

(2) With the aid of Suitable diagrams discuss the types of dialysis you know?

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1) Renal failure is the failure of the kidney to perform its functions. Which includes excretory functions, endocrine functions, regulation of blood pressure, hematopoietic function and regulation of blood Calcium level and also its role in homeostasis.

When the kidney fails to perform all these functions, or One of these functions <sup>that is called</sup> ~~then there is~~ Renal failure.

In the failure of excretory functions of the Kidney, it is usually characterized by decrease in glomerular filtration rate (GFR). So GFR is considered as the best index of renal failure.

However, decrease in GFR is not affected much in the initial stages of renal failure. If 50% of the nephrons are affected, GFR decreases only by 20 to 30%. It is because of the compensatory mechanism by the unaffected nephrons.

Renal failure <sup>may</sup> ~~can~~ either be acute or chronic.

### Acute Renal failure

Acute renal failure is the abrupt or sudden stopping of the renal function. The excretory function of the kidney is lost. It is often reversible within few days to few weeks. Acute renal failure may result in sudden life-threatening reactions in the body with the need for emergency treatment.

#### Causes

- 1) Acute nephritis (inflammation of kidneys), which usually develops by immune reaction.
- 2) Damage of the renal tissues by poisons like lead, mercury and carbon tetrachloride.
- 3) Renal ischemia which develops during circulatory shock.
- 4) Acute tubular necrosis i.e. the necrosis of tubular cells in kidney caused by burns, hemorrhage, snake bite, toxins (like insecticides, heavy metals and carbon tetrachloride) and drugs (like diuretics, aminoglycosides and platinum derivatives <sup>overdose of Paracetamol</sup>).
- 5) Severe transfusion reactions.
- 6) Sudden fall in blood pressure during hemorrhage, diarrhea, severe burns and cholera.
- 7) Blockage of ureter due to the formation of

7 hypovolaemia

= absorption in the kidney.  
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calculi (renal stone) or tumor.

features of Acute renal failure.

1) Oliguria (decreased Urinary Output). when the urinary Output is less than  $\leq 500 \text{ ml/day}$ . when there is hypovolaemia and Severe hypotension, this leads to decrease glomerular filtration pressure which leads to decrease in glomerular filtration rate. When this happens, there is oliguria or in Severe cases Anuria which is cessation in urinary Output.

2) proteinuria and Creatinuria <sup>urea</sup> there is increase level of protein and urea creatine in the urine due to failure of the excretory function of the ~~kidney~~ nephron i.e. the renal corpuscle.

3) Edema due to increase volume of extracellular fluid (ECF) caused by the retention of sodium and water, when there is acute nephritis, the kidney is not able to regulate the volume of the ECF.

4) Hematuria (presence of blood in urine).

5) Hypertension within few days because of increased ECF volume.

6) Acidosis due to retention of metabolic end products.

7) Coma due to Severe acidosis (if patients)

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is not treated in time) resulting in death within 10-14 days.

## CHRONIC RENAL FAILURE

Chronic renal failure is the progressive, long standing and irreversible impairment of renal functions.

When some of the nephrons lose the function, the unaffected nephrons can compensate it. However, when more and more nephrons start losing the function over the months or years, the compensatory mechanism fails and chronic renal failure develops.

### Causes

- 1) Chronic nephritis
- 2) Polycystic kidney disease.
- 3) Renal calculi (Kidney stone)
- 4) Urethral constriction
- 5) Hypertension
- 6) Atherosclerosis is when the arterial wall is been obstructed <sup>with</sup> fat deposits or when fat deposits clog the wall of the arterial wall leading to a blockage.
- 7) Tuberculosis
- 8) Slow poisoning by drugs and metals.

## Features of Chronic Renal failure.

i) Uremia is a condition characterized by excess accumulation of end products of protein metabolism. Such as Urea, nitrogen and creatinine in blood. There is also accumulation of some toxic substances like organic acids and phenols. Uremia occurs when there is failure of the kidney to excrete the metabolic end products and toxic substances.

### Common features of Uremia.

- i) Anorexia (loss of appetite)
- ii) Lethargy
- iii) Drowsiness
- iv) Nausea and Vomiting
- v) Pigmentation of skin
- vi) Muscular twitching, tetany and convulsion.
- vii) Confusion and mental deterioration.
- viii) Coma.

2) Acidosis: Uremia results in acidosis because of the accumulation of ~~sodium~~ metabolic end products as a result of the ~~kidney~~ renal tubule of the nephron not being able to excrete them.

3) Edema ~~results~~ <sup>is</sup> as a result of the renal tubule to excrete sodium and electrolytes, this

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causes increase in extracellular fluid volume resulting in development of edema.

5) Anemia; when the kidney is not been able to secrete erythropoietin which stimulates the process of erythropoiesis and then formation of red blood cells, this leads to ~~Anemia~~ decrease in the production of RBC resulting in normocytic anemia.

6) Hyperparathyroidism: Secondary hyperthyroidism is developed due to the deficiency of Calcitriol (1,25-dihydroxycholecalciferol) which is produced by the kidney. ~~When the kidney~~ failure of the kidney to produce Calcitriol increases the removal of calcium from bones resulting in osteomalacia.

## 7 Types of dialysis

There are ~~two~~ <sup>three</sup> primary types of dialysis

1) Hemodialysis (3) Hemofiltration.

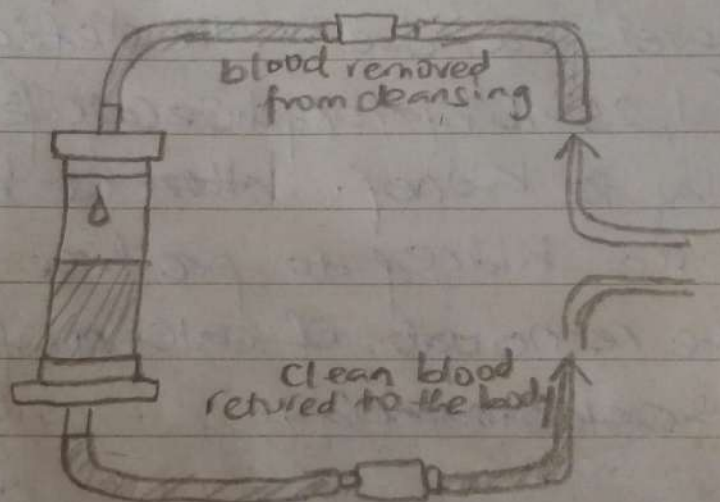
2) peritoneal dialysis

There are two Secondary types of dialysis.

1) ~~Hemofiltration~~ Hemodiafiltration

2) Intestinal dialysis

## HEMODIALYSIS



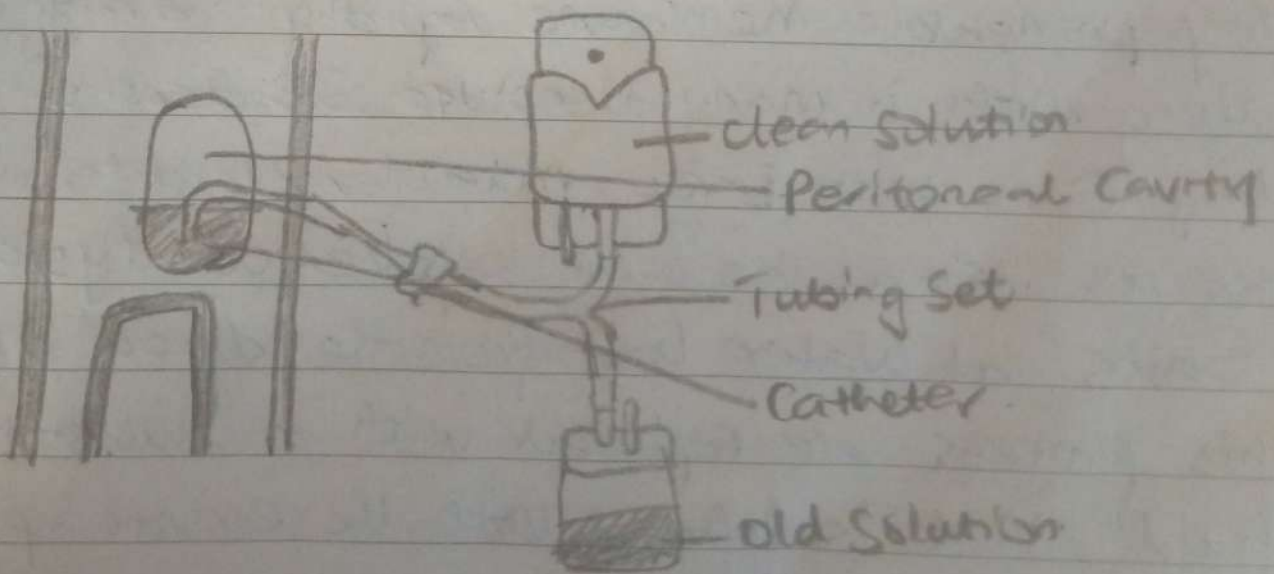
In hemodialysis, the patient's blood is pumped through the blood compartment of a dialyzer, exposing it to a partially permeable membrane.

The dialyzer is composed of thousands of tiny hollow synthetic fibers. The fibers wall acts as the semipermeable membrane. Blood flows through the fibers, dialysis solution flows around outside the fibers and water and wastes move between

the two solutions.

The cleansed blood is returned via the circuit back to the body. Ultrafiltration occurs by increasing the hydrostatic pressure across the dialyzer membrane. This is done by applying a negative pressure to the dialysate compartment of the dialyzer. This pressure gradient causes water and dissolved solutes to move from blood to dialysate and allows the removal of several litres of excess fluids during a typical 4-hour treatment.

### PERITONEAL DIALYSIS



In a peritoneal dialysis, a sterile solution containing glucose (called dialysate) is run through a tube into the peritoneal cavity, ~~the~~



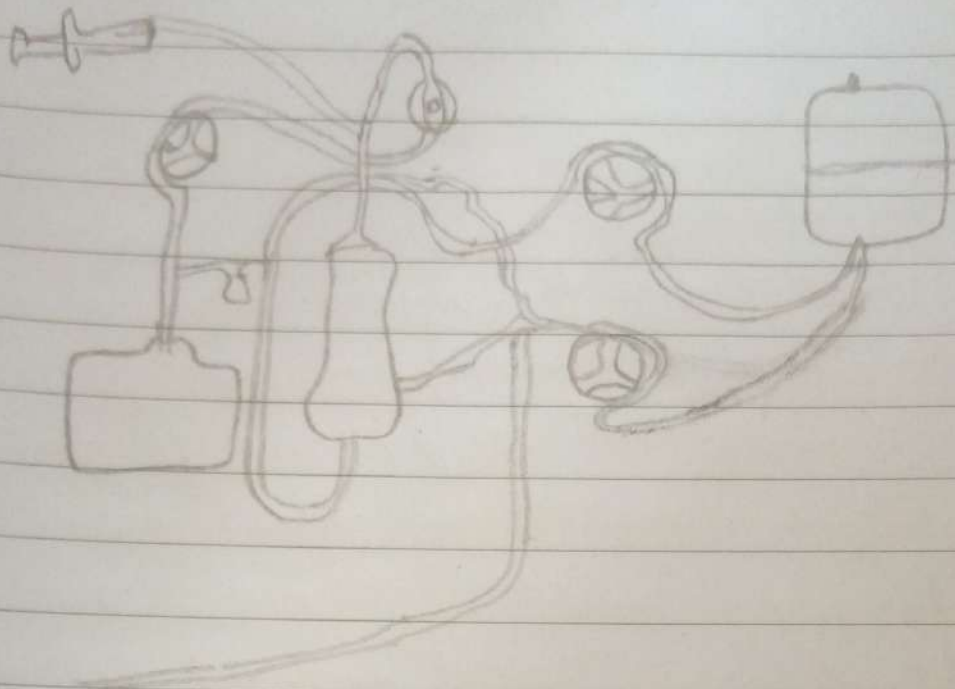
Where the peritoneal membrane acts as a partially permeable membrane.

This exchange is repeated 4-5 times per day; automatic systems can run more frequent exchange cycles overnight. Peritoneal dialysis is more efficient than hemodialysis.

### Hemofiltration:

Hemofiltration is a similar treatment to hemodialysis but it makes use of a different principle. The blood is pumped through a dialyzer or "hemofilter" as in dialysis but no dialysate is used. A pressure gradient is applied as a result, water moves across the very permeable membrane rapidly "dragging" along with it many dissolved substances including ones with larger molecular weights which are not cleared as well by hemodialysis.

Salts and water lost from the blood during this process are replaced with a "substitution fluid" that is infused with the extracorporeal circuit during the treatment.



### Hemodiafiltration

It is a combination of hemodialysis and hemofiltration thus used to purify the blood from toxins when the kidney is not working normally.

### Intestinal dialysis

In intestinal dialysis, the diet is supplemented with soluble fibers such as acacia fibre, which is digested by bacteria in the colon. The bacterial growth increases the amount of nitrogen that is eliminated in fecal waste.

An ~~alternate~~ alternate approach utilizes the ingestion of 1 to 1.5 liters of non-absorbable solutions of polyethylene glycol or mannitol every fourth hour.