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Original Article

Incidence and impact of acute urinary retention after robot-assisted radical prostatectomy

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ABSTRACT

Objective: To explore the incidence of and potential risk factors for acute urine retention (AUR) after robot-assisted radical prostatectomy (RARP) and its effect on early urine continence.

Methods: A retrospective analysis of patients who underwent RARP by a single surgeon between July 2016 and June 2017 was performed to assess the incidence of AUR and its effect on early continence. Continence was assessed through self-reported questionnaires completed approximately three months after surgery. Early urine continence was defined as using zero pads per day at the time of the three-month follow-up. Descriptive statistics and logistic regression analysis were used to assess independent predictor of AUR.

Results: Of 379 patients, 19 (5%) developed AUR after RARP. No significant difference in baseline characteristics between those who developed AUR post-RARP and those who did not. There was no statistically significant difference in the reported early continence and number of pads used per day between patients with AUR and patients without AUR (31.6% vs. 23.1%, $P = 0.39$), (1.6 vs. 1.4, $P = 0.913$), respectively.

Conclusion: AUR post-RARP is an infrequent postoperative complication with no impact on early continence rate. No patient-related factors were associated with the development of AUR.

1. Introduction

Prostate cancer is the second most frequently diagnosed cancer in men globally. [1] Over the past decade, robot-assisted radical prostatectomy (RARP) has emerged as one of the most common treatment modalities for clinically localized disease. [2] Functional outcomes following prostatectomy have a significant impact on quality of life. [3] Functional outcomes are dependent on variety of fixed and modifiable factors. Fixed factors such as patient characteristics and the surgeon's experience cannot be controlled for or manipulated. Modifiable factors on the other hand such as surgical technique and postoperative management can be altered and, in most cases, improved. [4] Intriguingly, there is limited data on the impact of postoperative morbidity on early urinary continence, a functional outcome that can have a substantial negative effect on patient satisfaction and overall wellbeing. Of particular interest is postoperative acute urinary retention (AUR); an often overlooked postoperative urinary event with significant morbidity potential.[5].

The incidence of AUR varies between 0.5% and 11% after RARP. [5–7] The pathophysiology of AUR after RARP is not fully understood. It has been postulated that edema at the urethral anastomosis is the leading cause of AUR after early catheter removal. However, other mechanisms such as increased bladder neck smooth muscle tone or pressure by surrounding hematoma have also been implicated in AUR after RARP. [5,8,9].

AUR is managed by catheter insertion which poses a potential risk to the vesicourethral anastomosis integrity and prolongs patient discomfort. The long-term ramifications of AUR post-RARP may also include an increase in the risk of bladder neck contracture, as well as urethral stricture formation. [10].

The impact of AUR on functional outcomes, explicitly early continence, is not well studied. Herein, we sought to explore the potential risk factors of AUR after RARP and its effect on early urine continence.

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2. Materials and methods

A retrospective analysis of patients who underwent RARP by (DIL) between July 2016 and June 2017 was performed to assess the incidence and effects of postacute urinary retention and or early continence. A retrospective review of data is approved under an Institutional Review Board (IRB) approved protocol. All RARPs were performed using a transperitoneal approach. All patients had a posterior reconstruction of the Denonvilliers fascia followed by anastomosis closure as described by Van Velthoven [11,12], using a running, double-armed 3-0 bidirectional barbed suture (Quill™, Angiotech Pharmaceutics). Patients who were preoperatively on alpha-blocker were advised to discontinue this after surgery. Anticholinergic were prescribed postoperatively if the patient had significant bladder spasm; patients were instructed to stop anticholinergic 24 hours before the catheter removal. Owing to variability in clinic staffing and scheduling, patients presented for catheter removal on postoperative days 6 or 8. In very rare cases, patients had their catheter removed outside our facility or affiliated facilities.

In the perioperative visit, patients are asked to sign a consent that allows our team to contact them at different time points to inquire about postsurgical complications, any adjuvant treatment received outside our facility, and to administer different postoperative questionnaires. Patients were encouraged to report any issues with their voiding after catheter removal and advised to contact us before any proposed intervention in any outside facilities to provide our approval to place a Foley catheter, perform cystoscopy, and coordinate the follow-up plan. Therefore, with our rigorous database maintenance, urine retention, urethral stricture, and bladder neck contracture could be identified in our database, even if the intervention was performed in other facilities.

Urinary function was assessed through self-reported questionnaires completed approximately three months after surgery. The questionnaires included pad use at the current time point and time to social/total continence. Early urine continence was defined as using zero pads per day (PPD) at the time of the three-month. The overall response rate for the follow-up questionnaires was 71.8%.

Patient age, body mass index, preoperative prostate specific antigen (PSA) level, preoperative AUA score, preoperative use of alpha-blockers, prostate size, the intraoperative presence of median lobe which was defined by the presence of prostate tissue that protruding into the bladder during bladder neck dissection, need for bladder neck reconstruction, catheter removal day, postoperative use of anticholinergic, bladder neck reconstruction, development of AUR, and self-reported continence were included in the analysis.

Data were compared using independent t-tests and chi-squares. Analysis of variance (ANOVA) was used to determine any significant difference between the two groups with respect to reaching early continence. To assess potential predictors of AUR after RARP, a logistic regression incorporating the following factors, age, catheter removal day, BMI, social continence, prostate size, the presence of median lobe, use of alpha-blockers, and use of anticholinergics was used. Statistical analysis was completed with SPSS®, version 25.

3. Results

Of 379 patients, 19 (5%) developed AUR requiring catheter replacement after RARP, 360 (95%) did not develop AUR. Table 1 summarizes patients' characteristics and perioperative factors across both groups. There was no significant difference in age, BMI, preopeative PSA, AUA score, PPD usage, and prostate size between those who developed AUR post-RARP and those who did not

Table 1
Patient characteristics and perioperative factors in men with and without AUR after RARP.

	Overall	AUR	No AUR	P-Value
No. pts (%)	379 (100)	19 (5)	360 (95)	
Age (yr)				0.6
Median (IQR)	62 (57–67)	63 (54–68)	61.5 (57–67)	
BMI (Kg/m2)				0.5
Median (IQR)	28.17 (25.5–31)	29.8 (27.4–33.5)	28 (25.5–30.8)	
Baseline total PSA level (ng/ml)				0.32
Median (IQR)	5.6 (4.4–8)	6.3 (4.8–9.5)	5.6 (4.4–8)	
Preoperative AUA-SS				0.38
Median (IQR)	6 (3–11.5)	5 (1–11.5)	6 (3–11.75)	
Prostate size (gm)				0.64
Median (IQR)	37.7 (29–49)	36 (30.9–49.2)	37 (27–50)	
Median lobe				0.09
Yes (%)	78 (20.5)	1 (5.5)	77 (21.4)	
No (%)	301 (79.5)	18 (94.5)	283 (78.6)	
Bladder neck reconstruction (%)	12 (3)	1 (5)	11 (3)	0.59
Preoperative alpha-blocker				0.068
Yes (%)	23 (6)	3 (16)	20 (6)	
No (%)	356 (94)	16 (84)	340 (94)	
Initial catheter removal				0.78
Postoperative Day 6 (%)	208 (55)	11 (58)	197 (54.7)	
Postoperative Day 8 (%)	171 (45)	8 (42)	163 (45.3)	
Gleason Score 6 (3 + 3) (%)	6 (1.5)	0 (0)	6 (1.7)	>0.5
Gleason Score 7 (3 + 4), (4 + 3) (%)	352 (3)	18 (94.7)	334 (92.8)	
Gleason Score ≥ 8 (%)	21 (5.5)	1 (5.3)	20 (5.5)	
Extraprostatic extension (%)	96 (25.3)	7 (36.8)	89 (24.7)	0.23
Seminal vesicle invasion (%)	24 (6.3)	1 (5.3)	23 (6.3)	0.84
Surgical margin (%)	74 (19.5)	7 (36.8)	67 (18.6)	0.051
Nerve sparing				0.0071
Full nerve sparing (%)	335 (88.4)	12 (63.2)	323 (89.7)	
Partial nerve sparing (%)	37 (9.8)	7 (36.8)	30 (8.3)	
Wide excision (%)	7 (1.8)	0 (0)	7 (2)	

IQR, interquartile range.

(Table 1). Patients who did not develop AUR were more likely to undergo full nerve sparing at least on one side compared with those who developed AUR (89.7% vs.63.2%, $P = 0.0071$).A single step binary logistic regression was performed to model the effects of age, catheter removal day, BMI, social continence, prostate size, the presence of median lobe, use of alpha-blockers, and use of anticholinergics on AUR development post-RARP. The regression was not significant, $P = 0.669$ (Table 2). During a 12-month follow-up, no patient developed bladder neck contracture, or urethral stricture.

Of interest were early continence and pads used per day at three months post-RARP. There was no statistically significant difference in the reported early continence and number of pads used per day between patients with AUR and patients without AUR (31.6% vs. 23.1%, $P = 0.39$), (1.6 PPD vs. 1.4 PPD, $P = 0.913$), respectively. At twelve-month post-RARP, there was no difference in the continence rate between patients with AUR and patients without AUR (56.2% vs. 51.5%, $P = 0.7$). The mean time to reach total continence was not different between the two groups (AUR: 245 vs. no-AUR:255 days, $P > 0.5$).

4. Discussion

This retrospective study assessed the incidence and the risk factors of AUR in 379 patients who underwent RARP between July 2016 and June 2017. AUR occurred in 5% of the patients; neither baseline demographic characteristics nor perioperative risk factors were associated with its development. In addition, AUR did not affect rates of early continence or the number of pads used per day three months postoperatively.

Consistent with our findings the incidence of AUR after RARP varies between 0.5%-11%. [5–7] This variation is linked to several factors such as patient age, the method of data collection, performing posterior reconstruction of the Denonvilliers fascia, the use of barbed suture which might be associated with increased tissue inflammation and subsequent edema, and the surgeon's experience. [5–9, 13–14].

Although our data did not show an association between patient-related factors or surgical factors and AUR, other studies have found that short catheterization time was associated with AUR, and this finding is usually attributed to postoperative edema at the anastomosis site. [5,9] Khemees et al [5] found that patients with AUR had short catheterization time (4.1 vs. 5.7 days, $P = 0.0008$) and reported an AUR adjusted odd ratio of 10.66 (95% confidence interval: 3.14–36.11, $P = 0.0001$). These findings should be interpreted cautiously as we cannot exclude sparse data bias with such a wide confidence interval. [15] In addition, all patients in the Khemees et al [5] study had cystography before the catheter removal and catheterization times ranged between 3 and 7 days. Our patients, on the other hand, did not undergo cystography and had catheter removal on POD 6 or 8 based on clinic schedules; this may explain why the catheterization length effect was attenuated in this study.

Table 2
Binary logistic regression analysis of AUR risk factors

	B	p- Value	Exp(B)	95% CI for EXP(B)	
				Lower	Upper
Age	−0.019	0.651	0.981	0.903	1.066
BMI	0.024	0.677	1.024	0.915	1.146
Preoperative PSA	0.046	0.395	1.047	0.941	1.165
AUA	−0.041	0.427	0.96	0.867	1.062
Prostate lize	0.004	0.841	1.004	0.969	1.04
Median lobe	−1.588	0.188	0.204	0.019	2.174
Alpha-blocker	0.891	0.316	2.437	0.427	13.889
Anticholinergic	0.662	0.58	1.939	0.186	20.254

It is also noteworthy to mention that the anastomosis suture used by Khemees et al [5] was 3-0 Monocryl™ suture, whereas a double-armed 3-0 bidirectional barbed suture (Quill™, Angiotech Pharmaceutics) was used during our RARPs. Evidence from animal studies shows that inflammation around Quill™ is greater than monofilament suture (Biosyn), as the Quill™ suture is more prone to barb slippage, resulting in greater histological tissue reaction during the critical healing period. More data are needed before the clinical relevance of this finding can be established. [14].

In an attempt to decrease the incidence of AUR post-RARP, some authors recommend alpha blockers post-RARP [7,16] In a clinical trial assessing the impact of alpha-blockers on postoperative AUR, 236 patients were randomized to receive treatment with 0.4 mg of tamsulosin from the day before RARP until 14 days after surgery or not to received tamsulosin treatment. The acute urinary retention rate was lower in the tamsulosin group compared with the control group (7.3% vs. 17.4%, $P = 0.018$). It should also be noted that the experience of the surgeon was an independent risk factor for the development of urinary retention even after adjusting for the patient age and tamsulosin treatment in this clinical trial. [7] Nevertheless, the study concluded that alpha blockers might improve bladder emptying after prostatectomy by relaxing the bladder neck and proximal urethra. Interestingly, although our practice is to discontinue alpha-blocker postoperatively, the overall incidence of AUR in this cohort was 5% which is lower than the incidence of AUR (12.3%) in this clinical trial. This observation, emphasize the influence of the surgeon's experiences on the AUR rate.

We believe that the pathophysiology of AUR post-RARP is may be related to impaired detrusor contractility, which has been reported in 29%-61% of patients after RARP, 47% were de novo cases, and 50% of these patients recovered.[17] Impaired detrusor contractility might be caused by the following symptoms: partial decentralization of the bladder as a consequence of the bladder mobilization during RARP, somatic denervation, and geometric bladder wall alteration associated with pre-existing hypoxemia with/without neuroplasticity. [17–19].

Matsushima et al [20] reported that patients who developed AUR after laparoscopic radical prostatectomy were less likely to achieve urine continence at 6 months (odds ratio: 4.472; $P = 0.03$). This finding has stirred the efforts of several investigators to scrutinize the effect of AUR on early continence after RARP; interestingly, no significant difference in the self-reported continence rate in AUR cases was observed. [5, 9] Our findings support the emerging evidence that AUR after RARP has no effect on early continence. This may be partially explained by the better tissue handling and less tissue traction offered by robotic surgery compared with laparoscopic surgery.

Our study had several limitations. This is a single high-volume surgeon series. Several modifications to the surgical technique such as modified graded bladder neck sparring, posterior reconstruction and bladder plication are implemented and not accounted for during data analysis. [21] All of which could have an impact on the outcomes. Despite these limitations, the findings from this study add to the existing evidence that early continence rate is not affected by AUR.

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Conflicts of interest

None declared.

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