



# Clinicopathologic Outcomes of Cystic Renal Cell Carcinoma

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## Abstract

**Patients commonly undergo nephrectomy for cystic renal masses because a predictable proportion of these masses contain malignant elements. We hypothesize that these cystic renal cell carcinomas (cRCCs) are less aggressive than stage-matched solid renal cell carcinomas (RCCs) and herein demonstrate a zero rate of recurrence in a cohort of 61 patients with moderate follow-up.**

**Background:** The purpose of this study was to describe the clinicopathologic characteristics and oncologic outcomes of patients who underwent nephrectomy for cystic renal masses. **Patients and Methods:** Using an institutional review board-approved database, we retrospectively reviewed the clinical, pathologic, radiologic, and oncologic outcome data of patients who received nephrectomy for a complex cystic renal mass. **Results:** Sixty-one patients were identified who received nephrectomy for a complex cystic lesion. Average age was 64 years. Thirty-nine (64%) patients were male. At the time of resection, 1 (1.6%), 3 (4.8%), 53 (86.8%), and 4 (6.5%) had a Bosniak category II, IIF, III, and IV cystic lesion, respectively. Nineteen (31.1%) patients were initially managed expectantly but underwent surgery because of progression of complexity on follow-up. Mean pathologic tumor size was 3.3 cm (range, 0.7-12 cm). Forty-eight (78.6%) of the lesions were found to be malignant. Thirty-seven (77.1%), 5 (10.4%), 4 (8.3%), and 2 (4.1%) were stage T1a, T1b, T2a, and T3a, respectively. Clear cell was the most common histologic subtype (44%), followed by papillary (21.3%), and unclassified RCC (4.9%). With a mean and median follow-up of 48.4 and 43.0 months, respectively, no patients developed a local or metastatic recurrence. All patients were alive at last follow-up. **Conclusion:** In our series with moderate follow-up, cystic RCCs do not appear to recur or progress regardless of size, histologic subtype, or grade. These findings suggest the malignant potential of cRCCs is significantly less than solid RCCs. Further investigation is required to determine if cRCCs should be classified and managed independently from solid RCCs.

*Clinical Genitourinary Cancer*, Vol. 13, No. 1, 67-70 © 2015 Elsevier Inc. All rights reserved.

**Keywords:** Carcinoma, Cystic kidney disease, Neoplasm metastasis, Neoplasm staging, Nephrectomy, Renal cell

## Introduction

Complex cystic renal masses represent a diagnostic and management dilemma for clinicians. A substantial proportion of these cystic masses represent cystic renal cell carcinoma (cRCC), and are thought to represent a potential risk for the development of

advanced stage disease, metastasis, and death. Radiologic criteria have been established that can reliably predict the rate of malignant components within these masses, and these radiologic criteria are used to justify surgical excision of masses meeting radiologic criteria thresholds.<sup>1</sup> However, the risk of metastases and death from cRCC has not been thoroughly characterized. These risks have been demonstrated for solid renal masses, and the current pathologic staging system of renal masses is used in part to predict its risk for recurrence, metastasis, and death.<sup>2</sup> At present, the same system is used for cRCC, however, it is unclear whether the risk stratification provided by this staging schema is appropriate in cases of cRCC. Because staging is based at least in part on lesions size, and size in cRCC is often predominantly represented by its cystic fluid component and not its solid enhancing component, it might be that

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Submitted: Apr 9, 2014; Revised: Jun 21, 2014; Accepted: Jun 27, 2014; Epub: Jul 3, 2014

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# Outcomes in Cystic Renal Cell Carcinoma

the current staging system for cRCC overestimates its oncologic risk. We sought to shed light on this uncertainty by analyzing the clinicopathologic outcomes of a cohort of patients who underwent nephrectomy for a cystic renal mass, and compared those outcomes with historical data of patients who underwent nephrectomy for solid renal masses. We hypothesize that cRCC has a lower rate of recurrence and metastasis than solid renal cell carcinoma (RCC).

## Patients and Methods

Using an institutional review board-approved renal tumor database, we identified patients who underwent nephrectomy for a cystic renal mass suspicious for cRCC between October 2005 and March 2013 at a single institution. Procedures were performed by 1 of 3 surgeons. We retrospectively reviewed prospectively-collected clinical, pathologic, radiologic, surgical, and oncologic data of identified patients. All patients were received imaging with contrast-enhanced computed tomography (CT), magnetic resonance, or both, except in cases for which renal insufficiency precluded the use of intravenous contrast agents. All radiologic studies were reviewed independently by genitourinary-trained radiologists to confirm a cystic lesion concerning for cRCC. Patients in whom there was > 20% solid enhancing component on preoperative imaging were excluded in an attempt to avoid inclusion of a previously solid renal mass that had undergone central cystic necrosis. Enhancement was defined as > 15 Hounsfield units on CT scans. The most recent Bosniak renal cyst classification criterion was used.<sup>3</sup> All pathologic specimens were reviewed by a genitourinary-trained pathologist.

## Results

Seventy patients were identified who received nephrectomy for a complex cystic lesion suspected to be cystic cRCC. Nine of these patients were eliminated after review of their preoperative radiographic studies, which demonstrated solid masses with central necrosis or > 20% solid tumor component. These patients were suspected of having a solid mass with extensive necrosis, rather than true cystic neoplasms. After eliminations, there were 61 patients available for analysis.

Average age was 64 years. Forty (64%) patients were male. At the time of resection, 1 (1.6%), 3 (4.8%), 53 (86.8%), and 4 (6.5%) had a Bosniak category II, IIF, III, and IV cystic lesion respectively. Nineteen (31.1%) patients were initially managed expectantly but underwent surgery because of progression of complexity on follow-up imaging (Table 1).

The mean tumor size was 3.3 cm (range, 0.7-12 cm) on final pathology. Forty-eight (78.6%) of the lesions were found to be malignant. Thirty-seven (77.1%), 5 (10.4%), 4 (8.3%), and 2 (4.1%) were stage T1a, T1b, T2a, and T3a, respectively. Nineteen (39.6%), 26 (54.1%), and 3 (6.3%) of the masses were found to be Fuhrman grade 1, 2, and 3, respectively. Clear cell was the most common histologic subtype (n = 27, 44%), followed by papillary (n = 13, 21.3%) and unclassified RCC (n = 3, 4.9%) (Table 2).

In our cohort, 42 (68.9%) cystic masses were removed surgically on diagnosis, and the remaining 19 (31.1%) were removed after demonstrating progression on imaging after a period of observation. More than 93% were removed via partial nephrectomy, with a relatively even distribution between open, laparoscopic, and robotic techniques (Table 3).

Mean and median follow-up were 48.4 and 43.0 months (respectively). 41 (67%) of patients had at least 2 years of clinical

**Table 1** Clinical Characteristics of Patients Undergoing Nephrectomy for Cystic Renal Masses (n = 61)

Characteristic	Value
<b>Age (Range), Years</b>	64.6 (23-92)
<b>Sex</b>	
Male	39 (64%)
Female	22 (35%)
<b>Size at Diagnosis (cm)</b>	3.7 (1-9.6)
<b>Bosniak Category at Diagnosis</b>	
II	1 (1.6%)
IIF	3 (4.8%)
III	53 (86.8%)
IV	4 (6.5%)
<b>Number of Other Cystic Lesions</b>	
0	38 (61.3%)
1	11 (17.7%)
2	4 (6.5%)
>2	9 (14.5%)
<b>Mean Follow-Up (Months)</b>	48.4
<b>Median Follow-Up (Months)</b>	43.0
<b>Minimum Follow-Up (Months)</b>	
6	58 (95.1%)
12	48 (78.7%)
18	43 (70.5%)
24	41 (67.2%)
36	35 (57.4%)
48	26 (42.6%)
60	21 (34.4%)

follow-up, and twenty-one (34%) patients had at least 5 years of clinical follow-up. No patients in the cohort developed a local or metastatic recurrence during their follow-up. All patients were alive at last follow-up.

## Discussion

Cystic renal masses are commonly resected because a certain proportion of these lesions contain malignant elements. The Bosniak classification system has consistently demonstrated the ability to predict, based on imaging findings, the proportion of these cystic masses that will be malignant. Centers specializing in the radiologic evaluation of such lesions have demonstrated an 82% rate of malignancy within Bosniak category III cysts.<sup>4</sup> Despite a predictable rate of malignant cells present within these cysts, the disease-free survival after resection of these masses was 100% in our cohort. Other cohorts of patients with cRCC have been evaluated and show an identical 100% rate of recurrence-free and metastasis-free survival after surgical resection.<sup>5-7</sup> In a single study a patient presented with metastatic disease and a second had aortocaval lymphadenopathy, but this study did not specifically include cystic masses with significant solid enhancing component, thus leaving open the possibility that these masses were not truly cRCC but rather solid lesions with cystic necrosis.<sup>6</sup> The excellent outcomes reported herein and in the literature are better than would be expected for solid RCC of equivalent stage and grade. For example, using a nomogram

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