

The Technique of Peritoneal Dialysis

Peritoneal Dialysis is a simple and safe procedure, and serves as a useful adjunct to the treatment of patients suffering from acute renal failure. It is specially useful in infants and children where haemodialysis is technically difficult. In this article, Miss SATINDAR MATHARU, Sister-in-Charge, Artificial Kidney and Renal Transplant Unit, PGI, Chandigarh, writes all about Peritoneal Dialysis.

RENAL failure is no more an 'un-treatable' disease. With the advent of various dialysis procedures and kidney transplantation, many a patient with end-stage renal failure are now able to lead a useful normal life.

When the kidneys fail, many toxic products which are formed during the normal metabolism get accumulated in the body, leading to various chemical and bio-chemical abnormalities. Dialysis is the procedure by which undesirable substances from the body are removed by a process of diffusion between the blood and the dialysis fluid across a semipermeable membrane. It can be either extracorporeal or intracorporeal. In the former case, an artificial kidney machine is used and a cellophane or a cuprophane membrane acts as a semi-permeable membrane, while in the latter case, the peritoneum itself acts as the semi-permeable membrane. This procedure is known as Peritoneal Dialysis.

The first peritoneal dialysis was performed in 1877¹ by Wegner and then in 1923 by Gonters² who used this procedure to treat patients with renal failure. Because of refinement of the technique, availability of administration sets and dialysis solution commercially, it has now become a simple and effective means for treating renal failure and a variety of other conditions.

Material and Method

At the P.G.I., Chandigarh, the peritoneal dialysis is performed with the locally improvised polythene catheters about 40 cms. long. The catheter has small holes of the size of 1-2 mm drilled in the distal 10-12 cms., each at a distance of 4-5 cm. The composition of the dialysis fluid used is as follows:

Sodium Chloride	130 mEq/L
Potassium Chloride	2 mEq/L
Magnesium Chloride	1 mEq/L
Calcium Chloride	2 mEq/L
Acetate	35 mEq/L
Dextrose	1.5 Cms%.

The composition is changed as and when required depending upon the bio-chemistry of the patient. In patients having overhydration or congestive heart failure, the osmolality of the dialysis solution is increased by using 4.5 per cent dextrose in place of 1.5 per cent and thus extracellular fluid is more rapidly removed from the patient. In patients with severe hyperkalaemia dialysis is done with potassium free solution. In patients with hypokalaemia, potassium level of dialysis solution is kept at 4 mEq/L.

Indications for Dialysis

The main indications for peritoneal dialysis are:

1. Oliguria or anuria for over 4-5 days;
2. Blood urea more than 150-200 mgm%;
3. Hyperkalaemia with K more than 6.5 mgm/L;
4. Severe hyponatraemia, hypokalaemia or acidosis;
5. Convulsions, coma, and pericarditis associated with uraemia;
6. Dialysable poisons, e.g., barbiturates, alcohol, etc;
7. Resistant congestive cardiac failure and pulmonary oedema;
8. Peritoneal dialysis is preferable in children since haemodialysis is technically difficult.
9. In cases of chronic renal failure awaiting renal transplant survey.

Technique

Peritoneal dialysis is done under strict aseptic technique like any other surgical procedure and the patient is nursed in a room where all the precautions for barrier nursing are taken.

Preparation of the Patient

Before starting the dialysis the procedure is explained to the patient (if he is conscious) or to the relatives, and their consent is taken. Abdomen is shaved and prepared. Bladder should be emptied. Predialysis weight and blood samples for bio-chemical estimation are taken.

Most of the patients do not require any sedation. In an unduly agitated or apprehensive patient, 50 mgm of phenergan or 2 grains of phenobarb may be given intramuscularly before starting the procedure.

Procedure

With all aseptic precautions and after giving local anaesthetic, the peritoneal catheter is introduced into the peritoneal cavity with the help of a trocar and cannula about 2-4 cms. below the umbilicus. A small

incision can be made for easy insertion of the trocar. Two litres of dialysis solution (this amount of fluid can be decreased to 150-200 mls in case of infant and children) is run through this catheter using an ordinary blood transfusion set. This catheter is kept in position with a skin stitch and dressing. The fluid is allowed to remain in the cavity for about 30-40 minutes and then drained off into a calibrated container *via* the drainage tube. The same cycle is repeated for 12-36 hours depending upon the clinical status and blood biochemistry report of the patient. This procedure can be repeated every second or third day if required.

Completion of Dialysis

When the procedure is over, the catheter is removed from the peritoneal cavity. A skin stitch is given if required and the skin opening is sealed with dressing.

The fluid may be sent for culture from the tip of the catheter to know about any contamination if present. Post-dialysis weight and blood samples for bio-chemical estimation are taken. The fluid retained or lost is calculated by carefully measuring the quantity of dialysis solution introduced in each exchange with total quantity removed, at the end of dialysis to avoid any overhydration or excessive dehydration.

During Dialysis

1. Patient is kept in a comfortable position.
2. Blood pressure, pulse, respiration and all other vital signs are checked frequently and recorded.
3. A careful dialysis record noting exact time of starting and ending of each exchange, quantity of fluid administered and removed in each exchange, and drugs given is maintained.
4. Patient can take his prescribed diet and medicines.
5. Strict intake and output chart is maintained.

Complications and Management

1. The most frequent but minor hazards are abdominal pain and discomfort. This may be relieved by putting the patient in a comfortable position and giving him analgesics if the pain is severe.
2. Mild bleeding may occur from the puncture site giving rise to haemorrhagic dialysate. Usually, it subsides after few exchanges, but sometimes it may be severe enough requiring blood transfusion. An attempt should be made to find out if any small vessel has been cut and this may require ligation.
3. Drainage may be unsatisfactory due to kinking or faulty positioning of the catheter and may require correction. Sometimes it may be necessary to reposition the catheter or to insert a new one.
4. Sometimes the recovery of the fluid is incomplete. In such cases hypertonic dialysis solution with 4.5 per cent dextrose may be used for a few exchanges until fluid balance is restored. Uncorrected fluid retention can lead to pulmonary oedema.

5. If strict aseptic measures are not taken, it can lead to peritonitis.

6. Loss of proteins and aminoacids is an important drawback of this procedure. Therefore, these losses should be replaced by adequate oral intake of proteins.

7. Cardiac arrhythmias may develop if potassium is too rapidly removed from patients on digitalis. In such patients who are on digitalis therapy and have a normal serum potassium level, dialysis should be done with dialysis solution containing 3-4 mEq/L of potassium and not with potassium free solution.

8. Dialysis with hypertonic solution containing 4.5 per cent or 7 per cent dextrose can lead to hyperglycaemic coma resulting from excessive absorption of glucose. Frequent check up of blood sugar level and administration of soluble insulin may be required for management of such cases.

Conclusion

Peritoneal dialysis is a simple and safe procedure, and serves as a useful adjunct to the treatment of patients suffering from acute renal failure. It is specially useful in infants and children where haemodialysis is technically difficult. Further, it may be life saving in cases of resistant congestive cardiac failure with pulmonary oedema where diuretic therapy has failed. The procedure can be organised even in a small hospital.

References

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