MRI renal mass protocol v1.0

Society of Abdominal Radiology Disease Focused Panel on Renal Cell Carcinoma

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The below protocol represents recommendations from the Disease Focused Panel (DFP) on Renal Cell Carcinomas which consists of 13 Abdominal Radiologists from 10 academic institutions. The recommended protocol was developed by reviewing and identifying common key elements in all of the members’ institutional renal mass protocols, and by iterative consensus by the DFP members. The panel’s collective expertise was utilized where evidence was not available.

**Protocol**

**Indications:** indeterminate renal mass; active surveillance; post-ablation surveillance; post nephrectomy surveillance

**Intravenous Contrast Material type, volume and injection rate:**
Type: Extracellular gadolinium-based contrast material
Volume: 0.1 mL/kg body weight.
Injection rate: 1-2 mL/second followed by 10-20 mL saline flush.

**Recommended sequences:**

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Plane</th>
<th>Slice thickness/gap</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D T2w single shot fast spin echo</td>
<td>Axial and/or coronal</td>
<td>Axial: 4-5mm/no gap Coronal: 5-6mm/no gap</td>
<td>Alternative: 2D axial T2w fast spin echo, 4-5mm/no gap</td>
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<tr>
<td>2D T1w gradient echo in/out phase</td>
<td>Axial</td>
<td>5-6mm/0.5-1mm</td>
<td>Alternative: 3D Dixon technique for in/out phase, 3-4mm/no gap</td>
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<tr>
<td>3D T1w SPGR with fat saturation pre-contrast</td>
<td>Axial and/or coronal</td>
<td>3-4mm/no gap</td>
<td></td>
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<tr>
<td>* 3D dynamic T1w SPGR with fat saturation post-contrast</td>
<td>Axial or coronal (same as pre)</td>
<td>3-4mm/no gap</td>
<td>Dynamic timing: 30 seconds, 90-100 seconds, 180-210 seconds. Note: pre- and dynamic post-contrast imaging can be obtained in the axial or coronal plane. After the dynamic series is acquired, obtain the other plane at 240 seconds. Obtain routine subtraction imaging with the dynamic series.</td>
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</tbody>
</table>
### Optional additional sequences

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Plane</th>
<th>Slice thickness</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D T1w SPGR with fat saturation delayed post contrast</td>
<td>Axial or coronal</td>
<td>3-4mm/no gap</td>
<td>5 – 7 minute delayed post contrast scan: perform in the axial plane if the dynamic images are coronal; perform in the coronal plane if the dynamic images are axial; additional sagittal acquisition through the kidneys can also be obtained</td>
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<tr>
<td>Diffusion weighted imaging</td>
<td>Axial</td>
<td>5-6mm/no gap</td>
<td>Suggested b-values: 0-50, 400-500, 800-1000 s/mm². May be helpful for nodal and metastatic disease evaluation</td>
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</tbody>
</table>

*: Obtain the pre- and dynamic post-contrast images in the same plane and with identical acquisition parameters, and acquire preferably at end expiration to facilitate subtraction imaging. Maintain constant receiver gain for all dynamic acquisitions before and after contrast material (i.e. set up entire dynamic series with a single pre-scan before the pre-contrast acquisition). Fat saturation can be performed with frequency-selective fat saturation strategies or using water-only reconstructed images from Dixon-based acquisitions. The latter provides in-phase/opposed-phase/fat-only reconstructions in the same breath-hold.

#### Examples of images at different phases following contrast administration

![Arterial phase](image1.png)

**Arterial phase**

![Corticomедullary phase](image2.png)

**Corticomедullary phase**

![Nephrographic phase](image3.png)

**Nephrographic phase**
Excretory phase