

Results of Continence Protective Levator Ani Urethral Suspension and Rhabdosphincter Remodeling Anastomosis Method in Radical Retropubic Prostatectomy

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ABSTRACT

Radical prostatectomy is the gold standard method in the treatment of prostate cancer, one of the most common cancers in men. However, incontinence that may occur after radical prostatectomy significantly affects the quality of life of patients. Although many factors play a role in postoperative incontinence, the surgical method plays an important role. In our study, we aimed to investigate the effect of the urethral anastomosis method using levator ani muscle and rhabdosphincter remodeling method on continence in radical prostatectomy.

We included 140 patients who underwent radical prostatectomy. Patients with and without postoperative urinary incontinence were compared in terms of ISUP grade, age, PSA, prostate volume, capsular invasion, seminal vesicle invasion and positive surgical margin.

Capsular invasion and seminal vesicle invasion were significantly higher in the group with urinary incontinence at the third, sixth and 12th postoperative months ($p<0.001$ and $p<0.001$). Continence rate was 71% at the third month, 87% at the sixth month and 91% at the 12th month.

Incontinence after radical prostatectomy is an important problem for patients. In our study, we demonstrated the importance of levator ani and rhabdosphincter and urethral anastomosis in providing postoperative continence. The importance of this issue will be better understood in future studies.

Keywords: radical prostatectomy, rhabdosphincter, urethral anastomosis, urinary incontinence

Introduction

The most frequent type of cancer in males over 50 is prostate cancer. (1) Radical prostatectomy (RP) is the most popular treatment for organ-confined illness in a patient who has been carefully chosen, yet, one of the main side effects of this treatment method is urinary incontinence. Postoperative incontinence rates range between 4 and 8%. (1, 2) On the other hand, these incontinence rates may be significantly higher depending on definitions and the use of different validated incontinence questionnaires. Most studies use the number of pads used to measure the degree of urine incontinence to estimate post-prostatectomy incontinence accurately. (3)

According to recent studies, incontinence rates following prostatectomy can reach 80%. (1, 2) There are several reasons for post-prostatectomy incontinence, and its causes are likely multifaceted (age, size of the prostate, the extent of the surgery, and the skill of the surgeon performing the procedure etc., RP possibly affects some urinary continence control mechanisms while removing others. The proximal sphincteric unit, which includes the prostate and has some control over continence, is removed during a prostatectomy. (4) When the proximal urethral sphincter removed, the rhabdosphincter takes over the maintaining continence role after surgery. (4, 5) However, there is a considerable risk of intraoperative injury to the rhabdosphincter and neurovascular supply because of their proximity to the prostate. Egawa and et al.

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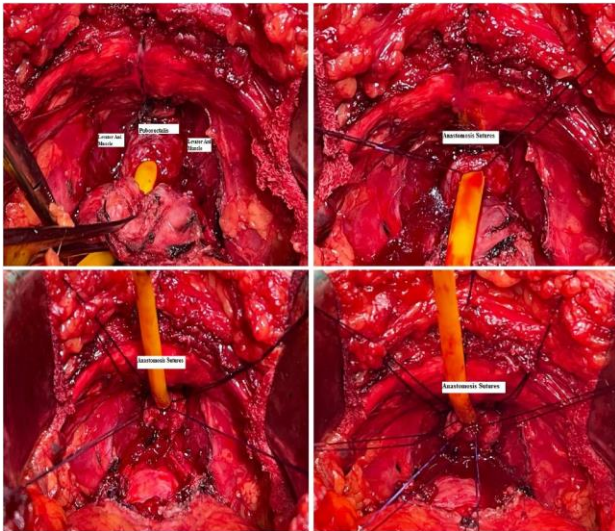


Fig.1. Intraoperative Image of Urethral Anastomosis Constructed With Levator Ani Muscle and Rhabdosphincter Remodelling Method

showed that the urethral sphincter's innervation is 0.3 to 1.3 cm from the prostate's apex, rendering it highly vulnerable to damage during apical dissection.(6) The bladder is similarly impacted by RP, with effects on detrusor innervation and function in addition to the urethral sphincter.

In light of this background information, we aimed to evaluate the effectiveness of urethral anastomosis with the levator ani and rhabdosphincter a modification of current RP technique, and to determine the postoperative incontinence rates.

Material and Method

Patient Evaluation: Approval for the study was obtained from the local ethics committee of Selçuk University Faculty of Medicine Faculty of Medicine with file number 2023/10. The data of 232 patients who underwent RP between 2015 and 2021 were retrospectively analyzed. 92 patients were excluded from the study due to incomplete data availability and 140 patients were included in the study. The patients' ages, PSA, prostate volumes and PSA densities were recorded. Then, the pathology results were examined, and the degree of International Society of Urological Pathology (ISUP), vesicula seminalis invasion, extracapsular spread, and surgical margin positivity were recorded. The patients included in the study had no preoperative incontinence (urge or stress). Urinary incontinence of the patients was recorded at the postoperative third and 12thmonth controls. Urinary incontinence was checked with a stress test. Incontinence was

observed by performing maneuvers that increase intra-abdominal pressure, such as straining and/or coughing.

Surgical Procedure: After performing general anesthesia, a slight reverse trendelenburg position was given, and surgical site sterilized and prepped. An 18-F After placement of the Foley catheter, a midline incision was made from below the umbilicus to the upper part of the pubis. The retzius cavity was bluntly opened and the pelvic side walls were mobilized. Two or four body wall retractors were positioned laterally at the wound's center caudally, and a fixed retractor is utilized to move the bladder and peritoneum cephalad. Diathermy or scissors cut through the endopelvic fascia on both sides, at the point where it reflects the prostate and the pelvic side wall. The puboprostatic ligaments were reached via an anterior and medial extension of the endopelvic incision. The dorsal venous complex is sutured with number 1 vicryl. Then, the bladder neck was resected between the prostate, and the urethra is reached. The Foley catheter is cut and suspended. After the urethra was completely separated from the bladder, a dissection is made towards the interfascial space. The bilateral ductus deferens were released and resected separately. Subsequently, the seminal vesicles were separated from the surrounding tissues. Prostate lateral pedicles were released and sutured. Then, the Denonvilliers' fascia was dissected, and the prostate was separated from the rectum up to the apex. The prostate apex was resected, and the urethra was exposed. Starting at 1 o'clock, 6 suspension sutures were placed (placed at 1, 3, 5, 7, 9, and 11 o'clock). At this stage, the levator ani muscle and rhabdosphincter muscle to support the urethra were enclosed in an anastomosis suture to assist continence. (Figure-1) Then, the suspenders are passed through the bladder neck in a clockwise direction, and the anastomosis was completed. The procedure was terminated by closing the patient in the anatomical plane. The sutures were removed on the 7th postoperative day, and the catheter was removed on the 15th postoperative day. The patient was called for control in the first month after the operation.

Statistical Analysis: Descriptive statistics for age, PSA, prostate volume, and PSA density of the patients were given together with the mean and standard deviation values. Patients with and without urinary incontinence at post-op 1 month according to age, were evaluated with the Kolmogorov-Smirnov test regarding normal distribution. Those who did not have urinary

incontinence in the postoperative controls were named group 1 and those with urinary incontinence were named group 2. As a result of the test, student's t-test and Mann Whitney U test were performed between both groups for continuous quantitative data (age, PSA, prostate volume, PSA density) due to the homogeneous distribution of the groups in terms of age. The Chi-Square and Fisher's exact tests were used in two independent groups to evaluate qualitative data (vesicula seminal invasion, extracapsular invasion, surgical margin positivity, whether there is a recurrence) and ordinal data (stage). A value of $p < 0.05$ was considered statistically significant.

Results

The mean and median values of mean age, PSA, prostate volume, and PSA density of all patients ($n=140$) included in the study are given in Table 1. While the mean age of group 1 was 61.8 years, the mean age of group 2 was 62.2 years and the difference was not statistically significant ($p=0.814$). The median PSA in group 1 was 9.61 mg/dl while the median PSA in group 2 was 12.29 mg/dl and the difference was not statistically significant ($p=0.098$). The median prostate volume was 51 ml in group 1 and 53.8 ml in group 2 and the difference was not statistically significant ($p=0.508$). While the median PSA density was 0.21 in group 1, this value was 0.30 in group 2 and the difference was not statistically significant ($p=0.913$). (Table 1)

When the rates of capsule invasion and seminal vesicle invasion were compared between the groups, group 2 had statistically significantly higher rates of capsule invasion and seminal vesicle invasion. (p values 0.001 and 0.001, respectively) There was no statistically significant difference in surgical margin positivity between the groups. ($p < 0.132$) Although there was no statistically significant difference, surgical margin positivity rate was higher in group 2 (40% vs 27%). There was no significant difference in ISUP grades between the groups ($p < 0.343$). (Table 2)

When compared at 6 months and 12 months postoperatively, capsular invasion and seminal vesicle invasion were statistically significantly higher in patients with incontinence. (p values 0.001 and 0.001, respectively) No significant difference was observed in terms of surgical margins. (p values 0.176 and 0.219, respectively) (Table 3)

Discussion

Continence rates after RP tend to increase over time after surgery.(7-11) Some studies have reported that improvement in continence continues in the first postoperative year,(7, 8) while others have reported that improvement continues up to 24 months.(12) The continence rates was reported 33% at 3 months (7), while this rate varied between 54% and 71% at 6 months.(7-11) The continence rates reach 84-93% at postoperative 12th month. (10, 11) In our study, the continence rates were 71% at 3 months, 87% at 6 months and 91% at 12 months. At the end of the 12th month, all of our patients with urinary incontinence had only stress incontinence.

The application of nerve-sparing RP in localized prostate cancer has provided a better understanding of the structure and function of the external urinary sphincter. Oelrich suggested that the rhabdosphincter passes under the pubic bone and pulls the sphincter complex upward and laterally and described the sphincteric musculature. (13) Steiner performed a cadaver dissection study for a better understanding of the anatomical basis of continence and emphasized the importance of the male urethral sling mechanism in achieving continence.(14) In another cadaver dissection study, a complex consisting of the rhabdosphincter and the fascia of the levator ani muscle was shown to surround the membranous urethra in a cylindrical shape and it was stated that this structure is an important part of the urethral sphincter complex in men. (15) As a result of these dissections, a musculofascial structure extending along the dorsal side of the rhabdosphincter was identified. They concluded that this structure is part of a complex structure that suspends and stabilizes the rhabdosphincter by fusing with the medial fascia of the levator ani laterally and the suprapubic fascia ventrolaterally. On the other hand, it is important to determine the relationship between the sphincter and prostate shape and size. Myers stated that the prostate can be of various shapes (typically donut or croissant shaped) and emphasized that the shape and size of the prostate should be taken into account when performing apical dissection during the operation to preserve the urethral sphincter as much as possible.(16) In a study of 90 patients conducted in 2019, the rhabdosphincter was included in urethral anastomosis and continence rates after RP were analysed. In this study, continence rates were 42.4% at 1 month, 61.1% at 6 months and 83.3%

Table 1. Comparison of Group1 (Non-Incontinence) and Group 2 (With Incontinence) In Terms of Age, Psa, Prostate Volume, and Psa Density Parameters At Postoperative 3rd Month

Parameter	Total (n=140)	Grup 1 (Non-incontinence group) (n=100)	Grup 2 (Group with incontinence) (n=40)	P
Age	62 (\pm 5.5)	61.88 (\pm 5.9)	62.2 (\pm 4.46)	.814*
PSA	10.3 (0.73-47.2)	9.61 (0.7-32.12)	12.29 (2.8-47.2)	.098**
Prostate volume	52 (20-143)	51 (20-107)	53.8 (20-143)	.508**
PSA Dandity	0.23 (0.04-1.35)	0.21 (0.04-0.98)	0.30 (0.08-1.35)	.193**

* Student's T testi, ** Mann Whitney U

Table 2. Comparison of Group 1 (Non-Incontinence) and Group 2 (With Incontinence) According To Isup Grade, Surgical Margin Status, Capsule Invasion, Seminal Vesicle Invasion, and Presence of Recurrence At Postoperative 3rd Month

Parameter	Grup 1 (Non-incontinence group) (n=100)	Grup 2 (Group with incontinence) (n=40)	Total (n=140)	P
ISUP Grade				
1	44 (%44)	16 (%40)	60 (%42.9)	.343*
2	44 (%44)	14(%35)	58 (%41.5)	
3	8 (%8)	7(%17.5)	15 (%10.7)	
4	1 (%2)	2 (%5)	3 (%2.1)	
5	2 (%2)	1(%2.5)	3 (%2.1)	
Surgical Margin				
Negative	73 (%73)	24 (%60)	97 (%69.3)	.132**
Positive	27 (%27)	16 (%40)	43 (%30.7)	
Capsule Invasion				
No	99 (%94)	30 (%87.5)	129 (%92.1)	.001**
Yes	1 (%6)	10 (%12.5)	11 (%7.9)	
Seminal Vesicle Invasion				.001**
No	98 (%93)	29 (%85)	127 (%90.7)	
Yes	2 (%7)	11(%15)	13 (%9.3)	

* Fisher's exact test, ** Chi-Square test

at 12 months.(17) In another study, continence rates were 71% at 3 months, 85% at 6 months and 89% at 12 months in patients who underwent urethral anastomosis with bladder neck preservation.(18) Again, in different studies in the literature, the general continence rates after RP varied between 54-71% at the 6th month. We performed anastomosis with both the rhabdosphincter and the levator ani muscle. When compared with these studies, the continence rate in our study was 71% at 3 months and 87% at 6

months. We think that our anastomosis method is effective in terms of providing continence in the early period.

There is controversy that the increased risk of postoperative incontinence may be related to preoperative factors. Clear identification of risk factors prior to RP would allow patients to be counseled on therapeutic choices and potentially improve surgical outcomes. However, the extent to which risk factors influence surgical outcomes is still a controversial issue. Various predisposing

Table 3: Comparison of Patients With and Without Incontinence In Terms of Surgical Margine, Capsule Invasion, and Seminal Vesicle Invasion At 6th and 12th Postoperative Months

Postoperative 6.month evaluation			
Parameter	Non incontinence group (n=122)	Group with incontinence (n=18)	p
Surgical Margine			
Negative	87	10	0.176*
Positive	35	8	
Capsule Invasion			
No	118	11	0.001*
Yes	4	7	
Seminal Vesicle Invasion			
No	117	10	0.001*
Yes	5	8	
Postoperative 12.month evaluation			
Parameter	Non incontinence group (n=127)	Group with incontinence (n=13)	p
Surgical Margine			
Negative	90	7	0.219*
Positive	37	6	
Capsule Invasion			
No	122	7	0.001*
Yes	5	6	
Seminal Vesicle Invasion			
No	121	6	0.001*
Yes	6	7	

*Chi-Square test

risk factors such as patient age, preoperative continence status, previous transurethral intervention, stage of the disease, surgical technique, and experience of the surgeon have been proposed. (19) Sphincter atrophy and neural degeneration with aging have been defined as risk factors for urinary incontinence after RP.(15, 20) Wei et al. reported a correlation between age and postoperative continence in their study of 482 patients.(21) In our study, no correlation was found between age and continence since the mean age of the patients was similar. In large series studies, the relationship between the stage of the disease and continence has not been fully demonstrated. (12, 21, 22) However, it has been reported that the stage of the disease changes the surgical technique, and continence increases in nerve-sparing applications. (22) In our study, 84% of the patients were ISUP grade 1 and 2 patients. Similar to the literature, there was no correlation between ISUP grade and incontinence in our study.

Lepor and Kaci found that apical dissection to obtain a negative surgical margin did not prevent the development of incontinence. (11) In our study, no significant correlation was found between surgical margin positivity and incontinence. On the other hand, we found a significant correlation between capsular invasion and seminal vesicle invasion and incontinence. We think that the possible reasons for this are the difficulty of nerve-sparing dissection and t dissection of the prostate from the surrounding tissues due to invasion. When we analyzed 13 patients with incontinence at the 12th postoperative month, we observed that approximately 50% of these patients had both capsular invasion and seminal vesicle invasion. Therefore, care should be taken especially in patients with capsular invasion and seminal vesicle invasion for the development of post operative incontinence.

Some studies have reported that there is no relationship between preoperative PSA value and incontinence.(11, 23) In our study, there was no

significant relationship between PSA value and incontinence rates, but the mean PSA was higher in patients with urinary incontinence at 3 months (12.29 vs 9.61). On the other hand, there are conflicting findings in the literature regarding the relationship between prostate volume and incontinence. Theoretically, it can be thought that prostate size may increase the risk of incontinence because it makes apical dissection more difficult. Konety et al. reported that continence rates were lower in patients with prostate volume greater than 50 cc. (24) However, Eastham et al. did not find a correlation between prostate volume and postoperative continence. (12) In our study, no significant difference was observed between prostate volumes, but both mean prostate volume and mean PSA density were higher in the group with incontinence at 3 months.

Limitations: Of course, our study has some limitations. First of all, being retrospective is the most important limitation of our study. Secondly, the fact that the majority of the patients were ISUP grade 1 and 2 may affect the incontinence rate. Thirdly, the fact that the average age of the patients included in the study was below 65 years may have reduced the risk of age-related incontinence.

Postoperative urinary incontinence is a significant concern that affects patient satisfaction. Continence in the postoperative period is influenced by patient selection, details of the surgical technique, the surgeon's experience and the tools defined to assess postoperative incontinence. Levator ani and rhabdosphincter are very important for post operative continence during the anastomosis phase of RP operation. We think that this anastomosis method is especially important in increasing urethral resistance and thus ensuring continence. The importance of this issue will be better demonstrated in prospective multicenter studies.

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