Pathological Concordance and Surgical Outcomes of Sporadic Synchronous Unilateral Multifocal Renal Masses Treated with Partial Nephrectomy

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Purpose: Patients with unilateral synchronous multifocal renal masses represent a unique population with renal cell carcinoma. While pathological concordance rates have been studied for bilateral cases, limited data exist on unilateral multifocal disease. We characterized pathological concordance rates in this population and evaluated the outcomes of nephron preservation.

Materials and Methods: Patients who underwent surgery from 2000 to 2012 for unilateral synchronous multifocal renal masses were identified from a prospectively maintained database. Demographic, surgical and pathological outcomes of this cohort were analyzed. Malignant concordance rates were defined as agreement of all malignant tumor types in a single renal unit. Histological concordance was defined as agreement of all resected mass histologies, eg all clear cell carcinomas. Nuclear grade was considered concordant if all tumors excised were low (Fuhrman 1 or 2, type 1) or high (Fuhrman 3 or 4, type 2) grade.

Results: Using our institutional database of 2,569 patients with renal tumors we identified 97 with unilateral synchronous multifocal renal masses. Malignant and benign concordance rates were 77.2% and 48.6%, and histological and grade concordance rates were 58.8% and 51.5%, respectively. In this cohort we identified 76 patients (76.3% male) with a median age of 62.5 years who had a total of 241 unilateral synchronous multifocal renal masses and underwent nephron sparing surgery. Median mass size was 2.0 cm (IQR 1.1–3.1), there was a median of 3 tumors per patient and median followup was 24 months (IQR 13–40). Identified renal cell carcinoma histologies included clear cell in 49.4% of cases, papillary in 33.5%, mixed in 4.5% and chromophobe in 2.8%.

Conclusions: In what is to our knowledge the largest published report of unilateral synchronous multifocal renal masses we document low pathological concordance rates. As such, percutaneous biopsy of a single renal mass in these patients may not help inform treatment decisions. Nephron sparing surgery may be performed with acceptable oncological and functional results in patients with unilateral synchronous multifocal renal masses.

Key Words: kidney; carcinoma, renal cell; neoplasms, multiple primary; nephrectomy; pathology, surgical

Abbreviations and Acronyms

BSRM = bilateral synchronous renal mass

CCI = Charlson age adjusted comorbidity score

CCS = Clavien classification score

CKD = chronic kidney disease

NSS = nephron sparing surgery

RCC = renal cell carcinoma

RN = radical nephrectomy

UMRM = unilateral synchronous multifocal renal mass

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PATIENTS with sporadic UMRMs represent a small but unique subset with RCC. Although previous reports demonstrated that between 5% and 25% of patients who undergo surgery for a presumed single renal mass are found to have multifocal disease,[1,2] reports of the safety and oncological efficacy of NSS in patients with ipsilateral multifocal disease have largely been limited to small institutional series with the largest series to date consisting of 26 patients.[3,4] As such, RN has traditionally been used to treat patients with multifocal disease in an effort to maximize oncological benefit despite potential long-term deleterious effects on renal function and its potential sequelae.[5]

Understanding rates of benign and malignant pathological disease in patients who present with UMRMs is an integral step that provides more data to inform patient treatment decision making. Although the pathological concordance of sporadic bilateral masses is relatively high,[6–8] rates of pathological concordance from unilateral multifocal cases of RCC are poorly defined. Such rates may provide insight into the intratumor genetic events in a single renal unit. Furthermore, improved understanding of the pathological concordance of UMRMs can inform clinically relevant decisions on management, especially since percutaneous renal biopsy is gaining increasing clinical traction.

We defined the pathological concordance of sporadic, unilateral multifocal renal masses and assessed clinical outcomes in patients who underwent planned partial nephrectomy using a large, single institution kidney cancer database.

Table 1. *Demographics and perioperative outcomes in patients treated with NSS for UMRMs*

No. pts	76
Mean ± SD age	62.2 ± 9.7
No. gender (%):	
M	58 (76.3)
F	18 (23.7)
No. race (%):	
White	60 (78.9)
Black	16 (21.1)
No. multifocal tumor side (%):	
Lt	45 (59.2)
Rt	31 (40.8)
Mean ± SD CCI	3.5 ± 2.3
No. American Society of Anesthesiologists score 3 or greater (%)	28 (36.8)
Mean ± SD body mass index (kg/m^2)	29.7 ± 6.2
Mean ± SD largest tumor nephrometry score	7.4 ± 2.1
Median No. tumors/pt (range)	3 (2–10)
No. partial nephrectomy (%):	
Open	65 (85.5)
Laparoscopic	3 (3.9)
Robotic	8 (10.5)
Mean ± SD estimated blood loss (ml)	313.9 ± 363.2
Mean ± SD time (mins):	
Ischemia	33.8 ± 20.3
Operative	237.6 ± 74.7
Mean ± SD hospital stay (days)	6.5 ± 4.2
Mean ± SD estimated glomerular filtration rate change (ml/min/1.73 m^2)	−1.4 ± 18.4
Mean ± SD creatinine change (mg/dl)	0.15 ± 0.5
No. CKD grade up staging (%)*	3 (3.9)
No. complications (%):	
Minor (CSS I/II)	8 (10.5)
Major (CSS III/IV)	7 (9.2)

* In all patients with CKD up staging progressed from stage III to IV with pTNM stage based on largest tumor resected.

MATERIALS AND METHODS

We reviewed our prospectively maintained, institutional review board approved, institutional kidney cancer database of 2,569 patients and identified all with UMRMs who were treated surgically for localized renal tumors from 2000 to 2012 (table 1). For study purposes malignant concordance was defined as pathologically confirmed RCC in each renal mass in a multifocal renal unit. Conversely, benign concordance was defined as a pathologically confirmed benign renal mass in each renal mass of a multifocal renal unit. Histological concordance was defined as the same histological subtype in all tumors excised from a renal unit. Grade concordance was defined as all low (eg Fuhrman grade 1 or 2 for clear cell RCC, or type 1 papillary RCC) or high (eg Fuhrman grade 3 or 4 for clear cell RCC, or type 2 papillary RCC) grade histology in all masses excised. Patients with a known hereditary familial renal cell carcinoma syndrome were excluded from analysis. All patients treated with surgery were included in concordance rate determination, while clinical outcomes assessment was restricted to patients who underwent NSS.

Preoperative evaluation of all patients treated with NSS included estimation of patient glomerular filtration rate using the Modified Diet in Renal Disease formula[9] and cross-sectional imaging of the abdomen to define tumor characteristics. Tumor anatomical characteristics were assigned for the largest tumor in a given multifocal renal unit using the R.E.N.A.L. (radius, exophytic/endophytic, nearness of tumor to collecting system or sinus, anterior/posterior and location relative to polar lines) nephrometry scoring system, as described previously.[10]

Demographic, clinical and operative data included patient age, gender, body mass index, CCI, American Society of Anesthesiologists score, tumor size, R.E.N.A.L. nephrometry score, procedure type, estimated blood loss, operative time, pathological data and hospital length of stay. All nephron sparing procedures were performed with intraoperative ultrasound to assist with intraoperative decision making. CKD stage was assigned according to the National Kidney Foundation definition.[11] All complications within 30 days of surgery were classified according to the CCS.[12]

Tumors were staged according to TNM classification based on the 2010 American Joint Committee on Cancer/IUCC classification system with tumor size defined as the diameter of the largest tumor in cm. Local tumor recurrence was defined as a new enhancing mass in a kidney that had previously undergone nephron sparing surgery.