The Association Between The Prognosis Of Ureteral Cancer And Natural Constriction By The Common Iliac Arteriovenous Crossing

K Takahara, S Tobu, S Kusano, K Nagase, K Udo, M Noguchi

Citation

K Takahara, S Tobu, S Kusano, K Nagase, K Udo, M Noguchi. *The Association Between The Prognosis Of Ureteral Cancer And Natural Constriction By The Common Iliac Arteriovenous Crossing*. The Internet Journal of Urology. 2017 Volume 15 Number 1.

DOI: 10.5580/IJAPA.46099

Abstract

Purpose

We investigated the association between the prognosis of ureteral cancer and natural constriction.

Materials and methods

We investigated retrospectively the association between the prognosis of ureteral cancer and natural constriction intended for the initial non multiple 89 ureteral cancer cases treated in a decade from January 2005 to December 2014, 68 cases of which was pathologically diagnosed with urothelial carcinoma, low grade, pT1, pN0. We classified the tumor location into three sections as upper, middle and lower ureter including natural constriction where was classified as ureteropelvic junction, common iliac arteriovenous crossings and ureterovesical junction. We assessed the cumulative cancer specific 5-year survival in each location of natural constriction using Kaplan Meier method. Multivariate analysis performed to identify a prognostic factor.

Results

14 cases (20.6%) occurred in upper ureter, 18 cases (20.6%) in middle ureter and 36 cases (52.9%) in lower ureter respectively. Among them, 4 cases (5.9%) occurred in ureteropelvic junction, 8 cases (11.8%) in common iliac arteriovenous crossing and 22 cases (32.4%) in ureterovesical junction respectively. The cumulative cancer specific 5-year survivals in natural constriction were 57.3% in ureteropelvic junction, 16.7% in common iliac arteriovenous crossing and 53.1% in ureterovesical junction respectively. 75.5% was in non-natural constriction. Common iliac arteriovenous crossing cases showed significantly lower survival rate compared to the other location cases. Ly+ cases and v+ cases had significantly higher hazard ratio in univariate analysis. The common iliac arteriovenous crossing cases showed a significantly higher hazard ratio in multivariate analysis.

Conclusions

The ureteral cancer in common iliac arteriovenous crossing has a lower cancer specific 5-year survival rate than other sites in the ureter.

INTRODUCTION

There is lower incidence of ureteral cancer compared to the bladder cancer that occurs in the urothelium which is only 5-10% of total urothelial carcinomas1. Therefore, lots of high scientific evidence reports have been analyzed with bladder cancer cases as rationale that this is urothelial cancer including bladder cancer. However, there is a difference between the ureter and bladder anatomically and also urodynamically. There are 3 natural constrictions in the ureter which are the ureteropelvic junction, the common iliac arteriovenous crossing, and the ureterovesical junction. The tumor at this site is more likely to occur compared to other parts of the ureter because of the stasis of urine flow causing colonization of tumor cells. There are a lot of studies of tumor location and the prognosis in ureteral cancer. While almost all of the studies have concluded that there is no

recognized relationship between the tumor location and its prognosis, there are rare studies focusing on natural constriction. We have examined the usefulness of natural constriction as a factor which affects the prognosis of ureteral cancers.

We are quite experienced in cases of the tumor at the intersection of the common iliac arteriovenous in fact. However, there are few studies which have focused on this site and little research regarding the other two natural constrictions exists. We investigated whether natural constriction of the ureter is a prognostic factor.

MATERIAL AND METHODS

We investigated retrospectively including 89 cases treated in our hospital in the decade from January 2005 to December 2014. 68 cases were pathologically diagnosed with urothelial carcinoma, low grade, pT1, pN0, ly0, v0. The bladder cuff technique was performed with open surgery without cystoscopy nor laparoscopy. No patients were treated with perioperative chemotherapy. We handled and described the cases in accordance with the terms of the Japanese Urological Association in regard to renal pelvis ureteral cancer. We divided the tumor location into three sections as follows; upper ureter (from the ureteropelvic junction to the iliac crest), middle ureter (that overlaps the pelvic bone), and lower ureter (pelvic ureter that does not overlap with the pelvic bone). Natural constriction was classified as follows; Ureteropelvic junction included in the upper ureter, the site in common iliac arteriovenous crossing included in the middle ureter, and ureterovesical junction included in the lower ureter. We confirmed the tumor location and the presence of hydronephrosis with preoperative computed tomography which was classified according society of fetal urology classification. Preoperative urine cytology was classified according to the Papanikolaou classification of the Japanese Society of Clinical Cytology. We described a patient's level of functioning in terms of their ability to care for themselves, daily activity, and physical ability with Eastern Cooperative Oncology Group - ECOG performance status. The data was analyzed using t-test and the multivariate Cox proportional-hazards regression model. In addition, we calculated for each cumulative cancer specific 5-year survivals and expressed them by the Kaplan-Meier method. Statistical significance was considered at $p < 0.05$ for all analyses. Statically analysis was done with BellCurve for Excel® software, version 2.0.

RESULTS

Characteristics (Table 1)

The patients age was 54-89 (median 76) including 45 men and 23 women. Tumor size was 5-75 mm (median 20 mm). Observation period was from 184 to 3169 days (median 965 days). There was hypertension in 24 cases, diabetes in 9 cases, dyslipidemina in 8 cases, smoking in 41 cases, and death by cancer in 14 cases. Chief complaint was macrohematuria in 33 cases, lumbago in 7 cases, no symptoms in 26 cases, and other in 2 cases. Performance status was PS 0 in 42 cases, PS 1 in 25 cases, and PS 2 in 1cases. There were 25 cases of ureteral cancer in the left and 43 cases in the right ureter. There were 68 cases including 14 cases in upper ureter, 18 cases in middle ureter, and 36 cases in lower ureter. Ureteral cancer with natural constriction occurred in 34 cases including 4 cases in the ureteropelvic junction, 8 cases in common iliac arteriovenous crossing, and 22 cases in the ureterovesical junction. Also there was no significant difference in evaluation items between the cases in and off natural constriction. There was hydronephrosis in 20 cases of SFU0, 6 cases of SFU 1, 12 cases of SFU2, 18 cases of SFU 3, and 12 cases of SFU 4. Urine cytology findings revealed 26 cases of class I, 9 cases of class II, 11 cases of class III, 6 cases of class IV, 2 cases of class V, and unknown of 2 cases in fresh samples and 8 cases of class I, 16 cases of class II, 6 cases of class III, 3 cases of class IV, 10 cases of class V, and N/A of 25 cases in barbotage samples. There were 41 cases of laparoscopic surgery and 27 cases of open surgery.

Cancer prognostic factor (Table 2)

Ly+ cases, v+ cases and common iliac arteriovenous crossing cases had a significantly higher hazard ratio in the univariate analysis. There was no significant difference in neither the cases of natural constriction nor of the elderly. Also only the common iliac arteriovenous crossing cases showed a significantly higher hazard ratio in the multivariate analysis.

Survival rates (Figure 1 and Figure 2)

The cumulative cancer specific 5-year survivals in the natural constriction group were 57.3% in the ureteropelvic junction, 16.7% in cthe ommon iliac arteriovenous crossing, and 53.1% in the ureterovesical junction respectively. It was 75.5% in non-natural constriction cases.

Natural constriction cases showed no significantly lower

survival compared to the other location cases. However, common iliac arteriovenous crossing cases showed significantly lower survival rate compared to the other location cases

Table 1

Characteristics

	n	(%)
Background		
Female	23	(33.8%)
Hypertension	24	(35.3%)
Diabetes	9	(13.2%)
Dyslipidemia	8	(11.8%)
Smoking	41	(60.3%)
Death	14	(20.6%)
Chief complaint		
Macrohematuria	33	(48.5%)
Lumbago	7	(10.3%)
No symptoms	26	(38.2%)
Other	2	(2.9%)
Performance status		
PS 0	42	(61.8%)
PS 1	25	(36.8%)
PS 2	1	(1.5%)
Tumor location		
Left	25	(36.8%)
Upper ureter	14	(20.6%)
Middle ureter	18	(26.5%)
Lower ureter	36	(52.9%)
The sites of natural constriction	34	(50.0%)
Ureteropelvic junction	4	(5.9%)
Common iliac arteriovenous crossing	8	(11.8%)
Ureterovesical junction	22	(32.4%)
Urine cytology		
Fresh sample		
Class I	26	(38.2%)
Class II	9	(13.2%)
Class III	11	(16.2%)
Class IV	6	(8.8%)
Class V	14	(20.6%)
Unknown	2	(2.9%)
Barbotage sample		
Class I	8	(11.8%)
Class II	16	(23.5%)
Class III	6	(8.8%)
Class IV	3	(4.4%)
Class V	10	(14.7%)
N/A	25	(36.8%)
Invasion		
ly+	22	(32.4%)
v+	22	(32.4%)
Surgery		
Laparoscopic	41	(60.3%)
Open	27	(39.7%)

Table 2

Univariate and Multivariate analyses

Analysis	Hazard ratio	(95% CI)	p Value
Univariate:			
Patients' age	1.0527	(0.9785 - 1.1325)	0.1680
Female	0.8576	(0.2660 - 2.7646)	0.7970
ly+	4.3327	(1.4453 - 12.9884)	<0.01
v+	5.0136	(1.6756 - 15.0014)	<0.01
Common iliac arteriovenous crossing	3.9962	(1.3323 - 11.9866)	<0.05
The sites of natural constriction	0.9364	(0.3260 - 2.6892)	0.9082
Multivariate:			
ly+	1.5273	(0.2068 - 11.2806)	0.6780
v+	3.4189	(0.7171 - 16.3000)	0.1219
Common iliac arteriovenous crossing	2.9525	(1.9582 - 9.0977)	<0.05

Figure 1

Kaplan-Meier curves showing cancer-specific 5-year survival in ureteral cancer patients whose tumor is in the sites of natural constriction and in other than those above.

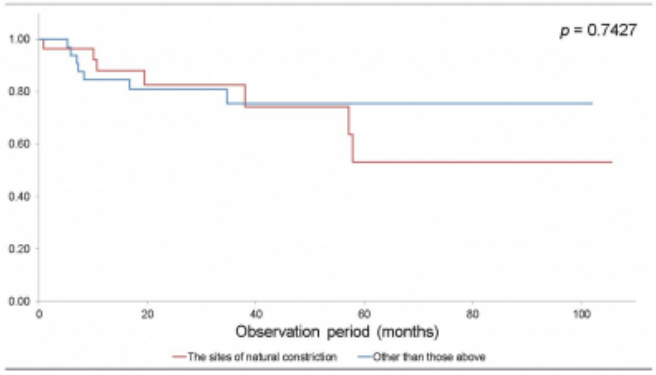
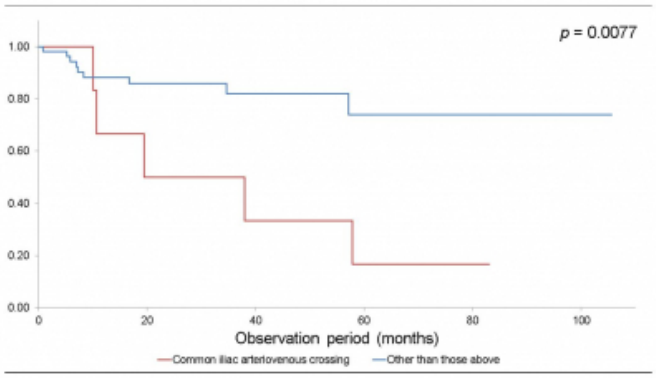


Figure 2

Kaplan-Meier curves showing cancer-specific 5-year survival in ureteral cancer patients whose tumor is in common iliac arteriovenous crossing and in other than those above.



DISCUSSION

Renal pelvis, ureter, and urine bladder are all places where urothelial carcinomas occur and they have different characteristics anatomically and urodynamically. There are

three parts of natural constriction in the ureter which cause urine flow stasis and relatively more likely to bound malignant cells than the other sites of the ureter. There are few studies focused on carcinomas in natural constriction sites inspite of this fact. There are a lot of studies which analyzed relationships between prognosis and the location of an urothelial carcinoma and which divided the ureter into three parts of upper, middle, and lower ureter.

Tashiro K et al2 reported that site specific five-year survival rate of ureteral cancers are 90% in the upper ureter, 60.8% in the middle ureter, and 66.5% in the lower ureter. However, there was no significant difference and they concluded that the location of the carcinoma is not a prognostic factor despite of the fact that carcinomas occur more frequently in the lower ureter and the ureterovesical junction. Lee HY et al3 reported that it is possible to predict the risk of cancer metastasis and the survival rate because lymphatic invasion and venous invasion are affected by the tumor location. Meta-analysis of the location and the prognosis of ureteral cancers by Wu Y et al4 reported multiple cases which underwent radical nephroureterectomy. The analyzed 17 studies that weren't focused on natural constriction of the ureter. However, it was reported in a multicenter study of ureteral cancer (urothelial carcinoma) after radical nephroureterectomy by Tanaka et al5 that metastatic sites depend heavily on the tumor location and classified the ureter locations into four sites: renal pelvis, upper ureter, middle ureter, and lower ureter. Milenkovic-Petronic et al6 revealed that tumors in diameter 3 cm or more were associated with a lower fiver-year survival rate but they did not find a single factor as an ureteral cancer prognostic factor other than the tumor location and the pathological progression. Our study didn't analyze the tumor size. On the other hand, Williams AK, et al7 showed the presence of multiple tumors was more likely associated with a bad prognosis than the tumor location. Amirian MJ et al8 examined urinary tract obstructions and the pathological progression and concluded that urinary tract obstructions detected by imaging studies don't always predict progression. In addition, they reported that there is a trend toward advanced stage with the presence of ipsilateral renal dysfunction.

We found only a significant low 5-year survival rate in the cases of the tumors in the common iliac arteriovenous crossing although some previous reports indicated that renal obstruction is not a prognostic factor for ureteral cancers.

We concluded tthat anatomical features contributed to the low survival rate in common iliac arteriovenous crossing tumors more than a renal obstruction by natural constriction. The location near nutrient vessels or lymphatic vessels may cause the tumor metastasis and invasion more often than other locations including natural constrictions. Ureteral cancers in the common iliac arteriovenous crossing are very close to a the nutrient vessels of the ureter. Our research results may lead to a change of perioperative treatment approach for ureteral cancers in the common iliac arteriovenous crossing in where the tumor has the poor prognosis. In other words, there may be a need to perform neoadjuvant chemotherapy preoperatively in cases of common iliac arteriovenous crossing locations.

The limitations of this study are that is was a retrospective study with a few cases. More cases are required to reveal the characteristics of an ureteral cancer with natural constriction in places such as the common iliac arteriovenous crossing.

CONCLUSIONS

Ureteral cancer in the common iliac arteriovenous crossing has a lower cumulative cancer specific 5-year survival rate than when located in other sites of the ureter.

References

1) Siegel RL, Miller KD, Jemal A: Cancer statistics, 2015. CA Cancer J Clin 2015; 65:5-29
2)Tashiro K, Nakajo H, Iwamuro S, Ohishi Y, Masuda F, Onodera S, Ueda M, Kido A, Iizuka N, Kawahara M: [A study of tumor location and prognosis in renal pelvic and ureteral cancer]. Nihon Hinyokika Gakkai Zasshi 1995; 86:279-82
3)Lee HY, Li CC, Huang CN, Ke HL, Li WM, Liang PI, Yang SF, Tu HP, Wu WJ, Yeh HC: Prognostic significance of lymphovascular invasion in upper urinary tract urothelial carcinoma is influenced by tumor location. Ann Surg Oncol 2015; 22:1392-400
4)Wu Y, Dong Q, Liu L, Han P, Wei Q: The impact of tumor location and multifocality on prognosis for patients with upper tract urothelial carcinoma: a meta-analysis. Sci Rep 2014; 15:6361
5)Tanaka N, Kikuchi E, Kanao K, Matsumoto K, Kobayashi H, Ide H, Miyazaki Y, Obata J, Hoshino K, Shirotake S, Akita H, Kosaka T, Miyajima A, Momma T, Nakagawa K, Hasegawa S, Nakajima Y, Jinzaki M, Oya M: Metastatic behavior of upper tract urothelial carcinoma after radical nephroureterectomy: association with primary tumor location. Ann Surg Oncol 2014; 21:1038-45
6)Milenkovic-Petronic D, Milojevic B, Djokic M, Sipetic-Grujicic S, Milojevic IG, Bumbasirevic U, Dzamic Z: The impact of tumor size on outcomes in patients with upper urinary tract urothelial carcinoma. Int Urol Nephrol 2014; 46:563-9
7)Williams AK, Kassouf W, Chin J, Rendon R, Jacobsen N, Fairey A, Kapoor A, Black P, Lacombe L, Tanguay S, So A, Lattouf JB, Bell D, Fradet Y, Saad F, Matsumoto E, Drachenberg D, Cagiannos I, Izawa JI: Multifocality rather

than tumor location is a prognostic factor in upper tract urothelial carcinoma. Urol Oncol 2013; 31:1161-5

8)Amirian MJ, Radadia K, Narins H, Healy KA, Hubosky SG, Bagley D, Trabulsi EJ, Lallas CD: The significance of functional renal obstruction in predicting pathologic stage of upper tract urothelial carcinoma. J Endourol 2014; 28:1379-83

Author Information

Kohei Takahara
Department of Urology, Saga University
Japan

Shohei Tobu
Department of Urology, Saga University
Japan

Shuhei Kusano
Department of Urology, Saga University
Japan

Kei Nagase
Department of Urology, Saga University
Japan

Kazuma Udo
Department of Urology, Saga University
Japan

Mitsuru Noguchi
Department of Urology, Saga University
Japan