นิพนธ์ต้นฉบับ

การผ่าตัดมะเร็งต่อมลูกหมากผ่านกล้องด้วยวิธีวางท่อปัสสาวะและกระเพาะปัสสาวะในแนวเดียวกัน ประสบการณ์ 5 ปี เกี่ยวกับการกลั้นปัสสาวะในโรงพยาบาลพระมงกุฎเกล้า

สาธิต ศิริบุญฤทธิ์, ณัฐพงศ์ บิณษรี, วีร์ลักษณ์ เลิศไพวัลย์,พูนเกียรติ เรืองโภคา

หน่วยศัลยกรรมระบบปัสสาวะ กองศัลยกรรม โรงพยาบาลพระมงกุฎเกล้า กรุงเทพฯ

บทคัดย่อ

วัตถุประสงค์: รวบรวมข้อมูลย้อนหลังผลลัพธ์ด้านการกลั้นปัสสาวะหลังการผ่าตัดมะเร็งต่อมลูกหมากผ่านกล้องด้วยวิธีวางท่อปัสสาวะและกระเพาะปัสสาวะในแนวเดียวกันซึ่งทำในโรงพยาบาลพระมงกุฎเกล้า

ผู้ป่วยและวิธีการศึกษา: ทำการศึกษาเชิงพรรณนาโดยนำข้อมูลจากประวัติการรักษาผู้ป่วยที่ได้รับการผ่าตัดมะเร็งต่อมลูกหมากผ่านกล้องด้วยวิธีวางท่อปัสสาวะและกระเพาะปัสสาวะในแนวเดียวกันจำนวน 70 ราย หลังการตัดต่อมลูกหมากออกแล้วคอกระเพาะปัสสาวะจะถูกเย็บให้มีขนาดเส้นผ่านศูนย์กลาง 1 เซนติเมตร สายสวนปัสสาวะชนิด Foley ขนาด 20 F จะถึงสอดผ่านรูเปิดท่อปัสสาวะเพื่อเข้าไปยังกระเพาะปัสสาวะ สายสวนปัสสาวะชนิด Foley จะถูกใส่น้ำปริมาณ 20 มิลลิลิตรเพื่อให้ลูกโป่งส่วนปลายขยายออก หลังจากนั้นทำการดึงรั้งท่อปัสสาวะไว้ให้คงที่ ในการศึกษานี้ผู้ศึกษาไม่ได้ใช้ท่อปัสสาวะผ่านออกทางหน้าท้องของผู้ป่วย

ผลการศึกษา: ระยะเวลาติดตามการรักษาอยู่ระหว่าง 12-60 เดือน ระยะเวลาเฉลี่ยที่ใช้ในการผ่าตัด 185 นาที ใช้สารประกอบของเลือดให้ผู้ป่วยจำนวน 2 ราย (ร้อยละ 2.86) ระยะเวลาเฉลี่ยที่ผู้ป่วยต้องใส่สายสวนปัสสาวะคือ 14.45 วัน ผู้ป่วย 32 รายสามารถกลั้นปัสสาวะได้ในช่วงแรกหลังผ่าตัด (ร้อยละ 45.71) ที่ระยะเวลา 6 เดือนหลังการผ่าตัดผู้ป่วย 53 รายสามารถกลั้นปัสสาวะได้อย่างสมบูรณ์หลังจากผ่าตัดไป 6 เดือน (ร้อยละ 75.71) และผู้ป่วยที่ได้รับการผ่าตัดทุกรายมีการกลั้นปัสสาวะได้อย่างสมบูรณ์เมื่อเวลาผ่านไป 1 ปีหลังการผ่าตัด พบการตีบบริเวณคอกระเพาะปัสสาวะในผู้ป่วย 4 ราย (ร้อยละ 5.71)

สรุป: การผ่าตัดมะเร็งต่อมลูกหมากผ่านกล้องด้วยวิธีวางท่อปัสสาวะและกระเพาะปัสสาวะในแนวเดียวกันสามารถทำได้ง่ายและผู้ป่วยซึ่งได้รับการผ่าตัดด้วยวิธีนี้สามารถกลั้นปัสสาวะได้อย่างรวดเร็วหลังผ่าตัด, มีปัสสาวะรั่วน้อยและเกิดการตีบของคอกระเพาะปัสสาวะในอัตราที่ยอมรับได้ การผ่าตัดด้วยวิธีนี้สามารถใช้เป็นทางเลือกในการรักษามะเร็งต่อมลูกหมาก

คำสำคัญ: การผ่าตัดมะเร็งต่อมลูกหมากผ่านกล้อง, การวางท่อปัสสาวะและกระเพาะปัสสาวะในแนวเดียวกัน, การกลั้นปัสสาวะ, มะเร็งต่อมลูกหมาก

Original article

Vesicourethral Alignment Technique in Laparoscopic Radical Prostatectomy at Phramongkutklao Hospital: 5 years' Experience in Continence Outcomes

Satit Siriboonrid, Nattapong Binsri, Weelak Lertpiwan,
Arkane Wongsawat, Poonkiat Reungpoca

Division of Urology, Department of Surgery, Phramongkutklao hospital, Bangkok, Thailand

Abstract

Objective: We reviewed continence outcomes after the vesicourethral alignment technique in laparoscopic radical prostatectomy was performed at Phramongkutklao Hospital, Bangkok, Thailand.

Material and Methods: Charts of 70 patients who underwent the vesicourethral alignment technique in laparoscopic radical prostatectomy (LRP) were reviewed. After prostatectomy, bladder neck was resized to 1 cm in diameter using the tennis racquet technique. A 20 F Foley catheter was inserted into the bladder via the preserved bladder neck under laparoscopic vision. The Foley catheter balloon was filled with 30 mL of sterile water, and mild traction was applied to appose the bladder neck to the urethral stump. The Foley catheter was fixed to the patient's leg. Cystostomy tube wasn't used in this study.

Results: The follow-up period ranged from 12 to 60 months. The mean operative time was 185 minutes in LRP. Blood transfusion was used in 2 cases (2.86%). The mean postoperative catheterization duration was 14.45 days in LRP. Early continence was found in 32 patients (45.71%). Complete continence was achieved in 53 patients (75.71%) after 6 months of follow-up;all of thepatients had complete continence at 1 year after the procedure. Contracture bladder neck was 5.71% (4 cases).

Conclusion: Vesicourethral alignment technique during laparoscopic radical prostatectomy is a feasible and promising approach with a high rate of early and late continence, minimal rate of urinary extravasation, andan acceptable rate of stricture. This technique could be considered as an alternative in anatomically demanding situations.

Keywords: Laparoscopic radical prostatectomy, vesiocourethral alignment, continence, prostate cancer

Introduction

Advances in task-specific surgical instrumentation, optics, and digital video equipment haveopened a new frontier for minimally invasive laparoscopic prostatectomy. In Phramongkutklao Hospital, we have performed laparoscopic radical prostatectomy (LRP) since 2008. Currently, almost all prostate cancer patients require this procedure for their therapeutic measurement;the advantages of this procedure are cosmetic, less blood loss, and shorter hospital stay.

Most new scientific data include reports of this procedure. Thus spurring interest in LRP, and in the ensuing years, surgeons at a number of centers throughout the world have acquiredthe skills and experience necessary to perform it. However, advanced laparoscopic skills are necessary to perform a proficient LRP, especially for the suturing of the vesicourethral anastomosis (VUA). Many urologists have been facing since Surgical Procedure the introduction of the technique.[1,2] The impact of VUA on continence depends on a well-healed stricture-free wide anastomosis that preserves the intrinsic sphincter mechanism of the bladder neck as much as possible. Recently, it has been well established that such anastomoses should be performed in a way that provides a urethra long enough to ensure adequate functioning.[3,4] The longer the preoperative and postoperative anatomic or functional length of the urethra, the higher the rate of postoperative early continence.[5-7] Although direct VUA is still the standard method of reconstruction in both ORP and LRP (with or without robotic assistance), direct suturing can be quite demanding in certain situations, such as in obese patients and those with a narrow deep pelvis. Furthermore, urethral suture bites might compromise functional urethral length to some degree in difficult situations. Here we present our 5 years' experience with the vesicourethral alignment technique in LRP, with a main focus on continence outcomes with this technique.

Material and Methods

We reviewed the data of 70 prostate cancer patients who underwent vesicourethral alignment technique in LRP at Phramongkutklao Hospital between 2008 and 2012. Patient selection occurred after obtaining approval from our Phramongkutklao Hospital Ethics Committee. In the general cases, we used the suturing technique for vesicourethral anastomosis. Vesicourethral alignment technique was used in cases which had short or difficult for suturing urethral stump. The prostate was removed through the transperitoneal laparoscopic antegrade approach with five port placement. Care was taken to preserve the bladder neck asmuch as possible. Unilateral or bilateral nerve-sparing procedures were used based on the intraoperative findings and clinical stage. Careful apical dissection was used to preserve the external sphincter mechanism and the puboprostatic ligament. During apical and seminal vesicular dissection, no electrocautery was applied. Hemostasis was accomplished with hemoclips in procedures involving nerve-sparing techniques or with bipolar electrocautery in other situations. After laparoscopic prostate removal via laparoscopic bag through 10 mm port and adequate hemostasis, bladder defect was sutured with VicylR 4-0 (tennis racquet technique). In all cases, bladder neck was resized to 1 cm in diameter for minimized leakage after realignment as seen in picture 1. A 20 F rubber Foley catheter was inserted transurethrally and passed into the bladder via the preserved bladder neck (under direct vision

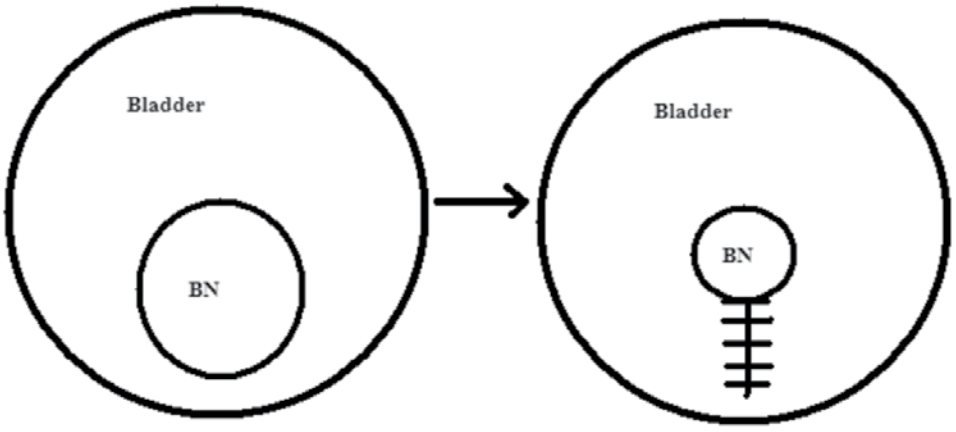
through laparoscopic monitor). The Foley balloon was filled with 30 ml of sterile water, and mild traction was applied to the bladder neck. Then bladder neck was apposed to the urethral stump as seen in picture 2. The bladder was filled and drained 2 or 3 times with 200 ml to 300 ml of normal saline solution in order to prove a well-sealed alignment as seen in picture 3. Then, the Foley catheter was fixed to the patient's leg and an external drainage with Jackson's pratt drain (No. 10, flat type) was placed in the retropubic space. We didn't use a cystostomy tube in this study. Patients with an external drainage greater than 75 ml/d after the 4th postoperative day were considered to have prolonged urine leakage.

Postoperative Care and follow-up

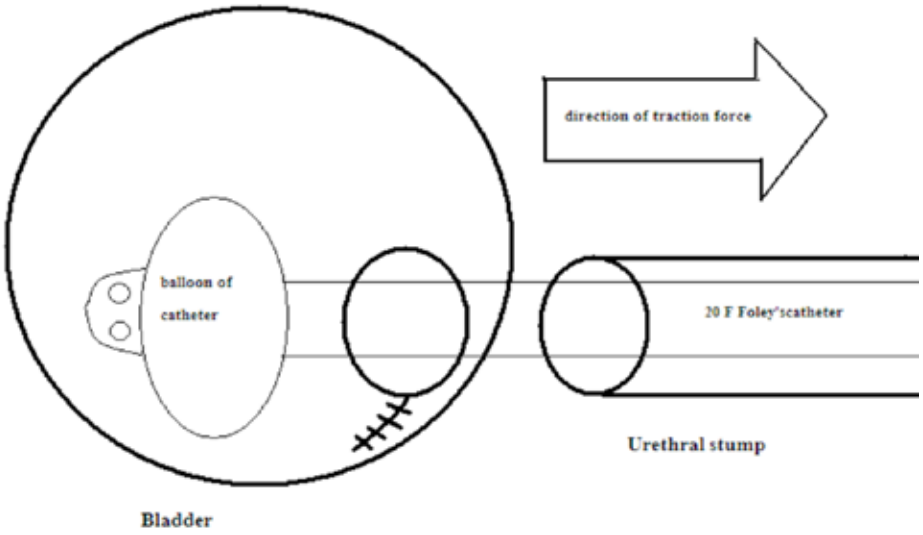
The patients received intravenous antibiotics (Cephazolin 1 gram. intravenous every 6 hrs) for a few days and then switched to oral antibiotic, and left absolute bed rest after the first postoperative day. The Foley catheter was removed 10 to 14 days postoperatively after side urethrography was done. The patients' age, pathological stage, and length of hospital stay were recorded. All the patients were followed up regularly every month for the first 3 months, and every 3 months thereafter during the 1st year after the surgery, then every 6 months. Serum level of prostate-specific antigen (PSA) was determined at each follow-up visit. Early continence status was determined 3 months after prostatectomy by asking the patients if they were totally continent (no pad or only a few drops on heavy exercises). On follow-up visits, the presence of any obstructive symptoms was queried. We used endoscopic evaluation only when obstructive urinary symptomswere encountered. Stricture was defined as any vesicourethral scarring that required transurethral incision of the bladder neck.

Results

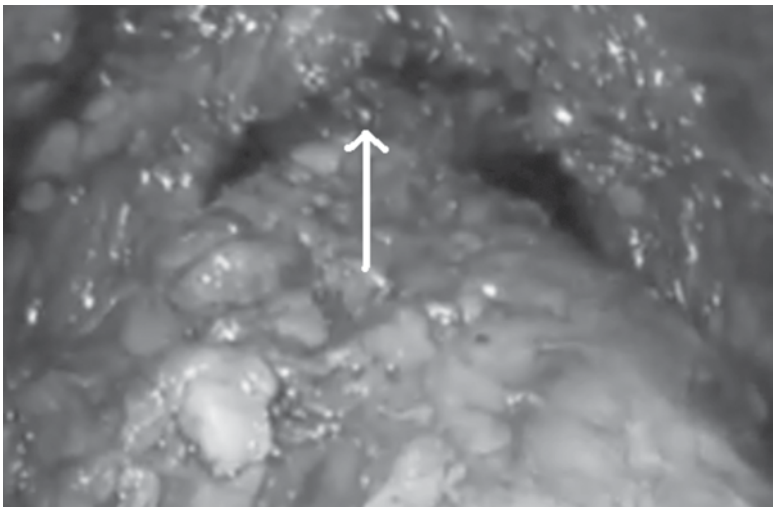
The mean age of the patients was 62.1 years (range, 45 to 74 years). All of the 70 patients (100%) underwent LRP. We used the American Joint Committee on Cancer (AJCC) 1997 for the staging in this study. Characteristics of the patients, and the operative parameters and outcomes are shown in the Table 1.



Picture 1. This picture shows the area of bladder neck (BN) after prostatectomy (left picture). We resized the bladder neck with Vicryl 4-0 (tennis racquet technique). Right picture shows the new bladder neck (1 cm in diameter) after reconstruction.



Picture 2. This picture shows vesicourethral alignment technique. 20 F Foley catheter was inserted between the urethral stump and bladder neck. Balloon was filled with 30 ml of sterile water. Traction was done as directed.



Picture 3. Bladder was filled with 300 ml of normal saline without leakage. White arrow indicates alignment line.

The mean follow-up period was 33.5 months (range, 12 to 60 months). Patients underwent history taking, physical examination, and blood was drawn for PSA evaluation during the follow-up period. Pathologic report was made by one pathologist and shown to the patients at the first follow-up. Operative time was calculated from the start of the procedure until the port wound was closed and fully stitched. We gave blood component (pack red cell) to two patients who had hematocrit profiles of less than 30% (blood examination for hematocrit was done when the patient arrived in

the recovery room). Each patient used only 1 unit. Two cases retained Foley catheter for 1 month because side urethrography, performed on day 14 and 21, detected leakage from the anastomosis. Side urethrography was performed again on day 30 and if there was no leakage we removed their catheter. Post-operative outcomes which we paid attention to in this study were continence, contracture bladder neck, and surgical margin. We found that almost half of the patients had continence at 3 months after the procedure (45.71%), 53 cases (75.71%) had continence at 6 months, and 2 cases had it at 1 year. This result showed early continence results from the procedure. Four cases had severe lower urinary tract symptoms at the time of follow-up; urethrocystoscopy was performed for evaluation. These patients had a contracture scar at the bladder neck then transurethral incision of the bladder neck was done to correct these events. One patient had a positive surgical margin pathologic report (positive margin at right lobe, Gleason score 3+4). His preoperative PSA and clinical staging was 12 ng/ml and T2a N0 M0, respectively. Post-operative PSA at 3 months after the operation was 3 ng/ml; we sent thepatient for evaluation again but we didn't find any evidence of local recurrence metastatic disease. Presently this patient is still in our follow-up program.

Table 1 The mean clinical characteristics and surgical outcome of patients who underwent vesicourethral alignment technique in laparoscopic racial prostatectomy.

Pathologic stage	
T1c N0 M0	65 (92.86%)
T2a N0 M0	5 (7.14%)
Gleason score	
Gleason score 3+3	1 (1.43%)
Gleason score 3+4	64 (91.43%)
Gleason score 4+3	5 (7.14%)
Mean preoperative PSA value (ng/mL)	7 ng/mL (maximum value = 12 ng/mL)
Mean operative time (minute)	185 min (maximum = 310 min)
Mean estimated blood lost	115 cc. (maximum = 450 cc.)
Blood transfusion	2 (2.86%)
Mean postoperative catheterization (days)	14.45 days (maximum = 30 days)
Postoperative outcome	
Continence outcome	
Continence at 3 months	32 (45.71%)
Continence at 6 months	21 (30%)
Continence at 9 months	15 (21.43%)
Continence at 1 years	2 (2.86%)
Contracture bladder neck	4 (5.71%)
Positive surgical margin	1 (1.43%)

Discussion

Screening programs from private hospital or yearly health check-up packages in Thailand involve a PSA test. New cases of prostate cancer have increased in the last 5 year and tend to be early stage. Radical prostatectomy has become a routine surgical procedure in many centers. However, VUA, which directly influences postsurgical continence and patient quality of life, has always been a challenge during this procedure.[8,9] Given that functional urethral length has a direct effect on continence, the anastomotic sutures should be applied as precisely as possible in order to incorporate as little of the urethra as is feasible.[3-6] Coakley and coworkers have shown that a membranous urethra longer than 12 mm on preoperative endorectal magnetic resonance imaging was associated with a higher rate of early continence.[5] Similarly, Paparel and colleagues have demonstrated that longer postoperative membranous urethras result in a higher rate of continence with a hazard ratio of 1.18 per millimeter.[6] Although direct suture anastomosis is a standard practice, it can be laborious and time consuming, especially in obese patients and those with a deep bony pelvis, anatomical constraints, or an ill-defined membranous urethral stump.[9] All of these barriers may compromise millimeters of functional urethral length. To overcome these difficulties, many investigators have tried modifications of the standard procedure. Historically, pubectomy has been proposed to expand the surgical field during anastomosis.[10] In 1997, Igel and Wehle introduced their alternative VUA technique based on the Vest technique.[9] Their alternative procedure incorporated 6 separate transperineal intra-urethral sutures which were tied over a bolster on the perineum. This maneuver took only about 12 minutes and showed its merits in 91 consecutive patients, with a continence rate of 87.9%, a stricture rate of 7.7%, and few instances of urinary extravasation. Later, Thiel and associates reviewed the 10-year long-term outcomes of this modification and found this technique efficient in the long-term.[11] Novicki and coworkers compared direct VUA with a modified Vest technique and reported a slightly better 1-year urine continence rate in the Vest group, but a higher rate of mild anastomotic stenosis.[2] The absence of urethral sutures and minimal urethral manipulation both of which lead to a longer functional urethral length may explain the higher rate of early and late continence with the Vest technique. Gallo and colleagues conducted the first randomized controlled trial to evaluate the effect of suture numbers (6 versus 4 versus 2) on functional outcome after radical prostatectomy.[12] Interestingly, they showed that there was no significant difference in urinary functional outcomes (stricture and continence) and postoperative urinary leakage, and that the duration of anastomosis and degree of urethral trauma could be reduced considerably by decreasing the number of sutures. Undoubtedly, VUA during LRP even with robotic assistance can be much more technically demanding and time-consuming with a steep learning curve. These difficulties may have a negative impact on continence status by decreasing the length of the urethra during suture placement.[13,14] Many authors have tried to minimize urethral trauma during this challenging procedure. Hruby and coworkers developed a novel device that incorporated 6 pairs of retractable bladder and urethral tines over a standard Foley catheter.[15] The tines acted as sutures to appose the bladder neck and urethra until healing occurred.

They tested the efficacy of their novel device during LRP by comparing it to standard direct anastomosis in 30 pigs. There were no differences regarding urinary outcomes (continence, stricture, and urine extravasation), and histopathologic evaluation of the site of VUA showed less fibrotic reaction with the use of bladder tines compared to absorbable suture material. With this innovation the duration of LRP and VUA was markedly reduced.[15]

Parallel with these investigations we hypothesized that by eliminating urethral suturing, a longer functional membranous urethral length could be achieved. We showed the safety and efficacy of sutureless radical prostatectomy in laparoscopic approaches with an excellent rate of early continence the highest concern for these patients and acceptable rate of stricture. We think that a 6-month early continence rate of 75.71% with this procedure is excellent, compared with post radical prostatectomy incontinence rates in the contemporary literature.[13] This high rate of early continence may originate mainly from leaving as maximum length as feasible membranous urethra during the procedure of "alignment" instead of "anastomosis."[3-5] We assume that the part of urethra incorporated in the anastomotic stitches may not participate in the continence mechanism and may lead to the shortening of maximum functional urethral length. Continence following vesicourethral alignment technique may also come back to the minimum manipulation of the external sphincter mechanism, together with the preserved bladder neck and puboprostatic ligaments. Also with the use of minimum (if any) heat around the membranous urethra and suture-free alignment, the blood supply at the critical area of the membranous urethra and the striated sphincter can be saved adequately. In other words, by application of this technique, many of the incontinence contributing factors such as impaired visualization, imprecise suture placement, and aggressive hemostasis could be obviated.[17] Therefore, the distal apical continence mechanism (puboprostatic ligament, external sphincter, and urethral stump) is manipulated as little as possible. Recently, Libertino and colleagues have presented their initial experience with sutureless vesicourethral alignment.[18] They have used a novel device, named "continuum," in order to "appose" (not suture) the bladder neck and the urethral stump during open and robotic radical prostatectomy in 19 patients. They achieved a 6-week continence rate of 88% using this technique. The incidence rate of bladder neck stricture after radical prostatectomy ranged between 0.5% to 32% in the most contemporary-series.[17]

This rate was 13.6% in our patients. Consistent with the literature, all of these patients had "thin" stenotic rings that were managed outpatiently with only bladder neck dilation in no more that 2 sessions (63.6% needed only one session of dilation). The rate of stricture was comparable between laparoscopic and open approaches (14.7% and 12.8%, respectively), and these patients were completely continent after bladder neck dilation. We do agree with Mccarthy and Catalona that the caliber of the bladder neck is an important factor to control the rate of stricture and continence. As Mccarthy and Catalona have shown, the incidence of bladder neck contracture could be decreased significantly if the bladder neck caliber increased from 18 F up to 22 F to 24 F.[19] We also used this technique and found such a bladder neck diameter optimal regarding both

stricture and continence issues. Interestingly, it seems that the rate of stricture formation may decrease with experience. The rate of stricture in our study 70 cases was 5.71%. We think that our technique, by providing adequate urethral stump, has promising urinary outcome. However, this open-label study should be further investigated and confirmed by cohort studies and using both imaging and functional modalities to measure the anatomic and functional urethral length during this technique.

Conclusion

Vesicourethral alignment technique during laparoscopic radical prostatectomy is a feasible and promising approach with high rates of early and late continence, minimal rate of urinary extravasation, and acceptable rate of stricture. This technique could be considered as an alternative in anatomically demanding situations.

References:

1. Steiner MS, Morton RA, walsh PC. Impact of anatomical radical prostatectomy on urinary continence. J Urol. 1991;145:512-4; discussion 4-5.
2. Novicki DE, Larson TR, Andrews PE, Swanson SK, Ferrigni RG. Comparison of the modified vest and the direct anastomosis for radical retropubic prostatectomy. Urology. 1997;49:732-6.
3. Rocco F, Carmignani L, Acquati P, et al. Early continence recovery after open radical prostatectomy with restoration of the posterior aspect of the rhabdosphincter. Eur Urol. 2007; 52:376-83.
4. Majoros A, Bach D, Keszthelyi A, et al. Analysis of risk factors for urinary incontinence after radical prostatectomy. Urol Int. 2007;78:202-7.
5. Coakley FV, Eberhardt S, Kattan Mw, wei DC, Scardino PT, Hricak H. Urinary continence after radical retropubic prostatectomy: relationship with membranous urethral length on preoperative endorectal magnetic resonance imaging. J Urol. 2002;168:1032-5.
6. Paparel P, Akin O, Sandhu JS, et al. Recovery of urinary continence after radical prostatectomy: association with urethral length and urethral fibrosis measured by preoperative and postoperative endorectal magnetic resonance imaging. Eur Urol. 2009;55:629-37.
7. Curto F, Benijts J, Pansadoro A, et al. Nerve sparing laparoscopic radical prostatectomy: our technique. Eur Urol. 2006;49:344-52.
8. Teber D, Erdogru T, Cresswell J, Gozen AS, Frede T, Rassweiler JJ. Analysis of three different vesicourethral anastomotic techniques in laparoscopic radical prostatectomy. world J Urol. 2008;26:617 22.
9. Igel TC, wehle MJ. Vesicourethral reconstruction in radical retropubic prostatectomy: an alternative technique. J Urol. 1999;161:844-6.
10. Lange PH, Reddy PK. Technical nuances and surgical results of radical retropubic prostatectomy in 150 patients. J Urol. 1987; 138:348-52.
11. Thiel DD, Igel TC, Brisson TE, Heckman MG. Outcomes with an alternative anastomotic technique after radical retropubic prostatectomy: 10-year experience. Urology. 2006;68:132-6.
12. Gallo L, Perdona S, Autorino R, et al. Vesicourethral anastomosis during radical retropubic prostatectomy: does the number of sutures matter? Urology. 2007;69:547-51.
13. Menon M, Hemal AK, Tewari A, Shrivastava A, Bhandari A. The technique of apical dissection

of the prostate and urethrovesical anastomosis in robotic radical prostatectomy. BJU Int. 2004;93:715-9.

14. Teber D, Dekel Y, Frede T, Klein J, Rassweiler J. The Heilbronn laparoscopic training program for laparoscopic suturing: concept and validation. J Endourol. 2005;19:230-8.
15. Hruby G, weld KJ, Marruffo F, et al. Comparison of novel tissue apposing device and standard anastomotic technique for vesicourethral anastomoses. Urology. 2007;70:190-5.
16. Steiner MS. Continence-preserving anatomic radical retropubic prostatectomy: the "No-Touch" technique. Curr Urol Rep. 2000;1: 20-7.
17. Park R, Martin S, Goldberg JD, Lepor H. Anastomotic strictures following radical prostatectomy: insights into incidence, effectiveness of intervention, effect on continence, and factors predisposing to occurrence. Urology. 2001;57:742-6.
18. Libertino J, Tuerk I, Landman J, Kella N. Sutureless vesico-ureteral anastomosis after radical prostatectomy: initial clinical feasibility data from the continuum study. Eur Urol Suppl. 2008;7:249.
19. Mccarthy J, Catalona w. Nerve-sparing radical retropubic prostatectomy. In: Marshall FF, editor. Textbook of operative urology. 1st ed. Philadelphia: wB Saunders; 1996. p. 537-44.