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Prophylactic Ureteral Stenting in Laparoscopic Colectomy: Revisiting Traditional Practice

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ABSTRACT

Background: Prophylactic placement of ureteral stents is performed during open colectomy to aid in ureteral identification and to enhance detection of injury. The effects of this practice in laparoscopic colectomy are unknown. This study compares outcomes of patients undergoing laparoscopic colectomy with and without prophylactic ureteral stenting.
Methods: A retrospective cohort study at a tertiary academic medical center was performed. The primary outcome measure was the incidence of ureteral injury. Secondary outcomes evaluated included mortality, length of stay, procedural duration, and new-onset urinary complication (hematuria, dysuria, and urinary tract infection).
Results: In 702 consecutive patients undergoing elective laparoscopic colectomy from 2013 to 2016, prophylactic stents were placed in 261 (37%) patients. Two ureteral injuries occurred (0.3%), both in patients who underwent ureteral stent placement ($P = 0.07$) and were found and repaired intraoperatively. There was no in-hospital mortality. When accounting for age-adjusted Charlson comorbidity score, procedural indication, gender, BMI, and extent of resection, no difference in hospital length of stay ($P = 0.79$) was noted comparing patients with and without stenting. However, stent placement prolonged operating time ($P = 0.03$) and increased the risk of new-onset urinary complications ($P = 0.04$).
Conclusions: In this study, ureteral injuries only occurred in those with stent placement. Prophylactic ureteral stents in laparoscopic colectomy are associated with increased operative time and urologic morbidity. Owing to the low prevalence of ureteral injury in the elective setting and the increased risk of urinary complications, use of prophylactic ureteral stenting should be highly selective.

Introduction

Prophylactic placement of ureteral stents during colectomy may mitigate the risk and adverse sequelae of ureteral injury by aiding intraoperative identification of the ureters and facilitating early repair.[1-4] However, the practice of stenting leads to higher rates of urologic adverse events such as ureteric or renal injury associated with catheterization,[2,5] postoperative hematuria or infection,[6,7] or disruption of normal anatomy. Collectively, the utility and harm of this practice is now often considered on an individual basis and no guidelines exist regarding best practice.

Prophylactic stenting in colectomy has been most closely examined in open colectomy procedures, where reported rates of ureteral injury range from 0.2% to 7.6%.[7,8] In these studies, stenting did not prevent ureteral injury but did

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facilitate detection of injury. By contrast, reported rates of ureteric injury in laparoscopic colectomy are lower ranging from 0% to 1.5%.[5,6,8,9] Benefits of prophylactic stenting in laparoscopic surgery have not been rigorously evaluated, although some have theorized an advantage in a setting when manual tactile localization is not possible.[5,7] Studies with laparoscopic colectomy suggest that careful patient selection may be required to offset the increased risk of postoperative urinary complications, although such reports involve small cohorts and do not account for preoperative comorbid risks.[5,6,8,9]

This study evaluated outcomes of a large cohort of patients undergoing elective laparoscopic colectomy to determine the outcomes of prophylactic ureteral stenting, accounting for demographics, comorbid conditions, procedural indications, and extent of resection. Based on previous studies assessing ureteral stenting in open colectomy, we hypothesize that placement of ureteral stents in laparoscopic colectomy is associated with greater perioperative morbidity.

Methods

Patient selection

The study protocol was approved by the Yale Human Investigational Committee. Adult patients undergoing elective laparoscopic partial or total colon resection between September 2013 and September 2016 at an urban, tertiary, academic medical center were evaluated in this study. Patients undergoing ileocecectomy, colostomy placement, or colostomy reversal were excluded.

Patient and operative variables

Data collected from individual patient charts included demographic information (age, sex, BMI), comorbidities (diabetes, prior myocardial infarction, congestive heart failure, smoking status, chronic steroid use, ASA classification, history of radiation within 30 d of surgery, history of prior colon surgery), procedural indications (diverticular disease, polyp disease, malignancy, inflammatory bowel disease, other), preoperative lab values (white blood cell count, hemoglobin, platelets, albumin, creatinine), and extent of resection (total colectomy; left or extended left colectomy; right or extended right colectomy; sigmoidectomy, low anterior resection, or abdominoperineal resection). Operative details including operative time, wound contamination classification, and estimated blood loss were recorded for all patients. The Charlson comorbidity index with age-adjustment was calculated and used for risk stratification.[10] Data regarding prophylactic ureteric stent placement, laterality and indication for use (anticipated adhesive disease, known urological disease, surgeon preference) were also collected.

Outcomes

The primary outcome of interest was the incidence of ureteral injury and subsequent timing to repair. Secondary outcomes that were evaluated included in-hospital mortality; postoperative length of stay (defined as time from procedure to hospital discharge); operative procedure duration; and new-onset urinary complications, including urinary tract infection (UTI), hematuria, or dysuria, with which the patient did not present to the hospital but developed within 1 wk of the procedure. All urine output during the hospital stay was assessed by the nursing staff for the presence of gross hematuria and documented if present. The presence of dysuria was documented if the patient subjectively reported pain on urination on daily inquiry by the care team. In such cases, or if clinical suspicion was raised by the care team, diagnosis of new-onset UTI was defined by the presence of both leukocytes and nitrates on urinalysis and a positive urine culture on hospitalization in the postoperative period.

Statistical methods

Bivariate analysis was performed to determine which variables were significant between the stented and unstented cohorts. Chi square tests were used for categorical variables, and *t*-tests (or analysis of variance) were used for continuous variables. A multivariable logistic regression model was created to study the variables associated with urinary morbidity (e.g., UTI, hematuria, dysuria, or ureteral injury). Covariates in the model included patient factors such as gender, BMI, and age-adjusted Charlson comorbidity score and operative factors such as the indication for operation, placement of ureteral stents, type of procedure, and operative time. Backward elimination technique was used with a significance threshold for inclusion in the final model of $P < 0.10$. Similarly, linear regression models were created for the continuous outcomes of length of stay and operative time. The use of ureteral stents was forced into all models. Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test, the c-statistic for logistic regression and the determination coefficient (R^2) for linear regression models. All analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC).

Results

Patient characteristics

A total of 702 consecutive patients underwent elective laparoscopic colectomy over a 3-y period. Prophylactic ureteral stents were placed in 261 patients (37.2%). In almost all cases ($n = 257$; 98.5%) bilateral stents were placed. Indications for prophylactic placement of stents included anticipated adhesions (35.2%), known urologic disease (16.5%), or surgeon preference (48.3%). In over 95% of cases, urethral catheters were left in place and removed the day after surgery. In addition, perioperative antibiotics were given before ureteral stent placement and induction of anesthesia.

As shown in Table 1, there was no statistical difference between the stented and unstented cohorts with regard to gender, BMI, and all examined disease comorbidities. However, the cohort that received prophylactic ureteral stents was significantly younger (56.9 ± 13.5 *versus* 62.2 ± 14.1, $P < 0.001$)