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Original article

Perioperative and long-term outcomes after radical cystectomy in hemodialysis patients

Scott C. Johnson, M.D.[a,*], Zachary L. Smith, M.D.[b], Shay Golan, M.D.[b], Joseph F. Rodriguez III, M.D.[b], Shane M. Pearce, M.D.[b], Norm D. Smith, M.D.[b], Gary D. Steinberg, M.D.[b]

[a] *Medical College of Wisconsin, Department of Urology, Milwaukee, WI*
[b] *The University of Chicago, Department of Surgery, Section of Urology, Chicago, IL*

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Abstract

Purpose: Patients on hemodialysis have an increased risk of developing advanced stage bladder cancer. They also have a significant risk of noncancer–related mortality. Radical cystectomy (RC) is the standard of care for nonmetastatic muscle–invasive bladder cancer, however little is known regarding outcomes in this population.

Materials and methods: The United States Renal Disease System database was used to identify all patients on hemodialysis who underwent RC for bladder cancer in the United States between 1984 and 2013. A total of 985 patients were identified for analysis. Perioperative outcomes were evaluated. Competing risks analysis was used to estimate overall and cancer-specific mortality along with factors associated with death.

Results: Median hospital length of stay was 10 days and 43.1% of patients experienced a complication. Mortality within 30 days was 9.3%. Overall mortality at 1, 3, and 5 years was 51.7%, 77.3%, and 87.9%, respectively. Cancer-specific mortality at 1, 3, and 5 years was 12.3%, 18.4%, and 19.7%, respectively. Age, diabetes, and cerebrovascular disease were independently associated with overall mortality, while performance of urinary diversion was associated with a protective effect. Active smoking was the sole risk factor for cancer-specific mortality.

Conclusions: RC in dialysis patients is associated with significant morbidity and mortality, with less than 15% overall survival at 5 years. Older patients, and those with a history of diabetes or cerebrovascular disease, are at an increased risk of mortality.

Keywords: Bladder cancer; Dialysis; End-stage renal disease; Radical cystectomy; Urinary diversion

1. Introduction

Urothelial carcinoma of the bladder is a prevalent and aggressive malignancy, with more than 79,000 new diagnoses and greater than 16,000 cancer-specific deaths expected in 2017 [1]. The gold standard for treatment of localized muscle-invasive bladder cancer and high-risk nonmuscle–invasive bladder is radical cystectomy (RC). Unfortunately, this operation is associated with significant morbidity, with nearly two-thirds of patients experiencing at least a minor complication [2]. Patients with end stage renal disease (ESRD) on dialysis have been shown to have an increased risk of developing malignancy [3]. Bladder cancer, specifically, has an increased incidence among these patients, with more than a 50% increased risk [4,5]. Furthermore, patients with ESRD are more likely to present with advanced disease [6]. At the same time, ESRD patients are at high risk of baseline mortality, with an estimated life expectancy of one-third that of nonESRD patients [7]. Despite the increased risk of developing advanced bladder cancer, there is very little known about the outcomes of ESRD patients undergoing RC. A single retrospective study of 45 patients demonstrated a 5-year survival of only 35%,

*Corresponding author. Tel.: +1 414-805-0805; fax: +1 414-955-0122.
E-mail address: scjohnson@mcw.edu (S.C. Johnson).

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while identifying preoperative duration on dialysis as a negative prognostic indicator [8]. ESRD patients on dialysis represent a unique population whose outcomes following RC may differ for several reasons. For one, those with ESRD may be more likely to have significant comorbidities, including cardiovascular disease. Secondly, in patients who produce little or no urine a urinary diversion may be omitted, which is widely considered as the most significant source of perioperative morbidity from RC.

Given the substantial baseline mortality risk, likelihood of advanced disease, and unique nature of the operation, it is possible that outcomes following RC in ESRD patients are substantially different than the average patient undergoing RC. These differences are unknown and would have important implications on preoperative counseling. Using a large national database of ESRD patients, we sought to characterize the outcomes of those undergoing RC, specifically perioperative outcomes and complications. We also determined long-term cancer-specific and all-cause mortality.

2. Methods

2.1. Population

A retrospective analysis of patients with ESRD who underwent RC from 1984–2013 was performed using the United States Renal Data System (USRDS) database. The USRDS is a prospective database created and maintained by the National Institute of Diabetes and Digestive and Kidney Diseases that includes every hemodialysis (HD) patient in the United States. Institutional review board exemption was granted due to the lack of identifiable data.

2.2. Demographics and outcomes

Patients were identified as having undergone open RC using International Classification of Diseases, 9th Revision, Clinical Modification (ICD9) procedure codes consistent with RC: 5771-RC, 5779-total cystectomy, and 688-pelvic evisceration. Only patients with a concurrent diagnosis of bladder cancer as identified by ICD9 code 188 or 2337 were included. Performance of urinary diversion as well as concurrent nephrectomy was determined by relevant ICD9 procedure codes (Supplemental Table 1). Demographic and medical history details available in the USRDS are derived from Center for Medicare & Medicaid Services Medical Evidence Report form (CMS 2728). Demographic details collected for our study included age, gender, race, body mass index, and active smoking status. Medical details collected included history of hypertension, diabetes, coronary artery disease (CAD), congestive heart failure, chronic obstructive pulmonary disease, and cerebrovascular disease (CVD), defined as a history of stroke or transient ischemic attack. Additionally, cause of ESRD, length of time on dialysis, and history of kidney transplant were obtained. Perioperative outcomes were obtained from hospital claim data, including length of stay, need for intensive care unit admission, and postoperative complications as identified by ICD9 coding. Complications were obtained from ICD9 diagnosis coding (Supplemental Table 2) and grouped by organ system (cardiac, vascular, respiratory, gastrointestinal (GI), urologic, wound, infectious, nervous, and those related to vascular access for dialysis—e.g., fistula thrombosis and dialysis catheter infection). Readmission rates were determined by identifying hospital admission claims within 30 days of initial hospital discharge following RC. Finally, mortality data as collected by ESRD Death Notification form (CMS 2746), including date and cause of death, was obtained.

2.3. Statistical analysis

Descriptive analysis of the population was performed. Categorical patient counts less than 10 were specified as $n < 10$ per USRDS policy. Mortality within 30 days of operation was reported. Trends in 30-day mortality across the study period were tested using an extension of the Wilcoxon rank-sum test [9]. Complications within 30 days of operation were also reported. Multivariable logistic regression was used to identify factors independently associated with experiencing a complication using year of operation, age, gender, smoking status, comorbid conditions, preoperative time on dialysis, performance of urinary diversion, and performance of concurrent nephrectomy as covariates. Both cancer specific and overall mortality were evaluated. Cancer-specific mortality was calculated using death from any other cause treated as a competing risk [10]. Factors associated with cancer-specific mortality in the model were also identified, using year of operation, age, gender, smoking status, comorbid conditions, preoperative time on dialysis, performance of urinary diversion, and performance of concurrent nephrectomy as covariates. With the same covariates, cox regression was used to determine overall mortality and identify factors associated with death from any cause. All hypothesis testing was 2 sided and P values less than 0.05 were considered statistically significant. All statistical analyses were performed with Stata/SE® Version 14.2 (StataCorp, College Station, TX, USA).

3. Results

3.1. Patient and operative details

We identified 985 patients with ESRD during time period who underwent RC. Demographic and medical details of the cohort can be seen in Table 1. Notably, the majority of patients were white, with an average age of 68.3 years. Mean duration of HD was 3.2 years prior to undergoing RC. The cause of ESRD was varied, with no single