of retinitis detection, and the immuno-suppression was tapering and graft nephrectomy was planned.

In conclusion, we suggest the retinitis may be due to severe antigen–antibody complex vasculitis, which showed in the graft biopsy, but CMV reactivation after strong immunosuppression such as OKT3 monoclonal antibody therapy cannot be excluded.

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The role of surgery and itraconazole in Aspergillus peritonitis in CAPD

Sir,

In their Case Report and review of literature, Tanis *et al.* [1] found only 13 cases of peritonitis which may be attributed to Aspergillus. In only five of these were there more than one positive culture and in only one were the classical hyphae seen. They also recommend catheter removal and antifungal agents. Nearly all patients had amphotericin B and only one had itraconazole as well. Recently we had an experience to suggest that catheter removal and amphotericin may result in inadequate treatment in a case of microscopy- and culture-confirmed Aspergillus peritonitis, and that surgical intervention in combination with prolonged use of itraconazole may be required.

The patient, a 37-year-old male presented with fever and generalized abdominal tenderness in June 1995. Before this visit, he had had a cough which was treated with antibiotics. He first presented in end-stage renal failure of unknown cause and was commenced on CAPD in January 1994. He was apyrexial with diffusely tender abdomen with rebound tenderness. Exit site and tunnel were normal. PD fluid was turbid with 920 w.b.c./μl (90% neutrophils). Gram-positive cocci were seen and the patient was treated with cephazolin and gentamicin i.p., which was changed on day 7 to vancomycin and amikacin i.p. because of lack of improvement. Previous dialysate cultures were negative. On day 13, the CAPD catheter was removed because of persisting symptoms and cloudy dialysate. Postoperatively the patient developed septicaemic shock, requiring the addition of dopamine, ceftazidime and cloxacillin intravenously. On day 18, PD fluid culture sent on day 13 showed *Aspergillus niger*, although the catheter tip sent for routine culture was negative. As the patient was well, no treatment was given.

By day 22, the patient was noted to have increasing ascites. Aspiration revealed a cloudy fluid with 2000 polymorphs/μl; staining revealed typical Aspergillus hyphae, which was confirmed on three subsequent samples. Amphotericin B (30 mg/day) was given intravenously. A repeat aspiration of the abdomen on day 50, revealed a persistently cloudy fluid with neutrophils, although fungal stains and cultures were negative. Abdominal ultrasound revealed multiple loculated collections. A surgical referral for open drainage was made. At laparotomy, the bowel was seen to be coated with fibrous capsule, and a large collection containing fibrin and turbid fluid was drained.

By day 65, after completing a cumulative dose of 1.5 g of amphotericin, the patient was well. As a small collection was seen on ultrasound, he was started on itraconazole 300 mg twice daily and discharged. The collection persisted and was noted to have increased in size to 10×10 cm. On day 120, straw-coloured fluid was aspirated, revealing 80 lymphocytes/μl, protein 51 g/l on examination, and was negative on culture. The patient was well on haemodialysis with no abdominal symptoms and an ESR of 38 mm/h. Itraconazole dose was reduced to 200 mg twice daily and a follow-up ultrasound arranged for 1 month.

It is reasonable to assume that the diagnosis is correct as hyphae were seen in several samples and Aspergillus confirmed on culture. Repeated bacterial and mycobacterial cultures were negative. The patient was not immunosuppressed and the only risk factor appeared to be antibiotic usage. It is not certain whether Aspergillus is the primary cause of peritonitis or whether this developed after weeks on antibiotics. The source of the infection was also not clear, though this was not investigated thoroughly. After catheter removal, despite treatment with adequate dose and duration of amphotericin, the patient still required open drainage. The infection appears to induce a strong fibrous reaction, leading to formation of loculated collection which resulted in both poor drug accessibility and failure to return to CAPD. In retrospect, it cannot be certain whether surgery could have been avoided by earlier catheter removal and initiation of antifungal therapy.

As smaller collections persisted, long-term antifungal therapy was necessary. The role of itraconazole in treatment of fungal peritonitis is at present unclear. Certainly it is an effective oral agent against systemic aspergillosis [2] and has relatively few side-effects [3]. It is, however, poorly soluble in water and is not detected in the peritoneal fluid following oral administration [4]. On the other hand it is effective in cryptococcal meningitis despite low measurable concentration in the CSF, an effect explained by high meningeal concentration of the drug [3]. Although high levels of itraconazole have been measured in the omentum [5], there is scant data at present to support its use in fungal peritonitis. In this patient, after 60 days of treatment, he was well and fluid aspirated was clear, suggesting a possible role for itraconazole in the treatment of aspergillus peritonitis. Further studies may be useful to define its role in peritonitis due to fluconazole-resistant Candida species and Aspergillus.

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Influence of methodological differences on microbiological diagnosis of CAPD peritonitis

Sir,

Peritonitis is still the most important complication of continuous ambulatory peritoneal dialysis (CAPD) [1]. Different

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Table 1.

	Patients (*n*)	Peritonitis *n*	Growths in solid media			Growths in liquid media	
			Blood agar	Chocolate agar	EMB	BKIB	TGB
First period	21	47	0	0	0	9 (19.1%)	9 (19.1%)
Second period	15	24	1	0	1	17 (70.8%)	17 (70.8%)
P (I/II)			Non-significant			($P<0.002$)	

EMB, eosin methilene blue agar; BKIB, brain–heart infusion broth; TGB, thioglycolate broth.

methods are used in the microbiological diagnosis of peritonitis. These are:

1. Concentration of 10–50 ml effluent by centrifugation and resuspension in 1 ml of sterile saline and nutrient broth. And then inoculation of blood agar and McConkey agar should be performed. If a perforated viscus is suspected, anaerobic cultures such as thioglycolate broth should be carried out.
2. Direct inoculation of 5–10 ml effluent into semiautomated blood culture system (Bactec, Septi-check etc).
3. Filtration of the effluent and the inoculation of the specimens left on the filter into the media mentioned above [2,3].

We investigated the effect of the amount of dialysate effluent on the results of the cultures. Thirty-six CAPD patients with peritonitis have been included in this study. Of these 19 were female and 17 were male. The mean age was 47 (22–70) years, mean duration of CAPD treatment was 12.5 (2–26) months. The study was done in two different periods. In the first period 10–50 ml effluent was evaluated. During the second period 100 ml effluent was evaluated. In both periods effluents were taken into 10 ml sterile tubes and then centrifuged at speed of 3500 *g* for 15 min to concentrate the organisms. The sediment was mixed with 1 ml sterile saline. From each of these suspensions, smears were prepared and examined by gram stain. The cultures were made from the suspensions left in the tubes. The same media were used for culture in both periods. These media were solid, such as blood agar, chocolate agar, and eosin methilene blue agar (EMB), and liquid such as brain heart infusion broth (BHIB) and thioglycolate broth (TGB). Inoculated media were incubated at 37°C and kept at least 72 h. For differentiation of the species, subcultures were obtained from the detected growths. Results are shown in Table 1.

Although the culture media used during both of the period were the same, we observed that if we increased the amount of the effluent, the positive culture results and the sensitivity of the method would increase. So we propose that the amount of the effluent examined must be not less than 100 ml no matter which method is used; and finally, as liquid media gives satisfactory results there is no need to use solid media for culture.

This study was presented at ISPD '95, 18–21 June, Stockholm, Sweden.

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Dialysate/plasma ratio of which solute is better correlated with clinical outcome in CAPD patients

Sir,

The peritoneal equilibration test (PET) has become a widely accepted method for assessing the peritoneal membrane transport properties [1]. Based on the ratio of dialysate/plasma creatinine concentrations (D/P_{crea}), patients can be classified as low, low-average, high-average, or high transporters. The results from PET have been used to determine the best peritoneal dialysis modality for a particular patient. The PET-derived D/P ratios of solutes have also been used to estimate daily solute clearance and to aid in prescribing modifications of the dialysis dose. There is evidence that increased peritoneal permeability has a deleterious effect on patient outcome [2–6]. High-transporter patients who have a D/P_{crea} ratio greater than 0.81 may have some problems related to ineffective ultrafiltration, which may in turn become poor prognostic factors. However, the relationships between the D/P ratios of other low-molecular-weight solutes such as urea or phosphate and clinical outcome have not been extensively studied.

Fifty patients, 27 male and 23 female, who had been on CAPD treatment for at least 6 months were studied. The mean age was 46.9 ± 13.8 years (range 15–75). All patients underwent a standard 4-h PET using a 2-l dialysate containing 2.5% glucose [1]. The D/P ratios for urea, creatinine and phosphate, and D_4/D_0 ratio for glucose were determined for each patient. None of the patients had peritonitis at the time of the study or in the 2 preceding months. Three clinical outcome parameters were selected: hospitalization days, peritonitis rate, and mortality. Correlations were calculated using Pearson's correlation coefficient. $P<0.05$ was considered as significant.

The mean D/P ratio was 0.91 for urea, 0.73 for creatinine, and 0.70 for phosphorus, and the mean D_4/D_{0glu} was 0.38 following a 4-h dwell. According to the D/P_{crea} ratio, the patients were classified as low ($n=2$), low-average ($n=11$), high-average ($n=23$), and high ($n=14$) transporters. The mean hospitalization rate was 20.2 ± 18.0 days/patient-year, and the peritonitis rate was 1.2 ± 0.9 episodes/patient-year. The mean D/P_{crea} ratio was positively correlated with hospitalization days ($r=0.494$, $P<0.001$), peritonitis rate ($r=0.378$, $P<0.01$), and mortality ($r=0.293$, $P<0.05$). The

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