0022-5347/05/1736-1908/0
THE JOURNAL OF UROLOGY®

Vol. 173, 1908–1911, June 2005
Printed in U.S.A.
DOI: 10.1097/01.ju.0000158450.71497.ae

DOES THE MANAGEMENT OF BLADDER PERFORATION DURING TRANSURETHRAL RESECTION OF SUPERFICIAL BLADDER TUMORS PREDISPOSE TO EXTRAVESICAL TUMOR RECURRENCE?

ANDREAS SKOLARIKOS, MICHAEL CHRISOFOS, NIKOLAOS FERAKIS, ATHANASIOS PAPATSORIS, ATHANASIOS DELLIS AND CHARALAMBOS DELIVELIOTIS

From the 2nd Department Of Urology, School of Medicine, University of Athens, Sismanoglio General Hospital Athens, Greece

ABSTRACT

Purpose: We evaluated the impact of a bladder perforation during transurethral resection of superficial bladder tumor on extravesical tumor recurrence and patient prognosis. We also defined potential risk factors for extravesical recurrence prospectively giving emphasis to the management of the perforation.

Materials and Methods: The medical records of 3,410 patients were reviewed. Parameters recorded included patient age and sex, tumor stage, grade, number, size and location at the time of perforation, the type of bladder perforation (extraperitoneal vs intraperitoneal) and the way the perforation was managed (open surgical repair vs conservative treatment). Logistic regression analysis was used to identify risk factors for extravesical recurrence. Cox regression analysis was used to compare cancer specific survival.

Results: A total of 34 cases of bladder perforation were recorded, 4 patients were treated with open surgery and 30 treated conservatively. The 4 patients who underwent open surgery presented with extravesical recurrence after a mean followup of 7.5 months. The remaining 30 patients had no evidence of extravesical recurrence after a mean followup of 60 months ($p < 0.001$). Of the patients with extravesical relapse 3 died of disease. The surgical management of bladder perforation was the best predictor of extravesical recurrence ($p < 0.001$, $r = 1.13$), followed by an intraperitoneal localization of the perforation ($p = 0.0003$, $r = 0.67$) and tumor size ($p = 0.01$, $r = 0.42$).

Conclusions: Surgical repair of a bladder perforation during transurethral resection of bladder tumor increases the risk of extravesical tumor cell recurrence and negatively affects patient prognosis.

KEY WORDS: carcinoma, transitional cell; bladder, recurrence, prognosis, punctures

Transurethral resection of bladder tumor (TURBT) followed by adjuvant intravesical chemotherapy or immunotherapy when indicated is the treatment of choice for superficial transitional cell carcinoma of the bladder. Complications of TURBT are fairly rare. Intraoperative and immediate postoperative bleeding is the most common with an incidence of 2% to 13%.[1] Bladder perforation is the second most common complication with an incidence of 1.3% to 5% depending on the series.[1] Extraperitoneal perforation accounts for 83% to 89% of the cases.[1,2] Usually it is managed conservatively with adequate bladder drainage via a urethral catheter.[1,2] Rarely the perivesical space is concomitantly drained in the case of a large collection or concurrent bladder infection. Intraperitoneal perforation is a more serious condition, which can be complicated by increased leakage and systemic absorption of irrigation fluid[3] or by bowel injury. Traditionally intraperitoneal perforation has been managed with open surgical repair.[4] Recent studies focus on minimal invasive management such as percutaneous peritoneal drainage[1,5] or laparoscopic repair of the bladder defect.[6]

Submitted for publication August 25, 2004.
Nothing to disclose.
Presented at annual meeting of American Urological Association, San Francisco, California, May 8–13, 2004.

Editor's Note: **This article is the second of 5 published in this issue for which category 1 CME credits can be earned. Instructions for obtaining credits are given with the questions on pages 2212 and 2213.**

For another article on a related topic see page 2166.

A major concern of bladder perforation during transurethral resection is the possibility of tumor cell dissemination into the perivesical area, which potentially increases tumor stage to T3 or greater, or even predisposes to metastasis. All published articles regarding the possibility of tumor seeding following bladder perforation during TURBT are either retrospective studies or case reports.[1,2,4,7–10] All these studies refer to a small number of patients and agree on the conclusion that although the possibility of tumor seeding exists, it is minimal.

Seeding of transitional carcinoma outside the urinary tract is a recognized risk factor after open surgical procedures such as partial cystectomy, suprapubic cystotomy and pyelotomy.[11–13] However, the management of bladder perforations, and the impact on extravesical tumor extension and on patient prognosis has never been specifically studied in the literature to our knowledge. We evaluated the impact of inadvertent bladder perforation during transurethral resection of superficial transitional cell carcinoma on extravesical tumor recurrence and ultimately on patient prognosis. We also defined potential risk factors for extravesical tumor recurrence, prospectively emphasizing whether open surgical repair vs conservative management of bladder perforation could have a different impact on extravesical tumor recurrence and patient prognosis.

MATERIALS AND METHODS

We reviewed the medical records of 3,410 patients who underwent TURBT in our department from September 1990

to September 2000, searching for those patients with documented bladder wall perforation. We focused those with a superficial bladder tumor diagnosis (Ta/T1) on the initial pathological report. All perforation cases were confirmed by an intraoperative cystogram.

All patients with documented perforation were postoperatively followed up with cystoscopy, examination under anesthesia, voided urine cytology, abdominal and pelvic ultrasonography, chest x-ray, and abdominal computerized tomography at regular intervals. Tumor recurrence and progression were recorded and histologically confirmed in every patient. We specifically focused on the incidence and the timing of extravesical recurrence. Parameters recorded on occurrence of a perforation included patient age and sex, tumor stage, grade, number, size, and location at the time of perforation, as well as the type of bladder perforation (extraperitoneal vs intraperitoneal). Logistic regression analysis was used to identify potential risk factors for extravesical recurrence. We compared the previously mentioned parameters to the way the perforation was managed, either conservatively with free drainage of the bladder via a transurethral catheter with or without drainage of the perivesical space, or open surgical repair of the bladder perforation. Kaplan-Meier survival and Cox regression analysis were used to calculate and compare cancer specific survival between patients treated with conservative management and patients who underwent open surgery, respectively, with $p < 0.05$ considered statistically significant.

RESULTS

A total of 40 cases (1.1%) of bladder perforation were recorded and 34 patients had a histologically confirmed superficial tumor (table 1). Of the 34 patients 26 (76.4%) were successfully treated conservatively with a urethral catheter indwelling for 1 week following TURBT. Perivesical space was percutaneously drained via a silicone tube inserted under ultrasound guidance in 4 patients (11.8%). Of these 2 had increasing hypogastric pain and 1 experienced peritonism. Computerized tomography of the pelvis revealed perivesical urinomas in both cases. The last patient had a persistent urinary tract infection during convalescence secondary to urinoma formation at the right lateral perivesical space.

Four patients (11.8%) needed an open surgical repair of the bladder perforation. Two had large bladder wall defects and persistent hemorrhage with concomitant increasing peritonism and respiratory distress, 1 had concurrent excessive electrolyte disorders, and 1 was suspicious for bowel injury, which was subsequently not confirmed at the surgical exploration. The defect was closed with absorbable material in a double layer suturing fashion and a transurethral catheter was placed for urine drainage. Drainage tube was left in the Douglas' pouch in 3 cases, while a further 1 was placed in the cavum Retzii in a patient with anterior bladder wall perforation.

Of the 34 patients none received immediate intravesical instillation of a chemotherapeutic agent. Twelve patients underwent adjuvant intravesical chemotherapy (8 mitomycin/4 epirubicin), and 5 patients received adjuvant intravesical bacillus Calmette-Guerin treatment starting 2 weeks after TURBT.

Of the 34 patients 4 (11.8%) presented with extravesical tumor recurrence during followup. All had an open surgical treatment of the bladder perforation and presented with extravesical tumor recurrence after a mean followup of 7.5 months (table 2). Patient 1 had an anterior abdominal wall involvement which was confirmed by needle biopsy to be transitional cell carcinoma. He could not be operated on due to a preceding myocardial infarct and a concomitant unstable angina pectoris. He received combination therapy with external beam radiation and systemic methotrexate, vinblastine, doxorubicin and cisplatin chemotherapy, and died 10 months later. Patient 2, a senior female with anterior abdominal wall involvement and a vesicocutaneous fistula underwent cystectomy with a wide excision of the involved abdominal wall. She received 1 cycle of systemic methotrexate, vinblastine, doxorubicin and cisplatin chemotherapy, and died of the disease 2 months later. Patient 3 presented with rectal wall involvement again confirmed as transitional cell carcinoma by needle biopsy. He died of metastatic disease 4 months after the initiation of systemic chemotherapy. Finally patient 4 presented with perivesical fat invasion. He underwent radical cystoprostatectomy with an extended pelvic lymphadenectomy. He is still alive with no evidence of disease 10 months after the procedure.

Table 3 shows a univariate analysis of the risk factors for extravesical tumor recurrence. Open surgical repair ($p < 0.001$), intraperitoneal perforation ($p = 0.006$), tumor diameter ($p = 0.02$) and tumor location at the time of the perforation ($p = 0.002$) were the most important parameters. Multivariate logistic regression analysis revealed that the only important factors associated with extravesical tumor recurrence were the open management of the perforation ($p < 0.001$, $r = 1.13$), followed by an intraperitoneal localization of the perforation ($p = 0.0003$, $r = 0.67$), and the size of the tumor ($p = 0.01$, $r = 0.42$, table 4). Disease specific survival was 100% for the patients who underwent either percutaneous drainage or conservative treatment of the perforation after a median followup of 60 months, compared with 25% for the patients treated with open surgery after a median followup of 15 months ($p < 0.001$, see figure).

DISCUSSION

The impact of bladder perforation on extravesical tumor cell seeding has not been extensively studied and remains controversial in literature. Our study shows that an inadvertent bladder perforation during transurethral resection for superficial bladder cancer may predispose to extravesical tumor recurrence and ultimately negatively affects patient

TABLE 1. *Descriptive statistics of 34 patients with bladder perforation during superficial bladder tumor resection*

	No.	%
Mean age (range)	74.59 (53–89)	
Sex (male/female)	26/8	76.5/23.5
Perforation location (intraperitoneal/extraperitoneal)	5/29	14.7/85.3
Management type (conservative/drainage/open)	26/4/4	76.5/11.8/11.8
No. tumors (single/multiple)	23/11	67.6/32.4
Presence of Ca in situ (yes/no)	2/32	5.9/94.1
Tumor location (anterior wall/posterior/rt lat/lt lat/dome/trigone)*	14/1/6/7/3/3	41.2/2.9/17.6/20.6/8.8/8.8
Tumor diameter (less than/greater than 3 cm)*	20/14	58.8/41.2
Tumor stage (Ta/T1)	15/19	44.1/55.9
Tumor grade (GI/GII/GIII)	7/21/6	20.6/61.8/17.6
Endovesical recurrence (yes/no)	17/17	50/50
Extravesical recurrence (yes/no)	4/30	11.8/88.2

* Regarding the tumor at perforation location.