

Short Communication

Unveiling the risks: Navigating operative and post-operative complications in Transurethral Resection of Bladder Tumor.

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Abstract

Background: Transurethral Resection of Bladder Tumor (TURBT) is a cornerstone in the management of non-muscle invasive bladder cancer, yet it poses inherent risks such as bleeding, perforation, electrolyte imbalances, and urinary tract infections (UTIs). Effective intraoperative management is crucial to minimize these risks and optimize patient outcomes. This study aimed to elucidate the spectrum of early complications following TURBT.

Methodology: A descriptive study involving 98 patients was conducted using non-probability consecutive sampling at the Department of Urology, Sindh Institute of Urology and Transplantation (SIUT), over a period of 6 months (February 22, 2022 - August 24, 2022). TURBT procedures were performed under general anesthesia, with patients admitted 24 hours preoperatively and discharged within 48 hours. Follow-up evaluations were scheduled at 1 week and 4 weeks post-resection to document complications.

Results: The study included 98 patients undergoing TURBT. Postoperative complications observed at the first week included increased rates of gross hematuria (20 patients), blood transfusions (7 patients), symptomatic urinary tract infections (3 patients), and acute kidney injury (3 patients). By the fourth week, complications had generally decreased, but persistent issues included urinary tract infections (10 patients), fever (10 patients), and acute kidney injury (4 patients). The duration of the procedure and tumor size significantly influenced complication rates, with longer procedures and larger tumors associated with higher incidences of fever, urinary tract infections, and acute kidney injury.

Conclusion: The study highlights that longer TURBT procedures and larger tumor sizes are associated with increased postoperative complications, including fever, urinary tract infections, and acute kidney injury. Effective management strategies and early detection of bladder cancer may help reduce these complications.

Keywords

Bladder Tumor, Acute Kidney Injury, Transurethral Resection of Bladder Tumor, Complications



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Introduction

Bladder cancer ranks as the seventh most common malignancy in men globally, with an age-standardized incidence rate of 9.0 per 100,000 people/years, compared to 2.2 in women¹. About 75% of bladder cancer cases initially present as non-muscle invasive disease (stage T1 or Ta, carcinoma in situ), a percentage significantly higher among younger individuals under 40². Since Beer's development of the first electro-surgical method for bladder tumor removal in 1910³, transurethral resection of bladder tumor (TURBT) has remained the primary treatment and diagnostic tool for non-muscle invasive bladder cancer (NMIBC)^{4,5}.

Operative complications during TURBT, ranging from bleeding and perforation to electrolyte imbalances and urinary tract infections, underscore the surgical risks inherent in the procedure. These risks necessitate meticulous intraoperative management to minimize adverse outcomes. Post-operatively, patients often experience complications such as hematuria, urinary retention, bladder spasms, and urinary incontinence, which can significantly impact their quality of life and clinical course. Moreover, the potential for recurrence of bladder cancer post-TURBT emphasizes the importance of vigilant surveillance and follow-up care.

Complications associated with TURBT are commonly classified as grade 1 (77.3%) and grade 2 (12.7%), with higher grades reported less frequently^{6,7}. Various non-conductive irrigation solutions like sterile water and glycine 1.5% are traditionally used during mono-polar loop excision of bladder tumors, with sterile water offering advantages such as improved visualization. However, concerns include osmotic lysis of red blood cells and dilutional hyponatremia from intravascular water absorption⁸.

Bladder perforation, a complication with a reported prevalence ranging from 0.9% to 5%, remains underreported and predominantly falls within grades I and II complications. Hematuria and acute urine retention are the most frequently encountered issues among TURBT patients,

comprising 74% of reported problems^{9,10}. Adductor spasms and obturator reflexes, though less common, also contribute to procedural challenges^{11,12}.

Currently, TURBT serves not only as the standard treatment for bladder cancer but also as a crucial method for diagnosing and staging the disease. Despite its widespread use, comprehensive data on the post-operative morbidities of patients undergoing endoscopic resection of bladder tumors are still lacking. Therefore, the aim of our study is to document early complications following TURBT, aiming to improve patient outcomes and enhance our ability to manage these complications effectively.

Methodology

Study Design

This descriptive study aimed to assess perioperative complications in patients undergoing transurethral resection of bladder tumors (TURBT) over a six-month period, from February 22 to August 24, 2022.

Setting

The research was conducted at the Department of Urology, Sindh Institute of Urology and Transplantation.

Participants

We included adult patients aged 12 to 80 years with bladder tumors who were admitted during the study period. Eligibility required being clinically fit for TURBT under general anesthesia and undergoing their first resection. Exclusion criteria encompassed patients on antiplatelet therapy, those with previous bladder resections, bleeding disorders, non-resectable tumors, or urethral strictures.

Study Size

Based on a preliminary estimate of surgical complications at 10%, with a margin of error of 6% and a 95% confidence level, the Open Epi Sample Size Calculator determined a required sample size of 98 patients. The study included 98 out of 120 TURBT procedures performed at our facility over six

months, achieved through consecutive non-probability sampling.

Variables

Demographic and preoperative variables included age, gender, and tumor size. Outcome variables, documented according to the modified Clavien-Dindo classification system, comprised perioperative complications such as fever, bladder perforation, and death.

Data Sources/Measurement

Demographic data and details on preoperative and perioperative complications were recorded prospectively. All TURBT procedures were performed by a consultant urologist with over three years of experience. The resection used a monopolar 26 Fr continuous irrigation resectoscope, with a 20-24 Fr three-way urethral catheter for postoperative irrigation. Bladder irrigation ceased once the effluent was clear, and catheters were removed within 24 hours or per protocol.

Data Collection and Follow-up

Patients were admitted 24 hours before the procedure and discharged within 48 hours post-operation. Vital signs and temperature were monitored during admission, with gross hematuria checked. Follow-up appointments were scheduled for one week and four weeks post-resection to document complications.

Bias

To minimize bias, we employed consecutive sampling of all eligible patients and standardized procedures for data collection. Anonymity and confidentiality were maintained by using medical record numbers instead of patient names, with data secured by password protection.

Statistical Analysis

Data were analyzed using SPSS version 21.0, presenting categorical variables as frequencies and percentages and continuous variables as means with standard deviations.

Ethical Considerations

Ethical approval was granted by the Institutional Ethical Review Committee. Participants were informed about the study objectives and provided written consent prior to enrollment.

Results

Participants

A total of 98 patients with bladder tumors were included in this study. Of these, 81 were men and 17 were women. The average age of the patients was 58.97 ± 13.79 years.

Descriptive Data

During the fourth week of follow-up, several postoperative complications were observed. Notably, 10 patients experienced fever, 10 developed urinary tract infections (UTIs), and 4 suffered from acute kidney injury (AKI). The duration of the transurethral resection of bladder tumor (TURBT) procedure and the size of the tumors were identified as significant factors influencing the occurrence of these complications.

Outcome Data

This study recorded a range of complications associated with transurethral resection of bladder tumors, categorized by the operative period, the first week postoperatively, and the fourth week postoperatively. During the operative phase, gross hematuria was the most frequent complication, affecting 9 patients. Additionally, there were three cases of bladder perforation and one instance of blood transfusion.

In the first week following surgery, the number of patients with gross hematuria increased to 20, and 7 patients required blood transfusions. New complications emerged during this period, including symptomatic urinary tract infections (UTIs) in 3 patients, acute kidney injury (AKI) in 3 patients, and fever in another 3 patients. Additionally, 5 cases of acute urinary retention were observed.

By the fourth week after surgery, there was a notable decrease in most complications. Gross hematuria was reported in only 3 patients, and no

further cases of bladder perforation or the need for blood transfusions were documented. However, symptomatic UTIs and fever persisted in 10 patients each, and 4 patients continued to experience AKI. One patient passed away during this period, but no new cases of acute urinary retention were reported.

Main Results

The findings of this study indicate that the first week following transurethral resection of bladder tumors is the most critical period for the

development of postoperative complications. During this time, patients were more likely to experience significant issues such as gross hematuria, symptomatic UTIs, AKI, and fever. Although the incidence of these complications generally decreased by the fourth week, some complications persisted, including UTIs, AKI, and fever, which underscores the need for continued monitoring and management of patients in the weeks following surgery.

Table 1: Operative and postoperative complications of transurethral resection of bladder tumor (n=98).

Complications	Operative	Post-operative	
		First Week	Fourth Week
Gross Hematuria	9	20	3
Required Blood Transfusion	1	7	0
Bladder Perforation	3	0	0
Symptomatic UTI	0	3	10
Acute Kidney Injury	0	3	4
Fever	0	3	10
Death	0	0	1
Acute Urinary retention	0	5	0

Discussion

The findings of our study are consistent with global data on transurethral resection of bladder tumors (TURBT), reaffirming the significant yet variable risk of postoperative complications associated with this procedure. We observed an overall complication rate of 8.1%, with the most common complications including hematuria, urinary tract infections (UTIs), fever, and urinary retention. These outcomes are in line with previous research by Gregg et al., which documented similar complications following TURBT, highlighting the procedure's inherent risks¹³. Additionally, Avallone et al. reported a higher overall complication rate of 34.3%, with specific incidences of UTIs (7%) and hematuria (8%), demonstrating the variability in complication rates across different patient populations and clinical settings¹⁴.

In our study, infectious complications were particularly prominent, constituting more than 30% of all complications observed within the four weeks postoperatively. This finding underscores the critical importance of implementing effective strategies to prevent postoperative infections, such as judicious use of catheters and strict adherence to antimicrobial prophylaxis guidelines¹⁵⁻¹⁷. Studies have shown that these measures can significantly reduce the risk of infections following urological procedures, and our results further support their essential role in postoperative care.

Furthermore, our analysis revealed a notable correlation between tumor size and perioperative morbidity. Patients with larger tumors (>3 cm) were more likely to experience postoperative complications, including fever, UTIs, and acute kidney injury (AKI). This finding suggests that early detection and treatment of bladder cancer, leading

to the management of smaller and less invasive tumors¹⁸⁻¹⁹, may mitigate the risk of complications associated with TURBT. The importance of early detection is supported by existing literature, which highlights that smaller tumors are generally associated with lower morbidity and better postoperative outcomes.

Our study also provided valuable insights into the specific postoperative complications observed during the fourth week of follow-up. Notably, 10 patients developed fever, 10 experienced UTIs, and 4 suffered from AKI. These findings emphasize the ongoing risk of complications beyond the immediate postoperative period and the need for continued monitoring and intervention during the recovery phase. The persistence of these complications in the later stages of recovery highlights the importance of extended follow-up care to promptly address any emerging issues.

Collectively, this study adds to the growing body of evidence on the complications associated with TURBT, particularly emphasizing the role of tumor size and infectious complications in perioperative morbidity. These findings underscore the need for vigilant perioperative care, including preventive measures against infections and strategies to ensure early detection and management of bladder cancer. Continued research and clinical efforts should focus on refining these approaches to improve patient outcomes following TURBT.

Limitations

Our study has several limitations that should be acknowledged. The relatively small sample size and short-term follow-up may limit the generalizability of our findings. Additionally, the lack of a control group and the single-center design may introduce bias and restrict the broader application of the results. Future research with larger, multi-center cohorts and extended follow-up periods is necessary to confirm these outcomes and offer a more comprehensive understanding of the management and prevention of complications following transurethral resection of bladder tumors (TURBT).

Conclusion

Our study underscores the significant risk of complications following transurethral resection of bladder tumors (TURBT), particularly the high incidence of infectious complications such as urinary tract infections (UTIs) and fever, which accounted for over 30% of all postoperative issues. Longer procedure times and larger tumor sizes were linked to an increased likelihood of complications, highlighting the importance of early detection and management of bladder cancer to reduce tumor burden and improve outcomes. The persistence of complications into the fourth week postoperatively emphasizes the need for extended follow-up care. Overall, our findings suggest that optimizing surgical techniques, enhancing perioperative care, and ensuring early intervention are crucial to minimizing risks and improving patient prognosis after TURBT.

Conflicts of Interest

The authors declare no conflict of interest.

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