

## Incidence and Prediction of Catheter-related Bladder Discomfort after Transurethral Resection of the Bladder Tumour

N Guo, D Su

### ABSTRACT

**Objective:** Catheter-related bladder discomfort (CRBD) has suggested a large inter- and intra-individual variation in patients after transurethral resection of the bladder tumour (TURB), emphasizing the need for valid predictors and improved treatment. We performed a prospective observational study to determine the incidence and predictors of early postoperative CRBD in patients undergoing TURB.

**Methods:** Consecutive adult patients under general anaesthesia necessitating urinary catheterization were included during a 5 month period. CRBD was assessed with a simple four-step severity scale: no pain, mild pain (revealed only by interviewing the patient), moderate (a spontaneous complaint by the patient) and severe discomfort (agitation, loud complaints and attempt to remove the bladder catheter).

**Results:** Predictors of CRBD were identified by univariate and multivariate analysis. A total of 220 consecutive adult patients were included, of which 82.3% complained of CRBD at day 1 (moderate or severe CRBD: 29.5%) and 23.2% complained of CRBD at day 3 (moderate or severe CRBD: 1.8%). In a multivariate analysis model, age < 65 years (OR = 1.7, 95% CI: 1.2, 4.8, p = 0.01) and male gender (OR = 2.7, 95% CI: 1.3, 9.7, p = 0.02) were identified as independent predictors of moderate or severe CRBD.

**Conclusion:** Our study identified the incidence and predictive factors of moderate or severe CRBD and suggested that future improved treatment after TURB should focus on < 65 years male patients.

**Keywords:** Catheter-related bladder discomfort (CRBD), predictive, Transurethral resection of the bladder tumour (TURB)

### INTRODUCTION

Catheter-related bladder discomfort (CRBD) is defined as an urge to void or discomfort in the suprapubic region, observed after operation in patients who are awakening from anaesthesia and have had a urinary catheterization during operation (1). Transurethral resection of the bladder tumour (TURB) is the choice for many bladder cancers (2). Most patients undergoing TURB are of high risk for CRBD. This symptom complex reduces the quality of life postoperatively and increases postoperative pain and agitation (3). It was reported that the preoperative administration of muscarinic receptor

antagonists, such as tolterodine and oxybutynin, can be effective in preventing CRBD (1, 4). However, the fact that CRBD is highly variable among patients underlines the need for individualized preoperative drug treatment and predictors of high validity. Besides, the adverse effects of premedication, such as dry mouth, dizziness and facial flushing, cannot be fully avoided. Therefore, we performed a prospective observational study in patients undergoing TURB to characterize CRBD and investigate predictive factors for their possible influence on early postoperative CRBD.

From: Department of Anesthesiology, Sun Yat-sen University Cancer Center, State Key Laboratory of Oncology in South China, Collaborative Innovation Center for Cancer Medicine, Guangzhou 510060, China.

Correspondence: Dr N Guo, Department of Anesthesiology, Sun Yat-sen University Cancer Centre, State Key Laboratory of Oncology in South China, Collaborative Innovation Center for Cancer Medicine, 651 Dongfengdong Road, Guangzhou 510060, China.  
Email: guona@sysucc.org.cn

## SUBJECTS AND METHODS

### Patients

This prospective observational study was conducted after an approval by the Institute's ethics committee at Sun Yat-sen University Cancer Center. Patients, aged from 18 to 80 years, with an American Society of Anaesthesiologists (ASA) physical status I–II, and scheduled to undergo elective TURB with general anaesthesia, were included from November 2014 to March 2015. Patients with a history of bladder outflow obstruction, overactive bladder, neurogenic bladder, morbid obesity, inability to cooperate with CRBD assessment due to mental disorders, chronic pain and chronic analgesic usage, were excluded from this study.

Data on demographic characteristics, presence of diabetes, counts of urinary white blood cells, history of transurethral catheterization three months prior to the surgery, size of Foley catheter, duration of operation, time to extubation (the time from the end of the procedure to the removal of the airway device), were prospectively collected on preprinted forms.

### Anaesthetic and surgical techniques

After admission to the operating room, vital signs and Narcotrend index were monitored. All patients were managed by propofol-based general anaesthesia with a fixed, continuous, intravenous remifentanyl at 0.1–0.2  $\mu\text{g}/\text{kg}/\text{min}$ . Propofol was adjusted to keep the Narcotrend index between D2 and E0 (5). The ventilation was adjusted to keep end-tidal  $\text{CO}_2$  between 35 and 45 mmHg. At the end of the procedure, residual neuromuscular blockade was antagonized with neostigmine 0.05 mg/kg and atropine 0.02 mg/kg.

Urinary catheterization was performed by the urological surgeons and its balloon was inflated with 10 ml of distilled water before the end of the operation. The urinary catheter was fixed in the supra-pubic area with adhesive tape, without any traction, and it was always left for free drainage into an urine bag. The bladder was irrigated continuously with 0.9% saline through the urinary catheter. After extubation, patients were transferred to the post-anaesthesia care unit (PACU).

### CRBD assessment

The incidence and severity of CRBD were assessed at day 1 (in the PACU) and day 3 (in the ward). The severity of CRBD was recorded as 'none' when patients did not complain of any CRBD even on asking, as 'mild' when reported by patients only on questioning, as 'moderate'

when reported by the patients on their own (without questioning and not accompanied by any behavioural responses), and as 'severe' when reported by patients on their own along with behavioural responses (flailing limbs, strong vocal response and attempt to pull out the catheter). Patients were informed before surgery how to distinguish bladder discomfort from postoperative pain.

### Statistical analysis

For continuous variables, we calculated the median and range and then evaluated significant differences using the Student *t*-test. For categorical variables, we calculated the number and percent and then evaluated significant differences using the Chi-square test or Fisher's exact tests, depending on the number of subjects in each group. Odds ratios (OR) were calculated by logistic regression. The *p* values less than 0.05 were considered significant. All analyses were per protocol and were performed using SPSS 15.0 software (SPSS Inc., Chicago, Illinois, USA).

## RESULTS

### Clinical data

During the period from November 2014 to March 2015, 231 patients underwent TURB under general anaesthesia. Around 11 patients were excluded from this study, six patients delayed extubation, three patients were unable to communicate or understand the questions in the PACU, and two patients were discharged at the day of operation. Thus, data were available from 220 patients. Clinical data are given in Table 1.

Table 1: Data from 220 patients undergoing TURB

	<i>N</i> = 220
ASA physical class (I:II)	167:53
Age (years)	65 $\pm$ 12.3
Male sex (%)	199 (90.1%)
Body mass index ( $\text{kg}/\text{m}^2$ )	25 $\pm$ 3.1
Duration of surgery (min)	31.2 $\pm$ 16.7
Time to extubation (min)	12.8 $\pm$ 5.3
Stay in PACU (min)	53 (30–110)

Data are expressed as the mean  $\pm$  SD, number of patients (%), median (range). ASA = American society of Anesthesiologists; PACU = post-anaesthesia care unit.

### Incidence and severity of CRBD

Incidence and severity of CRBD showed an inter- and intra-individual variation throughout this study period, which were highest at day 1 and decreased significantly from day to day (Table 2). A total of 181 patients (82.3%)

had CRBD at day 1, and 65 patients (29.5%) suffered from moderate or severe CRBD. The complaints of patients with CRBD included urination urgency ( $n = 87$ ), urethral burning sensation ( $n = 75$ ) and sensation of urethral foreign body ( $n = 19$ ). No patient was retained in the PACU specifically for bladder discomfort. Fifty-one patients (23.2%) had CRBD at day 3, and only four patients (1.8%) developed moderate or severe CRBD. The complaints of patients with CRBD were urgent urination ( $n = 28$ ), urethral burning sensation ( $n = 13$ ) and sensation of urethral foreign body ( $n = 10$ ).

Table 2: Incidence and severity of catheter-related bladder discomfort

	Day 1	Day 3
<b>CRBD</b>	181 (82.3%)	51 (23.2%)
<b>Severity of CRBD</b>		
Mild	116 (52.7%)	47 (21.4%)
Moderate	61 (27.7%)	4 (1.8%)
Severe	4 (1.8%)	0

Data are expressed as number of patients (%). CRBD = catheter-related bladder discomfort.

### Predictors of postoperative CRBD

Results and significant  $p$  values from the univariate analysis are given in Table 3. There were significant differences between moderate or severe CRBD and patients' characteristics, such as age, gender, size of Foley catheter. Interestingly, the history of transurethral catheterization 3 months prior to surgery was an independent factor of CRBD. In contrast, no significant associations were revealed between CRBD and the presence of diabetes, counts of urinary white blood cells and duration of surgery.

Multivariate logistic regression analysis showed that the following variables were independently and significantly associated with moderate or severe CRBD: age < 65 years (OR = 1.7, 95% CI: 1.2, 4.8,  $p = 0.01$ ) and male gender (OR = 2.7, 95% CI: 1.3, 9.7,  $p = 0.02$ ).

### DISCUSSION

In this prospective observational study, we found that the overall CRBD intensity after TURB showed inter- and intra-individual variation and moderate or severe CRBD was associated with age and gender.

In accordance with our study, others have shown that moderate or severe CRBD intensity is maximal in the PACU at day 1 after urological surgery, with a rapid decline to low median or mean levels during the following 2–3 days (6). Our results, therefore, suggest that future interventional treatment studies should take

Table 3: Results of univariate analysis for predictive factors of moderate or severe catheter-related bladder discomfort

Variable	N	Odds ratio	95%CI	$p$ -value
<b>Age (years)</b>				
< 65	163	3.8	1.3–7.9	0.001
≥ 65	57			
<b>Sex</b>				
Female	21	4.9	1.6–14.6	<0.001
Male	199			
<b>Presence of diabetes</b>				
No	192	0.8	0.3–2.7	NS
Yes	28			
<b>Size of Foley catheter</b>				
< 20 Fr	33	2.2	1.3–6.5	0.001
≥ 20 Fr	187			
<b>Transurethral catheterization 3 months prior surgery</b>				
No	189	1.9	1.4–5.8	0.002
Yes	31			
<b>Urinary white blood cell count</b>				
Normal	193	0.8	0.07–1.3	NS
High	27			
<b>Duration of surgery</b>				
< 30 min	169	0.4	0.1–1.7	NS
≥ 30 min	51			

this large variation in CRBD intensity into consideration, and the issue should be included in the preoperative patient information prior to TURB.

The incidence of CRBD in our study was comparable to some previous investigations (6–8), while a little higher than other studies (3, 4, 9, 10). It is thought that CRBD is caused by the stimulation to the junction between urethra and bladder and the view is supported by the finding that CRBD was rare in patients who had received suprapubic bladder fistulization (11, 12). Nonetheless, some patients that had no stricture at cysto-urethral junction still reported CRBD. Therefore, we believe that different operative techniques, which cause different wounds and pain, are responsible for the difference in the development of CRBD. In other words, CRBD is not caused by stricture at cysto-urethral junction alone and it might be induced by other contributors such as trauma and pain. Differences in the incidence between studies may be attributed to the fact that our study focused on the patients undergoing TURB which may cause a certain trauma to ureter and bladder.

In our series, the two most common symptoms of CRBD were urgent urination and burning sensation. An observational study involving 116 patients who underwent urological surgery (6) and a study conducted in 164

patients undergoing surgery in two teaching hospitals (10) reported comparable results.

Our univariate analysis revealed that the diameter of the Foley catheter and history of transurethral catheterization 3 months prior to surgery were predictors for moderate or severe CRBD. Similarly, the studies mentioned above also reported these two factors to be significant (6, 10). The link between these two predictors and CRBD might be due to the fact that the large diameter of the catheter-stimulated urethra and the history of urethral catheterization made it more irritable. However, multivariate logistic regression failed to support the link, suggesting that, in this study, they were not independent, predictive factors for moderate or severe CRBD. This inconsistency might be due to the fact that the sample size was small and the study population was in different races, which could diminish the power of the evidence. In our multivariate model, age and male gender were significantly associated with CRBD. The fact that younger patients are more sensitive to external stimuli, and men's urethra is longer than those of women, may explain these findings.

However, there were some limitations in our study. Firstly, this was a single-centre and small sample study that may have decreased the power of the result, particularly for the negative findings. Secondly, the lack of standardized intraoperative and postoperative pain management could induce some bias, which can affect CRBD evaluation.

## CONCLUSION

In conclusion, the present study has shown that, overall, CRBD after TURB is usually most intense on the day of operation, but carries a pronounced inter- and intra-individual variation day by day. Age < 65 and male gender are independent risk factors for moderate or severe CRBD after TURB. Our results suggest that future treatment studies after TURB should focus on this population.

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