LEVEEN SHUNT STUDY
(Tc-99m-Macroaggregated Albumin or Tc-99m-Sulfur Colloid)

Overview

• The LeVeen Shunt Study evaluates the patency of connections between the peritoneal cavity and the venous system or other cavities by tracing the movement of non absorbable labeled particles.

Indications

• Evaluation of the patency of peritoneo-venous (LeVeen) shunts (1-3).
• Evaluation of the patency of other connections with the peritoneal cavity (4,5).

Examination Time

• 1 hour; delayed images may be necessary.

Patient Preparation

• None.

Equipment & Energy Windows

• Gamma camera: Large field of view.
• Collimator: Low energy, high resolution, parallel hole.
• Energy window: 20% window centered at 140 keV.

Radiopharmaceutical, Dose, & Technique of Administration

• Radiopharmaceutical: Tc-99m-sulfur colloid (1).
  0 Tc-99m-macroaggregated albumin (Tc-99m-MAA) (6).
  0 Tc-99m-albumin colloid (3).
• Dose:
  > Colloid: 3 mCi (111 MBq) (3).
  > Macroaggregated albumin: 5 mCi (185 MBq) (6).
• Technique of administration: Intraperitoneal:
  1. Injection is performed by the nuclear medicine physician.
  2. Ultrasound imaging may be useful in locating pockets of ascites.
3. Local anesthesia is usually used.

**Patient Position & Imaging Field**

- Patient position: Supine.
- Imaging field: Abdomen and chest.

**Acquisition Protocol**

- Mix the radiopharmaceutical within the ascites by ballotment of the anterior abdomen and/or rolling the patient side to side.
- Acquire ANT images of abdomen and chest (entire length of shunt tubing) at 5, 10, and 20 minutes:
  1. Acquire each image for 1 minute.
  2. Expose the images so that background activity is just visible.
- Timing of delayed images, if any, will depend on the findings in the initial images. Show the images through 20 minutes to the nuclear medicine physician.

**Protocol Summary Diagram**

![Diagram showing Tc-99m-MAA, Roll patient, Serial images, Action, Time]

**Data Processing**

- None.

**Optional Maneuvers**

- Direct injection into shunt tubing: The radiopharmaceutical may be injected directly into the shunt tubing rather than the peritoneal cavity (2).
- Evaluation of pericardio-peritoneal windows and diaphragmatic disruptions (4,5).

**Principle Radiation Emission Data - Tc-99m (7)**

- Physical half-life = 6.01 hours.
Radiation | Mean % per disintegration | Mean energy (keV)
--- | --- | ---
Gamma-2 | 89.07 | 140.5

**Dosimetry - Tc-99m-Sulfur Colloid (will vary greatly with patency of shunt) (8)**

<table>
<thead>
<tr>
<th>Organ</th>
<th>rads/3 mCi</th>
<th>mGy/111 MBq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>1.02</td>
<td>10.2</td>
</tr>
<tr>
<td>Spleen</td>
<td>0.63</td>
<td>6.3</td>
</tr>
<tr>
<td>Bone marrow</td>
<td>0.03</td>
<td>0.3</td>
</tr>
<tr>
<td>Total body</td>
<td>0.04</td>
<td>0.4</td>
</tr>
<tr>
<td>Ovaries</td>
<td>0.02</td>
<td>0.2</td>
</tr>
<tr>
<td>Testes</td>
<td>0.002</td>
<td>0.02</td>
</tr>
</tbody>
</table>

**Dosimetry - Tc-99m-Macroaggregated Albumin (will vary greatly with patency of shunt) (9)**

<table>
<thead>
<tr>
<th>Organ</th>
<th>rads/6 mCi</th>
<th>mGy/222 MBq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungs</td>
<td>1.10</td>
<td>11.0</td>
</tr>
<tr>
<td>Bladder wall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 hour void</td>
<td>0.15</td>
<td>1.5</td>
</tr>
<tr>
<td>4.8 hour void</td>
<td>0.27</td>
<td>2.7</td>
</tr>
<tr>
<td>Liver</td>
<td>0.09</td>
<td>0.9</td>
</tr>
<tr>
<td>Spleen</td>
<td>0.08</td>
<td>0.8</td>
</tr>
<tr>
<td>Total body</td>
<td>0.08</td>
<td>0.9</td>
</tr>
<tr>
<td>Kidneys</td>
<td>0.06</td>
<td>0.6</td>
</tr>
<tr>
<td>Ovaries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 hour void</td>
<td>0.04</td>
<td>0.4</td>
</tr>
<tr>
<td>4.8 hour void</td>
<td>0.05</td>
<td>0.5</td>
</tr>
<tr>
<td>Testes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 hour void</td>
<td>0.03</td>
<td>0.3</td>
</tr>
<tr>
<td>4.8 hour void</td>
<td>0.039</td>
<td>0.39</td>
</tr>
</tbody>
</table>

**References**


