Urolithiasis After Ileal Conduit Urinary Diversion: A Comparison of Minimally Invasive Therapies

Lindsay L. Hertzig, Markian R. Iwaszko, Laureano J. Rangel, David E. Patterson, Matthew T. Gettman and Amy E. Krambeck*

From the Department of Urology and Division of Biostatistics (LJR), Mayo Clinic, Rochester, Minnesota

Abbreviations and Acronyms

GFR = glomerular filtration rate

PCNL = percutaneous nephrolithotomy

SWL = shock wave lithotripsy

UTI = urinary tract infection

Accepted for publication December 5, 2012.

Study received institutional review board approval.

* Correspondence: Mayo Clinic, 200 1st St. Southwest, Rochester, Minnesota 55905 (telephone: 507-284-9983; FAX: 507-284-4951; e-mail: Krambeck.amy@mayo.edu).

Purpose: We report our experience with ureteroscopy, percutaneous nephrolithotomy and shock wave lithotripsy for symptomatic stone disease in patients with ileal conduit urinary diversion.

Materials and Methods: We retrospectively reviewed the charts of all patients treated with cystectomy and ileal conduit urinary diversion from 1982 to June 2010 in whom urolithiasis subsequently developed.

Results: We identified 77 patients with urolithiasis requiring surgical intervention after ileal conduit urinary diversion. Average age at treatment was 62.5 years (range 30 to 82). Mean followup was 7.1 years (range 0.1 to 24.3). The primary therapy mode was percutaneous nephrolithotomy in 48 patients (62.3%), extracorporeal shock wave lithotripsy in 20 (26.0%) and ureteroscopy in 9 (11.6%). Average stone size was greater in the nephrolithotomy group than in the ureteroscopy and lithotripsy groups (2.1 vs 0.9 and 1.0 cm, respectively, $p < 0.0001$). Total complication rates were similar, including 29% for nephrolithotomy, 30% for lithotripsy and 33% for ureteroscopy ($p = 0.9$). The incidence of stone-free status was greater in the nephrolithotomy cohort than in the ureteroscopy and shock wave lithotripsy cohorts (83.3% vs 33.3% and 30%, respectively, $p < 0.0001$). The re-treatment rate did not significantly differ among the groups with 66.7% of the ureteroscopy group requiring subsequent procedures compared to 29.2% of the nephrolithotomy and 45% of the lithotripsy groups ($p = 0.08$). The change in the mean preoperative and current calculated glomerular filtration rate did not significantly differ among the 3 treatment groups.

Conclusions: Treatment for urolithiasis in patients with urinary diversion is associated with high re-treatment and complication rates. Percutaneous nephrolithotomy achieves a better stone-free outcome than ureteroscopy or shock wave lithotripsy. However, there is no difference in ancillary procedures or complication rates among the 3 treatment modalities.

Key Words: urinary bladder, urolithiasis, cystectomy, urinary diversion, lithotripsy

Intestinal segments are commonly used to reconstruct the urinary tract due to various malignant and nonmalignant conditions. After urinary diversion, patients are at increased risk for long-term complications, including stones of the upper urinary tract and reservoir or conduit. Metabolic derangements have been noted in patients with urinary intestinal diversion, including chronic acidosis and increased calcium excretion. Studies

0022-5347/13/1896-2152/0
THE JOURNAL OF UROLOGY®
http://dx.doi.org/10.1016/j.juro.2012.12.003
Vol. 189, 2152-2157, June 2013
Printed in U.S.A.

have proved that some metabolic derangements are the result of the resorption of urinary solutes across the bowel segment, increasing the risk of urolithiasis.[1,2] Urinary infection with urease producing bacteria and structural factors, including foreign bodies, also have a role in stone pathogenesis in this patient group.[2]

Since stone disease is common in patients with urinary diversion, multiple treatment options have been used.[3] Ureteroscopy, PCNL and SWL have become the mainstay for the surgical treatment of stones in all symptomatic patients with calculi, including those with urinary diversion. Advances in instrumentation and techniques have expanded treatment options, while minimizing morbidity.

We determined whether treatment complications and success differ among ureteroscopy, PCNL and SWL in patients with urolithiasis and intestinal urinary diversion.

MATERIALS AND METHODS

After obtaining institutional review board approval, we identified 91 patients in whom urolithiasis developed after radical cystectomy from 1982 to 2010. We excluded from analysis 14 patients with urinary diversion other than an ileal conduit, leaving 77 in our study cohort. Patients were subsequently categorized into 3 subsets based on initial treatment modality, including 1) ureteroscopy, 2) PCNL and 3) SWL.

We retrospectively reviewed the charts. Symptomatic UTI was defined as evidence of bacterial or yeast growth on urine culture, accompanied by fever, nausea, vomiting, chills or foul-smelling urine. Stone composition was based on the dominant component analyzed at stone removal except in the case of struvite. If any struvite was present in the stone, the composition was reported as such. Stone-free status was defined as no evidence of calculi on postoperative imaging.

Since we report a retrospective review involving multiple surgeons during a long period, technique and postoperative followup were not standardized. Most patients treated with PCNL were imaged with nephrostogram on postoperative day 1, while those treated with ureteroscopy and SWL were imaged with plain x-ray of the kidneys, ureters and bladder at postoperative followup within 6 months of the procedure.

Statistical analysis was performed using SAS®, version 9.2. All tests were 2 sided with $p < 0.05$ considered statistically significant.

RESULTS

Urolithiasis requiring surgical intervention developed after cystectomy in 77 patients with ileal conduit urinary diversion. The initial stone treatment modality was PCNL in 48 patients (62.3%), SWL in 20 (26%) and ureteroscopy in 9 (11.6%). Table 1 lists baseline demographic data on patients in each treatment group. Gender, mean body mass index and stone history did not significantly differ among the 3 groups. In the ureteroscopy group patients were older and had a lower mean estimated GFR. Many patients had a history of urolithiasis, including 19

Table 1. *Demographics, and preoperative and stone characteristics*

	PCNL	SWL	Ureteroscopy	Overall	p Value
No. pts	48	20	9	77	
No. male (%)	38 (79.2)	15 (75)	8 (88.9)	61 (79.2)	0.71
No. female (%)	10 (20.8)	5 (25)	1 (11.1)	16 (20.8)	
Mean ± SD age (range)	62.3 ± 13.8 (30.0–82.0)	59.2 ± 13.7 (35.0–76.0)	71.6 ± 6.2 (58.0–78.0)	62.5 ± 13.5 (30.0–82.0)	0.04
No. procedure yr (%):					0.47
1982–1992	17 (35.4)	14 (70)	0	31 (40.3)	
1993–2003	18 (37.5)	6 (30)	9 (100)	33 (42.9)	
2004–2010	13 (27.1)	0	0	13 (16.9)	
Mean ± SD kg/m^2 body mass index (range)	27.3 ± 5.9 (13.2–49.7)	26.6 ± 4.0 (18.3–34.6)	25.7 ± 6.2 (17.6–33.5)	26.9 ± 5.4 (13.2–49.7)	0.84
Mean ± SD mg/dl GFR (range)	74.8 ± 50 (16.3–330.8)	74.1 ± 34 (36.2–178.8)	42.4 ± 20.0 (12.2–75.2)	70.8 ± 44.6 (12.2–330.8)	0.03
No. stone history (%)	19 (39.6)	5 (25)	4 (44.4)	28 (36.4)	0.47
Mean ± SD yrs conduit-stone (range)	9.1 ± 10.3 (0.2–45.7)	8.2 ± 7.90 (0.2–25.6)	11.6 ± 9.5 (0.4–28.2)	9.1 ± 9.0 (0.2–45.7)	0.57
No. stone composition (%):*					0.21
Missing	9	9	7	25	
Calcium oxalate dihydrate	1 (2.6)	0	0	1 (1.9)	
Calcium oxalate monohydrate	2 (5.1)	2 (18.2)	1 (50)	5 (9.6)	
Calcium phosphate	9 (23.1)	4 (36.4)	0	13 (25)	
Magnesium ammonium phosphate	27 (69.2)	5 (45.5)	1 (50)	33 (63.5)	
No. stones	36	13	9	58	<0.0001
Mean ± SD cm stone size (range)	2.1 ± 1.25 (0.7–6.5)	1.0 ± 0.52 (0.50–2.50)	0.9 ± 0.14 (0.7–1.0)	1.7 ± 1.16 (0.5–6.5)	

* No uric acid stones.