Long-Term Use of Unidirectional Bacteriologic Filters to Reduce Peritonitis Frequency in CAPD

SUMMARY

We report the long term (up to 24 months) use of a 0.22 μ, 270 cm² membrane bacteriologic filter on the frequency of peritonitis in 33 patients considered to be at high risk for developing peritonitis. The frequency of peritonitis in 20 patients (in 325 patient-months) before the filter was placed was one in 3.38 months, and this was reduced (over 250 patient-months) to one in 5.95 months, a decrease of 49.9% (p < 0.001). In all 33 patients the cumulative probability of peritonitis was significantly reduced and the mean crude incidence (λ) of peritonitis was reduced from 0.265 to 0.134 (p < 0.01). This confirmed that the filter reduced the incidence of peritonitis and that the use of the filter maintained the reduction of peritonitis up to 24 months. Bacteria and spores introduced into dialysis fluid by touch contamination are trapped on the inflow surfaces of the filter, which reduced the probability of peritonitis and drop-outs from CAPD.

INTRODUCTION

Bacterial peritonitis remains the most important complication of continuous ambulatory peritoneal dialysis (CAPD). Mion et al. introduced a bacterial rejecting filter into a large unselected population of patients undergoing intermittent peritoneal dialysis and demonstrated a reduction in the incidence of peritonitis. Additionally, Slingeneyer and Mion have demonstrated that the bacterial rejecting filter could also substantially reduce the incidence of peritonitis in CAPD patients in a largely unselected population of patients. We have previously shown that in a high risk group of patients on CAPD that the short-term use of a bacterial filter substantially reduced the incidence and cumulative probability of peritonitis. The present study extends the experience of long-term use of the bacterial filter between the dialysis bag and delivery line in high risk patients followed for up to 2 years.

PATIENTS AND METHODS

Thirty-three patients (mean age 49.7 ± 14.9 years) considered to be at high risk for developing peritonitis entered the study. Patients were considered to be at high risk of developing peritonitis when they had a frequent history of peritonitis (equal to one episode of peritonitis every 3 months), were visually impaired, or had poor manual dexterity and technique, and the elderly. Twenty patients had a history of frequent peritonitis before the introduction of the bacterial filter and the other 13 patients had entered the study at the same time as they began CAPD. Throughout the study the use of betadine...
spike barriers (wraps) was discontinued in those patients who had used them previous to the study. The bacterial filter was changed every 14 days by nursing personnel using an aseptic technique. The bacterial rejecting filter (Peridex CAPD filter, Millipore Corp., Bedford, MA) is a membrane filter comprising three stacks of double membrane filtering units with support structure. The surface area of the filter is 270 cm$^2$, the filter has an external diameter of 9.3 cm and width of 1.9 cm. By use of one-way check valves the filter is designed to filter inflow fluid and bypass outflow fluid.

An episode of peritonitis was defined as cloudy fluid, greater than 100 WBC/ml of peritoneal dialysate, and/or systemic and abdominal symptoms. Each episode of peritonitis was recorded as were the organisms involved. Peritonitis was treated in a standard manner with oral cephalosporin and intramuscular and intraperitoneal aminoglycoside, increasing the frequency of exchanges to 6/day and changing antibiotics depending on the sensitivity of the microbial species.

The data were analyzed by a modification of the method of Peirratos et al.$^6$, $p = 1 - e^{-\lambda t}$, where $\lambda$ = the crude incidence of peritonitis per month and $t = \text{months at risk}$. The cumulative probability of infection per month was derived from the expression probability ($p$), $p = 1 - e^{-\lambda t}$; the mean $\lambda$ ($\lambda$) was derived after linearization of the probability curves using least squares linear regression analysis derived from the following expression: $\ln(1 - p) = \lambda$. Probability curves were also constructed for visual comparison of patient groups. Statistical comparison of the raw data was made by Mann Whitney "U" test for nonparametric statistics. The probability curves were subjected to linear regression analysis and compared by Fisher F test.

**RESULTS**

The results in terms of peritonitis frequency are shown in Figure 1. In the 20 patients with a previous history of frequent peritonitis (Group I) there were a total of 96 episodes of peritonitis prior to introduction of filter over a cumulative total of 320 patient-months (one episode of peritonitis every 3.38 patient-months). After introduction of the filter, the

![Fig. 1. Frequency of peritonitis before and after use of the bacteriologic filter.](image-url)