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CASE REPORT

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Antibiotic administration via indwelling peritoneal catheter to treat infected malignant ascites

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Abstract

Indwelling pleural catheter is an established management for malignant pleural effusions. Extending its use to patients with malignant ascites by insertion of a catheter intraperitoneally enables regular outpatient drainage and improves quality-of-life. However, indwelling pleural/peritoneal catheter (IPC/IPeC) is associated with catheter-related infections, traditionally managed with systemic antibiotics and occasionally requires catheter removal. Direct administration of antibiotics intra-abdominally via peritoneal dialysis (PD) catheters is a well-established, efficacious practice in PD-related peritonitis and minimizes systemic adverse effects. We applied the same principles to a patient with peritoneal mesothelioma who developed peritonitis 3 weeks after insertion of IPeC. Intraperitoneal vancomycin was administered via, and compatible with, the IPeC. The patient tolerated the treatment without adverse effects and made a full recovery without requiring catheter removal.

KEYWORDS
indwelling peritoneal catheter, indwelling pleural catheter, malignant ascites, peritonitis, pleural effusion

INTRODUCTION

Recurrent malignant ascites and pleural effusions cause significant morbidity in cancer patients. Indwelling peritoneal and pleural catheters (IPeCs/IPCs) are effective palliative interventions; they enable patients to have fluid drained in the outpatient setting, provide symptom control and reduce hospitalisations. However, catheter-related peritoneal/pleural infections are potentially life-threatening complications affecting around 5% of patients.[1,2] This is traditionally managed with systemic antibiotics and may necessitate catheter removal.

Intracavitary antibiotic delivery via IPeC/IPC represents an opportunity to improve treatment efficacy and minimize systemic adverse effects, but its safety has not been established. Intraperitoneal antibiotics are the recommended treatment for peritoneal dialysis (PD) related peritonitis, a condition with similar pathobiology involving a transcutaneous foreign body as the infection reservoir. Randomized trials have shown safety, improved outcomes and reduced adverse effects with intraperitoneal (vs. intravenous) antibiotics in PD-peritonitis.[3]

We hypothesised that patients with IPeC-related peritonitis may similarly benefit from catheter-administered antibiotics. We present a patient with peritoneal mesothelioma who developed *Staphylococcus aureus* peritonitis 3 weeks after IPeC insertion. He safely and successfully received intraperitoneal vancomycin and avoided catheter removal.

CASE REPORT

A 57-year-old male with peritoneal mesothelioma had an IPeC inserted for management of recurrent malignant ascites. He had no significant past medical history and was functionally well (European Cooperative Oncology Group score 0). He and his wife performed drainages via the IPeC at home, draining 600–1000 ml twice weekly. He was also receiving second-line gemcitabine/carboplatin chemotherapy after disease progression following cisplatin/pemetrexed treatment.

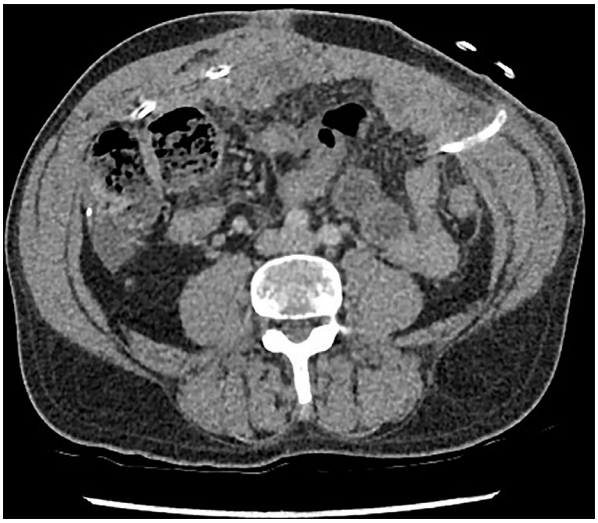

FIGURE 1 Computed tomography cross-sectional image of the abdomen of the patient with peritoneal mesothelioma, ascites and peritonitis post insertion of IPeC into left abdominal wall. The thickened peritoneal lining likely contributed to reduced systemic absorption of intraperitoneal antibiotics

On routine outpatient review 3 weeks following IPeC insertion, erythema was noted at the exit site. A wound swab and peritoneal fluid were sent for culture before he developed worsening abdominal pain, tachycardia, and fever and was hospitalized the following day. He was 1 week post-chemotherapy and was leukopenic (serum leukocyte count 2.78×10^9/L). His C-reactive protein (CRP) was raised at 129 mg/L. Abdominal computed tomography scan showed no infective fluid collection (Figure 1).

His peritoneal fluid showed Gram-positive cocci and he was commenced on empiric intravenous piperacillin/tazobactam 4.5 g 8-hourly and vancomycin 1.5 g 12-hourly. Peritoneal fluid culture subsequently confirmed methicillin-sensitive *S. aureus*.

After 24-hours of treatment, the patient appeared clinically stable but his peritoneal fluid remained turbid and CRP increased to 277 mg/L. In an attempt to control the peritoneal sepsis, vancomycin delivery was changed from intravenous to intraperitoneal, adopting a modified PD peritonitis protocol. Intraperitoneal 1.5 g vancomycin (19 mg/kg) was delivered daily in 500 ml 0.9% sodium chloride solution via IPeC and instilled by gravity. The catheter was clamped for 4 h post-instillation and placed on free drainage after. The patient continued receiving intravenous piperacillin/tazobactam.

A total of four daily intraperitoneal vancomycin doses were administered and no adverse events with instillation or post-instillation fluid drainage via IPeC were reported. Daily serum trough vancomycin levels remained <10 mg/L, indicating no significant systemic accumulation. The patient remained afebrile. His serum CRP decreased to 125 mg/L and abdominal discomfort improved. Peritoneal fluid cultures became negative 48 hours after intraperitoneal vancomycin initiation.

The patient was discharged at day eight and completed a 14-day course of intravenous piperacillin/tazobactam followed by a two-week course of oral amoxicillin/clavulanate. His CRP reduced to 51 mg/L at one-week post-discharge. Peritoneal fluid output remained minimal until 3 weeks post-discharge when it returned to pre-admission volumes. Chemotherapy was recommenced 6 weeks post-admission.

Five months post-discharge, the patient underwent exploratory laparotomy which showed reduction in omental tumour, but the disease remained inoperable. He developed a 61 mm post-operative abscess at the anterior abdominal wall and was hospitalized briefly for intravenous antibiotics. Peritoneal fluid showed gram positive bacilli on microscopy but culture was negative for bacteria. He completed a 6-week course of oral clindamycin and ciprofloxacin. His ascitic fluid drainage volumes declined significantly afterwards. His IPeC was removed 2 months later, after being in-situ for 20 months in total. He continued chemotherapy with no recurrence of ascites on abdominal imaging 4 months after IPeC removal. His mesothelioma remained stable, and he continued working full time.

DISCUSSION

We present a case of adjunct intraperitoneal antibiotic therapy delivered via IPeC in a patient with malignant ascites.

Intracavitary antibiotic therapy for IPeC-related infection is an attractive option as it delivers a high antibiotic concentration to the targeted site. This approach is the standard treatment for PD peritonitis and may be useful in patients with malignant ascites fitted with IPeC, where peritoneal tumour and thickening (as in our patient) may hinder the penetration of systemically delivered antibiotics. In our patient with normal renal function, serum vancomycin level was consistently low suggesting limited systemic absorption after intraperitoneal delivery and/or appropriate systemic clearance.

We have previously reported the largest series of IPeC use in Australasia and an infection rate of 8%.[4] Our literature review found no prior reports of intraperitoneal antibiotic delivery for IPeC infection.

Vancomycin is recommended for staphylococcal PD peritonitis. We selected a dose of 15–20 mg/kg as recommended for intravenous dosing, administered once daily (rather than twice daily as recommended for intravenous dosing) accounting for presumed increased availability of administration directly into the peritoneal cavity.

Due to concomitant use of systemic antibiotics, it is unclear the degree to which intraperitoneal antibiotics contributed to infection clearance. Nonetheless, our case highlights the safety and feasibility of intracavitary antibiotics delivered via IPeC. Further exploration of this approach is warranted to define the pharmacokinetics, optimal dosing regimens and patient selection for intraperitoneal antibiotic treatment for IPeC infections.

AUTHOR CONTRIBUTIONS

All authors contributed to writing, editing and approval of the final manuscript.

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CONFLICT OF INTEREST

None declared.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

ETHICS STATEMENT

The authors declare that appropriate written informed consent was obtained for the publication of this manuscript and accompanying images.

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