Clinical Protocol: Hepatobiliary (HIDA) Scan

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POLICY BASIS FOR PROCEDURE

- To establish a protocol for hepatobiliary imaging.

DESCRIPTION OF STANDARD PROCEDURE

SCOPE

All Nuclear Medicine Technologists and Physicians must adhere to these guidelines when performing a Hepatobiliary (HIDA) scan.

PROCEDURE

Indications (1-3)

- Diagnosis of acute cholecystitis
- Evaluation of extrahepatic biliary tract obstruction
- Evaluation of the post-surgical biliary tract
- Detection of bile leakage
- Detection of functional gallbladder disorder (FGBD) (4)
- Sphincter of Oddi dysfunction (SOD) in patients with post-cholecystectomy right upper quadrant pain (5)

Exam Time

- Initial: 1 hour
- Delayed images: Varies pending Radiologist's request in patients with suspected cholecystitis or other medical concerns
    - 1 hour post injection
    - 4 hours post injection
    - 24 hours post injection
    - SPECT/CT images may be required as determined by the interpreting physician

Patient Preparation

- The patient should be fasting at least 4 hours for evaluation of the gallbladder. This includes discontinuation of tube feedings and total parenteral nutrition (TPN) for that time period.
- For patients with suspected cholecystitis, if patient has fasted more than 24 hours, the patient should be pretreated with Sincalide (CCK) as a slow infusion. The nursing staff caring for the patient does this pre-treatment. Infuse the patient with 0.02 ug/kg of Sincalide intravenously over 30 minutes to minimize any potential side effects. Wait at least 30 minutes before beginning the study (2). Note short wait times may cause false positive exams. Experience has shown that 1-2 hours is better.

- For post-cholecystectomy bile leak, no patient preparation necessary. SPECT/CT maybe very useful for localization.
- For evaluation of post-cholecystectomy sphincter of Oddi dysfunction (SOD), the patient fasts for at least 3 hours and then is injected with 0.02 ug/kg of Sincalide over 3 minutes (5).

Equipment and Energy Windows

- Large Field of View Gamma Camera
- Collimator: Low Energy High Resolution Parallel hole
- Energy Window: 20% window centered at 140 keV

Radiopharmaceutical, Dose and Technique of Administration

- 5.0mCi ^{99m}Tc- Mebrofenin (Choletec), intravenous (i.v.) injection

Patient Position and Imaging Field

- Position: Supine
- Imaging Field: Upper abdomen off centered to the right to include the entire liver
- Additional views may be obtained pending Radiologist preference
    - Right Lateral
    - Right or Left anterior obliques (RAO, LAO)
    - Matrix: 128 x 128 or 256 X 256

Acquisition Protocol

- Flow: Acquire dynamic images at 3 seconds per frame for 20 frames
- Function: Acquire dynamic images at 1 minute per frame for 60 frames
- Gallbladder Ejection Fraction (GBEF)
    - If visualization of gallbladder within 1 hour, proceed with the administration of Sincalide over 60 minutes. Consult the reading Radiologist for confirmation.
    - Continue dynamic imaging during Sincalide infusion.

- SOD calculation
    - 15 minutes following the infusion of Sincalide, inject 6 mCi Mebrofenin. Acquire dynamic images at 1 minute per frame for 60 frames
- Morphine augmentation in suspected cholecystitis

    - If there are no signs of gallbladder at 30 minutes and the liver appears to have minimal tracer, refer to Radiologist to determine if Morphine Sulfate should be administered over a 2-3 minutes
    - Calculation: 0.04 mg/kg or standard dose of 2 mg
    - Image another 30-60 minutes following administration

Data Processing

- In patients for GBEF calculation
  All GBEF calculations should be made using GBEF program in Xeleris workstations.

    - Using the ROIs drawn over the gallbladder and the background area, calculate

GBEF. Use the GBEF program in Xeleris workstations.

- Calculation: [GB counts (max) – GB counts (min)]/GB counts (max)
- Normal EF: 38% (2-4)

- In patients for SOD calculation

All SOD calculations should be made using GBEF program in Xeleris workstations.

a. Using the ROIs drawn on the liver and CBD, % emptying of CBD can be calculated: Abnormal CBDEF% is greater than 50% at 60minutes.

b.The table below lists other criteria that may be determined. (5)

TABLE 1
Criteria for Scoring Scintigrams

Criteria	Score
1. Peak Time	
a. Less than 10 min	0
b. 10 or more min	1
2. Time of Biliary Visualization	
a. Less than 15 min	0
b. 15 or more min	1
3. Prominence of Biliary Tree	
a. Not prominent	0
b. Prominent major intrahepatic ducts	1
c. Prominent small intrahepatic ducts	2
4. Bowel Visualization	
a. Less than 15 min	0
b. 15–30 min	1
c. More than 30 min	2
5. CBD Emptying	
a. By more than 50%	0
b. Less than 50%	1
c. No change	2
d. Shows increasing activity	3
6. CBD-to-Liver Ratio	
a. $CBD_{60} \leq Liver_{60}$	0
b. CBD_{60} higher than $Liver_{60}$ but lower than $Liver_{15}$	1
c. CBD_{60} higher than $Liver_{60}$ and equal to $Liver_{15}$	2
d. CBD_{60} higher than both $Liver_{60}$ and $Liver^{15}$	3

Optional Manuever - Alternatives to Sincalide for GBEF

- In instances of Sincalide (CCK) shortages an oral cholecystagogue such as Ensure Enlive (University Hospital) or BoostPlus (PHHS) may be used as a substitute (6). The initial part of the exam is the same as the usual exam. The gallbladder is filled for 60 minutes. Subsequently the patient is given the oral cholecystagogue to drink within a 10 minute period. After ingestion images are acquired for 1 h. GBEF of 33% or greater is considered normal for these.

Principle Radiation Emission Data

- Physical half-life: 6.01 hours
- Radiation: Gamma
- Mean % per disintegration: 89.07%

- Mean energy: 140.5 keV

Dosimetry (7)

- According to models recommended in ICRP 106, a 222 MBq injection for a Tc-99m Disofenin/Mebrofenin study would impart to an adult male an approximate effective dose of 3.8 mSv (0.38 rem). The critical organ for this study is the Gallbladder, which would receive 24.4 mGy (2.44 rad).

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