Repeated peritoneal dialysis

Facilitation by a simple access device

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Repeated peritoneal dialysis can be a suitable alternative to hemodialysis for selected patients with end-stage renal failure. The procedure is often used for diagnostic evaluation and as a holding procedure before hemodialysis or renal transplantation or both. Percutaneous insertion of a dialysis catheter is uncomfortable and therefore is a limiting factor to patient acceptance of the procedure. Catheter insertion can be dangerous for the unconscious patient, or even for a patient with a soft, flabby abdominal wall. In inexperienced hands a major complication has been inadvertent perforation of the bladder or bowel during insertion and positioning of the catheter. To obviate some of these difficulties, we use a plastic peritoneal replacement prosthesis to make and maintain a fistulous tract in the abdominal wall between peritoneal dialyses.[1, 2] The device is a semi-rigid Teflon bar connected to a mesa-shaped Teflon disc head (*Fig. 1*). A model presently available is a one-piece molded unit of polyethylene. A similar device of soft silastic requires a stylet to keep the silastic shaft rigid during insertion. The diameter of the bar is similar to that of commercially available No. 11 French dialysis catheters.

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A peritoneal replacement prosthesis has been used to maintain easy access to the peritoneal cavity for repeated dialyses in 14 patients with chronic, end-stage renal failure. All were undergoing evaluation in preparation for renal transplantation or were awaiting home dialysis training. The prosthesis has been inserted after 371 peritoneal dialyses and left in place for a total of 2,372 days (*Table 1*). All patients had at least 16 dialyses and three patients had more than 40 dialyses each. Ten patients had no significant peritoneal infection; eight episodes of peritonitis were observed in the remaining four patients.

Method

The initial peritoneal dialysis is accomplished in the usual manner with a commercially available catheter with stylet.[3, 4] At the completion of dialysis, dressings are removed and the area around the catheter is cleansed. The catheter is partly withdrawn and gently moved back and forth, making certain that it has not adhered to intra-abdominal structures during dialysis.

The plastic bar of the prosthesis is coated with a film of antibiotic ointment which lubricates the prosthesis during insertion and provides an antibacterial seal for the catheter tract. The patient is cautioned to lie still while the catheter is completely withdrawn, and the prosthesis is immediately inserted along the catheter tract. A small amount of antibiotic ointment is placed beneath the head of the prosthesis which is advanced flush to the skin. It is stabilized with a Telfa-coated 3″ × 4″ sterile dressing held in place by paper tape. For the next dialysis the procedure is reversed. The

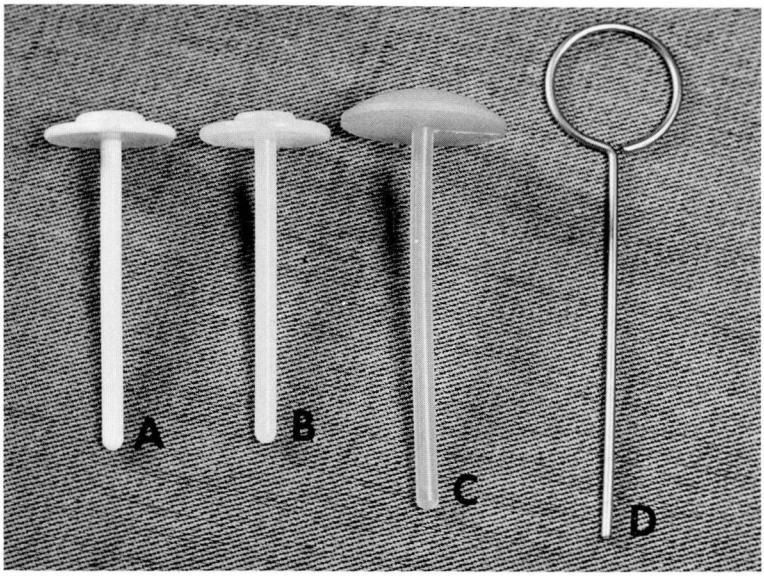

Fig. 1. (A) Deane peritoneal prosthesis, made of Teflon, consisting of tubular shaft attached to a mesa-shaped head. (B) Later model of the Deane prosthesis, a one-piece molded unit made of polyethylene. (C) Peritoneal replacement prosthesis made of silastic. The shaft is hollow and kept rigid by (D) a metal obturator during insertion.

entire procedure is easily performed by paramedical personnel.

It is important to have the prosthesis ready for immediate insertion when the catheter is withdrawn from the abdominal wall, and the patient must be cautioned to lie still with the abdominal wall relaxed during the procedure. Any undue delay between catheter removal and insertion of the prosthesis, or movement of the patient during this time may result in a shifting of tissue planes and loss of the catheter tract. If the catheter tract is lost it is impossible to insert the prosthesis without creating a new tract through the abdominal wall. If the prosthesis is to be left in place for more than 4 days between dialyses, the patient is instructed to change the dressing and cleanse the abdominal wall around the head of the prosthesis with an antiseptic solution. After suitable cleansing, a sterile dressing is replaced over the prosthesis and taped in place. A fresh seal of antibiotic ointment may be placed beneath the head of the prosthesis just before the sterile dressing is applied. Patients who are dialyzed twice a week need not give any particular care to the prosthesis other than keeping it covered with a clean dressing. If a dressing is not taped over the prosthesis between dialyses the prosthesis may be dislodged by coughing, clothing changes, or any undue activity.

Results

Peritoneal replacement prostheses have been left in place for a total of 2,372 patient days. The most significant complication of peritoneal dialysis is bacterial peritonitis. In this study, ten patients remained free of any significant peritoneal infection; eight episodes of peritonitis were observed in the remaining four patients (*Table 1*).

Peritoneal infection was considered

Table 1.—Catheter replacement prosthesis for repeated peritoneal dialysis

Pt.	Age/sex	Dialyses, number	Prosthesis, days	Peritonitis	
				Dialysis, number	Organisms
1	15 F	16	83	—	—
2	34 M	17	97	—	—
3	15 M	18	58	—	—
4	55 M	19	97	8	*P. mirabilis*
5	22 M	20	58	—	—
6	46 M	21	130	5	Nonhemolytic Strep.
7	27 F	21	178	—	—
8	37 M	22	185	11, 14, 15, 19, 20	*Ser. marcescens*
9	29 M	22	147	—	—
10	54 M	29	192	24	α-hemolytic strep.
11	20 M	32	202	—	—
12	48 F	42	278	—	—
13	56 F	45	410	—	—
14	21 F	47	257	—	—
Total		371	2,372	8	

significant when positive cultures were obtained in conjunction with abdominal tenderness or fever, or both, occurring during dialysis or within 24 hours after dialysis. It should be noted that prophylactic antibiotics were not used during the course of the study. Cultures were routinely collected from the first and last drainage cycles, at any time during dialysis that a change in character of fluids was observed, or when the patient complained of abdominal discomfort. The pattern of cultures obtained during serial dialyses will often predict the likelihood of subsequent significant peritonitis, thus allowing institution of suitable prophylactic antibiotics. For example, *Table 2* demonstrates the pattern of cultures noted in patient 13, who had a total of 45 dialyses over a period of 7½ months. Positive cultures were obtained from 12 of 45 dialyses in this patient; organisms cultured were coagulase negative staphylococci, or diphtheroid bacilli. There were no associated symptoms of fever or abdominal tenderness and no changes in the character of dialysate drainage. Antibiotics were not administered to this patient at any time during peritoneal dialysis.

In contrast, patient 8 had five episodes of peritonitis recorded during 22 dialyses (*Table 3*). During the early dialyses, coagulase negative staphylococci were cultured; no symptoms were recorded. *Serratia marcescens* was cultured from dialysis 10, but no symptoms were recorded. Symptoms were first noted during dialysis 11, when abdominal tenderness prompted the addition of 25 mg/liter ampicillin to the dialysis solutions. Antibiotics were not administered parenterally at this time or after dialysis. *Serratia marcescens* was again cultured during dialysis 13, at which time no symptoms were recorded, but dialyses 14 and 15 were associated with symptoms suggesting peritoneal infection. Despite treatment with chloromycetin at this time, cultures remained positive and symptoms recurred with dialyses 19 and 20. It has been our experience in similar situations that the same organisms can usually be cultured from the sinus tract, and eradication of the source of infection may be difficult un-

Table 2.—Pattern of cultures observed in patient 13 (45 dialyses, 410 prosthesis days)

Dialysis, number	Organism cultured	Symptoms	Treatment
3	Coag. neg. staph.	None	None
6	Coag. neg. staph.	None	None
11	Coag. neg. staph.	None	None
12	Coag. neg. staph. Diphtheroid bacilli	None	None
13	Coag. neg. staph.	None	None
15	Coag. neg. staph.	None	None
20	Coag. neg. staph.	None	None
21	Diphtheroid bacilli	None	None
22	Coag. neg. staph.	None	None
25	Coag. neg. staph.	None	None
27	Coag. neg. staph.	None	None
38	Coag. neg. staph.	None	None

Table 3.—Pattern of cultures observed in patient 8 (22 dialyses, 185 prosthesis days)

Dialysis, number	Organism cultured	Symptoms	Treatment
2	Coag. neg. staph.	None	None
5	Coag. neg. staph.	None	None
6	Coag. neg. staph.	None	None
7	Coag. neg. staph.	None	None
10	*Ser. marcescens*	None	None
11*	*Ser. marcescens*	Abdomen tender, afebrile	Ampicillin (fluids)
13	*Ser. marcescens*	None	None
14*	*Ser. marcescens*	Abdomen tender, afebrile	Chloromycetin (postop.)
15*	Sterile	Abdomen tender, purulent drainage	Chloromycetin (fluids)
16	*Ser. marcescens*	None	None
17	*Ser. marcescens*	None	None
18	*Ser. marcescens*	None	None
19*	*Ser. marcescens*	Abdomen tender, fever	None
20*	*Ser. marcescens*	Abdomen tender, fever	Chloromycetin (fluids) (postop.)

* Significant bacterial peritonitis.

less the sinus tract is allowed to close and a new sinus tract is constructed.

Discussion

Approximately 14% of dialyses in the present study had associated positive cultures. In the majority, the organisms cultured were coagulase negative staphylococci, or diphtheroid bacilli and did not require specific therapy. With the recovery of organisms other than coagulase negative staphylococci or diphtheroid bacilli, a high incidence of infection eventually will be noted, and the prompt addition of prophylactic antibiotics to the dialysate may prevent subsequent symptomatic infections. When positive cultures persist despite adequate prophylactic therapy, the sinus tract should be suspected as the probable source and a new tract constructed.

Other complications of peritoneal dialysis have been significantly reduced by use of the catheter replacement prosthesis. Local anesthesia is usually not required after the sinus tract is developed, and there have been fewer problems with final placement of the catheter and adequate drainage. Bleeding is no longer a problem with catheter placement, and the risk of perforation of abdominal viscera is significantly less because the sharp metal stylet is not required during catheter placement. The replacement prosthesis has been extremely well tolerated; the most notable symptom has been abdominal discomfort at the site of insertion. This can be avoided if the length of the prosthesis shaft is carefully selected to match the thickness of the abdominal wall. If local discomfort persists despite the insertion of a prosthesis with a shorter shaft, symptoms can often be relieved

by exchanging the more rigid plastic prosthesis for a soft silastic prosthesis. Significant skin reactions or cellulitis around the sinus tract have been noted in only one patient in this study. This healed spontaneously when a new sinus tract was established at another site on the abdominal wall.

The ease and safety with which a catheter is placed in an existent fistulous tract allows the entire procedure of peritoneal dialysis to be performed by paramedical personnel, thus saving the physican considerable time. Catheter placement is accomplished by a physician's assistant and the entire dialysis is performed by a practical nurse. The physician is called only if unusual resistance or difficulty is experienced in catheter placement or when drainage difficulties develop during dialysis. The cost of peritoneal dialysis is thus reduced by minimizing the physician's time and by having one paramedical person manage two or more dialyses.

Summary

A peritoneal replacement prosthesis maintained access to the peritoneal cavity in 14 patients undergoing repeated peritoneal dialysis for periods up to 7½ months. This replacement prosthesis simplifies catheter replacement, reduces complications of peritoneal dialysis, and increases patient acceptance of the procedure. Catheter replacement by this method can be performed with ease and safety by paramedical personnel and has proved suitable for patients undergoing repeated dialysis during evaluation or preparation for transplantation, or awaiting home hemodialysis training.

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