



Austin Radiological Association
Nuclear Medicine Procedure
SPHINCTER OF ODDI STUDY
(Tc-99m-Mebrofenin)

Overview

- The Sphincter of Oddi Study successively demonstrates hepatic perfusion, hepatocyte clearance, hepatic parenchymal transit, and biliary excretion as the radiopharmaceutical moves from the injection site to the intestine. A scintigraphic score is obtained from quantitative and visual criteria.

Indications

- Evaluation of Sphincter of Oddi dysfunction (SOD)
- 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 extrahepatic biliary tract obstruction.

Examination Time

- Routine study: 90 minutes

Patient Preparation

- The patient should have fasted at least 4 hours
- No narcotic pain relievers for 6 hours prior to exam.

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: 5 mCi (185 MBq). Pedi dose by NACG chart.
- 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

- Sincalide (CCK) is administered 15 minutes before radiopharmaceutical is injected.
- CCK is infused by hand, over 3 minutes, based on patient weight using .02 mcg/Kg.
- Acquire one minute Dynamic frames for 60 minutes. Acquire static images in conjunction with dynamic imaging.

Data Processing

- Display static images created during dynamic imaging.
- Draw ROI's and create time/activity curve to complete Sphincter of Oddi Worksheet, using Series ROI curve generic processing workflow

Manual Calculation of percent Common Bile Duct (CBD) emptying:

Calculate the percent CBD emptying from:

$$\text{CBD emptying (\%)} = \frac{A - B}{A} \times 100\%$$

Where: A = Peak CBD counts
B = CBD counts at 60 minutes

- When a continuously raising curve is obtained, the 30-min value is taken as peak CBD counts.

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

<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

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SPHINCTER OF ODDI STUDY

Patient Label

a. Time of peak liver activity: <10 min = 0; > 10 min = 1 -----	<input style="width: 100%; height: 20px;" type="text"/>
b. Time to first visualize biliary tree: <15 min = 0; > 15 min = 1-----	<input style="width: 100%; height: 20px;" type="text"/>
c. Prominent tree: not = 0, prom major intra = 1, prom small intra = 2-----	<input style="width: 100%; height: 20px;" type="text"/>
d. Time to first see bowel: <15 min = 0, 15-30 min = 1, >30 = 2-----	<input style="width: 100%; height: 20px;" type="text"/>
e. CBD emptying: >50% = 0, <50% = 1, no change = 2, increased act. = 3---	<input style="width: 100%; height: 20px;" type="text"/>
f. CBD/liver activity ratio at 60 min and 15 min:	<input style="width: 100%; height: 20px;" type="text"/>
1. CBD at 60 < liver at 60 = 0	<input style="width: 100%; height: 20px;" type="text"/>
2. CBD at 60 > liver at 60, but < liver at 15 = 1	<input style="width: 100%; height: 20px;" type="text"/>
3. CBD at 60 > liver at 60, and = liver at 15 = 2	<input style="width: 100%; height: 20px;" type="text"/>
4. CBD at 60 > liver at 60, and > liver at 15 = 3	<input style="width: 100%; height: 20px;" type="text"/>
Total -----	<input style="width: 100%; height: 20px;" type="text"/>

% CBD Emptying =
$$\frac{\text{Peak CBD counts} - \text{CBD counts @ 60 mins}}{\text{Peak CBD counts}} \times 100$$

Hepatobiliary scintigraphy score: normal < 5, max score = 12, higher numbers correspond to slower kinetics.

A Noninvasive Test of Sphincter of Oddi Dysfunction in Postcholecystectomy Patients:
 The Scintigraphic Score, J Nuc Med 1992, 33:1216-1222

EXAM PREP:

Inform patient to remain VERY still for exam – no talking, no moving

Evaluate your images for motion, and motion correct if necessary.
This is to ensure good ROI's and time / activity curve.

ROI's:

Liver: Draw in the right lobe excluding visible bile ducts

CBD: Draw in the lowest portion of the CBD not affected by superimposed bowel activity

SCORING PARAMETERS:

Score the following parameters, a-f, on worksheet:

- a. Time of peak liver activity. Obtained from the right lobe time / activity curve
- b. Time at which intrahepatic biliary tree was first visualized, determined from the static images.
- c. Prominence or dilatation of the biliary tree as determined from the static images as a subjective evaluation.
- d. Time at which bowel was first visualized as determined from the static images.
- e. Percent CBD emptying as calculated from the CBD curve using the equation on the worksheet.
- f. CBD-to-Liver ratio. This parameter is obtained from the static images by visually comparing the CBD at 60 min (CBD60) to the liver parenchyma at 60 (Liver60) and liver parenchyma at 15 min (Liver15). This ratio represents activity retained in the CBD at the end of the study.

The range of the final score varies from a minimum of 0 to a maximum of 12, the higher numbers corresponding to the slower kinetics.