

Urinary Tract Infection in Patients after Transurethral Resection of Bladder Tumor Procedure at a Tertiary Hospital

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Background and objective: The incidence of urinary tract infection (UTI) in the early stages after transurethral resection of bladder tumor (TURBT) can lead to morbidity, prolonged hospital stays, increased patient costs, and pose a risk for bladder tumor recurrence. The global incidence of post-TURBT UTI varies between 2-39%. This study aimed to determine the incidence of UTI in patients after TURBT.

Materials and Methods: This retrospective cross-sectional study utilized medical records from patients who underwent TURBT between 2017 and 2021 at a tertiary hospital. UTI after TURBT was defined by fever symptoms ($\geq 38^{\circ}\text{C}$) and positive bacteriuria in urinalysis. Asymptomatic bacteriuria (ABU) was defined as positive bacteriuria without fever symptoms. Descriptive statistics were used to process the study results, which were presented in tables and explanatory narratives. Statistical analysis was conducted using SPSS version 26, with a p-value < 0.05 considered statistically significant.

Results: A total of 140 patients underwent TURBT, and data from 92 patients were collected. Prior to TURBT, 56 (60.9%) patients tested positive for bacteriuria, but only 55 (59.8%) were asymptomatic. One patient (1.1%) had UTI before the TURBT and received antibiotic treatment prior to the procedure. After TURBT, urinalysis was performed on 9 (9.7%) patients. Among them, 4 (4.3%) patients experienced UTI, while 3 (3.3%) experienced ABU. The incidence of UTI after TURBT was found to increase the length of patient stays ($p = 0.003$).

Conclusion: The incidence of post-TURBT UTI was determined to be 4.3%. Only 9.8% of patients underwent urinalysis after TURBT.

Introduction

Bladder tumors are one of the most common urological malignancies [1]. In the United States, bladder tumors are the fourth most common tumor with an estimated incidence of 60,000 new cases in 2004 [2]. Transurethral resection of bladder tumors (TURBT) is the first-line intervention and diagnostic modalities for bladder cancer [3]. The initial diagnosis of a suspected bladder tumor is confirmed by pathological examination of the tissue obtained during transurethral resection [4].

Transurethral resection of bladder tumors is one of the most frequently performed endourological operations. TURBT action can increase the risk of urinary tract infection (UTI) through the

mechanism of injury to the bladder mucosal layer that is carried out by the action. The incidence of post-TURBT UTI varies between 2-39% [5]. UTI recurrence is known to be associated with a high risk of bladder cancer [6].

The length of stay in post-TURBT patients can be influenced by the patient's condition during hospitalization. Most patients can go home on the same day, while the longest length of stay is 11 days. Discharge of patients after TURBT on the same day can reduce hospital costs significantly [7]. The incidence of post-TURBT UTI can be one of the complications that causes a longer duration of hospital stay, so it is important to study.

There are only a few references that discuss the incidence of UTI after the TURBT procedure. Therefore, this study aims to determine the incidence of UTI after the TURBT procedure at a tertiary hospital in Bandung City for the period 2017-2021.

Materials and Methods

This study is a cross-sectional retrospective study. This study aims to determine the incidence of urinary tract infections in patients undergoing TURBT procedure at a tertiary hospital in Bandung in the 2017-2021 period. Urinary tract infection (UTI) in this study was defined by symptoms of fever ($\geq 38^{\circ}\text{C}$) and urinalysis results showed positive bacteriuria. While asymptomatic bacteriuria (ABU) is defined by the results of a positive bacteriuria examination without symptoms of fever.

The data from this study were obtained from the patient's medical record. The sample of this research is done by total sampling. The inclusion criteria in this study were patients who underwent the TURBT procedure at a tertiary hospital for the period 2017-2021. The exclusion criteria in this study were missing, illegible, or incomplete medical record data. This study was approved by our Institutional Review Board, The Research Ethics Committee of Dr. Hasan Sadikin General Hospital Bandung, (IRB Number: LB.02.01/X.6.5/340/2021), and informed consent was obtained from the subjects.

The results of the study were processed with descriptive statistics and then presented in the form of tables and explanatory narratives. The association between the incidence of post-TURBT UTI and length of stay was assessed using a retrospective Pearson correlation. Statistical analysis was performed using SPSS version 26 with a p-value <0.05 considered statistically significant. The flow of this is shown in (Figure 1).

Figure 1. Research Flowchart.

Results

In this study, 140 patients underwent TURBT at a tertiary hospital between 2017 - 2021. The data collected were 92 patients. The distribution based on the gender of the patients who underwent TURBT in this study were 74 (80.4%) male patients and 18 (19.6%) female patients. For the age distribution of patients undergoing TURBT, 69 (75%) patients were more than 50 years old, while 22 (23.9%) patients were in the age range of 20-50 years. There was one patient who underwent TURBT at the age of 9 years (Table 1).

No	Characteristics of Respondents		%
1	Gender	N	

	Male	74	80,4
	Female	18	19,6
2	Age		
	< 20 year	1	1,1
	20 - 50 year	22	23,9
	>50 year	69	75,0
3	Comorbid		
	Hypertension	21	22,8
	CKD	15	16,3
	Hypertension - CKD	1	1,1
	None	55	59,8

Table 1. Respondents Demographic Characteristics.

Patients who underwent TURBT procedures in this study were treated for an average of 5 days. The longest length of stay was 12 days and the shortest was 2 days of treatment (Table 2).

No	Length of stay	Day
1	Average	5
2	Maximal	12
3	Minimal	2

Table 2. Length of Stay of Patients Undergoing TURBT.

In this study, 1 (1.1%) patient had UTI before TURBT. In the post-TURBT, procedure 4 (4.3%) patients had UTI. In this study, only 9 (9.8%) patients underwent urinalysis examinations within 30 days after the procedure (Table 3).

No	Criteria	Pre TURBT		Post TURBT	
		N	%	N	%
1	Clinical Sign				
	Fever	1	1,1	4	4,3
	No Symptoms	91	98,9	88	95,7
	Total	92		92	
2	Urinalysis				
	Positive	56	60,8	7	77,7
	Negative	36	39,2	2	22,2
	Total	92		9	
3	Urinalysis Bacteria Findings				
	Rod	17	18,5	3	33,3
	Cocus	25	27,2	2	22,2
	Cocus & Rod	14	15,2	2	22,2
	Negative	36	39,1	2	22,2
	Total	92		9	

Table 3. Clinical Symptoms and Urinalysis of TURBT Patients.

Before the TURBT procedure, there were 55 (59.8%) patients with asymptomatic bacteriuria (ABU), in ABU patients received prophylactic antibiotic therapy, Ceftriaxone 33 (60%), Cefoperazone 9 (16.4%), and Cefazolin 4 (7.3%). 1 (1.1%) patient had UTI before the TURBT procedure, in this patient was given prophylactic antibiotics in the form of Ceftriaxone.

After the TURBT procedure, 9 (9.7%) patients underwent urinalysis and urine culture examinations

within 30 days. On post-TURBT urinalysis, 7 (7.6%) positive bacteriuria was found. There were 4 (4.3%) patients who experienced urinary tract infection (UTI) after the TURBT procedure with positive bacteriuria results and with complaints of fever. Post-TURBT UTI patients in this study were treated with ceftriaxone antibiotics while other patients were given a combination of antibiotics in the form of ceftriaxone - cefoperazone and ceftriaxone - ciprofloxacin. There were 3 (3.3%) patients with ABU after the TURBT procedure. In ABU patients after the TURBT procedure, ceftriaxone was given to two ABU patients and two other patients were treated with cefoperazone. From the results of urine culture, it was found that there was one patient who on Pre TURBT procedure showed negative culture results, and at post-TURBT, Cultures were positive for *Escherichia coli* and *Klebsiella pneumoniae*. There were two patients with the same urine culture results between pre and post TURBT procedures while the other 6 patients had changes in microorganisms on urine culture examination. The incidence of UTI after the TURBT procedure in this study increased the patient's length of stay ($p = 0.003$) (Table 4).

No		Pre TURBT			Post TURBT		Antibiotics	Length of stay
	Bacteriuria	Microorganisms	Fever	Bacteriuria	Microorganisms	Symptom		
1	Negative	Staphylococcus Aureus	No Fever	Cocus	Staphylococcus Aureus	Fever	Ceftriaxone	6
2	Cocus & Rod	Escherichia Coli & Aeromonas Hydrophyla/caviae	No Fever	Cocus & Rod	Escherichia Coli	No Fever	Cefoperazone	3
3	Negative	Escherichia Coli	No Fever	Negatif	Enterococcus faecalis	No Fever	Ceftriaxone	2
4	Cocus & Rod	Archomobacter Xylosoxidans	No Fever	Rod	Escherichia Coli	Fever	Ceftriaxone-Cefoperazone	12
5	Rod		No Fever	Cocus & Rod	Escherichia Coli Pseudomonas aeruginosa	Fever	Cefazoline-Ciprofloxacin	10
6	Rod	Enterobacter Cloacae	No Fever	Cocus & Rod	Escherichia Coli	Fever	Ceftriaxone	8
7	Cocus & Rod	Escherichia Coli	No Fever	Negative	Enterococcus Faecium Candida Albican	No Fever	Ceftriaxone	12
8	Cocus & Rod	Escherichia Coli. Klebsiella Pneumoniae	No Fever	Negative	Escherichia Coli. Klebsiella Pneumoniae	No Fever	Ceftriaxone	3
9	Rod	No Microorganisms	No Fever	Rod	Escherichia Coli. Klebsiella Pneumoniae	No Fever	Cefoperazone	6

Table 4. Pre TURBT and Post TURBT Examination Results.

Discussion

Urinary tract infections (UTI) mostly occur through certain pathways and are often caused by bacteria as one of the normal microbiomes in the urinary tract. Microbial sources associated with UTI are urethral microorganisms, bladder colonization, and perioperative contamination. Post-endourology procedures have a different impact on the risk of UTI based on the type of procedure.

The incidence of post-TURBT UTI varies between 2-39% [8].

Cases of bladder cancer occur more in men than women, with a male ratio of 9.6/100,000 and women 2.4/100,000 worldwide. In men, bladder cancer is the 6th most common neoplasm and the 9th most common cause of death. In America, 99% of bladder cancer occurs at the age of 55 years with a mean age at diagnosis of 73 years [9]. Among the various modalities to assist in the diagnosis of bladder cancer, TURBT remains the main modality for the diagnosis and treatment of bladder cancer [10]. In This study showed that TURBT was more common in men (80.4%) and age >50 reaching 75% of the total patients.

Comorbidities such as DM and HT are often found in patients with bladder tumors. HT and DM were found in 55% and 30% of patients with UTI after TURBT [11]. In this study, 22.8% of patients had hypertension and 16.3% had CKD. Only 1.1% of patients had both hypertension and CKD.

The length of stay for TURBT patients, most patients can go home on the same day, with the longest treatment being 11 days [7]. In this study, the average length of stay for post-TURBT patients is 5 days, with the longest treatment being 12 days. In patients who experienced UTI after TURBT in this study, the length of stay was longer than the average length of stay for other patients ($p = 0.003$; $\alpha = 0.05$). One-day surgery is known to reduce hospital expenses by up to >600 million rupiah based on a study by Wells et al [7].

Preoperative UTI increases the risk of postoperative UTI so it is recommended to be treated before surgery. Although studies on preoperative bacteriuria have not been sufficiently developed, it has been shown that patients with bacteriuria have a higher incidence of gastroenteritis and sepsis [8]. Before the TURBT procedure, there were 55 (59.8%) patients with asymptomatic bacteriuria (ABU), in ABU patients received prophylactic antibiotic therapy. After the TURBT procedure, 9 (9.7%) patients underwent urinalysis and urine culture examinations within 30 days. On post-TURBT urinalysis, 7 (7.6%) positive bacteriuria was found. There were 4 (4.3%) patients experienced urinary tract infection (UTI) after the TURBT procedure with positive bacteriuria results and complaints of fever. From the results of urine culture, it was found that there was one patient who on Pre TURBT procedure showed negative culture results, and at post-TURBT, Cultures were positive for *Escherichia coli* and *Klebsiella pneumonia*. There were two patients with the same urine culture results between pre and post TURBT procedures while the other 6 patients had changes in microorganisms on urine culture examination. Junuzovic et al showed that preoperative bacteriuria was significantly correlated with postoperative bacteriuria [12]. Majority of patients in this study did not undergo urinalysis after the procedure. The low urinalysis examination is possibly due to the Unrinalisis was examined if the patient shows symptom of fever on or in other condition shuch as prolonged treatment, old age, and patient with comorbidities. According to the EAU guidelines, in the setting of uncomplicated cystitis, urinalysis in patients with typical symptoms does not significantly improve diagnostic accuracy. However, a urine culture is recommended if the condition is atypical or in patients who do not respond to antibiotics [13]. In this study, 2 patients had negative urinalysis results for bacteriuria, while the culture results showed the growth of microorganisms. This was obtained because of the non-uniform procedure and timing of post-TURBT urinalysis examinations which resulted in the inadequate post-operative incident and postoperative pain data.

The diagnosis of UTI can be established through the patient's clinical symptoms in the form of fever, dysuria, urgency, and frequency. Other symptoms include pollakiuria, nocturia, incontinence, hematuria, suprapubic pain, smelly urine, fever, and changes in vaginal discharge [13-15]. In this study, more than 95% of patients had no symptoms of fever either preoperatively or postoperatively. Asymptomatic bacteriuria is defined as a clinically asymptomatic patient condition but a positive urinalysis result 10^5 CFU/mL, screening and treatment for asymptomatic bacteriuria is only needed in certain conditions such as pregnant women or before urological surgery procedures [13,14].

The incidence of UTI after TURBT can recur for several months postoperatively. In research by Kim et al. showed pyuria in 23.5% and 31.7% at 3 and 24 months postoperatively, bacteriuria was also found in 1.3% and 2.6% after 3 and 24 months of surgery [16]. UTI recurrence is known to be associated with an increased risk. high incidence of bladder cancer. This may be related to the mediation of nitric oxide (NO) during the inflammatory process in UTI, causing tumor growth and proliferation [6].

The most common cause of UTI is *E. coli*, followed by other microbes such as *Proteus* spp., *Klebsiella* spp., *Enterobacter* spp., *Pseudomonas* spp., *Acinetobacter* spp [8]. Based on research by Martinez-Delgado et al., the most common causes of infection were pre and the same post-TURBT consisted of *E. coli*, *E. fecalis*, *P. Mirabilis*., and others [11]. Urine culture in this study obtained the most results after TURBT in the form of *Escherichia coli* as much as 3 (33.3%) followed by the combination of *Escherichia coli* - *Klebsiella pneumoniae* 2 (22.2%) and *Enterococcus faecalis* as much as 1 (11,1%).

American Urological Association dan Japanese Urological Association recommends the use of prophylactic antibiotics in patients undergoing TURBT. The European Association of Urology only recommends prophylactic antibiotics in patients undergoing TURBT with a high risk of postoperative sepsis [17]. Junuzovic et al. used the antibiotic ceftriaxone in most of the cases [8]. In this study, patients who underwent TURBT received antibiotic therapy by giving the most types of antibiotics, namely ceftriaxone 5 (55.6%) patients and cefoperazone as many as 2 (22.2%), other antibiotics in the form of giving a combination of cefazolin-cefoperazone, cefazoline- ceftriaxone, this selection is related to the most common cause of post-TURBT UTI.

Based on a report from the European Center for Disease Prevention and Control (ECDC), in 2018, stated that *E. coli* was resistant to aminopenicillins (57.4%), fluoroquinolones (25.3%), third-generation cephalosporins (15.1%), and aminoglycosides (11.1%) [18]. This resistance varies in various regions, [11] so it is necessary to examine resistance cultures to determine the management of post-TURBT patients.

In conclusion, the incidence of urinary tract infections after TURBT in this study was 4.3% and the incidence of ABU after TURBT in this study was 3.3%. The incidence of UTI after the TURBT procedure increased the number of hospitalizations for TURBT patients ($p = 0.003$). Urinalysis was only performed in 9.8% of post-TURBT patients, this is possibly due to the urinalysis was examined if the patient shows symptom of fever on or in other condition shuch as prolonged treatment, old age, and patient with comorbidities

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