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Peritonitis in Continuous Ambulatory Peritoneal Dialysis: A One-Year Prospective Case Series on Microbiology and Outcomes

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Abstract

Background: Peritonitis is the leading complication of continuous ambulatory peritoneal dialysis (CAPD), contributing to technique failure and morbidity. Local microbiological data are essential for guiding empiric therapy.

Methods: This prospective observational case series included all International Society for Peritoneal Dialysis (ISPD)-defined peritonitis episodes occurring in CAPD patients at a tertiary care center in Northeast India from June 2024 to June 2025. Demographics, microbiology, treatment, and outcomes were recorded.

Results: Fourteen peritonitis episodes occurred in 13 patients over 120 patient-years, yielding a rate of 0.12 episodes/patient-year. Cultures were positive in 79% of episodes. Gram-positive organisms predominated (43%), followed by gram-negative organisms (21%) including Pseudomonas aeruginosa, and fungi (14%). Clinical cure was achieved in 71% of episodes. Catheter removal was required in 21%, primarily for fungal and resistant gram-negative infections. Ninety-day mortality was 0%.

Conclusion: Our peritonitis rate was well below the ISPD benchmark. Early recognition, protocol adherence, and prompt catheter removal in high-risk infections are key to preserving peritoneal dialysis technique survival.

Keywords: CAPD, peritonitis, peritoneal dialysis, microbiology, case series, ISPD

Introduction

Peritonitis remains the most important complication of continuous ambulatory peritoneal dialysis (CAPD), contributing significantly to morbidity, hospitalization, catheter loss, and technique failure [1]. The International Society for Peritoneal Dialysis (ISPD) recommends that peritoneal dialysis programs maintain a peritonitis rate below 0.40 episodes per patient-year; rates exceeding this threshold indicate quality-of-care gaps [1]. Fungal peritonitis and infections caused by resistant gram-negative organisms are particularly concerning, as they are associated with poor outcomes and higher rates of technique failure [2,3].

Knowledge of local microbiological patterns is vital for guiding empiric antibiotic therapy and for planning patient training strategies [4]. Data from Indian peritoneal dialysis centers remain limited, particularly from the northeastern region. This prospective case series aimed to evaluate the incidence, microbial spectrum, and clinical outcomes of CAPD-related peritonitis at a tertiary care center in Northeast India over a one-year period.

Methods

Study Design and Setting: This was a prospective observational case series conducted at the Department of Nephrology, Gauhati Medical College and Hospital, Guwahati, Assam, India, from June 2024 to June 2025. Institutional ethics committee approval was obtained, and written informed consent was taken from all participants.

Population: All episodes of peritonitis occurring in patients on CAPD during the study period were included. Peritonitis was defined as per ISPD criteria: the presence of at least two of the following—cloudy dialysate effluent, abdominal pain, and dialysate white blood cell count >100/µL with >50% polymorphonuclear cells [1].

Data Collection: Demographic data, comorbidities, peritoneal dialysis effluent culture and sensitivity results, antibiotic regimens, and clinical outcomes were recorded for each episode. Empiric therapy consisted of intraperitoneal vancomycin and ceftazidime as per ISPD recommendations, subsequently modified based on culture and sensitivity reports.

Outcome Measures: The primary outcomes included peritonitis rate (episodes per patient-year), clinical cure, relapse, catheter removal, technique failure (transition to hemodialysis), hospitalization, and 90-day mortality.

Results

A total of 14 peritonitis episodes occurred in 13 patients over 120 patient-years of follow-up, yielding a peritonitis rate of 0.12 episodes per patient-year. One patient experienced two separate episodes caused by different organisms, representing new infections rather than relapse. The median age of affected patients was 54 years (IQR 46–63), 62% were male, and 54% had diabetes mellitus as a comorbidity.

Peritoneal dialysate cultures were positive in 11 of 14 episodes (79%). Gram-positive organisms were the most frequently isolated, accounting for six episodes (43%), and included coagulase-negative staphylococci (n=3), Staphylococcus aureus (n=2), and Enterococcus species (n=1). Gram-negative organisms were identified in three episodes (21%), including Pseudomonas aeruginosa (n=2) and Escherichia coli (n=1). Fungal peritonitis due to Candida species occurred in two episodes (14%). Three episodes (21%) were culture-negative.

Table 1: Summary of Clinical Outcomes (n = 14 episodes)

Parameter	Value
Total episodes	14
Peritonitis rate (episodes/patient-year)	0.12
Median age, years (IQR)	54 (46–63)
Male sex, n (%)	8 (62%)
Diabetes mellitus, n (%)	7 (54%)
Culture-positive, n (%)	11 (79%)
Clinical cure, n (%)	10 (71%)
Relapse, n (%)	1 (7%)
Catheter removal, n (%)	3 (21%)
Transition to hemodialysis, n (%)	2 (14%)
Hospitalization, n (%)	9 (64%)
90-day mortality, n (%)	0 (0%)

Clinical cure was achieved in 10 episodes (71%). Catheter removal was required in three episodes (21%): both fungal peritonitis episodes and one Pseudomonas aeruginosa episode that failed to respond to targeted antibiotics. Two patients (14%) transitioned to hemodialysis following catheter removal. One episode (7%) met criteria for relapse. Hospitalization was required in nine episodes (64%). There were no peritonitis-related deaths within 90 days of any episode.

Discussion

The peritonitis rate of 0.12 episodes per patient-year observed in this series is well below the ISPD-recommended benchmark of 0.40 episodes per patient-year [1], reflecting the effectiveness of structured patient training and strict adherence to aseptic technique at our center. This rate compares favorably with published data from other Indian centers, where reported rates have ranged from 0.25 to 0.80 episodes per patient-year [3,5].

Consistent with global literature, gram-positive organisms predominated in our series, with coagulase-negative staphylococci being the most common isolate [1,2]. Notably, fungal peritonitis and Pseudomonas aeruginosa infections, though comprising a smaller proportion, were responsible for all catheter removals and the majority of technique failures. This underscores the established association between these organisms and poor peritoneal dialysis outcomes [1,6].

The culture-negative rate of 21% in our series is within the ISPD-accepted range of up to 20–30%, and may reflect prior antibiotic exposure or technical limitations in specimen processing [1]. Clinical cure at 71% is comparable to international standards, while the zero peritonitis-related mortality emphasizes the impact of

early recognition and ISPD-guided empiric therapy [1,3]. However, hospitalization was required in 64% of episodes, highlighting the ongoing clinical burden of peritonitis even in programs with low incidence rates.

Limitations of this study include the relatively small number of episodes, the single-center design, and the short follow-up period. Nonetheless, this series provides valuable microbiological and outcome data from an underrepresented region of India.

Conclusion

CAPD peritonitis at our center occurred at a rate well below international benchmarks. Gram-positive organisms predominated, while fungal and resistant gram-negative infections were the primary drivers of catheter loss and technique failure. Early recognition, strict ISPD protocol adherence, and prompt catheter removal in high-risk infections are essential to preserving peritoneal dialysis technique survival.

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