

# Partial Nephrectomy in the Treatment of Localized Renal Cell Carcinoma—Experience of Taichung Veterans General Hospital

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**Background:** Partial nephrectomy has been considered an effective and efficient method in the treatment of localized renal cell carcinoma. Herein, we retrospectively review our experience with partial nephrectomy in the treatment of localized renal cell carcinoma and compared it with patients who received radical nephrectomy.

**Methods:** From 1982 to 2005, 35 patients who received partial nephrectomy for localized renal cell carcinoma were enrolled in this study. Ten patients were female (28.6%). The median age was 70 years (range, 42–82 years). Sixteen (45.7%) patients had pathologic T1a tumors; 17 (48.6%) patients had pathologic T1b tumors and 2 (5.7%) patients had pathologic T2 tumor (7 cm). In the meantime, 128 patients who had T1N0M0 renal cell carcinoma and who received radical nephrectomy were assigned to a control group. Thirty-nine patients (30.5%) were female in this group. The median age was 62 years (range, 30–83 years). The tumor characteristics, location, surgical techniques and patient survival were subsequently compared.

**Results:** The median tumor size in the partial nephrectomy group was 3.9 cm (range, 1.5–7.0 cm), and it was 4.5 cm (range, 1–6.5 cm) in radical nephrectomy group. The tumor size was smaller in the partial nephrectomy group ( $p=0.003$ ). The median follow-up period was 4.38 years (range, 0.05–17.99 years) in the partial nephrectomy group and 5.66 years (range, 0.01–22.25 years) in the radical nephrectomy group. There was no local recurrence or distant metastasis in the partial nephrectomy group. The 5-year overall survival was 85.0% compared with 91.4% in the radical nephrectomy group ( $p=0.126$ ). The 5-year disease-specific survival in the partial nephrectomy group was 100%. The postoperative serum creatinine level increased to  $>2.0$  mg/dL in 5 (14.3%) patients in the partial nephrectomy group, but no patient needed hemodialysis during follow-up.

**Conclusion:** From our review, partial nephrectomy is safe and provides excellent disease control in the treatment of localized renal cell carcinoma in selected patients. Renal function preservation was observed in the partial nephrectomy group, while the operated kidney showed functioning in the follow-up nuclear medicine survey. [*J Chin Med Assoc* 2007;70(7):281–285]

**Key Words:** partial nephrectomy, radical nephrectomy, renal cell carcinoma

## Introduction

For years, radical nephrectomy was thought to be the standard of curative treatment for renal cell carcinoma. Once greater numbers of small, low-grade, incidental tumors develop, there is greater need for the discussion of surgical methods. In a series of reports, partial nephrectomy has achieved equivalent cancer control

and obtained better preservation of renal function than radical nephrectomy.<sup>1–5</sup> The trend of treatment for renal cell carcinoma has been changed to safer, more efficient and less complicated methods. We need more data to determine the positives and negatives of these therapies. Recently, minimally invasive nephron-sparing surgery has been reported to be a reliable cancer control in the treatment of localized renal cell carcinoma.<sup>6–9</sup>

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We compared the outcome of partial nephrectomy with radical nephrectomy in the treatment of T1N0M0 renal cell carcinoma.

## Methods

We retrospectively collected data from 35 patients with renal cell carcinoma who received partial nephrectomy between July 1982 and December 2005. Among these patients, 2 underwent partial nephrectomy laparoscopically. In the meantime, data from 128 patients with T1N0M0 renal cell carcinoma who underwent radical nephrectomy were recorded. The chart records were reviewed, and patients' sex, age, tumor size, tumor location, tumor characteristics, tumor cell type, intraoperative vascular control, postoperative comorbidity, concomitant surgical procedures, and follow-up periods were analyzed. The American Joint Committee on Cancer revision of the tumor, node, metastasis (TNM) system in 2002, 6<sup>th</sup> edition, was applied for tumor staging. The tumor location was classified as peripheral or central type. The tumor characteristic was defined as solitary or multifocal. Intraoperative vascular control was defined as arterial, both or none.

During partial nephrectomy, preoperative ureteral catheter placement was performed for the intraoperative detection of the collecting system. We routinely used intraoperative sonography to identify the tumor margin. Frozen section was not routinely performed. Postoperative comprehensive renal function tests were performed in some patients in the partial nephrectomy group. Serum creatinine levels were recorded in both groups.

We used Yate's contingency correction in the analysis of gender and Mann-Whitney U test in the comparison of age, tumor size, follow-up duration, and pre- and postoperative serum creatinine levels. Log-rank test was performed in the surviving analysis. Analyses

were performed using SPSS version 10.1 (SPSS Inc., Chicago, IL, USA).

## Results

Twenty patients in the partial nephrectomy group were pathologic grade 1; another 10 patients were grade 1–2, and the other 5 were grade 2. There was no grade 3 disease. Sixteen patients were clinical stage T1a, another 17 were T1b, and the other 2 were T2. In the radical nephrectomy group, 75 patients were grade 1, 30 patients were grade 2, another 21 patients were grade 1–2, and the other 2 patients were grade 3.

Fifty-seven patients had T1a disease, and the other 71 had T1b. There was no local recurrence or distant metastasis in the partial nephrectomy group. Nine patients died during follow-up in the partial nephrectomy group. Thirteen patients died due to disease in the radical nephrectomy group. Overall, 24 patients died during follow-up in the radical nephrectomy group. Two patients survived with disease in this group.

Table 1 demonstrates the baseline data of the 2 groups. The sex distribution was insignificant between the 2 groups. Partial nephrectomy patients exhibited older age (65.8 *vs.* 61.1 years,  $p=0.018$ ), and the average tumor size was smaller than that in the radical nephrectomy group (3.8 *vs.* 4.5 cm,  $p=0.003$ ). The 5-year overall survival was 85.0%, compared with 91.4% in the radical nephrectomy group ( $p=0.126$ ) (Figure 1).

The disease-free survival in the partial nephrectomy group was 100%. From analysis of the tumor location and tumor characteristic in the partial nephrectomy group, 31 (88.6%) patients had peripheral type tumors and the other 4 patients had central, medial type tumors. Two (5.7%) patients had 2 tumor foci, and the other 33 had solitary tumors. Among the partial nephrectomy cases, 28 (79.5%) were clear cell type, 3 (8.8%) were papillary cell type, 2 (5.9%) were chromophobe type,

**Table 1.** Variable differences between partial nephrectomy and radical nephrectomy groups\*

	Partial nephrectomy (n = 35)	Radical nephrectomy (n = 128)	p
Sex			0.916 <sup>†</sup>
Female	10 (28.6)	39 (30.5)	
Male	25 (71.4)	89 (69.5)	
Age (yr)	65.8 ± 10.5 (42–82)	61.1 ± 11.3 (30–83)	0.018 <sup>†</sup>
Tumor size (cm)	3.8 ± 1.3 (1.5–7.0)	4.5 ± 1.4 (1.0–6.5)	0.003 <sup>†</sup>
Follow-up duration (yr)	5.6 ± 4.7 (0.05–17.99)	6.9 ± 5.2 (0.01–22.25)	0.205 <sup>†</sup>

\*Data presented as n (%) or mean ± standard deviation (range); <sup>†</sup>Yate's contingency correction; <sup>‡</sup>Mann-Whitney U test.

1 (2.9%) was mixed clear and papillary cell type, and 1 (2.9%) was mixed oncocytic and chromophobe type. In the radical nephrectomy group, 109 (85.1%) were clear cell type, 6 (4.7%) were papillary cell type, 10 (7.8%) were chromophobe type, 2 (1.6%) were mixed clear and papillary cell type, and the other 1 (0.8%) was mixed clear and sarcomatoid cell type.

Vascular control has been widely used during partial nephrectomy, especially when tumor approach is difficult or when suturing.<sup>5</sup> In our study, vascular clamping was performed in 25 (70.5%) patients. Arterial clamping was performed in 23 patients, and the other 2 received both arterial and venous clamp. In the partial nephrectomy group, postoperative serum creatinine increased to >2.0 mg/dL in 5 (14.3%) patients. No patients needed dialysis during follow-up.

Seven (20%) patients received postoperative comprehensive renal function tests in the period of 3 months to 12 months postoperatively. The function of the operated kidney ranged from 53 to 189 mL/min (mean, 114.6 ± 34.2 mL/min). In the radical nephrectomy group, 6 (4.7%) patients with preoperative chronic renal insufficiency status received immediate hemodialysis postoperatively. There was no difference between the 2 groups in the comparison of preoperative and

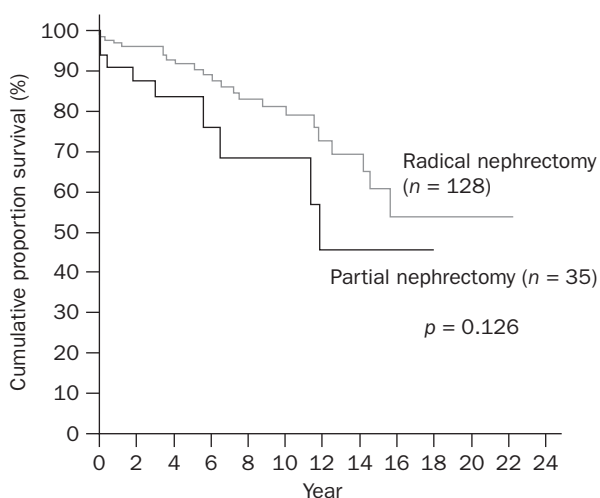
postoperative mean serum creatinine (1.3 and 1.7 vs. 1.2 and 1.7 mg/dL, respectively) (Table 2).

## Discussion

Previous results of partial nephrectomy have established its standard place in the treatment of localized, small renal cell carcinoma.<sup>1-5,7</sup> In our series, no disease recurrence or distant metastasis developed in the partial nephrectomy group, although the 5-year overall survival was only 85%, compared with 91% in the radical nephrectomy group. The disease-specific survival was excellent. Our result in radical nephrectomy was similar to those of other reported series, but the overall survival was poorer in the partial nephrectomy group, although there was no statistical significance.<sup>1,2,10</sup> The shortness of the follow-up duration in the partial nephrectomy group may have contributed to this effect.

Three major complications (8.6%) occurred, and 2 of them resulted in early mortality in our early experience of partial nephrectomy. One was a 76-year-old woman with old stroke and chronic renal insufficiency. She died of aspiration pneumonia with sepsis on the 19<sup>th</sup> postoperative day. The other one, a 73-year-old man, had acute cholecystitis and 4-cm right renal tumor. He received cholecystectomy and partial nephrectomy simultaneously. Postoperative poorly-controlled cholangitis and aspiration pneumonia developed, and he died of sepsis on the 6<sup>th</sup> postoperative day. The third complication was a renal fistula, which was successfully treated with prolonged internal drainage and debridement. In the comparison of complication rates, our series is similar to other reports.<sup>1,6</sup>

Partial nephrectomy has been reported to be beneficial in preserving postoperative renal function in selected patients.<sup>11-15</sup> Serum creatinine is used mostly in the comparison of perioperative renal function changes.<sup>5,6</sup> We did not find significant improvement in the comparison of perioperative serum creatinine between the 2 groups. Additionally, we performed comprehensive renal function tests postoperatively in the partial nephrectomy group, and it showed effective renal function preservation with an average of 114.6 mL/min



**Figure 1.** Log rank test overall survival curve of partial nephrectomy and radical nephrectomy groups.

**Table 2.** Perioperative serum creatinine changes between partial nephrectomy and radical nephrectomy groups\*

	Partial nephrectomy (n = 35)	Radical nephrectomy (n = 86)	p <sup>†</sup>
Creatinine (mg/dL)			
Preoperative	1.3 ± 0.6 (0.8–4.2)	1.2 ± 0.6 (0.9–6.3)	0.277
Postoperative	1.7 ± 1.2 (0.8–5.1)	1.7 ± 1.1 (0.9–7.1)	0.103

\*Data presented as mean ± standard deviation (range); <sup>†</sup>Mann-Whitney U test.

in 7 patients. Although there was a lack of perioperative comparison and fewer cases, this study still emphasized the advantage of partial nephrectomy in the preservation of renal function.

The indications for partial nephrectomy have been expanded due to the relatively safe and well-documented surgical experience.<sup>5</sup> In our series, only 6 patients reached the criteria of absolute indication, including solitary functioning kidney in 4 patients and multifocal tumors in 2 patients. Size, location and tumor characteristic (exophytic or endophytic) are the major factors we were concerned about preoperatively. Age and performance status were not the definitive contributors. Although we lacked the American Society of Anesthesiologists class score or Eastern Cooperative Oncology Group performance status data reported for other series, it showed the age was larger in the partial nephrectomy group than in the radical nephrectomy group.<sup>2,11</sup>

With regard to the surgical technique, vascular control and renal hypothermia have been considered as standard procedures in performing partial nephrectomy.<sup>5</sup> Both vascular control and renal hypothermia may decrease blood loss in larger tumors and prevent reperfusion injury. Surface cooling alone has been recommended and provides safe ischemic effect without permanent injury.<sup>16</sup> We found that around 30% of the partial nephrectomy patients in our study did not have clamping of renal vessels through meticulous patient selection. Gill et al<sup>6</sup> and Novick<sup>7</sup> reported their experience in partial nephrectomy. Laparoscopic partial nephrectomy achieved excellent outcome, and the complication rate was acceptable.<sup>6,7</sup> A laparoscopic technique seems feasible in partial nephrectomy, but is still a skills-oriented procedure. It should be performed only in selected cases by well-experienced surgeons. The da Vinci system has been introduced into our institute, and robot-assisted partial nephrectomy is now performed on a regular basis. Although the results have not been included in this study, the outcome is inspiring in our limited experience. The robot decreases the technical difficulty in extracorporeal suturing and permits urologists to complete the complex procedures within reasonable warm-ischemia time. Kaul et al<sup>17</sup> and Caruso et al<sup>18</sup> have reported their appreciated outcome in their early experience. On the other hand, the cost of robotic surgery remains a limitation to popularization.

Other minimally invasive treatments for localized renal tumor have been established, including cryoablation, radiofrequency ablation, high-intensity focused ultrasound, and microwave thermotherapy.<sup>8,9,19,20</sup> The existing data support the efficacy of cryotherapy and radiofrequency ablation in selected patients, especially for small, exophytic, peripheral tumors in the elderly

population. However, using these therapies is controversial, owing to the concern of completeness of tumor removal.

In conclusion, our review showed excellent oncologic control with partial nephrectomy in the treatment of localized, small renal cell carcinoma in selected cases. The benefit of renal function preservation can also be obtained from partial nephrectomy.

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