Original Article

Renal function after donor nephrectomy at a tertiary medical center in Southern Thailand

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Abstract

Objective: The aim of this study was to assess long-term renal function after living donor nephrectomy and determine the optimal follow-up period.

Material and Method: A retrospective review of living donor kidney transplantation (LDKT) patients who underwent open donor nephrectomy. Clinical chart review was performed. Kidney function was measured before and after surgery. We assessed donor kidney function using the estimated Glomerular filtration rate (eGFR) through the Cockcroft and Gault formula. The evaluation of kidney function after surgery was performed at 1 week, 1 month, 3 months, 6 months, and 12 months. Rate of renal function decline was analyzed and compared with the baseline.

Result: A total of 50 kidney donor patients were identified; the mean age of kidney donors was 39.18 (11.37) years old. The mean of eGFR before surgery was 92.4 (26.0) ml/min/1.73 m^2. After surgery eGFR at 1 week, 1 month, 3 months, 6 months and 12 months was 66.8 (18.3) ml/min/1.73 m^2, 66.8 (21.0) ml/min/1.73 m^2, 65.8 (18.6) ml/min/1.73 m^2, 69.4 (17.4) ml/min/1.73 m^2, 70.0(16.0) ml/min/1.73 m^2 respectively. Kidney function was reduced and returned to a new baseline at 6 months after surgery. The overall new baseline eGFR decreased 22.6% from eGFR at pre-donation.

Conclusion: Renal function declined after open donor nephrectomy. Change in renal function is not associated with gender. New baseline of eGFR will occur at 6 months after surgery.

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Introduction

The prevalence of patients with end-stage renal disease (ESRD) is an increasing trend. Most patients with ESRD are treated with renal replacement therapy (RRT), but the best treatment for this patient is kidney transplantation. At the same time, the waiting lists for cadaveric donor kidney transplantation continue to grow. Living donor kidneys may be an alternative for patients in order to receive kidneys for transplantation[1]. Living donor kidney transplantation has clear benefits for the recipient, including better renal function and longer patient quality of life[2]. The effect of kidney donation on the donor's physical well-being is an important issue. After nephrectomy, the remaining kidney will normally increase its filtration rate to 70% of the pre-donation level[3,4]. Knowledge in compensatory response to nephrectomy may be important data in the guidance of treatment for donor patients. In Songklanagarind Hospital, we have performed kidney transplantation for some time, but we have limited data regarding the results of renal function in donor patients after donor nephrectomy. The aim of this study was to determine the renal function and relative decrease in estimated Glomerular filtration rate (eGFR) after kidney donation.

Material and Method

Ethical approval for the study was obtained from the Institutional Review Board of Songklanagarind Hospital. The medical records of all living kidney donor patients in Songklanagarind Hospital from 1997 to 2016 were reviewed.

A total of 50 kidney donor patients were identified and met all entry criteria. All data were obtained by reviewing the patient histories, imaging studies, and operative records, as well as discharge summaries. Patients and factors which may be related to kidney function include age, weight, height, body mass index (BMI), and blood pressure; basic laboratory results were also reviewed. We assessed donor kidney function using eGFR through the Cockcroft and Gault formula. Renal recovery patterns were analyzed and compared with the rate of change postoperatively, which depended on time.

A Student's T-test was used to compare categorical data and continuous variables, with a $p<0.05$ considered to indicate statistical significance.

Result

Characteristics of the donor cohort

A total of 50 living related kidney transplantations were performed; 23 of them (46%) were male. Mean age (SD) at the time of nephrectomy was 39.18 (11.37) years old, aged between 18 to 60 years old. Mean time for follow-up was 9.7(4.3) months. Characteristic are described in Table 1. Mean BMI of patients was 24.27(4.51) kg/m^2. Five patients were identified as obese by BMI>30 kg/m^2. Male patients had higher BMI than female patients (24.6 kg/m^2 VS 23.8 kg/m^2). Forty-two of 50 patients donated Lt kidney to their relation. At the time of medical follow-up and examination, none of the donor patients was diagnosed ESRD and received RRT.

Table 1. Kidney donor preoperative characteristics.

Age (years)	39.18 ± 11.37
Sex (male:female)	23:27
BMI (kg/m^2)	24.47 ± 4.51
Baseline eGFR (ml/min/1.73 m^2)	92.4 ± 26.0
Mean time follow up (months)	9.7 ± 4.3
Operated side (right:left)	8:42
Blood loss (ml)	247.6 ± 160.4

Abbreviations

BMI for Body Mass Index, eGFR for estimated Glomerular Filtration Rate.

Baseline renal function and renal function outcome after donation

Table 2 shows the results of renal function before and after donation. Mean eGFR before donation was 92.4 (26) ml/min/1.73 m^2. Baseline GFR was higher in males than females (97.5 ml/min/1.73 m^2 VS 87.7 ml/min/1.73 m^2). After donation, Mean eGFR at 1 week, 1 month, 3 months, 6 months and 12 months was 69.0 (1.1) ml/min/1.73 m^2, 69.2 (20.8) ml/min/1.73 m^2, 71.9 (21) ml/min/1.73 m^2, 74.5 (20.9) ml/min/1.73 m^2, 70.0 (16.0) ml/min/1.73 m^2 respectively. In both men and women, eGFR was reduced by approximately 28.3% in the first week with a maximum decrease from baseline in the first month (30.3% decrease from baseline) and then gradually increased within six months, but still decreased 22.6% from baseline eGFR (shown in Table 2 and Figure 1). eGFR in males after donation was higher than females (Figure 2), but the rate of change in eGFR was not significant after surgery when comparing the sexes.

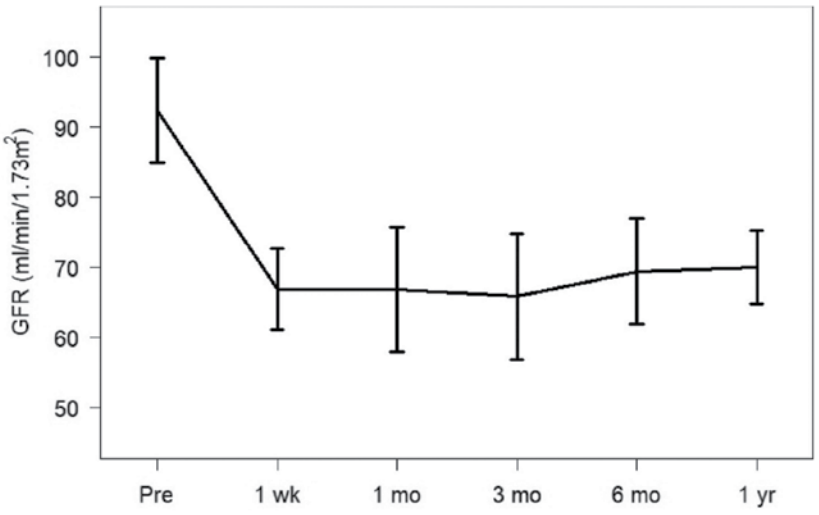

Figure 1.
Overall estimated Glomerular Filtration Rate after donation.

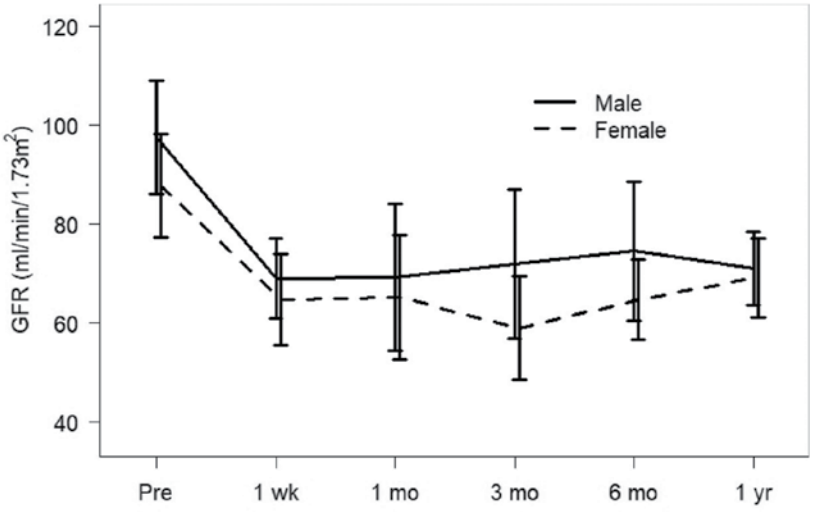

Figure 2.
Comparison of estimated Glomerular Filtration Rate after donation between males and females.

Table 2. eGFR depended on time after donation and percentage change.

	eGFR				Percentage change in eGFR from baseline			
	overall	Male	Female	P value	overall	Male	Female	P value
Baseline (SD)	92.4(26.0)	97.5(26.4)	87.7(25.2)	0.195	0	0	0	-
1 week (SD)	66.8(18.3)	69.0(17.1)	64.7(19.5)	0.466	-28.3(8.9)	-30.0(8.9)	-26.5(8.7)	0.221
1 month (SD)	66.8(21.0)	69.2(20.8)	65.1(21.8)	0.644	-30.3(8.2)	-33.1(4.3)	-28.3(9.8)	0.164
3 months (SD)	65.8(18.6)	71.9(21.0)	59.0(13.6)	0.134	-28.2(7.4)	-32.1(6.7)	-23.9(5.9)	0.012
6 months (SD)	69.4(17.4)	74.5(20.9)	64.7(12.6)	0.185	-22.6(11.9)	-26.0(5.7)	-19.2(15.5)	0.184
12 months (SD)	70.0(16.0)	71.0(14.4)	69.1(17.5)	0.726	-22.0(9.6)	-21.3(8.8)	-22.7(10.5)	0.679

Abbreviations: eGFR for estimated GlomerularFiltration Rate (ml/min/1.73 m^2).

Discussion

Renal deterioration after donor nephrectomy is a serious problem. Demonstrating the cause and risk factors is important and can prevent renal failure in donor patients. The risk for the donor to develop ESRD is 0.1-0.5%[5]. In our study there was not a significant rate of change in eGFR after surgery when comparing sexes. In the same way, most studies cannot demonstrate the effect of sex in kidney deterioration after nephrectomy[6,7]. Although in some studies it was reported that the female sex was associated with a decrease in renal function after donation[8,9]. Mjøen G et al. reported that old age, the male sex, and being overweight were associated with relative increases in serum creatinine after nephrectomy[3]. In the same way, Giessing M reported that the male sex, donor age, and African-American ethnicity are risk factors for ESRD[10].

Our study also showed the eGFR trend to decrease after donation and then slightly increase to a new baseline within 6 months. This result correlates with the result from a previous study. Fehrman-Ekholm I et al. reported that renal function improved for many years after donor nephrectomy, but slightly deteriorated in the long run[11]. Choi KH et al. also reported that renal function began to stabilize at the first month after live donor kidney transplantation[12].

There are several limitations in our study. It is retrospective and dependent on incomplete data that may affect the accuracy of the results. There is no consensus program for follow-up or imaging protocols for kidney donors after donation. The urine protein was not routinely checked or monitored in our cohort. A weakness of this study is that its duration was not long enough for observation. We believe these data could be useful in identifying risk, and determining the best treatment strategy for protecting patients who are likely to develop kidney deterioration.

Conclusion

Renal function declined after open donor nephrectomy. However, it improved over time and eGFR would reset to a new baseline 6 months after donation. Finally, the rate of change in renal function after donation is not associated with sex.

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Conflict of interest

The authors declare no conflict of interest.

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