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CASE REPORT - COMPLICATION

Ureteral obstruction following transurethral resection of bladder cancer within the Hutch's diverticulum

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Abstract

Here, we report a rare case of bladder cancer within the left congenital periureteral diverticulum, termed the Hutch's diverticulum. Following transurethral resection of the bladder tumor, repeated pyelonephritis was caused by stricture of the diverticulum orifice and ureter. We attempted transurethral dilation and ureteral stenting, but the obstruction did not improve. The patient's renal dysfunction showed gradual progression due to recurrent left pyelonephritis as well as the ureteral obstruction. Therefore, we finally performed a partial cystectomy, involving stricture and ureteral reimplantation. No tumor recurrence was observed over 39 months, and renal dysfunction did not progress following partial cystectomy.

Keywords Bladder diverticulum · Hutch's diverticulum · Diverticulum cancer · Partial cystectomy · Ureteral stricture · Ureteral reimplantation

Introduction

Bladder diverticula are associated with herniation caused by weakness of the bladder muscular wall [1]. Bladder diverticula may be either congenital or acquired [2], and has an incidence of 1.7% [3]. Approximately 90% of congenital bladder diverticula are located near the ureterovesicular junction, which is termed Hutch's diverticula [4]. Herein, we the case of a 75-year-old man with bilateral Hutch's diverticula and a tumor in the left diverticulum, who eventually underwent partial cystectomy and ureterovesiconeostomy.

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Case report

A 75-year-old Japanese man was referred to our department for a thorough investigation of high prostate-specific antigen (PSA) levels and dysuria requiring self-administered intermittent urination. Magnetic resonance imaging (MRI) revealed bilateral paraureteric diverticula, a tumor > 2 cm in diameter within the left diverticulum, and benign prostatic hyperplasia (BPH) (Fig. 1). Computed tomography (CT) revealed no abnormalities in the upper urinary tract. He was subsequently diagnosed with a bladder tumor arising within Hutch's diverticulum and BPH. Transurethral resection of the bladder tumor (TUR-BT) and transrectal prostate biopsy were performed. As the neck of the left diverticulum was narrow, a resectoscope was inserted through a neck incision, and the papillary tumor was subsequently completely resected (Fig. 2). The tumor was subsequently pathologically diagnosed as a pTa high-grade/Grade2 urothelial carcinoma. There were no malignant findings in the random biopsy for bladder mucosa and prostate needle biopsy. Two weeks after surgery, the patient developed acute pyelonephritis. Because left hydronephrosis was mild, antimicrobial agents were administered without stenting the ureteral catheter. Three months after surgery, contrast-enhanced CT tomography revealed a contrast effect consistent with the left diverticulum resection area (Fig. 3). TUR-BT was performed

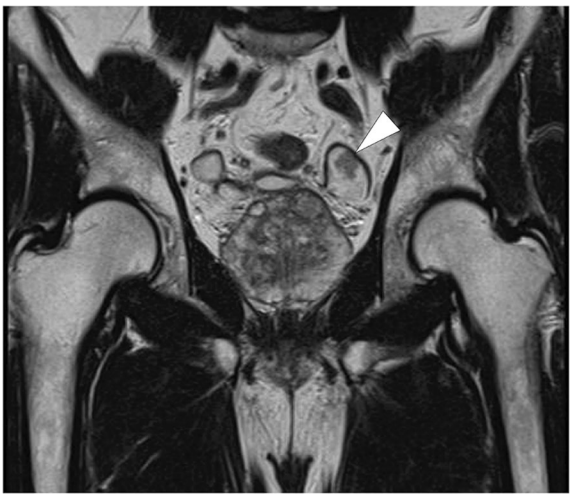

Fig. 1 MRI image of the bilateral Hutch's diverticula and the tumor within the left of them

to detect recurrence of the diverticular tumor. The left diverticulum appeared atrophic, with granulation tissue changes. No malignant pathological findings were observed in the resected tissues. Eight months after initial TUR, acute pyelonephritis with left-sided high-grade hydronephrosis was observed. Ureteral catheterization and administration of an antimicrobial agent were performed. Considering the lower urinary tract symptoms (LUTS), holmium laser enucleation of the prostate (HoLEP) and balloon dilatation of the left ureteral stricture were performed 10 months following initial TUR. Severe hydronephrosis with complete obstruction of the left ureteral orifice was observed 3 months following removal of the ureteral stent after HoLEP (Fig. 4). Partial cystectomy and ureterovesiconeostomy, including resection of the left hutch diverticulum, were performed 15 months after initial TUR. Although severe adhesions developed around the diverticular scar, the ureter remained completely obstructed at the same site. As such, the ureteral stent was removed one month after surgery.

No tumor recurrence was observed 39 months after initial TUR. Although gradual progression of renal dysfunction was observed throughout the clinical course and the patient's serum creatinine level worsened from 0.76 mg/dL before the initial TUR to 1.40 mg/dL, no further progression occurred after partial cystectomy.

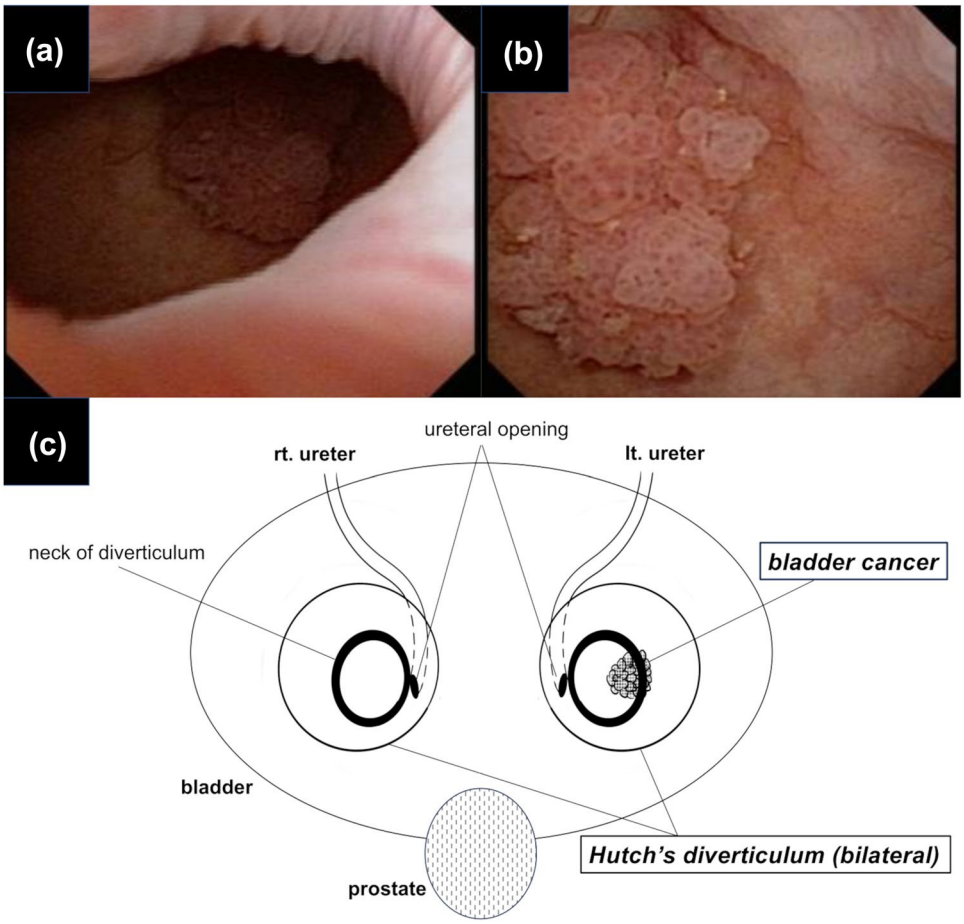

Fig. 2 **a** Cystoscopy images of the left Hutch's diverticulum **b** papillary tumors within the left diverticulum **c** schema of the bladder

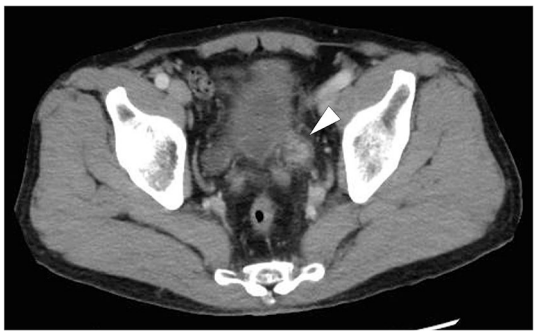

Fig. 3 CT image of the contrast effect consistent with the left diverticulum resection area

Discussion

Diverticular tumors account for approximately 1.5% of all bladder cancers, almost all of which are derived from acquired bladder diverticula [5, 6]. Hutch's diverticulum is a congenital bladder diverticulum that generally develops in childhood [1], and comprises a congenital disruption of the normal development of the muscles around the ureteral orifice, which is anatomically covered by Waldeyer's sheath between the ureter in the bladder and the bladder muscular layer [7]. Initially, a small amount of mucosa escapes through a congenital defect in the bladder muscular tissue. The defect then enlarges with urination, and the ureteral orifice eventually becomes encased by a diverticulum [8]. The incidence of Hutch's diverticulum is estimated to be less than 3% worldwide, and there have been no reports of bladder cancer within Hutch's diverticulum in the last decade. To our knowledge, this is the first report of transurethral surgery for bladder cancer with a Hutch's diverticulum.

There are several explanations for why TUR performed for Hutch's diverticular bladder tumors led to obstruction of the upper urinary tract in the present case. First, bladder diverticula are characterized by the thinness or absence of the intrinsic muscular layer, which increases the risk of perforation during biopsy and TUR of diverticular tumors [9]. Second, most Hutch diverticula have also been reported to be located cephalad and lateral to the ureteral orifice, in close proximity to the ureterovesical junction [4]. Third, if the ureteral orifice is involved by a tumor, electroresection of the ureteral orifice is required. This resection destroys the normal anatomy of the ureterovesical junction, and secondarily causes vesicoureteral reflux or ureteral stricture [10]. Previous reports have shown an incidence of ureteral stricture following TUR-BT involving the ureteral orifice of up to 16% [11–14]. Several reports have recommended performing ureteral stenting after ureteral orifice resection. However, others have reported that although ureteral catheterization prevents acute ureteral dysfunction due to edema and spasm, it has little effect on eventual fibrosis, which typically begins 3–4 weeks after resection [15]. As such, the necessity of ureteral catheterization at TUR-BT involving the ureteral orifice remains controversial. However, considering the fragility of Hutch's diverticulum and the position of the lower ureter, resection of bladder tumors within Hutch's diverticulum carries the risk of direct injury to the ureter, fibrosis with indirect heat conduction, and stricture of the diverticular orifice itself. Hence, stricture could have been avoided by temporary placement of a ureteral stent immediately after resection.

In this case, repeated increases in the intrarenal pelvic pressure and pyelonephritis associated with obstruction around the left ureteral orifice resulted in renal dysfunction. While attention to the risk of perforation and possible indirect thermal injury to organs adjacent to the diverticulum is required, TUR is a standard surgical option for the initial treatment of urothelial cancer within the diverticulum [9]. However, transurethral dilatation of the stricture and ureteral stenting did not improve the patient's renal function, a partial cystectomy and ureteral reimplantation were performed 15 months after the initial TUR. In this case, there was no recurrence after ureteral reimplantation. Previous research has indicated that BT with ureteral orifice involvement significantly increased the risk of subsequent occurrence of upper urinary tract urothelial carcinoma [11]. EAU

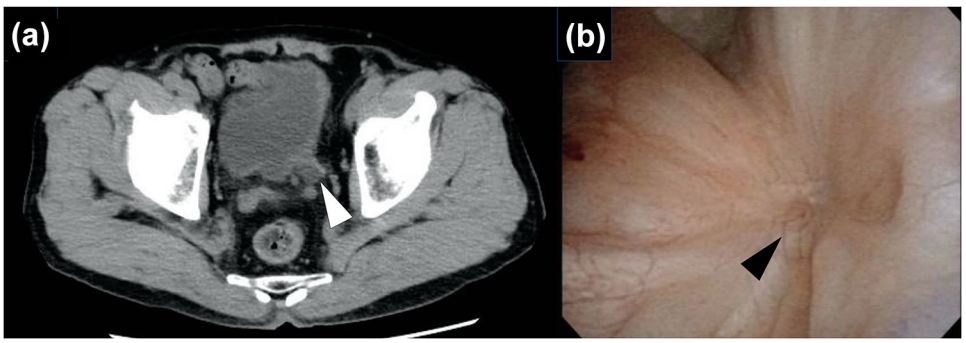

Fig. 4 **a** CT image of complete obstruction of the left ureteral lower end. **b** Cystoscopy image of absence of the left ureteral opening

guidelines recommend an extension of follow-up intervals by cystoscopic examination and urine cytology for patients with high-risk bladder cancer if there is no recurrence for 2 years after TUR [16, 17]. Since a recurrence after ureteral reimplantation is expected to complicate subsequent treatment, considering that the bladder tumor is an intradiverticular tumor without a muscle layer, it would have been safer to confirm that there was no recurrence in the upper urinary tract or bladder for 2 years after the initial TUR before performing a ureteral reimplantation. On the other hand, the possibility of stricture due to residual tumor after resection of the intradiverticular tumor could not be completely ruled out. Therefore, in this case, after confirming that there were no signs of malignancy in the bladder and left ureter by CT scan and cytological examinations, we performed a partial cystectomy with sufficient surgical margins and ureterocystostomy. The present case suggests that TUR for tumors within a Hutch's diverticulum, which is considered more complex, should be performed more carefully, including intraoperative ureteral catheterization, and that partial cystectomy with ureteral reimplantation should not be hesitated if a ureteral obstruction is suspected.

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Author contributions JT, YT, HS, YM, AY, and IN performed and supervised the entire treatment including operation and systemic therapy. YT, AY, JT, and IN were contributed to the study design and drafted the manuscript. All authors read and approved the final manuscript.

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Data availability Data and materials are available upon request to the corresponding author.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval Ethical approval was obtained from the Research and Ethics Committee of the institute.

Informed consent Informed consent was obtained from the patient for the publication of this case report.

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