

Accuracy of Determining Small Renal Mass Management with Risk Stratified Biopsies: Confirmation by Final Pathology

Schuyler J. Halverson,* Lakshmi P. Kunju,* Ritu Bhalla,* Adam J. Gadzinski,* Megan Alderman,* David C. Miller,† Jeffrey S. Montgomery,* Alon Z. Weizer,* Angela Wu,* Khaled S. Hafez* and J. Stuart Wolf, Jr.*,‡

From the Departments of Urology (DCM, JSM, AZW, KSH, JSW), Pathology (LPK, RB, MA, AW) and Medical School (SJH, AJG), University of Michigan Health System, Ann Arbor, Michigan

Purpose: We assess the accuracy of a biopsy directed treatment algorithm in correctly assigning active surveillance vs treatment in patients with small renal masses by comparing biopsy results with final surgical pathology.

Materials and Methods: From 1999 to 2011, 151 patients with small renal masses 4 cm or smaller underwent biopsy and subsequent surgical excision. Biopsy revealed cell type and grade in 133 patients, allowing the hypothetical assignment of surveillance vs treatment using an algorithm incorporating small renal mass size and histological risk group. We compared the biopsy directed management recommendation with the ideal management as defined by final surgical pathology.

Results: Biopsy called for surveillance of 36 small renal masses and treatment of 97 small renal masses. Final pathology showed 11 patients initially assigned to surveillance should have been assigned to treatment (8.3% of all patients, 31% of those recommended for surveillance), whereas no patients moved from treatment to surveillance. Agreement between biopsy and final pathology was 92%. Using management based on final pathology as the reference standard, biopsy had a negative predictive value of 0.69 and positive predictive value 1.0 for determining management. Of the 11 misclassified cases, 7 had a biopsy indicating grade 1 clear cell renal cancer which was upgraded to grade 2 (5) or grade 3 (2). After modifying the histological risk group assignment to account for undergrading of clear cell renal cancer, agreement improved to 97%, with a negative predictive value of 0.86 and a positive predictive value of 1.0.

Conclusions: Our results suggest that compared to final pathology, biopsy of small renal masses accurately informs an algorithm incorporating size and histological risk group that directs the management of small renal masses.

Key Words: kidney; carcinoma, renal cell; kidney neoplasms; biopsy, needle; sensitivity and specificity

THE increasing incidence of renal cell carcinoma has largely been driven by the incidental detection of increasingly smaller renal masses.^{1–3} Although smaller mass size has been associated with improved outcomes, increased detection and intervention

have not resulted in a reduction in mortality from renal cell carcinoma.^{4,5} This disconnect is likely because many renal masses smaller than 4 cm are benign or nonaggressive tumors and will not impact patient survival.

Abbreviations and Acronyms

NPV = negative predictive value

PPV = positive predictive value

RCC = renal cell carcinoma

RMB = renal mass biopsy

SRM = small renal masses

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Study received institutional review board approval.

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‡ Correspondence: Department of Urology, University of Michigan, 3875 Taubman Center, 1500 East Medical Center Dr., Ann Arbor, Michigan 48109-5330 (telephone: 734-764-8397; FAX: 734-936-9127; e-mail: wolfs@umich.edu).

For another article on a related topic see page 702.

Editor's Note: This article is the first of 5 published in this issue for which category 1 CME credits can be earned. Instructions for obtaining credits are given with the questions on pages 780 and 781.

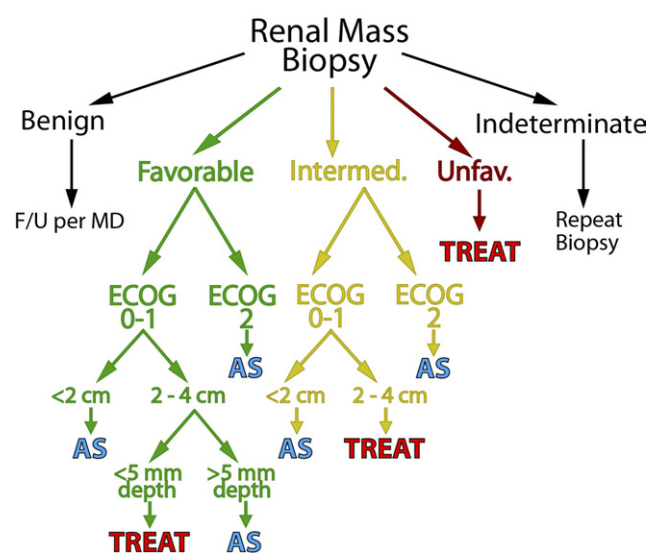


Figure 1. Biopsy directed management algorithm designating active surveillance (AS) vs treatment based on mass size, histological risk category, ECOG PS and depth of tumor invasion. F/U, followup.

While imaging cannot reliably distinguish benign from malignant renal masses, percutaneous RMB has been shown to be safe and accurate in determining the histology of small renal masses, frequently cited as accurate in more than 90% of cases.^{6–11} Coupled with a growing body of literature showing the safety of monitoring small renal masses, the incorporation of RMB results could allow clinicians to reduce the treatment burden for patients without compromising disease specific survival. In this study we assess the accuracy of percutaneous RMB combined with a risk stratified treatment algorithm to determine management in a cohort of patients with renal masses smaller than 4 cm.

MATERIALS AND METHODS

Subjects

Following institutional review board approval, records were retrieved on all 452 patients who underwent percutaneous biopsy for evaluation of renal masses between 1999 and 2011 at our institution. Clinical notes, imaging studies and pathology data were reviewed. The study group was then limited to 158 patients treated with partial or radical nephrectomy for renal masses smaller than 4 cm in greatest dimension on cross-sectional imaging. Excluding 4 cases with metastases to the kidney and 3 with von Hippel-Lindau disease, 151 cases remained for further analysis. Patients were counseled on the risks and benefits of RMB. Percutaneous RMB was performed by a radiologist under computerized tomography or ultrasound guidance, per operator preference, using previously described techniques.¹⁰

Risk Stratification

Our current management algorithm for SRM was developed based on consensus opinion independent of the study population (fig. 1). Factors considered in the algorithm include histological risk group, radiographic mass size, ECOG PS (Eastern Cooperative Oncology Group performance status) and depth of parenchymal penetration of the mass, whereby superficial masses are deemed more appropriate for surgery due to decreased perioperative risk. To use this algorithm all biopsies and final surgical pathology specimens were categorized into indeterminate, benign, favorable, intermediate or unfavorable histological risk groups.

The benign group included angiomyolipomas and oncocytomas. Favorable included chromophobe RCC, grade 1 clear cell RCC and grade 1 papillary type 1 RCC. Intermediate included grade 2 and unspecified clear cell RCC, grade 2 papillary type 1 RCC, untyped papillary RCC and unspecified oncocytic neoplasms. Unfavorable included all type 2 papillary RCCs, any grade 3 or 4 RCC subtype, urothelial carcinomas, unclassified RCCs and RCC with sarcomatoid features. Indeterminate signified that histology was unable to be confidently assessed for tissue diagnosis. These classifications were based on communications with our institution's pathologists, and may vary by institution, specifically with regard to what constitutes an unspecified oncocytic neoplasm.

To assess the impact of biopsy vs final pathology on management, our SRM algorithm was simplified to consider only radiographic mass size and histological risk category (fig. 2). All masses with favorable risk pathology were assigned active surveillance. All masses with unfavorable pathology were assigned treatment. Intermediate pathology masses were assigned active surveillance if the maximum radiographic dimension was less than 2 cm, or assigned treatment if the maximum radiographic dimension was 2 to 4 cm.

Analysis

Management was assigned based on the risk stratification of the initial biopsy. We then assessed the accuracy of that assignment according to final surgical pathology (assumed

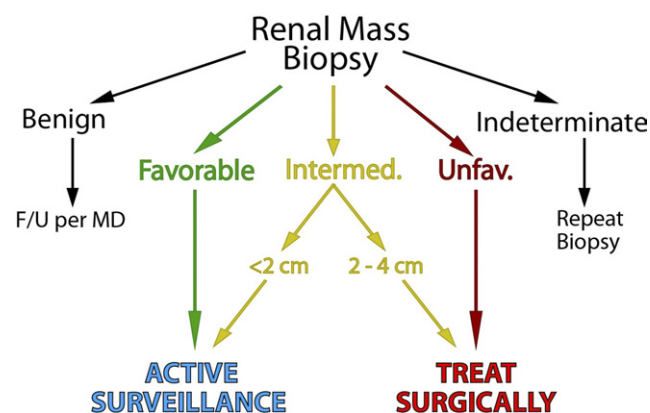


Figure 2. Simplified biopsy directed management algorithm designating active surveillance vs treatment based on mass size and histological risk category.

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