International Journal of Surgery

Journal Homepage: ijsopen.org

Research Article

Bladder Perforation During Trans-Urethral Resection of Bladder Tumors: Is the Open Exploration Ever Indicated?

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ARTICLE INFO

Article history:
Received: 4 December, 2023
Accepted: 29 January, 2024
Published: 25 March, 2024

Keywords:
Bladder perforation, TURBT, open exploration, outcomes

ABSTRACT

Objectives: Management of bladder perforation during TURBT and to evaluate the need for open exploration? **Materials and Methods:** A retrospective study design was done and 1550 patients underwent TURBT for bladder mass from January 2005 to November 2023. 52 patients were identified with bladder perforation. 20 patients with T2 tumour on biopsy were excluded from final analysis. Parameters recorded on occurrence of a perforation included patient age and sex, tumor stage, grade, multiplicity, size, location, type of bladder perforation and management undertaken. **Results:** Of a total of 32 patients, 20 were male and 12 patients were female. The mean age of presentation was 65±12.34yrs. 19 patients had T1 tumors. The site of urinary bladder associated with the highest perforation was postero-lateral wall seen in 14 patients. None of the patients had past history of TURBT or were previously operated. A total of 10 patients (31.25%) had intra-peritoneal perforation and 22 patients (68.75%) had extra-peritoneal perforation. **Conclusion:** We conclude from our study that open exploration is seldom required for bladder perforation during TURBT unless there are signs of peritonism.

1. Introduction

The bladder is the commonest urological organ subjected to iatrogenic injury [1]. Both urological and gynecological procedures can lead to full thickness laceration of bladder wall. Amongst urological procedures, transurethral resection of bladder tumors (TURBT) is considered to be a major cause of bladder perforation with an incidence of 1.3-58 % reported in several series [1, 2]. EAU guidelines for non-muscle invasive bladder cancer (NMIBC) have recommended optimal treatment of these tumors by TURBT and/or intravesical Instillations which is mostly BCG (Bacilli Calmette Guerin). Although associated with minor complications, the risk of life-threatening complications and severe morbidity after TURBT is extremely rare leading to its perception as a general outpatient procedure. The commonest complication following TURBT is bleeding followed by perforation [2].

Both extra-peritoneal and intra-peritoneal perforation can occur and extra-peritoneal perforations are more incessant than the intra-peritoneal ones. But large, lethal perforations following TURBT are limited [3]. For extra-peritoneal injury conservative treatment with bladder drainage and antibiotic prophylaxis is advised as per EAU guidelines [4]. For intra-peritoneal injuries, the standard of care is surgical exploration with repair [5]. However, in selected cases of intra-peritoneal perforation (in the absence of peritonitis or ileus), conservative management with continuous bladder drainage and antibiotic prophylaxis may still be offered [4, 5]. In addition to this, placement of an intra-peritoneal drain has also been advocated, especially when the lesion is larger [6].

The present study envisaged the spectrum of perforation occurring during TURBT from more than 15 years database of a high volume tertiary care center in northern India.

2. Materials and Methods

A retrospective study design was done at MGMCH, Dept of Urology, JAIPUR. 1550 patients underwent TURBT for bladder mass from January 2005 to November 2023. The pathological stage and grade for each patient was assigned in accordance with the Union for International Cancer Control TNM system (8th edition, 2017) and the World Health Organization staging system (2004). All patients with stage Ta, CIS, T1, T2 and T3 found on initial TURBT specimen were included. All patients with T4 and metastatic bladder cancer and were excluded. All the

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DOI: 10.60122/j.IJS.2024.10.05

patients were from different parts of India with demographic diversity. As per EAU guidelines, intravesical mitomycin C (40mg in first 6 hours) was used in postoperative instillation. 1.5% glycine was used for irrigation purpose.

52 patients were identified with bladder perforation. 20 patients were found to have T2 tumour on deep muscle biopsy and excluded from final analysis. In all cases of bladder perforation, the surgery was stopped as soon the perforation was discovered by the operating surgeon and the irrigation fluid discontinued.

Once the perforation was diagnosed, a radiologist was called to assess the nature of perforation- whether intraperitoneal or extraperitoneal by performing a bedside ultrasound. For all cases of extraperitoneal perforation, conservative management was done with catheter placement and antibiotic prophylaxis. For intraperitoneal perforation identified per-operatively, a catheter was placed and abdominal drain (Romovac ADK) was placed intraoperatively. In cases where the radiologist was unclear, the perforation was confirmed by an intraoperative cystogram and managed accordingly. Abdominal exploration was done for all cases which were found to have extensive bladder perforation and develops signs of peritonism.

Comorbidities and independent variables were evaluated from medical records and included smoking, diabetes, hypertension , age, gender, tumor stage and grade. All patients with non-muscle invasive tumour on initial biopsy were subjected to follow up using cystoscopy and urine cytology at 3 monthly intervals and abdominal ultrasounds and CT abdomen yearly as per EAU guidelines.

2.1. Statistical Analysis

Statistical tests were applied as follows: Quantitative variables were compared using independent T test/Mann-Whitney Test and qualitative variables were correlated using Chi-Square test. Univariate and multivariable linear regression models were used to analyze associations between variables and patients with bladder perforation and recurrence with patients having only bladder perforation. Fischer's exact test was used for univariate analysis. A difference was considered significant when the P-value was <0.05.

3. Results

The results are shown in (Table 1).

TABLE 1: Results.

Patient Characteristics	**Number(%)** **32**
1) Gender-	
Male	20 (62.5)
Female	12 (37.5)
2) Age	
Less than 60	11 (65.6)
More than 60	21 (34.37)
3) Tumor size	
<3cm	14 (43.75)
>3cm	18 (56.25)
4) Tumor stage	
Cis	5 (15.62)
Ta	8 (25)
T1 – Grade 1	8 (25)
T2 - Grade 2	3 (9.3)
T3 – Grade 3	8 (25)
5) Tumor multiplicity	
Solitary	15(46.8)
Multiple	17(53.12)
6) Tumour Location	
Dome	6 (18.75)
Anterior wall	10(31.25)
Posterior wall	2(6.25)
Postero-lateral wall	14(43.75)
7) Diabetes Yes	20 (62.5)
No	12 (27.5)
8) Hypertension Yes	11 (65.6)
No	21 (34.37)
9) Smoker Yes	19 (59.3)

No	13 (40.6)
10) Perforation	
Intra -peritoneal	10 (31.25)
Extra -peritoneal	22 (68.75)
11) Size of perforation	
< 0.5 cm	16(50)
0.5-1 cm	9(28.12)
1-2 cm	5(15.62)
>2cm	2(6.25)
12) Management undertaken	
Catheter Drainage only	21(65.6)
Intra-abdominal drain + catheter	10(31.2)
Open Surgical Exploration	1(3.12)

Of a total of 32 patients, 20 were male and 12 patients were female. The mean age of presentation was 65±12.34yrs. 19 patients had T1 tumors. The site of urinary bladder associated with the highest perforation was postero-lateral wall seen in 14 patients. None of the patients had past history of TURBT or were previously operated. A total of 10 patients (31.25%) had intra-peritoneal perforation and 22 patients (68.75%) had extra-peritoneal perforation. All patients with intra-peritoneal perforation were treated by catheter drainage, antibiotic prophylaxis and an intra-peritoneal drain. None of the patients underwent open surgical exploration as there was no associated bowel injury. The drain was removed as soon as the output reduced below 25 ml and a repeat cystogram demonstrated no leak. Of all patients, only 1 patient required open surgical exploration for a perforation that was missed initially and the patient later presented with increasing abdominal pain, distension and symptoms of peritonitis. However, this patient did not develop recurrence.

4. Discussion

TURBT continues to be the primary modality of treatment of bladder cancer. Bladder perforation after TURBT seems inevitable owing to a large part of this procedure being performed by trainee urology resident. The bigger picture of bladder perforation on clinical and oncological outcomes is still debatable. There is no literature consensus on what constitutes a 'large perforation' following TURBT. In our series majority perforations (78%) were less than 1 cm in size and only two patients had perforation larger than 2 cm. This might stem from the fact that the size of resecting loop is small (3-4mm diameters) and the surgeon immediately stopped the surgery following perforation.

Earlier studies suggest that in cases of heavily pretreated, thin-walled bladders; with large tumors located posteriorly or in the bladder dome, there is a high risk of perforation [3, 7]. This was contradictory to our findings. In all the 5 patients in our series none of them had any endo-urological surgical history in the past. 3 of the patients had their tumour predominantly involving the posterolateral wall and 2 in the dome. Most TURBT's are performed under regional anesthesia and possibility of obturator reflex is an inexorable possibility. The obturator nerves along with vessels pass from pelvic cavity running close to the bladder neck and infero-lateral bladder wall supplying adductor muscles [8]. These nerves are stimulated during deeper tissue resections involving this area, which inadvertently in some cases, leads to 'obturator jerk' causing iatrogenic bladder perforations [9]. Dome is an area supposedly farthest to reach cystoscopically and resection of tumors completely at this site have inherent difficulty.

The traditional management of intra-peritoneal bladder perforation is open laparotomy with repair of bladder wall and drainage of the intra-peritoneal fluid, exclusion of small bowel injury, and placement of intra-peritoneal drains [10]. However, we performed percutaneous drainage of the abdomen by placement of an intra-peritoneal drain and per urethral catheter for management of all such perforations. The advantages of percutaneous drainage are that it avoids the morbidity of a laparotomy. It also avoids further anesthesia, especially in patients in whom perforations are recognized late after recovery from anesthesia [11]. None of our patients witnessed any clinical signs of deterioration or bowel injury. We believe all such patients require close monitoring. If they show signs of peritonism in spite of intraperitoneal drain, a laparotomy is recommended.

There are few drawbacks in our study. Firstly, it is a retrospective study with limited analysis of a small cohort of patient. Many small perforations are also missed. There is also a certain surgeon's deprivation to document all such cases.

5. Conclusion

Till now bladder perforations during TURBT are being managed by surgical approach, but results from our study conclude that, bladder perforation should be managed conservatively unless there are signs of peritonism.

Conflicts of Interest

None.

Funding

None.

Consent

Informed consent was taken from the patient.

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