Outcomes of Patients with Surgically Treated Bilateral Renal Masses and a Minimum of 10 Years of Followup

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Abbreviations and Acronyms

BRM = bilateral renal mass
eGFR = estimated glomerular filtration rate
FRC = familial renal cancer
NCI = National Cancer Institute
NSS = nephron sparing surgery
OS = overall survival
RCC = renal cell carcinoma
RCCSS = RCC specific survival
RRT = renal replacement therapy
VHL = von Hippel-Lindau disease

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Purpose: Nephron sparing surgery has been advocated for patients with bilateral renal masses but long-term functional and oncological outcomes are lacking. We report the outcomes of patients with bilateral renal masses and a minimum 10-year followup.

Materials and Methods: Patients with bilateral renal masses evaluated at our institution who were treated with initial surgery at least 10 years ago and underwent interventions on each renal unit were included in the analysis. Collected data included demographics, hereditary diagnosis, number of renal interventions, renal function and mortality status. Overall and renal cell carcinoma specific survival was assessed. Comparisons were made of renal function and overall survival between groups with 2 renal units and a surgically solitary kidney.

Results: A total of 128 patients met study inclusion criteria. Median followup in our cohort was 16 years (mean 17, range 10 to 49). The median number of surgical interventions was 3 (range 2 to 10). Of the patients 87 (68%) required repeat interventions on the ipsilateral renal unit at last followup with a median of 6.2 years (range 0.7 to 21) between interventions. Overall and renal cell cancer specific survival was 88% and 97%, respectively. Six patients (4.7%) ultimately underwent bilateral nephrectomy. Although renal function was better preserved in patients with 2 kidneys (70 vs 53 ml/minute/1.73 m^2, $p = 0.0002$), there was no difference in overall survival between those with bilateral kidneys or a surgically solitary kidney.

Conclusions: At a minimum 10-year followup after initial surgery, nephron sparing surgery allowed for excellent oncological and functional outcomes. Despite the need for repeat surgical interventions, nephron sparing surgery enabled dialysis to be avoided in more than 95% of patients.

Key Words: kidney; carcinoma, renal cell; nephrectomy; reoperation; genetic diseases, inborn

THE treatment of patients with BRMs presents unique challenges. The goal of any surgical renal intervention is twofold, that is to perform an oncologically sound operation, while simultaneously preserving maximal renal function to avoid the need for RRT and its associated morbidity and mortality. Surgical treatment options for patients presenting with BRMs include bilateral radical nephrectomy with subsequent RRT as a bridge to renal transplantation, unilateral radical nephrectomy with contralateral

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partial nephrectomy, bilateral NSS or surgery and thermal ablation in select patients. Preoperative treatment considerations include tumor characteristics, such as size, number and location, and patient factors, such as medical comorbidities and baseline renal function.[1]

Many but not all[2] studies have recognized that decreased postoperative renal function is associated with an increased incidence of cardiovascular disease, hospitalization and overall mortality. NSS has become the treatment of choice for tumors less than 7 cm when technically feasible.[3–8] However, evidence demonstrating the long-term renal functional and oncological outcomes of NSS for BRMs is limited.[9–12]

While sporadic BRMs are rare and develop in approximately 3% to 5% of patients with RCC, the growing incidence of RCC will likely result in a greater number of patients being diagnosed with BRMs, creating challenging management questions.[13–15] The NCI experience with treating these complex patients emerged from the ongoing evaluation and treatment of individuals with multifocal BRMs and those with FRC syndromes, such as VHL, hereditary papillary renal carcinoma, hereditary leiomyomatosis and renal cell carcinoma, and Birt-Hogg-Dubé syndrome.[16] Patients with FRC tend to present at a younger age than the sporadic kidney cancer population and have a greater incidence of bilateral multifocal tumors. However, despite these differences, patients with FRC have pathological features similar to those of their sporadic counterparts and they serve as an informative BRM model.[16]

Having had a unique opportunity to evaluate the long-term oncological and functional outcomes of patients with BRMs, we describe the NCI experience with patients who underwent bilateral renal surgery and had a minimum of 10 years of postoperative followup.

MATERIALS AND METHODS

All patients were evaluated on a NCI institutional review board approved research protocol. A prospectively maintained urological oncology database was queried to identify all 407 patients who underwent renal tumor surgery before December 2000 to allow for at least 10 years of followup. This cohort was then limited to the 132 patients requiring bilateral renal surgery for synchronous or metachronous BRMs. Of these patients 128 (97%) had complete records available at NCI and they represent the final study cohort used for analysis. Of this group 86 patients (67%) underwent initial renal surgery between 1990 and 2000. Patient demographics, FRC diagnosis, type and number of renal interventions, most recent renal function, metastatic disease and mortality status were recorded. Patient characteristics were similar in those who underwent the first renal surgery before 1990 and from 1990 to 2000.

Oncological outcomes were evaluated by OS and RCCSS. OS was determined by chart review with death from any cause verified using the Social Security Death Index. RCCSS was attributed to patients with documented evidence of RCC progression as the cause of death. Survival data were obtained on the entire cohort of 128 patients and no patient was lost to followup. Recurrence-free survival was not assessed because of the multifocality of the renal masses and the inability to differentiate local tumor recurrence from de novo tumor formation in patients with FRC.

We calculated eGFR using the Modification of Diet in Renal Disease formula and the most recent serum creatinine value available.[17] Comparisons of renal function and OS between the groups with 2 renal units and a surgically solitary kidney were performed using the Student t test and Kaplan-Meier analysis with $p < 0.05$ considered significant.

RESULTS

The table lists study cohort demographics. Of the sample patients 73 (57%) were male. Mean age at initial surgery was 38 years (range 17 to 64) and at last followup it was 55 years (range 34 to 79). The most common FRC diagnosis in our cohort was VHL in 89 patients (70%). Median followup of our cohort was 16 years (mean 17, range 10 to 49).

Patient characteristics

No. pts	128	
Total No. renal surgeries	437	
No. male (%)	73	(57)
Mean age (range):		
At first surgery	38	(17–64)
At last followup	55	(34–79)
Median No. surgeries/pt (range):	3	(2–10)
Lt	1	(1–5)
Rt	2	(1–6)
Median yrs between ipsilat surgeries (range)	6.2	(0.7–21)
No. at most recent followup (%):		
Surgically solitary kidney	58	(45.3)
Bilat kidneys	64	(50.0)
Anephric	6	(4.7)
Median yrs followup (range):	16	(10–49)
Surgically solitary kidney	17	(10–48)
Bilat kidneys	14	(10–37)
Anephric	17	(16–20)
No. FRC diagnosis (%):*		
VHL	89	(70)
Birt-Hogg-Dubé syndrome	7	(5)
Hereditary papillary RCC, type 1	6	(5)
Clear cell	4	(3)
Other	3	(2)
Family renal oncocytoma	2	(2)
RCC, sporadic	1	(1)
Succinate dehydrogenase C	1	(1)
Tuberous sclerosis	1	(1)
Bilat multifocal renal Ca, neg or unknown family history	14	(11)

* Percents sum to greater than 100% due to rounding.