

# Protect the Ureters

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## ABSTRACT

From July 1, 2006 to June 30, 2007, 151 patients with complex pelvic pathology underwent placement of lighted ureteral stents by a general surgeon or gynecologist. None of the patients who underwent preprocedure ureteral stent placement had a ureteral injury. The procedures included laparoscopic colorectal surgery (45 pts), hysterectomy/GYN (49 pts), or pelvic adhesions (57 pts). The average time from placement of the stents to start of the operation was 5 minutes (range, 2 to 15). In 6 patients, the stents could not be placed, and all had ureteral pathology that was NOT noted preoperatively. Two patients had ureter injuries at our hospital and did not have ureteral stents placed during the same time period. The cost of the stents is \$205. OR time past the first half hour ranges from \$560 to \$716 for each additional half hour. The time saved from the lighted identification of the ureters versus visual nonstent identification is from zero minutes to 45 minutes. This is an extremely useful procedure that can theoretically reduce ureter injury to zero. In an era in which insurance will not pay for complications related to the original operation and high litigation costs, this procedure should be the standard of care for safely performing complex pelvic surgery.

**Key Words:** Ureter, Injury, Catheters, Cost-effective, Prevention, Prophylactic.

## INTRODUCTION

Ureter identification during a surgical procedure has been reported to range from an invasive procedure to a very minimal surgical procedure. The incidence of ureter injury during abdominal and pelvic surgery has been reported to range from 1% to 8%.<sup>1-13</sup> Surgeons and gynecologists agree that prophylactic ureteral catheterization may reduce the chance of a ureter injury.<sup>14-16</sup> Until recently, ureter identification would consist of placement of catheters that could only be detected by palpation either with a hand or laparoscopic instrument. Now, the use of visual identification of the ureters has become easier, and in the authors' opinion safer, especially while minimally invasive pelvic surgery is being taught. This retrospective review summarizes the advantages of cost and patient safety of prophylactic ureteral catheterization with lighted ureteral stents during gynecologic, pelvic, and colorectal procedures.

## METHODS

From July 1, 2006 to June 30, 2007, 151 patients undergoing complex pelvic surgery underwent placement of lighted ureteral catheters by one of the authors. During the time of the study at our hospital, only 2 part-time urologists were on staff. Twenty-four hour urologic consultation was not available, and in the case of an emergency, availability of a urologist was frequently delayed for approximately an hour. This situation initiated the need, as seen in many rural hospitals, for proactive ureteral identification at the time of complex pelvic surgery. Patients were selected for preoperative ureteral catheterization based on their history and physical, history of stage IV endometriosis, ovarian remnant, chronic pelvic pain with a history of pelvic adhesions, diverticular disease, or a sigmoid/rectal cancer. During the same time period at our hospital, 111 cystoscopies and 180 cystoscopies with ureteral stents were performed. Additionally at the same time period, 12 emergent urologic consults were requested for patients who did not have stents placed preoperatively. During the same time period, other pelvic operations as listed above were performed at our institution but not by the authors. Two patients who had a ureteral injury during the review did not undergo preprocedure ureteral catheter placement. The charts were reviewed retrospec-

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tively with the intent to describe this valuable technique of protecting the ureters. Only the authors' patients were included in this review. The average time from placement of the stents to starting the operation was 5 minutes. No complications occurred from placement of these catheters. An incidental finding of our review revealed 6 patients in whom the ureteral catheters could not be placed. All had ureteral pathology that was not noted preoperatively.

## RESULTS

These patients were all reviewed in a retrospective manner where the information regarding ureteral catheterization was obtained. Of the patients, 118 underwent elective and 31 underwent emergency procedures. The cost of the infrared ureteral catheters (Stryker Endoscopy, San Jose, California) was \$205 each. These catheters are fenestrated at the ends, which allows for urine collection, does not obstruct the ureters, and can be left in place if needed for continued stenting postoperatively. The other incurred expense was that of the reusable 22-French cystoscope with a 70-degree lens and the catheter-deflecting bridge provided by Storz Endoscopy (Tuttlingen, Germany). The cystoscope equipment cost (list price) of \$7900 depreciated for 3 years for about 300 uses is \$26.33/procedure or case.

Operating room cost analysis averaged \$2529 for the first half hour for a case in which 2 operating room personnel were in the room and \$3373 for the first half hour in which 3 people were utilized in the operating room. The cost of OR time after that was \$560 for each additional half hour for a 2-person procedure and \$716 for each additional half hour for a 3-person procedure. The average time for identification of a ureter where ureteral catheterization was not performed ranged from zero minutes to 45 minutes, not to mention the time when a urologist was requested when not in the hospital. Operative procedures were extended for over an hour in 3 cases. Specifics concerning initiation of a urology consult were not obtained from the medical records of charts that were not the authors' patients. Only review of the number of urology consults at our hospital were obtained when urgent intraoperative evaluations were needed. Once the ureteral catheters were placed, they were connected to the Infravision light source (Stryker Endoscopy, San Jose, California), and these ureteral catheters are then easily visualized with a laparoscope during the operative procedure or on direct palpation from an open procedure.

Of the 151 patients, 145 had successful placement of the ureteral catheter. As mentioned, none of the authors' patients during the procedure (pre-, intra-, or postoperative)

had a ureteral injury. Two patients who did not have ureteral catheters placed preoperatively did have ureteral injuries from ureter misidentification that required intraoperative intervention, one being a ureteroureterostomy and one being the placement of a double-J stent. The 6 patients in whom the catheters could not be placed had the following pathology: 3 had presumed ovarian remnant/endo/angulated ureter that only had a guidewire inserted, 2 colon cases (diverticulitis) with colovesical fistulas, and 1 preoperative radiated pelvis with a rectal cancer. Minimal hematuria was noted. The catheters were all placed 20cm in the respective right or left ureter to avoid passing the catheter into the renal pelvis. The main objective of placing catheters was to clearly visualize the pelvic portion of the ureter where the operative procedure was being performed. Statistical analysis of the data was not felt to be clinically relevant, because the safety of the patient is our primary endpoint.

## CONCLUSION

Ureteral catheterization during complex pelvic surgery is nothing new. Numerous articles have been written over several years regarding the incidence of injury to the ureters, intraoperative ureter identification, and ureter repair.<sup>17-19</sup> Few articles have been written regarding the prevention of ureteral injuries. Prophylactic ureteral indwelling stents have been described during colorectal surgery, gynecologic surgery, and even the use of nuclear contrast has been described; however, little has been mentioned regarding infrared ureteral catheterizations.<sup>20-22</sup> Chahin et al<sup>20</sup> described lighted ureteral catheterizations; however, the catheters used were not fenestrated and did not allow passage of urine through the catheters. The procedure itself of ureteral catheterization has been noted to have complications in and of itself; however, the complications of a cystoscopy with catheterization of the ureters is nowhere near as catastrophic as an unrecognized ureteral injury.<sup>23</sup> Litigation costs from ureteral injuries are wide ranging, from \$600,000 to several million dollars.<sup>24</sup> Lifelong disability has clearly been described and is well recognized. Articles have also been written regarding the cost associated with ureteral catheterization; however, this is miniscule compared with the magnitude of an injury caused by even one ureteral injury during the lifetime of a surgeon.<sup>25</sup> Despite all of the literature written about ureteral injuries, little has been mentioned regarding the shortened operating room times associated with this procedure. Additionally, in our study, 6 patients were identified who had unknown ureteral pathology that was recognized during our careful intraoperative evaluation of the lower urinary tract. This

avoids the “tag your it” phenomenon that can happen if “you” are the last surgeon to operate on the patient, if indeed there was an existing injury. “Complications,” such as hematuria, have been described as a problem associated with this procedure; however, it has been our experience that this “complication” of hematuria is transient in nature and does not result in postoperative sequela. Based on our findings, it is clear that prophylactic ureteral catheterization<sup>1</sup> can identify otherwise unrecognized ureter pathology,<sup>2</sup> is a safe and highly cost-effective way of preventing injuries to the lower urinary tract, and<sup>3</sup> should a ureter injury occur during a procedure, instant recognition allows for immediate intraoperative repair with no delay in identification of a ureter injury, thereby essentially negating any litigation that could potentially occur in the patient’s lifetime. Therefore, we also additionally conclude that technology exists today to essentially prevent all injuries to the lower urinary tract and should be used in any surgical procedure where the potential for lower urinary tract injury exists.

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