Laparoscopic Partial Nephrectomy: 3-Year Followup

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Purpose: LPN is a viable alternative to open partial nephrectomy for select small renal tumors. However, published intermediate term oncological data are sparse. We present our experience with LPN for tumor in 100 patients with a minimum followup of 3 years.

Materials and Methods: Of the 480 LPNs performed at our institution a minimum followup of 3 years is available in 100 patients since 1999. Overall and cancer specific survival data were obtained from patient charts, radiographic reports and direct telephone calls to patient families.

Results: All 100 cases were completed laparoscopically without open conversion. Mean tumor size was 3.1 cm and mean warm ischemia was 27 minutes. Final histopathology revealed renal cell carcinoma in 68 patients, including 1 with positive surgical margins. A second patient with oncocytoma had a positive surgical margin. At a median followup of 42 months (mean 42.6, range 24.3 to 62.5) no patient had evidence of local or port site recurrence. Two patients with renal cell carcinoma had a contralateral renal mass. Overall survival was 86% and cancer specific survival was 100%. Mean preoperative and postoperative serum creatinine was 1.1 and 1.3 mg/dl, respectively. Two patients with preoperative chronic renal insufficiency were undergoing hemodialysis.

Conclusions: At 3-year followup LPN provides oncological outcomes comparable to those in contemporary open partial nephrectomy series.

Key Words: kidney; laparoscopy; carcinoma, renal cell; kidney neoplasms; nephrectomy

Multiple options currently exist for the surgical management of renal tumors. With available 10-year followup data open surgical NSS is now an accepted treatment modality for appropriately selected patients with a small renal tumor.[1] LPN aims to duplicate the techniques used during open NSS, while minimizing the associated morbidity.[2] Numerous reports from several institutions have described the feasibility of LPN using various techniques. Although encouraging short-term data have been presented, adequate intermediate and long-term followup data are sparse. We report our intermediate term outcomes with LPN, focusing on oncological results and patient survival.

MATERIALS AND METHODS

Since September 1999, we have performed 480 LPNs. Demographic and operative data were collected prospectively and maintained in a computerized database, as approved by the institutional review board. All patients underwent preoperative staging, including history and physical examination, and radiographic imaging primarily comprising 3-dimensional CT with 3 mm or 5 mm cuts. Indications for surgery were a small, solitary, sporadic renal mass that satisfied CT criteria as being suspicious for malignancy. No patient had radiographic evidence of metastatic nodal disease at surgery. A 78-year-old male with a 3.5 cm left renal mass and a normal contralateral kidney had previously undergone thoracoscopic wedge resection of a lung nodule with biopsy proven metastatic RCC, clear cell type.

A total of 101 patients with a minimum of 3 years of followup from the time of surgery were evaluated. One patient with von Hippel-Lindau disease was excluded from study because of the high incidence of multifocality and recurrence associated with this disease. Of the remaining 100 patients 68 had pathologically confirmed, sporadic RCC. Noncancerous pathological findings in 32 patients included oncocytoma in 12, angiomyolipoma in 9, benign cyst in 8 and scar/infarct in 3. Patients were followed prospectively to date or until death. Although we have since performed LPN in patients with multiple renal masses,[3] 67 of the 68 patients with RCC in this series had a solitary tumor.

LPN was performed for imperative indications in patients with RCC, including chronic renal insufficiency and a contralateral renal tumor in 21 (31%) (table 1). Five patients (7%) had a solitary kidney with prior contralateral radical nephrectomy for cancer. Eight patients had baseline chronic renal insufficiency, of whom 1 had multiple indeterminate masses in the contralateral kidney on preoperative CT. The remaining 47 elective patients (69%) had a normal contralateral kidney or incidental simple cysts without other relative medical comorbidity, such as diabetes mellitus or hypertension. Five of these elective patients had a relative

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TABLE 1. *Contralateral kidney status preoperatively at LPN in 68 patients with RCC*

Status	No. Pts
Normal	37
Chronic renal insufficiency	8
Calculous disease	5
Multiple cysts	5
Synchronous bilateral tumors	5
After radical nephrectomy	5
After partial nephrectomy	3

indication for partial nephrectomy, given a history of nephrolithiasis.

Our surgical technique has previously been described in detail.[2] Briefly, cystoscopic insertion of an open ended ureteral catheter up to the renal pelvis was performed. The renal hilar vessels and tumor were dissected sequentially. Intraoperative ultrasound was performed to delineate and mark adequate resection margins. After clamping the hilar vascular pedicle the tumor was excised with cold endoscopic shears. The collecting system was suture repaired in a watertight manner, followed by parenchymal closure over a Surgicel™ bolster. Intraoperative surgical margin status was assessed by magnified laparoscopic visualization in the bloodless partial nephrectomy bed. If there was any suspicion regarding margin status, deep tumor bed biopsies were sent for frozen section. Following reconstruction and revascularization of the renal remnant the partial nephrectomy specimen was extracted intact and inked by the pathologist to confirm margin status. Laparoscopic exit was then completed. The ureteral catheter and Foley catheter were removed on postoperative day 2. The Jackson-Pratt drain (transperitoneal approach) or Penrose drain (retroperitoneal approach) was typically removed on postoperative day 5 after ensuring minimal drainage, that is less than 50 cc daily for 3 consecutive days.

Patients were followed in prospective fashion with history, physical examination and radionuclide renal scan at 1 month, in addition to CT in patients with pathologically confirmed cancer at 6 months and annually thereafter. If radiographic imaging was not performed at our institution, reports were obtained directly from the referring physician and entered into our computerized database. Cancer recurrence and patient survival were based on the clinical history and radiographic findings. When such survival data were not available, telephone calls were made directly to the patient or surviving family members.

RESULTS

All procedures were completed successfully without open conversion or perioperative mortality. Table 2 lists demographic and operative data on the cohort. Mean tumor size was 2.9 cm, 65% of patients required pelvicaliceal closure and mean warm ischemia time was 27 minutes.

Table 3 lists pathological tumor classification according to the 2002 TNM classification system.[4] Fuhrman grading was commented on by the pathologist in 59 patients and is provided for each stage. Overall 57 tumors (84%) were low stage (T1a), while 45 (66%) had a favorable grade of 2 or less. Two positive margins were noted on final pathological findings. A 69-year-old male who was the fourth patient in the series with surgery performed in 1999 and who had a 3.1 cm renal mass was also found to have a focal positive margin of a benign oncocytoma. The second patient, a 77-year-old female who was the ninth patient in the series with surgery performed in 1999 and who had a 3.9 cm tumor, was found to have a focal positive margin for a grade 3 clear cell carcinoma. This patient was without evidence of local recurrence at the last followup of 3 years. All remaining patients had negative pathological margins. The average margin width of normal parenchymal tissue, available in 42 patients, was 5 mm. Table 4 lists renal tumor histopathological classifications according to the American Joint Classification Committee on Cancer.[5] Clear cell carcinoma and papillary tumors made up the majority of histological cell types (94%).

Current followup data were available on 86 of 100 patients (86%). Nine of the 68 patients with RCC (13%) could not be located for current followup beyond the minimum of 3 years of followup. At a median followup 42 months (mean 42.6, range 24.3 to 62.5) 74 patients were alive for an overall survival rate of 86%. Nine patients (10.4%) died a median of 25 months after surgery of an unknown etiology (4), coronary artery disease (2), prostate cancer (1), lung cancer (1) and complications following spine surgery (1). No patient died of renal cancer for a cancer specific survival of 100%. No patient had local recurrence or port site metastasis. Two patients with a history of RCC had contralateral renal masses and were awaiting surgery.

TABLE 2. *Demographic and operative data*

Mean age	65
No. sex:	
Male	57
Female	43
No. side:	
Rt	44
Lt	56
No. approach:	
Transperitoneal	56
Retroperitoneal	44
Mean tumor size CT (cm)	2.9
Mean specimen wt (gm)	40
Mean estimated blood loss (ml)	219
No. blood transfusion (%)	3 (3)
Mean operative time (mins)	187
Mean warm ischemia time (mins)	27
No. pelvicaliceal closure (%)	61 (65)
Mean hospital stay (days)	2.5

TABLE 3. *TNM pathological tumor stage and Fuhrman grade in 68 patients with RCC*

Pathological T Stage	No. Pts
T1a (grade):	57*
1	8
2	29
3	12
4	1
T1b (grade):	6
2	4
3	1
T2	0
T3a	5
T3a grade 2	4

* One patient had known preoperative RCC metastatic to the lung.