consecutive new patients starting APD (12 on continuous cyclic peritoneal dialysis (CCPD) and six on nightly intermittent peritoneal dialysis (NIPD)) and 18 CAPD patients, who were followed for 1 year. Treatment allocation was based upon patient choice. The authors ascribed their finding to the less stable fluid and osmotic load together with the intermittent nature of APD, and the larger use of hypertonic dialysate.

Previously, Hiroshige et al. [2] also reported a more rapid decline of residual renal function in patients on automated peritoneal dialysis. In their 6 months, prospective, non-randomized study eight patients on NIPD and five on CCPD were compared with five patients on CAPD. Starting with a mean renal creatinine clearance of 4 ml/min/1.73 m², declining rates of renal creatinine clearance at 6 months were −0.29, −0.34 and +0.01 ml/min monthly for patients on NIPD, CCPD and CAPD, respectively. These authors also ascribed the accelerated decline of residual renal function in their APD group to the intermittent nature of the dialysis procedure with acute changes in volume state and osmotic load induced by the nightly sessions. Based on at least 10 years experience with CCPD in our department we do not share the impression that APD (98% CCPD) patients have an unusually rapid decline in residual renal function.

Our prospective, randomized study [3] comparing CAPD with Y-connector and CCPD revealed a significant decline in RRF over time in both groups. There was no significant difference between the dialysis modalities regarding residual renal function at any time point during follow-up [3]. Comparing the 11 CAPD-Y patients with the 13 CCPD patients that were followed for 24 months revealed no significant difference in residual renal function (Table 1B). The mean monthly decline in renal creatinine clearance was 0.07 ml/min in CAPD-Y and 0.08 ml/min in CCPD patients. The same held true when all patients that were followed for 18 months were compared (Table 1A), with a mean monthly decline in renal creatinine clearance of 0.10 and 0.09 ml/min for CAPD-Y and CCPD patients, respectively. A search in our current PD population (PD mode based upon patient preference) was fully in agreement with the results of our prospective study.

The influence of automated peritoneal dialysis on the decrease in residual renal function

Sir, In the May 1999 issue of Nephrology Dialysis and Transplantation Hufnagel et al. [1] conclude that patients treated with automated peritoneal dialysis (APD) lose their residual renal function faster than patients on continuous ambulatory peritoneal dialysis (CAPD). This conclusion was based on their non-randomized comparative study of 18
The discrepancy may be due to differences in study design and population. In a (non-randomized) study with a small number of patients the underlying renal disease and/or the decline of renal function prior to start of dialysis may have quite an impact on subsequent loss of renal function during (and not necessarily related to) dialysis therapy, Hufnagel et al. were not able to provide data in this regard. Alternatively, the dialysis prescription per se may have contributed to the observed discrepancy between our results and the findings of Hufnagel et al. and Hiroshige et al. Disregarding residual renal function by applying more hypertonic fluid than required for volume homeostasis at the start of dialysis will result in (reversible) oligo-anuria. When this is neglected, oligo-anuria persists and renal function will decline. In addition, our policy of a careful routine use of loop diuretics could have been beneficial by maintaining a more normal extracellular volume resulting in a reduced need for the use of hypertonic glucose solutions and a more stable fluid and osmotic load.

For the major part, the APD population described by Hufnagel et al. was treated with a continuous (CCPD, n = 12) rather than an intermittent (NIPD, n = 6) method of dialysis, whereas the opposite was true for the population described by Hiroshige et al. Again, the small numbers of patients do not allow to speculate about a different effect on preservation of renal function between these modes of peritoneal dialysis as compared to CAPD. If the intermittent or cyclic nature of NIPD or CCPD would result in a more rapid decline in renal function, this would be an important finding. Given the evidence provided (and the results of our prospective randomized study), we are not convinced that APD is associated with a more rapid decline in residual renal function than CAPD. We do agree that residual renal function should be closely monitored in all PD patients in order to adjust PD prescription and maintain adequacy (and residual renal function).


Table 1. Residual renal function (creatinine clearance in ml/min/1.73 m²) in patients randomized to be treated with continuous cyclic peritoneal dialysis (CCPD) or continuous ambulatory peritoneal dialysis with Y-connector (CAPD-Y) followed for 18 months (A) and 24 months (B), respectively

<table>
<thead>
<tr>
<th>Follow-up (months)</th>
<th>CAPD-Y</th>
<th>CCPD</th>
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<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3.8 ± 2.4</td>
<td>5.1 ± 3.9</td>
</tr>
<tr>
<td>12</td>
<td>3.8 ± 2.7</td>
<td>3.9 ± 4.1</td>
</tr>
<tr>
<td>18</td>
<td>3.8 ± 2.5</td>
<td>3.4 ± 3.9</td>
</tr>
</tbody>
</table>

B

<table>
<thead>
<tr>
<th>Follow-up (months)</th>
<th>CAPD-Y</th>
<th>CCPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>4.4 ± 2.8</td>
<td>3.9 ± 2.5</td>
</tr>
<tr>
<td>12</td>
<td>3.7 ± 3.3</td>
<td>3.2 ± 3.8</td>
</tr>
<tr>
<td>18</td>
<td>2.8 ± 3.2</td>
<td>3.1 ± 3.9</td>
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<tr>
<td>24</td>
<td>2.8 ± 3.3</td>
<td>2.1 ± 2.3</td>
</tr>
</tbody>
</table>

Reply

Sirs,

We read de Fijter’s letter with great interest. Automated peritoneal dialysis (APD) was no longer being offered to our patients several months after the end of the study under discussion. There were two reasons for this decision: (i) the abnormally rapid decline in residual renal function (RRF) was confirmed by our more recent data (previously unpublished data, Figure 1), and (ii) more than half of these patients were switched to another dialysis technique because of inadequate dialysis due to loss of RRF.

From de Fijter’s point of view the observed discrepancy between our respective findings may be due to clinical differences between our populations arising from methodological differences, i.e. a selection bias in our non-randomized population, and also to differences in prescriptions, i.e. hypothetical hypertonic fluid abuse in peritoneal dialysis and no routine use of loop diuretics.

First, we would like to comment on the differences in study design that we believe cannot explain the observed discrepancy. We concede that the small number of patients investigated in our study and the lack of data on the course of RRF decline prior to the start of peritoneal dialysis could have led to a selection bias in our study. The same hypothesis, however, also appears to apply to the study by de Fijter et al. despite randomization: indeed their sample size is approximatively the same as ours and they also provided no data about the course of RRF prior to recruitment.

Conversely, we do agree that differences in peritoneal dialysis treatment may have contributed to the observed disparities. Before focusing on this point, we would like to observe that all but one of our APD patients were given furosemide (250–500 mg daily), as reported in our paper. In the study by de Fijter et al. (January 1988–July 1991), APD patients were assigned to a continuous cyclic peritoneal dialysis (CCPD) programme and trained to use a PAC-X™ (Baxter) automated cycler that provided four or five nocturnal cycles (2-l fill volume per cycle) and one diurnal exchange. This may be considered a reverse conventional peritoneal dialysis programme which is automated but neither intermittent nor intensive and may insure good preservation of RRF. In our series, APD patients had a somewhat more intensive nightly session with 5–10 cycles using 1.5- to 2.0-l fill volume and a dwell time of 45–75 min (daily dialysate volume range: 8–191). CCPD patients had one or two additional exchanges, whereas nightly intermittent peritoneal dialysis patients had an empty cavity during the daytime. Considering these differences, we may assume that osmotic load varied more markedly with each APD session in our series.

Our patients performed their automated session using a 5.0 or 6.0 version HomeChoice™ cycler (Baxter) with a pneumatic pressure-dependent drain system rather than the PAC-X™ gravity-based drain system. In our past and present intermittent peritoneal dialysis experience, dialysate drain is easy to obtain in patients using the PAC-X™. In patients using the 5.0 or 6.0 version HomeChoice™, dialysate drain
is highly variable and often results in incomplete emptying of the cavity, in turn followed by reabsorption of the remaining dialysate. Thus, we may assume that volume homeostasis was not neglected in our series, as seems to imply de Fitjer. On the contrary, intensive ultrafiltration was required to treat fluid overload induced by incomplete collection of the dialysate and led to marked extracellular volume variations resulting in deleterious effects on glomerular filtration. Because of these acknowledged drain difficulties, technical modifications have recently been made to the HomeChoice™. With new HomeChoice versions (7.0 and later) flow rates and drained volume are continuously monitored during therapy, ultrafiltration collection can be targeted, and a last manual drain option that can be performed immediately after the last regular drain of the session is now available. These improvements encouraged us to offer again APD as a treatment option to end-stage renal disease patients requiring dialysis. By paying special attention to managing drain in APD sessions in our new patients together with using slow-dialysate flow rates and an additional daytime Extraneal® exchange we hope to treat them while avoiding unusual RRF decline.

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Acknowledgements.

I wish to thank Professor C. Pusey and Dr. Bartolotti for helpful discussion.

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8. J Exp Med. The involvement of glucosamine was quite unexpected.

9. J Clin Invest. These findings suggest that in some cases of acute glomerulonephritis we may assume that volume homeostasis was not neglected in our series.

10. Ann Med Int. The involvement of glucosamine was quite unexpected.

11. J Immunol. These findings suggest that in some cases of acute glomerulonephritis we may assume that volume homeostasis was not neglected in our series.

12. Nephrol Dial Transplant. The involvement of glucosamine was quite unexpected.