Reoperations following Robot-Assisted Radical Cystectomy: A Decade of Experience

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Abbreviations and Acronyms

RA = robot-assisted

RARC = RA radical cystectomy

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Purpose: There is a paucity of data regarding the operative management of complications after robot-assisted radical cystectomy. We reviewed operative management of robot-assisted radical cystectomy specific complications during our 10-year experience with this procedure and assessed the feasibility, safety and outcomes of robot-assisted reoperations.

Materials and Methods: We retrospectively reviewed the records of all patients who underwent surgical interventions for robot-assisted radical cystectomy specific complications between 2005 and 2015. Univariable and multivariable logistic regression models were fit to evaluate predictors of surgical intervention after robot-assisted radical cystectomy. Kaplan-Meier curves were used to describe time to surgical interventions.

Results: A total of 92 patients (23%) underwent surgical intervention after robot-assisted radical cystectomy. Mean followup was 27 months. Average time to any surgical intervention after cystectomy was 14 months. The reoperation rate was 5%, 2% and 16% at 30, 31 to 90 and greater than 90 days, respectively. Using the Kaplan-Meier method surgical interventions occurred at a rate of 30% at 2 years and 46% at 5 years. Interventions for ureteroileal complications were the most common (48 cases) followed by interventions for bowel obstruction, fistulas and abdominal wall related complications (11 cases). Clavien 3 or greater complications and neoadjuvant chemotherapy were associated with surgical intervention.

Conclusions: Even in experienced hands the long-term complications of robot-assisted radical cystectomy are notable. Of our patients 23% required surgical interventions after the procedure. Our initial experience with robot-assisted management of robot-assisted radical cystectomy complications appears safe and feasible, although the decision to proceed is determined primarily by surgeon experience.

Key Words: urinary bladder neoplasms, cystectomy, robotic surgical procedures, complications, reoperation

Radical cystectomy with pelvic lymph node dissection represents the standard of care for muscle invasive and refractory nonmuscle invasive bladder cancer.[1] Growing interest in minimally invasive approaches has been spurred, aiming to decrease perioperative morbidity. RARC has been shown to be equivalent to the open approach in terms of oncologic

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and functional outcomes with less blood loss, transfusion, shorter hospital stay and quicker recovery.[1]

However RARC remains a morbid procedure with significant complications.[2,3] Diversion related complications may necessitate surgical interventions during convalescence or even years later.[4] Although endoscopic and percutaneous procedures may allow for prompt management and prevent further deterioration, surgical revision remains the gold standard for definitive management.[5]

While many groups have reported complications following RARC using a standardized approach, there is a paucity of data on the outcomes of operative management of such complications and the role of RA surgery. We reviewed the operative management and outcomes of RARC specific complications during our 10-year experience, and further assessed the feasibility and safety of RA management.

METHODS

We retrospectively reviewed our prospectively maintained quality assurance database of 406 patients who underwent RARC performed by a single surgeon at our institution between November 2005 and May 2015. No open radical cystectomy was performed during this period. Data were reviewed for demographics, including age, gender, body mass index and ASA® (American Society of Anesthesiologists®) score as well as preoperative characteristics (neoadjuvant chemotherapy, prior abdominal surgery, staging and pathology findings), operative variables (diversion type and technique, operative time, blood loss and transfusion) and perioperative outcomes (complications, and hospital and intensive care unit stay). The technique of RARC has been previously described.[6] We adopted an intracorporeal approach to ileal conduits in 2009 and a stringent multidisciplinary protocol in 2011, which led to a substantial increase in the use of neoadjuvant chemotherapy.[7] Followup was advocated in compliance with NCCN Guidelines®.

We reviewed the records of all patients who underwent surgical intervention for RARC specific complications, including those operations performed elsewhere. Reoperations not pertaining to RARC or urinary diversion were excluded from study, eg evacuation of subdural hematoma and colonoscopy. Data on reoperations included approach, operative time, intraoperative complications, blood loss, transfusion rate, hospital stay, postoperative complications, followup imaging and the need for further surgical intervention.

Data are shown as the mean ± SD. Univariable associations were statistically assessed by the Wilcoxon rank sum or Kruskal-Wallis test for ordinal data and the Pearson chi-square test for categorical variables. Univariate and multivariate logistic regression models were fit to evaluate preoperative, operative and postoperative predictors of surgical intervention after RARC. Kaplan-Meier curves were used to describe time to surgical intervention. The Cochran-Armitage trend test was applied to evaluate the trend toward invasive operative approaches (RA vs open) for reoperations with time. All tests were 2-sided with statistical significance considered at $p < 0.05$. All statistical analyses were performed with SAS®, version 9.3.

RESULTS

A total of 92 patients (23%) underwent surgical intervention for complications pertaining to RARC or urinary diversion (fig. 1), including neoadjuvant chemotherapy in 28 (30%) and localized disease on final pathology findings in 57%. Mean followup was 27 months (supplementary table 1, http://jurology.com/).

Average time to any surgical intervention after RARC was 14 months. The reoperation rates were 5%, 2% and 16% at 30, 31 to 90 and greater than 90 days, respectively. Of the interventions 68% were performed more than 90 days after RARC. Using the Kaplan-Meier method surgical interventions occurred at a rate of 30% at 2 years and 46% at 5 years (fig. 2, *A*). Interventions for ureteroileal complications were the most common (48 cases or 52%) followed by interventions for bowel obstruction, fistulas and abdominal wall related complications (each 11% or 12%) (see table). A total of 57 patients (62%) received endoscopic and/or percutaneous intervention, of whom 21 required a more invasive procedure. As definitive treatment an invasive intervention (RA/laparoscopic or open) was performed in 56 patients (61%) (supplementary table 2, http://jurology.com/).

Starting from 2012 in all 34 complications requiring surgical management the intervention was performed with robotic assistance except in 6 patients. Three of these patients were operated on elsewhere and 3 were treated by other services at our institution, including the gynecologic oncology service for fistula in 1, and the surgical oncology service for fistula and bowel obstruction in 1 each. There was a significant trend toward RA revisions with time compared to open revisions ($p < 0.0001$, fig. 3).

On univariate logistic regression high grade complications (Clavien 3 or greater) were associated with surgical interventions after RARC (OR 5, 95% CI 2.48−10.1, $p < 0.001$). Patients who did not receive neoadjuvant chemotherapy were less likely to undergo intervention (OR 0.44, 95% CI 0.26−0.75, $p = 0.003$). Both variables remained significant on multivariable analysis (OR 7.33, 95% CI 3.12−17.24, $p = 0.001$ and OR 0.24, 95% CI 0.10−0.60, $p = 0.002$, respectively, supplementary table 3, http://jurology.com/).