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Case Report

Successful use of cytology brush in the treatment of relapsing CAPD peritonitis

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Introduction

Peritonitis is the most important complication of continuous ambulatory peritoneal dialysis [1]. When faced with recurrent episodes of peritonitis, it is necessary to classify these into relapse or reinfection. This distinction plays an important role on the fate of the Tenckhoff catheter but also helps explain the mechanism of recurrent infections and thus make appropriate preventive measures possible. Relapsing peritonitis has graver prognostic consequences than reinfection peritonitis. The cure rate is significantly lower in relapses than in reinfections (22% vs 80%). The catheter removal rate also is higher in relapses than in reinfections (78% vs 10%) [2]. The organisms responsible for relapsing peritonitis may be associated with fibrin within a biofilm on the inner surface of the Tenckhoff catheter. Recently, there are some reports that the addition of thrombolytic agents such as urokinase or streptokinase to appropriate i.p. antibiotic therapy can eradicate the relapsing organisms, but high incidences of side effects were noted including fever, abdominal pain or tenderness, and the onset of turbid dialysis bags [3]. Here, we describe a case of 41-year-old woman with recurrent CAPD peritonitis in which the last three episodes occurred at 1 month intervals. We performed brushing the intraluminal surface of the Tenckhoff catheter (Figure 1) with a disposable cytology brush (BC-15C, Olympus, Japan) (Figure 2) used in the pulmonary department. After brushing the intraluminal surface of the Tenckhoff catheter and antibiotic treatment, the patient did not experience another episode of peritonitis for almost 10 months.

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Case report

A 41-year-old female on CAPD presented with diffuse abdominal pain and cloudy peritoneal dialysate in May 1996. She was first diagnosed with end-stage renal

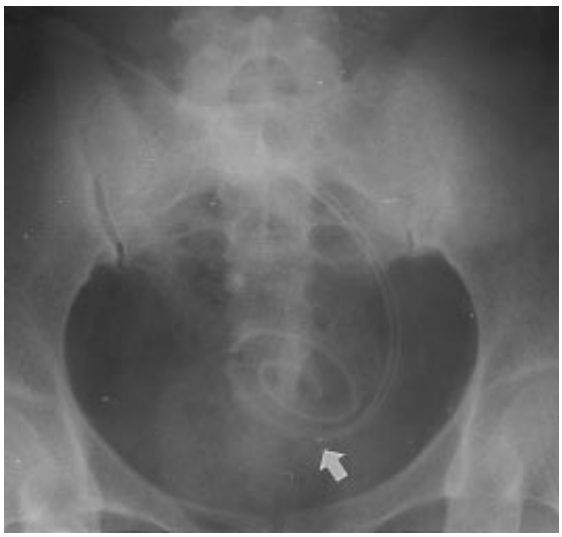

Fig. 1. Plain abdominal film show the bristles of the cytology brush in the curled portion of the Tenckhoff catheter (white arrow).

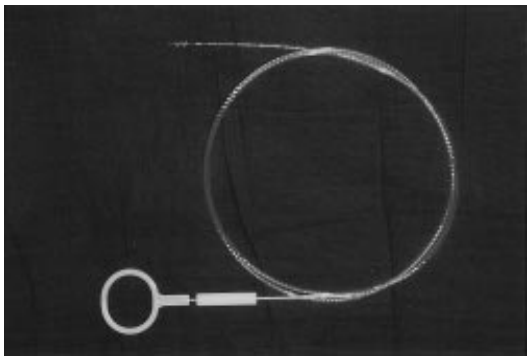

Fig. 2. The disposable cytology brush (BC-15C, Olympus, Japan).

disease in January 1993, possibly secondary to chronic glomerulonephritis. Whilst on CAPD therapy for 3 years, she experienced 11 episodes of peritonitis. The mean interval between each episode was 4.5 months, but the last three episodes of peritonitis (including the current episode) occurred at 1-month intervals. Among these 11 episodes of peritonitis, three were culture-negative and eight were culture-positive. Organisms identified in the dialysate cultures were *Staphylococcus aureus* in three, coagulase-negative staphylococci in two, *Acinetobacter lwoffi* in two, and *Acinetobacter baumanii* from one episode. In the last three episodes of peritonitis, *Acinetobacter baumanii* was cultured in the dialysate once, and no microorganism was found on the two subsequent cultures of dialysate samples taken after antibiotics were started.

On physical examination, the blood pressure was 110/80 mmHg, body temperature 37.2°C, and the pulse rate 82/min and regular. Chest and heart examinations were normal. The exit site was clear and the abdomen was diffusely tender. Laboratory data showed WBC count of 12 100/mm^3 with a differential of 82% polymorphonuclear leukocyte (PMN), 10% lymphocyte, and 5% monocyte. BUN was 62.6 mg/dl, serum creatinine 8.9 mg/dl, total protein 6.9 g/dl, and serum albumin 3.9 g/dl. Microscopic examination of the dialysate revealed a cell count of 725 leukocyte/mm^3. Urinalysis showed protein (2+) and stool occult blood was negative. No microorganism was seen in the concentration smear of the dialysate and the culture of dialysate revealed no growth. Empirical treatment was commenced with i.p. ciprofloxacin and tobramycin, according to the sensitivity of the last cultured *Acinetobacter baumanii*. However, we thought that the recurrent peritonitis might be related to the intraluminal biofilm within the Tenckhoff catheter. So we inserted the disposable cytology brush (BC-15C, Olympus, Japan) (Figure 2) into the Tenckhoff catheter till the tip of brush extended to the distal tip of the catheter and then performed repeated brushing of the intraluminal surface of the catheter (Figure 1). Four days after the commencement of the empirical antibiotic therapy and cytology brushing, the peritonitis was improved and the turbid dialysate also cleared. Since then, the patient has not developed peritonitis from May 1996 to February 1997.

Discussion

Relapsing peritonitis is defined arbitrarily as another episode of peritonitis caused by the same genus/species of organism which caused the immediately preceding episode and occurs within 4 weeks of completion of the antibiotic course [4]. Such relapses often lead to removal and replacement of CAPD catheters and/or alternative renal replacement therapy. Differentiation of relapse from reinfection can only be possible by careful microbiological studies. Relapse may legitimately be considered a failure of the antibiotic treatment in clearing all the infecting organisms [2]. The source of infection is never completely eradicated by the antibiotic therapy thus leading to another episode of peritonitis. In the majority of these cases, no obvious source of infection is found, and often the infection is eradicated only upon removal of the Tenckhoff catheter. The probable cause of relapsing peritonitis is colonization of responsible organisms within the biofilm of the Tenckhoff catheter. The organisms of relapsing peritonitis are liable to adhere, and grow on polymer surfaces, producing an extracellular slimy substance resulting in thick matrix with embedded microbial layers [5–7]. The biofilm is thought to inhibit the chemotactic response of neutrophils, proliferative response of lymphocytes, production of interferon-γ, and opsonization of bacteria [8,9]. Two enzymes, streptokinase and urokinase, have been utilized in the treatment of relapsing peritonitis. Both are considered to cause the conversion of plasminogen to plasmin, which in turn acts upon fibrin resulting in fibrinolysis. The rationale behind the utilization of such enzymatic agents in relapsing peritonitis is that organisms are trapped in fibrin along the peritoneal or intraluminal surface of the catheter. These organisms are then protected from the antibiotic actions and other defence mechanisms [10]. By exposing these organisms to the action of antibiotics, one may improve the cure rate. Previous papers on thrombolytic agent usage have reported not only resolution of relapsing peritonitis [11,12] or catheter malfunction [13–15] with minimal or no adverse reactions but also a 50% cure rate in relapsing peritonitis [3]. Clearly, this therapy would not be of benefit in peritonitis due to resistant bacteria, catheter tunnel infection, or external reinfection secondary to poor sterile technique. However, a high rate of side effects were noted [3]. Streptokinase probably releases a fibrin clot containing bacteria, leukocytes, and debris from the colonized catheter into the peritoneal cavity causing a 'peritonitis-like syndrome' of 1–3 days duration. The most serious side effect was the occurrence of fungal peritonitis occuring 5 days after the first streptokinase instillation [3].

In this case, the unique method of removing the intraluminal biofilm using a cytology brush was met with success. The cytology brush probably removes the intraluminal biofilm of the Tenckhoff catheter and thus reduces the sources of relapsing infection. Although we cannot confirm removal of the biofilm in the Tenckhoff catheter, the clinical response of this patient suggests that brushing intraluminal portion of a Tenckhoff catheter with a cytology brush is useful as an adjunct mode of therapy in the treatment of relapsing peritonitis.

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