Obstruction of Peritoneal Dialysis Catheter by Intraluminal Fungal Particles: An Increasingly Recognized Infection-Related Complication

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Background: Fungal peritonitis is rare but one of the most significant complications in peritoneal dialysis (PD) patients owing to its high rate of morbidity and mortality. Fungal peritonitis is suspected in patients with bacterial peritonitis or receiving antibiotics in the past 3 months. Candida species account for 70-90% of the cases, while the remaining is caused by other fungi. Clinical presentations of fungal peritonitis are indifferent from those of bacterial peritonitis, including abdominal pain, fever, and cloudy effluent. Recently, fungi colonization has been discovered on the internal wall of PD tubing, including Tenckhoff (TK) catheter and transfer set with or without concurrent peritonitis. This finding is not reported in the largest series of fungal peritonitis in PD patients from Hong Kong. A series from Thailand report ten patients presenting with particle-coated PD tubing, all of which are the detection of particles preceded the onset of peritonitis. Majority of cases in the series are caused by filamentous fungi. Moreover, there are a few reports describing the clinically significant obstruction of peritoneal catheter caused by fungal particles of Curvularia species. This rare clinical manifestation of fungal particle-coated PD tubing causing TK catheter dysfunction might represent a specific form of catheter-related complications caused mainly by filamentous fungi.

Objective: We hereby aimed to report another 10 cases of patients in Thailand who experienced TK catheter obstruction by fungal particles.

Methods: In June 2017, a survey was sent to PD centers throughout Thailand, requesting enrollment of patients who had particle-coated PD tubing or fungal peritonitis. Baseline characteristics, clinical manifestations, treatments, and outcomes of all eligible patients were obtained through retrospective review of medical records. This study was approved by the research ethics committee of Chulalongkorn University.
**Results:** Starting from January 2014 to June 2017, we identified ten patients who presented with TK catheter obstruction and positive fungal culture, half of which were males. The mean age of patients was 59.8 (20-86) years. Eight cases performed CAPD, while the other two performed automated PD. Seven patients were diabetic. None of the patients had HIV infection or received immunosuppressive therapy. The mean duration of PD was 42.5 months. All patients had either inflow or outflow problem in the absence of TK catheter migration. Two of them even experienced near-complete occlusion rendering them unable to fill the dialysate. Half of the patients also manifested with clinical syndrome of peritonitis, while the others did not. One patient in non-peritonitis group developed subsequent peritonitis 48 hours later following the milking of PD catheter. Fungal particles of black, brown, or white colors were observed in catheter lumen of eight patients. White blood cell (WBC) count in effluents was markedly higher in the peritonitis group (range 1,180-21,500 x 106 cells/L) compared with the non-peritonitis group (range 0-130 x 106 cells/L). The infection episodes showed no seasonal preference since they occurred throughout the year. History of bacterial peritonitis within the previous 3 months was evident in only two patients. Cultures of drained effluent, TK catheter, and transfer set yielded filamentous fungi in all patients. Aspergillus spp. was the most common etiology (6/10 cases). The rests were caused by Penicillium spp. (2 cases), Curvularia spp. (1 case), and Cladosporium spp. (1 case). All patients received urgent catheter removal at an average of 6.2 (1-13) days after diagnosis of fungal particle-related catheter obstruction or fungal peritonitis. In addition, amphotericin B was administered for 1-2 weeks in eight patients, two of which also received oral itraconazole or voriconazole for another 2-5 weeks. Two patients with peritonitis did not receive any antifungal therapy owing to failure to recognize the presence of fungal infection initially. However, both patients survived the episode of peritonitis reflecting the fact that the peritonitis may cause by bacterial infection superimposing on the fungal colonization observed in the PD tubing. Majority of patients (9/10 cases) were transferred to long-term hemodialysis (HD) except for one patients who could return to CAPD. Four patients died in the following year due to volume overload, stroke, sepsis not related to peritonitis, and undetermined cause, respectively.

**Conclusion:** Careful examination of the TK catheter and transfer set for intraluminal particles is especially advisable in PD patients presenting with flow problem without catheter malposition on plain radiography. Anyhow, the intraluminal particles are not always of fungal origin. The chemical or aseptic black particles containing mixtures of organic and inorganic compounds can also be found in PD tubing. The benign aseptic black particles are hardly distinguishable from fungal particles under gross appearance. Hence, testing PD effluent for components of fungal cell wall, (1->3)-ß-D-glucan and galactomannan, is an appropriate next-step investigation prior to considering TK catheter removal. Milking of the particle-coated PD tubing should also be prohibited because it can dislodge the adherent fungal particles into peritoneal cavity and results in fungal peritonitis.

**Keywords:** Fungal peritonitis, Particles, PD catheter colonization, PD catheter obstruction.