

---

# Renal tumors and the risk of malignancy based on size

Behrooz Azizi, MD,<sup>1,2</sup> Thomas Whelan, MD,<sup>2,3</sup> Michael Morse, MD<sup>2,3</sup>

<sup>1</sup>St. George's University School of Medicine, Grenada

<sup>2</sup>Saint John Regional Hospital, Saint John, New Brunswick, Canada

<sup>3</sup>Department of Urology, Dalhousie University, Halifax, Nova Scotia, Canada

---

AZIZI B, WHELAN T, MORSE M. Renal tumors and the risk of malignancy based on size. *The Canadian Journal of Urology*. 2009;16(6):4921-4923.

**Purpose:** To determine the incidence of malignancy in resected renal tumors in a subpopulation of Canadian patients and the significance of tumor size, patient's demographics, and whether the tumor was an incidental finding.

**Methods:** Medical records of 168 consecutive nephrectomies performed between March 2003 and June 2008 at our institution were reviewed retrospectively.

**Results:** Average age of the patients was 61 years old (SD 11, range 28-89) and male to female ratio was 1.3:1. Total of 180 masses were resected in 168 nephrectomies (128 radical, 40 partial) during the study period. Of the 180 masses, 20 (11%) were benign and 160 (89%) were

malignant lesions. Fifty-five percent of the resected renal masses were incidentally found on preoperative imaging. Based on the pathology reports, the average size of the masses was 5.5 cm (SD 4.0, range 0.3-25.0). The larger masses were more likely to be malignant than the smaller masses (Pearson's chi-square test,  $p = 0.040$ ).

**Conclusion:** The present study assists us to adequately assess the risk of malignancy of a renal mass in a Canadian population based on size which allows us to properly advise the patients and suggest best possible treatment options. We recommend more aggressive therapies for masses larger than 4 cm and parenchymal sparing procedures for masses smaller than 4 cm as large proportion of these are benign

**Key Words:** renal cell carcinoma, renal mass, tumor size, nephrectomy

---

## Introduction

Prevalence of renal cell carcinoma varies widely in different geographic locations.<sup>1</sup> There have been studies in the United States, Europe and a few from Asian countries that report different rates of malignancy in resected renal tumors. It has been established that the preoperative chance of malignancy in a documented renal tumor is affected by the size of the tumor measured radiologically.<sup>2-7</sup>

A large proportion of small renal tumors are benign making the nephron sparing surgery a better alternative since parenchymal sparing procedures have shown similar outcomes as radical nephrectomy for small tumors.<sup>8-11</sup> Here, we present our experience from a regional Canadian hospital with a catchment population of 250,000, which, to our knowledge is the first Canadian report on this topic.

## Methods

Medical records were reviewed from 168 consecutive patients undergoing radical or partial nephrectomy at our institution between March 2003 and June 2008. The retrospective review included operative notes, pathology reports and all clinical notes. Resected renal masses

---

Accepted for publication November 2009

Address correspondence to Dr. Thomas Whelan, Department of Urology, Saint John Regional Hospital, PO Box 2100, Saint John, New Brunswick E2L 4L2 Canada

TABLE 1. Classification of resected masses based on official pathology report

Benign	Total	20	11%
	Oncocytoma	15	
	Angiomyolipoma	2	
	Myelolipoma	1	
	Cystic nephroma	1	
	Cystic lesion	1	
Malignant	Total	160	89%
	Clear cell RCC	135	
	Papillary RCC	12	
	Chromophobe RCC	6	
	Sarcomatoid RCC	5	
	Angiosarcoma	1	
	Others	1	

were further categorized into four groups based on their size. Transitional cell carcinomas along with all nephroureterectomy cases were excluded from this study.

Pearson chi-square test was utilized for comparing group characteristics and significance level was set at  $\alpha = 0.05$ .

## Results

Average age of the patients was 61 years old (SD 11, range 28-89) and male to female ratio was 1.3:1. Total of 180 masses were resected in 168 nephrectomies (128 radical, 40 partial) during the study period. Of the 180 masses, 20 (11%) were benign and 160 (89%) were malignant lesions. Pathologic subtypes are noted in Table 1.

The incidence of malignancy was not affected by age and gender (Pearson's chi-square test,  $p = 0.293$  and  $0.376$ , respectively). Based on the pathology reports,

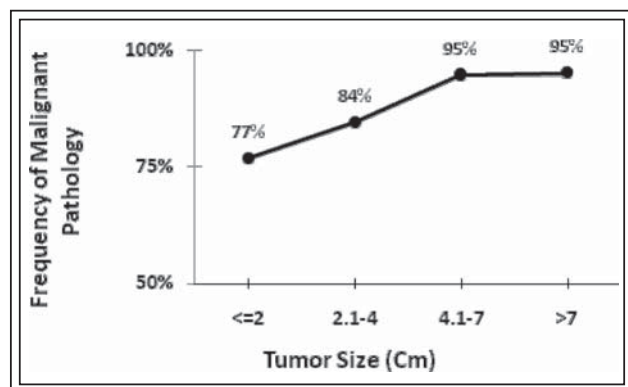


Figure 1. Frequency of malignancy based on the size of the renal tumor reported by the pathologist.

TABLE 2. Surgical approach based on tumor size n (%)

	Open	Lap	Converted
≤ 2 cm	17 (65%)	9 (35%)	0
2.1 cm-4 cm	36 (62%)	21 (36%)	1 (2%)
4.1 cm-7 cm	22 (39%)	32 (57%)	2 (4%)
> 7 cm	29 (73%)	9 (23%)	2 (5%)

the median size of the masses was 4.5 cm (average 5.5, SD 4.0, range 0.3-25.0). The larger masses were more likely to be malignant than the smaller masses (Pearson's chi-square test,  $p = 0.040$ ) as depicted in Figure 1.

Figure 2 shows the proportion of the radical and partial nephrectomies carried out in our institution in this time period based on the size of the tumors removed.

Fifty-five percent of the resected masses were asymptomatic and were incidentally noted on various imaging modalities taken for other indications. Most of the tumors larger than 7 cm were symptomatic due to their mass effect and only 1/3 were found incidentally, whereas, the smaller tumors ( $\leq 7$  cm) were mostly (62%) incidentalomas. Whether the tumor was symptomatic or not, did not affect the chance of malignancy (Pearson's chi-square test,  $p = 0.128$ ).

Average operation time was 154 minutes and ranged from 65 to 448 minutes. Overall 98 (58%) of the operations were open cases, laparoscopy was utilized in 65 (39%), and 5 (3%) were started with laparoscopic approach but converted to open due to technical difficulties and/or complications. Table 2 breaks down the surgical approach based on the size of the tumors.

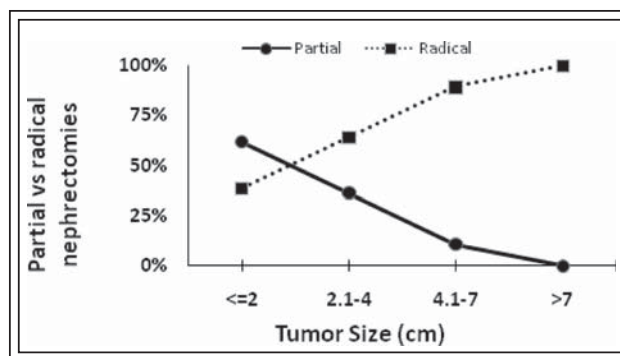


Figure 2. Proportion of radical and parenchymal sparing nephrectomies based on the size of renal masses removed.

TABLE 3. Summary of recent studies showing the rate of malignancy in different size categories. Sizes are all in centimeters

	Country	No. of patients	Average size (range)	< 2	2-4	4-7	> 7
Our study	Canada	168	5.5 (0.3-25)	77%	84%	95%	95%
Duchene et al <sup>3</sup>	USA	173		79%	81%	83%	100%
Schachter et al <sup>4</sup>	USA	482		76%	72%	88%	94%
Schlomer et al <sup>6</sup>	USA	331	4.3 (0.8-21)	72%	79%	94%	94%
Kutikov et al <sup>13</sup>	USA	143	2.5 (0.6-8)	84%	84%	86%	
Pahernik et al <sup>5</sup>	Germany	663	2.9 (0.8-4)	75%	82%		
Fuji et al <sup>2</sup>	Japan	176	2.3 (0.3-5.8)	88%			

## Discussion

In our study, probability of malignancy of a renal tumor was not affected by the patients' age and gender. However, one study from Japan<sup>2</sup> and two from the United States<sup>7,12</sup> showed a greater chance of malignancy in males. In another study from the United States,<sup>6</sup> those with malignant renal tumors were 4 years younger than those with benign tumors, which was contrary to our findings and DeRoche et al.<sup>12</sup>

We showed that bigger renal tumors, specially those larger than 4 cm, has substantial risk of malignancy (95%), which was consistent with two other studies from the United States.<sup>4,6</sup> There were three studies<sup>2,7,12</sup> that did not find any association between size and pathological finding. This could be due to the fact that they only studied tumors smaller than 7 cm and from our study we know that most of the tumors larger than 7 cm (95%) are malignant. Table 3 summarizes the findings of recent studies in regards to the size of the renal tumors and their probability of malignancy.

Using modern imaging techniques, many renal tumors can be visualized, providing patients and surgeons with treatment choices. The present study assists us to adequately assess the risk of malignancy of a renal mass based on size which allows us to properly advise the patients and suggest best possible treatment options. We recommend more aggressive therapies for masses larger than 4 cm and parenchymal sparing procedures for masses smaller than 4 cm as large proportion of these are benign. □

## References

- Curado MP, Edwards B, Shin HR, Storm H, Ferlay J, Heanue M, Boyle P, eds. Cancer Incidence in Five Continents, Vol. IX. IARC Scientific Publications No. 160, Lyon, IARC Press. 2007.
- Fujii Y, Komai Y, Saito K et al. Incidence of benign pathologic lesions at partial nephrectomy for presumed RCC renal masses: Japanese dual-center experience with 176 consecutive patients. *Urology* 2008;72(3):598-602.
- Duchene DA, Lotan Y, Cadeddu JA et al. Histopathology of surgically managed renal tumors: analysis of a contemporary series. *Urology* 2003;62(5):827-830.
- Schachter LR, Cookson MS, Chang SS, Smith JA, Dietrich MS, Jayaram G, Herrell D. Frequency of benign renal cortical tumors and histologic subtypes based on size in a contemporary series: what to tell our patients. *J Endourol* 2007;21(8):819-823.
- Pahernik S, Ziegler S, Roos F et al. Small renal tumors: correlation of clinical and pathological features with tumor size. *J Urol* 2007;178(2):414-417.
- Schlomer B, Figenshau RS, Yan Y et al. Pathological features of renal neoplasms classified by size and symptomatology. *J Urol* 2006;176(4 pt 1):1317-1320.
- Snyder ME, Bach A, Kattan MW et al. Incidence of benign lesions for clinically localized renal masses smaller than 7 cm in radiological diameter: influence of sex. *J Urol* 2006;176(6 pt 1):2391-2396.
- Fergany AF, Hafez KS, Novick AC. Long-term results of nephron sparing surgery for localized renal cell carcinoma: 10-year follow up. *J Urol* 2000;163(2):442-445.
- McKiernan J, Yossepowitch O, Kattan MW et al. Partial nephrectomy for renal cortical tumors: pathologic findings and impact on outcome. *Urology* 2002;60(6):1003-1009.
- Pahernik S, Roos F, Hampel C et al. Nephron sparing surgery for renal cell carcinoma with normal contralateral kidney: 25 years of experience. *J Urol* 2006;175(6):2027-2031.
- Patard JJ, Shvarts O, Lam JS et al. Safety and efficacy of partial nephrectomy for all T1 tumors based on an international multicenter experience. *J Urol* 2004;171(6 pt 1):2181-2185.
- DeRoche T, Walker E, Magi-Galluzzi C, Zhou M. Pathologic characteristics of solitary small renal masses: can they be predicted by preoperative clinical parameters? *Am J Clin Pathol* 2008;130(4):560-564.
- Kutikov A, Fossett LK, Ramchandani P, Tomaszewski JE et al. Incidence of benign pathologic findings at partial nephrectomy for solitary renal mass presumed to be renal cell carcinoma on preoperative imaging. *Urology* 2006;68(4):737-740.