Published in final edited form as:

J Urol. 2012 March ; 187(3): . doi:10.1016/j.juro.2011.10.151.

Comprehensive Assessment of Quality of Life and Psychosocial Adjustment in Patients with Renal Tumors Undergoing Open, Laparoscopic, and Nephron-Sparing Surgery

Patricia A. Parker, Ph.D.¹, Richard Swartz, Ph.D.², Bryan Fellman, M.S.³, Diana Urbauer, M.S.³, Yisheng Li, Ph.D.³, Louis L. Pisters, M.D.⁴, Charles J. Rosser, M.D.⁵, Christopher G. Wood, M.D.⁴, and Surena F. Matin, M.D.⁴

¹Department of Behavioral Science, The University of Texas MD Anderson Cancer Center ²Jones Graduate School of Business, Rice University ³Department of Biostatistics, The University of Texas MD Anderson Cancer Center ⁴Department of Urology, The University of Texas MD Anderson Cancer Center ⁵Section of Urologic Oncology, MD Anderson Cancer Center Orlando

Abstract

Purpose—We prospectively evaluated the general and cancer-specific quality of life (QOL) and psychosocial adjustment of patients with a renal mass who underwent radical versus partial nephrectomy performed by laparoscopic or open approaches. Materials and

Methods—172 patients with renal tumors completed questionnaires before surgery and again at 3 weeks, 2, 3, 6, and 12 months post-surgery. We assessed general QOL (SF-36), cancer-specific-QOL (CARES-SF), intrusive thoughts and avoidance behaviors, and fear of recurrence. We used mixed model regression analyses to compare these measures across surgery types over the course of the study and adjusted for tumor size, histology, stage and renal function.

Results—The physical component score of the SF-36 differed significantly by surgery type over time ($p = 0.04$). Patients who had laparoscopy improved by month 2 whereas those who had open surgery had poorer QOL until month 3. Better cancer-specific QOL was reported in patients undergoing radical versus partial nephrectomy. Age also had significant effects on outcomes.

Conclusions—We report on one of the most comprehensive patient-reported prospective QOL studies in RCC patients. There were significant differences in QOL and psychosocial adjustment outcomes over the course of one year among patients who had one of four commonly accepted surgical renal procedures, and we show that these outcomes must be evaluated in the context of tumor characteristics, cancer-specific outcomes and renal function. These QOL issues may be important to consider when choosing surgical procedures for patients with renal tumors.

Keywords

Quality of life; kidney cancer

© 2013 American Urological Association. Published by Elsevier Inc. All rights reserved.

Address correspondence to: Patricia A. Parker, Ph.D., Department of Behavioral Science—Unit 1330, The University of Texas MD Anderson Cancer Center, PO Box 301439, Houston, TX 77230-1439, Tel: (713) 745-2540, Fax: (713) 745-4286, pparker@mdanderson.org.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Health related quality of life (QOL) is an increasingly important factor to consider when examining the benefits of different cancer treatments. QOL plays an important role in the decision-making process and the ultimate acceptability for particular treatments ¹. This is especially true for patients for whom there may be multiple surgical treatment options, such as with a renal mass presumed to be renal cell carcinoma (RCC). Options frequently include: radical nephrectomy (removing the entire kidney) or partial nephrectomy. Multiple studies have demonstrated that long-term recurrence-free survival for patients with early-stage disease is favorable with partial nephrectomy and recent guidelines from the American Urological Association recommend partial nephrectomy whenever possible ².

However, there is little published data comparing the QOL outcomes of patients undergoing these surgeries. Most studies have been retrospective and report conflicting results. For example, a retrospective study ³ comparing post-operative QOL found patients who underwent radical nephrectomy had significantly higher scores on physical functioning than those undergoing partial nephrectomy but did not differ significantly on other QOL domains. Another retrospective study found no significant difference in overall QOL between treatment groups, although patients having more renal parenchyma had greater physical health and lower intrusion and avoidance scores ⁴. More recent prospective studies of radical versus partial nephrectomy have found little difference in QOL ^{5, 6}.

Adding to the complexity for early-stage kidney cancer is that surgery, either radical or partial nephrectomy, can be performed either laparoscopically or with an open procedure. A review on laparoscopic versus open partial nephrectomy found that the intermediate-term oncologic and functional outcomes in laparoscopic procedures were similar to open procedures ⁷. Laparoscopic partial nephrectomy remains a complex operation performed mostly at high volume centers, but more recently robotic partial nephrectomy is being increasingly performed as it appears to simplify the procedure for the surgeon ⁸. Laparoscopic radical nephrectomy is performed commonly at both community and academic centers, even at the risk of overutilization for tumors which may be amenable to nephron-sparing surgery ^{9, 10}. A small retrospective study of patients 1 year after undergoing laparoscopic versus open radical nephrectomy showed no significant difference in QOL ¹¹, while a prospective study of the same procedures noted QOL benefits among the laparoscopic group ¹².

In the present study, we attempted to address some of the limitations of prior studies by prospectively assessing general and cancer-specific QOL and psychosocial adjustment using established instruments in patients with a renal mass presumed to be RCC. In this observational study we examined changes in QOL and psychosocial adjustment over the first 12 months following radical or partial surgery via a laparoscopic or open approach.

Methods

Participants

Participants had renal tumors suspected to be RCC who were scheduled to undergo surgery. They had been diagnosed with early-stage (clinical T1–2) disease and were undergoing attempted curative treatment. Patients were 18 years or older and were able to speak and read English.

Procedure

Patients were recruited between July 2001 and December 2007. They completed a baseline questionnaire before surgery and additional questionnaires at 3 weeks and 2, 3, 6 and 12 months post-surgery. This study was opened when laparoscopy was not routinely offered at our institution, but became increasingly routine after 2002; the study was closed before

robotic renal surgery was offered. Laparoscopic radical nephrectomy was performed as previously described, with intact specimen extraction via periumbilical or low Gibson incision¹³. The decision to pursue open, laparoscopic, or nephron-sparing surgery was based on patient, tumor, and renal function characteristics and was at the discretion of the urologist in the context of physician-patient interaction. Patients completed the pre-operative questionnaire at their clinic visit and after surgery they received the remaining questionnaires in the mail to complete and return. This study was approved by the Surveillance Committee for the Protection of Human Subjects at our institution. Written informed consent was obtained prior to enrollment in this study.

Measures

Demographic and Medical Measures—Patients completed a background questionnaire that determined age, marital status, and education. Medical variables such as stage of disease were abstracted from patients' charts. Renal function was determined with the Modified Diet in Renal Disease equation to calculate the estimated glomerular filtration rate (GFR).

Questionnaires—QOL was assessed with two questionnaires, the Medical Outcomes Study 36-item short-form survey (SF-36) and the Cancer Rehabilitation Evaluation System-Short Form (CARES-SF). The SF-36 is a general QOL instrument assessing eight domains: physical functioning, physical impediments to role functioning, bodily pain, general health perceptions, vitality, social functioning, emotional impediments to role functioning, and mental health. Two summary scores, the Physical Component Summary (PCS) score and the Mental Component Summary (MCS) score were computed. Higher scores indicate better QOL.

The CARES-SF was used to assess cancer-specific QOL^{14–16}. It has been extensively validated with patients with a variety of cancers¹⁵. The instrument's items were summed to create a global score of cancer-specific QOL. Higher scores indicate poorer QOL.

The tendency to ruminate on thoughts about stressors (intrusive thoughts) and to avoid thoughts or behaviors related to stressors (avoidance behaviors) were measured using the Impact of Event Scale (IES)¹⁷. The IES assesses: intrusion (intrusively experienced ideas, images, or feelings) and avoidance (avoidance of certain ideas, feelings, or situations). The IES total score, which is simply the sum of the two subscale scores, was used in our analyses. Higher scores indicate more intrusive thoughts and avoidance behaviors.

Fear of recurrence was measured with a 5-item questionnaire developed by Litwin¹⁸. The items are summed to create a total fear of recurrence score. Higher scores indicate a greater fear of recurrence.

Statistical Analyses—Descriptive statistics were computed for participants at each of the six time points. We conducted separate mixed model regression analyses¹⁹ of the PCS, MCS, CARES, IES, and fear of recurrence scores to examine differences in these variables across surgery types over the course of the study. We examined possible interactions between open vs. laparoscopic surgery types by time since surgery and partial vs. radical procedures by time since surgery. We included pathologic stage of disease, tumor size, pre and postoperative (within first month) GFR and the respective baseline measure as covariates in all of the models. Mixed model regression analysis is valid in the presence of missing data (provided that the data are missing at random²⁰) and improves the precision of effect estimates by using all observed data, as compared to the approach of deleting all observations from subjects who have at least one missing observation. STATA statistical software was used for all analyses.

RESULTS

Of the 172 patients in our study, 12 percent of the patients had undergone partial laparoscopic nephrectomy (LP), 32 percent radical laparoscopic nephrectomy (LR), 42 percent partial open nephrectomy (OP), and 14 percent radical open nephrectomy (OR). A total of 64 patients completed all six assessments. The number of patients who were missing pre-operative, Week 3, Month 2, Month 3, Month 6 and Month 12 assessments were 18, 55, 62, 64, 63, and 58, respectively. Table 1 lists the demographic and medical characteristics of the study participants by surgery type. Across all of the surgical groups, more than half the participants were male, 79 percent were non-Hispanic white, and 80 percent were married and living with their spouse. Patients were an average of 58.1 years old and 42 percent had at least a college degree.

Nearly all of the patients were diagnosed with clinical stage T1 disease (Table 1). Pathologic stage of disease was the only variable that differed significantly by surgery, but only between partial and radical surgeries ($p = 0.001$), as would be expected. Baseline GFR was not significantly different between the 4 surgical groups, but the postoperative GFR was significantly different (Table 2). Post GFR was significantly associated with the SF-36 physical component score ($p=0.015$), IES ($p=0.012$) and fear of recurrence ($p=0.002$) and both pre and post GFR were associated with CARES-SF global score ($p=0.02$ and $p=0.001$, respectively).

General QOL

The descriptive statistics of SF-36 (PCS and MCS), CARES-SF global, IES, and fear of recurrence data for all study participants at each time point are presented in Table 3 by their respective surgery type. Pre-operative scores for the four surgical groups were compared at baseline to detect any differences using a Kruskal-Wallis test. There were no significant differences in baseline scores for any of the surveys. Additional findings are summarized below. The mixed model regression analyses revealed that there was a statistically significant interaction between open vs. laparoscopic surgery and time ($p = 0.04$) on PCS scores (Figure 1). Patients who had open surgery had lower scores on average 3 weeks post surgery than patients who had laparoscopic surgery ($p = 0.04$). Patients who underwent laparoscopic surgery improved by month 2 and had only minor changes to their PCS QOL after that time. Patients who had open surgery improved steadily for the first 3 months and then more slowly for the remainder of the year; by 12 months post-surgery, they had similar PCS scores as the laparoscopy patients. None of the factors examined were significantly associated with MCS scores at any time.

Cancer-specific QOL

Patients who had radical surgery had lower scores on average for the CARES-SF global score ($p = 0.03$), indicating better cancer-specific QOL, when compared to those patients having partial nephrectomy (Figure 2). Time was also a significant predictor: the CARES-SF global score was lower at 2 ($p = 0.001$), 3 ($p = 0.001$), 6 ($p = 0.001$) and 12 months ($p = 0.001$) compared with the 3 week score, indicating better QOL at these time points.

Intrusive Thoughts and Avoidance Behaviors, and Fear of Recurrence

Age was a significant predictor of the IES total score: older patients reported fewer intrusive thoughts and avoidance behaviors ($p = 0.04$). There was also a time effect, with patients reporting fewer intrusive thoughts/ avoidance behaviors at the 2 ($p = 0.03$), 6 ($p = 0.03$) and 12 month ($p = 0.001$) follow-up assessments compared with the 3 week assessment period. There was no effect of surgery type on IES scores.

Age was also significantly associated with fear of recurrence ($p = 0.02$); on average, older patients reported higher scores than younger patients did. Fear of recurrence was also higher at 2 months ($p = 0.004$), 3 months ($p = 0.03$) and 12 month ($p = 0.001$) time points compared with the 3 week assessment period. There was no effect of surgery type on fear of recurrence scores.

DISCUSSION

Overall, we found significant differences in QOL and psychosocial adjustment outcomes measured before and at 5 different points after four surgical renal procedures. Importantly, our results adjusted for tumor size, tumor stage, and kidney function. Patients undergoing laparoscopy had better early physical functioning scores, which improved immediately and more quickly than patients who had open surgery. Interestingly, postoperative GFR was a significant predictor of not only physical function but also cancer-specific QOL. Surgery type nor any of the other variables examined predicted mental component QOL scores. Age was consistently associated with a spectrum of outcomes. Older patients showed a higher fear of recurrence than younger patients but had fewer intrusive thoughts and avoidance behaviors.

A recent prospective study examined QOL and peri-operative outcomes among patients with early-stage kidney cancer who had retroperitoneoscopic radical, open radical, or partial nephrectomy⁵. They found no QOL differences among these groups when measured 1 year after surgery. Clark et al⁴ were the first to report that renal functional preservation has a measurable patient-reported QOL benefit; our prospective study supports this observation.

It may indeed be that there are more discriminable differences between surgical groups in certain domains that were not assessed in this study, or additional differences were too subtle for existing measures to detect⁶. Although QOL outcomes among patients with metastatic RCC are recognized and specific instruments exist to measure these outcomes^{21, 22}, no such instruments exist for patients with localized RCC²³. The measures used in this study have been used with other cancer populations and for patients with metastatic RCC, but may still not be sensitive or accurate enough to detect additional potentially meaningful differences in patients with localized RCC, which is a major limitation also noted by others^{6, 24}.

Proponents of minimally invasive surgery have argued that patients experience significant QOL benefits with these approaches compared with traditional open approaches²⁵. Clinical studies have shown clear benefits in regard to earlier return to activities, resumption of oral intake, and other peri-operative outcomes with minimally invasive surgery^{5, 11}. Our results show that these approaches have measurable short-term patient-reported QOL benefits, but the differences disappear after a few months. Patients' fear of cancer and its recurrence remains an important factor at 1 year.

Some limitations of this study should be noted. First, this study was conducted at a specialized cancer center and our cohort may have differed from patients treated in community hospitals or other settings. Also, the sample was mostly non-Hispanic white (79%) so the results may not be generalizable to other racial or ethnic groups. We also do not know whether differences in QOL or psychosocial adjustment among different surgical procedures would emerge after 1 year, although it seems most likely that any differences would occur shortly after surgery rather than over time. Nonetheless, a longer study would more clearly demonstrate whether QOL differences between the surgical groups exist. We assessed patients more frequently over this time period than many other studies. An important aspect of our study is that it included both general and disease-specific QOL as

well as other measures of distress. Another potential limitation is that since patients were not randomly assigned to surgical procedure, there may be factors that affected choice of surgical procedure that influenced QOL outcomes that were not assessed in this study. However, we made every effort to control for known factors that influence surgical decision including benign versus malignant histology, pathological stage, tumor size and renal function. Additionally, surgical procedures continue to evolve (e.g., more robotic-assisted laparoscopy) and future research is needed to examine the QOL effects of these procedures as they are developed.

In summary, we report on one of the most comprehensive patient-reported QOL outcome studies in patients undergoing surgery for renal tumors. This study shows that QOL measures have important ramifications in the assessment of less invasive surgical approaches, but must be evaluated in the context of tumor characteristics, cancer-specific outcomes, and renal function. In choosing the best surgical procedure for a given patient, it may be important to consider QOL effects.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This research was supported in part by a grant from the National Kidney Foundation (S. Matin, Principal Investigator) and through a core facility funded by NCI # CA16672. The authors are also very thankful to all of the patients who participated in this study.

References

1. Moinpour CM, Feigl P, Metch B, et al. Quality of life end points in cancer clinical trials: review and recommendations. *Journal of the National Cancer Institute*. 1989; 81:485. [PubMed: 2646455]
2. American Urological Association. [accessed February 11, 2011, 2009] Guideline for Management of the Clinical Stage 1 Renal Mass. Available at <http://www.auanet.org>
3. Shinohara N, Harabayashi T, Sato S, et al. Impact of nephron-sparing surgery on quality of life in patients with localized renal cell carcinoma. *European Urology*. 2001; 39:114. [PubMed: 11173949]
4. Clark PE, Schover LR, Uzzo RG, et al. Quality of life and psychological adaptation after surgical treatment for localized renal cell carcinoma: impact of the amount of remaining renal tissue. *Urology*. 2001; 57:252. [PubMed: 11182331]
5. Gratzke C, Seitz M, Bayrle F, et al. Quality of life and perioperative outcomes after retroperitoneoscopic radical nephrectomy (RN), open RN and nephron-sparing surgery in patients with renal cell carcinoma. *BJU International*. 2009; 104:470. [PubMed: 19239445]
6. Novara G, Secco S, Botteri M, et al. Factors predicting health-related quality of life recovery in patients undergoing surgical treatment for renal tumors: prospective evaluation using the RAND SF-36 Health Survey. *Eur Urol*. 57:112. [PubMed: 19406562]
7. Porpiglia F, Volpe A, Billia M, et al. Laparoscopic versus open partial nephrectomy: analysis of the current literature. *European Urology*. 2008; 53:732. [PubMed: 18222599]
8. Benway BM, Bhayani SB, Rogers CG, et al. Robot assisted partial nephrectomy versus laparoscopic partial nephrectomy for renal tumors: a multi-institutional analysis of perioperative outcomes.[see comment]. *Journal of Urology*. 2009; 182:866. [PubMed: 19616229]
9. Miller DC, Hollingsworth JM, Hafez KS, et al. Partial nephrectomy for small renal masses: an emerging quality of care concern? *Journal of Urology*. 2006; 175:853. [PubMed: 16469564]
10. Hollenbeck BK, Taub DA, Miller DC, et al. National utilization trends of partial nephrectomy for renal cell carcinoma: a case of underutilization? *Urology*. 2006; 67:254. [PubMed: 16442601]

11. Jiang J, Zheng X, Qin J, et al. Health-related quality of life after hand-assisted laparoscopic and open radical nephrectomies of renal cell carcinoma. *Int Urol Nephrol*. 2009; 41:23. [PubMed: 18633726]
12. Harryman OA, Davenport K, Keoghane S, et al. A comparative study of quality of life issues relating to open versus laparoscopic nephrectomy: a prospective pragmatic study. *Journal of Urology*. 2009; 181:998. [PubMed: 19150558]
13. Matin SF, Dhanani N, Acosta M, et al. Conventional and hand-assisted laparoscopic radical nephrectomy: Comparative analysis of 271 cases. *J Endourol*. 2006; 20:891. [PubMed: 17144857]
14. Schag CA, Ganz PA, Heinrich RL. Cancer Rehabilitation Evaluation System--short form (CARES-SF). A cancer specific rehabilitation and quality of life instrument. *Cancer*. 1991; 68:1406. [PubMed: 1873793]
15. Schag, CA.; Heinrich, RL.; Ganz, PA. Cancer Rehabilitation Evaluation System (CARES) Manual. Los Angeles: CARES Consultants; 1989.
16. Ganz PA, Schag CA, Lee JJ, et al. The CARES: a generic measure of health-related quality of life for patients with cancer. *Quality of Life Research*. 1992; 1:19. [PubMed: 1301111]
17. Horowitz M, Wilner N, Alvarez W. Impact of Event Scale: a measure of subjective stress. *Psychosomatic Medicine*. 1979; 41:209. [PubMed: 472086]
18. Litwin MS, Fine JT, Dorey F, et al. Health related quality of life outcomes in patients treated for metastatic kidney cancer: a pilot study. *Journal of Urology*. 1997; 157:1608. [PubMed: 9112487]
19. Verbeke, G.; Molenberghs, G. Linear Mixed Models for Longitudinal Data. New York: Springer-Verlag; 2000.
20. Little, R.; Rubin, D. Statistical Analysis with Missing Data. 2. Hoboken, NJ: John Wiley & Sons, Inc; 2002.
21. Cella D, Yount S, Du H, et al. Development and validation of the Functional Assessment of Cancer Therapy-Kidney Symptom Index (FKSI). *The Journal of Supportive Oncology*. 2006; 4:191. [PubMed: 16669463]
22. Litwin MS, Fine JT, Dorey F, et al. Health related quality of life outcomes in patients treated for metastatic kidney cancer: a pilot study. *J Urol*. 1997; 157:1608. [PubMed: 9112487]
23. Cella D. Quality of life in patients with metastatic renal cell carcinoma: the importance of patient-reported outcomes. *Cancer Treatment Reviews*. 2009; 35:733. [PubMed: 19699588]
24. Novara G, Secco S, Botteri M, et al. Factors predicting health-related quality of life recovery in patients undergoing surgical treatment for renal tumors: prospective evaluation using the RAND SF-36 Health Survey. *European Urology*. 2010; 57:112. [PubMed: 19406562]
25. Portis AJ, Clayman RV. Should laparoscopy be the standard approach used for radical nephrectomy? *Current Urology Reports*. 2001; 2:165. [PubMed: 12084286]

Figure 1.
SF-36 Physical Component Summary (PCS) Scores of laparoscopy and open surgery groups over time

Figure 2.
CARES-SF Global Scores of partial and radical surgery groups over time

TABLE 1

Demographic and Medical Characteristics

Characteristic	Total (N=172)	Surgery type			
		Laparoscopic		Open	
		Partial (n=20)	Radical (n=55)	Partial (n=72)	Radical (n=25)
Age, years, mean (SD)	58.1 (12.6)	55.3 (11.8)	59.6 (11.9)	57 (12.7)	58.2 (11.1)
Sex					
Female	47	50	47	44	48
Male	53	50	53	56	52
Race					
American Indian/Native	1	0	1	0	0
Black	8	20	4	8	4
Hispanic	11	5	13	15	0
White	79	75	78	75	96
Other	1	0	4	2	0
Marital Status					
Married and living together	80	70	85	78	80
Divorced or separated	11	30	7	10	4
Single and never married	3	0	2	7	0
Widowed	6	0	6	5	16
Education					
Less than high school	8	5	9	7	8
High school or technical	23	25	17	25	28
Some college	26	25	29	25	24
College Grad	27	25	27	27	24
Grad or professional	14	20	13	13	16
Unknown	2	0	5	3	0
Clinical Stage of Disease					
T1	94	100	96	97	74
T2	6	0	4	3	26

Data are represented as percentages

Table 2

Summaries for Tumor size, Pre/Post Glomerular Filtration Rate

		Mean (SD)	Median	Min - Max	P-value
Tumor Size	L-P (n=20)	2.1 (1)	1.6	1 – 4.2	<0.0001
	L-R (n=55)	4.7 (1.5)	4.5	2 – 8	
	O-P (n=72)	3 (1.4)	2.9	0.6 – 8	
	O-R (n=25)	7 (4.1)	3.5	1.5 – 16	
Total		4 (2.5)	6.7	0.6 – 16	
Significant pairwise comparisons: LP v LR; LP v OR; LR v OP; LR v OR; OP v OR					
Pre	L-P (n=20)	77.8 (16.2)	77.5	51 – 106	0.8382
	L-R (n=55)	77.6 (16.3)	78	35 – 110	
	O-P (n=72)	76.5 (17.8)	76	37 – 130	
	O-R (n=25)	74 (18.8)	67	46 – 115	
Total		76.7 (17.2)	75	35 – 130	
Post	L-P (n=20)	74 (13.4)	73	50 – 108	<0.0001
	L-R (n=55)	48.5 (10.5)	48	25 – 70	
	O-P (n=72)	69.8 (18.6)	71	24 – 116	
	O-R (n=25)	51.4 (14.5)	50	31 – 95	
Total		60.7 (18.5)	60	24 – 116	
Significant pairwise comparisons: LP v LR; LP v OR; LR v OP; OP v OR					

NOTE: L-P=laparoscopic-partial L-R=laparoscopic-radical O-P=open-partial O-R=open-radical