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Case Report

Seeding of a high-grade papillary urothelial carcinoma of the bladder along a nephroureterostomy tract

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ABSTRACT

Percutaneous nephrostomy placement is a common treatment for obstructive uropathy of various causes. Although rare in the literature, tumor seeding along the nephrostomy tract is a potential risk of percutaneous nephrostomy in the treatment of obstructive symptoms secondary to urothelial carcinoma. In this case report, we present one such unusual outcome where urinary bladder urothelial cancer cells metastasized to the paravertebral soft tissues through apparent seeding along a nephroureterostomy tract.

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Case presentation

A 63-year-old male former smoker presented to the emergency department (ED) with painless hematuria. Computed tomography urogram revealed 5 large bladder masses, the largest measuring 8.5 × 5.1 cm, as well as severe bilateral hydronephrosis (Fig. 1). Computed tomography chest revealed multiple lung nodules bilaterally, the largest measuring 0.3 cm in the right middle lobe. Transurethral resection was performed to debulk the bladder tumors. On histologic examination, high-grade papillary urothelial carcinoma was identified with focal superficial invasion of the lamina propria without invasion into the muscularis propria.

Lymphovascular invasion could not be appreciated and no additional associated epithelial lesions were identified. The patient was discharged with plans for repeat resection in 2 weeks; however, he was lost to follow-up.

Approximately 5 months after discharge, the patient again presented to the ED with complaints of dysuria, hematuria, shortness of breath, global weakness, fatigue, and unintentional weight loss. The patient was admitted and a complete metabolic panel revealed acute renal failure (BUN of >186 mg/dL, creatinine of 21.2 mg/dL) and metabolic acidosis with an anion gap of 31.9 mmol/L. After being dialyzed and stabilized, the patient was transferred for bilateral nephrostomy placement to relieve the bilateral obstructive hydronephrosis. A left

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Fig. 1 – Enhanced-coronal CT shows multiple lobulated bladder wall masses (yellow arrows), with moderate obstructive hydronephrosis bilaterally (blue arrowheads).

percutaneous nephrostomy (PCN) was placed without incident; however, the contralateral placement was complicated by ureteropelvic junction injury, therefore requiring conversion to nephroureterostomy placement to traverse the injury.

During the course of his admission, the patient continued to have hematuria. His hemoglobin continued to drop and could not be stabilized. Three days after admission, the patient underwent cystoscopy with transurethral resection of the bladder, fulguration, and clot evacuation. On examination under anesthesia, the patient was noted to have a palpable mass throughout the bladder with 90% of the bladder lumen

filled with tumor. After resection, urology estimated that 80% of the tumor still remained and felt the patient likely had unresectable disease. Pathology determined the tumor morphology to be consistent with T2 high-grade papillary urothelial carcinoma with invasion into the muscularis propria with no lymphovascular invasion.

Neither cystectomy nor radiation were performed at this time because the patient wanted time to weigh his options and urology determined his nutritional status needed to improve before further intervention could be considered. Two weeks after admission, the patient was deemed medically stable and the patient was discharged and scheduled for outpatient dialysis.

Four months after discharge, the patient presented for nephrostomy and nephroureterostomy catheter exchange. A right paravertebral soft tissue mass (Fig. 2) was noted at this time and subsequently biopsied (Fig. 3). Cytologic evaluation revealed urothelial carcinoma with “strong morphological similarities” to his previously diagnosed tumor.

Four months after evaluation of the paravertebral soft tissue mass, the patient presented to the ED complaining of abdominal pain, diarrhea, and fevers indicative of spontaneous bacterial peritonitis. In addition to continued enlargement of the paravertebral mass (Fig. 4), there was development of new pulmonary and hepatic metastases. Unfortunately, the patient ultimately expired from refractory septic shock.

Discussion

In the United States, 69,000 patients are diagnosed with urinary bladder cancer (UBC) each year, and the disease has a national prevalence of 521,000 patients. These numbers have been improving in Western communities over the past several decades. The decrease in the burden of UBC in Europe and USA is largely attributed to the decline in smoking prevalence in these Western cultures [1]. Cigarette smoking is understood to be the

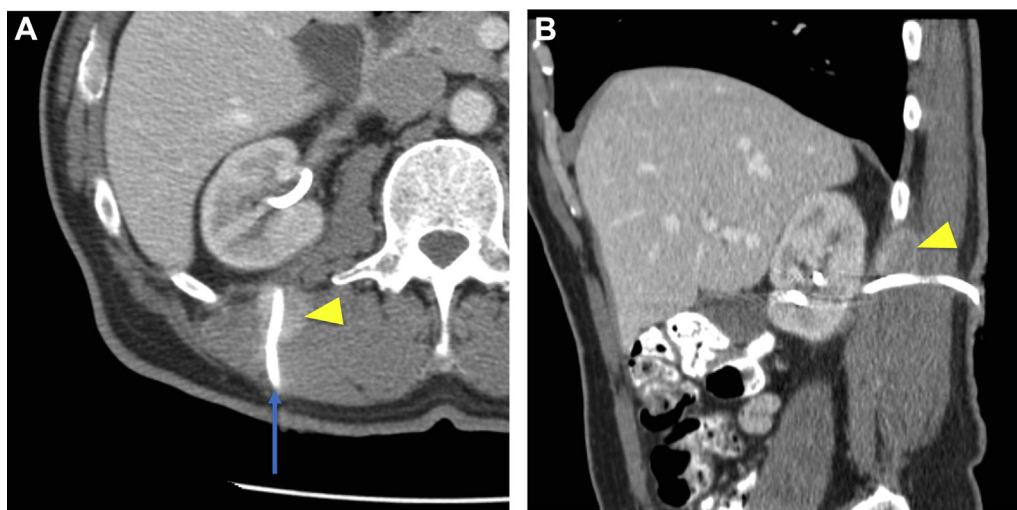


Fig. 2 – (A) Axial CT shows an enhancing 2 cm mass (yellow arrowhead) along the right percutaneous nephroureterostomy (blue arrow). (B) Sagittal reconstruction localizes the mass (yellow arrowhead) along the superior aspect of the percutaneous tract.

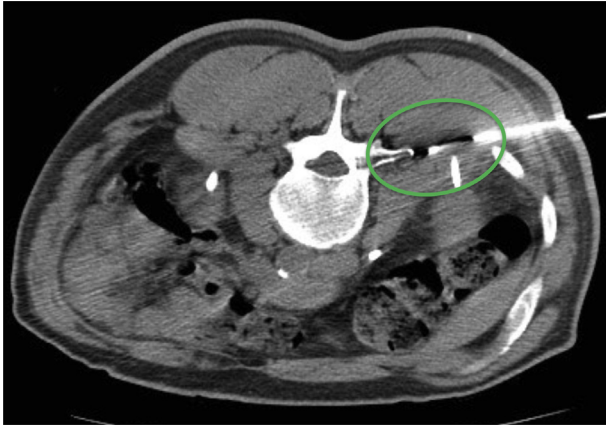


Fig. 3 – CT-guided core biopsy of the tract mass (green oval).

single most important influence to the development of UBC [2]. In the United States, as smoking rates declined from 52% in 1965 to 28% in 1990 for men and from 34% to 23% for women, UBC mortality likewise showed decreasing trends [3,4].

Geographically, UBC has the highest incidence in Western Europe and North America and the lowest incidence in Eastern Europe and Asian countries [5]. In the United States, age, sex, and race also appear to predispose patients to UBC as the disease typically occurs more frequently in men and in older individuals (median age of diagnosis at 69 and 71 years for men and women, respectively) [6]. The incidence of UBC is twice as high among white males compared to African American and Hispanic men [7].

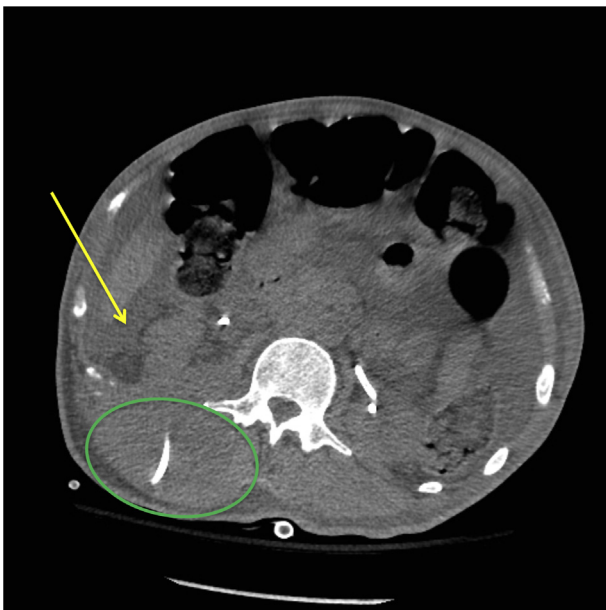


Fig. 4 – Follow-up noncontrast CT shows growth of the tract mass with infiltration and marked asymmetry of the right paraspinal musculature (green oval) as well as new perihepatic ascites (yellow arrow) secondary to liver metastases (not pictured).

In addition to cigarette smoke, there are several known environmental factors that may play a role in increasing the risk for the development of UBC. Occupational carcinogen exposures from jobs such as metal workers, painters, rubber industry workers, leather workers, textile and electrical workers, miners, cement workers, transport operators, excavating-machine operators, and jobs that involve manufacture of carpets, paints, plastics, and industrial chemicals are thought to account for 10%-20% of UBC. Carcinogens from these occupations include benzene, polycyclic hydrocarbons, diesel exhaust, and hair dyes [8]. Trihalomethanes formed as byproducts when chlorine or bromine is used to disinfect water for drinking, arsenic in drinking water, and consumption of Chinese herbs containing aristolochic acid have been associated with increased incidences of UBC [9–11]. Iatrogenic risk factors include radiation, cyclophosphamide treatment, certain analgesics, and thiazolidinediones as oral hypoglycemic agents for the treatment of diabetes mellitus [12–15]. Lastly, it has been shown that some of these risk factors can be mitigated through increased total daily fluid intake by diluting carcinogens and decreasing contact time with urothelial tissues [16].

Noninvasive urothelial lesions are classified into two main categories: flat lesions and papillary lesions. Flat lesions include dysplasia (low-grade intraurothelial neoplasia) and carcinoma in situ. Papillary lesions include urothelial papillomas, inverted papillomas, papillary urothelial neoplasms of low malignant potential, low-grade papillary urothelial carcinoma, and high-grade papillary urothelial carcinoma (HGPUC). Our patient suffered from HGPUC, the subtype of noninvasive urothelial carcinoma with the highest risk for progression [17]. Invasive urothelial carcinomas are characterized by invasion beyond the basement membrane, and can be classified by 1 of 8 histomorphologic phenotypes including squamous, glandular, nested, microcystic, micropapillary, lymphoepithelioma-like, plasmacytoid and lymphoma-like, and carcinomatoid variants. The most common sites of distant metastases of urothelial carcinoma include the liver, lung, mediastinum, and bone and primarily involve spread through the lymphatics. Only 1.1%-2.5% of all urologic malignancies have cutaneous involvement with the kidney being the most common organ to serve as a source of metastasis to the skin. The cancers of the urinary bladder are even less likely to have cutaneous involvement [18,19].

This case report presents a unique situation where HGPUC cells of the urinary bladder have metastasized to the paravertebral soft tissues via seeding through a percutaneous nephroureterostomy tract. In this case, the multiple percutaneous access maneuvers required to convert the nephrostomy to nephroureterostomy could be a potential contributing factor to this metastatic seeding. Instances such as this are rare in the literature and cutaneous metastases from urologic tumors in general occur in roughly 1% of individuals with advanced disease [20]. Although this is a rare complication, it illustrates the importance of carefully considering the mechanism by which the upper urinary tract is decompressed in the setting of obstruction secondary to lower urinary tract malignancy. We propose that in cases of obstructive uropathy secondary to lower urinary tract malignancy, isolated antegrade PCN or isolated retrograde “double J” ureteral stent is preferred to antegrade percutaneous nephroureteral stent. Although the latter may eliminate the need for external bag drainage, we feel

that its use should be reserved for situations requiring traversal of collecting system injury (as in this case) because of the potential for reflux of tumor cells along the catheter tract with resultant metastatic seeding.

Iatrogenic seeding of tumor cells has been reported in conjunction with a variety of procedures including partial cystectomy, suprapubic cystotomy, pyelotomy, laparoscopy, and biopsy [21]. This case demonstrates the need to consider the possibility of tract seeding and metastasis in any patient undergoing PCN placement in the treatment of obstructive uropathy secondary to high-grade urothelial cell carcinoma of the lower urinary tract.

REFERENCES

- [1] Ploeg M, Aben KH, Kiemeny LA. The present and future burden of urinary bladder cancer in the world. *World J Urol* 2009;27(3):289–93.
- [2] Freedman ND1, Silverman DT, Hollenbeck AR, Schatzkin A, Abnet CC. Association between smoking and risk of bladder cancer among men and women. *JAMA* 2011;306(7):737–45.
- [3] Mackay J, Eriksen M. The tobacco atlas. Geneva: World Health Organization; 2002.
- [4] Edwards BK, Brown ML, Wingo PA, Howe HL, Ward E, Ries LA, et al. Annual report to the nation on the status of cancer, 1975–2002, featuring population-based trends in cancer treatment. *J Natl Cancer Inst* 2005;97(19):1407–27.
- [5] Pelucchi C, Bosetti C, Negri E, Malvezzi M, La Vecchia C. Mechanisms of disease: the epidemiology of bladder cancer. *Nat Clin Pract Urol* 2006;3(6):327–40.
- [6] Scosyrev E, Noyes K, Feng C, Messing E. Sex and racial differences in bladder cancer presentation and mortality in the US. *Cancer* 2009;115(1):68–74.
- [7] Ryerson AB, Ehemann CR, Altekruse SF, Ward JW, Jemal A, Sherman RL, et al. Annual Report to the Nation on the Status of Cancer, 1975–2012, featuring the increasing incidence of liver cancer. *Cancer* 2016;122(9):1312–37.
- [8] Jung I, Messing E. Molecular mechanisms and pathways in bladder cancer development and progression. *Cancer Control* 2000;7(4):325–34.
- [9] Marshall G, Ferreccio C, Yuan Y, Bates MN, Steinmaus C, Selvin S, et al. Fifty-year study of lung and bladder cancer mortality in Chile related to arsenic in drinking water. *J Natl Cancer Inst* 2007;99(12):920–8.
- [10] Villanueva CM, Fernández F, Malats N, Grimalt JO, Kogevinas M. Meta-analysis of studies on individual consumption of chlorinated drinking water and bladder cancer. *J Epidemiol Commun Health* 2003;57(3):166–73.
- [11] Lai MN, Wang SM, Chen PC, Chen YY, Wang JD. Population-based case-control study of Chinese herbal products containing aristolochic acid and urinary tract cancer risk. *J Natl Cancer Inst* 2010;102(3):179–86.
- [12] Müller AC, Ganswindt U, Bamberg M, Belka C. Risk of second malignancies after prostate irradiation? *Strahlenther Onkol* 2007;183(11):605–9.
- [13] Travis LB, Curtis RE, Glimelius B, Holowaty EJ, Van Leeuwen FE, Lynch CF, et al. Bladder and kidney cancer following cyclophosphamide therapy for non-Hodgkin's lymphoma. *J Natl Cancer Inst* 1995;87(7):524–30.
- [14] Piper JM, Tonascia J, Matanoski GM. Heavy phenacetin use and bladder cancer in women aged 20 to 49 years. *N Engl J Med* 1985;313(5):292–5.
- [15] Mamtani R, Haynes K, Bilker WB, Vaughn DJ, Strom BL, Glanz K, et al. Association between longer therapy with thiazolidinediones and risk of bladder cancer: a cohort study. *J Natl Cancer Inst* 2012;104(18):1411–21.
- [16] Michaud DS, Clinton SK, Rimm EB, Willett WC, Giovannucci E. Risk of bladder cancer by geographic region in a U.S. cohort of male health professionals. *Epidemiology* 2001;12:719.
- [17] Epstein JI, Amin MB, Reuter VE. Bladder biopsy interpretation. In: *Biopsy interpretation series*. Philadelphia: Lippincott Williams & Wilkins; 2004.
- [18] Chin-Pao Chang I, Lee Y, Shih H-J. Unusual presentation of cutaneous metastasis from bladder urothelial carcinoma. *Chin J Cancer Res* 2013;25(3):362–5.
- [19] Kurian A, Lee J, Born A. Urothelial bladder cancer with cavitary lung metastases. *Can Respir J* 2011;18(3):e46–7.
- [20] Mueller TJ, Wu H, Greenberg RE, Hudes G, Topham N, Lessin SR, et al. Cutaneous metastases from genitourinary malignancies. *Urology* 2004;63(6):1021–6.
- [21] Sorokin I, Welliver RC, Elkadi O, Nazeer T, Kaufman RP. Tumor seeding of percutaneous nephrostomy tract from urothelial carcinoma of the kidney. *Case Rep Urol* 2013;2013:819470.