

Repair of Rectal Injury During Robotic-Assisted Laparoscopic Prostatectomy

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INTRODUCTION Rectal injury is a potential devastating complication in radical prostatectomy. We reviewed the incidence and management of rectal injuries with robotic-assisted laparoscopic radical prostatectomy performed by a single surgeon. Of the first 251 robotic-assisted laparoscopic radical prostatectomies performed, 2 (0.8%) were complicated by rectal injury.

TECHNICAL CONSIDERATIONS All patients underwent bowel preparation and received preoperative intravenous antibiotics. Both rectal injuries were detected intraoperatively and treated robotically. The rectotomy was closed in two layers of absorbable sutures and imbricated with a nonabsorbable suture. The rectum was then tacked to the levator fibers on one side with nonabsorbable suture to pull the injury away from the vesicourethral anastomosis. An omental flap was developed and tacked posterior to the urethra to cover the repair. A closed suction drain was placed. After surgery, the patients received broad-spectrum intravenous antibiotics and resumed oral intake on postoperative day 1. At 2 weeks, the Foley catheter was removed after voiding cystourethrography confirmed no extravasation.

CONCLUSIONS Rectal injury during robotic-assisted laparoscopic radical prostatectomy can be identified and managed intraoperatively without requiring open conversion. A three-layer closure tacked away from the vesicourethral anastomosis and reinforced by an omental flap resulted in an uneventful recovery. UROLOGY xx: xxx, xxxx. © 2008 Elsevier Inc.

Rectal injury is a potential complication of radical prostatectomy, with an incidence of 0.5%-9%.¹⁻³ The management strategies include extensive preoperative bowel preparation, perioperative and postoperative antibiotics, colostomy, and/or primary repair, with or without omental interposition between the rectum and the vesicourethral anastomosis.^{3,4} In both open and laparoscopic series, rectal injury has been shown to be successfully closed primarily in selected patients. We reviewed the management of rectal injury in 251 cases of consecutive robotic-assisted laparoscopic radical prostatectomy (RALP) at our institution.

MATERIAL AND METHODS

Patients

Of the first 251 RALPs performed by a single surgeon from November 2003 to May 2007, 2 (0.8%) were complicated by an intraoperative rectal injury. The data were prospectively collected regarding the patients' preoperative characteristics (age, prostate-specific antigen level, clinical stage, Gleason score), operative course, and postoperative outcome.

The patients underwent preoperative bowel preparation con-

sisting of a clear liquid diet the day before surgery and a Fleets enema the night or morning before surgery. An intravenous first-generation cephalosporin was administered before surgery.

Surgical Technique

All patients underwent transperitoneal RALP as previously described at our institution using the three-arm da Vinci Surgical System (Intuitive Surgical, Sunnyvale, CA).⁵ In brief, the patient was positioned in the extreme Trendelenburg position on spreader bars with his arms tucked at his sides and legs slightly spread to facilitate docking of the robot. A 12-mm robotic camera port was placed above the umbilicus, followed by two 8-mm robotic arm ports and 5-mm and 12-mm assistant ports.

After establishing the pneumoperitoneum, the bladder was mobilized by incising the peritoneum lateral to the medial umbilical ligaments. The endopelvic fascia was then opened and the dorsal vein complex was secured with suture ligature and divided. The bladder neck was transected, followed by the dissection of the vas deferens and seminal vesicles. Denonvilliers fascia was opened, and the dissection progressed in a plane between the rectum and the prostate toward the apex. For a non-nerve-sparing operation, the pedicles were then divided using monopolar and bipolar cautery, followed by transection of the apical urethra.

When a rectal injury was identified by laparoscopic vision, the prostatectomy was completed and the prostate placed in a laparoscopic entrapment device (Video 1.) The operative field was then abundantly washed with antibiotic irrigation. After clearly identifying the margins of the rectal defect, rectal closure was performed in two layers of running 2-0 polyglactin

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Table 1. Patient characteristics

Characteristic	Patient 1	Patient 2
Age (y)	66	69
Preoperative PSA (ng/mL)	7.9	2.4
Preoperative AUA symptom score	10	7
Clinical stage	T1c	T2a
Nerve-sparing procedure	No	No
Prostate weight (g)	34.0	43.8
Pathologic stage	pT3b	pT3a
Pathologic Gleason score	3+4	3+4
Surgical margin status	Positive	Negative
Continence	No pads at 3 mon	1 pad at 6 mon
3-mo Postoperative PSA (ng/mL)	0.2	<0.1
Postoperative AUA symptom score (3 mo)	26	8

PSA = prostate-specific antigen; AUA = American Urological Association.

suture and imbricated with several interrupted 3-0 silk sutures. The rectum was then tacked to the levator fibers on one side with interrupted 3-0 silk suture to pull the repair away from the subsequent vesicourethral anastomosis. Finally, a fat flap was developed from the omentum off the transverse colon and tacked down with 3-0 polyglactin interrupted sutures to cover the repair. The omental flap was harvested robotically with the laparoscope 30° down, with the assistant pulling the omentum toward the pelvis, which took approximately 15 minutes. The vesicourethral anastomosis was then performed with a standard Van Velthoven running stitch.⁶ A 10-mm-round Jackson-Pratt drain was placed in the pelvis away from the anastomosis. No anal dilation was performed.

Broad-spectrum intravenous antibiotics (ampicillin, gentamicin, and metronidazole) were given for 24 hours. Patients resumed oral intake the next day. On postoperative day 2, the drain was removed and the patient discharged from the hospital. The urethral catheter was removed at 2 weeks in both patients after voiding cystourethrography confirmed the absence of a urine leak.

RESULTS

In our series of 251 consecutive patients, 2 (0.8%) had a rectal injury during RALP. The rectal injuries occurred at cases 140 and 149. The patient characteristics and pathologic data are listed in Table 1. The 2 patients were 66 and 69 years old and the prostate-specific antigen level was 7.9 and 2.4 ng/mL, respectively. The clinical stage was T1c and T2a. The mean operative time was 207.5 minutes (range 195-220). Neither had undergone previous abdominal or transurethral surgery or preoperative radiotherapy or hormonal therapy. Both patients underwent a non-nerve-sparing procedure.

In both patients, the rectal injury was detected intraoperatively, and primary repair was performed robotically. Both injuries occurred during dissection of the plane between the rectum and the prostate near the apex and the division of the rectourethral muscle. The size of the rectal tear was less than 2 cm in both cases. These patients had an uneventful course. No wound infections and no late rectourethral fistula occurred.

The mean prostate weight was 38.9 g (individually, 34 and 43.8 g). Histopathologic examination revealed Stage

pT3a and pT3b. The Gleason score was 7 (3+4) for both patients. A positive surgical margin was reported in 1 patient at the seminal vesicle (pT3b). The postoperative prostate-specific antigen level in the latter patient at 3 months was 0.2 ng/mL, and he was referred for adjuvant radiotherapy. Mild stress urinary incontinence (ie, one light pad daily) with an American Urological Association symptom score of 4 was seen in 1 patient at 12 months of follow-up.

COMMENT

Rectal injury is an uncommon, yet potentially devastating, complication of radical prostatectomy. Inadvertent entry into the rectum during radical prostatectomy converts the case from clean contaminated to contaminated surgery and, therefore, increases the risk of wound infection, pelvic abscess, rectourinary fistula, sepsis, and even death.⁷

Although the incidence of rectal injury during retro-pubic radical prostatectomy has been reported to be up to 9%, contemporary open series have shown that rectal injuries occur in fewer than 0.5% of cases.^{2,8,9} In the largest series of laparoscopic radical prostatectomy (LRP), the incidence of this injury was 0.7%-8% and was only 0.2% in a contemporary RALP series (Table 2).¹⁰⁻²⁰ Katz et al.¹² reported six rectal injuries (2.0%) and one delayed rectourethral fistula in 300 consecutive LRPs. The rectal injuries were repaired laparoscopically, and the delayed rectourethral fistula required colostomy and prolonged urethral catheterization. One patient underwent immediate colostomy with laparoscopic primary repair. Guillonnet al.¹³ reported 13 rectal injuries (1.3%) and one delayed rectourethral fistula (0.1%) and one pelvic abscess (0.1%) in 1000 consecutive LRPs. Of these 15 patients, 11 were diagnosed intraoperatively and underwent laparoscopic repair in a two-layer closure. Of the 11 patients, 9 healed primarily without colostomy. The other 2 patients and the 2 patients diagnosed postoperatively required a delayed colostomy.

During open radical retro-pubic prostatectomy, rectal injury mainly occurs during transection of the rectoure-

Table 2. Complications of rectal injury after LRP and RALP

Investigator	Technique	Patients (n)	Rectal Injuries (n)	Bowel Preparation	Immediate Colostomy	Delayed Colostomy	Complications (n)
Turk et al. ¹⁰	LRP	125	3 (2.4)	NR	0	0	None
Rassweiler et al. ¹¹	LRP	438	3 (0.7)	NR	0	2	None
Katz et al. ¹²	LRP	300	6 (2.0)	Yes	1	1	Fistula (1)
Guillonnet et al. ¹³	LRP	1000	13 (1.3)	No	0	3	Fistula (1), pelvic abscess (1)
Artibani et al. ¹⁴	LRP	71	2 (2.8)	NR	0	0	None
Castillo et al. ¹⁵	ELRP	110	9 (8.0)	Yes	0	6	Fistula (6)
Poulakis et al. ¹⁶	ELRP	255	3 (1.2)	NR	NR	NR	Fistula (1)
Eden et al. ¹⁷	ELRP	100	1 (1)	NR	NR	NR	NR
Stolzenburg et al. ¹⁸	ELRP	900	6 (0.7)	NR	0	1	Fistula (1)
Hu et al. ¹⁹	LRP	358	9 (2.5)	NR	1	4	Fistula (7)
	RALP	322	0	NR			
Mennon et al. ²⁰	RALP	1100	2 (0.2)	Yes	0	0	None
Present series	RALP	251	2 (0.8)	Yes	0	0	None

LRP = laparoscopic radical prostatectomy; ELRP = extraperitoneal laparoscopic radical prostatectomy; RALP = robotic -assisted laparoscopic radical prostatectomy; NR = not reported.

Data in parentheses are percentages.

thral muscle.^{3,21} In LRP and RALP, rectal injury usually occurs during the development of the rectal-prostatic plane, because the urethra is left intact during most of the dissection, and the prostatectomy is performed primarily using an antegrade approach. The plane between the seminal vesicles, prostate, and rectum is developed from the prostatic base to the apex. Most rectal injuries occur from this dissection and are discovered near the apex and rectourethral muscle.¹²

The predisposing factors for rectal injury include periprostatic fibrosis, previous prostate or rectal surgery, radiotherapy, previous hormonal therapy, and infection.^{21,22} Neither of our patients had a history of radiotherapy, prostate surgery, or prostatitis. Locally advanced tumors can also result in a difficult dissection from direct spread or desmoplastic reaction.¹² In each case, the disease stage might have played a role in the rectal injury, because the prostate seemed “stuck,” and the plane between the prostate and rectum was ill-defined because of the desmoplastic reaction. The prostate weight, however, did not seem to have an effect on our incidence of rectal injury.

Both rectal injuries occurred during non-nerve-sparing prostatectomy. Guillonnet et al.¹³ also reported 12 of 13 rectal injuries during non-nerve-sparing prostatectomy and attributed it to the dissection plane being closer to the rectum and possibly over self-confidence while performing a “simpler” operation.

In both cases, we had performed sharp and blunt dissection with monopolar scissors and a bipolar Maryland dissector. We believe blunt dissection also contributed to the two rectal injuries and now carefully adhere to the posterior prostate surface using only sharp dissection while the assistant holds the rectum posteriorly with a suction irrigation tip.

Both of our rectal injuries were readily visualized intraoperatively with the aid of the da Vinci system with its magnified three-dimensional view of the operating field.

If uncertain of an injury, digital rectal examination or bubbled air into the rectum while filling the pelvis with irrigation fluid might be helpful in diagnosing and identifying the site of the laceration, because a delay in the diagnosis almost inevitably results in a colostomy. Although some recommend placement of an intrarectal device, such as a bougie or balloon, for better visualization of the anterior rectal wall, we prefer to have the rectum empty.^{11,13}

Although many recommend antibiotic therapy, a low-fiber diet, and anal dilation, the management of the rectal injury itself remains debatable with regard to interposition of healthy tissue between the rectal repair and vesicourethral anastomosis, and the necessity for a colostomy. In the past, a systematic diverting colostomy was recommended; however, currently, primary closure of the rectum without a diverting colostomy has been advocated. Various open and laparoscopic series have confirmed that intraoperatively identified rectal lacerations can be sutured primarily in nonirradiated patients.^{2,4,10–20} The use of preoperative antibiotics and the interposition of healthy tissue between the urethra and rectum have been debated, and a diverting colostomy is reserved for cases of massive fecal spillage, previous radiotherapy, or a tense suture line.²¹ Although the general surgery department was not consulted in our series, we recommend a low threshold for consultation in cases complicated by the adverse prognostic factors noted.

The incidence of rectal injury in our series is in accordance with other LRP and RALP series. The improved visualization with the da Vinci system might aid in the immediate intraoperative diagnosis and subsequent successful primary repair. We believe that tacking the repair to the pelvic sidewall and placing an interposing strip of omentum reduced the risk of a rectourethral fistula developing.

The three-layer closure and tacking of the rectum has not been previously described. A two-layer closure with or without an omental flap might be adequate, as de-

scribed by other investigators.^{12,13,15,18,19} Tacking of the rectum to the pelvic sidewall helped to distance the repair from the vesicourethral anastomosis and did not appear to place undue stress on the repair. Although this technique might be excessive, particularly when a small tear has occurred without electrocautery in the prepared bowel, the consequences of a failed repair can be devastating.

CONCLUSIONS

Rectal injury during RALP that is not recognized intraoperatively or not adequately repaired can result in devastating postoperative complications. Our series has shown that rectal injuries can be successfully repaired robotically with a meticulous three-layer closure tacked away from the vesicourethral anastomosis and reinforced by an omental flap.

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APPENDIX

SUPPLEMENTARY DATA

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.urology.2007.12.022](https://doi.org/10.1016/j.urology.2007.12.022).