HEPATOBILIARY STUDY
Radiology Associates of Clearwater

Overview

The Hepatobiliary Study successively demonstrates hepatic perfusion, hepatocyte clearance, hepatic parenchymal transit, and biliary excretion as the radiopharmaceutical moves from the injection site to the intestine.

Indications

Diagnosis of acute cholecystitis (1,2)

Evaluation of abdominal pain (RUQ pain, epigastric pain).

Evaluation of extrahepatic biliary tract obstruction (3).

Evaluation of the post surgical biliary tract (4).

Detection of bile leaks (5).

Diagnosis of biliary atresia and other congenital anomalies of the biliary tract (6,7).

Evaluation of liver transplants (8).

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

Examination Time

Routine study: 1-3 hours. (Delayed images may be needed.)

Patient Instruction / Scheduling

For emergency studies, the patient must be NPO for at least 2 hours prior to the study. For elective studies, the patient should be NPO for a minimum of 4 hours (This includes TPN or tube feeding). Whenever possible, schedule elective studies early in the morning, and instruct the patient to remain NPO after midnight.

Duration of the test is 1-3 hours. HIDA with GBEF may require 3 hours.

Narcotic analgesics, such as morphine, Percocet, Demerol, etc., should not be taken prior to scanning, unless approved by the physician.
Lab / Image Correlation

Obtain a current serum bilirubin value, if available, and record on requisition.

Obtain films and reports of all previous nuclear medicine studies.

Obtain reports of recent abdominal US, abdominal CT, or OCG exams.

Patient Preparation

As described in scheduling, the patient must be NPO, ideally between 2 and 24 hours (9,10) and the most recent serum bilirubin and LFT’s should be obtained, if available.

Before injecting, be sure to ask the patient again if he has truly been NPO. Note if any narcotic analgesics have been given within 4-6 hours, as these can cause spasm of the sphincter of Oddi. If narcotic analgesics have been given check with the Nuclear Medicine physician before proceeding. Optimally, opiates should be held for a minimum of 4-6 hours.

If patient has fasted >24 hr, or is on parenteral nutrition, the patient may be pretreated with sincalide IV – check with the physician.

a) give the patient 0.02 ugm/kg of kinevac (analog of cholecystokinin). [Note: There has been one report of a threatened abortion in conjunction with infusion of kinevac (12).]

b) inject intravenously over 3 minutes to minimize side effects.

c) wait at least 20 minutes before beginning the study (13).

If evaluation of the gallbladder is not desired (bile leak study), no patient preparation is needed.

Equipment & Energy Windows

Gamma camera: Large field of view.

Collimator: Low energy, high resolution, parallel hole.

Energy window: 20% window centered at 140 keV.

Matrix 128x128.
**Radiopharmaceutical, Dose, & Technique of Administration**

Radiopharmaceutical: Tc-99m Disofenin (DISIDA), or Tc-99m Mebrofenin (Choletec), IV. (14).

Dose: 5 mCi (185 MBq).

Technique of administration: Standard intravenous injection.

**Patient Position & Imaging Field**

Patient position: Supine.

Imaging field: Upper abdomen, off centered to the right to include the entire liver.

**Acquisition Protocol (9)**

With the patient supine, position the gamma camera to include the upper abdomen (entire liver, gallbladder, duodenum, and proximal small bowel) and part of the cardiac blood pool in the field of view.

Inject the radiopharmaceutical after positioning is completed. (If positioning or venous access is difficult, position immediately after injection.)

Obtain further anterior images immediately and at 5, 10, 15, 20, 25, 30, 45, and 60 minutes (acquire for 90 sec per image). Dynamic imaging mode may be used as well. At the end of the exam or when the gallbladder is clearly seen, obtain right lateral and LAO views to differentiate gallbladder from renal or duodenal activity. Angle the camera (not the patient) 45 degrees for LAO images. Acquire the right lateral either cross table (patient against camera) or with patient in left lateral decubitus position (camera above table). Review the images with the nuclear medicine physician if there are any questions to determine the need for changes in intensity or for additional views from other projections.

If there is gallbladder non-visualization, absence of small bowel activity, or common duct dilatation at 60 minutes, obtain anterior, LAO, RAO, and right lateral views for the same time and intensity at 2 hours.

*If the gallbladder does not visualize and the patient is symptomatic, notify the Nuclear Medicine Physician prior to releasing the patient.*
Gallbladder Ejection Fraction Determination:

a. For certain conditions, it may be necessary to assess gallbladder contractile response following injection of 0.02 mcg/kg of Sincalide (Kinevac, Squibb) slow IV over 30 minutes. *If Sincalide is not available Ensure 8oz. orally may used instead. Acquisition is the same as for Sincalide.

b. Acquire dynamic images for 30 minutes (60sec per frame). Acquire anterior or LAO projection images, in order to best separate gallbladder from activity in the ductal system and bowel. Position the gallbladder in the upper left quadrant.

c. NOTE: SINCALIDE MUST NOT BE ADMINISTERED BEFORE THE PHYSICIAN OR HIS DESIGNEE HAS EXPLAINED THE ANTICIPATED SIDE EFFECTS TO THE PATIENT. THE INDIVIDUAL GIVING THE SINCALIDE MUST RECORD ALL SYMPTOMS EXPERIENCED, AND WHETHER OR NOT THE PRESENTING SYMPTOMS WERE RECREATED.

Morphine Augmentation (Only if requested by the Nuclear Medicine Physician)

May be requested to enhance gallbladder visualization. This is administered after visualization of the intestinal activity. Always review patient’s history of allergies, and review chart for confirmation. Administer 0.04 mg/kg morphine sulfate intravenously over 3 minutes; this should be diluted to a volume of 10 ml using normal saline. Acquire images at 5 minute intervals for 30 minutes after morphine administration. Imaging beyond 30 minutes is not required. If the hepatic activity has cleared completely, administer an additional 3 mCi of Methrofenin IV five minutes prior to Morphine Sulphate injection. (Note that Hospital policy for monitoring must be followed for doses >5.0 mg of Morphine Sulphate IV, otherwise, we do not come under Hospital Analgesia/Sedation Policy.)

Bile leak study:

Obtain anterior images immediately and at 5, 10, 15, 20, 25, 30, 45, and 60 minutes (acquire for 90 sec per image). Dynamic imaging mode may be used as well. Obtain RLAT and LLAT images after rolling the patient on their side.

Data Processing

Calculate the gallbladder ejection fraction using the cameras processing software. Draw regions of interest around the gallbladder somewhat loosely so
that all gallbladder activity is included, but care must be taken to exclude any activity outside of the gallbladder. Ensure the region is appropriate for each frame. Background activity should be drawn within the liver superior to the gallbladder.

**Principle Radiation Emission Data - Tc-99m (33)**

Physical half-life = 6.01 hours.

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

**Dosimetry - Tc-99m-Trimethylbromo-IDA (34)**

<table>
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<tr>
<th>Organ</th>
<th>rads/6 mCi</th>
<th>mGy/222 MBq</th>
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<tbody>
<tr>
<td>Large intestine</td>
<td>2.84</td>
<td>28.4</td>
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<tr>
<td>Small intestine</td>
<td>1.79</td>
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<tr>
<td>Gallbladder wall</td>
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<td>8.2</td>
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<td>Ovaries</td>
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<td>Liver</td>
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<td>Bladder wall</td>
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<tr>
<td>Whole body</td>
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<td>1.2</td>
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<tr>
<td>Testes</td>
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<tr>
<td>Red marrow</td>
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<td>0.2</td>
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**References**


Normal Findings


1. This protocol is in agreement with the Society of Nuclear Medicine Procedure Guidelines Hepatobiliary Scintigraphy 3.0, Approved June 23, 2001
2. This procedure adheres to the ACR Standards, 1997.

JSM
PROTOCOL/HIDA
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