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Urologic Oncology: Seminars and Original Investigations ▮ (2018) ▮▮▮–▮▮▮

UROLOGIC ONCOLOGY

Original article

Temporal trends in venous thromboembolism after radical cystectomy

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Received 13 March 2018; received in revised form 27 April 2018; accepted 14 May 2018

Abstract

Purpose: To determine whether the rate of venous thromboembolism (VTE) following radical cystectomy (RC) is changing overtime.

Materials and methods: The American College of Surgeons National Surgical Quality Improvement Program database was used to identify patients who underwent RC for bladder cancer from 2011 to 2016. VTE was defined as pulmonary embolism or deep vein thrombosis within 30 days of RC. VTE rate by year was assessed using the Cochran-Armitage test for trend. Associations between patient features and VTE were evaluated with multivariable logistic regression.

Results: A total of 8,241 patients undergoing RC were identified, of whom 348 (4.2%) were diagnosed with VTE. VTE was diagnosed at a median of 13 days (IQR: 7–19) after RC, with 171 (49%) occurring after hospital discharge. Notably, the rate of VTE after RC was found to significantly decrease over time, from 5.1% in 2011 to 2.8% in 2016 ($P = 0.001$). On multivariable analysis, clinical factors significantly associated with increased odds of VTE included congestive heart failure (odds ratio [OR] = 2.83, $P = 0.01$), prolonged operative time (OR: 1.48–1.56, $P = 0.02$–0.01), and receipt of a perioperative blood transfusion (OR = 1.27; $P = 0.04$). When postoperative complications were adjusted for, sepsis/septic shock (OR = 2.37, $P < 0.001$) and perioperative infection (OR = 1.74, $P < 0.001$) were likewise found to be associated with VTE.

Conclusions: The rate of VTE after RC significantly decreased in recent years, potentially reflecting improvements in perioperative care. The specific casual factors underlying this trend, in addition to efforts to address identified risk factors for VTE, warrant continued study.

Keywords: Venous thromboembolism; Bladder cancer; Radical cystectomy; Health services research

1. Introduction

Venous thromboembolism (VTE) is a potentially modifiable cause of morbidity and increased cost following major cancer surgery [1,2]. Indeed, VTE has been noted in 3% to 11% of patients after radical cystectomy (RC) [3–7], and has been associated with the highest costs of all index complications following RC [8]. Opportunities for care improvement in this setting include timely administration of perioperative pharmacologic prophylaxis, early postoperative ambulation, and the use of extended-duration postoperative VTE prophylaxis.

Extended-duration VTE prophylaxis has been shown to significantly reduce the incidence of VTE after cancer surgery, with a number needed to treat of 14 and no significant increase in the risk of bleeding events [2]. As a reflection of these data, the American College of Chest Physicians guidelines now recommend 4 weeks of pharmacologic VTE prophylaxis following abdominal or pelvic cancer surgery [9]. Several groups have recently shown that

Supported in part by the Robert D. and Patricia E. Kern Center for the Science of Health Care Delivery.

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https://doi.org/10.1016/j.urolonc.2018.05.015
1078-1439/

usage of outpatient chemoprophylaxis after RC significantly reduces rates of VTE [10–13]. Nevertheless, as the widespread implementation of such practice pattern modifications remains uncertain, determining current trends in VTE after RC represents an important component of assessing the quality of care delivery. Previous studies assessing the rate of VTE after RC in the United States have only analyzed the time period through 2012, and therefore an updated assessment is needed [3,5,6]. Further, recent data suggest that VTE after major cancer surgery may actually be increasing, further underscoring the need for a contemporary analysis of patients with RC [14].

Herein, therefore, we evaluated changes in perioperative VTE rates within a large contemporary cohort of patients in the United States undergoing RC.

2. Materials and methods

2.1. Data source and study population

The American College of Surgeons National Quality Improvement Program (ACS-NSQIP) is a prospectively maintained database that collects 30-day postoperative outcomes from 603 hospitals across the United States [15]. Ninety-day outcomes are not captured by the database. Data are collected by trained nurse abstractors and subjected to regular audit to ensure data quality. Due to low capture of RC codes early on in the database (<600 cases/year), we chose to exclude years before 2011.

To develop the study cohort, we queried the ACS-NSQIP database from 2011 to 2016 to identify patients with bladder cancer (International Classification of Diseases, Ninth Revision: codes 188.0–188.9; 10th revision: codes C67.0–C67.9) who underwent RC (current procedural terminology [CPT] codes, open: 51570, 51575, 51580, 51585, 51590, 51595, 51596, or 51597; laparoscopic/robotic: 51999 plus at least 1 additional laparoscopic code comprising a standard component of RC as listed in the Appendix). Patients were excluded if they had concurrent nephroureterectomy or urethrectomy (CPT 50234, 50236, 50548 or 53215), had a history of a bleeding disorder (defined in NSQIP as a chronic condition such as hemophilia or anticoagulant therapy that is not stopped before surgery, excluding aspirin or NSAIDs) [15], were missing data on body mass index (BMI), or died on the day of surgery (Fig. 1).

2.2. Features studied and outcome measures

Covariates assessed included age, functional status, American Society of Anesthesiologists (ASA) physical status, BMI, current smoking (within 1 year of surgery), congestive heart failure (CHF), severe chronic obstructive pulmonary disease, diabetes, hypertension requiring medication, steroid use, operative time (analyzed by quartile), diversion type (continent vs. incontinent), surgical approach (open vs. laparoscopic/robotic), receipt of a perioperative blood transfusion (intraoperative or during index hospitalization), performance of a pelvic lymphadenectomy with RC, as well as the postoperative complications of wound dehiscence, infection, and sepsis/septic shock. Comorbid features were chosen for analysis on the basis of previously demonstrated associations with VTE after RC [3,5,6], or inclusion in the Caprini risk assessment score [16]. The full Caprini score was not calculable due to missing variables in the data set [16]. CPT codes defining lymphadenectomy and diversion type are listed in the Appendix. Postoperative

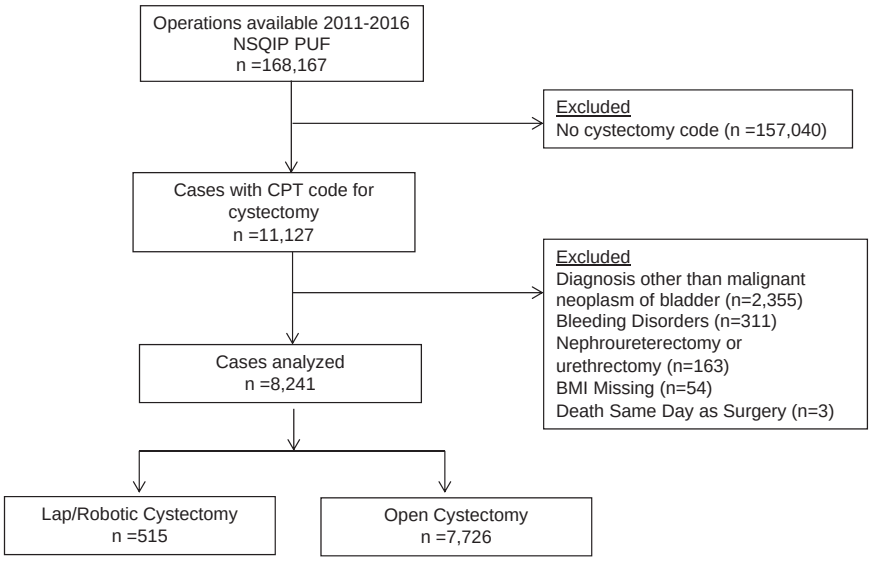

Fig. 1. Flow diagram depicting cohort selection.