



Clinical Study of Urinary Tract Tumors in Patients with Maintenance Dialysis for End Stage Renal Disease

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ABSTRACT

Introduction: The research in the past ten years shows that the incidence of malignant tumors in dialysis patients is significantly higher than that in normal people. The highest proportion of urinary tumors is one of the main causes of death in patients with end-stage renal disease, and the incidence is gradually increasing. However, the high-risk factors of urinary tract tumors in dialysis patients have not yet been fully elucidated, so exploring this issue is an important issue that the medical community needs to solve. The objectives of this study are to understand the clinical characteristics of maintenance dialysis patients with urinary tract tumors and the influence of related factors on their prognosis.

Methods: The clinical data of 22 patients with urinary tract tumors in maintenance dialysis (MHD) from the Affiliated Hospital of Chengde Medical College from January 2013 to June 2018 were retrospectively analyzed. The incidence of urinary tumors and clinical diagnosis and treatment were investigated. And prognosis, analysis of the impact of various relevant factors on the overall survival of patients with dialysis and urinary tumors.

Results: The 912 patients with maintenance dialysis, 22 patients had urinary tumors with an incidence of 2.41%. Among them, 13 patients were bladder tumors, 7 patients were renal or ureteral tumors, 1 patient was renal tumor, and 1 patient was prostate cancer. There were 17 cases of intermittent and painless gross hematuria, 2 cases of gross hematuria, 1 case of lumbar pain, 1 case of abdominal pain and dysuria, 1 case of frequent urination and dysuria. Ten patients underwent surgery, and 4 patients died. The postoperative survival of the patients was 12~103 months, with an average of 58.75 months. 12 patients were unable to undergo surgery because of other diseases or economic reasons; in 9 the disease was found during autopsy. The time from tumor to death was 14~38 months, with an average of 24.11 months. The causes of death in 13 death patients: 5 patients were myocardial infarction, 3 patients were heart failure, 3 patients were tumor metastasis, and severe sepsis in 2 patients.

Conclusion: There is increased propensity of GU tumors in maintenance dialysis patients. The tumors are of higher grade and demonstrate poor prognosis. Therefore, attention should be paid to the monitoring of urinary tract tumors in maintenance dialysis patients, especially elderly patients without cardiovascular and cerebrovascular complications, because their life expectancy can be longer.

Keywords: maintenance dialysis, urinary tumors, clinical studies, relevant factors.

Introduction

Epidemiological studies have shown that the incidence of malignant tumors in maintenance dialysis patients is relatively high, with urinary bladder tumors being the most common. Maintenance hemodialysis patients often require surgical treatment for complicated urinary tumors. This study investigated the clinical features of urinary tract tumors in patients with MHD

and related factors that influence the prognosis of patients.

Methods

Study design and settings: Cross-sectional survey of 912 patients with renal dysfunction with maintenance dialysis greater than 3 months, analysis of clinical data of 22 patients with urinary tumors, including age of renal failure, age of confirmed tumor, dialysis time,

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dialysis-tumor time, urea nitrogen before first dialysis, creatinine before first dialysis, albumin before first dialysis, hemoglobin before first dialysis, hemoglobin during dialysis, albumin during dialysis, imaging findings of tumor, tumor condition, surgical treatment, postoperative pathological results prognosis (recovery of tumor or postoperative survival time) and cause of death.

Inclusion criteria: Patients aged ≥ 18 years with maintenance dialysis due to end-stage renal disease and dialysis time > 90 days. The diagnostic criteria for maintenance dialysis combined with urinary tumors meet one of the following requirements: 1. Imaging examinations such as ultrasound, CT or MRI suggest urological tumors. 2. Endoscopic and FNAC or TRUCUT pathology suggest urinary tumors. 3. Surgical pathology specimen confirmed as urinary tumor.

Exclusion criteria: It has been identified as a malignant tumor before dialysis. And patients who refuse to cooperate with data collection.

Statistical analysis: Data processing using SPSS 22.0 statistical software, the measurement data was expressed by $x \pm s$, and the measurement data between groups were compared by t-test. Data comparisons were performed using the χ^2 test, multi-component comparisons were analyzed by analysis of variance, and tumor-related factors were analyzed using logistic regression analysis.

Results

Among the 912 patients with maintenance dialysis, 22 patients had urinary tumors with an incidence of 2.41%. Among them, 12 patients were bladder tumors, 3 patients were renal pelvic tumors, 4 patients were ureteral tumors, 2 patients were renal tumors, and 1 patient was prostate cancer. There were 17 cases of intermittent and painless gross hematuria, 2 cases of gross hematuria, 1 case of lumbar pain, 1 case of abdominal pain and dysuria, 1 case of frequent urination and dysuria, as shown in table 1. Ten patients underwent surgical treatment, including 2 cases of renal ureteral cystectomy, 8 cases of transurethral resection of bladder tumor; 9 cases of postoperative pathology were high-grade urothelial carcinoma, 1 case was papilloma; 4 cases had died. The postoperative survival period was 12~103 months, with an average of 58.75 months. The 5-year survival rate of patients after surgery was 50%. 12 patients were unable to undergo surgery due to other diseases or economic reasons; 9 patients died and the tumor was found to die from 14~38 months, with an average of 24.11 month. The cause of death in

patients: 5 cases of myocardial infarction, 3 cases of heart failure, 3 cases of tumor metastasis, 2 cases of serious infection.

Table 1: Clinical features of urinary tract tumors in maintenance dialysis patients

Parameter	Value
Number of cases	22
Bladder tumor	12
Renal pelvic tumor	3
Ureteral tumor	4
Kidney tumor	2
Prostate cancer	1
Age at the time of tumor discovery, mean age (years)	43~84, 66.22
Dialysis - tumor average time (months)	56
Men: women	7:15
Clinical features [value (%)]	
Intermittent hematuria	17 (77.27%)
Continuous hematuria	2 (9.09%)
Waist pain	1 (4.54%)
Abdominal pain, dysuria	1 (4.54%)
Frequent urination, difficulty urinating	1 (4.54%)
Postoperative patient follow-up results [value (%)]	
Relapse	1
Survive within 5 years	5 (50%)
Death within 5 years	5 (50%)

Single-factor correlation analysis was used to screen the relevant variables collected. According to the results of single-factor correlation analysis, the urea nitrogen before the first dialysis, the creatinine before the first dialysis, the albumin before the first dialysis, the hemoglobin before the first dialysis, the hemoglobin during the dialysis. Blood albumin and variables were substituted into the logistic regression equation during dialysis. The results showed: urea nitrogen before the first dialysis, creatinine before the first dialysis, hemoglobin before the first dialysis, hemoglobin during dialysis, and albumin during dialysis were independent risk factors for tumorigenesis ($P < 0.05$), of which urea nitrogen before the first dialysis. There was a positive correlation between creatinine before the first dialysis, hemoglobin before the first dialysis, hemoglobin during dialysis, and a negative correlation between serum albumin levels during dialysis, as shown in table 2.

**Table 2: Logistic regression analysis of urinary tumor-related factors in maintenance dialysis patients**

Variables	β value	Wald value	Exp	P value
Urea nitrogen before dialysis	2.079	8.554	0.125	0.003
Creatinine before first dialysis	1.002	0.110	1.002	0.014
Hemoglobin before the first dialysis	-0.801	15.785	0.904	0.038
Hemoglobin during dialysis	-1.348	18.459	0.706	0.016
Blood albumin during dialysis	-0.803	2.923	0.997	0.017

Discussion

The study found that patients with maintenance dialysis have a higher risk of malignancy and the highest proportion of urinary tumors.¹ Gao Yan et al² retrospectively analyzed the clinical data of 103 patients with maintenance dialysis, and found 12 cases of malignant tumors, the incidence rate was 11.65%; 5 cases of urinary system tumors (3 cases of renal cell carcinoma, 2 cases of bladder cancer), the highest incidence, accounting for 41.67% of all malignant tumors. As in previous reports, our results indicate a high incidence of urinary tumors in maintenance dialysis patients (2.41%). In addition, the incidence of urothelial cancer in maintenance dialysis patients is very high compared to the general population.

Factors affecting urinary tract tumors in dialysis patients are multifaceted: studies have found that,³ maintenance dialysis and urinary tumor patients with hemoglobin levels compared with patients without urinary tumors, the difference is statistically significant, suggesting tumor occurred in association with hypohemoglobinemia. Gao Yan et al believe that albumin less than 30g is also an independent risk factor for maintenance dialysis and malignant tumors.² In this study, the albumin and hemoglobin of dialysis patients with urinary tract tumors were compared with dialysis patients without concurrent tumors. The results showed statistically significant differences ($P < 0.05$). This further validates the level of albumin and hemoglobin in dialysis patients associated with the development of urinary tumors. In addition to the above factors, dialysis age greater than 6 years is also an independent risk factor for maintenance dialysis and malignant tumors.⁴

In addition, with the decline of renal function, urine scouring effect on the urethra is significantly weakened, while the metabolic toxin in the body increases the stimulation of the urinary tract, and the concentration of cytokeratin 18 (the urothelial tumor marker CK18) in the urine. The increase may also be the cause of high incidence of urinary tract tumors in dialysis patients;⁵ Studies have also

shown,⁶ the increase of genomic damage caused by DNA repair dysfunction in dialysis patients is also the cause of high incidence of dialysis combined with urinary tumors; Accumulation and release of uremic toxins such as creatinine, urea nitrogen, parathyroid hormone, beta microglobulin, and sulphuric acid phenol during dialysis, as well as an increase in genotoxic inflammatory cytokines (such as tumor necrosis factor) can lead to the occurrence of urinary tumors. Some scholars believe that the susceptibility of dialysis patients to oncogenic viruses is related to uremia immunodeficiency, which is characterized by impaired monocyte function, and defective T cell activation leads to reduced immune surveillance, which may also be the cause of high incidence of urinary tumors in dialysis patients.⁷

Similar to previous studies, painless gross hematuria is the main symptom in our report. The main diagnostic procedures include cystoscopy, re-sonography, and retrograde pyelography; urine cytology has a high false-negative rate, which is not the first choice for the diagnosis of urothelial cancer. Surgical resection was still the gold standard for maintenance dialysis patients; The mean postoperative survival was 58.75 months, and only one patient died directly from TCC. Due to the high incidence of urinary tumors in maintenance dialysis patients, the hematuria of dialysis patients should not be ignored, should be regarded as a symptom of urinary tumors, should be further diagnosed. Early detection and diagnosis and aggressive surgical intervention can yield satisfactory results.

For urinary tumors found early in maintenance dialysis, surgical treatment should be actively performed if all conditions permit. The mean postoperative survival (58.75 months) was significantly higher in the study than in those who did not (24.71 months). Kang et al suggest that prophylactic cystectomy should be considered in patients with end-stage renal disease undergoing maintenance dialysis with urothelial carcinoma because of the high incidence of nonfunctioning urinary tract tumors.⁸ Some scholars

believe that for patients with maintenance dialysis combined with only one side of urothelial carcinoma, unilateral urethroplasty is feasible; For patients with maintenance dialysis and myometrial invasive bladder cancer, it is difficult to treat residual urine after total bladder resection. Road monitoring, it is necessary to actively perform a primary urinary tract resection; For patients with multifocal urothelial carcinoma, staged urethral resection may be the best choice.⁹

Studies have reported that the mean and median survival of patients undergoing total urography with maintenance dialysis and urothelial carcinoma were 27.5 and 17.5 months, respectively.⁹ In this study, the 5-year survival rate (50%) of maintenance dialysis patients with urinary tract resection was better than that of patients without surgery (27.3%). It has been reported in the literature that⁹ the Charlson Comorbidity Index (CCI) is used as an indicator for assessing preoperative conditions in patients and is closely related to postoperative survival rate; 90-day mortality in maintenance dialysis patients with urinary tumors along with CCI the increase in value increased. When the CCI values were 0, 1, 2, and ≥ 3 , the patient mortality rates were 6.3%, 10.3%, 12.6%, and 15.9%, respectively. Therefore, CCI is important for the maintenance of dialysis patients with urinary tumors, and should be considered when evaluating the prognosis of patients with maintenance dialysis and urinary tumors.

Conclusion

The high incidence of urinary tumors in maintenance dialysis patients has been confirmed by domestic and foreign research centers, but the reasons have not yet been fully elucidated. Attention should be paid to the monitoring of urinary tract tumors in maintenance dialysis patients, especially in elderly patients without cardiovascular and cerebrovascular complications. Once urinary tract tumors are found, surgical treatment should be actively performed because they can achieve longer life.

References

1. Marquardt P, Krause R, Schaller M, et al. Vitamin

D status and cancer prevalence of hemodialysis patients in Germany. *Anticancer Res.* 2015, 35(2):1181-1187.

2. Gao Y, Wang HK, Wang JJ, et al. Incidence of malignant tumor and its related factors in maintenance hemodialysis patients. *Hainan Med J.* 2018, 29(4):491-493.
3. Huang JL, Liu W, Yu C, et al. Incidence of malignant tumor in patients with maintenance dialysis. *Journal of Tongji University(Medical Science).* 2015, 36(5):57-60.
4. Zhang L, Sun W, Hua JW, et al. Analysis of death causes in maintenance hemodialysis patients. *Clinical Focus.* 2014, 29(12): 1375-1378.
5. Li CE, Chien CS, Chuang YC, et al. Chronic kidney disease as an important risk factor for tumor recurrences, progression and overall survival in primary non-muscle-invasive bladder cancer. *Int Uro Nephrol.* 2016, 48(6):993-999.
6. Pedrazzoli P, Silvestris N, Santoro A, et al. Management of patients with end-stage renal disease undergoing chemotherapy: recommendations of the Associazione Italiana di Oncologia Medica (AIOM) and the Società Italiana di Nefrologia (SIN). *Esmo Open.* 2017, 2(3):e000167.
7. Kato S, Chmielewski M, Honda H, et al. Aspects of immune dysfunction in end-stage renal disease. *Clin J Am Soc Nephro.* 2008, 3(5):1526-1533.
8. Kang CH, Yu TJ, Hsieh HH, et al. The development of bladder tumors and contralateral upper urinary tract tumors after primary transitional cell carcinoma of the upper urinary tract. *Cancer.* 2003, 98(8):1620-1626.
9. Ou CH, Yang WH. Long-term outcomes of complete urinary tract exenteration for dialysis patients with urothelial cancer. *Int Urol Nephrol.* 2017, 49(4):623-627.