Increase in Peritonitis Rates with the Reuse of Drain Tubing of the Fresenius Liberty Cyclor

Editor:

Given the renewed interest in home dialysis, specifically peritoneal dialysis (PD), emphasis on preventing PD-related infections should be highlighted in continuous quality improvement programs. With the increased availability and use of automated PD (APD), the literature concerning reuse of tubing and cassettes and the association of such reuse with peritonitis has been scarce (1,2). Although reuse of tubing was deemed safe and cost-effective for the Baxter HomeChoice APD machines (Baxter Healthcare Corporation, Deerfield, IL, USA), peritonitis rates were higher, especially with gram-negative organisms (1–5). We report anecdotal evidence from our program that a recent increase in the peritonitis rate was associated with the reuse of drain tubing with the Fresenius Liberty cyclor (Fresenius Medical Care, Bad Homburg, Germany).

METHODS

We conducted a retrospective chart review of all PD patients at the University of Wisconsin PD program who were treated for peritonitis from January 2008 to January 2012. All patients were on continuous cycling PD. We used the Fresenius FITTness software application (Fresenius Medical Care) for the data analysis, and we divided the overall study duration into 3 periods as shown in Table 1. Period 2 was when reuse of the Liberty cyclers drain lines began. Peritonitis incidence rates were calculated per 100 patient-years. Differences between the time periods were evaluated by t-test.

RESULTS

Review of charts showed that most patients with peritonitis were reusing drain lines with the Fresenius Liberty cycler. For period 1 (before the switch to the new cycler), the peritonitis incidence rate was 48.72 per 100 patient-years (1 in 25 months). For period 2, (switch to the new cycler), it was 99.81 per 100 patient-years (1 in 12 months). For period 3 (drain line reuse ended), it was 33.69 per 100 patient-years (1 in 36 months). As Table 2 shows, the incidence of peritonitis increased considerably during the reuse period. Significant increases in the proportions of gram-negative infections (50%) and of fungal peritonitis (18.75%) are also notable. The

gram-negative organisms consisted mostly of *Klebsiella oxytoca*, *Serratia marcescens*, and *Enterobacter cloacae*.

DISCUSSION

The literature on the subject of drain line reuse is scarce. Ponferrada *et al.* (1) reported a cluster of gram-negative peritonitis episodes associated with the reuse of cassettes and drain lines with the Baxter HomeChoice cycler. Chow *et al.* (2) described a case series of 4 patients in which heavy colonization of the waste and residual fluid occurred immediately upon the start of their reuse protocol. Eventually, all 4 patients developed peritonitis with a rapid time course.

Our program also had a policy of reusing drain lines. Reuse had never been an issue with the Freedom or Newton cyclers (Fresenius Medical Care) that had been used previously. The Freedom cycler used drain bags, and the Newton cycler used a drain bag that was then pumped through a drain line. Both cyclers used a gravity system, and the drain line was longer in length. There was no potential for mixing of the fresh and spent dialysate.

With the Liberty cycler, our patients were instructed to change the drain lines weekly, as they had done with the Newton cycler. However, the recommendation from the company is to change drain lines daily. The increase in peritonitis was thought to stem from the fact that Liberty cycler drain tubing is shorter (61 cm) than that in the older APD machines and that it uses pump action rather than gravity. With the pump action, there is a potential for siphoning and mixing of the old and new fluid, creating a potential for the patient's fluid to become contaminated from the reused drain tubing. Because the present work was a retrospective review, we did not take samples of the fluid to prove contamination.

Conversion to the Fresenius Liberty cycler at our unit began in September 2009 and was completed in December 2010. Patients continued to reuse drain lines until April 2011. During that time 21 cases of peritonitis occurred. Those 21 cases occurred in 9 patients, all of whom were

TABLE 1
Time Periods Before, During, and After Reuse of
Cycler Drain Lines

Period 1	Previous cycler; with no reuse of drain lines	January 2008 to August 2009
Period 2	Liberty cycler; with reuse of drain lines	September 2009 to April 2011
Period 3	Liberty cycler; with no reuse of drain lines	May 2011 to January 2012

TABLE 2
Peritonitis Incidence Rates in the Time Periods Before, During, and After Reuse of Cycler Drain Lines

	Events	Patient days	Incidence rate (per 100 patient-years)	p Value ^a (vs period 2)	p Value ^a (vs period 3)
Period 1 (before reuse)	11	8247	48.72	0.05	0.61
Period 2 (during reuse)	21	7685	99.81	—	0.06
Period 3 (after reuse)	3	3252	33.69	0.06	—
Periods 1 and 3 combined	14	10937	46.75	0.03	—

^a Significance set at $p < 0.05$ calculated by t-test.

on APD, and 8 of whom were using the Fresenius Liberty cyclor. The 1 patient not using the Liberty cyclor had 2 episodes of peritonitis: 1 showed no growth on culture, and the other showed a touch contaminant. That patient also had chronic pancreatitis, which led to a permanent change to hemodialysis.

In all the peritonitis episodes, we thoroughly investigated other possible causes, including bowel perforation, constipation, touch contamination, use of hot tubs, exit-site infection (6,7), and so on. Home visits were performed as required by unit policy, and a peritonitis investigation tool that we developed was used to question patients about other possible causes. Age of the patients, time on dialysis, and comorbidities were also considered and were found not to be contributory on multivariable analysis (data not shown). In April 2011, we discontinued the reuse of drain tubing and have since noticed a significant decline in peritonitis rates.

Our study highlights an increased incidence of peritonitis associated with the reuse of drain lines with the Fresenius Liberty cyclor. Reuse of drain lines with a pump system is thought to be associated with an increased rate of peritonitis, presumably through mixing of spent and fresh fluid. For programs looking to increase their PD population, strict infection control policies and procedures should be in place, including investigating sources of contamination and making corrective action plans.

DISCLOSURES

MRC is a consultant for Deltanoid Inc. The remaining authors have no financial conflicts of interest to declare.

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