Utility of Preoperative Echocardiograms in Patients Receiving Treatment for Bladder Cancer. A Retrospective Study

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Abstract

Background: Preoperative risk assessment is part of routine clinical management that evaluates a patient's physical status and therefore surgical eligibility. These evaluations include age, comorbidities, physical status, and cardiac function, including resting LVEF. Patients with bladder cancer are especially high-risk due to older age and higher frequency of coexisting disease. This study aims to investigate the relationship between cardiac function reflected by resting LVEF and postoperative LOS in patients undergoing cystectomy or cystourethroscopy for treatment of bladder cancer.

Methods: Data were compiled from a database of patients undergoing treatment for bladder cancer at DUH from July 2000-August 2012. Decision to order a preoperative echocardiogram was based on clinical judgment. Echo reports were retrieved from the medical records and LVEF was recorded. Patients were stratified based on the values of LVEF. Echocardiogram with LVEF >50% were recorded as normal, and LVEF<50% were considered abnormal.

Results: Eighty-one patients were identified with an echocardiogram within 30 days prior to cystectomy or cystourethroscopy. Thirty-four cystectomy patients and 47 cystourethroscopy patients were identified. The chances of an abnormal finding from preoperative resting echocardiograms based on clinical judgment range between 10%-22%. Thirty-one cystectomy patients with normal echocardiogram had a mean LOS of 14.3 days. Three cystectomy patients with abnormal echocardiogram had a mean LOS of 22.6 days. In the cystourethroscopy cohort, 37 patients had normal echocardiogram and averaged 2.5 LOS, while ten patients with abnormal echocardiogram averaged 2.6 LOS.

Conclusion: The findings from preoperative echocardiogram is not a predictor in the LOS following cystourethroscopy although there was a trend towards longer LOS in patients undergoing cystectomy (p=0.09). Exploring other options such as exercise or stress echocardiogram as well as fitness assessments such as cardiopulmonary exercise testing may provide more powerful surgical risk stratification and prognostic information to urologists managing patients with bladder cancer.

Keywords: Preoperative testing; Echocardiogram; Surgical outcomes; Urology; Bladder cancer; Cystectomy; Cystourethroscopy

Abbreviations: LOS: Length of Stay; LVEF: Left Ventricular Ejection Fraction; DUH: Duke University Hospital

Introduction

In 2013, the American Cancer Society estimated a diagnosis of 72,570 new cases of bladder cancer and 15,210 deaths from bladder cancer [1]. The majority are elderly, with the average age at the time of diagnosis 73 years and 9 out of 10 individuals with bladder cancer over age 55. Although the rates of diagnosis and deaths have been fairly stable in males and decreasing in females, prognosis remains poor for most bladder cancer patients owing to the advanced stage at diagnosis and patient characteristics such as advanced age and existing co-morbidities [1].

Preoperative risk assessment is part of routine clinical management that serves to broadly evaluate a patient's physical status and therefore surgical eligibility. These evaluations often include age, comorbidities, and physical status, as well as cardiac function (i.e., resting left ventricular ejection fraction; LVEF). In general, a patient with a LVEF ≥ 55% is considered to have sufficient cardiac function for surgery.

In several non-cardiac surgical populations, there has been an effort to evaluate standard preoperative risk assessments, including echocardiogram, for its predictive capacity of adverse outcomes. Studies report the chances of an abnormal finding from preoperative resting echocardiograms based on clinical judgment range between 10%-22%, and numerous analyses have not found significant associations between preoperative echocardiogram and postoperative outcomes [2,3]. Furthermore, risk stratification and predictive capacity of conventional risk scoring algorithms is especially limited in geriatric surgical populations and delaying surgery pending cardiac assessment results may prove detrimental in certain groups [4,5].

Patients with bladder cancer are an especially high-risk population, due to older age and high frequency of coexisting chronic health problems [6]. To date, risk factors such as advanced tumor stage, male sex, and older age have been associated with poor survival irrespective

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of intent for surgical treatment [7]. However, there have been limited data identifying specific perioperative risk factors and morbidity, and there are no current studies investigating the predictive capacity of standard preoperative physical status assessments, including resting cardiac echocardiogram, on postoperative outcomes in bladder cancer patients undergoing surgical treatment. The aim of this study was to characterize the relationship between cardiac function reflected by resting echocardiogram and postoperative length of stay (LOS) in patients undergoing cystectomy or cystourethroscopy for treatment of bladder cancer.

We hypothesize that patients with abnormal echocardiogram will have longer hospital length of stays than patients with normal studies in both the cystectomy and cystourthroscopy patients.

Materials and Methods

This retrospective study was approved by the Duke Medicine IRB, IRB# 00005106. The requirement for written informed consent was waived by the IRB.

Data were compiled from a database of patients undergoing treatment for bladder cancer, including TURBT, bladder biopsy, or cystectomy (radical or partial) at Duke University Hospital from July 2000-August 2012. The decision to order a preoperative echocardiogram was based on clinical judgment.

The echo reports were retrieved from the medical records and LVEF was recorded. Patients were then stratified based on the values of LVEF. Echocardiogram with an LVEF ≥ 50% were recorded as normal, and an LVEF<50% were considered abnormal. Additional demographic data collected included age, race, ASA physical status, and hospital length of stay (LOS).

Descriptive statistics were obtained using the JMP software (SAS, Cary, NC). A p value <0.05 was declared significant.

Results

Eighty-one patients were identified with an echocardiogram within 30 days prior to cystectomy or cystourethroscopy.

Table 1 demonstrates the echo results and postoperative hospital length of stay. Thirty-four patients had cystectomy and 47 patients had cystourethroscopy. There were 31 (91%) cystectomy patients with normal LVEF and 3 (9%) with abnormal results. Thirty-seven (78%) of the cystourethroscopy had normal LVEF and 10 (22%) had an abnormal echocardiogram. Both the mean age of the sample groups (65.5 and 79.7 years for the normal and abnormal cystectomy patients groups, respectively, and 71.2 and 69 years for the normal and abnormal cystourethroscopy groups, respectively) and the sex ratios approximating a 3:1 ratio of male to female subjects is consistent with US bladder cancer patient demographics I. Nearly all of the cystectomy

	Cystectomy N=34		Cystourethroscopy N=47	
	Normal (>50%)	Abnormal (≤ 50%)	Normal (>50%)	Abnormal (≤ 50%)
Number of patients n (%)	31 (91)	3 (9)	37 (78)	10 (22)
Age Mean (SD)	65.5 (11.8)	79.7 (2.1)	71.2 (9.5)	69 (7.3)
Sex (M:F)	22:9	3:0	26:11	8:2
ASA (I/II/III/IV)	0/7/23/1	0/0/3/0	0/6/29/2	0/1/6/3
LOS mean (SD), median (IQR)	14.3 (10.1), 10.2 (8.9,17.2)	22.9 (14.4), 18.8 11.0,39.0)	2.5 (6.2), 0.5 (0.5,1)	2.6 (4.6), 1 (0.5,2.6)

Table 1: Echocardiogram results and postoperative hospital LOS.

and cystourethroscopy patients were designated as ASA class II or III. LOS for cystectomy patients averaged 14.3 days for those with normal echocardiogram and 22.9 days for those with abnormal results. Cystourethroscopy reflected a shorter length of stay, 2.5 to 2.6 days for patients with normal and abnormal echocardiogram, respectively.

Conclusion

In this single-institution retrospective study, the findings from preoperative echocardiogram were not a predictor in the LOS following cystourethroscopy, although there was a trend towards longer LOS in patients undergoing cystectomy (p=0.09).

In the bladder cancer patient population, there is a high incidence of perioperative mortality and morbidity associated with the surgical treatments for bladder cancer; [6] therefore, as bladder cancer populations often have many preoperative risk factors, the immediate risk of perioperative morbidity and long-term morbidity and mortality necessitates careful patient selection. However, based on our findings, the standard practice of including echocardiogram into the patient selection model may not not be as informative to the surgical and anesthetic teams and does not affect postoperative outcomes in bladder cancer patients.

Numerous studies in other patient populations have also found that the lack of predictive value of both resting and stress echocardiograms to identify non-cardiac surgical candidates at higher cardiac risk is limited and is not cost-effective [8]. The majority of these studies have been conducted in vascular surgery patients, another high-risk group, and the predictive capacity of several standard noninvasive cardiac function tests such as ambulatory electrocardiography, exercise electrocardiography, radionuclide ventriculography, myocardial perfusion scintigraphy, dobutamine stress echocardiography (DSE), and dipyridamole stress echocardiography, on adverse cardiac outcome, has consistently reported non-significant results, with some showing a positive trend of DSE towards better diagnostic performance [2,3].

Current bladder cancer surgical treatment studies have focused on intraoperative and postoperative predictors of poor outcome, with a paucity of data in preoperative period. To date, packed red blood cell (PBRC) transfusions received during radical cystectomy have been associated with a decrease in survival [9] and longer posteroperative radiotherapy treatments and gastrointestinal complications have been implicated with higher mortality rates [7].

Given the retrospective nature of the study design and small sample size, there are limitations to this study. Although all the patients included in this study were undergoing surgical treatment for bladder cancer, the cystectomy procedure is undoubtedly more intensive than cystourethroscopy: associated with longer surgery and anesthesia durations, higher complication rates, and longer hospital LOS. Cystourethroscopy can often be performed as an outpatient procedure, requiring smaller anesthetic exposure. Additionally, this study was limited to a single institution and did not adjust for existing patient co-morbidities.

Despite these limitations, in the interest of patient safety and cost-conscious healthcare, exploring other physical status assessments options may provide more powerful surgical risk stratification and prognostic information to urologists managing patients with bladder cancer. For example, cardiopulmonary-exercise-derived variables are emerging as a metric used to predict risk and guide surgical management [10]. In the geriatric non-cardiac surgical population, represented by most bladder cancer patients, it has been suggested that frailty and

functional status assessments are a more useful tool to stratify risk given that many surgical and cardiac risk scores are poorly correlated with chronological age [11,12]. Similarly, in oncologic populations, physical fitness assessed by peak oxygen consumption has been established as a significant prognostic marker and independent predictor of survival [13]. Furthermore, a growing literature suggests that exercise and enhanced fitness may also attenuate cognitive impairment and reduce dementia risk [14]. The recent introduction of "prehabilitation" into the surgical treatment plan seeks to mitigate or prevent development of a variety of adverse physical and cognitive outcomes by improving preoperative physical fitness.

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References

1. http://www.cancer.org/cancer/bladdercancer/detailedguide/bladder-cancer-key-statistics

2. Mantha S, Roizen MF, Barnard J, Thisted RA, Ellis JE, et al. (1994) Relative effectiveness of four preoperative tests for predicting adverse cardiac outcomes after vascular surgery: a meta-analysis. AnesthAnalg 79: 422-433.

3. Kertai MD, Poldermans D, Bax JJ, Klein J, Van Urk H (2003) Cardiac risk and perioperative management. J CardiovascSurg (Torino) 44: 431-435.

4. Leung JM, Dzankic S (2001) Relative importance of preoperative health status versus intraoperative factors in predicting postoperative adverse outcomes in geriatric surgical patients. J Am GeriatrSoc 49: 1080-1085.

5. Smeets SJ, Poeze M, Verbruggen JP (2012) Preoperative cardiac evaluation of geriatric patients with hip fracture. Injury 43: 2146-2151.

6. Lawrentschuk N, Colombo R, Hakenberg OW, Lerner SP, Månsson W, et al. (2010) Prevention and management of complications following radical cystectomy for bladder cancer. EurUrol 57: 983-1001.

7. Chahal R, Sundaram SK, Iddenden R, Forman DF, Weston PM, et al. (2003) A study of the morbidity, mortality and long-term survival following radical cystectomy and radical radiotherapy in the treatment of invasive bladder cancer in Yorkshire. EurUrol 43: 246-257.

8. Morgan PB, Panomitros GE, Nelson AC, Smith DF, Solanki DR, et al. (2002) Low utility of dobutamine stress echocardiograms in the preoperative evaluation of patients scheduled for noncardiac surgery. AnesthAnalg 95: 512-516, table of contents.

9. Sadeghi N, Badalato GM, Hruby G, Kates M, McKiernan JM (2012) The impact of perioperative blood transfusion on survival following radical cystectomy for urothelial carcinoma. Can J Urol 19: 6443-6449.

10. Hennis PJ, Meale PM, Grocott MP (2011) Cardiopulmonary exercise testing for the evaluation of perioperative risk in non-cardiopulmonary surgery. Postgrad Med J 87: 550-557.

11. Baldasseronil S, Orso F, Pratesi A, Foschini A, Marella AG, et al. (2012) [The complexity of risk stratification in older patient candidate to non-cardiac surgery]. Monaldi Arch Chest Dis 78: 129-137.

12. Kwon S, Symons R, Yukawa M, Dasher N, Legner V, et al. (2012) Evaluating the association of preoperative functional status and postoperative functional decline in older patients undergoing major surgery. Am Surg 78: 1336-1344.

13. Jones LW, Watson D, Herndon JE 2nd, Eves ND, Haithcock BE, et al. (2010) Peak oxygen consumption and long-term all-cause mortality in nonsmall cell lung cancer. Cancer 116: 4825-4832.

14. Ahlskog JE, Geda YE, Graff-Radford NR, Petersen RC (2011) Physical exercise as a preventive or disease-modifying treatment of dementia and brain aging. Mayo ClinProc 86: 876-884.