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ORIGINAL ARTICLE

Prevalence and factors associated with baseline chronic kidney disease in China: A 10-year study of 785 upper urinary tract urothelial carcinoma patients



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Background/Purpose: There is relatively little literature on prevalence of chronic kidney disease (CKD) prior to surgery in patients with upper urinary tract urothelial carcinoma (UTUC). We evaluated the prevalence and clinical associated factors of baseline CKD in patients with UTUC.

Methods: There were 785 patients with a pathologic diagnosis of UTUC from January 2002 to December 2011 who were analyzed in this study. Estimated glomerular filtration rate (eGFR) was calculated by re-expressed Modification of Diet in Renal Disease (MDRD) formulas for the Chinese population. A multivariate logistic regression was performed to evaluate the odds ratios (ORs) for CKD stage 3 or higher in UTUCs after data differences were tested.

Results: The prevalence of CKD in UTUCs presenting at our hospital was 58.6% and 70.8% in the group age 70 years and older. Older age [per year increased; OR = 1.050; 95% confidence interval (CI): 1.034–1.067], lower tumor stage (T stage; per stage increased; OR = 0.666; 95% CI: 0.544–0.816), higher tumor grade (per grade increased; OR = 1.392; 95% CI: 1.004–1.930) and the main tumor locating in the pelvis (ureter as reference; OR = 0.648; 95% CI: 0.475–0.885) were independently associated with decreased kidney function in the multivariate logistic

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regression. The use of serum creatinine (Scr) only to evaluate the renal function would ignore a large proportion of patients suffering from CKD stage 3 in UTUCs, especially in those older than 70 years (39.3% vs. 54.1%, $p = 0.022$).

Conclusion: We demonstrated a high prevalence (58.6%) of CKD in patients with UTUC, particularly in the group older than 70 years (70.8%). Older age, lower T stage, higher tumor grade, and the main tumor locating in pelvis (ureter as reference) were independently associated with CKD in UTUCs.

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Introduction

Urothelial carcinoma is a malignant tumor differentiated from the urothelial epithelium that could involve the kidneys, ureters, bladder, and urethra. In upper urinary tract carcinoma growing progress, the tumor would become an obstacle in the urinary tract, and the ever-increasing tract pressure could extend to all nephrons and finally affect kidney function. Because of the high recurrence rate in the remaining ureter, nephroureterectomy with bladder cuff excision is the standard treatment for the upper urinary tract urothelial carcinomas (UTUCs).^{1,2} The patient's renal function has become a particularly important concern because there will be only one kidney left after surgery. However, the extremely low prevalence (according to statistical research, the urothelial carcinoma occurs in the upper urinary tract in about 5% of all patients with urothelial carcinoma)³ of UTUC limited the research on revealing prevalence and factors associated with baseline chronic kidney disease (CKD) in the population with UTUC.

As CKD is being considered a serious worldwide public health problem, increasing studies uncovered the adverse relationship between long-term CKD and mortality.^{4–6} In the UTUC area, one study has pointed out the positive correlation between CKD and recurrence rate of the urothelial carcinoma in the bladder.⁷ Another study found that perioperative chemotherapy of this disease could have been affected by the changes in renal function following nephroureterectomy.⁸ According to the aforementioned findings, renal function is a crucial factor if future comprehensive therapeutic strategies are contemplated. Compromised renal function may prevent appropriate perioperative chemotherapy (cisplatin-based neoadjuvant or adjuvant requires a glomerular filtration rate (GFR) ≥ 60 mL/min, or at least 45 mL/min). Therefore, we evaluated the baseline renal function of the patients with UTUC and determined the prevalence of CKD in this cohort of patients.

Recent data suggest that serum creatinine (Scr) is an imperfect tool to estimate the degree of a patient's renal function.⁹ As defined by the American National Kidney Foundation, the percentage of patients with a normal Scr and a CKD stage 3 or greater is about 5%.¹⁰ To understand how many patients with UTUC and CKD stage 3 or higher had been ignored by using Scr as a single determinant of renal function, we calculated estimated glomerular filtration rate (eGFR) for each patient and compared it with Scr. Furthermore, we analyzed factors that might be associated

with CKD, including age, sex, tumor size, tumor location, tumor stage (T stage), lymph node status (N status), and tumor grade.

Materials and methods

The data source of this study ($n = 785$; tumor recurrence or complicating metastatic kidney disease were excluded from the analysis) was all the patients who received treatment in our center and in whom a pathologic diagnosis of UTUC was made from January 2002 to December 2011. After excluding distant metastasis, radical nephroureterectomy, or distal ureterectomy (in patients with CKD stages 4 and 5 who had evidence of ipsilateral functional kidney, or single-kidney patients) was performed in patients with typical UTUC radiography, or with positive cytology with or without fluorescence *in situ* hybridization assay. Ureteroscopy with tumor biopsy was performed when radiography was atypical to determine treatment strategy: Patients with positive pathologic evidence received surgical treatment and patients with negative evidence received reureteroscopy or were closely followed up. All the pathologic data analyzed in this study were identified from the surgical specimens. eGFR was calculated using reexpressed Modification of Diet in Renal Disease (MDRD) formulas modified based on Chinese people: $eGFR[\text{mL}/\text{min}/1.73 \text{ m}^2] = 175 \times \text{Scr}^{-1.234} \times \text{age}^{-0.179} \times (0.79 \text{ if female})$.¹¹ All the blood samples were collected prior to surgery (the next morning of admission after forbidding food and water for 8 hours) and sent to the central laboratory of Peking University First Hospital where the reexpressed MDRD equation was developed and detected under the same methods. CKD stage was defined according to the criterion provided by the American National Kidney Foundation.¹²

Statistical analysis

All the data were analyzed by SPSS version 18.0 software (SPSS Inc., Chicago, IL, USA). After being stratified by Scr and eGFR level, the data were presented as mean \pm standard deviation (SD) for continuous variables and exact number (with proportion) for categorical and grade variables. Differences were analyzed by Student *t* test for standard normally distributed continuous variables, Mann-Whitney U test for nonstandard normally distributed continuous variables and grade variables, and Chi-square test for categorical variables. A multivariate logistic regression was performed to evaluate the odds ratios (ORs)

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