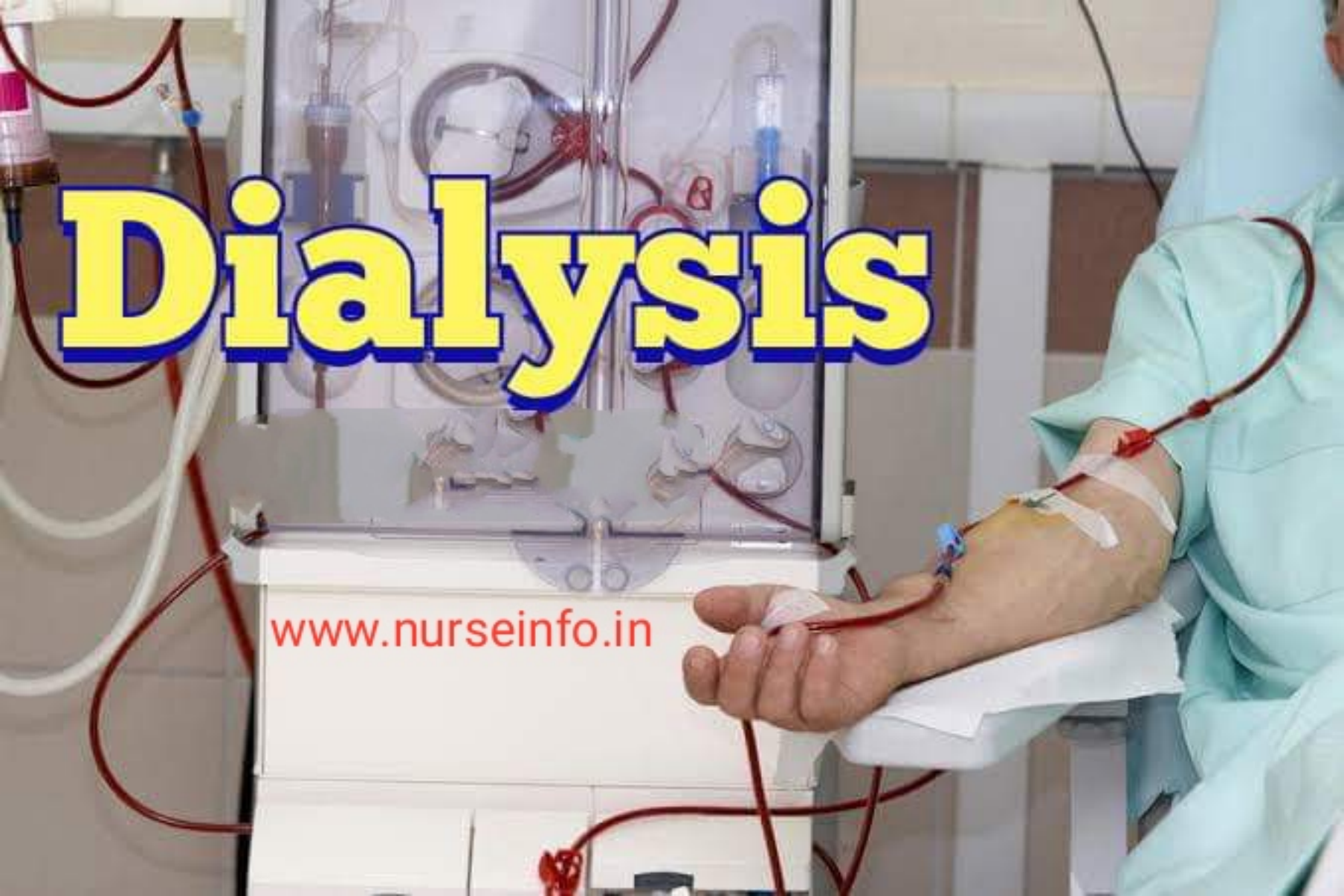
Dialysis
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DIALYSIS

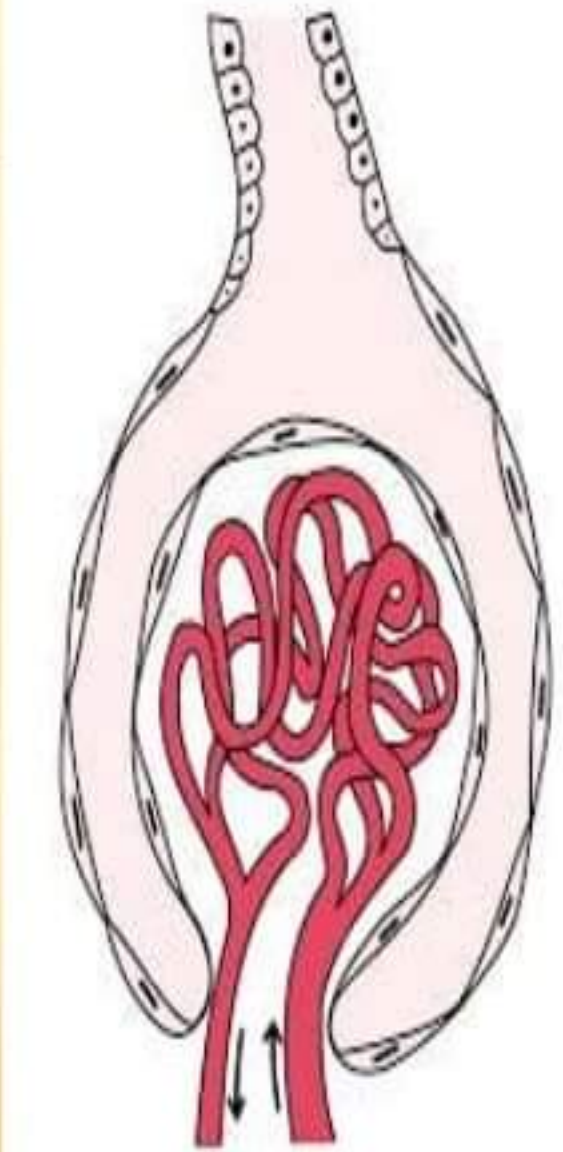
Definition-

- Dialysis is a technique in which substances move from the blood from semi permeable membrane and into a dialysis solution.

PURPOSE

- The purpose of dialysis is to maintain fluid electrolyte and acid base balance and to remove endogenous and exogenous toxins

- A semipermeable membrane is a thin layer of material that contains holes of various sizes, or pores.
- This replicates the filtering process that takes place in the kidneys, when the blood enters the kidneys and the larger substances are separated from the smaller ones in the glomerulus.



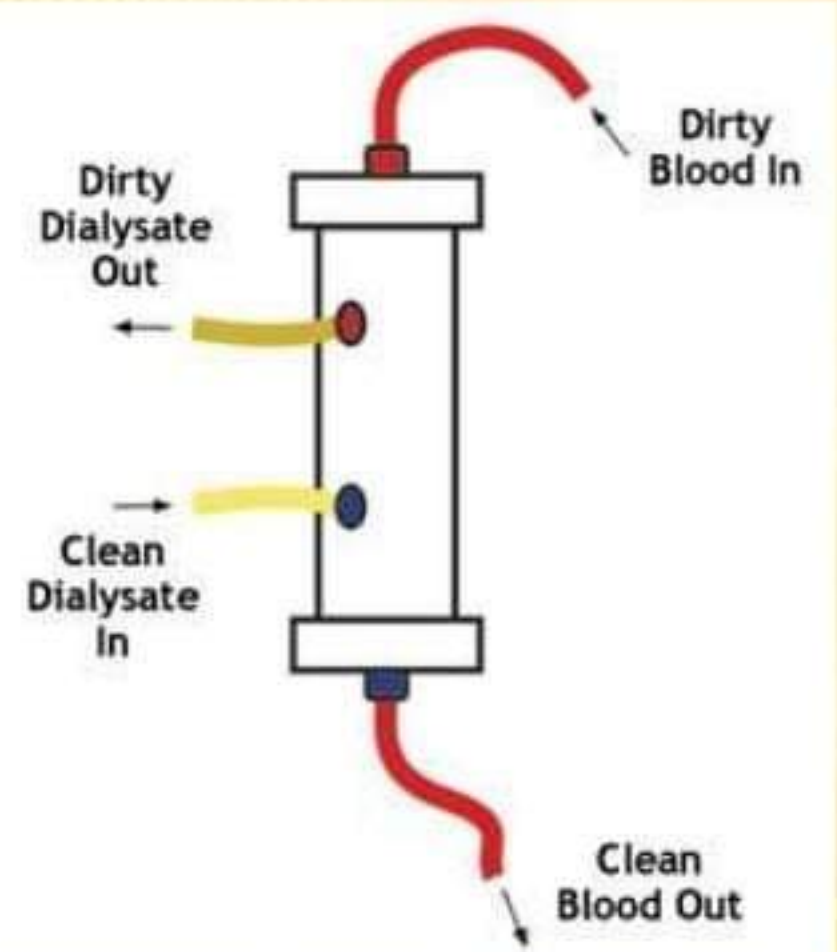
METHODS OF DIALYSIS INCLUDE

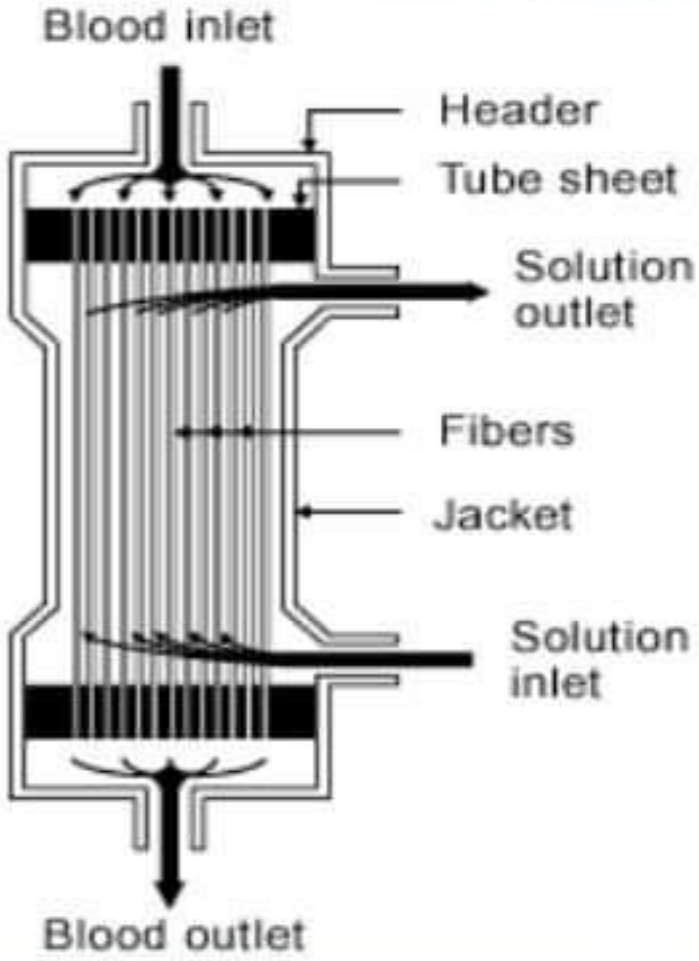
- Hemodialysis
- Peritoneal dialysis

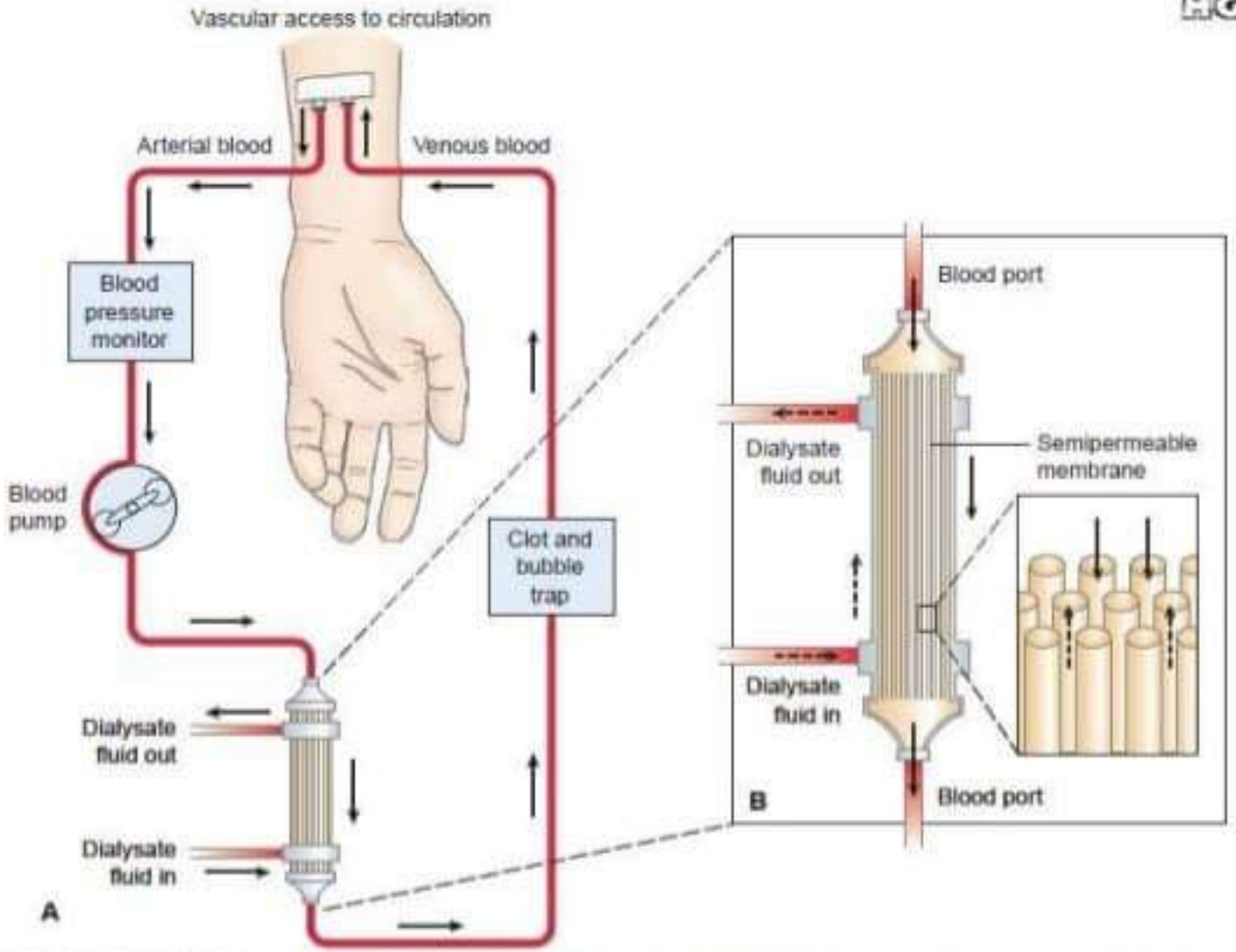
HEMODIALYSIS

- It is the procedure of cleansing the blood of accumulated waste products. It is used for patient with end stage renal failure or for acutely ill patient who require short term.

DIALYZER


Dirty
Blood In
Dirty
Dialysate
Out
Clean
Dialysate
In
Clean
Blood Out


Blood inlet
Header
Tube sheet
Solution
outlet
Fibers
Jacket
Solution
inlet
Blood outlet



HEMODIALYSIS SYSTEM . **A,** Blood from an artery is pumped into **(B)** a dialyzer where it flows through the cellophane tubes, which act as the semipermeable membrane (*inset*). The dialysate, which has the same chemical composition as the blood except for urea and waste products, flows in around the tubules. The waste products in the blood diffuse through the semipermeable membrane into the dialysate.

DIALYSATE

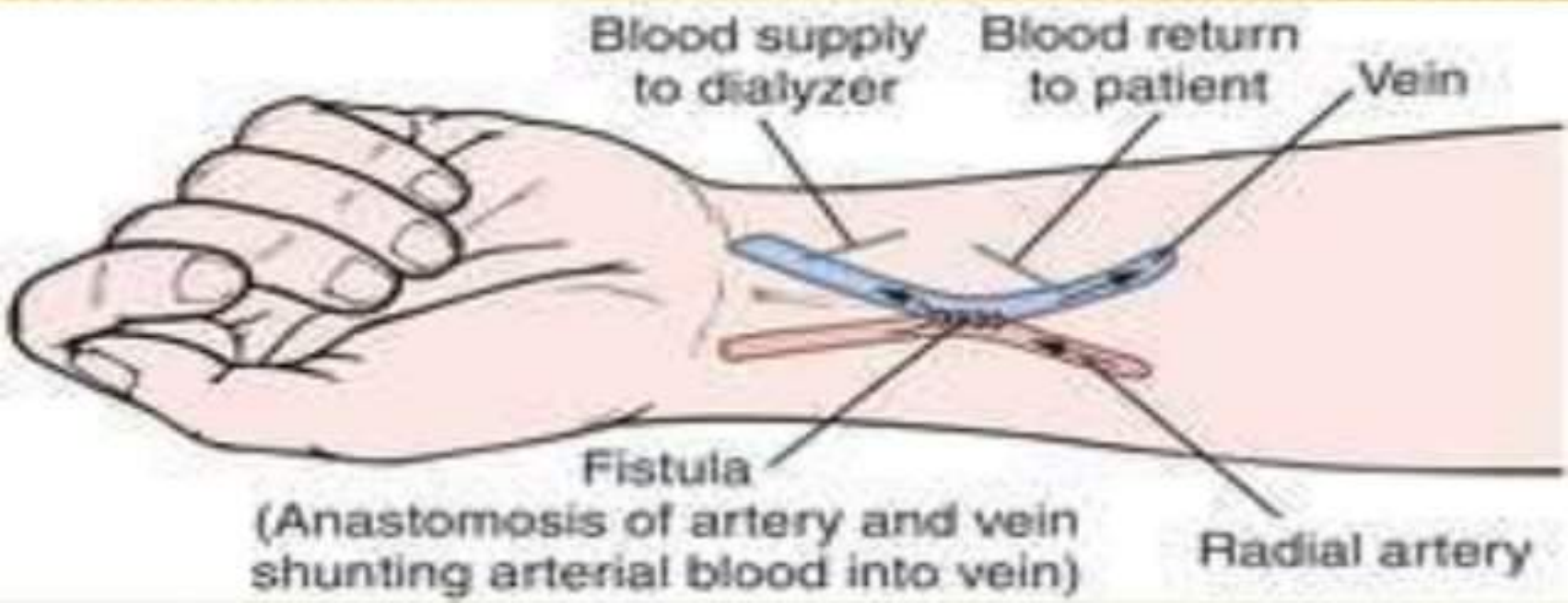
Composition	Hemodialysis	Peritoneal dialysis
Na	136 - 140 mEq/L	132 mEq/L
Cl	99 - 110 mEq/L	96 mEq/L
K	0 – 4 mEq/L	0 – 10 mEq/L
Ca	2.5 mEq/L	3.5 mEq/L
Mg	0.5 – 1 mEq/L	0.5 mEq/L
Acetate	2.5 – 5 mEq/L	-
Bicarbonate	27 – 39 mEq/L	-
Lactate	-	40 mEq/L
Glucose	200 mg/dL	1500 – 4250 mg/dL

PRINCIPLES

- 1. Diffusion
- 2. Osmosis
- 3. Ultrafilteration

METHODS OF CIRCULATORY ACCESS

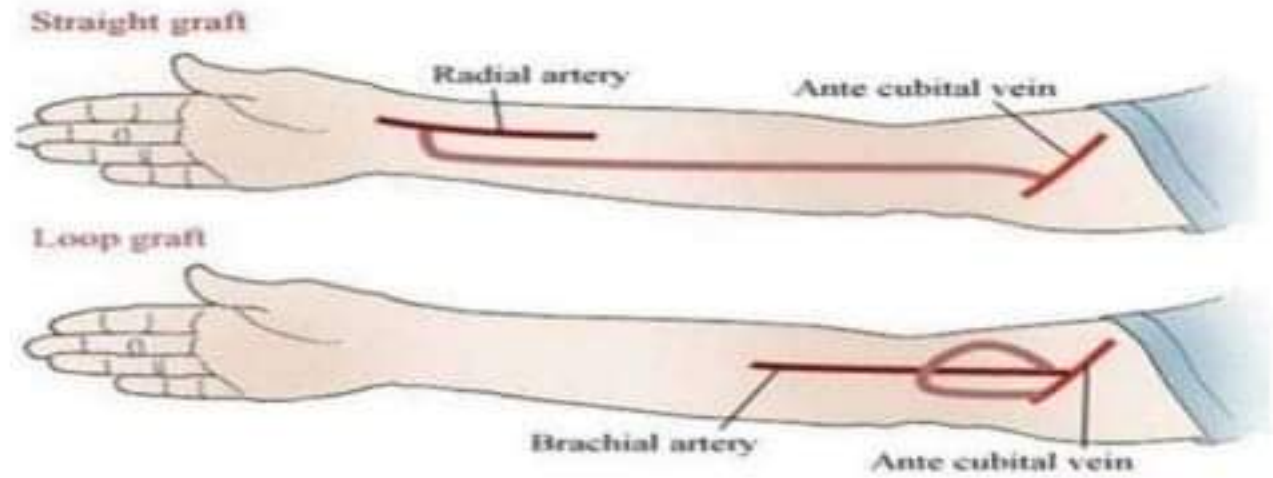
- **Arteriovenous fistula**- An **arteriovenous fistula** is an abnormal connection or passageway between an artery and a vein.



- Usually radial artery and cephalic vein are anastomosed in nondominant arm. Vessels in the upper arm may also be used.
- After the procedure the superficial venous system of the arm dilates.
- By means of two large bore needles inserted into the dialated venous system, blood may be obtained and passess through the dialyzer.
- The arterial end is used for the arterial flow and the distal end is used for the reinfusion of dialysed blood.
- Healing of AVF requires at least 6 to 8 weeks; a central vein catheter is used.

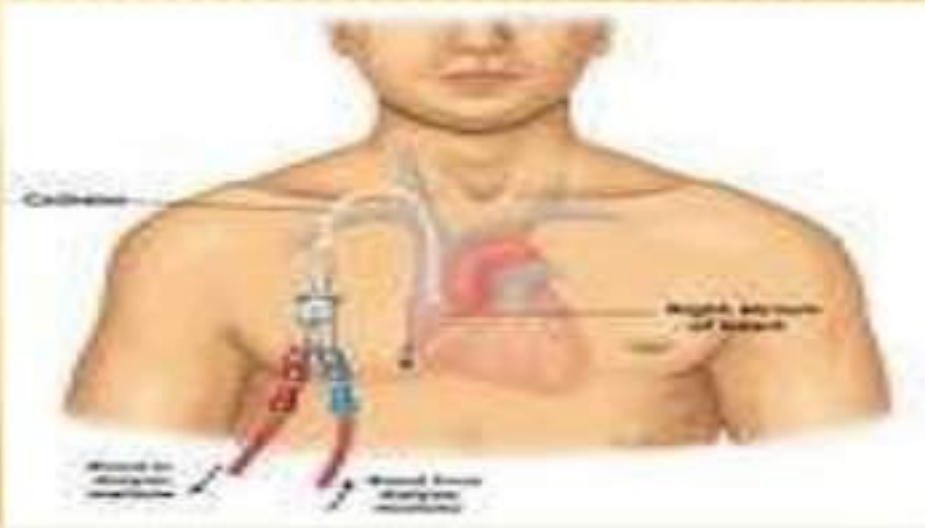
ARTERIOVENOUS GRAFT-

- If a patient is not a good candidate for an arteriovenous fistula, an arteriovenous graft is considered.



CENTRAL VEIN CATHETER-

- A third type of vascular access is a venous catheter. A venous catheter is a plastic tube which is inserted into a large vein, usually in the neck.



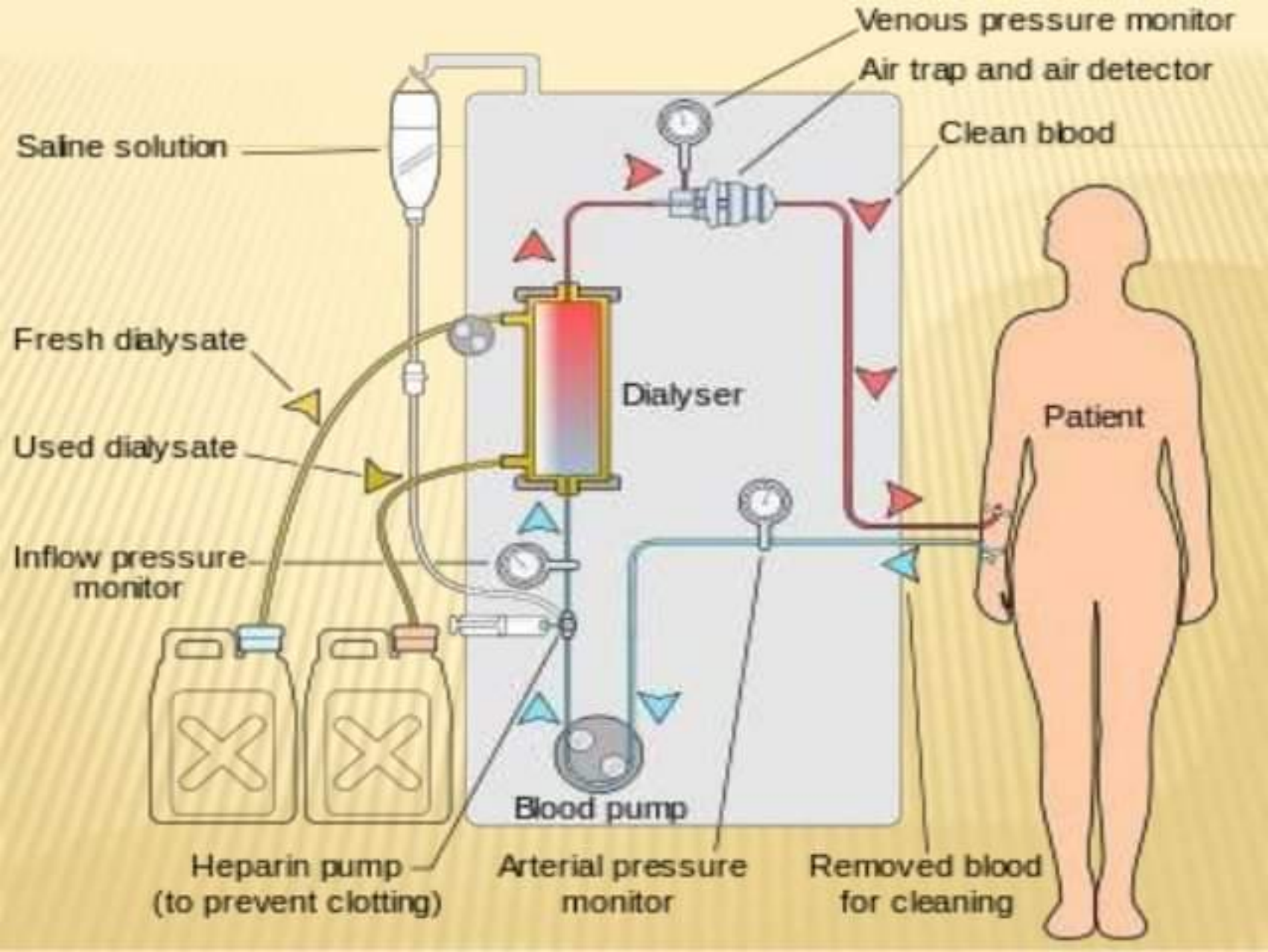
REQUIREMENT FOR HEMODIALYSIS....

- Access to patients circulation .
- Dialysis machine and dialyzer with semipermeable membrane.
- Appropriate dialysis bath.
- Time- approximately 4 hrs, three times weekly.
- Place- dialysis centre or home (if feasible

PROCEDURE

- Patient access is prepared and cannulated
- Heparin is administered
- Heparin and red blood flows through semipermeable dialysis in one direction and dialysis solution surrounds the membrane and flows in the opposite direction.
- Dialysis solution consist of highly purified water to which sodium, potassium , calcium, magnesium chloride, and dextrose have been added, bicarbonate is added to achieve the the proper pH balance.

- Through the process of diffusion solute in the form of electrolytes, metabolic waste products acid base balance components can be removed or added to the blood.
- Excess water is removed from the blood (ultrafiltration).
- The blood is then returned to the body through patient access.


Venous pressure monitor
Air trap and air detector
Saline solution
Clean blood
Fresh dialysate
Dialyser
Patient
Used dialysate
Inflow pressure monitor
Blood pump
Heparin pump (to prevent clotting)
Arterial pressure monitor
Removed blood for cleaning

COMPLICATIONS

- Infection
- Catheter clotting
- Central vein thrombosis
- Stenosis or thrombosis.
- Ischemia of the hand
- Aneurysm

MONITIORING DURING HEMODIALYSIS

- Involves constant monitoring of hemodynamic status, electrolyte and acid base balance as well as maintainence of sterility and closed system.
- Performed by a specially trained nurse and dialysis technician who are familiar with the protocol and equipment being used.

LIFE STYLE MANAGEMENT FOR CHRONIC HEMODIALYSIS

- **DIETARY MANAGEMENT** involves restriction or adjustment of protein , sodium, potassium, phosphorus or fluid intake.
- Ongoing health care monitoring includes carefull adjustment of medication that are normally excreted by the kidney or are dialyzable.

HEMODIALYSIS TREATMENT AND COMPLICATIONS:

- Performs head to toe physical assessment before, during and after hemodialysis regarding complications and access's security.
- Confirm and deliver dialysis prescription after review most update lab results. Address any concerns of the patient and educate patient when recognizing the learning gap.

DAY-TO-DAY CARE OF ARTERIAL FISTULA

- Always wash your hands with soap and warm water before and after touching your access. Clean the area around the access with antibacterial soap or rubbing alcohol before your dialysis treatments.
- Change where the needle goes into your fistula or graft for each dialysis treatment.

- Do not let anyone take your blood pressure, start an I.V, or draw blood from your access arm.
- Do not let anyone draw blood from your tunneled central venous catheter.
- Do not sleep on your access arm.
- Do not carry more than 10 lb with your access arm.
- Do not wear a watch, jewelry, or tight clothes over your access site.
- Be careful not to bump or cut your access.

HEMODIALYSIS DISEQUILLIBRIUM SYNDROME

- In nephrology, **dialysis disequilibrium syndrome** is the occurrence of neurologic signs and symptoms, attributed to cerebral edema, during or following shortly after intermittent hemodialysis.

CAUSES

- The cause of DDS is currently not well understood
- There are two theories to explain it; the first theory postulates that urea transport from the brain cells is slowed in chronic renal failure, leading to a large urea concentration gradient, which results in reverse osmosis. The second theory postulates that organic compounds are increased in uremia to protect the brain and result in injury by, like in the first theory, reverse osmosis

- Clinical signs of cerebral edema, such as local neurological deficits, papilledema and decreased level of consciousness, if temporally associated with recent hemodialysis, suggest the diagnosis.
- A computed tomography of the head is typically done to rule-out other intracranial causes.

- MRI of the head has been used in research to better understand DDS

TREATMENT

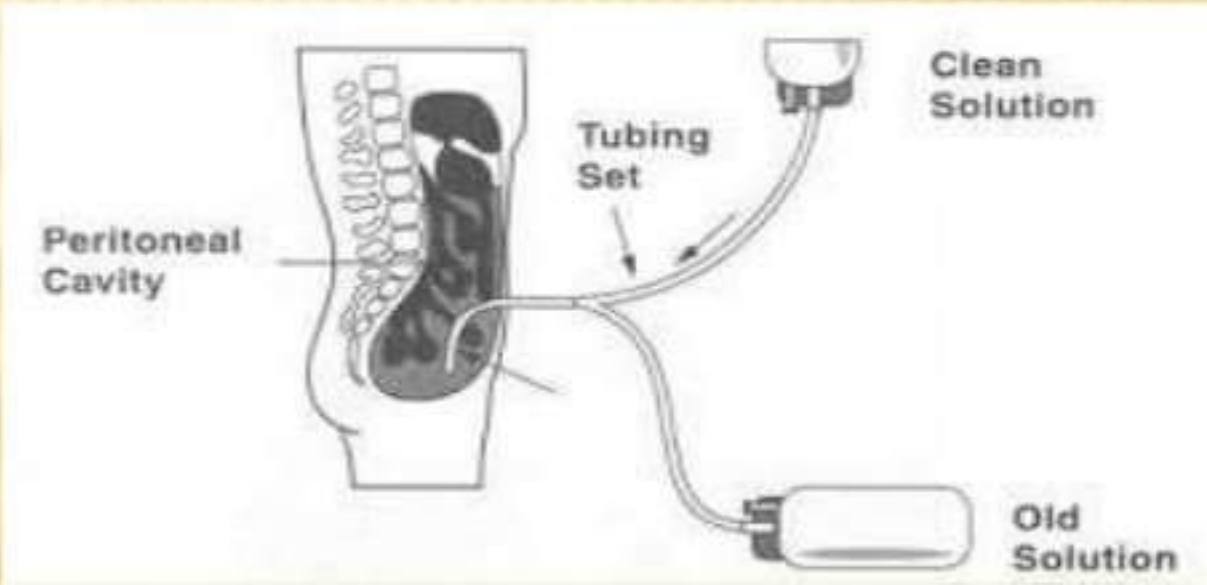
- Avoidance is the primary treatment. Better alternatives are Nocturnal or Daily Dialysis, which are far more gentle processes for the new dialysis patient.
- Dialysis disequilibrium syndrome is a reason why hemodialysis initiation should be done gradually, i.e. it is a reason why the first few dialysis sessions are shorter and less aggressive than the typical dialysis treatment for end-stage renal disease patients.

PERITONEAL DIALYSIS IS FURTHER DIVIDED INTO:-

- Intermittent peritoneal dialysis.
- Continuous ambulatory peritoneal dialysis.
- Continuous cycling peritoneal dialysis.

A.PERITONEAL DIALYSIS-

- Peritoneal dialysis is a way to remove waste products from your blood when your kidneys can no longer do the job adequately.

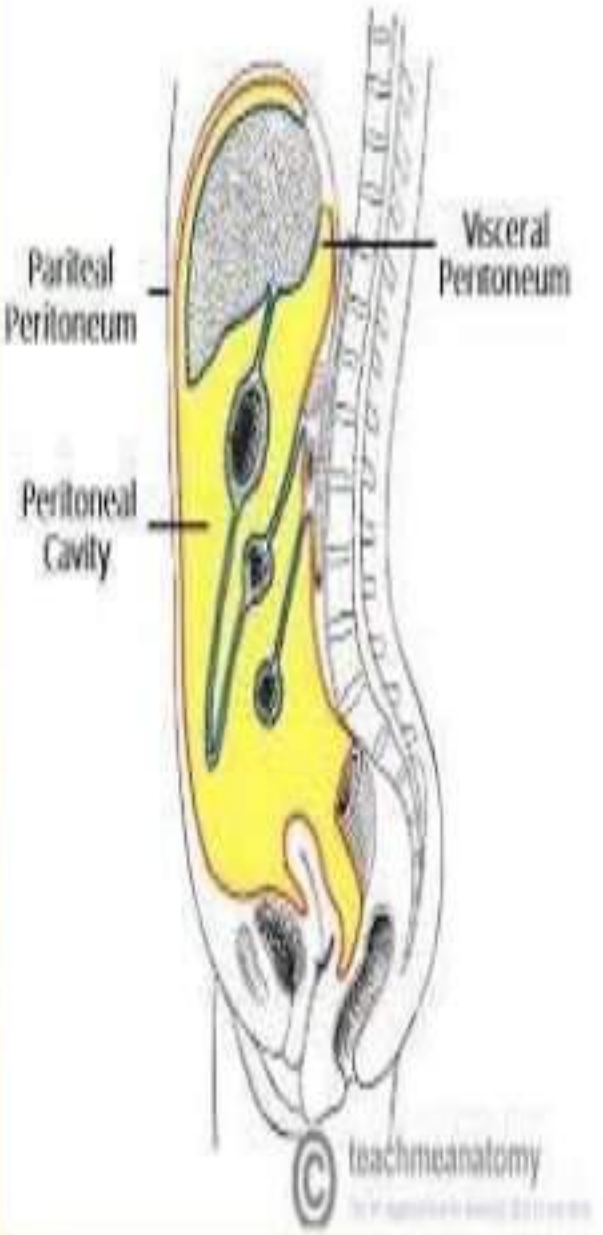


PERITONEUM-

- The **peritoneum** is the serous membrane that forms the lining of the abdominalcavity .
- It covers most of the intra-abdominal (or coelomic) organs, and is composed of a layer of mesothelium supported by a thin layer of connective tissue.

CONTI...

- The peritoneum supports the abdominal organs and serves as a conduit for their blood vessels, lymph vessels, and nerves.



INDICATIONS

- VASCULAR ACCESS FAILURE
- INTOLEANCE TO HEMODIALYSIS
- CONGESTIVE HEART FAILURE
- PROSTHETIC VALVULAR DISEASE

PROCEDURE

- **Preparing the patient-**
- The nurse's preparation of the patient and the family for PD depends upon the patients physical and psychological status, level of alertness, previous experience with dialysis, and understanding of and familiarity with the procedure.

CONTI...

- The nurse explain the procedure to the patient and assist in obtaining the signed consent. Baseline vital signs , weight and serum electrolyte levels are recorded.
- Evaluation of the abdomen for placement of the catheter is done to facilitate self care. Typically the catheter is placed on the non-dominant side to allow the patient easier assess to the catheter connection site when exchanges are done.

CONTI...

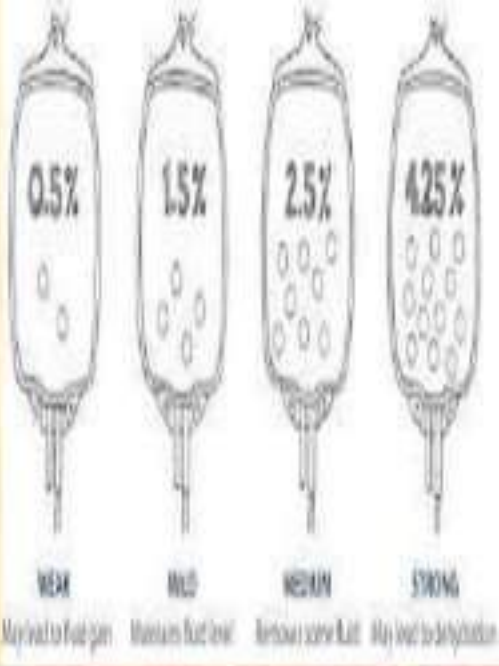
- The patient is encouraged to empty the bladder and bowel to reduce the risk of puncture of the internal organs during the insertion procedure.
- Broad spectrum antibiotics agent may be administered to prevent infection.

CONTI...

- The peritoneal catheter can be inserted in interventional radiology, in the operating room or at the bed side. Depending upon the situation this will need to explained to the patient and the family members.

PREPARING THE EQUIPMENTS

- **In addition to** assembling the equipments for PD
- Nurse consult the physician to determine the concentration of the dialysate to be used and the medication to be added to it
- Heparin
- Potassium chloride .
- Antibiotics
- Regular insulin
- Aseptic technique .



CONTI....

- Before medication are added the dialysate is warmed to body temparatuire.
- Solution that are too cold cause pain cramping and vasoconstriction and reduce clearance.
- Dry heating is recommended.

- Methods not recommended

1. Soaking the bags of the solution in warm water
2. Use of microwave to heat the fluid

CONTI...

- Immediately before initiating dialysis using aseptic technique, the nurse assemble the administration set and tubing.
- The tubing is filled with the prepared dialysate to reduce the amount of air entering the catheter and peritoneal cavity which could increase abdominal discomfort and interfere with instillation and drainage of the fluid

INSERTING THE CATHETER

- Ideally , the peritoneal catheter is inserted in the operating room or radiology suite to maintain surgical asepsis and minimize the risk of contamination.
- However in some circumstances the physician may insert the rigid stylet catheter at the bedside using strict asepsis.

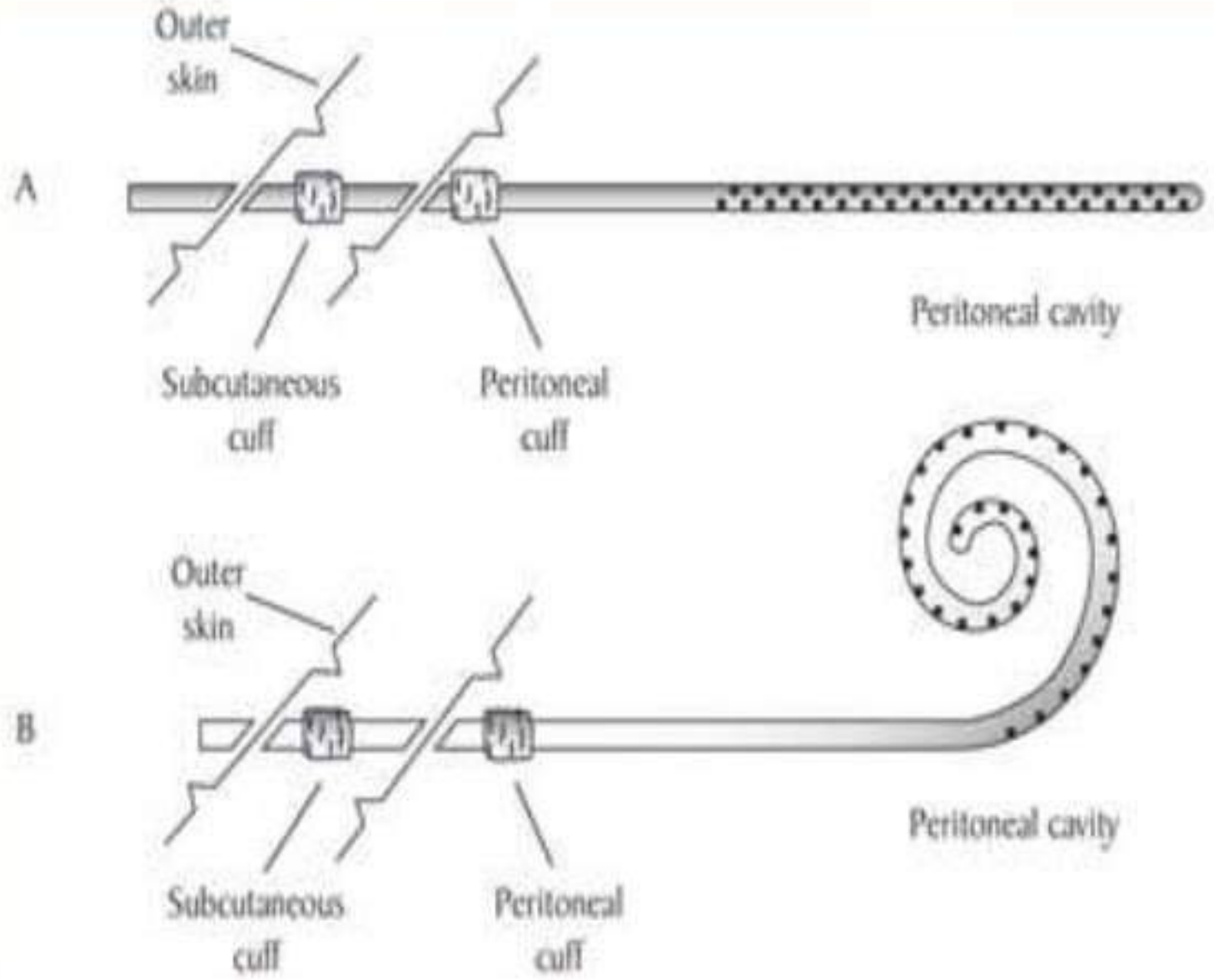
- Whenever a rigid catheter is used, carefully securing and close observation for bowel perforation is essential to minimize the complications.
- Catheter for long term use (e.g tenckhoff, swan)are usually soft and flexible and made of silicon with a radiopaque strip to permit visualization on X- ray.

Standard Tenckhoff catheter

Swan-neck catheter

Coil catheter

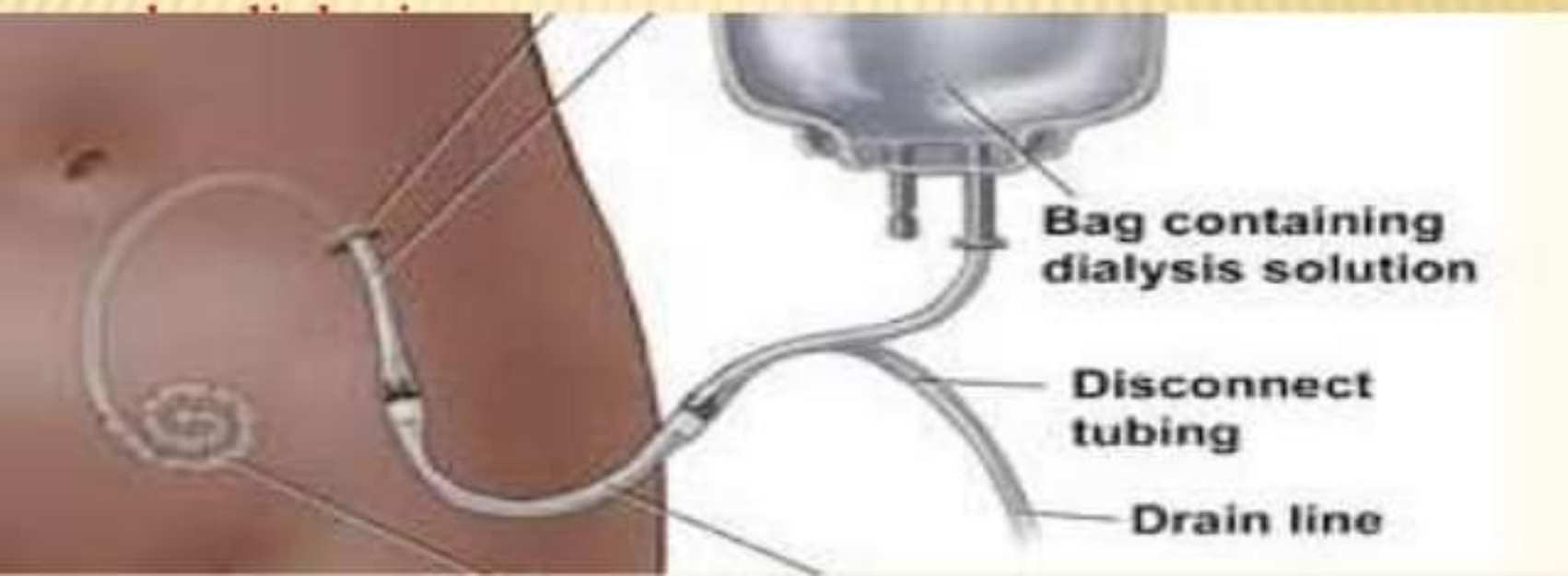
- These catheter have three section
- An interaperitoneal section with numerous openings and an open tip to let dialysate to flow freely.
- A subcutaneous section that passess from the peritoneal membrane and tunnels through muscle and subcutaneous fat to the skin.
- An external section for connection to the dialysate system.


A
Outer skin
Subcutaneous cuff
Peritoneal cuff
Peritoneal cavity
B
Outer skin
Subcutaneous cuff
Peritoneal cuff
Peritoneal cavity

- Most of these catheter have two cuffs which are made of Dacron polyster. The cuffs stabilizes the catheter, limit movements, prevent leaks, and provide a barrier against the organism.
- One cuff is placed just distal to the peritoneum and other cuff is placed subcutaneously.
- The subcutaneous tunnel 5 to 10 cm long further protects against bacterial infections.

PERFORMING THE EXCHANGE

- **PD involves a series of exchange or cycles. An exchange is** defined as the infusion , dwell , and drainage of the dialysate. This cycle is repeated through out the course of



CONTI...

- The dialysate is infused by gravity into the peritoneal cavity a period of about 5 to ten minutes is usually required to infuse 2 to 3 L of fluids.
- The prescribed dwell or equiliberation time allows diffusion and osmosis to occur.
- At the end of the dwell time the drainage portion of the exchange begins.
- The tube is unclamped and the solution drains from the peritoneal cavity by gravity through a closed system.

CONTI...

- Drainage is usually completed in 10 to 20 min.
- The drainage fluid is normally colourless or straw colour and should not be cloudy.
- Bloody drainage may be seen in the first few exchanges after insertion of a new catheter but should not occur after that time.
- The number of cycles or exchanges and their frequency are prescribed based on the monthly laboratory values and presence of uremic symptoms.

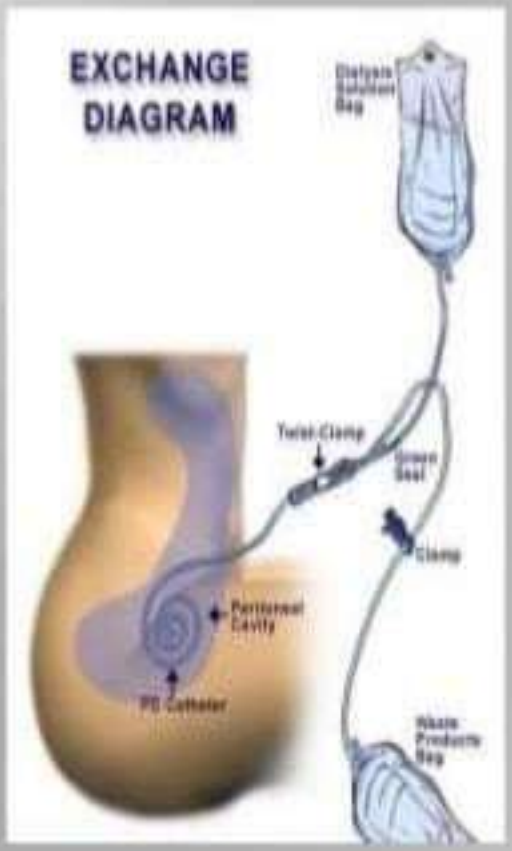
CONTI...

- The removal of excess water during PD occur because dialysate has a high dextrose concentration making it hypertonic. An osmotic gradient is created between the blood and the dialysate solution.
- Dextrose solution of 1.5 %, 2.5% and 4.25% are available in several volumes from 1000 ml to 3000 ml .
- The higher the dextrose concentration the greater the osmotic gradient and the more water will be removed. Selection of the appropriate solution is based on the patient fluid status

1. CONTINUOUS AMBULATORY PERITONEAL DIALYSIS

- It is the form of intracorporeal dialysis that uses the peritoneal as the semipermeable membrane.

Patient undergoing Peritoneal Dialysis (CAPD)



PROCEDURE-

- A permanent indwelling catheter is implanted into the peritoneum, the internal cuff of the catheter becomes embedded by fibrous in growth which stabilizer it and minimize leakage.
- The tube for connecting the catheter to an administration set attached via a locking mechanism to the distal end of the peritoneal catheter called the transfer set.

CONTI...

- It remain with the patient and must change at regular intervals.
- There are many types of administration sets, the most common being the double bag system. The double bag system has a pre attached bag of dialysate solution and drainage which has been shown to reduce peritonitis rates.
- In CAPD a patient is prescribed a set of number of exchanges .

CONTI...

- During the fill, the dialysate bag is raised to shoulder level and infused by gravity into the peritoneal cavity,
- During the dwell time the dialysate fluid is drained from the peritoneal cavity by gravity . drainage of 2 L plus ultrafiltration takes about 10 to 20 minutes if the catheter if functionally optimal.

- After the dialysate is drained , a fresh bag of dialysate solution is infused using aseptic technique and procedure is repeated.
- Patient perform four to five exchanges daily , 7 days per week with an overnight dwell time allowing uninterrupted sleep most patients become unware of fluid in the peritoneal cavity.

ADVANTAGES

- Physical and psychological freedom
- More liberal diet and fluid intake
- Relatively simple and easy to use.
- Satisfactory biochemical control of uremia.

COMPLICATIONS

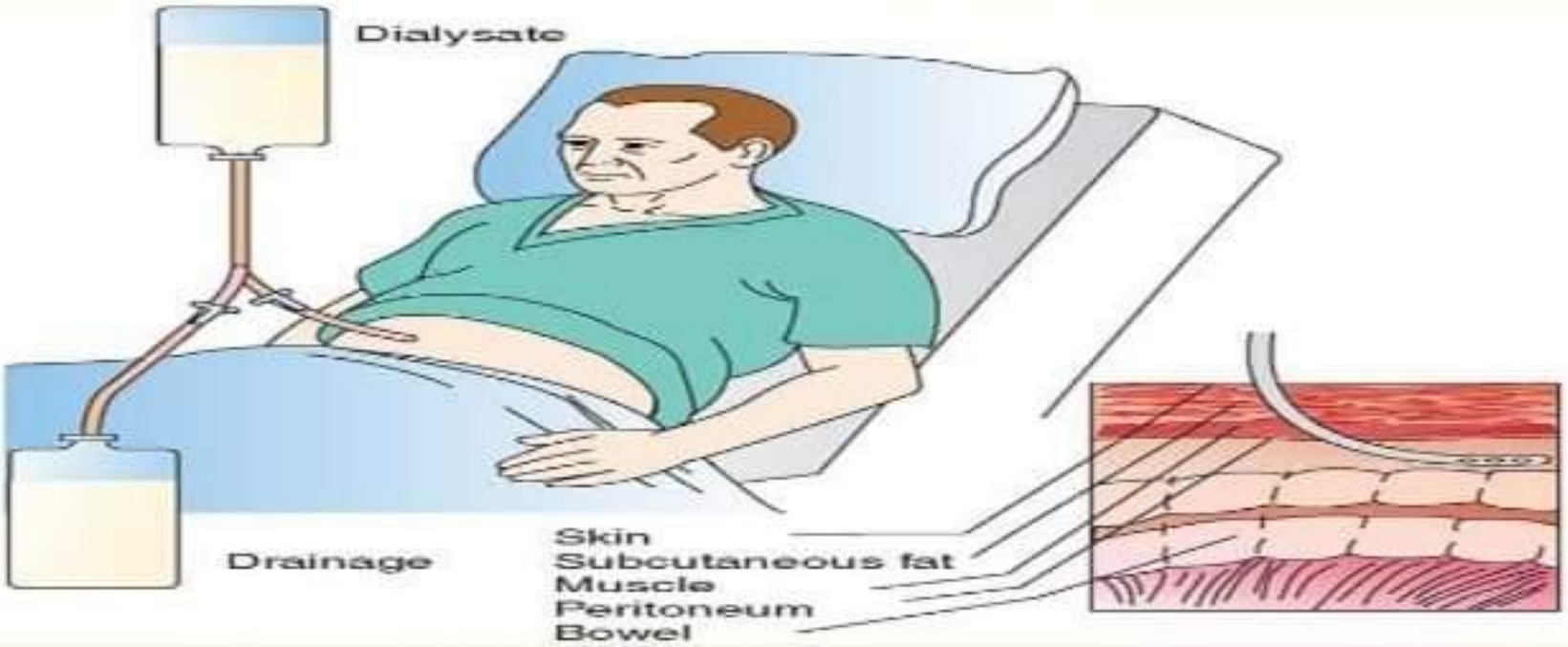
- Infectious peritonitis, exit-site and tunnel infections.
- Peritoneal pleural communication, hernia formation.
- GI bloating.
- Hypervolemia, hypovolemia.
- Bleeding at catheter site.

PATIENT EDUCATION

- The use of CAPD as along term treatment depends on prevention recurring peritonitis.
- Use a strict aseptic technique when performing bag use.
- Perform bag exchange in clean, closed off area without pets and other activities.

INTERMITTENT PERITONEAL DIALYSIS

- It is an option for treating acute kidney injury when access to the bloodstream is not possible or hemodialysis /CRRT is not available.



- It is similar to CAPD in that it involves access to the peritoneal cavity either with a newly inserted rigid stylet catheter or in chronic peritoneal patient the existing chronic catheter can be used.
- In IPD exchange ranges from 30 min to 2 hours. Exchanges are repeated continuously for a prescribed period of time which varies from 12 to 36 hours.
- Due to the rapid exchange patients are on bed rest. As with all peritoneal dialysis procedure aseptic technique is essential during catheter insertion exchanges and dressing changes to prevent peritonitis.

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ABSTRACT-

- **Dialysis Disequilibrium Syndrome: Brain death following hemodialysis for metabolic acidosis and acute renal failure – A case report**
- **AUTHORS**
- Sean M Bagsha, Adam D Peets,Morad Hameed,Paul JE Boiteau,Kevin B Laupland andChristopher J Doig

- **Background**
- Dialysis disequilibrium syndrome (DDS) is the clinical phenomenon of acute neurologic symptoms attributed to cerebral edema that occurs during or following intermittent hemodialysis (HD). We describe a case of DDS-induced cerebral edema that resulted in irreversible brain injury and death following acute HD and review the relevant literature of the association of DDS and HD.

- **Case Presentation**
- A 22-year-old male with obstructive uropathy presented to hospital with severe sepsis syndrome secondary to pneumonia. Laboratory investigations included a pH of 6.95, $PaCO_2$ 10 mmHg, HCO_3 2 mmol/L, serum sodium 132 mmol/L, serum osmolality 330 mosmol/kg, and urea 130 mg/dL (46.7 mmol/L).

CONCLUSIONS

- Death is a rare consequence of DDS in adults following HD. Several features may have predisposed this patient to DDS including: central nervous system adaptations from chronic kidney disease with efficient serum urea removal and correction of serum hyperosmolality; severe cerebral intracellular acidosis; relative hypercapnea; and post-HD hemodynamic instability with compounded cerebral ischemia

- **Abstract**
- **Concern of patient on dialysis**
- **Authors:** Stavroula Gerogianni “Alexandra” Hospital,Dialysis Unit,Athens Greece

- Background: Chronic Renal Failure (CRF) is a public health problem that has serious impact on mental and psychological health of patients undergoing haemodialysis

- **Material**-The sample study included 100 patients undergoing haemodialysis in four hospitals in Athens. Data was collected by the completion of a questionnaire KDQOL-SF, incorporating the tool overview of the SF-36. Health and an additional questionnaire that included demographic characteristics. Literature review was based on studies, reviews and articles derived from international and Greek data bases

- **Results**: The average number of participants was between 50 to 59 years old, with a rate of 69% being male and 31% women. Psychological disorders appeared to affect the population of patients at a large extent, with a sample rate feeling lack of rest (43.8 %), lack of joy (41.1 %), feeling tired (41.8 %) and irritability (37.5 %). The main stressor for these patients was the disease itself (41.7 %), dietary restrictions (25 %), restriction of fluid intake (32.7 %), decreased ability to travel (29.5 %), anxiety and sleep disorders

- The sexual life (59.8%) and appearance (57.7 %) did not concern all participants.
- Decreased physical function was shown by spending less time for activities (53.8 %), difficulty in performing work (51.6 %) and making fewer activities than they would like (62.8 %). Conclusions: Specific variables, such as age, gender, frequency and duration of dialysis, education, physical functioning, mental health and effects of the disease can affect either positively or negatively the quality of patients' life.

- Conclusion-

  Dialysis is a technique in which substances move from the blood from semi permeable membrane and into a dialysis solution. It is of two types

  1.peritoneal dialysis

  2.hemodialysis

SUMMARY-

1. Kidneys
2. Dialysis
3. Types
4. Methods of circulatory assess
5. Day to day care of access site
6. Hemodialysis disequillibrium syndrome

QUESTIONS

WHAT ARE THE TWO TYPE OF DIALYSIS?

- 1 hemodialysis
- 2. peritoneal

- Diffusion works from the area of _____to area of _____ concentration?

- And- high to low.

- Peritoneal dialysis is further divided into _____ subtypes?

- Ans – 3.