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Original article

Prophylactic antibiotics following radical cystectomy reduces urinary tract infections and readmission for sepsis from a urinary source

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Abstract

Introduction: Urinary tract infections (UTI) and sepsis contribute significantly to the morbidity associated with cystectomy and urinary diversion in the first 30 days. We hypothesized that continuous antibiotic prophylaxis decreased UTIs in the first 30 days following radical cystectomy.

Methods: Patients with urothelial carcinoma of the bladder who underwent a radical cystectomy with urinary diversion for bladder cancer at Oregon Health and Science University from January 2014 to May 2015 were included in the study. The ureteral stents were kept for 3 weeks in both groups. In October 2014, we enacted a Department Quality Initiative to reduce UTIs. Following the initiative, all radical cystectomy patients were discharged home on antibiotic prophylaxis following a postoperative urine culture obtained during hospitalization. To evaluate the effectiveness of the initiative, the last 42 patients before the initiative were compared to the first 42 patients after the initiative with regard to the rate of UTI in the first 30 days following surgery. We used a combination of comprehensive chart review and the American College of Surgeons′ National Surgical Quality Improvement Program (NSQIP) to determine UTI and readmission for urosepsis in the first 30 days following surgery. This ensured accurate capture of all patients developing a UTI.

Results: A total of 12% in the prophylactic antibiotic group had a documented UTI, whereas 36% in the no antibiotic group had a urinary tract infection ($P < 0.004$). A total of 1 (2%) patient in the antibiotic group was readmitted for urosepsis whereas 7 (17%) patients in the no antibiotic group were admitted for urosepsis ($P = 0.02$). There was no association noted between urine culture at discharge and the development of UTI in the 30-day postdischarge period ($P = 0.75$). The median time to UTI was 19 days and the most common organism was Enterococcus (32%). Thirty-percent of patients not receiving prophylaxis developed a UTI 1 day after ureteral stent removal. No patients had a UTI following stent removal in the prophylaxis group. No adverse antibiotic related events were noted.

Conclusion: Prophylactic antibiotics in the 30 days following radical cystectomy is associated with a significant decrease in urinary tract infections and readmission from urosepsis after surgery.

Keywords: Radical cystectomy; Urinary diversion; Urinary tract infections; Sepsis urinary source; Antibiotic prophylaxis

1. Introduction

Radical cystectomy (RC) with urinary diversion is a morbid operation, with 30-day complication rates of 28% to 60% [1,2]. Urinary tract infections (UTIs) and urosepsis contribute significantly to the morbidity associated with RC [2,3]. The rate of UTI in RC has ranged between 8.5% and 39% and the median time to UTI in RC patients has been reported to be 22.5 days [4–10]. Around 34% of these UTIs occur within the first 3 months following surgery [11].

Despite high rates of UTIs and readmissions for urosepsis in the first 30 days, there are no data and no guidelines that address the use of prophylactic antibiotics in the first 30 days following RC with urinary diversion. Our Department observed a high rate of UTIs and urosepsis in our RC population in patients that were not given antibiotic prophylaxis in the first 30 days following surgery.

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Table 1
Clinical characteristics

Clinical characteristics	Antibiotic prophylaxis ($N = 42$)	No antibiotic prophylaxis ($N = 42$)	P value
Median age (y)	66 (50–87)	69 (50–83)	0.8
Sex (female n [%])	12 (28)	10 (24)	0.8
Median BMI (kg/m^2)	28 (19–44)	28.5 (18–43)	0.7
Median albumin (g/dl)	3.7 (3.2–4.5)	3.7 (2.7–4.5)	0.9
Ileal conduit, n (%)	35 (84)	34 (81)	0.8

BMI = body mass index.

With significant rates of UTIs in this population in the first 30 days, we hypothesized that patients receiving a daily antibiotic prophylaxis (30 days) would develop fewer UTIs and have lower readmission rates for urosepsis compared to patients not receiving antibiotic prophylaxis. We enacted a quality initiative to begin using daily antibiotic prophylaxis for the first 30 days after surgery. The purpose of this study was to determine if this initiative decreased UTIs and urosepsis compared to RC patients before the initiative.

2. Methods

Patients undergoing RC with urinary diversion for bladder cancer were identified utilizing using our Departmental institutional review board-approved electronic database to extract an equal number of patients from before and after enacting the Quality Initiative in October 2014. Ureteral stents were removed 3 weeks postoperatively. Patients who underwent neobladder or catheterizable pouch had catheters removed at 3 weeks as well. Patients with a prolonged hospital stay, perioperative complication, or history of multidrug resistant (MDR) UTIs were excluded from the analysis. The first 42 patients did not receive daily prophylactic antibiotics or consistent antibiotics around the time of stent removal. They did receive perioperative antibiotics (cefoxitin) for 24 hours. Following the Quality Initiative, patients had a urine culture obtained the day before hospital discharge. The antibiotic of choice was (1) trimethoprim-sulfamethoxazole (TMP-SMX, 160 mg/800 mg) daily if no allergy or contraindication, and (2) nitrofurantoin 100 mg daily if TMP-SMX was not an option, or ciprofloxacin 250 mg daily otherwise. If the discharge urine culture was positive via a bagged specimen, patients were treated with 7 days of culture-specific antibiotics and then resumed their prophylaxis. A bagged specimen was used owing to ease of collection from the nursing staff. Data including 30-day follow-up were obtained from an institutional review board-approved institutional database using the National Surgical Quality Improvement Program (NSQIP) database and checked with comprehensive chart review. Using both NSQIP crossed with comprehensive chart review ensured capture of all UTIs. The primary outcomes were UTI in the first 30 days following surgery by both chart review and confirmatory phone interview. The phone interview was used when chart review alerted the provider to admission to an outside hospital but further information was needed to determine what had happened and gather the appropriate clinical information. UTI and sepsis were defined based on NSQIP criteria. In NSQIP, a postoperative symptomatic UTI was defined as having either a fever ($>38°C$) or malaise and a culture of $>100{,}000$ colonies/ml of urine with no more than 2 organisms. Sepsis from a urinary source was defined as a positive urine culture with $>100{,}000$ colonies/ml plus 2 of the following clinical signs and symptoms of systemic inflammatory response syndrome: temperature $>38°C$ or $<36°C$, heart rate >90 bpm, respiratory rate >20 breaths/minute, white blood cell $>12{,}000$ cell/mm^3 or $<4{,}000$ cells/mm^3, and anion gap acidosis. Statistical analysis was done using STATA version 13 and chi-squared analysis was used to assess the 30-day risk of UTI between the groups and the association between a positive discharge urine culture and the development of a UTI.

3. Results

A total of 84 patients at Oregon Health and Science were reviewed in the study between January 2014 and May 2015. There was no significant difference in age, body mass index, preoperative serum albumin, or type of urinary diversion between the 2 groups (Table 1). A total of 15/84 patients received an orthotopic neobladder, where only 3 patients developed a UTI, 2 of whom were in the antibiotic prophylaxis group. A total of 12% in the prophylactic antibiotic group had a UTI, compared to 36% in the no antibiotic group ($P < 0.004$, Table 2). The relative risk reduction was 60% and the number needed to treat (NNT) to prevent 1 UTI was 4.7. Urosepsis was significantly less common in the prophylactic antibiotic group (2% vs. 17%, $P = 0.02$, Table 2). The relative risk reduction was 86% and the NNT to prevent 1 readmission for urosepsis was 6.7. In the patients receiving antibiotics, 8 patients had positive bagged discharge urine cultures and only 1 patient had a symptomatic urinary tract infection. There was no association noted between urine culture at discharge and the development of UTI in the 30-day postdischarge period

Table 2
Rates of urinary tract infections and admission for urosepsis

Complications	Antibiotic prophylaxis ($N = 42$)	No antibiotic prophylaxis ($N = 42$)	Total	P value	RRR	NNT
UTI, n (%)	6 (12)	15 (36)	21	<0.004	0.60	4.6
Admission urosepsis, n (%)	1 (2)	7 (17)	8	0.02	0.86	7.0

RRR = relative risk reduction.