Factors predicting the success of a trial without catheter in acute urinary retention secondary to benign prostatic hyperplasia

KK Bhomi and CL Bhattachan

Department of Surgery, Nepal Medical College Teaching Hospital, Kathmandu, Nepal

Corresponding author: Dr. Krishna Kaji Bhomi MS, Fellowship in Urology (Singapore), Assistant Professor, Department of Surgery, Nepal Medical College Teaching Hospital, Kathmandu, Nepal; e-mail: kkbhomi@hotmail.com

ABSTRACT

Trial without catheter (TWOC) is a common practice in acute urinary retention (AUR) secondary to benign prostatic hyperplasia (BPH) although it is not successful in all patients. We conducted this study to identify the factors predicting the success or failure of TWOC in this subset of patients. Sixty-four patients with first episode of AUR secondary to BPH were enrolled in this study. These patients were given tamsulosin 0.4 mg daily for 3 days and TWOC was performed. Baseline international prostate symptom score (IPSS), residual volume of urine drained after catheterization (RU), prostate size (PS) and intravesical prostatic protrusion (IPP) by transabdominal ultrasound were recorded. TWOC was successful in 28 (43.75%) and failed in 36 (56.25%) patients. Discriminant analysis was done to evaluate the predictive factors. IPP, IPSS, PS and RU were found to predict the outcome of TWOC. A prediction model, using cut off values, was derived using receiver operating characteristic curves (ROC). A cut-off value of 8 mm for IPP detected failures with specificity of 89% and success with a sensitivity of 92% with area under ROC (AUROC) of 0.98. Similarly cut-off values of 16 for IPSS (specificity 84%, sensitivity 81%, AUROC = 0.90), 40 gm for PS (specificity 73%, sensitivity 84%, AUROC = 0.89); and 800 ml for RU (specificity 82%, sensitivity 64%, AUROC = 0.81) were derived. IPP, baseline IPSS, PS and RU can predict the outcome of TWOC. Among these factors, IPP is the most accurate in predicting the success of TWOC.

Key words: Success, trial without catheter, acute urinary retention, BPH.

INTRODUCTION

Acute urinary retention (AUR) refers to sudden inability to pass urine.[1] It is one of the most common urological emergency and in elderly male is usually caused by benign prostatic hyperplasia (BPH). Over one in ten men in their 70s will experience AUR within the next five years.[1,2] The risk increases to one in three for men in their 80s. Immediate management of AUR is bladder decompression by urethral catheterization while suprapubic catheterization is used if this fails. After initial management with catheterization for AUR associated with BPH, trial without catheter (TWOC) is now the standard practice in most of the hospitals in UK with or without a period of á-blocker therapy.[3] Evidence has shown that urgent surgery after AUR is associated with greater morbidity and mortality compared with delayed prostatectomy in part owing to the increased risk of sepsis and bleeding associated with catheterization.[4] This has led to the increasing use of a TWOC among urologists. Success rates of 23% - 30% have been reported for TWOCs performed 1 to 3 days after the catheterization.[5-7] Identifying those men least likely to void following a TWOC attempt would allow for more rapid access to the operating waiting list and reduce morbidity associated with longer catheterization.[8]

Several factors influence the success of a TWOC. Intravesical prostatic protrusion (IPP) has been shown to influence the outcome of TWOC while the effect of prostate size (PS) remains controversial.[9,10] In this study, besides IPP and PS, we have also evaluated the influence of baseline international prostate symptom score (IPSS) and residual volume of urine after catheterization (RU).

METHODOLOGY

Sixty consecutive men 50 years old or older presenting with first episode of BPH related AUR were enrolled in this study. AUR was defined as an episode of painful inability to void which was relieved by insertion of urethral catheter with drainage of clear urine. Exclusion criteria were presence of absolute indication of prostatectomy, neurological impairment, need for suprapubic catheterization, presence of gross hematuria or confirmed urinary tract infection, patients on anticholinergics or those with severe co-morbidities.

Baseline IPSS was documented in all patients. Urethral catheterization was done and residual urine volume drained was recorded. Trans-abdominal ultrasonography was done to record PS and IPP with about 200 ml urine in bladder. Patients were kept on tamsulosin 0.4 mg daily and were brought back for TWOC after 3 days of starting

Table-1: Patient demographics and evaluated factors

	Range	Mean±SD
Age (yrs)	54-82	67±7.4
Duration (months)	2-30	9±5.9
IPSS	6-32	17±6.5
RU (ml)	460-1400	841±202.2
PS (gm)	34-96	59±14.9
IPP (mm)	4-18	9±3.3

tamsulosin. For TWOC, measured volume of saline at room temperature was instilled into the bladder slowly followed by removal of catheter. Patient was then allowed to void and voided volume was recorded. TWOC was considered successful if patient could void with RU of <150 ml and patient did not need re-catheterization in next 24 hours. Patients with successful TWOC were maintained on tamsulosin. Patients with unsuccessful TWOC were re-catheterized and counseled for prostate surgery

Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 12. The t test was used to compare the parameters between men with successful and failed TWOC, and p value <0.05 was considered statistically significant. Receiver operating characteristic (ROC) curve was plotted to derive a prediction model using appropriate cut off values of the recorded variables. Area under receiver operating characteristic curve (AUROC) was calculated to determine the factor which has the best predictive power for the success of TWOC.

RESULTS

Over the period of study, 64 men fulfilled the selection criteria and were enrolled in the study. Patient demographics are illustrated in Table-1. Age of the patients ranged from 54 to 82 years with mean 67±7.4 years. Most of the patients presented several months after the symptoms started. Mean duration of symptoms was 9±5.9 months with range 2-30 months. Mean IPSS was 17±6.5 (range 6-32). Mean RU was 841±202.2 ml. Mean prostate size of this cohort was relatively large (59±14.9 grams) with largest prostate of 96 grams. Mean IPP was 9±3.3 mm with range 4-18 mm.

Table-2: Comparision of factors among patients with successful and failed TWOC

	Successful TWOC	Failed TWOC	p
Mean IPP	7.1	14.6	<0.001
Mean PV	46	68.4	0.02
Mean RU	622	874	0.09
Mean IPSS	10.2	22.4	0.008

TWOC was successful in 28 patients and failed in 36 patients as shown in Fig. 1. Men with successful TWOC had smaller mean IPP than those with failed TWOC (7.1 vs. 14.6; p<0.001) which was statistically significant (Table-2). Similarly men with successful TWOC had significantly smaller mean PS and IPSS (46 vs. 68.4 gm, p=0.02 and 10.2 vs.22.4, p=0.008 respectively). Mean RU was smaller in those with successful TWOC than in those with failed TWOC (622 vs. 874ml), however this difference was not statistically significant (p=0.09)

From ROC curve analysis, IPP was the most accurate parameter in predicting the success of TWOC (Fig. 2). Number of patients with success and failure of TWOC according to cut-off values of different factors is illustrated in Table-3. As shown in Table-4, a cut off value of 8 mm for IPP detected success with sensitivity of 92% and failure with specificity of 89% with AUROC of 0.98. Cut off value of 16 for IPSS detected success with sensitivity of 74% and failure with specificity of 84% (AUROC 0.90). Similarly cut off value of 50 gm for PV (sensitivity 84%, specificity 73%) and 800 ml for RU (sensitivity 64%, specificity 82%) resulted in AUROC of 0.89 and 0.81 respectively.

DISCUSSION

Acute urinary retention secondary to BPH used to be considered as an absolute indication for prostatectomy. However the development of effective medical treatment has led to a more conservative approach with trial without catheter after a course of á-blocker therapy. Guidelines published in 2003 have stated that a first episode of AUR with a successful TWOC may not be a mandatory indication for BPH surgery.[11,12] Results of several observational studies have shown that only 32% of patients with successful TWOC or even less will require surgery within 8-24 months of follow-up, favoring the need to offer a TWOC in patients with a first episode of AUR due to BPH.[10,13]

Table-3: Success and failure of TWOC according to cut-off values of different parameters

Parameter	Cut-off values	Success	Failure
IPP	<8 mm	24	2
	≥8 mm	4	34
IPSS	<16	23	8
	≥16	5	28
PS	<50 grams	16	3
	≥50 grams	12	33
RU	<800 ml	23	13
	≥800 ml	5	23

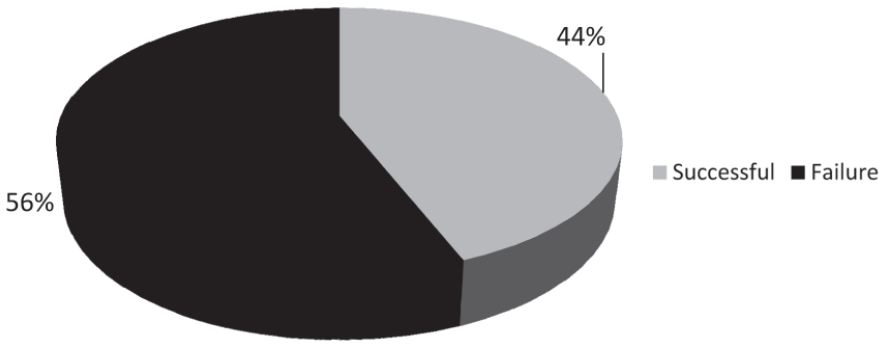

Fig. 1. Pie chart showing success and failure of TWOC

A national survey of consultant Urologists practicing in United Kingdom hospitals was done in 2003 regarding management of AUR secondary to BPH.[2] The results showed that 70.5% of the Urologists started á-blocker with 64% performing TWOC in 2 days. One failed TWOC was indication for surgery by 72.8% while second TWOC was advocated by 11.7%. A French cross sectional study of 2618 patients enrolled by 658 Urologists revealed that 73% of the patients had TWOC after 3 days and if first TWOC failed, 33% had second TWOC before considering surgical treatment.[8]

Our strict selection and exclusion criteria in this study ensure a homogenous population of AUR secondary to BPH in the absence of confounding factors. Previous reports demonstrated that duration of catheterization is not associated with TWOC outcome.[7,9,14] We performed TWOC after 3 days of catheterization to reduce catheter related morbidity. However Djavan *et al*[15] have reported that success of TWOC increases with the duration of catheterization.

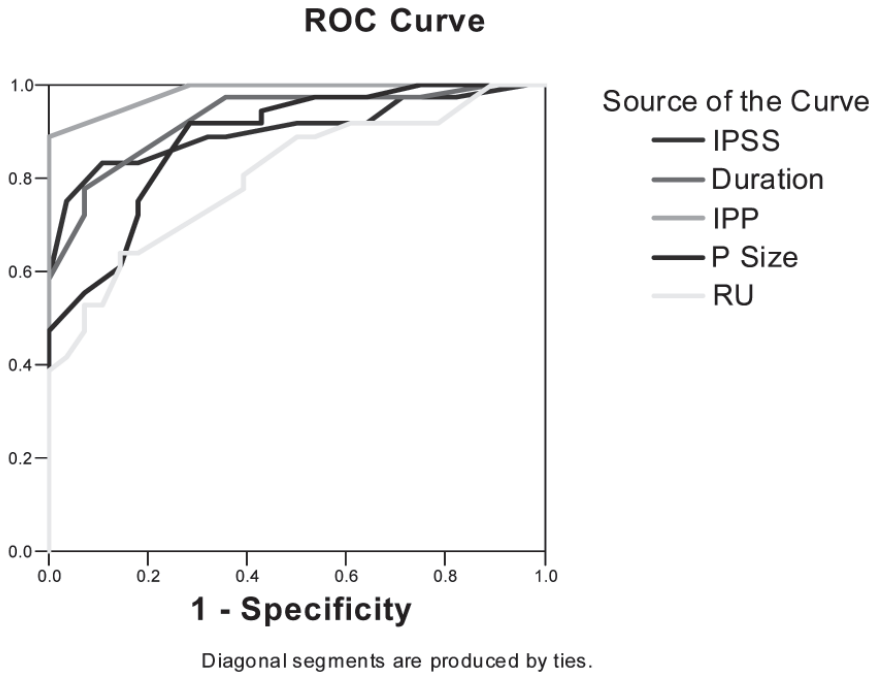

Fig. 2. ROC Curve of different parameters

Predicting who will successfully void on TWOC is not easy. Various factors predicting the success of TWOC have been evaluated including the prostate volume, IPP, RU, age, serum prostate specific antigen (PSA) and timing of catheter removal.

Our results clearly demonstrated that IPP is the most accurate factor in predicting the success of TWOC. IPP has consistently been shown to predict success of TWOC in previous studies.[9,16] IPP on trans-abdominal ultrasonography represents the median lobe with or without the lateral lobes of the prostate protruding into the bladder causing a ball-valve effect. It has been shown to correlate with urodynamically proven bladder outlet obstruction.[17] Patients with AUR who have larger IPP are less likely to have successful TWOC and thus may be better scheduled for early prostatectomy.

Size of the prostate as measured on trans-abdominal USG is also an important factor predicting the success of TWOC since men with successful TWOC had significantly smaller prostate volume as compared to those who failed in this study. Previous study by Kumar et al also demonstrated that failure of TWOC was associated with larger prostate size.[10] However studies by Tan *et al*[9] and Djavan *et al*[18] did not confirm this result.

Although Tanbe et al found that TWOC was more likely to be successful when RU was <900 ml, most of the previous studies did not show its significance for the prediction of success of TWOC.[6,7,10] Our study also did not show any statistically significant difference of RU between those who succeded and failed TWOC.

We also evaluated the relationship of baseline IPSS with the success of TWOC. Men with successful TWOC had significantly smaller IPSS than those with failed TWOC. ROC plot also showed AUROC of 0.90 indicating that it is more accurate than PV (AUROC 0.89) in predicting the success of TWOC. To our knowledge, this is the first

Table-4: Sensitivity, specificity and AUROC of different parameters

Parameter (cut-off point)	Sensitivity%	Specificity%	AUROC
IPP (8mm)	92	89	0.98
IPSS (16)	74	84	0.90
PS (50gm)	84	73	0.89
RU (800ml)	64	82	0.81

study evaluating the accuracy of IPSS in predicting the success of TWOC.

Several other factors have been studied to predict the outcome of TWOC. Hastie et al demonstrated that patients younger than 65 years had a more positive outcome but it was not statistically significant.[7]

In a study by Lim *et al*, serum PSA was significantly higher in patients with failed TWOC which was assumed to be due to prostatic infection or infarction associated with or giving rise to ARU.[14,9] However, as serum PSA may also rise after catheterization or in those with carcinoma prostate clinically not detectable, significance of serum PSA level to predict TWOC outcome can not be relied upon.

Among the different factors studied, IPP is the most accurate one to predict the success of TWOC following AUR secondary to BPH. IPP of <8 detects success with sensitivity of 92% and e"8 detects failure with specificity of 89%. Other predicting factors in decreasing order of accuracy are baseline IPSS, PV and RU.

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