



Austin Radiological Association
Nuclear Medicine Procedure
HEPATOBIILIARY STUDY
(Tc-99m-Mebrofenin)

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.
- Evaluation of extrahepatic biliary tract obstruction.
- Evaluation of the post-surgical biliary tract.
- Detection of bile leaks.
- Diagnosis of biliary atresia and other congenital anomalies of the biliary tract.
- Evaluation of liver transplants.

Examination Time

- Routine study: 1 hour. (Delayed images may be needed, up to four hours)
 - Study with CCK for GBEF: 105 minutes
 - Study with Ensure Plus for GBEF: 120 minutes

Patient Preparation

- If evaluation of the gallbladder is desired, the patient should have fasted between 4 – 6 hours.
- If evaluation of the gallbladder is not desired, no patient preparation is needed.
- No narcotic pain relievers for 6 hours prior to exam.
- If patient has not eaten in over 24 hours first pre-treat with CCK prior to Choletec administration.

Equipment & Energy Windows

- Gamma camera: Large field of view. (A dual head camera with 90° capability is optimal).
- Collimator: Low energy, high resolution, and parallel hole.
- Energy window: 15 -20% window centered at 140 keV.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Tc-99m-Mebrofenin.
- Dose: 3 - 6 mCi (222 MBq). PEDI by NACG chart.
- Technique of administration: Standard intravenous injection through in-dwelling catheter.

Patient Position & Imaging Field

- Patient position: Supine. Anterior for initial images, LAO when GBEF performed.
- Imaging field: Upper abdomen, off centered to the right to include the entire liver.

Acquisition Protocol

- Acquire one minute Dynamic frames for 60 minutes. Acquire static images in conjunction with dynamic imaging.
- If GB does not visualize in 60 minutes, check with the nuclear medicine physician to see what delayed images (paired ANT & R LAT) are needed.
- If CCK GBEF performed, acquire one minute Dynamic frames for 30 minutes
- Sincalide (CCK) is used to stimulate GB contraction to calculate ejection fraction
- CCK is infused by syringe pump over 30 minutes based on patient weight. .02 mcg/Kg. for patients age 17 and over. Reconstitute per package insert.
- If radiologist requests morphine for non-visualization of GB, medic will administer via slow injection at a rate of .04 mg/Kg, and patient is imaged dynamically for an additional 30 minutes. CCK is not typically administered s/p morphine, as morphine affects the sphincter of oddi and will decrease EF. A booster dose of approximately 1 mCi Tc-99m Mebrofenin may be given before morphine if biliary tree / liver activity appears insufficient.

- Alternative to Sincalide/CCK: When product is not available, or patient is under age 17, Ensure Plus (any flavor) may be used as a fatty meal substitute. After initial one-hour imaging, have patient sit up, drink one bottle (240ml) of Ensure Plus, lie down and image for 60 minutes. Process as usual. Normal value is $\geq 33\%$. Note that Ensure Plus Protocol was used. Also note percentage of Ensure Plus ingested, if less than 100%.

Data Processing

- Display static images created during dynamic imaging.
- Process CCK frames using workflow to calculate GBEF

Manual Calculation of GB ejection Fraction:

Calculate the gallbladder ejection fraction from:

$$\text{Ejection fraction (\%)} = \frac{A - B}{A} \times 100\%$$

Where: A = background corrected gallbladder counts at baseline
 B = background corrected gallbladder counts at end of 30 minute
 kinevac (CCK) infusion.

Normal CCK $\geq 35\%$. Normal Ensure Plus $\geq 33\%$

Method for timely correction of Data Analysis and reporting errors and notification of referring parties

- Data Analysis and reporting errors are reported to the interpreting physician and appropriate clinic manager for timely correction and notification of the referring physician via report addendum or STAT call if error is significant.

Principle Radiation Emission Data - Tc-99m

- Physical half-life = 6.01 hours.

<u>Radiation</u>	<u>Mean % per disintegration</u>	<u>Mean energy (keV)</u>
Gamma-2	89.07	140.5

Dosimetry - Tc-99m-Trimethylbromo-IDA (32)

<u>Organ</u>	<u>rads/6 mCi</u>	<u>mGy/222 MBq</u>
Large intestine	2.84	28.4
Small intestine	1.79	17.9
Gallbladder wall	0.82	8.2
Ovaries	0.61	6.1
Liver	0.28	2.8
Bladder wall	0.17	1.7
Whole body	0.12	1.2
Testes	0.03	0.3
Red marrow	0.02	0.2