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17/MHS01/266

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Renal Physiology Assignment

1 Discuss the Pathophysiological Basis involved in Renal Failure

Pathophysiological Basis Involved in Renal Failure

Renal Failure is a condition in which the the kidneys lose the ability to remove waste and balance fluids. This condition occurs as the last stage of chronic kidney disease and it is also known as End-stage Renal Disease.

Chronic Kidney Disease (CKD) is a long standing, progressive deterioration of renal function. It is defined as the presence of kidney damage or decreased kidney function that persists for at least 3 months. It is often associated with progressive and irreversible loss of large numbers of functioning nephrons. It is initially described as diminished renal reserve or renal insufficiency what progresses to renal failure. It is described thus due to Renal Functional Adaptation where the renal tissue not affected increases its performance in order to compensate for the affected renal tissue function loss.

There are many causes of Chronic Kidney Disease but the major causes are Diabetes Mellitus Type II, Hypertension, Glomerulonephritis, Polycystic kidney disease, Chronic pyelonephritis and unknown causes as well. Other causes are; obesity, amyloidosis, atherosclerosis, Tuberculosis, Renal Calculi, urethral Constriction etc. All the causes may lead to progressive deterioration of kidney function and further loss of nephrons to the point where Dialysis or kidney transplant is necessary for survival.

Decreased renal function interferes with the kidney's ability to maintain fluid and electrolyte homeostasis. The ability to concentrate or dilute urine is lost as well as decrease in ability to excrete excess phosphate, acid and potassium. This causes increased plasma concentrations of creatinine and urea due to diminished Glomerular Filtrate Rate; However Sodium and water balance in plasma is well maintained by increased excretion of sodium and normal response to thirst in water loss, except when dietary intake of Sodium and water is very restricted or excessive (excessive inta

causes Sodium and water overload leading to heart failure). Renal adaptation maintains potassium level except in excessive intake of potassium but this stops when Renal failure is advanced. Therefore there is high plasma potassium level.

In addition, Calcium, phosphate, parathyroid hormone and Vitamin D metabolism abnormalities can occur. Decreased renal production of Calcitriol causes hypocalcemia, decreased renal excretion of phosphate causes hyperphosphatemia and secondary hyperparathyroidism occurs. All this occurs as Renal osteodystrophy which is an abnormal bone mineralization due to hyperparathyroidism, calcitriol deficiency, hyperphosphatemia and hypocalcemia. This condition can progress to osteitis fibrosa or osteomalacia. Calcitriol deficiency can cause osteopenia or osteomalacia.

There is also occurance of metabolic Acidosis as Kidney function in pH balance is lost. Acidosis causes muscle wasting due to protein catabolism, bone loss due to bone buffering of acid, and accelerated progression of kidney disease. Anemia sets in during moderate to advanced stage of Chronic kidney disease. Anemia here is caused by deficient erythropoietin production due to reduced function renal mass. All this causes the patient to need dialysis or kidney transplant in order to survive.

Symptoms develop slowly and they include Anorexia, nausea, vomiting, nocturia, lassitude, stomatitis, fatigue, muscle twitches and cramps, peripheral neuropathies, seizures, undernutrition etc. Treatment includes fluid and electrolyte management, blood pressure control, treatment of anemia various types of dialysis and kidney transplantation.

2. With the aid of suitable diagrams, discuss the types of dialysis you know?

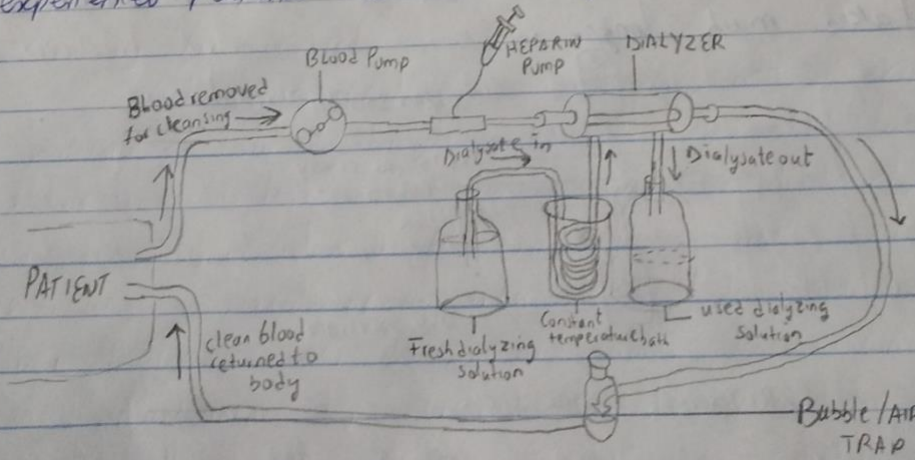
Dialysis

Dialysis is a treatment that filters and purifies the bl using a machine. It is a way of getting rid of the body's wa

extra salt and water and control blood pressure through an external artificial kidney or other techniques. Dialysis has been used since the 1940s to treat people with kidney problems. It is however not a cure for kidney diseases.

There are two major types of dialysis but a third has been added; the types of dialysis are Hemodialysis, Peritoneal dialysis, and Continuous Renal Replacement Therapy. 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, filtered and returned to the body. To do this a surgery is performed to create entrance point into blood vessels. There are three types of entrance points; Arteriovenous (AV) fistula [Connects an artery and vein], Arteriovenous Graft (This is a looped tube) and Vascular access catheter (this may be inserted into the large vein in the neck. AV fistula is more preferred. Both AV fistula and AV graft are ~~long~~ meant for long termed treatments while Catheters are for temporary used. Patients who receive AV fistula surgery recover and are ready for hemodialysis in 2 to 3 months while those for AV grafts are ready to three weeks.

Hemodialysis usually last for 3 to 5 hours depending on body size, amount of waste in body, and current state of health. It is performed three times a week in hospitals and at home for experienced patients who need long term treatment.



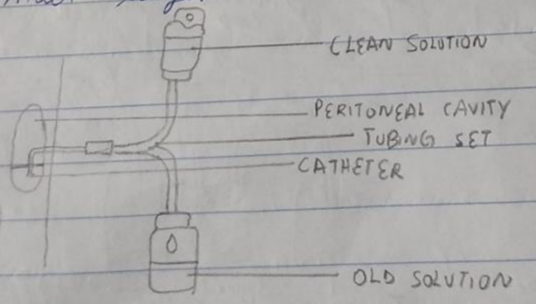
HAEMODIALYSIS

Peritoneal dialysis is another type of dialysis in which a soft plastic tube (catheter) is placed in the belly by surgery. It involves surgery to implant a peritoneal dialysis catheter into the abdomen. The catheter helps to filter blood through the peritoneum. During the treatment a sterile fluid (dialysate) flow into the peritoneum through catheter, the dialysate absorbs waste and it is drained from the abdomen. This process takes a few hours and needs to be repeated 4 to 6 times per day and can be done while sleeping or awake. There are three main types of Peritoneal ~~kidneys~~ dialysis;

i. Continuous ambulatory peritoneal dialysis [CAPD]: Here, the abdomen is filled and drained multiple times each day and doesn't require a machine. It must be performed while awake. It is performed by placing 2 quarts of dialysate into the abdomen by hooking up a plastic bag containg the dialysate and raising it to shoulder level. When the plastic bag is empty, it is removed and the fluid is then drained from the abdomen. Each exchange takes about 30 to 40 minutes.

ii. Continuous Cycling Peritoneal Dialysis (CCPD) or Automated Peritoneal dialysis (APD); This uses a machine to cycle the fluid in and out of the abdomen. It is done at night while sleeping.

iii. Intermittent Peritoneal Dialysis (IPD); This treatment is usually performed in the hospital and uses the same machine as CCPD but takes much longer.



PERITONEAL DIALYSIS.

Continuous Renal Replacement Therapy is the third and last type of dialysis. This therapy is used primarily in the intensive care unit for people with acute kidney feature. It is also known as - Hemofiltration. Here a machine passes the blood through tubings, a filter removes waste products and water and blood is returned to the body along with replacement fluid. This procedure takes 12 to 24 hours a day to be completed and is performed every day.