

## Lighted Ureteral Stents in Colorectal Surgery – A Five Year Experience

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### **Introduction**

Identifying the ureter during colorectal surgery is one of the most critical steps of the operation. Ureteral injuries are often discussed, albeit rarely encountered, ranging in the literature from 0.28-7.6% (da Silva). This type of injury has the potential to be a devastating complication and prevention is a top priority for the surgeon. Prophylactic ureteral stent placement has been utilized in pelvic surgery to facilitate intraoperative ureter identification and allow for immediate recognition of injury (Pokala). In laparoscopic colorectal surgery, lighted stents have been introduced to enhance visualization of the ureter with the goal to overcome the limitations of tactile feedback (Senagore). Despite their apparent theoretical advantages, much debate still surrounds the use of prophylactic stent placement, including lighted stents and their effectiveness in preventing injury (Chahin). Although there have been no randomized control trials to determine the utility of stents in preventing injury, several studies have suggested that they help to identify injuries at time of surgery. Complications secondary to stent placement have been documented in the literature and include urinary tract infections (UTIs), oliguria and hematuria. However, these complications are mainly transient and rates of UTIs with stent placement have been comparable to published rates of nosocomial UTIs after colorectal surgery (da Silva). This study reports a single institution's experience utilizing prophylactic lighted ureteral stents in laparoscopic

colorectal surgery and documents any ureteral injuries along with any complications from their placement.

## **Methods**

The study was a retrospective review of the case logs of two board certified colorectal surgeons at Monmouth Medical Center in Long Branch, New Jersey. Cases were reviewed between the dates January 2010 through June 2015 and include all laparoscopic or robotic-assisted colectomies where prophylactic ureteral stents were inserted. All ureteral stents, size five French, were placed utilizing cystoscopy by one of four urologists. Catheters were placed after induction of general endotracheal anesthesia prior to starting the colorectal procedure. Stents were removed at the conclusion of the laparoscopic procedure prior to extubation. All patients had foley catheters inserted by the urologist at the time of the ureteral stent insertion. Foley catheters remained in place for all patients postoperatively. A review of the incidence of ureteral injuries, UTIs and urinary retention was done. Urinary retention was documented when the foley catheter was reinserted post operatively.

## **Results**

A total of 465 laparoscopic colon resections were completed between January 2010 through June 2015 (66 months). Prophylactic lighted ureteral stents were inserted in all cases. Average age of patients was 60.9 years old. The series included 214 (46%) male and 251 (54%) female patients. Of the 465 cases, 160 (34%) were performed for malignant disease, while 305 (66%) were performed for benign disease. Diverticular

disease (n=264) and ulcerative colitis (n=15) were the most common benign indications for operative intervention. Rectal cancer comprised 76 out of the 160 malignant cases (47.5%). The remainder were performed for colon cancer (n=84, 52.5%). Laparoscopic low anterior resection (n = 228) and laparoscopic left colectomies (n = 115) were the most commonly performed procedures. There were no ureteral injuries or urinary tract infections identified postoperatively. Nineteen patients (4.1%) suffered from postoperative urinary retention. All patients (n=465) had transient postoperative hematuria, which resolved prior to discharge.

Table 1: nature of operation, number of ureteral injuries, incidence of urinary retention and UTIs.

Operation	Cases	Ureteral Injuries	Urinary Retention	UTI
Right	42	0	1	0
Extended Right	4	0	0	0
Transverse	3	0	0	0
Left	115	0	2	0
Extended Left	4	0	0	0
Sigmoid	12	0	1	0
LAR	228	0	12	0
Total Abdominal Colectomy	23	0	1	0
Subtotal Colectomy	5	0	0	0
Reversal	18	0	0	0
APR	5	0	1	0
Rectopexy	6	0	1	0

## **Discussion**

Iatrogenic injury is a major concern during any surgery. Low dissection during colorectal surgery requires constant awareness of ureteral location. In the past surgeons had to rely on their knowledge of anatomy to identify the ureters and prevent injury during surgery. According to Bieniek et al., the incidence of ureteral injuries during

colorectal surgery (CRS) has been cited as high as 7.6%. Alternatively, 5-15% of all ureteral injuries occur during CRS (Bieniek, Speicher). Pokala et al. suggests ureteral catheters might increase risk of injury during open colorectal procedures by making ureters less pliable, which may predispose to intraoperative ureteral injury. The authors also propose that stents do not reduce injury but may aid in early recognition (Pokala).

Laparoscopic CRS sparked a new challenge to surgeons, giving them less tactile feedback and more dependence on visual identification of ureters to avoid iatrogenic injury. Lighted ureteral stents were devised to improve visual identification of ureters throughout the dissection. Although these catheters also helped to identify injuries intraoperatively, their use did not change the incidence of ureteral injuries overall (Pokala).

The series done at this institution revealed no ureteral injuries from either catheter insertion or during the surgery in 465 laparoscopic colorectal resections in a time period spanning 66 months. The practice of bilateral stent placement for all colon resections has shifted to only placing left sided stents during left colon resections. The authors propose stents are more helpful during left colon resections secondary to proximity of the ureter during a low pelvic dissection. The careful identification of the LED illuminated ureter is a major step in preventing ureteral injuries during these cases.

Catheter associated urinary tract infections (CAUTIs) are a known complication of ureteral stent insertion (da Silva). However, in this series out of 465 cases with ureteral stent placement, no CAUTIs occurred. Beraldo et al. also showed a UTI occurrence as low as 2.2% in their 89 patients who underwent prophylactic ureteral stents (Beraldo). One study showed UTI rates lower (2% vs 4.3%) in their cases that used catheters

(Taujinaka). All of the catheters inserted in this review were done by one of four experienced urologists in a sterile environment. Furthermore, every patient received preoperative antibiotics with Cefoxitin 30 minutes prior to the start of the case. Finally, this institution utilizes an enhanced recovery pathway, which standardizes removing all foley catheters on postoperative day one.

Transient hematuria is known effect of instrumentation to the ureter. This was seen in all 465 cases which ureteral stents were used. The hematuria resolved in all cases. Ureteral edema and subsequent urinary retention has been reported as a complication of ureteral stent placement (Changchien). Nineteen patients (4%) required foley reinsertion during the postoperative period prior to discharge. Changchien et al. reviewed 2,355 who underwent surgery without the aid of ureteral stents for CRS and reports 5.5% incidence of urinary retention after colorectal resection. The authors conclude the addition of ureteral stents poses no additional risk of urinary retention than a traditional laparoscopic colon resection without stents.

Prophylactic ureteral stent placement has been associated with increased operative time (2). The average time for stent insertion prior to CRS was eight minutes. The average total additional time including set up, draping, procedure, and re-prep for the colorectal procedure was 28 minutes. Other studies which emphasize a coordinated approach to prophylactic stent placement and predefined protocols have demonstrated much shorter amount of additional time under general anesthesia to 11 minutes (Speicher). With additional coordination involving the entire treatment team, additional time spent in the operating room could potentially be decreased significantly.

The data presented in this series demonstrates no ureteral injuries over the course of 465 laparoscopic colorectal surgeries in which prophylactic lighted ureteral stents were used. This supports the notion that identification of the ureter via lighted stents can help prevent injury in colorectal resections without a large amount of additional risk. Standardization of operating room logistics may help to reduce additional operative time. Randomized studies are needed to prove definitive correlation between ureteral stent insertion and reduction of intraoperative ureteral injury during CRS.

## References

- Da Silva G, Boutros M, Wexner SD. Role of prophylactic stents in colorectal surgery. *Asian J Endosc Surg.* 2012; 5: 105-110
- Pokala N, Delaney C, Kiran R, et. al. A randomized controlled trial comparing simultaneous intra-operative vs sequential prophylactic ureteric catheter insertion in re-operative and complicated colorectal surgery. *Int J Colorectal Dis.* 2007; 22: 683-687
- Senagore AJ, Lutcheffeld M. An initial experience with lighted ureteral catheters during laparoscopic colectomy. *J Laparoendosc Surg.* 1994;6:399-403
- Chahin F, Dwivedi A, Paramesh A, et al. The Implications of lighted ureteral stenting in laparoscopic colectomy. 2002; 6: 49-52
- Bieniek JM, Meade PG. Reflux anuria after prophylactic ureteral catheter removal: a case description and review of the literature. 2012; 3: 294-296
- Speicher P, Goldsmith Z, Nussbaum D, et al. Ureteral stenting in laparoscopic colorectal surgery. 2014; 90: 98-103
- Beraldo S, Neubeck K, Von Friderici E, et al. The prophylactic use of ureteral stent in laparoscopic colorectal surgery. 2013; 102: 87-89
- Tsujinaka S, Wexner SD, da Silva G, et al. Prophylactic ureteric catheters in laparoscopic colorectal surgery. 2008; 12: 45-50
- Chanchien CR, Yeh CY, Huang ST, et al. Postoperative urinary retention after primary colorectal cancer resection via laparotomy: a prospective study of 2,355 consecutive patients. 2007; 10: 1688-1696