RECOMMENDATIONS FOR FASTING IN RAMADAN FOR PATIENTS ON PERITONEAL DIALYSIS

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♦ **Introduction:** The month of Ramadan holds great religious and social significance for Muslims all over the world. The aim of the present study was to provide a modified dialysis schedule for peritoneal dialysis (PD) patients that allows for fasting and that minimizes the effect on the patient's general health and volume status.

♦ **Methods:** We observed 31 patients under treatment at the PD unit of King Khalid University Hospital, King Saud University, Riyadh. During the 3 – 4 weeks before the start of Ramadan, all patients were counseled individually and in detail about the possibility of fasting. They were also provided with clear instructions about fluid intake (up to 1 L daily) and avoiding a high-potassium diet. Of the 31 patients, 18 (10 women, 8 men) elected to fast during the month of Ramadan.

The mean duration of fast in the study year (2009) in Riyadh, Saudi Arabia, was about 14 hours: from 0415 h (before sunrise) to 1800 h (after sunset). Depending on membrane type and patient preference, the fasting group was shifted to one of two regimens:

- **Modified continuous ambulatory PD (8 patients):** 3 exchanges during the night (1.36% or 2.27%), and icodextrin for a long dwell during the day. The first dialysis exchange was performed immediately after breaking the fast (1900 h), and the next at 2300 h. The final exchange was performed in the early morning before sunrise (0300 h), when the icodextrin was infused.
- **Modified continuous cycling PD (10 patients):** exchanges (1.36% or 2.27%) were performed over 6 – 7 hours, and icodextrin was infused for a long dwell during the day. The patient connected to the cycler at 2000 h or 2100 h, and therapy finished at nearly 0300 h, with icodextrin as the last fill.

♦ **Results:** Of the study patients, 2 were admitted because of peritonitis (1 in each modality group), and the modified

therapy was discontinued. In the modified CCPD group, 1 patient (on PD for 1 month before Ramadan) developed PD-related pleural effusion (proved by pleural fluid analysis), and PD was consequently discontinued. Hypotension developed in 2 patients of the CAPD group and 1 of the CCPD group during the first 2 weeks. In the CCPD group, 1 patient presented with lower limb edema and mild fluid overload. Overall, PD patients that opted to fast during Ramadan did not experience any serious morbidity or deterioration in renal function during their period of observance. No biochemical parameters or clearance studies showed a statistically significant *p* value.

♦ **Conclusions:** In view of the study findings, we conclude that most stable patients on PD can fast, provided that they strictly adhere to their medications and dialysis therapy in addition to the dietary restrictions. These patients should be followed closely to detect any complications and to ensure that adequate fluid and electrolyte balance are maintained.

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The month of Ramadan holds great religious and social significance for Muslims all over the world. Muslims are required to fast, including avoiding food and drink from sunrise to sunset (1). In Islam, Ramadan fasting is mandatory only for healthy adults. Generally, physicians would not recommend fasting for patients with chronic kidney disease stage 4, because of the risk of fluid imbalance and other complications. However, patients with end-stage renal disease who are stable on dialysis are often eager to fast during Ramadan. This choice allows them to have greater involvement in family activities and helps them to overcome the feelings of isolation and depression sometimes seen in this population (2,3).

In peritoneal dialysis (PD) patients, there is a theoretical concern that patients might become volume depleted

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if they continue to use their normal PD regimen while avoiding any fluid or food intake for approximately 14 hours daily. Similarly, there might be a concern that an aggressive PD prescription in the face of such fasting might lead to hypokalemia. On the other hand, after breaking the fast, people tend to consume, over a short period of time, large quantities of fluids (including water, juices, soft drinks, and tea) and foods rich in potassium and phosphorous (dates, nuts, fried food, cheese, and so on), which can lead to hyperkalemia and fluid overload. An additional factor might be that, during the Ramadan period, patients might have less time to spend on their dialysis exchanges because of attendance at congregational prayers in the mosque and also at nighttime social gatherings. Furthermore, long periods of time on the cyclor at night might prevent patients from participating fully in social aspects of the Ramadan celebration. For those reasons, we modify the dialysis schedule for PD patients, reducing the dialysis workload in the evening and avoiding excessive removal of fluid during the daytime.

Although several studies have looked at renal failure or transplant patients during Ramadan (4,5), no specific guiding criteria are available for fasting for PD patients. This lack of guidance is further complicated by the fact that the timing and duration of the daily fast varies with geographic location, and that in an individual location, the timing changes with the lunar calendar. Consequently, the fast in Ramadan varies in length each year and often takes place at different seasons in the same community. Fasting for patients on PD represents an important personal decision that should be made by the patient in the light of religious guidelines for exemptions and after careful consideration of the associated risks.

With improvements in training facilities and reductions in complications, PD as a renal replacement therapy is on the rise in the Kingdom of Saudi Arabia (6,7). At the PD center of King Khalid University Hospital, King Saud University, in Riyadh, Saudi Arabia, we are following a regimen of modified PD prescription with dietary and pharmacologic changes to facilitate fasting for PD patients.

METHODS

We observed 31 patients on treatment at the PD unit of King Khalid University Hospital, Riyadh. Of those 31 patients, 18 (10 women, 8 men) elected to fast during the month of Ramadan in the year 2009 (1430 H.).

PATIENT SELECTION

The criteria for fasting patients included stable general health, ability to carry out routine daily home

or outside activities, and good compliance to dietary and therapeutic restrictions. Patients were excluded from fasting if they had uncontrolled diabetes or hypertension, angina, postural hypotension, significant comorbidities leading to marked limitation of daily activities, or a history of noncompliance with therapy and dietary modifications.

PREPARATION

About 3 – 4 weeks before the start of Ramadan, all patients were counseled individually and in detail about the possibility of fasting. The patients that elected to fast received a further detailed interview and evaluation by nephrologist (addressing PD) and by the consultant in charge of the PD unit. These patients were evaluated by the clinical nutritionist and were given a thorough dietary assessment and recommendations. They were also provided with clear instructions about fluid intake (up to 1 L daily), avoiding constipation and hyperkalemia, regularly monitoring blood pressure and weight at home, and attending follow-up every 2 weeks. They were instructed to watch out for any alarming symptoms, including

- weight gain of more than 2 kg from baseline;
- dizziness and weakness (indicating hypotension);
- lower limb or facial swelling, or shortness of breath (indicating fluid overload); and
- lethargy or loss of appetite (indicating uremia).

For Ramadan, the patients were advised to take their routine morning medications in the evening after breaking the fast and their evening medications in the early morning before dawn. Any medications to be taken as thrice daily were changed to a twice-daily regimen or a different preparation was used. The patients who showed a tendency to hyperkalemia were advised to use calcium resonium powder 30 g daily with lactulose once daily as prophylaxis.

Weight, blood pressure, and biochemical parameters were reviewed at a clinic visit every 2 weeks, and each patient's medications or dialysis prescription was adjusted accordingly. Clearance and Kt/V were calculated at the start and 4 weeks after the end of Ramadan.

PROCEDURE

The duration of the fast in 2009 in Riyadh, Saudi Arabia, was about 14 hours: 0415 h (sunrise) to 1800 pm (sunset). Depending on membrane type and patient preference, the patients in the fasting group were switched to one of two regimens (Table 1): modified continuous

TABLE 1
Peritoneal Dialysis Prescription for Patients Fasting During Ramadan

Age (years)	PET category	Mode	Cycles	Initial prescription Fluid concentration	Mode	Cycles	For Ramadan Fluid concentration	Problems	Management
Group 1 – CAPD									
43	Low	CAPD	4	3×1.36% plus Ico	CAPD	3	2×2.27% plus Ico	Hypotension	1.36% plus 2.27% Drain Ico after 10 h
17	High	CAPD	4	3×1.36%, 1×Ico, 1-L fill volume	CAPD	3	1.36% plus 2.27% plus Ico		
21	Low-average	NIPD 8 h	4	10 L 1.36%, no last fill	CAPD	3	2.27% plus Ico		
24	Low	CCPD 8 h	5	5 L 1.36% plus 5 L 2.27%, 1.5 L Ico	CAPD	3	1.36% plus 2.27% plus Ico		
41	Low-average	CCPD 8 h	4	10 L 1.36%	CAPD	3	1.36%	Hypotension	
28	high-average	CAPD	4	1.36%, 4 cycles	CAPD	3	1.36% plus 2.27% plus Ico		
25	high-average	CCPD 8 h	5	5 L 1.36% plus 5 L 2.27%, 1.5 L Ico	CAPD	3	1.36% plus 2.27% plus Ico		
40	Low-average	CAPD	4	3×1.36%, 1×Ico	CAPD	3	1.36% plus 2.27% plus Ico		
Group 2 – CCPD									
61	Low	CCPD 8 h	5	10 L 2.27%	CCPD 6 h	4	10 L 2.27%	Pleural effusion	Switched to HD
46	High-average	CCPD 8 h	5	10 L 1.36%	CCPD 6 h	4	5 L 1.36% plus 5 L 2.27%	Hypotension	10 L 1.36% ↓ Antihypertensive
62	High-average	CCPD 8 h	5	5 L 1.36% plus 5 L 2.27%, 2 L Ico	CCPD 7 h	5	10 L 2.27% plus 2 L Ico		
34	Low-average	CCPD 9 h	4	10 L 2.27 plus Ico	CCPD 7 h	3	10 L 2.27% plus 2 L Ico		
53	Low-average	CCPD 9 h	5	10 L 2.27 plus Ico	CCPD 7 h	3	10 L 2.27% plus Ico		
56	High-average	CCPD 8 h	6	1.36%	CCPD 6 h	4	10 L 1.36%		
66	High	CCPD 9 h	6	5 L 2.27% plus 10 L 1.36% plus 1 L Ico	CCPD 6 h	6	5 L 2.27% plus 10 L 1.36% plus 1 L Ico		
48	Low-average	CCPD 10 h	5	5 L 1.36% plus 5 L 2.27%, 1.5 L Ico	CCPD 6 h	5	5 L 1.36% plus 5 L 2.27%, 1.5 L Ico		
64	High-average	CCPD 8 h	4	10 L 2.27% plus Ico	CCPD	3	1.36%±2.27% plus Ico	Fluid overload	↑ Lasix Add metolazone 10 L 2.27%
24	Low	CCPD 8 h	5	5 L 1.36% plus 5 L 2.27%, 1.5 L Ico	CCPD 7 h	3	1.36% plus 2.27% plus Ico		

PET = peritoneal equilibration test; CAPD = continuous ambulatory peritoneal dialysis; Ico = icodextrin solution; NIPD = nightly intermittent peritoneal dialysis; CCPD = continuous cycling peritoneal dialysis.

ambulatory PD (CAPD, $n = 8$) or modified continuous cycling PD (CCPD, $n = 10$).

Modified CAPD: Patients using CAPD performed 3 exchanges during the night (1.36% or 2.27%), and used icodextrin for a long dwell during the day. The first dialysis exchange was performed immediately after breaking the fast (1900 h), and the next exchange was performed at 2300 h. The final exchange was performed early in the morning before sunrise (0300 h), when the icodextrin was infused. Total ultrafiltration was recorded daily.

This regimen was used for younger patients (average age: 29.87 years) who were more active and wanted to attend prayers. Of the 8 patients using this regimen, 2 had low membrane transport; 3, low-average transport; and 3, high-average transport by a peritoneal equilibration test. This regimen gave the patients more freedom of movement between the exchanges.

Modified CCPD: Patients using CCPD (1.36% or 2.27%) were on the cyclor for 6 – 7 hours, and used icodextrin for a long dwell during the day. The patient connected to the cyclor at 2000 h or 2100 h, and finished therapy at nearly 0300 h, with icodextrin as the last fill for the long day dwell.

This regimen was used by relatively older patients (average age: 50.51 years) who were staying at home and who were more comfortable starting therapy after finishing Isha prayers (night prayer after sunset). Of the 10 patients using this regimen, 1 had low membrane transport; 5, low-average transport; 3, high-average transport; and 1, high transport by peritoneal equilibration test.

RESULTS

Among the fasting patients, 2 were admitted for peritonitis (1 in each group), and their modified therapy was discontinued. In the modified CCPD group, 1 patient (on PD for 1 month before Ramadan) developed PD-related pleural effusion (proved by pleural fluid analysis), and consequently PD was discontinued. Hypotension developed in 2 patients in the CAPD group and 1 patient in the CCPD group during the first 2 weeks of fasting. This symptom was managed by changing the PD fluid concentration to 1.36%, by adjusting antihypertensive therapy, and by discontinuing the long day dwell or draining the icodextrin after 8 hours. All 3 patients were able to continue on their modified regime. In the CCPD group, 1 patient presented with lower-limb edema and mild fluid overload. No pulmonary edema occurred, and this patient was managed on an outpatient basis by increasing the

dialysate concentration (using 2.27% fluid for all bags) and stricter fluid intake. Using that regimen, he was able to continue fasting for the rest of the month.

In the study group, average daily urine output (an estimate of residual renal function) was 697 ± 727.4 mL before Ramadan and 843.6 ± 547 mL after 4 weeks of fasting. Average weight gain was 1.67 ± 1.347 kg. The total weekly Kt/V was 1.913 ± 1.4 initially and 1.954 ± 1.63 at the end of the study period. The total weekly creatinine clearance was 71.67 ± 38.43 L initially and 65.095 ± 40.06 L at the end of study period. None of those differences was statistically significant.

Overall, PD patients who opted to fast during Ramadan did not experience any serious morbidity or deterioration in renal function.

DISCUSSION

One of the major goals of any dialysis unit is to enhance patient quality of life, preserve health, and encourage greater patient independence, with minimal interference in their lifestyle choices. Peritoneal dialysis is advantageous for patients, providing greater flexibility and ease of adjustment for lifestyle and daily schedule.

Ramadan is the ninth lunar month of the Islamic calendar. During Ramadan, Muslims abstain from food and drink from dawn to sunset (fasting); eating and drinking are permitted only at night. Muslims typically consume two main meals each day during this time, one after sunset, and the other just before dawn. In our society, the month of Ramadan holds great social and religious significance. For most people, evenings are a time for family to get together, to shop, and to engage in other social activities. For PD patients who are otherwise stable, being able to fast provides a greater degree of social involvement and leads to more independence and an improved sense of well being.

For patients on PD, fasting represents an important personal decision that should be made by the patient in light of religious exemptions and after careful consideration of the associated risks. This decision should be taken only after the treating physician and the PD team has held a detailed discussion with the patient and any caregivers and has provided thorough instructions about the limitations and risks associated with reduced dialysis.

Despite the fact that fasting during Ramadan is practiced by more than 1 billion Muslims worldwide, data on patients with diabetes and other chronic diseases are limited at best (5,8–18). Data for chronic kidney disease patients on dialysis in relation to fasting during Ramadan are especially sparse. Most of the available

recommendations are based on expert opinion rather than evidence. This lack of data can be attributed partly to the variation in Ramadan timing and difficulty in arranging frequent hospital visits for patients during this period. The aim of the present study was to provide a modified dialysis schedule for PD patients that would allow for fasting while minimizing the effects on general patient health and volume status.

Some studies have suggested that fasting does not adversely affect renal function in people without or with kidney disease, provided that adequate hydration is maintained (4). Also, studies in patients with diabetes have suggested that fasting during Ramadan is well tolerated, with no significant problems (5). Similarly, studies have shown that the effects of fasting during Ramadan are minimal for stable patients with cardiac disease. Most patients with stable cardiac disease can fast (8).

Studies in renal transplant patients have suggested that fasting during the month of Ramadan does not seem to be associated with any significant adverse effects for those with either normal or impaired graft function, and fasting during Ramadan has been suggested to be safe for patients 1 year after transplantation (19–23).

CONCLUSIONS

In view of earlier reports and our findings in the present study, we can conclude that most stable patients on PD can fast for Ramadan provided that they are followed closely and that strict fluid and electrolyte balances are maintained. However, patients who intend to fast need comprehensive education and follow-up in the PD unit. More input from centers dealing with Muslim patients would help to develop a clearer picture of the effects of fasting in patients on PD.

DISCLOSURES

The authors have no financial conflicts of interest to declare.

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