Early Continence After Open and Laparoscopic Radical Prostatectomy With Sutureless Vesicourethral Alignment

An Alternative Technique, 8 Years' Experience

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Introduction: We reviewed urinary outcomes after sutureless vesicourethral alignment in open radical prostatectomy (ORP) and laparoscopic radical prostatectomy (LRP).

Materials and Methods: Charts of 324 patients who underwent sutureless ORP (n = 188) and LRP (n = 136) were reviewed. After prostatectomy, a 22- to 24-F silicon Foley catheter was passed into the bladder via the preserved bladder neck. The Foley balloon was filled, and mild traction was applied to appose the bladder neck to the urethral stump. The Foley catheter was fixed to the patient's leg. No cystostomy was placed.

Results: The follow-up period ranged from 12 to 60 months. The mean operative time was 65 minutes in ORP and 260 minutes in LRP. Blood transfusion was significantly less frequent with LRP (9.6% versus 19.7%, $P = .02$). The mean postoperative catheterization durations were 12 days in ORP and 13 days in LRP. Complete continence was achieve in 293 patients (90.4%) after 3 months of follow-up (88.9% in LRP and 91.5% in ORP, $P = .78$). The continence rate improved to 96.3% in LRP and 95.2% in ORP at 1 year ($P = .52$). Bladder neck stricture rate was 13.6% (12.8% in ORP versus 14.7% in LRP, $P = .87$).

Conclusion: Sutureless vesicourethral alignment during ORP and LRP is a promising approach with minimum urinary extravasation, a high rate of continence, and an acceptable rate of stricture. This technique could be considered as an alternative in anatomically demanding situations.

Keywords: radical prostatectomy, continence, laparoscopy, prostatic neoplasms

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INTRODUCTION

Radical prostatectomy is now considered a gold standard for the management of selected patients with localized prostate cancer. Both open radical prostatectomy (ORP) and laparoscopic radical prostatectomy (LRP) are considered expeditious procedures in terms of oncologic control.[1,2] However, concerns about functional outcomes of are growing after both ORP and LRP. This is because an increasing number of patients are being diagnosed at earlier ages and stages, and they require a better functional outcome. In particular, urinary continence is of the highest concern for patients undergoing radical prostatectomy. Vesicourethral anastomosis (VUA) during prostatectomy is a "jigsaw

puzzle" many urologists have been facing since the introduction of the technique.[3,4] 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.[5,6] The longer the preoperative and postoperative anatomic or functional length of the urethra, the higher the rate of postoperative early continence.[7-9]

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 degrees in difficult situations. Here we present our 8 years' experience with sutureless vesicourethral alignment during ORP and LRP, with a main focus on functional urinary outcome with this technique.

MATERIALS AND METHODS

Patient Selection

After obtaining approval from our local ethics committee, the charts of 324 patients who underwent sutureless ORP and LRP between 2001 and 2008 were reviewed.

Surgical Procedure

The prostate was removed through an open or transperitoneal laparoscopic antegrade approach. Care was taken to preserve the bladder neck as much as possible. Unilateral or bilateral nerve-sparing procedures were used based on the intra-operative 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, and hemostasis was accomplished with hemoclips in procedures involving nerve-sparing techniques or with bipolar electrocautery in other situations.

Vesicourethral Alignment

After open or laparoscopic prostate removal and adequate hemostasis, a 22- to 24-F silicon Foley catheter was inserted transurethrally and passed into the bladder via the preserved bladder neck. The Foley balloon was filled with 40 mL to 50 mL of sterile water, and mild traction was applied to appose the bladder neck to the urethral stump. The bladder was filled and drained 2 or 3 times with 200 mL to 300 mL of hypertonic saline solution, in order to ensure a well-sealed alignment (Figure 1). Then, the Foley catheter was fixed to the patient's leg and an external drainage was placed in the retropubic space. No cystostomy was placed. Patients with an external drainage greater than 75 mL/d after the 2nd postoperative day were considered to have prolonged urine leakage.

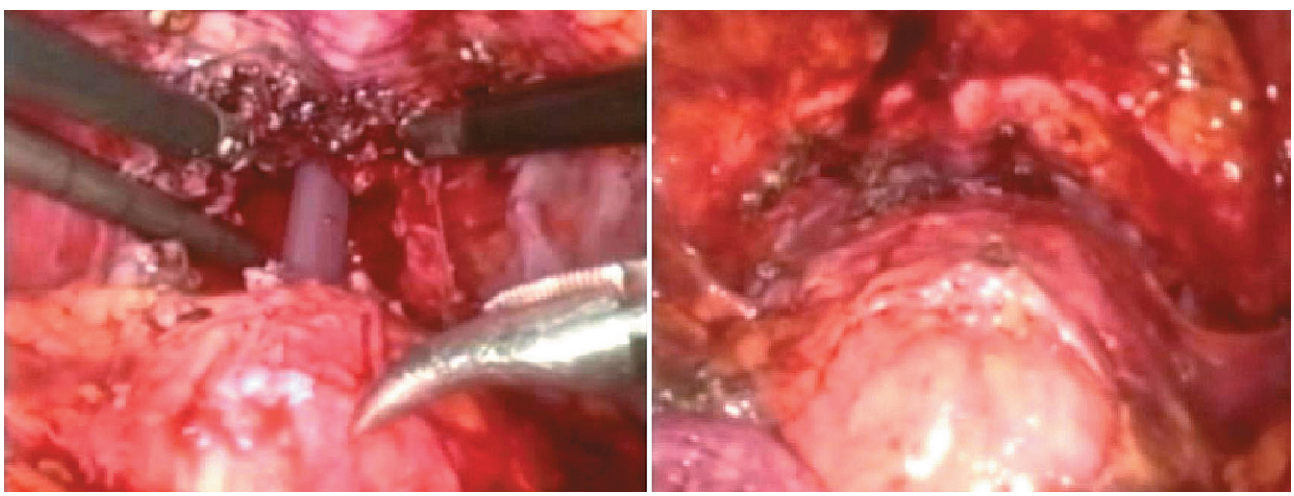

Figure 1. Left, Sutureless vesicourethral alignment during transperitoneal laparoscopic radical prostatectomy. **Right,** A sealed vesicourethral junction after filling the bladder.

Postoperative Care and Outcome

The patients received intravenous antibiotics throughout their hospital course, and left complete bed rest after the 2nd postoperative day. The Foley catheter was removed 10 to 14 days postoperatively.

The patients' age, pathological stage, and length of hospital stay were recorded. All patients were followed regularly every month for the first 3 months, every 3 months thereafter during the 1st year after the surgery, and 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. Routine yearly follow-up cystoscopy was considered in our first 30 patients to evaluate the site of VUA (Figure 2). However, the remaining 294 patients underwent endoscopic evaluation only when obstructive urinary symptoms were encountered. Stricture was defined as any vesicourethral scarring that required dilation with metallic sounds.

RESULTS

The mean age of the patients was 62.1 years (range, 45 to 74 years). Of the 324 patients, 136 (42.0%) underwent LRP. Characteristics of the patients, and the operative parameters and outcomes are shown in the Table. The mean

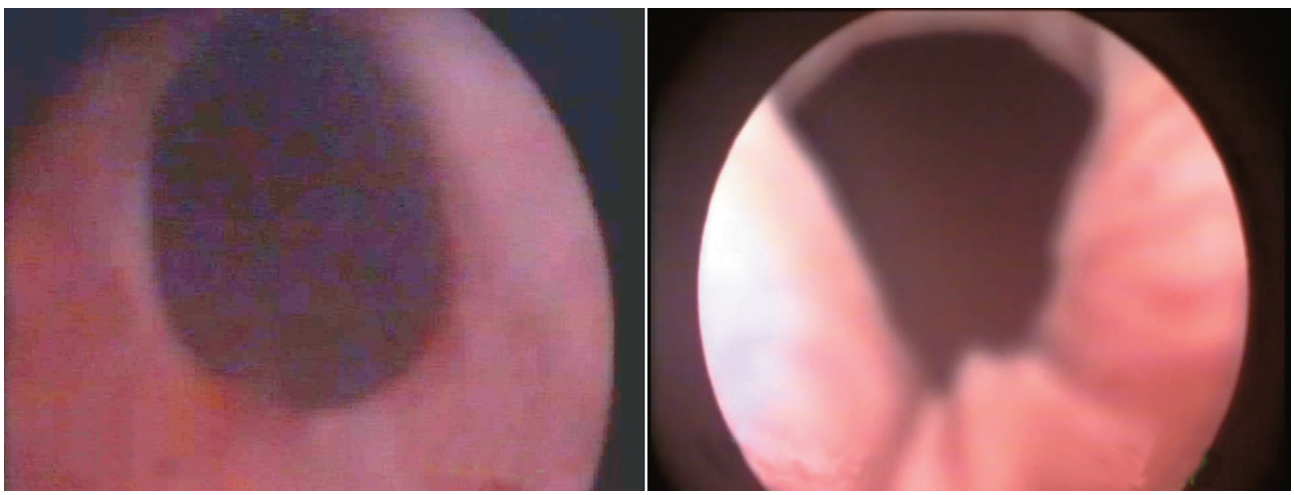

Figure 2. Left, Follow-up cystoscopic view of the site of vesicourethral junction after radical prostatectomy with sutureless vesicourethral alignment. A well-healed, stricture-free, wide vesicourethral junction is shown. **Left,** Cystoscopy 4 years after open surgery. **Right,** Cystoscopy 5 years after laparoscopy.

Clinical Characteristics and Surgical Outcome of Patients Who Underwent Sutureless Open and Laparoscopic Racial Prostatectomy*

Clinical Parameter	All	Laparoscopy	Open Surgery
Pathologic stage			
≤ T2	223	134 (71.3)	89 (65.4)
> T2	101	54 (28.7)	47 (34.6)
Mean preoperative PSA, ng/mL	13.1	12.7	13.6
Mean operative time, min	146.9	65.0	260.0
Blood transfusion	50 (15.4)	13 (9.6)	37 (19.7)
Mean postoperative catheterization, d	12.6	13.0	12.0
Postoperative outcome			
Continence at 3 months†	293 (90.4)	121 (89.0)	172 (91.5)
Continence at 1 year†	310 (95.7)	131 (96.30	179 (95.20
Bladder neck stricture	44 (13.6)	20 (14.7)	24 (12.8)
Positive surgical margin	80 (24.7)	38 (27.9)	42 (22.3)

*Values in parentheses are percents.
†Continence was defined as no leak and no need for pad.

follow-up period was 33.5 months (range, 12 to 60 months). One of our early patients (the 12th case) who had undergone LRP developed postoperative excessive urinary extravasation with prolonged ileus, nausea, and vomiting. On exploration, we found complete separation of the bladder neck from the urethral stump with the Foley catheter tip in the pelvic cavity. He was managed by reconstructing the bladder neck and using sutureless vesicourethral realignment with a 22-F internal Foley catheter. Another 2 cases of LRP were complicated by inadvertent rectal injury which was diagnosed intra-operatively and repaired laparoscopically in 2 layers. Both surgeries were successful and neither patient required colostomy. The blood transfusion rate was significantly lower in the patients with LRP than those with ORP (9.6% versus 19.7%, $P = .02$; Table).

Sutureless radical prostatectomy resulted in complete continent in 293 patients (90.4%) after 3 months of follow-up. There were no significant differences regarding early continence rate between the LRP and the ORP groups (89.0% versus 91.5%, $P = .78$). At 1-year follow-up, the continence rate improved to 95.7% (310 patients). This improvement was seen in both the LRP and the ORP groups, with no significant difference between them (96.3% versus 95.2%, $P = .52$; Table).

Bladder neck stricture was found in 44 patients (13.6%). In the last 150 cases, the rate of stricture reduced to 8.7%. The approach technique did not influence the rate of stricture (14.7% in LRP versus 12.8% in ORP, $P = .88$). There was no significant differences in the rate of Stricture formation was seen in 30 patients (13.5%) with pathologic stages T1 and T2 and in 13 (13.8%) of those with stages T3 and T4 of the disease ($P = .87$). All of the patients with bladder neck stricture suffered from obstructive urinary symptoms or acute urinary retention. The time to the occurrence of stricture was 3 to 4 months. All of these patients were managed by outpatient dilation of the anastomosis site with metallic sounds, and this therapy was successful in all cases. Twenty-eight of these patients (63.6%) were managed with a single session of urethral dilation, while the remaining patients required a second session. All strictures became self-limited with this approach, and none needed further interventions or redilation during subsequent follow-up (mean, 33 months). Of the 44 patients with bladder neck stricture, 8 (18.2%) had a previous history of adjuvant radiotherapy.

The overall rate of positive surgical margin was 24.7% (80 patients), and there was no significant difference between the LRP and ORP groups regarding the rate of positive surgical margin (27.9% versus 22.3%, respectively; Table). All of the patients with a positive surgical margin were managed by adjuvant radiotherapy. A preoperative serum PSA level higher than 20 ng/mL was a significant risk factor of positive surgical margin, as about one-third (34.7%) of those with a PSA higher than 20 ng/mL versus 21.1% of the patients with a PSA less than or equal to 20 ng/mL had a positive surgical margin ($P = .03$). Furthermore, the rate of positive surgical margin was directly related to pathologic stage: 13% of patients with stage T2 or lower versus 50.5% of those with higher stages of prostate cancer had a positive surgical margin ($P < .001$).

DISCUSSION

In the era of PSA and screening for prostate cancer, radical prostatectomy has become a routine surgical procedure in many centers. However, VUA, which directly influences postsurgical continence and the patients' quality of life, has always been a challenge during this procedure.[10,11] Given that functional urethral length has a direct effect on continence, the anastomotic sutures should be applied as precisely as possible to incorporate as little of the urethra as is feasible.[5-8] 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.[7] 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.[8] 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.[11] 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.[12] In 1997, Igel and Wehle introduced their alternative VUA technique based on the Vest technique.[11] 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.[13] 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.[4] 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.[14] 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.[15,16]

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.[17] 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.[17]

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 both open and laparoscopic approaches with an excellent rate of early continence—the highest concern for these patients—and acceptable rate of stricture. We think that a 3-month early continence rate of 90.4% with this procedure is excellent, compared with postradical 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.[5-8]" We assume that the part of urethra incorporating in the anastomotic stitches may not participate in continence mechanism and may lead to the shortening of maximum functional urethral length.

Continence following sutureless vesicourethral alignment may also come back to the minimum manipulation of 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.[19] Therefore, 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.[20] 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.[19] 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.[21] 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 last 150 cases was 8.7%; significantly lower than early 174 cases (17.8%).

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

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

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CONFLCIT OF INTEREST

None declared.

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