The Usefulness of Chest X-Rays for T1a Renal Cell Carcinoma Surveillance

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Purpose: The overall incidence of pulmonary metastasis of T1 renal cell carcinoma is low. We evaluated the usefulness of chest x-rays based on the current AUA (American Urological Association) guidelines and NCCN Guidelines® for T1a renal cell carcinoma surveillance.

Materials and Methods: Between 2006 and 2012, 258 patients with T1a renal cell carcinoma were treated with partial nephrectomy, radical nephrectomy or radio frequency ablation with surveillance followup at our institution. A retrospective chart review was performed to identify demographics, pathological findings and surveillance records. The primary outcome was the incidence of asymptomatic pulmonary recurrences diagnosed by chest x-ray in cases of T1a disease. Our secondary outcome was a comparison of diagnoses by treatment modality (partial nephrectomy, radical nephrectomy or radio frequency ablation).

Results: Pulmonary metastases developed in 3 of 258 patients (1.2%) but only 1 (0.4%) was diagnosed by standard chest x-ray surveillance. Median followup in the entire cohort was 36 months (range 6 to 152) and 193 of 258 patients (75%) had greater than 24 months of followup. A mean of 3.3 surveillance chest x-rays were completed per patient. When assessed by treatment type, there was no significant difference in the recurrence rate for partial nephrectomy (0 of 191 cases), radical nephrectomy (0 of 22) or radio frequency ablation (1 of 45 or 2.2%) ($p = 0.09$).

Conclusions: Chest x-rays are a low yield diagnostic tool for detecting pulmonary metastasis in patients treated for T1a renal cel carcinoma. Treatment mode does not appear to influence the need for chest x-ray surveillance.

Key Words: kidney neoplasms; carcinoma, renal cell; neoplasm metastasis; mass chest x-ray; lung neoplasms

Abbreviations and Acronyms

CT = computerized tomography
CXR = chest x-ray
LVI = lymphovascular invasion
PN = partial nephrectomy
RCC = renal cell carcinoma
RFA = radio frequency ablation
RN = radical nephrectomy

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THE last 2 decades have brought much change to postoperative imaging surveillance for RCC. Since 1994, when Montie introduced a standardized protocol,[1] numerous adaptations have developed based on rates of metastases in retrospective series.[2–9] Although approximately 70% of RCC is pathological stage T1 (pT1),[10] the variation in surveillance for these patients is broad.[2–9,11,12]

Specifically related to chest surveillance of RCC, ACR® recommends CXR instead of chest CT due to its low cost and lower likelihood of incidental findings.[13] However, while CXR is the most commonly ordered surveillance study for all stages of RCC,[14]

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the overall incidence of pulmonary metastases for pT1 disease is less than 5%.[15]

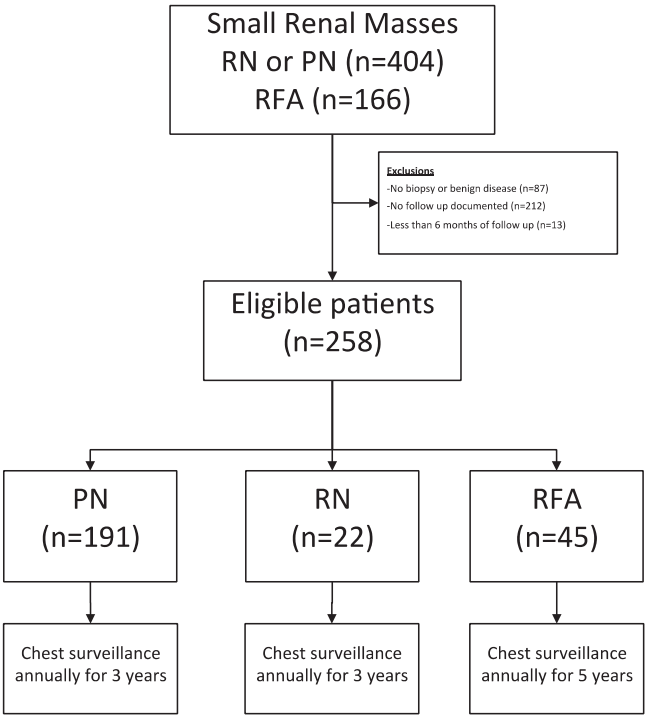
We retrospectively analyzed a single institution series of T1a RCC treated with curative intent to evaluate CXR as RCC surveillance based on the current AUA Guideline[16] and the NCCN Guidelines.[17] We hypothesized that annual postoperative CXR is a low yield screening tool to detect asymptomatic pulmonary metastases in this population.

MATERIALS AND METHODS

Patients

We identified 404 patients who underwent RN or PN from 2006 to 2012 and had pathological T1a renal cell carcinoma. In an additional 166 patients clinical T1a renal masses were treated with RFA during this period. Excluded from analysis were 87 patients without pathologically confirmed RCC, 212 who underwent imaging followup elsewhere and 13 with less than 6 months of followup at our institution. The figure shows our study flowchart.

Of the 258 patients who were eligible for study PN, RN and RFA were done in 191, 22 and 45, respectively. These patients were monitored for recurrence at periodic posttreatment followups, including physical examination, laboratory evaluation, CXR and abdominal ultrasound, CT or magnetic resonance imaging. The protocol was adapted during the study period based on contemporary recommendations. However, our current standard chest surveillance frequency is annually for 3 years in all patients treated with PN and RN, and annually for 5 years in all patients treated with RFA.



Study design

Methods

We retrospectively reviewed the records of eligible patients to analyze baseline demographics (age, gender and race), pathological findings (T stage, histological subtype, Fuhrman grade, LVI, sarcomatoid features and necrosis) and surveillance records (surveillance duration, CXR and chest CT results, and frequency of pulmonary metastases). All PN and RN specimens were analyzed at the university pathology service and retrospectively reviewed. RFA pathology was based on pretreatment core biopsy or biopsy at the time of treatment.

Patients with pulmonary metastases were identified and a detailed chart review was performed to understand symptomatology at diagnosis, indications for chest imaging and the concurrence of pulmonary metastases in relation to local or other metastatic recurrence. For patients with local recurrence before pulmonary metastases we reviewed the treatment of local recurrence to determine whether pathological stage changed. If these cases continued to be T1a, continued surveillance was included in this analysis. If these cases were up staged to T1b or greater, surveillance followup was censored at the time of up staging. For patients with metastatic recurrence surveillance followup was censored at the time of metastasis.

All CXRs of each patient were reviewed for pathological findings and categorized as ordered specifically for RCC surveillance or for other reasons. If a patient underwent surveillance chest CT instead, CXRs were reviewed to verify whether pathological findings could be identified for comparison.

Our primary outcome was the incidence of CXR diagnosed, asymptomatic pulmonary metastasis in all patients with T1a disease. Our secondary outcome was the incidence of pulmonary metastasis based on treatment type (PN, RN or RFA).

Statistical analysis was performed using IBM® SPSS®, version 22. Continuous variables were compared by 1-way ANOVA (age and tumor size) or the Kruskal-Wallis test (median imaging followup). Categorical data were analyzed using the chi-square test (gender, race, histology, Fuhrman grading, LVI and necrosis) or the Fisher exact test (sarcomatoid differentiation). Significance was considered at $p < 0.05$.

RESULTS

The table lists baseline demographics and pathological diagnoses in the 258 patients. Patients who underwent RN had significantly larger tumors than those treated with PN and RFA (3.1 vs 2.5 and 2.5 cm, respectively). Pathological findings were similar across the groups except for Fuhrman grade. RFA cases showed significantly less nuclear grades 3 and 4 than PN and RN cases (7% vs 23% and 18%, respectively). Approximately 20% of patients who underwent RFA did not have nuclear grading and all of them had no analysis of high risk features (LVI, sarcomatoid and necrosis) due to core tissue sampling.