UNM HOSPITALS

Hepatobiliary Study – Cholecystitis

Last updated 06.2018

Special Instructions	For patients who have not eaten a meal for ~24 hours or more, check with the radiologist about possible administration of Sincalide (CCK) or Ensure Plus, if CCK is unavailable, prior to starting the examination. For ED patients or inpatients, confirm whether gallbladder ejection fraction will be measured. If the gallbladder does not fill after 1 hour, check with the radiologist for possible reinjection of radiopharmaceutical and additional images (see below). To be performed at UNMH and SRMC.

Radiopharmaceutical: Tc-99m Choletec (mebrofenin) or Hepatolite (disofenin, DISIDA)

Dose (Adult/Pediatric): Refer to Nuclear Medicine Dose Chart

Route of Administration: Intravenous for radiopharmaceutical

- Slow intravenous administration of sincalide (CCK) over 2-3 min
  - if needed prior to radiopharmaceutical administration, for prolonged fast
- Slow intravenous administration of sincalide (CCK) over 60 min
  - if pump is available after gallbladder filling, to determine gallbladder ejection fraction
- Slow intravenous administration of sincalide (CCK) over 2-3 min
  - if pump is not available (e.g., if broken) after gallbladder filling, to determine gallbladder ejection fraction
  - **Must consult with radiologist (attending radiologist preferred) before utilizing this option**

- Oral administration of Ensure Plus or Boost Plus (1 can, 8 oz): It is important to advise patient to drink as fast as possible, and to begin imaging promptly after patient finishes drinking the bottle.

Patient Preparation: **Please ensure the following**:

- NPO for 4 hours (minimum 2 hours in small children)
- Morphine or other opioid derivates (e.g., hydromorphone (Dilaudid), Fentanyl) should preferably be held for 4 hours.
  - These medications cause contraction of the sphincter of Oddi and will prevent transit of radiopharmaceutical into small bowel.
  - Ketorolac (**Toradol**) or butorphanol (**Stadol**) can be used as a pain alternative at the discretion of the referring clinical service (Olsen JC, et al., Acad Emerg Med. 2008 Aug;15(8):718-22).
- If the patient needs CCK, either for pretreatment due to a prolonged fast or as part of gallbladder ejection fraction, morphine and morphine

derivatives must be withheld for 4 hours.

- If the patient will not need CCK (i.e., evaluation is for acute cholecystitis only and the patient has been eating normally), morphine and morphine derivatives will not interfere with gallbladder visualization and do not need to be withheld (with note that the small bowel may not be visualized). Consult with the radiologist if questions.
- If patient has **not** eaten a full meal for approximately 24 hours, consult with the radiologist about pretreatment with CCK via hand intravenous infusion over 2-3 minutes.
    - Wait at least **15 minutes** after CCK prior to radiopharmaceutical administration.
    - Instead of CCK, 1 can of Ensure Plus or Boost Plus may be consumed orally by the patient for pretreatment. Wait **4 hours** after Ensure Plus or Boost Plus to begin imaging (to allow gastric emptying to complete).
    - **If uncertain (e.g., patient ate very little, patient had only clear liquids, etc.), err on the side of giving the pretreatment.**

Equipment Setup:

Gamma Camera:

- LFOV camera for adult studies
- LFOV camera with ZOOM for studies in small children as appropriate

Collimator:

- SPECT-CT/E-CAM/EVO: High resolution

Computer setup:

Anterior:

- Dynamic acquisition
- 128 x 128 matrix
- Zoom 1.0 (greater for children)
- 1 min/image, 60 images

Rt lateral and any delayed images:

- Static acquisition
- 128 x 128 matrix
- Zoom 1.0 (greater for children)
- 5 min/image, 1 image in each requested projection

During CCK infusion (for chronic cholecystitis, 60-minute infusion):

- Dynamic acquisition

- 128 x 128 matrix
- Zoom 1.0 (greater for children)
- 1 min/image, **60 images**

During CCK infusion (for chronic cholecystitis, 2-3 minute hand infusion if pump not available):

- Dynamic acquisition
- 128 x 128 matrix
- Zoom 1.0 (greater for children)
- 1 min/image, **15 images**

Patient Positioning:

Anterior:

- Liver at top left of screen so that gallbladder and bowel can be visualized.

Right lateral:

- Liver at top center of screen

Procedure:

For acute cholecystitis:

- Begin imaging immediately after injection
- Anterior dynamic images for 60 minutes as above
- Confirm with radiologist if the gallbladder has filled; may need a right lateral image as above.
- If the gallbladder has filled, check with the radiologist to see if CCK (for chronic cholecystitis evaluation) is desired.

If the gallbladder does not fill after 1 hour, check with the radiologist for one of these options:

Both options: Likely reinjection of radiopharmaceutical if little tracer remains in liver/CBD

Option 1: Delayed imaging
be used if poor hepatic function and/or little to no bile production in 1st hour). Timing:

- Must be used if poor hepatic function and/or little to no bile production in 1st hour).
- Timing:
  - Consult with radiologist
  - Typically 4 hours post initial injection if normal bile production/liver function;
  - May need longer delays for poor liver function and/or delayed/decreased bile production (e.g., 24 hours)

Option 2: Morphine

- Have the clinical service administer morphine weight based 0.04

mg/kg in children and adults
  - Typically 2-4 mg in adult patients, max dose 4 mg or per referring clinical service);
  - Maximum dose in children of 2 mg or per referring clinical service
- Then likely reinject radiopharmaceutical (confirm with radiologist) followed by dynamic imaging (1 minute/frame, anterior projection) for at least 30 minutes.

For chronic cholecystitis:

- Initial imaging as for acute cholecystitis above.
- Confirm that the gallbladder has filled within 1 hour with the radiologist. Do not administer CCK if the patient received morphine to visualize the gallbladder.
- For pump infusion of CCK for GBEF (60 minutes), strongly prefered:
  - Have patient void prior to beginning imaging.
  - Administer CCK, dose per dose sheet, slowly over 60 minutes (be sure that the tubing is filled with CCK prior to beginning imaging); image over gallbladder during entire **60-minute** acquisition.
  - The patient may leave briefly to void if needed during imaging, in which case, individual ROIs may need to be drawn over the gallbladder on the initial and final images (with decay correction) to determine the GBEF.
- For hand infusion of CCK for GBEF (2-3 min infusion, 15-min acquisition), only with approval of attending radiologist:
  - Administer CCK, dose per dose sheet, by hand over 2-3 minutes; image over gallbladder for **15 minutes**
- For oral administration of Ensure Plus or Boost Plus for GBEF (patient drinks the Ensure/Boost Plus, then image for 60 minutes):
  - Have patient void prior to beginning imaging.
  - The patient may leave briefly to void if needed during the images, in which case, individual ROIs may need to be drawn over the gallbladder on the initial and final images (with decay correction) to determine the GBEF; image over gallbladder during entire **60-minute** acquisition.

Reference normal values for GBEF:

- CCK, 60-minute pump infusion and imaging: **≥38%**
- Ensure/Boost Plus, 60-minute infusion and imaging: **≥33%**
- CCK, 2-3 minute hand infusion and 15-minute imaging: **≥35%**

Processing:

Anterior 1-hour dynamic images:

- Merge each 5 images together to display 5-min/frame

Post-morphine images (if obtained):

- Merge each 2 images together to display 2-min/frame
- Labeled savescreens/lightboxes of any additional views or delayed images

Gallbladder ejection fraction:

For 60-minute pump infusion:

- Draw ROI around gallbladder, calculate EF over the 60-minute acquisition. If the patient moved or voided during the acquisition, GBEF may be determined from [(initial GB counts) – (final GB counts)]/[(initial GB counts)] or similar method, with decay correction. Merge each 4 images together to display 4-min/frame

For 2-3-minute hand infusion:

- Draw ROI around gallbladder, calculate EF over the 15-minute acquisition. Display 1-min/frame

Items Required For Complete Study:

- Raw data of all images to PACS
- Lightbox/savescreen of anterior images merged to 5 min/image
- Static or dynamic display of any additional projections/delayed images as noted above
- Transfer all digital images to PACS
- Complete the examination in RIS

References:

1. SNMMI Procedure Standard for Hepatobiliary Scintigraphy 4.0 (June 4, 2010) http://snmmi.files.cms-plus.com/docs/Hepatobiliary_Scintigraphy_V4.0b.pdf. Accessed June 2018.

2. https://www.eanm.org/content-eanm/uploads/2017/01/EANM_Dosage_Card_040214.pdf EANM Dosage Card. Accessed June 2018.