Preoperative and Operative Factors Associated with Complications Following Radical Nephroureterectomy

Arnouk, A.[1] Lallas, C.[2] Trabulsi, E.[2] Raman, J.[3]

[1]Jefferson Medical College, [2]Department of Urology, Thomas Jefferson University Hospital, [3]Department of Urology, Penn State Hershey

Abstract

Radical nephroureterectomy (RNU) is the gold standard for managing upper-tract urothelial carcinoma. We review preoperative, operative, and pathologic characteristics of patients undergoing RNU to identify factors associated with perioperative complications. A retrospective review of institutional databases from 8 academic centers identified 732 patients who underwent RNU. Data on preoperative, operative, and pathologic indices were collected. Almost 40% of patients in our cohort experienced a complication within 30 days of RNU. Increasing age, higher Charlson score, and lower baseline renal function were independently associated with patients developing complications. Longer OR duration and intraoperative transfusion requirement were also associated with post-RNU complications. Other operative and pathologic factors did not predict complications following surgery. These metrics should be determined prior to surgery and may guide patient counseling and surgical expectations.

Background

- Upper tract urothelial carcinomas represent 5% of urothelial tumors, with a peak incidence around age 80.[1]
- These tumors are multifocal, with high recurrence rate, and are often associated with high grade disease.[2]
- Radical nephrectomy with en bloc resection of the bladder cuff is the gold standard treatment.[3]

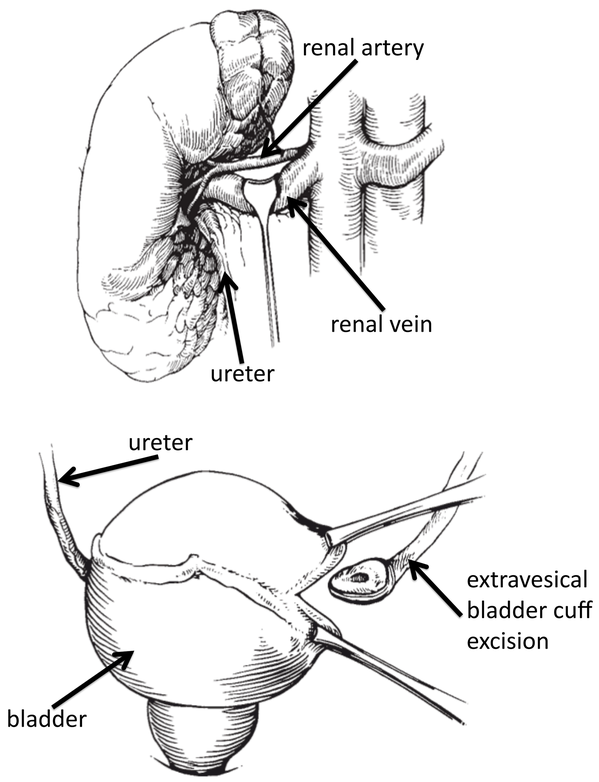

Figure 1. Mobilization of renal vasculature and the distal end of the ureter during radical nephroureterectomy (RNU). Images adapted from Novick AC, Gill IS, Klein E et al. Operative Urology, At the Cleveland Clinic. Springer; 2007.

Results

Preoperative Factors

- 371 men and 361 women, with a median age of 70 years, a median BMI of 27, and 75% of the cohort were Caucasian
- Comorbid Factors:
  - ✓ Median Charlson score of 4 (range, 1 – 14)
  - ✓ ASA ≥ 3 in 44% and ECOG status ≥ 2 in 11%
  - ✓ Comorbid medical conditions: hypertension (55%), hyperlipidemia (41%), coronary artery disease (24%), diabetes (17%), and pulmonary disease (14%)
  - ✓ Median baseline eGFR (CKD-EPI) was 58 ml/min/1.73m^2
  - ✓ CKD stage ≥ III in 50%
- Complication Rate:
  - ✓ **270 patients (37%) experienced a post-operative complication, and ≥Clavien 3 in 54 patients**
- Univariate Analysis:
  - ✓ Patient age, race, baseline eGFR, comorbidities and all comorbidity indices were associated with post-RNU complications
- Multivariate Analysis of above:
  - ✓ **Patient age** (OR 4.0, 95% CI 1.7 – 6.3, **p=0.05**)
  - ✓ **Charlson index** (OR 4.5, 95% CI 2.1 – 6.8, **p=0.03**)
  - ✓ **eGFR** (OR 7.8, 95% CI 3.4 – 12.1, **p=0.005**)

Operative/Pathologic Factors

- 73% of cases were performed via a minimally invasive approach and 36% had a lymph node (LN) dissection
- Operative Variables:
  - ✓ **Median OR duration: 200 minutes** (range, 60 – 977)
  - ✓ **Median EBL: 165cc** (range, 10 – 5000)
  - ✓ **12% of patients received an intraoperative transfusion**
- Final Pathology:
  - ✓ 56% of tumors were located in the kidney/renal pelvis
  - ✓ 50% were muscle invasive
  - ✓ 68% were high grade
  - ✓ 10% had positive lymph nodes
  - ✓ 6% had positive surgical margins
- Univariate Analysis:
  - ✓ EBL, OR duration, intraoperative transfusion, tumor location, pathologic stage, and surgical margin status were associated with complications
  - ✓ Surgical approach and LN dissection were among variables not associated with post-RNU complications
- Multivariate Analysis of above:
  - ✓ **OR duration** (OR 8.3, 95% CI 3.6 – 10.8, **p=0.004**)
  - ✓ **Intraoperative transfusion** (OR 6.8, 95% CI 2.4 – 8.7, **p=0.009**)

Methods

A retrospective review of institutional databases from 8 academic centers in the United States and Europe identified 732 patients (81 from Jefferson) who underwent RNU. Data on preoperative clinical, demographic, comorbidity indices, operative, and pathologic data were collected. Complications occurring in these patients within 30-days of surgery were graded using the modified Clavien-Dindo scale. Univariate and multivariate analyses determined the association between preoperative, operative, and pathologic variables and presence of complications.

Grade 1: Any deviation from the normal postoperative course without need for pharmacologic treatment or surgical, endoscopic, or radiologic interventions. Allowed treatments include antiemetics, antipyretics, analgesics, diuretics, electrolytes, and physiotherapy.
Grade 2: Complication requiring pharmacologic treatment not in grade 1, blood transfusion, and total parenteral nutrition.
Grade 3: Complication requiring surgical, endoscopic, or radiologic intervention.
>>Grade 3A: Intervention *not under* general anaesthesia.
>>Grade 3B: Intervention *under* general anaesthesia.
Grade 4: Life-threatening complications requiring intermediate care/intensive care unit management.
>>Grade 4A: Single organ dysfunction.
>>Grade 4B: Multiorgan dysfunction.
Grade 5: Death of patient.

Figure 2. The Clavien classification of postoperative complications.

Conclusions

- 37% of patients experienced a complication within 30 days of RNU.
- Increasing age, higher Charlson score, and lower baseline renal function were associated with patients developing complications.
- Longer OR duration and intraoperative transfusion requirement were associated with post-RNU complications.
- Other operative (surgical approach, LN dissection) and pathologic (stage, grade) factors did not predict complications following surgery.

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