Incidental Renal Masses

- Many solid renal masses are benign.
- The clinical behavior of RCC is variable and unpredictable.
- Most small RCCs are indolent

**Outline**

- Diagnostic imaging – where renal mass management begins...
- Treatment options – AUA view and rationale
- Future challenges

**Management Recommendations for Incidental Solid Renal Mass**

<table>
<thead>
<tr>
<th>Size</th>
<th>RCC</th>
<th>Surgery</th>
<th>MRI/Biopsy if hyperdense</th>
<th>Oncocytoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large (&gt;3cm)</td>
<td></td>
<td></td>
<td>Rarely benign</td>
<td></td>
</tr>
<tr>
<td>Small (1-3cm)</td>
<td></td>
<td></td>
<td>MRI/Biopsy if hyperdense</td>
<td></td>
</tr>
<tr>
<td>Very small (&lt;1cm)</td>
<td></td>
<td>Observe</td>
<td>Use thin sections</td>
<td>Oncocytoma</td>
</tr>
</tbody>
</table>

General Population

Silverman SG et al, Radiology 2008
Nephron Sparing Procedures

- Open, partial nephrectomy
- Laparoscopic partial nephrectomy
- Laparoscopic cryoablation
- Percutaneous ablation

Less Invasive

Rationale for NSS, including PTA

Survival after RN is worse than PN!

Surgery in which a benign renal mass is inadvertently resected is not only unnecessary – it is harmful! Hence, Biopsy! Percutaneous ablation maximizes nephron sparing!

Huang et al, Lancet Oncol 06

Staging of Renal Cell Carcinoma

- T1a: < 4.0 cm; limited to the kidney
- T1b: 4.0–7.0 cm; limited to the kidney
- T2: >7.0 cm; limited to the kidney
- T3a: extension into perinephric space
- T3b: extends to renal vein
- T3c: extends to IVC (infra-diaphragmatic)
- T4a: invades beyond Gerota’s fascia into adjacent organs
- T4b: extends to IVC (supra-diaphragmatic)

- N1: metastasis to a single lymph node
- N2: metastasis to multiple lymph nodes
- N3: fixed nodes at surgery
- N4: juxtaregional nodes
- M0: no distant metastasis
- M1: distant metastasis
Clinical T1 Renal Mass

CT or MRI; Percutaneous Biopsy as needed

T1a / Healthy  T1a / Surg risk  T1b / Healthy  T1b / Surg risk

Standard: PN  or  Standard: PN  or  Standard: RN  or  Standard: RN

Option: TA  or  Option: TA  or  Option: PN  or  Option: PN

Recomm: AS  or  Recomm: AS  or  Recomm: PN  or  Recomm: PN

Guideline Key

Standard: Health outcomes known to permit meaningful decisions; preferences are virtually unanimous.

Recommendation: Health outcomes known to permit meaningful decisions; preferences shared by majority but are not unanimous.

Option: Health outcomes not sufficiently known to permit meaningful decisions; preferences are unknown or equivocal.

Modified from AUA 2009  www.auanet.org/content

Clinical T1 Renal Mass

CT or MRI; Percutaneous Biopsy as needed

T1a / Healthy  T1a / Surg risk  T1b / Healthy  T1b / Surg risk

Standard: PN  or  Standard: PN  or  Standard: RN  or  Standard: RN

Option: TA  or  Option: TA  or  Option: PN  or  Option: PN

Recomm: AS  or  Recomm: AS  or  Recomm: PN  or  Recomm: PN

Modified from AUA 2009

Ablation vs PN: Meta-Analysis ’80–’06

Comment: How can the risk of metastases be greater w/ TA than AS?

AS group likely contains more benign disease...

Table 2  Estimates for Risk of Local Recurrence and Development of Metastases

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Local Recurrence</th>
<th>Metastatic Progression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial nephrectomy</td>
<td>1.9</td>
<td>0.6</td>
</tr>
<tr>
<td>Cryoablation</td>
<td>7.45</td>
<td>1.24</td>
</tr>
<tr>
<td>RFA</td>
<td>10.23</td>
<td>3.21</td>
</tr>
<tr>
<td>Active surveillance</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Mean age</td>
<td>1.05</td>
<td>1.0</td>
</tr>
<tr>
<td>Mean tumor size</td>
<td>2.13</td>
<td>2.74</td>
</tr>
<tr>
<td>Mean duration of follow-up</td>
<td>0.99</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Kunkle et al, Seminars in US, CT, and MRI 2009

vs Observation...

Percutaneous vs Surgical Approach

- AUA position, citing Kunkle et al, Meta-analysis, J Urol 2008, doesn’t make the distinction but rather refers to tumor ablation (TA) in the general sense.

- Percutaneous tumor ablation needs to be evaluated separately and compared to surgical, including laparoscopic approaches

Kunkle et al, J Urol 2008

High percentage of benign masses and masses for which there is no tissue diagnosis!

Kunkle et al, J Urol 2008
Renal Ablation: Meta-Analysis '96-'06

<table>
<thead>
<tr>
<th>N(masses)</th>
<th>Perc</th>
<th>Surgical</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>665</td>
<td>515</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N(pts)</th>
<th>Perc</th>
<th>Surgical</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>578</td>
<td>477</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean size</th>
<th>Perc</th>
<th>Surgical</th>
<th>P</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8 cm</td>
<td></td>
<td>2.5 cm</td>
<td>&lt; 0.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Biopsy</th>
<th>Perc</th>
<th>Surgical</th>
<th>P</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.57</td>
<td></td>
<td>0.88</td>
<td>&lt; 0.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% RCC</th>
<th>Perc</th>
<th>Surgical</th>
<th>P</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.84</td>
<td></td>
<td>0.64</td>
<td>&lt; 0.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prim Effect</th>
<th>Perc</th>
<th>Surgical</th>
<th>P</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.87</td>
<td></td>
<td>0.94</td>
<td>&lt; 0.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sec Effect</th>
<th>Perc</th>
<th>Surgical</th>
<th>NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.92</td>
<td></td>
<td>0.95</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Cx</th>
<th>Perc</th>
<th>Surgical</th>
<th>P</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.031</td>
<td></td>
<td>0.074</td>
<td>&lt; 0.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hosp Days</th>
<th>Perc</th>
<th>Surgical</th>
<th>P</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4</td>
<td></td>
<td>3</td>
<td>&lt; 0.05</td>
<td></td>
</tr>
</tbody>
</table>

Percutaneous Ablations (n=1083)

<table>
<thead>
<tr>
<th>Organ</th>
<th>CT</th>
<th>MRI</th>
<th>PET/CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>107</td>
<td>148</td>
<td>ETOH</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Kidney</td>
<td>213</td>
<td>177</td>
<td></td>
</tr>
<tr>
<td></td>
<td>74</td>
<td>29</td>
<td>-</td>
</tr>
<tr>
<td>Lung</td>
<td>17</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>MSK/Soft Tissue</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Adrenal</td>
<td>-</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>440</td>
<td>288</td>
<td></td>
</tr>
</tbody>
</table>

Cryo and RF

Stage 1 Renal Cell carcinoma

Both TA and PN are increasing...

RCC Over-Treatment?

"The availability and early successes of percutaneous tumor ablation is driving the treatment of small solid masses, presumed to be RCC, that otherwise would have been observed, or ignored, because of age or contraindications to surgery."

Silverman et al Radiology 2006

BWH Complications (2.1%)

- Hematuria – self-limited
- Perinephric hematoma
- Pneumothorax – (1) Rxed w/ catheter
- TIA (1) Rxed w/ endarterectomy
- Abscess/colo-caliceal fistula (1) Rxed with percutaneous drainage
- Antibiotic-associated colitis (1) – Rxed w/ sub-total colectomy
- Death (1) – related to GA

Clinical T1 Renal Mass

CT or MRI; Percutaneous Biopsy as needed

T1a / Healthy or T1a / Surg risk
T1b / Healthy or T1b / Surg risk

or

Standard: PN or Standard: RN

Option: TA or Option: AS

Option: AS

Recommend: AS

Modified from AUA 2009
Unable to predict behavior

- Preoperative nomograms that attempt to predict biologic behavior have been largely unsuccessful.
- Retrospective review of 862 pts with enhancing renal masses amenable to NSS evaluated age, symptoms, smoking hx, and mass size...
- Among nonsmokers with 3 cm masses, cancer risk increased with age in women, decreased in men; Little else could be derived from the data.
- Authors conclusions – improvements in biopsy needed!

Lane BR et al J Urol 2007

Clinical T1 Renal Mass

CT or MRI; Percutaneous Biopsy as needed

T1a / Healthy
T1a / Surg risk
T1b / Healthy
T1b / Surg risk

Standard: PN
Standard: PN
Standard: RN
Standard: RN

or
or
or
or

Active surveillance is now a recommended approach for a T1a mass and surgical risk.

Better to observe them?

- Many (25%) small (< 3 cm) enhancing masses are benign (Frank et al, J Urol 2004)
- As many as 50% of kidneys at necropsy contain small solid nodules that are called “adenomas” but are indistinguishable from renal cell carcinoma (Xipell et al, J Urol 1971)
- Most small RCC are low grade and their clinical behavior indolent (Kassouf et al, J Urol 2004)

Better to observe them?

- Metastases are extremely rare in the absence of growth (Chawla et al, J Urol 2006)
- Positive surgical margins do not predict local recurrence following partial nephrectomy (Yossepowitch et al, J Urol 2008)
- RCC mortality is increasing, and unaffected by small RCC treatment (Hollingsworth et al, J NCI 2006)

RCC Mortality Increasing

For all sizes, particularly RCC 4-7cm
Unaffected by small RCC treatment

Hollingsworth et al J Natl Cancer Inst 2006

Risk of Metastatic Disease

All associated with rapid interval growth!!

Observing solid masses

Better to observe them?

7/470=1.5%

Kunkle et al Seminars in US, CT, and MRI 2009
**Recent Data Supporting AS**

- MEDLINE search = 18 series; 880 pts w/ 936 masses (6 series; 259 pts w/ 284 masses sub-analyzed)
- Mean F/U = 33.5 mos
- Mean mass size = 2.3 cm
- Mean growth rate = 0.31 cm/yr; 65 masses (23%) didn't grow; none metastasized.
- Progression risk factors = age (75 vs 66), mass size (4 vs 2 cm), mass volume (66 vs 15 cm³), growth rate of (linear, 0.8 cm/yr vs 0.3 cm/yr or volumetric, 27 cm³/yr vs 6 cm³/yr)
- Reserve delayed intervention for tumors that exhibit significant linear or volumetric growth

Smaldone et al Cancer 2012

---

**Signs of Overdiagnosis**

- Increase in early stage disease
- Increase in resectability
- Longer 5-year survival rate
- Increase in the total number of cancers
- No change in number of advanced cancers
- No decrease in renal cancer deaths

Fulfilled in the case of RCC...

---

**What are the Challenges?**

- How can we minimize the cost and morbidity of evaluating and observing masses that are almost certainly benign?
- How much will an expanded use of biopsy reduce the number of unnecessary surgeries, ablations, or follow-up imaging exams?

---

**Challenges**

- How can we determine which small renal masses need treatment which do not?
- What is the appropriate ‘utilization rate’ for ablation?
- Who will be best served with active surveillance?

Prospective research!

---

**Renal Mass Management**

Diagnosis

- Imaging
- Biopsy

Treatment

- Staging
- Ablation

Follow-up

- Imaging
- Biopsy

Critical component!

Radiology’s Role