Dear Sir,

Loss of ultrafiltration can occur in continuous ambulatory peritoneal dialysis (CAPD) by alterations of the peritoneal solute transport. Its incidence increases with the duration of peritoneal dialysis. Most frequently it is reported in patients using dialysis fluid containing acetate as a buffer base. Loss of fluid removal capacity may also be caused by increased lymphatic absorption of the abdominal cavity [1]. Recently it has been found that phosphatidylcholine increases peritoneal fluid loss in CAPD patients [2,3]. We report the effects of phosphatidylcholine on peritoneal solute transport, transcapillary ultrafiltration and lymphatic absorption in a CAPD patient with loss of ultrafiltration due to sclerosing peritonitis.

Case Report
A 62-year-old male patient with chronic renal failure caused by analgesic nephropathy was started on hemodialysis in January 1981. In July 1982, he preferred to change this therapy to CAPD. In the following years, he experienced 11 episodes of peritonitis. The second episode occurred in May 1984 and was caused by Candida tropicalis. This led to a temporary removal of the catheter. After this episode, his net fluid removal was reduced, and gradually decreased in time. In March 1987, it was reduced to less than 300 ml/24 h despite the use of five exchanges of 2 liters or four exchanges of 3 liters Dianeal® glucose 3.86% solution each day. He refused to change to hemodialysis permanently. We therefore had to perform hemodialysis incidentally, only for ultrafiltration. In this period, he was temporarily treated with phosphatidylcholine intraperitoneally. In September 1987, he died of a myocardial infarction. At autopsy, typical findings of sclerosing peritonitis were seen.

Methods
The studies were done with commercially available dialysate (Dianeal, glucose concentration 1.36%) in the absence of peritonitis. First the abdominal cavity was rinsed twice with 2 liters of dialysate.
that was drained immediately after inflow. Then another 2 liters of dialysate (test bag), also
containing inulin (Inutest®; 2.5 g/l) and albumin (10 g/l), was instilled for 4 h. Finally, the
abdominal cavity was again rinsed twice with 2 liters dialysate. Mass transfer area coefficients
(MTC) of urea, lactate, creatinine, glucose, inulin and IgG were calculated using a mathematical
model assuming first-order kinetics. The lymphatic absorption was calculated as the difference
between the amount of albumin instilled and the total amount recovered (after drainage and in
the rinsing bags), divided by the geometrical mean of the dialysate albumin concentration.
The theoretical intraperitoneal volume after 4 h, i.e. the volume in the absence of lymphatic
absorption, was calculated as the amount of albumin instilled, divided by the albumin
concentration of the test bag after drainage. The cumulative transcapillary ultrafiltration after 4 h,
defined as the change of the intraperitoneal volume in the absence of lymphatic absorption, was
calculated by subtracting the instilled volume and the residual volume from the theoretical
intraperitoneal volume after 4 h. The net fluid removal was the difference between cumulative
transcapillary ultrafiltration and lymphatic absorption. The residual volume after drainage was
calculated from the sum of the albumin contents of the two rinsing bags, divided by the albumin
centration of the test bag. On the first day the test was performed without
phosphatidylcholine (Li-postabil®), and on the second day with 125 mg/l added to the test bag.
The following days, the patient added the same amount of phosphatidylcholine to the first
dialysate bag each day, and the total drainage volume (4 exchanges of 2 liters 3.86% glucose
solution) on 2 subsequent days was measured.

Results
There were no differences between the two studies concerning the MTC values of the measured
solute. The effects of phosphatidylcholine on the intraperitoneal water transport are given in
table I. With phosphatidylcholine, there was a more than fourfold decrease in lymphatic
absorption (85 vs. 368 ml/4 h). This led to a higher net fluid removal, when phosphatidylcholine
was administered (56 vs. -170 ml/4 h). The effect of phosphatidylcholine on transcapillary
ultrafiltration was only slight. The residual volumes after drainage were similar in the two
studies (162 and 147 ml). When phosphatidylcholine

\[
\text{Table I. Volume measurements with or without phosphatidyl-choline}
\]

<table>
<thead>
<tr>
<th>Volume kinetics, ml/4 h</th>
<th>Phosphatidylcholine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>without with</td>
</tr>
<tr>
<td>Transcapillary ultrafiltration</td>
<td>198 141</td>
</tr>
<tr>
<td>Lymphatic absorption</td>
<td>368 85</td>
</tr>
<tr>
<td>Calculated net fluid removal’</td>
<td>-170 50</td>
</tr>
<tr>
<td>Measured net fluid removal2</td>
<td>-200 50</td>
</tr>
</tbody>
</table>

1 The difference between transcapillary ultrafiltration and lymphatic absorption.
2 The difference between drained volume and instilled volume.

was added to the first bag of 4 exchanges of 2 liters 3.86% glucose, the drained volume was still
less than the instilled volume on the 2 days measured (net fluid removal -5 and -35 ml/4 h vs. -40
ml/4 h before giving phosphatidylcholine).

Discussion
In this patient, phosphatidylcholine caused an increase in the net fluid removal as a result of its
marked effect on lymphatic absorption. It reduced lymphatic absorption to the lowest value we
ever measured until now [4]. The MTC of the various solutes did not change when the drug was given.

Phosphatidylcholine is synthesized by peritoneal mesenteric tissue [5], and is present in the peritoneal effluent of patients on CAPD. The concentration in dialysate has been reported to be lower in patients with low ultrafiltration [2]. Phosphatidylcholine is a surface-active material that helps to repel water. It has been suggested that phosphatidylcholine restores the physiological properties of the peritoneum, but if this is the mechanism, its effect should lead to alterations in the peritoneal permeability. On the other hand, it could act as a cholinergic drug like neostigmine. In rats, both drugs have been reported to decrease lymphatic absorption, probably by decreasing the size of the subdiaphragmatic lymphatic vessels [6, 7].

As has been reported previously [2, 3], phosphatidylcholine did enhance the net fluid removal in our patient. We found no increase in peritoneal permeability for water or solutes in this patient. Although such effects could be diminished by the patient’s sclerosing peritonitis, the impressive effect on lymphatic absorption supports the hypothesis that phosphatidylcholine increases the peritoneal fluid loss by its cholinergic effects on the size of the subdiaphragmatic lymphatic vessels.

We conclude that phosphatidylcholine is a promising drug for increasing the net fluid removal by reducing lymphatic absorption.

References