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A Novel Surgical Technique for Preserving the Bladder Neck During Robot-Assisted Laparoscopic Radical Prostatectomy: Preliminary Results

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Abstract

Purpose: To describe our new surgical technique for preserving the bladder neck during robot-assisted laparoscopic prostatectomy (RALP) and to present the anatomy between the bladder neck and prostate.
Methods: Between December 2012 and May 2014, 52 RALPs were performed at our institute. Demographic, perioperative, and postoperative data were recorded. Quality of life (QoL) scores were assessed before RALP, after urethral catheter removal, and at the first month after RALP. Fatty connective tissue between bladder neck and prostate was introduced, and circular muscle fibers of the internal sphincter were seen in all patients. Complications were classified according to the Clavien-Dindo classification. Statistical analyses were performed.
Results: Mean follow-up was 9.6 ± 5.2 months; mean age was 61.1 ± 6.5 years. Our novel surgical technique for preserving the bladder neck was performed in 52 patients, and they were continent after catheter removal; mean duration of the catheter was 9.4 ± 1.4 days. There was a significant difference in QoL before RALP and after catheter removal, however, but there was no statistical difference between before and 1 month after RALP (respectively; $P < 0.001$, $P = 0.5$). Furthermore, there was no complication related to the bladder neck such as bladder neck stricture, acute/chronic urinary retention, as well as no Clavien III, IV, and V complications. In addition, conventional laparoscopy and/or open surgery was not needed in any of the RALP cases.
Conclusion: Our novel technique provided very early continence at the time of catheter removal after RALP within short-term follow-up. This can help early recovery and develop QoL scores after RALP.

Introduction

Robot-assisted laparoscopic prostatectomy (RALP) and laparoscopic radical prostatectomy (LRP) have become standards of minimally invasive surgical (MIS) treatment for patients with organ-confined prostate cancer (PCa).[1] Although superior functional outcomes have been described in the literature for MIS superiority in terms of early continence, outcomes are still controversial.[2] In addition, expensive equipment is still a problem for RALP.[3]

Quality of life (QoL) and functional results after RALP are at least as important as oncologic results. To date, considerable numbers of surgical techniques that aim to provide early continence after RALP have been described.[4–6] Most of these techniques are adaptations of open and laparoscopic surgical technique modifications. Nonetheless, these could not reach a rate of 100% continence at the time of catheter removal. Thus, late recovery of continence remains a problem.

In addition, there are some controversial data for preserving the bladder neck and its surrounding anatomy including the internal circular sphincter. Rocco and associates[4] reported benefits of posterior reconstructions, and Kalisvaart and colleagues[5] reported the benefits of anterior reconstruction for early continence after RALP. Furthermore, Hakimi and coworkers[6] reported the importance of urethral length for providing continence in RALP. On the other hand, Srougi and colleagues[7] stated that preserving the bladder neck did not provide any benefit after open radical prostatectomy (RP). It can be supposed that there still are data lacking on the surgical modalities and modifications for providing early continence after RP. In view of these reports and our limited surgical experience with long-term follow-up on RALP, we checked anatomic details for the relationship between the bladder neck and the prostate base.

The primary purpose of the present study was to describe our novel surgical technique including dissection technique for preserving the bladder neck during RALP. In addition, we

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introduced a novel anatomic area between the bladder neck and prostate.

Methods

This was a retrospective analysis of a prospective study. All patients were informed for the study, and signed consent forms were obtained. A Microsoft Office Excel spreadsheet was used for recording data. Our study is also part of a continuing RALP project in our institute. Exclusion criteria were irregular follow-up and lacking data.

Data collection

Between December 2012 and May 2014, 52 patients underwent RALP at our institute. Demographic data including age (years), comorbidities, body mass index (kg/m^2), American Society of Anesthesiologists score; preoperative data including prostate-specific antigen (PSA) (ng/mL), digital rectal examination findings, Gleason score in prostate biopsy, D'Amico classification,[8] hemoglobin level; perioperative data including operative time (minute), estimated blood loss (EBL), numbers of dissected lymph nodes, nerve-sparing status, numbers of blood transfusions, performed new surgical technique status; postoperative data including hospital stay, duration of catheter, continence status after catheter removal were recorded. In addition, Gleason score, positive surgical margin status, seminal vesicle invasion, and extracapsular extension were noted as pathologic data. The QoL assessment was performed before and after surgery. All complications were classified according to the Clavien-Dindo classification.[9] In the follow-up period, we recorded biochemical recurrence (BCR) and adjuvant therapies including hormone therapy (HT) and radiotherapy (RT).

The tumor, node, and metastasis (2009) staging system was used for clinical staging of PCa.[10] Potency was defined as an erection sufficient for intercourse, with or without medication. International Index of Erectile Functions (IIEF) questionnaires were completed by patients, before and after the surgery. Patients whose IIEF-5 scores ≤11 were accepted as having erectile dysfunction (ED).

Surgical technique

All patients underwent RALP by the transperitoneal route. We used a four-armed da Vinci® robotic surgical system (Intuitive Surgical, Inc., Sunnyvale, CA). Briefly, pnuemoperitoneum was created via carbon dioxide insufflation; then, trocars were placed. The bladder was seen, and the peritoneum under the bladder was incised. After seminal vesicles were dissected, the anterior (extraperitoneal) part of the bladder was dissected along the umbilical ligaments, and the bladder was reflected posteriorly to expose the region of the prostate. The adipose tissue anterior to the prostate and bladder neck was dissected and excised to provide clear visualization. The prostate was dissected in the Retzius space. After the bladder neck was preserved by our novel technique (described in detail below), then Hem-o-lok clips were placed on pedicles of the prostate, bilaterally. Bilateral nerves were spared, if applicable. Anastomosis between the urethral stump and the bladder neck was performed by 3/0 polydioxanone sutures, individually. Water resistance of the anastomosis was checked, and a drain was placed at the end of the RALP procedure.

A novel surgical technique for preserving the bladder neck

We identified an anatomic zone that comprises fatty connective tissues between the bladder neck and the prostate base (Fig. 1a).[11] To our knowledge and from reports in the literature, however, we were unable to find detailed information for this zone in anatomic references.[12]

Our novel surgical technique was started by determining the bladder, prostate, and the zone between prostate and bladder. An attempt to ''feel'' the bladder lumen was made by touching it with a robotic arm (Fig. 1b). Moreover, this area could be viewed by moving the urethral catheter backward and forward, gently. This area was filled by fatty connective tissue, and robotic scissors started dissection of the space (Fig. 1c). During the dissections, a robotic scissors was used, and the bladder was held by a Maryland bipolar forceps to help dissection. In this step, we reduced the energy of the monopolar scissors to 35 milliamps, and the space was exclusively dissected by monopolar scissors with its direction down at an approximately 20- to 30-degree angle (Fig. 1c).

Superficial vessels on the component that consisted of bladder and prostate were coagulated by Maryland bipolar forceps at the 12 o'clock position (Fig. 1d). Thus, we reduced possible bleeding from backflow. Meanwhile, superficial vessels on the bladder were coagulated by a closed monopolar scissors. Because of the lack of tactile sensation in RALP, the closed monopolar scissors was touching the base of the prostate safely during dissections (Fig. 1e). In addition, bipolar forceps was used for holding the bladder up or down at this step. After blunt dissection was performed, the urethra and the muscle fibers of the circular internal sphincter could be seen (Fig. 1f). At this step, the prostate was retracted by Maryland bipolar forceps.

Urinary continence status

The water resistance (or estanquity) of the anastomosis was assessed in the perioperative period by instilling 150 mL serum. In addition, patients were asked to fill out the self-administered modified International Continence Society questionnaires 1 month after RALP. Continence status was also evaluated by physical examination including Valsalva or cough stress test. Patients without urine leakage during coughing or sneezing, as well as those who stayed totally dry, were considered as continent. Patients who were consistently dry but had to use a safety pad occasionally during normal daily activity (walking, physical exercising, etc.) were also considered as continent. Those who used more than one protective pad per day and/or had urine leakage during coughing, sneezing, or during the night were considered incontinent.

Patients continent immediately after catheter removal were deemed as very early continent, and those who were continent 1 month after RALP were categorized as early continent. The rest of patients were defined as late continent.

All patients completed the SF-12 QoL form of the World Health Organization before surgery, at the time of catheter removal, and 1 month after RALP.[13]

Moreover, the accurate anatomic structure between bladder neck and prostate was also investigated in histopathology sections under the microscope with hematoxylin and eosin staining.

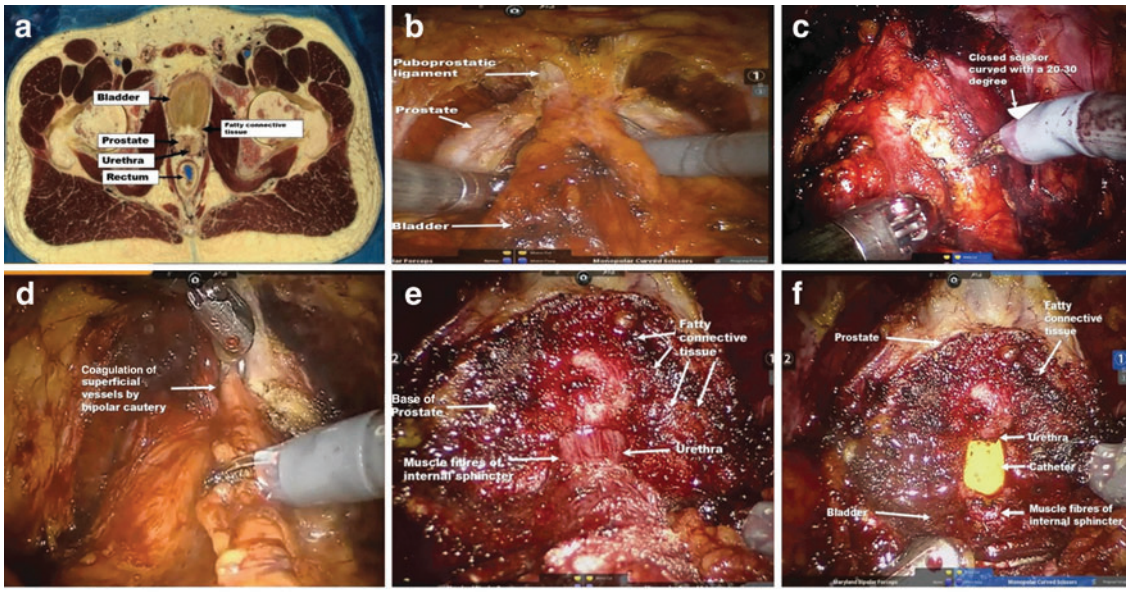

FIG. 1. Description of our novel surgical technique, and the space that consists of fatty connective tissue between the bladder neck and the prostate. Key points of our technique were reviewed for preserving the bladder neck during robot-assisted laparoscopic prostatectomy. (**a**) Cadaveric slides of pelvic area; arrows show the space between the bladder neck and prostate (adapted with permission from U.S. National Library of Medicine[11]). (**b**) At the beginning of the procedure, bladder, prostate, and components of them could be seen and touched with robotic arms; arrows show the anatomic points. (**c**) Dissection was performed with monopolar scissors while it was closed with an approximately 20- to 30-degree curve and electrical power of 35 milliamps. (**d**) Coagulation was performed to superficial vessels that were on the component of the bladder and prostate. (**e**) Dissections were performed while scissor was touching the base of the prostate. (**f**) Muscle fibers of the internal sphincter and urethra were exposed by dissections; arrows show urethra and internal sphincter.

Statistical analysis

The independent samples *t* test and paired samples *t* test were used for statistical analysis. Continuous variables were compared using the analysis of variance test between groups. The Statistical Package for the Social Sciences for Windows 16.0 (SPSS Inc., Chicago, IL) was used for statistical analysis. Statistical significance was accepted at $P < 0.05$.

Results

A total of 52 patients were enrolled in the present study. Mean age was 61.1 ± 6.5 years. Mean follow-up was 9.6 ± 5.2 months. Mean preoperative PSA level was 8.3 ± 6.9 ng/dL, and mean Gleason score was 6.5 ± 0.7. Mean body mass index (BMI) was 25.9 ± 4.4kg/m^2. Preoperative clinical stage and classification of the cases according to the D'Amico risk classification are presented in Table 1.

The mean operative time was 76.7 ± 24.5 minutes, and mean EBL was 48.4 ± 16.2 mL. We used aspiration collector bags for every patient. The level of blood in the bag was used as the EBL before anastomosis, checking by saline irrigation at the end of procedure. The nerve-sparing procedure was performed in 43 (82.6%) cases, respectively; 3 left, 7 right, and 33 bilateral. Our new surgical technique could be performed in all procedures. Mean dissection time for the space by our technique was 5.3 ± 1.1 minutes. Mean anastomosis time for bladder neck and urethral stump was 13.3 ± 1.1 minutes. These data are summarized in Table 1. In addition, there was no need for blood transfusion during the operations as well as in postoperative period.

Table 1. Demographic, Pre-Operative, and Operative Data of Patients

Parameter	*Value*
Mean age (y)	61.1 ± 6.5
Mean follow-up (mos)	9.6 ± 5.2
Mean ASA score	2 ± 0.6
Mean BMI (kg/m^2)	
Preoperative mean PSA (ng/dL)	8.3 ± 6.9
Mean preoperative Gleason score	6.5 ± 0.7
T_{1c} (*n*, %)	24 (46.1%)
T_{2a} (*n*, %)	2 (3.8%)
Preoperative T score	
T_{2b} (*n*, %)	14 (26.9%)
T_{2c} (*n*, %)	8 (15.3%)
T_{3a} (*n*, %)	4 (7.6%)
D'Amico classification	
Low risk (*n*,%)	15 (28.8%)
Middle risk (*n*,%)	24 (46.1%)
High risk (*n*,%)	13 (25%)
Preoperative mean Hb level	13.4 ± 3.1
Mean operative time (min.)	76.7 ± 24.5
Mean EBL (mL)	48.4 ± 16.2
Nerve sparing surgery	
Left (*n*,%)	3 (5.7%)
Right (*n*,%)	7 (13.4%)
Bilateral (*n*,%)	33 (63.4%)
Mean dissection time for Tunc space (min)	5.3 ± 1.1
Mean anastomosis time (min)	13.3 ± 1.1

ASA = American Society of Anesthesiologists; BMI = body mass index; PSA = prostate-specific antigen; Hb = hemoglobin; EBL = estimated blood loss.

Table 2. Postoperative and Pathology Data of Patients

Parameter	*Value*
Mean hospital stay (d)	2.7 ± 0.6
Duration of urethral catheter (d)	9.4 ± 1.4
Urinary incontinence after catheter removal (*n*, %)	-
Mean postoperative Gleason score	6.9 ± 0.8
Pathologic T level	
T_{2a} (*n*, %)	15 (28.8%)
T_{2b} (*n*, %)	5 (3.6%)
T_{2c} (*n*, %)	16 (30.7%)
T_{3a} (*n*, %)	8 (15.3%)
T_{3b} (*n*, %)	8 (15.3%)
PSM (*n*, %)	1 (2.2%)
Seminal vesicle extension (*n*, %)	8 (15.3%)

PSM = positive surgical margin.

The mean time for urethral catheter removal in all patients was the ninth day after surgery, and continence status was observed. We did not perform cystography, because the anastomosis between the urethral stump and bladder neck was performed using 12–13 single stitch.

There was no case of urinary incontinence after catheter removal. Additional assessment was performed 1 month after RALP, and the result was similar. There were 36 cases with T_2 and 16 cases with T_3 classification, according to pathology data (Table 2).

There was a statistically significant difference in QoL scores between the preoperative and after the catheter removal period ($P < 0.001$). There was no statistical significant difference in the QoL score between the preoperative period and 1 month after RALP ($P = 0.5$). The QoL scores are summarized in Table 3.

A similar procedure could be performed in all patients in terms of the anatomic landmark found in all 52 patients. Maximum preservation of the bladder neck could be performed. In some cases, however, additional maneuvers were needed. When three patients had a middle lobe, we could dissect the bladder neck more carefully and could see the muscle fibers of the internal sphincter. In addition, in four patients who had previously undergone transurethral resection of the prostate (TURP), there were some difficulties in recognizing the space between the bladder neck and prostate. We could recognize this, however, and the anatomic space was introduced in these patients. Anterior and posterior reconstructions were not performed in any procedure.

There was 1 (1.9%) BCR and 1 adjuvant HT and 2 RT (because of positive margins) were needed. One month after RALP, 9 patients had a spontaneous erection and 11 patients had erections with oral phosphodiesterase type 5 inhibitor drugs. In addition, patients who had ED underwent penile rehabilitation with oral phosphodiesterase type 5 inhibitors. In the follow-up period, there was no death from cancer or other causes.

Table 3. Quality of Life Scores of Patients at Intervals of Time for Surgery

Parameters	*Before RALP*	*After catheter removal*	*1 month after surgery*	P *value*
Mean QoL	2.3 ± 1	3.6 ± 1	2.6 ± 1.1	< 0.001*

*Statistically significant *P* value.
RALP = robot-assisted laparoscopic prostatectomy; QoL = quality of life.

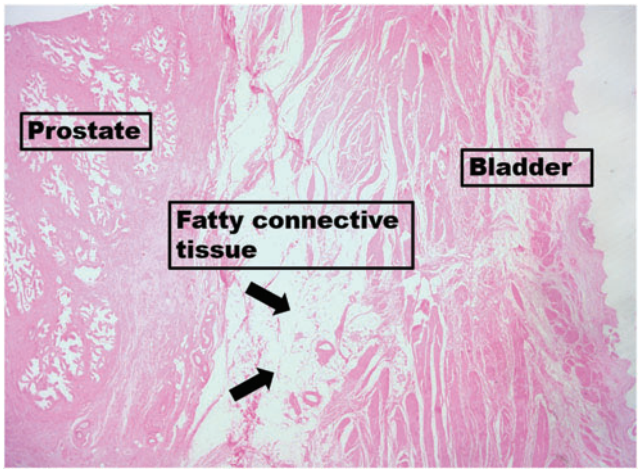

FIG. 2. The muscularis propria of the bladder merges with the prostate, and there was connective tissue that consisted of adipose tissue between them (hematoxylin and eosin, ×12.5). Arrows show the space that consists of fatty connective tissue.

There was no Clavien-Dindo class III, IV, and V complications. The most common complication was postoperative fever (in seven patients, 13.4%). This was treated by oral antipyretics. Two (3.8%) patients had wound infection in the trocar place. Furthermore, there was no complication related to bladder neck anastomosis, such as bladder neck stricture and acute/chronic urinary retention, in the follow-up.

In addition, glands of the prostate, bladder epithelium, lamina propria, and muscularis propria in the bladder were identified under light microscopy with hematoxylin and eosin staining, respectively (Fig. 2). The muscularis propria was merged with the prostate, but the connective tissue between them consisted of adipose tissue (Fig. 2).

Discussion

The oncologic safety of minimally invasive surgical treatment options such as RALP and LRP would have been questioned a decade ago.[14,15] Although RALP can be accepted as oncologically safe, some functional results have come into question recently.[16] Continence and erectile function are the main aspects of functional outcomes in patients who undergo RALP, and these are strongly associated with QoL.[17] Published studies have shown that urinary continence could be provided in long-term follow-up after RALP. Time to regain continence affects QoL in patients who undergo RALP, however. There are some well-known surgical techniques for providing early continence including bladder neck preservation, anterior and posterior reconstruction.[18,19] Most of these have been adapted from open surgical techniques to robotic surgical procedures. Despite all of these, there has not been a surgical technique to provide continence after urethral catheter removal.

In light of data above, we would like to introduce our novel surgical technique for preserving the bladder neck by presenting new anatomic details between the bladder neck and prostate. According to our new technique, very early continence could be provided when the urethral catheter is removed after RALP.

In the present series, short-term outcomes other than urinary continence were consistent with those of previous studies.[20,21] Urinary continence was present at catheter removal in all patients, and this may be because of the systematic approach that we have developed for dissecting the prostate and bladder neck. Recently, Brunocilla and associates[22] mentioned the importance of preserving the internal sphincter after open RP for early continence. Our series was in the same line with these investigators. Furthermore, our RALP series had some superiorities to the series by Brunocilla and colleagues,[22] in that no patient was incontinent after catheter removal. This may be a reflection of the minimally invasive technique of RALP; however, they introduced open RP series.[22]

Lee and coworkers[23] described a technique for bladder neck preservation during RALP. They described the importance of bladder neck preservation for early continence. Our results and the aim of the surgical technique were parallel to those of these investigators, but our series had some differences in that we did not cut the bladder neck. Besides, we performed dissections in all patients without distinction.

We strongly believe that our technique can be a part of modified bladder neck preservation. The key point for our technique was to dissect the space that consists of fatty connective tissue between the bladder neck and prostate. In addition, the nature of the space is without blood vessels. Therefore, bloodless dissections could be performed, and these could be faster during RALP procedures. The internal sphincter could be also preserved, and this helped to provide continence after catheter removal. In addition, to our knowledge, there are no published series that describe preservation of the internal sphincter during RALP. At the same time, we introduced a new anatomic area for our surgical technique. This may bring to mind a question as to whether we know the accurate surgical anatomy of the pelvic area or not. This may be another subject for a future study.

Quick recovery of QoL could be obtained in our series.[24] The erectile function rate of our study group was similar to that of published series, and very early continence status could improve QoL scores. At 1 month after surgery, and mean QoL score was similar to the score of the preoperative period. Nerve-sparing status may help these scores, but, in our opinion, all of them may be a reflection of our new surgical technique. Some technical difficulties were observed for performing our technique in cases of previous TURP and middle prostate lobe procedures. Zugor and associates[25] reported the safety of RALP in patients with previous TURP. In addition, Martinschek and colleagues[26] reached a similar conclusion with a matched pair study. Our results were similar to those of these studies. In addition, the continence status and pathological results of these patients were similar to other studies.[27]

There were a few high-risk patients according to D'Amico risk classification, however, and also there was no clinical T_3 patient in our study group. There were 16 T_3 (8 patients with T_{3a} and 8 patients with T_{3b}) patients according to pathologic results. These may be a reflection of understaging.[28,29] Nevertheless, these did not seem to influence continence status and applicability of our technique. The patient group was accepted as having organ-confined PCa before undergoing RALP. Patient selection bias may be a limitation of our study.

Complication rates of our series were comparable to those in the literature.[30] Surprisingly, there was no recorded complication associated with the bladder neck, such as bladder neck stricture and urinary retention. This may be a highlighted point of our technique.

There were some limitations in the present series, including the retrospective pattern and low number of patients. Nonetheless, we would like to introduce our novel surgical technique in the light of a new anatomic description.

The goal of our study was to provide very early continence after RALP without any complications when the catheter was removed. This technique also seems applicable in patients with high-risk PCa. Moreover, quick recovery in QoL scores may be another benefit of our novel surgical technique.

Conclusion

RALP can be performed safely in patients with PCa. Urinary continence can be provided by performing our technique. When the catheter was removed after RALP, there were no urinary and/or bladder neck complications in short-term follow-up. Thus, quick recovery in QoL scores can be obtained as a reflection of very early continence after RALP. The highlighted findings of the study should be confirmed by multicenter studies with high-volume study groups.

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Disclosure Statement

No competing financial interests exist.

References

1. Merseburger AS, Herrmann TR, Shariat SF, et al. EAU guidelines on robotic and single-site surgery in urology. Eur Urol 2013;64:277–291.
2. Hurtes X, Rouprêt M, Vaessen C, et al. Anterior suspension combined with posterior reconstruction during robot-assisted laparoscopic prostatectomy improves early return of urinary continence: A prospective randomized multicentre trial. BJU Int 2012;110:875–883.
3. Bolenz C, Freedland SJ, Hollenbeck BK, et al. Costs of radical prostatectomy for prostate cancer: A systematic review. Eur Urol 2014;65:316–324.
4. Rocco B, Cozzi G, Spinelli MG, et al. Posterior musculofascial reconstruction after radical prostatectomy: A systematic review of the literature. Eur Urol 2012;62:779–790.
5. Kalisvaart JF, Osann KE, Finley DS, Ornstein DK. Posterior reconstruction and anterior suspension with single anastomotic suture in robot-assisted laparoscopic radical prostatectomy: A simple method to improve early return of continence. J Robot Surg 2009;3:149–153.
6. Hakimi AA, Faleck DM, Agalliu I, et al. Preoperative and intraoperative measurements of urethral length as predictors of continence after robot-assisted radical prostatectomy. J Endourol 2011;25:1025–1030.

7. Srougi M, Nesrallah LJ, Kauffmann JR, et al. Urinary continence and pathological outcome after bladder neck preservation during radical retropubic prostatectomy: A randomized prospective trial. J Urol 2001;165:815–818.
8. D'Amico AV, Moul J, Carroll PR, et al. Cancer-specific mortality after surgery or radiation for patients with clinically localized prostate cancer managed during the prostate-specific antigen era. J Clin Oncol 2003;21:2163–2172.
9. Hruza M, Weiss HO, Pini G, et al. Complications in 2200 consecutive laparoscopic radical prostatectomies: Standardised evaluation and analysis of learning curves. Eur Urol 2010;58;733–741.
10. van der Kwast TH, Amin MB, Billis A, et al; ISUP Prostate Cancer Group. International Society of Urological Pathology (ISUP) Consensus Conference on Handling and Staging of Radical Prostatectomy Specimens. Working group 2: T2 substaging and prostate cancer volume. Mod Pathol 2011;24:16–25.
11. Available at www.nlm.nih.gov/research/visible/tools.html Accessed: May 29, 2014.
12. Eastham JA, Jarrard DF. Nerve-sparing radical retropubic prostatectomy: In: Scardino PT, Slawin KM, eds. Atlas of the Prostate. Philadelphia: Current Medicine LLC, 2006, pp 145–162.
13. Available at www.sf-36.org/demos/SF-12.html Accessed: June 15, 2014.
14. Yuh B, Artibani W, Heidenreich A, et al. The role of robot-assisted radical prostatectomy and pelvic lymph node dissection in the management of high-risk prostate cancer: A systematic review. Eur Urol 2014;65:918–927.
15. Thompson JE, Egger S, Böhm M, et al. Superior quality of life and improved surgical margins are achievable with robotic radical prostatectomy after a long learning curve: A prospective single-surgeon study of 1552 consecutive cases. Eur Urol 2014;65:521–531.
16. Montorsi F. Robotic prostatectomy for high-risk prostate cancer: Translating the evidence into lessons for clinical practice. Eur Urol 2014;65:928–930.
17. Acar C, Schoffelmeer CC, Tillier C, et al. Quality of life in patients with low-risk prostate cancer. A comparative retrospective study: Brachytherapy versus robot-assisted laparoscopic prostatectomy versus active surveillance. J Endourol 2014;28:117–124.
18. Brien JC, Barone B, Fabrizio M, Given R. Posterior reconstruction before vesicourethral anastomosis in patients undergoing robot-assisted laparoscopic prostatectomy leads to earlier return to baseline continence. J Endourol 2011;25:441–445.
19. Tan G, Srivastava A, Grover S, et al. Optimizing vesicourethral anastomosis healing after robot-assisted laparoscopic radical prostatectomy: Lessons learned from three techniques in 1900 patients. J Endourol 2010;24:1975–1983.
20. Novara G, Ficarra V, D'Elia C, et al. Trifecta outcomes after robot-assisted laparoscopic radical prostatectomy. BJU Int 2011;107:100–104.
21. Ficarra V, Novara G, Artibani W, et al. Retropubic, laparoscopic, and robot-assisted radical prostatectomy: A systematic review and cumulative analysis of comparative studies. Eur Urol 2009;55:1037–1063.
22. Brunocilla E, Schiavina R, Pultrone CV, et al. Preservation of the smooth muscular internal (vesical) sphincter and of the proximal urethra for the early recovery of urinary continence after retropubic radical prostatectomy: A prospective case-control study. Int J Urol 2014;21:157–162.
23. Lee Z, Sehgal SS, Graves RV, et al. Functional and oncologic outcomes of graded bladder neck preservation during robot-assisted radical prostatectomy. J Endourol 2014;28:48–55.
24. Willis DL, Gonzalgo ML, Brotzman M, et al. Comparison of outcomes between pure laparoscopic vs robot-assisted laparoscopic radical prostatectomy: A study of comparative effectiveness based upon validated quality of life outcomes. BJU Int 2012;109:898–905.
25. Zugor V, Labanaris AP, Porres D, Witt JH. Surgical, oncologic, and short-term functional outcomes in patients undergoing robot-assisted prostatectomy after previous transurethral resection of the prostate. J Endourol 2012;26:515–519.
26. Martinschek A, Heinzelmann K, Ritter M, et al. Radical prostatectomy after previous transurethral resection of the prostate: Robot-assisted laparoscopic versus open radical prostatectomy in a matched-pair analysis. J Endourol 2012; 26:1136–1141.
27. Jung H, Ngor E, Slezak JM, et al. Impact of median lobe anatomy: Does its presence affect surgical margin rates during robot-assisted laparoscopic prostatectomy? J Endourol 2012;26:457–460.
28. Gözen AS, Akin Y, Ates M, et al. Impact of laparoscopic radical prostatectomy on clinical T3 prostate cancer: Experience of single center with long term follow-up. BJU Int 2014 Feb 27. Epub ahead of print.
29. Akin Y, Avci E, Gulmez H, et al. Indications for intraoperative frozen section in robot assisted radical prostatectomy: A pilot study. Eur Rev Med Pharmacol Sci 2013;17:2523–2529.
30. Tewari A, Sooriakumaran P, Bloch DA, et al. Positive surgical margin and perioperative complication rates of primary surgical treatments for prostate cancer: A systematic review and meta-analysis comparing retropubic, laparoscopic, and robotic prostatectomy. Eur Urol 2012;62:1–15.

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Abbreviations Used

BCR = biochemical recurrence
EBL = estimated blood loss
ED = erectile dysfunction
HT = hormone therapy
IIEF = International Index of Erectile Functions
LRP = laparoscopic radical prostatectomy
MIS = minimally invasive surgery
PCa = prostate cancer
PSA = prostate-specific antigen
QoL = quality of life
RALP = robot-assisted laparoscopic prostatectomy
RP = radical prostatectomy
RT = radiotherapy
TURP = transurethral resection of the prostate