Early and Late Complications of Robot-Assisted Radical Cystectomy: A Standardized Analysis by Urinary Diversion Type

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Purpose: Minimally invasive surgical treatment for bladder cancer has gained popularity but standardized data on complications are lacking. Urinary diversion type contributes to complications and to our knowledge diversion types after minimally invasive cystectomy have not yet been compared. We evaluated perioperative complications stratified by urinary diversion type in patients treated with robot-assisted radical cystectomy.

Materials and Methods: We analyzed the records of 209 consecutive patients who underwent robot-assisted radical cystectomy at our institution from 2003 to 2012 with respect to perioperative complications, including severity, time period (early and late) and diversion type. All complications were reviewed by academic urologists. Urinary diversion was also done. As outcome measurements and statistical analysis, univariate and multivariate logistic regression models were used to determine predictors of various complications.

Results: The American Society of Anesthesiologists® (ASA) score was 3 or greater in 80% of patients and continent diversion was performed in 68%. Median followup was 35 months. Within 90 days 77.5% of patients experienced any complication and 32% experienced a major complication. The 90-day mortality rate was 5.3%. Most complications were gastrointestinal, infectious and hematological. On multivariate analysis patients with ileal conduit diversion had a decreased likelihood of complications compared to patients with Indiana pouch and orthotopic bladder substitute diversion despite the selection of a more comorbid population for conduit diversion. Continent diversion was associated with a higher likelihood of urinary tract infection. Our results are comparable to those of previously reported open and minimally invasive cystectomy series.

Conclusions: Open or minimally invasive cystectomy is a complex, morbid procedure. Urinary diversion is a significant contributor to complications, as is patient comorbidity. Although patients with an ileal conduit had more comorbidities, they experienced fewer complications than those with an orthotopic bladder substitute or Indiana pouch diversion.

Key Words: urinary bladder, urinary diversion, cystectomy, complications, robotics

Abbreviations and Acronyms

CCI = Charlson comorbidity index
GI = gastrointestinal
Hct = hematocrit
IC = ileal conduit
IP = Indiana pouch
OBS = orthotopic bladder substitute
ORC = open radical cystectomy
RARC = robot-assisted radical cystectomy
UTI = urinary tract infection

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MINIMALLY invasive radical cystectomy is an alternative surgical treatment of bladder cancer. Studies comparing ORC and RARC suggest that there are benefits to RARC regarding postoperative pain, blood loss and bowel function recovery.[1–3] Similar oncological control and complication rates

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between ORC and RARC have been implied, although to our knowledge the accrual and completion of randomized, controlled trials comparing ORC and RARC have yet to be completed.

Short-term complication data recently became available, showing similar complication rates for RARC and ORC when similar reporting methods were used.[2,3] Urinary diversion significantly contributes to complications regardless of the surgical approach to cystectomy.[4–6] To our knowledge no prospective, randomized trials have been performed to compare continent cutaneous diversion, neobladder and noncontinent conduit diversion, making standardized reporting essential for evaluation. We evaluated the complications of a large, consecutive series of patients treated with RARC by diversion type and organ system.

PATIENTS AND METHODS

Design and Analysis

A total of 254 RARCs were performed from 2003 to 2012 and 209 patients provided consent to an institutional review board approved, prospective data collection protocol. Demographic, clinical, surgical and pathological data were retrospectively reviewed and summarized using descriptive statistics. There were no study exclusions based on histology or prior pelvic radiation.

At our institution all patients are treated with RARC instead of ORC regardless of pathological or patient characteristics unless the patient is undergoing open surgery for another reason. The 2 ORC and RARC cases converted to open surgery were excluded from analysis. Neoadjuvant chemotherapy was offered as indicated, and preoperative staging was done by computerized tomography. Patients were offered orthotopic or cutaneous continent diversion, or an ileal conduit. Contraindications to orthotopic diversion included serum creatinine greater than 2 ng/ml, disease at the urethral margins or advanced disease. Contraindications to continent cutaneous diversion included poor manual dexterity, creatinine greater than 2 ng/ml, significant comorbidity, dementia or advanced disease.

Clinicopathological and complication data were collected prospectively. In addition, academic urologists independently reviewed all inpatient charts, outpatient notes, hospital notes from elsewhere and correspondence with local physicians. All complications were recorded and graded according to the established 5-grade Clavien classification.[7] Clavien grade I and II complications were categorized as minor, and grade III-V complications were considered major. All blood transfusions were recorded as Clavien grade II or greater. Preoperative comorbidities were calculated using the CCI.[8] All complications were evaluated relative to diversion type, organ system and time of occurrence (before vs after 90 days).

Operative Technique

RARC and extended bilateral pelvic lymphadenectomy were performed with the da Vinci® Surgical System using a previously described 6-port transperitoneal approach.[9] OBS, IC or IP is offered to all patients. We generally recommend IP as the continent diversion of choice in females.

In 2003 the surgeon performing cystectomy completed the diversion. Beginning in 2004 a 2-team approach was used and from that point forward a single surgeon performed all diversions. Extracorporeal diversion was completed through a midline incision 6 to 8 cm long using the camera port incision. ICs were constructed with interrupted Bricker ureteroileal anastomoses over 8Fr feeding tubes and Turnbull stomas. IPs were constructed using a segment of ascending colon and terminal ileum, and modified as described by Ahlering et al.[10] The terminal ileum was tapered over a 14Fr Robinson catheter and the pouch was drained with a temporary 24Fr catheter. OBSs were created as described by Studer et al[11] with the robot redocked for the OBS-urethral anastomosis.

Preoperative patient preparation included clear liquids and GoLYTELY® or magnesium citrate the day before surgery. Beginning in 2009 oral alvimopan was administered preoperatively and postoperatively in the absence of contraindications. Sequential compression devices were routinely used and a second-generation cephalosporin was administered intravenously for 1 day perioperatively. In 2006 subcutaneous low molecular weight heparin was initiated postoperatively with confirmation of stable Hct and continued for 4 weeks.

Nasogastric tubes were not routinely left in place or they were discontinued within 24 hours. Ileus was defined as the inability to tolerate oral intake 5 days postoperatively or the need for a nasogastric tube. A patient controlled analgesia device with morphine or hydromorphone was used postoperatively. Diets were advanced using clinical cues without a standardized pathway. Ureteral stents were removed 3 weeks postoperatively, as indicated. In all patients renal ultrasound and mercaptoacetyltriglycine renal scan were routinely performed after 6 weeks. Cystography was done after OBS 3 weeks postoperatively before Foley catheter removal. Temporary continent cutaneous pouch catheters were discontinued 3 weeks after surgery. Stomal catheters were not left in place postoperatively.

Statistical Analysis

Demographic, clinical and pathological variables were summarized using descriptive statistics with the median and IQR reported for continuous variables and the count and proportion reported for categorical variables. Variables were further stratified by urinary diversion and tested across the 3 groups using the Pearson chi-square and Kruskal-Wallis tests to compare categorical and continuous data, respectively. Univariate and multivariate logistic regression models were used to analyze the effects of diversion type, and demographic, preoperative, surgical and pathological factors on the incidence of various complications after RARC. SAS® was used for all statistical calculations and graphics.

RESULTS

Supplementary table 1 (http://jurology.com/) lists population demographics. Patients with IC had the