5-Year Outcomes of Laparoscopic Partial Nephrectomy

Brian R. Lane and Inderbir S. Gill*

From the Section of Laparoscopic and Robotic Surgery, Glickman Urological Institute, Cleveland Clinic Foundation, Cleveland, Ohio

Purpose: Laparoscopic partial nephrectomy is increasingly a definitive therapeutic option in patients with a small renal mass. Intermediate term oncological outcomes after laparoscopic partial nephrectomy are excellent up to a mean followup of 3 years. We present outcomes in 56 patients, each of whom has now completed a minimum of 5 years of followup after laparoscopic partial nephrectomy.

Materials and Methods: Of the 557 laparoscopic partial nephrectomies performed at our institution 58 patients with a localized tumor have completed more than 5 years since surgery. Clinical and renal functional data on 56 patients (97%) were obtained from medical records, radiographic reports and patient contact via telephone.

Results: Average patient age was 64 years and 9% were symptomatic at presentation. Average tumor size was 2.9 cm. On histopathology renal cell carcinoma was confirmed in 37 cases (66%) and pathological tumor stage was pT1a in 32 (86%). Final surgical margin was positive for cancer in 1 patient. Median serum creatinine preoperatively and postoperatively was 0.9 and 1.0 mg/dl, respectively. No patient with normal baseline serum creatinine undergoing elective laparoscopic partial nephrectomy had postoperative chronic renal insufficiency (serum creatinine more than 2 mg/dl). At a median followup of 5.7 years (range 5.0 to 6.9) no distant recurrence (0%) and a single local recurrence (2.7%) were detected. Overall and cancer specific survival was 86% and 100%, respectively, at 5 years.

Conclusions: To our knowledge this is the initial report in the literature of oncological and renal functional outcomes 5 years after laparoscopic partial nephrectomy with excellent results comparable to those of open nephron sparing surgery. At our center laparoscopic partial nephrectomy is an established alternative to open partial nephrectomy.

Key Words: kidney; carcinoma, renal cell; laparoscopy; nephrectomy; outcome assessment (health care)

Multiple options are available today for patients with a small, localized renal tumor. Traditional OPN provides excellent oncological and renal functional outcomes at 10 years and beyond.[1,2] LPN has evolved in application with groups at an increasing number of centers performing it for gradually expanding indications. Although short and intermediate term outcomes are excellent,[3–5] to our knowledge 5-year outcomes after LPN have not been reported to date. We assessed the outcome in 56 patients who completed 5 years of followup after LPN.

MATERIALS AND METHODS

Since September 1999, we have performed 557 LPNs for radiographically suspicious renal masses in patients who are candidates for NSS. Our technique of LPN has been described previously.[6] Clinical, operative and followup information on these patients was collected prospectively and maintained in an institutional review board approved computerized database. A total of 60 patients underwent LPN for a renal mass before July 31, 2001. Of these patients 5-year followup information is available on 56 who underwent LPN for a single, localized renal mass and they form the basis of this institutional review board approved study. Four patients were excluded, including 1 with von Hippel-Lindau disease who presented with multiple, bilateral renal lesions, 1 with metastatic disease who had previously undergone thoracoscopic wedge resection of a single lung nodule found pathologically to be metastatic clear cell RCC and 2 who were lost to followup. Final pathological findings in these 2 patients revealed 3 cm pT1a papillary RCC in the international patient and a benign renal cyst in the other.

Our followup surveillance protocol comprises history, physical examination and sCr (normal 0.7 to 1.4 mg/dl) at 1, 6 and 12 months, and annually thereafter. Radiographic evaluation consisted of chest x-ray and computerized tomography or magnetic resonance imaging of the abdomen at 6 months and annually thereafter for 5 years in patients with a confirmed pathological diagnosis of RCC. In patients who underwent clinical followup elsewhere sCr data and radiographic reports from the referring physician were obtained and entered into our computerized database. Cancer recurrence information was determined based on clinical and radiographic findings. Overall survival was determined by review of the medical record and telephone calls to the patient or patient family and death from any cause was verified through a search of the Social Security Death Index.[7] Cause of death was determined by contact with surviving family members, review of the medical record or the death certificate obtained via the National Death Index. For study purposes abnormal renal function was defined as sCr between 1.5 and 2.0 mg/dl and chronic renal insufficiency

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* Correspondence and requests for reprints: Section of Laparoscopic and Robotic Surgery, Glickman Urological Institute, 9500 Euclid Ave., A100, Cleveland, Ohio 44195 (telephone: 216-445-1530; FAX: 216-445-7031; e-mail: gilli@ccf.org).

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was defined as sCr greater than 2.0 mg/dl, each at least 30 days after surgery.

RESULTS

Mean patient age was 64 years (range 30 to 85) and the majority had little comorbidity, as assessed by the Charlson comorbidity index (table 1). Eastern Cooperative Oncology Group performance status was 0 in 54 patients (96%) and 1 in 2 patients (4%). Tumors were discovered incidentally in 91% of patients with the remaining 9% presenting with local symptoms. Preoperative radiographic evaluation with cross-sectional computerized tomography of the abdomen revealed a single, small renal mass with a mean size of 2.9 cm (range 1.3 to 7). No patient had radiographic evidence of nodal or distant metastatic disease at presentation.

A total of 23 patients (41%) underwent LPN for elective indications. These patients had a normal contralateral kidney and normal renal function, defined as sCr 1.4 mg/dl or less. Relative or absolute indications for LPN existed in the remaining 33 patients (59%). Five patients (9%) had a solitary kidney, of whom 3 had undergone previous contralateral radical nephrectomy for RCC, 1 had undergone contralateral simple nephrectomy for angiomyolipoma and 1 had a congenitally absent kidney. Six patients had synchronous bilateral tumors, including 4 who had previously undergone contralateral partial nephrectomy and 1 each who subsequently underwent contralateral partial or radical nephrectomy. Additional preexisting comorbid conditions included hypertension in 12 patients, abnormal renal function with sCr 1.5 mg/dl or greater in 7, diabetes mellitus in 4, multiple renal cysts in 9, kidney stone disease in 6, bilateral renal artery stenosis in 1 and caliceal diverticulum in 1.

All cases were completed successfully without conversion to radical nephrectomy or open surgery and without perioperative mortality. Parenchymal hemostatic sutures were placed in 100% of patients and collecting system closure was performed in 24 (43%). Intraoperative complications occurred in 3 patients (6%), including hemorrhage in 2 and incidental minor serosal bowel abrasion in 1, which was repaired laparoscopically with a single superficial figure-of-8 stitch without any sequelae. Postoperative complications occurred in 7 patients (13%), including 2 with pneumonia and 1 each with atrial fibrillation, wound infection, urine leakage managed conservatively by a ureteral stent, deep vein thrombosis managed by oral anticoagulation, and diffuse retroperitoneal bleeding from the partial nephrectomy bed, which was managed by reexploration 15 days after surgery with subsequent completion nephrectomy. Late complications included incisional hernias in 2 patients.

TABLE 1. *Demographic information*

No. men (%)/women	30 (54)/26 (46)
No. Eastern Cooperative Oncology Group performance status greater than 0 (%)	2 (4)
No. symptomatic at presentation (%)	5 (9)
No. solitary kidney (%)	5 (9)
No. bilat synchronous tumors (%)	6 (11)
No. abnormal baseline renal function (sCr 1.4 mg/dl or greater) (%)	7 (13)
Mean age (range)	63.8 (30–85)
Mean Charlson comorbidity index (range)	0.4 (0–3)
Mean American Society of Anesthesiologists score (range)	2.6 (2–4)
Mean kg/m^2 body mass index (range)	28.8 (18–48.6)

Final histopathological analysis revealed RCC in 37 patients (66%). Conventional clear cell RCC was present in 23 patients (62%), papillary RCC was present in 13 (35%) and chromophobe RCC was present in 1 (3%). Fuhrman nuclear grade was I to III in 5 (13%), 21 (57%) and 11 patients (30%), respectively. Of the tumors 32 (86%) were pathological stage T1a, while 2 were pT1b and 3 were pT3a. None of these tumors had a sarcomatoid component and 7 were partially cystic. Final pathological evaluation showed benign findings in 19 patients (38%), including angiomyolipoma in 8, oncocytoma in 8 and benign renal cyst in 3. Average pathological tumor size was 2.6 cm (range 1.2 to 6.5). In this initial portion of our LPN series a positive parenchymal margin was noted in 1 patient with oncocytoma and in 1 with RCC. The latter patient with a focal positive surgical margin after resection of pT1a clear cell RCC has remained free of disease more than 6.5 years after LPN.

Current 5-year followup data were available on all 56 patients. Median followup was 5.7 years (range 5.0 to 6.9) in 48 living patients and 5.6 years (range 0.24 to 6.9) in the entire group. Patient vital status was obtained using a validated method (the Social Security Death Index) and cause of death was verified using the National Death Index.[7] Eight patients died a median of 3.5 years after surgery (range 0.24 to 5.0) of unrelated causes, including myocardial infarction in 2, stroke in 2, liver failure in 1, metastatic prostate cancer in 1 and another unrelated cause in 2. To our knowledge no patient experienced distant RCC recurrence and no patient experienced cancer related death (table 2).

A single de novo local recurrence (2.7%) was detected in the 37 patients with RCC (table 2). This patient initially presented with a left 1.3 cm hilar solid enhancing mass and sub cm indeterminate renal lesions in each kidney. He underwent uncomplicated LPN for the hilar tumor with a 3 mm surgical margin. Intraoperative ultrasound did not identify any lesions other than the solid-appearing hilar tumor. Final histopathology revealed 2.5 cm pT1a papillary RCC with oncocytic features. During followup an indeterminate lesion in the left kidney grew to 0.8 cm 1 year and 1.8 cm 4 years after initial LPN. All other indeterminate lesions remained stable during followup. Repeat LPN was performed with negative surgical margins but final pathological findings revealed another papillary RCC that was 1.5 cm and pT1a. The patient did not experience further recurrence or progression during an additional 1 year of followup.

In the entire study group overall and cancer specific survival rates at 5 years were 86% and 100%, respectively. Recurrence-free survival in the 37 patients with RCC was 97.3% at 5 years.

After the index LPN procedure 1 patient underwent ipsilateral LPN for recurrent RCC and 3 underwent contralateral renal surgery, including LPN and laparoscopic radical nephrectomy in 1 each for synchronous RCC, and laparoscopic donor nephrectomy in 1. At last followup 43 patients had 1 intact contralateral kidney and 1 remnant ipsilateral kidney, 5 had bilateral remnant kidneys, 7 had only a solitary remnant kidney and 1 was anephric. Median clinical followup regarding renal function was 5.7 years (range 5.0 to 6.9) but several actual sCr values obtained by the referring physicians were not available for review. Median sCr was 0.9 mg/dl (range 0.6 to 3.4) before surgery and 1.0 mg/dl