Original Article

Safety of a first-day catheter removal after transurethral resection of the prostate (TURP): a propensity score-matched historical control study

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TURP, early postoperative catheter removal, community-based hospital

Abstract

Objective: Transurethral resection of the prostate (TURP) is the standard surgical management for patients with benign prostatic hyperplasia (BPH). Postoperative maintenance of bladder catheterization is a routine procedure. However, the timing of catheter removal varies. Our objective is to evaluate the safety of early catheter removal (less than 24 hours) whilst maintaining efficacy, especially in an overcrowded community-based hospital, which has a high rate of preoperative catheterization (47.7%).

Materials and Methods: This was a prospective and retrospective observational cohort study of 399 TURP indicated patients from February 2014 to September 2019. Since October 2017, the urological unit protocol has changed the process of removal of the catheter to less than 24 hours after monitoring for safety. Data from 95 patients after October 2017 was prospectively collected as the less than 24 hours group. The information from 2014 to October 2017 was collected and used as the control group. Data was then studied retrospectively for three years. The primary outcome, morbidity, and postoperative stay were compared with a 1:1 nearest neighbor propensity score-matched analysis.

Results: After the score was matched and balanced, there was no difference as regards complications between the two groups (Odd ratio (OR): 1, (95% Confidence interval (95% CI): 0.14-7.10, p-value: 1.00). Acute urinary retention and postoperative bleeding were also comparable (OR: 0.5, 95% CI: (0.05-5.51), p-value: 0.57, and p-value: 0.99). The postoperative hospital stay was significantly less in the < 24 hours group (38.1 less hours, 95% CI: (41.82- 34.31), p-value: < 0.01).

Conclusion: After TURP early catheter removal was safe even in the hospital with a high preoperative catheterization rate. Experienced surgeons, well-educated and compliant patients without contraindications (neurogenic bladder, urethral stricture, stroke, and some intraoperative complications: urinary bladder perforation, urinary tract infection, prostatic capsule perforation, or intraoperative bleeding) are our recommendation for adopting this protocol.

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Introduction

Benign prostatic hyperplasia (BPH) is a common condition of the elderly male. The incidence can be as high as 70 to 80 % in males older than 70 years old[1,2]. Symptomatic BPH in Thailand could be around 41.3 % in men aged more than 60[3]. The disease can cause a decrease in the quality of life of the affected individual[4,5].

In less symptomatic cases of the disease, pharmacologic treatment (alpha-blocker or 5-alpha reductase inhibitor) is the first-line treatment[6,7]. In more severe cases, Transurethral resection of the prostate (TURP) is a gold standard surgical management[8]. The indications are: resistance to drug therapy, recurrent urinary retention, complications from obstruction (such as vesicle stone, renal failure, urinary tract infection), or recurrent prostatic bleeding.

After surgery, bladder catheterization is routinely performed, the catheter being retained for around 1 to 5 days[9-12]. The tamponade effect, reduction of incidence of blood clotting, and urine drainage are positive attributes of its usefulness. Although many studies have supported early removal as a policy[13,14], an extensive review could not reach a definitive conclusion and endorse the practice of rapid removal[15]. In our hospital, maintaining catheterization for at least 3 to 5 days has been the rigorous approach. This approach caused crowding in the inpatient ward and caused extended discomfort to patients. There is one more feature of our hospital. As a tertiary government hospital, the extent of the case burden is a problem. Timely surgery cannot always be achieved, a factor reflected by the high rate of preoperative catheterization (47.7%). For the reasons mentioned above, we attempted to answer the question that in an overcrowded hospital, the approach of early catheter removal can be effective, ethical and still be safe.

Materials and Methods

This study was approved by the Sawanpracharak Hospital ethics committee. This was a prospective and retrospective observational cohort study of TURP indicated patients in Sawanpracharak hospital, Nakhon Sawan, Thailand, from February 2014 to September 2019. From October 2017 to September 2019, the urological unit protocol has changed to that of removal of a urinary bladder catheter after TURP to less than 24 hours. In the early period of changing to the protocol, the introduction of the rapid catheter removal practice was closely monitored until it was shown to be safe for patients, and the whole urology team felt confident with the approach. The data of this group (< 24 hours group) of 95 patients were prospectively collected. The information of the control group (304 patients) was then retrospectively reviewed for three years (the rigorous 3 to 5 days catheter retention group) (historical control) from the medical records. Neurogenic bladder, urethral stricture, and stroke patients, which were preoperative contraindications for early catheter removal, were excluded from both groups. There are also indications for prolonged maintenance of the catheter postoperatively from some intraoperative complications, which are urinary bladder perforation, urinary tract infection, prostatic capsule perforation, or intraoperative bleeding. These particular intra-operative complications, however, were not excluded as we decided to analyze them as the intention-to-treat basis.

All TURPs were performed with monopolar energy with sterile water irrigation by three certified urologists. A 24 Fr sized with 30-milliliter inflated balloon catheter was postoperatively inserted, tractioned, and attached to a thigh from 2 to 6 hours. Normal saline irrigation was then performed until drainage fluid was cleared. Catheter removal time was in accordance with the group. Although some instruments have changed during the five years, there was, nevertheless, no difference in equipment technology between the two groups.

Baseline data collection was age, comorbidity, indications for TURP, type of anesthesia, operative time, resected prostate weight, intraoperative complications, and postoperative traction time. Outcomes were complications (acute urinary retention, postoperative bleeding, and septicemia) and length of hospital stay. Data distribution analysis was carried out using Fisher's exact test for categorical data and a t-test or Mann-Whitney U test for continuous data.

Propensity score matching was utilized to compare the main results. Table 2 represents the chosen confounders to calculate the scores using logistic regression. With abundant control numbers (around three times), 1:1 nearest neighbor matching was used[16]. The balance of confounder distribution was checked with a propensity score

distribution mirrored histogram and standardized mean differences (SMD) which are presented in Figure 1 and also in Table 2. Estimation of treatment effect was analyzed using conditional logistic regression for the categorical outcome and paired t-test for the continuous results. Statistical analysis was performed using statistical software. < 0.05 of p-value was considered to be statistically significant.

Results

Table 1 represents the baseline data distribution between the two groups with its uni-variable analysis results. With raw unmatched data, the operative time was faster in the < 24 hours group (p-value < 0.01).

Table 2 presents the outcomes. It also shows a list of confounders used to calculate the scores. The balance of the covariates can be checked by comparing before and after the procedure matching the propensity score mirrored histogram (Figure 1) and SMD (Table 2). After matching, the graph showed fairly balanced scores, and mean differences of all factors were around and less than 10 % (0.010). Interpretation of these analyses, after matching, indicates that our data scores and covariate distribution were comparable[16,17]. According to the results, there was no difference as regards complications between the two groups (Odds ratio (OR): 1, (95% Confidence interval (95% CI): 0.14-7.10, p-value: 1.00). Acute urinary retention and postoperative bleeding, which are the main theoretical benefits of maintaining a catheter, were also the same (OR: 0.5, 95% CI: (0.05-5.51), p-value: 0.57, and p-value: 0.99). The OR for postoperative bleeding couldn't be calculated due to there being zero incidence in the control group. The < 24 hours group had a significantly shorter length of postoperative hospital stay (38.1 less hours, 95% CI: (41.82-34.31), p-value: < 0.01).

Discussion

TURP by monopolar energy is a gold standard for BPH indicated patients because it is effective and safe[8]. Catheterization time after the operation varies in accordance with experience and surgeon opinion. Around three days of balloon tamponade were traditionally recommended. Maintenance time, however, can range from less than 48 hours to up to four to five days[18-20].

Bladder catheterization and continued irrigation, although theoretically sound, reduces patient mobility which has associated problems and causes discomfort. Prolonged retention of the catheter can also cause urethral stricture, catheter-associated urinary tract infection (CAUTI)[21], increase the length of hospital stay, and increase

Table 1. Baseline data distribution (N=399)

	Control group (n = 304)	< 24 hours group (n = 95)	P-value
Age (years) mean (±SD)	72.0 (8.1)	72.5 (8.5)	0.61
Comorbidity n (%)	144 (47.4)	55 (57.9)	0.08
Preoperative catheterization n (%)	145 (47.7)	44 (46.3)	0.91
Operative time (minutes) median (range)	40 (10 -120)	35 (15-110)	< 0.01
General anaethesia n (%)	21 (6.9)	11 (11.6)	0.19
Resected Wt (grams) median (range)	15 (2-60)	12 (3-84)	0.39
Intraoperative complications n (%)	24 (7.9)	2 (2.1)	0.05
Bleeding	10 (3.3)	1 (1.1)	
Capsule perforate	7(2.3)	1(1.1)	
Bladder perforate	7(2.3)	0 (0)	
TURP syndrome	2 (0.7)	0 (0)	
Cardiovascular	0 (0)	0 (0)	
Septicemia	3 (1.0)	0 (0)	
PRC transfusion (n (%))	7 (2.3)	1 (1.1)	0.70
Traction time (hours), Median (range)	4 (0-19)	4 (2-6)	0.81

Mean (±SD) = mean ± standard deviation, Resected Wt = intraoperative resected prostate weight, PRC transfusion = Packed red cell transfusion

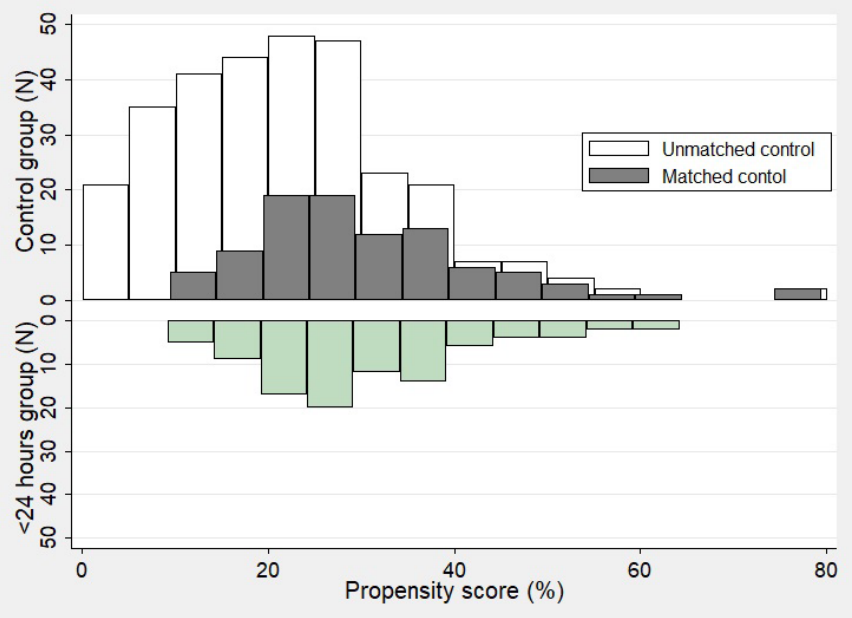

Figure 1. Mirrored histogram of the propensity score distribution.

Table 2. Main results of the study.

	Control group (N = 304)	< 24 hours group (N = 95)	SMD before matching	Control group (N = 95)	< 24 hours group (N = 95)	SMD after matching
Age (years) mean (±SD)	72 (8.1)	72.5 (8.5)	0.059	72.5 (8.2)	72.5 (8.5)	0.001
Comorbidity n (%)	144 (47.4)	55 (57.9)	0.211	50 (52.6)	55 (57.9)	0.106
Preop cath n (%)	145 (47.7)	44 (46.3)	0.028	39 (41.1)	44 (46.3)	0.105
Intra-op complication n(%)	24 (7.9)	2 (2.1)	0.268	1 (1.1)	2 (2.1)	0.049
OR time (minutes), median (range)	40 (10-120)	35 (15-110)	0.399	30 (10-90)	35 (15-110)	0.102
GA N (%)	21 (6.9)	11 (11.6)	0.161	10 (10.5)	11 (11.6)	0.036
Resected Wt (gm), median (range)	15 (2-60)	12 (3-84)	0.009	13 (2-60)	12 (3-84)	0.077
Traction time (hours), median (range)	4 (0-19)	4 (2-6)	0.141	4 (0-12)	4 (2-6)	0.084
Estimation of treatment effect			**P-value**		**P-value**	
PO complication n (%)	10 (3.3)	2 (2.11)	0.74	2 (2.11)	2 (2.11)	1.00
			Odds ratio (95% CI)		1 (0.14-7.10)	
AUR n (%)	6 (2.0)	1 (1.1)	1.00	2 (2.11)	1 (1.1)	0.57
			Odds ratio (95% CI)		0.5 (0.05-5.51)	
PO bleeding n (%)	2 (0.7)	1 (1.1)	0.56	0 (0.0)	1 (1.1)	0.99
			Odds ratio (95% CI)		NA	
PO stay (hours), median (range)	68 (18-216)	22 (20-72)	< 0.01	68 (20-142)	22 (20-72)	< 0.01
			Less hours (95% CI)		38.1 (41.82- 34.31)	

SMD = standardized mean differences; preop cath = preoperative catheterization; intra-op complication = intraoperative complication; OR time = operative time; GA = general anaethesia; Resected Wt = intraoperative resected prostate weight; AUR = acute urinary retention; PO = postoperative

treatment cost[22,23].

With advancements in surgical technique, anesthesia, and perioperative care, the long catheterization time may not necessary[24]. Catheterization time has gradually decreased. Until recently, a retaining hour with hospitalization less than 24 hours can be achieved[13,14], mainly applied as ambulatory care[25].

After close monitoring of the safety aspects, the early catheter removal protocol has been used in our urological unit. Our results could add weight to the confirmation that the practice was safe, even in an overcrowded community-based hospital. Benefits from the protocol were less discomfort to patients, early mobilization and a decrease in length of hospital stay. CAUTI incidence, however, was not collected in our data.

There were, nevertheless, limitations to our study. Firstly, operative time was significantly lower in the < 24 hours group. Although all surgeons have already progressed through the traditionally accepted learning curve five years ago (all have practiced for more than three years with high volume) the level of skill can still probably improve further. The high skill level could be reflected by the shorter operative time in the later years. Better results in the treatment group can be expected even if all factors are balanced. Secondly, the rate of re-admission was not included in our study. The data concerning readmission could be more reassuring as regards safety if it were available. Thirdly, the level of patient education and compliance level were not collected, a practice which in future studies needs to be included and requires effective interaction with and cooperation from patients.

Conclusion

The practice of catheter removal less than 24 hours after TURP was safe and feasible, even in an overcrowded hospital with high levels of preoperative catheterization. To adopt the protocol, we recommend surgeons need a high level of experience and patients should be well-educated and compliant. Our contraindications were patients with neurogenic bladder, urethral stricture, stroke, and some intraoperative complications, which are urinary bladder perforation, urinary tract infection, prostatic capsule perforation, or intraoperative bleeding.

Conflict of Interest

The authors declare no conflict of interest.

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