Robot-Assisted Radical Prostatectomy After Previous Prostate Surgery

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ABSTRACT

Background and Objectives: Our objective is to clarify the effect of previous transurethral resection of the prostate (TURP) or open prostatectomy (OP) on surgical, oncological, and functional outcomes after robot-assisted radical prostatectomy (RARP).

Methods: Between August 1, 2009, and March 31, 2013, 380 patients underwent RARP. Of these, 25 patients had undergone surgery for primary bladder outlet obstruction (TURP, 20 patients; OP, 5 patents) (group 1). A match-paired analysis was performed to identify 36 patients without a history of prostate surgery with equivalent clinicopathologic characteristics to serve as a control group (group 2). Patients followed up for 12 months were assessed.

Results: Both groups were similar with respect to preoperative characteristics, as mean age, body mass index, median prostate-specific antigen, prostate volume, clinical stage, the biopsy Gleason score, D'Amico risk, the American Society of Anesthesiologists (ASA) classification score, the International Prostate Symptom Score, continence, and potency status. RARP resulted in longer console and anastomotic time, as well as higher blood loss compared with surgery-naive patients. We noted a greater rate of urinary leakage (pelvic drainage, >4 d) in group 1 (12% vs 2,8%). The anastomotic stricture rate was significantly higher in group 1 (16% vs 2.8%). No difference was found in the pathologic stage, positive surgical margin, and nerve-sparing procedure between the groups. Biochemical recurrence was observed in 12% (group 1) and 11.1% (group 2) of patients, respectively. No significant difference was found in the continence and potency rates.

Conclusions: RARP after TURP or OP is a challenging but oncologically promising procedure with a longer console and anastomosis time, as well as higher blood loss and higher anastomotic stricture rate.

Key Words: benign prostatic hyperplasia, outcomes, previous surgery, prostate cancer, robotics

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INTRODUCTION

Robot-assisted radical prostatectomy (RARP) is a valuable therapeutic option for clinically localized prostate cancer (PCa).[1] The most recent data have shown significant advantages in blood loss and transfusion rates compared with retropubic RP (RRP)[2] and potential advantages for postoperative urinary continence[3] and recovery of erectile function.[4] Although the risk of positive surgical margin (PSM) status is at least equivalent between the 2 approaches, comparisons of the biochemical recurrence (BCR), cancer-specific, and overall survival data are insufficient to reach definitive conclusions, because the follow-up duration in existing studies is relatively short, and the overall experience with RARP in locally advanced PCa is still limited.[5]

Recent reports have demonstrated that RARP after a transurethral procedure for symptomatic BPH is feasible with regard to perioperative and short-term functional outcomes.[6–8] There are concerns about the effects of transurethral resection of the prostate (TURP) on bladder neck dissection and reconstruction during RP.[9–11] These studies have been restricted to TURP or simply classified all minimally invasive prostate therapies as a single entity, with no reports stratifying patients by open prostatectomy (OP). To that end, our objective was to clarify the effect of previous TURP or OP on surgical, oncological, and functional outcomes after RARP.

METHODS

Between August 2009 and March 2013, 380 consecutive patients with PCa underwent RARP at our institution. Of those patients, 25 (9%) (group 1) underwent RARP after a

prior surgical intervention for bladder outlet obstruction (BOO) (monopolar TURP, 20 patients; OP, 5 patients).

A retrospective cross-sectional evaluation of surgical and functional outcomes was performed to compare group 1 with 36 surgery-naive patients (group 2) who underwent RARP as the first and only prostate surgery. These patients were matched to those in group 1 according to certain parameters: (1) RARP was performed during the same period (i.e., between August 2009 and April 2013) and by the same surgeons (the first 100 RARPs of each surgeon were not included in the study, to avoid the learning curve) (AİT, VT). (2) Patients were comparable in mean age, body mass index (BMI), prostate volume, median level of prostate-specific antigen (PSA), International Prostate Symptom Score (IPSS), and the biopsy Gleason score (**Table 1**).

The study was approved by the ethics review board of our hospital.

Preoperative potency was evaluated with the five-item version of the International Index of Erectile Function (IIEF-5). A score above 17 was considered normal.[12] Patients answering "no leak" in response to the question "How often do you leak urine?" were defined as continent. All the patients were continent before surgery.

Pelvic lymph node dissection was performed in patients with either a PSA level >10 ng/mL or a Gleason score >6. Bilateral neurovascular bundle (NVB) preservation was attempted in patients with no palpable tumor, a biopsy Gleason score <7, and a preoperative PSA level <10 ng/mL.

All intraoperative, perioperative, and postoperative parameters were recorded, including skin-to-skin operative time, console time, urethrovesical anastomosis (UV) time, bladder neck reconstruction, NVB preservation, estimated blood loss, need for transfusion, postoperative hospital stay, time to catheter removal, pathologic stage, Gleason score, and PSM status (**Table 2**).

Perioperative complications and reinterventions encountered during the follow-up were stratified by the modified Clavien classification[13] and were characterized as minor (Clavien grade I–IIIa) and major postoperative complications (Clavien grade IIIb–IVa).

Functional results regarding urinary continence were evaluated prospectively early and 3, 6, and 12 months after surgery. Complete urinary continence was defined as no pad use or no urinary leakage. Requirement for 1 pad

(safety pad) daily was considered as mild incontinence (stress incontinence) and >1 pad daily as incontinence.

Functional results regarding potency were evaluated prospectively 6 and 12 months after surgery. Potency was defined as erections sufficient for penetration, with or without phosphodiesterase 5 (PD5) inhibitors. The analysis of potency was limited to patients who were potent before RARP, had bilateral nerve-sparing (NS) surgery and had a minimum follow-up of 12 months with no adjuvant therapy. The median postoperative follow-up of the patients was 31 months (range, 12–55).

For comparison between 2 groups of continuous values, Student's t test was used. For comparison of 3 or more groups, the 1-way analysis of variance with the Tukey correction for multiple comparisons was used. For comparison of binomial values, the χ^2 test was used. Simple linear regression was used to test the effect of 1 continuous parameter against another. Differences reaching $P < 0.05$ were considered significant.

RESULTS

Ten patients in group 1 underwent RARP an average of 3.4 months (range, 2–7) after the detection of incidental PCa. In contrast, 15 patients underwent RARP an average of 58.2 months (range, 16–96) after primary surgery for BOO (i.e., standard TURP or OP).

The preoperative clinicopathologic characteristics of the 2 groups are summarized in **Table 1.** Both groups were similar in age, BMI, preoperative PSA, prostate volume, clinical stage, Gleason score, preop IPSS, ASA classification, D'Amico classification, potency, and preoperative continence status.

Both groups were similar with respect to the requirement for lymphadenectomy. The pathological stages of the tumors in patients who did not have lymphadenectomy were T2a in 5 patients and T2c in 13 patients. Use of NS techniques was similar in both groups. The mean console time was significantly longer in the prostatectomy group than in the matched group (195 vs 160 minutes; $P = .016$). This reflected the significantly longer time required for prostatectomy and the longer anastomosis time (30 vs 25 minutes; $P = .003$). The need for bladder neck reconstruction was significantly higher in group 1 than in group 2 (80% vs 2%; $P < .001$). The mean estimated blood loss was significantly higher in group 1 than in group 2 (187 vs 116 mL; $P = .001$). The mean length of stay was similar between the 2 groups, as was the catheterization duration (median,

Table 1.
Patient Characteristics Before RARP

Characteristics	Group 1	Group 2	P
Patients (n)	25	36	
Previous surgery (n)			
TURP	20	—	
OP	5	—	
PCa (n)			
Incidental	10	—	
Delayed	15	—	
Age (y)			
Mean ± SD	63.2 ± 3.79	62.97 ± 3.65	0.814
Range	56–71	58–71	
BMI (kg/m^2)			
Mean ± SD	28 ± 2.36	27.61 ± 1.57	0.443
Range	24–34	24–31	
PSA (ng/mL)			
Mean	5.9 ± 3.94	5.59 ± 1.37	
Range	1–16	3–8	0.66
Preop IPSS, n (%)			
Mild (0–7)	13 (52)	24 (66.67)	
Moderate (8–19)	10 (40)	10 (27.78)	
Severe (20–35)	2 (8)	2 (5.56)	0.514
Preop potency, n (%)			
IIEF5 ≥17 potent	14 (56)	25 (69.44)	
IIEF5 <17 impotent	11 (44)	11 (30.56)	0.282
Preop Gleason score, n (%)			
6	21 (84)	28 (77.78)	
7	4 (16)	8 (22.22)	0.548
ASA classification, n (%)			
1	11 (44)	24 (66.67)	
2	14 (56)	12 (33.33)	0.078
Prostate volume (g)			
Mean ± SD	31.6 ± 19.2	33.42 ± 11.98	
Range	10–96	15–60	0.651
Clinical stage, n (%)			
T1a	7 (28)	0	
T1b	3 (12)	0	
T1c	15 (60)	36 (100)	
Organ confined disease, n (%)	25 (100)	36 (100)	
Extraprostatic extension, n (%)	0 (0)	0 (0)	
D'Amico risk, n (%)			
Low	18 (72)	29 (80.56)	
Intermediate	7 (28)	7 (19.44)	0.435
Preoperative continence (n)	25	36	

Table 2.
Intraoperative and Perioperative Data

Characteristics	Group 1	Group 2	P
Patients (n)	25	36	
Nerve sparing, n (%)			
Bilateral	21 (84)	34 (94.44)	
Unilateral	1 (4)	1 (2.78)	
Not performed	3 (12)	1 (2.78)	0.209
Estimated blood loss (mL)			
Mean ± SD	187 ± 95.18	116.67 ± 39.95	
Range	60–400	50–250	0.0001
Operation time (min)			
Mean ± SD	238.6 ± 67.6	203.6 ± 53.25	
Range	140–380	130–330	0.028
Console time (min)			
Mean ± SD	195.8 ± 62.21	160.56 ± 48.72	
Range	110–320	100–285	0.016
UV anastomosis time (min)			
Mean ± SD	30.8 ± 6.07	25.42 ± 7.11	
Range	20–40	15–40	0.003
Bladder neck reconstructions, n (%)	20/25 (80)	2/36 (5)	<0.001
Catheter time (d)			
Median	10	10	
Range	7–13	6–12	0.572
Length of stay (d)			
Mean ± SD	4.56 ± 1.33	4.56 ± 1.03	
Range	4–10	4–8	0.988
Pathological and Oncological Features After RARP			
Gleason score, n (%)			
6	17 (68)	23 (64)	
7	7 (28)	13 (36)	
8	1 (4)	0 (0)	0.412
Pathologic stage, n (%)			
T2a	5 (20)	5 (14)	
T2b	0	1 (3)	
T2c	19 (76)	26 (72)	
T3a	0	2 (6)	
T3b	1 (4)	2 (6)	0.641
Positive surgical margins, n (%)			
All	3 (12)	4 (11)	0.915
Biochemical recurrence	3 (12)	4 (11)	0.915

Table 3.
Perioperative and Postoperative Adverse Events

Event	Group 1	Group 2	Management
Minor (Clavien I–II) (n)			
Urinary leakage	3	1	Prolonged catheterization (>10 day)
UTI	1	3	Appropriate antibiotics
Ileus	0	1	Conservative
Hemorrhage	1	0	Transfusion
Major (Clavien III–IV) (N)			
Pulmonary embolism (n)	1	1	ICU referral
Anastomotic stricture (n)	4	1/36	Endoscopic incision
Totals, n (%)	10 (40)	7 (19)	

Data are the number of events.

10 days). No significant difference was found between the 2 groups in the pathologic stage or Gleason score. PSM rate in group 1 was 12%, and there were no significant differences between the 2 groups in PSM status (12% vs 11%; $P = .915$). After a follow-up of at least 12 months, PSA was elevated in 12% and 11.1% ($P = .915$) of groups 1 and 2, respectively (**Table 2**).

The overall complication rate was 40% in group 1 compared with 25% in group 2. Five major complications (Clavien class III–IV: 1 pulmonary embolism and 4 anastomotic stricture), and 5 minor complications occurred in group 1. Hemorrhage requiring transfusion occurred in 1 patient in group 1. In group 2, 4 major (1 hemorrhage, 1 pulmonary infection, 1 pulmonary embolism, and 1 anastomotic stricture) and 5 minor complications occurred. No rectal or bowel injuries occurred in any of the patients. We noted a greater rate of urinary leakage (pelvic drainage, >4 d) in group 1 (12% vs 2.8%). Anastomotic strictures (requiring endoscopic incision) developed 3 months to 2 y after surgery. The stricture rate was significantly higher in group 1 than in group 2 (16% vs 2.8%; $P < .05$) (**Table 3**).

Table 4 lists the postoperative functional results of both patient cohorts. In group 1, overall complete continence was achieved in 12 (48%), 18 (72%), 19 (76%), and 22 patients (88%) at the early and the 3-, 6-, and 12-month follow-ups, respectively. At the 12 month follow-up 1 (4%) and 2 (8%) patients complained about severe and mild UI, respectively. In group 2, overall complete continence was achieved in 19 (52%), 27 (75%), 29 (80%), and 30 (83%) patients at the early and the 3-, 6-, and 12-month follow-ups, respectively. At the 12-month follow-up, 6

(17%) patients complained about mild UI. Early and 3, 6, and 12 months after RARP, no statistically significant difference was found in continence rate between the 2 groups.

In group 1, of the 13 patients (52%) who were potent before surgery and in whom a bilateral nerve sparing procedure was performed, overall satisfactory erectile function was reported by 38 and 92% at the 6- and 12-month follow-ups, respectively. In group 2, of the 23 patients (64%) who were potent before surgery and in whom a bilateral NS procedure was performed, overall satisfactory erectile function was reported by 61 and 96% at the 6- and 12-month follow-ups. No difference was found in the potency rates after 12 months between the 2 groups (**Table 4**).

There were 5 patients in group 1 who had undergone OP before RARP. As expected, OP resulted in an increased incidence of surgically important adhesions, compared with TURP. The periprostatic reaction was not obvious, and cautery was enough for the dissection. OP cases requiring lysis of adhesions had longer console times (mean, 260 minutes; range, 190–320) and higher estimated blood loss (mean, 240 mL; range, 100–400), although they did not differ in perioperative, functional, or oncologic outcomes.

DISCUSSION

Most of the data used in the comparison of oncologic and functional outcomes in patients with and without previous TURP are derived from perineal, retropubic, laparoscopic, and endoscopic extraperitoneal RP studies. One common

Table 4.
Functional Outcomes in Patients Followed Up for 12 Months

Outcome	Group 1	Group 2	P
Patients	25	36	
Continence status, n (%)			
Early follow-up			
Complete	12 (48)	19 (52.78)	0.896
Mild	11 (44)	15 (41.67)	
Incontinent	2 (8)	2 (5.56)	
3-Month follow-up			
Complete	18 (72)	27 (75)	0.949
Mild	6 (24)	8 (22.22)	
Incontinent	1 (4)	1 (2.78)	
6–Month follow-up			
Complete	19 (76)	29 (80.56)	0.477
Mild	5 (20)	7 (19.44)	
Incontinent	1 (4)	0 (0)	
12-Month follow-up			
Complete	22 (88)	29 (80.56)	0.241
Mild	2 (8)	7 (19.44)	
Incontinent	1 (4)	0 (0)	
Potency status, n (%)	n = 13	n = 23	
6 Months	5 (38.46)	14 (60.87)	0.841
1 Year	12 (92.31)	22 (95.65)	0.196

disadvantage of these procedures is lacking the benefits provided by the robotic technique, such as enhanced visibility and dexterity, that allow easier access for the dissection of difficult tissue planes.[9–11,14–17]

Perforation of the prostatic capsule and extravasation of blood and irrigation fluid may lead to periprostatic fibrosis and distortion of the surgical planes during TURP. In addition, the cicatrization at the bladder neck after TURP pulls the ureteric orifices closer to the neck and causes difficulty in identifying the neck and orifices. In particular, the identification of the prostatovesical junction (influence anastomotic urinary leak and stricture) and preservation of adequate residual urethral length (influence long-term continence) appear to be the most difficult steps. Robotic technique provides 3-dimensional vision with ×10–15 magnification, but it may be difficult to find the ureteric orifices during the operation. Preoperative cystoscopic examination allows us to proceed with caution by checking the urethra, prostatic fossa, bladder neck and, most important, the position of the ureteric orifices and helps us

to catheterize both of them to avoid injury at the time of incision of the posterior bladder neck and during suturing of the anastomosis.

We did not observe a statistically significant difference between the 2 groups with respect to length of hospital stay or catheter removal time. However, we observed a significant difference in console time between the 2 groups that may have been caused by the obscured planes owing to the periprostatic inflammation and fibrosis from the previous BOO surgery that hindered dissection. In a study evaluating laparoscopic resection of the prostate (LRP) after TURP, Jaffe et al[9] reported the mean operative time in the TURP group (179 ± 44 minutes) to be longer than the in non-TURP group (171 ± 38 minutes) (P = .042). Colombo et al.[11] reported longer operative time in a study evaluating RRP after TURP and found a mean operative time of 135 ± 105 minutes in the TURP group vs 125 ± 85 minutes in the non-TURP group (P < .001). Eden et al.[14] similarly reported a mean operative time of 186.9 minutes in patients who underwent LRP after previous TURP or bladder neck incision. Martin et al[8] and

Gupta et al[7] in their RARP series, reported 200 and 189 minutes after transurethral resection and 186 and 166 minutes in surgery-naïve patients, respectively. With the expectation that the inflammation will subside in the meantime, our institutional policy is to wait for at least 3 months between TURP and RARP.

Mean estimated intraoperative blood loss was 187 ± 95 mL in group 1 vs 116 ± 39 mL in group 2 for RARP patients ($P = .001$). Gupta et al[7] noted higher blood loss in a study evaluating RARP after TURP. They found a mean blood loss of 494 mL in the TURP group vs 324 mL in the non-TURP group ($P < .001$).[7] In our patient groups, transfusion rates in each group of RARP were 0% (group 1) and 3% (group 2), respectively, relatively low compared with 11% in the Gupta et al.[7]

Previous OP can pose a significant barrier to minimally invasive procedures that is caused by adhesions and obliteration of the space of Retzius. Our operative results reveal that RARP after OP yields promising oncological and functional outcomes, although the procedures are slightly longer and are associated with a higher rate of blood loss. It is important to take the prostatectomy history into consideration when evaluating RARP outcomes, because patients who have undergone prostatectomy are at higher risk of complication. Suardi et al.[18] reported the feasibility of NS RRP for localized PCa after holmium laser enucleation of the prostate, TURP, or OP and found no significant difference in the continence rates among 3 groups.

Minor and major complication rates were not significantly different between our 2 groups. Minor complications were observed in 4 (16%) patients in group 1 compared with 6 (16.6%) in group 2. The most common minor complication was urinary leakage (12%) in group 1. A similar rate of urinary leakage was reported in patients who underwent RARP after previous TURP.[7] Jaffe and coworkers[9] reported that LRP after previous prostate surgery was associated with a significantly higher rate of anastomotic leakage (15.1%) compared to LRP without previous surgery (6.7%), possibly related to the presence of scarring and fibrosis of the previously resected bladder neck, which can lead to poor healing of the anastomosis in patients who have had prostatectomy.

Among the numerous factors associated with PSM frequency are surgical technique (procedure, ability, and experience), characteristics of the tumor (size, aggressiveness, and extension), and pathological analysis. In RARP series, PSM rates were not significantly different for patients who had undergone TURP.[6,7] Studies in LRP series similarly suggest no difference in oncological efficacy.[10,17] In our study, PSM rates were comparable between the 2 groups (12% group 1 vs 11% group 2). Reported overall

PSM rates varied between 6.25% and 22.2% after RALP in patients with previous prostate treatment.[6–8] The PSM rate of 12% in our study is comparable to that in other series.

Biochemical recurrence-free survival rate (88% vs 88.9%; respectively; $P = .915$) was not significantly different between groups 1 and 2 after a mean follow-up of 31.8 months (range, 12–55). The local recurrence rate was also similar in both groups. These results are consistent with a those of a series comparing 55 patients with and without previous TURP after LRP that showed no significant difference in the biochemical and local recurrence rates.[15]

In our study, the need for bladder reconstruction was significantly higher because of the wide bladder neck in patients with prior BOO surgery. In addition, the anastomotic stricture rate (16% vs 2.8%) was higher because of the technically more challenging anastomosis. The incidence of anastomotic stricture after RARP with a previous surgery has been reported in 1 study as 14%.[7] The possible cause of prolonged urinary leakage could be attributable to fibrosis and inflammation of the bladder neck, which was formerly operated on, and the vulnerable membranous urethra, resulting in poor healing of the anastomosis. The leakage may also have been related to the caliber of the reconstructed bladder neck and the amount of blood loss after RARP. In addition, the longer suture line may result in prolonged urinary leakage.

Yazici and colleagues[17] compared the effects of previous prostate surgery (TURP and suprapubic transvesical prostatectomy) on surgical, functional, and oncologic outcomes after RP with those of control subjects. The PSM rates were similar (20% in group 1 vs 16% in group 2); however, the 12 month continence rate was significantly higher in surgery-naïve patients (80% in group 1 vs 94% in group 2; $P < .05$). In the 1-year follow-up, 51% of the surgery-naïve patients and 30% of the patients with previous prostate surgery in the NS procedure subgroup reported satisfactory sexual intercourse. In this study, the authors did not compare the outcomes of erectile function between the 2 groups because of the limited number of NS procedures that had been performed in the group with past surgery. In our study, the difference in urinary continence status at 1 year after RARP did not reach a significant level between the 2 groups. In contrast, Colombo and colleagues[11] reported that the prevalence of postoperative complete UI and erectile function were obviously inferior in patients with a history of prostate surgery. Despite the equivalent continence rates between the 2 groups after 1 year, it is important to inform patients of the potential risk of delayed continence and the possibilities of early adjuvant medical treatment and physical therapy.

Potency is affected by multiple factors, including age, type and side of NS procedure, surgical technique, and preoperative potency status. Gupta and colleagues[7] did not find a significant difference in potency status after RARP between the group with previous surgery and the surgery-naïve group. In our study, the potency rate at 6 and 12 months were similar between the 2 groups. This finding is not surprising, because erectile dysfunction develops in approximately 6.5% of patients who have undergone TURP.[19]

These findings should be interpreted within the context of the limitations of our study. First, it was a retrospective analysis and the small number of patients limits the statistical power of the study. The design of our study, however, allowed us to assemble an ideal negative control group, matched to the study group for the major preoperative clinical variables. We are fully aware that our study provides only intermediate term (minimum, 12 months) functional results. The limited number of OP cases precluded the chance to perform reliable statistical analysis to elucidate any statistical significance.

RARP after TURP or OP is a challenging procedure with a long dissection time and considerable hemorrhage. Although anastomotic complications are a problem, perioperative, continence and short-term oncologic outcome is promising. Studies with high power and long term follow-up data including PSM status, anastomotic leakage and stricture rate, biochemical recurrence, continence, and potency are needed to thoroughly evaluate the impact of previous surgical prostate intervention when considering RARP.

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