Effect of Fasting for Ramadan on Kidney Graft Function During the Hottest Month of the Year (August) in Riyadh, Saudi Arabia

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Abstract

Objectives: **To assess the effect of fasting Ramadan during the hottest month of the year in Riyadh, Saudi Arabia.**

Materials and Methods: **This prospective cohort study was performed at the King Fahd National Guard Hospital in Riyadh, Saudi Arabia. We used the Modification of Diet in Renal Disease formula to estimate the glomerular filtration rate in renal transplant patients who fasted and did not fast before and after Ramadan.**

Results: **There were 43 fasters and 37 nonfasters of comparable ages, with fasters having longer posttransplant times compared with nonfasters (*P* = .0001). The 2 groups had similar mean estimated glomerular filtration rates before Ramadan: 75.6 ± 29.2 and 65.9 ± 25.9 mL/min (*P* = .1) and similar mean estimated glomerular filtration rates 6 months after Ramadan: 77.2 ± 29.7 and 64.1 ± 29 mL/min (*P* = .21). Mean changes in the estimated glomerular filtration rate were similar in the 2 groups: -1.5 ± 10.9 and -2.8 ± 19.3 (*P* = .7) as was the percentage change (-0.2.2 ± 13.4 and 1.8 ± 15.9; *P* = .4). In the fasting group, serum creatinine and estimated glomerular filtration rate were similar before and 6 months after Ramadan: 105.1 ± 55 and 105.14 ± 61 µmol/L (*P* = 1.0) and 75.6 ± 29 and 72.2 ± 29.7 mL/min (*P* = .36). No significant changes were observed in the nonfasting group. No significant differences were detected regarding fasting in the estimated glomerular filtration rate before and 6 months after Ramadan in the 3 groups with the low, moderate, and high glomerular filtration rates at baseline.**

Conclusions: **Fasting for Ramadan in August does not adversely affect graft function at a mean follow-up of 7.6 ± 1.3 months.**

Key words: *Ramadan, Fasting kidney graft, Hot climate*

Introduction

Fasting during Ramadan in August is mandatory for all healthy adult Moslems. Many reports have focused on its effect on kidney graft recipients; however, all the previous reports have dealt with fasting during months *other than* August.[1-9] This study is different in that it was performed during Ramadan of 2011, which occurred during August in Riyadh, Saudi Arabia, which has one of the hottest climates in the world.[10]

Materials and Methods

This prospective cohort study was performed at the King Fahd National Guard Hospital in Riyadh, Saudi Arabia. The glomerular filtration rate (GFR) was estimated using the 4-variable Modification of Diet in Renal Disease formula[11] in renal transplant patients who fasted and in a control group of patients who did not fast.

The estimated GFR (eGFR) was calculated before, and 1 and 6 months after Ramadan. The study was performed for Ramadan of 2011, which coincided with August. During Ramadan, the number of hours that fasting patients remained without food or drink ranged from 12 to 14 hours. The highest temperature reached during the day was 49°C (120°F).[12] The average humidity ranged from 12% to 14%.[13] Besides having a nonfasting control group, the fasters

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themselves also acted as their own controls in detecting the effect of fasting on allograft function.

Patients were advised to drink at least 2.5 L of fluid after breaking the fast and to take the morning dose of immunosuppressives and to take the evening dose just before start of the fast. Blood levels of cyclosporine and tacrolimus were measured before and after Ramadan in the fasting group. Diabetic patients took their antidiabetic medication during the evening and reversed the pattern of eating and treatment from day to night.

The purpose of the nonfasting control group was to assess whether any deterioration in renal function in the fasting patients was related to fasting, or to the progression of renal impairment in renal allografts owing to hot weather. Renal function, body mass index, serum albumin, and hemoglobin were measured a month before Ramadan, and after 1 and 6 months after Ramadan. All protocols were approved by the ethics committee of the institution before the study began, and the protocols conformed with the ethical guidelines of the 1975 Helsinki Declaration. Written, informed consent was obtained from all patients.

Statistical analyses

Baseline characteristics are summarized by calculating the percentages (for categorical data) and means and standard deviations (for continuous data). The chi-square and *t* tests were used to assess differences between fasters and nonfasters regarding baseline characteristics. Differences in eGFR were calculated. Paired *t* tests and Wilcoxon signed-rank test were used to assess significance between pre-Ramadan and post-Ramadan eGFR values among the fasters.

Results

There were 43 fasters and 37 nonfasters. The mean ages were 43.7 ± 15.6 and 41.8 ± 15.4 years (P = .6). The mean length of time after transplant in the 2 groups was 64.4 ± 30.4 and 27.7 ± 36.7 months (P = .0001) (Table 1). Mean serum creatinine and mean eGFR before Ramadan were similar in the 2 groups: 105.9 ± 55.4 and 123.1 ± 67 μmol/L (P = .2) and 75.6 ± 29.2 and 65.9 ± 25.9 mL/min (P = .1). Mean serum creatinine and mean eGFR 6 months after Ramadan also were similar in the 2 groups: 105.8 ± 55.6 and 127.8 ± 91 μmol/L (P = .2) and 77.2 ± 29.7 and 64.1 ± 29 mL/min (P = .21). Mean changes in eGFR were similar in the 2 groups: -1.5 ± 10.9 and -2.8 ± 19.3 (P = .7) as was the percentage change: -0.2.2 ± 13.4 and -1.8 ± 15.9 (P = .4) (Table 2).

We also assessed any significant differences before and after Ramadan within each group, with each patient acting as his own control (Table 2). It can be seen that in the fasting group, serum creatinine and eGFR were similar before and after Ramadan: 105.1 ± 55 and 105.14 ± 61 μmol/L (P = 1.0) and 75.6 ± 29 and 72.2 ± 29.7 mL/min (P = .36). No changes were observed in the nonfasting group (Table 2).

We found no significant differences in the eGFR before and 6 months after Ramadan in any of the 3 groups (low, moderate, and high GFR at baseline) (Table 3). During Ramadan and during follow-up, no cases of rejection, urinary tract infection, or urinary stone formation were observed.

Table 1. Comparing Fasting and Nonfasting Groups

Parameter	Fasting (n=43)	Nonfasting (n=37)	*P* Value
Age (y)	43.7 ± 15.6	41.8 ± 15.4	.6
Male (%)	46.5%	56.8%	.4
Transplant type: living (%)	62.8%	70.3%	.5
Duration after transplant (mo)	64.4 ± 30.4	27.7 ± 36.7	.0001
Pre-Ramadan SCr (μmol/L)	105.9 ± 55.4	123.1 ± 67	.2
1 Month post-Ramadan SCr (μmol/L)	105.8 ± 55.6	127.8 ± 91	.2
Mean time between Ramadan to last SCr/eGFR (mo)	7.6 ± 1.3	8.0 ± 1.3	.16
Latest post-Ramadan SCr (μmol/L)	105.1 ± 61	134.4 ± 143	.25
MDRD GFR before Ramadan (mL/min)	75.6 ± 29.2	65.9 ± 25.9	.1
1 Month post-Ramadan MDRD GFR (mL/min)	73.6 ± 27.5	66.2 ± 25.9	.2
6-Month post-Ramadan MDRD GFR (mL/min)	77.2 ± 29.7	64.1 ± 29	.21
Change in last eGFR (mL/min)	-1.5 ± 10.9	-2.8 ± 19.3	.7
Percentage change in last eGFR (%)	-2.2 ± 13.4	-1.8 ± 15.9	.4

Abbreviations: eGFR, estimated glomerular filtration rate; SCr, serum creatinine

Table 2. Renal Function Before and 6 Months After Ramadan

Nonfasting (n=37)	Before Ramadan	6 Months After Ramadan	*P* Value
SCr	123.1 (67)	134.4 (91)	.54
eGFR	65.9 (26)	64.1 (29)	.37
Fasting (n=43)	**Before Ramadan**	**6 Months After Ramadan**	
SCr	105.1 (55)	105.11 (61)	1.0
eGFR	75.6 (29)	77.2 (29.7)	.36

Abbreviations: eGFR, estimated glomerular filtration rate; SCr, serum creatinine

Table 2. Renal Function Before and 6 Months After Ramadan

Renal Function Parameter	Low Baseline eGFR Group (< 45 mL/min)	Moderate Baseline eGFR Group (45-75 mL/min)	High Baseline eGFR Group (> 75 mL/min)
n	8	11	24
Mean baseline eGFR	30.1 (10.7)	61.3	96.4
Mean eGFR at 6 months	29.3 (11.1)	69.6	97.5
Mean change in eGFR (mL/min)	-0.83	4.3	1
Mean percentage change in eGFR	-3.6	7.1	1.9
P Value of change within each group	.4	.2	.7

Abbreviations: eGFR, estimated glomerular filtration rate

Discussion

Fasting during the lunar month of Ramadan is mandatory for all healthy adult Moslems. The sick, travelers, debilitated elderly people, and pregnant and lactating women are excluded.[14] Excluded, also, are those in whom fasting may be detrimental to their health.[14]

Ramadan fasting lasts from sunrise to sunset during which the person refrains completely from eating or drinking. Ramadan is the ninth month of the Moslem lunar year, which is 11 days shorter than the Gregorian calendar. As such, Ramadan time moves throughout the 4 seasons and makes a full circle every 33 years. The last time Ramadan coincided with the hottest month (August) in Riyadh was in 1980. This was the year in which first renal transplant was done in Saudi Arabia. Now, 33 years later, we now have 12 550 patients with functioning kidney transplants in Saudi Arabia.[15] There are many Moslem countries performing organ transplants, with thousands of Moslems living with organ transplants.

We and others have previously examined the effect of Ramadan fasting on transplant patients with normal or with moderately impaired renal function and found no adverse effects.[1-9] We also noted no change in eGFR after fasting for 3 consecutive Ramadans, even after adjusting for age, presence of diabetes mellitus, baseline GFR, proteinuria, or time after transplant. There were no significant differences between fasters and nonfasters regarding changes in GFR, mean arterial pressure (MAP), and urinary protein excretion between baseline and the third Ramadan.[2]

In this study, we found that fasting the month of Ramadan in Riyadh, Saudi Arabia, did not adversely affect graft function. It should be noted, however, that the fasting group in this study had reasonably good renal function. Moreover, the duration after transplant in this group was long (64.4 ± 30.4 mo).

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