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Research Article | Journal of Urology and Nephrology Open Access | Open Access

Does Robot-Assisted Approach to Radical Cystectomy Influence Surgeon Choice for Urinary Diversion?

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Received: June 29, 2016; Accepted: : July 15, 2016; Published: July 25, 2016

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Abstract

To elucidate whether a robot-assisted approach to radical cystectomy affected the choice and actually deprived patients from continent urinary diversion (CUD)

Keywords: Robot-assisted; Radical; Cystectomy; Urinary diversion; Continent; Ileal conduit; Choice; Preference

Introduction

The choice of urinary diversion after Radical Cystectomy (RC) is a complex process that requires careful consideration of oncological safety, patient appropriateness, short and long-term complications, in addition to provision of the best possible quality of life (QoL) [1]. It remains unclear which diversion method is ideal for the individual patient. While continent urinary diversion (CUD) in the form of orthotopic neobladders may represent the new standard of care, as it offers better cosmesis and the potential for normal voiding without an abdominal stoma, it may not be feasible for all patients. Deciding the most appropriate method is usually individually tailored according to the patient and disease characteristics, and the availability of specially trained staff to assist with perioperative management and patient education [1]. Prior studies have shown that surgeon training and experience have a substantial influence in the presentation of the available options to patients, and therefore significantly affect the decision for urinary diversion [1-3]. Ileal conduit (IC) remains the most popular diversion method in United States (>80%) [4].

There has been increased utilization of robot-assisted radical cystectomy (RARC), since it provides superior perioperative outcomes, including reduced blood loss and hospital stay, without jeopardizing oncological outcomes [5,6]. Despite being employed for more than a decade now, it is still unknown whether a Robot-Assisted (RA) approach to RC affects the surgeon inclination towards IC rather than CUD. In this context, we sought to assess the trends of utilization and decision making for different methods of urinary diversion at our institute in which RARC is exclusively performed, and investigate whether a RA approach to RC affected the choice of urinary diversion or not.

Methods

Between 2005 and 2015, 425 consecutive patients with bladder cancer underwent RARC at Roswell Park Cancer Institute by a single surgeon. No open radical cystectomy was performed and no patient was referred to any outside institution. A retrospective review of our prospectively maintained RARC Quality Assurance Database was performed. Patients were thoroughly and carefully counseled about the risks and benefits of all types of urinary diversion, while considering their individual preferences. Patients were informed that even if CUD was planned preoperatively, intraoperative findings (as positive urethral margins) may preclude the decision for CUD. All patients had a marked stoma site prior to RARC. Techniques for RARC and urinary diversion have been previously described [7]. Follow up was done in compliance with National Comprehensive Cancer Network (NCCN) guidelines.

Patients who received ICs were classified according to the contraindication to CUD into 3 groups; absolute, relative and no contraindications to CUD. Absolute contraindications for CUD included impaired renal function (estimated Glomerular Filtration Rate (eGFR) <50 mL/ min), hepatic dysfunction, physical or mental impairment precluding Intermittent Self Catheterization (ISC), positive urethral margins (or bladder neck in females), and unmotivated patient. Relative contraindications included associated multiple comorbidities American Society of Anesthesiologists (ASA) score ≥3, advanced age, extensive disease with high risk of recurrence or the possible need for adjuvant therapy, prior pelvic irradiation, bowel and urethral disease (Supplementary Table 1) [8].

To investigate whether RA approach and the learning curve for RARC affected the choice of UD, we compared the proportion of patients who received IC without any contraindication to CUD

(those who were eligible for CUD) across the 10 years. Further, we compared the patient and disease characteristics among all eligible patients for CUD (those who received IC without contraindications versus those who received CUD). Data were analyzed for demographics (age, gender, Body Mass Index (BMI), and ASA score), preoperative characteristics (neoadjuvant chemotherapy and prior abdominal surgery), operative variables (operative time, Estimated Blood Loss (EBL), length of hospital and Intensive Care Unit (ICU) stay, type (IC versus CUD) and technique of diversion (intracorporeal versus extracorporeal)), and pathologic characteristics (tumor stage, soft tissue surgical margins, lymph node yield, and positive lymph nodes).

Univariable associations between baseline characteristics and outcome measurements were statistically assessed using Fisher exact test for categorical responses and Wilcoxon Rank-Sum test for continuous responses. All statistical analysis was performed using SAS software (version 9.3, SAS Institute Inc., Cary, NC). All tests were two-side, with statistical significance defined as p-value ≤ 0.05.

Results

A total of 425 patients underwent RARC and urinary diversion between 2005 and 2015, 3 of which had end stage renal disease and did not receive urinary diversion (excluded from the study). Majority of patients (N = 390, 92%) received IC. Median age was 70 years, 74% were males and 21% received neoadjuvant chemotherapy. Sixty-one percent received intracorporeal urinary diversion (ICUD). Median operative time was 364 minutes (interquartile range [IQR] 305-435), and median EBL was 300 cc. Mean LNY was 22 lymph nodes (SD 1), and 24% of patients had positive lymph nodes. Seven percent showed positive soft tissue surgical margins. Patients who received CUD were younger (median age 59 versus 71 years, $p < 0.01$) but had longer mean operative times (454 versus 358 minutes, $p < 0.01$) (Table 1).

Ninety-five patients (23%) had absolute contraindications to CUD (mainly renal compromise, n = 87), while 260 (62%) had relative contraindications to CUD. A total of 67 patients were eligible for CUD, of whom only 32 (8%) received CUD (Figure 1). Reasons for having IC rather than CUD among the eligible patients are summarized in Table 2.

Utilization of CUD remained stable over the 10 years. The proportion of patients who did not have any contraindication to CUD but still received IC decreased from 14% in 2005-2007 to 0% in 2014-2015. On the other hand, patients with relative contraindications to CUD increased from 52% to 77% over the same period of time ($p = 0.05$) (Figure 2A). Among the patients who were eligible for CUD (those who did not have contraindications, and those who received CUD), 32 patients (48%) received CUD. This proportion increased from 33% in 2005-2007 to 100% in 2014-2015 (Figure 2B). These patients were significantly younger, but had longer operative times and hospital stay (Supplementary Table 2).

Discussion

The choice of diversion is a complex decision that is affected by various factors. While absolute contraindications are well established, many relative indications include patients in the "gray zone" and therefore the decision for UD should be individually tailored to each patient. Commonly, females, elderly, patients with significant comorbidities, prior radiation therapy or locally advanced disease patients are less likely to receive CUD [1,9]. However, the past decade has witnessed a significant change in the paradigm for the acceptable criteria for CUD which proved to be feasible among patients with the aforementioned factors. Although the majority of patients presenting for RC are likely reasonable candidates for CUD, less than 25% of patients actually received it [4,10,11]. The major cause for under-

Table 1: Patient, disease characteristics and perioperative outcomes of patients who received IONB and IC as urinary

Variable	IC	CUD	All Patience	*P value*
Preoperative variables				
n of patients	390	32	422	
Age at cystectomy, median (IQR) (years)	71 (64 - 77)	59 (5262)	70 (62 - 77)	<0.01
Sex, Males, n (%)	290 (74)	23 (72)	313 (74)	0.76
BMI, mean (SD) (kg/m²)	28 (6)	28 (5)	28 (5)	0.21
ASA score, median	3 (1 - 3)	2 (1 - 2)	2.8 (2 - 3)	0.06
eGFR, median (IQR)	66 (48 - 82)	79 (70 - 94)	68 (49 - 83)	<0.01
Prior abdominal/pelvic surgery, n (%)	210 (56)	13 (41)	223 (52)	0.09
NAC, n (%)	84 (22)	3 (9)	87 (21)	0.09
Perioperative parameters				
Intracorporeal diversion, n (%)	259 (66)	0	259 (61)	<0.01
Operative time, median (IQR) (minutes)	358 (304 - 428)	454 (377 - 504)	364 (305 -435)	<0.01
EBL, median (IQR)	300 (200 - 500)	350 (188 - 625)	300 (200 -500)	0.96
Adjuvant chemotherapy, n (%)	69 (18)	6 (19)	75 (18)	0.65
Follow up, median (months)	17	26	22	0.04

IONB: Ileal Orthotopic Neobladder; IC: Ileal Conduit; BMI: Body Mass Index; KG/M²: Kilograms Per Meter Squared; SD: Standard Deviation; ASA: American Society Of Anesthesiologists Score; LN: Lymph Nodes; NAC: Neoadjuvant Chemotherapy; EBL: Estimated Blood Loss; ML: Milliliter; LNY: Lymph Node Yield

Table 2: Reasons for choosing IC over CUD among 35 eligible patients

Decision after discussion	n = 20
Concerns about urinary leakage/CIC	n = 6
Recommendation by other urologists/patients	n = 4
Concerns about metabolic complications	n = 1
Concerns about cancer recurrence	n = 1
Unknown	n = 3

utilization of CUD are surgeon-driven and is related to the surgeon training and their ability to manage complications and optimize outcomes. Another factor is the cost. Many urologists believe that shorter operative times, simpler postoperative care, fewer complications and shorter hospital stay may cut down the associated costs [1,2]. It is worth mentioning that when it comes to UD, comparative research between different studies or institutions may be complicated and subjected to inherent biases owing to the complexity of patient, disease and surgeon-related factors. Not all patients are eligible, and many factors contribute to the decision towards an IC.

While the adoption of RARC has been associated with improved perioperative outcomes and enhanced patients' recovery, much of the criticism to the procedure has been attributed to the longer operative times that were anticipated to be longer with adoption of an intracorporeal approach and also with construction of a continent reservoir. Whether the incorporation of RA technology has pushed surgeons towards ICs in favor of CUD remains unclear, especially when there is underutilization of CUD even among open surgeons. In our 10-year experience, only 32 (8%) patients received CUD, which is lower than previously reported in RA series [5,12]. Although this difference may be attributed in part by the patient and disease characteristics, surgeon and technology could still have a contribution. Stratifying the patients according to contraindication to CUD, the majority had some contraindication to CUD (23% had absolute and 62% had relative contraindications). Thirty-five patients (8%) were eligible to CUD (did not have any contraindication to CUD) but received ICs. All of these patients opted for IC after thorough discussion with the surgeon (except 3 were the exact causes were not clearly mentioned in the patient charts). Fear of urinary leakage and the possibility of ISC were the major determinant of the patients' decision (Table 2). Despite the fact that many urologists state

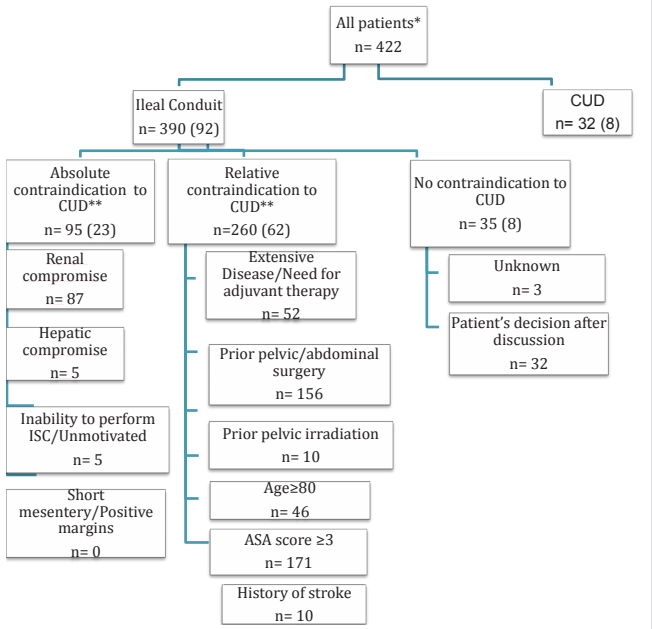

Figure 1: Contraindications to CUD.

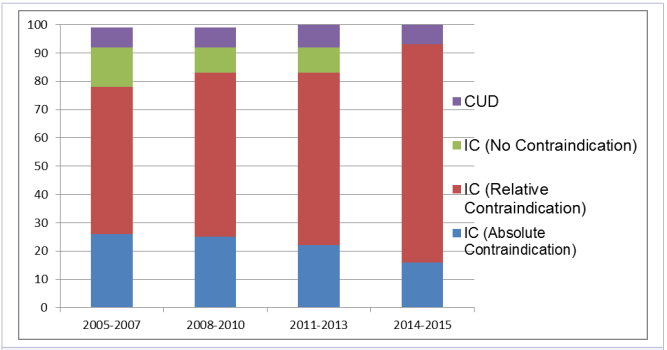

Figure 2a: Contraindications to CUD by years (p= 0.05).

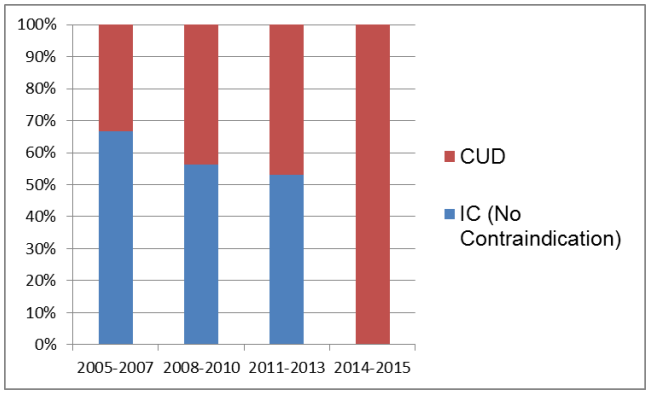

Figure 2b: Utilization of CUD among eligible patients across time.

that the majority of their patients prefer IC when given the pros and cons of CUD, other reports challenged this statement. Skinner et al mentioned that the majority of patients will opt for a CUD if the pros and cons of each type of diversion are presented in an unbiased approach [2,13]. Surgeon bias will inevitably influence the discussion, and the available options may not be presented in a balanced manner especially with the lack of strong evidence for the superiority of CUD in terms of health related QoL. In a systematic review of 21 studies including more than 2000 patients who underwent radical cystectomy and urinary diversion, 16 studies reported no difference in QoL between the two types of urinary diversion and 4 studies reported better QoL with orthotopic neobladders (of which 2 included younger and fitter patients). A single study reported a better QoL in IC patients. It is noteworthy that none of these studies were randomized, and only 4 were prospective [14]. Commonly, patients usually will go for what the surgeon believes will be the best for them [2].

Observing the trend over time, the proportion of patients who received CUD remained stable but low (less than 8%) across the 10 years. The proportion of patients who received IC without contraindications to CUD decreased significantly with time (14% in 2005-2007 to 0% in 2014-2015, p = 0.05). Among the eligible patients to CUD, more patients received CUD with time. This may be explained by the learning curve and operating on more complex patients who are older, harbor advanced disease stage and with multiple comorbidities. The use of robotics for

Supplementary Table 3: Absolute and relative contraindications to CUD [8]				
Contraindications	**Oncological control**	**General condition**	**Technical considerations**	**Others**
Absolute	Urethral/bladder neck positive margins	Renal compromise Hepatic compromise	Inability to perform ISC Length of mesentery	Unmotivated patient
Relative	Need for adjuvant chemotherapy Extensive local disease with high risk of recurrence	Advanced age Associated comorbidities Bowel disease	Urethral pathology Prior abdominal / pelvic surgeries Prior pelvic irradiation	Non-Compliance with rehabilitation
CUD: Continent Urinary Diversion; ISC: Intermittent Self-Catheterization				

Supplementary Table 4: Preoperative characteristics and outcomes of CUD eligible patients (who received IC without contraindication to CUD versus those who received CUD)			
Variable	**IC without contraindication to CUD**	**CUD**	**p-value**
Preoperative variables			
n	35	32	
Age, median (IQR)	64 (56 - 73)	59 (52 - 62)	**0.02**
Sex, male, n (%)	33 (94)	23 (72)	**0.01**
BMI, mean (SD) (kg/m^2)	28 (6)	28 (5)	0.21
ASA score, median (IQR)	2 (2 - 2)	2 (2-3)	**<0.01**
eGFR, median (IQR)	75 (62 - 87)	79 (70 - 94)	0.65
NAC, n (%)	5 (14)	3 (9)	0.48
Perioperative parameters			
Intracorporeal diversion, n (%)	19 (56)	0 (0)	**<0.01**
Operative time, median (IQR) minutes	367 (300 - 428)	454 (377-504)	**<0.01**
EBL, median (IQR), ml	300 (200 - 400)	350 (188 - 625)	0.29
Hospital stay, mean (SD) (days)	8 (4)	13 (9)	**<0.01**
30-d complications, n (%)	14 (40)	15 (7)	0.87
30-d Clavien ≥ 3 complications, n (%)	1 (3)	3 (9)	0.22
90-d complications, n (%)	23 (66)	21 (66)	0.86
90-d Clavien ≥ 3 complications, n (%)	0 (0)	4 (13)	0.05
30-d readmission, n (%)	8 (23)	5 (16)	0.23
90-d readmission, n (%)	14 (40)	9 (28)	0.19
Follow up, mean (months)	22	26	0.66
IONB: Ileal Orthotopic Neobladder; IC: Ileal Conduit; BMI, Body Mass Index; KG/M^2, Kilograms Per Meter Squared; SD, Standard Deviation; ASA, American Society Of Anesthiologists Score; LN, Lymph Nodes; NAC, Neoadjuvant Chemotherapy; EBL, Estimated Blood Loss; ML, Milliliter; LNY, Lymph Node Yield.			

complex genitourinary reconstructive procedures is emerging. We adopted a step-wise approach to RARC at our institute; where early in our learning curve achieving oncological efficacy was the main priority. Once achieved, optimizing operative times ensued, followed by ICUD, and RA surgical management of complications [15]. The increased experience and adequate visualization and access to challenging anatomical regions allowed operating on more technically complex patients.

Despite the novelty of this study, it has several limitations. The retrospective study design may limit the conclusions drawn from the study. The relative contraindications were obtained from charts review. These may differ among surgeons and also may not necessary reflect why these patients really received IC rather than CUD.

Conclusion

Majority of our patients had some contraindication to CUD, 16% were eligible for CUD but only half of them received it.

Surgeon preference may have led to the choice of IC over CUD in 8% of our patients and this proportion decreased with time.

Acknowledgements

Roswell Park Cancer Institute Alliance Foundation

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