESTATION

ANAEMIA: Decreased production of erythropoietin by diseased kidney results in decline in erythropoietin by diseased kidney results in decline in erythropoiesis and anemia.

INTEGUMENTARY SYSTEM: The deposit of urinary pigment such as urochrome in the skin causes sallow-yellow color.

Cardiovascular system: Azotaemia directly induces mucosal ulcerations in the lining of the stomach and intestines.

SKELETAL SYSTEM: Two major types of skeletal disorders may occur. Osteomalacia and ostesis fibrosa.

END-STAGE KIDNEY: Many kidney diseases, whatever the underlying cause, may progress to chronic renal failure. Macroscopically, the kidneys are usually found to be small and firm with symmetrical thinning of the cortex and poor demarcation of the cortex from the medulla. This condition is known as end-stage kidney. In both gross and histological appearance, there is often little clue to the original renal pathology. In the cortex, the non-functioning or obsolescent glomeruli are replaced by avascular, acellular fibrous material(fibrosis)

1. With the aid of suitable diagrams discuss the type of dialysis you know.

The term dialysis in physiological sense refers to the diffusion of solutes from an area of higher concentration to the area of lower concentration through a semipermeable membrane. This theory has been used to dialyze the blood of patients with renal failure especially those developing ureamia

TYPES OF DIALYSIS

There are three types of dialysis :

1. Hemodialysis

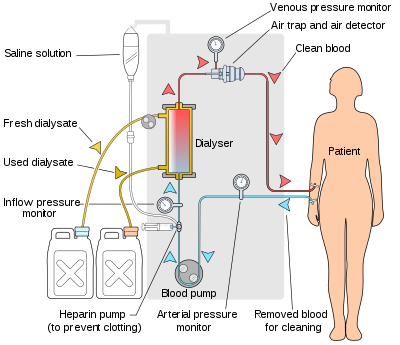
Hemodialysis is the most common type of dialysis. This process uses an artificial kidney(hemodialyzer) to remove waste and extra fluid from the blood. The blood is removed from the body and filtered through the artificial kidney. The filtered blood is then returned to the body with the help of a dialysis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

i.)Arteriovenous(AV) fistula. This type connects an artery and a vein. It’s the preferred option.

ii.)AV graft. This type is a looped tube.

iii.)Vascular access catheter. This may be inserted into 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 or three months after their surgery. People who receive AV grafts are ready in two or 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.



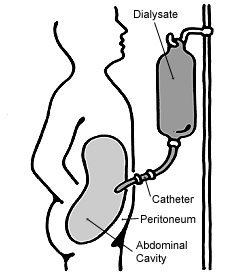
2.)Peritoneal dialysis

Peritoneal dialysis involves surgery to implant a peritoneal dialysis(PD) catheter into your abdomen. The catheter helps filter your blood through the pertitoneum, 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 :

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.



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.

