Overview

The Gastro-esophageal Reflux Study demonstrates the retrograde movement of stomach contents into the esophagus in a quantitative fashion.

Indications

Detection and quantitation of gastro-esophageal reflux (1-3).
Persistent, recurrent heartburn
Non cardiac chest pain
Dysphagia
Nocturnal aspiration

*Exams ordered for indications which are not listed above need to be discussed with the Nuclear Medicine Physician.

Examination Time

30 minutes.

Patient Instructions / Scheduling

The patient should be fasting at least 8 hours.
Discontinue any promotility medications for 48 hours.

Lab / Image Correlation

No laboratory reports are required.
Obtain any previous GI images or reports.

Patient Preparation

Ensure the patient has been fasting at least 8 hours.
Place the abdominal binder below the ribs.
Drape patient and stretcher with paper chux. Administer radiopharmaceutical with patient sitting upright on stretcher.

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: 99m-Tc Sulfur Colloid or Microlite in 150 cc of 0.1 NHCl (1/10th normal HCl, to be ordered from pharmacy), and 150 cc of orange juice - wait 15 min. prior to administration. Dose: 300-500 uCi p.o.
Technique of administration: Oral administration in the upright position (use gravity to assist complete passage of the labeled orange juice into the stomach). 30ml of water may be given after ingestion of radiopharmaceutical to wash activity from the esophagus.

Patient Position & Imaging Field

Patient position:
1. Upright for radiopharmaceutical administration and initial image.
2. Supine for diagnostic image acquisition.

Imaging field: Lower chest and upper abdomen.

Acquisition Protocol (1)

Administer dose with patient upright. Acquire a single 60sec upright image to ensure activity has cleared the esophagus. If esophageal activity persists, have the patient drink 10-30 cc of water to clear. Wait 15 minutes before imaging.

Place sphygmomanometer anteriorly with the DePuy Rib Belt wrapped (which is kept in the storage room) tightly around the patient. Belt should be placed on the abdomen beneath the costal margin. Pin belt securely if necessary.

With the patient supine, position so entire stomach is in lower field of view, esophagus in upper field of view. DO NOT MOVE PATIENT DURING ENTIRE ACQUISITION.

Put the patient in the supine position and acquire dynamic (3sec/frame) digital images in the ANT projection:
1. 60seconds with no pressure on the binder.
2. 60 seconds with 20mm Hg.
3. 60 seconds with 40mm Hg.
4. 60 seconds with 60mm Hg.
5. 60 seconds with 80mm Hg.
6. 60 seconds with 100mm Hg.

Data Processing
1. Regions of interest are drawn around the esophagus on the images acquired for each pressure value and counts are determined (Ep). If any residual activity was not cleared from the lower esophagus, an ROI is drawn around the esophagus on the initial upright image to collect background counts (Eb).
2. A ROI is drawn around the stomach on the upright image or the first supine image (Go).
3. Gastroesophageal reflux is calculated for each pressure value as follows:

\[
\%\text{GER} = \frac{E_p - E_b}{G_o} \times 100
\]

**Optional Maneuvers**

In children the study may be performed as follows (1,4-7):

1. Mix 300 µCi (37 MBq) of Tc-99m-sulfur colloid with 100 mL of formula (for infants) or juice (for older children).
2. With patient supine (infants) or sitting (older children), acquire sequential POST digital images of the upper abdomen and lower chest for 1 second each while the patient is drinking.
3. When the patient has finished drinking, flush any radioactivity remaining in the esophagus into the stomach by having the patient drink nonradioactive fluid.
4. Acquire serial POST digital images (with the patient supine) of the same field of view for 10 seconds each for 30 minutes:
   a) intermittent abdominal pressure by hand during this collection is optional.
5. The study is interpreted by reviewing the images on the computer monitor in cine fashion. Selected images are filmed for the permanent record.

**Principle Radiation Emission Data - Tc-99m** (8)

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-Sulfur Colloid in Acidified Orange Juice** (9)

<table>
<thead>
<tr>
<th>Organ</th>
<th>rads/300 µCi</th>
<th>mGy/11.1 MBq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large intestine</td>
<td>0.16</td>
<td>1.6</td>
</tr>
<tr>
<td>Small intestine</td>
<td>0.08</td>
<td>0.8</td>
</tr>
<tr>
<td>Ovaries</td>
<td>0.03</td>
<td>0.3</td>
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<tr>
<td>Stomach</td>
<td>0.03</td>
<td>0.3</td>
</tr>
<tr>
<td>Whole body</td>
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<td>0.1</td>
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<tr>
<td>Testes</td>
<td>0.002</td>
<td>0.02</td>
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</table>
References


Normal Findings


JSM
PROTOCOL\05-6
Rev. 7/19/08

Note:

1. This procedure has not yet been reviewed by the Society of Nuclear Medicine procedure guideline development process.

2. This procedure adheres to the ACR Standards, 1997.