Predictors for the success of trial catheter removal for women with urinary retention

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Introduction

Urinary retention, the incomplete elimination of urine from the bladder, can cause severe post-renal kidney failure and urinary tract infections, both of which can have lethal consequences.

In women, detrusor underactivity (DUA) is commonly believed to be the main cause for urinary retention. Trial catheter removal seems to be a good option for women as a less invasive and low-cost procedure, however, the efficacy of trial catheter removal for urinary retention in women has not been studied and real clinical evidence remains to be accumulated.

This study aimed to investigate the outcome of trial catheter removal for women with acute urinary retention and determine the predictors for the success of trial catheter removal. This study also evaluated the efficacy of oral alpha blockers and parasympathomimetics on trial catheter removal for women.

Methods and Materials

Consecutive patients who underwent trial catheter removal between July 2009 and July 2019 were enrolled and retrospectively analyzed in this study. The study was conducted in accordance with the principles set out in the Declaration of Helsinki and all local regulations.

In this study, urinary retention was defined as a post-void residual urine volume (PVR) >250 ml measured by ultrasound or computed tomography imaging with/without overflow incontinence. After diagnosis of urinary retention, a transurethral catheter was inserted to drain the residual urine from the bladder.

Following at least one week of urethral catheter use, trial catheter removal was performed. Prior to catheter removal, drug treatment with alpha blocker alone or a combination of alpha blocker and parasympathomimetics (bethanechol or distigmine bromide) were used to facilitate spontaneous voiding in some cases, as determined by physicians.

After instillation of warm saline (200-300ml or until the first desire to void), the urinary catheter was removed and residual urine was measured after the first void or 6 hours later.

The trial was defined as non-success if the PVR was >150 mL or the patient experienced difficulty emptying their bladder with abdominal discomfort or pain, and a transurethral catheter was reinserted.

The patients' characteristics including age, ECOG performance status (PS), body mass index (BMI), blood test parameters and comorbidity, were retrospectively compared according to the outcome of trial catheter removal.

Multivariate regression models were used to find the predictors of successful trial outcome and evaluate the impact of any medication on trial outcome.

Table 1. Comparison of characteristics and urinary volume information of patients with successful and non-successful outcome of catheter removal trial

		Successful	Non-successful	*P* value
Number of patients		59	45	
Age (years-old)		75.3 ± 11.9	77.3 ± 12.0	0.392
BMI (kg/m2)		21.9 ± 4.5	21.4 ± 4.1	0.623
ECOG performance status (PS)	0	6	2	0.374
	1	39	32	
	2	9	4	
	3	5	7	
	4	0	0	
Past history	Diabetes mellitus	16	13	0.842
	Cerebrovascular event	13	8	0.592
	Dementia	13	9	0.801
	Intra-pelvic surgery	17	14	0.800
Oral medicine at diagnosed of urinary retention	none	46	34	0.842
	Urapigil	1	1	
	Distigmine bromide	1	1	
	Urapidil and Distigmine bromide	1	0	
Oral medicine for catheter removal trial	none	20	15	0.598
	Urapigil	25	16	
	Urapidil and Bethanechol chloride	13	14	
	Urapidil and Distigmine bromide	1	0	
Residual urine volume at diagnosed of urinary retention (ml)		411.4 ± 73.0	583.0 ± 84.3	0.126
Residual urine volume at catheter removal trial (ml)		98.2 ± 12.9	256.6 ± 25.5	<0.001
Voided volume at catheter removal trial (ml)		128.4 ± 13.6	46.7 ± 10.0	<0.001

Table 2. Comparison of blood test results in patients with successful and non-successful outcome of catheter removal trial

	Successful	Non-successful	*P* value
Number of patients	59	45	
TP (g/dL)	6.5 ± 0.8	6.0 ± 1.0	0.038
Alb (g/dL)	3.2 ± 0.7	2.8 ± 0.8	0.039
AST (U/L)	24.5 ± 12.4	22.1 ± 8.7	0.342
ALT (U/L)	17.7 ± 12.0	17.6 ± 13.5	0.97
ALP (U/L)	298.8 ± 246.8	232.8 ± 93.9	0.192
BUN (mg/dL)	19.6 ± 9.4	18.2 ± 14.1	0.595
Cre (mg/dL)	1.1 ± 1.3	1.0 ± 1.2	691
CRP (mg/dL)	1.6 ± 2.4	3.1 ± 5.3	0.092
WBC (10^3/μL)	6.9 ± 2.4	6.8 ± 3.4	0.952
Neutrophil (/μL)	67.7 ± 11.7	64.8 ± 15.3	0.366
Hb (g/dL)	10.7 ± 1.7	10.5 ± 2.0	0.525
Plt (10^3/μL)	252.2 ± 104.8	280.2 ± 112.5	0.236
BS (mg/dL)	142.1 ± 75.2	131.6 ± 62.9	0.652

Results

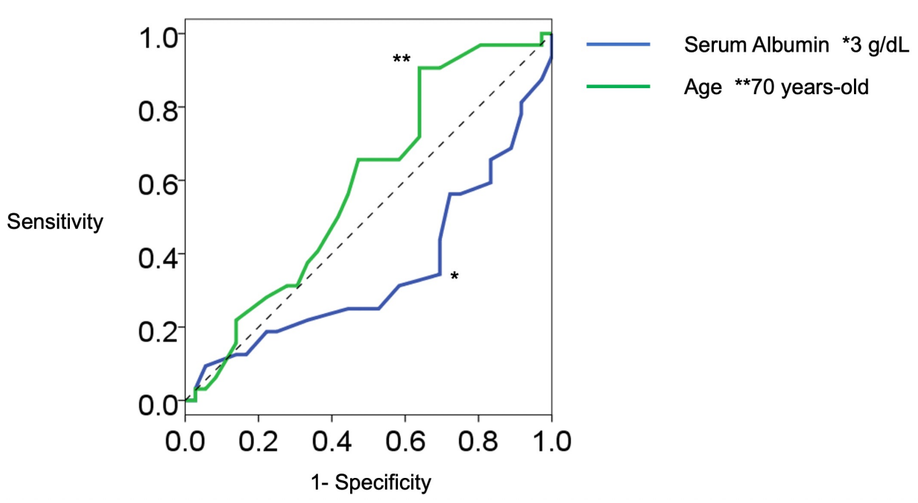
Fifty-nine of 104 (56.7%) women with urinary retention were catheter free post-trial. There was no significant difference between successful and non-successful trial in: average age (P=0.392), median PS (P=0.374), diabetes mellitus (P=0.842), dementia (P=0.801), or previous history of cerebrovascular events (P=0.592), or intra-pelvic surgery (P=0.800). Oral medications were administered for 39/59 (66.1%) in the success group and 30/45 (66.7%) patients in the non-success groups (P=0.598).

Blood tests showed that the serum albumin (3.2 ± 0.7 and 2.8 ± 0.8, P=0.039) and total protein values (6.5 ± 0.8 and 6.0 ± 1.0, P=0.038), were higher in the success group than the non-success group, respectively.

Multivariate logistic regression found that a serum albumin >3 g/dL was an independent predictor of successful trial catheter removal for women with urinary retention [P=0.030, odds ratio (OR) 3.3, 95% confidence interval (C.I.) of OR 1.1 – 9.9)] (Table). Age <70 years-old was a likely predictor of successful trial catheter removal (P=0.066, OR 4.8, 95% C.I. of OR 0.9 – 25.0).

Table 3. Multivariate logistic regression model predicting successful outcome of removal of a urinary catheter

		P value	O.R.	95% C.I. of O.R.	
				Lower	Upper
Initial model	constant	0.005	0.0		
	Residual urine volume at diagnosed of urinary retention	0.472	1.0	1.0	1.0
	Age, cut-off 70 years-old	0.022	8.0	1.3	47.6
	Diabetes mellitus	0.770	0.8	0.2	3.4
	Cerebrovascular event	0.339	0.5	0.1	2.0
	Dementia	0.159	0.4	0.1	1.5
	Intra-pelvic surgery	0.964	1.0	0.3	4.3
	PS, cut-off 2	0.824	1.2	0.3	4.8
	Albumin, cut-off 3g/dL	0.023	4.2	1.2	14.4
	Intake of oral medicine for trial	0.669	1.0	1.0	1.0
Final model	constant	0.005	0.0		
	Albumin, cut-off 3g/dL	0.030	3.3	1.1	9.9
	Age, cut-off 70 years-old	0.066	4.8	0.9	25.0



Discussion

Albumin is major of serum protein and usually represents the patient's whole nutrition status and liver function. Hypoalbuminemia in adults is defined as an intravascular albumin level <3.5 g/dL.

Albumin might serve as a nutritional marker, such that hypoalbuminemia represents poor nutritional status in patients who go on to experience poor clinical outcomes.

This study demonstrated the relationship between hypoalbuminemia and the outcome of trial catheter removal and suggested that catheter removal trial should be performed for women with a serum albumin value >3 mg/dL.

Surprisingly, PS, diabetes mellitus, dementia, and previous cerebrovascular events didn`t have an effect on the outcome of trial catheter removal.

This study suggested that even low PS and potential neurogenic bladder may not be preclude for trial catheter removal at least in patients with serum albumin value >3 mg/dL and age <70 years.

Our findings suggest that parasympathomimetics and alpha-1 blocker therapy in women with LUTS may not improve the outcome of catheter removal trial.

Conclusions

This is the first study to investigate the predictors of catheter free status after trial catheter removal for women with urinary retention.

We found that a serum Albumin value >3 mg/dL was a significant independent predictor of catheter free status after trial catheter removal.

Although an age <70 years was also a possible contributor (without reaching statistical significance), PS, diabetes mellitus, dementia and previous cerebrovascular events or intra-pelvic surgery had no influence on the outcome of trial catheter removal.