



Partial nephrectomy is effective treatment for selected kidney cancers.

Alexander Kaszas. *Evening*. Acrylic on canvas, 16" x 20". Courtesy of Windward Gallery, Morehead City, NC.

Current Status of Partial Nephrectomy in the Management of Kidney Cancer

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Background: *The technique of partial nephrectomy for managing renal cancers is well recognized, but guidelines regarding indications for its use are not generally accepted.*

Methods: *The authors review the indications for partial nephrectomy in various clinical situations, and they include their own experience to clarify the utility of the technique.*

Results: *Intraoperative renal ultrasound and helical computed tomography can assist the surgeon in technical decisions. Partial nephrectomy is considered when nephrectomy would render the patient anephric and dependent on dialysis.*

Conclusions: *The technical and operative advances in partial nephrectomy make the approach increasingly attractive for patients with kidney cancer in a variety of clinical circumstances.*

Introduction

Whenever preservation of functioning renal parenchyma is important, nephron-sparing surgery substitutes for radical nephrectomy. The first partial nephrectomy was performed in 1884 by Wells¹ for the

removal of a perirenal fibrolipoma. Partial nephrectomy to treat renal malignancy was first described in 1890 by Czerny.² In 1950, Vermooten³ reported that peripherally located, encapsulated renal tumors could be removed by partial excision of renal tissue. Partial nephrectomy has now become a standard procedure for appropriately selected patients with renal cell carcinoma (RCC).

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Indications

Nephron-sparing surgery is indicated for cases in which a radical nephrectomy would render the patient anephric with a subsequent immediate need for dialy-

sis. Such cases include synchronous bilateral RCC, tumors in a solitary kidney, and unilateral tumor with a poorly functioning contralateral kidney (imperative indications).⁴ Typical reasons for a solitary organ are prior removal, renal agenesis, or irreversible impairment from a benign disorder. Further indications for partial nephrectomy are patients with unilateral RCC and those with a functioning opposite kidney with an uncertain future function. The main reasons for the latter condition include artery stenosis, hydronephrosis, chronic pyelonephritis, and systemic diseases such as diabetes and hypertension that result in arteriosclerosis and nephron-affecting impairment. Another indication includes patients with small (4 cm or less in diameter), unilateral tumors with a healthy contralateral organ (elective indication).^{5,6} The ongoing controversy regarding elective indications is discussed later. Nevertheless, the results of partial nephrectomy are less satisfactory in patients with larger or multiple localized RCC, thus leaving radical nephrectomy as the standard therapeutic approach in these cases.

Preoperative Considerations and Preparation

The preoperative evaluation of the patient includes the determination of the extent and precise location of the tumor mass. Thus, in addition to noninvasive computed tomography (CT) or magnetic resonance imaging (MRI) and ultrasound to rule out locally extensive and/or metastatic disease, in some cases a renal angiogram might be performed to locate the main renal artery and its branches.^{7,8} Selective renal venography might be performed in patients with large or centrally located tumors to evaluate for intrarenal venous thrombosis secondary to malignancy.⁹ The latter indicates a more advanced local tumor stage resulting in an increased surgical complexity.

Renal scintigraphy is helpful to determine preoperatively the function of the kidney with tumoral lesion. A tumor-burdened kidney revealing low function is not an indication for partial nephrectomy if the contralateral organ shows normal creatinine clearance.^{4,6}

Intraoperative renal ultrasound is increasingly being used during intrarenal surgery and has played a role in determining if patients are suitable for partial vs radical nephrectomy.¹⁰ Technical advances in the development of sonographic instrumentation have made this possible. These advances include the development of high-frequency multi-Hertz transducers offering a marked improvement in resolution, the development of miniature, intraoperative transducers that facilitate access into the surgical field, and the compactness of

current model US machines that allow easy transport and mobility into the operating room suite. Also, the refinement of color and duplex Doppler sonography and the addition of power Doppler sonography have made intraoperative ultrasonography an integral component in the management of patients undergoing partial nephrectomy.

In patients undergoing partial nephrectomy, ultrasound can delineate a tumor in relation to the hilar anatomy¹⁰ and can demarcate the boundary of a surgical margin,^{10,11} thereby preserving the maximum amount of uninvolved parenchyma while still obtaining negative surgical margins.¹¹ Color and power Doppler sonography can identify arteries, veins, and the urinary collecting system near the potential resection site, and the thickness of a renal parenchymal margin between tumor and vessel may be estimated.¹² Vessels around the tumor are delineated, which facilitates dissection, and the success of revascularization may be assessed using color Doppler sonography.¹⁰ The presence of tumor thrombus in the renal vein may be determined.^{10,12} Additionally, vascular structures (arteries and veins) may be differentiated from nonvascular structures such as cysts or a dilated calyx.^{10,13}

Preoperative indeterminate lesions may be evaluated intraoperatively with ultrasound.¹⁰ Lesions extending deep into the parenchyma are better evaluated on intraoperative sonography¹⁰⁻¹² due to the use of higher-frequency transducers and closer proximity to the mass without interference from intervening organs and soft tissues. Complex cystic masses thought to be solid are more clearly delineated. Small lesions that are indeterminate on preoperative CT are characterized more accurately on intraoperative ultrasound; two small lesions appearing solid on preoperative CT proved to be a cyst^{10,13} and an angiomyolipoma¹¹ on intraoperative sonography. Intraoperative sonography may alter the surgical approach by characterizing a lesion and defining the location and extent of tumor.¹⁰ However, sonography still cannot distinguish whether a solid mass is benign or malignant.

Accessory lesions may be identified by intraoperative sonography.^{10,13} However, lesions may be missed, and those smaller than 5 mm may be beyond the resolution capacity of ultrasound.^{10,14} With further improvements in technology and continued research in the area of sonographic contrast agents, small lesions may prove to be more readily distinguished from normal renal parenchyma, and fewer accessory lesions may go undetected.

In addition to the standard imaging modalities, newer techniques have recently been proposed in an

attempt to assist the surgeon in planning the best approach to remove the tumor. Helical CT combined with three-dimensional volume rendering has recently been shown to accurately depict both the renal parenchyma and the vascular anatomy, thus providing the surgeon with a three-dimensional depiction of the tumor in relation to the critical components of the kidney.¹⁵

Principles of Open Surgery in Partial Nephrectomy

Several surgical techniques are available for performing nephron-sparing surgery in patients with renal tumors. Description of these techniques, including performing the incision, exposing the kidneys, and closing the situs, are described in detail elsewhere.^{4,16-18} The five main surgical processes include enucleation of tissue, polar segmental nephrectomy, wedge resection, major transverse resection, and extracorporeal partial nephrectomy followed by renal autotransplantation.¹⁹ All of these techniques require steady vascular control and thorough hemostasis, avoidance of renal ischemia, complete tumor removal with free margins, and efficient closure of the intrarenal collecting system. Finally, an adequate postoperative renal function must be maintained since a functioning renal remnant of at least 20% of one normal kidney is necessary to avoid end-stage renal failure.^{19,20} However, it is important not to compromise the extent of the surgical procedure to preserve renal function at the expense of an incomplete resection.

Partial nephrectomy can be performed in most cases in situ, but the extracorporeal access to the kidney still is effective in special cases.²¹ Extracorporeal surgery, which might achieve a more convenient approach to the tumor mass, followed by autotransplantation was first performed in the 1970s.²²⁻²⁴ Cases that are favorable for bench surgery are large, hypervascular tumors located centrally in the kidney that can affect the hilar-collecting system. Disadvantages of bench surgery include longer operative time due to ureteral and vascular anastomosis and an increased risk for both temporary and permanent postoperative renal failure.²⁵

Laparoscopic Approach for Partial Nephrectomy

In 1990, laparoscopic nephrectomy was introduced by Clayman et al.²⁶ Since then, various authors reported on their experiences with an endoscopic technique for total nephrectomy in patients with RCC.^{27,28} In 1998, Janetschek et al.²⁹ investigated whether laparoscopic surgery is a suitable technique for partial resection of small renal malignancies. In seven cases in which procedures could be completed as planned, neither local recurrence nor metastases were observed during a follow-up of 7 to 35 months. The authors conclude that endoscopic partial nephrectomy is feasible. However, it remains to be seen if future developments in laparoscopic technology will facilitate this type of surgical approach in order to significantly reduce the operation time.

Table 1. — Reported Complications Associated With Partial Nephrectomy

Study	Urinary Fistula (%)	Bleeding (%)	Acute Renal Failure/ Acute Hemodialysis	Perioperative Deaths	Complications Requiring Reoperation
Marberger et al, 1981 ³⁰	6.5	4.3	4.3 / 4.3	2.2	2.2
Carini et al, 1988 ³¹	NR	NR	8.2 / 2.8	5.6	2.8
Petritsch et al, 1990 ³²	NR	NR	NR / 0.8	1.7	NR
Morgan and Zincke, 1990 ³³	3.3	1.1	NR / 1.1	2.2	NR
Provet et al, 1991 ³⁴	NR	NR	18 / NR	NR	NR
Van Poppel et al, 1991 ³⁵	NR	3.2	NR	3.2	6.5
Steinbach et al, 1992 ³⁶	2.1	1.4	0.7 / 0	1.4	1.4
Moll et al, 1993 ³⁷	6.7	3.7	NR	NR	0.6
Thrasher et al, 1994 ³⁸	4.8	2.4	7.1 / 2.4	4.8	2.4
Campbell et al, 1994 ³⁹	15.2	1.6	10 / 4.9	0.8	1.6
Polascik et al, 1995 ⁴⁰	8.9	0	1.5 / 0	1.5	0

NR = not reported
 From Polascik TJ, Pound CR, Meng MV, et al. Partial nephrectomy: technique, complications, and pathological findings. *J Urol.* 1995;154:1312-1318. Adapted with permission.

Complications of Partial Nephrectomy

Numerous studies regarding nephron-sparing surgery present data on technical and renal-related complications secondary to the operation (Table 1).³⁰⁻⁴⁰ Several studies support the observation that urinary fistula is the major complication following partial nephrectomy. In a 1994 study by Campbell et al,³⁹ local or renal-related complications occurred in 78 (30.1%) of 258 partial nephrectomies. In a 1995 study by Polascik and colleagues,⁴⁰ complications were reported after 33 (50%) of 66 operations. In both studies, the most common complication was urinary fistula in 15.2% and 8.9%, respectively. In the study by Campbell et al, the incidence of fistulae was significantly less for operations performed after 1988. However, Polascik and colleagues reported no cases of urinary fistula occurring after 1988. They attribute the observed diminished complication rates after 1988 to improvements in surgical technique and an increased incidence of smaller, serendipitously discovered tumors.

If persistent flank drainage suggests the development of a urinary cutaneous fistula, the diagnosis can be confirmed by measuring the creatinine level of the drainage fluid and detection of indigo carmine in the fluid following the intravenous application of the dye. However, if the intrarenal urinary drainage is not obstructed, the fistula will close and resolve spontaneously after some weeks in most cases. If the drainage is inadequate, chances are that a urinoma or abscess may develop. After insertion of a new sufficient percutaneous flank drainage, an intravenous pyelogram or a retrograde pyelogram should be performed to detect the cause and localization of the obstructed drainage; this should be followed by the placement of a ureteral stent. If this approach is impossible, the insertion of a percutaneous nephrostomy may be performed. A second operation to close the urinary fistula is rarely necessary.

Besides urinary fistulae, further complications of partial nephrectomy include hemorrhage, ureteral obstruction, and renal insufficiency. Postoperative hemorrhage might be indicated by gross hematuria and/or a decrease in hemoglobin and hematocrit, and it is often caused by postoperative relaxation of angiospastic arteries. If self-tamponade occurs, which most likely takes place in the retroperitoneal space, it might be self-limiting.

However, regularly monitoring vital signs and determining blood chemistry are required. The patient should stay in bed, and blood transfusions should be given if indicated. Renal angiograms may be used to localize the bleeding, and reexploration should not be delayed if conservative measures seem to be ineffective within the first hours after surgery.

Clots within the renal collecting system secondary to postoperative bleeding may cause ureteral obstruction. The obstruction can lead to urine leakage and the development of fistulae, but most blood clots are resolved spontaneously by urease-induced lysis. Placement of a ureteral stent may support initial urinary drainage if the intrarenal collecting system is entirely blocked.

Postoperative renal insufficiency results from a combination of intraoperative ischemia and loss of functioning renal parenchyma. The extent of renal insufficiency varies, and its degree is reflected by the increase of retention parameters such as creatinine, blood urea, and potassium. Severe renal insufficiency may require temporary dialysis. If the compensatory hypertrophy of the remnant kidney tissue cannot compensate for the loss of renal function, a permanent insufficiency requiring permanent dialysis may result. The degree of postoperative renal insufficiency is usually mild and can be treated with adequate transfusion and electrolyte management.

Postoperative Follow-up

Surveillance for recurrence of the malignancy, particularly local recurrence, is critical in patient follow-up. Table 2 presents data from recent studies indicating a 1.2% to 9% incidence of local recurrent malignancy.

Table 2. — Studies Evaluating the Incidence of Local Recurrent Malignancy

Study	Number of Patients	Local Tumor Recurrence	5-Year Cancer-Specific Survival
Novick et al, 1989 ²⁵	100	9.0%	Not reported
Morgan and Zincke, 1990 ³³	104	5.8%	89%
Steinbach et al, 1992 ³⁶	121	4.1%	90%
Licht et al, 1994 ⁴¹	216	4.2%	87%
Herr, 1999 ⁴²	70	1.4%	97%*
Dechet et al, 1999 ⁴³	171	1.2%	99.3%**
Filipas et al, 1999 ⁴⁴	201	1.9%	98%
Hafez and Novick, 1999 ⁴⁵	485	3.2%	92%

* 10-yr survival
 ** 15-yr survival

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nancy.^{25,33,36,41-45} Surveillance for recurrence should be performed at six-month intervals over a period of at least four years and at yearly intervals thereafter. Surveillance includes biochemical liver and renal function studies, chest radiographs, and abdominal ultrasound. The most accurate tool for detecting local recurrence remains CT scanning. If local recurrence has been detected and metastases have been ruled out, the patient may be considered for secondary surgical treatment.⁴⁶ A second partial nephrectomy might be feasible for some patients, but if technically not possible, Novick¹⁹ suggests that total nephrectomy with initiation of chronic dialysis and subsequent renal allotransplantation is an alternative. However, Zincke and Ghavamian⁴⁷ cite emerging data suggesting that the problem of local recurrence is not that of a poorly performed surgical procedure but rather of multifocality. Multifocality seems to be increased in the presence of papillary tumors and possibly also in those patients who have evidence of neovascularity in their malignancies.^{48,49} Current data suggest that the incidence of satellite tumors is high when the primary tumor has vascular invasion. Moreover, those results suggest that satellite lesions are overlooked in 40% of patients who undergo partial nephrectomy.⁵⁰ Again, these data underline the importance of careful long-term follow-up.

Long-term Renal Function After Partial Nephrectomy

Recent data show that patients with a remnant solitary kidney are at higher risk for developing glomerular hyperfiltration resulting in increased risk for proteinuria, glomerular damage, and impaired renal function.⁵¹⁻⁵³ A statistically significant association was found between more proteinuria and lesser amount of remnant renal parenchyma. Renal biopsies in patients with moderate to severe proteinuria detected focal segmental or even global glomerulosclerosis. The development of proteinuria is a common early indication of

structural or functional renal impairment. Thus, the postoperative follow-up should include monitoring of 24-hour urinary protein concentration and glomerular filtration rate. Patients presenting with proteinuria of higher than 150 mg/day should be treated with a low-protein diet. Converting enzyme inhibitor drugs should also be prescribed since these agents suggest a beneficial effect on preventing glomerulopathy induced by loss of renal parenchyma.^{54,55}

Partial Nephrectomy vs Radical Nephrectomy With Subsequent Treatments

Controversies arise from the point of view that patients would receive better treatment if they underwent radical nephrectomy with subsequent dialysis or renal transplantation. The majority of patients receiving partial nephrectomy are between the fifth and seventh decade of life, and few of them are eligible for allotransplantation because of concurrent pulmonary and/or heart diseases.^{56,57} In his 1983 study, Penn⁵⁸ reported an overall 32% incidence of recurrent RCC in patients who underwent dialysis and transplantation. Only those who received an allograft after a four-year observation period remained recurrence-free within the reported follow-up interval. With the additional waiting period due to organ shortage, patients after total nephrectomy likely face subsequent dialysis for a long period of time. The five-year survival time for dialysis patients in their fifth or sixth decade of life is only approximately 40% (Table 3).⁵⁹ If the patients finally undergo renal transplantation, 80% to 85% of them will show a functioning graft at the end of the first year; that percentage declines to less than 60% after five years.⁶⁰ These data strongly suggest that nephron-sparing surgery is the better choice for treatment for appropriately selected patients.

Partial Nephrectomy for Patients Presenting With von Hippel-Lindau Disease

The von Hippel-Lindau syndrome is the most common cause of familial renal cancer characterized by hemangioblastomas of the central nervous system, retinal angiomas, pheochromocytoma, epididymal cystadenomas, and pancreatic and renal cysts and carcinomas.⁶¹⁻⁶³ Because individuals affected with this autosomal dominant hereditary disorder might develop multiple bilateral tumors throughout their lives,⁶⁴ the nephron-sparing surgical approach to this group of patients has always been controversial. RCC will develop in 45% of all patients with von Hippel-Lindau disease.⁶⁵⁻⁶⁷ The dis-

ease is nearly always bilateral, the presenting lesions are usually small and frequently low grade. Furthermore, the renal cysts in von Hippel-Lindau disease contain either frank carcinoma or a lining of hyperplastic clear cells representing incipient cancer.^{68,69} Therefore, all patients with von Hippel-Lindau disease who undergo partial nephrectomy or enucleation for RCC should also have all other solid and cystic renal lesions excised to ensure complete tumor removal.¹⁷

Partial nephrectomy for von Hippel-Lindau disease has been supported argumentatively by Taylor⁷⁰ and by the surgical and clinical experience of several other authors.⁷¹⁻⁷³ The latest study by Persad et al⁷⁴ supports the preceding series that nephron-sparing surgery can provide effective initial treatment for those patients. The surgery should be accompanied by close follow-up, since most of the patients will eventually develop local recurrent malignancies. Studies with a long-term follow-up of patients with von Hippel-Lindau disease have shown that some patients can remain free of renal malignancies for more than five years.^{66,73,75} However, other authors presented data showing development of metastasis following partial nephrectomy.⁷¹ Walther et al⁷² suggest from these series that it might be possible to select patients with fewer aggressive manifestations of renal neoplasm and who show low grade, low stage, and smaller renal lesions. Using their own screening criteria that focused on early localized disease and low grade, they found that none of their patients with a lesion of 3 cm or greater developed metastatic disease over their short-term follow-up. It remains to be seen if the results

of his long-term follow-up support the excellent long-term survival data reported by Steinbach et al⁷³ in 1995. They reported 5- and 10-year cancer specific survival rates of 100% and 81%, respectively. They concluded from their data that nephron-sparing surgery, if technically feasible, can preserve renal function for an extended interval without compromising cancer-free survival in most patients. However, patients treated in this manner should be advised of the importance of close post-operative surveillance and the probable need for repeat renal surgery, since the malignancy will recur locally in most patients. If bilateral nephrectomy becomes necessary, the data from Steinbach et al suggest that renal transplantation can provide satisfactory replacement therapy for end-stage renal disease in patients with von Hippel-Lindau syndrome.

Partial Nephrectomy for Advanced RCC

Although data have been gathered since the early 1980s on the feasibility of nephron-sparing surgery for advanced RCC, the indications for partial nephrectomy in those patients are still indistinct and not well defined.

Starting in 1981, Marberger et al³⁰ reported on three patients with Robson stage IV disease and four patients with lymphatic involvement who underwent partial nephrectomy. All of the first three patients died within the following 43 weeks, and three of the latter four

Table 4. — Outcomes in Selected Studies on Partial Nephrectomy

Study	Number of Patients	Disease-Specific Survival (%)	Mean Follow-up (mos)	Mean Tumor Size (cm)*	Local Tumor Recurrence (%)
Bazeed et al, 1986 ⁷⁶	23	100	35.8	3.3	0
Carini et al, 1988 ³¹	10	90	29.9	3.5	0
Brisset et al, 1989 ⁸⁶	15	100	40	3.0 - 5.5	0
Morgan and Zincke, 1990 ³³	20	100	45.6	3.1	0
Petritsch et al, 1990 ³²	52	96	60	NR	NR
Van Poppel et al, 1991 ³⁵	21	95	41.2	3.2	0
Selli et al, 1991 ⁸⁷	20	90	2 - 31	<3.5	0
Provet et al, 1991 ³⁴	19	100	35	2.6	0
Steinbach et al, 1991 ⁸⁵	61	90	36	3.2	3.3
Herr, 1999 ⁴²	70	97	10 yrs	3.0	1.4
Dechet et al, 1999 ⁴³	171	99.3	5.6 yrs	2.6	1.2
Fillipas et al, 1999 ⁴⁴	201	98	4.2 yrs	3.3	1.9

*Note that the mean tumor size is almost less than 3.5 cm.
 NR = not reported
 From Licht MR, Novick AC. Nephron sparing surgery for renal cell carcinoma. *J Urol.* 1993;149:1-7. Updated with permission.

patients died shortly after surgery. Similarly, in 1986, Bazeed et al⁷⁶ reported that two patients presenting with stage IV cancer died shortly after operation. In their 1989 study, Novick et al²⁵ presented a 42% five-year cancer-specific survival rate for six patients with resected metastases. In a 1990 report from Morgan and Zincke,³³ four of six patients with stage IV disease died due to the development of metastases. Finally, in the same year, Angermeier et al⁹ reviewed nine patients with venous involvement in a solitary functioning kidney. Four patients died of metastatic RCC, two of them additionally showing local recurrence in the remnant kidney.

In summary, these data suggest poor survival outcome for partial nephrectomy in patients with advanced RCC. The limiting factor is clearly the high incidence of recurrent malignancy.

Partial nephrectomy for advanced RCC will probably become more significant in the light of novel systemic therapeutic approaches to RCC, especially adoptive immunotherapy and gene therapy.^{77,78}

Partial Nephrectomy for Patients With Normal Contralateral Kidney

The decision to perform nephron-sparing surgery in patients with RCC and with normal contralateral kidney is again driven by the desire to preserve renal tissue, particularly in cases presenting with small, peripherally located tumors, often incidentally detected. An increase in incidentally detected tumors is due to the

widespread use of ultrasound and CT in most fields of clinical medicine.^{79,80} The majority of those incidental tumors show a low pathologic stage.⁸¹⁻⁸⁴ However, Novick¹⁹ notes that radical nephrectomy is still considered the definitive form of surgical treatment due to (1) the low risk of a metachronous contralateral RCC (1% to 2%), (2) a local tumor recurrence rate of approximately 5% after partial nephrectomy,^{47,49} and (3) occasional cases of unsuspected multicentricity that would not be treated by partial nephrectomy. Moreover, in favor of total nephrectomy, he refers to long-term follow-up studies on living, related kidney donors who proved a low risk of contralateral kidney renal loss in individuals with one kidney. On the other hand, Novick reports on several studies presenting excellent results with partial nephrectomy for a selected group of patients. Table 4 summarizes some of the data.^{31-35,42-44,76,85-87} Local recurrence was reported in only one study in which two patients were successfully treated with repeat surgical excision.⁸⁵ In recent years, it has become clear that the tumor size is of great significance for the clinical outcome of these patients.^{79,88} Also, it is generally accepted that nephron-sparing surgery should be performed only if the tumor lesion has a diameter of less than 4 cm; otherwise, total nephrectomy is recommendable. Wunderlich and colleagues⁷⁹ in their 1998 autopsy study suggests that nephron-sparing surgery might be advisable in patients with RCC that is 2-cm or less in diameter if there is an imperative indication in cases of RCC larger than 2 cm. However, the establishment of the benchmark of 4 cm has led to a recent proposal to subdivide the 1997 TNM staging criteria for T1 lesions into T1a (less than 4 cm) and T1b (greater than 4 cm).⁵⁰

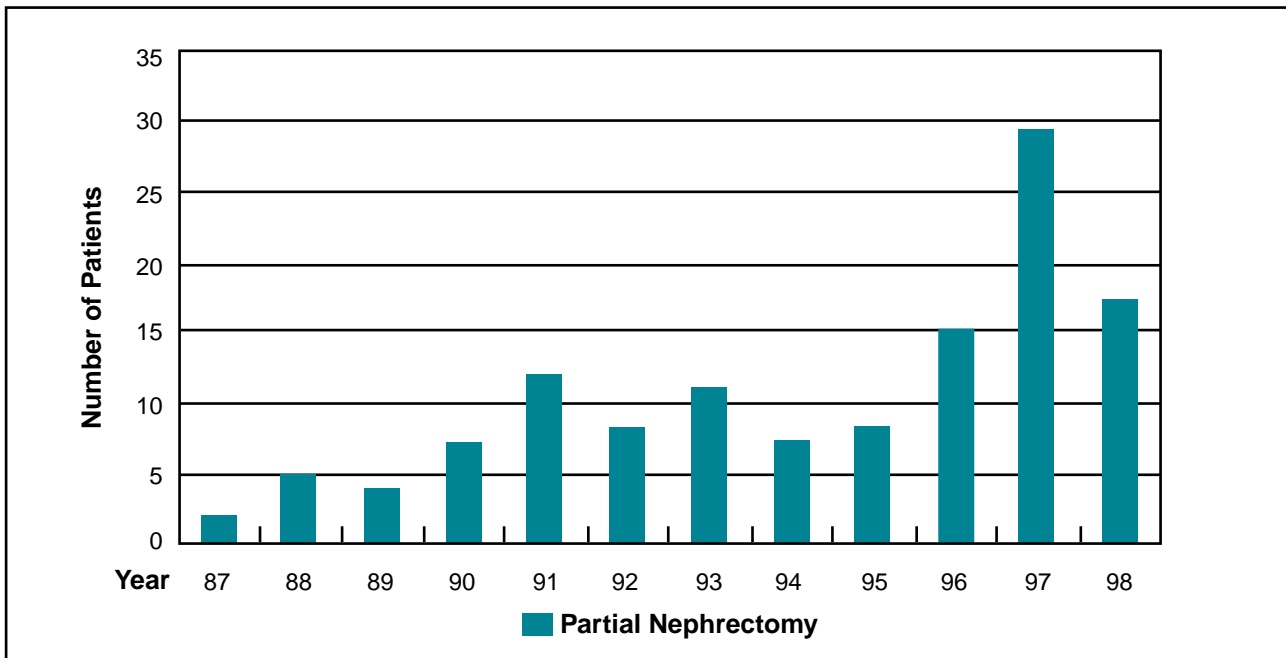


Fig 1. — Number of patients who had a partial nephrectomy from 1987 to 1998: UCLA experience.

Table 5. — Patient Characteristics and Outcomes:
Partial vs Radical Nephrectomy

	Partial Nephrectomy	Radical Nephrectomy
Number of Patients	163	125
Median Age (range)	62.4 (34-86)	61.5 (32-81)
Men/Women (%)	54 / 46	60 / 40
Category: T1*	132 (81%)	79 (63.2%)
T2*	18 (11%)	30 (24%)
T3*	12 (7.4%)	16 (12.8%)
T4*	1 (0.6%)	0
Medium Months Follow-up (range)	57 (10-160)	55 (12-113)
Cancer-Specific Survival Rate (%)	98	91.2

* Based on 1997 TNM classification.

Partial Nephrectomy for Patients With Synchronous Bilateral RCC

In 1952, Krumbach and Ansell⁸⁹ reported for the first time a partial and radical nephrectomy for synchronous bilateral RCC without metastatic lesions. Generally, the intent is to preserve the highest possible amount of renal parenchyma for patients presenting with bilateral synchronous malignancies. Total nephrectomy with subsequent separate contralateral partial nephrectomy should be performed only if one kidney is

extensively affected by RCC. On the other hand, if the patient presents with a very low tumor burden on one side, a bilateral surgical approach may be performed in one operating session, thus reducing peri-operative risks and mortality. In all other cases of synchronous bilateral RCC, the kidney that is less tumor-burdened should be removed first.¹⁴

The UCLA Experience on Partial Nephrectomy for Renal Cell Cancer

We recently reviewed our experience with nephron-sparing surgery vs radical nephrectomy from 1987 to 1998 and evaluated the efficacy of all partial nephrectomies performed during that time period (Fig 1).⁹⁰ A total of 163 patients undergoing nephron-sparing surgery were matched with 125 patients undergoing radical nephrectomy (Table 5). Patients were followed for a period of 10 to 160 months (mean follow-up time of 74 months) during which tumor recurrence, metastasis, and patient deaths were recorded.

Twenty patients in the partial nephrectomy arm died. Two patients died of an acute myocardial infarction one day postoperatively, and one patient died of pneumonia five days postoperatively. Seven patients died free of disease. Of the 10 cancer deaths, seven

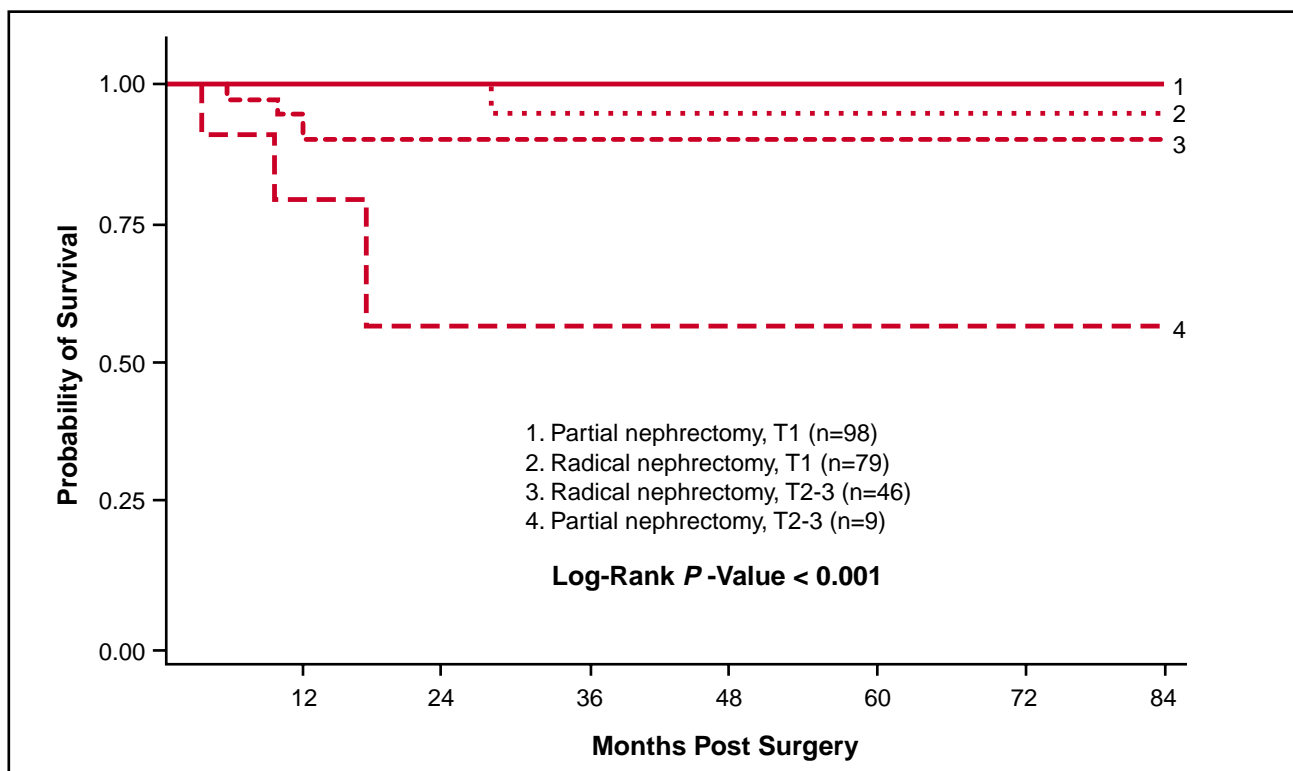


Fig 2. — Kaplan-Meier disease-specific survival plots by 1997 TNM staging classification for patients who had a partial vs radical nephrectomy from 1987 to 1997 (operative deaths excluded in each group).

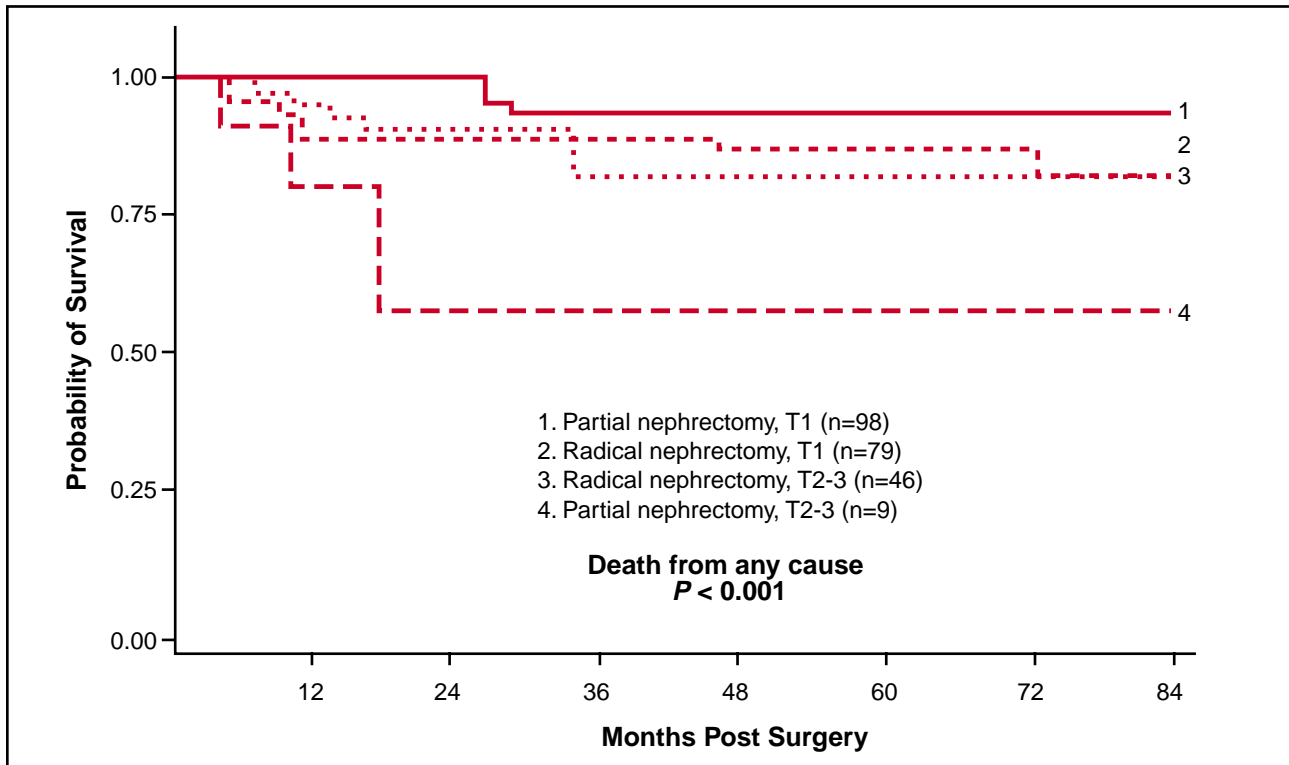


Fig 3. — Kaplan-Meier survival plots method by 1997 TNM staging classification. There was a difference in survival between T2-3 patients with partial nephrectomy and any other T1.

were secondary to metastatic disease and three were due to local recurrence. The overall crude survival rate of patients treated with nephron-sparing surgery was 92%, and the disease-free survival rate was 98%.

The overall cancer-specific survival rate of patients treated with radical nephrectomy was 91.2% vs 98% for partial nephrectomies performed during the same time period. The survival rate of patients undergoing radical nephrectomy for T1 RCC was 100% based on the 1997 TNM staging system. The Kaplan-Meier cancer-specific survival curves in Figs 2 and 3 are based on the 1997 staging system. There was no statistical difference in survival in patients with T1 lesions who were treated with partial or radical nephrectomy ($P=0.219$).

In contrast, the survival rates of patients who underwent radical nephrectomy with T2-3 RCC lesions were 91.4% compared with 66% of patients who underwent partial nephrectomy. Survival of patients with RCC lesions greater than T1 receiving partial nephrectomy was significantly lower than survival of patients with lesions greater than T1 receiving radical nephrectomies as well as those with T1 lesions receiving either type of surgery ($P=0.001$) (Fig 3).

Our data indicate and underscore that radical nephrectomy and nephron-sparing surgery provide equally effective curative treatment for patients who

present with a single, small, clearly localized RCC (T1 tumors). Following nephron-sparing surgery for localized RCC, cancer-free survival is significantly better in patients with tumors less than 4 cm in size compared to patients with larger tumors. The results of partial nephrectomy are less satisfactory in patients with greater than T1 tumors.

Conclusions

Partial nephrectomy provides effective therapy for patients presenting with RCC and thus has been established as an accepted therapeutic approach and surgical procedure. However, its future importance as a therapeutic option for the control of localized kidney tumor depends on the use of the appropriate diagnostic inventory that leads to the correct indication and proper patient selection. Moreover, surgical skills and operative detail will affect postoperative complications and tumor recurrence.

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