



Beth Piraino

FAILURE OF PERITONEAL CATHETER CUFF SHAVING TO ERADICATE INFECTION

Beth Piraino Judy
Bernardini Andrew
Peitzman and
Michael Sorkin

ABSTRACT

Often the catheter is lost when exit-site infections fail to resolve with antibiotic therapy. Excision of the external cuff has been proposed as an alternative to catheter removal. Prospectively we recorded the results of 22 cuff-shaving procedures and all subsequent CAPD-related infections. After the cuff shaving we encountered six dialysate leaks, which resulted in catheter removal. In 10 other patients, four developed peritonitis, four tunnel infection and two recurrent exit-site infection with the same micro-organism that caused the original exit site infection. Cuff shaving did not decrease the exit-site infection and peritonitis rates. Median catheter survival time after the cuff shaving was 1.5 months (range from 0 to 23 months). In conclusion, cuff shaving often fails to eradicate catheter infection. We need to develop alternative methods for treating and preventing exit-site infections.

From the Departments of Medicine and Surgery, University of Pittsburgh, Pittsburgh, PA. Presented at the Seventh Annual CAPD Conference, Kansas City, Missouri, February, 1987.

Key Words: Peritonitis, Exit-site infection, Cuff shaving, Peritoneal Catheter.

Exit-site and tunnel infections represent a serious threat to the CAPD patient, because they are important causes of peritonitis and catheter loss (1). Often the catheter is removed to resolve a persistent infection (2, 3). However, this requires temporary hemodialysis and a disruption of the patient's life style.

As an alternative to catheter removal many have proposed excision of the infected external cuff (3-6). Early reports were promising but were based on small numbers of patients and provided little or no information on infections subsequent to the cuff shaving (4, 5).

This study was done to determine whether cuff shaving is effective in treating infections and saving peritoneal catheters. We compared infection rates and catheter survival in three groups of patients: (1) those who had the cuff shaving; (2) those with exit-site infections who did not have the cuff shaving; and (3) those without exit-site infections. We found that cuff shaving often does not eradicate catheter infection.

METHODS

Patients and definitions: The study included all patients who underwent peritoneal catheter cuff shaving at Presbyterian University Hospital between August 1983 and December 1985. One patient had cuff shaving on two different catheters; both are included in the analysis. For the procedure we chose: (1) patients with continuous purulent drainage from the exit site resistant to antibiotics and local care, (2) those with recurrent and frequent

exit-site infections due to the same organism, (3) those whose most superficial cuff had become partially extruded, and (4) those with persistent tenderness over the most superficial cuff. Initially, exit-site infections were treated with local care and antibiotics the choice of which was dictated by the results of culture. The two most common regimens used were oral cephalexin or intraperitoneal vancomycin for a minimum of 10 days. Antibiotics were continued for a longer period if signs of infection persisted. A subsequent exit-site infection was counted as a separate episode if the patient had been off antibiotics for at least two weeks, and if, in the interval, the exit site appearance had returned to normal.

To gain additional information about the natural history of catheter infections, we defined three groups of patients. Group 1 consisted of 21 patients who had cuff shaving on 22 catheters. Concurrent CAPD patients, (Table I) were matched with Group 1 patients by age, sex, and length of time on CAPD as of February 1, 1986. Group two consisted of 16 patients who had 25 peritoneal catheters, which were affected by exit-site infections(s); they did not have cuff shaving. The third group, 19 patients, had 19 catheters without exit-site infections.

Catheter Insertion

All patients had standard adult two-cuff chronic Tenckhoff catheters. All had been inserted by surgeons, generally using a paramedian incision. Tunnel direction was variable and individualized for each patient, based on his or her anatomy and previous incisions.

TABLE I: Comparison of Three Groups of Patients

	GROUP 1: CUFF SHAVED	GROUP 2: EXIT- SITE INFECTIONS, CUFF NOT SHAVED	GROUP 3: NO EXIT- SITE INFECTIONS
Patients, n	21	16	19
Catheters, n	22	25	19
Mean age, yr	39 ± 13	42 ± 14	40 ± 16
Female, %	71%	69%	67%
White race, %	90%	88%	100%
Mean time on CAPD, mo.	24 ± 12	29 ± 14	21 ± 11
Exit site infection rate, episodes/yr	2.4*	1.2	0
Peritonitis rate, episodes/yr	1.1*	1.0	0.4

*Before the cuff shaving procedure.

The Cuff Shaving Procedure

The surgical procedure was as follows. Under gentle traction, the superficial cuff was externalized. If necessary, under local anesthesia, after enlarging the exit site, the cuff was freed from the surrounding tissues, by blunt and sharp dissection. A scalpel, applied parallel to the exposed cuff, removed a slice of this; the procedure was repeated until the entire cuff was excised. Obviously infected tissue was debrided. After the shaving, the catheter was allowed to retract into the tunnel. In general, dialysate was left within the abdominal cavity during the procedure. In most cases, antibiotics were administered before and for about one week after the procedure.

Computations and Statistical Methods

Time on CAPD was calculated from initiation of CAPD training to the point dialysis was discontinued or to the end of the study February 1, 1986. Cumulative exit-site infection and peritonitis rates were calculated as the total number of infections divided by total patient years on CAPD. To compare the exit-site infection rates before and after cuff shaving, we counted as an exit-site infection in the post-shaving period, any infection that persisted after the procedure. The results are given as means +/- standard deviation. Life table analyses was used to characterize catheter survival. The SPSS Life Table Program was performed on the University of Pittsburgh DEC 10 computer system. Comparison of catheter survival was done by calculation of the Lee-Desu statistic -a

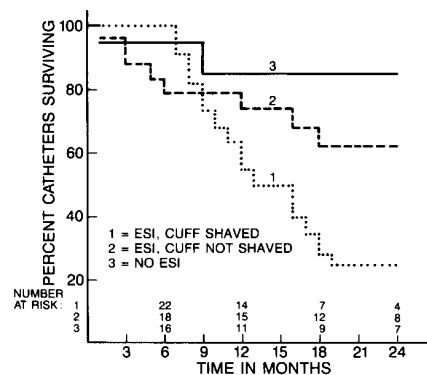


Figure 1. Survival of peritoneal catheters. The difference among the three groups was significant (Lee-Desu statistic = 7.26, d.f. = 2, p = 0.026).

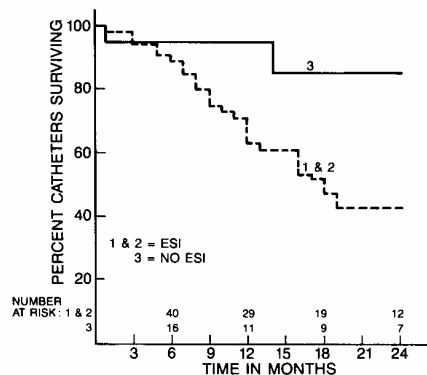


Figure 2. Survival of catheters without exit-site infections was significantly longer than those catheters with exit-site infections (Lee-Desu statistic = 5.32, p = 0.02).

TABLE II: Results of Cuff Shaving Procedures

CATHETER	NO CATHETER USED POST CUFF SHAVING	INFECTION(S) PRESENT AT TIME OF CUFF SHAVING*	ORGANISM PRESENT AT TIME OF CUFF SHAVING	SUBSEQUENT INFECTIONS, ORGANISM	COMMENTS
1	0	ESI, TI, P	<i>S. aureus</i>		immediate leak, catheter removed
2	0	ESI	<i>S. aureus</i>		immediate leak, catheter removed
3	0	ESI	<i>S. aureus</i>		immediate leak, catheter removed
4	0	ESI, P†	<i>S. epidermidis</i> , <i>Streptococcus viridans</i> , diphtheroids		immediate leak, catheter removed
5	0	ESI	<i>P. aeruginosa</i>		immediate leak, catheter removed
6	0	ESI	<i>P. aeruginosa</i> , <i>S. faecalis</i> , <i>S. epidermidis</i> , <i>Enterobacter</i>		immediate leak, catheter removed
7	0.5	ESI	<i>P. aeruginosa</i>	TI; <i>P. aeruginosa</i>	catheter removed
8	0.5	ESI	<i>P. aeruginosa</i>	TI; <i>P. aeruginosa</i>	catheter removed
9	1	ESI	<i>Proteus</i> , <i>Streptococcus</i> , <i>Klebsiella</i> , diphtheroids	None	leak, catheter removed
10	1	ESI	<i>P. aeruginosa</i> , <i>Klebsiella</i> , <i>E. coli</i>	TI; <i>P. aeruginosa</i>	catheter removed
11	1	ESI	<i>S. aureus</i>	TI, P; <i>S. aureus</i>	catheter removed
12	2	ESI	<i>P. aeruginosa</i>	TI, P; <i>P. aeruginosa</i>	catheter removed
13	4	ESI, TI	<i>S. aureus</i> , <i>E. coli</i> ‡	P, <i>E. coli</i>	patient transplanted
14	4	ESI	<i>S. aureus</i> , <i>Proteus</i>	TI; <i>S. aureus</i>	catheter removed
15	5	ESI	<i>P. aeruginosa</i> , <i>Proteus</i>	ESI; <i>Proteus</i>	leak, catheter removed
16	5	ESI, TI	<i>Serratia</i>	P; <i>Serratia</i>	leak, catheter removed
17	7.5	ESI	<i>S. aureus</i>	noner	catheter extruded
18	8	ESI	<i>S. aureus</i>	persistent P; sterile	catheter removed
19	9	ESI	<i>S. epidermidis</i>	TI; <i>S. aureus</i>	catheter removed
20	11	ESI, TI	<i>S. aureus</i>	P; <i>S. epidermidis</i>	catheter extruded
21	14	ESI	<i>S. aureus</i> , <i>Serratia</i>	none	catheter extruded
22	23	ESI	<i>S. aureus</i>	recurrent ESI; <i>S. aureus</i>	catheter extruded

*ESI = Exit-site infection, TI = Tunnel infection, P = Peritonitis

†Peritonitis was sterile

‡*E. coli* and *S. aureus* grown from ESI 2 mo. before cuff shaving; only *S. aureus* grown from ESI at time of cuff shaving.

removed 8 and 9 months, respectively, after the shaving because of infection. The other three catheters (17, 20, 21), eventually were lost because the catheter gradually extruded from the tunnel and "fell out". Median catheter-survival time after cuff shaving was 1.5 months with a range of 0 to 23 months.

The exit-site infection rate was 2.4 episodes/year before the shaving procedure (Group 1) compared to the much lower rate of 1.2 episodes/year in those with exit-site infections not selected for the procedure (Group 2), Table I. The

after shaving was minimally different than that before, and to the rate in those who had exit-site infections but did not have cuff shaving. In addition, the procedure did not lower the high exit-site infection rate seen in these patients .

Removal of the infected cuff did not induce a resolution of any of the infections due to *Pseudomonas aeruginosa*; this finding supports that of Krothapalli *et al* (8) and ourselves (9), namely that *Pseudomonas* exit-site infections frequently are associated with tunnel infections and often require catheter removal. At the present time, the most appropriate management of persistent exit-site infections due to *Pseudomonas aeruginosa* appears to be removal of the peritoneal catheter .

The cuff-shaving procedure also was not efficacious in two patients who had both exit-site infection and peritonitis. Each developed an immediate dialysate leak. Simultaneous occurrence of peritonitis and exit-site infection suggests that the inner cuff is involved. These infections are best dealt with by removing the catheter .

We began the cuff-shaving procedure after it was described by Nichols and Nolph (4) -authors who did not specify the effect of cuff shaving on infection rates and catheter survival. Winchester and Helfrich, who described briefly the results of 12 cuff shavings (5), found that after the procedure only four of 12 catheters required removal for infection. The other eight catheters continued in use after the procedure for one to 13 months. They gave no data on frequency of subsequent infections.

The technique of cuff shaving that we used was similar to that described by Helfrich and Winchester (5), namely the catheter was gently pulled to expose the cuff in most cases. In

1 and 2 combined), Fig 2 (Lee Desu statistic = 5.32, d.f. = 1, p = 0.02). Patients without any exit-site infections had an 85% catheter survival at two years compared to a 42% survival in those with such infections.

DISCUSSION

Some workers recommend removal of the subcutaneous cuff instead of the catheter to eradicate persistent exit-site infections (3-6), but little has been published on the results of this procedure. Prospectively we collected data

addition, as described by Nichols and Nolph (4), we often incised the infected tissue around the catheter exit-site. Several other techniques have been proposed to eradicate exit-site infections (10, 11). Andreoli *et al* described two patients with tunnel infections , who recovered after the tunnel was unroofed by opening its most distal part (10). Roman and Gonzalez replaced part of the catheter in the tunnel by exposing it, splicing it, attaching a new external segment with a connector, and exiting at a new site (11). They carried out this procedure in 12 patients on CAPD, successfully in 5 who continued to use the same catheter for a follow-up period of 1.5 to 20 months (11) .Further studies are needed to determine the efficacy of these various procedures in eradicating catheter infections .

In summary , we found that the cuff-shaving procedure infrequently eradicated the catheter infection and often resulted in dialysate leaks. It was particularly unsuccessful with exit-site infections involving *Pseudomonas aeruginosa*, or when peritonitis was associated with an exit-site infection. The procedure did not produce a significant decrease in exit-site infection or peritonitis rates. Patients with exit-site infections had more than double the peritonitis rate seen in those without exit-site infections, and had shortened catheter survival. We suggest that although exit-site infections cause significant morbidity, the cuff shaving procedure has limited utility. Attention should be directed toward the development of methods to prevent exit-site infections.

ACKNOWLEDGEMENT

We appreciate the assistance of Mrs. Deborah Frawley in the preparation of the

on peritoneal infections before and after 22 consecutive cuff-shaving procedures done over a 27 -month interval on 21 patients. In 27% (6/22) of these the catheter had to be removed immediately after the procedure because a large dialysate leak developed. In 10 of the 16 remaining catheters infection persisted after the cuff was shaved and the catheter had to be removed in eight of these. Only six (27%) of the cuff shavings achieved apparent resolution of the infection, but one of these catheters was lost after only one month because a dialysate leak developed

manuscript and of Mr .William Gilchrist for operating the computer program comparing catheter survival.

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from the exit site. Median catheter survival after cuff shaving was 1.5 months. These data suggest that cuff shaving often fails to eradicate the catheter infection because frequently the inner cuff also is infected. This results in recurrent tunnel infection, peritonitis, and dialysate leaks.

We found that patients with exit-site infections have a markedly shortened catheter survival and a higher peritonitis rate compared with those without such infections. The cuff shaving procedure appeared to have little effect on the peritonitis rate because the rate

