

## Laparoscopic Radical Prostatectomy: Omitting a Pelvic Drain

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### ABSTRACT

*Purpose:* Our goal was to assess outcomes of a selective drain placement strategy during laparoscopic radical prostatectomy (LRP) with a running urethrovesical anastomosis (RUVA) using cystographic imaging in all patients.

*Materials and Methods:* A retrospective chart review was performed for all patients undergoing LRP between January 2003 and December 2004. The anastomosis was performed using a modified van Velthoven technique. A drain was placed at the discretion of the senior surgeon when a urinary leak was demonstrated with bladder irrigation, clinical suspicion for a urinary leak was high, or a complex bladder neck reconstruction was performed. Routine postoperative cystograms were obtained.

*Results:* 208 patients underwent LRP with a RUVA. Data including cystogram was available for 206 patients. The overall rate of cystographic urine leak was 5.8%. A drain was placed in 51 patients. Of these, 8 (15.6%) had a postoperative leak on cystogram. Of the 157 undrained patients, urine leak was radiographically visible in 4 (2.5%). The higher leak rate in the drained vs. undrained cohort was statistically significant ( $p = 0.002$ ). Twenty-four patients underwent pelvic lymph node dissection (8 drained, 16 undrained). Three undrained patients developed lymphoceles, which presented clinically on average 3 weeks postoperatively. There were no urinomas or hematomas in either group.

*Conclusions:* Routine placement of a pelvic drain after LRP with a RUVA is not necessary, unless the anastomotic integrity is suboptimal intraoperatively. Experienced clinical judgment is essential and accurate in identifying patients at risk for postoperative leakage. When suspicion is low, omitting a drain does not increase morbidity.

**Key words:** prostatectomy; urinoma; laparoscopy; complications; drainage; surgical anastomosis

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### INTRODUCTION

Acceptance of the laparoscopic radical prostatectomy (LRP) since its inception, and later its robotic counterpart, has been motivated by a drive to minimize perioperative morbidity. Room for improvement still exists, with the hope that minor technical adjustments will further decrease morbidity. The following editorial remark accompanies a 1996 article addressing the morbidity of drains following radical retropubic prostatectomy (RRP): “anything

that reduces patient discomfort deserves consideration” (1).

Savoie et al. first suggested a pelvic drain might be omitted following an open RRP in an analysis of 116 consecutive cases (2). These same authors updated this concept with 552 patients, arriving at the same conclusion (3). In a recent comprehensive review of published LRP literature, drain placement was not addressed (4), since published series seldom report this detail. In many centers, pelvic drainage remains a routine part of open and minimally invasive

prostatectomy. We hypothesized that improved optical magnification and a running urethrovesical anastomosis (RUVA) may obviate routine pelvic drainage. We assessed the relationship between pelvic drainage and postoperative complications in a consecutive series of 268 LRP in which routine postoperative cystography was performed in all patients, regardless of drain status.

## MATERIALS AND METHODS

Laparoscopic radical retropubic prostatectomy (LRP) was performed on 268 patients at the Lahey Clinic Medical Center between January 2003 and December 2004. Two hundred and eight patients were identified in whom an RUVA was performed. Complete preoperative, operative, and post-operative patient information was obtained from a combination of a prospective database maintained by the Department of Urology Clinical Research Assistants and from a retrospective chart review. The age, comorbidities, prostate specific antigen (PSA), Gleason score, clinical stage, estimated blood loss, blood transfusions, pelvic lymph node dissection (PLND), pathological stage, pathological Gleason score, prostate size, intravenous narcotic use, length of stay, and complications were recorded. The body mass index (BMI) was calculated from the preoperative height and weight documented in the anesthesia report. The operative time was calculated from incision start time to procedure end time as recorded in the operative nursing report. Narcotic use was calculated to be the sum of intravenous narcotics recorded by the nursing staff and administered via patient controlled analgesic or on an as needed basis. Different narcotic medications were converted to morphine equivalents for comparison.

All patients underwent either a transperitoneal or extraperitoneal LRP as described previously (5,6) by a single surgeon (IT). When nerve sparing was indicated and technically feasible, this was performed using a harmonic scalpel (Ethicon Endo-Surgery). Lymphadenectomy included the external iliac and obturator lymph nodes. The anastomosis was performed with two 2-0 monocryl sutures each with a polydioxanone absorbable suture clip Lapra-

Ty™ on one end. The first suture was placed at the 5:30 position, and 2 - 3 running stitches were made in the counterclockwise direction. The second suture was placed at the 6:30 position, and 2 - 3 running stitches made in the clockwise direction. Therefore, prior to cinching the sutures, at least 4 to 6 running stitches were placed. Therefore, the initial tension is distributed over 4 - 6 stitches instead of 1. Then the sutures were continued in a running manner in their appropriate direction until they meet at the anterior aspect of the anastomosis and tied together with an intracorporeal knot.

Anastomotic integrity was tested by distending the bladder with approximately 200 mL of saline, prior to inflating the Foley balloon. A Jackson-Pratt closed suction or Penrose drain was placed at the discretion of the senior surgeon (IT) when a leak was visualized at the anastomosis or a complex bladder neck reconstruction was performed. Indications for drain placement were obtained from the operative report. When omitted from the operative report, the indication was recorded as unspecified. The drain was placed in close proximity to the anastomosis. If drainage was less than 50 cc per 8-hour shift, the drain was removed. A routine cystogram was performed within the first 7 postoperative days in 90% of patients. The remaining patients had a cystogram prior to postoperative day (POD) 14 due to scheduling difficulties.

Patients were seen postoperatively at 1 week, 5 weeks, 3 months, 6 months, 9 months, and 1 year in follow-up. The Foley catheter was removed on POD 7 if the cystogram showed no evidence of leak, defined as any amount of contrast extravasation. Patients were asked a series of questions to screen for symptomatic intra-abdominal collections, and complete abdominal examination was performed. Directed radiographic imaging was performed when warranted by clinical symptoms. The primary endpoint was the incidence of early postoperative complications: urine leak, urinoma, lymphocele, and hematoma.

Fisher's exact test was used to analyze the association between categorical data: (1) urine leak and drain placement, (1) urine leak and surgical approach, and (3) drain placement and performance of PLND. Two-tailed p values were reported. Unpaired t-test was used to compare mean values between the drained and undrained groups for the following parameters:

age, PSA, biopsy Gleason, pathologic Gleason, BMI, prostate size, operative time, estimated blood loss, morphine equivalents used, and length of stay. The chi-square test was used to compare the distribution of clinical and pathologic stage between both groups.

## RESULTS

A total of 208 patients underwent LRP with a RUVA between January 2003 and December 2004.

The drained and undrained groups did not differ with respect to age, preoperative PSA, biopsy Gleason sum, pathologic Gleason sum, BMI, clinical stage, pathologic stage, or prostate size (Table-1).

The operative and post-operative data demonstrated a statistically significant difference between the drain and undrained groups in regards to operative time, post-operative narcotic use, and length of stay (Table-2). However, there was no statistical difference in estimated blood loss between groups. When a drain was placed, operative time was longer by an

**Table 1** – Patient, tumor characteristics.

	Drained	Undrained	p Value
Age (years)			
Mean age $\pm$ SD	57 $\pm$ 7	59 $\pm$ 6	0.07
Median	57	59	
Range	28 - 71	41 - 74	
PSA (ng/mL)			
Mean PSA $\pm$ SD	5.9 $\pm$ 2.7	6.0 $\pm$ 4.1	0.81
Range	1.1-14.1	0.5 - 27.5	
Mean biopsy Gleason sum	6.3	6.3	0.23
Mean pathologic Gleason sum	6.6	6.5	0.83
BMI (kg/m <sup>2</sup> )			
Mean BMI $\pm$ SD	28.3 $\pm$ 4.4	28.2 $\pm$ 4.1	0.85
BMI range	22.5 - 41.5	18.1 - 41.6	
Clinical stage (%)			0.38
cT1	42 (82)	124 (79)	
cT2	9 (18)	33 (21)	
Pathologic stage (%)			0.69
pT2	44 (86)	137 (88)	
pT3	7 (14)	18 (12)	
Prostate size (grams) $\pm$ SD	45 $\pm$ 18	48 $\pm$ 17	0.24

BMI = body mass index; SD = standard deviation.

**Table 2** – Operative and postoperative data.

	Drained	Undrained	p Value
Operative time (min) $\pm$ SD	186 $\pm$ 32	169 $\pm$ 23	< 0.0001
Estimated blood loss (mL) $\pm$ SD	158 $\pm$ 92	174 $\pm$ 119	0.38
Morphine equivalents $\pm$ SD	32.0 $\pm$ 21.0	17.2 $\pm$ 17.8	< 0.0001
Length of stay (days) $\pm$ SD	2.6 $\pm$ 1.4	1.6 $\pm$ 0.6	< 0.0001

**Table 3** – Indications for drain placement.

	N (%)
Leak visible at anastomosis	4 (7.8)
Intraoperative cystotomy	3 (5.9)
Bladder neck reconstruction	2 (3.9)
Hemostasis concerns	2 (3.9)
Unspecified	40 (78.4)

average of 17 minutes (95% CI 9-25,  $p < 0.0001$ ). Postoperative narcotic use and average length of stay were significantly greater when comparing the drained and undrained groups, respectively. In the majority of cases, the indication for drain placement was not specified in the operative record (Table-3). Reasons stated for drain placement included the following: visible leak during testing of the anastomosis, inadvertent cystotomy during bladder neck dissection, extensive bladder neck reconstruction, and concerns for hemostasis (Table-3).

The incidence of urinary extravasation on post-operative cystogram is outlined in Table-4. Drains were placed in 51 patients (25%), and omitted in 157 (75%). Cystograms were available for 206 patients (99%). Mean duration of drainage was 48 hours. Overall, 12 patients had radiographic evidence of a urinary leak (5.8%). The patients with a drain had a statistically higher incidence of a urinary leak. Pres-

ence of radiographic urine leak was not significantly associated with surgical approach ( $p = 0.23$ ), either transperitoneal ( $n = 32$ , 4 leaks) or extraperitoneal ( $n = 172$ , 8 leaks). As shown in Figure-1, 90% of patients had postoperative cystograms within the first 7 postoperative days; the remainder were performed the following week. As expected, earlier cystograms demonstrate the majority of leaks, with 50% seen on POD 1 or 2. All leaks resolved on follow-up imaging after prolonged drainage. No patient developed a urinoma in this series.

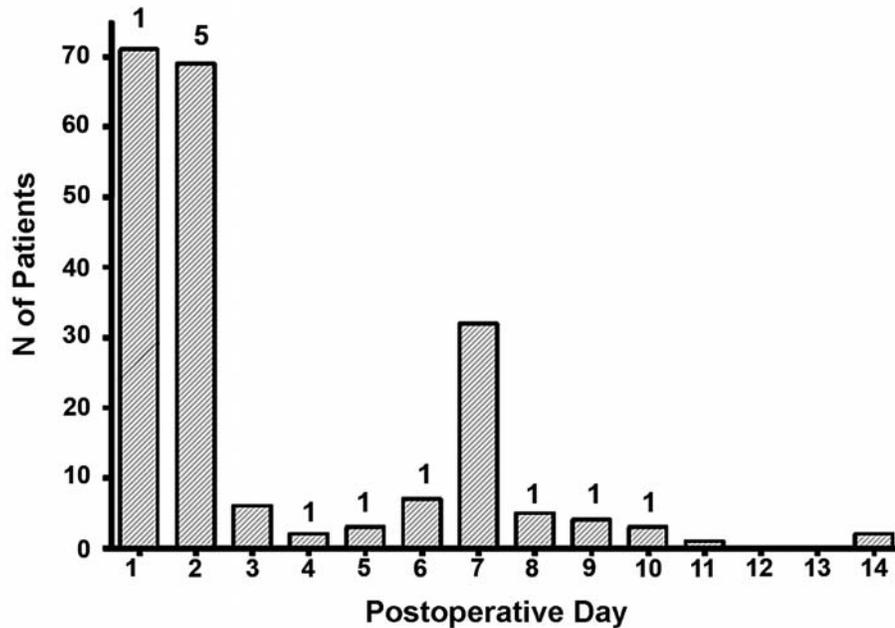
Of the 208 patients, non-nerve sparing, unilateral nerve sparing, and bilateral nerve sparing procedures were performed in 21 (10.1%), 55 (26.4%), and 126 (60.6%) patients. Nerve sparing data was missing in 6 (2.9%) patients. There were no postoperative bleeding complications, including hemorrhage or hematoma. No patient required intraoperative or postoperative blood transfusion, or reoperation for bleeding. One patient required a secondary procedure for anastomotic urine leak. This patient had mild unilateral hydronephrosis and a clinical leak with increasing drain output. He returned to the OR on POD 7 for ureteral stent and suprapubic catheter placement. Of note, had cystograms not been performed in any patient, this is the only patient whose leak was apparent from increased pelvic drain output. The remaining 11 patients with a radiographic leak had no increased drainage.

Three patients underwent laparoscopic lymphocele fenestration. Their lymphoceles (12.5% of

**Table 4** – Complication rates, PLND status.

	Drained	Undrained	Total	p Value
Total number of patients	51	157	208	
Cystogram performed	51	155	206	
Cystographic leak (%)	8 (15.6)	4 (2.5)	12 (5.8)	0.002
Resolved with prolonged catheterization	7	4	11	
Second procedure for drainage	1	0	1	
Urinoma	0	0	0	
PLND performed	8	16	24	0.32
Lymphocele	0	3 (18.8)	3 (12.5)	
Lap lymphocele fenestration	0	3 (18.8)	3 (12.5)	

PLND = pelvic lymph node dissection.



**Figure 1** – Distribution of cystogram based on postoperative day performed. Leaks are indicated as numbers above bar graphs.

patients undergoing PLND) presented on average 3 weeks postoperatively with symptoms of low-grade fever, urinary retention with bladder spasms, or lower extremity edema. Of the patients undergoing PLND in whom drains were omitted, the approach was extraperitoneal in 14/16 (87.5%). Drain placement was not significantly associated with the performance of PLND ( $p = 0.32$ ).

## COMMENTS

The Miami group, who were the first to suggest that routine pelvic drainage after open RRP was unnecessary (2,3) placed drains with a similar selective strategy. Since their report, the Roswell Park group has also supported the safety of drain omission (7). These reports relied on global comparisons of complication rates, without imaging studies. The present study is the first, to our knowledge, in which routine postoperative cystograms were used to assess the true radiographic leak rate underlying this clinically driven algorithm, adding to a growing body of literature to support selective drain omission.

Using this selective algorithm, drains were placed in 25% of patients, approximately the same frequency as prior reports (2,7). The overall cystographic leak rate defined as any radiographic extravasation in this series is 5.8% and objective imaging was available for 99% of patients. Interestingly, only one of the ten patients with radiographic evidence of a leak had a clinical leak.

What is the correlation between clinical and radiographic impressions of water tightness? Ischia and Lidsay, in a study of 68 patients undergoing open prostatectomy, found a strong correlation between intraoperative assessment with saline instillation, and subsequent low leak rate on cystogram. Out of 68 consecutive patients, 53 had no intraoperative leakage, and of these only two (3.7%) had leaks on day 7 cystograms (8). Our data are similar, in that unsuspected leaks in the undrained group occurred in only 4 patients (2.5%).

Our overall cystographic leak rate compares favorably with published series. Cystography data has generally been analyzed to assess the feasibility of early catheter removal, and to correlate leak rates with the occurrence of anastomotic strictures. Studies often

have inconsistent reporting (clinical vs. radiographic leak rate) and discrepant testing intervals. Leibovitch et al. found 5.7% of patients with significant contrast extravasation in a consecutive series of 245 patients undergoing open RRP. However, minimal or contained extravasation was observed in an additional 11.4%, for a total leak rate of 17.1% (9). Cystography was performed late (19.2 days postoperatively) compared to the current study.

Contrast extravasation in the first 5-8 days postoperatively has historically been reported to range from 67-78% (9). Similar statistics have fueled conventional wisdom that early extravasation was common following open RRP. Dalton et al. (10) reported a leak rate of 34.5% in a series of 55 patients studied with cystograms starting on day 7. Ramsden et al. reported a 31% leak rate in 275 consecutive open RRP cases where cystography was performed between postoperative days 8 and 10 (11). Contemporary numbers are much lower. Guazzoni et al. reported a 12% leak rate on postoperative day 5 cystograms in patients undergoing LRP with an interrupted anastomosis (12). In another review of 619 open RRP with cystograms at day 10 a leak rate of 4.6% was reported (13), which is similar to our findings.

Even when timing of cystography and anastomotic technique are similar, leak rates may differ. Nadu et al. reported the only other series of LRP with a RUVA in which cystography was routinely performed (14). A cystographically apparent leak was present in 17/113 patients (15.1%), even though most parameters mirror our series. The RUVA was performed with a single 3-0 polyglactin suture. Cystograms were performed between postoperative days 2-4. No urinomas developed, and drain status was not reported. What accounts for the higher leak rate? Patients were asked to Valsalva during cystography, which may transmit greater pressures to the anastomosis, whereas patients are imaged while voiding without Valsalva at our institution.

Hoznek et al. were the first to describe a RUVA, which has significantly decreased operative time and efficiency during this portion of the procedure (15). The difference in early integrity between running and interrupted techniques is not known. Theoretically, suture tension may be distributed more evenly over the circumference of the anastomosis.

Authors have assumed, based on lack of symptomatic urine leak, that the anastomosis is watertight (16). Our cohort includes the learning curve for the RUVA, as well as objective imaging. Therefore, a low leak rate of 5.8% lends further evidence to this clinical observation. Although a selective drain placement strategy may be appropriate when a laparoscopic interrupted anastomotic technique is employed, our study did not include patients with this technique, nor was it designed to compare different anastomotic techniques. We also noted that although the senior surgeon had performed several hundred LRP prior to this time period, this cohort contains his learning curve for the RUVA. We have previously reported that a low leak rate may be a good surrogate endpoint for advanced acquisition of technical skill (17).

Intuitively, a senior surgeon's judgment of anastomotic integrity should be accurate, and objective imaging substantiates this impression. When a drain was placed, the leak rate was significantly higher. When the anastomosis was watertight intraoperatively and a drain omitted, the leak rate was indeed significantly lower, but not zero. Four patients in the undrained group did have leaks, none of which developed into urinomas. The longer operative time in the drained group was statistically significant. However, we did not conclude that placing a drain led to a statistically longer operative time. In the majority of cases the reason for drain placement was not specified. A narrow pelvis or otherwise small working space, fibrotic bladder neck tissue, presence of a median lobe, or a difficult posterior dissection from previous prostatitis may all contribute a sense of complexity to performing a LRP. These factors are less quantifiable, and translate into prolonged operative time. Since indications for placement were neither prospective nor randomized, selection bias of the senior surgeon is inherent in this study. That this bias has statistically significant clinical utility, however, is an important finding.

Traditionally, drains are placed to allow the egress of urine, blood, and lymphatic fluid. Clinical suspicion was sufficient to omit a drain without increasing the chance of urinoma. Symptomatic lymphoceles were also acceptably uncommon (3/24 PLND). Since PLND was performed in only 24 patients, we are unable to draw firm conclusions

regarding drainage following PLND. However, our data suggests that lymphoceles should generally not be used as a justification for drain placement. Lymphoceles in this series became symptomatic 3 weeks postoperatively. Lymphoceles therefore accumulate long after the pelvic drain has been removed. Fried et al. observed a similar time course, where two symptomatic lymphoceles occurred at 4 and 9 weeks postoperatively (18). Pepper et al. reported a series of 260 open RRP with PLND in which 9 patients developed lymphoceles (3.5%) 12-120 days postoperatively (19). The mean time at diagnosis was not provided.

In general, the lymphocele rate after open PLND is between 4.7-14.8% (19). The wide range depends on the surgical technique used, and whether clinical or radiographic diagnostic triggers are employed. Freid et al. reported clinically detected lymphoceles in 1% of 111 patients, although 7/23 (30.4%) who subsequently underwent CT imaging for adjuvant radiation had lymphoceles (18). The approach, whether transperitoneal or extraperitoneal, also contributes. With the former, lymphatic fluid is absorbed, compared to an extraperitoneal approach where the retroperitoneal space is an enclosed area where any lymphatic drainage can readily form a lymphocele. However, our data suggests that drainage is not mandatory even after PLND and an extraperitoneal approach. Of the 16 patients undergoing PLND without postoperative drainage, 87.5% were approached extraperitoneally and only 3 developed symptomatic lymphocele. A larger study with power to address this question is needed before definitive recommendations can be made.

The morbidity of the drain itself is not a primary endpoint of this study. The drained group utilized more narcotic medication than the undrained group. We cannot conclude that the increased pain was attributable to the drain. Without directed questionnaires and pain score assessment, the contribution of drains to increased narcotic use is speculative. Evidence for drain related pain was reported by Niesel et al., who found that roughly one out of every four patients experience pain after RRP attributable only to the drain site and not the incision (1). The longer length of stay in the drained group is also likely multifactorial. The single patient with a clinical urine

leak had an 11 day hospital stay, which may have contributed to the increased mean length of stay in the drained group.

In addition to the retrospective, nonrandomized nature of this study, a potential criticism is the role of the cystogram itself in subsequent decision making. Here, 90% of leaks were only apparent radiographically, and prolonged catheterization and repeat imaging were performed. Can the cystogram itself be omitted? At the present time, after the results of the present study and with increased experience, we have ceased performing routine cystography. Using this selective drain algorithm we have found no increased incidence of complications.

## CONCLUSIONS

Routine pelvic drainage has traditionally accompanied radical prostatectomy. Our results suggest a pelvic drain can be omitted in patients undergoing an LRP with a RUVA if the anastomosis is watertight intraoperatively. Incidence of clinically detected urine leak, urinoma, hematoma, and lymphocele is not increased with this selective strategy.

## CONFLICT OF INTEREST

None declared.

## REFERENCES

1. Niesel T, Partin AW, Walsh PC: Anatomic approach for placement of surgical drains after radical retroperitoneal prostatectomy: long-term effects on postoperative pain. *Urology*. 1996; 48: 91-4.
2. Savoie M, Soloway MS, Kim SS, Manoharan M: A pelvic drain may be avoided after radical retroperitoneal prostatectomy. *J Urol*. 2003; 170: 112-4.
3. Araki M, Manoharan M, Vyas S, Nieder AM, Soloway MS: A pelvic drain can often be avoided after radical retroperitoneal prostatectomy--an update in 552 cases. *Eur Urol*. 2006; 50: 1241-7; discussion 1246-7.
4. Trabulsi EJ, Guillonnet B: Laparoscopic radical prostatectomy. *J Urol*. 2005; 173: 1072-9.
5. Rhee HK, Triaca V, Sorcini A, Tuerk IA: Transperitoneal laparoscopic radical prostatectomy: descending

- technique. *J Endourol.* 2004; 18: 601-4; discussion 604.
6. Stolzenburg JU, Do M, Rabenalt R, Pfeiffer H, Horn L, Truss MC, et al.: Endoscopic extraperitoneal radical prostatectomy: initial experience after 70 procedures. *J Urol.* 2003; 169: 2066-71.
  7. Sharma S, Kim HL, Mohler JL: Routine pelvic drainage not required after open or robotic radical prostatectomy. *Urology.* 2007; 69: 330-3.
  8. Ischia JJ, Lindsay S: Is a cystogram necessary after radical prostatectomy? *ANZ J Surg.* 2005; 75: 825-7.
  9. Leibovitch I, Rowland RG, Little JS Jr, Foster RS, Bihrl R, Donohue JP: Cystography after radical retropubic prostatectomy: clinical implications of abnormal findings. *Urology.* 1995; 46: 78-80.
  10. Dalton DP, Schaeffer AJ, Garnett JE, Grayhack JT: Radiographic assessment of the vesicourethral anastomosis directing early decatheterization following nerve-sparing radical retropubic prostatectomy. *J Urol.* 1989; 141: 79-81.
  11. Ramsden AR, Chodak GW: Can leakage at the vesicourethral anastomosis be predicted after radical retropubic prostatectomy? *BJU Int.* 2004; 93: 503-6.
  12. Guazzoni G, Cestari A, Naspro R, Riva M, Centemero A, Zaroni M, et al.: Intra- and peri-operative outcomes comparing radical retropubic and laparoscopic radical prostatectomy: results from a prospective, randomised, single-surgeon study. *Eur Urol.* 2006; 50: 98-104.
  13. Varkarakis J, Wirtenberger W, Pinggera GM, Berger A, Harabayashi T, Bartsch G, et al.: Evaluation of urinary extravasation and results after continence-preserving radical retropubic prostatectomy. *BJU Int.* 2004; 94: 991-5.
  14. Nadu A, Salomon L, Hoznek A, Olsson LE, Saint F, de La Taille A, et al.: Early removal of the catheter after laparoscopic radical prostatectomy. *J Urol.* 2001; 166: 1662-4.
  15. Hoznek A, Salomon L, Rabii R, Ben Slama MR, Cicco A, Antiphon P, et al.: Vesicourethral anastomosis during laparoscopic radical prostatectomy: the running suture method. *J Endourol.* 2000; 14: 749-53.
  16. Van Velthoven RF, Ahlering TE, Peltier A, Skarecky DW, Clayman RV: Technique for laparoscopic running urethrovesical anastomosis: the single knot method. *Urology.* 2003; 61: 699-702.
  17. Cohen MS, Canes D, Tuerk IA: Secondary learning curve for the laparoscopic radical prostatectomy. *J Urol.* 2006; 175: (Suppl. 4): 367.
  18. Freid RM, Siegel D, Smith AD, Weiss GH: Lymphoceles after laparoscopic pelvic node dissection. *Urology.* 1998; 51 (5A Suppl): 131-4.
  19. Pepper RJ, Pati J, Kaisary AV: The incidence and treatment of lymphoceles after radical retropubic prostatectomy. *BJU Int.* 2005; 95: 772-5.

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