# Early Complications of Cystectomy After High Dose Pelvic Radiation

Manuel S. Eisenberg, Ryan P. Dorin, Georg Bartsch, Jie Cai, Gus Miranda and Eila C. Skinner*

*From the USC Institute of Urology, Keck School of Medicine, University of Southern California, Los Angeles, California*

**Abbreviations and Acronyms**

ASA = American Society of Anesthesiologists
CC = continent cutaneous
EBL = estimated blood loss
IC = ileal conduit
LOS = length of stay
MSKCC = Memorial Sloan-Kettering Cancer Center
ON = orthotopic neobladder
RC = radical cystectomy
RT = radiation therapy
UD = urinary diversion

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Supplementary material for this article can be obtained at www.uscurology.com/research/early-complications.

* Correspondence: USC Institute of Urology, University of Southern California, Keck School of Medicine, 1441 Eastlake Ave., NOR 7416, Los Angeles, California 90033-9178 (telephone: 323-865-3700; FAX: 323-865-0120; e-mail: skinner_e@ccnt.usc.edu).

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**Purpose:** Radical cystectomy in patients with a history of pelvic radiation therapy is often a challenging and morbid procedure. We report early complication rates in patients undergoing cystectomy and urinary diversion after high dose pelvic radiation.

**Materials and Methods:** From 1983 to 2008, 2,629 patients underwent cystectomy with urinary diversion at a single institution. Of these patients 148 received 60 Gy or greater pelvic radiation therapy before surgery. Patient medical records were retrospectively reviewed and any complication within 90 days of surgery was graded using the Clavien-Dindo system.

**Results:** Median patient age was 74 years with a median American Society of Anesthesiologists score of 3. Patients received a median of 70 Gy pelvic radiation therapy a median of 2.3 years before surgery. Urinary diversions performed were ileal conduit in 65 patients (43.9%), continent cutaneous pouch in 35 (23.6%) and orthotopic neobladder in 48 (32.4%). A total of 335 early complications were identified. The highest grade complication was 0 in 23% of the patients, grade 1 in 12.2%, grade 2 in 32.4%, grade 3 in 18.9%, grade 4 in 7.4% and grade 5 in 6.1%. Age older than 65 years and American Society of Anesthesiologists score were statistically significant predictors of postoperative complications ($p = 0.0264$ and $p = 0.0252$, respectively). The type of urinary diversion did not significantly affect the grade distribution or number of early complications per patient ($p = 0.7444$ and $p = 0.1807$, respectively).

**Conclusions:** The early complication rate using a standardized reporting system in patients undergoing radical cystectomy after radiation therapy is higher than previously published in nonirradiated subjects. Age and American Society of Anesthesiologists score but not urinary diversion type were associated with early complications in this population.

**Key Words:** cystectomy, postoperative complications, classification, radiotherapy

RADICAL cystectomy with urinary diversion is the gold standard treatment for muscle invasive bladder cancer, and is often indicated in treating advanced cases of other malignancies such as prostate, uterine and cervical cancers. Although cancer control rates are high, RC is a relatively morbid procedure with modern complication rates ranging from 25% to 57% and mortality rates ranging from 0.3% to 5.7%.[1–4]

In addition to surgery there are organ preserving protocols using RT for many pelvic malignancies. For bladder cancer RT is advocated by some as a safe, effective alternative to RC in



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select patients.[5] Historically salvage cystectomy for failed RT in bladder cancer has been required in 8% to 29% of cases, with complication rates as high as 66% and mortality rates up to 33%.[6] In addition, RT for nonbladder malignancies confers a small risk of de novo urothelial carcinoma, leading to post-radiation cystectomy. Lastly in a subset of patients the toxicity of RT can result in crippling bladder dysfunction, also leading to cystectomy.

Pelvic RT results in tissue damage that is not limited to the organ of interest, but can also affect surrounding pelvic organs including the rectum, urethra, external sphincter and small bowel. RT often results in a desmoplastic reaction, making identification and dissection of surgical planes difficult.[6,7] Complications attributed to radiation damage, presumably due to endarteritis with subsequent ureteral and bowel ischemia, include anastomotic leakage, upper urinary tract obstruction, prolonged ileus, diarrhea, delayed wound healing and increased infection rates.[4,7–9] In this study we used a standardized complication reporting system to objectively grade all early (90 days or less) complications after cystectomy and UD following high dose (60 Gy or greater) pelvic radiation.

## MATERIALS AND METHODS

From 1983 to 2008, 2,629 patients underwent RC with UD at our institution. Of these patients 148 received 60 Gy or greater pelvic RT before surgery. Patient characteristics were prospectively entered into an institutional review board approved database. Operative characteristics evaluated are listed in table 1.

RC was performed in each case as previously described.[10] The degree of lymphadenectomy was determined by the desmoplastic reaction in each case. The type of UD performed was determined by patient-surgeon consultation.

Patient medical records including inpatient notes, hospital discharge summaries, outpatient notes, hospital readmission records and personal communications were retrospectively reviewed, and all inpatient and post-discharge complications were recorded. All complications within 90 days of surgery were considered related to surgery and graded by 3 independent reviewers according to the 2004 Clavien-Dindo grading system (table 2). Each reviewer was blinded to all patient demographics, operative variables and type of UD performed. Any discrepancies in grading triggered reexamination of the medical record until a consensus in grading was reached. Adverse outcomes specifically due to cancer progression were not considered surgical complications as stipulated by Dindo et al.[11] All complications were further classified by organ system.

To compare patient and perioperative variables with complication outcomes statistical analysis was performed using chi-square analysis and the Kruskal-Wallis test for categorical and continuous variables as appropriate. Univariate and multivariate analyses were performed to identify variables significantly associated with the presence and severity of complications. Statistical analysis was performed using SAS® version 9.2 software.

**Table 1.** *Operative characteristics*

| | No. (%) |
|---|---|
| Diversion type: | |
| IC | 65 (43.9) |
| CC | 35 (23.6) |
| ON | 48 (32.4) |
| Lymphadenectomy: | |
| Not performed | 49 (33.1) |
| Less than 15 lymph nodes removed | 40 (27.0) |
| 15 or More lymph nodes removed | 59 (39.9) |
| Operative mortality | 0 |

**Table 2.** *Highest grade complication per patient according to Clavien-Dindo classification*

| Grade | Definition | No. (%) |
|---|---|---|
| 0 | No complication observed | 34 (23.0) |
| 1 | Any deviation from normal postop course without need for pharmacological treatment (allowed regimens include antiemetics, antipyretics, analgesics, diuretics, electrolytes, physiotherapy, bedside wound care)* | 18 (12.2) |
| 2 | Requiring pharmacological treatment with drugs other than those allowed for grade 1 complications (blood transfusions + total parenteral nutrition also included)† | 48 (32.4) |
| 3a | Requiring surgical, endoscopic or radiological intervention with pt not under general anesthesia | 14 (9.5) |
| 3b | Same as 3a but requiring general anesthesia | 14 (9.5) |
| 4a | Life threatening complication requiring intensive care unit management, single organ dysfunction | 11 (7.4) |
| 4b | Same as 4b but involving multiorgan dysfunction | 0 (0) |
| 5 | Death of pt | 9 (6.1) |

* Modifications of Clavien-Dindo classification for grade 1 include opening of previously placed gastrostomy tube, nasogastric tube placement, Foley catheter placement, bladder irrigation and topical dermatologic medications.
† Modifications of Clavien-Dindo classification for grade 2 include peripheral parenteral nutrition, peripherally inserted central catheter line placement and enteral nutrition via nasogastric or gastrostomy tube.

## RESULTS

Ileal conduit diversion was performed in 43.9% (65 of 148) of patients, CC diversions were performed in 23.6% (35 of 148) and ON in 32.4% (48 of 148, table 1). Lymphadenectomy was performed in 66.9% (99 of 148) of the patients. Median operative time in 121 patients was 5.5 hours (IQR 5.0 to 6.0). Median EBL in 120 patients was 850 ml (IQR 600 to 1,475). Postoperative blood transfusions were required in 21% (31 of 148) of the patients. There were no intraoperative complications or deaths. When comparing basic demographics based on UD performed, age ($p = 0.0013$) and ASA score ($p = 0.0391$) were significantly higher in the IC group (table 3).

Of the 148 patients 15 (10.1%) died during the first 90 days after surgery. Of these deaths 6 were attributed to disease progression and, therefore,