CHAPTER 188

Nursing and Procedure Issues in Peritoneal Dialysis

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OBJECTIVES

This chapter will:
1. Describe the role of peritoneal dialysis in management of acute kidney injury (AKI).
2. Describe the procedure for performing acute peritoneal dialysis (PD) in management of AKI.
3. Discuss the role and importance of nursing team in acute PD.

The use of peritoneal dialysis (PD) remains relevant in the setting of acute kidney injury (AKI), particularly in the developing world.[1] Various techniques of continuous PD are described in the literature. PD is a continuous form of renal replacement therapy and remains relevant in many situations such as lack of infrastructure for hemodialysis, hemodynamically unstable patients, in patients with marked cardiac dysfunction, in major calamities, and in seropositive individuals.

PROCEDURE

PD is indicated for any patient needing renal replacement therapy (RRT). It is contraindicated in patients who have undergone recent abdominal surgery or are suffering from any acute abdominal illness. It is relatively contraindicated in patients with deranged coagulation profile or in the presence of abdominal hernia. In acute setting, PD can be performed using Tenckoff's catheter placed by percutaneous method, as in urgent-start PD. It also can be performed with a rigid catheter, described as acute intermittent PD (AIPD) in developing countries such as India. Steps of performing PD catheter placement are similar in both the methods:
Step 1: Preparation of the abdomen
Step 2: Creating ascitis
Step 3: PD catheter placement
Step 4: Dialysis exchanges

Step 1: Preparation of the Abdomen

Preparation of the abdomen involves shaving of the abdomen to clip abdominal wall hairs. The skin of all patients should be cleaned with chlorhexidine or povidone iodine. The abdomen should be draped properly to maintain sterility.

Step 2: Creating Ascitis

Creation of ascitis is an important step in placement of PD catheter for acute use. Ascitis is created using a 16- or 18-gauge needle inserted at a site along the linea alba about 2 cm beneath the umbilicus. The other sites are

McBurney's point on the right side or similar position in left iliac fossa. The priming needle then is connected to the intravenous transfusion set. Ascitis can be created using a normal saline or PD fluid. Approximately 50 mL/kg of fluid is instilled in the peritoneal cavity. The free and continuous flow of fluid through the drip chamber is a reasonably reliable indicator of fluid flowing in the peritoneal cavity. One has to be mindful and careful about puncturing bowel loops or urinary bladder by puncturing needle.

Step 3: Peritoneal Dialysis Catheter Placement

Techniques to place soft and rigid PD catheters are different, and we will discuss them separately.

- Placement of Tenckoff or similar soft catheter for urgent-start PD: A guidewire is pushed through the needle used for creating ascitis. Serial dilators available in catheter set are passed to dilate the track. A big-bore dilator with a peel-apart sheath then is placed, and the PD catheter then is passed through the peel apart sheath. The sheath is torn apart gradually as the catheter is placed in peritoneal cavity. The inner cuff is placed at the rectus sheath. A subcutaneous tunnel then is created under local anesthesia, an exit site is chosen, and a small cut is made at the proposed exit site. The PD catheter is passed through the subcutaneous tunnel to be exteriorized from the exit site. The entire procedure is carried out under the fluoroscopic guidance.
- Placement of a rigid PD catheter: A typical commercially available PD catheter set includes PD catheter with stylet, a stab, and a connector tube. After creating ascitis, the PD catheter is mounted with the stylet inside the catheter and its sharp tip protruding out. The sharp tip of the stylet is placed at the site of puncture of priming needle. The abdominal wall is pierced with screwing movement. The sharp tip of the stylet is withdrawn slightly as peritoneal cavity is reached. The PD catheter with the stylet then is directed toward pelvic cavity. The stylet is removed after the PD catheter is placed properly. The connector tube then is connected to the external end of the PD catheter. The catheter is anchored to the abdominal wall by way of a purse-string suture put around the bead on the PD catheter. The connector tube is now attached to a three way connector, and PD exchanges are carried out.

Step 4: Peritoneal Dialysis Exchanges

PD exchanges in urgent-start PD are performed with the help of cycler. Typically, 1000-mL exchanges are performed with an exchange time of 1 hour. Incremental exchanges with prolonged dwell time and increased volume are performed if the patient is tolerating the procedure well.

A similar principle is followed in AIPD. A typical exchange has 10 minutes inflow time, 35 minutes of dwell time, and 15 minutes of outflow time. The role of PD nurse is critically important in this situation.

In general, PD with soft catheter has many advantages over AIPD. However, in resource-constrained settings, rigid catheters may still be used.

NURSING ISSUES IN PERITONEAL DIALYSIS

Nurse has a critical role in management of acute PD, especially in AIPD. Patients need very close monitoring for mechanical, infective, and therapy-related issues. A nurse has to be watchful for inflow failure, outflow failure, or leak at PD catheter at entry or exit site. In AIPD, an hourly chart of net ultrafiltration has to be maintained. A nurse also has to be watchful about infective complications of PD. Initial hemorrhagic drain in acute PD is managed with the help of rapid exchanges and addition of heparin to PD fluid. However, persistent discoloration may be a sign of peritonitis. PD fluid may be added with hypertonic dextrose to improve ultrafiltration and with potassium chloride injection to avoid hypokalemia. Some authors have described use of vasodilators such as verapamil, diltiazem, and sodium nitroprusside added to PD fluid to improve solute clearance in AIPD.[2,3]

REVIEW OF LITERATURE

The use of PD for treatment of AKI was widespread until the advent of extracorporeal blood therapies in an unstable patient.[4] A review of current literature shows reports of declining PD use in AKI.[5] However, this may not be a true reflection because the use of PD remains widespread in developing countries and may be the only available option. In developed countries, it has a role in the event of large-scale calamities. Large number of casualties coupled with infrastructural damage can overwhelm the available healthcare facilities. PD can be useful because it is technically simple and does not have infrastructural requirements such as electricity and municipal water supply.[6–8]

However, there are certain limitations for use of PD for AKI. Inadequate efficacy of small solute clearances, especially in hypercatabolic patients, and unpredictable ultrafiltration volumes are two important issues.[9,10] The study by Phu et al. demonstrated higher mortality and higher cost per survivor with the use of PD compared with venovenous hemofiltration.[11] On the contrary, Gabriel et al. in Brazil found no mortality differences between PD and hemofiltration and demonstrated a shorter time to recovery of renal function with PD.[12,13]

CONCLUSION

This chapter describes the role of PD and related procedures in AKI. It can be used in a selected group of patients with comparable clinical outcomes. The success of the procedure depends largely on active participation of nursing team in association with the medical team.

Key Points

1. The application of peritoneal dialysis (PD) in acute kidney injury (AKI) patients requires significant team organization.
2. The role of nephrology and critically ill nurses in all the phases of urgent PD administration

(preparation of the material, placement of PD catheter, PD start, PD maintenance) is fundamental.
3. In critically ill AKI patients on PD, maintaining sterility and timely reporting of alert signals are the most important nursing issues.

Key References

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A complete reference list can be found online at ExpertConsult.com.

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