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Comparison Between Laparoscopic and Open Radical Nephroureterectomy in a Contemporary Group of Patients: Are Recurrence and Disease-Specific Survival Associated with Surgical Technique?

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Abstract

Background: Open radical nephroureterectomy (ORN) is the current standard of care for upper tract urothelial carcinoma (UTUC), but laparoscopic radical nephroureterectomy (LRN) is emerging as a minimally invasive alternative. Questions remain regarding the oncologic safety of LRN and its relative equivalence to ORN.
Objective: Our aim was to compare recurrence-free and disease-specific survival between ORN and LRN.
Design, setting, and participants: We retrospectively analyzed data from 324 consecutive patients treated with radical nephroureterectomy (RN) between 1995 and 2008 at a major cancer center. Patients with previous invasive bladder cancer or contralateral UTUC were excluded. Descriptive data are provided for 112 patients who underwent ORN from 1995 to 2001 (pre-LRN era). Comparative analyses were restricted to patients who underwent ORN ($n = 109$) or LRN ($n = 53$) from 2002 to 2008. Median follow-up for patients without disease recurrence was 23 mo.
Intervention: All patients underwent RN.
Measurements: Recurrence was categorized as bladder-only recurrence or any recurrence (bladder, contralateral kidney, operative site, regional lymph nodes, or distant metastasis). Recurrence-free probabilities were estimated using Kaplan-Meier methods. A multivariable Cox model was used to evaluate the association between surgical approach and disease recurrence. The probability of disease-specific death was estimated using the cumulative incidence function.
Results and limitations: Clinical and pathologic characteristics were similar for all patients. The recurrence-free probabilities were similar between ORN and LRN (2-yr estimates: 38% and 42%, respectively; $p = 0.9$ by log-rank test). On multivariable analysis, the surgical approach was not significantly associated with disease recurrence (hazard ratio [HR]: 0.88 for LRN vs ORN; 95% confidence interval [CI], 0.57–1.38; $p = 0.6$). There was no significant difference in bladder-only recurrence (HR: 0.78 for LRN vs ORN; 95% CI, 0.46–1.34; $p = 0.4$) or disease-specific mortality ($p = 0.9$). This study is limited by its retrospective nature.
Conclusions: Based on the results of this retrospective study, no evidence indicates that oncologic control is compromised for patients treated with LRN in comparison with ORN.

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1. Introduction

Open radical nephroureterectomy (ORN) with excision of the distal ureter and bladder cuff is considered the current standard of care for the treatment of nonmetastatic upper tract urothelial carcinoma (UTUC) [1]. However, ORN has been associated with significant morbidity. Laparoscopy has been shown to be equally effective as open surgery for some urologic malignancies while resulting in less perioperative morbidity [2]. In 1991, Clayman et al first described the technique of laparoscopic nephroureterectomy (LRN), and since then it has emerged as an accepted minimally invasive treatment alternative to ORN. However, the oncologic efficacy of LRN and its equivalence to ORN have not been established.

UTUC is a biologically aggressive malignancy with a high potential for disease recurrence and eventual death. Some investigators have hypothesized that tumor dissection and high-pressure pneumoperitoneum during LRN are associated with a higher risk of bladder and/or local recurrence as well as port-site metastasis [3]. The differential effect of LRN versus ORN on oncologic outcomes after radical nephroureterectomy (RN) remains controversial. Although several recent studies suggested comparable oncologic results between ORN and LRN in well-selected patients [4–10], others reported a higher risk of intravesical disease recurrence with LRN as compared with ORN [11–13].

We hypothesized that there is no difference in clinical outcomes between ORN and LRN when performed by expert surgeons. To test this hypothesis, we studied the effect of surgical approach on bladder-only recurrence, any recurrence, and disease-specific survival at a single cancer center with genitourinary surgeons and pathologists.

2. Materials and methods

2.1. Patient selection and technique

In this study approved by the institutional review board, we retrospectively reviewed all the prospectively collected data on 324 consecutive patients treated with RN at Memorial Sloan-Kettering Cancer Center (MSKCC) between 1995 and 2008. The first LRN was performed in our institution in 2002. Because the aim of the study was to assess the differential effect of surgical approach on oncologic outcomes, we restricted our analyses to patients who underwent ORN or LRN from 2002 to 2008. Additional descriptive data are provided for the cohort of patients who underwent ORN between 1995 and 2001 (historical control group). We excluded patients who underwent previous or concurrent radical cystectomy ($n = 46$), had prior contralateral UTUC ($n = 4$), or had metastatic UTUC prior to RN ($n = 3$), leaving 274 patients for analysis.

RN was performed by genitourinary surgeons at MSKCC according to the standard criteria, that is, dissection of the kidney with the entire length of the ureter and adjacent segment of the bladder cuff. The indication for lymph node dissection was at the discretion of each surgeon. The hilar and regional lymph nodes adjacent to the ipsilateral great vessel generally were resected, which included paracaval for right side and paraortic for left side above bifurcation of the aorta. For patients with distal ureter tumors, lymph node dissection was performed including common, external, and internal iliac and obturator nodes. Extended lymphadenectomy (including retrocaval and interaortocaval for right side and interaortocaval for left side) was not routinely performed unless the patient was otherwise suspected of locally advanced disease (pT3/pT4 or node positive). Choice of method (laparoscopic vs open) mainly depended on patient and surgeon preference. Laparoscopic technique was performed by a transperitoneal approach in 35 patients and a retroperitoneal approach in 18. No hand-assisted technique was used in these patients. Bladder cuff excision for LRN patients was done by open technique in 40 patients, laparoscopically in 11, or transurethrally (ie, resection of the ureteric orifice) in 2. During ORN the bladder cuff was resected using a completely extravesical approach.

2.2. Pathologic evaluation

Surgical specimens were processed according to standard pathologic procedures at our institution. All specimens were histologically confirmed to be urothelial carcinomas. UTUC was defined as urothelial carcinoma in the renal pelvis or calices as well as tumors located within the ureter. Tumors were staged according to the 2002 American Joint Committee on Cancer/Union Internationale Contre le Cancer TNM classification. Tumor grading was assessed according to the 1998 World Health Organization/International Society of Urologic Pathology consensus classification [14].

2.3. Follow-up regimen

Patients were followed every 3 mo for the first year, every 4 mo for the second year, every 6 mo from the third through the fifth years, and annually thereafter. Follow-up consisted of a history, physical examination, routine blood work and serum chemistry studies, urinary cytology, chest radiograph, cystoscopic evaluation of the urinary bladder, and radiographic evaluation of the contralateral upper urinary tract. Since 2001, computed tomography (CT) urograms have been the standard imaging modality for evaluating the abdomen and pelvis for urothelial recurrence. Bone scans, chest CT, and magnetic resonance imaging were performed when clinically indicated.

Disease recurrence was defined as any documented recurrence—by radiograph, endoscope, or pathology—in the bladder, contralateral kidney, operative site, regional lymph nodes, or distant metastases. Cause of death was determined by chart review corroborated by death certificate. Most patients who were identified as having died of UTUC had progressive widely disseminated metastases at the time of death.

2.4. Statistical methods

Univariate logistic regression was used to investigate the association between baseline patient characteristics (age, body mass index [BMI], and American Society of Anesthesiologists [ASA] grade) and surgical approach. Multivariable regression models were used to investigate the association between surgical approach and operative outcomes, controlling for the effects of age, BMI, and ASA. Linear regression was used for the outcomes of blood loss and operative time, logistic regression was used for any transfusion, and quantile regression was used for length of stay.

Recurrence-free probabilities were estimated using Kaplan-Meier methods, censoring patients without disease recurrence at their date of last follow-up. Survival time was calculated from the date of RN. A multivariable Cox proportional hazards regression model was used to evaluate the association between surgical approach and disease recurrence, controlling for the effects of age, ASA, pathologic stage and grade, nodal status, pathologic carcinoma in situ, and prior history of bladder cancer. Analyses were repeated for the outcome of bladder-only recurrence, where patients without bladder recurrence were censored at their date of last follow-up. The probability of disease-specific death was estimated using the cumulative incidence function, accounting for the competing risk of death from other causes. All covariates adjusted for in