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Quality of Life Following Laparoscopic Living-Donor Nephrectomy

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ABSTRACT

Background and Objectives: This study compares donor quality of life (QOL) with extirpative (simple or radical) patients' QOL after laparoscopic nephrectomy and analyzes factors predictive of mental QOL for donors.

Methods: One hundred one donors and 48 extirpative laparoscopic nephrectomy patients filled out the SF-36v2 form at pre- and postoperative visits, and scores were transformed to norm-based. Donor characteristics were collected and analyzed using univariate analysis.

Results: Donor patients had a decline in the mental summary at all time points that became significant at 7 months (–2.9), whereas extirpative patients trended positive at 7 months (+2.6). Both groups had a significant decline in the physical summary at 1 month, which rebounded by 4 months. Female gender, positive social/psychiatric history, and major graft recipient complications were all significant predictors of a decline in mental health at 1 month.

Conclusion: Compared with patients who undergo extirpative surgery, kidney donors have significant mental stress associated with donation that persists beyond the postoperative period. Better preoperative counseling and postoperative monitoring might lead to better outcomes, especially for those in high-risk groups.

Key Words: Living donors, Quality of life, Mental health, Laparoscopy.

INTRODUCTION

Each month, the waiting list for kidney transplant grows longer, with more than 90,000 currently waiting in the United States and more than 66,000 of those waiting for longer than 1 year. In 2010, 4656 patients died while waiting for a transplant.[1] In 1995, Ratner et al performed the first laparoscopic donor nephrectomy with the goal of removing obstacles and increasing supply.[2] Since that time until 2010, donations from living donors increased from 3389 to 6277. Although total kidney transplants have increased from 11,084 to 16,899, the percentage coming from living donors has only increased from 31% to 37% during the same span. The small increase in living donations comes despite the known superior transplant survival and function of living versus cadaveric transplants.

Previous studies show that most donors are happy with their decision to donate, but they also show higher rates of anxiety and depression when compared with the general population.[3] Few studies use a surgical control group. This study compares kidney donor quality of life (QOL) with extirpative (simple or radical) patients' QOL after laparoscopic nephrectomy and analyzes factors predictive of QOL for donors. Our aim is to better understand QOL deficits in donors so that we can provide better preoperative counseling, achieve higher postoperative satisfaction, and obtain an increase in willing donors.

METHODS

Donor and extirpative laparoscopic nephrectomy patients filled out the SF-36v2 health survey by QualityMetric at preoperative and postoperative visits. This survey asks 36 questions that measure 8 health domains: physical function, social function, bodily pain, emotional well-being, energy–fatigue, general health perceptions, role limitations caused by physical problems, and role limitations attributable to emotional problems. These 8 health domains are summarized into the physical component health (PCH) and the mental component health (MCH) scores. This survey has been validated in several populations. Scores were transformed to norm-based with a score of 50

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equaling the average of a sample taken in 1998 of the general US population.

All nephrectomies were performed by a single experienced laparoscopic surgeon. Partial nephrectomy patients and those with pT4, nodal, or metastatic disease were excluded from the study. Donor characteristics (gender, age, body mass index [BMI], social history, marital status, and relation to recipient) and surgical outcomes (nephrectomy side, surgery duration, blood loss, hospital stay, Cockcroft-Gault estimated glomerular filtration rate [GFR], and recipient complications) were collected using both paper and electronic chart records retrospectively. Statistical analysis was performed with the 2-tailed Student's *t* test and Pearson chi-square test using IBM SPSS statistics version 19 (Armonk, NY). The study was approved by the medical center's institutional review board.

RESULTS

One hundred one donors between January 2006 and June 2010 completed 175 surveys, with 56, 57, 38, and 24 surveys completed at the preoperative visit, and at 1, 4, and 7 or more months, respectively. Forty-seven extirpative nephrectomy patients completed of 70 surveys, with 13, 33, 9, and 15 surveys completed at the preoperative visit, and at 1, 4, and 7 or more months, respectively. There were no operative complications in the donor group, with the longest hospital stay being 4 days. The only postoperative complication was an incisional hernia that required surgical correction. In the graft recipient group, there were 26 complications, including 2 deaths, 1 loss of graft caused by vein thrombus, 2 cases of wound dehiscence requiring surgical correction, 2 exploratory laparotomies for bowel obstruction or perforation, 7 readmissions for graft rejection, and 10 readmissions for other causes.

Mean donor estimated GFR preoperatively, postoperatively, and at 1, 4, and 7 months was 94, 59, 65, 65, and 67, respectively. Sixty-two of the recipients were either first-degree relatives or spouses, including 12 fathers, 7 mothers, 4 sons, 6 daughters, 15 brothers, 9 sisters, 4 husbands, and 5 wives. Twenty-four of the recipients were non–first-degree family relations, and the final 15 were altruistic or emotionally related. The overall incidence of psychiatric or social history was 38% in the donor group, with specific diagnoses of depression (8%), anxiety (8%), drug use (4%), daily alcohol use (1%), and tobacco use (23%).

In the extirpative group, 32 surgeries were for localized renal cell carcinoma (pT1-T3b) and 15 were for atrophic symptomatic kidneys (polycystic kidney disease, ureteral stricture, stone disease, pyelonephritis, and vesicoureteral reflux). The donor group had a lower median age, lower BMI, and more left-sided nephrectomies than the extirpative group **(Table 1)**.

The donor group had a significantly higher PCH than the extirpative group at all times including preoperatively **(Figure 1)**. For both groups, the 1-month PCH was significantly lower than the preoperative PCH, but both returned to baseline by 4 months. Donors also had a higher preoperative and 1-month MCH than extirpative patients. However, at 4 months, the donor MCH trended below baseline and was not significantly different from the extirpative group. At 7 months, the donor MCH was significantly lower than at the preoperative level, whereas the extirpative group trended above the preoperative level nonsignificantly **(Figure 2)**.

Donor characteristics and operative outcomes were evaluated to find predictors of MCH decline at 1 month (**Table 2 and Table 3)**. Women had a lower MCH than men (51.7 vs 55.5, $P = .035$); those with a significant social (daily alcohol use or tobacco use) or psychiatric (depression,

Table 1.
Patient Characteristics and Hospital Outcomes for Laparoscopic Donor and Extirpative Nephrectomies

	Donor	Extirpative	Total	*P* Value
Total patients (n)	101	48	149	
Median age (range)	38 (19–62)	57 (17–86)	42 (17–86)	<.001
Mean BMI	26.9	33.7	29.1	<.001
Gender				
Female (%)	57 (56)	25 (53)	82 (55)	
Male	44 (44)	22 (47)	66 (45)	.6
Nephrectomy side				
Left (%)	66 (66)	17 (36)	83 (56)	
Right	35 (34)	30 (64)	65 (44)	.001
Avg. surgery length (hours)	3.4	3.1	3.3	.07
Avg. blood loss (mL)	53	65	56	.45
Avg. hospital stay (days)	2.3	2.4	2.3	.07

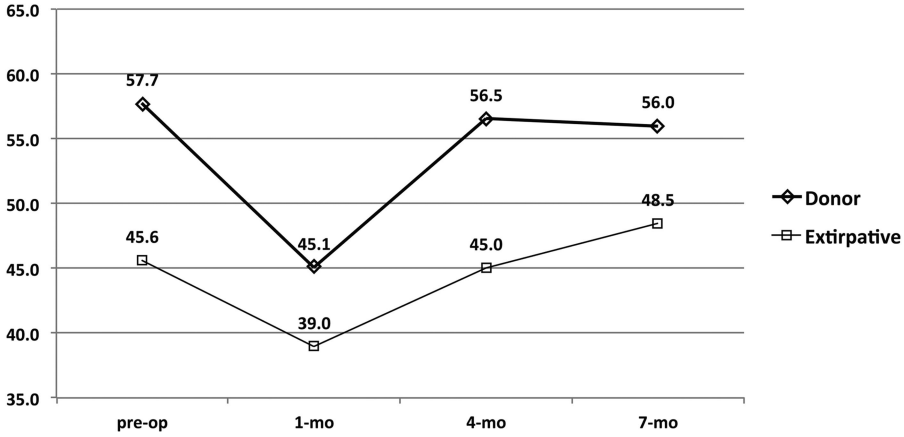

Figure 1. Physical component health scores for donor and extirpative laparoscopic nephrectomy. $P < .05$ at each time. A score of 50 represents the average in the healthy general public.

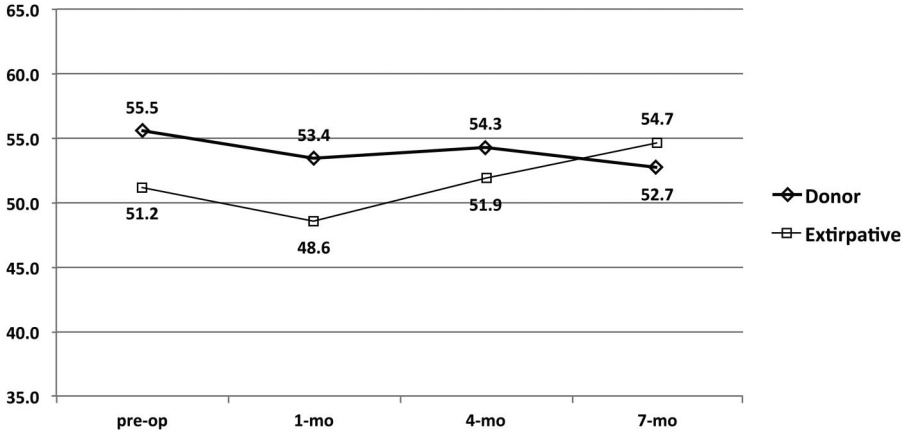

Figure 2. Mental component health scores for donor and extirpative laparoscopic nephrectomy. $P < .05$ preoperatively and at 1 month only. A score of 50 represents the average in the healthy general public.

anxiety, or drug use) history had a lower MCH that those who did not (51.0 vs 55.3, $P = .019$); and those whose recipients had a major complication (death, further surgery, or graft rejection) had a lower MCH than those whose recipients did not (47.7 vs 54.3, $P = .013$).

Those above the median age of 38 years trended toward a lower MCH than those ≤38 years (52.3 vs. 54.8, $P = .164$). BMI, marital status, relationship to the recipient, nephrectomy side, use of a hand assistance port, surgery duration, length of hospital stay, and postoperative GFR were not predictive of mental health.

DISCUSSION

The donor nephrectomy represents a unique procedure in which patients incur bodily harm for the good of others. This represents a challenge for surgeons who wish to both increase the supply of kidneys for the >90,000 currently on the waiting list in the United States and honor the principles of autonomy and "do no harm." Studies have shown high levels of safety and satisfaction among donors, but efforts to minimize comorbidities continue.[4]

Few studies assess the QOL in donors with a surgical control group. In 2011, Maglakelidze et al[5] presented a prospective study of 57 donors with a surgical control group of 52 patients undergoing nephrectomy or partial nephrectomy for renal tumors. Results of MCH or PCH were not reported, but some individual domains of the SF-36 survey were better for the donor group at a mean follow-up of 32 months. In 2010, Wiesenthal[6] presented a prospective study looking at predictors of recovery after both extirpative (n = 56) and donor (n = 95) laparo-

Table 2.
Donor Factors and the 1-Month Mental Component Health Score

	Donors in Group	1-Month Surveys Completed	1-Month MCH	*P* Value
Total patients (n)	101	57	53.4	
Gender				
Male	44	26	55.5	.035
Female	57	31	51.7	
Age (median: 38 years)				
≤38	55	26	54.8	.164
>38	46	31	52.3	
BMI (median: 26)				
≤26	51	30	53.2	.816
>26	50	27	53.6	
Social history (tobacco/alcohol/ psychiatric)				
Negative	61	32	55.3	.019
Positive	38	25	51.0	
Marital status				
Positive	62	33	53.3	.865
Negative	39	24	53.6	
Relation to recipient				
1-Degree relative or spouse	62	34	53.5	.934
Other	39	23	53.3	

Table 3.
Operative Factors, Outcomes, and the 1-Month Mental Component Health Score

	Donors in Group	1-Month Surveys Completed	1-Month MCH	*P* Value
Nephrectomy side				
Left	66	36	54.0	.365
Right	35	21	52.3	
Surgery time (median: 3.3 hours)				
<3.3	47	29	53.5	.911
≥3.3	54	28	53.3	
Blood loss (median: 50 mL)				
≥50	52	31	54.7	.106
<50	48	26	51.7	
Hospital stay (median: 2 days)				
1–2	73	44	53.6	.786
3–4	28	13	53.0	
GFR at 1 month				
≥60	52	29	54.0	.442
<60	35	23	52.5	
Major recipient complications (death, surgery, or graft rejection)				
No	87	50	54.3	.013
Yes	14	7	47.7	

scopic surgery. Using a postoperative recovery scale, they showed that donors took longer (62 days) than nondonors (53 days) to return to 75% of baseline despite the fact that they were younger, weighed less, and were more active. Outcomes specific to mental health were not addressed.

By comparing donors and extirpative patients, we are able to show a similar postoperative decline in physical health followed by a recovery at 4 months. However, the mental health recovery seen in the extirpative group at 4 months was not seen in the donor group. This possibly demonstrates the unique mental stress of incurring bodily loss without the mental (tumor removal) or physical (symptomatic kidney removal) gains of extirpative surgery. There are numerous baseline differences between the donor and extirpative groups, including BMI and age. Unfortunately, we are unable to correct for these because of the small sample size.

Numerous studies show that the laparoscopic approach to donor nephrectomy decreases postoperative pain and shortens the recovery period when compared with open or mini-incision. Ratner et al[7] presented their initial experience with the laparoscopic approach in 1997, showing a significantly decreased estimated blood loss, shorter time until resumption of oral intake, decreased postoperative pain, shorter hospitalization, and a shorter interval until the resumption of full activities.

Hiller et al[8] in 1995 had similar findings when evaluating their first 10 laparoscopic donors and commented, "The laparoscopic nephrectomy procedure may decrease many of the concerns of potential donors, thus making live kidney donation more attractive and increasing the kidney

supply." Subsequent studies have continued to support benefits of the laparoscopic approach.[9–12]

More recently, studies have looked at the psychosocial or mental effects of donation that might not entirely be addressed by the laparoscopic approach. Frade et al[13] compared pre- and postoperative (mean: 18 months) SF-36 assessments in 32 donors and failed to show a decline in psychosocial function. This is in contrast to the decrease in MCH found in our study but could be explained by the increased time from surgery or small sample size. They also note a very high incidence of preoperative mild to moderate depression at 66% compared with our 16% rate of depression or anxiety.

In agreement with our findings, in 2004, Smith et al[3] published a prospective study that followed 48 donors for 12 months and found a 29% incidence of *Diagnostic and Statistical Manual of Mental Disorders-IV* axis I psychiatric disorders (depressive 12%, anxiety 6%, adjustment 13%). Only 2% had a disorder at the start of the study, and 15% had one at the end. They also found a significant decline in the SF-36 MCH and concluded that donors should be alerted to possible psychosocial impairment, assessed for risk factors, and monitored for at least 12 months. Other studies have supported the need for increased postoperative monitoring.[14]

Few studies have identified risk factors for the mental health of donors. In 1999, Johnson et al[15] surveyed 524 donors between 1984 and 1996. A majority had an excellent QOL, with 96% saying they would donate again. However, 4% found the experience to be extremely stressful and 8% found it very stressful. Donors who had perioperative complications and female donors were more likely to find the overall experience more stressful. Also, donors whose recipients died within 1 year of transplant were more likely to say they would not donate again.

In support of Johnson et al using the SF-36v2 scores at 1 month, we also found that female gender and major complications in graft recipients are risk factors for mental health decline. We also found that a history of tobacco or alcohol use or psychiatric diagnosis was a predictor of mental health decline. Smith et al, in the aforementioned study, also found a strong correlation between psychiatric diagnosis and MCH scores.

A weakness of our study is the low survey completion rate, which might introduce bias. Also, although the surveys were performed in a prospective manner, the data collection was otherwise done retrospectively. Finally, the sample sizes were too small to correct for the large difference in age between the donor and extirpative groups (median age: 38 vs 57 years, respectively). Regarding the effect of age, Minnee et al concluded in a group of 105 donors that there was not a significant difference in QOL between younger and older donors assessed with the SF-32.[16]

CONCLUSION

Kidney donors are a unique surgical group and experience significantly more mental stress associated with donation compared with those undergoing extirpative surgery that persists beyond the postoperative period. Female gender, social/psychiatric history, and graft recipient complications appear to be risk factors for mental health decline. It is hoped that better preoperative counseling and postoperative monitoring will lead to better mental health outcomes and help to further remove obstacles to live kidney donation.

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