SUBJECT: RENAL SCAN - TUBULAR FUNCTION (Tc-99m-DMSA)

Overview

Tc-99m-DMSA is cleared from blood into the renal tubular cells, but not secreted into the tubular lumen. Thus, the Tubular Function Study depicts tubular function without interference from radioactivity in the collecting system.

Indications

- Diagnosis of acute and chronic pyelonephritis (1-3).
- Differentiation of renal masses from normal variants.
- Quantification of regional renal function (4).

Examination Time

- Initially: 15 minutes for injection of the radiopharmaceutical.
- Delayed images at 4 hours: 1 hour for image acquisition.

Patient Preparation

None.

Equipment & Energy Windows

- Gamma camera: Large field of view.
  - Rotating gamma camera.
- Collimators: Low energy, high resolution, parallel hole VXGP and Pin-Hole.
- Energy window: 20% window centered at 140 keV.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Tc-99m-dimercaptosuccinic acid (Tc-99m-DMSA) (5).
- Dose: 3 mCi for adults.
  - Adjust pediatric dose according to the pediatric dose chart.
- Technique of administration: Standard intravenous injection.

Patient Position & Imaging Field

- Patient position: Supine or prone.
- Imaging field: Kidneys (upper abdomen).

Acquisition Protocol

- 4 hours following injection, position the patient prone and acquire a digital POST image for approximately 600 seconds.
SPECT tomography (4,6-8):
Image acquisition parameters:

a) degrees of rotation: 360
b) number of images: 64.
c) time per image: 30 seconds.
d) Matrix 128X128X16.

Data processing SPECT:

a) Use Auto spect and reconstruct transverse, sagittal, and coronal image.
b) filter selection use bone default.

Data Processing/Display

Display

- Statics.
- Transverse, Sagittal, and Coronal.
- All labels apply—Right, Left, Anterior, etc….

Principle Radiation Emission Data - Tc-99m (9)

Physical half-life = 6.01 hours.

<table>
<thead>
<tr>
<th>Radiation</th>
<th>Mean % per disintegration</th>
<th>Mean energy (keV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma-2</td>
<td>89.07</td>
<td>140.5</td>
</tr>
</tbody>
</table>

Dosimetry - Tc-99m-DMSA (10,11)

<table>
<thead>
<tr>
<th>Organ</th>
<th>rads/5 mCi</th>
<th>mGy/185 MBq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal cortices</td>
<td>4.25</td>
<td>42.5</td>
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<tr>
<td>Kidneys (total)</td>
<td>3.15</td>
<td>31.5</td>
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<tr>
<td>Bladder wall</td>
<td>0.35</td>
<td>3.5</td>
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<tr>
<td>Liver</td>
<td>0.16</td>
<td>1.6</td>
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<tr>
<td>Total body</td>
<td>0.08</td>
<td>0.8</td>
</tr>
<tr>
<td>Bone marrow</td>
<td>0.11</td>
<td>1.1</td>
</tr>
<tr>
<td>Ovaries</td>
<td>0.07</td>
<td>0.7</td>
</tr>
<tr>
<td>Testes</td>
<td>0.03</td>
<td>0.3</td>
</tr>
</tbody>
</table>

References


Normal Findings