




The effects of bladder neck sparing with an additional anterior urethral fixation on postoperative continence after robot-assisted radical prostatectomy

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ABSTRACT

OBJECTIVE: Urinary incontinence remains one of the main problems affecting the quality of life after radical prostatectomy. Along with the improved understanding of the precise anatomy of the prostate, urethra and their surrounding structures, minimally invasive surgical techniques have been refined and described, aiming to improve functional outcomes without oncological compromise. This study aimed to investigate the impacts of anterior urethral fixation (AUF) and bladder neck sparing (BNS) on the early continence success after Robot-assisted Radical Prostatectomy (RALP).

METHODS: This retrospective study included 120 patients who underwent RALP between January 2018 and June 2019. Patients were allocated to one of two groups; group 1 (n=60) underwent RALP with BNS, group 2 (n=60) underwent RALP with both AUF and BNS. The patient continence status was measured at baseline on day 7 and in the 1st, 3rd, and 6th months postoperatively.

RESULTS: Concerning Incontinence Impact Questionnaire-7 form, statistically significant better results in group 2 were recorded in all visits, but the last (month 6) (p=0.023). Following catheter removal, postmicturition symptoms, including incomplete emptying and post-micturition dribble rate, were significantly higher in group 1 after catheter removal and in the 1st month (13.3% vs. 0 p=0.006). This difference was not recorded at the next visits (months 3 and 6).

CONCLUSION: Our findings showed that the combination of AUF and BNS significantly increases early continence rates and decreases post-micturition symptoms after RALP without hampering oncologic outcomes.

Keywords: Incontinence after prostatectomy; prostate; prostate cancer; quality of life after prostatectomy; robot-assisted radical prostatectomy.

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Urinary incontinence remains one of the main problems affecting the quality of life after radical prostatectomy [1]. Along with the improved understanding of the precise anatomy of the prostate, urethra and their

surrounding structures, minimally invasive surgical techniques have been refined and described, aiming to improve functional outcomes without oncological compromise [2]. Nevertheless, despite continuous technique



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development and a better understanding of the etiology of incontinence [3], post-prostatectomy incontinence (PPI) rates vary from 2% to 60% [4].

In a review by Ficarra et al. [5], outcomes of patients undergoing robotic-assisted (RALP), laparoscopic (LRP), and open retropubic radical prostatectomy (ORP) were evaluated. The authors concluded that pre-operative patient characteristics, surgeon experience, and surgical technique were the main factors affecting PPI rates. Nerve-sparing procedures, anterior urethral ligaments preservation, different urethrovesical anastomosis techniques [5] and anatomic-functional effects, such as detrusor hypocontractility, intrinsic sphincter deficiency, and decreased membranous urethral length and venous sealing effect [1], have been reported to influence the continence success rates.

Regaining of urinary continence after radical prostatectomy is time-dependent, and current evidence indicates that continence improves up to at least 24 months after an ORP [6]. With the increasing use of LRP and RALP, continence recovery is a much faster process dropping to 3–6 months [7], with late continence rates reaching 90%, and early continence remaining the main challenge [5]. Anterior urethral fixation (AUF) and posterior reconstruction (PR) appear to achieve better continence rates after 1 and 3 months [8]. In this study, we report the impact of AUF and bladder neck sparing (BNS) on the early continence success after RALP.

MATERIALS AND METHODS

This retrospective study included 120 patients who underwent RALP between January 2018 and June 2019. All procedures were performed by a single surgeon with an experience of more than 250 RALPs. Patients were allocated to one of two groups: group 1 (n=60) underwent RALP with BNS, group 2 (n=60) underwent RALP with both AUF and BNS. Prostate tumors of clinical-stage cT2 or less were included. Patients with prostatic and urethral surgery history, previous pelvic radiotherapy, incontinence, diabetes mellitus, neurogenic bladder, and urinary catheter were excluded from this study. Collected data included age, body mass index (BMI), international prostate symptom score (IPSS), prostate volume (PV), quality of life (QoL), prostate-specific antigen (PSA), T stage, Gleason score pattern, American Anesthesiology score (ASA), and D'Amico risk classification. Surgical parameters, such as nerve-sparing, BNS, AUF, duration of catheterization (days), hospital stay (hours)

Highlight key points

- Urinary incontinence remains one of the main problems affecting the quality of life after radical prostatectomy.
- Anterior urethral fixation and bladder neck sparing significantly increases early continence rates.

and pathologic outcomes, including pathologic stage, Gleason score, positive surgical margins, positive lymph nodes and complication rates (using the Clavien-Dindo classification) were also recorded.

The patient continence status was measured at baseline on the day 7, and in the 1st, 3rd, and 6th months post-operatively. Questionnaires were given to the patients before discharge from the hospital. The patients filled self-reported forms according to Incontinence Impact Questionnaire-7 (IIQ-7) and International Continence Society:

Category 1. No incontinence with a physical examination, including coughing or sneezing-Full continence

Category 2. Patients were dry except for the daily activity, including walking, exercising. <1 safety ped used-Continence

Category 3. Patients who had urinary leakage during the physical examination and daily activity or >1 safety ped used- Incontinence.

Category 1 and 2 patients were considered to be a continent. Continence following catheter removal was defined as very early continence, while early continent were the patients who were continent one month postoperatively. The remaining patients were classified as a late continent.

Post-micturition symptoms were assessed by the two following questions:

1. Have you had a sensation of not emptying your bladder completely after you have finished urination (incomplete emptying)?
2. Have you experienced dribbling after urination (post-micturition dribble)?

According to the ICS-PMS scoring system, a score of 1-4 was accepted as the presence of PMS.

Technique

All patients underwent RALP with a transperitoneal approach with a four-armed da Vinci SI (Intuitive Surgical, Inc., Sunnyvale, CA). In Group 1, we performed the BNS technique as previously described [9]. In the

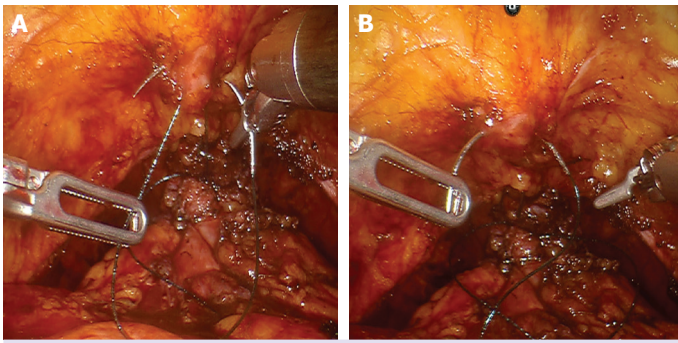


FIGURE 1. (A) Anterior Urethral Fixation (AUF) was performed with a 3-0 V-lock suture passing through the urethral anastomosis and posterior face of pubic bone periost. **(B)** The needle was held backward and then passed through the pubic bone. This movement was repeated twice.

second group, AUF was applied in addition to BNS. AUF was performed with a 3–0 V-lock suture passing through the urethral anastomosis and posterior face of pubic bone periost. The needle was held backward and then passed through the pubic bone. This movement was repeated twice [10] (Fig. 1).

Statistical Analysis

Statistical analysis was performed using SPSS v23 (Statistical Package for the Social Sciences). Kolmogorov-Smirnov and Kurtosis–Skewness normality tests were used to assess the normality of the data. Continuous variables were compared using independent samples t-test or Mann-Whitney U test. The categorical data were compared using a Chi-squared or a Fisher's exact test. The data were expressed using means and standard deviations or percentages. A $p < 0.05$ value was considered statistically significant.

RESULTS

One hundred and twenty patients were enrolled in this study. The mean age, serum PSA levels, pre-operative PV, BMI, mean follow-up period, ASA score, mean Gleason score and pre-operative D'amico risk classification were similar in both groups (Table 1). Furthermore, there were no differences concerning different peri-operative data (Table 2).

The urethral catheter was always removed on the 7th post-operative day. The continence status of the patients is summarized in Table 3. In both groups, recorded continence rates were higher on post-operative day 7 and in

TABLE 1. Preoperative patients' characteristics

Variable	Group A (n=60)	Group B (n=60)	p
Age (years)*	62.18±7.03	63.93±5.92	0.14
BMI (kg/m ²)	27±3.43	27±3.68	0.99
Mean follow-up (6 month)	12±3.52	11±3.61	0.43
IPSS score, median (range)	4±5.03	4.5±4.42	0.84
IIEF-score	20±3.1	20±3.07	0.34
Prostate volume (mL)	43±16.86	46±17.72	0.21
PSA level (ng/ml)	8±4.72	7.2±5.27	0.87
Preoperative Hb level			
ASA score, %			0.92
1	51.7	55	
2	36.7	33.3	
3	11.7	11.7	
D'amico classification			0.18
Low risk, %	41.7	31.7	
Intermediate risk, %	40	56.7	
High risk, %	18.3	11.7	
TNM classification, %			0.97
T1c	8.3	5	
T2a	33.3	36.7	
T2b	23.3	25	
T2c	11.7	13.3	
T3a	13.3	11.7	
T3b	10	8.3	

BMI: Body mass index; IPSS: International prostate symptom score; IIEF: International index of erectile function; PSA: Prostate specific antigen; ASA: American society of anaesthesiologists.

the 1st, 3rd and 6th months. Concerning IIQ-7 form, statistically significant better results in group 2 were recorded in all visits but the last (month 6) ($p=0.023$). Following catheter removal, postmicturition symptoms, including incomplete emptying and post-micturition dribble rate, were significantly higher in group 1 after catheter removal and in the first month (13.3% vs. 0 $p=0.006$). This difference was not recorded at the next visits (months 3 and 6). During the entire follow-up period, there were no high grade (>Clavien-Dindo class II) complications. Furthermore, there was no complication related to the urethrovesical anastomosis and no urethral bladder neck stricture. QoL scores are presented in Table 4, and no statistical differences were recorded except directly after catheter removal. Concerning the oncological outcome, the overall PSM rate was 3.3%. There was no significant

TABLE 2. Comparison of the perioperative and postoperative outcomes

Variable	Group A (n=60)	Group B (n=60)	p
Operative time (min)	117.5±11.68	117±12.89	0.95
Anastomosis time (min)	21.5±2.51	21.5±2.51	0.77
Estimated blood loss (mL)	34±14.72	34±14.18	0.81
Hospital stay (days)	27±4.89	26±5.09	0.91
Duration of the urethral catheter (days)	7	7	1
Neurovascular bundle sparing, (%)			0.99
Never done	18.3	20	
To the left side	15	15	
To the right side	18.3	16.7	
To both side	48.3	48.3	
Pelvic lymph node dissection, (%)	33.3	41.7	0.45
Complications			0.33
No complication	78.3	88.3	
Grade 1 (%)	11.7	6.7	
Grade 2 (%)	10	5	
Mean postoperative Gleason score	6±0.85	6±0.76	0.67
TNM classification, (%)			0.78
T2a	25	23.3	
T2b	23.3	26.6	
T2c	36.6	38.3	
T3a	3.3	3.3	
T3b	11.6	8.3	
Positive surgical margin	3.3	3.3	1
Seminal vesicle extension	11.6	8.3	0.08

difference between the two groups regarding PSM rate, seminal vesical invasion and pathologic T stage.

DISCUSSION

Radical prostatectomy is the preferred treatment for localized and a reasonable option for locally advanced prostate cancer. In the era of minimally invasive therapy, especially the implementation of RALP has decreased the morbidity of this procedure. Nevertheless, erectile dysfunction and stress urinary incontinence still constitute challenging complications [5, 11]. Since the pioneering works of Rocco et al. [12, 13] about the posterior rhabdosphincter reconstruction, various techniques have

been introduced to improve early continence rates. These techniques include the anterior (AR) and posterior reconstruction (PR) [14–17], the periurethral suspension [18, 19], and the bladder neck sparing [9].

In 2002, a urethral suspension technique achieved higher continence rates after radical retropubic prostatectomy (RRP) [20]. Since then, various techniques have been introduced with the robotic approach. Patel et al. [18] reported their periurethral suspension technique presenting improved continence recovery times and continence rates on the 3rd postoperative month. Dal Moro et al. [16] presented a technique of complete reconstruction of the posterior urethral support in a prospective non-randomized study of 36 patients. Their technique involved the suturing of the pelvic floor muscles to create a dynamic semicircular urethral support and achieved 50% and 83% continence rates directly after catheter removal and after 30 days, respectively. A few years later, Student and colleagues published their own series of vesicourethral support reconstruction in a randomized controlled trial of 66 patients. The authors presented continence rates of 21.9%, 43.8%, 62.5%, 75% and 86.7% after 24 hours, two weeks, one month, six months and one year, respectively [17].

Bladder neck preservation is an additional way of increasing early continent rates. Lee et al. [21] published their technique highlighting the relevance of the grade of BNS with early postoperative continence. The authors concluded that BNS is a graded, rather than all-or-none outcome and that an increasing degree of BNS is associated with an earlier return to continence, without compromising oncologic outcomes. Our group has also presented our BNS technique in a cohort of 52 patients with a mean duration of catheter removal at 9.4 days. No patient suffered from late urinary incontinence and very early continence status could improve the QoL scores [9]. The important detail in this technique is reaching the area of the fatty connective tissue without blood-vessels between the bladder neck and the prostate. If proper bleeding control is performed, the process is fast, and the internal sphincter is at the same time protected. Preservation of the sphincter is key to succeed urinary continence in the early period [9].

The anterior suspension (AS) stabilizes and maintains a true anatomical position of the urethra [15]. A recent meta-analysis by Grasso et al. [22] demonstrated significantly lower anastomotic leakage rates and no significant differences for positive surgical margins

TABLE 3. Continence status

Variable	Group A				Group B				p	Group A&B			
	After catheter removal	1 st mo	3 rd mo	6 th mo	After catheter removal	1 st mo	3 rd mo	6 th mo		After catheter removal	1 st mo	3 rd mo	6 th mo
	%	%	%	%	%	%	%	%		%	%	%	%
Continence rate	96.7	100	100	100	95	100	100	100					
Post-micturition symptoms;													
Incomplete emptying alone	16.7	13.3	3.3	0	3.3	0	0	0	0.029	0.006	0.49	1	
Post-micturition dribble alone	13.3	11.7	0	0	1.7	0	0	0	0.032	0.013	1	1	
Both	11.7	6.7	3.3	0	1.7	0	0	0	0.06	0.027	0.49	1	
IIQ form 7	7±1.19	3±1.08	0±0.64	0±0.27	1±1.03	0±0.54	0	0	0.001	0.001	0.001	0.023	

IIQ: Incontinence impact questionnaire; mo: Month.

TABLE 4. Quality of life

Variable (score)	Group A (n=60)	Group B (n=60)	p
Preoperative	2±1.11	2±1.11	0.64
After catheter removal	3±0.99	3±0.84	0.02
1 st month	2±0.9	2±0.7	0.31
3 rd month	2±0.91	2±0.86	0.48
6 th month	2±0.89	2±0.86	0.27

rates or complications. The analysis also confirmed the benefits at 30 days after catheter removal and showed a significant advantage in terms of urinary continence recovery in the first 90 days. On the other hand, a posterior reconstruction (PR) improves continence by providing tension-free anastomosis with no urine leakage [23]. In a study of 72 patients, AS was combined with PR, significantly increasing continence rates after one and three months but demonstrating no further effect on early (15th day) and late (6th month) continence [10].

In the present study, the results of a combined AUF and BNS were similar to BNS after the 1st, 3rd and 6th months. The main strength of our work is the reported outcomes, which are better than the ones already reported, as continence directly after catheter removal was achieved in 97% of the cases. The remaining patients were continent after

the first month. Our technique also nullified postmicturition symptoms after catheter removal, as only two patients (3.3%) experienced incomplete bladder emptying, one patient (1.7%) experienced post-micturition dribble, and one patient (1.7%) experienced both symptoms. We believe that the internal sphincter is protected during BNS since the anatomical structure of the bladder neck, including the internal sphincter, is preserved, while continence rates are improved by providing anatomical support of the urethra with AUF. At the same time, oncological outcomes were not compromised as there were only two cases (3.3%) in each group with positive surgical margins. Our work is not without limitations, the main being its retrospective character. Additionally, no functional outcomes regarding potency are presented as patients cannot be monitored after the procedures since they live far from our institution. Further research is deemed necessary to help standardize optimal reconstruction techniques to achieve maximum continence, and while succeeding optimal oncological outcomes.

Conclusion

The combination of AUF and BNS significantly increases early continence rates and decreases post-micturitional symptoms after RALP without hampering oncologic outcomes.

Ethics Committee Approval: The Gazi University Clinical Research Ethics Committee granted approval for this study (date: 13.01.2020, number: 05).

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Authorship Contributions: Concept – LT; Design – LT; Supervision – EG; Materials – EG; Data collection and/or processing – SYal; Analysis and/or interpretation – EK; Literature review – SYil; Writing – OA; Critical review – OA, CA.

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