

Clinical Value of Pathologic Examination of Non-neoplastic Kidney in Patients with Upper Urinary Tract Malignancies

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Introductions and Aims

While surgical resection remains the standard of care in the treatment of upper urinary tract malignancies, nephrectomy (NPx) is a risk factor for the development of chronic kidney disease (CKD). The aim of this study was to determine whether histologic evaluation of non-neoplastic kidney using tumor NPx specimens could enable early identification of unrecognized kidney disease and could be an independent risk factor in predicting post-operative renal outcomes.

Methods

We studied a cohort of 44 patients with renal cell carcinoma and 7 patients with urothelial cancer received NPx or nephroureterectomy. Routine pathologic evaluations including immunofluorescence and electron microscopic studies were performed. Detailed examination of glomerular, tubular, interstitial, and vascular pathology was performed. All samples were graded according to a priori scoring system ranging from a minimum of 0 to a maximum of 15 points. CKD was defined as estimated glomerular filtration rate (eGFR) < 60 mL/min/1.73m² over 3 months.

Results

Table 1. Baseline patient characteristics at the time of nephrectomy

Variables	Patients (n = 51)
Age (years), median (IQR)	63 (53-73)
Gender (male), n (%)	38 (74.5)
BMI (kg/m ²), median (IQR)	24.3 (22.7-26.6)
Hypertension, n (%)	26 (51)
Diabetes mellitus, n (%)	20 (39.2)
Cardiovascular disease, n (%)	9 (17.6)
Previous malignancy, n (%)	13 (25.5)
Smoking history, n (%)	22 (43.1)
Hepatitis B, n (%)	5 (9.8)
Hepatitis C, n (%)	1 (2)
Preoperative proteinuria, n (%)	12 (23.5)
Preoperative hematuria, n (%)	18 (35.3)
Preoperative creatinine (mg/dL), median (IQR)	0.81 (0.71-1.01)
Preoperative eGFR (mL/min/1.73m ²), median (IQR)	92.1 (72.8-104.8)

Table 2. Pathologic review of non-neoplastic kidney in patients with nephrectomy

Pathologic findings	Number of cases (%)
Normal	13 (25.5)
Glomerulonephritis	15 (29.4)
IgA nephropathy	9 (17.6)
C1q nephropathy	5 (9.8)
Membranous glomerulonephritis	1 (2.0)
Diabetic nephropathy	14 (27.5)
Vascular nephropathy	11 (21.6)
Hypertensive nephrosclerosis	8 (15.7)
Ischemic nephropathy	3 (5.9)
Reflux nephropathy	1 (2.0)
Chronic pyelonephritis	1 (2.0)

Table 3. Semi-quantitative evaluation of non-neoplastic kidney

Histologic scoring	All patients(%)
Glomerular global sclerosis	
0: none globally sclerosed	5.9
1: 0-10% global glomerulosclerosis	56.9
2: 11-20% global glomerulosclerosis	23.5
3: >20% global glomerulosclerosis	13.7
Interstitial fibrosis	
0: <5% of renal tissue replaced by fibrous connective tissue	49
1: 6-25% of renal tissue replaced by fibrous connective tissue	39.2
2: 26-50% of renal tissue replaced by fibrous connective tissue	7.8
3: >50% of renal tissue replaced by fibrous connective tissue	3.9
Tubular atrophy	
0: absent	49
1: <25% of tubule affected	39.2
2: 26-50% of tubule affected	7.8
3: >50% of tubule affected	3.9
Fibrous intimal thickening	
0: absence of chronic vascular change	5.9
1: <25% narrowing of the vascular luminal area	39.2
2: 26-50% narrowing of the vascular luminal area	49
3: >50% narrowing of the vascular luminal area	5.9
Hyaline arteriolar thickening	
0: absence	21.6
1: hyaline deposits present in only one arteriole, no circumferential involvement	49
2: more than one arteriole, no circumferential involvement	21.6
3: circumferential involvement, independent of the number of arterioles	7.8

Table 4. Univariate analysis for clinical variables affecting CKD

	Chronic kidney disease		
	Yes (n=19)	No (n=27)	P - value
Age, mean ± SD	65.2 ± 12.0	59.5 ± 10.1	0.089
Gender (male), n (%)	16 (84.2)	19 (70.4)	0.320
BMI, mean ± SD	24.3 ± 3.4	24.2 ± 3.0	0.897
Hypertension, n (%)	12 (63.2)	12 (44.4)	0.245
Diabetes mellitus, n (%)	8 (42.1)	10 (37)	0.767
Cardiovascular disease, n (%)	4 (21.1)	4 (14.8)	0.700
Smoking, n (%)	10 (52.6)	12 (44.4)	0.756
Preoperative proteinuria, n (%)	9 (47.4)	3 (11.5)	0.015
Radical nephrectomy, n (%)	19 (100.0)	16 (59.3)	0.001
Pathologic abnormality, n (%)	17 (89.5)	16 (59.3)	0.044
Preoperative eGFR, mean±SD	78.2 ± 19.8	99.3 ± 21.6	0.002
Histologic score, mean±SD	7.1±3.6	4.0±2.0	0.002

Since no one had CKD in partial nephrectomized patients, we determined risk factors for CKD in radical nephrectomized patients. Cox regression analysis demonstrated that post-operative AKI (p=0.002), initial eGFR (p=0.013), and histologic score of non-neoplastic kidney (p=0.031) were the independent predictors for CKD in radical nephrectomized patients.

Conclusions

We conclude that routine pathologic examination of non-neoplastic kidney using tumor NPx specimens is important in recognizing patients who have unidentified kidney disease and who are at risk for CKD.

