Original Article

Quality of life and kidney function of living kidney donors at the Faculty of Medicine, Chiang Mai University.

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Keywords:
kidney transplantation,
quality of life,
kidney donors

Abstract

Objective: To compare the quality of life, residual kidney function, and complications of kidney donors before and after donation at the Faculty of Medicine, Chiang Mai University, Thailand.

Material and method: This prospective cohort study included 76 participants who visited the clinic for planning donor nephrectomy and/or routine follow-up after donation between November 2015 and June 2017. The primary outcome was the quality of life of living kidney donors after donation at the short-term and long-term follow-ups, assessed using the SF-36 questionnaire. The secondary outcome was the assessment of residual kidney function after donation. Other potential consequences of kidney donation are also reported in our study, including hypertension, proteinuria, complications during pregnancy, and second thoughts.

Result: Quality of life showed a decline in the early post-donation period but gradually improved over time, especially as regards physical components. The overall quality of life in kidney donors remained higher than in the general population after donation. Sixty-three donors had a GFR ≥60 mL/min/1.73 m^2 after donation. Eight donors had a GFR of 45-59 mL/min/1.73 m^2. Five donors did not visit the clinic for routine follow-up after donation due to transportation difficulties. No significant proteinuria was detected in our study. Two donors developed hypertension after donation. Two donors became pregnant after donation and underwent successful delivery without complication. One donor regretted her decision because of an early graft loss in her recipient due to renal vein thrombosis.

Conclusion: Donor nephrectomy is recognized as a safe procedure. A decrease in quality of life after donation was observed only in the early post-donation period. Mental health was not affected by kidney donation. Overall quality of life in kidney donors was higher than in a comparative general population. Residual kidney function after donation was at an acceptable level based on GFR.

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นิพนธ์ต้นฉบับ

คุณภาพชีวิตและสภาวะการทำงานของไตของผู้บริจาคไตในคณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่

ดนัย แก้วจงประสิทธิ์, จักรกฤษณ์ จันทร์อู่, อัคร อมันตกุล, ศิวัฒม์ ภูริยะพันธ์

หน่วยศัลยศาสตร์ระบบปัสสาวะ ภาควิชาศัลยศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่

คำสำคัญ:
การผ่าตัดเปลี่ยนไต,
คุณภาพชีวิต,
ผู้บริจาคไต

บทคัดย่อ

วัตถุประสงค์: เพื่อเปรียบเทียบคุณภาพชีวิต, สภาวะการทำงานของไตในผู้บริจาคไตในคณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ รวมไปถึงภาวะแทรกซ้อนภายหลังการผ่าตัดบริจาคไต

ผู้ป่วยและวิธีการศึกษา: การศึกษาแบบ Prospective cohort study มีผู้เข้าร่วมงานวิจัย 76 ราย ซึ่งเป็นผู้บริจาคไตที่เข้ารับการวางแผนผ่าตัด และ/หรือ ติดตามอาการภายหลังการบริจาคไต ตั้งแต่ พฤศจิกายน 2015 ถึง มิถุนายน 2017 วัตถุประสงค์หลักของการศึกษาคือการติดตามคุณภาพชีวิตภายหลังการผ่าตัดบริจาคไตในทั้งระยะสั้นและระยะยาว โดยประเมินด้วยแบบสอบถาม SF-36 questionnaire วัตถุประสงค์รองของการศึกษาคือ สภาวะการทำงานของไตภายหลังการผ่าตัดบริจาค หรือภาวะอื่นๆ ที่มีโอกาสเกิดขึ้นได้ภายหลังการบริจาคไต เช่น ความดันโลหิตสูง, โปรตีนรั่วในปัสสาวะ, ภาวะแทรกซ้อนขณะตั้งครรภ์ และการคิดไตร่ตรองอีกครั้งถึงการผ่าตัดบริจาคไต

ผลการศึกษา: คุณภาพชีวิตของผู้บริจาคไตในด้านร่างกาย (physical components) ลดลงในช่วงแรกหลังการผ่าตัด หลังจากนั้นจะดีขึ้นตามลำดับ คุณภาพชีวิตโดยรวมของกลุ่มผู้บริจาคไตมีค่าสูงกว่าประชากรทั่วไปในทุกด้าน ผู้บริจาคไต 63ราย มีค่า GFR $\geq$60 mL/min/1.73 m^2 หลังการผ่าตัดบริจาคไต ผู้บริจาคไต 8ราย มีค่า GFR อยู่ในช่วง 45-59 mL/min/1.73m^2 หลังการผ่าตัดบริจาคไต ผู้บริจาคไต 5 ราย ไม่ได้มาติดตามอาการหลังผ่าตัด

เนื่องจากปัญหาด้านการเดินทาง ไม่พบภาวะโปรตีนรั่วในปัสสาวะอย่างมีนัยสำคัญภายหลังการผ่าตัดบริจาคไต

ผู้บริจาคไต 2 ราย ได้รับการวินิจฉัยว่า ความดันโลหิตสูงภายหลังการผ่าตัดบริจาคไต ผู้บริจาค 2 ราย ตั้งครรภ์หลังการผ่าตัด และสามารถคลอดบุตรได้ตามปกติโดยไม่มีภาวะแทรกซ้อน ผู้บริจาคไต 1 ราย รู้สึกเสียใจที่ผ่าตัดบริจาคไตเนื่องจากไตบริจาคนั้นสูญเสียการทำงานจากภาวะ renal vein thrombosis

สรุป: การผ่าตัดบริจาคไต เป็นการผ่าตัดที่ปลอดภัย คุณภาพชีวิตในมิติของร่างกาย(physical components) อาจลดลงในช่วงพักฟื้นหลังผ่าตัด แต่ไม่ส่งผลในด้านจิตใจ (mental components) ของผู้บริจาคแต่อย่างใด และไม่ส่งผลต่อคุณภาพชีวิตในระยะยาว นอกจากนี้คุณภาพชีวิตโดยรวมของผู้บริจาคไตมีค่าสูงกว่ากลุ่มประชากรทั่วไปในทุกด้าน ค่าสภาวะการทำงานของไตที่เหลืออยู่ อยู่ในเกณฑ์ที่ยอมรับได้

ผู้นิพนธ์หลัก: ศิวัฒม์ ภูริยะพันธ์ หน่วยศัลยศาสตร์ระบบปัสสาวะ ภาควิชาศัลยศาสตร์ คณะแพทยศาสตร์, มหาวิทยาลัยเชียงใหม่ อำเภอเมือง จังหวัดเชียงใหม่

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Kidney transplantation (KT) is the optimal renal replacement therapy for patients with end-stage renal disease (ESRD). There are 2 types of kidney donors: deceased kidney donors and living kidney donors. Living-kidney transplantation shows superior patient and graft survival rates and lower morbidity in recipients than when the transplantation is from a deceased donor. Living transplantation also enables the operation to be more carefully planned[1]. Quality of life in living KT recipients was better than in deceased KT recipients. Research has been conducted which evaluates residual kidney function, risk of ESRD, hypertension, adverse pregnancy outcomes, and the quality of life in living kidney donors after nephrectomy. The results of these studies show that patient survival and risk of ESRD are no different from the general population.[2,5] Immediately after donation, residual kidney function remained at 50% of pre-donation levels. However, the remnant kidney demonstrated adaptive hyperfiltration, increasing the glomerular filtration rate to 60-75% of pre-donation levels by a year after donation.[3] Residual kidney function can therefore be maintained at an acceptable level.[4] Quality of life changes after donation are low[5] and show no difference when compared with the general population[6,7] The short-form, 36-item long health survey (SF-36), is a standardized questionnaire used to measure the quality of life at Srinagarind Hospital in Thailand. The result of this study is that donor nephrectomy did not affect the quality of life of the donors.[8]

Data from the Thai Transplant Registry Annual Report 2016: there were 8,132 kidney transplantations in Thailand. Thirty-one centers carried out the operations. In the Faculty of Medicine, Chiang Mai University, kidney transplantation has been performed for 30 years. The proportion of living KT is between 35 and 48% of all kidney transplantations per year over the last 5 years (Figure 1, 2). The quality of life of living kidney donors at the Faculty of Medicine, Chiang Mai University has never been studied.

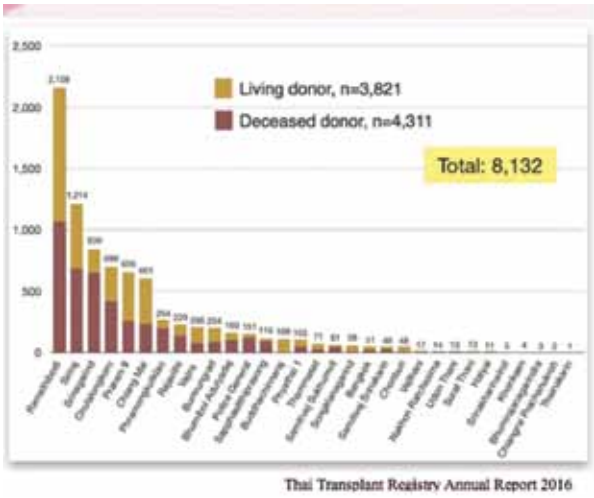


Figure 1. Kidney transplantation in Thailand

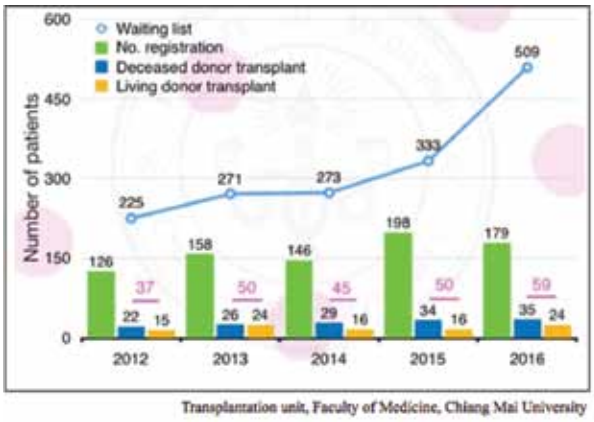


Figure 2. Chiang Mai University kidney transplant program

Objective

To determine the quality of life, residual kidney function, and any associated complications of kidney donors after donation at the Faculty of Medicine, Chiang Mai University.

Material and method

Our study is a prospective cohort study. All kidney donors who visited the clinic for planning donor nephrectomy and/or routine follow-up after donation between November 2015 and July 2017 were invited to participate in our study (Figure 3).

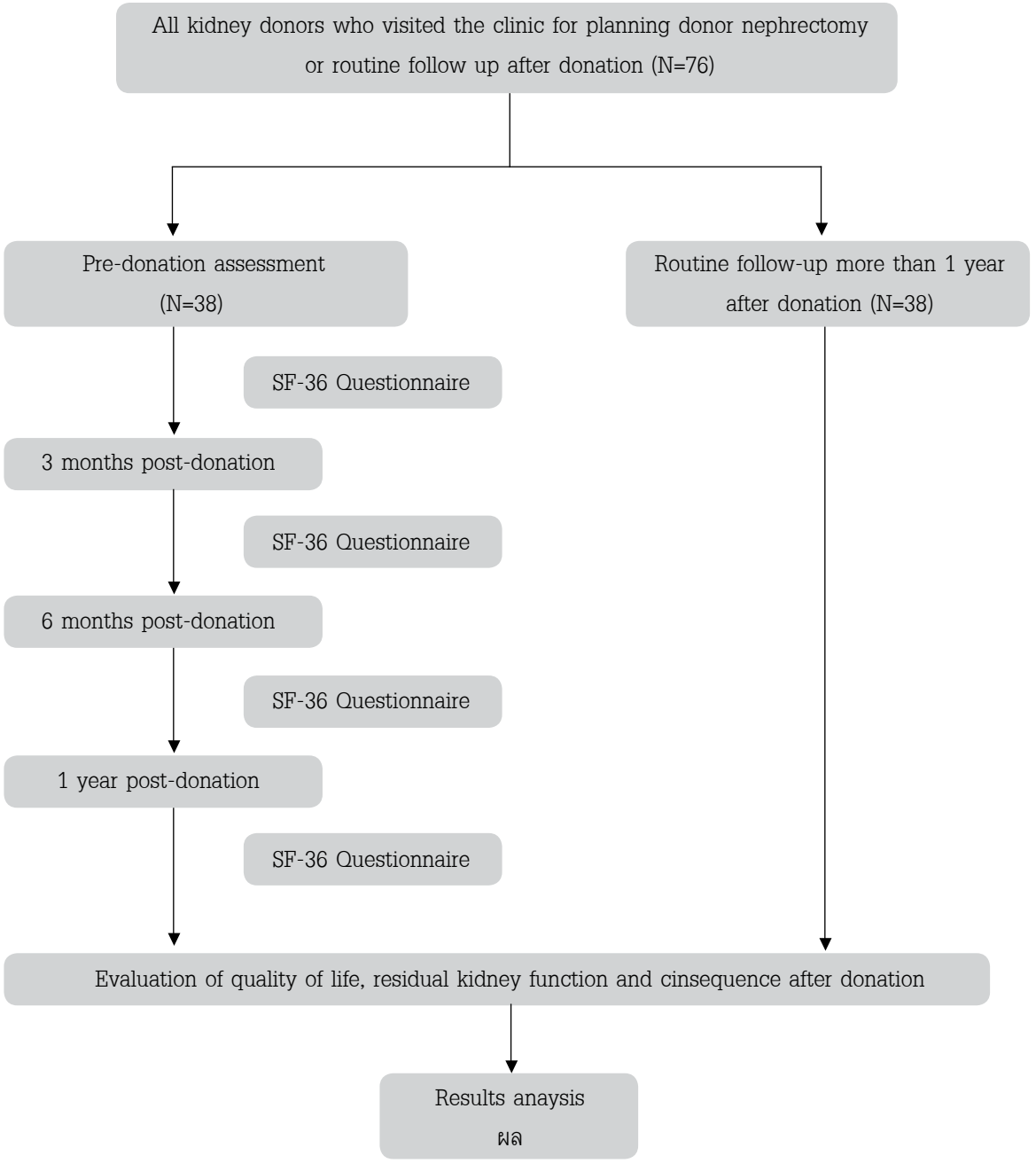


Figure 3. Research methodology

We divided participants into 2 groups. The first group included kidney donors who visited the clinic for planning donor nephrectomy between November 2015 and July 2016; they were monitored in order to assess quality of life, kidney function, and complications at pre-donation and post-donation at 3 months, 6 months, and 1 year after donation. The second group included kidney donors who visited the clinic for a routine follow-up more than 1 year after donation between November 2015 and July 2017. We collected data concerning quality of life, residual kidney function, and associated complications after donation at the time of follow-up.

We measured quality of life using the Thai version of the SF-36 questionnaire[9-11], asked about decision-making, and feedback. We evaluated residual kidney function by estimating GFR using the CKD-EPI Creatinine 2009 Equation.

Due to a potentially larger population in the second group, we set the number of participants in this group at the same total as in the first group in order to make a direct comparison of the differences between the groups.

Data was calculated using the Stata 12.0 program. Donor characteristics were compared by descriptive statistics and reported as Mean±Standard Deviation (SD) and percentage. Quality of life assessment was divided into 2 parts: the first part focused on physical components, including physical functioning (PF), role limitation due to physical problems (RP), body pain (BP) and general health perception (GH); the second part focused on mental components, including social functioning (SF), role limitations due to emotional problems (RE), general mental health (MH), and vitality (VT). Quality of life and residual kidney function at post-donation 3 months, 6 months, and 12 months were compared with the baseline (pre-donation) by paired t-test. The level of statistical significance was set at $P<0.05$.

Result

Seventy-six healthy donors were included in our study. In the first group, 38 healthy donors underwent open donor nephrectomy during the study period and visited the clinic for routine follow-up until 1 year after donor nephrectomy. Thirty-three participants (86%) completed the entire follow-up. Five participants were lost to follow-up due to transportation difficulties. In the second group, the longest follow-up time after donor nephrectomy was 17 years (mean 5.3 years). Donor baseline characteristics were not different between the 2 groups apart from kidney function and systolic blood pressure (Table 1). However, the higher level of systolic blood pressure in the second group was still within normal blood pressure limits and of no clinical significance.

The results of our study showed a change in the quality of life of donors in the short-term (≤1 year after donor nephrectomy) when compared to the baseline (Table 2). This was particularly the case in the first 3 months after donation. Most aspects of quality of life declined, with statistical significance, apart from the domain of general mental health (MH), which did not show any statistically significant change ($P>0.05$). After monitoring the quality of life until 1 year after donation, we found that quality of life gradually improved over time. However, the domains of body pain (BP) and limitations due to physical problems (RP) were statistically significantly lower than the baseline in the first year after donation (BP 6.9 VS 6.3, $P=0.017$; RP 3.8 VS 3.4, $P=0.046$). When compared with donors in the second group (long-term follow-up), the quality of life in the domain of body pain showed no statistically significant change (BP 6.8 VS 6.3, $P=0.084$) (Table 3).

Baseline quality of life of kidney donors in our study was higher than in the comparative Thai general population[10] in all dimensions. Quality of life of donors also remained higher than the Thai general population in the long-term follow-up (Figure 4).

Residual kidney function after donor nephrectomy showed a statistically significant decline ($P<0.001$). Mean GFR decreased from 102.47 mL/min/1.73m^2 to 71.63, 71.15, 74 mL/min/1.73m^2 at pre-donation to post-donation at 3 months, 6 months, and 1 year respectively. Sixty-three donors had a GFR ≥60 mL/min/1.73m^2 after donation. Eight donors had a GFR of between 45 and 59 mL/min/1.73 m^2 (4 cases in short-term arm and 4 cases in long-term arm). Mean GFR declined by 27.8-30.1% in the first year after donation. Mean residual kidney function in the long-term follow-up was 80 mL/min/1.73 m^2 (Figure 5).

There was no significant proteinuria in our study. Two donors were diagnosed with hypertension. Blood pressure was well controlled by a single medication. Two female donors became pregnant after donation and both underwent successful delivery without complication. One donor became pregnant within 1 year after donation. Most donors were satisfied with their decision. One donor did regret her decision because of early graft loss due to renal vein thrombosis.

Table 1. Comparison of donor characteristics

Parameters	Group 1 (Short-term)	Group 2 (Long-term)	P-value
Age			
Mean±SD	40.3 ± 12.5	45.2 ± 11.4	0.08
BMI			
Mean±SD	23.4 ± 3.4	22.5 ± 3.8	0.205
GFR			
Mean±SD	102.5 ± 17.0	80.4 ± 14.3	<0.001
Systolic BP			
Mean±SD	114.4 ± 11.3	123.5 ± 12.8	0.016
Diastolic BP			
Mean±SD	71.1 ± 10.5	74.7 ± 10.9	0.150
Sex, n (%)			
Male	11 (29.1)	10 (26.3)	1.000
Female	27 (71.1)	28 (73.7)	
Employment, n (%)			0.860
Government service	6 (15.8)	9 (23.7)	
Private business	11 (29.91)	10 (26.3)	
Employee	5 (13.2)	3 (7.9)	
Farmer	5 (13.2)	3 (7.89)	
Unemployed	6 (15.8)	6 (15.8)	
General job	5 (13.2)	7 (18.4)	
Relationship, n (%)			0.340
Spouse	5 (13.2)	5 (13.2)	
Sibling	13 (34.2)	14 (36.8)	
Parent	8 (21.5)	12 (31.6)	
Offspring	8 (21.5)	7 (18.4)	
Other	4 (10.5)	0 (0.00)	
Status, n (%)			0.200
Single	10 (26.3)	11 (28.9)	
Marriage	23 (60.5)	27 (71.1)	
Divorce	4 (10.5)	0 (0.00)	
Widow(er)	1 (2.6)	0 (0.00)	
Education, n (%)			0.500
Primary school	7 (18.4)	9 (23.7)	
High school	19 (50)	13 (34.2)	
Bachelor degree	12 (31.6)	16 (42.1)	

Table 2. Comparison of quality of life at the short-term follow-up

Quality of Life	N=38 Mean±SD	Difference (95% CI)	P-value
PF			
- Baseline	19.2 ± 1.5	-	-
- Month 3	17.9 ± 2.2	-1.3 (-2.2 to -0.4)	0.009
- Month 6	18.4 ± 1.6	-1.8 (-1.5 to 0.1)	0.036
- Month 12	18.7 ± 1.9	-0.45 (-1.3 to 0.5)	0.316
RP			
- Baseline	3.8 ± 0.5	-	-
- Month 3	3.0 ± 1.6	-0.8 (-1.4 to -0.2)	0.013
- Month 6	3.2 ± 1.2	-0.6 (-0.9 to 0.2)	0.003
- Month 12	3.4 ± 1.0	-0.4 (0.8 to 0.01)	0.046
SF			
- Baseline	7.3 ± 1.1	-	-
- Month 3	6.8 ± 2.1	-0.5 (-1.1 to 0.2)	0.158
- Month 6	6.8 ± 2.1	-0.5 (-1.3 to 0.3)	0.195
- Month 12	6.6 ± 1.7	-0.6 (-1.3 to 0.1)	0.065
RE			
- Baseline	2.9 ± 0.4	-	-
- Month 3	2.5 ± 0.8	-0.4 (-0.7 to -0.09)	0.014
- Month 6	2.8 ± 0.5	-0.2 (-0.3 to 0.03)	0.096
- Month 12	2.6 ± 0.9	-0.4 (-0.7 to 0.02)	0.038
BP			
- Baseline	6.9 ± 1.2	-	-
- Month 3	6.1 ± 1.4	-0.9 (-1.5 to -0.3	0.006
- Month 6	6.2 ± 1.5	-0.8 (-1.3 to -0.2)	0.009
- Month 12	6.3 ± 1.3	-0.7 (-1.2 to -0.13)	0.017
MH			
- Baseline	20.9 ± 2.8	-	-
- Month 3	20.4 ± 2.7	-0.5 (-1.9 to 0.9)	0.475
- Month 6	21.6 ± 3.1	0.7 (-0.8 to 2.3)	0.347
- Month 12	21.5 ± 3.1	0.6 (-0.9 to 2.2)	0.417
VT			
- Baseline	16.3 ± 2.9	-	-
- Month 3	14.6 ± 2.7	-1.7 (-3.2 to -0.2)	0.032
- Month 6	15.8 ± 3.1	-0.5 (-0.2 to 1.01)	0.497
- Month 12	16.2 ± 2.7	-0.09 (-1.5 to 1.3)	0.897
GH			
- Baseline	18.8 ± 2.5	-	-
- Month 3	16.4 ± 4.0	-2.4 (-4.0 to -0.8)	0.004
- Month 6	18.3 ± 3.7	0.4 (-2.0 to 1.3)	0.631
- Month 12	17.8 ± 3.1	-0.9 (-2.4 to 0.5)	0.191

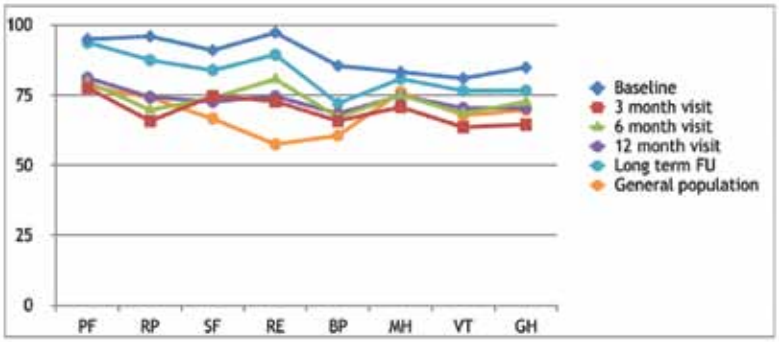
Physical components: PF=Physical functioning, RP=Role limitation due to physical problems, BP=Body pain, GH=General health perception

Mental components: SF=Social functioning, RE=Role limitations due to emotional problems, MH=General mental health, VT=Vitality

Table 3. Comparison of quality of life at the long-term follow-up

Parameters	Pre-donation N=38	Long-term FU N=38	P-Value
PF			
Mean ± SD	19 ± 1.6	18.8 ± 1.8	0.424
RP			
Mean ± SD	3.8 ± 0.5	3.5 ± 1.03	0.026
SF			
Mean ± SD	7.3 ± 1.0	6.7 ± 1.7	0.095
RE			
Mean ± SD	2.9 ± 0.4	2.7 ± 0.9	0.044
BP			
Mean ± SD	6.8 ± 1.2	6.3 ± 1.2	0.084
MH			
Mean ± SD	20.8 ± 2.7	21.6 ± 4.3	0.254
VT			
Mean ± SD	16.3 ± 2.9	16.3 ± 2.7	0.984
GH			
Mean ± SD	18.7 ± 2.4	17.9 ± 3.0	0.253

PF= Physical functioning, RP= Role limitation due to physical problems, SF=Social functioning, RE=Role limitations due to emotional problems, BP=Body pain, MH=General mental health, VT=Vitality, GH= General health perception



PF = Physical functioning, RP = Role limitation due to physical problems, SF = Social functioning, RE = Role limitations due to emotional problems, BP = Body pain, MH = General mental health, VT = Vitality, GH = General ealth perception

Figure 4. Comparison of quality of life between donors and the general population in Thailand

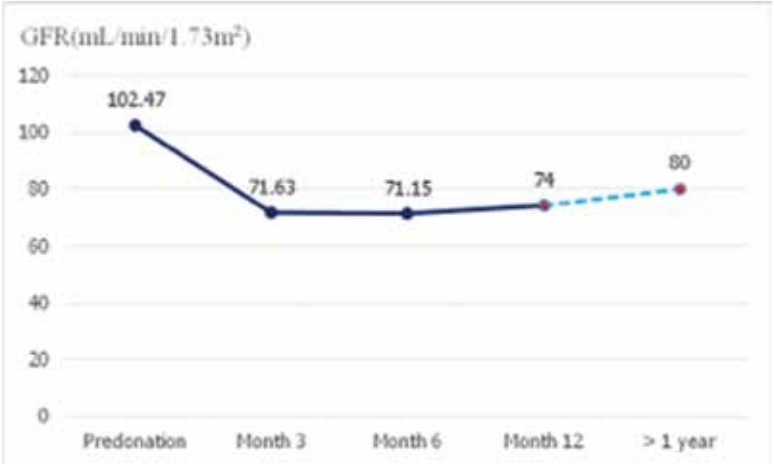


Figure 5. Kidney function of donors (GFR, mL/min/1.73 m^2)

Discussion

All participants in our study were healthy donors. The technique employed in all of the operations was open donor nephrectomy. Left kidneys were selected for preference as the left renal vein is longer than the right.

The results of our study show the baseline quality of life of kidney donors was higher than the comparative Thai general population in all domains. The quality of life of the donors remained higher than the Thai general population even though the participants underwent surgery. The quality of life in the early period after donation declined as regards the physical component because of the recovery from the pain associated with open surgery. Donors were advised by their physician and their nursing staff to limit vigorous activity, which may have affected the domain of role limitation due to physical and emotional problems (RP and RE) at the long-term follow-up. However, the domain of physical function (PF) that was used to assess daily activity was not affected in the long-term (PF 19 VS 18.8, P=0.424). Domain of general health perception (GH) also showed no change (GH 18.7 VS 17.9, P=0.253).

The mental components of the quality of life in our participants remained at a high level during the study period and were higher than the comparative Thai population at the long-term follow-up. The domains of vitality (VT), general mental health (MH) and social functioning (SF) were not changed (Figure 2, 3). The quality of life in the domain of role limitation due to emotional problems (RE) was not significantly altered after donation (RE baseline VS post donation 6 months =2.9 VS 2.8, P=0.09).

Donor nephrectomy may have affected the quality of life in the early post-donation period, but only the physical components were impacted by the operation and healed over time. Mental components were not affected and the participants had good mental health after donation. This result was similar to the findings of a previous study[12]. In the long-term, the results show a better quality of life than in the general population in all domains.

Residual kidney function was significantly lower than the pre-donation level (GFR pre-donation vs post-donation 3 months, 6 months, 1 year, >1 year = 102.47 VS 71.6, 71.15, 74, 80 mL/min/1.73 m^2; P<0.001). However, most donors had residual kidney function within the acceptable range (GFR ≥60 mL/min/1.73 m^2). Eight donors had low residual kidney function (GFR 45-59 mL/min/1.73 m^2). This result was similar to those seen in previous studies[13, 14].

Other literature reported that age at donation was a strong determinant of the development of stage 3 CKD and hypertension[15]. Our study showed no significant proteinuria or pregnancy complications in participants, which is similar to the findings from previous studies[3,5,14]. Residual kidney function can be maintained at an acceptable range for many years[4]. Incidence of ESRD in kidney donors was 0.5-1.1%, which is not different from the general population[2].

There were several limitations to this study, including its short duration, the number of participants in the prospective cohort study arm, and the lack of pre-donation information regarding kidney function in donors who visited for a long-term follow-up. A further limitation could be the lack of baseline characteristics for the comparative Thai general population, which would have allowed for closer comparison with the participants in our study.

Conclusion

Donor nephrectomy is a safe procedure. A decrease in the quality of life after donation was observed in the early post-donation period. Mental health was not affected by kidney donation. Overall, the quality of life in kidney donors was better than in the general population. Residual kidney function after donation was at an acceptable level.

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