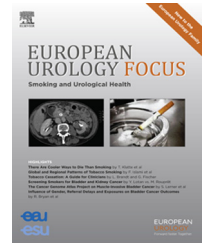


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Urothelial Cancer

# In-depth Critical Analysis of Complications Following Robot-assisted Radical Cystectomy with Intracorporeal Urinary Diversion

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## Article info

### Article history:

Accepted June 2, 2016

### Associate Editor:

James Catto

### Keywords:

Bladder cancer  
Complications  
Cystectomy  
Intracorporeal urinary diversion  
Robotics  
Reference standards

## Abstract

**Background:** Robot-assisted radical cystectomy with intracorporeal urinary diversion (iRARC) is an attractive option to open cystectomy, but the benefit in terms of improved outcomes is not established.

**Objective:** To evaluate the early postoperative morbidity and mortality of patients undergoing iRARC and conduct a critical analysis of complications using standardised reporting criteria as stratified according to urinary diversion.

**Design, setting, and participants:** A total of 134 patients underwent iRARC for bladder cancer at a single centre between June 2011 and July 2015.

**Intervention:** Radical cystectomy with iRARC.

**Outcome measurements and statistical analysis:** Patient demographics, pathologic data, and 90-d perioperative mortality and complications were recorded. Complications were reported according to the Clavien-Dindo (CD) classification and stratified according to urinary diversion type and either surgical or medical complications. The chi-square test and *t* test were used for categorical and continuous variables respectively. Multivariable logistic regression was performed on variables with significance in univariate analysis.

**Results and limitations:** The 90-d all complication rate following ileal conduit and continent diversion was 68% and 82.4%, and major complications were 21.0% and 20.6% respectively. The 90-d mortality was 3% and 2.9% for ileal conduit and continent diversion patients, respectively. On multivariate analysis, the blood transfusion requirement was independently associated with major complications ( $p = 0.002$ ) and all 30-d ( $p = 0.002$ ) and 90-d ( $p = 0.012$ ) major complications. Male patients were associated with 90-d major complications ( $p = 0.015$ ). Critical analysis identified that surgical complications were responsible for 39.4% of all 90-d major complications. The incidence of surgical complications did not decline with increasing number of iRARC cases performed ( $p = 0.742$ ,  $r = 0.31$ ). Limitations of this study include its retrospective nature, limited sample size, and limited multivariate analysis due to the low number of major complications events.

**Conclusions:** Although complications following iRARC are common, most are low grade. A critical analysis identified surgical complications as a cause of major complications. Addressing this issue could have a significant impact on lowering the morbidity associated with iRARC.

**Patient summary:** We looked at the surgical outcomes in bladder cancer patients treated with minimally invasive robotic surgery. We found that surgical complications account for most major complications and previous surgical experience may be a confounding factor when interpreting results from a different centre even in a randomised trial setting.

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<http://dx.doi.org/10.1016/j.euf.2016.06.002>

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Please cite this article in press as: Tan WS, et al. In-depth Critical Analysis of Complications Following Robot-assisted Radical Cystectomy with Intracorporeal Urinary Diversion. Eur Urol Focus (2016), <http://dx.doi.org/10.1016/j.euf.2016.06.002>

## 1. Introduction

Radical cystectomy (RC) with lymphadenectomy is the standard of care for patients with muscle-invasive bladder cancer (MIBC) and selected high-risk non-muscle-invasive bladder cancer (NMIBC). Risk factors for bladder cancer include advancing age, tobacco smoking, and exposure to industrial carcinogens, resulting in a patient cohort with a high incidence of concurrent cardiovascular and pulmonary disease. In addition to pre-existing comorbidity, the extent of surgery including urinary diversion places patients undergoing RC at significant risk of postoperative complications [1].

Early oncologic outcomes have suggested no significant difference between robot-assisted radical cystectomy with intracorporeal urinary diversion (iRARC) and open radical cystectomy (ORC) [2].

An aim of minimally invasive surgery (MIS) is to replicate principles of open surgery with the added advantage of reducing the risk of postoperative complications and allowing an early return to normal activity [3]. In the context of RC, MIS has particular relevance because the complication rate for ORC is >60%, with a significant 90-d mortality rate of 5.1%, having fallen from as high as 10.3% due to centralisation of care [4–6]. Despite evidence that MIS has benefits over open colectomy [7], comparison between the outcomes of ORC and robot-assisted radical cystectomy (RARC) has not demonstrated major differences. Results from a randomised controlled trial by Bochner et al that compared ORC with RARC showed a significantly lower blood loss and longer operative time in the RARC arm but no difference in Clavien-Dindo (CD) 2–4 complications and length of stay (LOS) [8]. The requirement to convert to open extracorporeal urinary diversion may mask the potential benefits of the minimal invasive approach.

We evaluate 90-d perioperative morbidity and mortality in 134 iRARC cases stratified according to type of urinary diversion and CD classification, with complications attributed to surgical or medical aetiology.

## 2. Patients and methods

### 2.1. Patient population

Data on patients undergoing iRARC were recorded prospectively and maintained using an institutional approved database which began in June 2011. By July 2015, 163 RCs had been performed. A total of 134 patients underwent iRARC; 29 patients who underwent planned ORC due to previous abdominal surgery or patient or surgeon preference were excluded from analysis. All cases were performed by two surgeons. Since January 2013, 93.4% of cystectomy procedures performed (113 of 121) have been iRARC, which is now the default procedure at our institution with 63 RC cases performed in 2015. All patients undergoing iRARC had MIBC or high-risk NMIBC. Intracorporeal urinary diversion was either ileal conduit or continent diversion (neobladder or Mitrofanoff). This study was part of a quality assurance programme and registered with our institutional department (Urology2015.2).

### 2.2. Surgical technique

The technique for iRARC was previously described [9]. Briefly, a standard six-port transperitoneal approach with the patient in 27° Trendelenburg

was used. Pelvic lymph node dissection included external, internal, common iliac, and obturator fossa lymph nodes. Specimens were retrieved using an Endocatch bag (Covidien, Dublin, Ireland) that was removed via the vagina if possible in female patients or otherwise via an iliac fossa incision in all others. The left ureter was passed posteriorly to the sigmoid mesocolon. Ileal conduit was constructed by mobilising a 15-cm segment of terminal ileum 15 cm from the ileocaecal valve using a laparoscopic 60-mm intestinal stapler (Endo-GIA, Covidien Corp., Dublin, Ireland). Continent diversion was constructed using a 50-cm segment of ileum. Ureteroileal anastomosis for the ileal conduit and continent diversion was performed using either the Bricker or Wallace anastomosis, depending on surgeon preference. The 6F infant feeding tubes or Bander stents were used as ureteric stents and externalised.

### 2.3. Data collected

Patient demographics, clinical and pathologic characteristics, perioperative variables, transfusion requirements, hospital LOS, and standardised complication data were recorded prospectively. Preoperative cardiopulmonary exercise testing (CPET) variables such as anaerobic threshold, peak oxygen consumption, and minute ventilation/carbon dioxide production were also recorded. All patients were followed up for a minimum of 90 d postsurgery.

### 2.4. Study outcomes measured

The 30- and 90-d complications were classified according to the modified Memorial Sloan Kettering Cancer Center CD system [4]. Minor and major complications were defined as CD 1–2 and CD 3–4 respectively. Complications were divided into surgical and medical complications. Surgical complications were defined as urinary leak, anastomotic stricture, significant bleeding, or herniation and wound dehiscence. Medical complications were defined as organ dysfunction, sepsis, or bowel related not arising from a surgical cause. Ileus was defined as persistent postoperative vomiting requiring a nasogastric tube insertion or inability to tolerate enteral intake  $\geq 48$  h.

### 2.5. Statistical methods

Descriptive statistics were used to report continuous data that included mean, median, interquartile range, standard deviation, and 95% confidence interval. The chi-square test and *t* test were used for categorical and continuous variables, respectively. The Pearson correlation coefficient was used to determine correlation. Multivariable logistic regressions were performed on variables with significance in univariate analysis. Statistical significance was set at a *p* value <0.05. Statistical analysis was performed using SPSS v.22 (IBM Corp., Armonk, NY, USA).

## 3. Results

Table 1 details the patient demographic data for 100 ileal conduit cases and 34 continent diversion cases. Significantly more patients with an American Society of Anesthesiologists (ASA) score  $\leq 2$  ( $p < 0.001$ ) were in the continent diversion group compared with the ileal conduit group. Consistent with this was a reduced physical fitness in patients undergoing ileal conduit reflected by CPET variables (all  $p < 0.05$ ) compared with patients undergoing continent diversion. Five ileal conduit patients required open conversion: two patients had extensive locally advanced stage T4 disease, two had significant intraperitoneal adhesions, one of whom was converted following

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