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Platinum Priority – Brief Correspondence

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End-Stage Renal Disease After Renal Surgery in Patients with Normal Preoperative Kidney Function: Balancing Surgical Strategy and Individual Disorders at Baseline

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Abstract

Although nephron-sparing surgery (NSS) has demonstrated benefit in terms of renal function preservation, it is unclear whether NSS might also decrease the risk of end-stage renal disease (ESRD) relative to radical nephrectomy (RN). In the current paper, we aimed to report the rate and the predictors of ESRD after surgery, accounting for detailed individual baseline characteristics and comorbidities. A multi-institutional collaboration among five European tertiary care centers allowed study of 2027 patients with normal preoperative renal function and a clinically localized T1abN0M0 renal mass. Cox regression analyses were used to predict the risk of ESRD (defined as the onset of a postoperative estimated glomerular filtration rate <15 ml/min per 1.73 m²) after adjusting for the individual baseline risk of developing chronic kidney disease. Univariable ESRD rates at 5 and 10 yr of follow-up were virtually equivalent for patients who underwent NSS (1.5% and 2.5%, respectively) versus RN (1.9% and 2.7%, respectively; hazard ratio [HR]: 0.8; 95% confidence interval [CI], 0.4–1.6). However, diabetes, smoking, uncontrolled hypertension, and other comorbidities were consistently more frequent in the NSS group relative to their RN counterparts. After adjusting for detailed baseline individual characteristics, NSS was shown to have an independent protective effect relative to RN (HR: 0.4; 95% CI, 0.2–0.8; *p* = 0.02) at multivariable analyses.

Patient summary: After accounting for individual baseline characteristics, such as age, diabetes, uncontrolled hypertension, or other comorbidities, partial nephrectomy independently protects against end-stage renal disease and the consequent need for dialysis relative to radical nephrectomy.

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If technically feasible, nephron-sparing surgery (NSS) represents the standard of care for patients diagnosed with a clinically localized renal mass [1], mainly due to a demonstrated benefit in terms of preservation of renal function [2]. In a recent subanalysis of 514 patients included in the European Organization for Research and Treatment of Cancer (EORTC) randomized trial 30904, the incidence of end-stage renal disease (ESRD) was nearly identical for patients treated with either NSS or radical nephrectomy (RN) [2]. In the current paper, we aimed to report the rate and the predictors of ESRD after renal surgery. To limit the inherent risk of bias, we investigated a large multi-institutional data set that allowed adjustment for a detailed panel of intrinsic confounders such as uncontrolled hypertension, diabetes, body mass index (BMI), and other comorbidities.

The current study relied on a collaborative database collected from five European tertiary care centers. Patients with a primary diagnosis of nonmetastatic clinical T1 unilateral kidney cancer without a baseline condition of chronic kidney disease who were treated with NSS or RN between 1984 and 2010 were included. The outcome of the study was ESRD, defined as the onset of a postoperative estimated glomerular filtration rate (GFR) <15 ml/min per 1.73 m². GFR was calculated by the Chronic Kidney Disease Epidemiology Collaboration formula in younger patients

(aged <70 yr) and by the Berlin Initiative Study formula in older patients (aged ≥70 yr) [3]. We included the following covariates: age, year of surgery, preoperative GFR, tumor size, hypertension (none, uncontrolled, or controlled by medical therapy), diabetes, baseline Charlson comorbidity index (CCI), BMI, and smoking status (no, yes, or former). First, descriptive statistics were reported. Second, multivariable Cox regression analyses were used to assess the impact of surgery type (NSS vs RN) on ESRD after adjustment for all available covariates. Finally, multivariable Cox regression coefficients were used to plot the covariate-adjusted ESRD rates according to different patient subgroups.

Overall, 2027 patients were included in the study (Table 1). Patients were treated with NSS (65.8%, *n* = 1334) or RN (34.2%, *n* = 693). Patients treated with NSS were more frequently diagnosed with concomitant comorbidities (CCI ≥0; 55% vs 40%; *p* < 0.001), uncontrolled hypertension (21% vs 13%; *p* < 0.001), diabetes (12% vs 7%; *p* < 0.001), and smaller tumor (32 vs 50 mm; *p* < 0.001) (Table 1). Mean follow-up was 72 mo. Supplementary Figure 1 depicts ESRD events according to treatment type. Median time to ESRD was 45 mo (interquartile range: 19–106 mo). Unadjusted ESRD rates at 5 and 10 yr of follow-up were virtually equivalent between patients who underwent NSS (1.5% and 2.5%, respectively) versus RN (1.9% and

Table 1 – Clinical characteristics of 2027 patients with cT1N0M0 renal tumor with normal renal function before surgery and treated with either nephron-sparing surgery or radical nephrectomy, stratified by treatment delivery

Variable	NSS (<i>n</i> = 1334, 65.8%)	RN (<i>n</i> = 693, 34.2%)	<i>p</i> value
Clinical characteristics			
Age, yr, median (IQR)	61 (51–69)	61 (52–69)	0.4
Gender, %			0.9
Male	66.0	66.2	
Female	34.0	33.8	
eGFR before surgery, ml/min/1.73 m ² , median (IQR)	86 (82–98)	85 (85–93)	0.002
Body mass index, median (IQR)	25.7 (23.8–27.9)	25.8 (23.8–27.9)	0.7
Smoking status, %			<0.001
No	59.2	53.1	
Smoker	27.3	22.6	
Former	13.6	19.8	
Diabetes, %	12.5	7.4	<0.001
Hypertension, %			<0.001
No	56.5	67.2	
Uncontrolled	21.1	13.3	
Controlled by therapy	22.4	19.5	
Charlson comorbidity index, %			<0.001
0	45.3	60.0	
1	16.2	18.2	
>1	38.6	21.7	
Clinical tumor size, median (IQR)	3.2 (2.5–4.0)	5.0 (3.7–6.0)	<0.001
Surgical characteristics			
Ischemia time, min, median (IQR)	11 (0–18)	NA	NA
Type of ischemia, %			
No ischemia	32.4		
Warm ischemia	66.9	NA	NA
Cold ischemia	0.8		
Open, <i>n</i> (%)	889 (66.6)	615 (88.7)	<0.001
Laparoscopic, <i>n</i> (%)	315 (23.6)	78 (11.7)	
Robotic, <i>n</i> (%)	130 (9.7)	0 (0)	

eGFR = estimated glomerular filtration rate; IQR = interquartile range; NA = not applicable; NSS = nephron-sparing surgery; RN = radical nephrectomy. Mann-Whitney and chi-square tests were used to compare the statistical significance of differences in the distribution of continuous and categorical variables, respectively.

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