

## Voiding Dysfunction

# Analysis of the Treatment of Two Types of Acute Urinary Retention

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**Purpose:** This study analyzed the type of acute urinary retention (AUR) and evaluated the treatments used, including trial without catheter (TWOC).

**Materials and Methods:** This study was based on 299 patients who were treated for AUR from January 2007 to August 2009. The patients were classified into the spontaneous AUR group (group S) and the precipitated AUR group (group P), in which AUR was consecutive to triggering events. The treatment modalities including TWOC, the success rate of TWOC, age, prostate-specific antigen (PSA) levels, the volume of the prostate, and the drained volume at catheterization were analyzed in each group.

**Results:** Of 299 men with AUR, 160 (54%) had spontaneous AUR and 139 (46%) had precipitated AUR. Compared with group P, patients in group S were more likely to be treated by surgery, either immediately (16.9% vs. 3.6%,  $p < 0.05$ ) or after prolonged catheterization (42.2% vs. 29.1%,  $p < 0.05$ ). The success rate of TWOC was lower in men of older ages ( $\geq 70$  years) and in those with enlarged prostates ( $\geq 50$  ml), higher PSA levels ( $\geq 3$  ng/ml), and a large drained volume at catheterization ( $\geq 1,000$  ml).

**Conclusions:** In this group of AUR patients, there were slightly more patients with spontaneous AUR (54%) than with precipitated AUR (46%). The success rate of TWOC was more than 70% regardless of the type of AUR. Although TWOC is recommended primarily in the treatment of AUR, early surgical intervention should be considered if the patient has an enlarged prostate ( $\geq 50$  ml) or a large drained volume at catheterization ( $\geq 1,000$  ml).

**Key Words:** Prostatic hyperplasia; Urinary catheterization; Urinary retention

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## INTRODUCTION

Acute urinary retention (AUR) is a common urological emergency in men and is defined as a sudden and painful inability to pass urine voluntarily [1]. It is estimated that 10% of men in their 70s and a third of men in their 80s will experience AUR within the next 5 years [2]. As a primary treatment of AUR caused by benign prostatic hyperplasia (BPH), early transurethral prostatectomy (TUR-P) has been frequently performed because it is known to bring about prominent improvement in lower urinary tract symptoms (LUTS) [3]. However, one should not overlook the complications and risks of TUR-P, which can be problems on their own [4]. Murray et al. [5] reported that 23%

of study subjects did not require prostatectomy as the result of a urodynamic study performed in patients with AUR. In another study, Pickard et al. [6] reported that about 9.2% of patients who had undergone TUR-P could not perform self-voiding after the surgery so that urethral catheterization and clean intermittent catheterization had to be conducted. Of these patients, 0.9% had to undergo permanent urethral catheterization. Pickard et al. [6] also reported that prostatectomy in patients with a history of AUR had a large risk of postoperative complications.

Management of AUR consists of immediate bladder decompression by catheterization, which is usually followed by BPH-related surgery [7]. Surgical intervention in the presence of a urinary catheter can also lead to an increased

risk of sepsis, which potentially contributes to the observed increase in operative morbidity, especially in older patients [8,9]. These findings led to the increasing use of trial without catheter (TWOC) [7]. Recently, TWOC, which is a therapeutic method to induce self-voiding after a certain period of urethral catheterization, is being attempted in many patients with AUR. However, there is no consensus on the optimal management of AUR in terms of type and duration of catheterization or postcatheterization management. Therefore, this study analyzed the type of AUR and evaluated the treatment methods of AUR.

## MATERIALS AND METHODS

### 1. Patients

This study was based on the records of all patients who visited The Catholic University of Korea, Catholic Medical Center Hospitals for AUR from January 2007 to August 2009. Patients who had a first episode of AUR and could be followed up for at least 4 weeks were selected for inclusion in the study. Patients who had any previous surgery of the lower urinary tract or AUR secondary to a specific cause such as a urethral stricture or urethral stone were excluded.

### 2. Study design

The patients were classified into the spontaneous AUR group (group S), which had no triggering events, and the precipitated AUR group (group P), in which AUR was consecutive to triggering events.

TABLE 1. Demographic characteristics of the subjects

Characteristic	Spontaneous group	Precipitated group
Age (yr)	73±10	72±9.8
TRUS (ml) <sup>a</sup>	50.21±27.03	45.01±28.26
PSA (ng/ml)	6.27±7.83	5.32±6.13

Values are presented as mean±SD.

TRUS, prostate volume by transrectal ultrasound; PSA, prostate-specific antigen.

<sup>a</sup>:p<0.05.

TABLE 2. Causes of acute urinary retention (AUR)

Cause	Incidence
BPH natural history (spontaneous AUR)	160 (54)
Medications (parasympatholytics, sympathomimetics, etc.)	56 (18)
Postoperative (with general or locoregional anesthesia)	35 (12)
Alcohol consumption	24 (8)
Urinary tract infections	12 (4)
Others (bed rest, urolithiasis, constipation, etc.)	12 (4)

Values are presented as number (%).

BPH, benign prostatic hyperplasia.

We defined an immediate surgery as surgery performed without removal of a catheter and an elective surgery as surgery performed after successful initial TWOC. The success rate of TWOC was defined as the percentage of patients who could void successfully after an initial TWOC.

We analyzed the patients' clinical characteristics and the cause of AUR and its management (TWOC, immediate surgery, elective surgery, and indwelling catheter). We assessed the success rate of TWOC in each group and the predictors of success of TWOC, including age, volume of the prostate, serum prostate-specific antigen (PSA) level, drained volume at catheterization, duration of catheterization, and type of AUR.

Statistical comparisons were made by using Student's t-test. A p-value < 0.05 were considered statistically significant.

## RESULTS

### 1. Demographic characteristics of the subjects

As shown in Table 1, age and PSA did not differ significantly between the groups (73.00±10.02 years vs. 72.00±9.80 years and 6.27±7.83 ng/ml vs. 5.32±6.13 ng/ml, respectively, p>0.05). Compared with that in group P, the volume of the prostate in group S was larger (50.21±27.03 ml vs. 45.01±28.26 ml, p<0.05).

### 2. Causes of AUR

The spontaneous AUR group (group S), which had no triggering events, included 160 patients (54%), and the precipitated AUR group (group P), in which AUR was consecutive to triggering events, included 139 patients (46%). As shown in Table 2, The most common precipitating events in group P were use of drugs with sympathomimetic or anticholinergic effects (n=56, 40%), surgical procedures with general or locoregional anesthesia (n=35, 25%), alcohol consumption (n=24, 17%), urinary tract infections (n=12, 9%), and other conditions including bed rest, urolithiasis, and constipation (n=12, 9%).

### 3. Duration of catheterization and drained volume at catheterization

The duration of catheterization and the drained volume at catheterization did not differ significantly between the groups (9.7±10.1 days vs. 8.9±9.1 days and 658.3±488.6 ml vs. 705.7±511.8 ml, respectively, p>0.05) (Table 3).

TABLE 3. Duration of catheterization and drained volume at catheterization

	Spontaneous group	Precipitated group
Duration of catheterization (d)	9.7±10.1	8.9±9.1
Drained volume at catheterization (ml)	658.3±488.6	705.7±511.8

Values are presented as mean±SD.

**TABLE 4.** Treatment methods in each group

	Spontaneous group	Precipitated group
Immediate surgery	25 (17)	5 (4)
TWOC	135 (83)	134 (96)
After TWOC		
TWOC only	43 (32)	77 (57)
Elective surgery	57 (42)	39 (29)
Indwelling catheter	35 (26)	18 (14)

Values are presented as number (%).

TWOC, trial without catheter.

#### 4. Treatment methods in each group

As shown in Table 4, compared with group P, patients in group S were more likely to be treated by surgery, either immediately (16.9% vs. 3.6%,  $p < 0.05$ ) or after prolonged catheterization (42.2% vs. 29.1%,  $p < 0.05$ ).

#### 5. Success rate of TWOC

In group S, of the 135 men who underwent a TWOC, the trial was successful in 100 patients (74%), but 35 men (26%) had an indwelling catheter owing to voiding failure (Table 5). In group P, of the 134 men who underwent a TWOC, the trial was successful in 116 patients (87%), but 18 men (13%) had an indwelling catheter owing to voiding failure (Table 5). The success rate of TWOC was 74.1% in group S and 86.5% in group P. The presence of AUR-triggering factors increased the overall success rate of TWOC. Compared with group S, patients in group P were characterized by a smaller prostate ( $45.01 \pm 28.26$  ml vs.  $50.21 \pm 27.03$  ml,  $p < 0.05$ ) on transrectal ultrasound (TRUS) and a lower PSA level ( $5.32 \pm 6.13$  ng/ml vs.  $6.27 \pm 7.83$  ng/ml,  $p < 0.05$ ). The success rate of TWOC in patients with a drained volume at catheterization  $\geq 1,000$  ml was lower than the success rate of TWOC in others (58% vs. 84%,  $p < 0.05$ ). There was no significant difference between the success rate of TWOC in patients with a catheterization lasting  $\geq 5$  days and the success rate in others (81% vs. 77%,  $p > 0.05$ ). The success rate of TWOC was lower in men of older ages ( $\geq 70$  years) and with an enlarged prostate ( $\geq 50$  ml), higher PSA ( $\geq 3$  ng/ml), and large drained volume at catheterization ( $\geq 1,000$  ml).

## DISCUSSION

AUR is a common urological emergency in men and is defined as a sudden and painful inability to pass urine voluntarily. AUR represents the most common indication for BPH-related surgery, but its management is still not standardized because of a lack of existing guidelines [10]. Manikandan et al. [11] administered a questionnaire survey to 264 urologists in the United Kingdom on early treatments for BPH-caused AUR and reported that 98% of respondents used urethral catheterization and 70.5% used  $\alpha$ -blockers concurrently with urethral catheterization.

**TABLE 5.** Success rate of trial without catheter (TWOC)

	TWOC	
	Success	Failure
Type <sup>a</sup>		
Group S	74	26
Group P	87	13
Age <sup>a</sup> (yr)		
$< 70$	86	14
$\geq 70$	77	23
PSA <sup>a,b</sup> (ng/ml)		
$< 3$	75	25
$\geq 3$	64	36
Prostate size <sup>a,c</sup> (ml)		
$< 30$	89	11
30–50	84	16
$\geq 50$	61	39
Drained volume at catheterization <sup>a,d</sup> (ml)		
$< 700$	87	13
700–1,000	72	28
$\geq 1,000$	58	42
Duration of catheterization (d)		
$< 5$	81	19
$\geq 5$	77	23

Values are presented as %.

PSA, prostate-specific antigen.

<sup>a</sup>:  $p < 0.05$ , <sup>b</sup>: Available in 184 men, <sup>c</sup>: Available in 180 men, <sup>d</sup>: Available in 262 men.

Also, Taube and Gajraj [12] and Kumar et al. [13] reported in their studies that urethral catheterization was used as the initial treatment of AUR and that when patients were successful in self-voiding, the AUR recurred only in a small number of patients. They suggested that when patients with AUR have successful post-urethral catheterization self-voiding, surgical treatment of BPH can be delayed or even avoided. A number of therapeutic options are available for AUR, ranging from medical therapy (usually  $\alpha$ -blockers) to positioning of an indwelling catheter (or intermittent catheterization) and surgery. However, owing to the urgent nature of the problem and the need for fast and definitive treatment, immediate catheterization is often the first approach taken by urologists [14]. By analyzing clinical prognosis when urethral catheterization is used in patients with AUR, it will be possible to identify the appropriateness of TWOC as a primary treatment of AUR. In this study, compared with the patients in group P, the patients in group S were more likely to be treated by surgery, either immediately or after prolonged catheterization. Furthermore, the success rate of TWOC was more than 70% for any type of AUR. TWOC is therefore recommended in the treatment of AUR.

Fitzpatrick et al.'s study [10] identified factors predicting failure of TWOC in patients who had been treated for AUR with the use of an indwelling catheter. In this worldwide survey of 6,074 men aged over 70 years, prostate mass  $> 50$  g was shown to be a predictor of TWOC failure, and

those patients required either further catheterization or surgery. The size of the prostate is a known risk factor for AUR [2,15]. McNeill et al. [16] reported that when the size of the prostate is larger, AUR continues or has a high probability of requiring surgical treatment even after self-voiding has been achieved. When the size of prostate was rather small, they suggested that the AUR likely originated from other underlying causes, and in such cases, no surgical treatment is required. Daly et al. [17] reported that patients with elevated PSA ( $>2.9$  ng/ml), a large prostate size shown on a digital rectal examination (DRE), and a volume drained at the time of catheterization of  $>1,000$  ml are best managed by surgical intervention, whereas patients with volumes drained at the time of catheterization of  $<1,000$  ml, a PSA  $\leq 2.9$  ng/ml, and moderate to small prostates on a DRE may be managed medically. In this study, compared with the patients in group S, the patients in group P were characterized by a smaller prostate on TRUS and a lower PSA level. We analyzed the success rate of TWOC in the aspects of age, prostate size (TRUS), and PSA level regardless of type of AUR. Patients with AUR who were older than 70 years, had an enlarged prostate  $\geq 50$  ml, and had a higher PSA level ( $\geq 3$  ng/ml) were shown to have a lower success rate of TWOC. In this study, we focused on the presence or absence of AUR-triggering factors regardless of the size of the prostate. Also, we identified that the presence of AUR-triggering factors increased the overall success rate of TWOC.

Taube and Gajraj [12] reported that when the urinary retention volume was  $\geq 900$  ml, it was highly probable that TWOC would fail in patients with AUR. Likewise, Djavan et al. [18] reported that when the urinary retention volume was  $\leq 1,000$  ml, there was likely a higher probability of self-voiding to succeed, whereas when urinary retention volume was  $\geq 1,300$  ml, the duration of catheterization should be extended. Fitzpatrick et al. [10] reported that a drained volume at catheterization of  $\geq 1,000$  ml influenced the success rate of TWOC, whereas catheterization for  $>3$  days did not influence TWOC success but was associated with increased morbidity and prolonged hospitalization for adverse events. In the present study, the success rate of TWOC in patients with a drained volume at catheterization of  $\geq 1,000$  ml was lower than the success rate of TWOC in others. Patients with a catheterization time of  $\geq 3$  days were very small in number ( $n=28$ ). Thus, we divided the patients into those with catheterization  $\geq 5$  days and those with catheterization  $<5$  days. There was no significant difference in the success rate of TWOC in patients with catheterization  $\geq 5$  days and the success rate of TWOC in others.

BPH-induced AUR is considered to result by the sudden stimulation of the  $\alpha_1$ -adrenergic receptor that enhances contraction of the smooth muscle located between the prostate and the prostatic capsule, which leads to an increase in resistance of the bladder outlet [19,20]. Although it is known that  $\alpha$ -blockers can delay BPH-induced AUR but cannot reduce the risk of cumulative incidence [21], several

reports have suggested that the post-AUR use of  $\alpha_1$ -blockers prevents the recurrence of AUR and increases the success rate of self-voiding [9,18,22,23].  $\alpha_1$ -Blockers are known to increase the maximal urinary flow and to reduce intravesical pressure, urethral opening pressure, and maximal intravesical pressure, thereby helping to start urination and its maintenance by lowering the intravesical pressure required for urination [24]. Fitzpatrick et al. [10] reported that most men (86%) received an  $\alpha_1$ -blocker (mainly alfuzosin) before catheter removal with consistently higher TWOC success rates, regardless of age and type of AUR, and multivariate regression analysis confirmed that the use of an  $\alpha_1$ -blocker before TWOC doubled the chances of success (odds ratio, 1.92; 95% confidence interval, 1.52 to 2.42;  $p < 0.001$ ).

This study was conducted as a retrospective, multi-center study with various  $\alpha_1$ -blockers being used by each institution. Most of the patients' records did not record the previous intake history of  $\alpha_1$ -blockers or the duration of such intake. Thus, we could not analyze the influence of  $\alpha_1$ -blocker use before TWOC on the success rate of TWOC.

The potential limitations of our study are as follows: 1) the subject number was insufficient because patients from a multi-center hospital participated in this study. 2) Because this study was a retrospective, multi-center study, we checked out the medical records of the patients but we could not get information on variables such as the history of use of  $\alpha_1$ -blockers before TWOC, symptoms of LUTS, etc.

A further large-scale, prospective study is required to investigate the multiple factors that can influence the success rate of TWOC. Such a study will help to identify the predictors of successful TWOC. Also, the success rate of TWOC depending on the kinds of  $\alpha$ -blockers used and previous intake history should be examined in further studies.

## CONCLUSIONS

Among the AUR patients studied, the group with spontaneous AUR (54%) was somewhat larger than the group with precipitated AUR (46%). The success rate of TWOC was more than 70% regardless of the type of AUR. Although TWOC is recommended primarily in the treatment of AUR, early surgical intervention should be considered if a patient has an enlarged prostate ( $\geq 50$  ml) or a large drained volume at the time of catheterization ( $\geq 1,000$  ml).

## CONFLICTS OF INTEREST

The authors have nothing to disclose.

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