



Fungal peritonitis in continuous ambulatory peritoneal dialysis patients; a study from South of India

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Abstract

Introduction: Fungal peritonitis is a potential life-threatening complication for patients undergoing continuous ambulatory peritoneal dialysis (CAPD).

Objectives: To assess the incidence and outcome of fungal peritonitis in CAPD patients.

Patients and Methods: Dialysis records of all end-stage renal disease patients initiated on CAPD treatment were reviewed retrospectively. The study was conducted during January 2010 to December 2016. Mann–Whitney U test was applied for data analysis.

Results: Out of 265 dialysis patients, a total of 36 fungal peritonitis were recorded. The incidence rate of fungal peritonitis was 13.6%. The majority of cases was affected by *Candida albicans* was 41.6%. Moreover, the major cause of end-stage renal disease (ESRD) in our study was diabetic nephropathy in 38.8% of cases.

Conclusion: In this study, we found initiation of antifungal therapy and early removal of catheter reduced the mortality rate of fungal peritonitis in CAPD patients.

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Introduction

Peritonitis is one of the most frequent complications in patients undergoing peritoneal dialysis and also these patients showed the increased incidence of fungal peritonitis. The incidence of fungal peritonitis infections in peritoneal dialysis patients varies among the centers, with differences in the proportion of episodes and method of treatment in worldwide (1). The majority of the fungal infections were due to *Candida* species (79%) with high morbidity and mortality ranging between 20% and 30% (2). Additionally various non-*Candida albicans* species were also detected in peritoneal dialysis patients (3). The treatment for fungal peritonitis includes fluconazole, amphotericin B and flucytosine, alone or as combination therapy, based on fungal susceptibilities (4). However, these conventional antifungal regimens are disappointing, because it usually leads to removal of catheters or may transfer patients to hemodialysis (5).

Key point

In this study on 265 CAPD patients, a total of 36 fungal peritonitis was recorded. We found initiation of antifungal therapy and early removal of catheter, reduced the mortality rate of fungal peritonitis in CAPD patients.

Objectives

Our study aimed to find the incidence and outcome of fungal peritonitis among the peritoneal dialysis patients.

Patients and Methods

Study population

This retrospective study was conducted at the dialysis center in Sri Ramachandra medical center of Sri Ramachandra University, Chennai, India. This study reviewed the dialysis records of 265 end-stage renal disease (ESRD) patients who shown different etiologies for ESRD and initiated on continuous ambulatory peritoneal dialysis

(CAPD) between January 2010 and December 2016. During the study, demographic characteristics, causes of ESRD, duration of peritoneal dialysis, prior history of fungal or bacterial peritonitis, nature of isolated fungi and clinical outcomes (including mortality, loss of peritoneal dialysis catheter and successful reinsertion of peritoneal dialysis catheter) were collected from the hospital data sheet and analyzed. Using the CAPD fluid and CAPD catheter culturing of peritonitis, the type of fungi was diagnosed. The individuals who had an effluent WBC count of 100/mL or more and differential polymorphonuclear count of more than 50% and also positive culture of fungus were included to the study. Patients with a negative fungal culture were excluded from the study.

Ethical issues

1) The research followed the tenets of the Declaration of Helsinki and its later amendments. 2) Informed consent was obtained; and 3) Permission of the ethical review committee of Sri Ramachandra University, Chennai, India was obtained prior to execution of the study.

Statistical analysis

Parameters were expressed in percentages (%) and mean values \pm standard deviations. Differences between groups were assessed using Mann-Whitney U test. SPSS version 16.0 (SPSS Inc., Chicago, Ill, United States) was applied for the statistical analysis and P value <0.05 were considered to be statistically significant.

Results

For this study a total 265 CAPD patients were included during January 2009 to December 2016. The mean age of study population was 44.5 ± 13.3 years. Among them 36 patients had fungal peritonitis with incidence of 13.6%. The episodes of infections and type of treatment after identification of fungi were documented in Table 1.

The major causes of ESRD in our study were diabetic nephropathy (38.8%). Other causes included chronic interstitial nephritis (27.7%), chronic glomerulonephritis (30.5%) and hypertensive nephropathy (2.7%) (Figure 1). The commonest fungal isolated (Table 1) in our center was candida albicans in 41.6% ($n=15$). Among non-*Candida albicans* species, three episodes were observed due to *Candida tropicalis* (22.2%, $n=8$), whereas two episodes of *Candida parapsilosis* (5.5%, $n=2$) and *Candida glabrata* (5.5%, $n=2$) was detected too. The *C. parapsilosis* was treated with caspofungin while other infected individuals were treated with fluconazole. The *Aspergillus* species are accounts for 16% of cases. Among them, *Aspergillus flavus* in 8.3%, *Aspergillus nidulans* in 5.5%, and *Aspergillus terreus* in 2.7% of individuals was detected. The other species accounts for 8.3% of patients. Among them, *Penicillium* species in 2.7%, *Cladosporium* sp. in 2.7% and *Fusarium* sp. in 2.7% of cases were found. In patients, *A. flavus* was treated with voriconazole. Other infected

Table 1. Types of micro-organisms isolated during 36 episodes of peritoneal dialysis peritonitis and Antifungal treatment

Type of organisms	Number of episodes N=36 (%)	Treatment after organisms identified
<i>Candida</i> species	27 (75.0)	
<i>C. albicans</i>	15 (41.6)	Fluconazole
<i>C. tropicalis</i>	8 (22.2)	Fluconazole
<i>C. parapsilosis</i>	2 (5.5)	Caspofungin
<i>C. glabrata</i>	2 (5.5)	Fluconazole
<i>Aspergillus</i> species	6 (16.0)	
<i>A. flavus</i>	3 (8.3)	Voriconazole
<i>A. terreus</i>	1 (2.7)	Amphotericin B
<i>A. nidulans</i>	2 (5.5)	Amphotericin B
Other Species	3 (8.3%)	
<i>Penicillium</i>	1 (2.7)	Amphotericin B
<i>Fusarium solani</i>	1 (2.7)	Amphotericin B
<i>Cladosporium</i>	1 (2.7)	Amphotericin B

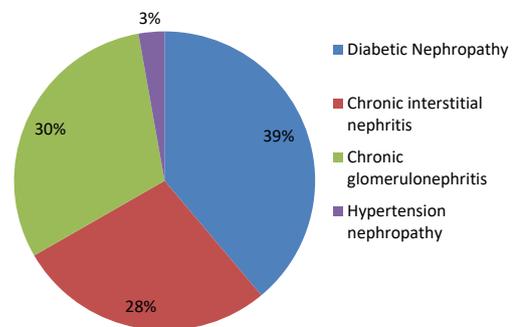


Figure 1. Native kidney disease of studied individuals.

individuals were treated with amphotericin B (Table 1). The CAPD catheter was removed for all the affected individuals. Additionally, the re-insertion of CAPD catheter was conducted for 13.8% ($n=5$) and around 26 (72.2%) patients were continued to be on hemodialysis. Five patients (13.8%) died during the episode of fungal peritonitis (Table 2). Moreover, all the patients in this study had at least a previous episode of bacterial peritonitis. Among them, individuals with two or more episodes (61.0%) of bacterial peritonitis were more prone to fungal peritonitis. Moreover, the mortality by fungal mortality was detected with more than four episodes of bacterial peritonitis. However, none of the study population received antifungal prophylaxis during bacterial peritonitis. These results suggest that more than two episodes of bacterial peritonitis are a risk factor for the development of fungal peritonitis. Based on the duration of peritoneal dialysis, fungal peritonitis was divided into two groups below one year ($n=9$; 25% of cases) and more than one year ($n=27$; 75% of cases). There was no significant differences for age, gender, continuation of hemodialysis, re-insertion of catheter, mortality and infected micro-organisms between the groups was seen (Table 3).

Table 2. Outcome of CAPD fungal peritonitis

Outcome	No. of patients, N=36 (%)
Reinsertion of CAPD catheter	5 (13.8)
Continuation of hemodialysis	26 (72.2)
Mortality	5 (13.8)

Table 3. Baseline clinical characteristics of the two study groups

Characteristics	< 1 year (n = 9)	>1 year (n = 27)	P value
Age (y), mean \pm SD	35 \pm 15	47.4 \pm 11.3	0.054
Gender M/F (%)	7/2 (77%/22%)	22/5 (81.5%/18.5%)	-
Re-insertion of catheter	2	3	0.319
Continuation of HD	6	20	0.378
Mortality	0	4	0.261
<i>Candida</i> species	8	19	0.211
Other species	1	8	0.423

Abbreviation: HD, hemodialysis.

Discussion

In our study, 13.6% of CAPD patients had fungal peritonitis. Among them, the majority of cases were affected by *Candida albicans* (41.6%). Moreover, the major cause of ESRD in our study was diabetic nephropathy (38.8%). However, between the groups there were no significant differences observed for the studied characteristics.

Fungal peritonitis accounts for 3%-6% of patients undergoing peritoneal dialysis (2), while in some centers, the percentage of incidence can be higher (6). In our study fungal peritonitis accounted for 13.6% of all peritonitis episodes. Similarly, the Indian studies conducted by Prasad et al, (6) and Ram et al (7) detected the incidence of fungal peritonitis varying from 14.3% to 23.9%, respectively.

In our study, all 36 cases had prior exposure to antibiotics due to the bacterial peritonitis. In a recent study by Kumar et al, 45% of patients had prior exposure to antibiotics (8). Further studies are also revealed that prior episodes of bacterial peritonitis and exposure of antibiotic therapies are the most important risk factor for the fungal peritonitis. It should be noted that inconsistent incident rate varies from 34% to 80% in studies conducted in different centers (6,9-12). However, patients treated with antifungal prophylaxis during antibiotic therapy had less incident rate of fungal peritonitis (13). The majority of fungal peritonitis is caused by *Candida* species. This accounts for 70%-90% in adults and 80%-100% in the pediatric population (2). In our study we observed *C. albicans* as the most common fungus with 41.6% incidence.

In our center, CAPD catheters are removed immediately after identification of fungi by microscopy or culture then patients are treated with systemic antifungals. In our patients, re-insertion of CAPD catheter was conducted for 13.8% while 72.2% patients were continued to be on hemodialysis. Five patients (13.8%) died during the episode of fungal peritonitis. Similarly a recent Indian study detected the mortality rate of 60.4% when peritoneal

dialysis catheter was left in situ in most of the patients (7). Consistently, various studies indicated that leaving the catheter in situ is associated with greater mortality (6,9,14). However, studies conducted in different centers where they removed catheter are found less mortality rate varying from 5% to 53% (11,12,15).

Conclusion

In conclusion, fungal peritonitis is frequent complications of peritoneal dialysis that associated with morbidity and mortality. In our center, we observed that 13.6% of fungal peritonitis incidence and the majority of cases were caused by *Candida* species. However, the antifungal therapy and early removal of catheter were shown the reduced mortality rate of CAPD fungal peritonitis of our study.

Limitations of the study

Our study had some limitations; first, this study was a small retrospective study which included only 36 cases as a major limitation to conclude the incident rate. Secondly, drug levels and sensitivity tests were not conducted for patients to correlate with the fungal peritonitis.

Authors' contribution

RYS and RE conceived the study and collected the data from study participants. GR and JM analyzed the data and drafted the final manuscript; all authors read, revised, and approved the final manuscript.

Conflicts of interest

There were no points of conflicts.

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