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Robotic assisted laparoscopic radical prostatectomy following transurethral resection of the prostate: perioperative, oncologic and functional outcomes

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Purpose: The aim of this study was to assess surgical, oncologic and functional results after robotic-assisted laparoscopic radical prostatectomy (RALP) with and without previous transurethral resection of the prostate (TURP).

Methods: Between December 2005 and January 2010, 200 patients underwent RALP, of whom 16 (8%) had received previous TURP and 184 (92%) had not. Perioperative and postoperative data were compared between those with previous TURP (group 1) and those without previous TURP (group 2). All patients included in the study had at least 1-year follow-up.

Results: Preoperative clinical parameters were comparable between both groups. Group 1 patients were found to have significantly more need for bladder neck reconstruction (93.75 % vs. 15.21%, $P<0.001$), more rectal injury (18.75% vs. 0%, $P<0.001$), higher incidence of major complications (18.8% vs. 1.1%, $P<0.001$), and smaller specimen volume (31.63 mL vs. 45.49 mL, $P<0.001$) than group 2. The 12-month continence rate was 93.8 % in group 1 and 97.8% in group 2 ($P=0.344$). A nerve-sparing technique was significantly less successfully performed in group 1 patients than in group 2 (33.3% vs. 92.0 %, $P=0.001$).

Conclusions: Performing RALP for prostate cancer in patients who have had previous TURP is a technically demanding procedure and may be potentially associated with a higher perioperative major complication rate in short-term follow-up. Neurovascular bundle preservation is technically more challenging.

Keywords: Prostatic neoplasm, Prostatectomy, Robotics, Transurethral resection of prostate

INTRODUCTION

Incidental cancer of the prostate is found in 3%–16% of specimens from transurethral resection of the prostate (TURP) [1,2]. The results of open radical retropubic prostatectomy (RRP) or laparoscopic radical prostatectomy (LRP) for prostate cancer after previous TURP have been evaluated [3-11]. The reports are conflicting as to whether or not previous TURP worsens the prognosis after radical prostate surgery as a result of fibrous scarring and altering of tissue layers associated with difficult surgical procedures.

Since 2000, use of the da Vinci robotic system (Intuitive Surgical, Sunnyvale, CA, USA) has allowed the worldwide spread of RALP. The advantages of surgical robotics include three-dimensional visualization, seven degrees of freedom with instrument movement and absence of the fulcrum effect of conventional laparoscopy. However, limited data are available regarding robotic-assisted laparoscopic radical prostatectomy (RALP) after previous TURP [12-14]. In our previous study [15], we found that learning curve to decrease

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major complications of RALP is significantly decreased after 150 cases. Nevertheless, RALP in patients with previous TURP tended to be more technically difficult and potentially associated with more perioperative complications. Hence, the aim of the present study was to examine whether previous TURP affects the oncologic safety, functional efficacy and complication rates of RALP.

MATERIALS AND METHODS

1. Patients and procedure

From December 2005 to January 2010, 200 consecutive patients with prostate cancer underwent RALP by a single surgeon (Y.C.O.) at our institution. RALP was performed after a minimum of 6 weeks after biopsy and 12 weeks after TURP. Among 200 RALPs performed, 16 patients (8%) had received previous TURP (group 1) and 184 patients (92%) had not. Recorded preoperative clinical characteristics included age, body mass index (BMI), American Society of Anesthesiologists anesthetic/surgical risks class (ASA), prostate-specific antigen (PSA) levels, PSA density, biopsy percentage, biopsy Gleason score and clinical stage (using the 2002 American Joint Committee on Cancer stage).

Transperitoneal RALP was performed as previously described [15-17]. Dissection of the bilateral pelvic lymph nodes (BPLND) was usually performed and only excluded in low-risk patients with a low likelihood (<3%) of lymph node positivity. Neurovascular bundle (NVB) sparing procedures using the Vattikuti Institute Prostatectomy technique [18] were performed depending on preoperative tumour status and each patient's choice. For low risk patients, bilateral NVB preservation was tried. For intermediate risk patients, unilateral NVB preservation was tried. And no NVB preservation will be attempted for high risk patients. Urethrovesical anastomosis was made utilizing two 18-cm 3–0 Monocryl continuous stitches. An 18-French silicon Foley catheter with a 10-mL balloon was placed. The urinary bladder was then filled with 200 mL normal saline to check for watertight anastomosis.

Intraoperative and perioperative parameters were recorded for each surgery including performance of BPLND, type of NVB preservation (i.e., none, unilateral, bilateral), vesicourethral anastomosis time, surgeon's console time, estimated blood loss, transfusion rate and complications up to 180 days postoperatively. Console time was defined as the time interval while the surgeon was sitting at the surgical console using the daVinci system during the entire operation. Specimens were fixed, Indian ink-coated and serially perpendicular sectioned at 4-mm intervals. Oncologic results were recorded, including specimen volume, tumour volume, tumour percentage, Gleason score, positive surgical margin (PSM) rate, and nodal status. Perioperative complications over the 180-day postoperative period were evaluated and graded from grade 0 to grade V according to the Clavien-Dindo classification system [19]. Grade I to grade II were considered as minor complications, while grade III to grade V were classified as major complications.

Continence was defined as having no pad use. Potency was defined as achieving sufficient erection to intercourse with or without phosphodiesterase 5 inhibitor. Postoperative potency and continence data for up to 12 months were assessed and recorded. PSA or biochemical failure was regarded as two serial serum PSA results >0.2 ng/mL [20].

The preoperative, intraoperative, and postoperative data were collected, and the results were retrospectively compared between the patients with a history of resection (group 1) and those without previous TURP (group 2).

2. Statistical analysis

A retrospective cross-sectional evaluation of surgical, oncologic and functional results was made to compare groups 1 and 2. The SPSS ver. 12.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical analyses. Statistical analysis was carried out using the independent sample *t*-test & chi-square test. In all tests, $P<0.05$ was considered to indicate statistical significance.

RESULTS

As shown in Table 1, a total of 200 patient charts were reviewed, identifying 16 patients with previous TURP (group 1) and 184 without previous TURP (group 2). In group 1, there were three patients with benign pathology in the previous TURP specimens but prostate cancer was discovered during subsequent follow-up. The other 13 patients had prostate cancer incidentally identified in TURP chips. No significant differences were found between the two groups in age, BMI, ASA risk class, clinical stage, mean preoperative PSA level, free PSA, PSA density or Gleason grade from the biopsies. However, the biopsy percentage was higher in group 1 than in group 2 (33.4% vs. 21.6%, $P=0.003$).

Table 2 reveals the intraoperative data and complications. The need for bladder neck reconstruction was significantly greater in group 1 than in group 2 (93.75% vs. 15.21%, $P<0.001$). Rectal injury was higher in group 1 compared to group 2 (18.75% vs. 0%, $P<0.001$). More major complications occurred in group 1 than in group 2 (18.8% vs. 1.1%,

Table 1. Preoperative characteristics, preoperative variables during robotic-assisted laparoscopic prostatectomy in the two groups

Variable	TURP		*P*-value
	Group 1 (Yes, n=16)	Group 2 (No, n=184)	
Age (yr)	67.5±7.4	64.8±6.9	0.134
Body mass index (kg/m^2)	25.2±3.5	24.5±2.8	0.400
ASA physical status classification system			0.112
1	0 (0)	40 (21.7)	
2	14 (87.5)	128 (69.6)	
3	2 (12.5)	16 (8.7)	
PSA (ng/mL)	26.44±29.59	17.85±20.27	0.271
Free PSA (ng/mL)	3.51±4.71	2.02±2.20	0.080
PSA density	0.67±0.54	0.52±0.57	0.333
Biopsy percentage	33.4±26.0	21.6±20.5	0.032
Gleason score	6.63±1.02	6.59±1.08	0.892
Clinical stage			0.451
T1	8 (50.0)	71 (38.6)	
T2	8 (50.0)	101 (54.9)	
T3	0 (0)	12 (6.5)	

Values are presented as mean±standard deviation or number (%).
TURP, trans-urethral resection of prostate; ASA, American Society of Anesthesiologists; PSA, prostate-specific antigen.

Table 2. Patient perioperative data and complications using the Clavien classification system[a)]

Variable	TURP		*P*-value
	Group 1 (Yes, n=16)	Group 2 (No, n=184)	
Vesicourethral anastomosis (min)	32.6±19.9	30.3±10.2	0.432
Need for reconstruction of bladder neck	15 (93.75)	28 (15.21)	<0.001
Console time (hr)	3.16±1.74	2.95±0.78	0.367
Blood loss (mL)	145.0±161.4	183.2±18.06	0.416
Transfusion	0 (0)	7 (3.8)	1.000
BPLND	14 (87.5)	153 (83.2)	1.000
Complications	4 (25.0)	20 (10.9)	0.108
Clavien grade I	1 (25.0)	5 (25.0)	0.004
Clavien grade II	0 (0)	13 (65.0)	
Clavien grade III	1 (25.0)	2 (10.0)	
Clavien grade IV	2 (50.0)	0 (0)	
Minor (Clavien grade I–II)	1 (6.3)	18 (9.8)	<0.001
Minor (Clavien grade III–V)	3 (18.8)	2 (1.1)	
No complication	12 (75.0)	164 (89.1)	
Rectal injury	3 (18.75)	0 (0)	<0.001
Anastomosis stricture	0 (0)	2 (1.08)	1.000

Values are presented as mean±standard deviation or number (%).
TURP, trans-urethral resection of prostate; BPLND, bilateral pelvic lymph node dissection.
[a)]Clavien system: grade I, deviate from the normal postoperative course without treatment; grade II, drug or bedside treatment; grade III, endoscopic (IIIa) or surgical intervention (IIIb); grade IV, life-threatening problem, single organ (IVa) or multiorgan (IVb); grade V, death; minor, I–II; major, III–V.

Table 3. Patient postoperative and oncologic results

Variable	TURP		*P*-value
	Group 1 (Yes, n=16)	Group 2 (No, n=184)	
Foley catheter (day)	9.31±2.82	9.00±2.57	0.644
Postoperative stay (day)	4.19±2.01	3.77±2.26	0.477
Pathology stage			
pT2	4 (25.0)	74 (40.2)	0.128
pT3	10 (62.5)	104 (56.5)	
pT4	2 (12.5)	6 (3.3)	
Surgical margin positive	7 (43.8)	74 (40.2)	0.992
pT2	1 (25.0)	4 (5.4)	0.610
pT3	4 (40.0)	64 (61.5)	0.199
pT4	2 (100)	6 (100)	
Specimen volume (mL)	31.63±8.82	45.49±20.99	<0.001
Tumor volume	7.43±6.88	11.05±11.73	0.226
Tumor percentage	22.81±21.21	25.86±24.47	0.631
Pathology Gleason score			
2–4	0 (0)	2 (1.1)	0.179
5–7	16 (100)	151 (82.1)	
8–10	0 (0)	31 (16.8)	
Node positive	1 (6.3)	12 (6.52)	1.000
PSA failure	3 (18.8)	21 (11.4)	0.416

Values are presented as mean±standard deviation or number (%).
TURP, trans-urethral resection of prostate; PSA, prostate-specific antigen.

$P<0.001$). Console time, vesicourethral anastomosis time and surgical complication rate were slightly increased in group 1, although no statistically significant difference existed.

Outcome analysis is shown in Table 3. There was mild increase in the length of hospital stay and duration of bladder catheterization in group 1, but differences were not statistically significant. Mean prostate specimen volume was significantly greater in group 2 than in group 1 (31.63 mL vs. 45.49 mL, $P<0.001$).

The oncological outcomes are also reported in Table 3. Pathological stages were distributed similarly between the two groups. The combined, overall PSM rate for all patients regardless of pathologic stage was 43.8% and 40.2% in groups 1 and 2, respectively ($P=0.992$). The pathological Gleason score and node positive rate were similar in the two groups. During the first year after RALP, the PSA level was measured every 3 months in all patients; at 1 year after RALP three of 16 patients (18.8%) after TURP and RALP, and 21 of 184 (11.4%) after RALP only ($P=0.416$) had a PSA recurrence.

NVB preservation and functional results are presented in Table 4. The continence rate was slightly decreased in group 1 than in group 2 at 1 week, 1 month, 3 months, 6 months, and 12 months after RALP, although no statistically significant difference was observed. A nerve-sparing procedure

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Table 4. Functional results after RALP and neurovascular bundle preservation

Variable	TURP		*P*-value
	Group 1 (Yes, n=16)	Group 2 (No, n=184)	
Continence within			
1 Week	4 (25.0)	72 (39.1)	0.396
1 Months	9 (56.3)	114 (62.0)	0.855
3 Months	14 (87.5)	172 (93.5)	0.310
6 Months	15 (93.8)	179 (97.3)	0.398
12 Months	15 (93.8)	180 (97.8)	0.344
Attempt to NVB preservation	6 (37.5)	88 (47.8)	0.594
Successful NVB preservation	2 (33.3)	81 (92.0)	0.001
Incidence NVB preservation	2 (12.5)	81 (44.0)	0.029
Potency at 12 months	2 (100)	65 (80.3)	1.000
Bilateral NVB	2 (100)	48 (73.8)	1.000
Unilateral NVB	0 (0)	17 (26.2)	

Values are presented as number (%).
RALP, robotic-assisted radical prostatectomy; TURP, transurethral resection of prostate; NVB, neurovascular bundle.

was attempted in 37.5% of patients in group 1 and 47.8% in group 2, separately ($P=0.594$). Moreover, NVB preservation was successfully performed in only 33.3% of group 1 patients, compared with 92.0% of group 2 patients ($P=0.001$). The NVB seemed to be less able to be free from the prostatic capsule after previous TURP. In group 1, two patients had bilateral NVB preservation and had potency after 12 months. In group 2, 65 patients had potency after 12 months, including 17 who had unilateral NVB preservation and 48 who had bilateral NVB preservation.

DISCUSSION

After the introduction of PSA measurement and the increasing use of transrectal ultrasound-guided biopsies, the frequency of detected prostate cancer at prostate chips during TURP has decreased [21]. The results from different series of open, laparoscopic and robot-assisted prostatectomies after

Table 5. Surgical, oncologic and functional results after open radical retropubic prostatectomy (RRP), laparoscopic radical prostatectomy (LRP), extraperitoneal laparoscopic radical prostatectomy (ELRP) and robotic-assisted radical prostatectomy (RALP) with and without previous transurethral resection of the prostate (TURP) in the literature

Investigator	Technique	Perioperative outcome & complication rate	Oncological outcome	Functional outcome
Palisaar et al. [3]	RRP	No higher complication rate	Insignificantly higher PSM rate and PSA failure rate	Similar complete urinary control rate Similar potency rate when nerve preserved
Colombo et al. [4]	RRP	Longer operative time Increased morbidity rate	Insignificantly higher PSM rate and PSA failure rate	Less satisfactory functional results
Do et al. [6]	ELRP	Comparable perioperative outcome Higher complication rate	Comparable oncological outcome	Similar continence rate Lower potency rate
Teber et al. [7]	LRP	Longer operative time Comparable complication rate	Comparable oncological outcome	Delayed continence time Unaffected potency rate if nerve sparing
Menard et al. [8]	LRP	Worse perioperative outcome Higher surgical complicate rate	Comparable oncological outcome	Similar continence rate More difficult NVB preservation Similar potency rate when nerve preserved
Jaffe et al. [9]	LRP	Longer operative time, length of stay Higher overall complicate rate	Higher PSM rate	NR
Eden et al. [10]	LRP	Longer catheterization time No difference in complication rate	Similar PSM rate Similar biochemical recurrence rate	Delayed continence time No difference in erection rates
Martin et al. [12]	RALP	Longer catheterization time No difference in complication rate	Similar PSM rate	NR
Gupta et al. [13]	RALP	Greater blood loss and a need for bladder neck reconstruction	Higher PSM rate Higher biochemical recurrence rate	Higher incontinence rate
Zugor et al. [14]	RALP	More need for bladder neck reconstruction Longer operative time More minor complicate rate	Comparable PSM rate	Delayed continence and potency time
Present study	RALP	More need for bladder neck reconstruction More rectal injury and major complications More difficulty in the NVB preservation	Comparable PSM rate and PSA recurrence rate	Similar continence rate More difficult NVB preservation

PSM, positive surgical margin; PSA, prostate-specific antigen; NR, not recorded; NVB, neurovascular bundle.

TURP in the literature are summarized on Table 5. The effects of previous TURP on open RRP are controversial. Palisaar et al. [3] used a case-controlled design to match 62 cases (with previous TURP) with an equivalent number of controls (without previous TURP). Matching parameters included patient age, BMI, prostate volume, preoperative PSA level, Gleason score, pathological stage and nerve-sparing procedure. After complete 1-year follow-up, they reported that previous TURP does not cause a higher perioperative complication rate nor a worse functional result. The overall PSM rates and one-year biochemical recurrence rates were comparable in their study.

Colombo et al. [4] examined 109 patients who had RRP for prostate cancer, all of whom had previous operation for bladder outlet obstruction. Among 88 of these 109 patients, the previous intervention was TURP. They reported that RRP could be safely undertaken with slightly increased morbidity after previous prostate surgery, but erectile function and urinary continence were compromised in contrast to patients with no previous treatment.

The effect of previous TURP on LRP is also debated. Do et al. [6] stated that 100 of 2,300 patients had endoscopic extraperitoneal radical prostatectomy after previous TURP. That procedure is technically more challenging, but perioperative, functional and short-term oncologic outcomes are promising and are directly equal to outcomes without previous TURP. However, the potency results were inferior in the patients with previous TURP.

Teber et al. [7] described outcomes of LRP in clinical T1a and T1b prostate cancer. They reported that LRP is oncologically safe. The recovery to total continence was delayed, but the potency rates remained unaffected if a nerve-sparing procedure was executed. Menard et al. [8] revealed that LRP after TURP would not hinder the oncologic results, but that it was related to poorer intraoperative and postoperative outcomes. Also, NVB preservation was technically more difficult and negatively affected postoperative erectile function.

Jaffe et al. [9] described poorer surgical outcomes in men undergoing LRP after TURP, inclusive of operative time, length of stay, PSM rate, and overall complication rate but without mentioning the functional results. However, Eden et al. [10] reported the functional results after LRP in patients with previous bladder outlet surgery, and did not find any difference even in the nerve-sparing procedures.

As for RALP, few results are reported comparing RALP outcomes in patients with and without previous prostate treatment. Martin et al. [12] evaluated 24 patients receiving RALP who had a history of previous treatment to the prostate compared to 486 men without previous treatment and concluded that a history of previous treatment of the prostate does not seem to compromise the perioperative outcomes of RALP. Gupta et al. [13] compared outcomes of RALP in 26 patients with TURP to 132 cases of RALP without TURP and discovered a longer operating time, higher operative difficulty and hampered oncological or continence outcomes. Zugor et al. [14] used a match-paired analysis to compare 80 cases with previous TURP with an equivalent number of controlled patients and reported that technically more demanding, a prolonged operative time and time interval before continence and potency returns in patients with a previous TURP. But it can be safely performed without compromising functional results. Our results found significant increase in the need of bladder neck reconstruction, more rectal injury, major complications and difficulty in the NVB preservation procedure in the patients receiving RALP with previous TURP.

In the literature describing open RRP or LRP after TURP, most authors described the procedure as being more difficult [4-8]. Perforation of the prostatic capsule during TURP with extravasation of blood and irrigation fluid can result in periprostatic fibrosis and distortion of the surgical planes [4,5]. We observed increased need for bladder neck reconstruction, more vesicourethral anastomosis time, console time, catheter duration, hospital stay, major complication rate and less chance to successful NVB preservation in the patients who had previously undergone TURP, probably suggesting the suspicion that prior TURP does add to the complexity of RALP, although these did not reach statistical significance except for the need for bladder neck reconstruction, rectal injury, major complication rate and successful rate of NVB preservation.

In our experience, the three cases with rectal injuries occurred in cases #81, 125, 129, with none observed in the first 50 patients [22]. The operative difficulties were mainly encountered during identification of the anterior bladder neck, resection of the posterior part of the bladder neck and when starting dissection of the posterior plane of the prostate. Technical difficulties were also encountered during dissection of the apex and identification of the urethral stump; however, it is less likely to objectively quantify these parameters. To avoid rectal injury in RALP, dissection of the prostatic apex should be made carefully and sharply with cold scissors instead of an electrical energy source to prevent thermal damage. Also, the rectum should be hold posteriorly by the assistant during dissection the recto-urethral muscle from the posterolateral angle. In addition, it is mandatory to adequately incise the posterior layer of Denovillier's fascia to avoid false entry into the perirectal fat after completing dissection of both seminal

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vesicles. Previous TURP results in a wide bladder neck, which can sometimes be very close to the ureteral orifices, suggesting that these structures could be easily injured during dissection of the posterior bladder neck. In an attempt to visualize the ureteral orifices by insertion of double-J stents bilaterally, ureteral injury can be avoided [6]. In the first two cases of group 1, double-J stents were inserted to clearly identify the ureteral orifices; however, in the following cases, we were more confident to identify the ureteral orifices under direct vision from robotic laparoscope and did not insert double-J stents. A wider bladder neck also increased the time of bladder neck sparing and bladder neck reconstruction (tennis racket method) during vesicourethral anastomosis.

Do et al. [6] and Menard et al. [8] performed LRP at least 3 months after the TURP procedure since, by that time, the periprostatic inflammation caused by the TURP had probably subsided and conditions in the operative field would have been more favourable. Elder et al. [23] recommended that radical perineal prostatectomy should be performed during the first month after TURP or after a time interval of 4 months. In our series, RALP was routinely carried out after a minimum of 6 weeks post biopsy and 12 weeks post TURP.

A statistically significant difference was observed between group 1 and group 2 in this study in the weight of the prostatic specimens (31.63 mL vs. 45.49 mL, respectively, $P<0.001$). This result seems to be in contrast to the data from other reports [8,9]. Jaffe et al. [9] suggested that patients with a history of TURP have larger prostates that, after resection, are then similar to the size of prostates in men who did not undergo TURP. In our series, this result may be due to much more prostate tissue removed when TURP.

Oncological outcome is the primary end-point for patients with prostate cancer receiving radical prostatectomy. The technical difficulties did not seem to have much influence in the short-term oncologic outcomes after RALP for the patients with previous TURP, as shown by the overall PSM rate and the 1-year biochemical failure rate. In the current series, the PSM rate for pT2, pT3, and pT4 patients was 25%, 40%, and 100%, respectively, and the overall PSM rate was 43.8% in patients with previous TURP. Other series of LRP and RALP in patients with previous prostate treatment reported overall PSM rates of 6.25%–26.1% [6,8-10,12-14]. PSM frequency is influenced by surgical technique (procedure, ability and experience), tumour features (size, aggressiveness, extension) and pathological analysis [24]. PSM rates in our study seem to be higher compared to other series. This may be explained as a result of our surgical population having higher PSA results and a higher incidence of high-risk patients than in other series.

In terms of functional outcomes, our data revealed no statistical significance in continence and potency results among two groups. Although statistically significant differences were not observed in preoperative PSA levels and preoperative Gleason scores between the groups with and without previous TURP, the isolation and preservation of the NVBs was technically feasible in only 33.3% of patients after TURP, compared to 92.0% in the patients without previous TURP. The nerve sparing technique appeared to us to be more difficult in patients with previous TURP, and many investigators concur [4,6,8]. This difficulty results from greater tissue reaction and periprostatic fibrosis caused by fluid extravasation during TURP. However, we demonstrated that potency could be achieved if a nerve-sparing procedure was possible after previous TURP. The aetiology of erectile dysfunction after radical prostatectomy is multifactorial, and neurogenic factors and thermal injury seem to play a crucial role [8,25]. Therefore, a history of TURP should also be viewed as a risk factor for erectile dysfunction after RALP.

Patient age, preoperative International Prostate Symptom Score (IPSS) and anastomotic stricture development were considered to be independent risk factors for incontinence after radical prostatectomy [8,26]. Nevertheless, Kessler et al. [27] showed a significant effect of nerve-sparing surgery on urinary continence. We observed differences between the TURP and non-TURP groups with regard to the nerve sparing procedures, but the continence rates were somewhat lower in patients with previous TURP at 1 week, 1 month, 3 months, 6 months and 12 months after RALP, even though no significant differences were found.

The present study has several limitations and study results should be carefully interpreted. First and most important, this is a small series and there were significantly fewer patients in group 1 than in group 2. Second, this was a retrospective study and the time interval between TURP and RALP was not consistent, which could be an important variable, substantially contributing to the degree of periprostatic inflammation and scarring over time. Third, the technical difficulties, (e.g., identification of anterior bladder neck, resection of posterior part of bladder neck, and dissection of posterior plane of prostate) are hard to objectively quantify; therefore, is definitely a limitation of this study. Fourth, we know that the postoperative functional results should have employed validated questionnaires and that the lack of preoperative continence and erectile function status determination might introduce bias into the analysis. Fifth, a multi-institutional study with more long-term and large-scale data, including rates of PSA failure, continence and potency, are needed to examine the efficacy of RALP in the patients with previous TURP.

In conclusion, previous TURP represents a technical challenge for performing RALP, and the perioperative results, the incidence of major complications and short-term functional outcomes of RALP may be inferior to those of patients without TURP. NVB preservation is more technically demanding. We suggest that these potential risks should be clearly explained to patients with history of TURP who are candidates for RALP and the procedure should be handled by an experienced robotic surgeon.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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