Influence of renal function by transplant operation for living-related kidney donors in a short term

Chong-Wei Zhang[1], Guo Huang[2], Qing-Wei Wang[2,3], Xing-Chao Liu[4], Ya-Mei Li[5], Li Wang[6]

[1]Department of Laboratory Medicine, West China Hospital, Sichuan University, Chengdu, Sichuan 610041, China;
[2]Department of Clinical Laboratory, Sichuan Academy of Medical Sciences & Sichuan Provincial People's Hospital, School of Medicine, University of Electronic Science and Technology of China, Chengdu, Sichuan 610072, China;
[3]Chengdu Institute of Biology, Chinese Academy of Sciences, Chengdu, Sichuan 610041, China;
[4]Hepatobiliary & Pancreatic Center, Sichuan Academy of Medical Sciences & Sichuan Provincial People's Hospital, Chengdu, Sichuan 610072, China;
[5]Department of Rehabilitation Medicine, Sichuan Academy of Medical Sciences & Sichuan Provincial People's Hospital, Chengdu, Sichuan 610072, China;
[6]Department of Urology/Institute of Urology/Organ Transplantation Center, West China Hospital, Sichuan University, Chengdu, Sichuan 610041, China.

To the Editor: Data from the Global Observatory on Donation and Transplantation (GODT) indicate that of the 126,670 solid organs reported to be transplanted in 2015, kidneys made up 66% of these organs.[1] Because of its high effectiveness, kidney transplantation (KT) has been used to treat end-stage renal disease (ESRD) for more than 60 years in humans.[2] Live donor kidney transplantation significantly improves graft and patient survival compared with transplantation from a deceased donor. KT is not harmful to the living donors in the short term, and Living-related Kidney Donors (LKDs) have a relatively low risk of developing ESRD (approximately 0.1%, a percentage lower than ESRD incidents in the general population) in the long term.[4] However, some reports showed that the risk is significantly higher than a matched healthy population in the long term.[3] These potential risks must be considered for LKDs. Thus, it is important to evaluate health and renal function for LKDs in clinical.

The SF-36 health scale was used to evaluate health related quality of life by evaluating eight physical and mental health qualities: physiological function (PF), role physical (RP), bodily pain (BP), general health (CH), vitality (VT), social function (SF), emotional function (RE) and mental health (MH).[4] eGFR is an important indicator for evaluating renal function. The eGFR $< 60\,mL{\cdot}min^{-1}{\cdot}1.73\,m^{-2}$ is defined as chronic kidney disease (CKD) stage 3.[5] Compared to kidney recipients, kidney donors are generally thought to be healthier and thus clinicians may provide less follow-up monitoring. Lack of renal function monitoring limits the safety and effective implementation of living-related KTs. In the present study, we investigated the impact of KT on living-related kidney donors by examining the quality of life and changes in related renal function measures for LKDs.

All donors in this study underwent a comprehensively and judicious standardized medical assessment before surgery under informed consent. Our studies were approved by West China Hospital of Sichuan University Biomedical Research Ethics Committee. Participants were recruited from the West China Hospital database of registered kidney recipients and donors from July 2014 to June 2016. Only recipients that had undergone the nephrectomy within the last year were included. LKDs' ranged in age from 18 to 65 years old. All the KTs were performed at the Kidney Transplantation Centre of West China Hospital in Sichuan, China. The standardized medical assessment involved collection and testing of blood samples to compare the compatibility of ABO blood groups and human histocompatibility antigens (HLA)[6]; physical evaluation to identify any potential contraindications; and verification of kinship with official documentation. LKD nephrectomies were performed using an open technique with resection through the 12th rib or minimally invasive surgery with laparoscopy.

All participants in the study were contacted by telephone in advance and encouraged to provide samples for a biochemical blood test in West China hospital. A total of 120 LKDs completed the entire questionnaire one year after the operation. The LKDs consisted of 28 (23.3%) males and 92 (76.7%) females. The average LKD age at surgery was 46.7 ± 10.2 years. Parents were the best LKD matches at 56.7%, and siblings were the second-best

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Chong-Wei Zhang and Guo Huang contributed equally to this work.

Correspondence to: Dr. Li Wang, Department of Urology/Institute of Urology/Organ Transplantation Center, West China Hospital, Sichuan University, Chengdu, Sichuan 610041, China
E-Mail: huaxiwl05@163.com

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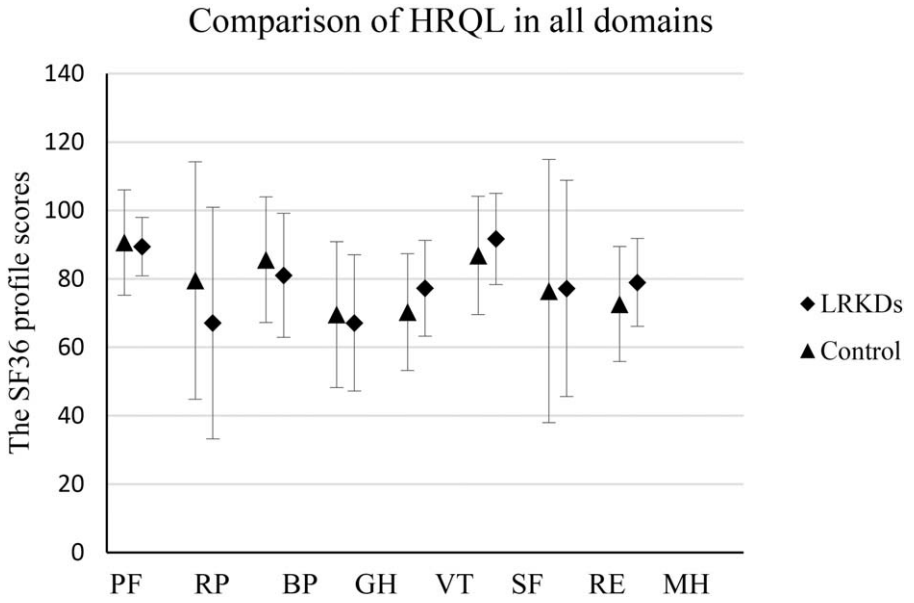

Figure 1: Comparison between 120 LKDs and 2249 general persons (GPs) in quality of life. BP: Bodily pain; GH: General health; MH: Mental health; PF: Physical functioning; RE: Role-emotional; RP: Role-physical; SF: Social functioning; VT: Vitality.

option with an average match of 23.3%. Nearly all the nephrectomies were performed by an open technique with the 12th rib removed. Several procedures utilized the laparoscopic technique for kidney extraction. No accompanying complications (including creatinine rising, urine loss, wound infection or bleeding in short time, and creatinine, hypertension, anemia and so on in the long term) obviously impacted LKDs' daily life. We met the statement regarding institutional review board of study as well as adherence of living donor workup and Amsterdam criteria.

We performed a face-to-face interview to using the SF-36 scale by a well-trained interviewer to determine quality of life. For those who agreed to participate, we interviewed their corresponding related recipient at the end of their blood collection and conducted the interview at a follow-up visit. The results of LKD quality of life surveys were entered independently by 2 investigators. Any discrepancies were checked and corrected according to the primary data in the SF-36 scale. The quality of life scores of donors was obtained from the investigation with SF-36 according to their responses. The scores were transformed to 0 to 100 scale.

Biochemical parameters were also measured. Renal function impairment was defined as a post-donation GFR < 60 $mL{\cdot}min^{-1}{\cdot}1.73\,m^{-2}$ according to the Kidney Disease Outcome Quality Initiative (K/DOQI) guidelines.[7,8] All the statistical analyses, involving transformation of quality of life scores and comparing with the norms, between pre-operation and post-operation, were completed through SPSS version 20.0 software (IBM, USA) by *t* test or rank-sum test. If the data obeys normal distribution, *t* test is used for comparing the difference of indexes between preoperative and postoperative patients, otherwise rank-sum test is used for that. The significance level was set up at 0.05.

To evaluate the influence of nephrectomy on LKD quality of life, LKDs completed the SF36 profile [Figure 1]. SF-36 scores in urban and rural residents of Sichuan province (China) were referenced as follows: PF, 90.62 ± 15.40; RP, 79.51 ± 34.70; BP, 85.61 ± 18.37; GH, 69.55 ± 21.32; VT, 70.29 ± 17.07; SF, 86.85 ± 17.28; RE, 76.45 ± 38.47; MH, 72.65 ± 16.81.[9] LKDs SF36 profile scores in all domains were as follows: PF, 89.42 ± 8.54; RP, 67.08 ± 33.85; BP, 81.04 ± 18.11; GH, 67.13 ± 19.92; VT, 77.25 ± 14.01; SF, 91.67 ± 13.33; RE, 77.22 ± 31.62; MH, 78.97 ± 12.85. There was no significant difference between these 2 groups.

To further study the influence on renal function of LKDs, we compared the physiological and biochemical indexes related to renal function including eGFR before and after surgery [Table 1]. The 24 indexes were compared to evaluate renal function. There was no significant difference between Neutrophils, Platelet, TB, DB, LDL, Ca^{2+} blood levels before and after donation. While there were significant differences in the remaining 18 indexes, the changes were within or slightly below the normal range. For example, the mean level of eGFR was down from 99.03 to $72.34\,mL{\cdot}min^{-1}{\cdot}1.73\,m^{-2}$. These results indicate that while there were significant differences in renal function before and after kidney donation, the function following donation remained within or slightly below the range of normal clinical variables. In order to further clarify the age factor affecting the quality of life, we compared the physiological and biochemical indexes related to renal function including eGFR before and after surgery in middle-aged and elder. The results showed the change of the reference value ALT ($-1.0[-11.0–2.0]$ IU/L vs. $1.5[-4.0–8.0]$ IU/L, $Z = -2.097$, $P = 0.036$) at baseline after donation was slightly smaller in elder group ($\geq$60 years old, $n = 24$) than in the middle-aged group ($\geq$45 and $<$60 years old, $n = 59$), and while the change of the

Table 1: The preoperative and postoperative measures of LKDs ($n=120$ in each group).

Parameters	Pre-operation	Post-operation	*t*/Z	*P*
Cholesterol (mmol/L)	4.53±0.94	4.97±0.96	4.913*	<0.001
Globulin (g/L)	27.62±4.24	29.81±4.39	2.879*	0.005
Mg^{2+}(mmol/L)	0.87±0.12	0.82±0.07	−3.610*	0.003
RBC ($\times10^{12}$/L)	4.36 (4.11, 4.71)	4.53 (4.28, 4.82)	−4.899†	<0.001
Hemoglobin (g/L)	132 (123,141)	138 (128,145)	−5.351†	<0.001
WBC ($\times10^{9}$/L)	6.36 (35.51, 7.39)	5.60 (4.66, 6.81)	−3.706†	<0.001
Neutrophils (%)	59.55 (53.60, 64.75)	61.20 (53.73, 67.58)	−1.583†	0.113
Lymphocyte (%)	31.70 (26.53, 37.56)	29.30 (24.93, 36.00)	−1.969†	0.049
Platelet (10^{9}/L)	161.5 (126.0, 204.8)	175.0 (140.3, 214.0)	−1.916†	0.055
ALT (IU/L)	19 (14,26)	19 (14,26)	−0.138†	0.891
AST (IU/L)	23 (19.75,27)	21 (18,27)	−2.630†	0.009
TB (μmol/L)	10.95 (8.95,13.35)	11.40 (9.70,14.15)	−1.528†	0.127
DB (μmol/L)	3.3 (2.7,4.4)	3.5 (2.6,4.6)	−0.834†	0.404
Albumin (g/L)	44.55 (42.38,46.23)	43.45 (40.70,46.10)	−2.657†	0.008
Creatinine (μmol/L)	87.8 (77.0,101.0)	63.7 (55.4,73.9)	−8.810†	<0.001
eGFR ($mL\cdot min^{-1}\cdot1.73\,m^{-2}$)	70.72 (60.65, 83.58)	101.00 (90.59, 109.06)	−9.119†	<0.001
Uric acid (μmol/L)	312.0 (272.0, 359.5)	263.5 (217.0, 304.8)	−8.259†	<0.001
Blood glucose (mmol/L)	5.29 (4.95, 5.64)	5.13 (4.70, 5.50)	−3.304†	0.001
TG (mmol/L)	1.32 (0.88, 2.26)	1.13 (0.81, 1.55)	−4.420†	<0.001
LDL (mmol/L)	2.77 (2.19, 3.40)	2.53 (2.16, 3.30)	−3.481†	0.081
Na^{+}(mmol/L)	140.9 (139.9,142.5)	141.8 (140.5,143.4)	−1.746†	0.001
K^{+}(mmol/L)	4.01 (3.84,4.19)	4.13 (3.39,4.34)	−3.327†	0.012
Ca^{2+}(mmol/L)	2.28 (2.22,2.34)	2.25 (2.18,2.35)	−1.674†	0.094
P (mmol/L)	1.12 (1.00, 1.26)	1.04 (0.93,1.15)	−8.101†	<0.001

Data are presented as Mean±SD or Median (P_{25}, P_{75}). ALT: Alanine transferase; AST: Aspartate transferase; DB: Direct bilirubin; IQR: Interquartile range; LDL: Low density lipoprotein; RBC: Red blood cells; SD: Standard deviation; TB: Total bilirubin; TG: Glycerin trilaurate; WBC: White blood cell. * *t* values. †Z values; $P<0.05$ was considered statistically significant.

reference value eGFR (−24.22 [−33.02–12.29] $mL\cdot min^{-1}\cdot1.73\,m^{-2}$ *vs.* −32.69 [−41.22–21.25] $mL\cdot min^{-1}\cdot1.73\,m^{-2}$, $Z=-2.36$, $P=0.018$) at baseline after donation was the opposite. Besides, there was no significant difference for the change of the remaining 22 renal function indexes after operation.

Living-donor renal transplantation can effectively reduce mortality and improve recipient quality of life.[10] Compared to recipients, donors receive little follow-up medical monitoring despite the number of accompanying complications that can arise in LKDs. For example, LKD respiratory mechanics and pulmonary function may change following donor nephrectomy.[11] Previous studies found that there were no significant differences between donors and healthy individuals in quality of life or renal function.[12]

Our study evaluated 24 indexes of renal function and found that there were significant differences in 18 indexes including eGFR before and after donation. However, the function of the kidney was within or slightly below the range of normal clinical variables [Table 1]. Previous meta-analysis of kidney donors has shown inspective proteinuria increases with donation time.[11] Our data showed that proteinuria content of some donors changed from negative to positive. The increased blood glucose after donation may easily cause hyperglycemia if the donors pay no attention to eating habits. Our study also showed mean value of AST (aspartate transferase) slightly increased after donation. In addition, to further clarify other factors that affect the quality of life, we analyzed the renal function indexes in middle-aged and elder. The results indicated that age factor did not mainly affect the quality of life for the donors.

To evaluate the influence of indexes for LKDs, we compared SF36 profile scores in healthy individuals and donors. Statistical analysis showed that there was no statistically significant difference between these two groups [Figure 1]. Combined with analysis of 24 physiological and biochemical indexes, we infer that renal function in living donors is expected to improve for many years.[12] Hence, more medical care should be provided to living donors to promote improvement of quality of life and renal function. Our study demonstrates that a decrease in renal function did not affect the quality of life in LKDs in the short term, and we speculated that more medical care should be given to the donors in the long run. The regular follow-up half a year or a year after surgery is a necessary postoperative donor care. It includes the examination of the patient's blood pressure, urine, and other biochemical indicators. In addition, the doctor will also guide the recipients' daily life.

Conflicts of interest

None.

References

1. Carmona M, Álvarez M, Marco J, Mahíllo B, Domínguez-Gil B, Núñez JR, *et al*. Global organ transplant activities in 2015. Data from the Global Observatory on Donation and Transplantation (GODT). Transplantation 2017;101:S29. doi: 10.1097/01.tp.0000525015.43613.75.
2. Vercellino M, Masera S, Lorenzatti M, Condello C, Merola A, Mattioda A, *et al*. Kidney transplantation. Med Sestra 1972;31:3–6. doi: 10.1111/j.1525-139X.2008.00511.x.
3. Cozzi DA, Ceccanti S, Cozzi F. Long-term risks for kidney donors. Kidney Int 2014;86:447. doi: 10.1038/ki.2014.145.
4. Gómezbesteiro MI, Santiagopérez MI, Alonsohernández A, Valdéscañedo F, Rebolloalvarez P. Validity and reliability of the SF-36 questionnaire in patients on the waiting list for a kidney transplant and transplant patients. AM J Nephrol 2004;24:346–351. doi: 10.1159/000079053.
5. Deo A, Levey AS. Decreased Estimated Glomerular Filtration Rate (eGFR): Interpretation in Acute and Chronic Kidney Disease. Berlin Heidelberg: Springer; 2012. doi: 10.1007/978-3-642-00418-6_281.
6. Santos RD, Langewisch ED, Norman DJ. Weir MR, Lerma EV. Immunological assessmentof the transplant patient. Kidney Transplantation: Practical Guide to Management New York: Springer; 2014;23–34. doi: 10.1007/978-1-4939-0342-9_2.
7. Foundation NK. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Am J Kidney Dis 2002;39:S1–S266. doi: 10.1016/S0272-6386(02)70054-1.
8. Rook M, Hofker HS, van Son WJ, Jj HVDH, Ploeg RJ, Navis GJ. Predictive capacity of pre-donation GFR and renal reserve capacity for donor renal function after living kidney donation. AM J Transplant 2006;6:1653. doi: 10.1111/j.1600-6143.2006.01359.x.
9. Li N, Liu C, Li J, Ren X. The norms of SF-36 scale scores in urban and rural residents of Sichuan province. J West China Univ Med Sci 2001;32:43.
10. Garg AX, Muirhead N, Knoll G, Yang RC, Prasad GVR, Thiessen-Philbrook H, *et al*. Proteinuria and reduced kidney function in living kidney donors: a systematic review, meta-analysis, and meta-regression. Kidney Int 2006;70:1801–1810. doi: 10.1038/sj.ki.5001819.
11. Moraes K, Paisani DM, Pacheco NCT, Chiavegato LD. Effects of nephrectomy on respiratory function and quality of life of living donors: a longitudinal study. Rev Bras Fisioter 2015;19:264–270. doi: 10.1590/bjpt-rbf.2014.0105.
12. Fehrman-Ekholm I, Kvarnström N, Söfteland JM, Lennerling A, Rizell M, Odén A, *et al*. Post-nephrectomy development of renal function in living kidney donors: a cross-sectional retrospective study. Nephrol Dial Transpl 2011;26:2377. doi: 10.1093/ndt/gfr161.

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