



Original article

## Declining incidence of benign lesions among small renal masses treated with surgery: Effect of diagnostic tests for characterization

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### Abstract

**Purpose:** We evaluated the changes in the incidence of benign lesions in surgically removed small renal masses (SRMs) and the effect of diagnostic tests for characterizing SRMs.

**Methods:** We included 2,707 patients receiving surgery for SRMs (<4 cm). Trends in the incidence of benign histology were evaluated according to the surgery year (period 1: 2001–2005, 2: 2006–2010, and 3: 2011–2015). Multivariable logistic regression analysis was performed to identify factors associated with benign lesions. Additionally, the number of surgeries prevented due to benign histological findings on renal mass biopsies (RMB) done on 206 patients with SRM during study period was evaluated.

**Results:** Benign histology was identified in 192 (7.1%) patients. Incidence of benign histology was 9.7%, 7.0%, and 6.3% for period 1, 2 and 3, respectively. The uses of multiphase computed tomography and magnetic resonance imaging were more common in periods 2 and 3 than in period 1 ( $P < 0.001$ ). The use of RMB in period 3 was higher than in periods 1 and 2 (0.8 vs. 0.9 vs. 9.0%,  $P < 0.001$ ). In multivariable analysis, older age, male sex, larger tumor size, and recent surgery year (period 3 vs. 1, odds ratio = 0.62,  $P = 0.028$ ) were independently associated with decreased odds of benign lesions. The number of prevented surgeries by performing RMB was 0, 10, and 39 in periods 1, 2, and 3, respectively.

**Conclusions:** Incidence of benign histology after surgery for SRMs declined during recent years, which might be associated with the recent increased use of RMB. © 2018 Elsevier Inc. All rights reserved.

**Keywords:** Carcinoma, Renal cell; Diagnosis; Incidence; Nephrectomy

### 1. Introduction

With the increased use of cross-sectional imaging modalities, the incidence of localized renal cell carcinoma (RCC) has been increasing during the last 3 decades, with the greatest increase observed in small renal masses (SRMs), usually defined as having a radiological diameter of <4 cm [1–3]. However, at the same time, the incidence of benign histology in surgical specimens has increased as the size of renal masses has decreased, even in renal masses suspected to be RCC on preoperative diagnostic examinations [4].

In the current clinical guidelines, contrast-enhanced multiphase computed tomography (CT) is considered the most reliable radiologic examination for characterizing renal masses before surgery [5]. However, the characteristics of some renal tumors remained indeterminate even with multiphase CT [6]. Because surgery for benign renal tumors is generally considered nonbeneficial [7,8], recent imaging studies and renal mass biopsy (RMB) have been widely used to identify histologic characteristics before definitive management; magnetic resonance (MR) imaging has been reported to be an effective method for distinguishing angiomyolipomas (AML) from RCC [9] and percutaneous RMB has shown high diagnostic accuracy for distinguishing benign lesions from RCC with a tolerable rate of complications [2,10]. Despite imaging or tissue

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acquisition suggesting a benign result, a fair number of patients still undergo surgery for their SRM [8,11–13].

As mentioned earlier, variable imaging studies and RMB have been widely used to identify tumor histology before definitive management, and these efforts may have impacted trends in the incidence of benign lesions after surgery for SRM over time. However, to our knowledge, no studies have been conducted to elucidate this issue because multiple factors (i.e., level of evidence, cost, insurance system in each country, etc.) could affect the use of diagnostic tests for SRMs. We thereby sought to evaluate the changes in the incidence of benign lesions in SRMs by surgery year, which might reflect the change in diagnostic tests used, with a large cohort of patients with SRMs during the past 15 years.

## 2. Methods

### 2.1. Patient cohort

A total of 2,707 patients who underwent curative surgery for SRMs (<4 cm) at our institute from January 2001 to December 2015, including 683 patients who underwent radical nephrectomy and 2,024 patients who underwent partial nephrectomy, were included in this study. Diagnostic procedures and surgical methods performed in the 2,707 patients are depicted in the Fig. The electronic medical records of these patients were retrospectively reviewed to retrieve the detailed demographic and clinical characteristics. This study was approved by the Institutional Review Board of Asan Medical Center.

### 2.2. Diagnostic tests

Preoperative cross-sectional imaging investigations, predominantly contrast-enhanced CT, were performed in the

entire study population. In patients with a preoperative estimated glomerular filtration rate of <60 ml/min/1.73 m<sup>2</sup>, contrast-enhanced MR imaging was preferentially considered instead of contrast-enhanced CT. Our institutional technical parameters of multiphase CT for the characterization of SRMs were reported previously [14,15]. In cases with unclearly characterized SRMs on contrast-enhanced CT, MR imaging or RMB or both were performed. The technical details and diagnostic performance of MR imaging in characterizing SRMs have been previously reported [16–18]. All images were interpreted by radiologists who were members of the institutional genitourinary radiology faculty.

Percutaneous RMBs were performed by our experienced radiologists in the genitourinary division of the radiology department of our institute. Data on diagnostic accuracy with the detailed procedure of RMB at our institute were previously reported [2]. All pathologic specimens obtained with RMB were assessed by genitourinary pathologists. Whether or not to perform surgery was decided by clinicians, considering the clinical situations in which the probability of RCC cannot be excluded based on the diagnostic test performed for characterizing SRMs.

### 2.3. Outcomes

The pathologic outcomes of surgical specimens were retrospectively reviewed. The biopsy and final pathologic outcomes were categorized as either malignant or benign histology. Benign histology included oncocytoma, AML, and other benign lesions. Each type of RCC and any tumor with malignant potential were considered as having a malignant histology. All surgical specimens were assessed by genitourinary pathologists.

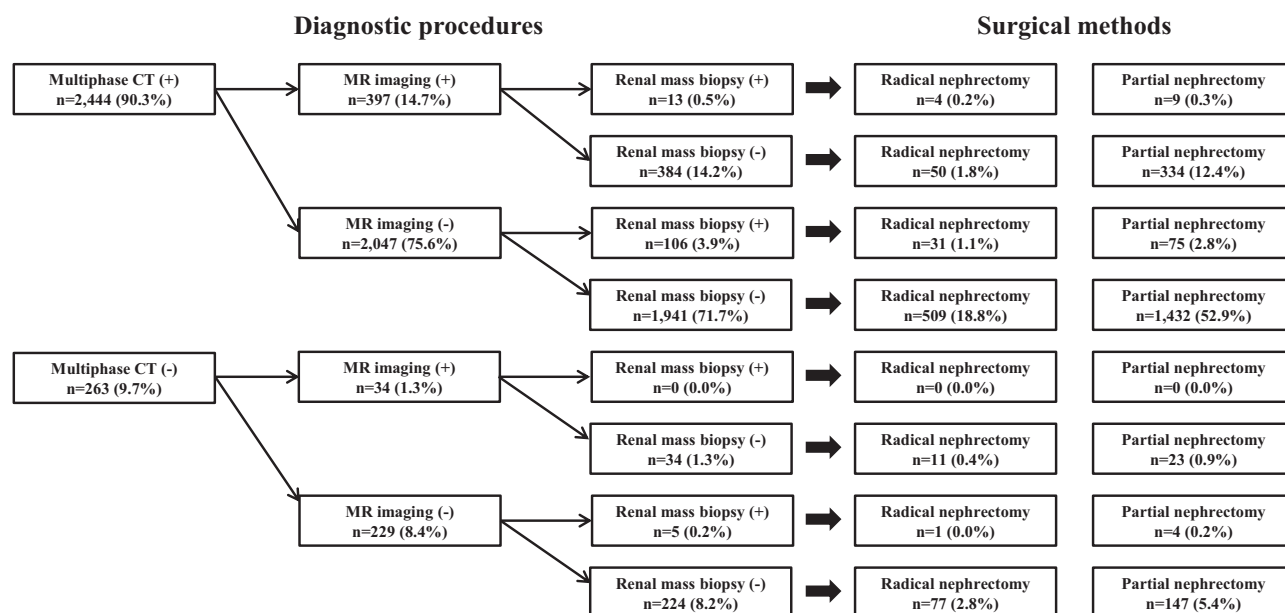


Fig. Diagram for diagnostic procedures and surgical methods. (+): patients underwent an examination, (-): patients did not undergo an examination.

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