Original Paper

Current Urology

Curr Urol 2016;10:145–149
DOI: 10.1159/000447169

Received: September 9, 2016
Accepted: December 19, 2016
Published online: July 30 , 2017

Bladder Neck Contracture Following Radical Retropubic versus Robotic-Assisted Laparoscopic Prostatectomy

Benjamin L. Spector Nathan A. Brooks Michael E. Strigenz James A. Brown

Department of Urology, University of Iowa, Iowa City, Iowa, USA

Key Words

Radical retropubic prostatectomy •
Robotic-assisted laparoscopic prostatectomy •
Bladder neck contracture • Prostatic adenocarcinoma

Abstract

Introduction: Radical retropubic prostatectomy (RRP) and robotic-assisted laparoscopic prostatectomy (RALP) are co-standard surgical therapies for localized prostatic adenocarcinoma. These surgical modalities offer similar outcomes; however, lower rate of bladder neck contracture (BNC) is amongst the touted benefits of RALP. The differences between approaches are largely elucidated through multiple-surgeon comparisons, which can be biased by differential experience and practice patterns. We aimed to eliminate inter-surgeon bias through this single-surgeon comparison of BNC rates following RRP and RALP. ***Materials and Methods:*** We retrospectively reviewed all RRPs and RALPs performed by one surgeon over 4 years. We compared clinical characteristics, intraoperative and postoperative outcomes. ***Results:*** RRP patients had more advanced cancer and a higher biochemical recurrence rate. No significant differences were noted between groups in rates of anastomotic leakage, BNC, or 12-month postoperative pad-free continence. ***Conclusion:*** RRP offers similar outcomes to RALP with regard to postoperative urinary extravasation, urinary continence, and BNC.

Introduction

Radical retropubic prostatectomy (RRP) and robotic-assisted laparoscopic prostatectomy (RALP) are currently co-standard surgical therapies for localized prostate cancer. While both surgical approaches offer similar functional and oncologic outcomes [1, 2], benefits of RALP over RRP include reduced blood loss, transfusion rate, and duration of hospital stay [2–4]. A decreased rate of bladder neck contracture (BNC) is an additional proposed benefit of RALP [5–14].

The incidence of BNC following RRP varies between 0.48 and 33% [6–12, 15]. By comparison, the BNC rate following RALP has been reported at 0–6.3% [6–14]. The superiority of RALP over RRP with regard to BNC rate has been attributed to the improved visual magnification, precision, and dexterity afforded by a robotic surgical approach during creation of a watertight urethrovesical anastomosis [6–11, 13, 16–19].

While the precise pathophysiology of BNC development has yet to be elucidated, a possible cause includes prolonged anastomotic leakage resulting in healing by secondary intent with subsequent scarring and bladder neck ischemia causing fibrosis [5, 6, 11, 15]. Identified risk factors for BNC following prostatectomy are age, prostate-specific antigen (PSA) level, cigarette smoking, prior transurethral resection of the prostate (TURP), and

KARGER

Fax +41 61 306 12 34
E-Mail karger@karger.com
www.karger.com

Accessible online at:
www.karger.com/cur

James A. Brown
Department of Urology, University of Iowa
200 Hawkins Dr., 3RCP
Iowa City, IA–52242-1089 (USA)
E-Mail james-brown-2@uiowa.edu

prior radiation [5, 6, 8, 9, 11, 14, 15, 20]. Technical factors associated with BNC development include surgical approach, low surgeon volume, poor mucosal apposition, absence of mucosal eversion, excessive intraoperative blood loss, urinary extravasation, and excessive narrowing of the urethrovesical anastomosis [5–11, 15].

BNC typically presents clinically within 6 months of radical prostatectomy (nearly all cases present within 12 months) with symptoms of poor urinary stream, prolonged postoperative incontinence, urinary frequency, urgency, incomplete voiding, and/or nocturia [5, 6, 8–10, 15]. Significant morbidities are associated with BNC including urinary retention, urinary tract infection, and the need for a secondary procedure for repair [5–8, 15].

Though improved BNC rates with RALP compared to RRP have been reported, differences in training, experience, and practice patterns complicate multiple-surgeon comparisons [2, 21]. We aim to diminish these sources of inter-surgeon bias through this single surgeon comparison of BNC rate following RALP versus RRP.

Materials and Methods

Upon Institutional Review Board approval, medical records of 117 men with prostatic adenocarcinoma who underwent prostatectomy (74 consecutive RRPs and 43 consecutive RALPs) from February 2010 through May 2014 were retrospectively reviewed. A single surgeon (J.A.B) performed all procedures with routine assistance by resident physicians. This surgeon received prior laparoscopic and robotic prostatectomy fellowship training and performed over 200 open retropubic, 35 standard laparoscopic, and 25 RALPs as a faculty surgeon prior to initiating this study. When counseling these men preoperatively, the main indication for RRP over RALP was higher-risk disease with the need for more extensive lymphadenectomy; however continence status and patient preference also contributed to the decision of RRP versus RALP.

Patient demographic data, preoperative lower urinary tract dysfunction, PSA level, pathology, continence at 12 months postoperatively, anastomotic leak, and BNC rate were recorded. Continence was defined as the use of no pads per day.

Operative Technique

For RRPs, the urethrovesical anastomosis was performed using a Capio™ RP suture-capturing device (Boston Scientific, Marlborough, MA) to facilitate placement of 6–8 interrupted sutures at the 2, 4, 8, 10, 12, and 6-o'clock positions with 2-0 Monocryl suture. For RALPs, the da Vinci® SI Surgical System (Intuitive Surgical, Inc., Sunnyvale, CA) was used to perform a double-arm suture running urethrovesical anastomosis using two 3-0 V-lock sutures. With both operative techniques, watertight anastomosis was ensured through visual inspection for anastomotic leakage following bladder distention with approximately 100 ml of normal saline. Resident physicians were involved in various aspects of each procedure, including routine performance of a portion of the anastomosis in both cohorts.

Table 1. Baseline demographic data

	RRP	RALP	p
Number of patients	70	43	
Mean ± SEM			
Age, years	60.3 ± 0.8	64.0 ± 1.0	< 0.01
BMI, kg/m^2	28.6 ± 0.5	30.2 ± 0.9	0.19
Number (%)			
Current smokers, n (%)	22 (31.4)	4 (9.3)	0.02
Diabetes, n (%)	8 (11.4)	4 (9.3)	1.00
Prior TURP, n (%)	3 (4.3)	0 (0.0)	0.16
Preoperative LUTD, n (%)	5 (7.1)	4 (9.3)	0.71

Diagnosis of BNC

One RRP patient was diagnosed with BNC by cystoscopy at an outside facility. All other patients with BNC were diagnosed at our institution using flexible cystoscopy. With the exception of one patient, all investigations for BNC were prompted by urinary symptoms, including decreased urinary stream, recurrent urinary tract infection, persistent stress urinary incontinence, and sensation of incomplete voiding with or without elevated post-void residual volume. The one remaining patient was diagnosed incidentally following the inability to pass a Foley catheter during an unrelated emergency department presentation.

Statistical Analysis

Bivariate analysis was performed using the Fisher's exact test for categorical variables and Students *t*-test. All statistical testing was two-sided and assessed for significance at the 5% level using Prism V 6.05 (GraphPad, San Diego, CA).

Results

Preoperative Baseline Data

Of the 74 men initially reviewed in the RRP group, 70 were included in the final analysis. Four aborted cases were excluded; 2 cases early in the series were aborted due to the finding of grossly positive lymph node metastases, 1 case due to presence of extensive surgical mesh behind and above the symphysis pubis, and 1 case due to the inability to place the patient supine secondary to ankylosing spondylitis. All 43 RALP cases were included in our analysis.

At the time of procedure, the RRP cohort was significantly younger than the RALP cohort and had a larger proportion of current cigarette smokers. There was no difference in rates of prior TURP or preoperative LUTD between the RRP and RALP groups (table 1). The RRP cohort had a significantly higher median preoperative

Table 2. Operative outcomes

	RRP	RALP	p
Mean ± SEM			
Operative time, minutes	249 ± 5	352 ± 11	< 0.01
Median (range)			
EBL, ml	800 (200–3,000)	100 (25–450)	< 0.01
Catheter removal, post operative day	15 (8–36)	13.5 (8–27)	0.17
Number (%)			
Presenting for 12 month follow-up	54	30	
Pad-free continence*	35 (64.8)	19 (63.3)	0.95

EBL = Estimated blood loss. *Percentages reflect the proportion of patients present at 12 month follow-up.

Table 3. Complications

	RRP	RALP	p
Number (%)			
Clinically significant anastomotic leak	3 (4.3)	2 (4.7)	1.00
Blood transfusion	12 (17.1)	0 (0.0)	< 0.01
High-grade complications	17 (24.3)	6 (14.0)	0.23
BNC	2 (2.9)	2 (4.7)	0.63

PSA (7.2 vs. 5.4 mg/l, $p \leq 0.01$). Additionally, the RRP cohort had higher proportions of patients with preoperative Gleason scores > 7 (20.0 vs. 4.7%, p = 0.07) and high-risk D'Amico categorization [22] (27.1 vs. 9.3%, p = 0.07), however these values did not reach statistical significance.

Intraoperative, Perioperative, and Postoperative Data

When compared to RALPs, RRPs were performed in a significantly shorter mean operating time (table 2). Additionally, the RRP group experienced a higher median estimated blood loss (table 2), and a higher blood transfusion rate (table 3). There was no difference in duration of catheterization postoperatively between groups (table 2). A greater number of RRP specimens were categorized as pathologic stage T3 (30.0 vs. 16.3%, p = 0.11) and Gleason grade > 7 (20.0 vs. 9.3%, p = 0.07), and a greater number of RRP patients experienced biochemical recurrence at last follow-up (24.2 vs. 2.3%, $p \leq 0.01$).

Complications and Functional Outcomes

There was no difference in overall incidence of clinically significant anastomotic leak between RRP and RALP groups (table 3). Three and 2 (4.3 and 4.7%) patients were diagnosed with a clinically significant anastomotic leak in the RRP and RALP groups, respectively. A clinically significant anastomotic leak was defined as elevated drain creatinine (≥ 0.2 mg/dl above serum creatinine level) measured on postoperative day 1 or 2 that did not resolve prior to hospital discharge, and that necessitated drain placement beyond the duration of hospitalization or catheter placement beyond postoperative day 18. Foley catheters were routinely scheduled for removal at 2 weeks (± 3 days) postoperatively. A single RALP patient without elevated drain creatinine or prolonged drain placement was diagnosed with posterior urine leak by computed tomography after presenting to the emergency department on postoperative day 4 with complaints of lower abdominal pain and gross hematuria; otherwise all patients with clinically significant anastomotic leak were diagnosed by our standard definition. The RALP patient diagnosed with anastomotic leak by computed tomography subsequently developed a urinoma requiring treatment by interventional radiology with drain placement. All other clinically significant anastomotic leaks resolved with conservative management within 36 days (range 13–36 days). None of the men that experienced anastomotic leak were diagnosed with subsequent BNC. There was no difference in high-grade complications (defined as Clavien-Dindo Classification grade III or greater) [23] between the RRP and RALP cohorts (table 3).

There was no difference in overall BNC rate between the 2 cohorts (table 3). Two patients were diagnosed with BNC in each of the RRP and RALP groups (2.9 and 4.7%, respectively). One RRP patient noted weakened urinary stream, beginning approximately 7 months postoperatively, and subsequently presented to a local urologist where he was diagnosed with BNC by cystoscopy. The other presented to the emergency department with acute mental status changes and was incidentally found to have BNC with urinary retention following the inability to pass a Foley catheter at 18 months postoperatively. Both patients were diagnosed via cystoscopy and treated by BNC dilation. In the RALP group 1 patient presented at 15 months postoperatively with symptoms of straining during urination and an elevated post-void residual volume that had progressed over the previous year. He was found to have BNC diagnosed by cystoscopy, but the patient was minimally bothered by his symptoms

and no further intervention was pursued. The second RALP patient presented with weak urinary stream and urinary retention at approximately 10 months postoperatively. BNC was diagnosed by cystoscopy. Initially he was treated with dilation with subsequent transurethral incision of the bladder neck after the dilation failed. This patient did well for approximately 2 months before once again noting weakened urinary stream, and cystoscopy revealed near concentric scarring diffusely throughout the bladder neck. A transurethral resection of the bladder neck was then performed.

Among the men who presented for follow-up at 12 months postoperatively (n = 54 for the RRP cohort, n = 30 for the RALP cohort), there was no difference in complete pad-free urinary continence between RRP and RALP groups at that time (table 2). The remaining 16 men in the original RRP cohort and 13 men in the original RALP cohort were lost to follow-up prior to the 12-month postoperative time point.

Discussion

By examining a single surgeon's anastomotic leakage, BNC and pad-free continence rates following RRP and RALP, we sought to eliminate the bias present in multiple surgeon comparison studies. The incidence of anastomotic leakage and BNC following our RRP and RALP procedures fell within previously reported rates. Interestingly, despite the increased presence of known BNC risk factors in the RRP cohort relative to the RALP cohort, including a greater prevalence of cigarette smoking, higher preoperative PSA values, and increased intraoperative blood loss, there was no difference in rate of BNC between the 2 groups. The 3 men with symptomatic BNCs experienced symptom onset within the expected first 12 postoperative months with the typical complaints of LUTD. However, one RRP patient had an asymptomatic BNC discovered incidentally 18 months after surgery. Therefore, the clinically symptomatic BNC rate was lower for the RRP cohort (n = 1, 1.4%) than the RALP cohort (n = 2, 4.7%, p = 0.56). It is possible there are additional patients with minimally symptomatic or asymptomatic BNCs in both cohorts. We did not evaluate asymptomatic patients for the presence of a sub-clinical BNC in either cohort.

We observed the previously demonstrated benefits of RALP over RRP of decreased blood loss and lower transfusion rate. Additionally, our finding of similar pad-free urinary continence rates of approximately 64% between the 2 surgical modalities is consistent with previous reports. However, our finding of equivalent BNC rates following RRP and RALP, despite the presence of a greater number of risk factors associated with BNC in the RRP group, refutes previous suggestions of lower BNC incidence as a benefit of RALP in the management of prostatic adenocarcinoma.

While visual confirmation of the intact bladder neck is an advantage of RALP, there are several potential explanations for our comparable RRP BNC rate. These include: highly accurate placement of interrupted sutures using Capio™ RP suture-capturing device [7], increased ability to preserve an intact bladder neck during RRP compared with RALP, routine performance of mucosal eversion during RRP, and less tension during the approximation of the posterior anastomosis in the supine rather than steep Trendelenburg position.

Conclusion

Open radical retropubic prostatectomy using the Capio™ RP suture-capturing device appears to offer similar outcomes to RALP with regard to the development of postoperative urinary extravasation, BNC, and the recovery of postoperative urinary continence.

References

1 Patel VR, Tully AS, Holmes R, Lindsay J: Robotic radical prostatectomy in the community setting—the learning curve and beyond: initial 200 cases. J Urol 2005;174:269–272.

2 Ahlering TE, Woo D, Eichel L, Lee DI, Edwards R, Skarecky DW: Robot-assisted versus open radical prostatectomy: a comparison of one surgeon's outcomes. J Urol 2004;63: 819–822.

3 Hakimi AA, Feder M, Ghavamian R: Minimally invasive approaches to prostate cancer: a review of the current literature. Urol J 2007; 4:130–137.

4 Moran PS, O'Neill M, Teljeur C, Flattery M, Murphy LA, Smyth G, Ryan M: Robot-assisted radical prostatectomy compared with open and laparoscopic approaches: a systematic review and meta-analysis. Int J Urol 2013;20:312–321.

5 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;57:742–746.

6 Parihar JS, Ha YS, Kim IY: Bladder neck contracture—incidence and management following contemporary robot assisted radical prostatectomy technique. Prostate Int 2014;2: 12–18.

7 Schurtz EA, Markes J, Newton MR, Brown JA: Novel use of Capio urethral anastomotic suturing device: a 50 case assessment. Curr Urol 2013;7:145–148.

8 Breyer BN, Davis CB, Cowan JE, Kane CJ, Carroll PR: Incidence of bladder neck contracture after robot-assisted laparoscopic and open radical prostatectomy. BJU Int 2010; 106:1734–1738.

9 Carlsson S, Nilsson AE, Schumacher MC, Jonsson MN, Volz DS, Steineck G, Wiklund PN: Surgery-related complications in 1253 robot-assisted and 485 open retropubic radical prostatectomies at the Karolinska University Hospital, Sweden. Urology 2010;75: 1092–1097.

10 Msezane LP, Reynolds WS, Gofrit ON, Shalhav AL, Zagaja GP, Zorn KC: Bladder neck contracture after robot-assisted laparoscopic radical prostatectomy: evaluation of incidence and risk factors and impact on urinary function. J Endourol 2008;22:377–383.

11 Webb DR, Sethi K, Gee K: An analysis of the causes of bladder neck contracture after open and robot-assisted laparoscopic radical prostatectomy. BJU Int 2008;103:957–963.

12 Krambeck AE, DiMarco DS, Rangel LJ, Bergstralh EJ, Myers RP, Blute ML, Gettman MT: Radical prostatectomy for prostatic adenocarcinoma: a matched comparison of open retropubic and robot-assisted techniques. BJU Int 2008;103:448–453.

13 Coelho RF, Palmer KJ, Rocco B, Moniz RR, Chauhan S, Orvieto MA, Coughlin G, Patel VR: Early complication rates in a single-surgeon series of 2500 robotic-assisted radical prostatectomies: report applying a standardized grading system. Eur Urol 2010;57:945–952.

14 Rebuck DA, Haywood S, McDermott K, Perry KT, Nadler RB: What is the long-term relevance of clinically detected postoperative anastomotic urine leakage after robotic-assisted laparoscopic prostatectomy? BJU Int 2011;108:733–738.

15 Besarani D, Amoroso P, Kirby R: Bladder neck contracture after radical retropubic prostatectomy. BJU Int 2004;94:1245–1247.

16 Hanson GR, Odom E, Borden LS Jr, Neil N, Corman JM: Post-operative drain output as a predictor of bladder neck contracture following radical prostatectomy. Int Urol Nephrol 2008;40:351–354.

17 Guru KA, Seereiter PJ, Sfakianos JP, Hutson AD, Mohler JL: Is a cystogram necessary after robot-assisted radical prostatectomy? Urol Oncol 2007;25:465–467.

18 Box GN, Ahlering TE: Robotic radical prostatectomy: long-term outcomes. Curr Opin Urol 2008;18:173–179.

19 Zorn KC, Gofrit ON, Orvieto MA, Mikhail AA, Zagaja GP, Shalhav AL: Robotic-assisted laparoscopic prostatectomy: functional and pathologic outcomes with interfascial nerve preservation. Eur Urol 2007;51:755–763.

20 Elliott SP, Meng MV, Elkin EP, McAninch JW, Duchane J, Carroll PR: Incidence of urethral stricture after primary treatment for prostate cancer: data from CaPSURE. J Urol 2007;178:529–534.

21 Gettman MT, Blute ML: Critical comparison of laparoscopic, robotic, and open radical prostatectomy: techniques, outcomes, and costs. Curr Urol Rep 2006;7:193–199.

22 D'Amico AV, Whittington R, Malkowicz SB, Schultz D, Blank K, Broderick GA, Tomaszewski JE, Renshaw AA, Kaplan I, Beard CJ, Wein A: Biochemical outcome after radical prostatectomy, external beam radiation therapy, or interstitial radiation therapy for clinically localized prostate cancer. JAMA 1998; 280:969–974.

23 Dindo D, Demartines N, Clavien PA: Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004;240:205–213.