Role of routine stentograms following urinary diversion in modern practice

Stanton M. Regan, MD, Stephen D. W. Beck, MD, Richard Bihrle, MD, Richard S. Foster, MD[1]

Department of Urology, Indiana University School of Medicine, Indianapolis, Indiana, USA

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Objective: *To examine the usefulness of routine stentograms in patient management following urinary diversion.*

Materials and methods: *A retrospective review of all patients undergoing urinary diversion from February 2004 to February 2007 was performed. Three hundred twenty-six patients were identified. One hundred fifty patients were excluded: 101 patients had no stentogram and 49 patients had incomplete records or follow up.*

Results: *Of the 176 patients, ureteral anastamosic leak was detected in three of 344 ureters (0.9%). The ureteral stents were left in situ until the leaks resolved. None of the three developed a ureteral stricture. Ten (3.0%) ureters had delayed drainage and the stents were removed as scheduled. One patient developed hydronephrosis from a retained portion of the ureteral stent. The 328 ureters (95.4%) with normal stentograms were followed for 30 weeks (3-144). Four ureters (1.25%) developed distal ureteral strictures and one patient developed a ureteral tumor recurrence. No patient developed a poststentogram complication.*

Conclusions: *The incidence of a ureteral enteric anastamotic leak detected by stentogram is less than 1%-2%. Routine stentograms do not appear necessary in stable patients without clinical signs of a urine leak and thus are now only seldom performed at our institution.*

Key Words: stentogram, urinary diversion, cystectomy, ureteral stents

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Address correspondence to Dr. Stanton M. Regan, Department of Urology, Indiana University School of Medicine, 535 N. Barnhill Drive, Suite 420, Indianapolis, IN 46202-5289 USA

Introduction

Temporary placement of open ended ureteral stents at the time of urinary diversion is promoted by some practitioners as a means to reduce postoperative complications, mainly ureteral enteric stricture formation.[1,2] Historically, prior to stent removal, "stentograms" were performed to evaluate the integrity of the ureteral enteric anastamosis. However

it has more recently been observed that the ureteral leak rate is exceedingly low; consequently, the question has arisen as to the usefulness of routine stentograms.[3-5] The purpose of this study was to determine the incidence of ureteral leak at stentogram and the influence that the use of stentograms has upon clinical decision making and patient outcomes, in order to weigh the benefit of routine stentograms in identifying the rare ureteral leak against the inherent risk of subjecting all patients to the test itself.

Materials and methods

A retrospective study was performed to identify all patients undergoing urinary diversion performed from February 2004 to February 2007 at one center. Three hundred twenty-six patients were identified. One hundred fifty patients were excluded: 101 patients had no stentogram and 49 patients had incomplete records or follow up. Records of the remaining 176 patients (344 ureters) were reviewed.

Routine postoperative stentograms were routinely obtained by three surgeons while other faculty members used chemoanalysis of drain fluid and clinical symptomatology to diagnose ureteral leaks or strictures. Per protocol, retrograde stentograms were performed under fluoroscopic guidance. Broad spectrum intravenous antibiotics were administered before contrast material was injected and static images were obtained. These images were reviewed by a radiologist for leak or delayed drainage. Stentograms were routinely scheduled just prior to discharge, typically on postoperative day (POD) 4 to 7.

Stent removal criteria included peritoneal drain output less then 25 milliliters/day, a clinically stable patient, and no significant leak per stentogram. Peritoneal drains were pulled prior to discharge when drain output was less than 25-50 milliliters/day.

Renal ultrasound (RUS), intravenous pyelogram (IVP), loopogram/pouchogram, stentogram and/or antegrade nephrograms were used for radiographic follow up.

Results

Patient characteristics are summarized in Table 1. Of the 176 patients undergoing urinary diversion, 146 (83.0%) underwent a radical cystectomy. Seven patients underwent simple cystectomy and one patient had a total exenteration. Twenty-two patients underwent urinary diversion without a cystectomy. The primary indication for surgery was transitional cell carcinoma in 134 (76.1%), nontransitional cell carcinoma of the urinary bladder in nine and nonbladder pelvic malignancies in eight. Seven patients underwent urinary diversion for radiation cystitis.

TABLE 1. **Patient characteristics**

Characteristic	**n = 176**
Sex	
Male	129 (73.3%)
Female	47
Diversion	
CUR	42
Ileal loop	97
Bladder replacement	36
Colon conduit	1
Indications	
Transitional cell	134
Other bladder cancers	9
Nonbladder pelvic malignancy	8
Radiation cystitis	7
Neurogenic	10
Other	8
Surgery	
Urinary diversion alone	22
Simple cystectomy	7
Radical cystectomy	146
Total exenteration	1
Anastamosis type	
Running	38
Interrupted	138

Ileal loop urinary diversion was performed in 97 (55.7%), continent urinary reservoir in 42 (23.9%), bladder replacement in 36 (20.4%) and colon conduit in 1. There were 344 ureteral enteric anastamosis in the 176 patients. A refluxing end to side Bricker anastamosis was performed for all ureters regardless of the type of urinary diversion. All ureters were spatulated and the anastamosis performed with a running or interrupted 5-0 PDS. The 5F open-ended ureteral stents were used to stent all 344 ureters.

Mean and median time to stentogram was 6 days. Median follow up time was 9 months. Of 344 ureters studied, three leaks (0.9%) were identified. A rightsided leak was observed via stentogram on postoperative day 6 (POD 6) in Patient #1 who had a history of radiation cystitis and underwent an ileal loop urinary diversion. Repeat stentograms 14 and 21 days later revealed a persistent small, contained leak. This leak was considered clinically insignificant and the ureteral stent was removed. No stricture was identified per IVP at 11 weeks and no hydronephrosis was

observed on RUS at 6 months. Patient #2 underwent an early stentogram on POD 2 due to concerns of a ureteral leak following cystectomy with ileal loop urinary diversion for transitional cell carcinoma. The exam revealed no leak, but the patient developed an ileus. A repeat "high-pressure" stentogram" on POD 5 revealed a small, contained leftsided leak that was considered clinically insignificant; the stents were subsequently removed. The leak resolved without evidence of stricture per IVP 6 weeks later. Patient #3 had a small rightsided ureteral leak found on antegrade nephrostogram on POD 6 after undergoing an ileal loop urinary diversion for vesicoperineal fistula. The leak was considered clinically insignificant by the urologist; the patient was discharged after removing the stents and nephrostomy tubes on POD 6 and POD 7, respectively. Follow up at 3 months showed chronic mild hydronephrosis per RUS.

Ten ureters (2.9%) in 9 patients had delayed ureteral drainage (8 right and 2 left) on stentogram per radiology. Despite this reading, the ureteral stents were removed as scheduled. Eight patients had stable follow up exams after a mean of 24 weeks (range 6-56). One patient required right percutaneous nephrostomy tube (PCN) at 6 weeks for a distal ureteral obstruction secondary to a retained piece of ureteral stent. The fragment was extricated and subsequent IVP demonstrated a patent ureter.

Three patients had incidental findings on stentogram unrelated to the anastamosis. One complicated patient had a urostomy defect with mesh erosion that required bilateral PCN on POD 16 to divert urine away from the wound. Two patients status post cystectomy and bladder replacement had minor urine leaks along the neobladder suture line at time of stentogram (POD 4 and POD 5). The stents were removed on POD 9. One of these patients developed bilateral ureteral stricture requiring bilateral PCN 6 months later.

Of the 328 ureters (95.4%) with normal initial stentograms, nine ureters (2.9%) in seven patients developed severe hydronephrosis (6 left, 3 right) at a mean of 11 weeks (range 4-21). Of these nine ureters, four continued to require nephrostomy tubes as they awaited reimplantation, four had stabilization of their hydronephrosis without surgical intervention and removal of their nephrostomy tubes, and one patient underwent nephroureterectomy for tumor recurrence.

It is estimated to cost $550 per stentogram. As such, the cost, excluding ancillary expenses, to identify a ureteral anastamotic leak was roughly $63,067. No patient developed an immediate poststentogram complication.

Discussion

Placement of temporary ureteral stents at time of urinary diversion is widely used by many surgeons. Also, postoperative stentograms are used by some. In the recent decade, with greater awareness of risk/benefit ratios and in an era of cost containment, the routine use of postoperative stentograms has been questioned. In the current study of 344 ureters in 176 patients, three patients were identified with a ureteral anastamotic leak at routine stentogram. These healed with conservative management with no subsequent stricture formation.

Investigators from Robert Wood Johnson Medical School evaluated stentograms in 51 patients undergoing urinary diversion. Of the 51 patients (102 ureters) one ureteral enteric leak was identified, Table 2. Despite prophylactic antibiotics, nine patients (17.6%) developed complications attributable to the stent study including: minor contrast allergy in one, transient fever in three, and pyelonephritis and/or sepsis with bacteremia in five. At a cost of $569 per ureter, per study, totaling $58,000, this group concluded that the cost and morbidity of routine stentogram was greater than the benefit of identifying the rare patient with a clinically unrecognized ureteral leak.[3]

In a similar study, Manion et al reported a 2.2% (3 ureters) leak rate at stentogram performed on 135 ureters in 73 patients.[4] A third, more recent study from Canada evaluated 100 patients undergoing urinary diversion.

TABLE 2. **Incidence of anastamotic leak at postoperative stentogram**

Author	No. patients	Leak per pt. (%)	No. ureters	Leak per ureter (%)
Manion[4]	73	3 (4.1%)	135	3 (2.2%)
Touma[5]	100	5 (5.0%)	197	5 (2.5%)
Pantuck[3]	51	1 (2.0%)	102	1 (1.0%)
Current study	176	3 (1.7%)	344	3 (0.9%)
Total	400	12 (3.0%)	778	12 (1.5%)

Of 197 ureters evaluated, five (2.5%) ureteral enteric leaks were identified. All were managed conservatively without subsequent stricture formation[5].

The cumulative data, Table 2 indicates that the incidence of a ureteral enteric urine leak is exceedingly low. Stentograms of 778 ureters in 400 patients revealed 12 leaks (1.5%). Furthermore, it appears that these leaks can be managed conservatively with little risk of stricture formation. As such, the benefit of routine stentograms in identifying the rare ureteral leak must be weighed against subjecting all patients to the test itself with its inherent risks.

As an alternative, some surgeons suggest monitoring peritoneal drain fluid for signs of anastamotic leak such as high output or elevated fluid creatinine. Fluid creatinine levels are inexpensive ($8/exam at our institution) and very specific. In the current study every patient could have been monitored for the price of only three stentograms. In practice, only patients with high drain outputs are evaluated leading to more dramatic savings while offering effective surveillance for anastamotic leak. This is the protocol followed by some of our faculty without any apparent increase in stricture or leak rate.

Although the results of this study do not support the need for routine stentograms, there are limitations to our study. The 101 patients without stentogram could have been used to verify the efficacy of peritoneal drain fluid monitoring versus stentogram. A prospective review comparing patients with and without routine postoperative stentograms would better characterize the risks and benefits of these two management strategies. Also, some have speculated that routine stentograms may prevent complications that would cost more than the current expense of $63,000/leak. Since not one of the patients with a leak in our study developed a delayed complication and all of the complications described arose in patients with normal or delayed draining stentograms, the exam does not appear to be predictive of patients who will develop complications. Certainly the current cumulative data does not support the use of routine stentograms in this patient population.

Conclusion

The incidence of a ureteral enteric anastamotic leak detected by stentogram is less than 1%-2%. Patients that do not undergo stentograms seem to do well although no formal comparison was performed. Routine stentograms do not appear necessary in stable patients without clinical signs of a urine leak. As a result of these results, very few stentograms are now performed at our institution. □

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