Advances in Regular Dialysis Treatment for Chronic Renal Failure: a Permanent Peritoneal Dialysis Catheter and an Automatic Hospital or Home Peritoneal Dialysis Machine

HAROLD P. McDONALD, Jr.
State University of New York, Downstate Medical Center,
Brooklyn, New York, U.S.A.

Satisfactory treatment of patients with chronic renal failure by repeated peritoneal dialysis requires the development of a bacteriologically safe access to the peritoneal cavity, an inexpensive sterile dialysate supply, and an automatic fluid delivery-withdrawal machine suitable for unattended home use. We are presently working on the development of an automatic peritoneal dialysis machine (McDonald, 1969) that will make sterile dialysate by Millipore filtration, deliver and withdraw the dialysate, and monitor the net fluid balance with suitable controls and alarms. Over the past 18 months Silastic peritoneal dialysis catheters with Dacron cloth skirts and sleeves (McDonald et al., 1968) have been inserted into patients with chronic renal failure for twice weekly peritoneal dialysis treatment. Three patients have had functioning catheters for over one year. The following percutaneous catheter insertion technique has been used exclusively for the past nine months without difficulty or complication.

PERCUTANEOUS CATHETER INSERTION TECHNIQUE

The abdomen is prepared and draped as for an abdominal operation. The site for the catheter placement is selected either (1) lateral to the umbilicus or (2) midline just below the umbilicus. The skin and subcutaneous tissue at the proposed catheter site is infiltrated with 1% lidocaine. A transverse skin incision is made just sufficient to accommodate the 26F (French) Campbell trocar. With a small haemostat an adequate subcutaneous space is created around the skin incision for the catheter skirt to lie freely.

The peritoneal cavity is filled with $\text{CO}_2$ at 30 cm/$\text{H}_2\text{O}$ pressure through a temporary peritoneal dialysis catheter or through a pneumoperitoneum cannula. (A Malmstrom automatic pressure regulator is helpful in filling the abdomen with $\text{CO}_2$). The Campbell trocar is then inserted gently into the peritoneal cavity (Figure 1). Two towel clips in the skin around the trocar
Figure 1. The 26F Campbell trocar is inserted into the peritoneal cavity that has been filled with CO₂, via a temporary peritoneal catheter.

Figure 2. The obturator is removed.
Figure 3. The permanent Silastic peritoneal dialysis catheter with Dacron cloth skirt and sleeve is inserted through the side groove of the trocar.

Figure 4. The trocar is removed and the Dacron cloth skirt is fashioned to rest in the previously dissected subcutaneous space.
can be useful in providing countertraction during insertion of the trocar. The trocar obturator is removed (Figure 2) and the CO₂ can be heard escaping from the peritoneal cavity.

The Dacron sleeve on the catheter is trimmed to approximately the thickness of the abdominal wall. The catheter is then inserted through the side groove of the trocar sheath into the peritoneal cavity (Figure 3). The trocar is removed and the Dacron skirt is positioned in the previously dissected subcutaneous space (Figure 4). One nylon suture is used to close the skin around the catheter. Antibiotic ointment is used around the catheter exit site for the first two weeks after insertion.

Some peritoneal dialysis each day for the first two weeks is helpful in preventing the omentum from adhering to the catheter. At the completion of each of these dialysis periods 300 to 500 ml dialysate is left indwelling. Sterile technique is used in connecting the dialysis tubing to the catheter. A sterile rubber cap is placed over the end of the catheter between dialyses.

Tissue ingrowth into the Dacron cloth secures the catheter into position and creates a tissue seal around the catheter to prevent infection. We have had only one infection around a catheter that had been in for more than a few weeks. This infection originated deep in the abdominal wall a few days after the patient had a tooth extraction. Occasionally omental adhesion to the catheter prevents dialysate outflow. The catheter is freed from the adhesion by blunt finger dissection through a small abdominal incision separate from the catheter site.

The peritoneal dialysis catheter is available from Cutter Laboratories, Berkley, California, USA.

REFERENCES